PRODUCT DATA

Hand-held Analyzer Types 2250 and 2270

Type 2250 and Type 2270 are the innovative, 4th generation hand-held analyzers from Brüel & Kjær. The analyzers' easy, safe and clever design philosophy is based on extensive research. Type 2250 has won several awards for its excellent ergonomics and design.

Both analyzers can host a number of applications including frequency analysis, logging, FFT, building acoustics and signal recording. Additionally, Type 2270 can, with the 2-channel Option, make use of both channels to simultaneously measure with two microphones, two accelerometers or one of each.

All hand-held analyzer application modules can be ordered as part of a fully pre-configured instrument or separately at any time, as the need arises. Brüel & Kjær delivers the functionality you need now, plus the capability to add more functionality later, making this is a very secure investment.

The combination of application modules and innovative hardware makes these instruments dedicated solutions for performing high-precision measurement tasks in environmental, occupational and industrial application areas. Together with Measurement Partner Suite BZ-5503 for post-processing they are the total solution for your measurement needs.

Uses and Features

Uses

- Environmental noise assessment
- Occupational noise evaluation
- Reverberation Time measurements[*]
- Noise reduction
- Product quality control
- Class 1 sound measurements to latest international standards
- Real-time analysis in 1/1- and 1/3-octave bands
- Tone assessment using 1/3-octave and FFT methods
- Loudness and noise rating measurements
- Analysis of time histories for broadband parameters and spectra (Logging)
- Measurement documentation using text, voice, metadata and signal recording annotations
- Logging some or all broadband and spectral parameters
- Low-frequency building vibration according to ISO 8041:2005 and DIN 45669 – 1:2010 – 09
- Infrasound (G-weighting) measurements according to ISO 7196:1995 and ANSI S1.42 – 2001 (R2011)

Features

- Hardware:
  - 2-channel measurement capability with any combination of microphones and accelerometers[†]
  - Large, high-resolution, touch-sensitive color screen
  - Data storage on high-capacity plug-in memory cards
  - Communication via USB, LAN, or GPRS/3G modems
  - Integral digital camera for documentation and reference[†]
  - Automatic detection of and correction for windscreen
  - Robust and environmentally protected (IP44)
- Software:
  - Dynamic range in excess of 123 dB(A)
  - 0.5 Hz – 20 kHz broadband linear range
  - Personalized measurement, display and job setup
  - 'Smiley' quality indicators with hints and warnings
  - Timers for automatic start of measurement
  - Measurement Partner for archiving, previewing and exporting data; software maintenance and online display
  - GPS coordinates stored with measurement data
  - Simultaneous acoustic and weather data measurement
  - 24- or 16-bit recording during all or parts of measurement

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[*] For more information, please refer to the relevant product data sheet.

[†] Type 2270 only.

Brüel & Kjær

Introduction

Types 2250 and 2270 are flexible instruments that can cover your measurement and analysis needs – from the traditional uses in assessing environmental and workplace noise to industrial quality control and development.

This data sheet describes different combinations of software modules (applications) available for Type 2250 and Type 2270. All instruments are delivered with the Sound Level Meter Software BZ-7222 enabled. These modern Class 1 Sound Level Meters (SLMs) fulfil the requirements up to and including the latest standard, IEC 61672–1 (see the specifications section for compliance information), and are delivered with a number of pre-defined measurement and display setups tailored to suit specific requirements.

Optional Applications

A variety of applications that can be used in any combination can be purchased when you need them and are delivered as easily installed licenses.

The applications described in this data sheet are:
- **Frequency Analysis Software BZ-7223 –** analyse, in real-time, the 1/1- and 1/3-octave filter bands with a dynamic range in excess of 135 dB, from the noise floor to 140 dB, the maximum measurable level
- **Logging Software BZ-7224 –** freely select parameters to log at periods from 1 s to 24 hr. Running together with SLM Software, all broadband parameters can be logged. If Frequency Analysis Software is also enabled, spectra can be logged at the same rates. Logging (or noise profiling) is used to develop time histories for use in environmental noise as well as workplace noise assessment
- **Enhanced Logging Software BZ-7225 –** continuously monitor and log periodic reports in addition to the features of Logging Software. Parameters such as L_{dn} and L_{den} are calculated
- **Signal Recording Option BZ-7226 –** attach actual samples of the measured signal to your measurements using the actual measurement transducer
- **2-channel Option BZ-7229 (Type 2270 only) –** realise the full potential of your analyzer with 2-channel functionality for SLM, Frequency Analysis, Logging, Enhanced Logging and Building Acoustics software
- **Tone Assessment Option BZ-7231 –** identify any 1/3-octave bands with audible tones above a set limit
- **Low Frequency Option BZ-7234 –** measure infrasound (G‑weighting) and building vibration (w_m weighting) with 1/3 octave spectra to very low frequencies

Information regarding the following applications can be found in their respective Product Data sheets:
- **Reverberation Time Software BZ-7227 –** start a basic measurement by clapping your hands. The 'traffic light' shows measurement status at a glance, and the resulting reverberation time (RT) spectrum is shown as well as the average RT for the room. For assessing the acoustic quality of auditoria, halls, public spaces and workplaces. (Product Data BP 2152)
- **Building Acoustics Software BZ-7228 –** assess sound insulation in buildings and of building elements. Airborne as well as impact sound insulation can be measured, and final results shown on the spot to international (ISO) and 12 national standards. The required sound sources and PC reporting software are available, as well as complete building acoustics systems. (Product Data BP 2190)
- **FFT Analysis Software BZ-7230 –** analyse using the Fast Fourier Transform (FFT) algorithm, the tool of choice for measurement and diagnostics of machinery noise and vibration. The 'profile' of a machine is its fingerprint, revealing sources of noise and vibration and their paths to the measurement position. Useful in product development, troubleshooting, quality control and environmental noise measurements.
  With Tone Assessment Option BZ-7231, FFT Analysis offers objective indication of tonal noise audibility and annoyance (Product Data BP 2183)
- **Sound Intensity Software BZ-7233 (Type 2270 only)** – make sound intensity measurements from beginning to end. A single user can make complete intensity measurements for total sound power and noise source location. You can use the built-in camera to take a photo to aid in probe placement during measurement and for use as a background for a map of the results (Product Data BP 2341)

Long-term and Continuous Noise Monitoring

For long-term and continuous noise monitoring, Brüel & Kjær offers a wide range of Noise Monitoring Terminal (NMT) and Noise Sentinel solutions that will meet and evolve with your needs. For more information, please consult Product Data BP 2379 for NMT solutions and Product Data BP 2389 for Noise Sentinel solutions.

The Hand-held Analyzer Hardware
Great care has been taken to ensure that the hardware is ergonomically optimal in field use. Both Type 2250 and Type 2270 use the same award-winning design. The key features are shown in Fig. 1.

Fig. 1 *Key features of Hand-held Analyzer Types 2250 and 2270*

Microphone/Preamplifier Stage:
• Falcon™ Range ½″ microphone and microphone preamplifier stage
• The microphone preamplifier stage is able to drive an extension cable of up to 100 m, a valuable feature when a measurement requires remote location of the microphone

Windscreen

Windscreen Sensor

Navigation Pushbuttons:
• Up/down, left/right arrow keys

Event Pushbutton:
• For marking events

Back Erase/Exclude Pushbutton:
• Allows you to erase the last 5 s of data
• Mark logged data with an exclude marker

Start/Pause Pushbutton:
• Press to start a measurement
• Press to pause a measurement

Reset Measurement Pushbutton:
• Allows you to reset the measurement buffers

Display:
• Touch sensitive color screen with backlight

Power Switch

G4 indicates hardware version 4

Stylus (stored)

Camera (only available with Type 2270)

Commentary Pushbutton:
• Allows you to attach recorded messages to measurements

Accept Pushbutton:
• Accepts any changes made to parameters/setups

Red, yellow, green Status Indicators

Store Pushbutton:
• Store measurement results

Microphone for commentary

Mounting thread

Non-slip surfaces for safe grip

Battery Compartment for rechargeable battery pack

Thread for tripod/wrist strap

FFT ANALYZER*
CF Card NT\Project 002*
00:00:04
Avg# >10   Main   Tr#---
MAX   1.350 kHz   22.5 Tot: 93.9
FFT   1.350 kHz   12.4 Tot: 93.9
RMS   Wgt: Z   FC: Off   Exp
Span   2 kHz
Lines   400
19:45:17

Cover for protecting connectors

Output:
• Output socket for software-determined signals

Trigger/Tacho Input

3.5 mm Stereo Socket for Headphones:
• For reviewing recorded comments or listening to measurement signals

Reset button

USB 2.0 (On-the-Go) Micro-AB socket:
• Allows data transfer and remote control of the instrument directly with a host PC

USB 2.0 Standard A socket
• For connection to USB devices

High-speed LAN Interface

Slots for Secure Digital (SD) memory cards

Input Channels 1 and 2 (2-channel option only available with Type 2270):
• For AC/DC or CCLD signals. Can be used when analysing electrical signals

Battery Charge:
• 8 – 24 V DC input from a universal mains adapter or external batteries

120261

Battery Charge Indicator LED

Post-processing Software

Fig. 2
*Measurement Partner
Suite BZ-5503*

Measurement Partner Suite BZ-5503, in its basic configuration, comes with your hand-held analyzer. It is Brüel & Kjær's state-of-the-art data viewing and post-processing toolbox for Environmental noise and vibration professionals, designed to give the quickest route from measurement data to finished report.

The free, basic configuration provides data archive, preview and export capabilities, software maintenance and online display.

Additional valuable data analysis and post-processing tools are available on a time-limited subscription basis. You only pay for what you need, when you need it, with no penalty should your subscription lapse.

For more information on Measurement Partner Suite BZ-5503, please consult Product Data BP 2430.

Connectivity

Fig. 3
*Secure access to
measurement data
from anywhere*
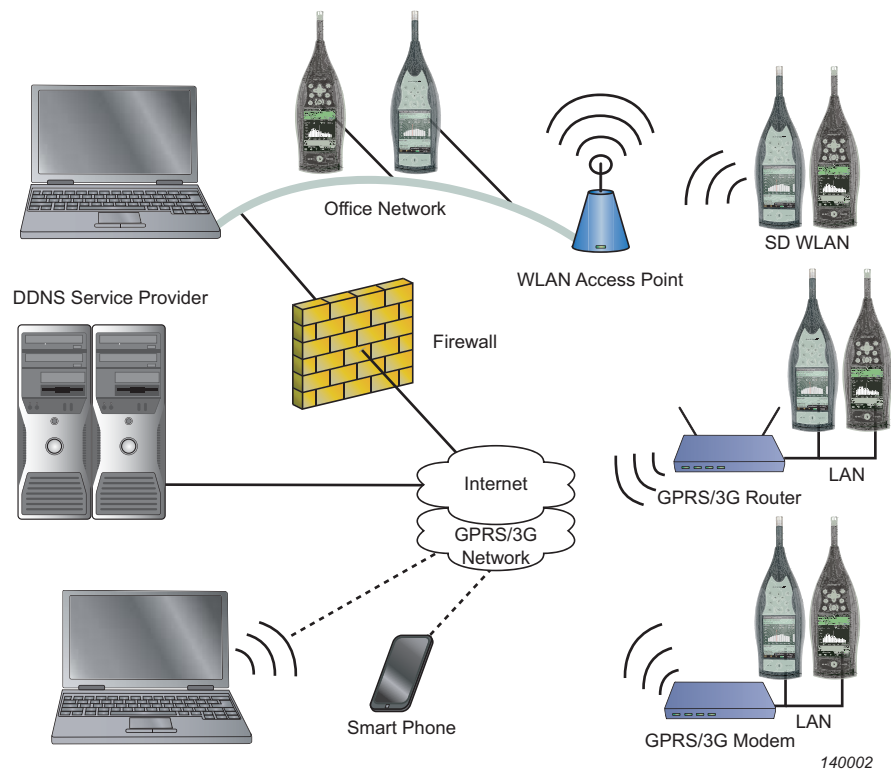
Remote Internet Communication

Broadband Internet communication with Type 2250 and Type 2270 allows operation through routers, mobile broadband and firewalls with all the usual security protocols. These analyzers, with their support of IP EDGE or GPRS technologies for remote logging and instrument control, offers speed, price and coverage benefits over the now aging GSM technology.

Alerting the Operator

Email or SMS/text messages can be sent to a PC or mobile device to inform operators instantly of noise events that require a response, battery power levels that require attention, memory storage status, calibration status and many other user-programmed trigger conditions. This is a very low-cost solution for receiving important alerts.

Secure Digital High Capacity (SDHC)

SDHC memory cards complying with the new SD 2.0 standard, offer up to 32 GB of removable data storage. This enables very long signal recordings and measurement profiles to be made.

Using the Platform

All user choices for setups (what to measure) and preferences (how to display it) are controlled using easy to understand lists, that can be expanded and collapsed. No more cluttered displays, choose only the parameters you want to see.

Annotating Your Measurement Data

The standard package allows you to document your measurements with written notes and voice annotations. Notes are added using a virtual keyboard on the touch screen.

Voice annotations are recorded using a separate commentary microphone when the commentary pushbutton is pushed and held. Voice annotations and notes can be attached before, during and after the measurement; however, spoken comments during the measurement should be made during a pause or with the microphone placed at a distance using an extension cable. These unique features allows you to document your measurement and always have this information attached to the measurement. Notes and voice annotations can be reviewed on the instrument itself or after the data has been transferred to Measurement Partner Suite.

Sound Level Meter Software – BZ-7222

Fig. 4

Sound Level Meter Software displays with a sound measurement (left) and a vibration measurement (right) with an accelerometer, including the icons for added annotations, visible in the upper right corner
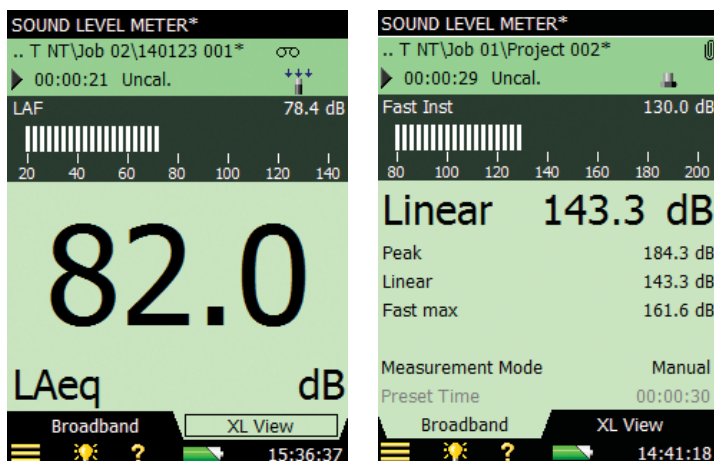

All Hand-held Analyzer Types 2250 and 2270 come with the Sound Level Meter Software enabled. This makes your analyzer a versatile broadband SLM. If you connect an accelerometer to the rear socket, it also functions as a Vibration Meter that can display parameters as engineering units or logarithmically in dB. The software complies with the latest international standard (IEC 61672–1) as well as national standards. For a complete list of measured parameters, see Specifications.

2-channel Measurements with BZ-7222

Fig. 5

Logging displays with (left) single- and (right) 2-channel options, showing part of profile with 100 ms resolution
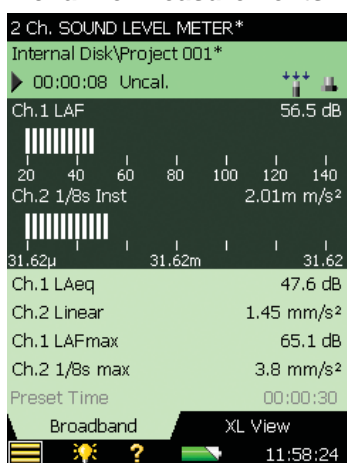

Type 2270 users with 2-channel Option BZ-7229 enabled can measure two channels of broadband values with any combination of transducers: two microphones, two accelerometers or one microphone and one accelerometer.

Frequency Analysis Software – BZ-7223

Fig. 6
Frequency Analysis Software BZ-7223 displays (left to right): 1/3-octave showing dual spectra and generator icon, Cursor readouts, Loudness and Noise Rating (NR) results

The decisive band and the corresponding NR curve is shown.
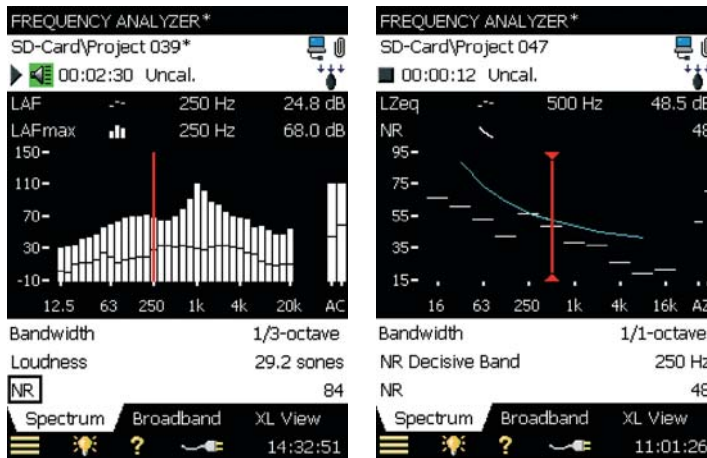
This application enables real-time measurements in 1/1- and 1/3-octave bands, adding frequency information to your data, making it easy to collect spectra, whatever the task.

Each 1/1- or 1/3-octave band has a dynamic range in excess of 135 dB, from the noise floor to 140 dB, the maximum measurable level.

The available ranges are centre frequencies 8 Hz to 16 kHz (1/1-octave) and centre frequencies 6.3 Hz to 20 kHz (1/3-octave). The Low-frequency option extends the ranges to 1 and 0.8 Hz, respectively.

Spectra can be A-, B-, C-, G- or Z-weighted. Five spectra and full spectral statistics are measured and stored. In addition, seven different L_N spectra and instantaneous values are available for display. Two spectra (for example, a minimum and maximum spectrum) can be superimposed on the display. All the broadband quantities measured by Sound Level Meter Software BZ-7222 are computed in parallel with the analysis. Spectral analyses can be documented using notes and voice annotations.

For a measured spectrum, single-number parameters, such as Noise Rating, Speech Interference Level and Loudness, can be calculated and displayed for noise impact analysis and limit comparison. A programmable generator is available for measurements requiring a sound source. You can select white or pink noise and set the upper and lower limits.

*Fig. 7*
2-channel Frequency Analyzer display
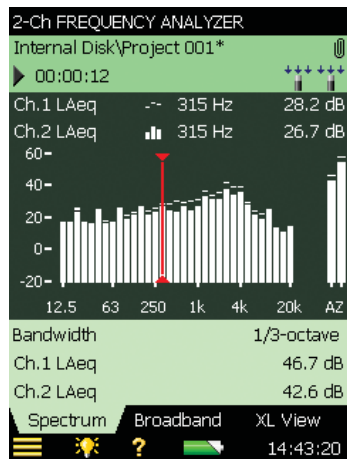
2-channel Measurements with BZ-7223
Type 2270 users with 2-channel Option BZ-7229 enabled can measure two spectra simultaneously with any combination of transducers. If the transducers are one microphone and one accelerometer, two independently scalable y-axes are available.

Simple difference calculations are available between channels when transducer type and weightings are compatible.

Logging Software – BZ-7224

Fig. 8
Logging displays with (left) single- and (right) 2-channel options, showing part of profile with 100 ms resolution
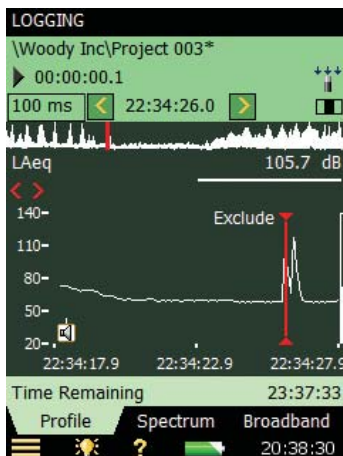
With Logging Software enabled, your analyzer becomes a versatile instrument for obtaining time histories (logging profiles). Logging Software allows you to select any of the available broadband parameters and log them at intervals from 1 s to 24 h. Additionally L_{Aeq} and/or L_{AF} can be simultaneously logged at 100 ms intervals.

If Frequency Analysis Software BZ-7223 is enabled, the Logging Software also lets you log spectra the same as your broadband values at intervals from 1 s to 24 h.

Logging Software BZ-7224 incorporates a number of features designed to make difficult field work as manageable as possible:

• Five user-definable markers can be set while you measure. Use these to annotate specific noise or vibration sources
• Markers can be set in the field using the stylus and the touch screen. Simply 'tap and drag' on the part of the profile you want to mark and select a marker from the drop-down list
• Markers can even be set after the noise event has passed. The display covers the latest 100 samples (100 s of profile when logging at 1 s intervals, otherwise more), so in most cases, you can wait for the event (or disturbance) to end before placing your marker. Alternatively, scroll back in the profile, freeze the display, and set your marker
• Voice annotations, using the commentary microphone, are attached to the exact point on the profile where the annotation is made

All markers and annotations are saved with the measurement and are imported into Measurement Partner Suite BZ-5503 where they are directly accessible in the profile.

Logging data are stored directly on SD cards and can be directly read from the SD card by Measurement Partner. Large amounts of data can be quickly transferred directly from the instrument using the USB cable or using a standard card reader.

For example, a project where all broadband parameters, one 100 ms parameter, all 1/3-octave spectra and full statistics are measured with a logging period of 1 s for a total duration 24 h will use 88 Mb.

Fig. 9
2-channel Logging display
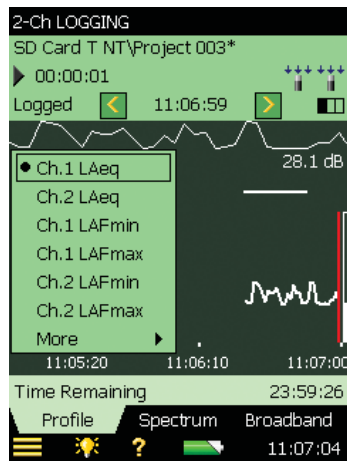
2-channel Measurements with BZ-7224

Type 2270 users with 2-channel Option BZ-7229 enabled can log measurement data using both input channels with any combination of transducers: two microphones, two accelerometers or one of each.

You can toggle between the two measurement channels on the instrument display and can see both measurement channels on the same graph when the measurement data are transferred to Measurement Partner Suite BZ-5503 for post-processing.

Enhanced Logging Software – BZ-7225

Enhanced Logging Software BZ-7225 builds on the functionality of Logging Software BZ-7224 and equips your analyzer for extended logging periods, allowing you to measure continuously, saving data to SD memory cards or USB devices.

Additional functionality includes:
• Measure continuously, saving data to SD memory cards or USB devices
• Reboot automatically and resume operation in case of power failure
• Save data in manageable portions (every 24 hr), selectable for download
• Make periodic reports; i.e., calculate measurement parameters at preset intervals (report periods)
• Measure L_{dn}, L_{den}, L_{day}, $L_{evening}$ and L_{night}

A periodic report is similar to the *Measurement Total* of the Logging software, except it is made periodically. For example, you may need to know L_{Aeq} values at 1 h intervals during an extended logging period. The Enhanced logging software will do this for you.

Combining periodic reports with level triggered event markers and Signal Recording Option BZ-7226 provides an overview as well as a focus on essential details.

A typical setup for 24 hr of extended logging might be:
• Continuous measurement
• Hourly periodic reports
• Level triggered marker for events above L_{AF} = 60 dB(A)
• Signal Recording of events (please refer to the Signal Recording Option BZ-7226)
• Logging of other parameters as required (please refer to the Logging Software BZ-7224)

After the measurement, you can check L$_{dn}$ or L$_{den}$, the Total and the periodic reports, and then browse the events and sound recordings to verify the quality of your measurements. for semi-continuous logging, Measurement Partner Suite license BZ-5503-A enables you to remotely schedule the automatic download of projects from your instrument to Measurement Partner.

2-channel Measurements with BZ-7225

2-channel Option BZ-7229 will work in the same way as for the Logging software BZ-7224. All additional functionality that Enhanced Logging software BZ-7225 offers over Logging software BZ-7224 is available on both channels for users running G4 hardware.

For Type 2270 users with older hardware, it is not possible to perform 2-channel measurements with Enhanced Logging (contact your Brüel & Kjær sales representative for details on the trade-in programme).

Signal Recording Option – BZ-7226

Signal Recording Option BZ-7226 works with all applications and enables you to make recordings of the actual measured signal with the microphone used for acoustic measurements (i.e., not the commentary microphone) or accelerometer used for vibration measurements. Signal recordings are automatically transferred with the data to Measurement Partner Suite and can be helpful in identifying noise sources during post-processing.

Another important use of signal recording is to record signals for later processing. This could be in industrial applications – analysing an engine run-up or a machinery process cycle – or in Environmental applications – recording noise for later post-processing in Measurement Partner Suite. With Measurement Partner Suite's BZ-5503-C license, you can perform an FFT-based pure tone assessment on .WAV files.

In addition to manual and automatic signal recording, Logging Software BZ-7224 and Enhanced Logging Software BZ-7225 can trigger signal recording based on level exceedance, meaning that recordings can be automatically initiated when no operator is present.

The Signal Recording Option offers a choice of 24- or 16-bit recording with post processing supported in Measurement Partner. You can use 24-bit recording to capture the full 120 dB dynamic range of Type 2250/2270, which is convenient for later signal analysis. You can use 16-bit recording to consume less memory; however, this requires selecting the level range for recording (or using the automatic gain control).

2-channel Measurement Option BZ-7229

2-channel Option BZ-7229 adds an extra measurement channel to hand-held analyzer Type 2270. The two channels accept inputs from the same type of transducer (e.g., two microphones) or different transducers (e.g., one microphone and one accelerometer).

2-channel functionality is available for the following software modules: Sound Level Meter BZ-7222, Frequency Analysis BZ-7223, Logging BZ-7224, Enhanced Logging BZ-7225 and Building Acoustics Software BZ-7228. BZ-7229 is compatible with Signal Recording Option BZ-7226 and Low Frequency Option BZ-7234.

Tone Assessment Option BZ-7231

Fig. 10
Tone Assessment Option BZ-7221 showing 1/3-octave bands with audible tones higher than a set limit (tones are identified by the blue dots)
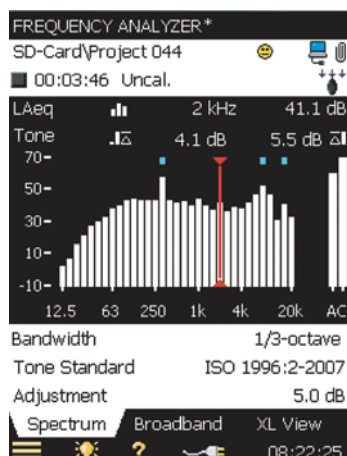
Tone Assessment (optional application) identifies any 1/3-octave bands with audible tones above a set level limit. The assessment is based on the band's prominence versus adjacent bands. The adjustment is the penalty to add to L$_{Aeq}$.

Annoying tones in the spectrum are assessed according to the ISO 1996 standard. The level of each 1/3-octave band is compared to the levels of its neighbours, and all tones as well as the overall penalty (adjustment) are indicated. The search parameters are user adjustable to suit national requirements.

Note:
With the Tone Assessment option, the FFT Analysis application offers objective indication of tonal noise audibility and annoyance. For details, please refer to Product Data BP 2183.

Low Frequency Option BZ-7234
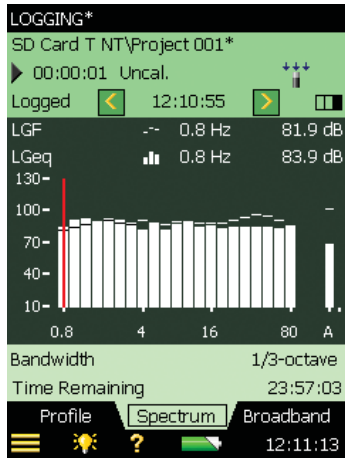
Low Frequency Option BZ-7234 enables low-frequency functionality in Sound Level Meter BZ-7222, Frequency Analysis BZ-7223, Logging BZ-7224 and Enhanced Logging BZ-7225.

With the low-frequency option enabled and the appropriate transducer selection, infrasound (including G-weighting) and building vibration measurements (including W_m weighting) can be performed according to the most important international standards. For infrasound measurements use Low Frequency microphone Type 4193 or Type 4964 optionally with the Low Frequency Adaptor UC-0211. For building vibration use accelerometer Type 8344.

Adding Weather Parameters to Your Measurement Data

Weather conditions affect the propagation of sound, so wind speed and direction must be taken into account when measuring noise outdoors. Consequently, most environmental noise measurement standards define limits for wind speed and direction. To identify the portions of your measurement that are within allowable limits for wind speed and direction, use Weather Station Kit MM-0316-A (two parameters) or MM-0256-A (six parameters).

The weather stations are based on ultrasound technology and operate well above the upper frequency limit of the microphone. Connect your weather station to your instrument, turn it on, and you are ready to start measuring with no software setup necessary. The weather station is powered by the analyzer's battery, so there is no need for extra batteries.

Post-processing in Measurement Partner
Noise and weather parameters are captured simultaneously on the instrument and are available for display and post-processing in Measurement Partner Suite BZ-5503 along with your noise data when you are back in the office. To quickly identify the portions of your logging profile where wind speed and direction are within the allowed limits, use Measurement Partner's report and marker wizard (requires license BZ-5503-A).

Outdoors Protection
For outdoor environmental noise measurements, your analyzer may need extra weather protection, offered by All-weather Case Type 3535-A and Outdoor Microphone Type 4952. For details, please refer to Product Data BP 2251 and Product Data BP 2099 respectively.

Overview of Software Features

The table below presents a summary of the main features of each of the basic application modules available with Type 2250 and Type 2270. See Specifications for more details.

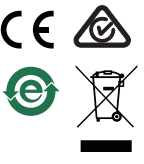| Feature	SLM Software	Frequency Analysis Software	Logging Software	Enhanced Logging Software
IEC/ANSI SLM standards Type/Class 1	•	•	•	•
120+ dB Dynamic Range – no need for range switching	•	•	•	•
Sound levels up to 140 dB with supplied Microphone Type 4189	•	•	•	•
Sound levels up to 152 dB using Microphone Type 4191	•	•	•	•
Frequency weightings A, B, C, Z (linear) and time weightings F, S, I	•	•	•	•
Free-field/diffuse-field correction	•	•	•	•
Automatic windscreen detection and correction	•	•	•	•
Preset time start/stop	•	•	•	•
Multi-language user interface	•	•	•	•
Context-sensitive help	•	•	•	•
Voice, metadata and text annotation of measurements	•	•	•	•
Display color-schemes optimised for day, night, indoor and outdoor use	•	•	•	•
Personal login – protects your personal setups from other users	•	•	•	•
Broadband statistics based on L_{Aeq}, L_{AF} or L_{AS}	•	•	•	•
Maximum broadband range: 0.5 Hz – 20 kHz	•	•	•	•
Remote control using GPRS/EDGE/3G modem	•	•	•	•
Transfer of data files while measuring (USB, LAN or modem)	•	•	•	•
Recording of measured signal during measurement – 16 or 24 bit	•[*]	•[*]	•[*]	•[*]
Timers for automatic start of measurement	•	•	•	•
Occupational health parameters	•	•	•	•
Weather data and GPS input	•	•	•	•
G-weighting for infrasound parameters	•[†]	•[†]	•[†]	•[†]
W_m-weighting for building vibration parameters	•[†]	•[†]	•[†]	•[†]
Tone assessment		•[‡]	•[‡]	•[‡]
1/1-octave spectra (max. range 1 Hz to 16 kHz)		•	•[**]	•[**]
1/3-octave spectra (max range 0.8 Hz to 20 kHz)		•	•[**]	•[**]
Spectral statistics based on L_{AF} or L_{AS}		•	•[**]	•[**]
Loudness and Noise Rating results		•	•[**]	•[**]
Charge Injection Calibration			•	•
Level triggers and recordings			•[*]	•[*]
Logging of all or selected broadband parameters and spectra			•	•
Logging period 1 s to 24 h			•	•
L_{Aeq}, L_{AS}, L_{AF} logged every 100 ms			•	•
Profile display			•	•
Profile overview of entire measurement			•	•
Markers on profile display			•	•
Recording of signal during noise events			•[*]	•[*]
Periodic reports of all measured data				•
Report period 1 min to 24 h, Logging time up to 31 d				•
Timer trigger for recordings				•[*]
L_{dn}, L_{den}, L_{day}, $L_{evening}$, L_{night}				•
Continuous measurement				•
Back-erase – last 5 seconds of measurement data	•	•		

* If Signal Recording Option is enabled   † If Low Frequency Option is enabled
‡ If Tone Assessment Option is enabled   ** If Frequency Analysis Software is enabled

Compliance with Environmental Standards

CE ⚠️ ♻️ 🗑️	The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China WEEE mark indicates compliance with the EU WEEE Directive
Safety	EN/IEC 61010–1, ANSI/UL 61010–1 and CSA C22.2 No.1010.1: Safety requirements for electrical equipment for measurement, control and laboratory use
EMC Emission	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards **NOTE:** The above is only guaranteed using accessories listed in this Product Data
EMC Immunity	EN/IEC 61000–6–2: Generic standard – Immunity for industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards **NOTE:** The above is only guaranteed using accessories listed in this Product Data
Temperature	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –10 to +50°C (14 to 122°F) Storage Temperature: –25 to +70°C (–13 to 158°F)
Humidity	IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at +40°C (104°F)). Recovery time 2 ~ 4 hours
Mechanical	Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s^2, 10 – 500 Hz IEC 60068–2–27: Bump: 1000 bumps at 400 m/s^2 IEC 60068–2–27: Shock: 1000 m/s^2, 6 directions
Enclosure	IEC 60529 (1989): Protection provided by enclosures: IP20

Specifications – Hand-held Analyzer Type 2250/2270 Platform

Specifications apply to Type 2250/2270 fitted with Microphone Type 4189 and Microphone Preamplifier ZC-0032

Microphone

SUPPLIED MICROPHONE
Type 4189: Prepolarized Free-field ½″ Microphone
or
Type 4190: Free-field ½″ Microphone
Nominal Open-circuit Sensitivity: 50 mV/Pa (corresponding to –26 dB re 1 V/Pa) ± 1.5 dB
Capacitance: 14 pF (at 250 Hz)

MICROPHONE PREAMPLIFIER ZC-0032
Nominal Preamplifier Attenuation: 0.25 dB
Connector: 10-pin LEMO
Extension Cables: Up to 100 m in length between the microphone preamplifier and Type 2250/2270, without degradation of the specifications
Accessory Detection: Windscreen UA-1650 can be automatically detected when fitted over ZC-0032

MICROPHONE POLARIZATION VOLTAGE
Selectable between 0 V and 200 V

SELF-GENERATED NOISE LEVEL
Typical values at 23°C for nominal microphone open-circuit sensitivity:

Weighting	Microphone	Electrical	Total
"A"	14.6 dB	12.4 dB	16.6 dB
"B"	13.4 dB	11.5 dB	15.6 dB
"C"	13.5 dB	12.9 dB	16.2 dB

Weighting	Microphone	Electrical	Total
"Z" 5 Hz–20 kHz	15.3 dB	18.3 dB	20.1 dB
"Z" 3 Hz–20 kHz	15.3 dB	25.5 dB	25.9 dB

Interface

KEYBOARD
Pushbuttons: 11 keys with backlight, optimised for measurement control and screen navigation

ON-OFF BUTTON
Function: Press 1 s to turn on; press 1 s to enter standby; press for more than 5 s to switch off

STATUS INDICATORS
LEDs: Red, amber and green

DISPLAY
Type: Transflective back-lit colour touch screen
240 × 320 dot matrix
Colour Schemes: Five different – optimised for different usage scenarios (day, night, etc.)
Backlight: Adjustable level and on-time

USER INTERFACE
Measurement Control: Using pushbuttons on keyboard
Setup and Display of Results: Using stylus on touch screen or pushbuttons on keyboard
Lock: Keyboard and touch screen can be locked and unlocked

USB INTERFACE
Hardware Versions 1 to 3: USB 1.1 OTG Mini B socket
Hardware Version 4: USB 2.0 OTG Micro AB and USB 2.0 Standard A sockets

MODEM INTERFACE
Connection to Internet through GPRS/EDGE/HSPA modem connected through:
• the Compact Flash slot (hardware versions 1 – 3)
• the USB Standard A Socket (hardware version 4)
Supports DynDNS for automatic update of IP address of host name

PRINTER INTERFACE
PCL printers, Mobile Pro Spectrum thermal printer or Seiko DPU S245/S445 thermal printers can be connected to USB socket

MICROPHONE FOR COMMENTARY
Microphone, which utilises Automatic Gain Control (AGC), is incorporated in underside of analyzer. Used to create voice annotations for attaching to measurements

CAMERA (TYPE 2270 ONLY)
Camera with fixed focus and automatic exposure is incorporated in underside of analyzer.
Used to create image annotations for attaching to measurements
Image Size:
• Hardware versions 1 – 3: 640 x 480 pixels
• Hardware version 4: 2048 x 1536 pixels
Viewfinder Size: 212 x 160 pixels
Format: jpg with exif information

Inputs/Outputs

COMPACT FLASH SOCKET (Hardware Version 1 to 3 only)
Connection of CF memory card, CF modem, CF to serial interface, CF Ethernet interface or CF WLAN interface

SECURE DIGITAL SOCKET
• 1 × SD socket for hardware versions 1 – 3
• 2 × SD sockets for hardware version 4
Connect SD and SDHC memory cards
LAN INTERFACE SOCKET Hardware Versions 1 to 3 (Type 2270 only):
• Connector: RJ45 MDI
• Speed: 10 Mbps
• Protocol: TCP/IP

Hardware Version 4 (Types 2250 and 2270):
• Connector: RJ45 Auto-MDIX
• Speed: 100 Mbps
• Protocol: TCP/IP

INPUT SOCKET (2 - TYPE 2270 ONLY)
Connector: Triaxial LEMO
Input Impedance: $\geq 1\ M\Omega$
Direct Input: Max. input voltage: $\pm 14.14\ V_{peak}$
CCLD Input: Max. input voltage: $\pm 7.07\ V_{peak}$
CCLD Current/voltage: 4 mA/25 V

TRIGGER SOCKET
Connector: Triaxial LEMO
Max. Input Voltage: $\pm 20\ V_{peak}$
Input Impedance: $> 47\ k\Omega$
Precision: $\pm 0.1\ V$

OUTPUT SOCKET
Connector: Triaxial LEMO
Max. Peak Output Level: $\pm 4.46\ V$
Output Impedance: $50\ \Omega$

HEADPHONE SOCKET
Connector: 3.5 mm Minijack stereo socket
Max. Peak Output Level: $\pm 1.4\ V$
Output Impedance: $32\ \Omega$ in each channel

Power

EXTERNAL DC POWER SUPPLY REQUIREMENTS
Used to charge the battery pack in the analyzer
Voltage: 8 – 24 V DC, ripple voltage < 20 mV
Current Requirement: min. 1.5 A

Power Consumption: < 2.5 W, without battery charging, < 10 W when charging
Cable Connector: LEMO Type FFA.00, positive at centre pin

EXTERNAL AC MAIN SUPPLY ADAPTOR
Part No.: ZG-0426
Supply Voltage: 100 – 120/200 – 240 VAC; 47 – 63 Hz
Connector: 2-pin IEC 320

BATTERY PACK
Part No.: QB-0061 Rechargeable Li-Ion battery
Voltage: 3.7 V
Capacity: 5200 mAh nominal
Typical Operating Time:
• Single-channel: >11 h (screen backlight dimmed); >8.5 h (full screen backlight)
• Dual-channel: >7.5 h (full screen backlight)
Use of external interfaces (LAN, USB, WLAN) will decrease battery operating time. Connecting a weather station or a GPS receiver can decrease battery operating with up to 20%
Battery Cycle Life: > 500 complete charge/discharge cycles
Battery Aging: Approximately 20% loss in capacity per year
Battery Indicator: Remaining battery capacity and expected working time may be read out in % and in time
Battery Fuel Gauge: The battery is equipped with a built-in fuel gauge, which continuously measures and stores the actual battery capacity in the battery unit
Charge Time: In analyzer, typically 10 hours from empty at ambient temperatures below 30°C. To protect the battery, charging will be terminated completely at ambient temperatures above 40°C. At 30 to 40°C charging time will be prolonged. With External Charger ZG-0444 (optional accessory), typically 5 hours
NOTE: It is not recommended to charge the battery at temperatures below 0°C (32°F) or over 50°C (122°F). Doing this will reduce battery lifetime

CLOCK
Back-up battery powered clock. Drift < 0.45 s per 24 hr period

Storage

INTERNAL FLASH-RAM (NON-VOLATILE)
For user setups and measurement data:
• Hardware versions 1 – 3: 20 MB
• Hardware version 4:512 MB

EXTERNAL SECURE DIGITAL MEMORY CARD
SD and SDHC Card: For store/recall of measurement data

EXTERNAL COMPACT FLASH MEMORY CARD (Hardware Versions 1 – 3 Only)
CF Card: For store/recall of measurement data

USB MEMORY STICK (Hardware version 4 only)
For store/recall of measurement data

Environmental

WARM-UP TIME
From Power Off: < 2 min
From Standby: < 10 s for prepolarized microphones

WEIGHT AND DIMENSIONS
650 g (23 oz.) including rechargeable battery
$300 \times 93 \times 50$ mm ($11.8 \times 3.7 \times 1.9''$) including preamplifier and microphone

User Interface

USERS
Multi-user concept with login. Users can have their own settings with jobs and projects totally independent of other users

PREFERENCES
Date, Time and Number formats can be specified per user

LANGUAGE

User Interface in Catalan, Chinese (People's Republic of China), Chinese (Taiwan), Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Korean, Polish, Portuguese, Romanian, Russian, Serbian, Slovenian, Spanish, Swedish, Turkish and Ukrainian

HELP

Concise context-sensitive help in English, French, German, Italian, Japanese, Korean, Polish, Portuguese, Romanian, Serbian, Slovenian and Spanish

UPDATE OF SOFTWARE

Update to any version using BZ-5503 through USB or update via Internet

REMOTE ACCESS

Connect to the analyzer using Measurement Partner Suite BZ-5503, using the 2250/2270 SDK (Software Development kit) or using an Internet browser supporting JavaScript. The connection is password protected
Two levels of protection:
• Guest level: for viewing only
• Administrator level: for viewing and full control of the analyzer

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Software Specifications – Sound Level Meter Software BZ-7222

Conforms with the following National and International Standards:
• IEC 61672−1 (2002−05) Class 1
• IEC 60651 (1979) plus Amendment 1 (1993−02) and Amendment 2 (2000−10), Type 1
• IEC 60804 (2000−10), Type 1
• DIN 45657 (1997−07)
• ANSI S1.4−1983 plus ANSI S1.4A−1985 Amendment, Type 1
• ANSI S1.43−1997, Type 1

NOTE: The International IEC Standards are adopted as European standards by CENELEC. When this happens, the letters IEC are replaced with EN and the number is retained. Type 2250/2270 also conforms to these EN Standards

Input

CHANNELS (Type 2270 only)

All measurements are made from either Ch. 1 or Ch. 2

TRANSDUCERS

Transducers are described in a transducer database with information on Serial Number, Nominal Sensitivity, Polarization Voltage, Free-field Type, CCLD required, Capacitance and additional information.
The analogue hardware is set up automatically in accordance with the selected transducer

CORRECTION FILTERS

For Microphone Types 4189, 4190, 4191, 4193, 4193 + UC-0211, 4950, 4952, 4955-A, 4964, 4964 + UC-0211 and 4184-A, BZ-7222 is able to correct the frequency response to compensate for sound field and accessories:
Sound Field: Free field or diffuse field (for Types 4952 and 4184-A only: 0° (Top) reference direction and 90° (Side) reference direction)
Accessories:
• Types 4189, 4190, 4964 and 4964 + UC-0211 only: None, Windscreen UA-1650 or Outdoor Microphone Kit UA-1404
• Types 4191, 4193, 4193 + UC-0211 and 4955-A only: None or Windscreen UA-1650
• Type 4950 only: None or Windscreen UA-0237
For Accelerometer Types 4397-A, 4513, 4513-001, 4513-002, 4514, 4514-001, 4514-002, 4533-B, 4533-B-001, 4533-B-002, 4534-B, 4534-B-001, 4534-B-002, 8324, 8341, 8344, 8347-C + 2647-D the lower frequency limit will be optimized to match the specifications for the accelerometer

Analysis

DETECTORS

Parallel detectors on every measurement:
A- or B-weighted (switchable): Broadband detector channel with three exponential time weightings (Fast, Slow, Impulse), one linearly averaging detector and one peak detector
C- or Z-weighted (switchable): As for A- or B-weighted
Overload Detector: Monitors the overload outputs of all the frequency weighted channels

MEASUREMENTS FOR SOUND INPUT

X = frequency weightings A or B
Y = frequency weightings C or Z
V = frequency weightings A, B, C or Z
U = time weightings F or S
Q = exchange rate 4, 5 or 6 dB
N = number between 0.1 and 99.9
For Storage   Full statistics

For Display and Storage:

Start Time	Stop Time	Overload %
Elapsed Time	L_{Xeq}	L_{Yeq}
L_{XE}	L_{YE}	$L_{Ceq}-L_{Aeqk}$
L_{XSmax}	L_{XFmax}	L_{XImax}
L_{YSmax}	L_{YFmax}	L_{YImax}
L_{XSmin}	L_{XFmin}	L_{XImin}
L_{YSmin}	L_{YFmin}	L_{YImin}
L_{XIeq}	L_{YIeq}	$L_{Aleq}-L_{Aeq}$
L_{AFTeq}	$L_{AFTeq}-L_{Aeq}$	Time Remaining
$L_{ep,d}$	$L_{ep,dv}$	E
Dose	Proj. Dose	L_{vpeak}
#VPeaks (>NNNdB)	#VPeaks (>137dB)	#VPeaks (>135dB)
T_{Vpeak}	L_{avUQ}	TWA
TWAv	DoseUQ	Proj. DoseUQ
$L_{Aeq,T1,mov,max}$	$L_{Aeq,T2,mov,max}$	

Weather Data (requires connection to a weather station):

Wind Dir. avg.	Wind Dir. min.	Wind Dir. max.
Wind Speed avg.	Wind Speed min.	Wind Speed max.
Amb. Temp.	Amb. Humidity	Amb. Pressure
Amb. Rain Gauge		

Only for Display as Numbers or Quasi-analog Bars:

L_{XS}	L_{XF}	L_{XI}
L_{YS}	L_{YF}	L_{YI}
$L_{XS(SPL)}$	$L_{XF(SPL)}$	$L_{XI(SPL)}$
$L_{YS(SPL)}$	$L_{YF(SPL)}$	$L_{YI(SPL)}$
L_{XN1} or L_{XUN1}	L_{XN2} or L_{XUN2}	L_{XN3} or L_{XUN3}
L_{XN4} or L_{XUN4}	L_{XN5} or L_{XUN5}	L_{XN6} or L_{XUN6}
L_{XN7} or L_{XUN7}	$L_{Vpeak,1s}$	Trig. Input Voltage
Std.Dev.	$L_{Aeq,T1,mov}$	$L_{Aeq,T2,mov}$

Instantaneous Weather Data:
Wind Dir.   Wind Speed
Instantaneous GPS Data:
Latitude   Longitude

MEASUREMENTS FOR VIBRATION AND DIRECT INPUT

For Display and Storage:

Start Time	Stop Time	Overload %
Elapsed Time	Time Remaining	
Linear	Fast max	Slow max
Fast min	Slow min	Peak
T_{Peak}		

Only for Display as Numbers or Quasi-analog Bars:

Fast Inst	Slow Inst	Trig. Input Voltage

Instantaneous GPS Data:
Latitude   Longitude

MEASURING RANGES

When using Microphone Type 4189:

Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted: 16.6 to 140 dB

Primary Indicator Range: In accordance with IEC 60651, A-weighted: 23.5 dB to 122.3 dB

Linearity Range: In accordance with IEC 60804, A-weighted: 21.4 dB to 140.8 dB

Linear Operating Range: In accordance with IEC 61672, A-weighted: 1 kHz: 24.8 dB to 139.7 dB

Peak C Range: In accordance with IEC 61672, 1 kHz: 42.3 dB to 142.7 dB

SAMPLING FOR STATISTICS

The Statistics can be based on either L_{XF}, L_{XS} or L_{Xeq}:

- Statistics L_{XFN1-7} or L_{XSN1-7} are based on sampling L_{XF} or L_{XS}, resp., every 10 ms into 0.2 dB wide classes over 130 dB
- Statistics L_{XN1-7} are based on sampling L_{Xeq} every second into 0.2 dB wide classes over 130 dB

Full distribution saved with measurement

The Std.Dev. (Standard Deviation) parameter is calculated from the statistics

Measurement Display and Control

MEASUREMENT DISPLAYS

SLM: Measurement data displayed as numbers of various sizes and one quasi-analog bar

Measured sound data are displayed as dB values, vibration data as dB values or in physical units (SI units (m/s2) or US/UK units (g)), direct data as voltage in dB or V, housekeeping data as numbers in relevant format. Instantaneous measurement L_{XF} or Fast Inst is displayed as a quasi-analog bar

MEASUREMENT CONTROL

Manual: Manually controlled single measurement

Automatic: Pre-set measurement time from 1 s to 24 hr in 1 s steps

Manual Controls: Reset, Start, Pause, Back-erase, Continue and Store the measurement manually

Auto-start: A total of 10 timers allow set up of measurement start times up to a month in advance. Each timer can be repeated. Measurements are automatically stored when completed

BACK-ERASE

The last 5 s of data can be erased without resetting the measurement

Measurement Status

ON SCREEN

Information such as overload and running/paused are displayed on screen as icons

TRAFFIC LIGHTS

Red, yellow and green LEDs show measurement status and instantaneous overload as follows:

- Yellow LED flash every 5 s = stopped, ready to measure
- Green LED flashing slowly = awaiting calibration signal
- Green LED on constantly = measuring
- Yellow LED flashing slowly = paused, measurement not stored
- Red LED flashing quickly = intermittent overload, calibration failed

NOTIFICATIONS

Sends an SMS or e-mail daily at a specified time or if an alarm condition is fulfilled

Alarm Conditions:

- Disk Space below set value
- Trig. Input Voltage below set value
- Internal Battery enters set state
- Change in Measurement State
- Reboot of analyzer

Signal Monitoring

The input signal can be monitored using an earphone/headphones connected to the headphone socket, or it can be fed to the output socket

OUTPUT SIGNAL

Input Conditioned: A-, B-, C- or Z-weighted

Gain Adjustment: −60 dB to 60 dB

L_{XF} output (every ms) as a DC voltage between 0 V and 4 V

DC output for calibration purposes: 0 dB ~ 0 V and 200 dB ~ 4 V

HEADPHONE SIGNAL

Input signal can be monitored using this socket with headphones/earphones

Gain Adjustment: −60 dB to 60 dB

Annotations

VOICE ANNOTATIONS

Voice annotations can be attached to measurements so that verbal comments can be stored together with the measurement

Playback: Playback of voice annotations can be listened to using an earphone/headphones connected to the headphone socket

Gain Adjustment: −60 dB to +60 dB

TEXT ANNOTATIONS

Text annotations can be attached to measurements so that written comments can be stored with the measurement

GPS ANNOTATIONS

A text annotation with GPS information can be attached (Latitude, Longitude, Altitude and position error). Requires connection to a GPS receiver

IMAGE ANNOTATIONS (TYPE 2270 ONLY)

Image annotations can be attached to measurements. Images can be viewed on the screen.

Calibration

Initial calibration is stored for comparison with later calibrations

ACOUSTIC

Using Sound Calibrator Type 4231 or custom calibrator. The calibration process automatically detects the calibration level when Sound Calibrator Type 4231 is used

ELECTRICAL

Uses internally generated electrical signal combined with a typed-in value of microphone sensitivity

CALIBRATION HISTORY

Up to 20 of the last calibrations made are listed and can be viewed on the analyzer

Data Management

METADATA

Up to 30 metadata annotations can be set per project (text from keyboard or text from pick list, number from keyboard or auto generated number)

PROJECT TEMPLATE

Defines the display and measurement setups. Setups can be locked and password protected

PROJECT

Measurement data stored with the project template

JOB

Projects are organised in jobs

Explorer facilities for easy management of data (copy, cut, paste, delete, rename, open project, create job, set default project name)

Software Specifications – Frequency Analysis Software BZ-7223

The specifications for BZ-7223 include the specifications for Sound Level Meter Software BZ-7222. BZ-7223 adds:

Standards

Conforms with the following National and International Standards:
- IEC 61260 (1995–07) plus Amendment 1 (2001–09), 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI S1.11 – 1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0 – C
- ANSI S1.11 – 2004, 1/1-octave Bands and 1/3-octave Bands, Class 0

Input

CHANNELS (TYPE 2270 ONLY)
All measurements are made from either Ch. 1 or Ch. 2

Frequency Analysis

CENTRE FREQUENCIES
1/1-oct. Band Centre Frequencies: 8 Hz to 16 kHz
1/3-oct. Band Centre Frequencies: 6.3 Hz to 20 kHz

MEASUREMENTS FOR SOUND INPUT
X = frequency weightings A, B, C or Z, Y = time weightings F or S
Data for Storage
Full Spectral Statistics
Spectra for Display and Storage

L_{Xeq}	L_{XSmax}	L_{XFmax}
L_{XSmin}	L_{XFmin}	

Spectra for Display Only

L_{XS}	L_{XF}	L_{XYN1}
L_{XYN2}	L_{XYN3}	L_{XYN4}
L_{XYN5}	L_{XYN6}	L_{XYN7}

Single Values

SIL	PSIL	SIL3
$L_{Xeq}(f1 - f2)^*$		
NR	NR Decisive Band	
RC	RC Classification	
NCB	NCB Classification	
NC	NC Decisive Band	
Loudness	Loudness Level	

MEASUREMENTS FOR VIBRATION AND DIRECT INPUT
Spectra for Display and Storage

Linear	Fast max	Slow max
Fast min	Slow min	

Spectra for Display Only

Fast Inst	Slow Inst

Single Values

Linear $(f1 - f2)^*$

MEASURING RANGES
When using Microphone Type 4189:
Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz 1/3-octave: 1.1 to 140 dB

* Where f1 and f2 are frequency bands in the spectrum.

Linear Operating Range: In accordance with IEC 61260, 1/3-octave: ≤ 20.5 to 140 dB

SAMPLING FOR OCTAVE OR 1/3-OCTAVE STATISTICS
X = frequency weightings A or B
The Statistics can be based on either L_{XF} or L_{XS}:
- Statistics L_{XFN1-7} or L_{XSN1-7} are based on sampling L_{XF} or L_{XS}, respectively, every T ms into 1 dB wide classes over 150 dB;
T = 100 for frequency range set to 12.5 – 20 kHz
T = 200 for frequency range set to 6.3 – 20 kHz
Full distribution can be saved with measurement

Displays

MEASUREMENT DISPLAYS
Spectrum: One or two spectra superimposed + A/B and C/Z broadband bars
Table: One or two spectra in tabular form
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available. Sound data are displayed as dB values, vibration data as dB values or in physical units (SI units (m/s2) or US/UK units (g)), direct data as voltage in dB or V.
Cursor: Readout of selected band

Generator

INTERNAL GENERATOR
Built-in pseudo-random noise generator
Spectrum: Selectable between Pink and White
Crest Factor:
Pink Noise: 4.4 (13 dB)
White Noise: 3.6 (11 dB)
Bandwidth: Selectable:
- Lower Limit: 50 Hz (1/3-oct.) or 63 Hz (oct.)
- Upper Limit: 10 kHz (1/3-oct.) or 8 kHz (oct.)
Output Level: Independent of bandwidth
- Max.: 1 Vrms (0 dB)
- Gain Adjustment: –60 to 0 dB
When bandwidth is changed, the level for all bands is automatically adjusted to comply with the set output level
Correction Filters: For sound sources Type 4292, Type 4295 and Type 4296: Flat or Optimum
Repetition Period: 175 s
Output Connector: Output socket

EXTERNAL GENERATOR
Selectable alternative to Internal Generator (for microphone input only)
To control external noise generator, set:
- **Levels:** 0 V (Generator off), 4.5 V (Generator on)
- **Rise-time and Fall-time:** 10 μs
The noise generator is turned on and off automatically during the measurement
Escape Time: 0 to 60 s
Build-up Time: 1 to 10 s
The generator can be turned on and off manually for checking equipment and sound levels

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Software Specifications – Logging Software BZ-7224

The specifications for BZ-7224 include the specifications for Sound Level Meter Software BZ-7222. BZ-7224 adds:

Logging

MEASUREMENTS
Logging: Measurement data logged at pre-set periods into files on:
- SD Card: All hardware versions
- CF Card: Hardware versions 1 – 3
- USB Memory Stick: Hardware version 4

Logging Period: From 1 s to 24 hr with 1 s resolution
Fast Logging: L_{AF}, L_{AS} and L_{Aeq} (sound input) or Fast Inst, Slow Inst and Linear (vibration and Direct input) can be logged every 100 ms, irrespective of logging period
Broadband Data Stored at each Logging Interval: All, or up to 10 selectable broadband sound data incl. Trig. Input Voltage, Weather data, and $L_{Aeq,T,mov}$ (for vibration and direct input: up to 5 parameters)
Broadband Statistics Stored at each Logging Interval: Full distribution, or none (sound input only)

Spectrum Data Stored at each Logging Interval: All, or up to three selectable spectra (license for BZ-7223 required)
Spectral Statistics Stored at each Logging Interval: Full distribution, or none (sound input only, license for BZ-7223 required)
Logging Time: From 1 s to 31 days with 1 s resolution
Measurement Total: For the logging time, in parallel with logging: All broadband data, statistics and spectra (license for BZ-7223 required)

MARKERS
One data exclusion marker and four user-definable markers for on-line marking of sound categories heard during the measurement
Events can be set manually

TRIGGERS
Markers can be set and signal recordings can be started (license for BZ-7226 required) when a broadband level is above or below a specified level

ANNOTATIONS
On-line annotations with spoken comments, written notes or images (Type 2270 only)

Calibration

CHARGE INJECTION CALIBRATION (CIC)
Injects an internally generated electrical signal in parallel with the microphone diaphragm. A manual CIC can be performed whenever there is no measurement in progress
An automatic CIC can be performed at the start and end of a logging measurement

Measurement Displays

Profile: Graphical display of selectable measurement data versus time. Fast display of next or previous marker, profile overview of entire measurement
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available. Sound data are displayed as dB values, vibration data as dB values or in physical units (SI units (m/s2) or US/UK units (g)), direct data as voltage in dB or V.
X-axis: Scroll facilities
Cursor: Readout of measurement data at selected time

Notifications

Alarm Conditions (in addition to those specified for BZ-7222):
• CIC failed
• Trigger Level exceeded

Software Specifications – Enhanced Logging Software BZ-7225

The specifications for BZ-7225 include the specifications for Logging Software BZ-7224. BZ-7225 adds:

Logging

For Display and Storage
L_{dn}, L_{den}, L_{day}, $L_{evening}$ and L_{night}
Selectable Day, Evening and Night periods and penalties (sound input only)
Periodic Reports: Measurement data logged at a preset report period into files on:
• SD Card: All hardware versions
• CF Card: Hardware versions 1 – 3
• USB Memory Stick: Hardware version 4
Report Period: From 1 min to 24 hr with 1 min resolution
Broadband Data and Statistics Stored at each Reporting Interval: All including Weather data
Spectrum Data Stored at each Reporting Interval: All (license for BZ-7223 required)
Spectral Statistics Stored at each Reporting Interval: Full distribution, or none (sound input only, license for BZ-7223 required)
Logging Time: From 1 s to 31 days with 1 s resolution or Continuous
Data are saved in separate projects for every 24 hr of logging – at a user-defined time of day
Automatic reboot and resume of operation in case of power failure

TRIGGERS
Signal Recording Timer
For periodically starting a signal recording (license for BZ-7226 required)
Level Triggers
Markers can be set and signal recordings can be started (license for BZ-7226 required) when a broadband or frequency band level is above or below a specified level. Hold off time between triggers can be set. You can specify up to four independent Level Triggers to be active at four different times during the day

Calibration

CHARGE INJECTION CALIBRATION (CIC)
Injects an internally generated electrical signal in parallel with the microphone diaphragm. A manual CIC can be performed whenever there is no measurement in progress
An automatic CIC can be performed at the start and end of a logging measurement. The CIC can be set to occur up to 4 times in each 24 hour period
CIC Duration: 10 s

Notifications

Alarm Conditions (in addition to those specified for BZ-7224): L_{Aeq} for the latest Report Period exceeds a set threshold

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Software Specifications – Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 is enabled with a separate license. It works with all the software for Type 2250/2270: Sound Level Meter, Frequency Analysis, Logging Software, Enhanced Logging Software and Reverberation Time Software
For data storage, Signal Recording requires:
• SD Card: All hardware versions
• CF Card: Hardware versions 1 – 3
• USB Memory Stick: Hardware version 4

RECORDED SIGNAL
A-, B-, C- or Z-weighted signal from the measurement transducer

AUTOMATIC GAIN CONTROL
The average level of the signal is kept within a 40 dB range, or the gain can be fixed

SAMPLING RATE AND PRE-RECORDING
The signal is buffered for the pre-recording of the signal. This allows the beginning of events to be recorded even if they are only detected later.

Sampling Rate (kHz)	Maximum Pre-recording (s) 16-bit		Maximum Pre-recording (s) 24-bit		Memory (KB/s) 16-bit	Memory (KB/s) 24-bit
	HW 1 – 3	HW G4	HW 1 – 3	HW G4		
8	110	470	70	310	16	24
16	50	230	30	150	32	48
24	30	150	16	96	48	72
48	10	70	3	43	96	144

PLAYBACK
Playback of signal recordings can be listened to using the earphone/headphones connected to the headphone socket

RECORDING FORMAT
The recording format is either 24- or 16-bit wave files (extension .WAV) attached to the data in the project, easily played-back afterwards on a PC using BZ-5503, Type 7820 or 7825. Calibration information is stored in the .WAV file, allowing BZ-5503 and PULSE to analyse the recordings

Functions with BZ-7222 and BZ-7223

Manual Control of Recording: Recording can be manually started and stopped during a measurement using a pushbutton or an external signal
Automatic Control of Recording: Start of recording when measurement is started. Minimum and Maximum recording time can be preset

Functions with BZ-7224 and BZ-7225

Manual Control of Recording (using Manual Event or Back-erase pushbutton, or an external signal): Recording during all of the event,

or for preset minimum and maximum duration. A Sound marker is set while recording. Selectable pre- and post-recording time
Manual Control of Recording (using touch screen): Recording for the selected time period (subject to the limitations of the pre-recording buffer). A Sound marker is set for the selected time period
Automatic Control of Recording: An event can be triggered when a broadband level is above or below a specified level. Recording during all of the event or for preset minimum and maximum duration. Selectable pre- and post-recording time

Functions with BZ-7227

Automatic Control of Recording: Start of recording when measurement is started
16-bit recording format only

Software Specifications – Reverberation Time Software BZ-7227

Standards

Conforms with the relevant parts of the following:
- IEC 61672 –1 (2002– 05) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993–02) and Amendment 2 (2000–10), Type 1
- ANSI S1.4–1983 plus ANSI S1.4A–1985 Amendment, Type 1
- IEC 61260 (1995–07) plus Amendment 1 (2001–09), 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI S1.11–1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0–C
- ANSI S1.11– 2004, 1/1-octave Bands and 1/3-octave Bands, Class 0
- ISO 140
- ISO 3382
- ISO 354

CORRECTION FILTERS
For Microphone Types 4189, 4190, 4191, 4193, 4950, 4952, 4955-A, 4964 and 4184-A, BZ-7227 is able to correct the frequency response to compensate for sound field and accessories

Broadband Measurements

DETECTORS
A- and C-weighted broadband detectors with F exponential time weighting
Overload Detector: Monitors the overload outputs of all the frequency weighted channels

MEASUREMENTS
L_{AF} and L_{CF} for Display as Numbers or Quasi-analogue Bars

MEASURING RANGES
When using Microphone Type 4189:
Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted: 16.6 to 140 dB
Primary Indicator Range: In accordance with IEC 60651, A-weighted: 23.5 dB to 122.3 dB
Linear Operating Range: In accordance with IEC 61672, A-weighted: 1 kHz 24.8 dB to 139.7 dB

Frequency Analysis

CENTRE FREQUENCIES
1/1-oct. Band Centre Frequencies: 63 Hz to 8 kHz
1/3-oct. Band Centre Frequencies: 50 Hz to 10 kHz

MEASUREMENTS
L_{ZF} spectrum for display only
L_{Zeq} spectra sampled at 5 ms intervals

MEASURING RANGES
When using Microphone Type 4189:
Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz 1/3-octave: 1.1 to 140 dB

Linear Operating Range: In accordance with IEC 61260, 1/3-octave: ≤ 20.5 dB to 140 dB

Internal Generator

Built-in pseudo-random noise generator
Spectrum: Selectable Pink or White
Crest Factor:
- Pink noise: 4.4 (13 dB)
- White noise: 3.6 (11 dB)
Bandwidth: Follows measurement frequency range
- Lower Limit: 50 Hz (1/3-oct.) or 63 Hz (oct.)
- Upper Limit: 10 kHz (1/3-oct.) or 8 kHz (oct.)
Output Level: Independent of bandwidth
- Max.: 1 Vrms (0 dB)
- Gain Adjustment: −60 to 0 dB
When bandwidth is changed, the level for all bands is automatically adjusted to comply with the set output level
Correction Filters for Sound Sources Type 4292, Type 4295 and Type 4296: Flat or Optimum
Turn-on Time and Turn-off Time: Equivalent to RT = 70 ms
Repetition Period: 175 s
Output Connector: Output Socket
Control: See Measurement Control

External Generator

Selectable as alternative to internal generator
For controlling external noise generator
Levels: 0 V (Generator off), 4.5 V (Generator on)
Rise-time and Fall-time: 10 µs
Control: See Measurement Control

Reverberation Time

EDT, T20 and T30 in octave or 1/3-octave bands
Decays: Measured and stored using averaging time of 5 ms
Evaluation Range: 0 to −10 dB for EDT, −5 to −25 dB for T20 and −5 to −35 dB for T30
Measurement Time: Automatic selection of measurement time for the decays based on the actual reverberation time of the room
Maximum Measurement Time: from 2 to 30 s
Averaging: EDT, T20 and T30 measurements can be averaged (arithmetic averaging or ensemble averaging)
EDT, T20 and T30 Calculation: From slope in evaluation range
Slope Estimation: Least squares approximation
Quality Indicators: Quality Indicators with status information like Overload, Curvature in %, etc.; extensive list of status information. Quality indicators are available on reverberation time spectra for each frequency band, and as overall quality indicators for each measurement position and for the total project (room)
Reverberation Time Range: Max. 50 s, min. 0.1 – 0.7 s, depending on bandwidth and centre frequency

Wide Band Reverberation Time: The arithmetic average of the Reverberation Time within a selectable frequency range is calculated

Measurement Display and Control

OVERVIEW MAP
Map of Source and Receiver positions with reverberation time readout for a selectable frequency band on each measurement position together with quality indicator
Organisation of Source and Receiver Positions: measure at all receiver positions for each source or measure in a number of positions (1 to 10) for each source
Source and Receiver positions can be added, moved or deleted

OVERVIEW TABLE
Table of measurement positions with reverberation time readout for selectable frequency band on each position together with quality indicator
Positions can be included/excluded from Room average

SOUND LEVEL SPECTRUM
LZF spectrum plus A and C broadband bars
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available
Cursor: Readout of selected band
Quality indicator for each frequency band

REVERBERATION TIME SPECTRUM
One or two spectra can be displayed
Y-axis: Range: 0.5, 1, 2, 5, 10 or 20 s. Auto zoom available
Cursor: Readout of selected band
Quality Indicator for each frequency band

REVERBERATION TIME SPECTRUM TABLE
One or two spectra can be displayed in tabular form

DECAY
Decay curve for a position or the room average available for each frequency band
Display of evaluation range and regression line
Readout of Curvature in %
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto zoom or auto scale available

MEASUREMENT CONTROL
Measurement Sequence: Supports measuring:
- at all receiver positions before using another source
- at a receiver position for all sources before measuring at a new position
- at subsequent receiver positions without source information, or
- at manually selected source and receiver positions

During measurement, the instantaneous sound level spectrum is displayed. After measurement, the reverberation time is displayed
Interrupted Noise Excitation: Measurements are started manually and can be automatically stored on completion of measurement
The noise generator is turned on and off automatically
Escape Time: 0 to 60 s
Build-up Time: 1 to 10 s
Number of Decays per Measurement: 1 to 100, ensemble averaged into one decay
The generator can be turned on and off manually for checking equipment and sound levels
Serial Measurements: Selected frequency bands can be measured serially, that is, one by one in an automatic sequence. This can be done automatically in combination with the parallel measurement
Impulse Excitation: Manual start of first measurement. When level (say from starter pistol) exceeds the user-selected trigger level, the decay is recorded and backwards integration performed (Schroeder method). The trigger can then be armed automatically for measuring at the next position
Signal Recording: (requires license for Signal Recording Option BZ-7226) Recording of the Z-weighted measured signal can be done at each position. For data storage, Signal Recording requires:
- SD Card: All hardware versions
- CF Card: Hardware versions 1 – 3
- USB Memory Stick: Hardware version 4

Measurement Status

ON SCREEN
Information such as *overload*, *awaiting trigger* and *running/paused* are displayed on screen as icons

TRAFFIC LIGHT
Red, yellow and green LEDs show measurement status and instantaneous overload as follows:
- Yellow LED flashing every 5 s = stopped, ready to measure
- Green LED flashing slowly = awaiting trigger or calibration signal
- Green LED on constantly = measuring
- Yellow LED flashing slowly = paused, measurement not stored
- Red LED flashing quickly = intermittent overload, calibration failed

Calibration

Initial calibration is stored for comparison with later calibrations

ACOUSTIC
Using Sound Calibrator Type 4231 or custom calibrator. The calibration process automatically detects the calibration level when Sound Calibrator Type 4231 is used

ELECTRICAL
Uses internally generated electrical signal combined with a typed-in value of microphone sensitivity

CALIBRATION HISTORY
Up to 20 of the last calibrations made are listed and can be viewed on the analyzer

Signal Monitoring

Input signal A-, C- or Z-weighted can be monitored using an earphone/headphones connected to the headphone socket
Headphone Signal: Input signal can be monitored using this socket with headphones/earphones
Gain Adjustment: −60 dB to 60 dB

Annotations

VOICE ANNOTATIONS
Voice annotations can be attached to the Reverberation Time Project, to Sources, to Receivers and to measurements at each Position
Playback: Playback of voice annotations or signal recordings can be listened to using earphone/headphones connected to the headphone socket
Gain Adjustment: −60 dB to +60 dB

TEXT & IMAGE ANNOTATIONS
Text and image (Type 2270 only) annotations can be attached to the Reverberation Time Project, to Sources, to Receivers and to measurements at each Position

GPS ANNOTATIONS
A text annotation with GPS information can be attached to the project (Latitude, Longitude, Altitude and position error). Requires connection to a GPS receiver

Data Management

Project Template: Defines the display and measurement setups
Project: Measurement data for all positions defined in a room are stored with the Project Template
Job: Projects are organised in Jobs
Explorer facilities for easy management of data (copy, cut, paste, delete, rename, open project, create job, set default project name)
For specifications and details on documenting results in Qualifier Type 7830 and Qualifier Light Type 7831, please refer to Product Data BP 1691

Software Specifications – 2-channel Option BZ-7229

2-channel Option BZ-7229 is enabled with a separate license. It adds 2-channel functionality to Sound Level Meter, Frequency Analysis, Logging, Enhanced Logging and Building Acoustics Software and to Signal recording option on Type 2270.
NOTE: 2-channel Enhanced Logging is not available for hardware versions 1-3.
Please refer to Product Data BP 2190 for Dual-channel Building Acoustics Software specifications
In general the 2-channel Option adds an extra channel of measurement data. The two channels can have input from same type of transducers (e.g., two microphones) or two different transducers (e.g., one microphone and one accelerometer)

SELF-GENERATED NOISE LEVEL
Typical values at 23°C for nominal microphone open-circuit sensitivity:
High Range:

Weighting	Microphone	Electrical	Total
"A"	14.6 dB	28.3 dB	28.5 dB
"B"	13.4 dB	26.9 dB	27.1 dB
"C"	13.5 dB	27.0 dB	27.2 dB
"Z" 5 Hz–20 kHz	15.3 dB	31.2 dB	31.3 dB
"Z" 3 Hz–20 kHz	15.3 dB	32.1 dB	32.2 dB

Low Range:

Weighting	Microphone	Electrical	Total
"A"	14.6 dB	12.4 dB	16.6 dB
"B"	13.4 dB	11.5 dB	15.6 dB
"C"	13.5 dB	12.9 dB	16.2 dB
"Z" 5 Hz–20 kHz	15.3 dB	18.3 dB	20.1 dB
"Z" 3 Hz–20 kHz	15.3 dB	25.5 dB	25.9 dB

MEASURING RANGES
The full level measuring range is covered in two range settings: High Range for the least sensitive range and Low Range for the most sensitive range
When using Microphone Type 4189:

Broadband Analysis
Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted:
High Range: 28.5 to 140 dB
Low Range: 16.6 to 110 dB
Primary Indicator Range: In accordance with IEC 60651, A-weighted:
High Range: 41.7 dB to 122.3 dB
Low Range: 23.5 dB to 92.3 dB
Linearity Range: In accordance with IEC 60804, A-weighted:
High Range: 39.6 to 140.8 dB
Low Range: 21.4 to 110.8 dB
Linear Operating Range: In accordance with IEC 61672, A-weighted:
1 kHz:
High Range: 43.0 dB to 139.7 dB
Low Range: 24.8 dB to 109.7 dB
Peak C Range: In accordance with IEC 61672, 1 kHz:
High Range: 58.5 dB to 142.7 dB
Low Range: 42.3 dB to 112.7 dB

Frequency Analysis
Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz 1/3-octave:
High Range: 18.5 to 140 dB
Low Range: 1.3 to 110 dB

Linear Operating Range: In accordance with IEC 61260:
High Range: $\leq$ 39.3 to 140 dB
Low Range: $\leq$ 20.6 to 110 dB

Measurements with BZ-7222 and BZ-7223

Two channels, each with all the data from the single channel measurement, except for common housekeeping parameters like Start Time, Elapsed Time etc. and weather and GPS data.

Under Range Detector: Monitors the under range of all the frequency weighted detectors when set to High Range. Under range is set if level is below lower limit of Linear Operating Range. Detectors available for both Ch. 1 and Ch. 2

AUTORANGE
Manual and automatic range controls are provided

Spectrum Display (for BZ-7223)
Spectra from both channels can be superimposed. Data from different transducer types are displayed with individual Y-axis
Spectra for Display (Microphone Input):
- Ch.1 - Ch.2 LX_{eq}
- Ch.2 - Ch.1 LX_{eq}
X = A,B,C,Z
Spectra for Display (Accelerometer or Direct Input):
- Ch.1 - Ch.2 Linear
- Ch.2 - Ch.1 Linear
Single Values for Display (Microphone Input):
- Ch.1-Ch.2 LX_{eq}
- Ch.2-Ch.1 LX_{eq}
- Ch.1-Ch.2 LY_{eq}
- Ch.2-Ch.1 LY_{eq}
X = A, B. Y = C, Z
Single Values for Display (accelerometer or direct input):
- Ch.1 - Ch.2 Linear
- Ch.2 - Ch.1 Linear

Measurements with BZ-7224 and BZ-7225

Fast Logging: Up to a total of four of the 100 ms parameters from the two channels can be logged.
Broadband Data Stored at Each Logging Interval:
All, or up to 10 selectable broadband values from the two channels.
Spectrum Data Stored at each Logging Interval:
All, or up to four selectable spectra from the two channels (license for BZ-7223 required)
2-channel Signal Recording (license for BZ-7226 required):
2-channel Signal Recording is available in Sound Level Meter, Frequency Analysis, Logging and Enhanced Logging Software
The signals from the two channels can be recorded into a "stereo" wave file of either 2 × 24-bit or 2 × 16-bit

NOTE: 2 × 24-bit at 48 kHz is not available for hardware versions 1–3

SAMPLING RATE AND PRE-RECORDING FOR 2-CHANNEL RECORDING

Sampling Rate (kHz)	Maximum Pre-recording (s) 16-bit		Maximum Pre-recording (s) 24-bit		Memory (KB/s) 16-bit	Memory (KB/s) 24-bit
	HW 1 – 3	HW G4	HW 1 – 3	HW G4		
8	50	230	30	150	32	48
16	20	110	10	70	64	96
24	10	70	3	43	96	144
48	0	30	NA	16	192	288

Software Specifications – Tone Assessment Option BZ-7231

LICENSE
Tone Assessment Option BZ-7231 is enabled with a separate license and can be used with the FFT template (BZ-7230) or with 1/3-octave and logging template (BZ-7223, BZ-7224 and BZ-7225)

FFT Based Tone Assessment (with BZ-7230 Only)

STANDARD
Tone assessment is based on the measured FFT spectrum in accordance with 'ISO 1996:2007 Acoustics – Description, assessment and measurement of environmental noise – part 2: Determination of environmental noise levels. Annex C (informative) Objective method for assessing the audibility of tones in noise – Reference method'

SPECTRA ASSESSED
Any displayed sound FFT spectrum (FFT, Ref or MAX) may be assessed Assessment is made as post-processing, that is, when measurement is paused or stopped

SETUP ACCORDING TO STANDARD
Setups in violation of the standard are indicated as such on the display, you may then accept to apply the default setup
Tone assessment will be made if possible, in spite of standard violations
Tone Seek Criterion: 0.1 to 4.0 dB in 0.1 dB steps

TONE AT CURSOR
A sinusoidal tone is available at the Headphone output, to help confirm identified tones
Frequency: the frequency is selected by the Main cursor
Gain: −70 dB to +10 dB
Options: The generated tone can be mixed with the input signal

TONE ASSESSMENT CURSOR
All tones found are indicated in the display.
The Tone cursor is initially placed at the most prominent tone, and can then be stepped through the tones found.
You can also use the Main cursor to step through the tones

RESULTS
Results are displayed in the Tone panel and in the Value panel
They are not saved with the measurement

All Tones: Frequency, Tone level L_{pti}, Masking noise level L_{pn}, Audibility ΔL_{ta}, Critical Band CB, Tone vs. Noise Level difference ΔL_{ts}, Audibility criterion $\Delta L_{ts,krit}$
Most Prominent Tone: Tone Level L_{pt}, Adjustment K_t

QUALITY INDICATORS
On the display, a quality indicator (smiley) will indicate that a hint is available for tone assessment quality. Click on the indicator to see the hint

1/3-octave Based Tone Assessment (with BZ-7223/24/25 Only)

Tone assessment is based on the measured 1/3-octave spectrum in accordance with either the international 'ISO 1996:2007 Acoustics – Description, assessment and measurement of environmental noise – part 2: Determination of environmental noise levels. Annex D (informative) Objective method for assessing the audibility of tones in noise – Simplified method' or the Italian law 'DM 16-03-1998: Ministero dell'ambiente, Decreto 16 marzo 1998'

SPECTRA ASSESSED
The displayed 1/3-octave spectrum (L_{eq}, L_{max} or L_{min}) may be assessed. Assessment is made as post-processing, that is, when measurement is paused or stopped

SETUP ACCORDING TO STANDARD
Setups in violation of the standard are indicated as such on the display. You can then accept to apply the default setup. Tone assessment will be made if possible, in spite of standard violations. For tone assessment according to ISO 1996-2, Annex D, you can set the division between the Low and Middle frequency range, the division between the Middle and High frequency range, and the limits for the level differences between adjacent bands.
For tone assessment according to DM 16-03-1998, the tones are tested against loudness contours. Select between ISO 226: 1987 Free-field, 1987 Diffuse-field and 2003 Free-field

RESULTS
Tones are indicated above the spectrum when *Tone* is selected as spectrum parameter. The resulting adjustment can be viewed on the Value panel. It is not saved with the measurement

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Software Specifications – Low Frequency Option BZ-7234

Low Frequency Option BZ-7234 is enabled with a separate license. It adds G-weighting and Building Vibration parameters to Sound Level Meter, Frequency Analysis, Logging and Enhanced Logging Software and adds low frequency 1/1- and 1/3-octave analysis to Frequency Analysis, Logging and Enhanced Logging Software.

G-weighting

Specifications for G-weighing apply to Type 2250/2270 fitted with one of the microphone Types 4193 or 4964 (both with or without the Low Frequency Adaptor UC-0211) and Microphone Preamplifier ZC-0032

Standards

Conforms with the following National and International Standards:
• ISO 7196:1995
• ANSI S1.42–2001 (R2011)

Analysis

DETECTORS
G-weighted (replacing C/Z-weighted) broadband detectors with one 10 s exponential time weighting, one linearly averaging detector and one peak detector.

MEASUREMENTS
Y = time weightings F or S
Spectra for Display and Storage (BZ-7223 required) Spectra for

L_{Geq}	L_{GSmax}	L_{GFmax}
L_{GSmin}	L_{GFmin}	

Display Only (BZ-7223 required)

L_{GS}	L_{GF}	L_{GYN1}
L_{GYN2}	L_{GYN3}	L_{GYN4}
L_{GYN5}	L_{GYN6}	L_{GYN7}

Single Values for Display and Storage

L_{Geq}	L_{G10max}	L_{G10min}
L_{Gpeak}	T_{Gpeak}	

Single Values for Display Only

L_{G10}	$L_{Gpeak,1s}$

MEASURING RANGES

G-weighted Linear Operating Range at G-filter reference frequency
10 Hz, Single Range

Single Range:.

Microphone	Low (dB)	High (dB)
4193	41.0	161.0
4194 + UC-0211	44.1	151.4
4964	29.6	149.0
4964 + UC-0211	32.6	139.3

High Range:

Microphone	Low (dB)	High (dB)
4193	41.6	161.0
4194 + UC-0211	51.8	151.4
4964	30.3	149.0
4964 + UC-0211	41.7	139.3

Low Range:

Microphone	Low (dB)	High (dB)
4193	41.0	131.0
4194 + UC-0211	44.1	147.4
4964	29.6	119.0
4964 + UC-0211	32.6	137.3

Building Vibration

Specifications for Building Vibration parameters apply to Type 2250/2270 fitted with an accelerometer.

Standards

Conforms with the following International Standards:
• ISO 8041:2005
• DIN 45669-1:2010–09

Analysis

DETECTORS

Wm-weighted or Wmb-weighted detectors run in parallel with the Linear weighted broadband detectors.
Wmb is the band-limiting part of the Wm weighting.

MEASUREMENTS

Spectra for Display and Storage (BZ-7223 required)

aW	Fast max	Slow max
Fast min	Slow min	

Spectra for Display Only (BZ-7223 required)

Fast Inst	Slow Inst

Single Values for Display and Storage

aW	aW_{Crest}	MTVV
KBF_{max}	KBF_{Tm}	Peak
T_{Peak}		

Single Values for Display Only

aW,1s	KBF

Low Frequency 1/1- and 1/3-octave Analysis

Frequency Analysis

CENTRE FREQUENCIES

1/1-oct. Band Centre Frequencies: 1 Hz to 16 kHz
1/3-oct. Band Centre Frequencies: 0.8 Hz to 20 kHz

Standards

Conforms with the following National and International Standards:
• IEC 61260 (1995–07) plus Amendment 1 (2001–09), 1/1-octave Bands and 1/3-octave Bands, Class 0
• ANSI S1.11–1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0–C

• ANSI S1.11–2004, 1/1-octave Bands and 1/3-octave Bands, Class 0

Sound Measurements

Low frequency sound measurements require use of a low frequency microphone. This can be the Type 4193 or Type 4964, both together with Low Frequency Adaptor UC-0211

Vibration Measurements

Brüel & Kjær recommends Low-level Accelerometer Type 8344 for low frequency vibration measurements

Software Specifications – Measurement Partner Suite BZ-5503

BZ-5503 is included with Types 2250, 2270 and 2250 Light (referred to as Type 2250/70 here) for easy synchronisation of setups and data between the PC and hand-held analyzer. BZ-5503 is supplied on ENV DVD BZ-5298

PC REQUIREMENTS

Operating System: Windows[®] 7 or XP (both in 32-bit or 64-bit versions)
Recommended PC:
• Intel[®] Core™ 2 Duo
• Microsoft[®].NET 4.0
• 2 GB of memory
• Sound card
• DVD drive
• At least one available USB port

ON-LINE DISPLAY OF TYPE 2250/2270 DATA

Measurements on Type 2250/2270 can be controlled from the PC and displayed on-line with the PC, using the same user interface on the PC as on Type 2250/2270
Display: 1024 × 768 (1280 × 800 recommended)

DATA MANAGEMENT

Explorer: Facilities for easy management of analyzers, Users, Jobs, Projects and Project Templates (copy, cut, paste, delete, rename, create)
Data Viewer: View measurement data (content of projects)
Synchronisation: Project Templates and Projects for a specific user can be synchronised between PC and Type 2250/2270

USERS

Users of Type 2250/2270 can be created or deleted

EXPORT FACILITIES

Excel: Projects (or user-specified parts) can be exported to Microsoft® Excel® (Excel 2003 – 2010 supported)

Brüel & Kjær Software: Projects can be exported to Predictor-LimA Type 7810, Acoustic Determinator Type 7816, Evaluator Type 7820, Protector Type 7825 or Qualifier (Light) Type 7830 (7831)

POST-PROCESSING

Measurement Partner Suite is a suite of modules, including post-processing tools for data acquired with Type 2250/2270. The following post-processing modules are available:
• Logging Module BZ-5503-A
• Spectrum Module BZ-5503-B
• WAV File Analysis Module BZ-5503-C
These two modules help to assess logging data and measured spectra, such as calculating contribution from markers on a logging profile or correcting spectra for background noise

TYPE 2250/2270 SOFTWARE UPGRADES AND LICENSES

The software controls Type 2250/2270 software upgrades and licensing of the Type 2250/2270 applications

INTERFACE TO TYPE 2250/2270

USB, LAN or Internet connection

USB Connection:
• Hardware versions 1 – 3: USB ver. 1.1
• Hardware version 4: USB ver. 2.0

LICENSE MOVER

To move a license from one analyzer to another use BZ-5503, together with the License Mover VP-0647. See the analyzer's user manual for details

LANGUAGE

User Interface in Chinese (People's Republic of China), Chinese (Taiwan), Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Korean, Polish, Portuguese, Romanian, Russian, Serbian, Slovenian, Spanish, Swedish, Turkish and Ukrainian.

HELP

Concise context-sensitive help in English

Ordering Information

Type 2250-A	Hand-held Analyzer with Sound Level Meter Software BZ-7222	
Type 2250-B	Hand-held Analyzer with Sound Level Meter BZ-7222 and Frequency Analysis Software BZ-7223	
Type 2250-C	Hand-held Analyzer with Sound Level Meter Software BZ-7222 and Logging Software BZ-7224	
Type 2250-D	Hand-held Analyzer with Sound Level Meter Software BZ-7222, Frequency Analysis Software BZ-7223 and Logging Software BZ-7224	
Type 2250-E	Hand-held Analyzer with Sound Level Meter Software BZ-7222, Frequency Analysis Software BZ-7223, Enhanced Logging Software BZ-7225 and Signal Recording Software BZ-7226	
Type 2270-A	Hand-held Analyzer with Sound Level Meter Software BZ-7222	
Type 2270-B	Hand-held Analyzer with Sound Level Meter BZ-7222 and Frequency Analysis Software BZ-7223	
Type 2270-C	Hand-held Analyzer with Sound Level Meter Software BZ-7222 and Logging Software BZ-7224	
Type 2270-D	Hand-held Analyzer with Sound Level Meter Software BZ-7222, Frequency Analysis Software BZ-7223 and Logging Software BZ-7224	
Type 2270-E	Hand-held Analyzer with Sound Level Meter Software BZ-7222, Frequency Analysis Software BZ-7223, Enhanced Logging Software BZ-7225 and Signal Recording Software BZ-7226	

Included with Hand-held Analyzer Type 2250/2270:
• Microphone:
  – Type 4189: 1/2″ Prepolarized Free-field Microphone
    or
  – Type 4190: 1/2″ Free-field Microphone
• ZC-0032: Microphone Preamplifier
• AO-1494: USB Standard A to USB Micro B Interface Cable for hardware version 4, 1.8 m (6 ft)
• AO-1476: USB Standard A to USB Mini B Interface Cable for hardware versions 1 – 3, 1.8 m (6 ft)
• BZ-5298: Environmental Software, including Measurement Partner Suite BZ-5503
• UA-1650: 90 mm dia. Windscreen with AutoDetect
• UA-1651: Tripod Extension for Hand-held Analyzer
• UA-1673: Adaptor for Standard Tripod Mount
• DH-0696: Wrist Strap
• KE-0440: Travel Bag
• KE-0441: Protective Cover
• FB-0679: Hinged Cover (Type 2250 only)
• FB-0699: Hinged Cover (Type 2270 only)
• HT-0015: Earphones
• UA-1654: 5 Extra Styli
• QB-0061: Battery Pack
• ZG-0426: Mains Power Supply

Software and Accessories Available Separately

SOFTWARE MODULES

BZ-7223	Frequency Analysis Software
BZ-7224	Logging Software (including memory card)
BZ-7225	Enhanced Logging Software (including memory card)
BZ-7225-UPG	Upgrade from Logging Software BZ-7224 to Enhanced Logging Software BZ-7225 (does not include memory card)
BZ-7226	Signal Recording Option
BZ-7227	Reverberation Time Software
BZ-7229	2-channel Option (Type 2270 only)
BZ-7228	Building Acoustics Software
BZ-7230	FFT Software
BZ-7231	Tone Assessment Option
BZ-7233	Sound Intensity Software (Type 2270 only)
BZ-7234	Low Frequency Option

ACCESSORIES

Type 3535-A	All-weather Case (see Product Data BP 2251)
Type 4964	Low Frequency Microphone
Type 8344	Low Level Accelerometer
MM-0256-A	Six-Parameter Weather Station Kit
MM-0316-A	Two-Parameter Weather Station Kit

Included with MM-0256-A or MM-0316-A:
• MM-0256-002: Six-Parameter Weather Station (and mounting kit)
• MM-0316-002: Two-Parameter Weather Station (and mounting kit)
• AO-0657: USB Cable
• AO-0659: Cable M12 8-pin (F) to Lemo 1-B 8-pin (M), 10 m (33.3 ft)
• BR 1779: Weather Station Field Guide
• DB-4364: Weather Station Pole Adapter
• KE-4334: Weather Station Carrying Case
• QX-0016: Screwdriver
• QX-1171: 2.5 mm Hex Wrench
• UA-1707-A: Weather Station Tripod Adaptor
• ZH-0689: Weather Station USB Adaptor

AO-0440-D-015	Signal Cable, LEMO to BNC Male, 1.5 m (5 ft)
AO-0646	Sound Cable, LEMO to Minijack, 1.5 m (5 ft)
AO-0697-D-030	Microphone Extension Cable, 10-pin LEMO, 3 m (10 ft)
AO-0697-D-100	Microphone Extension Cable, 10-pin LEMO, 10 m (33 ft)
AO-0701-D-030	Accelerometer Cable, LEMO to M3, 3 m (10 ft)
AO-0702-D-030	Accelerometer Cable, LEMO to 10 – 32 UNF, 3 m (10 ft)
AO-0722-D-050	Accelerometer cable, LEMO to MIL-C-5015, 5 m (16 ft)
AO-0726-D-030	Signal Cable, LEMO to SMB (for Tacho Probe MM-0360), 3 m (10 ft)
AO-0727-D-010	Signal Cable, LEMO to BNC Female, 1 m (3.3 ft)
AO-0727-D-015	Signal cable, LEMO to BNC Female, 1.5 m (5 ft)
JP-1041	Dual 10-pole Adaptor
UA-0587	Tripod
UA-0801	Small Tripod
UA-1317	Microphone Holder
UA-1404	Outdoor Microphone Kit
UA-1672	AutoDetect Insert for UA-1650
UC-0211	Low Frequency Adaptor
UL-1009	SD Memory Card for Hand-held Analyzers
UL-1013	CF Memory Card for Hand-held Analyzers, for hardware versions 1 – 3
UL-1016	10/100 Ethernet CF Card for hardware versions 1 – 3
UL-1017	SDHC Memory Card for Hand-held Analyzers
UL-1019	CF WLAN Card for Hand-held Analyzers for hardware versions 1 – 3
UL-0250	USB to RS–232 Converter for hardware version 4
UL-1025	SD WLAN Card for Hand-held Analyzers for hardware version 4
ZG-0444	Charger for QB-0061 Battery Pack

CALIBRATION

Type 4231	Sound Calibrator (fits in KE-0440)
Type 4226	Multifunction Acoustic Calibrator
Type 4228	Pistonphone
Type 4294	Calibration Exciter
Type 4194-002	Calibration Exciter for Type 8344

MEASURING WITH REVERBERATION TIME SOFTWARE BZ-7227

Type 2734-A	Power Amplifier[*]
Type 2734-B	Power Amplifier with built-in UL-0256 Wireless Audio System[*]
Type 4224	Sound Source[*]
Type 4292-L	OmniPower Sound Source[*]
Type 4295	Omnidirectional Sound Source[*]
AO-0523-D-100	Cable from Type 2250/2270 to Power Amplifier, 10 m (33 ft.)
AO-0524-D-100	Cable from Type 2250/2270 to Type 4224, 10 m (33 ft.)
AQ-0673	Cable from Power Amplifier to sound source, 10 m (33 ft.)
KE-0364	Tripod Carrying Case for Type 4292-L
KE-0392	Carrying Case for Type 4295[*]
KE-0449	Flight Case for Type 4292-L[*]
UA-1476	Wireless Remote Control[*]
UL-0256	Wireless Audio System[*]

POST-PROCESSING

Type 7820	Evaluator – data viewing and calculation software
Type 7825	Protector – software for calculation of Personal Noise Exposure
Type 7831	Qualifier Light
Type 7830	Qualifier
BZ-5503-A	Logging Module (see Product Data BP 2430)
BZ-5503-B	Spectrum Module (see Product Data BP 2430)
BZ-5503-C	WAV File Analysis Module (see Product Data BP 2430)

Service Products

MAINTENANCE

2250-UPG	Upgrade of software applications to latest version
2250-EW1	Extended Warranty, one year extension
2250-MW1	5-year Warranty, including yearly Accredited Calibration (annual payment)
2250-MW5	5-year Warranty, including yearly Accredited Calibration
2270-UPG	Upgrade of software applications to latest version
2270-EW1	Extended Warranty, one year extension
2270-MW1	5-year Warranty, including yearly Accredited Calibration (annual payment)
2270-MW5	5-year Warranty, including yearly Accredited Calibration

ACCREDITED CALIBRATION

2250 CAI	Accredited Initial Calibration of Type 2250
2250 CAF	Accredited Calibration of Type 2250
2250 CTF	Traceable Calibration of Type 2250
2250 TCF	Conformance Test of Type 2250, with certificate
2270 CAI	Accredited Initial Calibration of Type 2270
2270 CAF	Accredited Calibration of Type 2270
2270 CTF	Traceable Calibration of Type 2270
2270 TCF	Conformance Test of Type 2270, with certificate

[*]   For sound source systems and components, please see Product Data BP 1689 or BP 0066.

Brüel & Kjær