PRODUCT DATA

Integrating Sound Level Meter and Hand-Arm Vibration Meter — Type 2239B

USES
- Measurement of workers' exposure to noise and hand-arm vibration in the work place
- Surveys of environmental noise
- Complaint investigations
- Conformance test of power tools

FEATURES
- Sound level meter conforms with: IEC60651 (1979) and 60804 (2000) Type 1; IEC61672 (Draft, March 2001) Class 1 and ANSI S1.4 – 1983 and S1.43 – 1997 Type 1
- Vibration meter conforms with ISO 8041 Type 2 and ISO 5349
- Measures RMS and Peak values simultaneously and with independent frequency weightings
- Sound level meter measures: $L_{eq}$, Peak, $MaxP$, $MaxL$, $MinL$, SPL, and Inst
- Vibration meter measures: $A_{eq}$, $A_{eq4}$, $A_{eq8}$, $A_{max}$, $A_{min}$, $A_{np}$, Peak, and Inst
- Hand-arm vibration and linear frequency weightings for vibration measurements
- Included mounting bracket attaches the accelerometer firmly to a tool handle for vibration measurements
- Stores results from up to 40 measurements
- Back-lit display
- Five built-in languages: English, German, French, Spanish, Italian

Description
Type 2239B makes industrial noise and vibration monitoring easy. The combined sound and vibration meter functions make it a handy and economical choice for general occupational health inspections.

Intuitive User-interface
Measurements are displayed on a large LCD screen (with back light), which includes a quasi-analogue bar that shows the current sound pressure level. The clearly marked arrows and symbols on the front panel, combined with the large screen, make the instrument very easy to learn and use. The display is clear and concise. Clear instructions and warnings guide you through your measurement.

Real-time Clock
Type 2239B has a real-time clock and calendar, which marks each measurement with the date and time.

AC Output
The linearly weighted AC output enables you to make a direct calibrated recording (on Digital Audio Tape, for example), which can be used later for complete acoustical analysis. It also enables headphone monitoring of sound measurements.

Data Storage and Processing
The instrument is capable of storing up to 40 records of sound measurements and 40 records of vibration measurements (for a total of 80 records). Each record stores the date, measurement time, overload status, and all relevant measurement parameters. These results can be transferred in a spreadsheet-compatible format via the built-in serial interface to a PC. Results can also be printed on a portable printer.
As a Sound Level Meter
Type 2239 B is quick and easy to use when taking environmental noise and occupational health measurements. Its specifications conform with Type 1 requirements for all national sound level meter standards.

Dual, Independently Weighted Detectors
The instrument features two parallel, independently frequency-weighted detectors. This enables it to display both RMS and Peak readings simultaneously.

Fast and Easy Acoustical Calibration
To calibrate Type 2239 B, simply fit an acoustic calibrator to the instrument and press a button. The sound level meter calculates the required correction factor and calibrates automatically.

A Complete Sound Picture
During measurement, the following parameters are available on the screen:

- Equivalent constant sound level ($L_{eq}$)
- Maximum peak ($MaxP$)
- Maximum RMS level ($MaxL$)
- Minimum RMS level ($MinL$)
- Maximum peak from last 1s ($Peak$)
- Maximum RMS from last 1s ($SPL$)
- Instantaneous RMS level ($Inst$)
- Overload status

When the measurement is finished, $L_{eq}$, $MaxP$, $MaxL$, latched overload status, measurement time and the measurement date are all stored in memory.

As a Hand-Arm Vibration Meter
Quick to Change
To change from a sound level meter to a vibration meter, simply unscrew the microphone/preamplifier assembly and replace it with the accelerometer/charge amplifier assembly. The instrument detects the change automatically.

Two Frequency Weightings
Two weightings are available: hand-arm and linear. The hand-arm weighting makes the instrument most sensitive to frequencies that most effect the human body when working with hand-held tools. The linear setting provides a flat response. The setting you need may change depending on local regulations.

Dual Detectors
Like the sound level meter function, the vibration meter function features two parallel detectors. This enables it to display and record both RMS and Peak readings simultaneously.

A Complete Vibration Picture
During measurement, the following parameters are available on the screen:

- Equivalent constant acceleration ($A_{eq}$)
- Equivalent 8 hour constant exposure ($A_{eq8}$)
- Equivalent 4 hour constant exposure ($A_{eq4}$)
- Maximum RMS acceleration ($A_{max}$)
- Minimum RMS acceleration ($A_{min}$)
- Maximum peak acceleration ($A_{mp}$)
- Maximum peak acceleration from last 1s ($Peak$)
- Instantaneous RMS acceleration ($Inst$)
- Overload status

When the measurement is finished, $A_{mp}$, $A_{eq}$, $A_{eq8}$, $A_{eq4}$, $A_{max}$, $A_{min}$, latched overload status, measurement time and the measurement date are all stored in memory.
For Sound Only
If you are looking for a Type 1 sound level meter only, then ask your Brüel & Kjær representative about Type 2239A. It has all the sound measurement features of Type 2239B, but does not include the vibration measurement capabilities.

For Vibration Only
If you want a hand-arm vibration meter alone, ask your Brüel & Kjær representative about Type 2537. It has all the vibration monitoring features of the Type 2239B, but does not include the sound level meter function.

Compliance with Standards

C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.

<table>
<thead>
<tr>
<th>Safety</th>
<th>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.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMC Immunity</td>
<td>EN 50082–1: Generic immunity standard. Part 1: Residential, commercial and light industry. EN 50082–2: Generic immunity standard. Part 2: Industrial environment. RF Immunity implies that sound level indications of 60 dB or greater will be affected by no more than ±1 dB. When measuring vibration with the Lin frequency weighting in an industrial environment, levels below 0.3 m/s² may be affected (extreme worst case).</td>
</tr>
</tbody>
</table>

Note: Sound level meter values are 14 dB better than required by IEC 61672 (Draft, March 2001).

Specifications - Type 2239B

General

<table>
<thead>
<tr>
<th>MEMORY</th>
<th>40 Records of Measurement Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLOCK</td>
<td>Real-time (calendar) and measurement duration</td>
</tr>
<tr>
<td>OVERLOAD INDICATION</td>
<td>Instantaneous indication of overload and latched overload. Stored records also include a latched overload indicator</td>
</tr>
<tr>
<td>AC OUTPUT</td>
<td>Short-circuit protected LEMO series 00 socket</td>
</tr>
<tr>
<td>Max. Output:</td>
<td>0.5 V RMS</td>
</tr>
<tr>
<td>Output Resistance:</td>
<td>100 kΩ</td>
</tr>
<tr>
<td>Output:</td>
<td>Signal from preamplifier (unweighted)</td>
</tr>
<tr>
<td>DISPLAY</td>
<td>4 line back-lit LCD showing:</td>
</tr>
<tr>
<td></td>
<td>• Input signal level - indicated with a quasi-analogue bar (updated 15 times per second)</td>
</tr>
<tr>
<td></td>
<td>• Selected parameter with level</td>
</tr>
<tr>
<td></td>
<td>• Warnings for overload and low battery</td>
</tr>
<tr>
<td></td>
<td>• Measuring range</td>
</tr>
<tr>
<td></td>
<td>• Time and frequency weighting</td>
</tr>
<tr>
<td></td>
<td>• Elapsed measurement time</td>
</tr>
<tr>
<td></td>
<td>• Menus for displaying and editing settings</td>
</tr>
<tr>
<td></td>
<td>• Stored measurement results can be recalled</td>
</tr>
<tr>
<td>BATTERIES</td>
<td>Four 1.5 V LR6/AA size alkaline cells</td>
</tr>
<tr>
<td>Lifeline:</td>
<td>&gt;14 h (at room temperature)</td>
</tr>
<tr>
<td>SERIAL INTERFACE</td>
<td>Compatible with:</td>
</tr>
<tr>
<td></td>
<td>• EIA -574</td>
</tr>
<tr>
<td></td>
<td>• EIA - 232 - E with 25-pole adaptor</td>
</tr>
<tr>
<td>Baud Rate:</td>
<td>9600</td>
</tr>
<tr>
<td>Data Bits:</td>
<td>8</td>
</tr>
<tr>
<td>Stop Bit:</td>
<td>1</td>
</tr>
<tr>
<td>Parity:</td>
<td>None</td>
</tr>
<tr>
<td>Handshake:</td>
<td>XON/XOFF</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL EFFECTS
Storage Temp.: -25 to +60°C (-13 to +140°F) Operating Temp.: -10 to +50°C (14 to 122°F) Maximum Humidity for Operation: 90% RH at 40°C for 96 h Warm-up Time: <15 s

PHYSICAL CHARACTERISTICS
Size: 257 × 180 × 41 mm Weight: 460 g (including batteries)

Sound Level Meter Functions

STANDARDS
Conforms with:
• EN 60651/IEC 60651 (1979) Type 1 plus Amendments 1 and 2
• EN 60804/IEC 60804 (2000) Type 1
• IEC 61672 (Draft, March 2001) Class 1
• ANSI S1.4 – 1983 Type 1
• ANSI S1.43 – 1997 Type 1

NOISE FLOOR
Below measurement range; less than 30 dB

DETECTORS
Simultaneous RMS and Peak with independent frequency weightings Linearity Range: 70 dB Pulse Range: 73 dB Non-linear Distortion: Insignificant Peak Detector Rise Time: Typically 50 μs (<100 μs)

TIME WEIGHTINGS
Fast, Slow, and Impulse according to Type 1 tolerances
**FREQUENCY WEIGHTING**

- RMS: A, C
- Peak: C

**MEASURING RANGES**

<table>
<thead>
<tr>
<th>Range (dB)</th>
<th>Max. Peak level</th>
<th>Upper limit (RMS) for signals with crest factor = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 – 100</td>
<td>103</td>
<td>83</td>
</tr>
<tr>
<td>50 – 120</td>
<td>123</td>
<td>103</td>
</tr>
<tr>
<td>70 – 140</td>
<td>143</td>
<td>123</td>
</tr>
</tbody>
</table>

**PARAMETERS**

- Types: $L_{eq}$, Max$D$, Max$L$, Min$L$, Peak, SPL, Inst
- Resolution: 0.1dB
- Updated: Once per second

**VIBRATION SENSITIVITY**

- <80 dB with L-weighting at 1 m/s$^2$ horizontally
- <85 dB with L-weighting at 1 m/s$^2$ vertically

**EFFECT OF MAGNETIC FIELD**

- 80A/m (1Ørsted) at 50Hz gives < 30 dB

**HUMIDITY EFFECT**

- <0.5 dB for 30% <RH <90% (at 40°C (104°F), 1kHz)

**TEMPERATURE EFFECT**

- <0.5 dB (–10 to +50°C (–14 to 122°F))

**Hand-Arm Vibration Functions**

**STANDARDS**

- Conforms with ISO 8041 Type 2 and ISO 5349

**INPUT**

- 0.35 pC/ms$^{-2}$ for Accelerometer Type 4505 A

**FREQUENCY WEIGHTINGS**

- Linear (Unweighted) (8 – 5000 Hz)
- Hand-Arm Vibration (8 – 1000 Hz)

**MEASURING RANGES**

- Hand-Arm: 5 – 1500 Hz
- Linear: 6.3 – 5000 Hz (-3dB)
- Inst. Low Range Setting: 0.1 – 316 m/s$^2$
- Inst. High Range Setting: 1 – 3160 m/s$^2$
- Peak, Low Range Setting: 0.14 – 447.2 m/s$^2$
- Peak, High Range Setting: 1.4 – 4472 m/s$^2$

**DETECTORS**

- RMS Averaging Time: 1s
- Peak Rise Time: <100 ms
- Automatic reset at 1s intervals

**PARAMETERS**

- $A_{min}$, $A_{max}$, $A_{eq}$, $A_{eq4}$, and $A_{eq8}$ are calculated based on 1s exponential averaging of the instantaneous RMS readings (Inst).
- $A_{mp}$ is the highest peak reading (Peak)

**TRANSDUCER**

- Accelerometer Type 4505 A

**REFERENCE CALIBRATION**

- Frequency: 159.15 Hz
- Acceleration: 10 m/s$^2$ (gives an indication of 1 m/s$^2$ when HA weighted)

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**Ordering Information**

**Type 2239B**  Sound Level and Hand-Arm Vibration Meter

Includes the following accessories:

- Type 4188 Prepolared Free-field 1/2" Condenser Microphone
- ZC 0027 Preamplifier
- Type 4505A Accelerometer
- ZE 0777 Charge Amplifier
- DB 3550 Mounting Stud
- KE 0323 Shoulder Bag
- UA 1236 Protective Cover
- 4 × QB 0013 Four 1.5V LR6/AA Size Alkaline Cels
- AO 0038 Low-noise Cable

**Optional Accessories**

- Type 4231 Sound Level Calibrator
- Type 4226 Multifunction Acoustic Calibrator

**Type 4294**  Vibration Calibration Exciter

**Type 2322**  Portable Printer

**Type 4500**  Cubic Accelerometer

**Type 4501**  Cubic Accelerometer

**AO 0283**  Super-low-noise Teflon Cable (for Types 4500 and 4501)

**AO 0339**  Low-noise Cable (for Types 4500 and 4501)

**AO 0403**  LEMO to BNC Cable

**AO 1442**  9-pole Cable with 25-pole Adaptor (for computer and serial printer)

**UA 1251**  Tripod

**UA 1254**  Microphone Holder (for tripod)

**UA 0459**  Windscreen (Ø 65 mm)

**KE 0325**  Carrying Case with insert for the instrument, Sound Level Calibrator Type 4231, Portable Printer Type 2322 and Tripod UA 1251

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