

# PRODUCT DATA

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

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.

With FFT Analysis Software the easy, safe and clever approach of Type 2270/2250 to product design is embodied in the easily visible color display, the very high frequency resolution offered by up to 6400 lines of analysis, the wide dynamic range and the clever tap-and-drag operation of key display and measuring features.

With FFT Analysis Software and FFT-based Tone Assessment Software, objective and subjective tone assessments can be undertaken with the ease of use that the Type 2270/2250 graphical user interface affords.



### Uses and Features

#### USES

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

#### FEATURES

- Hand-held, single-channel, FFT measurement
- Analysis of sound or vibration
- CCLD input for accelerometers
- Transducer database
- Wide dynamic range
- For transient and continuous signals
- Real-time operation (no data loss)
- Up to 6400 lines of analysis
- Resolution down to 16 mHz
- Spans from 100 Hz to 20 kHz in a traditional 1-2-5 sequence
- Zoom analysis

- Linear and exponential averaging
- Internal and external trigger
- Tachometer function
- A-weighting in pre- or post-processing
- Dual overlay spectrum display
- Acceleration, velocity and displacement shown
- Measurements in SI (metric) and UK/US units
- Unit scaling (RMS, Pwr, PSD, ESD, Peak, P-P)
- Max. hold spectrum
- Compare spectrum to reference spectrum
- Level limit with output for quality control
- Frequency correction for high precision
- Auto peak finding
- Utility software for archiving and viewing data
- Tone generator output
- Signal recording (option)
- Export signal recording to PULSE for analysis
- PC software for analysis, reporting and archiving

#### Tone Assessment Features

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

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## The Type 2270 and 2250 Hand-held Analyzer Family

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Type 2270 and 2250 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.

**Fig. 1**  
Left: Type 2270  
Right: Type 2250



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.

For further information on Type 2270, please refer to the Product

Data BP 2199, and for further information on Type 2250, please refer to Product Data BP 2025. Alternatively, visit our website at [www.bksv.com](http://www.bksv.com) to discover the capabilities and versatility of the respective hand-held analyzers.

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## FFT Analysis Software BZ-7230

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

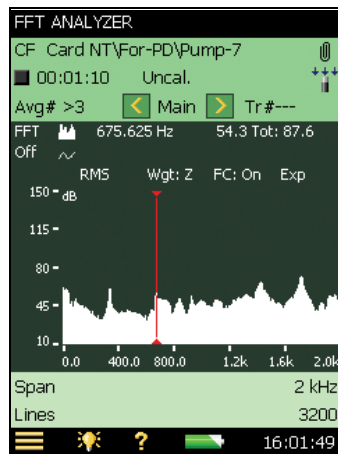
FFT sound and vibration analysis is all about the details, and the beauty of your hand-held analyzer is in its details. It feels secure in your hand, solid in construction and eager to make measurements. The analyzer's high-resolution touch screen colour display brings enhanced usability to FFT analyzers, enabling you to easily switch cursor and display parameters. 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 expand your view and see the individual details of your measurement. This is not a 'toy' audio analyzer, you can zoom into the measurement to any desired frequency range with more resolution than anyone could possibly need, see Table 1.

**Table 1**  
Frequency resolutions  
available in FFT Analysis  
Software BZ-7230

Frequency Span		Frequency Resolution (Hz)							
		100	200	500	1000	2000	5000	10000	20000
No. of Lines	100	1	2	5	10	20	50	100	200
	200	0.5	1	2.5	5	10	25	50	100
	400	0.25	0.5	1.25	2.5	5	12.5	25	50
	800	0.125	0.25	0.625	1.25	2.5	6.25	12.5	25
	1600	0.0625	0.125	0.3125	0.625	1.25	3.125	6.25	12.5
	3200	0.03125	0.0625	0.15625	0.3125	0.625	1.5625	3.125	6.25
	6400	0.015625	0.03125	0.078125	0.15625	0.3125	0.78125	1.5625	3.125

**Note:** The NBW (Noise Bandwidth) equals the Frequency Resolution for the Rectangular window, Hanning weighting makes the NBW of the filters 1.5 × Frequency Resolution. The Record Length is 1/Frequency Resolution

**Fig. 2**  
Spectrum view  
showing high dynamic  
range and high  
frequency resolution



FFT spectrum analysis is ideal for noise or vibration source identification, and the hand-held analyzer combines analysis power with ease of use. It offers 6400 lines of real-time frequency analysis at better than 5 Hz resolution, all the way to the hearing limit of 20 kHz. A tap of the screen turns on the Frequency Correction algorithm, which computes the peak frequencies with approximately ten times better resolution. The wide dynamic range of over 150 dB allows you to measure sound and vibration at the first attempt.

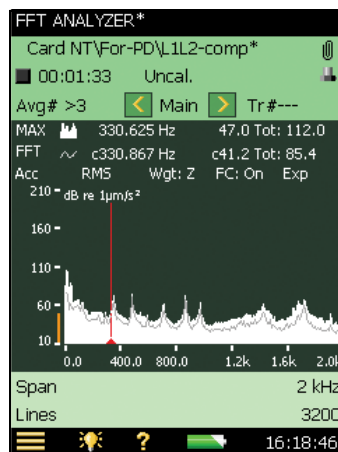
With this kind of frequency and dynamic range, setup is easy. Connect and position your transducer, press the Start/Pause pushbutton and view your spectrum. If you want to zoom in, drag the stylus across the desired frequency span, tap *Zoom* and you can now measure using the correct range – *Easy, Safe,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

## Applications

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

Attach an accelerometer to an engine mount and measure its movement at idle RPM – as displacement? No problem. Set up the tachometer trigger input and you will see the running speed in the display!

**Fig. 3**  
View showing the  
overlay of resonance  
on operation  
frequencies



Do you want to spot check the output of a random vibration shaker? With the stylus, set the delta cursor for the desired frequency span and read out the Power Spectral Density (PSD). And select  $g^2/Hz$  or  $(m/s^2)^2/Hz$  as your reference units – *Easy, Safe, Clever.*

Do you want to find a component's resonant frequencies? 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, see Fig. 3.

## Product Development

Product noise and vibration is a common concern for the development engineer, and the FFT analyzer is the tool of choice for noise and vibration testing. With FFT Analysis Software BZ-7230, this tool becomes one of the easiest to use as well.

**Fig. 4**  
Using Type 2250 for  
product vibration  
testing



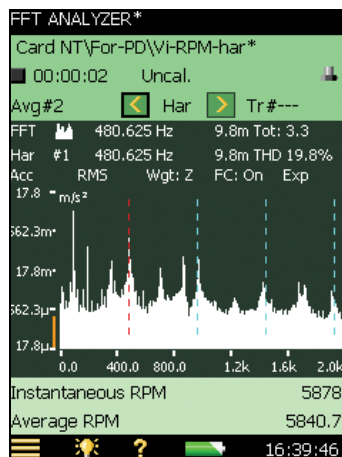
Start by benchmarking competitive or previous generation products. Use the narrow-band analysis with up to 6400 lines to identify precisely the forcing functions and resonances, setting design standards for your next generation product.

During development, you can evaluate component performance to improve your design. The analyzer's dual overlay display makes it easy to compare measurements between design iterations. Utility Software for Hand-held Analyzers BZ-5503 makes it easy to securely archive, view and export data for every measurement in the project – *Easy, Safe, Clever.*

## Machinery Analysis and Troubleshooting

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.

**Fig. 5**  
View showing an RPM  
readout, with harmonic  
cursors and vibration  
measurement units



A preset limit over a range of frequencies can be set 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. 5) with the gear ratio you enter. 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

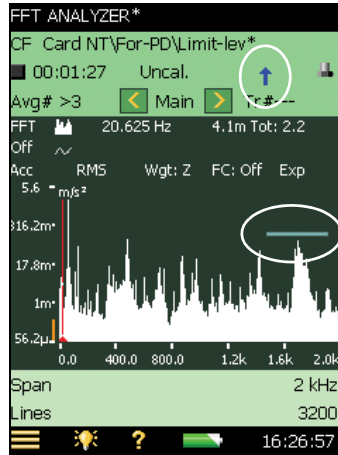
Type 2270/2250 is already a comprehensive tool for the consultant or engineer. FFT Analysis Software BZ-7230 adds vibration and sound measurement technology that traditional 1/3-octave analysis cannot provide. Low frequencies can be analysed down to 7 Hz (at -1 dB) using the standard Microphone Type 4189, down to 0.6Hz (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.



## Product Quality Testing

**Fig. 6**

View showing the Limit Level (blue line) and Limit Indicator (blue arrow) on a frequency spectrum



FFT Analysis Software, together with your Hand-held Analyzer, is a simple tool to use for quality assurance.

The Limit Level parameter allows you to set a level limit over a frequency range that you determine (using the convenient touch screen interface) so that any measurement result exceeding the limit will activate the Limit Indicator, see Fig. 6.

The ability to precisely set the limit frequency range makes FFT Analysis Software, together with the analyzer, very effective compared to broadband meters.

### Add Recording to the Mix

Sound Recording Option BZ-7226 enables you to record the input signal for later playback or analysis. The recording may be automatic (lasting for the duration of the measurement), or be controlled manually, or last as long as the limit level is exceeded. Pre- and post-recording delays may be set, as well as a duration limit. The recording upper frequency limit can be reduced from the full 20 kHz in four steps to save memory. Sound 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. 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](http://www.bksv.com).

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## Tone Assessment Option BZ-7231

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Noise can be described as tonal if it contains a noticeable or discrete, continuous note. This may include noises such as hums, hiss, screeches, drones, etc., and 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. Although the methodology of any standard could be the subject of much discussion, the result of a test carried out in accordance with it, is not.

### Automatically Configured for ISO 1996 Assessments

By its nature, making objective measurements to what is inherently a subjective response to a sound is difficult. Issues such as prominence, amplitude/frequency masking, and calculation of any tonal penalties makes the ISO 1996 assessments more than a simple FFT measurement.

BZ-7231 Tone Assessment Option for Type 2270 and 2250 Hand-held Analyzers 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.

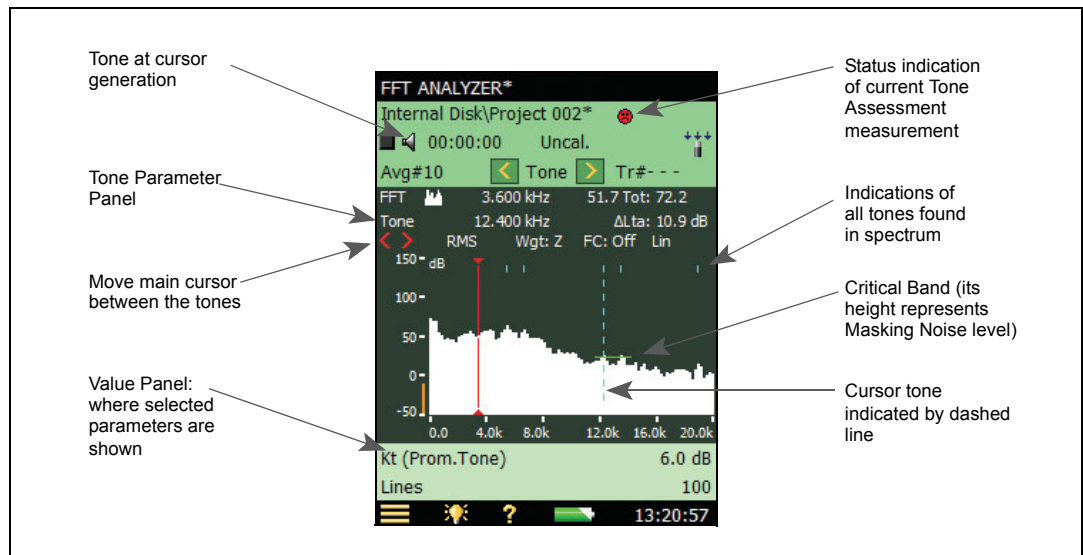
### All the Details Available Instantly

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:

- $K_t$  – the value added to the  $L_{Aeq}$  to give the tone-corrected rating level
- $\Delta L_{ta}$  – 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 hand-held analyzer and the tone corrected rating level can be calculated on the spot.

**Fig. 7**  
Typical FFT spectrum display, showing the various fields and parameters



**Fig. 8**  
Performing an outdoor tone assessment measurement



As the objective measurement result can be comprehensive in its detail, it can also be helpful to have a sound recording of the noise for a non-technical audience to listen to subjectively. Of course, this high quality calibrated recording can be exported to secondary measurement systems for further analysis and documentation. The subjective assessment is also enhanced by the facility to connect headphones to Type 2270/2250 and use the integrated tone generator in the analyzer to compare the tonal noise being analysed with a generated tone at a specific frequency, or even mix the measured and generated tonal elements.

### Subjective Search for Tone Source

For a 'tone hunt', Type 2270/2250 can be used in a manner similar to a hand-held amplifier with headphones connected to the headphone output, and the microphone signal is played through the headphones. You can then amplify the signal in real-time in 1 dB steps. This

enhances the operators hearing to be able to hear low level tones which the complainant may be more tuned to, or in some cases, to deduce a tonal element as being a hearing damage issue, such as tinnitus, rather than anything physically present in the acoustic environment.

### Ease of Operation – Measurement Quality Indicators

Those familiar with the other Type 2270/2250 applications might remember the incredible dynamic range of the instrument – extending from the instruments noise floor to a peak level of over 140 dB with the Type 4189 microphone. And remember, this is all in one measurement range.

With this kind of frequency and dynamic range, Type 2270/2250 becomes perhaps the first hand-held narrow-band frequency analyzer where you never have to worry about the setup. Put the instrument in position, select the ISO 1996-2 standard and press the Start/Pause push-button, it's that easy. The measurement analysis is also made easy with measurement quality indicators, or smileys, to suggest how to improve the assessment, see Fig. 7.

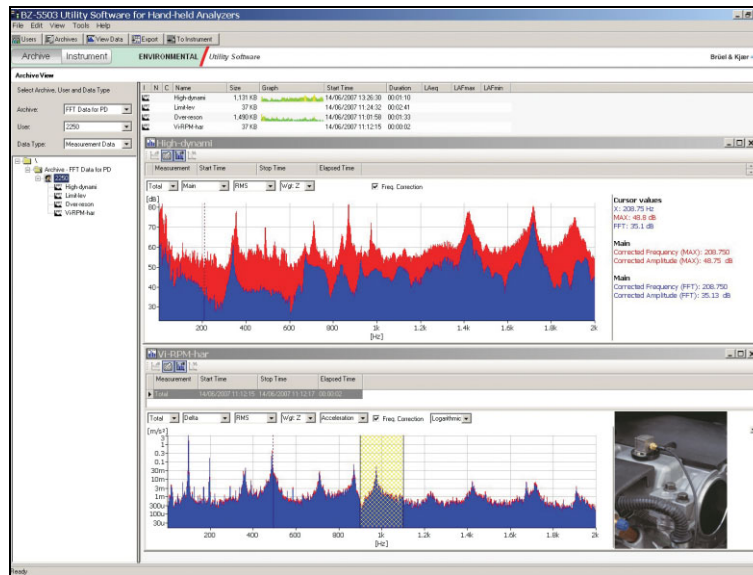
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## Utility Software for Hand-held Analyzers BZ-5503

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Once you've taken your measurements you'll need to do something with them. Your hand-held analyzer offers the triple storage options of an 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 the 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. 9**  
A typical BZ-5503 display with photograph of measurement environment



The BZ-5503 Utility program is an all-purpose program that forms the information link to (and from) your analyzer, see Fig. 9. Its primary functions are to manage and archive user data, handle application software updates, upgrades and licensing; and to control the analyzer's data from a PC. It enables you to perform the following:

### 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 contains Total  $L_{Aeq}$ 's 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<sup>®</sup> Excel<sup>®</sup>, 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 via optional Dial-up CF Card Modem. This is also useful for instructional purposes, using projectors or large screen monitors.

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## **Type 2270/2250 Hardware and Resident Software**

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### **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 come with the Sound Level Meter Software (BZ-7222) enabled. This makes the analyzer into a modern Class 1 Sound Level Meter (SLM). It fulfills 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 pre-defined 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 and 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 with a dynamic range from the noise floor in each individual band to 140 dB.
- **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. Logging (or noise profiling) is used to develop time histories for use in environmental noise as well as workplace noise assessment and product development.
- **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.
- **Sound Recording Option BZ-7226**, which provides you with a uniquely versatile facility for attaching samples of the actually measured signal to your measurements. This option works with all software modules. The recording uses the measurement transducer, while voice annotations (standard in all modules) use a separate commentary microphone.



- **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.

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### Recommended Application Software – For Use on PC

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

- Type 7815 Noise Explorer – Data Viewing software
- Type 7820 Evaluator – Environmental Noise software
- Type 7825 Protector – Noise at Work software

Noise Explorer, Evaluator 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.) 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.)

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### Accredited Calibration and Hardware Maintenance at Brüel & Kjær


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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.

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### 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><b>Safety</b></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><b>EMC Emission</b></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><b>EMC Immunity</b></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>

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## Specifications – Type 2270 and 2250 Platforms

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These specifications refer to both Type 2270 and Type 2250 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:** Prepolarized Free-field ½" 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: 0 V or 200 V

### TRANSDUCER DATABASE

Transducers are described in a transducer database with information on Serial Number, Preamp 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, 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

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

**Project Template:** Defines the display and measurement setups

**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 CF memory card, CF modem or CF LAN Interface

### LAN INTERFACE SOCKET (TYPE 2270 ONLY)

**Connector:** RJ45

**Speed:** 10 MB/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<sub>Peak</sub>, 10 V<sub>RMS</sub> for sinusoidal input signals, no damage for signals up to ± 20 V<sub>Peak</sub>. 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:**  $> 47 k\Omega$

#### OUTPUT SOCKET

**Connector:** Triaxial LEMO

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

**Output Impedance:**  $50 \Omega$

**Load Impedance:**  $> 15 k\Omega \parallel < 1 nF$  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:**  $32 \Omega$  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:**  $640 \times 480$

**Viewfinder Size:**  $212 \times 160$

**Format:** jpg with exif information

#### EXTERNAL DC POWER SUPPLY REQUIREMENTS

Used to charge the battery pack in the instrument

**Voltage:**  $8-24 VDC$ , 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  $30^\circ C$ . To protect the battery, charging will be terminated completely at ambient temperatures above  $40^\circ C$ . At  $30$  to  $40^\circ C$  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  $0^\circ C$  or over  $50^\circ C$  ( $32^\circ F$  to  $122^\circ F$ ). 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-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  $+50^\circ C$  ( $14$  to  $122^\circ F$ ),  $< 0.1 dB$

**Storage Temperature:**  $-25$  to  $+70^\circ C$  ( $-13$  to  $+158^\circ F$ )

#### HUMIDITY

IEC 60068-2-78: Damp Heat: 90% RH

(non-condensing at  $40^\circ C$  ( $104^\circ F$ )).

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

#### MECHANICAL

Environmental Protection: IP44

Non-operating:

IEC 60068-2-6: Vibration:  $0.3 mm$ ,  $20 m/s^2$ ,  $10-500 Hz$

IEC 60068-2-27: Shock:  $1000 m/s^2$

IEC 60068-2-29: Bump: 4000 bumps at  $400 m/s^2$

#### 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 Catalan, Chinese, English, French, German, Italian, Japanese, Polish, Portuguese, Romanian, Serbian, Slovenian and Spanish

## 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 2)

### 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<sup>1</sup>

**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

**Exponential Averaging:** With an averaging time of up 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 seconds 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 -18 to 18 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 above 2479653 the Trigger Input is pulled up to +5V through a 7.5 k $\Omega$  resistor when this parameter field is set to On

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

### MEASUREMENT RANGE

(See Table 2)

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  $\pm 1$  dB limits for Direct Input and microphones, and the  $\pm 10$  % 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  $10^{38}$ . 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 and Linear Y-axis, 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

**Table 2** 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 $\mu$ V – 14.1 V <sub>Peak</sub>	300 nV – 75 mV <sub>Peak</sub>	1.5/6.3 Hz – 20 kHz
4189	50 mV/Pa	10 dB – 143 dB <sub>Peak</sub>	-10 dB – 97.5 dB <sub>Peak</sub>	6.8/7.8 Hz – 20 kHz
4191	12.5 mV/Pa	22 dB – 155 dB <sub>Peak</sub>	2 dB – 109.5 dB <sub>Peak</sub>	3.6/6.6 Hz – 20 kHz
4193	12.5 mV/Pa	22 dB – 155 dB <sub>Peak</sub>	2 dB – 109.5 dB <sub>Peak</sub>	0.56/6.3 Hz – 20 kHz
4950	50 mV/Pa	10 dB – 143 dB <sub>Peak</sub>	-10 dB – 97.5 dB <sub>Peak</sub>	4.3/6.3 Hz – 19 kHz
4952	31.6 mV/Pa	14 dB – 146 dB <sub>Peak</sub>	-6 dB – 101.5 dB <sub>Peak</sub>	4.3/6.3 Hz – 14 kHz
4397-A	1 mV/ms <sup>-2</sup>	3 mms <sup>-2</sup> – 7.1 kms <sup>-2</sup> <sub>Peak</sub>	300 $\mu$ ms <sup>-2</sup> – 75 ms <sup>-2</sup> <sub>Peak</sub>	1.25/6.3 Hz – 20 kHz
4513	1 mV/ms <sup>-2</sup>	3 mms <sup>-2</sup> – 7.1 kms <sup>-2</sup> <sub>Peak</sub>	300 $\mu$ ms <sup>-2</sup> – 75 ms <sup>-2</sup> <sub>Peak</sub>	1.25/6.3 Hz – 10 kHz
4513-001	10 mV/ms <sup>-2</sup>	300 $\mu$ ms <sup>-2</sup> – 710 ms <sup>-2</sup> <sub>Peak</sub>	30 $\mu$ ms <sup>-2</sup> – 7.5 ms <sup>-2</sup> <sub>Peak</sub>	1.25/6.3 Hz – 10 kHz
4513-002	50 mV/ms <sup>-2</sup>	60 $\mu$ ms <sup>-2</sup> – 141 ms <sup>-2</sup> <sub>Peak</sub>	6 $\mu$ ms <sup>-2</sup> – 1.5 ms <sup>-2</sup> <sub>Peak</sub>	1.25/6.3 Hz – 10 kHz

**Vibration:** Acceleration, velocity or displacement in dB or physical units. SI units (m/s<sup>2</sup>, 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 limit 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<sup>2</sup> (THD)

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

#### LIMIT LEVEL CHECK

**Limit Level:** Determines the level at which the spectrum is checked

**Limit Range:** Determines the frequency range for the limit level check

**Indication:** Two indicators are displayed, latched and instantaneous. When the spectrum exceeds the limit level, a recording can be started (license for BZ-7226 required) and a 3.3VDC signal can be output at the Output Socket

#### 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 Preamplifier ZC-0032

#### 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

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

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)
- ANSIS1.4–1983 plus ANSI S1.4A–1985 Amendment, Type 1
- ANSIS1.43–1997, 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

#### 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 <sub>Xeq</sub>	L <sub>Yeq</sub>
L <sub>XFmax</sub>	L <sub>YFmax</sub>	L <sub>XFmin</sub>
L <sub>YFmin</sub>	L <sub>Xleq</sub>	L <sub>Yleq</sub>
L <sub>AFTeq</sub>		

#### Only for Display as Numbers or Quasi-analogue Bars

L <sub>XF</sub>	L <sub>YF</sub>
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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 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

## 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 or Max) 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 may 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 may 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  $\Delta L_{ta}$ , 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. Click on the indicator to see the hint

**Software Specifications – Sound 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

**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

**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

**Limit Level:** Recording is started when the Limit Level is exceeded

**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

**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® 2000/XP/.NET

**Recommended PC:** Pentium® III (or equivalent) processor, 512 Mbyte RAM, SVGA graphics display/adaptor, sound card, CD ROM drive, mouse, USB, Windows® XP

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## Ordering Information

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**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
- ZC-0032: Microphone Preamplifier
- BZ-7222: Sound Level Meter software
- BZ-7230: FFT Analysis Software
- KE-0440: Travel Bag
- KE-0441: Protective Cover for Hand-held Analyzer
- DH-0696: Wrist Strap
- 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
- QB-0061: Battery Pack
- ZG-0426: Mains Power Supply
- AO-1476: USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
- HT-0015: Earphones
- BZ-5298: Environmental Software, including BZ-5503 Utility Software for Hand-held Analyzers
- FB-0679: Hinged Cover for Hand-held Analyzer

**2270-H-003** Hand-held Analyzer Type 2270 with BZ-7222 Sound Level Meter Software, BZ-7223 Frequency Analysis Software, BZ-7226 Sound 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 Sound 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
- ZC-0032: Microphone Preamplifier
- BZ-7222: Sound Level Meter software
- BZ-7223: 2250 Frequency Analysis Software
- BZ-7226: 2250 Sound Recording Option
- BZ-7230: FFT Analysis Software
- KE-0440: Travel Bag
- KE-0441: Protective Cover for Hand-held Analyzer
- DH-0696: Wrist Strap
- 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
- QB-0061: Battery Pack
- ZG-0426: Mains Power Supply
- AO-1476: USB Standard A to USB Mini B Interface Cable, 1.8 m (6 ft)
- HT-0015: Earphones
- BZ-5298: Environmental Software, including BZ-5503 Utility Software for Hand-held Analyzers
- UL-1009: SD Memory Card for Hand-held Analyzers
- FB-0679: Hinged Cover for Hand-held Analyzer

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### SOFTWARE MODULES AVAILABLE SEPARATELY

BZ-7230 FFT Analysis Software  
BZ-7231 Tone Assessment Option  
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 Sound Recording Option  
BZ-7227 Reverberation Time 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

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### MEASUREMENT ACCESSORIES

Type 4513 Accelerometer, general purpose, with 1 mV/ms<sup>-2</sup> sensitivity and 10–32 UNF connection  
Type 4513-001 Accelerometer, suitable for low level measurement, 10 mV/ms<sup>-2</sup> and 10–32 UNF connection  
Type 4513-002 Accelerometer, suitable for very low level measurement, 50 mV/ms<sup>-2</sup> and 10–32 UNF connection  
Type 4397-A Accelerometer, with 1 mV/ms<sup>-2</sup> sensitivity, suitable for high frequency and high level measurement, with M3 connection  
AO-0701-D-030 Accelerometer cable, LEMO to M3, length 3 m (10 ft)  
AO-0702-D-030 Accelerometer cable, LEMO to 10–32 UNF, length 3 m (10 ft)  
YJ-0216 Beeswax for mounting accelerometer  
QS-0007 Tube of Cyanoacrylate Adhesive  
UA-0642 Mounting magnet for accelerometer 10–32 UNF mounting  
UA-1077 Mounting magnet for accelerometer M3 mounting  
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)  
UA-0801 Small Tripod  
UA-1317 Microphone Holder  
UL-1009 SD Memory Card  
UL-1013 CF Memory Card  
ZG-0444 Charger for QB-0061 Battery Pack



#### TRADEMARKS

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