

PRODUCT DATA

Accelerometer — Type 4505 A

Accelerometer Type 4505 A is a piezoelectric accelerometer with low sensitivity to extraneous environmental effects. This is achieved through its patented ThetaShear® design. The accelerometer has been designed with particular emphasis on low mass – it has a lightweight titanium housing – and small physical dimensions combined with a relatively high sensitivity. The accelerometer is hexagonal for ease of mounting. Type 4505 A has a top-mounted Microdot (10–32 UNF) connector for attaching cables and a 10–32 UNF–2 A mounting stud on its base. The accelerometer casing is electrically insulated from signal ground.

USES

- Vibration measurements for signature analysis
- Vibration measurements for test cells
- Vibration measurements for product and quality control

FEATURES

- Low-weight ThetaShear construction giving high sensitivity/weight ratio and low sensitivity to environmental factors
- High resonance frequency giving a (+10%) frequency range up to 16 kHz
- Electrically insulated for ground-loop protection
- Operating temperature range –54 to +230°C (–65 to +446°F)
- High transverse resonance frequency > 20 kHz



ThetaShear

The ThetaShear design is illustrated in Fig. 2. A slotted, cylindrical stanchion holds a central, seismic mass flanked by two piezoelectric disks. This assembly is clamped rigidly by the cover. The parts are firmly held together without the use of any bonding agent other than molecular adhesion, a principle which has proved extremely reliable in Brüel & Kjær DeltaShear™ accelerometers.

4505A

Environmental Sensitivity

One of the most troublesome environmental factors encountered when using piezo-electric accelerometers is temperature transients. By careful choice of materials and mechanical design, this has been reduced to a minimum.

The ThetaShear design also provides excellent immunity to other environmental effects such as base strains, magnetic sensitivity and acoustic fields.

Calibration

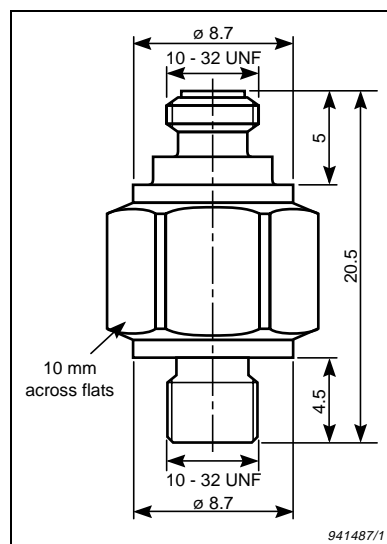
Each Type 4505 A is individually calibrated and supplied with a comprehensive calibration chart. Long-term stability and reliability is ensured by artificial ageing during the production process. Field checking and system calibration are straightforward using Brüel & Kjær hand-held Vibration Calibrator Type 4294.

Ground Insulation

The base of the accelerometer is insulated from signal ground with a ground insulation of greater than $10\text{M}\Omega$. Ground loops, which can be particularly troublesome during multichannel measurements, are avoided by insulating the sensor from the body and thus from the test object.

Cables

Fig. 1
Physical dimensions
(mm) of
Type 4505 A



For normal use, the 1.2 m Cable AO 0038, or the 3 m, reinforced Cable AO 0122 is recommended. Both these cables are Teflon-insulated for use up to 250°C (480°F).

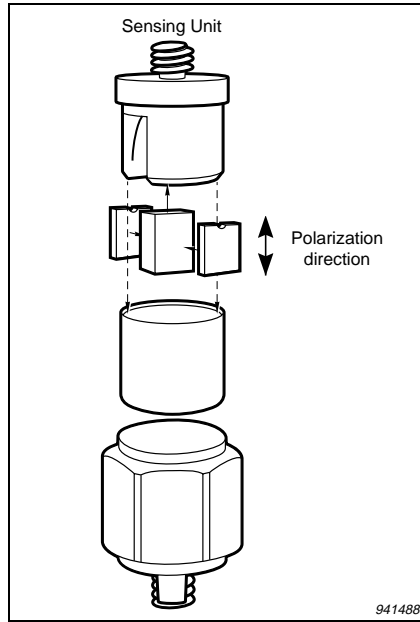
Extra connectors are available as UA 0130, a set of 25 10-32 UNF Microdot coaxial plugs, and UA 0730, a set of 25 reinforced Microdot connectors. A special assembly, QA 0035, is available for mounting these plugs on cables.

Extension Adaptor Set UA 0186, comprising 25 10-32 UNF extension connectors JJ 0032, is used for coupling cables with this type of connector.

In order to distinguish between the individual accelerometers in a multichannel measurement setup, coloured cable markers are available for cable AO 0038. See the Ordering Information.

Cable Clamping

Fig. 2
*Exploded view of
Type 4505 A*



When using miniature accelerometers, the accelerometer cable can affect the measurement result because of forces exerted by the cable on the accelerometer connector. This causes amplitude irregularities in the output from the accelerometer at frequencies up to approximately 200 Hz. However, this problem can be reduced by using a flexible cable. To effectively reduce the problem at low frequencies, it is recommended that you clamp the cable. One way of doing this is to make a small loop in the cable close to the accelerometer (maximum diameter 30 mm) and to clamp the cable beside the base of the accelerometer with mounting wax or double-sided tape. This also reduces the possibility of dynamically induced noise being generated by the cable.

Specifications – Accelerometer Type 4505 A

Dynamic

Charge Sensitivity (at 159.2 Hz): 0.3 pC/ms², 3 pC/g (25%)
Frequency Response (10%): 16.6 kHz ±10% re sensitivity at 159.2 Hz

Note: This specification is only valid if the cable is clamped as described in this Product Data

Mounted Resonance Frequency: 50 kHz
Transverse Resonance Frequency: > 20 kHz
Transverse Sensitivity: ≤ 5% of sensitivity
Undamped Natural Frequency: 70 kHz

Electrical

Capacitance: 1000 pF
Polarity: Positive (for an acceleration directed from base into the accelerometer body)
Ground Insulation (@100 V): > 10 MΩ

Environmental

Ambient Temperature Range: -54 to +230°C (-65 to +446°F)

Humidity: Sealed
Acoustic Sensitivity (154 dB SPL): 0.04 ms⁻²
Temperature Transient Sensitivity: 1 ms⁻²/°C
Base Strain Sensitivity (3 Hz lower limiting frequency): 0.05 ms⁻²/με
Magnetic Sensitivity (50 Hz): 12 ms⁻²/tesla

Physical

Case Material: Titanium, ASTM Grade 2
Piezoelectric Element:
Design Configuration: ThetaShear¹
Material: Type PZ 23
Seismic Mass: 0.8 gram (0.03 oz.)
Connector: Top mounted 10–32 UNF coaxial
Mounting: 10–32 UNF–2A mounting stud
Mounting Surface Flatness: < 10 μm
Dimensions (H×Diam.): 16 mm×10 mm (across flats)
Weight: 4.9 gram (0.17 oz.)

Note: All values are typical at 25°C (77°F), unless measurement uncertainty is specified. All uncertainty values are specified at 2σ (i.e. expanded uncertainty using a coverage factor of 2)

1. The ThetaShear design is a Brüel & Kjær patent

Ordering Information

Type 4505 A Accelerometer
Includes the following accessories:
Carrying box
Individual Calibration chart

AC0005 Teflon-insulated, low-noise cable (excl. connectors; available per metre)
UA 1243 3×30 pieces of red/green/yellow cable markers
UA 1244 As above, for cable AC0005

Optional Accessories

CABLES

AO0038 1.2 m (4 ft) super low-noise accelerometer cable, Teflon-insulated
AO0122 3 m (10 ft) super low-noise reinforced accelerometer cable, Teflon-insulated

CONNECTORS

UA0130 Set of 25 10–32 UNF Microdot connectors JP0012
UA0730 Set of 25 reinforced Microdot connectors JP0056
UA0186 Set of 25 10–32 UNF extension adaptors JJ0032

TOOLS

QA0035 Connector Assembly Tool for cable AC0005 and connector JP0012

Brüel & Kjær reserves the right to change specifications and accessories without notice