PRODUCT DATA

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

Building Acoustics is the assessment of sound insulation in buildings and building elements. It is important for the well-being of people in their homes, workplace or public venues, thus minimum standards are set in the building regulations of each country.

BZ-7228 software is available for Hand-held Analyzers Type 2250 and Type 2270. It provides the flexibility, ease of use and confidence in your results that field measurements require in building acoustics.

Type 2270 users can turn their analyzer into a 2-channel building acoustics analyzer with 2-channel Option BZ-7229.

Back at the office, Qualifier Type 7830 and PULSE Reflex Building Acoustics Type 8780 offers versatile post-processing and reporting of your measurement results.

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Uses and Features

Uses (BZ-7228)
- Measurement of:
  – Airborne sound insulation
  – Façade sound insulation
  – Impact sound insulation

Features (BZ-7228)
- Complete hand-held building acoustics analyzer
- Measures source and receiving room level spectra
  – Built-in pink and white noise generator
  – Equalisation of sound source spectra
  – Parallel or serial measurements
- Measures reverberation time spectra:
  – Impulse and Interrupted Noise methods
  – Built-in pink and white noise generator
- Measurement position management
- Calculates final results on the spot: ISO plus 12 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 (Type 2250 and 2270)
- 2-channel measurements (Type 2270 only, with BZ-7229)

Uses (Type 7830 or Type 8780)
- Building acoustics calculation
- Report generation
- Data archiving

Features (Type 7830 or Type 8780)
- Building acoustics results calculation
- Analysis and report generation in one application (Type 8780 incorporates Microsoft® Office)
- Automatic data integrity checking
- Before and after scenario combination and comparison in one project (Type 8780 only)
- ISO plus 12 national standards

Brüel & Kjær

The Hand-held Analyzers

Types 2250 and 2270 are robust, hand-held anayzer 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 make them easy to grip, hold and operate single-handedly. Their high-resolution colour touch screens show the analzyer 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 that signal recordings require the 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
Typical configuration for building acoustics measurements: sound source, generator, analyzer and PC for reporting
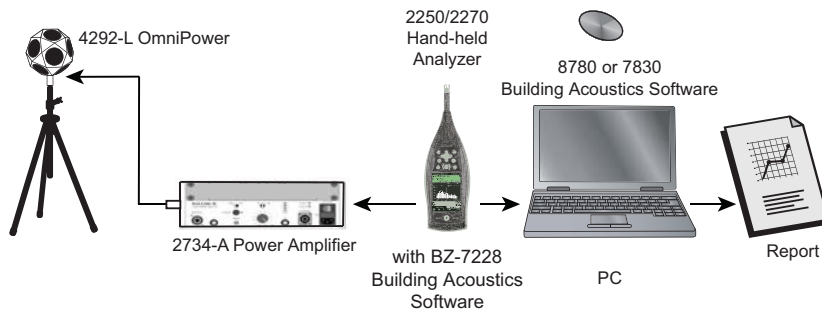
4292-L OmniPower

2734-A Power Amplifier

2250/2270 Hand-held Analyzer

with BZ-7228 Building Acoustics Software

8780 or 7830 Building Acoustics Software

PC

Report

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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.

Fig. 3
Sound source and microphone positions for measuring airborne sound insulation

*L1 = Source room level
L2 = Receiving room level
B2 = Background level
T2 = Reverberation Time*

Source Room   Partition   Receiving Room

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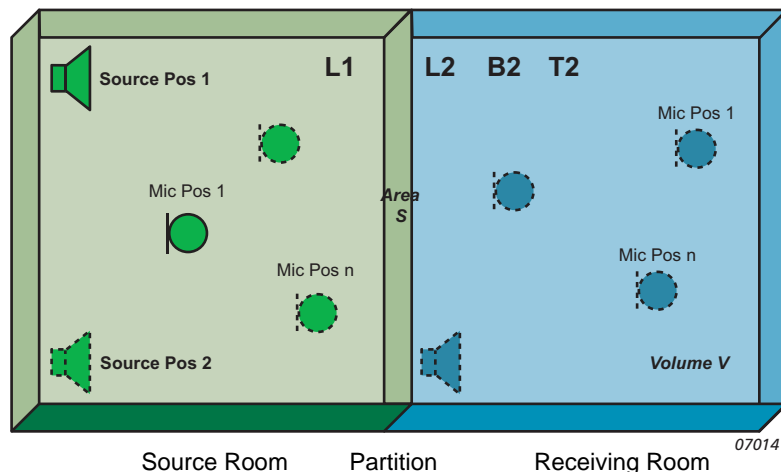
The average reverberation time spectrum, T2, is measured to correct for the amount of absorption in the receiving room. Finally, the single number result (for example: D_{nTw}) is calculated from the L1, L2, B2 and T2 spectra, and the result can then be compared with the minimum requirements stated in 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.,) may be measured in any order, to suit field conditions and your preferences. Fig. 4, Fig. 5 and Fig. 6 show typical displays when performing both single- and 2-channel building acoustics measurements.

Fig. 4 shows a typical building acoustics display when you are ready to measure the first L2 position, with source position 1.

Fig. 4
Typical single-channel display when you are ready to measure the first L2 position, with source position 1
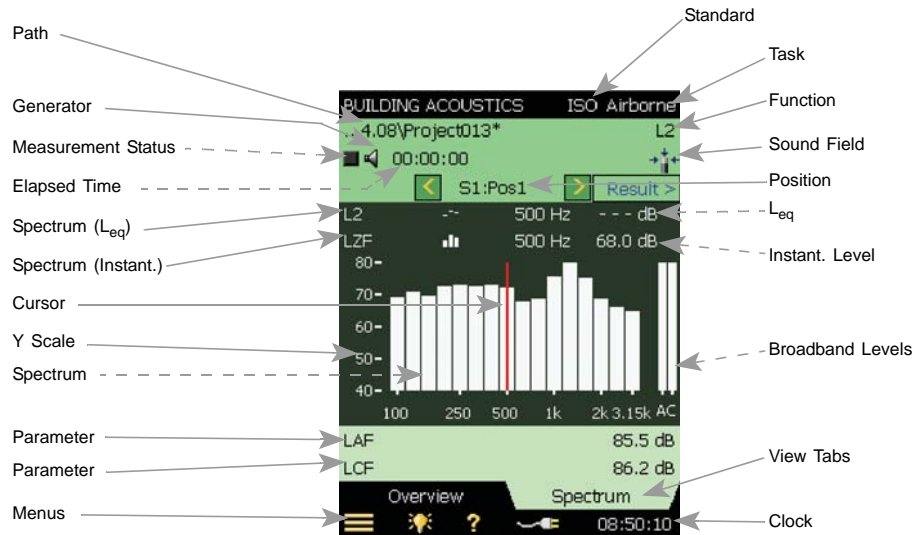

The instantaneous (live) spectrum is shown and the high-resolution, colour, touch screen shows the setup, status and data at a glance.

Using the stylus (or navigation pushbuttons) you can directly activate the indicated features (except those with dashed lines in Fig. 4 above).

You can check the generator and loudspeaker signal level by tapping the Generator icon to switch the generator on and off.

Fig. 5
Typical single-channel display
*Left: Inspection phase*
Right: Save phase
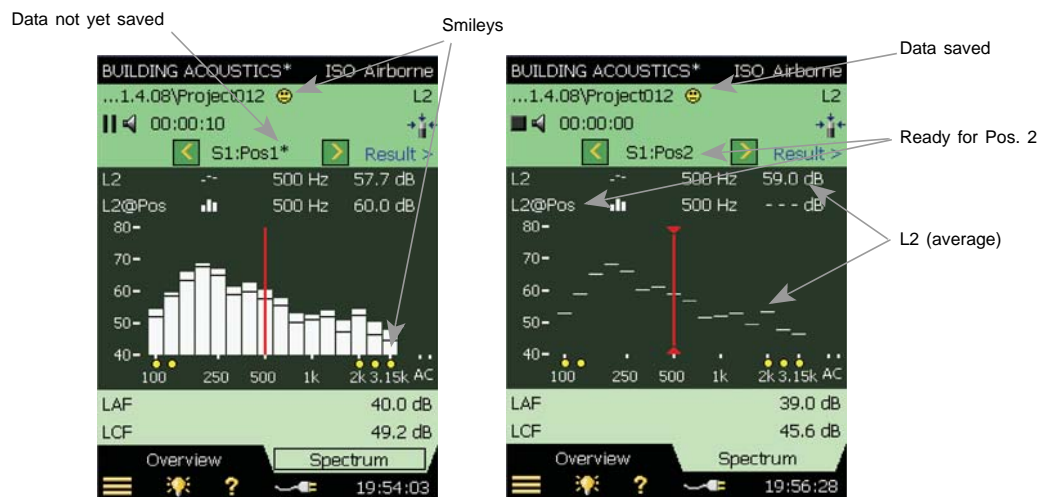
Once the spectrum at position 1 has been measured (for the preset time of 10 s), you may inspect the spectrum before saving (see Fig. 5, left).

A yellow 'smiley' icon indicates that you may be able to improve the measurement at one frequency band. Tap the smiley icon to read the explanation and take the necessary action.

Press the Save pushbutton to save the measurement (see Fig. 5, right). You are now ready to measure at position 2.
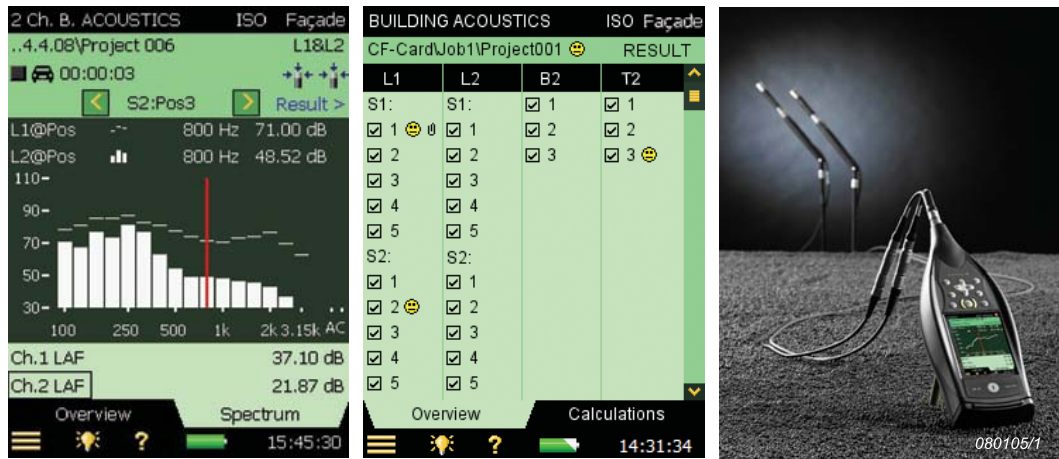
2-channel measurements (Type 2270 only) are as easy as single-channel measurements.

In Fig. 6 (left), L1 and L2 Position 3 has been measured and saved. You are now ready to measure in the next 2-channel position. The Overview tab view (Fig. 6, centre) shows all the measured and saved positions, with any smiley icons and annotations (paper clip icon). Any position may be excluded from the average calculation by tapping the check mark.

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. The Reverberation Time may range from 0.1 seconds (or less) in anechoic chambers, to 10 or more seconds in large public spaces.

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 using either Impulsive Excitation (Schroeder Method), from a starting pistol or balloon burst, or by using 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 20 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 included in Fig. 8 (left). A yellow 'smiley' icon indicates that you may be able to improve the measurement at one (or more) frequency bands – if just one position shows a red smiley, then the 'master' smiley will also be red. Tap the relevant smiley icon to read the explanation. A reverberation decay curve for 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).

Fig. 8
Reverberation time spectrum (left); reverberation decay curve (centre); and overview of results (right)
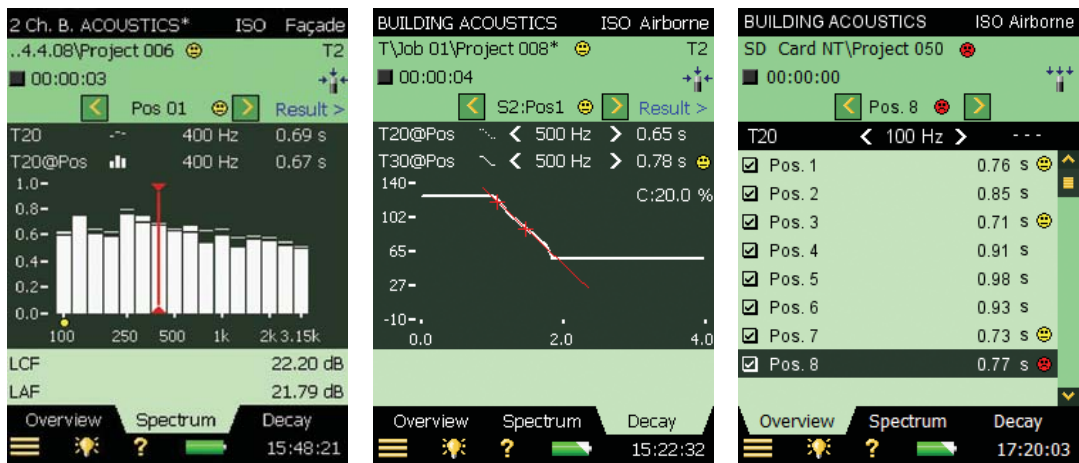
NOTE: A dedicated Reverberation Time Software module (BZ-7227) is also available. Please contact your Brüel & Kjær representative for details.

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, and the calculated parameters in Table 2 (see page 8).

Results

In addition to measurement data, you may also need the receiving room volume and the partition area for some calculations. These can of course be entered using the stylus/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 re-use 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 dB (the weighted field sound reduction index according to the ISO 140–4). This means you will know on site if your construction under test fulfils the minimum requirements of the local building regulations. Examples of final results are shown in Fig. 9.

Fig. 9
With the required data measured, final results are shown, including the reference curve. For some results the volume of the receiving room and the area of the partition must be entered
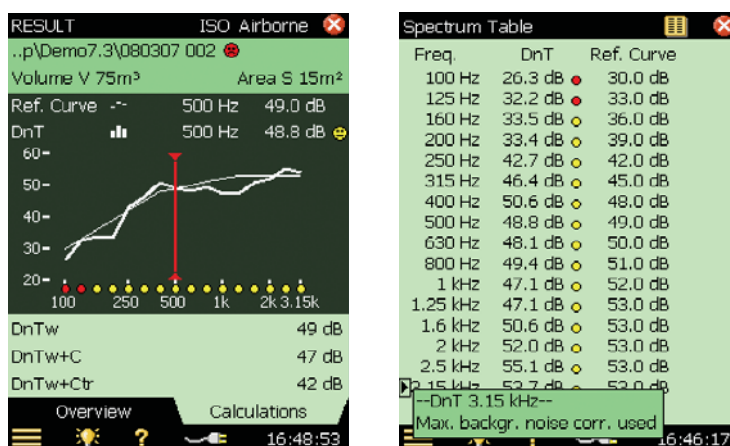
Other Tasks

Façade Sound Insulation
Façade 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). The outdoor microphone positions are flush with the facade, or 2 m in front of it. Calculations are similar to those of the airborne sound insulation, but take the pressure increase at the microphone positions into account.

Impact Sound Insulation
Impact sound is typically caused by footsteps, and to measure impact sound insulation a standardised 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

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

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In the field, using a wireless system can speed up measurements by reducing the number of cables and make it easier for you to move between microphone positions and rooms.

## Review, Analysis and Report Generation using PULSE Reflex Building Acoustics Type 8780

PULSE Reflex Building Acoustics Type 8780 is the software package for post-processing and reporting of building acoustics measurements made with Type 2250/2270. Measured data can be directly imported from Type 2250/2270 into Type 8780 for viewing, further analysis/re-analysis and reporting of data. In addition to being a post-processing tool, Type 8780 allows you to control Type 2250/2270 software upgrades as well as licensing of the Type 2250/2270 applications.

The application incorporates the following features:
- 'Fast-track' report generation using the PULSE Reflex workflow concept and a library of user-defined report templates
- Versatile handling of measurement data in combining and comparing assessments
- Interactive measurement integrity checks ensuring the best quality of calculation possible
- Available in several languages, Type 8780 can generate reports complying with national and international legislation
- Edit measurement data in the interactive display to instantly reveal which factors contribute most to your sound insulation results

Once your measurements are imported, Type 8780 will display data numerically and graphically, in one clear and concise environment, see Fig. 11.
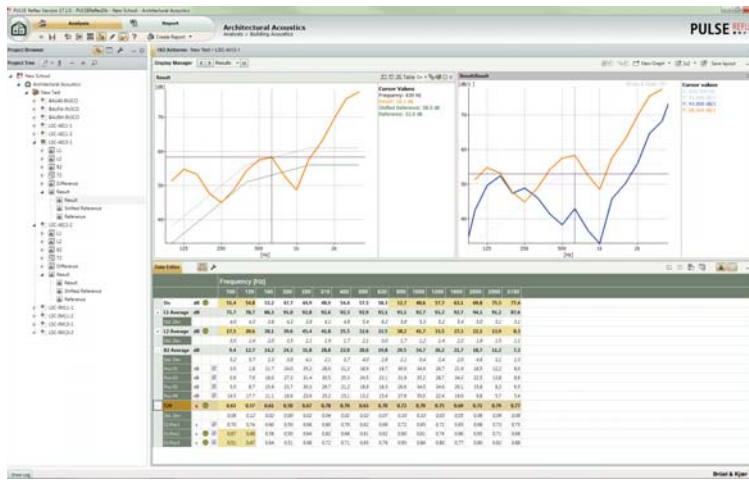
The tabular Data Editor (at the bottom of the screen) presents all measured data and calculation results in detail and provides the controls to refine data as well as to select which measurements to include in the final analysis of a partition. The table groups all information visually, making it very easy to examine detail, while at the same time seeing the overall results. In addition to the numerical data, the table also reveals the quality and status of each item using the smiley system well known from Type 2250/2270 (see Fig. 12) and by colour coding item(s).

Fig. 12
Close-up of the Data Editor table showing an example of a smiley indicator with the associated explanation

Having graphical data and numerical values displayed simultaneously makes evaluation of the data (and interactive work with the data) a very intuitive process. Changes applied in one part of the interface, such as, editing the graphs or items in a table, will immediately be reflected in the other parts.

Fig. 13
Example of a report in standard template format, for example, ISO 140. Standard templates are available for selected national and international standards. All templates can be fully customised. New templates can be derived from the delivered ones, or created from scratch
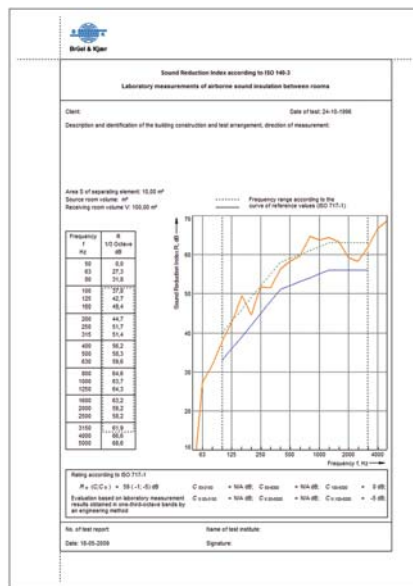
The software comes with default setups for all relevant displays for the measured data and results, so that a report is just a few clicks away. The flexibility of the software also allows you to create any type of display to combine and compare data as needed, for example to compare data from different partitions or measurements of sound insulation of a partition before and after repair. Displays can also be used to refine data quality graphically, for example, by adjusting the slope line in reverberation decays.

Reporting your Data

PULSE Reflex Building Acoustics includes a very flexible reporting module, which embeds the Microsoft® Office suite installed on your system into the PULSE Reflex environment. This means that you can fully customise your reports and you can create a new report using one of the pre-installed or self-made templates using only a few mouse clicks. See a report example in Fig. 13. Reports can remain linked to the data, so that if you need to revise your analysis, a single click will refresh the report to reflect all the changes.

Reviewing and Reporting using Qualifier Type 7830

Fig. 14
Typical building acoustics project using Type 7830
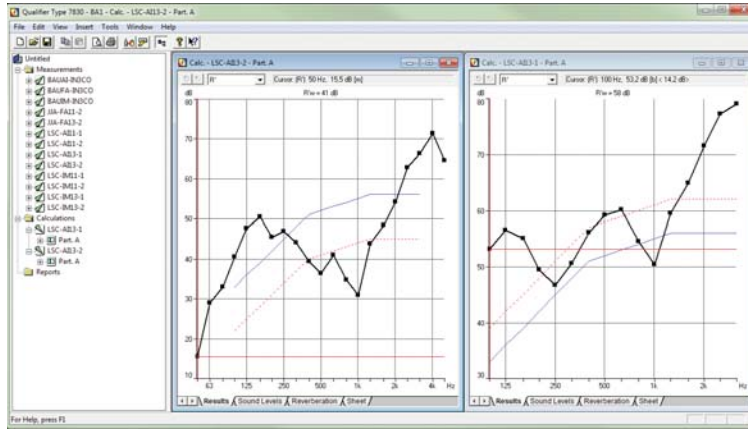
With Qualifier Type 7830, you can view, recalculate, document and report data. View measured and calculated data just as with Type 2250/2270. Qualifier's user interface provides a Project Tree for easy browsing and copy/paste across data folders. Selected data can be displayed as tables, 3D plots and 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.

Reporting Your Data

Qualifier also allows you to report your calculations (or recalculations) using templates based on specific standards such as ISO 140. Templates are available for a selection of national and international standards. You can also customise 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*

		International	Germany	Austria	Italy	UK	England Wales	Sweden	Switzerland	France	Spain	Netherlands		USA
Measurement		ISO	DIN	ÖNORM	UNI	BS	BREW	SS	Sia	NF-S31	NBE	NEN	NEN'06	ASTM
Typical Parameters		R' $L'n$	R $L'n$	DnT $L'nT$	Dn Ln	DnT $L'nT$	DnT	R' $L'n$	DnT $L'nT$	$DnAT$ $LnAT$	$DnAT$ $LnAT$	Ilu Ico	DnT,A LnT,A	FTL Ln
Airborne	Lab	10140–2[*]	EN 20140–3	S 5101	8270–1	EN 20140–3		EN 20140–3		051	74-040-84/3			
	Field	140–4	52210–1	S 5100–1	8270–4	2750–4	BREW	20140–4	181	054, -057	74-040-84/4	5077	5077	E336–90
	Façade	140–5	52210–5	S 5100–3	8270–5	2750–5		EN 20140–5	181	055, -057	74-040-84/5	5077	5077	E966–90
Impact	Lab	10140–3[*]	52210–1	S 5101	8270–6	2750–6		EN 20140–6		-052	74-040-84/6			
	Field	140–7	52210–1	S 5100–2	8270–4	2750–7		EN 20140–7	181	056, -057	74-040-84/7	5077		E1007-11
RT			3382–2	52212									5077	5077	
Rating	Airborne	717–1	52210–4	S5100–1	8270–7	5821–1, –3	BS EN 717-1	SS-ISO 717–1	181	-057	NBECA-88	5077	NPR 5079	E413–73 E1332–90
	Impact	717–2	52210–4	S5100–2	8270–7	5821–2		SS-ISO 717–2	181	-057	NBECA-88	5077		E989

[*] Partially fulfilled.

Table 2 *Calculated parameters*

	Measurement Standards							
	ISO, DIN, ÖNORM, UNI, BS, BREW	**SS**	**Sia**	**NF**	**NBE**	**NEN**	**NEN'06**	**ASTM**
Basic Standards:	ISO 140 ISO 717	ISO 140 ISO 717	ISO 140 ISO 717	NF S31-05x	ISO 140	NEN 5077	NEN 5077-2006	ASTM E336, 1007, E966, E1332
Airborne **Calculated parameters:**	*D Dn DnT R´ R* *Dw Dw+C Dw+Ctr Dnw Dnw+C Dnw+Ctr DnTw R´w or Rw +C +Ctr +C50-3150 +C50-5000 +C100-5000 +Ctr50-3150 +Ctr100-5000 +Ctr50-5000*	*ISO plus:* *Dw8 DnTw8 R´w8 Rw8*	*ISO plus:* *DnTw+C–Cv*	*D DnT R* *DnATrose DnATroute Rrose Rroute*	*ISO plus:* *DA DnAT RA R´A*	*DnT* *Ilu Ilu;k*	*DnT* *DnT,A DnT,A,k*	*NR NNR FTL* *NIC NNIC FSTC*
Façade **Calculated parameters:**	*R´45° R´tr,s Dls,2m Dls,2m,n Dls,2m,nT Dtr,2m Dtr2m,n Dtr,2m,nT* *Dls,2m,w Dls,2m,n,w Dls,2m,nT,w Dls,2m,nT,w+C Dls,2m,nT,w+Ctr Dtr,2m,w Dtr,2m,n,w Dtr,2m,nT,w+C Dtr,2m,nT,w+Ctr R´45°w or R´tr,s,w +C +Ctr +C$_{50-3150}$ +C$_{50-5000}$ +C$_{100-5000}$ +Ctr$_{50-3150}$ +Ctr$_{100-5000}$ +Ctr$_{50-5000}$*	See ISO	*ISO plus:* *D45°nT Dls,2m,nT,w +C–Cv Dtr,2m,nT, w+C–Cv D45°nT,w+C tr–Cv*	*DnT45° DnTtr* *DnATroute45° DnATroute*	*ISO plus:* *R´A45° Dls,2m,nAT Dtr,2m,nAT Dtr,2m,A Dls,2m,A Dls,2m,n,w+C Dls,2m,n,w+Ctr R´A45°AavD,2m, AavD,2m,n,AavD,2m, nT,AavR´A45°AefD,2m, AefD,2m,n,AefD,2m, nT,Aef*	*Gi* *G$_A$ G$_{A;K}$*	*Gi* *G$_A$ G$_{A;K}$*	*OILR OITL* *OITC*
Impact **Calculated parameters:**	*L´nt L´nT Ln* *L´nw L´nTw or Lnw +Ci +Ci$_{50-2500}$*	*ISO plus:* *L´nw8 L´nTw8 Lnw8*	See ISO	*LnT Ln* *LnAT LnA*	*ISO plus:* *LnAT LnA*	*LnT* *Ico*		*LnT Ln* *IIC NISR*

Complete System

Brüel & Kjær provides a wide range of accessories 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

Some of these options are shown in Fig. 15. Please refer to separate product data sheets for details. Ask your local Brüel & Kjær representative for more information on complete systems.

Fig. 15
Accessories for building acoustics measurements

AQ-0673

2734-B Power Amplifier including AKG SR 450 Receiver

AO-0523

4292-L OmniPower Sound Source

UA-1476 Wireless Remote Control Receiver

UA-1476 Wireless Remote Control Receiver

AKG PT 450 wireless audio transmitter

UA-1476 Remote Control Wireless Transmitter

3207 Tapping Machine

AQ-0633

AO-0524

4224 Sound Source

WL-1330 LEMO 10-pole female to 7-pole Brüel & Kjær male

WL-1330 7-pole Brüel & Kjær female to 10-pole LEMO male

4231 Calibrator

4189 Microphone ZC-0032 Preamplifier

UA-1317 Microphone Holder

UA-0801 Light-weight Tripod

3923 Rotating Microphone Boom

10-pin Mic.Extension Cables: AO-0697-030 3 m AO-0697-100 10 m

AR-0199 10-pin Flat Cable

JP-1041 Dual 10-pole Adaptor

Building Acoustics Software 8780 and 7830

* Not supplied by Brüel & Kjær

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Accredited Calibration Services at Brüel & Kjær

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 bi-annually or annually. Any errors detected during calibration will be repaired prior to returning the instrument to you.

Compliance with Standards

CE ⚠ ♻ 🗑	The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China WEEE mark indicates compliance with the EU WEEE Directive
Safety	EN/IEC 61010–1, ANSI/UL 61010–1 and CSA C22.2 No.1010.1: Safety requirements for electrical equipment for measurement, control and laboratory use
EMC Emission	EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards **NOTE:** The above is only guaranteed using accessories listed in this Product Data
EMC Immunity	EN/IEC 61000–6–2: Generic standard – Immunity for industrial environments EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards **NOTE:** The above is only guaranteed using accessories listed in this Product Data
Temperature	IEC 60068–2–1 & IEC 60068–2–2: Environmental Testing. Cold and Dry Heat. Operating Temperature: –10 to +50°C (14 to 122°F) Storage Temperature: –25 to +70°C (–13 to 158°F)
Humidity	IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at +40°C (104°F)). Recovery time 2 ~ 4 hours
Mechanical	Non-operating: IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s2, 10 – 500 Hz IEC 60068–2–27: Bump: 1000 bumps at 400 m/s^2 IEC 60068–2–27: Shock: 1000 m/s^2, 6 directions
Enclosure	IEC 60529 (1989): Protection provided by enclosures: IP20

Specifications – Type 2250/2270

Microphone

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

MICROPHONE PREAMPLIFIER ZC-0032
Nominal Preamplifier Attenuation: 0.25 dB
Connector: 10-pin LEMO
Extension Cables: Up to 100 m in length between the microphone preamplifier and Type 2250/2270, without degradation of the specifications

MICROPHONE POLARIZATION VOLTAGE
Selectable between 0 V and 200 V

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

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

Interface

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

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

STATUS INDICATORS
LEDs: Red, amber and green

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

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

USB INTERFACE
USB 2.0 OTG Micro AB and USB 2.0 Standard A sockets

MODEM INTERFACE
Connection to Internet through GPRS/EDGE/HSPA modem connected through the 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 utilises Automatic Gain Control (AGC), is incorporated in underside of analyzer. Used to create voice annotations for attaching to measurements

CAMERA (TYPE 2270 ONLY)
Camera with fixed focus and automatic exposure is incorporated in underside of analyzer
Used to create image annotations for attaching to measurements
Image Size: 2048 x 1536 pixels
Viewfinder Size: 212 x 160 pixels
Format: JPG with exif information

LAN INTERFACE SOCKET
• Connector: RJ45 Auto-MDIX
• Speed: 100 Mbps
• Protocol: TCP/IP

INPUT SOCKET (2 – TYPE 2270 ONLY)
Connector: Triaxial LEMO
Input Impedance: ≥ 1 MΩ
Direct Input: Max. input voltage: ± 14.14 V_{peak}
CCLD Input: Max. input voltage: ± 7.07 V_{peak}
CCLD Current/voltage: 4 mA/25 V

TRIGGER SOCKET
Connector: Triaxial LEMO
Max. Input Voltage: ± 20 V_{peak}
Input Impedance: > 47 kΩ
Precision: ± 0.1 V

OUTPUT SOCKET
Connector: Triaxial LEMO
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

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
Part No.: QB-0061 Rechargeable Li-Ion battery
Voltage: 3.7 V
Capacity: 5200 mAh nominal
Typical Operating Time:
• Single-channel: >11 h (screen backlight dimmed); >8.5 (full screen backlight)
• 2-channel: >7.5 h (full screen backlight)
Use of external interfaces (LAN, USB, WLAN) will decrease battery operating time
Battery Cycle Life: > 500 complete charge/discharge cycles
Battery Aging: Approximately 20% loss in capacity per year
Battery Indicator: Remaining battery capacity and expected working time may be read out in % and in time
Battery Fuel Gauge: The battery is equipped with a built-in fuel gauge, which continuously measures and stores the actual battery capacity in the battery unit
Charge Time: In analyzer, typically 10 hours from empty at ambient temperatures below 30°C. To protect the battery, charging will be terminated completely at ambient temperatures above 40°C. At 30 to

40°C charging time will be prolonged. With external charger ZG-0444 (optional accessory), typically 5 hours

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

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

Storage

INTERNAL FLASH-RAM (NON-VOLATILE)
For user setups and measurement data
• 512 MB

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

USB MEMORY STICK
For store/recall of measurement data

Environmental

WARM-UP TIME
From Power Off: <2 minutes
From Standby: <10 seconds for prepolarized microphones

TEMPERATURE
IEC 60068−2−1 & IEC 60068−2−2: Environmental Testing. Cold and Dry Heat.
Operating Temperature: −10 to + 50°C (14 to 122°F), <0.1 dB
Storage Temperature: −25 to +70°C (−13 to +158°F)

HUMIDITY
IEC 60068−2−78: Damp Heat: 90% RH (non-condensing at 40°C (104°F))
Effect of Humidity: <0.1 dB for 0% <RH <90% (at 40°C (104°F) and 1 kHz)

MECHANICAL
Environmental Protection: IP44
Non-operating:
IEC 60068−2−6: Vibration: 0.3 mm, 20 m/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 × 93 × 50 mm (11.8 × 3.7 × 1.9″) incl. preamplifier and microphone

User Interface

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

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

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

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

UPDATE OF SOFTWARE
Update to any version (from 4.0 and up) using BZ-5503, included, through USB or update via Internet:

WEB PAGE
Connect to the analyzer using an Internet browser supporting JavaScript®. The connection is password protected:
• Guest level: for viewing only
• Administrator level: for viewing and full control of the analyzer

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Specifications – Building Acoustics Software BZ-7228

Specifications apply to BZ-7228 unless otherwise stated.
BZ-7229 2-Channel Option is for Type 2270 only

STANDARDS
Conforms with the relevant parts of the following:
• IEC 61672−1 (2002−05) Class 1
• IEC 60651 (1979) plus Amendment 1 (1993−02) and Amendment 2 (2000−10), Type 1
• ANSI S1.4−1983 plus ANSI S1.4A−1985 Amendment, Type 1
• IEC 61260 (1995−07) plus Amendment 1 (2001−09), 1/1-octave Bands and 1/3-octave Bands, Class 0
• ANSI S1.11−1986, 1/1-octave Bands and 1/3-octave Bands, Order 3, Type 0−C
• ANSI S1.11−2004, 1/1-octave Bands and 1/3-octave Bands, Class 0
• ISO, SS, DIN, Önorm, BS, BREW, Sia, UNI, NF-S31, NBE, NEN, NEN'06, ASTM, see tables under Building Acoustics Measurement Standards on page 8

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

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

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

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

Broadband Analysis

DETECTORS
A- and C-weighted: Broadband detectors with Fast exponential time weighting
Overload Detector: Monitors the overload outputs of all the frequency weighted channels
Under Range Detector: Monitors the under range of all the frequency weighted detectors when set to High Range. Under range is set if level is below lower limit of Linear Operating Range
Type 2270: Detectors available for both Ch. 1 and Ch. 2

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

MEASURING RANGES
When using Microphone Type 4189:
Dynamic Range: From typical noise floor to max. level for a 1 kHz pure tone signal, A-weighted:
Single Range: 16.6 to 140 dB
High Range: 28.5 to 140 dB
Low Range: 16.6 to 110 dB
Primary Indicator Range: In accordance with IEC 60651, A-weighted:
Single Range: 23.5 to 123 dB
High Range: 41.7 to 123 dB
Low Range: 23.5 to 93 dB

Linear Operating Range: In accordance with IEC 61672, A-weighted:
1 kHz:
Single Range: 24.8 to 140 dB
High Range: 43.0 to 140 dB
Low Range: 24.8 to 110 dB

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_{rms} (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

Selectable 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 μs
Control: See Measurement Control

Measurements

Measurements are done at a number of positions and categorised 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_{ZF} 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 hour
Range (L1 and L2 simultaneously only): Autorange 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. 20 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
LZF 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 on page 9

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[*]

Measurement Status

On Screen: Information such as *overload*, *awaiting trigger* and *running/paused* are displayed on screen as icons or text

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

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[*] Signal Recording requires an SD card or USB stick for data storage and a license for Signal Recording Option BZ-7226

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 instrument

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

Voice Annotations

Voice annotations can be attached to the building acoustics project and to measurements at each position

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

Gain Adjustment: −60 dB to 0 dB

Text & Image Annotations

Text and image (Type 2270 only) annotations can be attached to the building acoustics project and to measurements at each position

Data Management

Project Template: Defines the display and measurement setups

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

Re-use of data: Data for L1, B2 or T2 in one project can be re-used in another project

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)

Specifications – Signal Recording Option BZ-7226

Signal Recording Option BZ-7226 is enabled with a separate license. It works with all the software for Type 2250/2270: Sound Level Meter, Frequency Analysis, Logging Software, Enhanced Logging Software and Reverberation Time Software

For data storage, Signal Recording requires either:
- 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

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

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

Sampling Rate (kHz)	Maximum Pre-recording (s)	Sound Quality	Memory (KB/s)
8	470	Low	16
16	230	Fair	32
24	150	Medium	48
48	70	High	96

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

Specifications – PULSE Reflex Building Acoustics Type 8780

PULSE Reflex Building Acoustics is the software package for post-processing and reporting of building acoustics measurements made with Type 2250/2270.
In addition, PULSE Reflex Building Acoustics provides functionality to manage and maintain Type 2250/2270:

TYPE 2250/2270 SOFTWARE UPGRADES AND LICENSES
PULSE Reflex Building Acoustics controls Type 2250/2270 software upgrades and licensing of the Type 2250/2270 applications

ON-LINE DISPLAY OF TYPE 2250/2270 DATA
Measurements on Type 2250/2270 can be controlled from the PC and displayed on-line with the PC, using the same user interface on the PC as on Type 2250/2270

INTERFACE TO TYPE 2250/2270
USB ver. 2.0, LAN Ethernet connection
• DVD drive

RECOMMENDED PC
• Gen Intel® Core™ i7 3 GHz processor or better
• 8 GB RAM
• 250 GB Solid State Drive (SSD) with 20 GB free space or better
• DVD-RW drive
• 1 Gbit Ethernet network
• Microsoft® Windows® 8 Pro (x64), Windows® 7 SP1 (x32 and x64) or Windows® XP Professional (SP3)
• Microsoft® Office 2007 (SP2), Office 2010 (SP2) (x32) or Office 2013

Specifications – Qualifier Type 7830

STANDARDS
See Tables 1 and 2 under Building Acoustics Measurement Standards on page 8

LANGUAGES
English, French and German

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
On-line context-sensitive and user-guide

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

MINIMUM PC
• Pentium® III (or newer)
• 256 MB RAM
• SVGA graphics display/adaptor
• Sound card
• CD-ROM drive
• Mouse
• USB
• PC card slot (for data transfer)
• Windows® XP, Windows Vista® or Windows® 7

Ordering Information

BUILDING ACOUSTICS KITS

BZ-7228-200   Building Acoustics Kit for single-channel airborne sound insulation, including:
- Building Acoustics Software BZ-7228
- Tripod for Type 2250 UA-0801
- Power Amplifier Type 2734-A
- OmniPower Sound Source Type 4292-L (tripod and carrying bag KE-0462 included)
- Carrying bag KE-0364 for Type 4292-L Tripod
- Signal Cable AO-0523-D-100, Triaxial LEMO to XLR3M, 10 m (33 ft)
- Speaker Cable AQ-0673, Speakon® 4-pin (M) to Speakon 4-pin (M),10 m (33 ft)
  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, including the same items as BZ-7228-200 and:
- Tapping Machine Type 3207
- Battery Kit UA-1477 for Type 3207

Accessories for upgrading a BZ-7228-200 or BZ-7228-300 kit to a 2-channel building acoustics kit:
- Prepolarized Free-field 1/2″ Microphone Type 4189
- Microphone Preamplifier ZC-0032
- Dual 10-pole Adaptor JP-1041
- Microphone Extension Cable AO-0697-D-100, 10-pin LEMO, 10 m (33 ft)
- 2-Channel Option BZ-7229

Software and Accessories Available Separately

SOFTWARE MODULES

BZ-7228	Building Acoustics Software for Types 2250 and 2270
BZ-7228-100	Upgrade of BZ-7227 Reverberation Time software to BZ-7228 Building Acoustics Software
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
Type 8780	PULSE Reflex Building Acoustics

MEASUREMENT ACCESSORIES

Type 3923	Rotating Microphone Boom
Type 4231	Sound Level 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 Adaptor
KE-0449	Flight case for OmniPower Sound Source Type 4292-L
UA-0587	Tripod
UA-0801	Lightweight Tripod
UA-1317	1/2″ Microphone Holder
UA-1404	Outdoor Microphone Kit
UL-1009	SD Memory Card for Hand-held Analyzers
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

AO-1449-D-010	LAN Cable
UL-0250	USB to RS−232 Converter

SOUND SOURCES

Type 4292-L	OmniPower Sound Source
Type 4295	OmniSource Sound Source
Type 4224	Portable Battery & Mains Powered Sound Source
Type 3207	Tapping Machine
Type 2734-A	Power Amplifier

For further information on sound sources and accessories please refer to the 'Sound Sources for Building Acoustics' product data, BP 1689.

Service Products

ACCREDITED CALIBRATION

2250-J-CEI	Initial Calibration
2250-J-CEF	Periodic Calibration
2270-K-CEI	Initial Calibration
2270-K-CEF	Periodic Calibration

HARDWARE MAINTENANCE

2250/2270-EW1	Extended Warranty, one year extension (Types 2250/2270)

2014-02

BP 2190−16

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