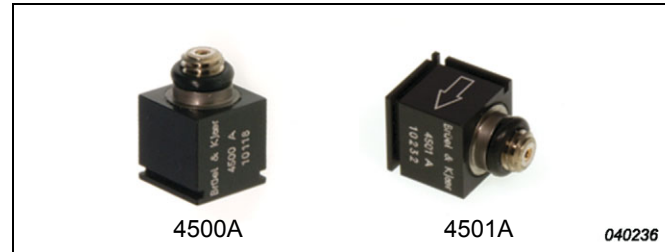


PRODUCT DATA

Piezoelectric Accelerometer Cubic Charge Accelerometers — Types 4500 A and 4501 A

Types 4500 A and 4501 A are cubic piezoelectric ThetaShear® accelerometers. These cubic accelerometers have low sensitivity to extraneous environmental effects, which is achieved through the ThetaShear design. The accelerometers feature a 10–32 UNF connector. On Type 4500 A, it is positioned on the top surface, which is perpendicular to its main axis. On Type 4501 A, it is positioned on the side surface, which is parallel to its main axis.

The piezoelectric element used is the PZ 23 lead zirconate titanate element. The housing is aluminium.



USES AND FEATURES

USES

- General purpose multi-axis vibration and shock measurements on low-mass structures and in confined spaces
- Excellent for applications where a large number of accelerometers are required

FEATURES

- Low weight
- Low sensitivity to environmental factors
- Electrically insulated for ground-loop protection
- High resonance frequency

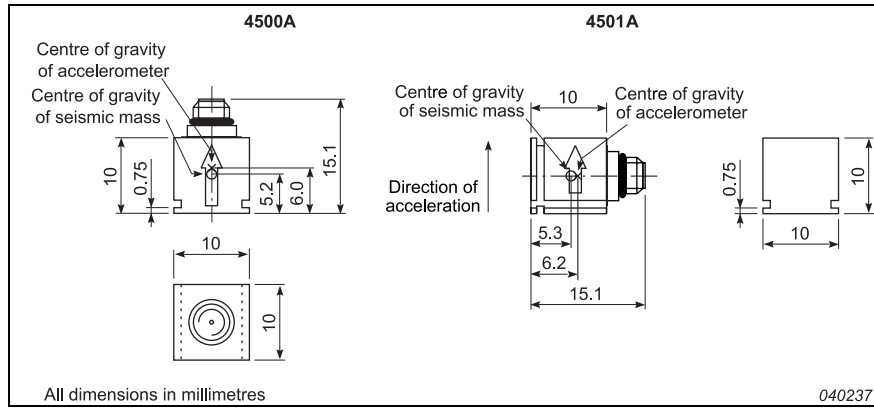
Characteristics

This piezoelectric accelerometer may be treated as a charge source. Its sensitivity is expressed in terms of charge per unit acceleration (pC/g).

The ThetaShear design involves a slotted cylindrical stanchion holding a central seismic mass, flanked by two piezoelectric plates. This assembly is clamped rigidly by the cover. To ensure optimum accuracy and reliability, no bonding agent other than molecular adhesion is required to hold the assembly together. The ThetaShear design provides for a combination of highest measurement stability, excellent sensitivity-to-weight ration and low sensitivity to extraneous environmental effects.

A remarkable feature of the ThetaShear principle is the fact that the transverse resonance frequency is always outside the 10% frequency limit. This ensures minimum interference from orthogonal vibration components in the useful frequency range of the accelerometer. The ThetaShear design also provides excellent immunity to other environmental effects such as base strains, magnetic sensitivity and acoustic fields.

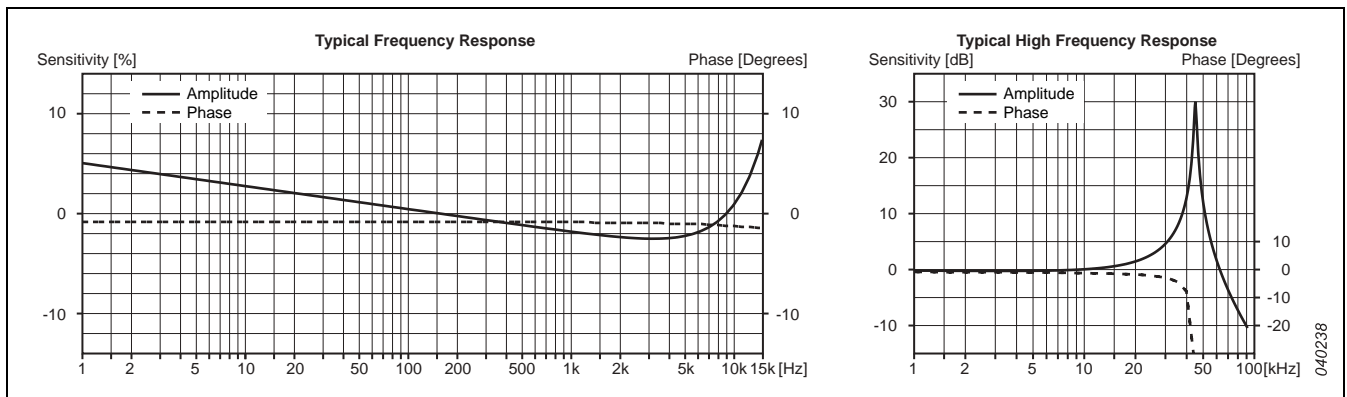
Fig. 1
Dimensions of Types
4500A and 4501A



Calibration

The sensitivity given in the calibration chart has been measured at 159.2 Hz with an acceleration of 10 g. For a 99.9% confidence level, the accuracy of the factory calibration is $\pm 2\%$.

Fig. 2 Typical amplitude response of Type 4500/4501A



Mounting

Special effort has been put into making mounting as flexible as possible. The accelerometer housing has slots that allow the use of mounting clips. The accelerometers can be easily fitted or removed to or from a number of different test objects.

There are three major mounting possibilities:

- The mounting clips are glued to the object, or fitted with double-sided, adhesive tape.
- A mounting clip with thick base can be modified, before use, to suit the mounting surface on the test object.
- A mounting clip with swivel base and a Spirit Level which makes it easy to align the accelerometer in order to retain the co-ordinate system.

Common Specifications for all Plastic Mounting Clips

Temperature range: -54° to $+50^{\circ}\text{C}$ (-65° to $+122^{\circ}\text{F}$)

For brief use, <1 hour: -54° to $+80^{\circ}\text{C}$ (-65° to $+176^{\circ}\text{F}$)

Maximum acceleration: 10 g peak (Perpendicular to mounting surface: 70 g peak)

Material: Glass reinforced polycarbonate

Fig. 3

Mounting Clip UA 1407

Specifications:

Upper limiting frequency ($\pm 10\%$):

– Type 4500 A mounted with grease: 3 kHz; dry mounting: 1.5 kHz

– Type 4501 A mounted with grease: 4 kHz; dry mounting: 2 kHz

Weight: 0.4 gram



Fig. 4

Mounting Clip with Thick Base UA 1475

Specifications:

Upper limiting frequency ($\pm 10\%$):

– Type 4500 A mounted with grease: 3 kHz; dry mounting: 1.5 kHz

– Type 4501 A mounted with grease: 4 kHz; dry mounting: 2 kHz

Thick Base UA 1475 can be filed down to suit your mounting surface needs

Weight: 0.7 gram

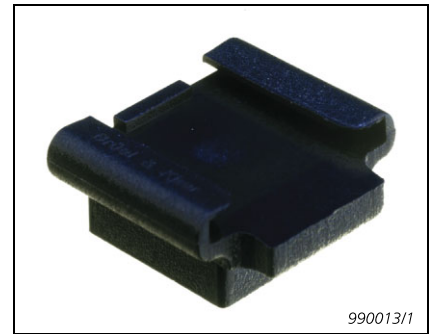


Fig. 5

Swivel Base UA 1478

Specifications:

Excitation must be along one of the accelerometer's axes of sensitivity but with mounting surface of the hemispherical part at 45° to the direction of the excitation

Upper limiting frequency, mounted with grease ($\pm 10\%$):

Weight: 0.8 gram



Fig. 6

Spirit Level UA 1480

Specifications:

Max. dimensions: 85 × 23 × 17 mm

Material: Black, anodised aluminium



Ground Insulation



Ground loop noise, particularly troublesome in multichannel measurements, is avoided by electrically insulating the sensing elements from the common body. Both Type 4500 A and Type 4501 A feature this electrical insulation with respect to signal ground and have a resistance of more than 10 M Ω .

The electrical insulation of Types 4500 A and 4501 A comes from the accelerometer's fully hard-anodised common body, with insulation at the three cylindrical mounting holes. The hard anodised mounting surfaces provide additional insulation.

Cable Clamping

When using miniature accelerometers, the accelerometer cable can affect the measurement result because of forces exerted by the cable on the accelerometer connector. This can then cause amplitude irregularities in the output from the accelerometer at frequencies up to approximately 200 Hz. This can be reduced by using a flexible cable. To effectively reduce the problem at low frequencies, it is generally recommended to clamp the cable. One way of doing this is to make a small loop in the cable close to the accelerometer (max. diameter 30 mm) and 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 generated by the cable.

Compliance with Standards

 	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand
Safety	EN 61010-1 and IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL 3111-1: Standard for Safety – Electrical measuring and test equipment
EMC Emission	EN/IEC 61000-6-3: Generic emission standard for residential, commercial and light industrial environments. EN/IEC 61000-6-4: Generic emission standard for industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
EMC Immunity	EN/IEC 61000-6-1: Generic standards – Immunity for residential, commercial and light industrial environments. EN/IEC 61000-6-2: Generic standards – Immunity for industrial environments. Note 1: The above is only guaranteed using accessories listed in this Product Data sheet. Note 2: The above is only guaranteed when the AC output is not in use.
Temperature	IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing. Cold and Dry Heat. Operating Temperature: -55 to +175°C (-67 to +347°F) Storage Temperature: -25 to +70°C (-13 to +158°F)
Humidity	IEC 60068-2-78: Damp Heat: 90% RH (non-condensing at 40 °C (104 °F))

Specifications – Cubic Charge Accelerometers Types 4500 A, 4501 A

	Units	4500 A	4501 A
Dynamic Characteristics			
Charge Sensitivity (@ 160 Hz)	pC/g	3	
Frequency Response		See typical Amplitude Response	
Mounted Resonance Frequency	kHz	>45	
Amplitude Response ±10% [1]	Hz	1 to 10000	
Transverse Sensitivity	%	<5	
Transverse Resonance Frequency	kHz	>20	
Electrical Characteristics			
Min. Leakage Resistance	GΩ	≥10	
Capacitance	pF	1000	
Grounding		Electrically insulated (>10 MΩ) for ground-loop protection	
Environmental Characteristics			
Temperature Range	°C (°F)	-55 to 175 (-67 to 347)	
Humidity		Sealed	
Max. Non-destructive Shock (± peak)	g pk	3000	
Base Strain Sensitivity	Equiv. g/μ strain	0.002	0.005
Thermal Transient Sensitivity	Equiv. g/°C (g/°F)	0.04 (0.022)	
Magnetic Sensitivity (50 Hz–0.03 Tesla)	g/T	0.2	
Physical Characteristics			
Dimensions		See outline drawing	
Weight	gram (oz.)	4.1 (0.145)	
Case Material		Anodised aluminium	
Connector		10–32 UNF	
Mounting		Mounting clip or adhesive	

[1] Low-end response of the transducer is a function of its associated electronics

Ordering Information

Types 4500 A and 4501 A includes the following accessories:

- Carrying box
- Calibration chart
- One mounting clip

Optional Accessories

AO 0038	Super low-noise cable, 10–32 UNF connectors 1.2 m (4 ft.)
AO 0122	Reinforced super low noise cable, 10–32, 3 m (10 ft.), 250°C (482°F)
AO 0231	Teflon low-noise cable, 10–32 UNF/TNC, length 3 m (10 ft.), 260°C (500°F)
AO 0406	Double-screened low-noise cable, 10–32 UNF, 5 m (16 ft), 250°C (482°F), including Adaptor JP 0145

AO 1382	Teflon low noise cable, double screened 10–32, 1.2 m (4 ft.)
AO 1419	Low-noise cable, 10–32 UNF, 1.2 m (4 ft.), 250°C (482°F)
DV 0459	Calibration Clip
JP 0145	Plug adaptor, BNC/10–32 UNF
QA 0035	Connector Assembly Tool for cable AC 0005 and connector JP 0012
QA 0220	Cable connecting/removal tool
QS 0007	Cyanoacrylate Adhesive
UA 0130	Microdot connectors, 10–32 UNF (set of 25)
UA 1407	Small mounting clips (set of 100 clips)
UA 1475	Small thick base clip (set of 100)
UA 1478	Small swivel base (set of 100)
UA 1564	Small high-temperature clip, insulated (set of 5)
YJ 0216	Mounting Wax

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