

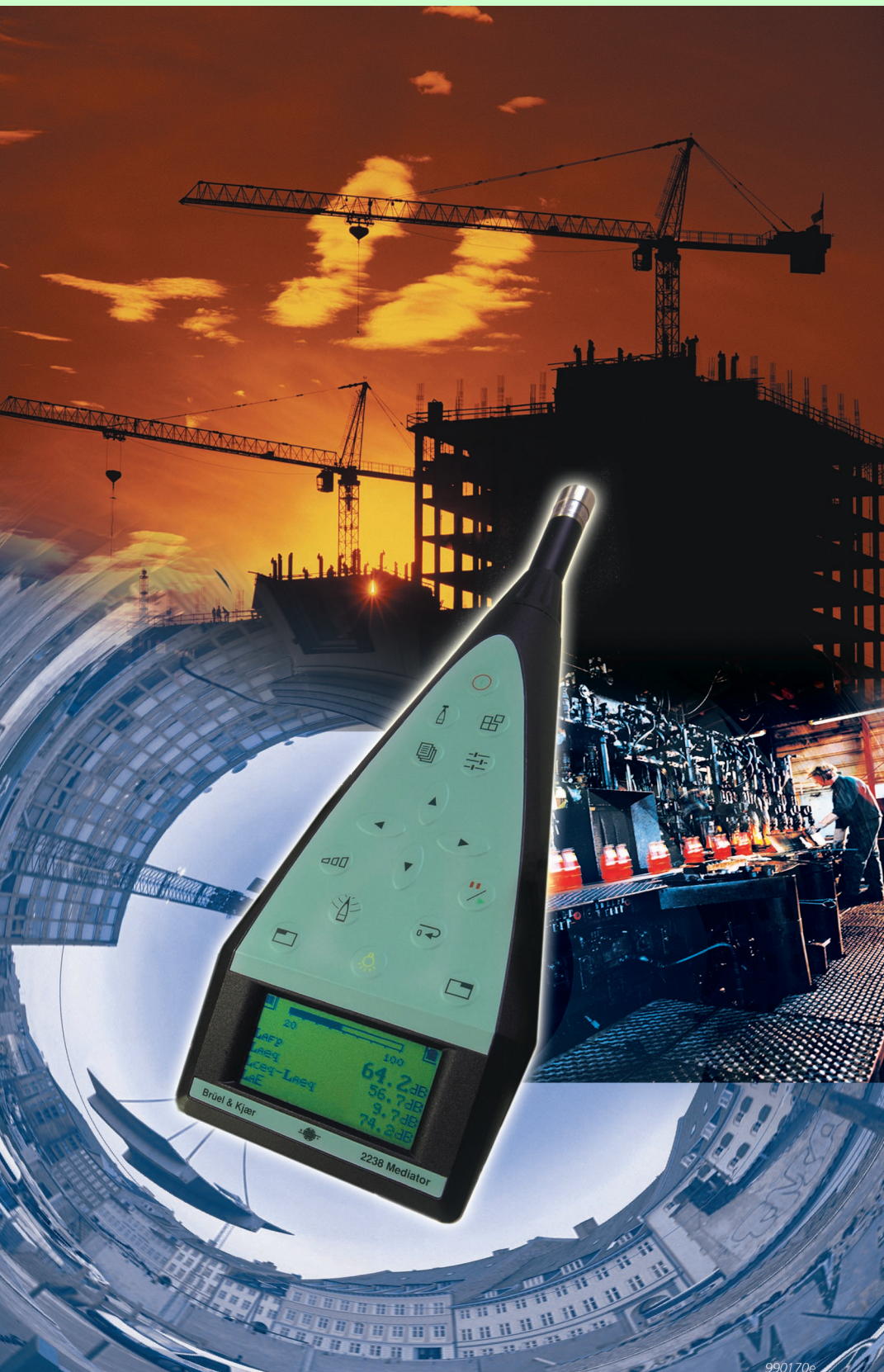
# PRODUCT DATA

## 2238 Mediator™ — Class 1 Integrating Sound Level Meters

When it comes to investing in a sound level meter, it's important to get an instrument that can keep up with you as your measurement requirements expand. 2238 Mediator does just that. Mediator can host a set of dedicated software packages that you can combine in any way you like. As a result you get the functionality you need now, plus the option of adding more later – and your investment is securely protected.

2238 Mediator is the modern interpretation of the classic sound level meter. While providing, as ever, high precision measurements, the many talents of the Mediator come fully into play by installing software modules making the instrument into a dedicated solution to measurement tasks in environmental, occupational and industrial application areas. All Mediators come with Basic Sound Level Meter Software installed, and other functions like statistics, logging and frequency analysis are added through easily installed software options – or you get exactly what you need installed from the factory.

The hardware comes with two independently frequency weighted detectors. These can be used for RMS/ Peak measurements or as two RMS detectors in parallel. All time weighted parameters (using F, S and I time constants) can be computed in parallel. A standard 2 Mbytes of memory is available for storing data. All versions can be fully controlled via the serial interface. Effects of sound incidence (frontal or random) can be corrected by a built-in filter, as can the effects of a windscreen, thus giving you Class 1 precision in all situations.



990170e

**2238**

## USES

- Environmental noise:
  - Assessment
  - Monitoring
  - Complaints
- Occupational noise evaluation
- Selection of hearing protection
- Noise reduction
- Product quality control
- General purpose Class 1 sound measurements

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## A Range Of Sound Level Meters

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*Up to four sound level meters in one – a solution for everyone*

*A range of software packages*

Sound level meters have many uses, ranging from the traditional uses in assessing environmental and workplace noise to industrial quality control and development. With its many options that allow you to tailor 2238 Mediator to suit your exact needs, there is a solution for everyone. These solutions are further enhanced by Brüel & Kjær's post-processing software suite, including 7815 Noise Explorer™ for general noise assessment, 7820 Evaluator™ for environmental noise and 7825 Protector™ for assessing workplace noise.

2238 Mediator is a whole range of products described in this data sheet. All instruments come with Basic Sound Level Meter Software BZ 7126 installed. This makes the unit into a modern precision integrating sound level meter with simultaneous RMS and Peak measurements, ideal for noise measurements at the workplace and for level checks in any set-up. Three additional standard software packages can be ordered factory-installed or they can be ordered separately at a later date for an instrument upgrade (the software is easily downloaded from any standard PC). The additional software comprises:

- Enhanced Sound Level Meter Software BZ 7125, adding statistics, back-erase and periodic reports, plus the choice between independently frequency weighted RMS/RMS or RMS/Peak measurements. This is especially valuable for assessments of environmental noise
- Logging Sound Level Meter Software BZ 7124, which allows free selection of up to 12 parameters to log at intervals from 1 s to 1 h (including two external DC values); alternatively you can log the  $L_{eq}$  plus two external values at a 100 ms rate. Results can be logged to a file in Mediator or to the interface. This allows for time histories for use in environmental noise as well as workplace noise
- Frequency Analysis Software BZ 7123, providing automatic scans of the 1/1- and 1/3-octave filter bands. Time/accuracy optimised dwell times are available as well as the option of averaging up to 99 spectra.

2238 Mediator can have up to four software packages installed. Choose the one to suit your current measurements and start measuring. If your application changes, just switch to a different software package – there is no need to load it into the instrument since it is already resident in the standard 2 Mbytes internal memory. This large memory also allows up to 511 measurements to be stored *per package*.

All combinations of factory installed software packages are available. See page 6 for an overview.

*Fig. 1 The potentially large amounts of data are conveniently managed using the file manager's save, recall, print and delete functions*



Menu	Cancel
001.H25	99Aug10 14:56
002.H25	99Aug10 14:56
003.H25	99Aug10 14:57
004.H25	99Aug10 14:58
005.H25	99Aug10 14:58
006.H25	99Aug10 14:59
007.H25	99Aug10 14:59



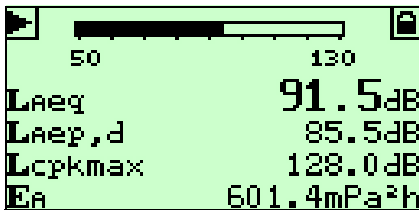
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## To the Point with Basic Sound Level Meter Software BZ 7126

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All Mediators come with the Basic Sound Level Meter Software BZ 7126 installed and is the simplest configuration of the instrument. The BZ 7126 software makes the sound level meter fully equipped to support measurements at the workplace and is also ideal for on the spot level checks in any situation.

*Fig. 2 Mediator's display is a 128×64 pixel graphics display with backlight, shown here in actual size. The display shows a typical Basic Sound Level Meter screen. The parameters displayed are freely selectable during measurements*



Running the Basic SLM Software allows simultaneous measurements of RMS and Peak levels, each with its own frequency weighting. The available parameters include the  $L_{eq}$ , maximum and minimum sound levels and the maximum peak level; occupational health related parameters such as  $L_{Aep,d}$ , dose percentages and exposure are also available. Measurements can be manually controlled, or the measurement time can be preset, in which case the result is automatically saved after the measurement. With the standard 2Mbytes memory installed in Mediator, up to 511 individual measurements can be stored at any one time. Saved measurements can be downloaded to PC software, printed or recalled to the display. An integrated file manager makes data management easy – see Fig. 1.

This is precision measurements made simple, which is further enhanced by the ability to save and recall four different setups, making it fast and easy to make sure that the right setup is used (frequency weightings, measurement range, duration, and so on). A measurement can be started automatically at any time within one month.

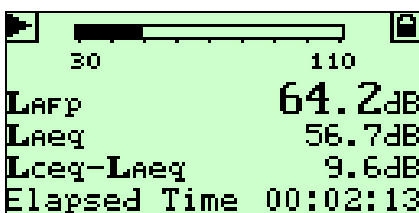
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## Digging Deeper with Enhanced Sound Level Meter Software BZ 7125

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When assessing environmental noise problems, large amounts of data are often needed. Enhanced Sound Level Meter Software BZ 7125 adds a number of interesting twists to 2238 Mediator in order to supply all necessary data in one shot. All standardised time constants (Fast, Slow, Impulse) are computed in parallel at any time, and on top of that you can choose to run two RMS measurements with independent frequency weightings (typically an A-weighted and a C-weighted RMS channel). You select which parameters to display, print or analyse, but all of them are computed and available at any time and saved with the measurement.

*Fig. 3 Sample screen from Enhanced SLM Software BZ 7125. Note that A- and C- weighted values are available simultaneously. Mediator's dual RMS detectors simultaneously compute F, S and I time constants in parallel*



Additionally, full statistics are available. Seven  $L_N$  values (from  $L_1$  to  $L_{99}$ ) can be freely selected for display. However, a full level distribution is saved with each measurement and is available for later analysis, for example using a PC running 7820 Evaluator, 7825 Protector or 7815 Noise Explorer software from Brüel & Kjær.

With the enhanced BZ 7125 software the instrument's two auxiliary sockets (generally used for AC and DC output) can be used as inputs to sample a DC voltage. The voltage can be displayed and saved with the measurement, so you might use this feature to include meteorological conditions or a traffic count with your noise data. The auxiliary sockets can also be configured as input/output triggers in order to synchronise measurements with external equipment, for example noise sources.

Fig. 4 Outdoor Gear Type 3592 and Outdoor Microphone Kit UA 1404



Measurements can be manually controlled, or the measurement time can be preset, in which case the results are automatically saved to a file. And the measurement can be set up to repeat 1–99 times in a sequence where each measurement is saved when finished and a new measurement is immediately started. This feature can be used to generate a sequence of periodic reports, for example, hourly reports covering 24 hours. As a matter of course this feature can be combined with the auto-start, enabling measurements to start unattended, for example, at midnight, using a specified setup.

When supplemented with Outdoor Gear Type 3592 and Outdoor Microphone Kit UA 1404 (see Fig. 4), 2238 Mediator is ideally suited for short as well as long term unattended measurements. The auto-start feature enables the instrument to start and stop measuring at predefined times, or you can control the instrument via modem (not supplied by Brüel & Kjær).

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### Time Histories with Logging Sound Level Meter Software BZ 7124

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Equipped with Logging SLM Software BZ 7124, 2238 Mediator becomes a versatile instrument for obtaining time histories. You select which of up to 12 parameters to log for each interval (including two DC values). To increase the total available measurement time, select

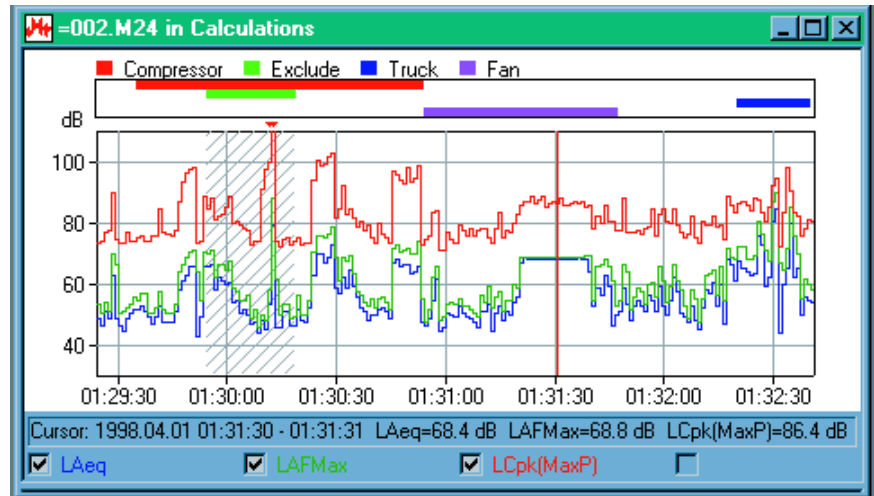
fewer parameters. Whatever you choose, the expected total measurement time with the selected setup is computed on-screen as you make your choices. The instrument can be set up to log the selected parameters at intervals from 1 s to 1 h in 1 s steps. And you can have the results logged to a file (up to 511 of them) or to the serial interface. For detailed profiles of short-term  $L_{eq}$ , 2238 Mediator can also be set to log values every 100 ms. In this case the  $L_{eq}$  is logged, and optionally two external DC voltages.

For attended measurements, four distinct on-the-fly markers are available. The markers (any of which can be on or off at any one time) are used as an annotation of the obtained data, for example, to point out specific noise sources. When data are transferred to PC software (7815 Noise Explorer, 7820/21 Evaluator or 7825 Protector), these markers are also transferred and immediately available for further analyses. 2238 Mediator running BZ 7124 can control sound recording while measuring on a PC running 7815 Noise Explorer or 7820/21 Evaluator. Recorded sounds are tagged to a marker and can be replayed from the cursor position in a profile display.

Fig. 5 Logged values annotated with markers using the Logging Sound Level Meter software

The window is a sample screen from 7820 Evaluator or 7821 Evaluator Light software which can directly import Mediator measurement results for further processing. The Evaluator software is dedicated to the assessment of environmental noise, whereas the 7825 Protector software aims at handling noise in the workplace. A general purpose software, 7815 Noise Explorer, is also available for reporting and management of data. All of the post-processing software programs handle all kinds of measurement results from the 2238 Mediator

Types 7815 and 7820/21 support recording of sound controlled by 2238 Mediator with logging software BZ 7124.



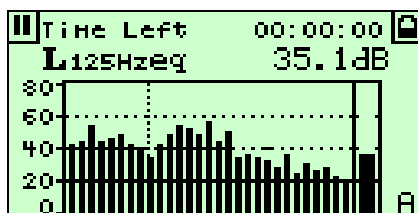
### Examples of Memory Capacity with Logging SLM Software

Assuming an empty file system at the start of measurements, Mediator can:

- Log one parameter, for example the  $L_{eq}$ , every second for more than a week
- Log four parameters every second for more than 2 days and nights
- Log 12 parameters every 15 minutes for more than 270 days
- Log  $L_{eq}$  10 times per second for more than 17 hours

## Getting Detail with Frequency Analysis Software BZ 7123

Fig. 6 Example of a frequency analysis in 1/3-octaves.  $L_{eq}$ ,  $L_{Min}$ , and  $L_{Max}$  can be displayed for each frequency band



2238 Mediator's optional 1/1-and 1/3-octave filter set can in all variants be used for measurements in any single frequency band. However, this filter set comes fully into its own when running Frequency Analysis Software BZ 7123. This software automates measurements in the nine octave bands and the 29 1/3-octave bands, making it a simple matter to obtain spectra in order to, for example, select hearing protection, qualify heat and ventilation systems, and assess low or high frequency contents.

As a user you select the bandwidth and the start and stop band, and can select one of the available time/accuracy optimised scan programs (providing you with tolerances of 0.25, 0.5 or 1.0 dB). The bar graph display is updated as the measurement progresses. In addition to making one scan, you can average up to 99 spectra into one resulting average spectrum. Alternatively, a fixed user-defined dwell time for all chosen frequency bands can be selected. In each frequency band  $L_{eq}$ ,  $L_{Min}$  and  $L_{Max}$  are measured using time constant F or S. A simultaneous overall broadband measurement is made during the scan(s) of the filter set.

If interrupting noise occurs during a measurement, the current measurement (scan) can be paused, providing you with the opportunity to back-erase, that is, delete one or more of the already measured frequency bands and continue the measurement from there.

## Outline of the Software Modules

The table below presents a summary of the characteristics of each of the software modules available with 2238 Mediator. Detailed specifications are found on page 7 to page 11.

Note that 2238 Mediator is always delivered with Basic Sound Level Meter Software BZ 7126 installed. Mediator can be ordered with any combination of additional software modules. See Ordering Information.

Feature	BZ 7126 Basic SLM	BZ 7125 Enhanced SLM	BZ 7124 Logging SLM	BZ 7123 Frequency Analysis
Class 1 to latest IEC and ANSI standards	●	●	●	●
4 setups can be stored (for each software)	●	●	●	●
4 auto-starts up to one month in advance (shared)	●	●	●	●
Automatic data storage with preset measurement time	●	●	●	●
Saves up to 511 files (for each software)	●	●	●	●
Calibration history, initial and 20 latest calibrations (shared)	●	●	●	●
Frontal/random and windscreen correction filters	●	●	●	●
Serial interface control	●	●	●	●
AC and DC outputs	●	●	●	●
Criterion level (70–100 dB), threshold level (0–100 dB)	●	●		
Exposure, dose and $L_{Aep,d}$	●	●		
Back-erase (5, 10, 15 s)		●		
Measurement sequence, periodic reports		●		
$L_{Ceq}$ - $L_{Aeq}$ , $L_{Aeq}$ - $L_{Aeq}$ , $L_{AFM5}$ - $L_{Aeq}$		●		
RMS/RMS or RMS/Peak		●	●	
All time weightings simultaneously (F, S, I)		●	●	
Statistics		●	●	
Two DC inputs for external parameters		●	●	
Logging of up to 12 parameters, 1 s to 1 h intervals			●	
Logging of $L_{eq}$ and DC inputs, 100 ms interval			●	
Four markers available for annotation			●	
Control of sound recording on PC			●	
Data output to file or interface			●	
Automatic scan of 1/1- and 1/3-octave bands				●
Time/accuracy optimised dwell times				●
Fixed dwell times, 1 s to 1 h				●
Bar-graph display with cursor read-out				●
Back-erase in current spectrum				●
Averaging of spectra				●
Trigger input/output for synchronising		●	●	●

# Specifications Common to all 2238 Mediator Variants

Specifications apply to 2238 Mediator fitted with the supplied microphone and preamplifier

## STANDARDS

Conforms with the following:

- o IEC 60651 Type 1, 1979 & Amendment 1 1993 & Amendment 2 2000
- o IEC/EN 61672 – Draft March 1998 Class 1
- o EN 60651 Type 1
- o EN 60804 Type 1
- o ANSI S1.4–1983 Type S1
- o ANSI S1.43–1997 Type 1

## SUPPLIED MICROPHONE

Type 4188 Pre-polarized Free-field 1/2" Condenser Microphone

**Nominal Sensitivity:** –30 dB re 1 V/Pa or 31.6 mV/Pa

**Frequency Range:** 8 Hz–16 kHz ±2 dB

**Capacitance:** 12 pF

## MICROPHONE PREAMPLIFIER

ZC 0030

**Extension Cables:** Available in lengths of 3 m and 10 m. No recalibration is required

## MEASURING RANGES

**Dynamic Range:** 80 dB, adjustable to give full-scale readings from 80 to 140 dB in 10 dB steps

**Max. Peak Level:** 3 dB above full scale reading

**Upper Limit (RMS) for Crest Factor = 10:** 17 dB below full scale reading

**Pulse Range:** 83 dB

**Linear operating ranges (broadband):**

For the individual level ranges, at 1 kHz, the nominal upper boundary level minus the lowest sound pressure level measurable with a noise margin of 5 dB.

With a Microphone Type 4188 of nominal sensitivity:

Upper limit	Lower limit	Max. peak level	Upper limit (CF=10)
140 dB	60 dB	143 dB	123 dB
130 dB	50 dB	133 dB	113 dB
120 dB	40 dB	123 dB	103 dB
110 dB	30 dB	113 dB	93 dB
100 dB	25 dB	103 dB	83 dB
90 dB	25 dB	93 dB	73 dB
80 dB	25 dB	83 dB	63 dB

## INHERENT NOISE LEVEL

This is due to the combination of electrical noise and microphone thermal noise at 20°C (68°F). Typical values with supplied microphone of nominal sensitivity (in dB):

Weighting	Electrical noise (2238)	Thermal noise (4188)	Combined noise
"A"	14 dB	14.2 dB	17.1 dB
"C"	17 dB	13.2 dB	18.5 dB
Lin. 5 Hz – 20 kHz	22 dB	14.5 dB	22.7 dB

## DISPLAY

128 pixel×64 pixel dot matrix display with backlight

## AUTO-START

Mediator supports a total of four timers which allow setup of measurement start times up to a month in advance

## CALIBRATION

Semi-automatic, using Sound Level Calibrator Type 4231 or Multifunction Acoustic Calibrator Type 4226.

The initial factory calibration (sensitivity and microphone serial number) is stored for comparison with later calibrations. When using the supplied microphone the maximum allowed deviation from the initial sensitivity is ±1.5 dB. An unspecified microphone can be chosen during calibration, in which case calibration can be made with practically any sensitivity.

**Stored Calibration History:** 20 latest calibrations plus initial calibration

## MEMORY

2 Mbytes. Up to 511 measurements can be stored by each loaded software module, including time stamp, complete setup and calibration data

## SERIAL PRINTER

Measurement data can be printed on Portable Printer Type 2322 or on an IBM® Proprinter-compatible printer

## CLOCK

Real-time (calendar)

## SERIAL INTERFACE

Conforms to EIA/TIA 574 (RS-232), coupled as Data Terminal Equipment (DTE). Cable (AO 1442) is included

**Connector:** 9–pin D-type male

**Baud Rates:** 4800, 9600, 19200, 38400 and 115200

**Word Length:** 8 bits, no parity, 1 stop bit

**Handshake:** Hardwired, modem

## SETTLING TIME

**From Power On:** <10 s

## ENVIRONMENTAL EFFECTS

**Storage Temperature:** –25 to +70°C (–13 to + 158°F)

**Operating Temperature:** –10 to +50°C (14 to 122°F)

**Effect of Temperature:** < 0.5 dB (–10 to +50°C)

**Effect of Humidity:** < 0.5 dB for 30% < RH < 90% (at 40°C, 1 kHz)

## BATTERIES

Four 1.5 V LR6/AA alkaline cells

**Lifetime (at room temperature):** Typically > 10 h (with filter set selected typically > 7 h)

## EXTERNAL DC POWER SUPPLY

**Voltage:** Regulated 7 to 15 V

**Power:** Approximately 150 mA at 7 V (approximately 210 mA with filter set selected)



## WEIGHT AND DIMENSIONS

460 g (1 lb 2 oz) (with batteries), 257×97×41 mm

## LANGUAGE

Each instrument is loaded with English, German, French, Italian and Spanish text. You can select one of these languages at any time

## Compliance with Standards

 	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
<b>Safety</b>	EN 61010-1 and IEC 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use. UL3111-1: Standard for Safety – Electrical measuring and test equipment
<b>EMC Emission</b>	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: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device.
<b>EMC Immunity</b>	EN 50082-1: Generic immunity standard. Part 1: Residential, commercial and light industry. RF immunity implies that sound level indications of 45 dB or greater will be affected by no more than 0.5 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 0.5 dB. These levels of immunity are 14 dB better than required by IEC/EN 61672 (Draft). <b>Note:</b> The above conformance is guaranteed only when using accessories listed in this Product Data sheet.

## Specifications with BZ7126 Basic SLM Software

### DETECTORS

Simultaneous detection of RMS and Peak with independent frequency weightings

**RMS:** Three selectable exponential time weightings (Fast, Slow, Impulse) and a linear averaging detector. Selectable frequency weighting A, C or Lin

**Peak:** Selectable frequency weighting C or Lin

**Overload Detector:** Monitors all the frequency weighted channels

**Exchange Rate:** 3 dB. In addition, 4 or 5 dB can be selected

**Criterion Level:** Can be set in the range 70–100 dB

**Threshold Level:** Can be set in the range 0–100 dB

### SAMPLE RATE

160 Hz

### DISPLAY

**Measurement Display:** Range and quasi-analogue bar, plus four measurement parameters that can be freely selected from all available parameters during measurements

### MEASUREMENT CONTROL

Manual control, or pre-set measurement time in the range 1½/2½/3½s–24 h with automatic storage of measurement

### Aux 1 OUTPUT

**Connector:** LEMO coaxial

**AC Output Signal:** Range-adjusted AC output, unweighted or with the frequency weighting selected on the RMS detector. Short-circuit protected

**Output:** 1 VRMS corresponding to full-scale indication

**Max. Load:** 10 kΩ||1 nF

**Output Impedance:** Typically 100 Ω

### Aux 2 OUTPUT

**Connector:** LEMO coaxial

**DC Output Signal:** DC version of signal on the RMS detector (delayed 0.8s)

(Fast, Inst). Short-circuit protected

**Output:** 0 to 4.0V DC (50 mV/dB)

**Update Rate:** 160 times per second

**Max. Load:** 10 kΩ||1 nF

**Output Impedance:** Typically 100 Ω

### MEASUREMENTS

L <sub>XYp</sub>	L <sub>XYInst</sub>	L <sub>XYMax</sub>
L <sub>XYMin</sub>	L <sub>Xeq</sub>	L <sub>XIeq</sub>
LA <sub>ZavQ</sub>	L <sub>Aep,d</sub>	E <sub>A</sub>
Dose% <sub>A</sub>	Dose% <sub>AZQ</sub>	L <sub>AE</sub>
L <sub>Vpk</sub>	L <sub>Vpkmax</sub>	# <sub>V</sub> Peaks
Overload%	Underrange%	Elapsed time
Start time	Start date	Time

Legend:

V = Frequency weighting C or L

X = Frequency weighting A, C or L

Y = Time weighting F, S, or I

Z = Time weighting F or S

Q = Exchange rate 4 or 5 dB (additional to the 3 dB exchange rate)



# Specifications with BZ7125 Enhanced SLM Software

## DETECTORS

Two detectors with independent frequency weightings. One detector is an RMS detector, the other can be set up as a Peak detector or as an additional RMS detector, allowing two independently weighted RMS detectors in parallel, each providing three exponential time weightings in parallel.

**RMS:** Three simultaneous exponential time weightings (Fast, Slow, Impulse) and a linear averaging detector. Selectable frequency weighting A, C or Lin

**Peak:** Selectable frequency weighting C or Lin

**Overload Detector:** Monitors all the frequency weighted channels

**Exchange Rate:** 3 dB. In addition, 4 or 5 dB can be selected

**Criterion Level:** Can be set in the range 70 – 100 dB

**Threshold Level:** Can be set in the range 0 – 100 dB

## SAMPLE RATE

160 Hz, statistics sampled at 40 Hz

## DISPLAY

**Measurement Display:** Range and quasi-analogue bar, plus four measurement parameters that can be freely selected from all available parameters during measurements. Where applicable, frequency and time weighting of selected parameter are selected with softkey.

Separate display for back-erase.

## MEASUREMENT CONTROL

Manual control, or pre-set measurement time in the range 30 s – 100 h with automatic storage of measurement

### Measurement Sequences:

Mediator can be set up to make a sequence of individual measurements (up to 99) in immediate succession

## Aux 1 SOCKET

**Connector:** LEMO coaxial.

Can be used as an AC output or a DC input for an external signal

### AC Output Signal:

Range-adjusted AC output, unweighted or with the frequency weighting selected on RMS detector 1. Short-circuit protected

**Output:** 1 V RMS corresponding to full-scale indication

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100  $\Omega$

### DC Input:

**Voltage Range:** 0 to 4 V (max. –1 to 6 V)

**Resolution:** 5 mV (800 steps)

## Aux 2 SOCKET

**Connector:** LEMO coaxial.

Can be used as a DC output, a DC input for an external signal, a trigger input or a trigger output

### DC Output Signal:

DC version of the signal on RMS detector 1 (Fast, Inst) (delayed 0.8 s). Short-circuit protected

**Output:** 0 to 4.0 V DC (50 mV/dB)

**Update Rate:** 160 times per second

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100  $\Omega$

### DC Input:

**Voltage Range:** 0 to 4 V (max. –1 to 6 V)

**Resolution:** 5 mV (800 steps)

### Trigger Input:

**Voltage Range:** 0 to 4 V (max. –1 to 6 V)

**Trigger Level:** 2 V, duration > 12.5 ms

### Trigger Output:

**Level:** 4 V

**Duration:** Throughout measurement

## MEASUREMENTS

L <sub>XYp</sub>	L <sub>XYInst</sub>	L <sub>AFT5</sub>
L <sub>XYMax</sub>	L <sub>XYMIN</sub>	L <sub>XYN</sub>
L <sub>Xeq</sub>	L <sub>Xleq</sub>	L <sub>AFTm5</sub>
L <sub>Ceq</sub> – L <sub>Aeq</sub>	L <sub>Aleq</sub> – L <sub>Aeq</sub>	L <sub>AFTm5</sub> – L <sub>Aeq</sub>
L <sub>AZavQ</sub>	L <sub>Aep,d</sub>	E <sub>A</sub>
Dose % <sub>A</sub>	Dose % <sub>AZQ</sub>	L <sub>AE</sub>
L <sub>Vpk</sub>	L <sub>Vpkmax</sub>	# <sub>V</sub> Peaks
AUX 1	AUX 2	Overload%
Underrange%	Elapsed time	
Start time	Start date	Time

### Legend:

V = Frequency weighting C or L

X = Frequency weighting A, C or L

Y = Time weighting F, S and I

Z = Time weighting F and S

Q = Exchange rate 4 dB or 5 dB (additional to the 3 dB exchange rate)

*Note 1:* When both detectors are set to RMS, it is not possible to select the same frequency weighting for the two detectors.

*Note 2:* Time weightings F, S and I are available simultaneously.

*Note 3:* If the Aux 1 and Aux 2 sockets are used for input, the signal(s) can be displayed and stored.

*Note 4:* Values for statistics are sampled 40 times a second and are derived from the signal on the RMS detector with a preselected time weighting (F, S or I). The class width is 0.5 dB. Seven percentiles (L<sub>XYN,T</sub>) are available during measurement at user-selectable levels (1% – 99%). A complete level distribution is stored.

# Specifications with BZ7124 Logging SLM Software

## DETECTORS

Two detectors with independent frequency weightings. One detector is an RMS detector; the other can be set up as a Peak detector or as an additional RMS detector, allowing two independently weighted RMS detectors in parallel, each providing three exponential time weightings in parallel.

**RMS:** Three simultaneous exponential time weightings (Fast, Slow, Impulse) and a linear averaging detector. Selectable frequency weighting A, C or Lin

**Peak:** Selectable frequency weighting C or Lin

**Overload Detector:** Monitors all the frequency weighted channels

**Exchange Rate:** 3 dB. In addition, 4 or 5 dB can be selected

## SAMPLE RATE

160 Hz, statistics sampled at 40 Hz

## DISPLAY

**Measurement Display, current log period:** Range and quasi-analogue bar, plus four measurement parameters that can be freely selected from all available parameters during measurements.

**Measurement Display, overall:** Range and quasi-analogue bar, plus four measurement parameters that can be freely selected from all available parameters during measurements

## MEASUREMENT CONTROL

Manual control, or pre-set measurement time with automatic storage of measurement

## Aux 1 SOCKET

**Connector:** 2 pin LEMO. Can be used as an AC output or a DC input for an external signal

### AC Output Signal:

Range-adjusted AC output, unweighted or with the frequency weighting selected on RMS detector 1. Short-circuit protected

**Output:** 1 V RMS corresponding to full-scale indication

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100  $\Omega$

### DC Input:

**Voltage Range:** 0 to 4 V (max. -1 to 6 V)

**Resolution:** 5 mV (800 steps)

## Aux 2 SOCKET

**Connector:** LEMO coaxial.

Can be used as a DC output, a DC input for an external signal, a trigger input or a trigger output

### DC Output Signal:

DC version of the signal on RMS detector 1 (Fast, Inst) (delayed 0.8 s). Short-circuit

protected

**Output:** 0 to 4.0 V DC (50 mV/dB)

**Update Rate:** 160 times per second

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100  $\Omega$

### DC Input:

**Voltage Range:** 0 to 4 V (max. -1 to 6 V)

**Resolution:** 5 mV (800 steps)

### Trigger Input:

**Voltage Range:** 0 to 4 V (max. -1 to 6 V)

**Trigger Level:** 2 V, duration > 12.5 ms

### Trigger Output:

**Level:** 4 V

**Duration:** Throughout measurement

## MEASUREMENTS

Parameters logged and stored in each interval (when selected):

L <sub>XYMax</sub>	L <sub>XYMIN</sub>	L <sub>XYN</sub>
L <sub>Xeq</sub>	L <sub>Xleq</sub>	L <sub>AFTm5</sub>
L <sub>AZavQ</sub>	L <sub>Vpkmax</sub>	# <sub>VPeaks</sub>
AUX 1	AUX 2	Marker settings

Parameters in overall measurement:

L <sub>XYp</sub>	L <sub>XYInst</sub>	L <sub>XYMax</sub>
L <sub>XYMIN</sub>	L <sub>Xeq</sub>	L <sub>Xleq</sub>
L <sub>Vpk</sub>	L <sub>Vpkmax</sub>	# <sub>VPeaks</sub>
Overload%	Underrange%	Elapsed time
Start time	Start date	Time

Legend:

V = Frequency weighting C or L

X = Frequency weighting A, C or L

Y = Time weighting F, S and I

Z = Time weighting F and S

Q = Exchange rate 4 dB or 5 dB (additional to the 3 dB exchange rate)

*Note 1:* When both detectors are set to RMS, it is not possible to select the same frequency weighting for the two detectors.

*Note 2:* Time weightings F, S and I are available simultaneously.

*Note 3:* If the Aux 1 and Aux 2 sockets are used for input, the signal(s) can be displayed and logged.

*Note 4:* Values for statistics are sampled 40 times a second and are derived from the signal on the RMS with a preselected time weighting (F, S or I). The class width is 0.5 dB. Seven percentiles (L<sub>XYN,T</sub>) are available during measurement at user-selectable levels (1% - 99%).

# Specifications with BZ7123 Frequency Analysis Software

## DETECTORS

Simultaneous detection of spectrum and broadband parameters  
**Spectrum:** 1/1-octave and 1/3-octave band filters with two exponential time weightings (Fast, Slow) and a linear averaging detector

**Broadband:** Two selectable exponential time weightings (Fast, Slow) and a linear averaging detector

**Selectable frequency weighting:** A, C or Lin

**Overload Detector:** Monitors all the frequency weighted channels

## SAMPLE RATE

160 Hz

## DISPLAY

**Spectrum:** Bargraph display of current and averaged spectrum with cursor read-out plus broadband channel.  $L_{eq}$ ,  $L_{Min}$  and  $L_{Max}$  can be selected for graphic display and read-out.

**Broadband measurement:** Range and quasi-analogue bar, plus four measurement parameters that can be freely selected from all available parameters during measurements

## MEASUREMENT CONTROL

Time/accuracy optimised scan time at three confident levels (0.25, 0.5 or 1.0 dB), or manually selected dwell time in the range 1 s to 1 h

User selected number of scans (in the range 1–99) averaged into one resulting spectrum

## Aux 1 OUTPUT

**Connector:** LEMO coaxial

**AC Output Signal:** Range-adjusted AC output, filtered through the currently selected band.  
Short-circuit protected

**Output:** 1 VRMS corresponding to full-scale indication

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100 $\Omega$

## Aux 2 OUTPUT

**Connector:** LEMO coaxial

**DC Output Signal:** DC version of the signal on the RMS detector (Fast, Inst), filtered through the currently selected band (delayed 0.8s). Short-circuit protected

**Output:** 0 to 4.0V DC (50 mV/dB)

**Update Rate:** 160 times per second

**Max. Load:** 10 k $\Omega$  || 1 nF

**Output Impedance:** Typically 100 $\Omega$

## FILTER SET SPECIFICATIONS (ZT 0328)

### STANDARDS

Conforms with the following:

IEC/EN 61260 (1995) Octave and 1/3-octave Bands Class 1

ANSI S1.11–1986 Octave and 1/3-octave Bands, Order 3, Type 1D

### OCTAVE AND 1/3-OCTAVE BAND FILTERS

**Nominal 1/1-octave Band Centre Frequencies:** 31.5 Hz, 63 Hz, 125 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 4 kHz and 8 kHz

**Nominal 1/3-octave Band Centre Frequencies:** 20 Hz, 25 Hz, 31.5 Hz, 40 Hz, 50 Hz, 63 Hz, 80 Hz, 100 Hz, 125 Hz, 160 Hz, 200 Hz, 250 Hz, 315 Hz, 400 Hz, 500 Hz, 630 Hz, 800 Hz, 1 kHz, 1.25 kHz, 1.6 kHz, 2 kHz, 2.5 kHz, 3.15 kHz, 4 kHz, 5 kHz, 6.3 kHz, 8 kHz, 10 kHz and 12.5 kHz

### MEASUREMENTS

Parameters measured in each frequency band:

$L_{eq}$	$L_{ZMax}$	$L_{ZMIN}$
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Parameters in concurrent broadband measurement:

$L_{XZp}$	$L_{XZInst}$	$L_{XZMax}$
$L_{XZMIN}$	$L_{Xeq}$	Overload%
Underrange%	Elapsed time	Start time
Start date	Time	

Legend:

X = Frequency weighting A, C or L

Z = Time weighting F or S

# Ordering Information

Type 2238-X (see exact order number from table)

Order number	BZ 7126 Basic SLM	BZ 7125 Enhanced SLM	BZ 7124 Logging SLM	BZ 7123 Frequency Analysis
2238-A* Mediator	●			
2238-B* Mediator	●	●		
2238-C* Mediator	●	●	●	
2238-D Mediator	●			●
2238-E Mediator	●	●	●	●
2238-F* Mediator	●		●	
2238-G Mediator	●	●		●
2238-H Mediator	●		●	●

\* Add "F" to include a 1/1- and 1/3-octave band filter set allowing you to select a frequency band as a frequency weighting.

Select models 2238-D, -E, -G, or -H to include automatic frequency analysis with a pre-installed filter set. Later upgrade with the frequency analysis software BZ 7123 possible for other models with a filter set installed.

In addition to the above order numbers, complete systems can be ordered at special prices. A typical system would consist of:

- 2238 Mediator
- PC post-processing software (Type 7815 Noise Explorer, Type 7820/21 Evaluator or Type 7825 Protector, as applicable)
- Sound Level Calibrator Type 4231
- Tripod UA 1251
- Windscreen UA 0237

Please contact your local Brüel & Kjær representative for information.

## Accessories Included

Type 4188	Prepolarized Free-field 1/2" Condenser Microphone
ZC 0030	Microphone Preamplifier
AO 1442	RS-232 Null Modem Cable
KE 0323	Shoulder Bag
UA 1236	Protective Cover
QB 0013	4 Alkaline Batteries

## Optional Accessories

Type 7815	Noise Explorer Software
Type 7820	Evaluator Software
Type 7821	Evaluator Light Software
Type 7825	Protector Software
Type 4231	Sound Level Calibrator
Type 4226	Multifunction Acoustic Calibrator
Type 3592	Outdoor Gear
UA 1404	Outdoor Microphone Kit
Type 2322 A	Portable Printer (European version)
Type 2322 B	Portable Printer (UK version)
Type 2322 C	Portable Printer (US version)
UA 1251	Lightweight Tripod
UA 0237	Windscreen (90 mm)
AO 0560	Microphone Extension Cable (10 m)
AO 0561	Microphone Extension Cable (3 m)
AO 0585	Cable from 2238 to audio input on a PC
UA 1254	Microphone Cable Holder (for tripod)
AO 0403	LEMO to BNC Cable (output/input cable)
ZG 0386	Power Supply (European version)
ZG 0387	Power Supply (UK version)
ZG 0388	Power Supply (US version)
KE 0325	Carrying Case (with insert for Sound Level Meter, Calibrator Type 4231, Portable Printer Type 2322 or Windscreen UA 0237, and Tripod UA 1251)

## Services Available With Delivery

2238 CAF	Accredited Calibration
2238 CAI	Accredited Initial Calibration
	For models with a filter set installed, order ZT 0328 CAI in addition

## Upgrades

2238 MUF	1/1- and 1/3-octave band filter set with installation (Upgrade of models 2238-A, -B, -C and -F) Must be installed at a Brüel & Kjær service centre
BZ 7125	Enhanced Sound Level Meter Software Upgrade of models 2238-A, -A-F, -D, -F, -F-F and -H)
BZ 7124	Logging Sound Level Meter Software (Upgrade of models 2238-A, -A-F, -B, -B-F, -D and -G)
BZ 7123	Frequency Analysis Software (Upgrade of models 2238-A-F, -B-F, -C-F and -F-F)

Software upgrades are delivered on disk, including installation program; can be installed by the user. License certificate and additional manual included. Serial number of instrument must be stated when ordering software upgrades

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