

## BRÜEL & KJÆR® Calibrators

### Sound Calibrator Type 4231

*Sound Calibrator Type 4231 is a handy, portable sound source for calibration of sound level meters and other sound measurement equipment. The calibrator is very robust and stable, and conforms to EN/IEC 60942 (2017) Class 1, and ANSI S1.40-2006.*



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#### Uses and Features

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##### Uses

- Calibration of sound level meters and other sound measurement equipment

##### Features

- Conforms to EN/IEC 60942 (2017) Class 1, and ANSI S1.40-2006
- Robust, pocket-sized design with highly stable level and frequency
- Calibration accuracy  $\pm 0.2$  dB
- 94 dB SPL or 114 dB SPL for calibration in noisy environments
- Extremely small influence of static pressure and temperature
- Sound pressure independent of microphone equivalent volume
- 1 kHz calibration frequency for correct calibration level independent of weighting network
- Fits Brüel & Kjær 1" microphones (1/2", 1/4" and 1/8" microphones with adaptor)
- Switches off automatically when removed from the microphone

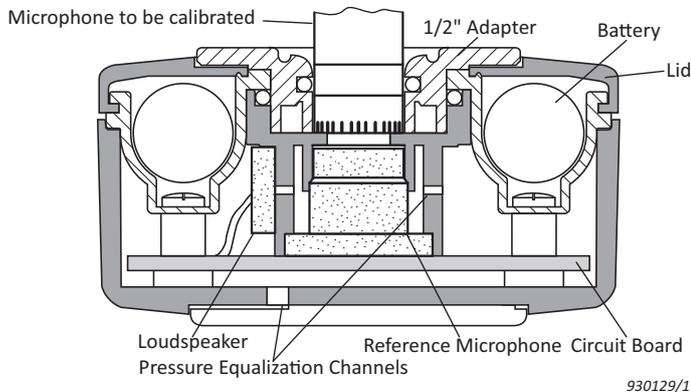
## Sound Calibrator Type 4231

Sound Calibrator Type 4231 is a pocket-sized, battery-operated sound source for quick and direct calibration of sound level meters and other sound measuring systems. It fits Brüel & Kjær 1" microphones and, using the supplied removable adaptor, 1/2" microphones. With optional adaptors, it can be used for 1/4" and 1/8" microphones as well.

The calibration frequency is 1000 Hz (the reference frequency for the standardized international weighting networks), so the same calibration value is obtained for all weighting networks (A, B, C, D and linear). The calibration pressure of  $94 \pm 0.2$  dB re  $20 \mu\text{Pa}$  is equal to 1 Pa or  $1 \text{ N/m}^2$ . The +20 dB level step gives 114 dB SPL, which is convenient for calibration in noisy environments, or for checking linearity.

The design of Type 4231 is based on a feedback arrangement to ensure a highly stable sound pressure level and ease of use. The feedback loop uses a condenser microphone (see Fig. 1), which is specially developed for this purpose.

*Fig. 1 Cross-sectional view of Sound Calibrator Type 4231. The feedback loop is based on a high-quality condenser microphone to ensure a very stable sound pressure level*



This microphone is optimized to have extremely high stability and independence of variations in static pressure and temperature around the 1 kHz calibration frequency. The result of this is a user-friendly calibrator where exact fitting of the microphone is not critical and the effects of changes in temperature and static pressure are negligible.

*Fig. 2 Type 4231 fitted on the B&K 2245 Sound Level Meter microphone. The calibrator's centre of gravity is positioned very close to the microphone, giving a stable setup*



The calibrator gives a continuous sound pressure level when fitted on a microphone and activated.

The sensitivity of the sound measuring equipment can then be adjusted until it indicates the correct sound pressure level.

The calibrator is automatically switched off when removed from the microphone.

A leather protection case, which does not need to be removed to use the calibrator, is supplied.

## Compliance with Standards

	<p>The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives.</p> <p>RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME in Australia.</p> <p>China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China.</p> <p>WEEE mark indicates compliance with the EU WEEE Directive</p>
<b>Safety</b>	<p>EN/IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use</p> <p>ANSI/UL 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use</p>
<b>EMC Emission</b>	<p>EN/IEC 61000-6-3: Generic emission standard for residential, commercial and light industrial environments</p> <p>EN/IEC 61000-6-4: Generic emission standard for industrial environments</p> <p>CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits</p> <p>FCC Rules, Part 15: Complies with the limits for a Class B digital device</p> <p>This ISM device complies with Canadian ICES-001 (standard for interference-causing equipment)</p>
<b>EMC Immunity</b>	<p>EN/IEC 61000-6-1: Generic standards – Immunity for residential, commercial and light industrial environments</p> <p>EN/IEC 61000-6-2: Generic standards – Immunity for industrial environments</p> <p>EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements</p> <p>EN/IEC 60942: Instrumentation Standard – Electroacoustics – Sound Calibrators</p> <p><b>NOTE:</b> The above is only guaranteed using accessories listed in this document</p>
<b>Temperature</b>	<p>IEC 60068-2-1 &amp; IEC 60068-2-2: Environmental Testing. Cold and Dry Heat</p> <p>Operating Temperature: –10 to +55 °C (+14 to 122 °F)</p> <p>Storage Temperature: –25 to +70 °C (–13 to +158 °F)</p>
<b>Humidity</b>	<p>IEC 60068-2-78: Damp Heat: 90% RH (non-condensing at +40 °C (+104 °F))</p>
<b>Mechanical</b>	<p>Non-operating:</p> <p>IEC 60068-2-6: Vibration: 0.3 mm (10 to 58 Hz), 20 m/s<sup>2</sup> (58 to 500 Hz)</p> <p>IEC 60068-2-27: Shock: 1000 m/s<sup>2</sup></p> <p>IEC 60068-2-29: Bump: 3000 bumps at 400 m/s<sup>2</sup></p>
<b>Enclosure</b>	<p>IEC 60529: Protection provided by enclosures: IP 50 with leather protection case</p>

## Specifications – Sound Calibrator Type 4231

All values are typical at +25 °C (+77 °F), unless measurement uncertainty or tolerance field is specified. All uncertainty values are specified at  $2\sigma$  (that is, expanded uncertainty using a coverage factor of 2)

### STANDARDS SATISFIED

- EN/IEC 60942 (2017), Class 1, Sound Calibrators
- ANSI S1. 40-2006, Specification for Acoustic Calibrators Class 1

### SOUND PRESSURE LEVELS

94.0 dB  $\pm$  0.2 dB (Principal SPL) or 114.0 dB  $\pm$  0.2 dB re 20  $\mu$ Pa at reference conditions

### FREQUENCY

1 kHz  $\pm$  0.1%

### SPECIFIED MICROPHONE

Size according to IEC 61094-4:

- 1" without adaptor
- 1/2" with adaptor UC 0210 (supplied)
- 1/4" with adaptor DP 0775 (optional)
- 1/8" with adaptor DP 0774 (optional)

### EQUIVALENT FREE-FIELD LEVEL

(0° incidence, re Nominal Sound Pressure Level)

–0.15 dB for 1/2" Brüel & Kjær microphones. See the Type 4231 user manual for other microphones

### EQUIVALENT RANDOM INCIDENCE LEVEL

(re Nominal Sound Pressure Level)

+0.0 dB for 1", 1/2", 1/4" and 1/8" Brüel & Kjær microphones

### NOMINAL EFFECTIVE COUPLER VOLUME

>200 cm<sup>3</sup> at reference conditions

### DISTORTION

<1%

### LEVEL STABILITY

**Short-term:** Better than 0.02 dB (as specified in IEC 60942)

**One Year:** Better than 0.05 dB (s = 96%)

**Stabilization Time:** <5 s

### REFERENCE CONDITIONS

**Temperature:** +23 °C  $\pm$  3 °C (+73 °F  $\pm$  5 °F)

**Pressure:** 101  $\pm$  4 kPa

**Humidity:** 50%, –10% +15% RH

**Effective Load Volume:** 0.25 cm<sup>3</sup>

### ENVIRONMENTAL CONDITIONS

**Pressure:** 65 to 108 kPa

**Humidity:** 10 to 90% RH (non-condensing)

**Effective Load Volume:** 0 to 1.5 cm<sup>3</sup>

### INFLUENCE OF ENVIRONMENTAL CONDITIONS (TYPICAL)

**Temperature Coefficient:**  $\pm$ 0.0015 dB/°C

**Pressure Coefficient:**  $+8 \times 10^{-4}$  dB/kPa

**Humidity Coefficient:** 0.001 dB/% RH

### POWER SUPPLY

**Batteries:** 2  $\times$  1.5 V IEC Type LR6 ("AA" size)

**Lifetime:** Typically 200 hours continuous operation with alkaline batteries at +23 °C (+73 °F)

**Battery Check:** When Type 4231 stops working continuously, and only operates when the On/Off button is held in, the batteries should be replaced

### DIMENSIONS AND WEIGHT

(Without case)

**Height:** 40 mm (1.5")

**Width:** 72 mm (2.8")

**Depth:** 72 mm (2.8")

**Weight:** 150 g (0.33 lb), including batteries

## Ordering Information

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### Type 4231      Sound Calibrator

includes the following accessories:

- KE 0317: Leather Case
- 2 × QB 0013: Alkaline Battery Type LR6
- UC 0210: Adaptor for 1/2" microphones

### OPTIONAL ACCESSORIES

DP 0775	Adaptor for 1/4" microphones
DP 0774	Adaptor for 1/8" microphones
DP 0887	Adaptor for Head and Torso Simulator (HATS) Type 4128



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