Product Data

Type 2237 B Controller — Integrating Sound Level Meter and Hand-Arm Vibration Meter

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 651 (1979) and 804 (1985) Type 2; IEC 1672 (Draft, April 1997) Class 2; BS 5969 and BS 6698 Type 2I; and ANSI S1.4 – 1983 and Draft S1.43 – 199X Type 2
- ❍ 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
- ❍ Also available as a factory upgrade from a Type 2237 A Controller Integrating Sound Level Meter

Description

The 2237 B Controller 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
The 2237 Controller 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 & 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.

Convenient Downloading
The instrument comes with communication software that runs on a PC under Windows. The software's graphical interface makes it simple to download measurement records.

As a Sound Level Meter

The Type 2237 B Controller is quick and easy to use when taking environmental noise and occupational health measurements. Its specifications conform with Type 2 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 & Easy Acoustical Calibration
To calibrate the 2237 B Controller, 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 weighing 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 2 sound level meter only, then ask your Brüel & Kjær dealer about the 2237 A Controller. It has all the sound measurement features of the 2237 B Controller, but does not include the vibration measurement capabilities.

For Vibration Only

If you want a hand-arm vibration meter alone, ask your Brüel & Kjær dealer about the Type 2537. It has all the vibration monitoring features of the Type 2237 B, but does not include the sound level meter function.

Specifications 2237 B Controller

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 651 (1979) Type 2 plus Amendment 1
- EN 60804/IEC 804 (1985) Type 2 plus Amendment 2
- IEC 1672 (Draft, April 1997) Class 2
- ANSI S 1.4 – 1983 Type S2
- BS 5969 and BS 6698 Type 2

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

CE	CE-mark indicates compliance with EMC Directive
Safety	EN 61010–1 and IEC 1010-1: Safety requirements for electrical equipment for measurement, control and laboratory use
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 1672 (Draft, April 1997)	

TIME WEIGHTINGS:
Fast, Slow, and Impulse according to Type 2 tolerances

MICROPHONE:
Type 4137 Prepolarized Free-field 1/2″ Condenser Microphone
Sensitivity: –30 dB re 1 V/Pa ±2 dB
Frequency Range: 8 Hz to 10 kHz ±2 dB
Capacitance: 12 pF

FREQUENCY WEIGHTING:
RMS: A, according to Type 2 tolerances
Peak:
C, according to Type 2 tolerances
Linear: 31.5 Hz – 8 kHz (–3 dB)

MEASURING RANGES:

Range (dB)	Max. Peak level	Upper limit (RMS) for signals with crest factor = 5 (14 dB)
30 – 100	103	89
50 – 120	123	109
70 – 140	143	129

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 (1 Ørsted) at 50 Hz gives < 34 dB (L)

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

TEMPERATURE EFFECT:
<0.5 dB (–10 to +50°C)

Hand-Arm Vibration Functions

STANDARDS:
Conforms with ISO 8041 Type 2 and ISO 5349

INPUT:
0.35 pC/ms^{-2} for accelerometer Type 4505

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:
Type 4505 accelerometer

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

Ordering Information

2237B Controller: Sound Level and Hand-Arm Vibration Meter

Includes the following accessories:

Type 4137	Prepolarized Free-field 1/2″ Condenser Microphone
ZC 0027	Preamplifier
Type 4505:	Accelerometer
ZE 0777:	Charge Amplifier
DB 3585:	Mounting Stud
Type 4137:	Prepolarized Free-field 1/2″ Microphone
KE 0323:	Shoulder Bag
UA 1236:	Protective Cover
4 × QB 0013:	Four 1.5 V 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 1242:	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