

## BRÜEL & KJÆR® Sound Level Meters

### Hand-held Analyzer Type 2270 for Sound Intensity Measurements with Sound Intensity Software BZ-7233 and Sound Intensity Probe Kit for 2270 Type 3654

Portable and battery-operated, Hand-held Sound Intensity System based on Type 2270 makes it easy for one person to make a sound intensity measurement from beginning to end. The powerful combination of Hand-held Analyzer Type 2270, Sound Intensity Software BZ-7233 and Sound Intensity Probe Kit Type 3654 enables you to make intensity measurements for noise source location and sound power calculations. Automatic measurement guidance and aural feedback during measurements allow you to concentrate on making a smooth scan of the area under investigation. The system provides on-the-spot analyses of sound intensity spectra, which can be exported via Measurement Partner Suite BZ-5503 to Microsoft® Excel® for sound power calculation or to PULSE™ Mapping for Hand-held Sound Intensity Type 7962 for noise contour mapping. The system is part of the Type 2270 hand-held platform with its vast range of sound and vibration analysis applications.



#### Uses, Benefits and Features

##### Uses

- Sound power and noise mapping on rotating machinery, compressors, pumps, gearboxes, transformers, heating systems, etc.
- Sound intensity measurements compliant with IEC 61043
- Sound power determination compliant with:
  - ISO 9614-1
  - ISO 9614-2
  - ANSI S12.12
  - ECMA 160
- Noise source location

##### Benefits

- Complete hand-held system with optional accessories
- Accessories from Type 2260-E can be used
- On-the-spot results
- Visual and aural feedback during measurements

##### Features

- 1/1- and 1/3-octave analyses
- Frequency range: 50 Hz – 10 kHz using 12 mm spacer
- Laboratory and field calibration capability
- Measurement quality indicators
- Grid measurements of up to 25 surfaces with up to 15 × 15 segments
- Photographic, textual, metadata and verbal annotations
- Up to 30 metadata per segment
- Visual data manager keeps track of measurements and data
- Automatic sequence of segment measurements
- Ad hoc sequence of segment measurements
- Copy, exclude and delete options for segment results
- Number map, contour map and level curves of results and quality indicators
- Number map, contour map and level curves superimposed on Type 2270 camera image of the measurement object
- Utility software for archiving, reporting and exporting results
- Export to mapping software
- Generator output
- Proprietary broadband phase correction to extend dynamic range
- Signal recording as option

Fig. 1  
Getting to all those  
difficult places

### Sound Intensity Made Easy



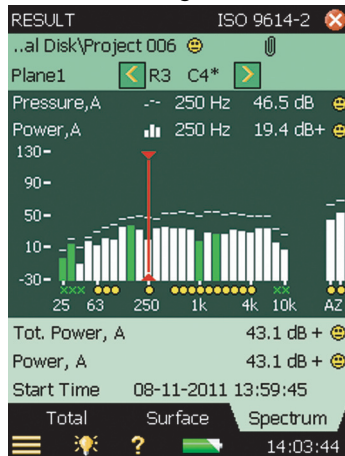
The combination of strict legislation and customer requirements has increased pressure on manufacturers to provide precise specifications of their products' noise levels. The need to determine sound power escalates accordingly, but many manufacturers pale at the thought of making such complicated and time-consuming measurements. However, heavy equipment and a jungle of cables are made superfluous by this single-unit, hand-held sound intensity analyzer comprising Hand-held Analyzer Type 2270, Sound Intensity Software BZ-7233 and Sound Intensity Probe Kit Type 3654.

Sound Intensity Software BZ-7233 transforms the analyzer into a powerful measurement tool using the intensity technique to determine sound intensity levels and map noise. Simply swap the analyzer's microphone for the sound intensity probe and start measuring. It is easy for just one person to make a sound intensity measurement from scanning to final result. A unique phase-calibration technique lets you make all your measurements with a 12 mm spacer covering a frequency range from 50 Hz to 10 kHz. If post-processing is required, you can use the included Measurement Partner Suite BZ-5503 to view and export data to spreadsheets, or export to PULSE Mapping for Hand-held Sound Intensity Type 7962 for noise contour mapping.

## Sound Power Determination Using the Hand-held Sound Intensity System

Fig. 2  
Sound intensity spectrum

### Noise Labelling and Standards



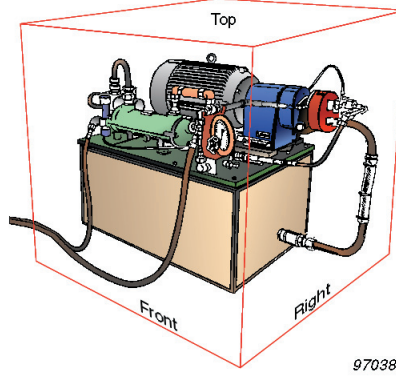
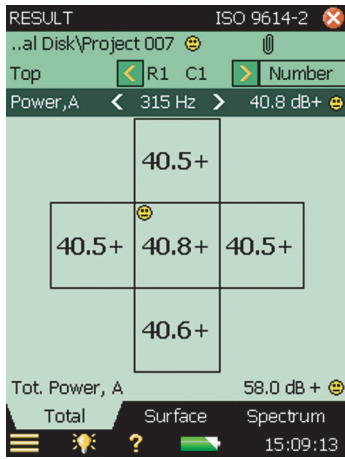
We live in an ever-noisier world, and our awareness of noise has escalated dramatically, increasing the demand for noise-friendly surroundings. Manufacturers are aware of this and are labelling their machines, be they refrigerators or turbines, with their noise output according to national and international standards. Machines often consist of parts made by subsuppliers, so the noise labelling of each part is important as it enables the manufacturer to predict the noise output from a new machine. The stringent EU Machine Directives have also played a major role in the enforcement of product labelling.

### Measurement Procedure

Consider a noise source standing on a reflecting floor. Imagine a virtual box that completely envelops the source. The sound power from the source will radiate through the five free segments of the box (right, left, front, rear, top). Measure the average sound intensity for each of the five segments and the analyzer will calculate the resulting sound intensity and sound power for each segment and for the total box, taking the segment areas into account.

As an aid to scanning, a wire frame can be used to indicate the location of segments; alternatively, markers on the floor can be used to indicate the base of the box and a tape measure to show its height.

**Fig. 3**  
 Predefined surfaces on the screen (left) representing the imaginary surfaces surrounding the sound source (right)

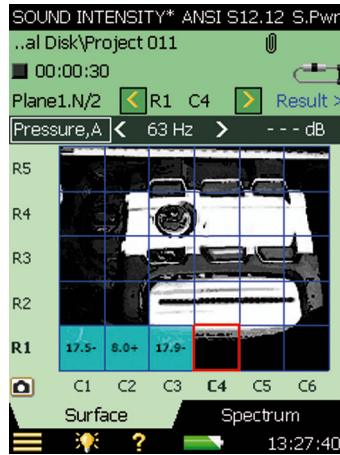
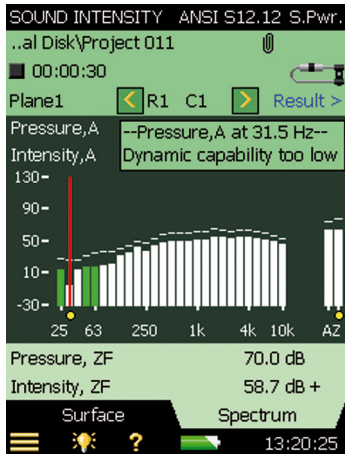


Measure one segment at a time, scanning it at a constant speed and covering equal areas in equal time. Hold the probe with its axis perpendicular to the segment, and the probe centre in the segment plane. A probe windscreen will reduce the disturbance due to air turbulence, which is often encountered outdoors or near fans.

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### Support During Measurement

**Fig. 4**  
 Left: Measurement quality indicators: Dynamic capability and overload are checked and indicated  
 Right: Housekeeping during measurement is done by coloured segments

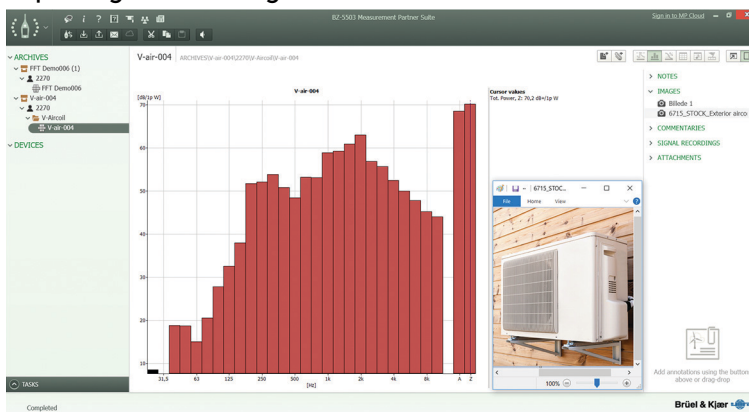


Features during measurement include quality control of the measurement by means of quality indicators, a back-erase to the latest pause (or back-erase the latest scan), and aural feedback to earphones for step-by-step guidance and information. This gives warnings regarding overloads and failed criteria, and a periodic sound signal assists you in keeping a steady scanning pace.

During the measurement you can use the Surface View for housekeeping. The coloured segments on top of the image of the measurement object are ideal for keeping track of the measurement process.

### Exporting and Viewing

**Fig. 5**  
 Measurement Partner Suite BZ-5503 displays the overall sound power data from the measurement, and the data can be exported to spreadsheet, text or mapping applications



Sound intensity levels measured by the hand-held sound intensity system can be transferred to Measurement Partner Suite BZ-5503. You can then archive and view the data for the overall sound power. All data can be exported to Excel® or to text files in XML and various text formats. For noise contour mapping, data can be exported to PULSE Mapping for Hand-held Sound Intensity Type 7962 for noise source identification.



## Annotations - Filling in the Blanks

**Fig. 6**  
Use the built-in camera in Type 2270 to photograph the test device

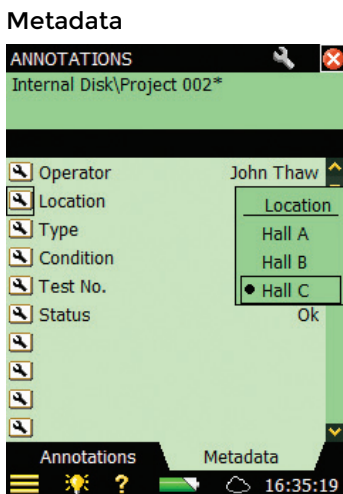


Whatever the application, there is more to your measurements than just the bare numbers of your results. With annotations it is easy to attach comments, notes and images to measurement results by:

- Tapping in notes using the on-screen QWERTY keyboard
- Pressing the Commentary pushbutton to record using the built-in commentary microphone
- Taking a photo of the test device or measurement configuration, both for documentation and for keeping track of measurements (Fig. 6)

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

**Fig. 7**  
The Annotations page showing six user-defined metadata items and a pick-list for the Location entry



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

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

Metadata functionality can be used for sorting measurements in Measurement Partner Suite BZ-5503.

## Calibration and Verification

**Fig. 8**  
Complete calibration made using Sound Intensity Calibrator Type 4297



Complete calibration can be made using Sound Intensity Calibrator Type 4297. This includes pressure calibration of both channels, phase calibration of the two channels and verification of the pressure-residual intensity index. Phase calibration enhances the dynamic capability and extends the usable frequency range down to 50 Hz using a 12 mm spacer.

**Fig. 9**  
Pressure calibration made with Sound Calibrator Type 4231

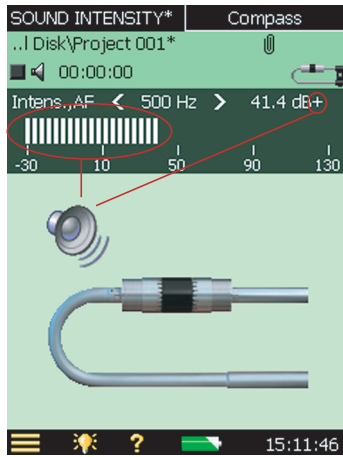


Pressure calibration alone can be performed using Sound Calibrator Type 4231 with Intensity Adaptor DP-0888, which provides 97 dB  $\pm$  0.7 dB at 1 kHz.

The sound intensity system automatically compensates for resonances between the microphone and spacer in the frequency range 5 kHz to 10 kHz, thus enhancing the usable frequency range up to 10 kHz with a 12 mm spacer.

## Noise Source Location

**Fig. 10**  
Compass display for noise source location



### Hand-held Power

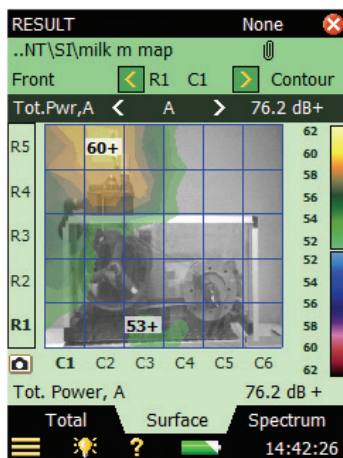
A sound intensity system tracks down puzzling and problematic noise sources efficiently and effortlessly. This versatile hand-held system makes it easy for you to manoeuvre around complex surfaces when solving problems.

### As a Simple Compass

A compass display and instantaneous spectrum display are available for online source location. These will quickly navigate you to the problem area. The compass data is used to show the direction of incidence of the sound energy in relation to the probe for a specific frequency band or for the overall A- or Z-weighted level.

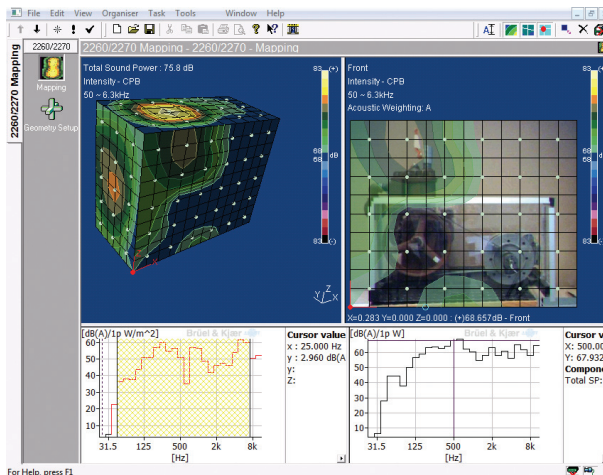
## Noise Mapping

**Fig. 11**  
A 5 × 6 contour map



A complicated machine or structure radiates sound from several sources and absorbs sound in other places. In order to evaluate the effectiveness of noise reduction methods you need to know how much noise is radiated by the individual components of the machine. This means finding the sound power of those components. With its advanced housekeeping features, the hand-held sound intensity system is capable of collecting and storing a large number of measurements in a simple, flexible and effective way. Divide the surface of the structure into a number of segments and define a corresponding grid on the screen. Each segment may be assigned its own set of metadata.

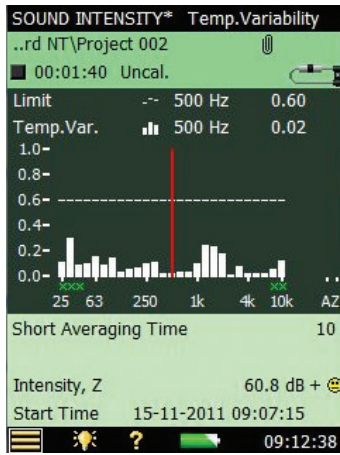
**Fig. 12**  
Data from Type 2270 can be exported to PULSE Mapping for Hand-held Sound Intensity Type 7962 and displayed as 2D and 3D maps



Collect data by measuring at the centre of each segment. As you make the measurements one at a time, the system automatically helps you along by offering extensive information and guidance, which includes automatic selection of the next predefined segment, evaluation of the sound field as soon as the relevant information is available, and quick and easy overview facilities. Results can be analysed as a number map. You can study maps of single frequency bands or alternatively look at total levels. To see contour maps, or 3D plots round an entire measurement surface, export data to the optional Type 7962 mapping software.

## Temporal Variability

**Fig. 13**  
Determination of temporal variability



Type 2270 calculates the temporal variability indicator of the sound field. It measures ten times for an averaging time of 8 to 12 seconds, as recommended by ISO 9614-1, and calculates the normalized standard deviation. If the value is too large, you can take action to reduce the temporal variability of extraneous intensity, or measure during periods of less variability, or increase the measurement period at each position.

## Building Acoustics

Building acoustics applications such as leakage detection benefit enormously from the intensity technique. Sound intensity enables extra information regarding the contribution of various flanking and leakage transmissions to be gathered. In a traditional pressure-based measurement you get an apparent sound reduction index  $R'$  that takes every type of transmission into account. Traditional measurements cannot identify individual transmission paths. This application identifies contributions of any particular segment of any given partition or surface. If a compound partition is to be studied, for example, a wall containing a window, the respective sound intensity for both the wall material and window can be found.

You can create a sound field on one side of a wall (the source room) with Power Amplifier Type 2734 or OmniPower™ Sound Source Type 4292-L internal noise generator. The analyzer's built-in generator can be useful in some applications, particularly with wireless connection to the power amplifier/sound source.

### Leakage

If measurements indicate a sound transmission loss problem or 'hidden' flanking transmission, the hand-held sound intensity system can conveniently be used to locate and quantify the noise source areas.

## Accessories

**Fig. 14**  
Sound intensity system including Sound Intensity Probe Kit Type 3654




The hand-held sound intensity system consists of Hand-held Analyzer Type 2270 with sound intensity software, and Sound Intensity Probe Kit Type 3654.

The probe kit comes with a weatherproof carrying case to house the analyzer, probe with windscreen, extension stem with handle, intensity adaptor for Type 4231, earphones and tape measure. Sound Intensity Microphone Pair Type 4197 includes 8.5, 12 and 50 mm microphone spacers as standard accessories.

The carrying case can also house optional accessories such as a sound calibrator, sound intensity calibrator and spare batteries.

## Compliance with Environmental Standards

	<p>The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EU directives</p> <p>RCM mark indicates compliance with applicable ACMA technical standards – that is, for telecommunications, radio communications, EMC and EME</p> <p>China RoHS mark indicates compliance with administrative measures on the control of pollution caused by electronic information products according to the Ministry of Information Industries of the People's Republic of China</p> <p>WEEE mark indicates compliance with the EU WEEE Directive</p>
<b>Safety</b>	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
<b>EMC Emission</b>	<p>EN/IEC 61000–6–3: Generic emission standard for residential, commercial and light industrial environments</p> <p>EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements</p> <p>CISPR 22: Radio disturbance characteristics of information technology equipment. Class B Limits</p> <p>IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards</p> <p><b>Note:</b> The above is only guaranteed using accessories listed in this document</p>
<b>EMC Immunity</b>	<p>EN/IEC 61000–6–2: Generic standard – Immunity for industrial environments</p> <p>EN/IEC 61326: Electrical equipment for measurement, control and laboratory use – EMC requirements</p> <p>IEC 61672–1, IEC 61260, IEC 60651 and IEC 60804: Instrumentation standards</p> <p><b>Note:</b> The above is only guaranteed using accessories listed in this document</p>
<b>Temperature</b>	<p>IEC 60068–2–1 &amp; IEC 60068–2–2: Environmental Testing.</p> <p>Cold and Dry Heat</p> <p>Operating Temperature: –10 to +50 °C (14 to 122 °F)</p> <p>Storage Temperature: –25 to +70 °C (–13 to 158 °F)</p>
<b>Humidity</b>	IEC 60068–2–78: Damp Heat: 93% RH (non-condensing at +40 °C (104 °F)). Recovery time 2 ~ 4 hours
<b>Mechanical</b>	<p>Non-operating:</p> <p>IEC 60068–2–6: Vibration: 0.3 mm, 20 m/s<sup>2</sup>, 10 – 500 Hz</p> <p>IEC 60068–2–27: Bump: 1000 bumps at 400 m/s<sup>2</sup></p> <p>IEC 60068–2–27: Shock: 1000 m/s<sup>2</sup>, 6 directions</p>
<b>Enclosure</b>	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.

## Specifications – Type 2270 with Sound Intensity Probe Type 3654 and Sound Intensity Software BZ-7233

Specifications are given for Type 2270 with software BZ-7233 installed and using Sound Intensity Probe Kit Type 3654, including ½" Microphone Pair Type 4197 and Dual Preamplifier Type 2683.

Unless otherwise noted, values are given under reference ambient conditions with nominal sensitivities for the microphones and preamplifiers and with a 12 mm spacer. A license for Sound Intensity Software BZ-7233 is required to run the system. Sound Level Meter Software BZ-7222 is included with Type 2270. For transducer-specific specifications, see product data [BP 2324](#)

### REFERENCE CONDITIONS

**Reference Sound Pressure Level:** 94 dB  
**Reference Frequency:** 250 Hz  
**Reference Temperature:** +20 °C  
**Reference Static Pressure:** 1013.25 hPa  
**Reference Relative Humidity:** 65%

### INSTRUMENTATION STANDARDS

Conforms with the following standards:

- IEC 61043 (1993–12) Class 1
- IEC TS 62370 (2004–05)
- 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

### SOUND POWER STANDARDS

Conforms with the following standards:

- ISO 9614–1:1993 (E)
- ISO 9614–2:1996 (E)
- ANSI S12.12–1992
- ECMA 160:1992

### FREQUENCY RANGE

1/1- and 1/3-octave spectral measurements based on a linear electrical frequency response (Z freq. weighting)

**1/1-octave Band Centre Frequencies:** 31.5 Hz – 8 kHz

**1/3-octave Band Centre Frequencies:** 25 Hz – 10 kHz

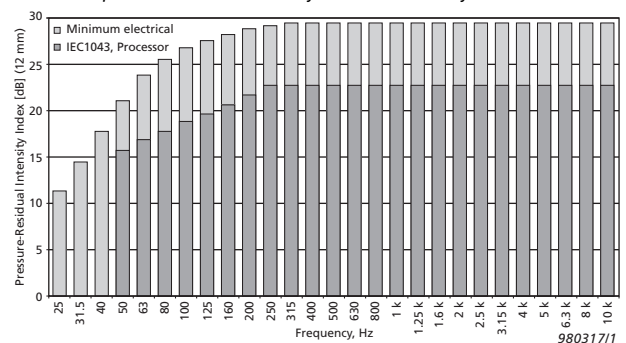
### FREQUENCY WEIGHTING

Z- and A-weighted total results are based on weighted summation of spectral bands in the frequency range 22 Hz – 11.3 kHz. Frequency bands can be manually excluded from calculation

### PRESSURE-RESIDUAL INTENSITY INDEX

The minimum pressure-residual intensity index for the analyzer (the "Processor" in IEC 61043), measured with pink noise at a band-filtered level of 114 dB in the high range, is shown in the figure below

Fig. 1 Minimum pressure-residual intensity index for the analyzer



### ENHANCED PHASE MATCHING

The phase matching of the sound intensity system can be enhanced using a Sound Intensity Calibrator Type 4297



## HIGH-FREQUENCY COMPENSATION

High-frequency compensation is made for the ½" microphone and 12 mm spacer combination. The mean pressure and sound intensity spectra can then be measured at frequencies up to 10 kHz (one octave higher than the normal theoretical limit)

## DETECTORS

**Linear Integration:** 1 s to days in 1 s steps

**Overload Detector:** Monitors the two channels for overload

## AUTORANGE

Manual and automatic range controls are provided

## SPACER SETTINGS

**Spacer Length:** 6 – 200 mm in 0.5 mm steps

## AMBIENT CONDITIONS SETTINGS

Measurements are automatically compensated for the current temperature and ambient pressure set by the user

## Measurements

### SPECTRA

Simultaneous measurement of mean pressure and intensity

### TEMPORAL VARIABILITY

Assessment of whether or not the sound field is stationary. Measured in accordance with ISO 9614 – 1. Result stored with project

## Signal Monitoring

**Headphone Output:** Can be set to output the input mean pressure signal, the aural feedback signal or both to be monitored with headphones/earphones

**Gain Adjustment:** –60 dB to +60 dB

**Output Socket:** Can be set to output the Intensity AF, CF or ZF broadband level as a voltage between –4.47 V and +4.47 V. Gain is 20 dB/V. Lowest level (=0 V) can be set

## Internal Generator

Built-in pseudo-random noise generator

**Spectrum:** Selectable between Pink and White

**Crest Factor:**

- Pink Noise: 4.4 (13 dB)
- White Noise: 3.6 (11 dB)

**Bandwidth:** Selectable:

- Lower Limit: 50 Hz (1/3-oct.) or 63 Hz (oct.)
- Upper Limit: 10 kHz (1/3-oct.) or 8 kHz (oct.)

**Output Level:** Independent of bandwidth

- Max.: 1 Vrms (0 dB)
- Gain Adjustment: –60 to 0 dB

When bandwidth is changed, the level for all bands is automatically adjusted to comply with the set output level

**Repetition Period:** 175 s

**Output Connector:** Output Socket

## Analysis

### SURFACE AND PROJECT DEFINITION

- Setups and measurements for a given measurement session and measurement of temporal variability are stored in a project
- A project can contain up to 25 surfaces (Custom) or 5 surfaces pre-structured as a box (Box)
- A surface is defined as a plane with a number of segments of equal size organized as a rectangle
- Each segment can contain one measurement
- Height and width can be set for the segments or total surface
- For ANSI S12.12, each surface is doubled using N/2 and N segments
- Dimensions can be set in SI units or US/UK units
- A surface can contain up to 15 × 15 segments
- Definitions of surface and segments can be modified at any time (before, during or after a measurement)
- Measurements can be stored in previously measured segments, overwriting existing data (a warning is displayed)
- Individual segments can be deleted
- The measured data of a segment can be copied to other positions

### IMAGES

- Image annotations can be selected as background for surfaces

- The selected part of the image can be adjusted to match the surface
- Displayed in black and white and can be made darker or lighter for optimal visibility together with grid and readouts on the screen

## CALCULATIONS

- Sound power can be calculated for each segment, surface or total surface
- Frequency bands or segments can be manually included in or excluded from calculations
- The following status information is available for each frequency band or segment: Data excluded; Dynamic capability too low; Overload; Underrange; Repeatability failed; Extraneous noise too high; Averaging time too short; Convergence index failed; High levels outside tot.; A frequency range; Temporal variability too high; Sound field is non-uniform
- Quality Indicators based on status information are shown in the measurement displays

## Measurement Displays

### SPECTRUM

Display of one or two spectra plus calculated Z- or A-weighted totals.

Quality indicators are shown below each frequency band

**Available Spectra:** Sound pressure (Z- or A-weighted), sound intensity (Z- or A-weighted), p-l index, dynamic capability, scan difference, repeatability limit

**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 and quality indicator for each frequency band

### SPECTRUM TABLE

One or two spectra can be displayed in tabular form

### SURFACE

For display of all segments organized in a rectangle

- The segments are displayed in the correct height/width ratio
- A grid of segments can be superimposed on the surface
- Segments are coloured in accordance with the measurement status: The current position is green when measurement is in progress and yellow when paused and not saved. All segments with saved data are blue
- The values from a selectable frequency band are displayed together with quality indicators
- The surface can be superimposed on an image
- The transparency of the colours can be adjusted

### TOTAL VALUES

Single values displayed as numbers: sound pressure, sound intensity, p-l index (all Z- or A-weighted)

### COMPASS

For display of the direction of the incident sound energy near the probe

## Result Displays

### SPECTRUM

Display of one or two spectra plus calculated Z- and A-weighted totals. Quality indicators are shown below each frequency band

**Available Spectra (per segment, surface and total surface):** Sound pressure (Z- or A-weighted), sound intensity (Z- or A-weighted), p-l index, dynamic capability, sound power (Z- or A-weighted)

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

**Available spectra per segment:** Scan difference, repeatability limit

**Available spectra for the total surface:** Field non-uniformity, field non-uniformity limit, extraneous noise, convergence index, convergence index limit

**Cursor:** Readout of selected band and quality indicator for each frequency band

### SPECTRUM TABLE

One or two spectra can be displayed in tabular form

### SURFACE

For display of all the segments organized in a rectangle

- The segments are displayed in the correct height/width ratio
- A grid can be superimposed on the surface



- The surface can be superimposed on an image
- Number:** The values from a selectable frequency band are displayed together with quality indicators
- Curve:** Displays curves of equal levels from a selectable frequency band
- Contour:** Displays colours between the curves of equal levels from a selectable frequency band
- For Curve and Contour:** Hide/show maxima, zoom in or out, auto scale, transparency adjustment and two colour scales

## General Specifications

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### Hardware Interface

#### PUSHBUTTONS

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

#### ON-OFF BUTTON

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

#### STATUS INDICATORS

**LEDs:** Red, yellow and green

#### DISPLAY

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

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

**Backlight:** Adjustable level and time

#### USER INTERFACE

**Measurement Control:** Using pushbuttons

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

**Lock:** Pushbuttons and touchscreen can be locked and unlocked

#### USB INTERFACE

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

#### MODEM INTERFACE

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

Supports DynDNS for automatic update of IP address of host name

#### PRINTER INTERFACE

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

#### MICROPHONE FOR COMMENTARY

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

#### CAMERA (TYPE 2270 ONLY)

Camera with fixed focus and automatic exposure is incorporated in underside of analyzer.

Used to create image annotations for attaching to measurements

**Image Size:** 2048 × 1536 pixels

**Viewfinder Size:** 212 × 160 pixels

**Format:** jpg with exif information

#### SECURE DIGITAL SOCKET

2 × SD sockets

Connect SD and SDHC memory cards

#### LAN INTERFACE SOCKET

- Connector: RJ45 Auto-MDIX

- Speed: 100 Mbps

- Protocol: TCP/IP

#### TWO INPUT SOCKETS

**Connector:** Triaxial LEMO

**Input Impedance:** ≥1 MΩ

**Direct Input:** Max. input voltage: ±14.14 V<sub>peak</sub>

**CCLD Input:** Max. input voltage: ±7.07 V<sub>peak</sub>

**CCLD Current/voltage:** 4 mA/25 V

### TOTAL

**For Display of Surface Results Organized in a List or an Exploded Box:** Include/exclude a surface from calculation of total surface results

### TOTAL VALUES

**Single Values per Segment, Surface or Total Surface Displayed as**

**Numbers:** Sound pressure, sound intensity, p-l index, sound power (all Z- or A-weighted)

Single values for field non-uniformity (A-weighted), start time, stop time, overload, time remaining

### TRIGGER SOCKET

**Connector:** Triaxial LEMO

**Max. Input Voltage:** ±20 V<sub>peak</sub>

**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

### 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

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

**Typical Operating Time:**

**Dual-channel:** >7.5 h (full screen backlight)

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

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

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

**Charge Time:** In 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 × 1.9") 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

## Input

### TRANSDUCER DATABASE

Transducers are described in a transducer database with information on Serial Number, Preamplifier ID, Nominal Sensitivity, Polarization Voltage and Free-field Type.

In addition to ½" Microphone Pair Type 4197, ½" Microphone Pair Type 4181 and ¼" Microphone Pair Type 4178 (consisting of two phase-matched Microphones Type 4939 are supported)

### CORRECTION FILTERS

For microphone pairs Type 4197 and Type 4181, the analyzer is able to correct the frequency response to compensate for Ellipsoidal Windscreens UA-0781

## Calibration

Initial calibration for each transducer is stored for comparison with later calibrations

### ACOUSTIC

Individual (pressure) gain calibration of the two input channels can be performed using Sound Intensity Calibrator Type 4297, Sound Intensity Calibrator Type 3541-A, Sound Calibrator Type 4231 with Coupler DP-0888 or a custom calibrator

### ELECTRICAL

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

### VERIFICATION

Verification of the pressure-residual intensity index can be made using Sound Intensity Calibrator Type 4297. Pressure-residual intensity index is stored with the calibration and on each measurement for documentation purposes and for calculating the dynamic capability

### FIELD CHECK

A field check of the intensity measured with the probe in normal and reversed position can be performed

### CALIBRATION HISTORY

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

## Data Management

### METADATA

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

### PROJECT TEMPLATE

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

### PROJECT

Measurement data stored with the project template

### JOB

Projects are organized in jobs.

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

## Measurement Control

### MANUAL OR SEMI-AUTOMATIC

Measurements are started manually and the user is guided through the measurement for each segment. After storing the measurement for one segment, the analyzer is automatically ready to measure the next segment. 16 different segment sequences are available.

For ISO 9614-2 and ECMA 160, the measurement supports two scans per segment with repeatability check

### AURAL FEEDBACK

Periodic sound signal to earphones to assist your measurement process

### MANUAL CONTROLS

Reset, Start, Pause, Back-erase, Continue and Store the measurement manually

### AUTO-START

A total of 10 timers allow set up of measurement start times up to a month in advance. Each timer can be repeated. Measurements are automatically stored when completed

### BACK-ERASE

It is possible to erase backwards to the latest pause

## Measurement Status

### 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

## Annotations

### VOICE ANNOTATIONS

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

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

**Gain Adjustment:** -60 dB to +60 dB

### TEXT ANNOTATIONS

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

### GPS ANNOTATIONS

A text annotation with GPS information can be attached (Latitude, Longitude, Altitude and position error). Requires connection to a GPS receiver

### IMAGE ANNOTATIONS (TYPE 2270 ONLY)

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

## 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 × 768 (1280 × 800 recommended)

### DATA MANAGEMENT

**Explorer:** Facilities for easy management of analyzers, users, jobs, projects and project templates (copy, cut, paste, delete, rename, create)

**Data Viewer:** View measurement data (content of projects)

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

### USERS

Users of Type 2250/2270 can be created or deleted

### EXPORT FACILITIES

**Excel®:** Projects (or user-specified parts) can be exported to Microsoft® Excel® (Excel 2003 – 2016 supported)

## Ordering Information

### Type 2270-G-S 2270 Sound Intensity Analyzer Kit

which includes the following:

- Type 2270-W: Hand-held Analyzer
- Type 3654: Sound Intensity Probe Kit

### Type 2270-G-SC 2270 Sound Intensity Analyzer Kit with calibrator

which includes the following:

- Type 2270-W: Hand-held Analyzer
- Type 3654: Sound Intensity Probe Kit
- Type 4297: Sound Intensity Calibrator

### INCLUDED SOFTWARE

- BZ-7233: Sound Intensity Software
- BZ-7222: Sound Level Meter Software
- BZ-7223: Frequency Analysis Software
- BZ-7226: Signal Recording Option
- BZ-7229: 2-channel Option
- BZ-7231: Tone Assessment Option
- BZ-7232: Noise Monitoring Software
- Type 7962: PULSE Mapping for Hand-held Sound Intensity

### INCLUDED PROBE KIT

- Type 4197: Sound Intensity Microphone Pair
- Type 2683: Dual Preamplifier
- DP-0888: Intensity Adaptor for Type 4231 (providing 97 dB ±0.1 dB at 1 kHz)
- HT-0015: Earphones
- KE-0458: Carrying Case for Type 2270 and Probe Kit
- QA-0236: Tape Measure
- UA-0781: Ellipsoidal Windscreen
- UA-1439: Extension Stem
- UA-1440: Handle with Integral Cable

**Brüel & Kjær 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 or BK Connect

### POST-PROCESSING

With the post-processing module licence, Measurement Partner Suite includes a range of post-processing tools for data acquired with Type 2250/2270. These tools help to assess logging data and measured spectra, such as calculating contribution from markers on a logging profile, or correcting spectra for background noise

### HAND-HELD ANALYZER SOFTWARE UPGRADES AND LICENSES

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

### INTERFACE TO HAND-HELD ANALYZER

USB, LAN or Internet connection

### LICENSE MOVER

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

### LANGUAGE

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

### HELP

Concise context-sensitive help in English

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

### INCLUDED ACCESSORIES

- FB-0669: Hinged Cover for Type 2270
- QB-0061: Battery Pack
- ZG-0426: Mains Power Supply
- UA-1650: 90 mm dia. Windscreen with AutoDetect
- Compulsory Accessory Kit UA-1710-D01 including:
  - KE-0441: Protective Cover, for hand-held analyzer
  - UL-1050: Wireless USB-A (M) Adaptor
  - UA-1651: Tripod Extension, for hand-held analyzer
  - UA-1654: 5 Extra Styli
  - UA-1673: Adaptor for Standard Tripod Mount
  - DH-0696: Wrist Strap
  - DD-0594: Protection Plug, for hand-held analyzer without Preamplifier
  - AO-1494: Cable, USB 2.0, USB-A (M) to USB-micro-B (M) black, 1.8 m (5.9'), max. +70 °C (158 °F)
  - BZ-5298: Environmental Software

**NOTE:** Microphone Type 4189 and Microphone Preamplifier ZC-0032 are not included with Types 2270-G-S or 2270-G-SC, but are available separately

## Accessories and Components Available Separately

### CALIBRATION

Type 4231  
Type 4297

Sound Calibrator (fits Type 3654)  
Sound Intensity Calibrator (fits Type 3654)

### MEASURING

Type 3654  
AO-0440-D-015  
AO-0646  
AO-0697-030  
AO-0697-100  
UA-0750  
UA-0801  
UL-1009  
UL-1017

Sound Intensity Probe Kit  
Signal Cable, LEMO to BNC, 1.5 m (5')  
Sound Cable, LEMO to Minijack, 1.5 m (5')  
Mic. Extension Cable, 10-pin LEMO, 3 m (10')  
Mic. Extension Cable, 10-pin LEMO, 10 m (33')  
Tripod  
Small Tripod  
SD Memory Card for hand-held analyzers  
SDHC Memory Card for hand-held analyzers

### INTERFACING

Type 7962  
M1S-7962-N

PULSE Mapping for Hand-held Sound Intensity  
Software Support for Type 7962

### MEASUREMENT PARTNER SUITE SOFTWARE

BZ-5503-012

Measurement Partner Suite Post-processing  
Module, 1-year subscription for one instrument  
Measurement Partner Suite Post-processing  
Module, permanent license for any instrument  
(dongle)

BZ-5503-ND

BZ-5503-NI

Measurement Partner Suite Post-processing  
Module, permanent license for one instrument

See product data [BP 2430](#)

For more optional accessories, please refer to the Type 2250/2270 platform product data, [BP 2025](#)

## Service Products

### SYSTEM CALIBRATIONS

3654-CTF      Sound Intensity Probe Kit, Traceable Calibration  
(Chain calibration of the entire probe kit including  
SLM, microphone pair, and dual microphone  
preamplifier)

3654-CTI      Sound Intensity Probe Kit, Initial Traceable  
Calibration (Chain calibration of the entire probe  
kit including SLM, microphone pair, and dual  
microphone preamplifier)

### INDIVIDUAL CALIBRATIONS

CALI-S-CAF      Calibrator Single, Accredited Calibration of  
Type 4297 Calibrator

CALI-S-CAI      Calibrator Single, Initial Accredited Calibration of  
Type 4297 Calibrator

MIC-PAIR-CAF      Microphone Phase-Match, Accredited Calibration  
of Type 4197 Microphone Pair

MIC-PAIR-CAI      Microphone Phase-Match, Initial Accredited  
Calibration of Type 4197 Microphone Pair

MIC-PAMP-CAF      Microphone Preamplifier, Accredited Calibration  
of Type 2683 Dual Microphone Preamplifier

MIC-PAMP-CAI      Microphone Preamplifier, Initial Accredited  
Calibration of Type 2683 Dual Microphone  
Preamplifier

SLM-ADV-CAF      SLM Advanced, Accredited Calibration of  
Type 2270 Hand-held Analyzer

SLM-ADV-CAI      SLM Advanced, Initial Accredited Calibration of  
Type 2270 Hand-held Analyzer

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