

# PRODUCT DATA

## Piezoelectric Accelerometer Miniature Triaxial DeltaTron Accelerometer — Type 4504 A

Miniature Triaxial DeltaTron<sup>®</sup> Accelerometer Type 4504 A is a triaxial piezoelectric ThetaShear<sup>®</sup> (patented) accelerometer with three independent outputs for simultaneous high-level measurements in three mutually perpendicular directions. Each transducing element is individually calibrated.

Type 4504 A features three separate and rugged 10–32 titanium connectors. It has 3 mm threaded holes for mounting with M2 screws or M3 studs.

The piezoelectric element used is the PZ23 lead zirconate titanate element. The housing is aluminium.



### USES AND FEATURES

#### USES

- General purpose accelerometer

#### FEATURES

- Triaxial

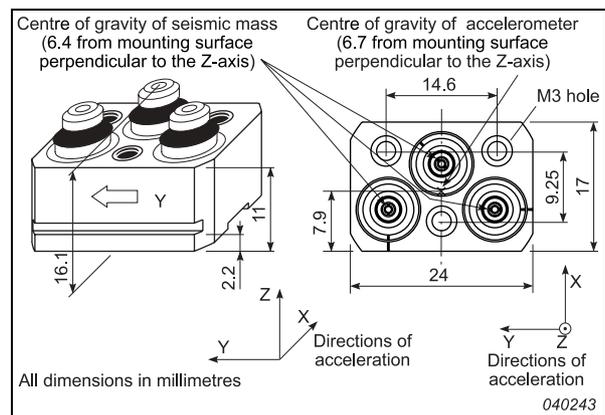
- Low weight
- High sensitivity to weight ratio
- Low sensitivity to environmental factors
- High resonance frequency
- Clip mounting

### Characteristics

DeltaTron accelerometers operate on a constant-current power supply and give output signals in the form of voltage modulation on the power supply line.

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 ratio and low sensitivity to extraneous environmental effects.

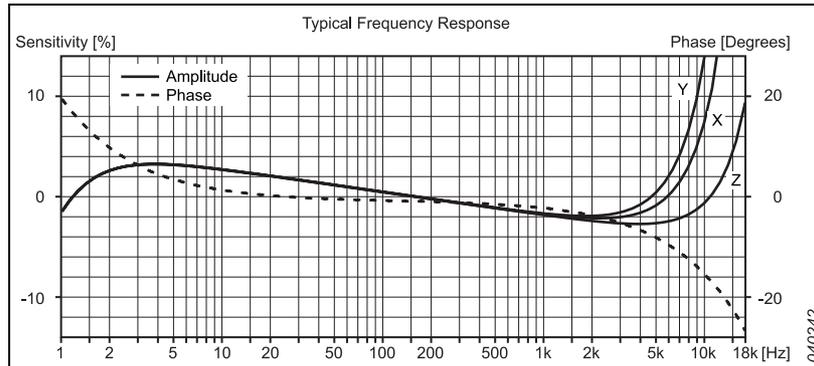
A remarkable feature of the ThetaShear principle is the fact that the transverse resonance frequency will always be found outside the 10% frequency limit. This ensures minimum



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.

## Calibration

**Fig. 1**  
Typical Frequency Response of Type 4504 A



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  $\pm 2\%$ .

## Mounting

Special effort has been put into making mounting as flexible as possible. For fast and easy mounting, Mounting Clips UA 1408, UA 1473 and UA 1474 can be used. Five of the six surfaces can be used for mounting with adhesive cement or mounting wax. Where threaded holes can be provided in the test piece, Type 4504 A can be mounted from the top via mounting holes in the base. The base can accommodate three M2 screws for top mounting.

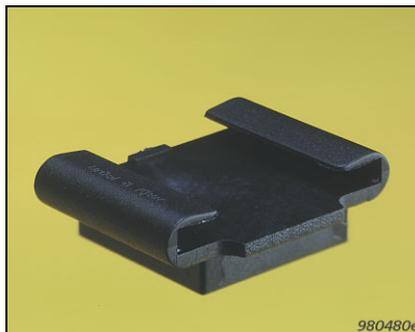
**Fig. 2**  
Mounting Clip UA 1408

Specifications:  
Upper limiting frequency, 10%  
- mounted with grease: 2 kHz  
- dry mounting: 1.2 kHz  
Weight: 2.1 gram



**Fig. 3**  
Mounting Clip with Thick Base UA 1474 can be filed down to suit your mounting surface needs (see picture, far right)

Specifications:  
Upper limiting frequency (10%)  
- mounted with grease: 2 kHz  
- dry mounting: 1.2 kHz  
Weight: 3.9 gram



**Fig. 4**  
High-temperature Mounting Clip UA 1563

Specifications:  
Temperature range:  
-55° to +175°C (-67° to +347°F)  
If discolouring can be accepted:  
-55° to +250°C (-67° to +482°F)  
Maximum acceleration:  
Perpendicular to mounting surface: 50 g peak  
Material:  
Base: Anodised aluminium;  
Spring: Stainless spring steel  
Weight: 11 gram



**Fig. 5**

Mounting Clip with Swivel Base UA 1473

Specifications:

Upper limiting frequency: 10%

(mounted with grease):

- excited along one of the accelerometer's axes of sensitivity but with mounting surface of the hemispherical part perpendicular to the direction of excitation: 1.3 kHz
- excited 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: 1.0 kHz

Weight: 5.0 gram



**Fig. 6**

Spirit Level UA 1480

Specifications:

Max. dimensions: 85 × 23 × 17 mm

Material: Black, anodised aluminium



## Cables and Connectors – 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
<b>Safety</b>	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
<b>EMC Emission</b>	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.
<b>EMC Immunity</b>	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. <b>Note 1:</b> The above is only guaranteed using accessories listed in this Product Data sheet. <b>Note 2:</b> The above is only guaranteed when the AC output is not in use. <b>Note 3:</b> Sensitivity to RF (in accordance with EN/IEC 61000–6–2) 20 μm/s <sup>2</sup> @ 10 V/m.
<b>Temperature</b>	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –50 to +125°C (–58 to +257°F) Storage Temperature: –25 to +70°C (–13 to +158°F)
<b>Humidity</b>	IEC 60068–2–78: Damp Heat: 90% RH (non-condensing at 40°C (104°F))

## Specifications – Miniature Triaxial DeltaTron Accelerometer Type 4504 A

	Units	4504 A
<b>Dynamic Characteristics</b>		
Voltage Sensitivity (@ 160 Hz)	mV/g	10 ± 20%
Measuring Range	g	±750
Frequency Response		See typical Amplitude Response
Mounted Resonance Frequency	kHz	x: 26 y: 23 z: 44
Amplitude Response ±10%	Hz	x: 1 to 11000 y: 1 to 9000 z: 1 to 18000
Residual Noise	mg	<4
Transverse Sensitivity	%	<5
Transverse Resonance Frequency	kHz	x: 20 y: 20 z: 20
<b>Electrical Characteristics</b>		
Output Impedance	Ω	<100
Resistance (body to mounting surface)	MΩ	>10
Bias Voltage	V	12 ± 0.5
Power Supply	mA	2 to 20
Start-up Time	s	<2
Grounding		Insulated
<b>Environmental Characteristics</b>		
Temperature Range	°C (°F)	-50 to +125 (-58 to +257)
Humidity		Sealed
Max. Operational Sinusoidal Vibration (peak)	g pk	750
Max. Operational Shock (± peak)	g pk	3000
Base Strain Sensitivity	Equiv. g/μ strain	0.001
Thermal Transient Sensitivity	Equiv. g/°C (g/°F)	0.05 (0.03)
Magnetic Sensitivity (50 Hz–0.03 Tesla)	g/T	1
<b>Physical Characteristics</b>		
Dimensions		See outline drawing
Weight	gram (oz.)	15 (0.54)
Case Material		Aluminium
Connector		3 × 10–32 Titanium
Mounting		Mounting clip, adhesive, M2 screws or M3 stud

All values are typical at 25°C (77°F) unless measurement uncertainty is specified

## Ordering Information

Type 4504 A includes the following accessories:

- Carrying box
- Calibration chart
- One mounting clip

## Optional Accessories

- AO 0406: Screen cable fitted with Microdot connectors. Supplied with a Microdot to BNC adaptor
- AO 0531: PVC insulated flexible cable, 10–32 UNF to BNC, 5 m (16.4 ft.) 0.5 to 70°C (23 to 158°F)
- 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 0460: Big Calibration Clip
- JP 0415: Watertight Connector

- UA 0130: Connector Set, consisting of 25 Connectors for Cable AC 0005, AC 0208 and AC 0104, length 5 m (16 ft.)
- QA 0035: Connector Assembly Tool for 10–32 UNF connector
- QA 0220: Cable connecting/removal tool
- QS 0007: Cyanoacrylate adhesive
- UA 1244: As above, for Cable AC 0005 and AC 0208
- UA 0186: Extension Adaptor Set, consisting of 25 Extension Adaptors (10–32 UNF) for cables with 10–32 UNF connector
- UA 1408: Big mounting clips (set of 100)
- UA 1474: Big mounting clip, thick base (set of 100)
- UA 1563: Big high temperature clip, insulated (set of 5)
- UA 1473: Big swivel base (set of 100)
- UA 1480: Spirit level for swivel bases
- YJ 0216: Beeswax for mounting
- YQ 2003: M3 stud, 5 mm
- YQ 2007: M3 stud, 8 mm
- WB 1372: DeltaTron Power Supply

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

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