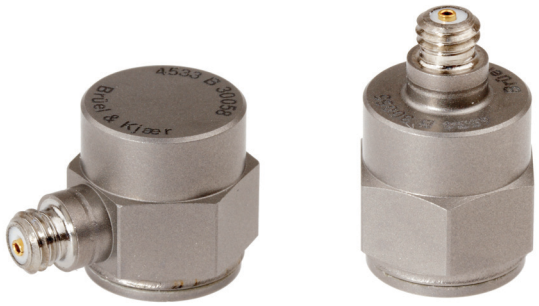
# PRODUCT DATA

## 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* Accelerometers with TEDS†, 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.*




4533-B 4534-B

### Uses and Features

#### Uses
- General purpose vibration measurement

#### Features
- Insulated base to avoid group 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® 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 group 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$^{-2}$ to 50 mV/ms$^{-2}$.

The sensitivities measured at 159.2 Hz and 20 ms$^{-2}$ 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$^{-2}$ | 1 | 10 | 50 | 5 |
| mV/g | 9.8 | 98 | 490 | 49 |

* CCLD: Constant Current Line Drive, also known as DeltaTron® and IEPE
† 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 $k = 2$.

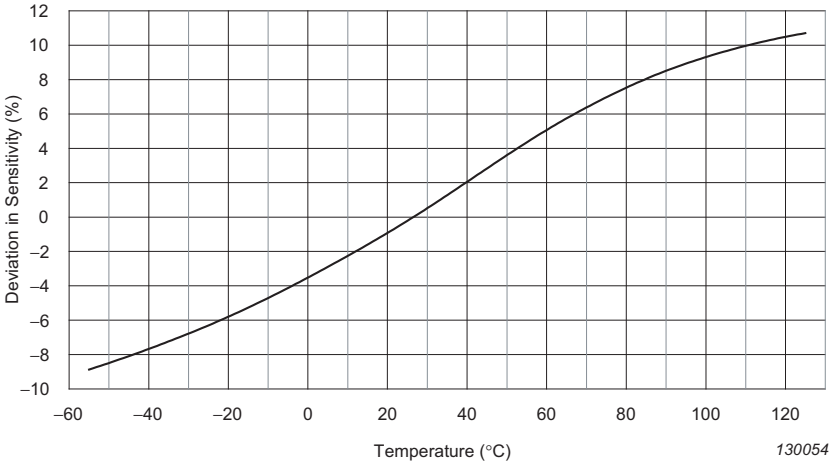
The upper frequency limits given on the calibration chart are the frequencies where the deviation from the reference sensitivity at 159.2 Hz is less than ±10%. The upper frequency limit is approximately 30% of the mounted resonance frequency. This assumes that the accelerometer is correctly mounted on 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 ±10%.

## Temperature Response

The accelerometer families operate within a temperature range of –55 to +125°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

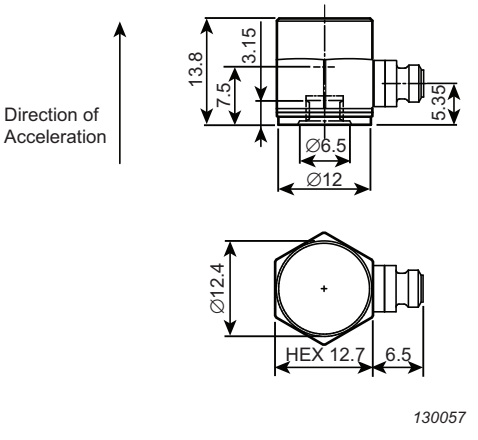
The maximum output voltage of a CCLD accelerometer when driving long cables depends on the supply current at which it is operating, and on the capacitive load due to the connecting cable. The maximum cable length in metres (for distortion ≤ 1%) is given by:

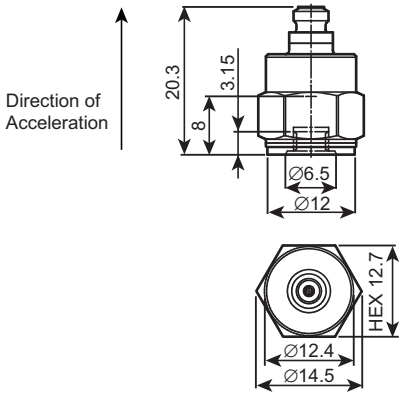
$$L = 140\,000 \times \frac{I_s - 1}{f \times V_o \times C_m}$$

where:
$I_s$ = supply current (mA), $f$ = frequency (kHz), $V_o$ = output voltage ($V_{peak}$), $C_m$ = 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<br>4534-B | 4533-B-001<br>4534-B-001 | 4533-B-002<br>4534-B-002 | 4533-B-004<br>4534-B-004 |
|---|---|---|---|---|---|---|
| **General Characteristics** | | | | | | |
| Voltage Sensitivity (at 159.2 Hz and 20 $ms^{-2}$ RMS) | | $mV/ms^{-2}$ (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 $ms^{-2}$) | | % | < 5 | | | |
| Measuring Range | | $ms^{-2}$ (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 | 1 Hz to 12.8 kHz | μV (μg) | 5 (500) | 13 (130) | 50 (100) | 7 (140) |
| Spectral | 10 Hz | $mms^{-2}/\sqrt{Hz}$ ($\mu g/\sqrt{Hz}$) | 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)) | | $mms^{-2}$/°C (g/°F) | 0.02 (0.0011) | | | |
| Magnetic Sensitivity (at 50 Hz, 0.038 T) | | $ms^{-2}$/T (g/kG) | 3 (0.03) | | | |
| Base Strain Sensitivity (at 250 με in base plane) | | $ms^{-2}/\mu\varepsilon$ ($g/\mu\varepsilon$) | 0.03 (0.003) | | | |
| Max. Non-destructive Shock (peak) | | $g_{pk}$ | 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 |
| 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 |

* Additional accessories and cables are available on the Brüel & Kjær website www.bksv.com

† 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

**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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**HEADQUARTERS: Brüel & Kjær Sound & Vibration Measurement A/S · DK-2850 Nærum · Denmark**
**Telephone: +45 7741 2000 · Fax: +45 4580 1405 · www.bksv.com · info@bksv.com**

Local representatives and service organisations worldwide

Brüel & Kjær