

PRODUCT DATA

FFT Analysis Software BZ-7230 and Tone Assessment Option BZ-7231 for use with Hand-held Analyzers Types 2250 and 2270

Types 2250 and 2270 are the easy, safe and clever approach to machinery noise and vibration assessment, diagnostics and quality control. The analyzers combine high frequency resolution (up to 6400 lines of analysis), tap-and-drag operation and a wide dynamic range to become the perfect on-location machine noise and vibration tool.

Frequency analysis based on the Fast Fourier Transform (FFT) algorithm is the tool of choice for measurement and diagnostics of machinery noise and vibration. The frequency "profile" of a machine is its fingerprint, revealing its sources of noise and vibration and their paths to the measurement position.

FFT Analysis Software and FFT-based Tone Assessment Software enable objective and subjective tone assessments.

Vibration Analyzer Type 2250-H-001 (photo) is focused on vibration measurements and includes the FFT Analysis Software only (no Sound Level Meter Software or microphone). It may be upgraded for other applications..



Uses and Features

Uses

- Single-channel FFT analysis of sound or vibration
- Tone assessment in accordance with ISO 1996-2 (optional)
- Machinery troubleshooting
- Product development
- Quality control and inspection
- Automotive component analysis

Features

- Wide dynamic range
- PC software for analysis, reporting and archiving included
- User-defined Metadata to aid documentation

FFT Spectra

- Up to 6400 lines of analysis
- Spans from 100 Hz to 20 kHz in a traditional 1-2-5 sequence
- Zoom analysis capabilities
- Resolution down to 16 mHz
- Frequency correction for high precision
- Dual overlay spectrum display
- Compare spectrum to reference spectrum
- Auto peak finding
- Max. hold spectrum
- A-weighting in pre- or post-processing

Measurements

- Transducer database
- CCLD input for accelerometers
- Real-time operation (no data loss)
- For transient and continuous signals
- Linear and exponential averaging
- Internal and external trigger
- Tachometer function
- Measurements in SI (metric) and UK/US units
- Unit scaling (RMS, Pwr, PSD, ESD, Peak, P-P)

Quality Control

- Tolerance windows with check against preset limits
- Quality Check template for quick and clear results
- TTL output for control of external devices

Signal Recording (optional)

- Record input signal for later playback or analysis
- Export signal recording to PULSE for analysis

Tone Assessment (optional)

- Tone assessment on hand-held analyzer
- Measurement quality indicators on tone assessment
- Tone generator output

The Type 2250 and 2270 Hand-held Analyzer Family

Fig. 1

Left: Type 2270

Right: Type 2250



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Fig. 2

Vibration Analyzer
2250-H-001,
accessories and
shoulder bag



100060

Type 2250 and 2270 hand-held analyzers are both innovative, 4th generation analyzers from Brüel & Kjær with an award winning design based on extensive research amongst sound and vibration technicians, engineers and consultants from all around the world.

Type 2270, with its dual-channel measurement capability (when installed with an appropriate dual-channel license), and the single-channel Type 2250, can host many of the same measurement application modules (for further details see the ordering information at the end of this Product Data).

Two such modules are FFT analysis Software BZ-7230 and Tone Assessment Option BZ-7231. The measurement procedure and functionality is the same regardless of the host analyzer and will therefore be described collectively.

Vibration Analyzer Type 2250-H-001 is focused on vibration measurements and includes the FFT Analysis Software only (no Sound Level Meter Software or microphone). The Vibration Analyzer comes with the Shoulder Bag KE-0459, which has dedicated space for both the analyzer and the basic vibration analysis accessories.

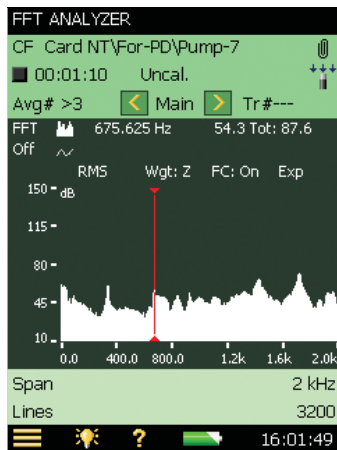
FFT Analysis Software BZ-7230

FFT Analysis Software BZ-7230 is an application installed on the Type 2250/2270 hand-held measurement platform (please refer to page 8 for an overview of Type 2250/2270 hardware and resident software).

The Fast Fourier Transform is a digital signal processing technique that converts a time record into a narrow-band constant bandwidth filtered spectrum. The measurement is defined by specifying a frequency span and a number of lines (or filters). A zoom facility allows you to focus on any part of the frequency range by specifying the centre frequency for the analysis span. BZ-7230 allows resolutions down to 1/64 Hz, when you use a 100 Hz frequency span and 6400 lines of analysis.

Fig. 3

Spectrum view
showing high dynamic
range and high
frequency resolution



FFT sound and vibration analysis is all about the details; the beauty of this hand-held analyzer is its details: secure in your hand, solid in construction and pleasantly intuitive. The analyzer's high-resolution touch-screen colour display brings enhanced usability to FFT analyzers, enabling easy cursor and display parameter transition. As many as 6400 lines of FFT are represented on the screen – and simply tapping and dragging the stylus across the screen selects a frequency range to the individual details of your measurement.

FFT spectrum analysis (Fig.3) is ideal for noise or vibration source identification with 6400 lines of real-time frequency analysis at better than 5 Hz resolution—all the way to 20 kHz. Tapping the screen turns on the Frequency Correction algorithm, which computes peak frequencies with ten times better resolution. The wide dynamic range (over 150 dB) allows accurate sound and vibration measurement on the first attempt.

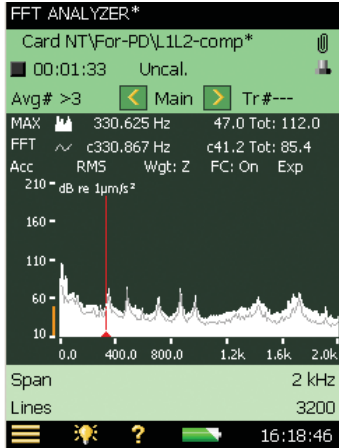
With this kind of frequency and dynamic range, setup is easy. Connect and position your transducer, press the Start/Pause pushbutton and view your spectrum. If you want to zoom in, drag the stylus across the desired frequency span, tap *Zoom* and you can now measure using the correct range – *Easy, Safe, Clever*.

Troubleshooting

FFT Analysis Software BZ-7230 includes the analysis tools and measurement units for a wide range of troubleshooting applications.

Measuring an engine mount's movement at idle RPM as displacement is easy. Attach an accelerometer and set up the tachometer trigger input and the running speed will be displayed.

Fig. 4
View showing the overlay of resonance on operation frequencies



Spot checking the output of a random vibration shaker is also easy. Use the stylus to set the delta cursor for the desired frequency span and read out the Power Spectral Density (PSD), then select g^2/Hz or $(m/s^2)^2/Hz$ as your reference units.

Finding a component's resonant frequencies is easy, too. Switch the analyzer's FFT from continuous to transient signals and tap the component to excite its resonances. The internal trigger starts the measurement, and the FFT software will use a rectangular time window to capture the entire transient. Save the resonance spectrum as a reference then measure a machine's vibration spectrum to see if any resonance lines up with the operational frequencies (Fig. 4).

Quality Testing and Inspection – Tolerance Windows

Quality control involves examining and monitoring parts, assemblies and sub-assemblies in order to check adherence to standardised tolerances. Rotating or reciprocating elements (such as pistons, shafts and gears) in

many machines, tools and vehicles lead to vibrations and noise. Measuring and analysing that noise and vibration can be used to detect assembly faults and ensure compliance with required standards.

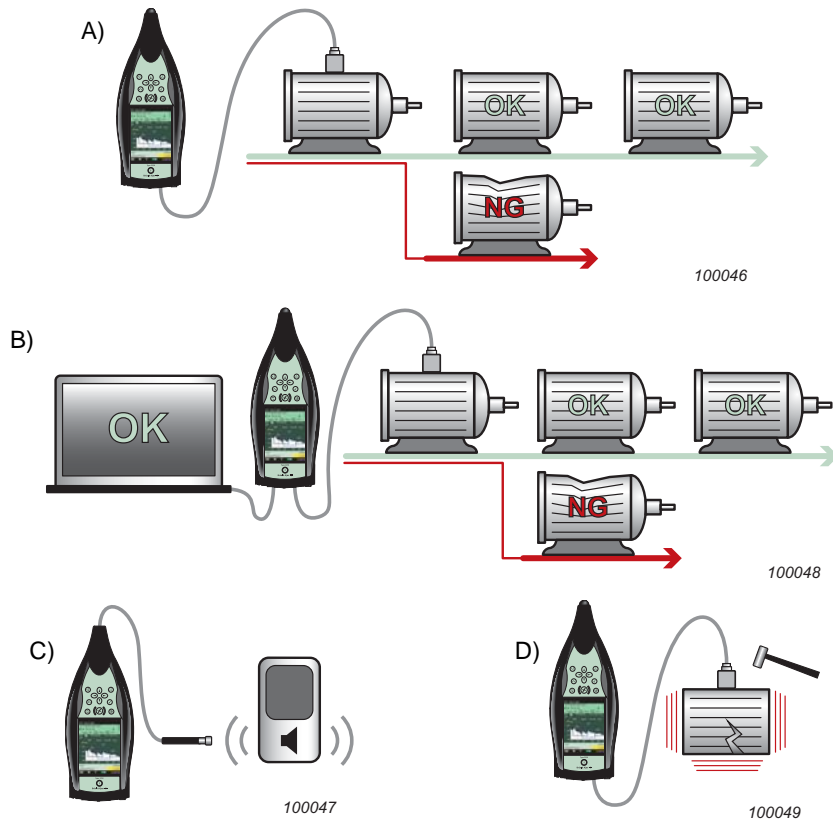
Fig. 5
New products have characteristic sound and vibration spectra; deviations indicate problems

A) Spot checks: Perform quick quality checks anywhere

B) Dedicated QC: Type 2250 can be linked to a PC using software based on the command library supplied

C) Audio quality: Type 2250 can measure audio spectra and then compare the sound level and harmonics to set limits

D) Material inspection: Using a test hammer, Type 2250 measures the telltale resonance pattern and compares it to acceptance limits



The Tolerance Windows feature in BZ-7230 makes quality control measurements easy.

The designers of the machine, tool or vehicle specify limits for permissible deviations. These specifications are set up on Type 2250/2270 using one or several tolerance windows, each of which defines an upper and lower limit for the levels over a specific frequency range.

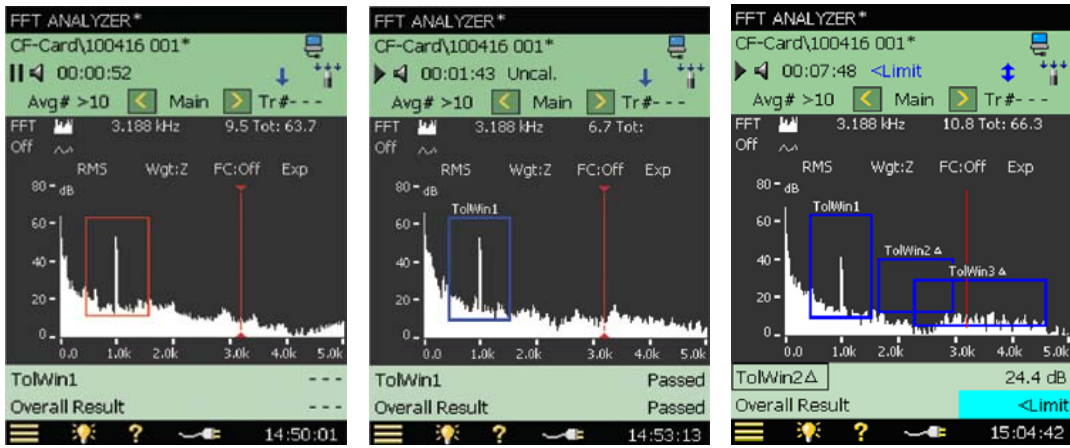
The value checked can be set to the level of the FFT lines or to the sum of FFT lines (Delta Sum).

Fig. 6

Left:
Drawing the tolerance window by dragging the stylus

Centre:
Resultant tolerance window (set to check FFT lines)

Right:
Additional tolerance windows (set to Delta Sum) – up to 10 windows can be active and they may overlap

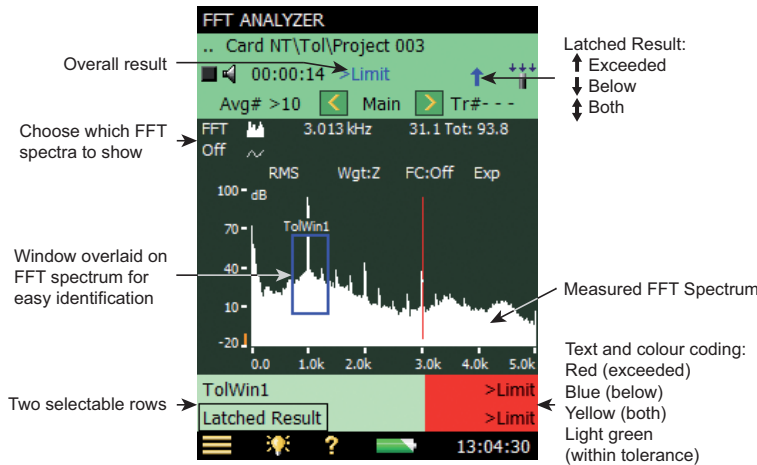


Settings and preferences for a particular application can be saved collectively in templates. By recalling a template, Type 2250/2270 is ready for specific measurements in just seconds, including the specification of tolerances. Up to 10 tolerance windows per template can be active at the same time, making it possible to test different tolerances for different frequency ranges in one measurement. In addition, it is possible to test for two limit ranges over the same frequency range, which is as easy as overlapping tolerance windows. In addition you can define tolerances for four non-FFT values; for example, two instantaneous parameters (LAF and Instantaneous RPM) and two average parameters (LAeq and Average RPM).

During measurement, the FFT spectrum and single values are compared to set limits (indicating 'above upper limit', 'within limits', 'below lower limit', 'above and below limits'). The test is performed and indicated for each window. An overall result is also indicated. It will indicate 'failed' if the spectrum or single parameters crossed the upper or lower tolerances for any window or 'passed' if within the tolerances for all windows.

Fig. 7

BZ-7230 provides comprehensive indication of the test result



The pass/fail indication is also available as an electrical signal at Type 2250/2270's output socket. A 3.3V DC output indicates an exceeded upper limit, a -3.3V DC indicates levels below the lower limit, and an alternating $\pm 3.3V$ indicates violation of both limits. This feature makes it easy to utilise Type 2250/2270 in production control systems where the output signal can trigger warnings or start specific actions for the failed item. Being able to listen to the signal makes it easier to identify the problem source. You can

therefore configure the analyzer to start recording automatically when data exceed tolerances (license for BZ-7226 required). The input signal, which will be attached to the specific project, can be played back or exported to a PC for further analysis. For more information see Signal Recording Option BZ-7226 on page 6.

The FFT Analyzer application comes with two additional templates.

Fig. 8

FFT Analyzer Advanced provides two additional tabs with detailed test result information

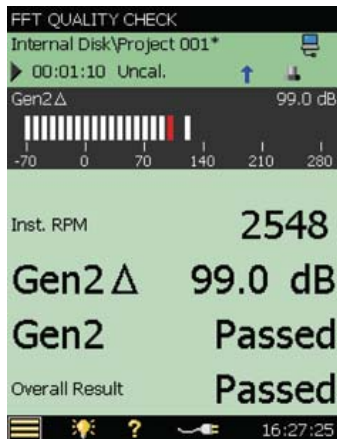


FFT Analyzer Advanced Template

The Results tab offers a view with 11 selectable results, which can be configured by tapping on any parameter label.

The XL View tab provides a bar graph and three selectable results. The bar graph shows the FFT spectrum total, a user-selectable delta sum or a single-value parameter. The bar graph also incorporates a quick view of the maximum value (white line) and upper limit (red line) into its display.

Fig. 9
The Quality Check template provides specific customisable information for well-established tasks



FFT Quality Check Template

The Quality Check template provides a bar graph and four selectable results in an easily readable large font. The bar graph shows the FFT spectrum total, a user-selectable delta sum or a single-value parameter. The bar graph also incorporates a quick view of the maximum value (white line) and upper limit (red line) into its display.

This template is particularly useful when tolerance windows are well established and FFT spectra are not needed for viewing, which is often the case with quality inspection tasks.

Fig. 10
Using Type 2250 with Laser Tacho Probe (MM-0360) in product vibration testing



Product noise and vibration is a common concern for development engineers, and the FFT analyzer is the primary choice for noise and vibration testing. FFT Analysis Software BZ-7230 builds on that already well-respected tool to make it one of the easiest to use as well.

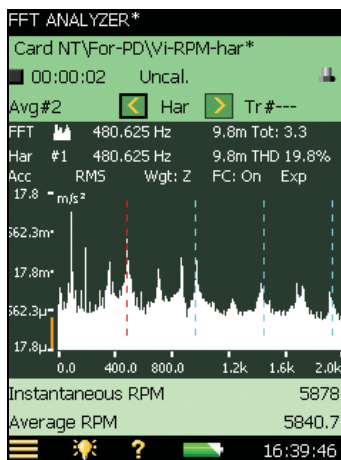
Benchmark competitive and previous generation products. Use narrow-band analysis to identify forcing functions and resonances to aid in setting the standards for the next generation product.

Early component performance evaluation can greatly improve product design. The analyzer's dual overlay display makes it easy to compare measurements between design iterations.

Personal computer Utility Software BZ-5503 makes it easy to transfer measurement data to a PC where data viewing, exporting and archiving complete the analysis and reporting project.

Machinery Analysis and Troubleshooting

Fig. 11
View showing an RPM readout, with harmonic cursors and vibration measurement units



The portability of the analyzer platform gives you easy access to any product, lets you recall a baseline reference spectrum, and then compare it instantly with a spectrum you've just measured.

Set the tolerance window feature over a range of frequencies to warn of machinery failure. Harmonic and delta cursors help you identify rotational and mesh frequencies, steering you efficiently toward operational deficiencies.

The analyzer's trigger input can even accept a tachometer input – providing a direct readout of RPM (see Fig. 11) with the gear ratio you define. The unique commentary feature of the analyzer lets you verbally record your field observations and attach them directly to the measurement result. The analyzer's multi-user facility allows you to define user-specific configurations and measurement points, so you can organise your field measurements, and the BZ-5503 utility program makes it easy to review the results on your PC.

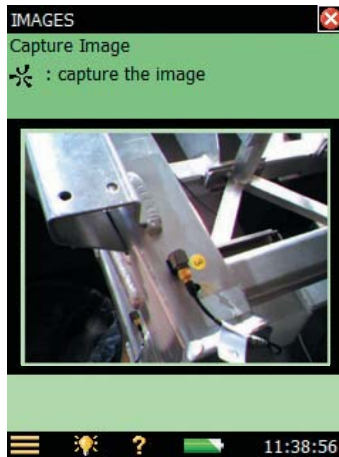
Building Vibration and Noise Measurements

Type 2250/2270 is already a comprehensive tool for the consultant or engineer. FFT Analysis Software BZ-7230 adds vibration and sound measurement technology that traditional 1/3-octave analysis cannot provide. Low frequencies can be analysed down to 7 Hz (at -1 dB) using the standard Microphone Type 4189, down to 0.6 Hz (at -1 dB) using optional Microphone Type 4193, and down to 1.3 Hz (at -10%) using one of the recommended accelerometers. Now, with suitable transducers, the rumble and rattle of HVAC installations or the contribution of nearby rail or road traffic can easily be measured.

Annotations – Filling in the Blanks

Fig. 12

Use the built-in camera in Type 2270 to photograph the test device



Whatever your application – product development, troubleshooting, quality check or tone assessment – there is more to your measurements than just the bare numbers of your results. With annotations it is easy to attach comments, notes and images to measurement results by:

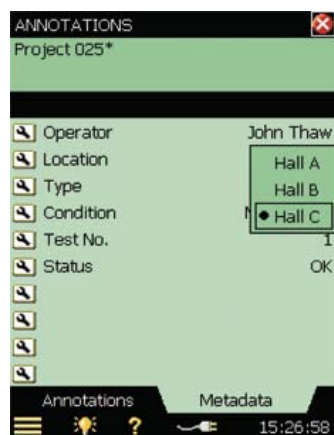
- Tapping in notes using the on-screen QWERTY keyboard
- Pressing the Commentary pushbutton to record using the built-in commentary microphone
- Press the Manual Event pushbutton and take a photo of the test device or measurement configuration (Type 2270 only)

All annotations are automatically saved with the project and can be reviewed at any time.

Metadata

Fig. 13

The Annotations page showing six user-defined metadata items and a picklist for the Location entry



Metadata are supplementary information entries about your measurement that make archiving, retrieving and post-processing data easier and more efficient. Examples of metadata are file name, date and time, setup and annotations made by the operator.

In addition you can define the names and types of up to 10 text strings. The entry format may be editable text, a user-defined picklist, numeric or an index number that automatically increments when a measurement is saved.

Metadata functionality is available in all 2250/2270 applications and can be used for sorting measurements in the BZ-5503 utility software.

Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 enables input signal recording for later playback or analysis. The recording can be automatic (lasting for the duration of the measurement), controlled manually, or last as long as the limit level is exceeded. Pre- and post-recording delays and duration limits may be set. The recording upper frequency limit can be reduced from the full 20 kHz in four steps to save memory. Signal recording files can be quite large, so you will be directed to store your measurements (and recording) on a memory card in either of the hand-held analyzer's integrated SD or CF memory card slots. Type 2250/2270 hand-held analyzers support SDHC cards, which provide memory capacity of up to 32 GB. The recorded standard format .WAV files are easily input into other analysis tools, for example the Brüel & Kjær PULSE Analyzer Platform. For more information on PULSE, please contact your local Brüel & Kjær representative or visit www.bksv.com.

Tone Assessment Option BZ-7231

Fig. 14

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 compound and help explain subjective reactions.

Automatically Configured for ISO 1996 Assessments

Tone Assessment Option BZ-7231 for Hand-held Analyzers Type 2270 and 2250 running FFT Analysis Software BZ-7230, offers a quick and easy 'in-the-field' objective assessment of tonal noise components, in compliance with ISO 1996 assessments. The facility to carry out the ISO Standard tone assessment on the analyzer with an immediate result 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 FFT analysis to follow the ISO 1996-2 standard. When this option is selected, the analyzer automatically selects the appropriate measurement configuration. Simply press 'start' and the measurement and analysis are in progress.

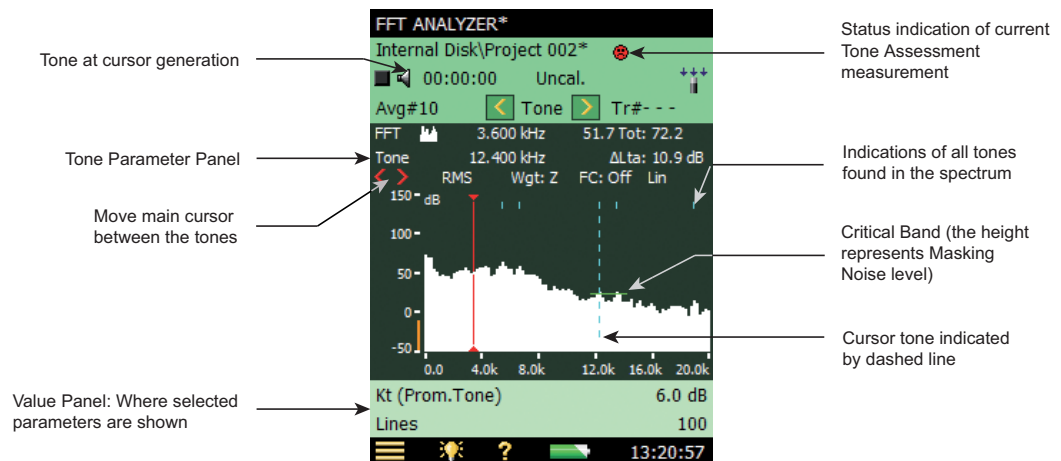
All the Details Available Instantly

On completion of the 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:

- Kt – the value added to the LAeq to give the tone-corrected rating level
- ΔLta – the audibility of all tones found in the same critical band as the selected tone
- Lpn – the Total level of the masking noise in the band containing the selected tone
- Lpti – the Level of the selected tone
- Lpt – 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 LAeq and other broadband parameters are measured simultaneously by the hand-held analyzer and the tone corrected rating level can be calculated on the spot.

Fig. 15
Typical FFT spectrum display for the Tone Assessment option, showing the various fields and parameters



Utility Software for Hand-held Analyzers BZ-5503

Once you've taken your measurements, you'll need to do something with them. Your hand-held analyzer offers three storage options: internal disk, or external Compact Flash (CF) and Secure Device (SD) format memory cards. From there, the included USB cable (or LAN cable on Type 2270) makes data transfer to an archive on your PC, or network location, easy. Alternatively, if you have used an external memory card, just insert it into the computer's card reader.

Fig. 16
A typical BZ-5503 display with photograph of measurement environment



Utility program BZ-5503 is an all-purpose program forming the information link to (and from) your analyzer, see Fig.16. Its primary functions are to manage and archive user data, handle updates, upgrades and licensing of application software; and to control the analyzer's data from a PC.

Archiving and Managing Data

- Transfer data and setups from your analyzer to archives on a PC or PC network disk drive
- Transfer data between SD and CF Cards and the archives
- If your analyzer has been set up for multi-users, it will automatically organise archives, data and setups on a per-user basis
- Search archives for data containing measurement and project parameters. For example, you can search for data that contain values of Total L_{Aeq} above 65 dBA
- Use the extensive preview functions to listen to recordings and annotations, view results and photographs including spectra and profiles
- Export data from archives into Type 7815, 7820 or 7825 for post-processing and reporting software applications
- Export data to Microsoft® Excel®, or export in XML or delimited text format

Application Upgrades and Licensing

- Update existing analyzer applications with improvements and added capability
- Install upgrades and additional application licenses when purchased, including time-limited trial licenses
- Maintain an analyzer application software pack legacy

Control your Analyzer from a PC

- Create users on your analyzer
- Manage analyzer data (copy, delete, rename)
- Create, edit and transfer setups to your analyzer
- Control the analyzer remotely from a PC connected via USB, LAN (Type 2270 only) or WLAN via CF WLAN Card UL-1019. This is also useful for instructional purposes, using projectors or large screen monitors

Type 2250/2270 Hardware and Resident Software

Introduction

Your hand-held analyzer has generous hardware and software specifications creating an extremely flexible instrument to cover your current and future measurement and analysis needs, ranging, for example, from the traditional uses in assessing environmental and workplace noise to industrial quality control and development. The hand-held analyzer is a technological platform for realising measurement applications in a compact and robust hand-held instrument.

This Product Data describes FFT Analysis Software BZ-7230 and FFT-based Tone Assessment Software BZ-7231, one of a suite of software applications available your hand-held analyzer. All instruments (with the exception of the 2250 Vibration Analyzer) come with the Sound Level Meter Software BZ-7222 enabled. This makes the analyzer into a modern Class 1 Sound Level Meter (SLM). It fulfils the requirements of the latest standard, IEC 61672–1, as well as earlier standards. Even in its most basic configuration, the analyzer is delivered with a number of predefined measurement and display setups tailored to suit specific requirements.

Optional Software Modules

As a platform, the analyzer allows you to choose different combinations of software modules (applications). Additional applications can be purchased when needed and are delivered as easily installed licenses, and the software can be used in any combination. In this way your investment in the analyzer platform is securely protected: when your need for measurements and analyses expands, the analyzer can accommodate them. Brüel & Kjær is committed to maintaining an ever-growing range of applications on this platform.

The optional software modules available are:

- **Frequency Analysis Software BZ-7223**, providing real-time analysis of the 1/1- and 1/3-octave filter bands over a wide frequency range
- **Logging Software BZ-7224**, which allows free selection of parameters to log at periods from 1 s to 24 h. Running together with the Sound Level Meter Software, all broadband parameters can be logged. If Frequency Analysis Software is also enabled, spectra can be logged at the same rates
- **Enhanced Logging Software BZ-7225**, providing continuous monitoring and logging of periodic reports in addition to the features of Logging Software. Parameters like L_{dn} and L_{den} are calculated
- **Signal Recording Option BZ-7226**, which provides you with a uniquely versatile facility for attaching samples of the measured signal to your measurements. This option works with all software modules
- **Reverberation Time Software BZ-7227**, allows you to perform reverberation time measurements, which are used in assessing acoustics in the workplace, auditoria, halls, public spaces, etc. It can also be used to calculate room corrections for building acoustics and sound power, as well as absorption coefficients
- **Building Acoustics Software BZ-7228/7229 and Type 8780**, transform your hand-held analyzer into a measurement system for the assessment of sound insulation of partitions in a building such as walls and ceilings

For further information see the separate Product Data:

- Hand-held Analyzer Type 2270 with Sound Level Meter Software BZ-7222, Optional Frequency Analysis Software BZ-7223, Logging Software BZ-7224, Enhanced Logging Software BZ-7225, Signal Recording Option BZ-7226 (<http://www.bksv.com/doc/bp2199.pdf>)
- 2250 Reverberation Time Software BZ-7227 for Hand-held Analyzer Type 2250-F and Post-processing Software: Qualifier Light Type 7831 (<http://www.bksv.com/doc/bp2152.pdf>)
- Building Acoustics Software BZ-7228 and Dual-channel Building Acoustics Software BZ-7229 for Hand-held Analyzers Types 2250 and 2270, and PULSE Reflex™ Building Acoustics Type 8780 (<http://www.bksv.com/doc/bp2190.pdf>)

Recommended Application Software – For Use on PC

For comprehensive data management and post-process reporting, consider using Type 2250/2270 data together with one of following PC-software packages:

- Type 7815 Noise Explorer – Data Viewing software
- Type 7820 Evaluator – Environmental Noise software
- Type 7825 Protector – Noise at Work software
- Type 8780 – PULSE Reflex Building Acoustics software


Noise Explorer, Evaluator, PULSE Reflex and Protector all support a wide range of user-definable graphic and tabular displays. Graphs and tables can be imported into standard Windows® applications such as word processors and spreadsheets. Evaluator Type 7820 has built-in calculation algorithms that allow you to produce compound sound level figures from several contributions. Some may have impulse or pure tone penalties, depending on which measurement standard you choose, for example, ISO 1996, DIN 45 645, TA Lärm, NFS 31-010, or BS 4142. (See Product Data BP-1752 at: <http://www.bksv.com/doc/bp1752.pdf>.) Protector Type 7825 calculates noise exposure according to ISO 9612–2. For situations where only workpoint noise measurements are available, Protector can combine these measurements with a profile of a person’s movements, simulating their personal noise exposure. (See Product Data BP-1717 at: <http://www.bksv.com/doc/bp1717.pdf>.)

Accredited Calibration and Hardware Maintenance at Brüel & Kjær

For Types 2250 and 2270, you can order accredited calibration and choose between DANAK, A2LA, UKAS, Eichamt (Austria), RvA, ENAC, NATA and Inmetro. We recommend you order accredited calibration together with the new instrument.

Should the technician detect the need for repair during calibration, this can be performed while it is in our hands so you don’t have to be without your instrument. You can minimise the risk of unexpected costs by purchasing a hardware maintenance contract with 5 years warranty.

Compliance with Standards

	<p>CE-mark indicates compliance with the EMC Directive and Low Voltage Directive. C-Tick mark indicates compliance with the EMC requirements of Australia and New Zealand.</p>
<p>Safety</p>	<p>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.</p>
<p>EMC Emission</p>	<p>EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments. CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits. FCC Rules, Part 15: Complies with the limits for a Class B digital device. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards. Complies with Canadian standard ICES–001</p>
<p>EMC Immunity</p>	<p>EN/IEC 61000–6–2: Generic standards – Immunity for industrial environments. EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements. IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards.</p>

Specifications – Type 2250 and 2270 Platforms

These specifications refer to both Type 2250 and Type 2270 unless otherwise stated.

DUAL-CHANNEL MEASUREMENTS (TYPE 2270)

Two independent measurement channels are available on Type 2270 to enable you to measure various acoustic parameters, subject to having a dual-channel application license

REFERENCE ENVIRONMENTAL CONDITIONS

Air Temperature: 23°C

Static Pressure: 101.325 kPa

Relative Humidity: 50%

SUPPLIED MICROPHONE

Type 4189: ½" Prepolarized Free-field Condenser Microphone

Nominal Open-circuit Sensitivity: 50 mV/Pa (corresponding to –26 dB re 1 V/Pa) ± 1.5 dB

Capacitance: 14 pF (at 250 Hz)

MICROPHONE PREAMPLIFIER ZC-0032

Nominal Preamp Attenuation: 0.25 dB

Connector: 10-pin LEMO

Extension Cables: Up to 100 m between the microphone preamplifier and the hand-held analyzer, without degradation of the specifications

Note: EMC is only tested with a 10 m cable (AO-0441-D-100)

Accessory Detection: Windscreen UA-1650 can be automatically detected when fitted over ZC-0032

MICROPHONE POLARIZATION VOLTAGE

Selectable between 0 V and 200 V

TRANSDUCER DATABASE

Transducers are described in a transducer database with information on Serial Number, Preamplifier ID No., Nominal Sensitivity, and CCLD required

For microphones, Polarization Voltage, Free-field Type and Capacitance are also included

For accelerometers, Weight is also included.

The analogue hardware is set up automatically in accordance with the selected transducer

CORRECTION FILTERS

For Microphone Types 4189, 4190, 4191, 4193, 4950 and 4952, BZ-7230 is able to correct the frequency response to compensate for sound field and accessories:

Sound Field: Free-field or Diffuse-field (for Type 4952 only: 0° (Top) reference direction and 90° (Side) reference direction)

Accessories (Type 4189 only): None, Windscreen UA-1650 or Outdoor Microphone Kit UA-1404

Accessories (Types 4191 and 4193 only): None or Windscreen UA-1650

Accessories (Type 4950 only): None or Windscreen UA-0237

CALIBRATION

For Accelerometer Types 4397-A, 4513, 4513-001, 4513-002, 4514, 4514-001, 4514-002, 8341, 8324 and 6233C-10, the lower frequency limit will be optimised to match the specifications for the accelerometer. Initial calibrations for each transducer are 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

Mechanical: Using Calibrator Exciter Type 4294 or custom calibrator

Direct Electrical: Using an external voltage reference

Electrical: Uses internally generated electrical signal combined with a typed-in value of the sensitivity

Calibration History: Up to 20 of the last calibrations made are listed and can be viewed on the instrument

KEYBOARD

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

ON-OFF BUTTON

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

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

DISPLAY

Type: Transflective back-lit colour touch screen

240 × 320 dot matrix

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

Backlight: Adjustable level and on-time

USER INTERFACE

Measurement Control: Using pushbuttons on keyboard

Setup and Display of Results: Using stylus on touch screen or pushbuttons on keyboard

Lock: Keyboard and touch screen can be locked and unlocked

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 0 dB

TEXT ANNOTATIONS

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

IMAGE ANNOTATIONS (TYPE 2270 ONLY)

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

DATA MANAGEMENT

Metadata: Up to 10 Metadata annotations can be set per project (text from keyboard or text from picklist, number from keyboard or auto generated number)

Project Template: Defines the display and measurement setups. Setups can be locked

Project: Measurement data stored with the Project Template

Job: Projects are organised in Jobs

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

USB INTERFACE

USB 1.1 OTG Mini B socket

MODEM INTERFACE

Hayes compatible GSM or standard analogue modems connected through the Compact Flash slot

COMPACT FLASH SOCKET

For connecting to the Internet through GPRS/EDGE/HSPA modem connected through the Compact Flash slot

Supports DynDNS for automatic update of IP address of hostname

For connecting CF memory card, CF modem, CF LAN Interface or CF WLAN Interface

LAN INTERFACE SOCKET (TYPE 2270 ONLY)

Connector: RJ45

Speed: 10 Mbit/s

Protocol: TCP/IP

REAR INPUT SOCKET (TYPE 2270 HAS TWO)

Connector: Triaxial LEMO used for Direct input as well as input with Constant-Current Line Drive (CCLD) power supply

Input Impedance: ≥ 1 MΩ

Direct Input: Max. input voltage: ± 14.14 V_{Peak}, 10 V_{RMS} for sinusoidal input signals, no damage for signals up to ± 20 V_{Peak}. Source Impedance ≤ 1 kΩ

CCLD Input: Max. input voltage: $\pm 7.07 V_{Peak}$ (no indication for violation of this level), no damage for signals in the range -10 to $+25 V_{Peak}$

CCLD Current/Voltage: 4 mA/25 V

CCLD Cable Break/Short Indication: Checked before and after measurements

TRIGGER SOCKET

Connector: Triaxial LEMO

Max. Input Voltage: $\pm 20 V_{Peak}$, no damage for signals up to $\pm 50 V_{Peak}$

Input Impedance: $> 47 k\Omega$

CCLD Current/Voltage: 4 mA / 25 V

OUTPUT SOCKET

Connector: Triaxial LEMO

Max. Peak Output Level: $\pm 4.46 V$

Output Impedance: 50 Ω

Load Impedance: $> 15 k\Omega$ || $< 1 nF$ for < 0.2 dB attenuation from DC to 20 kHz, short-circuit proof without affecting the measurement results

Max DC Offset: $\pm 15 mV$

Source: Input conditioned (gain adjustment -60 dB to 60 dB)

HEADPHONE SOCKET

Connector: 3.5 mm MiniJack stereo socket

Max. Peak Output Level: $\pm 1.4 V$ (no load)

Output Impedance: 32 Ω in each channel, short-circuit proof without affecting the measurement results

Sources: Input conditioned (gain adjustment -60 dB to 60 dB), playback of voice annotations (gain adjustment -60 dB to 0 dB) and playback of recordings (gain adjustment -60 dB to 0 dB)

MICROPHONE FOR COMMENTARY

Microphone, which utilises Automatic Gain Control (AGC), is incorporated in underside of instrument. 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 instrument.

Used to create image annotations for attaching to measurements

Image Size: 640 \times 480 pixels

Viewfinder Size: 212 \times 160 pixels

Format: jpg with exif information

EXTERNAL DC POWER SUPPLY REQUIREMENTS

Used to charge the battery pack in the instrument

Voltage: 8–24 V DC, ripple voltage $< 20 mV$

Current Requirement: min. 1.5 A

Power Consumption: $< 2.5 W$, without battery charging, $< 10 W$ when charging

Cable Connector: LEMO Type FFA.00, positive at centre pin

EXTERNAL AC MAIN SUPPLY ADAPTOR

Part No.: ZG-0426

Supply Voltage: 100 – 120/200 – 240 VAC; 47 – 63 Hz

Connector: 2-pin IEC 320

BATTERY PACK

Part No.: QB-0061 Rechargeable Li-Ion battery

Voltage: 3.7 V

Capacity: 4800 mAh nominal

Typical Operating Time: > 8 hours

Battery Cycle Life: > 500 complete charge/discharge cycles

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 instrument, typically 10 hours from empty at ambient temperatures below 30 °C. To protect the battery, charging will be terminated completely at ambient temperatures above 50 °C. At 30 to 50 °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 or over 50 °C (32 °F to 122 °F). Doing this will reduce battery lifetime

STORAGE SYSTEM

Internal Flash-RAM (non-volatile): 20 MB for user setups and measurement data

External Secure Digital Memory Card (SD-/SDHC-card): For store/recall of measurement data

External Compact Flash Memory Card (CF-card): For store/recall of measurement data

REAL-TIME CLOCK

Back-up battery powered clock. Drift $< 0.45 s$ per 24 hour period

WARM-UP TIME

After reaching equilibrium with the ambient environment and switching on power

From Power Off: < 2 minutes

From Standby: < 10 seconds for prepolarized microphones

TEMPERATURE

IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat.

Operating Temperature: -10 to $+50$ °C (14 to 122 °F), < 0.1 dB

Storage Temperature: -25 to $+70$ °C (-13 to $+158$ °F)

HUMIDITY

IEC 60068–2–78: Damp Heat: 90% RH (non-condensing at 40 °C (104 °F)).

Effect of Humidity: < 0.1 dB for 0% $< RH < 90%$ (at 40 °C (104 °F) and 1 kHz)

MECHANICAL

Environmental Protection: IP44

Non-operating:

IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s², 10–500 Hz

IEC 60068–2–27: Shock: 1000 m/s²

IEC 60068–2–29: Bump: 4000 bumps at 400 m/s²

WEIGHT AND DIMENSIONS

650 g (23 oz.) including rechargeable battery

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

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, Croatian, Czech, Danish, English, Flemish, French, German, Hungarian, Japanese, Italian, Polish, Portuguese, Romanian, Serbian, Slovenian, Spanish, Swedish and Turkish

HELP

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

SOFTWARE UPDATES

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

WEB PAGE

Connect to the instrument using an Internet Browser supporting Java script. The connection is password protected

Two levels of protection:

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

NOTIFICATIONS

Sends an SMS or e-mail 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 instrument

Software Specifications – FFT Analysis Software BZ-7230

Specifications for FFT analysis are given for the hand-held analyzer with software BZ-7230 installed and fitted with one of the recommended transducers (see Table 1)

FFT ANALYSIS

Sampling Frequency: Downsampling from 51.2 kHz

Frequency Span: 100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz, 10 kHz, 20 kHz

Lines: 100, 200, 400, 800, 1600, 3200, 6400*

Zoom Centre Frequency: Can be set so that the Frequency Span is placed in the range 0 to 20 kHz

Spectrum: Averaged and Maximum

Pre-weighting: Z (none), A, B or C

MEASUREMENT CONTROL

Manual Start

Measurements can be manually started and stopped using a pushbutton or an external signal

Exponential Averaging: With an averaging time equivalent to 999 spectra, measured with Hanning window and 67% overlap

Linear Averaging: Up to 8388607 spectra measured with Hanning window and 67% overlap

Triggered Start

Transient Signal Type: Linear averaging of up to 32767 triggered spectra measured with rectangular window and 0% overlap

Continuous Signal Type: Linear averaging of up to 32767 spectra measured with Hanning window and 67% overlap. Up to 32767 spectra are averaged on each trigger

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

TRIGGERS

Delay: From 16383 samples before the trigger time to 300 s after

Hold Off: 0 to 300 s

Internal Trigger: Uses the time signal from the measurement transducer. The internal level is set in the relevant measurement units

External Trigger: Uses the trigger input. The external level is set in the range -20 to 20 V

Hysteresis (Only for External Trigger): 0 to 10 V

Slope (Only for External Trigger): Rising, Falling

Pull-up (Only for External Trigger): For Type 2270 and Type 2250 serial numbers between 2479653 and 2630265, the Trigger Input is

* The actual number of lines is one more than stated, to provide symmetry around the centre frequency.

Table 1 Measurement ranges with the recommended transducers

Transducer	Nominal Sensitivity	Spurious Free Dynamic Range for High Levels	Spurious Free Dynamic Range for Low Levels	Typical Frequency Response Extended Low Frequency On/Off
Direct Input	1 V/V	3 μ V – 14.1 V _{Peak}	300 nV – 75 mV _{Peak}	1.5/6.3 Hz – 20 kHz
4189	50 mV/Pa	10 dB – 143 dB _{Peak}	-10 dB – 97.5 dB _{Peak}	6.8/7.8 Hz – 20 kHz
4190	50 mV/Pa	10 dB – 143 dB _{Peak}	-10 dB – 97.5 dB _{Peak}	4.0/6.7 Hz – 20 kHz
4191	12.5 mV/Pa	22 dB – 155 dB _{Peak}	2 dB – 109.5 dB _{Peak}	3.6/6.6 Hz – 20 kHz
4193	12.5 mV/Pa	22 dB – 155 dB _{Peak}	2 dB – 109.5 dB _{Peak}	0.56/6.3 Hz – 20 kHz
4950	50 mV/Pa	10 dB – 143 dB _{Peak}	-10 dB – 97.5 dB _{Peak}	4.3/6.3 Hz – 19 kHz
4952	31.6 mV/Pa	14 dB – 146 dB _{Peak}	-6 dB – 101.5 dB _{Peak}	4.3/6.3 Hz – 14 kHz
4397-A	1 mV/ms ⁻²	3 mms ⁻² – 7.1 kms ⁻² _{Peak}	300 μ ms ⁻² – 75 ms ⁻² _{Peak}	1.25/6.3 Hz – 20 kHz
4513/4514	1 mV/ms ⁻²	3 mms ⁻² – 7.1 kms ⁻² _{Peak}	300 μ ms ⁻² – 75 ms ⁻² _{Peak}	1.25/6.3 Hz – 10 kHz
4513-001/4514-001	10 mV/ms ⁻²	300 μ ms ⁻² – 710 ms ⁻² _{Peak}	30 μ ms ⁻² – 7.5 ms ⁻² _{Peak}	1.25/6.3 Hz – 10 kHz
4513-002/4514-002	50 mV/ms ⁻²	60 μ ms ⁻² – 141 ms ⁻² _{Peak}	6 μ ms ⁻² – 1.5 ms ⁻² _{Peak}	1.25/6.3 Hz – 10 kHz
6233-C-10+2647-D	1 mV/ms ⁻²	3 mms ⁻² – 7.1 kms ⁻² _{Peak}	300 μ ms ⁻² – 75 ms ⁻² _{Peak}	1.25/6.3 Hz – 8 kHz
8324+2647-D	1 mV/ms ⁻²	3 mms ⁻² – 7.1 kms ⁻² _{Peak}	300 μ ms ⁻² – 75 ms ⁻² _{Peak}	1.25/6.3 Hz – 10 kHz
8341	10 mV/ms ⁻²	300 μ ms ⁻² – 710 ms ⁻² _{Peak}	30 μ ms ⁻² – 7.5 ms ⁻² _{Peak}	0.7/6.3 Hz – 10 kHz

pulled up to +5 V through a 7.5 k Ω resistor when this parameter field is set to *On*. For instruments with serial number 2630266 and above the Pull-up has been changed to a CCLD power supply

MEASUREMENT RANGE

(See Table 1)

The lower limit of the measurement range is influenced by self-generated random noise and self-generated tones called spurious signals. The influence of the random part can be reduced to a level below the spurious signals by selecting a small analysis bandwidth (small span and many lines). Therefore, the lower limit is specified as the maximum Peak level of the spurious signal lines

BZ-7230 has only one measuring range but the spurious level depends on the peak level of the signal. Therefore, two specifications are given. One for high levels, where the upper limit is the overload limit, and one for low levels.

The Typical Frequency Response shows the ± 1 dB limits for direct input and microphones, and the ± 10 % limits for accelerometers

RPM MEASUREMENT

RPM is measured on the signal connected to Trigger input when Tacho is set to *On*

Range: 1 to 6000000 RPM

Instantaneous RPM: Instantaneous RPM is only displayed (and not stored)

Average RPM: Displayed and stored together with each spectrum result. In linear averaging it is an average over the same time as the spectrum. In exponential averaging it is the last measured RPM

Gear Ratio: 10⁻⁵ to 10³⁸. The displayed RPM's are the measured RPM's divided by the RPM Gear Ratio.

OVERLOAD

Instantaneous Overload: Displayed as an icon and indicated by the Traffic Light

Spectrum Overload: Displayed and stored with each spectrum result

DISPLAY SPECTRA

Two spectra superimposed

Scaling: RMS, Peak, Peak-to-Peak, Power, PSD, ESD

Reference Spectrum: Compare spectrum to stored (measured) reference

Axis: Logarithmic or Linear Y-axis, Logarithmic or Linear X-axis

X-axis: Display full frequency range or expand the X-axis until only 20 FFT lines are displayed. Scroll available

Y-axis Display Range: 5, 10, 20, 40, 60, 80, 100, 120, 140, 160, 180 or 200 dB. Auto-zoom or Auto-scale available

Digital Post-weighting: Z (none) or A-weighting

DISPLAY PARAMETERS

Sound: Sound Pressure Level in dB

Vibration: Acceleration, velocity or displacement in dB or physical units. SI units (m/s², m/s or m) or US/UK units (g, m/s or Mil)

Direct: Voltage in dB or V

CURSORS

Readings: Total level within the spectrum.

Frequency Correction: For spectra measured with a Hanning window, spectral peaks are interpolated to a higher precision

Main: Reads level versus frequency

Symmetrical Delta and Delta: Defines lower and upper frequency limits for any part of the spectrum and calculates the level sum within that frequency range

Harmonic: Identifies fundamental frequency and harmonics in the spectrum and calculates the Total Harmonic Distortion* (THD)

Reference: Reads the difference between the main cursor Y-value and the reference cursor Y-value

TOLERANCE CHECK

Tolerance Window: Determines the upper and lower levels and the top and bottom frequency at which the spectrum is checked. The check can either be made on all the FFT lines within the specified range or on the Delta Sum of the lines

With exponential averaging, the Delta Sum is calculated every 100 ms for 100 to 1600 FFT lines and every 1 s for 3200 and 6400 lines

The following parameters are measured for check on Delta Sum with exponential averaging:

- Delta Sum
- Max Delta Sum
- RPM at time for Max Delta Sum
- L_{AF} at time for Max Delta Sum
- FFT Spectrum at time for Max Delta Sum

Up to 10 tolerance windows can be specified per template.

Single Values Check: Tolerances can be set for the parameters: L_{AF}, Instantaneous RPM, L_{Aeq} and Average RPM.

Indication: Results for each tolerance window and for the four single values can be displayed. An Overall Result (combination of all results) and a Latched Result (latched during measurement) can be displayed and are indicated in the status panel.

When tolerance limits are violated, a recording can be started (license for BZ-7226 required) and a 3.3 V DC signal (above upper limit), a -3.3 V DC (below lower limit) or a signal alternating between 3.3 V and -3.3 V (both above and below limits) can be output to the Output Socket

BAR GRAPH

LAF, LZf, Total of Spectrum and Delta Sum can be displayed on a bar graph with indication of Max Delta Sum and Upper Limit

For engineering units, the axis on Bar Graph can be logarithmic or linear and can be zoomed

Sound Level Meter Parameters

Sound level meter (broadband) parameters are measured simultaneously with the FFT parameters. However, their measurement starts when the Start/Pause pushbutton is pressed and ends at the nearest whole second after the end of the FFT measurement

Specifications for the Sound Level Meter parameters apply to Hand-held Analyzer Type 2270/2250 fitted with Microphone Type 4189 and Microphone Pre-amplifier ZC-0032

MEASUREMENTS

X = frequency weightings A or B

Y = frequency weightings C or Z

V = frequency weightings A, B, C or Z

For Display and Storage

Start Time	Stop Time	Overload %
Elapsed Time	L _{Xeq}	L _{Yeq}
L _{XFmax}	L _{YFmax}	L _{XFmin}
L _{YFmin}	L _{Xleq}	L _{Yleq}
L _{AFTeq}	L _{Vpeak}	

* Total Harmonic Distortion (THD) is the sum (in %) of all the harmonics relative to the sum of the fundamental and all the harmonics.

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

Conforms with the following National and International Standards:

- IEC 61672–1 (2002–05) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993–02) and Amendment 2 (2000–10), Type 1
- IEC 60804 (2000–10), Type 1
- DIN 45657 (1997–07)
- ANSI S1.4–1983 plus ANSI S1.4A–1985 Amendment, Type 1
- ANSI S1.43–1997, Type 1

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

DETECTORS

Parallel Detectors on every measurement:

A- or B-weighted (switchable) broadband detector channel with 'Fast' time weighting, 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

Only for Display as Numbers

L_{XF} L_{YF}

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 123 dB

Linearity Range: In accordance with IEC 60804,

A-weighted: 21.4 dB to 140 dB

Linear Operating Range: In accordance with IEC 61672,

A-weighted: 1 kHz: 24.8 dB to 140 dB

Peak C Range: In accordance with IEC 61672: 42.3 dB to 143 dB

Broadband parameters for Accelerometer inputs: When Hand-held Analyzer Type 2270/2250 is fitted with an accelerometer, the following broadband parameters can be displayed in engineering units:

- L_{Xeq}
- L_{Yeq}
- L_{XFmax}
- L_{YFmax}
- L_{XFmin}
- L_{YFmin}
- L_{Vpeak}
- L_{XF}
- L_{YF}

Software Specifications – Tone Assessment Option BZ-7231

LICENSE

Tone Assessment Option BZ-7231 is enabled with a separate license and can be used with the FFT template

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, Max or spectrum obtained at Max Delta Sum) may be assessed

Assessment is made as post-processing, i.e., when measurement is paused or stopped

SETUP ACCORDING TO STANDARD

Default Setup: 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: Selected by the main cursor

Gain: –70 dB to +10 dB

Options: The generated tone can be mixed with the input signal, please refer to the Preferences/Headphone Settings

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 Parameter 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

Most Prominent Tone: Tone Level L_{pt} , Adjustment K_t

QUALITY INDICATORS

In the display, a quality indicator (smiley) will indicate that a hint is available for tone assessment quality. Tap on the indicator to see the hint

Software Specifications – Signal Recording Option BZ-7226

RECORDING

Recording Option BZ-7226 is enabled with a separate license
Recording requires a CF- or SD-Card for data storage

RECORDED SIGNAL

The 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

Manual Control of Recording: Recording can be manually started and stopped during a measurement using a pushbutton

Automatic Control of Recording: Start of recording when measurement is started. Minimum and Maximum recording time can be preset

Tolerance Level: Recording is started when the tolerance limits are violated

PLAYBACK

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

RECORDING FORMAT

The recording format is 16-bit wave files (extension .wav) attached to the data in the project, easily played-back afterwards on a PC using BZ-5503, Type 7815 or 7820. Calibration information is stored in the wav file, allowing PULSE to analyse the recordings

SAMPLING RATE AND PRE-RECORDING

The signal is buffered for the pre-recording of sound. This allows the beginnings of events to be recorded even if they are only detected later

Sampling Rate (kHz)	Maximum Pre-recording (s)	Sound Quality	Memory (KB/s)
8	100	Low	16
16	50	Fair	32
24	30	Medium	48
48	10	High	96

Software Specifications – Utility Software for Hand-held Analyzers BZ-5503

BZ-5503 is included with the Hand-held Analyzer for easy synchronisation of setups and data between PC and Analyzer. BZ-5503 is supplied on CD-ROM BZ-5298

ON-LINE DISPLAY OF TYPE 2270/2250 DATA

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

DATA MANAGEMENT

Explorer: Facilities for easy management of Instruments, Users, Jobs, Projects and Project Templates (copy, cut, paste, delete, rename, create)

Data Viewer: View measurement data (content of projects). Graphics and data can be copied to Windows® clipboard

Template Editor: Editor for changing setups in Project Templates

Synchronisation: Project Templates and Projects for a specific user can be synchronised between PC and analyzer

USERS

Users of the analyzer can be created or deleted

EXPORT FACILITIES

Excel: FFT Projects can be exported to Microsoft® Excel®

Type 7815/20: FFT Projects can be exported to Noise Explorer Type 7815, Evaluator Type 7820

HAND-HELD ANALYZER SOFTWARE UPGRADES AND LICENSES

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

INTERFACE TO HAND-HELD ANALYZER

USB ver. 1.1 or Hayes compatible GSM or standard analogue modem

PC REQUIREMENT

Operating System: Windows® 7/XP or Windows Vista®

(32 and 64 bit versions) and Microsoft® .NET

Recommended PC: Pentium® III (or equivalent) processor, 2048 MB RAM, SVGA graphics display/adaptor, sound card, DVD drive, mouse, USB, Windows® 7

Ordering Information

2250-H-001 Hand-held Analyzer Type 2250 with BZ-7230 FFT Analysis Software (Vibration Analyzer)

Included with 2250-H-001:

- AO-1476: USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
- BZ-5298: Environmental Software, including BZ-5503 Utility Software for Hand-held Analyzers
- BZ-7230: FFT Analysis Software
- DD-0594: Protection Plugs for Top Socket × 5
- FB-0679: Hinged Cover for Hand-held Analyzer
- KE-0459: Shoulder Bag
- QB-0061: Battery Pack
- UA-1654: 5 Extra Styli
- UA-1673: Adaptor for Standard Tripod Mount
- ZG-0426: Mains Power Supply

2270-H-002 Hand-held Analyzer Type 2270 with BZ-7222 Sound Level Meter and BZ-7230 FFT Analysis Software

2250-H-002 Hand-held Analyzer Type 2250 with BZ-7222 Sound Level Meter and BZ-7230 FFT Analysis Software

Included with 2270-H-002 and 2250-H-002:

- Type 4189: Prepolarized Free-field 1/2" Microphone
- AO-1476: USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
- BZ-5298: Environmental Software, including BZ-5503 Utility Software for Hand-held Analyzers
- BZ-7222: Sound Level Meter software
- BZ-7230: FFT Analysis Software
- DH-0696: Wrist Strap
- FB-0679: Hinged Cover for Hand-held Analyzer
- HT-0015: Earphones
- KE-0440: Travel Bag
- KE-0441: Protective Cover for Hand-held Analyzer
- QB-0061: Battery Pack
- UA-1650: 90 mm dia. Windscreen with AutoDetect
- UA-1651: Tripod Extension for Hand-held Analyzer
- UA-1654: 5 Extra Styli
- UA-1673: Adaptor for Standard Tripod Mount
- ZC-0032: Microphone Preamplifier
- ZG-0426: Mains Power Supply

2270-H-003 Hand-held Analyzer Type 2270 with BZ-7222 Sound Level Meter Software, BZ-7223 Frequency Analysis Software, BZ-7226 Signal Recording Option and BZ-7230 FFT Analysis Software

2250-H-003 Hand-held Analyzer Type 2250 with BZ-7222 Sound Level Meter Software, BZ-7223 Frequency Analysis Software, BZ-7226 Signal Recording Option and BZ-7230 FFT Analysis Software

Included with 2270-H-003 and 2250-H-003:

- Type 4189: Prepolarized Free-field 1/2" Microphone
- AO-1476: USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
- BZ-5298: Environmental Software, including BZ-5503 Utility Software for Hand-held Analyzers
- BZ-7222: Sound Level Meter software
- BZ-7223: 2250 Frequency Analysis Software
- BZ-7226: 2250 Signal Recording Option
- BZ-7230: FFT Analysis Software
- DH-0696: Wrist Strap
- FB-0679: Hinged Cover for Hand-held Analyzer
- HT-0015: Earphones
- KE-0440: Travel Bag
- KE-0441: Protective Cover for Hand-held Analyzer
- QB-0061: Battery Pack
- UA-1650: 90 mm dia. Windscreen with AutoDetect
- UA-1651: Tripod Extension for Hand-held Analyzer
- UA-1654: 5 Extra Styli
- UA-1673: Adaptor for Standard Tripod Mount
- UL-1009: SD Memory Card for Hand-held Analyzers
- ZC-0032: Microphone Preamplifier
- ZG-0426: Mains Power Supply

SOFTWARE MODULES AVAILABLE SEPARATELY

BZ-7222	Sound Level Meter Software
BZ-7222-UPG	Upgrade to allow SLM-based applications to run on Type 2250
BZ-7223	Frequency Analysis Software
BZ-7224	Logging Software
BZ-7225	Enhanced Logging Software
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-7229	Dual-channel Building Acoustics Software (Type 2270 only)
BZ-7230	FFT Analysis Software
BZ-7231	Tone Assessment Option
BZ-7232	Noise Monitoring Software

CALIBRATION

Type 4294	Calibration Exciter
Type 4231	Sound Calibrator (fits in KE-0440)
Type 4226	Multifunction Acoustic Calibrator
Type 4228	Pistonphone
2270-CAI	Accredited Initial Calibration of Type 2270
2270-CAF	Accredited Calibration of Type 2270
2270-CTF	Traceable Calibration of Type 2270
2270-TCF	Conformance Test of Type 2270, with certificate
2250-CAI	Accredited Initial Calibration of Type 2250
2250-CAF	Accredited Calibration of Type 2250
2250-CTF	Traceable Calibration of Type 2250
2250-TCF	Conformance Test of Type 2250, with certificate
4513-CAF	IEPE Accelerometer, Accredited Calibration
4513-CTF	IEPE Accelerometer, Traceable Calibration

PC SOFTWARE

BZ-5503	Utility Software for Hand-held Analyzer Type 2250 (supplied as standard with Type 2250)
Type 7815	Noise Explorer – data viewing software
Type 7820	Evaluator – data viewing and calculation software

MEASUREMENT ACCESSORIES

Type 2647-D-004	Charge to DeltaTron Converter with integral cables and connectors for Type 8324 Accelerometer and Types 2250/2270; 80 Hz – 10 kHz
Type 4397-A	Accelerometer, with 1 mV/ms ⁻² sensitivity, suitable for high frequency and high level measurement, with M3 connection
Type 4513	Accelerometer, general purpose, with 1 mV/ms ⁻² sensitivity and 10–32 UNF connection
Type 4513-001	Accelerometer, suitable for low level measurement, 10 mV/ms ⁻² and 10–32 UNF connection
Type 4513-002	Accelerometer, suitable for very low level measurement, 50 mV/ms ⁻² and 10–32 UNF connection
Type 4514	Accelerometer, general purpose, with 1 mV/ms ⁻² sensitivity and 10–32 UNF connection
Type 4514-001	Accelerometer, suitable for low level measurement, 10 mV/ms ⁻² and 10–32 UNF connection
Type 4514-002	Accelerometer, suitable for very low level measurement, 50 mV/ms ⁻² and 10–32 UNF connection
Type 8324	Accelerometer, Industrial, with 1 mV/ms ⁻² sensitivity and Mil-C-5015 side connection
Type 8341	Accelerometer, Industrial, with 10.2 mV/ms ⁻² sensitivity and Mil-C-5015 top connection
AO-0440-D-015	Signal cable, LEMO to BNC, length 1.5 m (5 ft)
AO-0697-015	Microphone Extension Cable, 10-pin LEMO, length 1.5 m (5 ft)
AO-0697-030	Microphone Extension Cable, 10-pin LEMO, length 3 m (10 ft)

AO-0697-100	Microphone Extension Cable, 10-pin LEMO, length 10 m (33 ft)	MM-0360	Laser Tachometer Probe
AO-0701-D-030	Accelerometer cable, LEMO to M3, length 3 m (10 ft)	QS-0007	Tube of Cyanoacrylate Adhesive
AO-0702-D-030	Accelerometer cable, LEMO to 10–32 UNF, length 3 m (10 ft)	UA-0642	Mounting magnet for accelerometer 10–32 UNF mounting
AO-0722-D-050	Accelerometer cable, LEMO to MIL-C-5015, length 5 m (16 ft)	UA-0801	Small Tripod
AO-0726-D-030	Calbe for Laser Tachometer Probe MM-0360, LEMO to SMB, length 3 m (10 ft)	UA-1077	Mounting magnet for accelerometer M3 mounting
AO-0726-D-050	Calbe for Laser Tachometer Probe MM-0360, LEMO to SMB, length 5 m (16 ft)	UA-1317	Microphone Holder
AO-0727-D-015	Signal cable, LEMO to BNC Female, length 1.5 m (5 ft)	UL-1009	SD Memory Card
		UL-1013	CF Memory Card
		UL-1016	10/100 Ethernet CF Card
		UL-1017	SDHC Memory Card
		YJ-0216	Beeswax for mounting accelerometer
		ZG-0444	Charger for QB-0061 Battery Pack

TRADEMARKS

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