

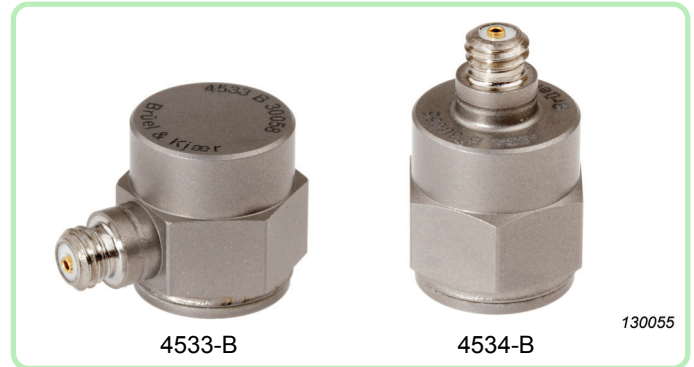
# PRODUCT DATA

## CCLD Accelerometers with TEDS

Type 4533-B, 4533-B-001, 4533-B-002, and 4533-B-004 and  
Type 4534-B, 4534-B-001, 4534-B-002, and 4534-B-004

*The general purpose families of CCLD<sup>\*</sup> Accelerometers with TEDS<sup>†</sup>, Types 4533-B and 4534-B, have wide frequency range, low noise, and low sensitivity to environmental factors. Each unit features a lightweight, robust, hermetically sealed titanium housing, an insulated base and a 10–32 UNF threaded mounting hole suitable for use in a variety of environmental conditions.*

*The main difference between Type 4533-B and Type 4534-B is the position of the coaxial connector. The Type 4534-B family has a top-mounted coaxial connector, while the Type 4533-B family has a side-mounted connector.*



### Uses and Features

#### Uses

- General purpose vibration measurement

#### Features

- Insulated base to avoid ground loops
- Wide frequency range from 0.2 Hz to 12.8 kHz
- Hermetically sealed to be used in tough environments
- Low noise floor for low-level measurements
- Low-impedance output to drive long cables
- 10–32 UNF threaded mounting hole for secure mounting

### Description

The Type 4533-B and 4534-B families of accelerometers are based on Brüel & Kjær's patented ThetaShear<sup>®</sup> design. The ThetaShear design gives a high sensitivity-to-weight ratio and a very low sensitivity to environmental factors.

The lightweight, robust and hermetically sealed titanium housing makes the accelerometers suitable for use in tough environments. The insulated base avoids ground loop problems, and the 10–32 UNF threaded mounting hole ensures good mounting. All these features make the accelerometers suitable for use in a variety of environmental conditions.

The accelerometers consist of a low-noise preamplifier with built-in TEDS functionality, and have variants with sensitivities from 1 mV/ms<sup>-2</sup> to 50 mV/ms<sup>-2</sup>.

The sensitivities measured at 159.2 Hz and 20 ms<sup>-2</sup> RMS are listed in Table 1.

**Table 1**  
Sensitivities of  
Types 4533-B  
and 4534-B

	4533-B 4534-B	4533-B-001 4534-B-001	4533-B-002 4534-B-002	4533-B-004 4534-B-004
mV/ms <sup>-2</sup>	1	10	50	5
mV/g	9.8	98	490	49

<sup>\*</sup> CCLD: Constant Current Line Drive, also known as DeltaTron<sup>®</sup> and IEPE

<sup>†</sup> TEDS: Transducer Electronic Data Sheet

## Calibration

Each accelerometer is individually calibrated using random excitation and 1600-line FFT transformation to provide a high-resolution (amplitude and phase) frequency response, yielding a unique characterization and securing the integrity of the vibration measurement.

The sensitivity given in the calibration chart has been measured at 159.2 Hz with 95% confidence level, using the coverage factor  $k = 2$ .

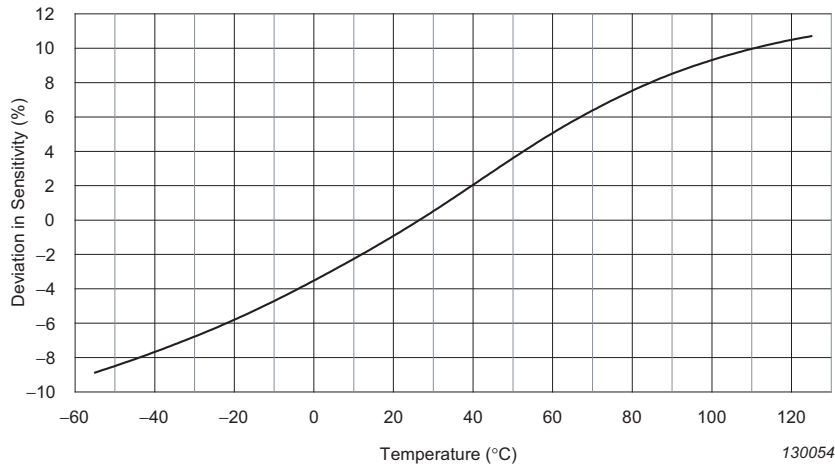
The upper frequency limits given on the calibration chart are the frequencies where the deviation from the reference sensitivity at 159.2 Hz is less than  $\pm 10\%$ . The upper frequency limit is approximately 30% of the mounted resonance frequency. This assumes that the accelerometer is correctly mounted 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 built-in preamplifiers. The lower frequency limits are given in the specifications for deviations from reference sensitivity of less than  $\pm 10\%$ .

## Temperature Response

The accelerometer families operate within a temperature range of  $-55$  to  $+125^\circ\text{C}$ . The typical temperature response is shown in Fig. 1.

**Fig. 1**  
Typical temperature response for the Type 4533-B and 4534-B accelerometer families



## Maximum Cable Length

The maximum output voltage of a CCLD accelerometer when driving long cables depends on the supply current at which it is operating, and on the capacitive load due to the connecting cable. The maximum cable length in metres (for distortion  $\leq 1\%$ ) is given by:

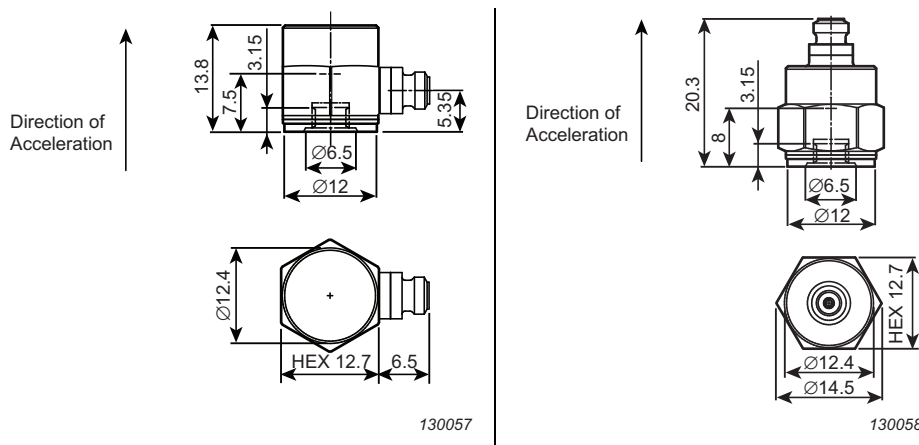
$$L = 140\,000 \times \frac{I_s - 1}{f \times V_o \times C_m}$$

where:

$I_s$  = supply current (mA),  $f$  = frequency (kHz),  $V_o$  = output voltage ( $V_{\text{peak}}$ ),  $C_m$  = cable capacitance (pF/m)

## Dimensions

**Fig. 2**  
Left: Dimensions (in mm) for 4533-B, 4533-B-001, 4533-B-002 and 4533-B-004  
Right: Dimensions (in mm) for 4534-B, 4534-B-001, 4534-B-002 and 4534-B-004



## Specifications – CCLD Accelerometer Families Type 4533-B and 4534-B

		Units	4533-B 4534-B	4533-B-001 4534-B-001	4533-B-002 4534-B-002	4533-B-004 4534-B-004
General Characteristics						
Voltage Sensitivity (at 159.2 Hz and 20 ms <sup>-2</sup> RMS)		mV/ms <sup>-2</sup> (mV/g)	1 (9.8) ±10%	10 (98) ±10%	50 (490) ±10%	5 (49) ±10%
Frequency Range	Amplitude (±10%)	Hz	0.2 to 12.8k		0.3 to 12.8k	0.2 to 12.8k
	Phase (±5°)	Hz	1 to 10k	1 to 5k	2 to 1.5k	1 to 5k
Mounted Resonance Frequency		kHz	> 38			
Maximum Transverse Sensitivity (at 30 Hz, 100 ms <sup>-2</sup> )		%	< 5			
Measuring Range		ms <sup>-2</sup> (g)	±7000 (±714)	±700 (±71)	±140 (±14)	±1400 (±143)
Amplitude Linearity		%	≤ 1			
Polarity			Polarity of the electrical signal is positive for an acceleration in the direction of the arrow in Fig. 2			
Electrical Characteristics						
Bias Voltage	at room temperature (25°C) and 4 mA	V DC	+13 ± 1			
	at full temperature and current range					
Power Supply Requirements	Constant current	mA	+2 to +20			
	Unloaded supply voltage	V DC	+21 to +32			
Output Impedance		Ω	< 15			
Start-up Time (to final bias ± 10%)		s	< 30			
Inherent Noise						
Broadband  Spectral	1 Hz to 12.8 kHz	μV (μg)	5 (500)	13 (130)	50 (100)	7 (140)
	10 Hz	mms <sup>-2</sup> /√Hz (μg/√Hz )	0.25 (25)	0.15 (15)	0.11 (11)	0.14 (14)
	100 Hz		0.07 (7)	0.025 (2.5)	0.022 (2.2)	0.03 (3)
	1000 Hz		0.044 (4.4)	0.01 (1)	0.009 (0.9)	0.014 (1.4)
Insulation Resistance (body to mounting surface)		MΩ	>100			
Environmental Characteristics						
Operating Temperature Range		°C (°F)	-55 to +125 (-67 to +257)			
Temperature Coefficient of Sensitivity		%/°C	+0.11			
Temperature Transient Sensitivity (with 3 Hz Low. Lim. Freq (-3 dB, 6 dB/oct))		mms <sup>-2</sup> /°C (g/°F)	0.02 (0.0011)			
Magnetic Sensitivity (at 50 Hz, 0.038 T)		ms <sup>-2</sup> /T (g/kG)	3 (0.03)			
Base Strain Sensitivity (at 250 με in base plane)		ms <sup>-2</sup> /με (g/με)	0.03 (0.003)			
Max. Non-destructive Shock (peak)		g <sub>pk</sub>	10 000			
Physical Characteristics						
Case Material			Titanium ASTM Grade 5			
Piezoelectric Sensing Element			PZ23			
Construction			Shear			
Sealing			Hermetic			
Weight		gram (oz.)	8.6 (0.3)			
Electrical Connector			10-32 UNF			
Mounting			10-32 UNF threaded, depth 3.8 mm			



Compliance with EMC Directive and Low Voltage Directive of the EU;  
Compliance with the EMC requirements of Australia and New Zealand

## Order Information

**Type 4533-B, 4533-B-001, 4533-B-002, 4533-B-004, and Type 4534-B, 4534-B-001, 4534-B-002, and 4534-B-004**

**Include the following accessories:**

- Carrying box
- Calibration chart
- 10–32 UNF stainless steel mounting stud, length 5.3 mm

### **OPTIONAL ACCESSORIES\***

AO-0038-D-xxx†	Super low-noise cable, 10–32 UNF to 10–32 UNF connector, 250°C (482°F)
AO-0531-D-xxx	Flexible cable, 10–32 UNF to BNC connector, 70°C (158°F)
JP-0145	Plug adaptor, BNC/10–32 UNF
UA-0186	Extension connector for 10–32 UNF cables, set of 25
QS-0007	Tube of cyanoacrylate adhesive
YJ-0216	Beeswax for mounting

† Cables are available in different lengths, specified by -D-xxx, where D indicates that the length is in decimetres and xxx is the required length

DB-0544	10–32 UNF Round tip
QA-0029	Tap for 10–32 UNF thread
UA-0866	Cement stud 10–32 UNF 0.14 mm (0.005"), set of 25
UA-2064	10–32 UNF threaded steel stud with flange, length 5.3 mm (0.2"), set of 10
UA-2063	10–32 UNF threaded steel studs, length 7.5 mm (0.3"), set of 10

### **SERVICE**

4533-CAF	Accredited Calibration
4533-CAI	Accredited Calibration Performed as Initial
4533-CTF	Traceable Calibration
4533-CTI	Traceable Calibration Performed as Initial
4533-EW1	Extended Warranty, one year extension
4534-CAF	Accredited Calibration
4534-CAI	Accredited Calibration Performed as Initial
4534-CTF	Traceable Calibration
4534-CTI	Traceable Calibration Performed as Initial
4534-EW1	Extended Warranty, one year extension

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