PRODUCT DATA

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

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: IEC 60651 (1979) and 60804 (2000) Type 1; IEC 61672 (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_{mp}, 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 2239 B 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 2239 B 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 1 s (Peak)
- Maximum RMS from last 1 s (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 1 s (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 2239 A. It has all the sound measurement features of Type 2239 B, 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 2239 B, but does not include the sound level meter function.

Compliance with Standards

CE, C-Tick	CE-mark indicates compliance with: EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand
Safety	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
EMC Emission	EN 50081–1: Generic emission standard. Part 1: Residential, commercial and light industry EN 50081–2: Generic emission standard. Part 2: Industrial environment CISPR 22 (1993): Radio disturbance characteristics of information technology equipment. Class B Limits FCC Rules, Part 15: Complies with the limits for a Class B digital device
EMC Immunity	EN 50082–1: Generic immunity standard. Part 1: Residential, commercial and light industry RF immunity implies that sound level indications of 50 dB or greater will be affected by no more than ±1 dB 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/s^2 may be affected (extreme worst case)
Note: Sound level meter values are 14 dB better than required by IEC 61672 (Draft, March 2001)	

Specifications – Type 2239 B

General

MEMORY
40 Records of Measurement Results

CLOCK
Real-time (calendar) and measurement duration

OVERLOAD INDICATION
Instantaneous indication of overload and latched overload. Stored records also include a latched overload indicator

AC OUTPUT
Short-circuit protected LEMO series 00 socket
Max. Output: 0.5 V RMS
Output Resistance: 100 Ω
Output: Signal from preamplifier (unweighted)

DISPLAY
4 line back-lit LCD showing:
- Input signal level – indicated with a quasi-analogue bar (updated 15 times per second)
- Selected parameter with level
- Warnings for overload and low battery
- Measuring range
- Time and frequency weighting
- Elapsed measurement time
- Menus for displaying and editing settings
- Stored measurement results can be recalled

BATTERIES
Four 1.5 V LR6/AA size alkaline cells
Lifetime: > 14 h (at room temperature)

SERIAL INTERFACE
Compatible with:
- EIA–574
- EIA–232–E with 25-pole adaptor

Baud Rate: 9600
Data Bits: 8
Stop Bit: 1
Parity: None
Handshake: XON/XOFF

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 × 97 × 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 S 1.4 – 1983 Type 1
- ANSI S 1.43 – 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

Range (dB)	Max. Peak level	Upper limit (RMS) for signals with crest factor = 10
30 – 100	103	83
50 – 120	123	103
70 – 140	143	123

PARAMETERS
Types: L_{eq}, MaxP, MaxL, MinL, Peak, SPL, Inst
Resolution: 0.1 dB
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
80 A/m (1Ørsted) at 50 Hz gives < 30 dB

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

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 (–3 dB)
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: 1 s
Peak Rise Time: <100 µs
Automatic reset at 1 s intervals

PARAMETERS
A_{min}, A_{max}, A_{eq}, A_{eq4}, and A_{eq8} are calculated based on 1 s 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)

Ordering Information

Type 2239B	Sound Level and Hand-Arm Vibration Meter
Includes the following accessories:	
Type 4188	Prepolarized Free-field 1/2″ Condenser Microphone
ZC 0027	Preamplifier
Type 4505 A	Accelerometer
ZE 0777	Charge Amplifier
DB 3585	Mounting Stud
KE 0323	Shoulder Bag
UA 1236	Protective Cover
4 × QB 0013	Four 1.5V LR6/AA Size Alkaline Cells
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 (∅65 mm)
Carrying Case	
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

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