Precision Integrating Sound Level Meter — Type 2236

USES:
- Measuring environmental noise
- Measuring occupational noise
- Frequency analysis of sound sources

FEATURES:
- Conforms with IEC 651 (1979) and 804 (1985) Type 1
- Conforms with ANSI S1.4-1983 and Draft S1.43-199X Type 1
- Calculates and displays $L_N$ values*
- Simultaneous RMS and Peak measurements with independent frequency weighting
- Automatic logging of results
- Performs complete statistical analyses
- 40 records of manually stored results
- Back-lit display
- Automatic-start allows for unattended measurements
- Optional octave filter

* user-definable for USA, UKe and Japanese models

Description

Precision Integrating Sound Level Meter Type 2236 has been designed specifically for environmental- and occupational-noise measurements.

**Double-detector**
A unique feature of the 2236 is that RMS and Peak detection occurs in parallel. In this way the sound level meter can display both the RMS value and the Peak value of the same signal — particularly useful when analyzing transients or impulses.

**Intuitive User-interface**
The clearly marked arrows and symbols on the front panel, combined with the large LCD screen (with backlight) make the sound level meter very easy to learn and use. The display is clear and concise, and an interactive dialog guides you through your measurement, quickly and efficiently. Warnings are also given when you attempt to change a set-up parameter once you have started your measurement.

**Statistics**
The sound level meter has three user-definable $L_N$ values (only two fixed ones for the International version). With the USA and UKe models you can also perform Level and Cumulative Distributions on the results, allowing basic statistics on the spot.

**Real-time Clock**
The 2236 sound level meter has a real-time clock for marking results with the date and time of any measurement — particularly useful for storing data for future use or pres-
Fig. 1 System setup for printing, recording and transferring results from the sound level meter.

AC & DC Outputs
The AC output from the sound level meter is the unweighted output signal from the preamplifier. This can be recorded on a DAT recorder, and used for further spectral analysis and noise source identification. The DC output is the analogue equivalent of whatever parameter is currently being measured, except that it does not include the correction for the range and the microphone K-factor.

Printing Results
Once you've finished measuring you can print your results, which can either be transferred onto a PC in a spreadsheet-compatible format with short heading for additional analysis or graphical presentation.

Interfacing to External Devices
The sound level meter communicates to external devices via the interface. By using the 9-pole to LEMO Cable AO 0404, and 9-pole Cable with 25-pole Adaptor AO 1386 you can easily connect the sound level meter to Graphics Printer Type 2318, a PC or a serial printer.

The AC output of the sound level meter can also be connected to a DAT recorder via LEMO to BNC Cable AO 0403.

Example Printout
Fig. 2 shows a printout from Graphics Printer Type 2318 for a Level Distribution measurement.

Optional Features
Internal Filters
Type 2236 is also available with nine built-in 1/1-octave filters at 1/1-octave intervals. These band-pass filters have centre frequencies of 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz and 8 kHz.

dB2XL Software
The dB2XL software allows you to transfer the measurement results from the sound level meter directly into a Microsoft® Excel spreadsheet, and to produce basic graphs.

Reporter™ Software
This, more comprehensive software, allows you to generate reports from the measurement results obtained from the sound level meter and display them.

Accredited Calibration
The sound level meter can also be sold with an accredited calibration that conforms to IEC 651 and IEC 804.
Specifications 2236

STANDARDS:
Conforms with IEC 651 (1979) and 804 (1985)
Type 1, and ANSI S1.4 – 1963 and Draft S1.43,
6th September, 1992 Type 1
1/1-octave filter set conforms with IEC 225 – 1966
and ANSI S1.11–86, order 3, Type 1–D (Types
2236 C and 2236 D only)

MEASURING RANGES:

<table>
<thead>
<tr>
<th>Range (dB)</th>
<th>Max.</th>
<th>Upper limit (RMS) for signals with crest factor = 10 (20dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 90</td>
<td>93</td>
<td>73</td>
</tr>
<tr>
<td>20 – 100</td>
<td>103</td>
<td>83</td>
</tr>
<tr>
<td>30 – 110</td>
<td>113</td>
<td>93</td>
</tr>
<tr>
<td>40 – 120</td>
<td>123</td>
<td>103</td>
</tr>
<tr>
<td>50 – 130</td>
<td>133</td>
<td>113</td>
</tr>
<tr>
<td>60 – 140</td>
<td>143</td>
<td>123</td>
</tr>
</tbody>
</table>

* Only available with Types 2236 C and 2236 D when filter selected.

† Level non-linearity caused by noise floor is < 0.4 dB at
30dB(A) (re IEC 651) and < 1 dB at 26dB(A)
† Level non-linearity caused by noise floor is < 0.4 dB at
30dB(A) (re IEC 651) and < 1 dB at 26dB(A)

NOISE FLOOR:
Typically: 18dB(A)
Maximum: 20dB(A) RMS
Includes preamplifier’s electrical noise and microphone’s thermal noise

DETECTORS:
Simultaneous RMS and Peak with independent frequency weightings
Linearity Range: 80dB
Peak Pulse Range: 83dB
Non-linear Distortion: Too small to affect accuracy
Peak Detector Rise Time: <50µs

FREQUENCY WEIGHTING:
Selected independently for RMS and Peak
RMS: A, C according to IEC651 Type 1
L: flat from 10Hz to 20kHz (±2dB) with Type 1 tolerances
Peak: C according to IEC651 Type 1
L: flat from 10Hz to 20kHz (±2dB) with Type 1 tolerances

FILTER (only available with Types 2236 C and 2236 D):
Band-pass Filters: Nine 1/1-octave filters at 1/1-octave intervals (base 10)
Centre Frequencies: 31.5, 63, 125, 250, 500Hz, 1, 2, 4, 8kHz
Maximum Noise Floor in Each Frequency Band:
See diagram for details

TIME WEIGHTING:

<table>
<thead>
<tr>
<th>Int.</th>
<th>USA</th>
<th>UKi</th>
<th>UKe</th>
<th>Jap.</th>
</tr>
</thead>
</table>

according to IEC651 Type 1

DISPLAY:
4 line LCD showing:
• Measuring range and quasi-analogue bar showing input signal
• Battery low, pause and overload with hold indicators
• Time weighting and elapsed measurement time
• Frequency weighting (Peak or RMS or filter centre frequency (only available with Types
2236 C and 2236 D), selected parameter with level

Optional back-light
The quasi-analogue bar is updated 15 times per second
Displayed parameter level updated once per second

PARAMETERS:
Common (and UKi only): MaxL, MinL, MaxP,
Peak, SPL, Leq, SEL, LEPd, and Overload in %
of measurement time
Specific:

<table>
<thead>
<tr>
<th>Int.</th>
<th>USA</th>
<th>UKi</th>
<th>UKe</th>
<th>Jap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLE</td>
<td>LCE</td>
<td>LEC</td>
<td>LAV,5</td>
<td></td>
</tr>
</tbody>
</table>

RESOLUTION:
Leq Values: 0.5dB
Other Parameters: 0.1dB

EXCHANGE RATE:

<table>
<thead>
<tr>
<th>Int.</th>
<th>USA</th>
<th>UKi</th>
<th>UKe</th>
<th>Jap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3, 5</td>
</tr>
</tbody>
</table>

RESET:
Resets Buffer (including elapsed time) to zero.
Warning prior to reset if elapsed time > 1 min.
Reset when changing frequency or time weighting
Resets all results in Log, Memory and Buffer if
held down together with (Data)
Optional reset when changing level of measurement range (L95 not available if range change is
without reset)

MICROPHONE:
Type 4188 prepolarized free-field 1/2” condenser microphone
Sensitivity: –30dB re 1V/Pa ±2dB
Frequency Range: 8Hz to 12.5kHz ±2dB
Capacitance: 12pF

MEMORY:
40 Records of Overall Results
RESULT LOGGING:

<table>
<thead>
<tr>
<th>Int.</th>
<th>USA</th>
<th>UKi</th>
<th>UKe</th>
<th>Jap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leq</td>
<td>Lq10</td>
<td>Lq10</td>
<td>Lq10</td>
<td>Lq10</td>
</tr>
</tbody>
</table>

Log Rate Log Cap. | Int. | USA | UKi | UKe | Jap. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1s*</td>
<td>36 m</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 s</td>
<td>6 h</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10 s</td>
<td>2.1/2 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>30 s</td>
<td>7.1/2 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1 m</td>
<td>15 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5 m</td>
<td>75 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>10 m</td>
<td>150 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>15 m</td>
<td>225 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>30 m</td>
<td>450 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>60 m</td>
<td>900 d</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

* only L95 logged at this rate

Logged To: log or interface
Memory Capacity: 128Kbytes (Types 2236 A and 2236 C), Equivalent to 21600 sets of results
(for example, 6hrs of 1s logging)
512Kbytes (Types 2236 B and 2236 D), Equivalent to 86400 sets of results (for example, 24hrs of
1s logging)

SERIAL INTERFACE:
Compatible with EIA-574
Compatible with EIA-232-E with 25-pole adaptor
Baud Rate: 1200 – 19200 (1200 – 9600 for
Japanese version)
Data Bits: 8
Stop Bit: 1
Parity: None
Handshake: Hardware, XON/XOFF or None

Result Output Formats

<table>
<thead>
<tr>
<th>Int.</th>
<th>USA</th>
<th>UKi</th>
<th>UKe</th>
<th>Jap.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Logged (Printer)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Logged (CSV)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Logged (Spreadsheet)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Level Distribution</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Cumulative Distribution</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Distribution Resolution (dB)</td>
<td>1 or 5</td>
<td>1 or 5</td>
<td>0.5, 1, 2, 5, 10</td>
<td></td>
</tr>
</tbody>
</table>

Heading: Long or short (only short for USA model)

DC OUTPUT:
Short-circuit protected coaxial LEMO socket (series 00)
### Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2236 A</td>
<td>Precision Integrating Sound Level Meter with 128 Kbyte memory</td>
</tr>
<tr>
<td>2236 B</td>
<td>Precision Integrating Sound Level Meter with 512 Kbyte memory</td>
</tr>
<tr>
<td>2236 C</td>
<td>Precision Integrating Sound Level Meter with 128 Kbyte memory and 1/1-octave filter set</td>
</tr>
<tr>
<td>2236 D</td>
<td>Precision Integrating Sound Level Meter with 512 Kbyte memory and 1/1-octave filter set</td>
</tr>
</tbody>
</table>

The –xxx extension refers to the particular English-language version.

### Includes the following accessories:

- 4 x QB 0013 1.5 V LR6/AA alkaline cells
- Type 4188 Prepolarized Free-field 1/2″ Microphone
- KE 0323 Shoulder Bag
- UA 1236 Protective Cover

### Optional Accessories

- **For Measuring:**
  - Type 4231 Sound Level Calibrator
  - Type 4226 Multifunction Acoustic Calibrator
  - UA 1251 Tripod
  - UA 0801 Tripod
  - UA 1254 Microphone Holder (for tripod)
  - UA 0459 Windscreen (∅ 65 mm)
  - AO 0408 Microphone Extension Cable (3m)
  - AO 0409 Microphone Extension Cable (10m)
  - ZT 0326 Octave Filter Set Upgrade
  - Type 4189 Prepolarized Free-field 1/2″ Microphone

- **For Transferring Results to a PC:**
  - AO 1386 9-pole Cable with 25-pole Adaptor

### For Recording on a DAT Recorder, Transferring Signals to an Analyzer or Using with Headphones:

- AO 0403 LEMO to BNC Cable

### For Printing:

- Type 2318 Graphics Printer
- WQ 1138 Serial Printer (Euro version)
- EQ 4001 Serial Printer (US version)
- EQ 4002 Serial Printer (UK version)
- AO 0404 9-pole to LEMO Cable (for 2318)
- AO 1386 9-pole Cable with 25-pole Adaptor (for serial printer)

### Upgrades:

- ZT 0326 Octave Filter Set (for A and B models)

### Carrying Case:

- KE 0325 Carrying Case with insert for sound level meter, Sound Level Calibrator Type 4231, Serial Printer WQ 1138 and Tripod UA 1251

### Services available with delivery:

- EK 0102 Accredited Calibration re IEC 651 and IEC 804

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