

Triaxial Charge Accelerometer Types 4321 and 4321-V

Triaxial Charge Accelerometer Types 4321 and 4321-V are piezoelectric accelerometers with DeltaShear™ design. The accelerometers are suited to operate in temperatures up to 250 °C (482 °F) and to measure up to 10000 Hz.



180067

Uses and Features

Uses

- General purpose vibration testing and analysis
- Vibration analysis on larger structures
- Measurements in high-temperature environments
- Multi-axis vibration and shock measurements

Features

- Triaxial
- Wide frequency range
- Wide dynamic range
- High resonance frequency

Description

Type 4321 is a triaxial Unigain* accelerometer with three independent outputs for simultaneous high-level measurements. It features three 10–32 UNF electrical connectors and can be mounted with a 10–32 UNF threaded steel stud or an M4 screw. The housing material is titanium, and the piezoelectric element is PZ 23.

Type 4321 is available as a V-type†. Type 4321-V has the same connectors, housing, specifications and long-term stability as Type 4321, but it has a relaxed sensitivity tolerance and transverse sensitivity.

Characteristics

This piezoelectric accelerometer may be treated as a charge source. Its sensitivity is expressed in terms of charge per unit acceleration (pC/ms^{-2} , pC/g).

The DeltaShear design consists of three piezoelectric elements and three seismic masses arranged in a triangular configuration around a triangular centre post. They are held in place by a clamping ring that isolates the configuration from the base. The ring also prestresses the piezoelectric elements to give a high degree of linearity. This design provides a high sensitivity-to-mass ratio, a relatively high resonance frequency and high isolation from base strains and temperature transients.

* Unigain: The individual measured sensitivity is within $\pm 2\%$ of the specified sensitivity

† V-type: The individual measured sensitivity is within $\pm 15\%$ of the specified sensitivity

Calibration

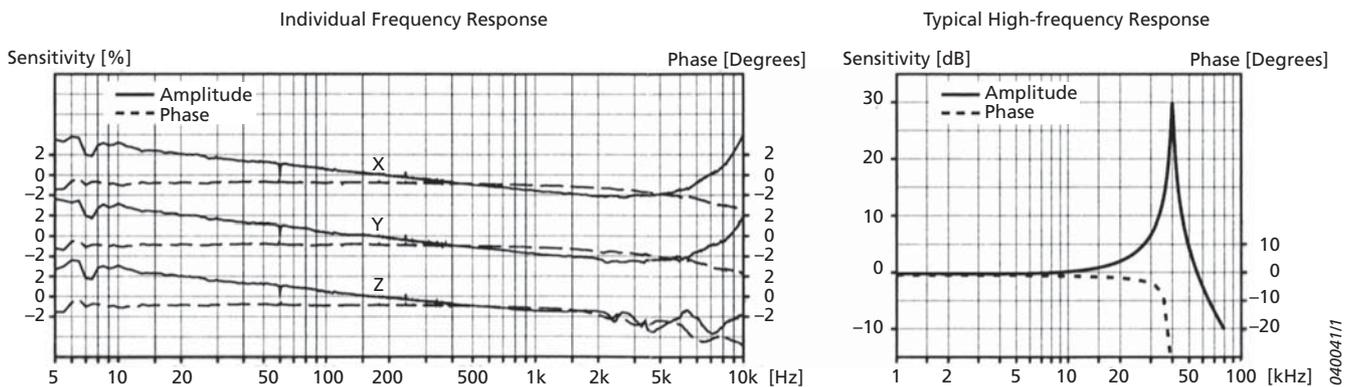
Each accelerometer is calibrated using random excitation and 1600-line FFT transformation to provide a high-resolution (amplitude and phase) frequency response. This yields a unique characterization and secures the integrity of your vibration measurements.

The sensitivity given on the calibration chart is measured at 159.2 Hz with 95% confidence level using coverage factor $k = 2$.

The upper frequency limits given on the calibration chart are frequencies where the deviation from the reference sensitivity at 159.2 Hz is within $\pm 10\%$. The upper frequency limit is approximately 30% of the mounted resonance frequency. This assumes that the accelerometer is correctly mounted on the test structure – poor mounting can have a marked effect on the mounted resonance frequency.

The lower frequency limits and phase response are determined by the amplifier used.

Fig. 1 Individual frequency and typical high-frequency response curves for Type 4321



Brüel & Kjær's Triaxial Charge Accelerometer Family

Type 4321 is part of a family of triaxial charge accelerometers. To find the triaxial accelerometer that fits your needs, visit www.bksv.com.

Table 1
Comparison of
Brüel & Kjær
triaxial charge
accelerometers

		4326-A	4326-A-001	4321	4527-C
Temperature	°C (°F)	175 (347)	230 (446)	250 (482)	230 (446)
Number of connectors		3			1
Weight	g	13	17	55	6
Isolated		Yes		No	No
Capacitance	pF	1000		1100	290
Frequency range *	Hz	X: 1 to 9000 Y: 1 to 8000 Z: 1 to 16000		X: 0.1 to 10000 Y: 0.1 to 10000 Z: 0.1 to 10000	X: 1 to 10000 Y: 1 to 10000 Z: 1 to 12800
Mounting		Mounting clip Adhesive M2 screws M3 stud		M4 screws	M3 stud Adhesive
Sensitivity	pC/ms ⁻²	0.316		1.0	0.316
Product Data		BP 1341		BP 2034	BP 2535

* Lower limiting frequency is determined by the amplifier used

Specifications – Piezoelectric Charge Accelerometer Types 4321 and 4321-V

Type No.		4321	4321-V
General			
Weight	g (oz)	55 (1.94)	
Charge Sensitivity (at 159.2 Hz)	pC/ms ⁻²	1.0 ± 2%	1.0 ± 15%
	pC/g	9.8 ± 2%	9.8 ± 15%
Frequency Range (±10% limit)	Hz	X, Y, Z: 0.1 to 10000	
Mounted Resonance Frequency	kHz	X, Y, Z: 40	
Max. Transverse Sensitivity (at 30 Hz, 100 ms ⁻²)	%	X: 1.0, Y: 1.2, Z: 0.4	X, Y, Z: <5
Transverse Resonance Frequency	kHz	X, Y, Z: 14	
Max. Operational Continuous Sinusoidal Acceleration (peak)	kms ⁻²	5	
	g	500	
Electrical			
Residual Noise Level (measured with NEXUS Type 2692-001 in the specified frequency range)	mms ⁻²	2.30	
	mg	0.23	
Capacitance (excluding cable)	pF	1100	
Min. Leakage Resistance (at 20 °C)	GΩ	>20	
Environmental			
Operating Temperature Range	°C (°F)	-74 to +250 (-101 to +482)	
Temperature Coefficient of Sensitivity	%/°C	0.1*	
Temperature Transient Sensitivity (3 Hz Low. Lim. Freq. (-3 dB, 6 dB/octave))	ms ⁻² /°C	0.4	
	g/°F	0.02	
Base Strain Sensitivity (at 250 µε in the base plane)	ms ⁻² /µε	0.2	
	g/µε	0.02	
Magnetic Sensitivity (50 Hz, 0.038 T)	ms ⁻² /T	4.00	
	g/kG	0.04	
Max. Non-destructive Shock (± peak)	kms ⁻²	10	
	g	1000	
Mechanical			
Housing Material		Titanium ASTM Grade 2	
Piezoelectric Sensing Element		PZ 23	
Construction		DeltaShear	
Sealing		Sealed	
Electrical Connector		3 × 10-32 UNF-2A	
Mounting		10-32 UNF × 5 mm threaded hole, M4 screw	
Mounting Torque	Max.	Nm (lbf-in)	3.5 (31.0)
	Min.		0.5 (4.4)

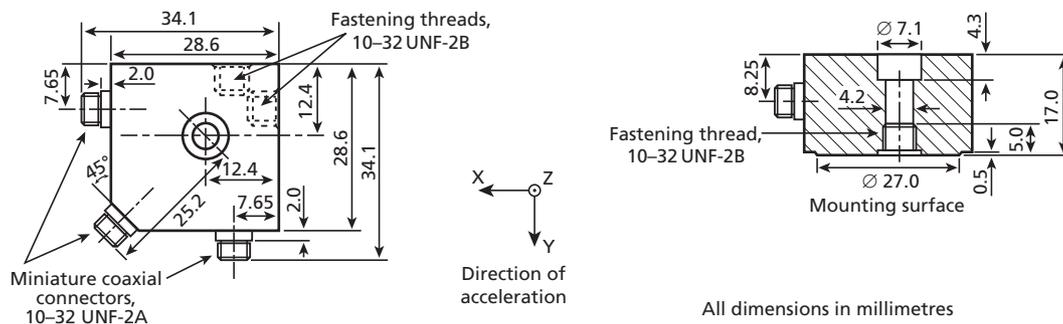
* In the temperature range -25 to +125 °C (-13 to +257 °F)

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

COMPLIANCE WITH STANDARDS

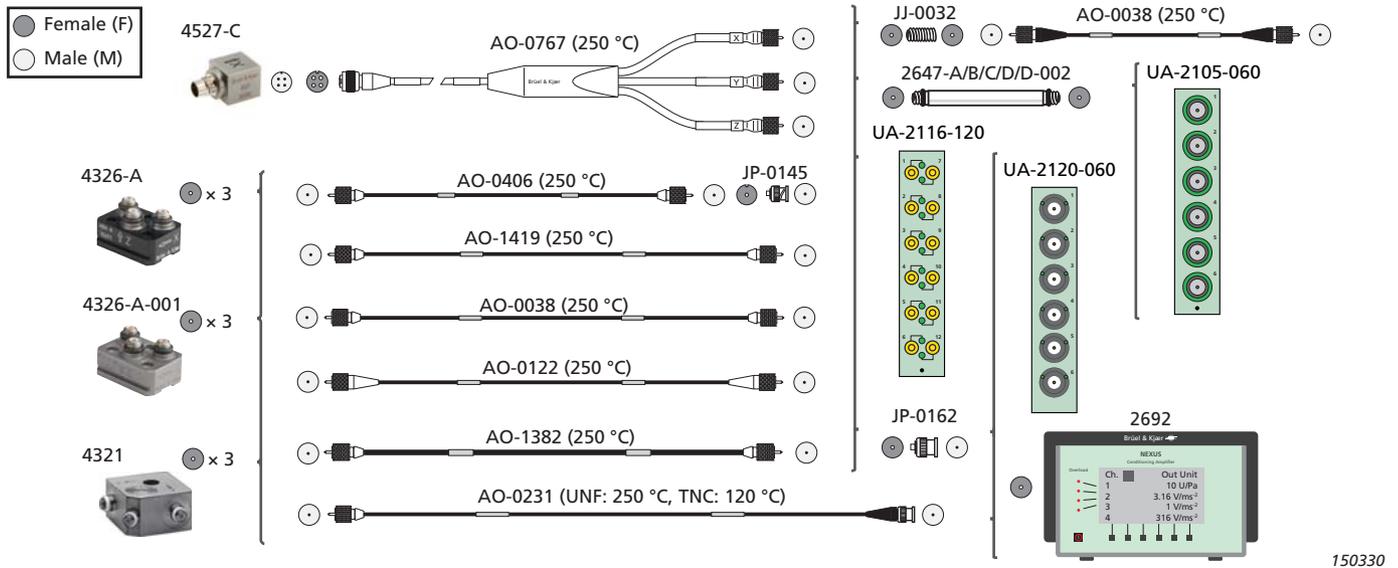


Fig. 1 Dimensions of Type 4321



751129/6

Fig. 2 Cabling, signal conditioning and data acquisition hardware options for Brüel & Kjær's family of triaxial charge accelerometers



Ordering Information

Type 4321 Unigain Charge Accelerometer
Includes the following accessories:

- Carrying box
- Calibration chart
- AO-0038: Cable with 10–32 UNF connectors, length 1.2 m
- 10–32 UNF threaded steel stud, length 12.7 mm
- M4 threaded steel screw, length 16 mm

Type 4321-V V-type Charge Accelerometer
Includes the following accessories:

- Carrying box
- Calibration chart
- 10–32 UNF threaded steel stud, length 12.7 mm
- M4 threaded steel screw, length 16 mm

Optional Accessories

CABLING

- AO-0038-x-yyy* Super low-noise, single-screened coaxial cable, 10–32 UNF connectors, 250 °C (482 °F)
- AO-0122-x-yyy* Super low-noise, robust double-screened cable, 10–32 UNF connectors, 250 °C (482 °F)
- AO-0231-x-yyy* Super low-noise cable, 10–32 UNF to TNC, 250 °C (482 °F)
- AO-1382-x-yyy* Low-noise, double-screened cable, 10–32 UNF connectors, 250 °C (482 °F)
- JP-0162 Plug adaptor, 10–32 UNF (F) to TNC (M)

MOUNTING

- QA-0013 Hexagonal key for 10–32 UNF studs
- QA-0029 Tap for 10–32 UNF thread

* x = D (decimetres) or M (metres)
yyy = length in decimetres or metres
Please specify cable length when ordering

- QA-0038 Hexagonal key for M4 studs
- UA-0146 Accelerometer accessory set
- UA-0866 Cementing stud with Ø 14 mm flange, 10–32 UNF thread (set of 25)
- UA-2063 Steel stud, 10–32 UNF, length 7.9 mm (set of ten)
- UA-2064 Steel stud, double-ended with flange, 10–32 UNF, length 5.3 mm (set of ten)
- YJ-0216 Beeswax for mounting
- YO-0534 Insulating mica washer, Ø 15 mm
- YP-0150 Insulated stud, fully threaded, 10–32 UNF, length 13 mm
- YQ-0093 Steel screw, M4 × 16 mm
- YQ-2960 Set screw, 10–32 UNF × ½" (12.8 mm)

CONDITIONING AND FRONT ENDS

- Type 3053-B-120 12-ch. Input Module LAN-XI 25.6 kHz (CCLD, V)
- UA-2116-120 LAN-XI Front Panel, 12-channel Charge, 12 × 10–32 UNF (F) microdot connectors (Gain: –1 mV/pC)
- Type 3050-A-060 6-ch. Input Module LAN-XI 51.2 kHz (Mic, CCLD, V)
- UA-2105-060 LAN-XI Front Panel, Charge Accelerometer, 6-ch. for the family of Charge to CCLD Convertor Type 2647 Charge to CCLD Convertor NEXUS Conditioning Amplifier

CALIBRATION

- Type 4294 Calibration Exciter

Calibration Services

- TRIAXIAL ACCELEROMETER SERVICES**
- ACC-T-CAI Accredited initial calibration
- ACC-T-CAF Accredited calibration
- ACC-T-CFF Factory standard calibration
- ACC-T-CTF Traceable calibration

Brüel & Kjær and all other trademarks, service marks, trade names, logos and product names are the property of Brüel & Kjær or a third-party company.

