**PRODUCT DATA**

**Hand-held Analyzer Types 2250 and 2270 for Building Acoustics Measurements**
with Building Acoustics Software BZ-7228

**Uses and Features**

**Uses (BZ-7228)**
- Measurement of:
  - Airborne sound insulation
  - Facade sound insulation
  - Impact sound insulation

**Features (BZ-7228)**
- Complete hand-held building acoustics analyzer
- Built-in pink and white noise generator
- Measures source and receiving room level spectra:
  - Equalization of sound source spectra
  - Parallel or serial measurements
- Measures reverberation time spectra:
  - Impulse and Interrupted Noise methods
- Measurement position management
- Calculates final results on the spot: ISO 16283, ISO 140 plus 13 national standards
- Measurement quality indicators
- Colour touch screen user interface
- Signal recording, voice commentary and integrated camera (Type 2270 only) to document test environment
- Single-channel measurements (Types 2250 and 2270)
- 2-channel measurements (Type 2270 only, requires BZ-7229 which is included on all new Type 2270 analyzers)

**Uses (Type 7830)**
- Building acoustics calculation
- Report generation
- Data archiving

**Features (Type 7830)**
- Building acoustics results calculation
- Analysis and report generation in one application
- Automatic data integrity checking (smiley)
- ISO plus 13 national standards

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Brüel & Kjær
The Hand-held Analyzers

Types 2250 and 2270 are robust, hand-held analyzer platforms designed to host a wide range of sound and vibration measurement applications. Their uses range from assessing environmental and workplace noise to industrial quality control and product development (product data BP 2025).

Easy to use – their light and ergonomic design makes them easy to grip, hold and operate single-handedly. Their colour touch screens show the analyzer setup, status and data at a glance, and with a tap of the stylus, you can make quick selections. The “traffic light” indicator, positioned centrally on the pushbutton panel, shows you the current measurement status, even from a distance.

Robust – the hand-held analyzers are built for the tough environment of field measurements. They will work reliably in rain, dust, heat, frost, and during day or night.

To document your measurement, you can add spoken or written comments and make signal recordings during any measurement.

Note: Signal recordings require Signal Recording Option BZ-7226.

Type 2250 is a single-channel analyzer, while Type 2270 is 2-channel and has additional features such as a built-in camera (allowing you to attach photos to your measurements).

Tasks in Building Acoustics

Fig. 2 shows a typical configuration for the most common task in building acoustics measurements: airborne sound insulation.

Fig. 3 shows a typical airborne task setup using a loudspeaker (emitting pink noise) and a number of microphone positions to measure the average source room spectrum L1, and the average receiving room spectrum L2. The average background noise spectrum B2 is also measured to verify the true L2 spectrum.

The average reverberation time spectrum, T2, is measured to correct for the amount of absorption in the receiving room. Finally, the single number result (for example: $D_{nTz}$) is calculated from the L1, L2, B2 and T2 spectra, and the result can then be compared with the minimum requirements stated in the building regulations.
The sound level depends on the position in the rooms, so several microphone positions are used to measure the average of the source room level, L1, the average of the receiving room level L2 and the average of the background noise level B2. The average reverberation time T2 is also measured using several positions.

In Touch with your Measurements

The spectra required (L1, L2, etc.) can be measured in any order, to suit field conditions and your preferences. Fig. 4 shows a typical building acoustics display when you are ready to measure the first L2 position, with source position 1.

The instantaneous (live) spectrum is shown and the high-resolution, colour, touchscreen shows the setup, status and data at a glance. Using the stylus (or navigation pushbuttons) you can directly activate the indicated features (except those with dashed lines in Fig. 4). You can check the generator and loudspeaker signal level by tapping the Generator icon to switch the generator on and off.
2-channel measurements (Type 2270 only) are as easy as single-channel measurements with the advantage that you can reduce the total measurement time by measuring source and receiver positions simultaneously or by measuring two positions in the same room simultaneously.

Reverberation Time

Reverberation time (RT) is an important parameter describing the acoustic quality of a room or space. It is important for sound levels, speech intelligibility and the perception of music. In building acoustics, it is used to correct for the effects of RT on building acoustics and sound power measurements.

Reverberation Time is the decay time for sound in a room after the excitation stops. It is the time for a 60 dB drop in level, but the decay is usually measured over a 20 or 30 dB drop and then extrapolated to the 60 dB range. It is labelled T20 and T30, respectively, for those two evaluation ranges.

Reverberation time varies between positions in a room, so it is usually measured at several positions. The average can be determined for the RT spectra, or the decays for each frequency band can be averaged and the reverberation time spectrum then calculated for the averaged decays (ensemble average).

Reverberation time can be measured by using either impulsive excitation (Schroeder Method), from a starting pistol or balloon burst, or interrupted noise.

All it takes to measure reverberation time is to press the Start/Pause pushbutton (and burst the balloon in the case of impulsive excitation). Reverberation times from 0.1 to up to 30 seconds are then measured at peak sound levels up to 143 dB. No trial measurements, no overloads, and the ‘traffic light’ clearly shows the measurement status from a distance.

A Reverberation time spectrum, showing T20 and T30, is shown in Fig. 8 (left). A reverberation decay curve for a 1/3-octave band is included in Fig. 8 (centre) and an overview of results at one frequency band is included in Fig. 8 (right).
Calculations

Standards
Even though the measurement functions (L1, L2, B2, T2) are the same for any building acoustics measurement, the detailed measurement setup and calculation procedures depend on your national building regulations. To ensure that your measurements comply, select the relevant standard before you save your first measurement. This will automatically activate the required setup for measurement and calculation. An overview of the available standards is shown in Table 1 (page 9), and the calculated parameters in Table 2 (page 10).

Results
In addition to measurement data, you may also need the receiving room volume and the partition area for some calculations. These can be entered using the stylus or navigation pushbuttons on the appropriate instrument display page. You may want to reuse some of your earlier measurements (like a T2 spectrum known from a similar receiving room), to save time. This is also possible, by using a reuse facility in the Explorer display.

The calculations use a reference curve for frequency weighting of the sound reduction spectrum, resulting in a single number like \( R'w = 52 \text{ dB} \) (the weighted field sound reduction index according to the ISO 140–4). This means that you will know on site whether your construction under test fulfils the minimum requirements of the local building regulations. Examples of final results are shown in Fig. 9.
Other Tasks

Facade Sound Insulation
Facade sound insulation is a variant of airborne sound insulation, with its own standards. The “source room” is the space outside the facade, and the sound source may be road traffic or a loudspeaker representing outdoor noise. When using traffic noise, the indoor and outdoor sound levels must be measured simultaneously, requiring 2-channel measurements (Type 2270 only).

Impact Sound Insulation
Impact sound is typically caused by footsteps, and to measure impact sound insulation a standardized impact sound source (tapping machine) is placed in the source room. The receiving room levels are measured as for airborne sound insulation, with several positions of the tapping machine. Calculations are like those for airborne sound insulation, except the results represent absolute (not relative) levels.

Wireless Systems

In the field, using Wireless Audio System Kit UL-0256 can speed up measurements by reducing the number of cables and make it easier for you to control the amplifier when not in the same room.

Fig. 10
Optional wireless systems are available to control the sound source for airborne and impact sound insulation measurements

Annotating your Measurement Data

Measurement Partner Field App is the recommended solution for on-site annotation of your measurement data.

Measurement Partner Field App
Measurement Partner Field App transforms the way you work with your hand-held analyzer. It is an advanced companion app for the sound and vibration professional offering:
• Remote analyzer control
• Remote display
• Remote annotation of measurement data
• Cloud support

Whenever you stand next to your analyzer to operate it, you disturb the sound field. Therefore, we have released a field app that lets you stay away from your analyzer. Once your analyzer is powered on, you can wirelessly connect to it using Wireless USB-A Adapter UL-1050 for G4, Ethernet CF Card UL-1019 for G3.
Once connection is made to the analyzer, you are ready to start, stop and pause your measurement from a safe distance. During noise measurements, the instantaneous LAF profile is displayed on the field app. During vibration measurements, the Fast inst. profile is shown.

This allows you to keep an eye on the status of your measurement without being close to the analyzer. This is particularly important when low noise levels are being measured such as for indoor measurements.

MP Field App supports notes, voice commentary, image, video and GPS annotations. All annotations can be uploaded to MP Cloud for merging with the project in Measurement Partner Suite.

It is also possible to annotate your measurements directly on the analyzer using notes, voice commentaries and images (Type 2270 only). These are transferred to Measurement Partner Suite along with your measurement data.

### Uploading Measurement Data to Measurement Partner Cloud

Types 2250 and 2270 can send measurement data to Measurement Partner Cloud (MP Cloud) where projects are immediately available for post-processing, sharing or storage subject to account capacity. Only authorized users have access to the data when it is the MP Cloud.

You can create a Cloud account by visiting the MP Cloud web service at cloud.bksv.com. You open an account, register your analyzer serial numbers and perform a one-time pairing of analyzer and account, ensuring data security. You can also administer access to the account from the web service and order subscriptions to increase account capacity.

You can connect the hand-held analyzer to the Internet through modem, LAN or Wi-Fi connected to router. In the field, the analyzer can connect through Wi-Fi to hotspot on a smart device (Wi-Fi using CF-card UL-1019 for G1-G3 and Wireless USB-A Adapter UL-1050 for G4, respectively).

After measurement is completed and the project is saved, you log the analyzer into the cloud, and projects are uploaded to the cloud from the analyzer. To do this, you simply need to move your data to the Cloud folder, which is automatically created when you log on to your account. The data will now be ready for post-analysis in Measurement Partner Suite by anyone who has access to the relevant Cloud archive.
Post-processing Software

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

The free, basic configuration provides data archive, preview and export capabilities, software maintenance and online display. Archives can be stored locally, on network drives or, alternatively, in MP Cloud for easy sharing with anyone on the planet.

Measurement Partner Suite also merges Field App annotations with the corresponding instrument project.

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

Reviewing and Reporting using Qualifier Type 7830

With Qualifier Type 7830, you can view, recalculate, document and report data. Measured and calculated data are viewed just as with Types 2250 and 2270. Qualifier’s Project Tree enables easy browsing and copy/pasting across data folders. Selected data can be displayed as tables, 3D plots and graphs. Editing options include adjustment of reverberation decay graphical alignment, manual data entries, copy/paste data and changing the calculation standard (where compatible). All changes to data are annotated accordingly.

Qualifier also allows you to report your calculations (or recalculation) using templates based on specific standards. Templates are available for a selection of national and international standards. You can also customize a template to include your company’s logo in the report, or create a report from a blank report template.
### Building Acoustics Measurement Standards

**Table 1  Building acoustics standards supported by BZ-7228 and Qualifier Type 7830**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>ISO</th>
<th>DIN</th>
<th>ÖNORM</th>
<th>UNI</th>
<th>BS</th>
<th>BREW</th>
<th>SS</th>
<th>Sia</th>
<th>NF-S31</th>
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<td>$R'_{L'n}$</td>
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<td>$LnT$</td>
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<td>$LnT$</td>
<td>$DnT$</td>
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<td>EN 20140–3</td>
<td>S 5101</td>
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<td>NBeca-88</td>
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<td>NPR 5079</td>
</tr>
</tbody>
</table>

* Partially fulfilled (does not support correction of the result for the contribution of flanking transmission).
Brüel & Kjær provides a wide range of accessories (Fig. 14) to help you build a complete building acoustics measurement system, such as:
- Power amplifier and a choice of sound sources
- Tapping machine for impact sound insulation measurements
- Tripods, extension cables and flat cables
- Microphone and cable for 2-channel applications
- Wireless transmission of generator signal and wireless remote control of tapping machine
- Rotating microphone boom
- Calibrators

The combination of cables and accessories necessary will depend on whether it is a single- or 2-channel measurement, whether wireless transmission of the generator signal is being used and the layout of the partition and rooms being measured.
Fig. 14
Accessories for building acoustics measurements

Accredited Calibration Services at Brüel & Kjaer

Ensure traceable measurement history from day one with accredited calibration for your Type 2250/2270. We recommend calibration at a Brüel & Kjær ISO 7025 certified laboratory biannually or annually. Any errors detected during calibration will be repaired prior to returning the instrument to you.
Compliance with Environmental Standards

The CE marking is the manufacturer’s declaration that the product meets the requirements of the applicable EU directives.
RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME.
China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People’s Republic of China.
WEEE mark indicates compliance with the EU WEEE Directive.

Safety

EN/IEC 61010–1, ANSI/UL 61010–1 and CSA C22.2 No.1010.1: Safety requirements for electrical equipment for measurement, control and laboratory use.

EMC Emission

EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments.
EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements.
CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits.
IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards.

EMC Immunity

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.

Temperature

Operating Temperature: –10 to +50 °C (14 to 122 °F).
Storage Temperature: –25 to +70 °C (–13 to 158 °F).

Humidity

IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at +40 °C (104 °F)). Recovery time 2 ~ 4 hours.

Mechanical

Non-operating:
IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s², 10 – 500 Hz.
IEC 60068–2–27: Bump: 1000 bumps at 400 m/s².
IEC 60068–2–27: Shock: 1000 m/s², 6 directions.

Enclosure

IEC 60529 (1989): Protection provided by enclosures: IP 44.

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

General Specifications

Transducer

SUPPLIED TRANSDUCER
One of the Following Microphones:
- Type 4189: Prepolarized Free-field ½” Microphone
- Type 4190: Free-field ½” Microphone
- Type 4966: Free-field ½” Microphone
Nominal Open-circuit Sensitivity: 50 mV/Pa (corresponding to –26 dB re 1 V/Pa) ±1.5 dB
Capacitance: 14 pF (at 250 Hz)

SUPPLIED MICROPHONE PREAMPLIFIER
Part No.: ZC-0032
Nominal Preamplifier Attenuation: 0.25 dB
Connector: 10-pin LEMO
Extension Cables: Up to 100 m in length between the microphone preamplifier and Type 2250/2270, without degradation of the specifications.

MICROPHONE POLARIZATION VOLTAGE
Selectable between 0 V and 200 V

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

<table>
<thead>
<tr>
<th>Weighting</th>
<th>Microphone</th>
<th>Electrical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>“A”</td>
<td>14.6 dB</td>
<td>12.4 dB</td>
<td>16.6 dB</td>
</tr>
<tr>
<td>“B”</td>
<td>13.4 dB</td>
<td>11.5 dB</td>
<td>15.6 dB</td>
</tr>
<tr>
<td>“C”</td>
<td>13.5 dB</td>
<td>12.9 dB</td>
<td>16.2 dB</td>
</tr>
<tr>
<td>“Z” 5 Hz–20 kHz</td>
<td>15.3 dB</td>
<td>18.3 dB</td>
<td>20.1 dB</td>
</tr>
<tr>
<td>“Z” 3 Hz–20 kHz</td>
<td>15.3 dB</td>
<td>25.5 dB</td>
<td>25.9 dB</td>
</tr>
</tbody>
</table>

Hardware Interface

PUSHBUTTONS
11 buttons with backlight, optimized for measurement control and screen navigation.

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

STATUS INDICATORS
LEDs: Red, yellow and green.

DISPLAY
Type: Transflective back-lit colour touchscreen 240 x 320 dot matrix.
Colour Schemes: Five different – optimized for different usage scenarios (day, night, etc.).
Backlight: Adjustable level and time.
**USER INTERFACE**

Measurement Control: Using pushbuttons
Set-up and Display of Results: Using stylus on touchscreen or pushbuttons
Lock: Pushbuttons and touchscreen can be locked and unlocked

**USB INTERFACE**

USB 2.0 OTG Micro AB and USB 2.0 Standard A sockets for Wireless USB-A Adapter UL-1050, printer or weather station

**MODEM INTERFACE**

Connection to Internet through GPRS/EDGE/HSPA modem connected through the USB Standard A Socket.
Supports DynDNS for automatic update of IP address of host name

**PRINTER INTERFACE**

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

**MICROPHONE FOR COMMENTARY**

Microphone, which utilizes automatic gain control (AGC), is incorporated in underside of analyzer. Used to create voice annotations for attaching to measurements

**CAMERA (TYPE 2270 ONLY)**

Camera with fixed focus and automatic exposure is incorporated in underside of analyzer. Used to create image annotations for attaching to measurements

**LAN INTERFACE SOCKET**

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

**INPUT SOCKET**

One socket with Type2250; two with Type2270

- Connector: Triaxial LE MO
- Input Impedance: ≥1 MΩ
- Direct Input: Max. input voltage: ±14.14 V<sub>peak</sub>
- CC LD Input: Max. input voltage: ±7.07 V<sub>peak</sub>
- CC LD Current/voltage: 4 mA/25 V

**TRIGGER SOCKET**

- Connector: Triaxial LE MO
- Max. Input Voltage: ±20 V<sub>peak</sub>
- Input Impedance: >47 kΩ
- Precision: ±0.1 V

**OUTPUT SOCKET**

- Connector: Triaxial LE MO
- Max. Peak Output Level: ±4.46 V
- Output Impedance: 50 Ω

**HEADPHONE SOCKET**

- Connector: 3.5 mm Minijack stereo socket
- Max. Peak Output Level: ±1.4 V
- Output Impedance: 32 Ω in each channel

**Storage**

**INTERNAL FLASH-RAM (NON-VOLATILE)**

512 MB for user set-ups and measurement data

**EXTERNAL MEMORY CARD**

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

**USB MEMORY STICK**

For store/recall of measurement data

**Power**

**EXTERNAL DC POWER SUPPLY REQUIREMENTS**

Used to charge the battery pack in the analyzer

- Voltage: 8 – 24 V DC, ripple voltage <20 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 V AC; 47 – 63 Hz
- Connector: 2-pin IEC 320

**BATTERY PACK**

Rechargeable Li-Ion battery

- Part No.: QB-0061
- Voltage: 3.7 V
- Capacity: 5200 mAh nominal

**Typical Operating Time:**

- Single-channel: >11 h (screen backlight dimmed); >10 h (full screen backlight)
- Dual-channel: >10 h (full screen backlight)

**Battery Cycle Life**: >500 complete charge/discharge cycles

**Battery Aging**: Approximately 20% loss in capacity per year

**Battery Indicator**: Remaining battery capacity and expected working time may be read out in % and in time

**Battery Fuel Gauge**: The battery is equipped with a built-in fuel gauge, which continuously measures and stores the actual battery capacity in the battery unit

**Charge Time**: In analyzer, typically 10 hours from empty at ambient temperatures below 30 °C (86 °F). To protect the battery, charging will be terminated completely at ambient temperatures above 40 °C (104 °F). At 30 to 40 °C, charging time will be prolonged. With External Charger ZG-0444 (optional accessory), typically 5 hours

**Note**: It is not recommended to charge the battery at temperatures below 0 °C (32 °F) or over 50 °C (122 °F). Doing this will reduce battery lifetime

**CLOCK**

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

**Environmental**

**WARM-UP TIME**

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

**WEIGHT AND DIMENSIONS**

650 g (23 oz) including rechargeable battery

300 × 93 × 50 mm (11.8 × 3.7 × 0.94") including preamplifier and microphone

**Software Interface**

**USERS**

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

**PREFERENCES**

Date, time and number formats can be specified per user

**LANGUAGE**

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

**HELP**

Concise context-sensitive help in Chinese (People’s Republic of China), English, French, German, Italian, Japanese, Polish, Romanian, Serbian, Slovenian, Spanish and Ukrainian
UPDATE OF SOFTWARE
Update to any version using BZ-5503 through USB or update via Internet

REMOTE ACCESS
Connect to the analyzer using:
• Measurement Partner Suite BZ-5503
• Measurement Partner Field App (iOS or Android smartphone app)
• the 2250/2270 SDK (software development kit)
• a REST interface through HTTP
• an Internet browser supporting JavaScript
The connection is password protected with two levels of protection:
• Guest level: for viewing only
• Administrator level: for viewing and full control of the analyzer

CLOUD
Connect to Measurement Partner Cloud on cloud.bksv.com for transferring data to an archive in the cloud for storage or easy synchronization with Measurement Partner Suite BZ-5503

Input
DUAL CHANNELS (Type 2270 only)
All measurements are made from either Ch. 1 or Ch. 2 or both simultaneously

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

CORRECTION FILTERS
For microphone Types 4189, 4190, 4191, 4192, 4193, 4950, 4952, 4964 and 4966, BZ-7228 is able to correct the frequency response to compensate for sound field and accessories

Calibration
Initial calibration is stored for comparison with later calibrations

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

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

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

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

PROJECT TEMPLATE
Defines the display and measurement set-ups. Set-ups can be locked and password-protected

PROJECT
Measurement data for all positions defined in source room (L1) and in receiving room (L2, B2 and T2) are stored with the Project Template

JOB
Projects are organized in jobs.
Explorer facilities for easy management of data (copy, cut, paste, delete, rename, open project, create job, set default project name)

REUSE OF DATA
Data for L1, B2 or T2 in one project can be re-used in another project

Measurement Control

Measurement Sequence: Supports measuring:
• at all microphone positions before using another source
• at a microphone position for all sources before measuring at a new position
• at subsequent microphone positions without source information
• at manually selected source and microphone positions
Measurements are started manually and can be automatically stored on completion of measurement

Generator (L1, L2 and T2): The noise generator is turned on and off automatically

Escape Time: 0 to 60 s
Build-up Time: 1 to 10 s
The generator can be turned on and off manually for checking equipment and sound levels

EXCITATION T2
Interrupted Noise: Measurements are started manually and can be automatically stored on completion of measurement

Number of Decays per Measurement: 1 to 100, ensemble averaged into one decay

Impulse: Manual start of first measurement. When level (say from starter pistol) exceeds the user-selected trigger level, the decay is recorded and backwards integration performed ( Schroeder method).
The trigger can then be armed automatically for measuring at the next position

Signal Recording: Recording of the Z-weighted measured signal can be done at each position*

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

Measurement Status

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

TRAFFIC LIGHTS
Red, yellow and green LEDs show measurement status and instantaneous overload as follows:
• Yellow LED flashing every 5 s = stopped, ready to measure
• Green LED flashing slowly = awaiting 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

NOTIFICATIONS
 Sends an SMS or email daily at a specified time or if an alarm condition is fulfilled

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

Annotations

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

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

Gain Adjustment: –60 dB to +60 dB

*Signal recording requires an SD card or USB stick for data storage and a license for Signal Recording Option BZ-7226
Specifications – Building Acoustics Software BZ-7228

Specifications apply to BZ-7228 unless otherwise stated.

2-channel Option BZ-7229 is for Type 2270 only

Standards
Conforms with the relevant parts of the following:
- IEC61672–1 (2013) Class 1
- IEC 60651 (1979) plus Amendment 1 (1993–02) and Amendment 2 (2000–10), Type 1
- ANSI S1.4–1983 plus ANSI S1.4A–1985 Amendment, Type 1
- IEC 61260–1 (2014), 1/1-octave Bands and 1/3-octave Bands, Class 1
- IEC 61260 (1995–07) plus Amendment 1 (2001–09), 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI S1.11–1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0–C
- ANSI S1.11–2004, 1/1-octave Bands and 1/3-octave Bands, Class 0
- ANSI/ASA S1.11–2014 Part 1, 1/1-octave Bands and 1/3-octave Bands, Class 1
- ISO 16283, ISO 140, SS, DIN, Önorm, BS, BREW, Sia, UNI, NF-S31, NBE, NEN, NEN'06, ASTM, see tables under “Building Acoustics Standards”

Frequency Analysis

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

MEASURING RANGES
When using Microphone Type 4189:
- Dynamic Range: From typical noise floor to max. level for a pure tone signal at 1 kHz 1/3-octave:
  - Single Range: 1.1 to 140 dB
  - High Range: 11.3 to 140 dB
  - Low Range: 1.1 to 110 dB
- Linear Operating Range: In accordance with IEC 61260:
  - Single Range: ±20.5 to 140 dB
  - High Range: ±39.1 to 140 dB
  - Low Range: ±20.5 to 110 dB

Internal Generator
Built-in pseudo-random noise generator
- Spectrum: Selectable Pink or White
- Crest Factor:
  - Pink Noise: 4.4 (13 dB)
  - White Noise: 3.6 (11 dB)
- Bandwidth: Follows measurement frequency range
- Lower Limit: 50 Hz (1/3-oct.) or 63 Hz (oct.)
- Upper Limit: 10 kHz (1/3-oct.) or 8 kHz (oct.)
- Output Level: Independent of bandwidth
- Max.: 1 \( V \) (0 dB)
- Gain Adjustment: –80 to 0 dB
When bandwidth is changed, the level for all bands is automatically adjusted to comply with the set output level
- Correction Filters: For sound sources Type 4292-L, Type 4295 and Type 4296: Flat or Optimum
- Turn-on Time and Turn-off Time: Equivalent to RT = 70 ms
- Repetition Period: 175 s
- Output Connector: Output Socket
- Control: See Measurement Control

External Generator
Selective as alternative to internal generator
For controlling external noise generator
- Levels: 0 V (Generator off), 3.3 V (Generator on)
- Rise-time and Fall-time: 10 \( \mu \)s
- Control: See Measurement Control

Measurements
Measurements are done at a number of positions and categorized in functions (L1 for source room levels, L2 for receiving room levels, B2 for receiving room background noise levels and T2 for receiving room reverberation time measurements)

LEVELS L1, L2 AND B2
- \( L_{AF} \) spectrum for display only
- \( L_{Zeq} \) in 1/1-octave or 1/3-octave bands
- L1 and L2 simultaneously or as single channels
- Averaging time: 1 s to 1 h
Range (L1 and L2 simultaneously only): Auto-range or manually set to High Range or Low Range

Averaging: Up to 10 source positions each with up to 10 measurement positions or up to 100 measurements may be averaged

Status Indications: Overload, under range, etc.

Crosstalk:
- 5 Hz – 10 kHz < -110 dB
- 10 kHz – 20 kHz < -100 dB

REVERBERATION TIME T2
T20 and T30 in 1/1-octave or 1/3-octave bands
Decays: $L_{Zeq}$ spectra sampled at 5 ms intervals
Evaluation Range: –5 to ~25 dB for T20 and –5 to ~35 dB for T30
Measurement Time: Automatic selection of measurement time for the decays based on the actual reverberation time of the room
Maximum Measurement Time: From 2 to 20 s
Averaging: T20 and T30 measurements can be averaged (arithmetic averaging or ensemble averaging)
T20 and T30 Calculation: From slope in evaluation range
Slope Estimation: Least squares approximation
Quality Indicators: Quality indicators with status information like Overload, Curvature in %, etc.; extensive list of status information.
Quality indicators are available on reverberation time spectra for each frequency band, and as overall quality indicators for each measurement position and for the averaged result

Reverberation Time Range: Max. 30 s, min. 0.1 –0.7 s, depending on bandwidth and centre frequency

Manual Data Entry: A T2 value may be entered in any frequency band of a measured spectrum

Measurement Displays

OVERVIEW
Table of measurement positions for each function (L1, L2, B2 or T2) with readout for selectable frequency band on each position together with quality indicator.
Positions can be included/excluded from average

SOUND LEVEL SPECTRUM
$L_{Zeq}$ spectrum plus A and C broadband bars
$L_{Zeq}$ spectrum for L1@Pos, L2@Pos, B2@Pos, L1, L2, B2, L1-L2, L2-B2
Y-axis: Range: 5, 10, 20, 40, 60, 80, 100, 120, 140 or 160 dB. Auto-zoom or auto-scale available
Cursor: Readout of selected band quality indicator for each frequency band

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

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

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

Result Displays

OVERVIEW
Table of measurement positions for all functions (L1, L2, B2 or T2) with readout of quality indicators.
Positions can be included/excluded from result

CALCULATIONS
Shows the sound reduction index (spectrum and weighted) according to the selected standard, along with the reference curve (if any), or deviations (from the reference curve). See Table 2 under “Building Acoustics Measurement Standards”

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

Software Specifications – Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 is enabled with a separate license. It works with all analyzer software: Sound Level Meter, Frequency Analysis, and Logging Software, Enhanced Logging Software and Reverberation Time Software.
For data storage, signal recording requires:
- SD Card
- USB Memory Stick

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

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

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

<table>
<thead>
<tr>
<th>Sampling Rate (kHz)</th>
<th>Maximum Pre-recording (s)</th>
<th>Sound Quality</th>
<th>Memory (KB/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>470</td>
<td>Low</td>
<td>16</td>
</tr>
<tr>
<td>16</td>
<td>230</td>
<td>Fair</td>
<td>32</td>
</tr>
<tr>
<td>24</td>
<td>150</td>
<td>Medium</td>
<td>48</td>
</tr>
<tr>
<td>48</td>
<td>70</td>
<td>High</td>
<td>96</td>
</tr>
</tbody>
</table>
Specifications – Qualifier Type 7830

STANDARDS
See Tables 1 and 2 under “Building Acoustics Measurement Standards”

LANGUAGES
English, French, German, Italian and Spanish

VIEWS
Result Level Views: A collection of views showing the resulting single values, reduction curve and underlying average curves (L1, L2, B2 and T20/T30)

Average Level Views: Each of the parameters (L1, L2 and B2) has a corresponding view showing all of the measurement curves included in the average calculation and a view of the resulting average curve. In T20/T30 Average mode, it is possible to see all of the T20/T30s included in the average calculation. In Ensemble Average mode, it is possible to see the averaged 3D and averaged single frequency decay curves. Both modes gives the user the ability to see the resulting T20/T30 spectrum

Position Level Views: Each of the level measurements (L1, L2 and B2) can be viewed as a spectrum. In addition, the T2 reverberation measurement can be viewed as 3D-multispectra and as single frequency decay curves. Furthermore it is possible to see the calculated T20/T30 spectrum

Data Sheets: All of the measurement and the most relevant intermediate and final results can be viewed as values in a table (not decays)

CURSOR READ-OUT
All curves have cursor read-out

MANUAL INPUT
Allows graphical input and modification of the regression line in reverberation decay curves. Calculated sound reduction curves can also be adjusted graphically (The impact on the single value index is shown simultaneously). To give maximum flexibility, position, average and calculated data can be overridden by manually inputting data in the data sheets

CALCULATIONS
Supports calculation of insulation and reverberation tasks. Insulation calculations include airborne and impact sound insulation (lab/field). In addition, airborne facade calculation is supported.

REPORT GENERATION
Based on document templates it is possible to make reports conforming to the supported standards

OUTPUT
Relevant views and sheets can be printed or exported to the clipboard. Text or graphs may be transferred to word processors in RTF (Rich Text Format)

HELP
Online context-sensitive and user guide

DATA TRANSFER
• Via USB using Measurement Partner Suite BZ-5503

MINIMUM PC
• Windows® 7, 8 or 8.1 (all in 32-bit or 64-bit versions)
• Intel® Core™ i3
• 2GB RAM
• Sound card
• DVD drive
• Mouse

Specifications – Measurement Partner Suite BZ-5503

BZ-5503 is included with Types 2250 and 2270 for easy synchronization of setups and data between the PC and hand-held analyzer. BZ-5503 is supplied on ENV DVD BZ-5298

PC REQUIREMENTS
Operating System: Windows® 7, 8.1 or 10 (all in 32-bit or 64-bit versions)
Recommended PC:
• Intel® Core™ i3
• Microsoft®.NET 4.5
• 2 GB of memory
• Sound card
• DVD drive
• At least one available USB port
• Solid State Drive

ONLINE DISPLAY OF TYPE 2250/2270 DATA
Measurements on the analyzer can be controlled from the PC and displayed online with the PC, using the same user interface on the PC as on the analyzer

Display: 1024 x 768 (1280 x 800 recommended)

DATA MANAGEMENT
Explorer: Facilities for easy management of analyzers, users, jobs, projects and project templates (copy, cut, paste, delete, rename, create)
Data Viewer: View measurement data (content of projects)
Synchronization: Project templates and projects for a specific user can be synchronized between PC and analyzer and between local and cloud archives. Measurement Partner Suite BZ-5503 merges Measurement Partner Field App annotations with the corresponding analyzer project

USERS
Users of Type 2250/2270 can be created or deleted

EXPORT FACILITIES
Excel®: Projects (or user-specified parts) can be exported to Microsoft® Excel® (Excel 2003 – 2016 supported)
Bruel & Kjaer Software: Projects can be exported to Predictor-LimA Type 7810, Acoustic Determinator Type 7816, Protector Type 7825, Qualifier (Light) Type 7830 (7831), PULSE Mapping for Hand-held Sound Intensity Type 7962/7752/7761 or PULSE Reflex

POST-PROCESSING
Measurement Partner Suite is a suite of modules, including post-processing tools for data acquired with Type2250/2270. The following post-processing modules are available:
• Logging Module BZ-5503-A
• Spectrum Module BZ-5503-B
• WAV File Analysis Module BZ-5503-C

These modules help to assess logging data and measured spectra, such as calculating contribution from markers on a logging profile or correcting spectra for background noise

HAND-HELD ANALYZER SOFTWARE UPGRADES AND LICENSES
The software controls analyzer software upgrades and licensing of the analyzer applications

INTERFACE TO HAND-HELD ANALYZER
USB, LAN or Internet connection

* Not all data are available in all exports. The data exported are dependent on the type and target of the export.
LICENSER MOVER
To move a license from one analyzer to another use BZ-5503 together with License Mover VP-0647

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

HELP
Concise context-sensitive help in English

Ordering Information

Building Acoustics Kits
The following kits are designed to provide Type2250 and Type2270 users with the necessary accessories to perform single-channel building acoustics measurements:

BZ-7228-200 Building Acoustics Kit for single-channel airborne sound insulation

includes:
• BZ-7228: Building Acoustics Software (includes Reverberation Time Software BZ-7227)
• Type 2734-A: Power Amplifier
• Type 4292-L: OmniPower™ Sound Source (tripod and carrying bag KE-0462 included)
• AO-0523-D-100: Signal Cable, Triaxial LEMO to XLR3M, 10 m (33 ft)
• AQ-0673: Speaker Cable, speakON® 4-pin (M) to speakON 4-pin (M), 10 m (33 ft)
• KE-0364: Carrying bag for Type4292-L Tripod
• UA-0801: Tripod for Type 2250

Note: Flight case KE-0449 for OmniPower sound source must be purchased separately

BZ-7228-300 Building Acoustics Kit for single-channel airborne or impact sound insulation

includes the same items as BZ-7228-200 plus:
• Type 3207: Tapping Machine
• UA-1477: Battery Kit for Type 3207

TWO-CHANNEL MEASUREMENTS
Type 2270 users ONLY can upgrade a BZ-7228-200 or BZ-7228-300 kit to perform 2-channel building acoustics measurements with a combination the following accessories, depending on your measurement scenario:
• BZ-7229: 2-channel Option
• Type 4189: Prepolarized Free-field ½” Microphone
• AO-0697-D-100: Microphone Extension Cable, 10-pin LEMO, 10 m (33 ft)
• AR-0199: Flat Cable, 10-pin LEMO, 0.5 m (1.64 ft)
• JP-1041: Dual 10-pole Adapter Cable
• UA-0801: Lightweight Tripod
• UA-1317: ½” Microphone Holder
• ZC-0032: Microphone Preamplifier

For help determining the type and quantity of required accessories, please contact your local Brüel & Kjær sales representative

Software and Accessories Available Separately

SOFTWARE MODULES
BZ-7228 Building Acoustics Software for Types 2250 and 2270
BZ-7228-100 Upgrade of Reverberation Time Software BZ-7227 to Building Acoustics Software BZ-7228
BZ-7229 2-channel Option Type 2270
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-7230 FFT Analysis Software
BZ-7231 Tone Assessment Option
BZ-7234 Low Frequency Option

PC SOFTWARE
BZ-5503-A Measurement Partner Suite, Logging Module
BZ-5503-B Measurement Partner Suite, Spectrum Module
BZ-5503-C Measurement Partner Suite, WAV file analysis module
Type 7830 Qualifier

MEASUREMENT ACCESSORIES
Type 3923 Rotating Microphone Boom
Type 4231 Sound Calibrator
AO-0440-D-015 Signal Cable, LEMO to BNC, 1.5 m (5 ft)
AO-0646 Sound Cable, LEMO to Minijack, 1.5 m (5 ft)
AO-0697-030 Microphone Extension Cable, 10-pin LEMO, 3 m (10 ft)
AO-0697-100 Microphone Extension Cable, 10-pin LEMO, 10 m (33 ft)

AR-0199 Flat Cable, 10-pin LEMO, 0.5 m (1.64 ft)
JP-1041 Dual 10-pole Adapter Cable
KE-0449 Flight case for OmniPower Sound Source
UA-0587 Tripod
UA-0801 Lightweight Tripod
UA-1317 ½” Microphone Holder
UA-1404 Outdoor Microphone Kit
UA-1476 Wireless Remote Control Unit
UL-0256 Wireless Audio System kit, B&K specified
UL-0256-A Wireless Audio System (AKG WMS 470 Set, RF Band VII-50 mW)
UL-1009 SD Memory Card for hand-held analyzers
UL-1013 CF Memory Card for hand-held analyzers, hardware versions 1 – 3
UL-1017 SDHC Memory Card for hand-held analyzers
ZG-0444 Charger for Battery Pack QB-0061

Brüel & Kjær supplies a wide range of microphones and microphone accessories. Please contact your local Brüel & Kjær office for more information regarding the different types and their use, or visit the website at www.bksv.com.

INTERFACING
BZ-5503-D Measurement Partner Field App for iOS and Android (free download at App Store® and Google Play™)
BZ-5503-E Measurement Partner Cloud Entry Level, free cloud storage
BZ-5503-F-012 Measurement Partner Cloud Basic, basic cloud storage subscription for one year
BZ-5503-G-012 Measurement Partner Cloud Professional, enterprise cloud storage subscription for one year
AO-1449-D-010 LAN Cable
UL-0250  USB to RS-232 Converter
UL-1050  Wireless USB-A Adapter

**SOUND SOURCES**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4292-L</td>
<td>OmniPower Sound Source</td>
</tr>
<tr>
<td>4295</td>
<td>OmniSource™ Sound Source</td>
</tr>
<tr>
<td>3207</td>
<td>Tapping Machine</td>
</tr>
<tr>
<td>2734-A</td>
<td>Power Amplifier</td>
</tr>
<tr>
<td>2734-B</td>
<td>Power Amplifier with Wireless Audio System</td>
</tr>
<tr>
<td></td>
<td>UL-0256</td>
</tr>
</tbody>
</table>

For further information please refer to the Sound Sources for Building Acoustics product data, BP1689

Type 4224  Portable Battery & Mains Powered Sound Source
For further information please refer to the Sound Source Type 4224 product data, BP 0066

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**Service Products**

**ACCREDITED CALIBRATION**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>2250-CAI</td>
<td>Accredited Initial Calibration of Type 2250</td>
</tr>
<tr>
<td>2250-CAF</td>
<td>Accredited Calibration of Type 2250</td>
</tr>
<tr>
<td>2270-CAI</td>
<td>Accredited Initial Calibration of Type 2270</td>
</tr>
<tr>
<td>2270-CAF</td>
<td>Accredited Calibration of Type 2270</td>
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</tbody>
</table>

**HARDWARE MAINTENANCE**

<table>
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<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2250-EW1</td>
<td>Extended Warranty of Type 2250, one year extension</td>
</tr>
<tr>
<td>2270-EW1</td>
<td>Extended Warranty of Type 2270, one year extension</td>
</tr>
</tbody>
</table>
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