

PRODUCT DATA

Hand-held Analyzer Types 2250 and 2270 for Types 2250-S, 2250-S-C, 2270-S and 2270-S-C

Types 2250 and 2270 are innovative hand-held analyzers with an easy, safe and clever design philosophy that 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 simultaneously measure with two microphones, two accelerometers or one of each. All application modules can be ordered as part of a fully preconfigured instrument or separately at any time, as the need arises.

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

Uses and Features

Uses

- Class 1 sound measurements to latest international standards
- Environmental noise assessment and tone assessment (1/3-octave and FFT)
- Loudness and noise rating measurements
- Occupational noise evaluation
- Reverberation time measurements (see BP 2190)
- Building acoustics (see BP 2190)
- Product quality control (see BP 2183)
- Noise source identification using sound intensity (see BP 2341)*
- Audiometer calibration
- Real-time analysis in 1/1- and 1/3-octave bands
- Analysis of logging profiles for broadband parameters and spectra
- Vibration criteria measurements
- Low-frequency building vibration according to ISO 8041:05 and DIN 45669 – 1:2010 – 09
- Whole-body and hand-arm human vibration measurements (RMS, MTVV and Crest Factor)
- Infrasound (G-weighting) measurements according to ISO 7196:1995 and ANSI S1.42 – 2001 (R2011)

* Type 2270 only.



Features

- Hardware:
 - 2-channel measurement capability with any combination of microphones and accelerometers*
 - Large, high-resolution, touch-sensitive colour screen
 - Communication via USB, LAN and options for Wi-Fi or 4G communication
 - 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 Suite for comprehensive post-processing
 - GPS coordinates stored with measurement data
 - Simultaneous noise and weather data acquisition
 - 24- or 16-bit recording during all or parts of measurement

Introduction

Types 2250 and 2270 are flexible hand-held analyzers that cover all your sound and vibration measurement and analysis needs – from the traditional uses in assessing environmental and workplace noise to industrial quality control and development.

The high-resolution touchscreen allows you to easily navigate through the setup menu tailoring one of the many predefined templates to precisely your measurement requirements. The large dynamic range copes with both the loudest noises and those just above the noise floor and the frequency range, extended with the low-frequency option, spans from 20 kHz down to infrasound for measurement of noise sources suspected of emitting very low frequency noise.

When on site, the weather station kit measures weather parameters that are stored on the analyzer together with the noise data. After completion, transfer your measurement data to Measurement Partner Suite, which has tools to help you extract exactly what you need from your data.

This product data describes different combinations of software modules (applications) available for Type 2250 and Type 2270. All analyzers 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 predefined measurement templates tailored to suit specific requirements.

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.

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.

Standard Applications

The following applications are included with every new Type 2250 and Type 2270 analyzer:

- **Sound Level Meter Software BZ-7222** – standard sound level meter software according to IEC 61672-1/ANSI
- **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
- **2-channel Option BZ-7229 (Type 2270 only)** – realize 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** – when used in conjunction with the FFT Analysis Software, this software provides an objective in-field assessment of tonal noise components

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 product data are:

- **Logging Software BZ-7224** – freely select parameters to log at periods from 1 s to 24 h. 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** – 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
- **Enhanced Vibration and Low Frequency Option BZ-7234** – measure infrasound (G-weighting) and building vibration (w_m weighting) with 1/3-octave spectra to very low frequencies and add enhanced vibration capabilities to your instrument including time domain integration and band-pass filtering

Information regarding the following applications can be found in their respective product data:

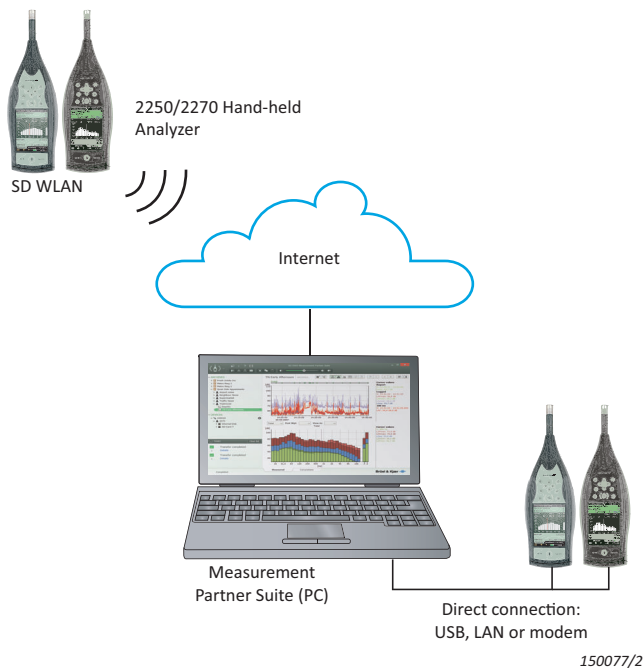
- **Reverberation Time Software BZ-7227** – start a basic measurement by clapping your hands. The ‘traffic light’ shows measurement status at a glance, and the resulting reverberation time (RT) spectrum is shown as well as the average RT for the room. For assessing the acoustic quality of auditoria, halls, public spaces and workplaces ([product data BP 2190](#))
- **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 13 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 ([product data BP 2183](#)). With Tone Assessment Option BZ-7231, FFT Analysis offers objective indication of tonal noise audibility and annoyance
- **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](#))

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



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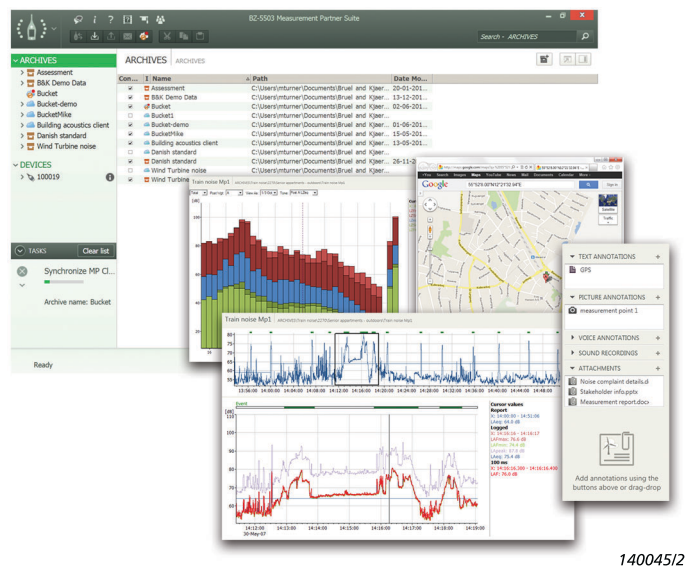
Fig. 2 Secure access to measurement data from anywhere



Remote Internet Communication

Access your data from anywhere by using various technologies. Type 2250/2270 can operate via Wi-Fi, modem communication (for example, 3G) or LAN (Ethernet).

Fig. 3 Measurement Partner Suite BZ-5503



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Measurement Partner Suite BZ-5503, in its basic configuration, comes with your hand-held analyzer (see [product data BP 2430](#)). It is the Brüel & Kjær data viewing and post-processing toolbox for environmental noise and vibration.

The free, basic configuration provides data archive, preview and export capabilities, software maintenance and online display. Archives can be stored locally or on network drives.

Advanced post-processing functionality is available with a Measurement Partner Suite post-processing module licence. A range of subscription or capex licence options are available, locked to either your instrument's serial number or a USB dongle, giving you the flexibility to choose the licence model that meets the needs of your business.

2-channel Measurement Option – BZ-7229

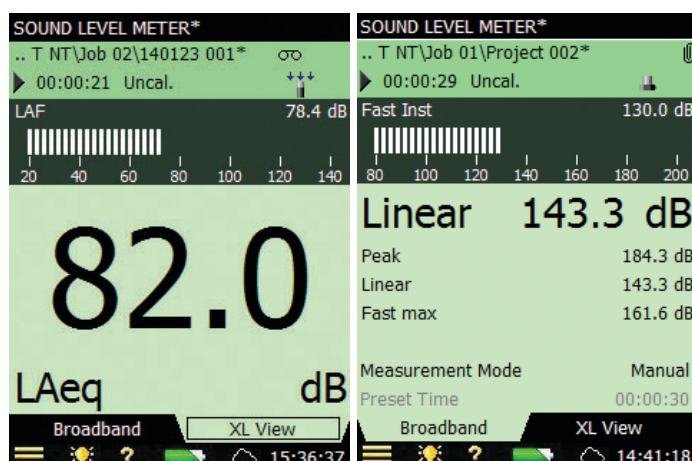
2-channel Option BZ-7229 adds an extra measurement channel to Hand-held Analyzer Type 2270 and is a standard application included on all new Type 2270 analyzers. The two channels accept inputs from the same type of transducer (for example, two microphones) or different transducers (for example, one microphone and one accelerometer.)

2-channel functionality is available for the following modules: Sound Level Meter Software BZ-7222, Frequency Analysis Software 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.

Sound Level Meter Software – BZ-7222

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”.

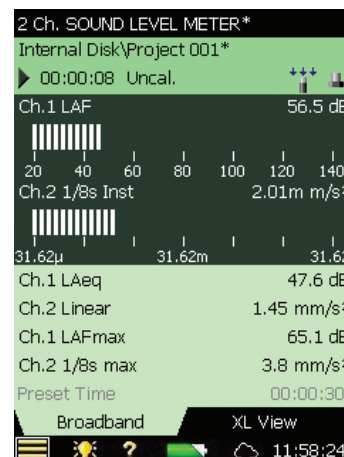
Fig. 4 Sound Level Meter Software displays with a sound measurement (left) and a vibration measurement (right) with an accelerometer, including the icons for added annotations, visible in the upper right corner



2-channel Measurements with BZ-7222

Type 2270 users can measure two channels of broadband values with any combination of transducers: two microphones, two accelerometers or one microphone and one accelerometer.

Fig. 5 Sound level meter software display showing 2-channel measurement. Channel 1 is noise, channel 2 is vibration in engineering units



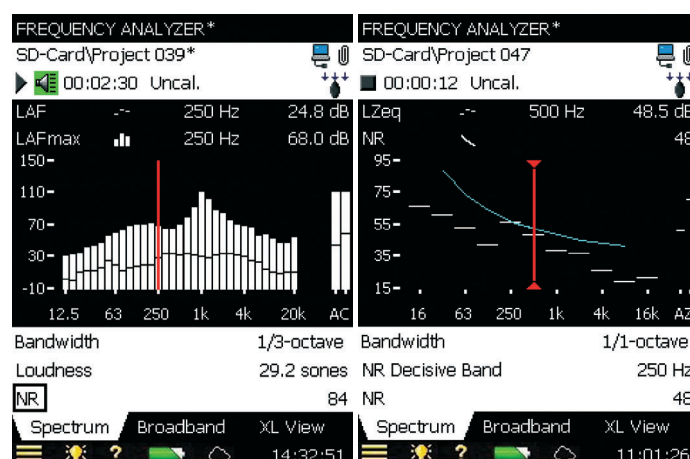
Frequency Analysis Software – BZ-7223

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.

Fig. 6 Frequency Analysis Software BZ-7223 displays: (Left) 1/3-octave showing dual spectra and generator icon, cursor readouts, loudness and noise rating (NR) results. (Right) The decisive band and the corresponding NR curve is shown



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.

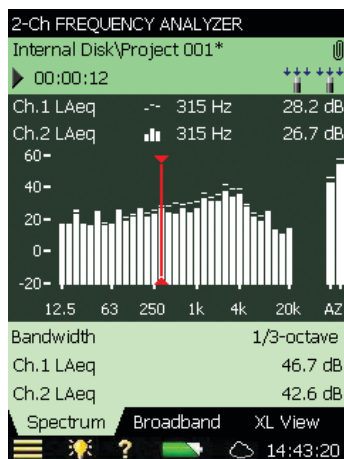
Simple difference calculations are available between channels when transducer type and weightings are compatible.

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.

2-channel Measurements with BZ-7223

Type 2270 users 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.

Fig. 7 2-channel Frequency Analyzer display



Enhanced Logging Software – BZ-7225

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.

With Frequency Analysis Software BZ-7223, the logging software also lets you log spectra the same as your broadband values at intervals from 1 s to 24 h.

Enhanced Logging Software BZ-7225 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 Suite. Large amounts of data can be quickly transferred directly from the analyzer using the USB cable or using a standard card reader. 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.

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.

The enhanced logging templates equip 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; that is, 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 hours 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

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, the post-processing module licence for Measurement Partner Suite enables you to remotely schedule the automatic download of projects from your analyzer to Measurement Partner.

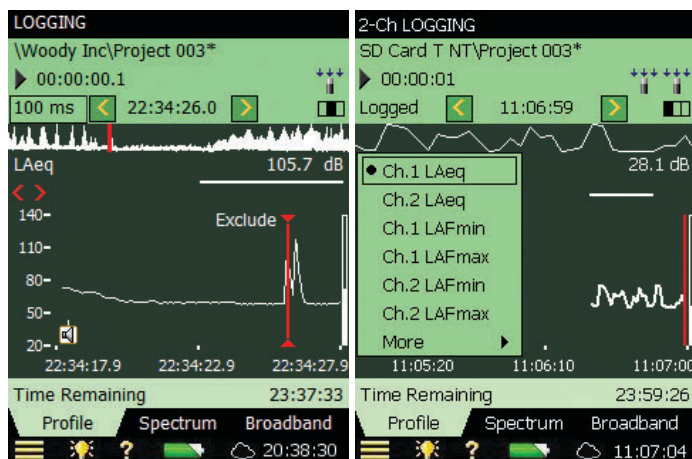
2-channel Measurement Logging

Type 2270 users 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 analyzer 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.

Fig. 8 Left: Single-channel logging display showing a LAeq profile with marker functionality on the analyzer

Right: 2-channel Logging display



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 (that is, 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 the post-processing module licence for Measurement Partner Suite, 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).

Tone Assessment Option – BZ-7231

Fig. 9 Performing an outdoor tone assessment measurement



Noise can be described as tonal if it contains a noticeable or discrete, continuous note. This can include noises such as hums, hisses, screeches, drones, etc. Any such subjective description is open to discussion and contradiction when reported.

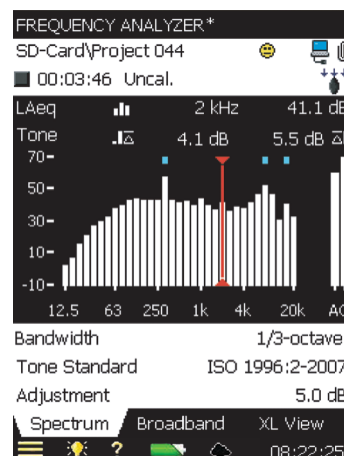
ISO 1996–2 (2007) Annex C, *Objective method for assessing the audibility of tones in noise-reference method*, provides measurement procedures to be used to verify the audibility of tones and to quantify them. Measurement results can therefore be compounded and help explain subjective reactions.

Automatically Configured for ISO 1996 Assessments Tone Assessment Option BZ-7231 offers a quick and easy 'in-the-field' objective assessment of tonal noise components, in compliance with ISO 1996 assessments and is a standard application on all new analyzers. The facility to carry out the ISO standard tone assessment offers objective feedback about whether you have 'found the problem' or need to take further measurements. In addition, the analyzer offers an easy way of setting up the analysis to follow the ISO 1996–2 standard. When this option is selected, simply press Start and the analyzer automatically selects the appropriate measurement configuration and the measurement and analysis are in progress.

Used with BZ-7223: 1/3-octave Bands

Tone Assessment 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 LAeq. 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.

Fig. 10 Tone Assessment Option BZ-7231 showing 1/3-octave bands with audible tones higher than a set limit (tones are identified by the blue dots)



Used with BZ-7230: FFT

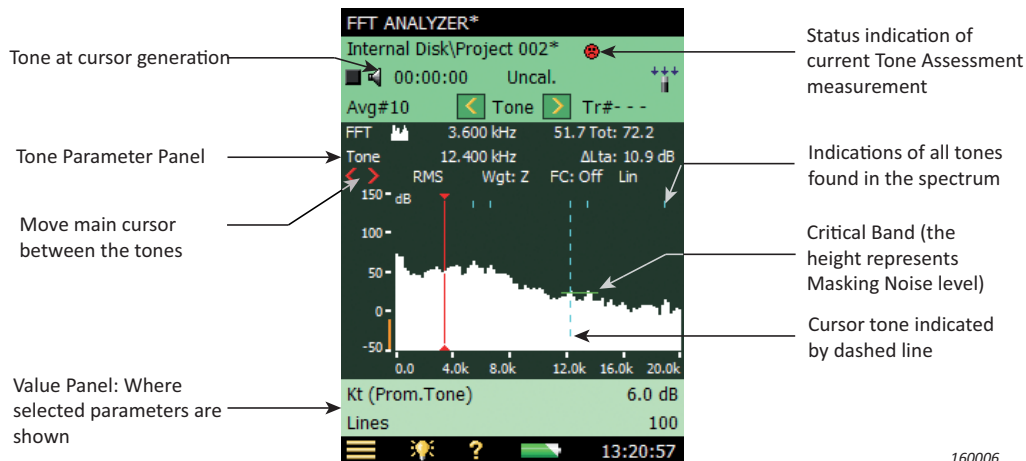
After a measurement, the calculation of tonal parameters for all the possible tonal candidates in the analysis takes only a few seconds, after which the following comprehensive list of results can be displayed on the spot:

- K_t – the value added to the L_{Aeq} to give the tone-corrected rating level
- ΔL_{ta} – the audibility of all tones found in the same critical band as the selected tone
- L_{pn} – the Total level of the masking noise in the band containing the selected tone

- L_{pti} – the Level of the selected tone
- L_{pt} – the total Level of all tones in the critical band containing the prominent tone
- Critical Band – the start and end of the critical band containing the selected tone

The L_{Aeq} and other broadband parameters are measured simultaneously by the analyzer and the tone corrected rating level can be calculated on the spot.

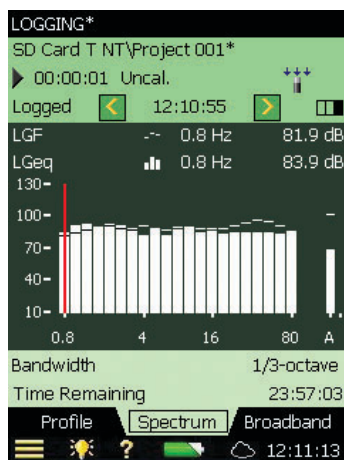
Fig. 11 Typical FFT spectrum display for the Tone Assessment Option, showing the various fields and parameters



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Enhanced Vibration and Low Frequency Option – BZ-7234

Fig. 12 Low Frequency Option showing G-weighted parameters L_{GF} and L_{Geq}



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

With the low-frequency sound option enabled and the appropriate transducer selection, infrasound (including G-weighting) measurements can be performed according to the most important international standards. For infrasound measurements, use low-frequency Microphone Type 4193 or Infrasound Microphone Type 4964 optionally with the Low-frequency Adapter UC-0211.

BZ-7234 also adds additional single- and dual-axis (with Type 2270) vibration capabilities. Time-domain integration and bandpass filtering allow measurement of:

- Peak particle velocity (PPV). Useful for monitoring buildings near blasting, construction and mining. For PPV measurements use accelerometers from the Brüel & Kjær Type 4533/4534 family (see [product data BP 2464](#))
- Vibration criteria (requires Frequency Analysis Software BZ-7223). Used when doing location surveys for vibration-sensitive instruments (for example, electron microscopes) and tools. Also useful with logging of vibration near installed vibration-sensitive instruments using optional Logging Software BZ-7224.

For building vibration, use Accelerometer Type 8344 (see [product data BP 2262](#)).

A wide range of human vibration weightings is also available:

- W_m weighting for whole-body vibration measurements in buildings
- W_b , W_c , W_d , W_e , W_k for whole-body vibration
- W_h for hand-arm vibration
- W_j for vertical head vibration

For human vibration, use accelerometers from the Type 4533/4534 family (see [product data BP 2464](#)).

Fig. 13 Hand-held analyzer measuring outdoor noise using a weather station kit



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).

Fig. 14 Weather Station Kit MM-0316-A



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 analyzer, 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 of Weather Data

Noise and weather parameters are captured simultaneously on the analyzer 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 a post-processing module licence for Measurement Partner Suite).

Outdoor 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.

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 BZ-7222	FREQUENCY ANALYSIS SOFTWARE BZ-7223	LOGGING SOFTWARE BZ-7224	ENHANCED LOGGING SOFTWARE BZ-7225
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 colour-schemes optimized 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	•†	•†	•†	•†
Back-erase – last 5 seconds of measurement data	•	•	•	•
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 days				•
Timer trigger for recordings				•*
L_{dn} , L_{den} , L_{day} , $L_{evening}$, L_{night}				•
Continuous measurement				•

* If Signal Recording Option is enabled † If Low Frequency Option is enabled

‡ If Tone Assessment Option is enabled ** If Frequency Analysis Software is enabled

	<p>The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives</p> <p>RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME</p> <p>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</p> <p>WEEE mark indicates compliance with the EU WEEE Directive</p>
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	<p>EN/IEC 61000-6-3: Generic emission standard for residential, commercial and light industrial environments</p> <p>EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements</p> <p>CISPR 32: Radio disturbance characteristics of information technology equipment. Class B Limits</p> <p>IEC 61672-1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards</p> <p>NOTE: The above is only guaranteed using accessories listed in this document</p>
EMC Immunity	<p>EN/IEC 61000-6-2: Generic standard – Immunity for industrial environments</p> <p>EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements</p> <p>IEC 61672-1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards</p> <p>NOTE: The above is only guaranteed using accessories listed in this document</p>
Temperature	<p>IEC 60068-2-1 & IEC 60068-2-2: Environmental Testing.</p> <p>Cold and Dry Heat</p> <p>Operating Temperature: -10 to +50 °C (14 to 122 °F)</p> <p>Storage Temperature: -25 to +70 °C (-13 to 158 °F)</p>
Humidity	IEC 60068-2-78: Damp Heat: 93% RH (non-condensing at +40 °C (104 °F)). Recovery time 2 ~ 4 hours
Mechanical	<p>Non-operating:</p> <p>IEC 60068-2-6: Vibration: 0.3 mm, 20 m/s², 10 – 500 Hz</p> <p>IEC 60068-2-27: Bump: 1000 bumps at 400 m/s²</p> <p>IEC 60068-2-27: Shock: 1000 m/s², 6 directions</p>
Enclosure	IEC 60529 (1989): Protection provided by enclosures: IP 44*

* With preamplifier, extension cable or protection plug connected to the top socket and the hinged cover protecting the bottom connectors.

ADDITIONAL STANDARDS FOR MICRO USB WIRELESS ADAPTER UL-1050*

Safety	EN 60950-1:2006+A11:2009+A1:2010 +A12:2011
EMC Emission	<p>EN 301 489-1 V1.9.2</p> <p>EN 301 489-17 V2.2.1</p> <p>EN 55022: 2010+AC:2011</p>
Spectrum & Health	<p>EN 300 328 V1.7.1</p> <p>EN 62311:2008</p>
Restriction of Hazardous Substances	EN 50581:2012

FCC GRANT OF EQUIPMENT AUTHORIZATION FOR MICRO USB WIRELESS ADAPTER UL-1050*

FCC Identifier	KA2WA121A1
FCC Rule Parts	15c
Frequency Range (MHz)	2412.0 – 2462.0
Output Watts	0.269
EC Declaration of Conformity	1Tx1R 802.11bgn USB adapter
C-Tick Authorization	AS/NZS 4268: 2008+A1:2010

* From the D-Link Corporation declaration of conformance for Wireless N 150 Micro USB Adapter DWA-121.

Specifications – Hand-held Analyzer Type 2250/2270 Platform

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

Transducer

SUPPLIED TRANSDUCER

One of the Following Microphones:

- Type 4189: Prepolarized Free-field ½" Microphone
- Type 4190: Free-field ½" Microphone
- Type 4966: 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)

SUPPLIED MICROPHONE PREAMPLIFIER

Part No.: 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
"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

Hardware Interface

PUSHBUTTONS

11 buttons with backlight, optimized 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, yellow and green

DISPLAY

Type: Transflective back-lit colour touchscreen 240 × 320 dot matrix

Colour Schemes: Five different – optimized for different usage scenarios (day, night, etc.)

Backlight: Adjustable level and time

USER INTERFACE

Measurement Control: Using pushbuttons

Set-up and Display of Results: Using stylus on touchscreen or pushbuttons

Lock: Pushbuttons and touchscreen can be locked and unlocked

USB INTERFACE

USB 2.0 OTG Micro AB and USB 2.0 Standard A sockets for Wireless

USB-A Adapter UL-1050, printer or weather station

MODEM INTERFACE

Connection to Internet through GPRS/EDGE/HSPA modem connected through the USB Standard A Socket.

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 utilizes 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: 2048 × 1536 pixels

Viewfinder Size: 212 × 160 pixels

Format: jpg with exif information

SECURE DIGITAL SOCKET

2 × SD sockets

Connect SD and SDHC memory cards

LAN INTERFACE SOCKET

- Connector: RJ45 Auto-MDIX
- Speed: 100 Mbps
- Protocol: TCP/IP

INPUT SOCKET

One socket with Type 2250; two with Type 2270

Connector: Triaxial LEMO

Input Impedance: $\geq 1\text{ M}\Omega$

Direct Input: Max. input voltage: $\pm 14.14\text{ V}_{\text{peak}}$

CCLD Input: Max. input voltage: $\pm 7.07\text{ V}_{\text{peak}}$

CCLD Current/voltage: 4 mA/25 V

TRIGGER SOCKET

Connector: Triaxial LEMO

Max. Input Voltage: $\pm 20\text{ V}_{\text{peak}}$

Input Impedance: $> 47\text{ k}\Omega$

Precision: $\pm 0.1\text{ V}$

OUTPUT SOCKET

Connector: Triaxial LEMO

Max. Peak Output Level: $\pm 4.46\text{ V}$

Output Impedance: 50 Ω

HEADPHONE SOCKET

Connector: 3.5 mm Minijack stereo socket

Max. Peak Output Level: $\pm 1.4\text{ V}$

Output Impedance: 32 Ω in each channel

Storage

INTERNAL FLASH-RAM (NON-VOLATILE)

512 MB for user set-ups and measurement data

EXTERNAL MEMORY CARD

SD and SDHC Card: For store/recall of measurement data

USB MEMORY STICK

For store/recall of measurement data

Power

EXTERNAL DC POWER SUPPLY REQUIREMENTS

Used to charge the battery pack in the analyzer

Voltage: 8 – 24 V DC, ripple voltage $< 20\text{ mV}$

Current Requirement: min. 1.5 A

Power Consumption: $< 2.5\text{ W}$, without battery charging, $< 10\text{ W}$ 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 V AC; 47 – 63 Hz

Connector: 2-pin IEC 320

BATTERY PACK

Rechargeable Li-Ion battery

Part No.: QB-0061

Voltage: 3.7 V

Nominal Capacity: 5500 mAh (typical); 5200 mAh (minimum)

Typical Operating Time:

Single-channel: $> 11\text{ h}$ (screen backlight dimmed); $> 10\text{ h}$ (full screen backlight)

Dual-channel: $> 10\text{ h}$ (full screen backlight)

Use of external interfaces (LAN, USB, Wi-Fi) will decrease battery operating time. Connecting a weather station or a GPS receiver can decrease battery operating with up to 20%. Connecting Wireless USB-A Adapter UL-1050 can decrease battery operating time up to 35%

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 (86 °F). To protect the battery, charging will be terminated completely at ambient temperatures above 40 °C (104 °F). 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 $< 0.45\text{ s}$ per 24-hour period

Environmental

WARM-UP TIME

From Power Off: $< 2\text{ min}$

From Standby: $< 10\text{ s}$ for prepolarized microphones

WEIGHT AND DIMENSIONS

650 g (23 oz) including rechargeable battery

300 × 93 × 50 mm (11.8 × 3.7 × 1.9") including preamplifier and microphone

Wireless Connection to Mobile Device

Specifications apply to Wireless USB-A Adapter UL-1050

Operating Frequency: 2.4 GHz

Data Rate:

- IEEE 802.11n: up to 150 Mbps
- IEEE 802.11g: up to 54 Mbps
- IEEE 802.11b: up to 11 Mbps

Encryption/Authentication:

- 64/128-bit WEP
- WPA-PSK
- WPA2-PSK

Range: The range is similar to a standard WLAN unit, typically from 10 to 50 m (33 to 164'), depending on the environment and the number of other WLAN transmitters in the area (smartphones, Wi-Fi, etc.)

Power Requirements: Power Consumption: <1 W

Software 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 Chinese (People's Republic of China), English, French, German, Italian, Japanese, Polish, Romanian, Serbian, Slovenian, Spanish and Ukrainian

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
- the 2250/2270 SDK (software development kit)
- a REST interface through HTTP
- an Internet browser supporting JavaScript

The connection is password protected with two levels of protection:

- Guest level: for viewing only
- Administrator level: for viewing and full control of the analyzer

Input

DUAL CHANNELS (Type 2270 only)

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

TRANSDUCER DATABASE

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, 4192, 4193, 4193 + UC-0211, 4950, 4952, 4952+EH-2152, 4955-A, 4964, 4964 + UC-0211, 4966 and 4184-A, BZ-7222 is able to correct the frequency response to compensate for sound field and accessories:

Sound Field: Free-field, diffuse-field or pressure-field (Type 4192 only). 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, 4192, 4193, 4193 + UC-0211, 4966 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

Calibration

Initial calibration for each transducer 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 set-ups. Set-ups can be locked and password-protected

PROJECT

Measurement data stored with the project template

JOB

Projects are organized in jobs.

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

Measurement Control

MANUAL

Manually controlled single measurement

AUTOMATIC

Preset measurement time from 1 s to 24 h 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 flashing 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 email 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

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

Software Specifications – Sound Level Meter Software BZ-7222

Standards

Conforms with the following national and international standards:

- IEC 61672–1 (2013) 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/ASA S1.4–2014, Class 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

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 Display and Storage:

Start Time	Stop Time	Overload %
Elapsed Time	L _{Xeq}	L _{Yeq}
L _{XE}	L _{YE}	L _{Ceq} –L _{Aeq}
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 _{Xleq}	L _{Yleq}	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	#VPeaks	#VPeaks
(>NNNdB)	(>137dB)	(>135dB)
T _{vpeak}	L _{avUQ}	TWA
TWAv	DoseUQ	Proj. DoseUQ
L _{Aeq,T1,mov,max}	L _{Aeq,T2,mov,max}	L _{Ceq,T1,mov,max}
L _{Ceq,T2,mov,max}	ΔL _{eq,T1,mov,max}	ΔL _{eq,T2,mov,max}
Avg. RPM		

Weather Data (requires 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
Rainfall		

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}
L _{Ceq,T1,mov}	L _{Ceq,T2,mov}	ΔL _{eq,T1,mov}
ΔL _{eq,T2,mov}	Inst. RPM	

Instantaneous Weather Data:

Wind Dir.	Wind Speed
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Instantaneous GPS Data:

Latitude	Longitude
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MEASUREMENTS FOR VIBRATION INPUT

For Display and Storage:

Start Time	Stop Time	Overload %
Elapsed Time	Time Remaining	
aLinear	aLin(1k–20kHz)	
aFast max	aF max(1k–20kHz)	
aSlow max	aS max(1k–20kHz)	
aFast min	aF min(1k–20kHz)	
aPeak	aT _{Peak}	
Crest Factor	Avg. RPM	

Only for Display as Numbers or Quasi-analog Bars:

aFast Inst	aF Inst(1k–20kHz)
aSlow Inst	aS Inst(1k–20kHz)
Inst RPM	Trig. Input Voltage

Instantaneous GPS Data:

Latitude	Longitude
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MEASUREMENTS FOR 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}	Crest Factor	Avg. RPM

Only for Display as Numbers or Quasi-analog Bars:

Fast Inst	Slow Inst
Inst RPM	Trig. Input Voltage

Instantaneous GPS Data:

Latitude	Longitude
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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
• C-weighted: 25.5 dB to 139.7 dB
• Z-weighted: 30.6 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

RPM MEASUREMENT

RPM is measured on the signal connected to Trigger input when Tacho is set to On
Range: 1 to 6000000 rpm
Gear Ratio: 10^{-5} to 10^{38} . The displayed rpm is the measured rpm divided by the rpm gear ratio

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/s^2) 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

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

Software Specifications – Frequency Analysis Software BZ-7223

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

Standards

Conforms with the following national and international standards:
• IEC 61260-1 (2014), 1/1-octave Bands and 1/3-octave Bands, Class 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
• ANSI/ASA S1.11-2014 Part 1, 1/1-octave Bands and 1/3-octave Bands, Class 1

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	

* where f1 and f2 are frequency bands in the spectrum

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
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Single Values:

Linear (f1 - f2)*

* where f1 and f2 are frequency bands in the spectrum

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 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 100 ms into 1 dB wide classes over 150 dB.

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, 160 or 200 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/s^2) 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 V_{rms} (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 as 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

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 preset periods into files on:

- SD Card
- USB Memory Stick

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. For sound input you can also log LAF every 10 ms. One spectrum (L_{eq} , LF or LS) can be logged every 100 ms. The 10 ms LAF and the 100 ms spectrum can only be stored and not displayed on the analyzer; it can be displayed on Measurement Partner Suite BZ-5503

Broadband Data Stored at each Logging Interval: All, or up to 10 selectable broadband sound data incl. Trig. Input Voltage, Avg. RPM, 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, 160 or 200 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/s^2) 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
- USB Memory Stick

Report Period: From 1 min to 24 h 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

Software Specifications – Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 is enabled with a separate license. It works with all analyzer software: Sound Level Meter, Frequency Analysis, Logging Software, Enhanced Logging Software and Reverberation Time Software.

For data storage, signal recording requires:

- SD Card
- USB Memory Stick

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)	8	16	24	48
Maximum Pre-recording (s) 16-bit	470	230	150	70
Maximum Pre-recording (s) 24-bit	310	150	96	43
Memory (kB/s) 16-bit	16	32	48	96
Memory (kB/s) 24-bit	24	48	72	144

SAMPLING RATE (KHZ)	8	16	24	48
Maximum Pre-recording (s) 16-bit	G1 – 3	110	50	30
	G4	470	230	150
Maximum Pre-recording (s) 24-bit	G1 – 3	70	30	16
	G4	310	150	96
Memory (kB/s) 16-bit	16	32	48	96
Memory (kB/s) 24-bit	24	48	72	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 or Enviro Noise Partner BZ-7301. Calibration information and possible tachometer trigger information are stored in the .wav file allowing BZ-5503 and BK Connect 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 (2013) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993-02) and Amendment 2 (2000-10), Type 1
- IEC 61260-1 (2014), 1/1-octave Bands and 1/3-octave Bands, Class 1
- ANSI S1.4-1983 plus ANSI S1.4A-1985 Amendment, Type 1
- ANSI/ASA S1.4-2014, Class 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

- ANSI/ASA S1.11-2014 Part 1, 1/1-octave Bands and 1/3-octave Bands, Class 1
- ISO 140
- ISO 3382
- ISO 354

CORRECTION FILTERS

For Microphone Types 4189, 4190, 4191, 4192, 4193, 4950, 4952, 4952+EH-2152, 4955-A, 4964, 4966 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: 23.5 dB to 122.3 dB
- C-weighted: 25.5 dB to 139.7 dB
- Z-weighted: 30.6 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 V_{rms} (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 μ s

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

Organization 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
- USB Memory Stick

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

Software Specifications – 2-channel Option BZ-7229

2-channel Option BZ-7229 is a standard application included with all new Type 2270 analyzers. 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. Please refer to Product Data BP 2190 for 2-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 (such as two microphones) or two different transducers (such as 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

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 AND 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 organized in Jobs

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

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

BROADBAND ANALYSIS

When using Microphone Type 4189:

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
- C-weighted: 1 kHz
 - High Range: 41.7 dB to 139.7 dB
 - Low Range: 25.5 dB to 109.7 dB
- Z-weighted: 1 kHz
 - High Range: 45.9 dB to 139.7 dB
 - Low Range: 30.6 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: ≤ 39.3 to 140 dB
- Low Range: ≤ 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

Underrange Detector: Monitors the underrange of all the frequency-weighted detectors. Underrange 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 L_{Xeq}
- Ch.2 – Ch.1 L_{Xeq}

X = A, B, C or 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 L_{Xeq}
- Ch.2 – Ch.1 L_{Xeq}
- Ch.1 – Ch.2 L_{Yeq}
- Ch.2 – Ch.1 L_{Yeq}

X = A or B. Y = C or Z

Single Values for Display (accelerometer or direct input):

- Ch.1 – Ch.2 Linear
- Ch.2 – Ch.1 Linear
- Ch.1 – Ch.2 Linear detector 2 (Acc. input only)
- Ch.2 – Ch.1 Linear detector 2 (Acc. input only)

Measurements with BZ-7224 and BZ-7225

Fast Logging: Up to a total of four of the 100 ms broadband parameters from the two channels can be logged (incl. the 10 ms parameter for sound input). Up to two 100 ms spectra from the two channels

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

SAMPLING RATE AND PRE-RECORDING FOR 2-CHANNEL RECORDING

Sampling Rate (kHz)	8	16	24	48
Maximum Pre-recording (s) 16-bit	230	110	70	30
Maximum Pre-recording (s) 24-bit	150	70	43	16
Memory (KB/s) 16-bit	32	64	96	192
Memory (KB/s) 24-bit	48	96	144	288

Software Specifications – Tone Assessment Option BZ-7231

LICENSE

Tone Assessment Option BZ-7231 is a standard application included with all new Type 2250/2270 analyzers. The option can be used with the FFT template (BZ-7230) or with 1/3-octave frequency analysis and logging template (BZ-7223, BZ-7224 or 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

Enhanced Vibration and Low Frequency Option BZ-7234 is enabled with a separate license. It adds G-weighting and human vibration parameters, and integration and double integration of the acceleration signal for vibration and displacement 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-weighting 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):

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

Spectra for 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:

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

General Vibration

Specifications for general vibration parameters apply to Type 2250/2270 fitted with an accelerometer

Standards

Conforms with the following International standards:

- ISO 2954
- ISO 10816 series

Analysis

DETECTORS

Addition to the Acc Linear and Acc 1k – 20 kHz settings for the two broadband detectors:

Vel 3 – 20000 Hz Vel 0.3 – 1000 Hz Vel 10 – 1000 Hz
 Vel 1 – 100 Hz Dis 10 – 1000 Hz Dis 30 – 300 Hz
 Dis 1 – 100 Hz

The weighting for the peak detector can be set to one of the settings chosen for the broadband detectors or Acc Linear.

The weighting for the spectrum detectors can be set to Acc Linear or Vel 3 – 20000 Hz, Vel 0.3 – 1000 Hz, Vel 10 – 1000 Hz or Vel 1 – 100 Hz

Single Values for Display and Storage: Peak-Peak for displacement

Human Vibration

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

Standards

Conforms with the following International Standards:

- ISO 8041:2005
- ISO 5349-1
- ISO 2631 series
- DIN 45669-1:2010-09

Analysis

DETECTORS

Two broadband detectors can each be set to one of the weightings:

Acc Linear Vel 0.3 – 1000 Hz Vel 1 – 100 Hz
 W_b W_c W_d
 W_e W_j W_h
 W_k W_m W_{xb}
 W_{hb} W_{mb}

W_{mb} is the band limiting part of W_m . W_{hb} is the band limiting part of W_h and W_{xb} is the band limiting part of W_b , W_c , W_d , W_e , W_j and W_k

The weighting for the peak detector can be set to one of the settings chosen for the broadband detectors or Acc Linear.

The weighting for the spectrum detectors can be set to Acc Linear or Vel
0.3 – 1000 Hz or Vel 1 – 100 Hz

MEASUREMENTS

Single Values for Display and Storage:

MTVV KBF_{max} KBF_{Tm}

Peak-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 61260–1 (2014), 1/1-octave Bands and 1/3-octave Bands, Class 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
- ANSI/ASA S1.11 – 2014 Part 1, 1/1-octave Bands and 1/3-octave Bands, Class 1

Sound Measurements

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

Vibration Measurements

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

Specifications – Measurement Partner Suite BZ-5503

BZ-5503 is included with Types 2250 and 2270 for easy synchronization 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, 8.1, 10 or 11 (all in 32-bit or 64-bit versions)

Recommended PC:

- Intel® Core™ i3
- Microsoft® .NET 4.5
- 2 GB of memory
- Sound card
- DVD drive
- At least one available USB port
- Solid State Drive

ONLINE DISPLAY OF TYPE 2250/2270 DATA

Measurements on the analyzer can be controlled from the PC and displayed online with the PC, using the same user interface on the PC as on the analyzer

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)

Synchronization: Project templates and projects for a specific user can be synchronized between PC and analyzer

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 – 2016 supported)

Brüel & Kjær Software: Projects can be exported* to Enviro Noise Partner BZ-7301, Work Noise Partner BZ-7302, Building Acoustics Partner BZ-7350, PULSE Mapping for Hand-held Sound Intensity Type 7962 or BK Connect

POST-PROCESSING

With the post-processing module licence, Measurement Partner Suite includes a range of post-processing tools for data acquired with Type 2250/2270. These tools help to assess logging data and measured

spectra, such as calculating contribution from markers on a logging profile, or correcting spectra for background noise. Standard calculators for BS 4142, TA Lärm, Emergence and uncertainty analysis according to ISO 1996 are also included

HAND-HELD ANALYZER SOFTWARE UPGRADES AND LICENSES

The software controls analyzer software upgrades and licensing of the analyzer applications

INTERFACE TO HAND-HELD ANALYZER

USB, LAN or Internet connection

LICENSE MOVER

To move a license from one analyzer to another use BZ-5503 together with License Mover VP-0647

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

* Not all data are available in all exports. The data exported are dependent on the type and target of the export.

Type 2250-S	Hand-held analyzer
Type 2270-S	2-channel hand-held analyzer
Type 2250-S-C	Hand-held analyzer with Sound Calibrator Type 4231
Type 2270-S-C	2-channel hand-held analyzer with Sound Calibrator Type 4231

which include the following as standard:

INCLUDED SOFTWARE

- BZ-7222: Sound Level Meter Software
- BZ-7223: Frequency Analysis Software
- BZ-7231: Tone Assessment Option
- BZ-7232: Noise Monitoring Software
- BZ-7229: 2-channel Option (Type 2270 only)

INCLUDED MICROPHONE AND PREAMPLIFIER

- Type 4189: ½" Prepolarized Free-field Microphone or
- Type 4190: ½" Free-field Microphone or
- Type 4966: ½" Free-field Microphone
- ZC-0032: Microphone Preamplifier

INCLUDED ACCESSORIES

- FB-0679: Hinged Cover (Type 2250 only)
- FB-0699: Hinged Cover (Type 2270 only)
- QB-0061: Battery Pack

- ZG-0426: Mains Power Supply
- UA-1650: 90 mm dia. Windscreen with AutoDetect
- Compulsory Accessory Kit UA-1710-D01 including:
 - KE-0441: Protective Cover, for hand-held analyzer
 - UL-1050: Wireless USB-A (M) Adaptor
 - UA-1651: Tripod Extension, for hand-held analyzer
 - UA-1654: 5 Extra Styli
 - UA-1673: Adaptor for Standard Tripod Mount
 - DH-0696: Wrist Strap
 - DD-0594: Protection Plug, for hand-held analyzer without Preamplifier
 - AO-1494: Cable, USB 2.0, USB-A (M) to USB-micro-B (M) black, 1.8 m (5.9'), max. +70 °C (158 °F)
 - BZ-5298: Environmental Software

NOTE: These accessories are also available separately

Analyzer Alone

To purchase a hand-held analyzer without microphone or preamplifier, order:

Type 2250-W	Hand-held Analyzer
Type 2270-W	2-channel Hand-held Analyzer

Both Type 2250-W and 2270-W include the software and accessories listed above.

Software and Accessories Available Separately

SOFTWARE MODULES

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-7228	Building Acoustics Software
BZ-7230	FFT Software
BZ-7233	Sound Intensity Software (Type 2270 only)
BZ-7234	Enhanced Vibration and Low Frequency Option

MEASUREMENT PARTNER SUITE SOFTWARE

BZ-5503-012	Post-processing Module, 1-year subscription for one instrument
BZ-5503-ND	Post-processing Module, permanent license for any instrument (dongle)
BZ-5503-NI	Post-processing Module, permanent license for one instrument

See product data [BP 2430](#)

PC SOFTWARE

BZ-7302-X-ND	Work Noise Partner export from Measurement Partner Suite, licence for any instrument (dongle)
BZ-7302-X-NI	Work Noise Partner export from Measurement Partner Suite, licence for one instrument
BZ-7350-X-ND	Building Acoustics Partner export from Measurement Partner Suite, licence for any instrument (dongle)
BZ-7350-X-NI	Building Acoustics Partner export from Measurement Partner Suite, licence for one instrument

CALIBRATION

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

TRANSDUCERS

Type 4964	Low-frequency Microphone
Type 8344	Low-level Accelerometer

CABLES

AO-0440-D-015	Signal Cable, LEMO to BNC Male, 1.5 m (5')
AO-0646	Sound Cable, LEMO to Minijack, 1.5 m (5')
AO-0697-D-030	Microphone Extension Cable, 10-pin LEMO, 3 m (10')
AO-0697-D-100	Microphone Extension Cable, 10-pin LEMO, 10 m (33')
AO-0701-D-030	Accelerometer Cable, LEMO to M3, 3 m (10')
AO-0702-D-030	Accelerometer Cable, LEMO to 10 – 32 UNF, 3 m (10')
AO-0722-D-050	Accelerometer cable, LEMO to MIL-C-5015, 5 m (16')
AO-0726-D-030	Signal Cable, LEMO to SMB (for Tacho Probe MM-0360/2981), 3 m (10')
AO-0727-D-010	Signal Cable, LEMO to BNC Female, 1 m (3.3')
AO-0727-D-015	Signal Cable, LEMO to BNC Female, 1.5 m (5')

BUILDING ACOUSTICS AND REVERBERATION TIME ACCESSORIES

HBK 2755-X	Smart Power Amplifier*
HBK 2755-A-X	Smart Power Amplifier (without Wi-Fi®)
Type 4292-L	OmniPower Sound Source
KE-0449	Flight Case for Type 4292-L
KE-0364	Tripod Carrying Case for Type 4292-L
AO-0523-D-100	Cable, from Type 2250/2270 to power amplifier, 10 m (33 ft)
AQ-0673	Cable, from power amplifier to sound source, 10 m (33 ft)

For more information on these accessories, see the following product data:

- HBK 2755 and HBK 2755-A: [BP 2678](#)
- Type 4292-L: [BP 2667](#)

* HBK 2755 Smart Power Amplifier cannot be controlled by Type 2250 nor Type 2270 over Wi-Fi. HBK 2755 must be connected via a cable (AO-0523) to use the integrated signal generator of Type 2250 or Type 2270. HBK 2755 attenuation settings and internal generator can be controlled by almost any Wi-Fi-enabled device with a web browser.

MISCELLANEOUS

Type 3535-A	All-weather Case (see product data BP 2251)
JP-1041	Dual 10-pole Adaptor
KE-0440	Travel Bag
UA-0750	Tripod
UA-0801	Small Tripod
UA-0588	Tripod Adaptor for ½" microphone/ preamplifier assemblies
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-1017	SDHC Memory Card for hand-held analyzers
ZG-0444	Charger for QB-0061 Battery Pack

MM-0256-A	Weather Station Kit
MM-0316-A	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')	
• BR 1779: Weather Station Field Guide	
• DB-4364: Weather Station Pole Adaptor	
• 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	

Service Products

MAINTENANCE

2250-EW1	Extended Warranty, one year extension
2270-EW1	Extended Warranty, one year extension

ACCREDITED CALIBRATION

SLM-ADV-CAF	SLM Advanced, Accredited Calibration incl. microphone
SLM-ADV-CAI	SLM Advanced, Initial Accredited Calibration incl. microphone
VM-CAF	Vibration Meter, Accredited Calibration incl. accelerometer
VM-CAI	Vibration Meter, Initial Accredited Calibration incl. accelerometer