B&K 2245
with Product Noise Partner

User Guide

for Version 1.5

TABLE OF CONTENTS

OVERVIEW

Your instrument works with applications:

- **Noise Partner** for general-purpose, basic sound level measurements
- **Enviro Noise Partner** for measuring and analysing sound levels in the world around us
- **Work Noise Partner** for determining sound exposure levels in the workplace
- **Product Noise Partner** for testing noise emission levels of products

There is a mobile version and a PC version of each application.

Product Noise Partner performs sound power calculations according to standards. The PC application enables you to enter your test setup, connect to the instrument to make measurements remotely, and view results. The PC application also has facilities for adding custom metadata, creating templates and exporting data for reports. The mobile app connects to the instrument to act as a remote control and is designed to complement the PC application. The mobile app allows you to edit the metadata and setup, make and annotate measurements, and view results quickly and easily.

Product Noise Partner does not eliminate the need for the information contained in the standards, which should be consulted as your primary guide for how to determine sound power properly.

Licences

B&K 2245 is a type-approved sound level meter (SLM). However, this basic functionality can be extended with optional licences; it can perform frequency analysis, log broadband and spectral data, perform statistical analysis and make audio recordings.

Licences for the instrument control the functionality of the instrument and to which applications it can connect.

BZ-7300: Noise Partner

This licence enables you to make simple, broadband measurements, to make general-purpose sound pressure level measurements, and to make basic occupational, product and environmental measurements.

- Measure broadband parameters.
- Connect to Noise Partner mobile app and PC application.

BZ-7301: Enviro Noise Partner

This licence enables you to measure and report on environmental noise concerns.

- Measure broadband parameters.
- Perform spectrum analysis (1/1- and 1/3-octave).
- Perform statistical analysis of measured broadband parameters.
- Average and log intervals of broadband and/or spectral data (logging mode).
- Record audio.
- Connect to Enviro Noise Partner mobile app and PC application.

BZ-7302: Work Noise Partner

This licence enables you to measure occupational noise-related concerns, such as noise exposure surveys and risk mitigation for noise-induced hearing loss.

- Measure broadband parameters.
- Perform spectrum analysis (1/1- and 1/3-octave).
- Average and log intervals of broadband and/or spectral data (logging mode).
- Record audio.
- Connect to Work Noise Partner mobile app and PC application.

BZ-7303: Product Noise Partner

This licence enables you to determine the sound power level of a device under test (DUT) according to standards.

- Measure broadband parameters.
- Perform spectrum analysis (1/1- and 1/3-octave).
- Perform statistical analysis of measured broadband parameters.
- Record audio.
- Connect to Product Noise Partner mobile app and PC application.

BZ-7304: Exhaust Noise Partner

This licence enables you to measure exhaust noise.

- Measure broadband parameters.
- Connect to Noise Partner mobile app and PC application.

About the instrument

The instrument measures **sound level meter** parameters (Leq, LE, Lpeak, Lmax, Lmin, L(SPL), L) with up to two simultaneous frequency weightings (A, B, C, Z) and up to three simultaneous time weightings (F, S, I) for the exponential averaging.

The instrument performs **frequency analysis** of either 1/1- or 1/3-octave spectra (Leq, Lmax, Lmin) with one of the available frequency weightings (A, B, C, Z) and time weightings (F, S).

The instrument takes **single measurements**. In other words, the instrument calculates a single value for each measured parameter for the total measurement time.

The instrument performs **statistical analysis** on either LAeq, LAF or LAS with calculation of 5 user-defined percentile levels.

The instrument takes **audio recordings**.

Standards

Go to: **Menu** > **About** > **Metrology** > **Standards**.

Here you will see the complete list of standards to which the instrument conforms.

About the PC application

The PC application can be used for every part of the testing process: setting up, measuring, viewing results and creating a report. The only thing the PC application doesn't do is make annotations.

Functionality of the PC version of Product Noise Partner:

- Create and edit databases.
- Define custom metadata fields.
- Enter the test setup for devices under test (DUTs).
- Interact with a graphical representation of the test setup.
- Create and use templates.
- Control the instrument remotely (make measurements).
- Import DUTs from the instrument.
- View measurements, annotations, calculations and results.
- Play back recorded audio (digitally gained).
- Export data to Microsoft® Excel® for reporting.

About the mobile app

The mobile app interfaces with the instrument, making remote measurements possible and making it easier to change settings and interact with the data. It is recommended that you use the mobile app whenever possible.

Functionality of the mobile version of Product Noise Partner:

- Create and edit devices under test (DUTs).
- Edit setup and metadata for the DUT.
- Control the instrument remotely (make measurements).
- Annotate measurements (add photos, videos, notes and commentary).
- See the status of the instrument and access instrument settings.
- View measurements and results.
- Display GUI in dark mode (set at the system level).

System requirements

The mobile app

- iOS-based phone or tablet

    See supported iOS versions for current app version in the App Store®, under **Product Noise Partner** > **Information** > **Compatibility**.

The PC application

System Requirements:

- Windows® 8.1 or 10 (64-bit) operating system
- Microsoft® .NET 4.7.2 framework

Recommended PC:

- Intel® Core™ i5 or better
- Sound card
- Solid State Drive (SSD)
- 8 GB of memory
- At least one available USB port
- Microsoft Office 2016 or later

Data storage

The instrument

Data storage: Approximately 12 GB

The instrument has 16 GB of built-in storage, of which approximately 12 GB is available for data storage. All measurement data and annotations are stored on the instrument.

Measurements and annotations are imported to the PC application from the instrument. They can then be saved to your computer or to a location on a network.

Useful settings

- **Menu** > **Data explorer**: View past measurements or move them to trash.
- **Menu** > **Status**: See remaining storage space.
- **Menu** > **System settings** > **Data management**: Edit settings for data backup and retention.

Mobile app

Neither measurement data nor annotations are stored on your mobile device, everything is uploaded to and stored on the instrument.

Service and support

The instrument comes with the standard product warranty for Brüel & Kjær products.

Visit www.bksv.com/Service to request a quote for or find information about services.

- Hardware maintenance and repair
- Calibration
- Extended warranty contracts for hardware

Firmware updates

Update firmware over the Internet.

1. Connect the instrument to a network with access to the Internet.

   See for more information.

2. Press ⊜ briefly to open the menu.

3. Go to: **System settings** > **Advanced settings**.

4. Set **Service mode** to *Enabled*.

5. Go to: Check for updates.

6. Follow the prompts.

✎ **Note:**

- When you return your instrument for service, the firmware will be updated to the latest version.

- For type-approved firmware versions, you may need to return the instrument to a certified service centre to update the firmware. Check with your type-approving authority before updating the firmware.

Application updates

Updates are handled via the application.

Contact information

For service and support, contact your nearest Brüel & Kjær Customer Care support team.

Headquarters: info@bksv.com, +45 7741 2000

China (Beijing): +86 21 6113 3674

France: service.fr@bksv.com, +33 1 69 90 71 02

Germany: bkservice.de@bksv.com, +49 421 17 87 0

Italy: it.info@bksv.com, +39 02 5768061

Japan: info_jp@bksv.com, +81 3 6810 3500

North & South America: bkservice@bksv.com, +1 770 209 6907

Spain: servicio.tecnico@bksv.com, +34 91 659 08 20

UK & **Ireland**: ukservice@bksv.com, +44 1223 389800

Go to www.bksv.com/contact for contact information to our other global offices.

Additional documentation

Product data

- B&K 2245 with Noise Partner: BP 0029
- B&K 2245 with Enviro Noise Partner: BP 0030
- B&K 2245 with Work Noise Partner: BP 0031
- B&K 2245 with Exhaust Noise Partner: BP 0032
- B&K 2245 with Product Noise Partner: BP 2643
- Microphone Type 4966: BP 2536

Manuals and guides

- Getting Started Guide: BR 1812
- Instruction Manual for B&K 2245 with Microphone Type 4966: BE 1910
- Phone / Tripod Holder UA-2237 Guide: BR 8071
- Windscreen UA-1650 Guide: BR 0011

Help

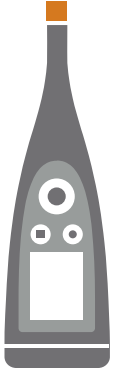Help for B&K 2245 with Product Noise Partner is also available in HTML format.

Resources

- Environmental Noise: BR 1626
- Measuring Sound Primer: BR 0047
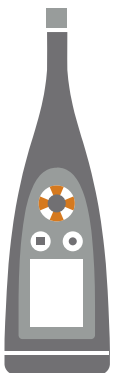
THE INSTRUMENT

Hardware interface

The **microphone** is at the top of the instrument.

⊜ is the **power/menu/reboot** button.

Press and hold the button to power the instrument on or off. When the instrument is on, press the button briefly to open the menu. If the instrument becomes unresponsive, press and hold the button for approximately 40 seconds (remove cables first).

The arrow buttons **scroll** through measurement displays, **auto-zoom** graphs, **move** cursors and **navigate** the menu.

Press ▲ and ▼ briefly to scroll through measurement displays.

Press ◄ and ► briefly to scroll through the parameters for each display.

Press and hold ◄ or ► to move the cursor on the Spectrum display.

Press and hold ▲ to auto-zoom the Y-axis on the Spectrum display.

◼ is the **stop/reset** button.

Press the button once to stop a measurement. At this point, averaged measurement parameters will stop updating and you can review the results. Press the button again to clear the results and reset the instrument for the next measurement. Data is saved automatically.
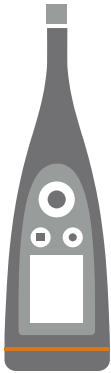
◉ is the **start/pause** button.

Press the button once to start a measurement, press it again to pause the measurement, press it a third time to resume the measurement.
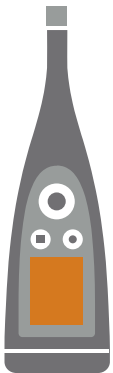
The **screen** displays sound levels and the menu.

The **light ring** is colour-coded to reflect the status of the instrument.

The light ring is solid **green** while measuring.

The light ring flashes **yellow** slowly while idle or quickly while paused (measuring).

The light ring flashes **red** quickly for intermittent overloads.

The light ring is solid **purple** for latched overloads.

The light ring flashes **white** slowly when switched off and charging the battery.

The light ring flashes **blue** while pairing a mobile device with the instrument.

On the base of the instrument is a **threaded hole** for mounting the instrument on a tripod and a **USB-C™ socket**. Use the USB socket as a connector or as signal output.

Instrument GUI
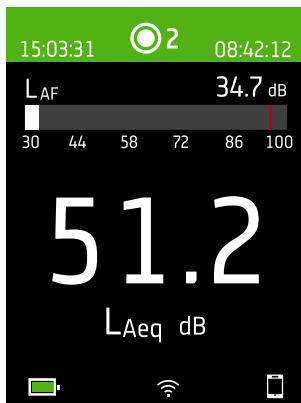
This is an example of the instrument graphical user interface (GUI) in dark colour scheme while measuring and connected to the mobile app.

💡 **Hint:** You can view the GUI in a web browser via the instrument's IP address. See **Web server display on page 19** for more information.
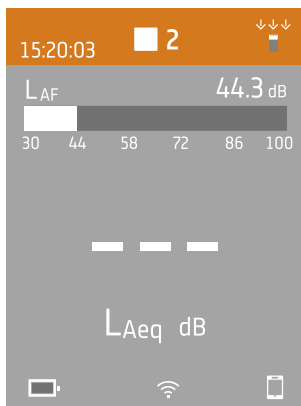
The top region shows measurement information and instrument status.

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When idle, the instrument displays the current time (to the left) and input settings (to the right).

⏱ : Indicates the clock is controlled from a network time protocol (NTP) server on the Internet. Precision of the time is within 10 ms.

🛰 : Indicates that clock is controlled from a satellite. Precision of the time is within 1 ms.

⚠ : Indicates that the clock is estimated to be more than 2 s wrong.

↓↓↓ ▮ : Indicates that Sound field is set to Free-field and there is not a windscreen.
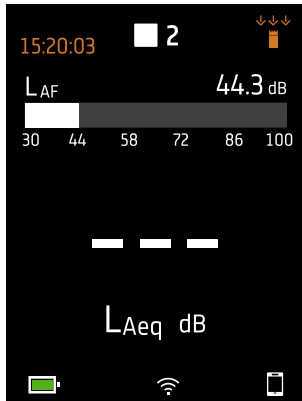
↓↓↓ ● : Indicates that Sound field is set to Free-field and there is a windscreen.

→▮← : Indicates that Sound field is set to Diffuse-field and there is not a windscreen.

→●← : Indicates that Sound field is set to Diffuse-field and there is a windscreen.
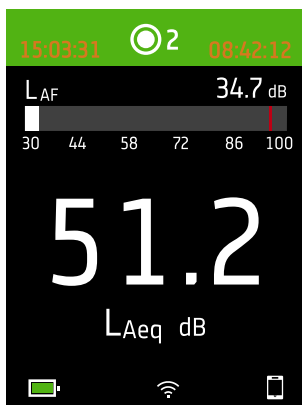
During a measurement, the instrument displays the start time (to the left) and the elapsed time (to the right).
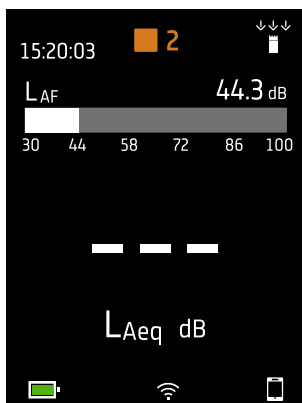
The number in the centre is the measurement number. The first measurement of every day is number 1. The number increments with each new measurement.

The background colour of the top region and the centre symbol change to indicate the state of the instrument.

▯ : Indicates that the instrument is ready to measure.

◎ : Indicates that the instrument is measuring.

❚❚ : Indicates that the instrument is paused.

▯ : Indicates that the instrument is stopped and displaying results from the measurement.

Press ▲ and ▼ briefly to scroll through measurement displays. Press ◄ and ►
briefly to scroll through the parameters for each display.

SLM view (left) and List view (right) are the main displays
for single measurements. SLM view shows a bar graph
and one broadband parameter. List view shows a bar
graph and a list of broadband parameters.
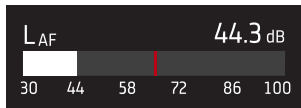
The bar graph shows the instantaneous sound level (L) with frequency and time
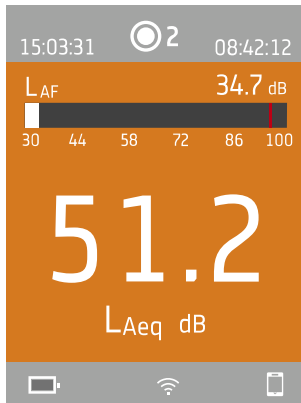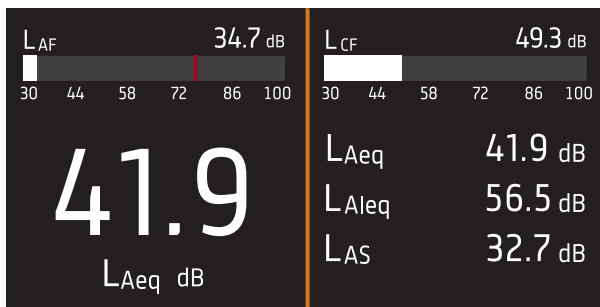weightings. This display is sometimes called the fast bar or fast display.

| : Indicates the maximum instantaneous sound level during a measurement.

✎ **Note:** The bar graphs in SLM view and List view are unique, that is they can each be set to show a different parameter.

- Go to **Menu** > **Display settings** > **SLM view** > **Graph parameter** to set the parameter for the bar graph when displaying one broadband parameter.
- Go to **Menu** > **Display settings** > **List view** > **Graph parameter** to set the parameter for the bar graph when displaying a list of broadband parameters.
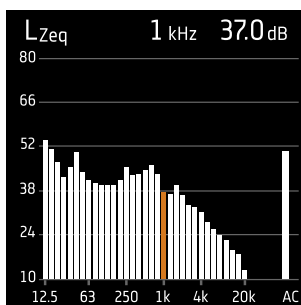
Spectrum view displays the frequency analysis of spectrum parameters, shown as decibel (dB) levels by Hertz (Hz).

Press and hold ◄ or ► to move the cursor in the display. The readout above the graph shows the location of the cursor and its decibel level. Press and hold ▲ to auto-scale the Y-axis to fit the data.

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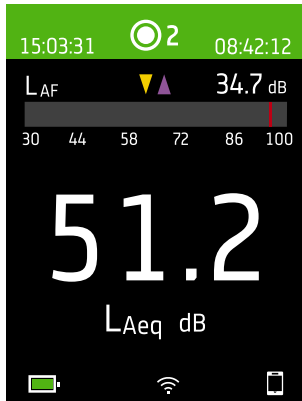
For very low or very high sound levels, you will see indicators.

▼ : Indicates a signal that is under the measurement range.

Overload occurs when the signal is over the measurement range. There are two types of overload indicators: latched and instantaneous. The latched-overload indicator is triggered at the first instance of overload and persists until the instrument is reset. The instantaneous-overload indicator is triggered every time the signal is over the measurement range.

▲ : Indicates instantaneous overload.

▲ : Indicates latched overload.
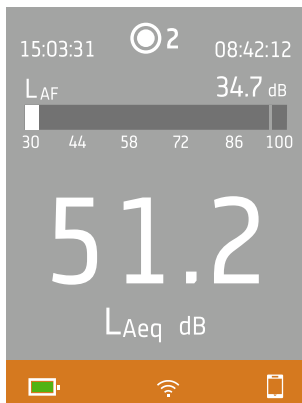
The bottom region provides information about the system: battery, network, and connectivity status.

The battery icons show the status of the battery. For example, 🔌 (charging) or 🔋 (full).

The network icons show the current network settings and its status. For example, 📶 (connected to a wireless network), (ᵢ) (acting as a hotspot), ⛓ (Ethernet connection) or ✈ (aeroplane mode).

The connectivity icons show you to which application the instrument is connected: 📱 (mobile) or 🖥 (PC).

📤 indicates that a backup is in progress.

The menu
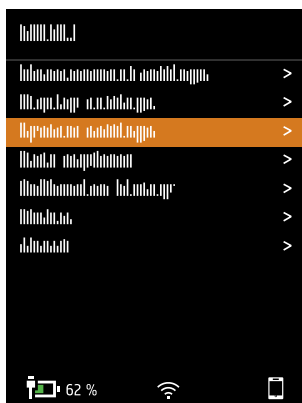
Use the buttons on the instrument to interact with the menu.

⊜ : Open / close the menu; open a response dialog; confirm a setting in a response dialog; enable / disable parameter selection boxes.

▲ : Navigate up a list; increment a value in a response dialog.

▼ : Navigate down a list; decrement a value in a response dialog.

◀ : Navigate down a level in the menu; exit a response dialog (without confirming a setting).

▶ : Navigate up a level in the menu; enter a response dialog.

Web server display

You can display the instrument GUI in a web browser.

You will need:

- Your instrument
- A computer or mobile device with Wi-Fi® and a web browser installed

Procedure:

1. Go to: **System settings** > **Network settings** > **Web server display**.
2. Select **Enabled**.
3. Network your devices.

   This is one way to network your devices:

   a. On the instrument, go to: **System settings** > **Network settings** > **Wi-Fi settings** > **Wi-Fi mode**.

   b. Select **Act as hotspot**.

   c. Make note of the hotspot name (example: BK2245-000000) and password.

   d. Connect your device to the hotspot as per the manufacturer's instructions.
4. On your mobile device or computer, open a web browser.
5. Type <***IP address*/display**> in the address bar of the browser.

   When acting as a hotspot, the IP address of the instrument is 10.42.0.1, so you will type <**10.42.0.1/display**>.

✎ **Note:** You can find the instrument's IP address here: **System settings** > **Network settings**. Look under Wi-Fi settings or Ethernet settings depending on your connection.

Charge the battery

The instrument has an internal Lithium-ion rechargeable battery.

Procedure

1. Connect the instrument to a power source.

   🔌 indicates that the battery is charging with a readout of the percentage charged.
2. Disconnect the power source to stop charging.

Approved power sources

- Mains
- Base station (the base station is powered via mains)
- Computer
- Power bank

Status

Go to **Menu** > **Status** to see the status of the battery.

- **Status**: Either *Full*, *Charging*, or *Discharging*
- **Time remaining**: The approximate time left on the charge
- **Charged**: The percentage to which the battery is currently charged

Power consumption

Settings for the screen and wireless configuration can have a noticeable effect on the instrument's power consumption. The type of measurement you perform will not have a large effect on battery consumption.

To manage power consumption, you can modify these settings:

- **System settings** > **Power management**
- **System settings** > **Network settings** > **Wi-Fi settings** > **Wi-Fi mode**
- **Display settings** > **Screen brightness**
- **System settings** > **Network settings** > **Web server display**

Battery calibration

To improve the accuracy of battery readings, it is recommended to calibrate the battery regularly.

1. Press ⊜ briefly to open the menu.
2. Go to: **System settings** > **Advanced settings** > **Service mode**.
3. Select **Enabled**.
4. Go to: **Calibrate battery**.

Follow the prompts to calibrate your battery.

Fix an unresponsive instrument

If your instrument freezes, try rebooting the instrument.

1. Remove all external connections, including the charger.
2. Press and hold ⊜ until the instrument reboots.

   This should take approximately 40 seconds.

Drying the instrument

IP rating

The enclosure for the instrument has an IP (ingress protection) rating of 55 as defined in IEC 60529. The double-digit rating number is actually two separate ratings. The first number is the rating of protection against the entry (ingress) of solids, such as dust. The second number is the rating of protection against the entry of liquids, such as water.

- **Protection against solids**: A rating of five means that the ingress of dust is not entirely prevented, but that it does not enter in quantities sufficient to interfere with the operation of the instrument.

- **Protection against liquids**: A rating of five means that the ingress of water from a low-pressure jet (6.3 mm (0.25 in)) from any direction has no harmful effect on the instrument. A rating of five means that the instrument is not watertight.

Where can water get in?

It is possible for water to enter the space between the microphone cartridge and the microphone preamplifier when, for example, the instrument is exposed to heavy rain. Also, water may enter the instrument body if, for example, the instrument is submerged in water.

On B&K 2245, the **microphone cartridge** attaches to (and detaches from) the microphone preamplifier, which is an integral part of the instrument body.

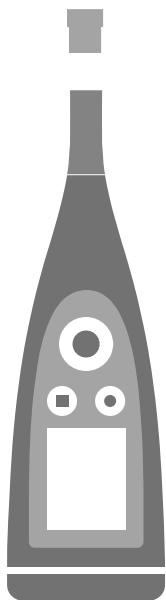The **instrument body** includes the microphone preamplifier and houses the signal processor. Of course, the instrument body also provides the user interface (control buttons, a display screen and a light ring) which allows you to interact with the instrument.

✎ **Note:** The microphone preamplifier cannot be removed from the instrument.

What will happen?

Water ingress between the microphone cartridge and the microphone preamplifier will not permanently damage the instrument, but measurement operation will be disturbed until everything is dry. This is because the contacts between the microphone cartridge and microphone preamplifier are very sensitive to contamination, such as water, which disrupts the ability of the signal to travel from the microphone cartridge to the microphone preamplifier.

✎ **Note:** Water that enters the instrument body will cause permanent damage.

How to dry the instrument

1. Turn the microphone cartridge anticlockwise to remove the microphone from the instrument body.
2. Let the microphone cartridge and instrument body dry by evaporation.
3. Reattach the microphone cartridge to the instrument body.

DOWNLOAD THE APPS

Download the PC application

You will need:

- A computer with access to the Internet and a web browser

System Requirements:

- Windows® 8.1 or 10 (64-bit) operating system
- Microsoft® .NET 4.7.2 framework

Recommended PC:

- Intel® Core™ i5 or better
- Sound card
- Solid State Drive (SSD)
- 8 GB of memory
- At least one available USB port
- Microsoft Office 2016 or later

Procedure:

1. Go to: www.bksv.com/downloads.
2. From the list of available downloads, expand **B&K 2245 Software, firmware and manuals**.
3. Click **B&K 2245 Software downloads**.
4. Scroll down to the application.
5. Click **Install Product Noise Partner Software** to start the download.
6. Once the download is complete, double-click the file (Setup.exe) to start installation.

   ✎ **Note:** The file will be placed in a location that is defined by the settings in your web browser.

The PC application will start immediately after installation.

Updates

You will be informed of updates via the application.

Download the mobile app

You will need:

- iOS-based phone or tablet

  See supported iOS versions for current app version in the App Store®, under **Product Noise Partner** > **Inform-ation** > **Compatibility**.

Procedure:

1. Go to the App Store.
2. Search for and install Product Noise Partner.

Updates

You will be informed of updates via the App Store.

CONNECT DEVICES

Communication between the instrument and the devices running the applications is an essential part of using the instrument. Once you understand the ways in which the devices can communicate, you will be able to change connections to suit your circumstances.

There are basically two ways to connect the mobile app or the PC application to the instrument: locally or remotely. The difference between the two types is that remote connections enable you to connect to the instrument when you are not near it. For most people, a local connection is all you will need.

Local connections

A local connection is a connection to a local area network (LAN). It is the simplest way to connect the applications to the instrument. Typically, the network will be your office or home network, but you can also use the instrument to create a hotspot to which you can connect devices while you are out in the field.

Once the instrument and the device running the application are using the same network, they can communicate. You will use Wi-Fi®, Bluetooth® and Ethernet in varying combinations to enable communication between devices.

✏ **Note:** The mobile app and PC application do not connect to one another, the applications only connect to the instrument.

Join your local network

Connect all devices (instrument, mobile device and PC) to your local network so that they can communicate with one another. Connect the mobile device and PC as per the manufacturer's instructions. Connect the instrument using one of the following options:

- Use an Ethernet connection:
    - Use a USB-C to USB-A cable to connect the instrument to your PC.
    - Use a USB-C to Ethernet adaptor to connect an Ethernet cable directly to the instrument.
    - Place the instrument on the desktop base station (an optional accessory that provides power and a network connection to the instrument).
- Use a wireless connection:
    a. Press ⊜ briefly to open the menu.
    b. Go to: **System settings** > **Network settings** > **Wi-Fi settings** > **Wi-Fi mode**.
    c. Select **Connect to network**.
    d. Go to: **Wi-Fi name**.
    e. Select the network you wish to join.
    f. Enter the password at the prompt.

        Use ▲ and ▼ to scroll through the character menu.

        Use ◄ and ► to move left or right.

        Press ⊜ to advance to the options: OK or Cancel.

Use the instrument as a hotspot

Connect your mobile device and / or PC to the instrument's hotspot so that the devices can communicate.

1. On the instrument, go to: **System settings** > **Network settings** > **Wi-Fi settings** > **Wi-Fi mode**.
2. Select **Act as hotspot**.
3. Make note of the hotspot name (example: BK2245-000000) and password.
4. Connect the mobile device and / or PC to the hotspot as per the manufacturer's instructions.

Change the hotspot password

If you wish to change the default password for the instrument hotspot:

1. Go to: **System settings** > **Network settings** > **Wi-Fi settings**.
2. Ensure that Wi-Fi mode is set to Act as hotspot.
3. Select **Password**.
4. Use ▲ and ▼ to scroll through the character menu.
5. Press ⬇ to confirm the changes.

✏ **Note:** Restart the instrument to apply the new password.

Remote connections

It is possible to connect to an instrument remotely, that is, connect to an instrument on a network from a different network or the Internet. Establishing a remote connection is a little more complicated than creating a local connection, but it can be helpful if you want to be able to access your instrument from remote locations. The following includes information about your instrument, general guidelines for the configuration of your router to enable remote connection, and how to test the connection.

✏ **Note:**

- Remote connection is optional. In other words, you do not need to be able to connect to your instrument remotely in order to use it with the mobile app or the PC application.
- Please refer to the manufacturer of your router or to your Internet service provider (ISP) for information specific to your network.
- The instrument must be on and connected to the network in order to access it remotely using the mobile app or the PC application.

Before you begin, you will need some information about your Internet service:

- Is your IP address IPv4 or IPv6 or both?

  The instrument supports both. The difference is that IPv4 requires port forwarding while IPv6 does not.

- If you have an IPv4 address, is it static or dynamic?

  You can use either static or dynamic addresses. However, dynamic IPv4 addresses change, which requires you to enter a new IP address in the mobile app or PC application every time the address changes.

- If you have a dynamic IPv4 address, can you get a static IP address or set up a DynDNS (dynamic domain name system)?

  You can use a static IP address or set up DynDNS, which works by assigning a persistent host name to the instrument, to overcome the problem of changing IPv4 addresses.

- Is your ISP blocking any instrument ports?

  ✎ **Note:** The instrument uses ports 80, 443 and 8700 to 8720. It is not possible to change these ports. Therefore, remote connection is not possible if your ISP blocks any of those ports.

What you will need:

- An instrument that is connected to the network (either by Wi-Fi® or Ethernet)
- Access to the settings interface of your network router

How to connect remotely via an IPv4 address

Use the NAT (network address translation) capabilities of your router to forward the ports of your instrument so that you can connect to it remotely.

A general procedure is as follows:

✎ **Note:** This procedure applies to static IPv4 addresses and dynamic IPv4 address using DynDNS.

1. Look for the port forwarding option on your router.

   If you do not find it right away, look for advanced options.

2. Create port-forwarding rules.

   Port-forwarding rules link the IP address of the instrument to ports that it uses so that when you send a request to the instrument's network from another network, the router knows to which device to direct the request.

   You can find the IPv4 address of the instrument on the instrument or on the router.

   - On the instrument, go to: **Menu** > **Network settings** > **Wi-Fi settings** or **Ethernet settings** > **IP address**.
   - On the router, see the list of the connected devices.

   The instrument uses the following ports:

   - Port 80: The common port assigned to HTTP (hypertext transfer protocol)
   - Port 443: The common port assigned to HTTPS (hypertext transfer protocol secure)
   - Ports 8700 to 8720: Open ports

   ✎ **Note:** All ports use TCP (transmission control protocol).

3. From another network, such as a mobile network, test the setup.

   ✎ **Note:** Turn off Wi-Fi on your mobile device to make sure that you are not connected to the same network as the instrument.

   a. Open the mobile app.
   b. Tap **Connect instrument**.
   c. From the instrument list, tap **Connect manually**.

      ✎ **Note:** If the mobile app is connected to an instrument, disconnect from it to access the list.

    d.   Enter the IP address or host name, and if used, the password.

- For IPv4 addresses, enter your network's public WAN IP address.

  You can find your WAN IP address on your router or through an Internet search of 'my IP'.

- For DynDNS, enter the host name given by the DynDNS.

    e.   Tap **Connect**.

✎ **Note:** You can also test the setup using the PC application. Click ⬇, to open the import dialog then click ☰ and select **Add instrument from IP address**.

How to connect remotely via an IPv6 address

You do not have to set up port forwarding when using an IPv6 address.

To test the remote connection, try to connect to the instrument from a different network. The easiest way to check is to use a mobile device that has a mobile network and the mobile app installed.

✎ **Note:** Turn off Wi-Fi on your mobile device to make sure that you are not connected to the same network as the instrument.

1. Open the mobile app.
2. Tap **Connect instrument**.
3. From the instrument list, tap **Connect manually**.

   ✎ **Note:** If the mobile app is connected to an instrument, disconnect from it to access the list.

4. Enter the IPv6 address of your instrument.

   To find the IPv6 address, go to: **Menu** > **Network settings** > **Wi-Fi settings** or **Ethernet settings** > **IPv6 address**.

   ✎ **Note:** Enter the address in brackets, for example: [2701:db8:424d:d15::1a2f::].

5. Tap **Connect**.

✎ **Note:**

- If you are unable to connect, try adjusting the firewall settings on your router.
- You can also test the setup using the PC application. Click ⬇, to open the import dialog then click ☰ and select **Add instrument from IP address**.

Connect the PC application to the instrument

Connect the PC application to the instrument to upload templates to the instrument, to import devices or measurements from the instrument, or to control the instrument remotely.

1. Power on the instrument.
2. Connect your instrument and your PC to the same local network.

   See [Local connections on page 25](#) for more information.
3. In the PC application, click ➤.

4. Find your instrument in the Connect dialog.

   ✏ **Note:** It may take a few seconds for the instrument to appear in the dialog. To refresh the list: Click ☰, then ↻.

5. Click on the instrument to select it.

6. Click **Connect**.

   When the instrument and the PC application are connected, the button will change to: Connected.

7. Click **Done**.

Connect using IP address

If you are trying to establish a remote connection to the instrument or you do not see your instrument listed, you can use its IP address.

1. In the Connect dialog, click ☰.

2. Click **Add instrument from IP address**.

3. Enter the IP address of the instrument and the password (if used).

See **Local connections on page 25** and **Remote connections on page 26** for more information.

Connection status

In the lower left corner of the GUI, is information about the connection status and which instrument is connected.

- ✅ : Connected
- ❌ : Disconnected

Connect the mobile app to the instrument

The mobile app connects to the instrument via Wi-Fi® and Bluetooth®.

What you will need:

- The instrument

- An iOS-based mobile device (phone or tablet) with the mobile app installed

   ✏ **Note:** You will need to enable Wi-Fi and Bluetooth on your mobile device.

How to connect

1. Turn on the instrument.

2. Open the mobile app.

3. Tap **Connect instrument**.

   ✏ **Note:** After successfully connecting to your instrument this button will change to Configure instrument.

4. Tap on your instrument to connect.

💡 **Hint:** Give the instrument a nickname (**System settings** > **Network settings** > **Nickname**). A nickname can make it easier to find your instrument in a list. Also, nicknames are fun!

5. The mobile app will prompt you to connect the mobile device and the instrument to the same local network.

   You have two options:

   - *Connect to network*: The instrument and the mobile device connect to the Wi-Fi access point of your personal or work network.
   - *Act as hotspot*: This enables the instrument's hotspot and your mobile device connects to it.

6. After choosing, the mobile app prompts you for the permissions and information required to connect to the desired network.

That's it! The instrument shows ▢ when it is connected to the mobile app.

Once the mobile app has connected to an instrument, the app will remember the instrument and re-establish a connection automatically after separation.

How to add the instrument manually

If you want to find an instrument that is not showing up in the list of discovered instruments, such as an instrument on another network, you can manually add the instrument to the list using its IP address.

✏ **Note:** Use this functionality to connect to your instrument remotely.

1. On the mobile app, tap **Connect manually**.

2. Enter the IP address or host name, and if used, the password.

   For local connections, you can find the IP address of the instrument here: **Menu** > **System settings** > **Network settings** > **Wi-Fi settings** or **Ethernet settings**.

   For remote connections, the IP address or host name will depend on your setup. Refer to **Remote connections on page 26** for information about which IP address or host name to use.

3. Tap **Connect**.

How to disconnect devices

Disconnect the instrument from the mobile app if you wish to connect the mobile app to another instrument. When you disconnect the instrument, the mobile app will not connect to the instrument automatically.

1. From the home screen of the mobile app, tap **Configure instrument** to open the instrument menu.

2. Tap the disconnect button next the instrument.

3. Tap **Disconnect**.

✏ **Note:** If you disconnect the instrument from the mobile app, the app will still discover the instrument.

Troubleshooting connection problems

- Check that the instrument is set to act as a hotspot (**System settings** > **Network settings** > **Wi-Fi settings** > **Wi-Fi mode**).

- Check that the instrument is generating a hotspot, it will show ((⋮)).

- Check that Wi-Fi is enabled on the mobile device.

- Make sure that the two devices are within range.

- Try turning Wi-Fi off and on again on the mobile device.

- Try re-entering the network password on the mobile device. You may have to forget the network first.

- If you get an invalid password error message on the mobile device when trying to connect to the instrument hotspot, try rebooting the instrument.

DATABASES

The main storage facility of Product Noise Partner is databases. Databases store devices under test (DUTs) and templates. Databases also store the data for each DUT, which includes metadata, test setup properties, measurement data, calculations and annotations.

Create a database

The first time you start the PC application, the first thing to do will be to create a new database. Creating a database is a two-part process. First, you will pick a name and location for your database. Second, you will define a set of metadata fields. Metadata fields are the categories or types of data that you will use to describe the DUTs in your database. Each database contains one set of metadata fields and this set will be applied to each and every DUT you add to the database.

1. Click **Create Database**.
2. In the dialog:
    a. Navigate to the location you would like to store the database.

        The location can be on your PC or on a network.

    b. Enter a name.

        This will be the name of the folder that contains the database and the database file (.pndb).

    c. Click **Save**.

        The Metadata Fields dialog will open.

3. Add/edit metadata fields.

    See below for details.

4. Click **Finish**.

Metadata fields

New databases include two metadata fields by default: Date and Description. Add more metadata fields, or edit the default metadata fields to customise the metadata fields for your database.

Being able to customise metadata makes Product Noise Partner more versitile, allowing you to create multiple databases with metadata fields tailored to the devices it will store. For example, one database can be created to track the design versions of a single product, while another database can be created to track the make, model and serial number of different products being tested for noise emission compliance.

See **Metadata (PC) on page 39** for information about filling out metadata fields using the PC application or **Metadata (mobile) on page 39** for information about filling out metadata fields using the mobile app.

Add metadata fields

1. In the Metadata Fields dialog, click ＋.
2. Enter a name for the metadata field.

3. Enter a description, if desired.

    Descriptions will be visible when filling out the metadata fields in both the PC and mobile version of the application. Descriptions can be helpful if more than one person will be using the database.

4. Select the type of metadata.

    This enables you to format the metadata field so that it best fits the type of data to be entered.

    - **Text**: Adds a text box for letters, numbers, symbols and spaces. Description, the default metadata field, is a text box.
    - **Checkbox**: Adds a checkbox that can be selected or deselected. The field is true when the box is selected. This formatting is useful for binary metadata: on or off, true or false, yes or no.
    - **Whole number**: Adds a text box for integers only. The default range is 0 to 100, but you can change the range to suit your setup. For example, if you add a metadata field for the year the product was made and you are only testing products made in the 1990s, you can select a range such as 1990 to 1999. Numbers outside of the defined range will not be saved.
    - **Decimal number**: Adds a text box for numbers with fractional quantities. The default range is 0 to 100, but you can change the range to suit your setup.
    - **Selection**: Adds a drop-down menu for which you can define custom options. Enter the options you want to use in the Selection values box. Each option must be on a separate line, commas or semi-colons cannot be used to list the options.
    - **Date and time**: Adds selectors for the date and time. Date, the default metadata field, is a date and time selector. When you add a device to the database, Date and time is set to be the date and time at which the device is added.

5. Define a default value.

    For all types of metadata (except Date and time), you can define what is in the metadata field by default.

6. Repeat steps 1 through 5 as desired.

7. Click **Finish**.

💡 **Hint:** Custom metadata fields and templates simplify the process of repeated testing.

Edit metadata fields

1. Select a metadata field in the list.
2. Change the name, description, type and default values as desired.

✏ **Note:** You can edit the name and description of the default metadata fields (Date and Description) but you cannot change their type.

Delete metadata fields

1. Select a metadata field in the list.
2. Click 🗑.
3. Click **Yes**.

✏ **Note:** You cannot delete the default metadata fields (Date and Description).

Open a database

1. Start the PC application.
2. Click **Open Database**.
3. Navigate to the database you would like to use.
4. Click **Open**.

💡 **Hint:** You can also set the application to open the last database upon startup. See **Application menu (PC) on page 61** for more information.

Switch databases

If you already have a database open, you can open a different database without closing the application.

1. Open the application menu.

   Click on the Product Noise Partner tab in the upper left corner.
2. Click **Open Database**.
3. Do one of the following:
     - Select a database to open from the list of recent databases.
     - Click **Browse**, then navigate to a database.
4. Click **Open**.

Edit a database

1. Open the database you would like to edit.
2. Click 🗄 (upper left).
3. Change the name of the database, if desired.
4. Click **Next**.
5. Edit the metadata fields, using the Metadata Fields dialog.
6. Click **Finish**.

DUTS

DUTs (PC)

The device under test (DUT) is the product whose sound power levels are being determined. DUTs and their metadata, setup properties, measurements, calculations and annotations are stored in a Product Noise Partner database. You can save a DUT as a template, which simplifies the process of adding DUTs to a database.

Create a DUT

1. Open a database.

   See **Databases on page 32** for more information about creating and using databases.

2. Click **+ New DUT** (upper left).

3. Enter the name and serial number of the DUT.

   A name is mandatory, but the serial number is optional.

4. Select one of the following options:

   - **New**: You will then select the standard you are using to test the DUT.

   - **From Template**: You will then select the template you would like to use. See **Templates on page 46** for more information about creating and using templates.

   If this is the first DUT you have ever created, then select New.

5. Click **Create**.

✏ **Note:**

- DUTs are listed in a browser on the left.
- DUTs are listed in order by date.
- Click on a DUT to select it, you can then add metadata, enter your setup information and make measurements.

Delete a DUT

1. Right-click on a DUT in the list.
2. Click **Delete**.

💡 **Hint:** You can also use the Delete key on your keyboard.

Import a DUT

DUTs that have been created and tested using the mobile app will be stored on your instrument, including their metadata, setup information, measurement data and annotations. Import these DUTs to the PC application to add them to the database, review the results, and export data for reporting.

1. Connect to the instrument.

   See **Connect the PC application to the instrument on page 28** for more information.

2. Click ⤓.

3. In the dialog, click on a DUT to select it.

    Use the Control and Shift keys to select multiple devices.

4. Click **Import**.

✎ **Note:** You can only import DUTs into databases from which they were created. In more words, you can only import DUTs that were created using a template which was made from a DUT in the database into which you are importing.

Edit a DUT

To change the name and/or serial number of devices, select a DUT in the list and click ✐.

Save a DUT as a template

Templates simplify the process of adding devices under test (DUTs) to a database by allowing you to reuse metadata and setup properties. Templates also carry information from the database to the mobile app (via the instrument) so that you can use the mobile app for the test and to make annotations.

A template can be helpful, for example, during product development. You can create a template of the test setup for the product then use the template to add a new DUT for each design version. This allows you to keep a unique set of measurement data for each design version in a single database.

1. Click on a DUT in the list to select it.
2. Click ▭ .
3. Edit the template name, if desired.
4. Click **OK**.

For more information about templates, see **Templates on page 46**.

Export a DUT

You can export the data for a DUT to a Microsoft® Excel® report.

1. Click on a DUT in the list to select it.
2. Click ▣ .
3. **Report template**: Select a report template, otherwise the default template will be used. Click the browse button to browse to a location.
4. **Destination file**: Select a location for the report to be saved. Click the browse button to browse to a location.
5. **Open report when done**: Enable or disable.
6. Click **Generate**.

Filter the DUTs

Click ▽ to show or hide deleted DUTs.

Restore a deleted DUT

Right-click on a deleted DUT and select **Restore**.

Search the DUTs

The search bar searches the names and serial numbers of DUTs in the database.

DUTs (mobile)

The mobile app allows you to add, test and measure devices under test (DUTs) using a mobile device.

To use the mobile app when testing a device, you must create a template using the PC application. This is because the mobile app cannot interface with a database directly. Templates allow the mobile app to create devices that will be compatible with a database. Here's how it works: A template is transferred from the PC application to the instrument, then from the instrument to the mobile app. The mobile app is then used to create and test DUTs, based on the template, which are stored on the instrument. DUTs can be imported from the instrument to the PC application (and hence the database) because they were created with a template from the database.

Before you can add a device using the mobile app:

1. Create a template using the PC application.

   See **Templates on page 46** for more information.

2. Connect the PC application to the instrument.

   See **Connect the PC application to the instrument on page 28** for more information.

3. Upload the template to the instrument.

   See **Templates on page 46** for more information.

Add a new DUT

1. Tap **New DUT**.
2. Enter the name (required) and a serial number (optional) of the device.
3. Select the template to use (if there is more than one template).
4. Tap **Done** to close the keypad.
5. Tap **Done** to create a new device.

You will now be able to edit the metadata and test setup, to make measurements and to add annotations.

See the following for more information:

- **Metadata (mobile) on page 39**
- **Setup (mobile) on page 45**
- **Measurement (mobile) on page 56**
- **Annotations on page 58**

All DUTs

Tap **DUTs** to view a list of DUTs that have been created using the mobile app. DUTs are listed in order by the time of creation, with the newest devices at the top of the list.

- Tap a device to open it.

  Edit its metadata or setup, make measurements, or add annotations.

- Swipe left on a device to edit or delete it.

  Tap ✒ to change the device's name or serial number.

  Tap 🗑 to delete the device.

METADATA

Metadata (PC)

The **Metadata** window is where you add metadata to a device under test (DUT).

The metadata fields that you see in the Metadata window are the fields that have been defined for the database. See **Databases on page 32** for more information about creating and editing metadata fields in a database.

Add metadata

1. Click on a DUT in the list to select it.
2. Click **Metadata**.
3. Enter data in each field using the keyboard or the provided selectors.

✎ **Note:**
- Date and Description are default metadata fields.
- The date and time are set automatically to the time of creation of the DUT, but the fields are editable.

Search metadata

Click 🔍 to open a search bar. The search bar allows you to search the metadata fields in the database.

Description

If a description was added when the metadata field was created, it will be displayed below the metadata fields.

Metadata (mobile)

You can use the mobile app to enter metadata for a device under test (DUT). Metadata fields are defined in the database using the PC app. You cannot create metadata fields using the mobile app. For more information about creating and editing metadata fields, see **Databases on page 32**.

Add metadata

1. From the home screen, open a DUT.
   - Tap **New DUT** to create a new DUT.
   - Tap **DUTs** to open the list of DUTs and select one.
2. Tap **Metadata**.
3. Enter metadata.
4. Tap **Close** to return to the menu for the DUT.

Description

If a description was added when the metadata field was created, it will be displayed below the metadata fields.

✎ **Note:** To read the description of the metadata field in the mobile app, tap a field then tap **Done** to close the keypad or selector.

SETUP

Setup (PC)

The **Setup** window is where you enter the test setup for the device under test (DUT). To do this, you will fill out the fields in the **Sound Power Properties** panel. The properties you enter will be saved with the DUT. You can create a template of the DUT to reuse its setup. See **Templates on page 46** for more information.

The Setup window includes:

- **Sound Power Properties**: A panel with the properties for the test environment (the essentially free field in which the test is being conducted), the DUT, the measurements and the calculations for the test.
- **Measurement Surface**: A panel that shows the geometry, or graphical representation, of the reference box and measurement surface, including the measurement points.
- **Warnings**: A panel that alerts you of possible problems with the setup.

Sound power properties

Use the properties to enter your setup information.

✎ **Note:** The section below gives information about all properties related to determining sound power according to standards. The Sound Power Properties panel is dynamic, meaning that properties are enabled and disabled depending on the standard and the settings you choose. Not all properties will be used for all tests.

Device Under Test

Toy type: For EN 71-1, select the type of toy you are testing.

Geometry

Geometry properties enable you to define the reference box and the measurement surface for your test.

Measurement Surface: Select the measurement surface you are using for the test.

- *Hemisphere*: Measurement points are on a hypothetical spherical surface which surrounds the reference box and terminates at the reflecting planes.
- *Parallelepiped*: Measurement points are on a hypothetical box-shaped surface which surrounds the reference box and terminates at the reflecting planes.
- *Custom*: Select this option if you want to use a cylinder or combination measurement surface. Edit the location of measurement points in the Measurement Points panel of the PC application.

Reflecting planes: Enter the number of reflecting planes that are in the test environment.

Additional points: For ISO 3746 and EN 71-1, add a tick mark to the box if you want to add more measurement points to the measurement surface.

Hemisphere configuration: This setting determines the location of the measurement points (that is, the microphone traverse) on the measurement surface.

- *Broadband sources*: Choose this setting to use the optional measurement points for DUTs which emit no audible discrete tones.
- *All types of sources*: Choose this setting to use measurement points suitable for all DUTs, including those which emit discrete tones.

Reduced points: For ISO 3744, add a tick mark to the box if you can reduce the number of measurement points. This setting is enabled when Measurement Surface is set to Hemisphere and Hemisphere configuration is set to Broadband sources.

Radius: Enter the radius of the hemispherical measurement surface in meters.

Reference box (width, length, height): Enter the dimensions of the hypothetical shape that represents the DUT in meters.

✒ **Note:** When testing rattles or squeeze toys, the reference box is not really needed. This information can be treated as metadata.

Characteristic dimension: The characteristic dimension is automatically calculated by the application.

Measurement distance: Enter the distance from the reference box to the parallelepiped measurement surface in meters. For testing toys such as rattles and squeeze toys (EN 71-1), this is the distance between the toy and the microphone (0.5 m) and it is entered in the setup by default.

Measurement height: For testing toys such as rattles and squeeze toys (EN 71-1), enter the distance between the source (the rattle or squeeze toy) and the floor in meters. The height should be at least 1 m.

Number of points: For custom measurement surfaces, this is the number of measurement points on the measurement surface. See **Setup (PC) on page 41** for information about custom measurement point locations.

Surface area: The surface area of the measurement surface is automatically calculated by the application.

Calculation

Calculation properties allow you to enable or disable background noise and environmental corrections.

- Background correction (K1): Enable this setting to apply corrections for background noise in the test environment.

  Product Noise Partner will apply background corrections to the frequencies that meet the criteria given in the standard.

- Single point for background: If you are using background correction, enable this setting to calculate the background correction from a single measurement point. Also, be sure to select the measurement point to use (the default is Point 1).

- Room correction (K2): Enable this setting to apply corrections for the acoustic quality of the test environment .

K2A calculation type: K2A is the A-weighted environmental correction. Use the drop-down menu to choose the method for calculating the correction.

- *With RSS*: In this method, the sound power of the reference sound source is measured and compared to its calibrated sound power.

- *From absorption*: In this method, K2 is calculated from sound absorption in the room. Product Noise Partner supports calculating K2 from absorption using either the approximate method or the reverberation method.

  ✒ **Note:** You will also need to enter Environment and, if used, Reverberation Time properties.

Measurement times

Enter the amount of time you will measure the background noise, reference sound source and DUT in seconds.

Initial samples: Enter the initial number of samples for each operator. Additional samples can be added for a particular operator, if the difference between samples is too big.

✏ **Note:** These times will be applied to the instrument settings (**Measurement settings** > **Measurement control**). See **Measurement control on page 65** for more information about the settings.

Reverberation Time

To enable Reverberation Time properties, the Calculation properties must be set to use room correction and K2A calculation type must be set to *From absorption*.

Enter the date of the reverberation time measurement. If you measure reverberation time periodically, this field lets you track that.

To enter RT60 values for the frequency spectrum, click on a row in the table.

✏ **Note:** You must also enter the volume of the room in the Environment properties.

Reference sound source

To use a reference sound when determining sound power, Product Noise Partner needs to know the calibrated sound power levels of the reference sound source for comparison with the measured levels.

To enter the calibrated levels of the reference sound source (from its calibration chart) in the table:

- Click on the text boxes to enter the type, manufacturer and serial number of the reference sound source.
- Click the calendar icon or click on the text box to enter the calibration date.
- Click on a row in the table column then enter the sound power level for the corresponding frequency.

Environment

Room surface area: For calculating K2 from absorption using the approximate method, enter the surface area of the room in which the test is taking place.

Room volume: For calculating K2 from absorption using the reverberation method, enter the volume of the room in which the test is taking place.

Absorption coefficient: For calculating K2 from absorption using the approximate method, enter the absorption coefficient of the test environment.

✏ **Note:** Room surface area, Room volume and Absorption coefficient are enabled when **K2A calculation type** is set to *From absorption* in the Calculation properties.

Temperature, **Pressure**, and **Humidity**: Atmospheric conditions of the test environment. You can use the default values or enter new values. This data is used to calculate Lw ref, atm (the sound power calculation at reference atmospheric conditions).

Uncertainty

Operating conditions: Choose the mode of operation you will use while testing.

Sigma OMC (σ_{OMC}): Enter a standard deviation for the instability of the operating conditions for the DUT.

Sound type: Choose if the DUT emits sounds with or without discrete tones.

Limits

Exposure category: For EN 71-1, this is where you set the category for the length of time the sound source is active.

Category 1	time > 30 s
Category 2	5 s > time > 30 s
Category 3	time < 5 s

Add a tick mark to enable limits for the calculated sound power levels. Click on the text boxes to enter or change values. For ISO 3744 and ISO 3746, enter upper and lower limit values. For EN 71-1, limit values are entered automatically.

When you enable limits, pass/fail results are shown in the Measurement window. See for more information.

Warnings

Check the **Warnings** panel for information about errors or problems with the setup.

Measurement surface and measurement points

The **Measurement Surface** panel shows the geometric representation of the measurement setup (the reference box within the measurement surface and all the measurement points). **Measurement Points** is a panel that contains a table of the measurement points, showing their Cartesian coordinates and their partial area. Partial area is the part of the measurement surface that belongs to a measurement point. For hemisphere and parallelepiped measurement surfaces, the partial area is calculated as the surface area divided by the number of measurement points.

The two panels are different representations of the same information, and as such, they work together. For example, when you select a measurement point in one panel, the point is also selected in the other panel.

Controls

- Move the geometry: Right-click on the geometry and drag.
- Zoom in/out: Mouse over the geometry and scroll up/down.
- Select a measurement point: Click on a point in the geometry or on an item in the list of measurement points.
- Show/hide the measurement surface grid: Click ⊞.
- Show/hide the reference box: Click ⬚.
- Show/hide the measurement point labels: Click ¹₃².
- Return the view to the default orientation: Click ↩.
- Copy the geometry or measurement points to your clipboard: Click ⧉.

   💡 **Hint:** Paste copied data into Microsoft® Office applications, for example.

Edit measurement points

The ability to edit measurement points allows you to create custom measurement surfaces.

1. In Sound Power Properties, set **Measurement Surface** to *Custom*.

2. In the table of measurement points, click on a row to select a point.

3. Edit the point.

   - Double-click on the X, Y or Z value to enter a number (in meters).

   - Click 🗑 to delete the point.

4. Repeat as needed.

Setup (mobile)

To edit the setup for the device under test (DUT) using the mobile app:

1. From the home screen, open a DUT.

   - Tap **New DUT** to create a new DUT.

   - Tap **DUTs** to open the list of DUTs and select one.

2. Tap **Setup**.

3. Tap on a property to edit its settings.

4. Tap **Close** to return to the menu for the DUT.

TEMPLATES

Templates simplify the process of adding devices under test (DUTs) to a database by allowing you to reuse metadata and setup properties. Templates also carry information from the database to the mobile app (via the instrument) so that you can use the mobile app for the test and to make annotations.

A template can be helpful, for example, during product development. You can create a template of the test setup for the product then use the template to add a new DUT for each design version. This allows you to keep a unique set of measurement data for each design version in a single database.

Create a template

A template is created from a DUT and is stored in the database in which it is created. A template includes the metadata, setup information and measurement data for the DUT from which it was created. You can create and use multiple templates in a single database.

Before you can create a template:

1. Create a database.

   See **Databases on page 32** for more information.

2. Add a device.

   See **DUTs (PC) on page 35** for more information.

3. Add metadata and set up the device.

   See **Metadata (PC) on page 39** and **Setup (PC) on page 41** for more information.

How to create a template:

1. Click on a DUT in the list to select it.
2. Click ⊟ .
3. Edit the template name, if desired.
4. Click **OK**.

The next time you add a new DUT to the database, you will be able to use the template to create it.

The templates saved in a database are listed on the left side of the user interface, in the Templates window.

💡 **Hint:** Custom metadata fields and templates simplify the process of repeated testing.

Rename a template

Templates are saved with information about which device was used to create the template.

💡 **Hint:** If you plan to create multiple templates, it is a good idea to rename them so that they are easy to identify.

This can also make it easier to choose the right template in the mobile app, where display space is limited.

1. Right-click on a template in the list of templates.
2. Click **Rename**.
3. Enter a new name.
4. Click **OK**.

Delete a template

1. Right-click on a template in the list of templates.

2. Click **Delete**.

💡 **Hint:** You can also use the Delete key on your keyboard.

Create a new DUT from a template

1. Click **+ New DUT**.

2. Enter the name and serial number of the DUT.

   A name is mandatory, but the serial number is optional.

3. Select **From Template**.

4. Use the drop-down menu to select the template you would like to use.

5. Click **Create**.

💡 **Hint:** Double-click on a template in the list of templates to create a new DUT using that template.

Upload templates

To use the mobile app when testing a product, you will need to place a template on the mobile app. Templates allow you to add DUTs using the mobile app. Templates are transferred to the mobile app through the instrument.

💡 **Hint:** If you have not uploaded any templates to the mobile app, there is a sample template on the mobile app. The sample template allows you to use the mobile app without creating and uploading a template. However, the sample template is designed for demonstration purposes only and is not to be used for tests.

To upload a template to the instrument:

1. Connect the PC application to the instrument.

   See for more information.

2. Click ↑ to upload the template to the instrument.

✏️ **Note:**

- All the templates are transferred to the instrument. If a template was changed, it is updated.

- If there are templates from another database on the instrument, they will be deleted from the instrument.

Automatic upload of templates

Enable templates to upload to the instrument automatically. This eliminates the need to manually upload templates (that is, click ↑). Every time the instrument and the PC application connect or whenever there is a change in the list of templates (if a template is added, deleted or renamed), the templates will be uploaded.

Automatic upload is a setting for the application, not the database. This means that templates will upload automatically regardless of the database that is open. Any templates on the instrument that are not in the open database will be removed from the instrument.

1. Open the application menu.

   Click on the Product Noise Partner tab in the upper left corner.

2. Click **Options**.

3. Under Template Settings, click the Automatic Upload checkbox.

   - Tick mark = enabled
   - No tick mark = disabled

CALIBRATION CHECK

It is a best practice to check the accuracy of your instrument before and after a measurement by performing a calibration check. A calibration check is not a calibration. **Calibration** includes an adjustment of the instrument's sensitivity. A **calibration check** compares the current sensitivity of the instrument with the sensitivity from its initial calibration, checking that it has not changed too much.

When you place a sound calibrator on the microphone, the instrument detects the tone and automatically checks the deviation of the sensitivity of the instrument from its initial calibration.

How to perform a calibration check

You will need:

- The instrument
- A sound calibrator such as Type 4231

  A sound calibrator generates a known sound level, against which the measured level can be checked. Type 4231 generates a tone at 1 kHz with levels at 94 dB or 114 dB.

  ✎ **Note:** Be sure to add the calibrator's serial number in the calibration settings of the instrument. Go to: **Menu** > **System settings** > **Advanced settings** > **Calibration** > **Type 4231 no.**

Procedure:

1. Turn on the instrument.

   ✎ **Note:** Ensure that the **instrument is not measuring** and that the **menu is not open**.

2. Gently seat the calibrator on the microphone.
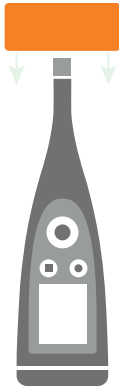
3. Turn on the sound calibrator.
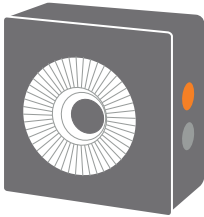
4. After a short period the instrument will initiate a calibration check, choose **Yes**.

5. The calibration check will have one of two results:

    - *Pass*: The measured sound level is within tolerance. The instrument is ready for use.
    - *Fail*: The measured sound level is greater than the acceptable tolerance. The instrument should be recalibrated or serviced.

6. Exit the calibration check.

Calibration history

Go to: **Menu** > **Calibration history**.

Here you can view an instrument's history of calibrations and calibration checks.

Calibration settings

Go to: **Menu** > **System settings** > **Advanced settings** > **Calibration**.

Automatic calibration check

The instrument is set to perform a calibration check automatically by default.

To change this setting, set **Automatic check** to *Disabled*.

Calibration reminder

The instrument is set to remind you when it is time to calibrate by default.

To change the settings:

1. Enable Service mode.
2. Go to: **Calibration**.
3. Edit the settings for **Calibration reminder** and **Calibration interval** as desired.

Custom calibration

The instrument is set to use Sound Calibrator Type 4231 by default.

To use a different calibrator and set a custom calibration level:

1. Go to: **Calibrator**.
2. Select **Custom**.
3. Select **Custom calibrator no.** to add the calibrator's serial number.
4. Select **Custom level** to specify the sound level in dB.

MEASUREMENTS

The exact steps of a measurement will vary depending on the settings you use in Measurement control.

A basic overview is as follows:

1. Press ⦿ to start a measurement.

2. If necessary, press ⦿ to pause.
3. Press ⦿ to resume.
4. Press ▪ to stop the measurement.

At this point, you can review the results of the measurement.

5. Press ▪ again to clear the data from the last measurement and return the instrument to its ready state.

✎ **Note:**

- You will not need to stop the measurement if it has a preset time. Go to **Menu** > **Measurement settings** > **Measurement control** to enable or disable preset measurement times.
- Data is stored automatically when the measurement stops.
- If you are using the instrument with the mobile app, annotations will be synced with the measurement and saved on the instrument.

Data explorer

Go to: **Menu** > **Data explorer**.

Browse the measurements stored on the instrument, with the option to open or delete measurements.

1. Navigate to the desired folder.
2. Press ▶.
3. Choose **Open** to view the measurement on the instrument.

   ✏ **Note:**

   - Press ▉ to close the measurement.
   - Opening a measurement changes the current settings of the instrument to the settings of the measurement.

   Or choose **Move to Trash** to move the measurement to Trash.

To open the trash folder, go to: **Data** > **Show Trash**. Once you empty the trash, measurements will be permanently deleted.

Measurement (PC)

Use the **Measurement** window to make measurements and view results.

The Measurement window is divided into panels: Measurement Points, Results, Spectrum, and Measurement Surface. The panels that are displayed change based on the standard that is being used. The panels work together, so the information being displayed changes depending on what has been selected.

Measurement points

The **Measurement Points** panel provides you with the tools to manage measurements for each of the measurement points. It has a toolbar with buttons for making, importing and deleting measurements.

Below the toolbar, all the measurements for the test are displayed and grouped by measurement type: Background, Reference Sound Source and Device Under Test. Calculations are displayed in the Results section of the table. This section will not be enabled until all measurements have been completed.

Calculated results:

- Lp': The measured instantaneous sound pressure level spectrum (p = pressure)

  Lp: The measured instantaneous sound pressure level spectrum with background correction applied

  - RSS = reference sound source
  - ST = device under test (DUT)
  - B = background
- K1: Correction factor for background noise, in dB
- K2: Correction factor for the reference sound source, in dB
- Lw: Sound power calculation, L = level and w = watts

- Lw ref, atm: Sound power calculation at reference atmospheric conditions

  Atmospheric conditions are entered in the Environment section of the Sound Power Properties panel in the Setup window (see **Setup (PC) on page 41** for more information).

- Sigma tot (σ_{tot}): Total standard deviation

- Background criteria: This row tells you if background noise criteria are met.

  There are two criteria: absolute and relative.

  For the absolute criterion, background noise requirements are met if the background noise is within certain limits for all frequency bands. This can only happen in a good anechoic chamber. The pass/fail result for meeting the absolute criterion is shown in the A column.

  The relative criterion is a bit more complicated. For each frequency band, pass/fail results are determined by the difference between Lp'(ST) and Lp(B):

  - Fail: Lp'(ST) – Lp(B) < 6 dB
  - Pass: Lp'(ST) – Lp(B) ≥ 6 dB

  If all the frequency bands pass, the background noise requirements are met. If not, LwA is calculated twice: once with all the frequency bands and once without the failed frequency bands (that is, where Lp'(ST) – Lp(B) < 6 dB). If the difference between these two LwA values is <0.5 dB, the background noise requirements are met.

  However, there is an additional "discount" you can use when calculating LwA without the failed frequency bands. Certain frequency bands can be excluded from the frequency range of interest for the purpose of determining compliance with the criterion for background noise (ISO 3744:2010, 4.2.1.2). The excluded bands are marked as "excluded". This means there could be fewer bands that fail, which would make it more likely that the difference between the two LwA values will be <0.5 dB.

Make a measurement using the PC application

Before you can make a measurement:

1. Create a database.

   See **Databases on page 32** for more information.

2. Add a DUT.

   See **DUTs (PC) on page 35** for more information.

3. Set up the test.

   See **Setup (PC) on page 41** for more information.

To make a measurement:

1. Connect the PC application to the instrument.

   See **Connect the PC application to the instrument on page 28** for more information.

2. Click on a DUT in the list to select it.

3. Open the **Measurement** window.

4. Measure the background noise (if applicable).

   ✎ **Note:** For background noise measurements, the DUT and the reference sound source (if used) must be off.

   a. Set the instrument up at Point 1.

   b. In the PC application, select Point 1 under Background.

   c. Click ▶.

   d. After the instrument has stopped measuring, move the instrument to the next measurement point.

      The instrument will measure for the preset time then stop automatically. Measurement times are defined in the Measurement Times section of the Sound Power Properties panel in the Setup window.

   e. In the PC application, select the corresponding measurement point.

      ✎ **Note:** It is very important to select the corresponding measurement point. Once you start a measurement, any existing data will be overwritten.

   f. Click ▶.

   g. Repeat Steps d to f for all measurement points.

5. Repeat the measurement process for Reference Sound Source (if applicable).

   ✎ **Note:** For reference sound source measurements, the DUT must be off.

6. Repeat the measurement process for Device Under Test.

   ✎ **Note:** For DUT measurements, the reference sound source must be off.

Move to the next measurement point automatically

Instead of manually selecting the next measurement point in the application GUI (graphical user interface), you can set the application to move the next measurement point automatically. You can enable or disable automatic advancement at any point during the test.

Click ↓☰ to enable or disable automatic advancement. When the feature is enabled, the button background is dark.

Import measurements from the instrument

1. Connect the PC application to the instrument.

   See **Connect the PC application to the instrument on page 28** for more information.

2. Select the measurement point to which you want to import a measurement.

   💡 **Hint:** Select multiple measurement points to import measurements for multiple points simultaneously.

3. Click ↓.

4. Select the measurements you want to import.

5. Click **Import**.

Results

The **Results** panel shows readouts of the calculated sound power (Lw, LwA) and a large, colour-coded box which indicates the test results clearly.

The pass/fail results are determined by the limits defined in the setup (Setup window > Limits), see **Setup (PC) on page 41** for more information.

- A device **passes** the test if the calculated levels are **between** the lower and upper limits.
- A device **fails** the test if the calculated levels are **outside** of the lower or upper limits.

Spectrum

The **Spectrum** panel shows the spectrum of the selected measurement or calculation.

Click the lock button to lock or unlock the Y-axis. If you lock the Y-axis, it will not automatically scale to fit the data it displays. This can be helpful when comparing data.

Measurement surface

The **Measurement Surface** panel shows the geometric representation of the measurement setup, that is, the reference box within the measurement surface and all the measurement points. This is the same geometry you see in the Setup window.

Controls

- Move the geometry: Right-click on the geometry and drag.
- Zoom in/out: Mouse over the geometry and scroll up/down.
- Select a measurement point: Click on a point in the geometry or on an item in the list of measurement points.
- Show/hide the measurement surface grid: Click ⊞.
- Show/hide the reference box: Click ⬠.
- Show/hide the measurement point labels: Click ¹₃²·
- Return the view to the default orientation: Click ↩.
- Copy the geometry or measurement points to your clipboard: Click 🗒.

    💡 **Hint:** Paste copied data into Microsoft® Office applications, for example.

Measurement (mobile)

You can make measurements using the mobile app. This enables you to make measurements from a distance without your PC.

The measurement screen has controls for making measurements, displays of the measurement spectrum and geometry, and readouts of the measured and calculated levles.

How to measure using the mobile app

1. Connect the mobile app to the instrument.

   See **Connect the mobile app to the instrument on page 29** for more information.

2. Go to the measurement screen in the mobile app.

   a. From the home screen, tap **DUTs**.

   b. Tap on the DUT you wish to measure in the list of devices.

   c. Tap **Measurement**.

3. Measure the background sound levels (if applicable).

   ✎ **Note:** For background noise measurements, the DUT and the reference sound source (if used) must be off.

   a. Set up the instrument at the first measurement point.

   b. In the mobile app, use the left/right arrows to set the measurement.

   - Set the measurement to **Point 1**.
   - Set the measurement to **Background**.

   c. In the mobile app, tap ○.

      ✎ **Note:** If you change the measurement point while measuring, the measurement will stop.

   d. After the instrument has stopped measuring, move the instrument to the next measurement point.

      The instrument will measure for the preset time then stop automatically. Measurement times are defined in the Measurement Times section in Setup.

   e. In the mobile app, advance to the corresponding measurement point.

      ✎ **Note:** It is very important to select the corresponding measurement point. Once you start a measurement, any existing data will be overwritten.

   f. Tap ○.

   g. Repeat Steps d to f for all measurement points.

4. Repeat the measurement procedure for the reference sound source (if applicable).

   - Make sure that the DUT is off and the reference sound source is on.
   - Set the measurement to **Point 1** and **Reference Sound Source**.

5. Repeat the measurement procedure for the DUT.

   - Make sure that the DUT is on and the reference sound source is off.
   - Set the measurement to **Point 1** and **Device Under Test**.

Measurement views

During the measurement process you can switch between **Spectrum** and **Surface** views.

- **Spectrum** displays the measured levels during and after the measurement.

  Before starting another measurement, you can use the Spectrum display to review the last measurement.

- **Surface** shows the geometry of the DUT, with the current measurement point highlighted.

ANNOTATIONS

Annotations

Use the mobile app to add annotations, or comments, to the DUT. There are four types of annotations: photo, video, note, and commentary. Every DUT can have multiple annotations of different types.

It is always a good idea to add annotations to your measurements. For example, they can help you and your colleagues identify measurements at a later date and provide valuable information about the context of a measurement.

How to make annotations

1. Open a DUT.

   From the home screen, tap **DUTs** then select a DUT from the list.

2. Open an annotations screen.

   Do one of the following:

   - Tap **Annotations**.
   - Tap **Measurement**, then tap 📎.

3. Choose the kind of annotation you want to add:

   - 📷 : Photos

     You can use either front-facing or rear-facing camera to take a photo.

   - 🎥 : Videos

     You can use either front-facing or rear-facing camera to record video.

   - ✏️ : Notes
   - 🎤 : Commentary

4. Snap a photo, make a recording or write a note.

5. Photos: Tap **Retake** to take a different photo or **Use Photo** to use it.

   Videos: Tap **Retake** to take a different video, tap the play button to view the video, or tap **Use Video** to use it.

   Notes: Tap **Done** to save the note or **Cancel** to discard it.

   Commentary: Tap the play button to listen to the recording. Tap **Delete recording** if you want to record a different commentary, tap **Done** to save the commentary, tap **Cancel** to discard the commentary.

6. Repeat as needed.

View annotations in the mobile app

1. From the home screen, tap **DUTs**.
2. Tap on a DUT in the list to open it.
3. Tap **Annotations**.
4. Tap on an annotation to expand it.

✎ **Note:**

- Only one annotation at a time can be expanded.
- To view a video annotation or listen to an audio annotation tap the play button.
- You can also navigate through video / audio by using the slider at the bottom.

Edit annotations

1. Swipe left on an annotation.

2. Tap the edit button to edit the annotation's name.

    When editing notes, you have two options: *Edit note* or *Rename note*.

3. Tap **Done** to save the changes.

Delete annotations

1. Swipe left on an annotation.

2. Tap 🗑.

Review annotations in the PC application

If you created annotations using the mobile app, you can review them in the PC application.

It is always a good idea to add annotations to your measurements. For example, they can help you and your colleagues identify measurements at a later date and provide valuable information about the context of a measurement.

Check out the gallery

You will find any photos or video that have been attached to the DUT in the Gallery window in the panel on the right side of the user interface.

✎ **Note:** Videos will be identifiable by a play button

1. Click on a DUT in the list to select it.

2. In the side panel, click on **Gallery** to expand the window.

    - Use the arrows to browse.
    - Right-click on the image to open the context sensitive menu to save a copy of the file.
    - Click on a video to play it.

Listen to commentary

You will find any voice memos that have been attached to the measurements in the project in the Commentaries window.

1. Click on a DUT in the list to select it.

2. Open the **Commentary** window.

3. Press the play button.

4. Use the slider to move forward or backward in the recording.

5. Click ⊲ to open the volume slider.

Read notes

You will find any notes that have been attached to the measurements in the project in the Notes window.

1. Click on a DUT in the list to select it.

2. Open the **Notes** window.

APPLICATION MENU (PC)

The application menu gives you access to settings for the application. You can also open and create databases from the application menu, which can be useful when a database is open.

Open the application menu

Click on the Product Noise Partner tab in the upper left corner.

Database menu

Create a database

You can create a new database from the application menu.

Click **Create Database**, then follow the prompts. For more information about databases, see **Databases on page 32**.

Open a database

If you already have a database open, you can open a different database without closing the application.

1. Click **Open Database**.
2. Click on a database in the list of recent databases or click **Browse** to navigate to a database not listed.
3. Click **Open**.

Application menu

About

Get information, such as the version number, about the application.

Options

UI Language: Select the language for the user interface (UI).

Open last: Enable this setting to open the last open database automatically when you start the application.

Automatic Upload

Enable templates to upload to the instrument automatically. This eliminates the need to manually upload templates (that is, click ↑). Every time the instrument and the PC application connect or whenever there is a change in the list of templates (if a template is added, deleted or renamed), the templates will be uploaded.

Automatic upload is a setting for the application, not the database. This means that templates will upload automatically regardless of the database that is open. Any templates on the instrument that are not in the open database will be removed from the instrument.

- Tick mark = enabled
- No tick mark = disabled

CONFIGURE YOUR INSTRUMENT

You can edit instrument settings using the instrument or using the mobile app.

The functionality of the mobile app enhances the usability of the instrument. For example, it is easier to use the keypad on your mobile device to enter passwords than it is to scroll through characters on the instrument. It is recommended to use the mobile app to set up the instrument wherever possible.

✎ **Note:**

- Product Noise Partner will automatically set up your instrument to measure the correct parameters for calculating the sound power of a device under test (DUT) according to standards. That being said, it is possible to modify the instrument's settings. If the instrument is not set up correctly, the mobile app will prompt you for permission to make the necessary changes before making measurements.

- You cannot access all of the instrument settings from the mobile app. If you cannot find a setting in the mobile app, check the instrument.

Access instrument settings on the instrument

Press ⊜ briefly to open the menu.

Use the arrow buttons to navigate through the menu and the power button to make selections.

💡 **Hint:**

- The menu is hierarchical. Your current location in the menu is shown in the header.

- The menu opens at the location from which it was closed.

- An arrow (>) on the far right indicates that there is a sub-menu, press ▶ to access it.

- Navigate to the ✖ and press ⊜ to exit parameter menus.

- You can also use the mobile app to edit some of the instrument settings.

Access instrument settings on the mobile app

1. Open the mobile app.

2. Connect the mobile app to the instrument.

   See **Connect the mobile app to the instrument on page 29** for more information.

3. Tap **Configure instrument**.

Input settings

Input settings ensure that you are collecting accurate data. The instrument optimizes the frequency response based on the selected microphone and makes corrections based on the selected sound field and windscreen.

Go to: **Measurement settings** > **Input**.

Microphone

Use this setting to tell the instrument which microphone is attached.

The instrument is designed for use with Microphone Cartridge Type 4966. Type 4966 is prepolarized, so it can be used with battery-operated equipment such as B&K 2245, and is optimized for use in free-field environments. By default, the instrument is set up to use the attached Type 4966 microphone cartridge.

Microphone list

The microphone list populates the options available when you specify which microphone is connected to the instrument. Therefore, the list of microphones allows you to set up the instrument for use with a different microphone cartridge. The microphone list initially contains Type 4966 only. You can edit the microphone list, but only on the instrument.

The type and serial number, sensitivity and sound field for each microphone are stored in the list.

Add a microphone to the list

1. Press ⬓ briefly to open the menu.
2. Go to: **System settings** > **Advanced settings**.
3. Enable **Service mode**.
4. Go to: **Microphones**.
5. Select any microphone and choose **Create new**. A new microphone Type 4966 will be created and added to the list.
6. Select the new microphone and choose **Edit**.
7. Choose the type of microphone: *4966* or *Unknown*.
8. Enter the microphone's serial number.
9. Enter the microphone's sensitivity from the calibration chart.
10. If **Type** is set to *Unknown*, enter the nominal sensitivity (from the calibration chart) and if the microphone is for free sound fields.

Delete a microphone from the list

1. In the microphone list, select a microphone.
2. Choose **Delete**.
3. Confirm that you want to delete the microphone.

✎ **Note:** You cannot delete the default microphone from the list, that is, the microphone that came with the instrument.

Sound field

It is important that the instrument knows the type of sound field in which you are measuring so it can apply the appropriate correction to your measurements. These corrections will enhance the overall frequency response of the system regardless of whether or not the microphone you are using is designed for the sound field in which you are measuring.

- Choose **Free-field** if you are in an environment with no (or very few) objects or surfaces that will reflect sound. Free-field sounds generally come from the sound source.
- Choose **Diffuse-field** if you are in an environment with a lot of objects or surfaces that reflect sound. Diffuse-field sounds come randomly from all angles (random incidence) due to reflection off surfaces within the environment.

✏ **Note:** Generally, ISO requires free-field conditions and ANSI requires diffuse-field conditions. Be sure to check your local standards for the setting you require.

Windscreen

Windscreens are used to reduce the amount of wind-induced noise in measurements. Therefore, windscreens are generally used for outdoor measurements, but they can be used any time you want to protect measurements from unwanted noise caused by air movement.

Windscreen detect is the setting that enables or disables automatic detection of Windscreen UA-1650.

- *Enabled*: The instrument detects the windscreen and applies the appropriate correction.
- *Disabled*: Specify the windscreen manually under **Windscreen type**.

Measurement control

Measurement control settings specify how your measurements will run.

Go to: **Measurement settings** > **Measurement control**.

Measurement time

This setting controls how the measurement stops: automatically or manually.

- *Preset*: The instrument will measure for the time specified in **Preset time**, then stop and save automatically.
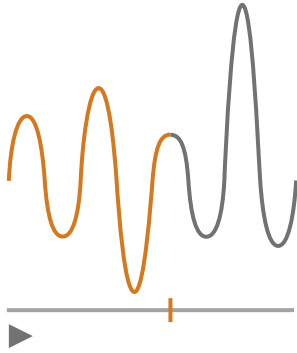
- *Free*: You control the measurement manually.
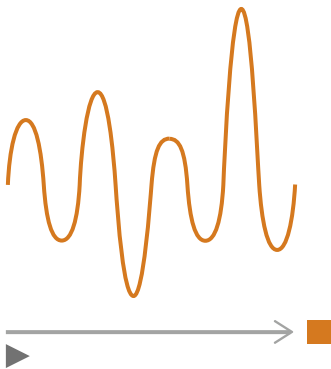
Preset time

This setting controls the amount of time for which the instrument will measure when **Measurement time** is set to *Preset*.

Back-erase mode

This setting determines what happens when you resume a paused measurement.

💡 **Hint:** You can change these settings while a measurement is paused.

- *Enabled*: Overwrite measurement data for the **Back-erase time**.
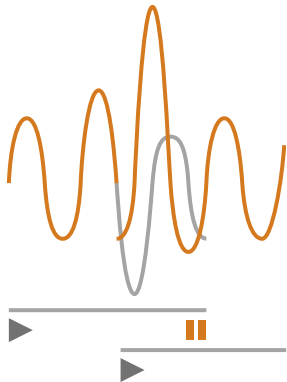
- *Disabled*: Resume the measurement without overwriting earlier data.
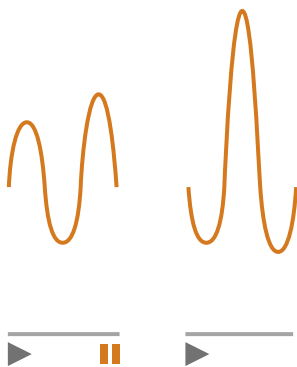
Back-erase time

This setting controls the number of seconds that will be erased when the measurement is resumed. This setting is enabled when **Back-erase mode** is set to *Enabled*.

Broadband parameters

The instrument measures broadband sound level parameters with frequency weightings that mimic how humans hear sounds and time weightings that define the averaging of sound levels over time. The different parameters that you can measure are combinations of the parameters (Leq, LE, Lpeak, Lmax, Lmin, L(SPL) and L) with frequency weightings (A, B, C or Z) and time weightings (F, S or I).

You can make measurements with up to two frequency weightings simultaneously.

Go to: **Measurement settings** > **Broadband parameters**.

How to set up broadband parameters using the instrument

1. Enable a frequency weighting.
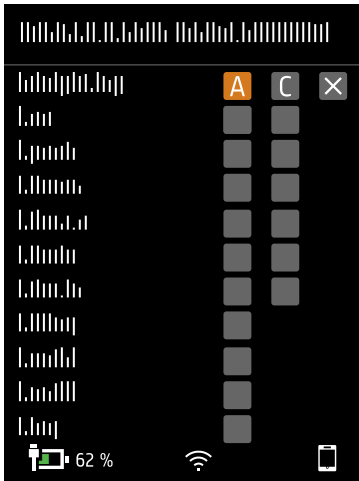
   a. Press ◀ to navigate to a weighting box.

   b. Press ▤ to scroll through the frequency weightings.

2. Enable measurement parameters.
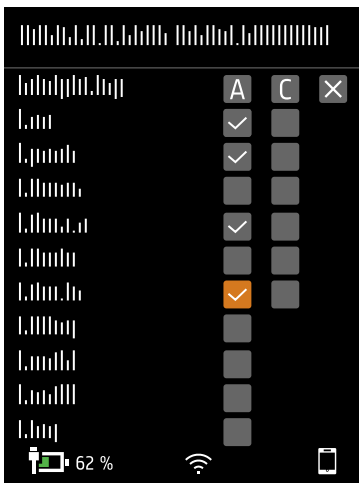
   a. Press ▼ to navigate to a parameter.

   b. Press ▤ to enable / disable parameters.

3. Navigate to ☒.

4. Press ▤ to close the parameter selection menu.

How to set up broadband parameters using the mobile app

1. Tap **1** to enable parameters for the first frequency weighting.

   The instrument measures broadband parameters with up to two frequency weightings simultaneously, you will enable parameters for each frequency weighting separately.

2. Select the frequency weighting.

   a. Tap **Weighting**.

   b. Select the desired frequency weighting.

      ✏ **Note:** The options are the unused frequency weightings.

      See **Broadband parameters on page 67** for more information.

   c. Tap **Back**.

3. Enable measurement parameters.

   a. Tap a parameter.

   b. Tap **On** to enable or **Off** to disable the parameter.

      See **Broadband parameters on page 67** and **Broadband parameters on page 67** for more information.

   c. Tap **Back**.

4. Repeat the process for the second frequency weighting.

5. Tap **Done** to return to the project menu or tap **Back** to return to the instrument settings menu.

About parameters

Time-averaged levels

The instrument can average levels of the sound source over time.

- **Leq** = equivalent continuous sound level

  This parameter calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured.

- **LE** = sound exposure level

  This parameter takes the sound levels for a period of time and calculates the constant sound level that would produce the same total sound energy in one second. Sound level exposure is sometimes called single event level (SEL).

Peak levels

- **Lpeak** = peak sound level

  This parameter gives the highest value of the frequency-weighted acoustic signal.

  Lpeak,1s is the peak sound level during the latest second.

Exponentially averaged levels

Exponentially averaged sound levels provide easy-to-read values. A number of parameters are derived from exponential averaging:

- **Lmax** = maximum sound level

  This parameter gives you the highest time-weighted sound level that occurs during the measurement time.

  Lmax is often used in conjunction with another noise parameter (for example, Leq) to ensure a single noise event does not exceed a limit.

- **Lmin** = minimum sound level

  This parameter gives you the lowest time-weighted sound level that occurs during the measurement time.

- **L** = instantaneous sound level

  This parameter shows the instantaneous time-weighted sound level as measured by the instrument.

- **L(SPL)** = sound pressure level

  This parameter calculates the maximum time-weighted sound level during the latest second.

✏ **Note:** Lpeak,1s, L and L(SPL) are instantaneous values, as such they are for display only and are not saved with the measurement.

About time weightings

The instrument uses three standard-defined time weightings: F, S and I. Time weightings define the exponential averaging in the root-mean-square (RMS) measurement to average the fluctuations in sound levels and create useful readings.

Time weightings use time constants. Time constants define the time it takes for the instrument to respond to a change in sound levels.

- **F** = 125 ms time constant, decay of 34.7 dB/s

  The fast rise and decay of this time weighting means it will show a lot of the variations in the acoustic signal. You can use this weighting to measure sounds that fade rapidly, such as a dog bark.

  ✏ **Note:** F time weighting can be used for most measurements.

- **S** = 1 s time constant, decay of 4.3 dB/s

  The relatively slow rise and decay of this time weighting means it will smooth the variations in the acoustic signal. You can use this weighting to measure sounds that fade slowly, such as a bell toll.

- **I** = 35 ms time constant, decay of 2.9 dB/s

When choosing a time weighting to use, ask yourself if you want to track or smooth the variations in sound levels over time.

About frequency weightings

Frequency weightings mimic how humans hear sound.

A-weighting

- Represents the human ear's response at low to medium sound levels
- Equal loudness curve: 40 dB
- The most commonly applied frequency weighting
- Can be used for all sound levels

B-weighting

- Represents the human ear's response at medium sound levels
- Equal loudness curve: 70 dB

C-weighting

- Represents the human ear's response at fairly high sound levels
- Equal loudness curve: 100 dB
- Mainly used to assess peak values of high sound pressure levels (LCpeak)

Z-weighting

- No frequency weighting
- Used to collect unweighted data

✏ **Note:** An **equal loudness curve** is a frequency response curve. Equal loudness curves are the experimental results of presenting pure tones and levels at different frequencies to young people with no hearing impairment. Along a contour line the young, average, normal listener will judge tones presented with different combinations of frequency and dB to be equally loud.

Table of parameters

This table gives an overview of all the possible parameter/frequency weighting combinations.

✎ **Note:** The parameters are listed as they appear in the Broadband parameters menu.

	A	B	C	Z
Leq	LAeq	LBeq	LCeq	LZeq
Lpeak	LApeak	LBpeak	LCpeak	LZpeak
LFmax	LAFmax	LBFmax	LCFmax	LZFmax
LSmax	LASmax	LBSmax	LCSmax	LZSmax
LFmin	LAFmin	LBFmin	LCFmin	LZFmin
LSmin	LASmin	LBSmin	LCSmin	LZSmin
LIeq	LAIeq			
LImax	LAImax			
Lpeak,1s	LApeak,1s	LBpeak,1s	LCpeak,1s	LZpeak,1s
LE	LAE	LBE	LCE	LZE
LF	LAF	LBF	LCF	LZF
LS	LAS	LBS	LCS	LZS
LF(SPL)	LAF(SPL)	LBF(SPL)	LCF(SPL)	LZF(SPL)
LS(SPL)	LAS(SPL)	LBS(SPL)	LCS(SPL)	LZS(SPL)

Spectrum parameters

Spectrum parameters are the parameters upon which you can perform spectral analysis.

Spectral analysis has many uses. For example, it can be used to see the sound levels at low, medium and high frequencies, to see where the sound energy is in the frequency spectrum, or to assess sounds with distinct tones.

Measure spectrum parameters (Leq, Lmax and Lmin) with frequency weightings (A, B, C, or Z) and time weightings (F and S).

Go to: **Measurement settings** > **Spectrum parameters**.

Set up spectrum parameters using the instrument

1. Press ◀ to navigate to the bandwidth box.
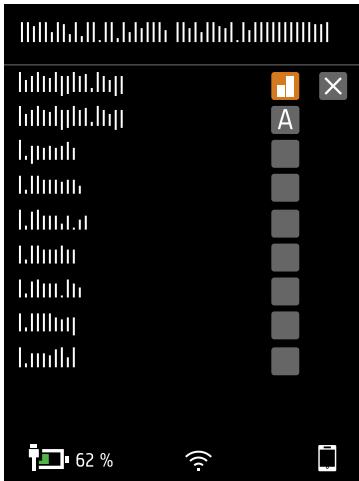
2. Press ≣ to toggle between bandwidths.

    *   ▗ = 1/1-octave

    *   ▖▗ = 1/3-octave

3. Enable a frequency weighting.
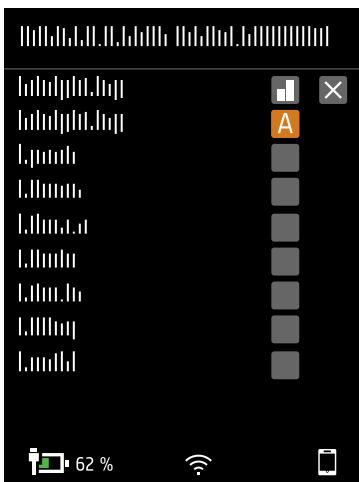
    a. Press ▼ to navigate to the weighting box.

    b. Press ≣ to scroll through the frequency weightings.

4. Enable measurement parameters.
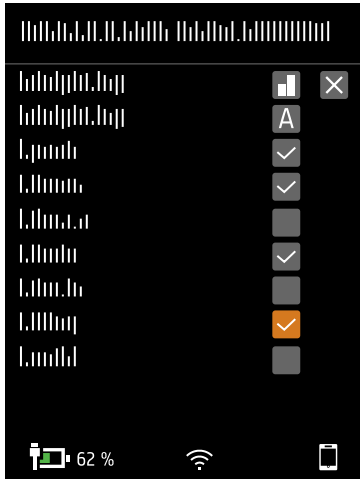
    a. Press ▼ to navigate to a parameter.

    b. Press ⊜ to enable / disable parameters.

5. Navigate to ✖.

6. Press ⊜ to close the parameter selection menu.

Set up spectrum parameters using the mobile app

1. Select the bandwidth of frequency analysis.

    a. Tap **Bandwidth**.

    b. Select a bandwidth: *1/3-octave* or *1/1-octave*.

       See **Spectrum parameters on page 72** for more information.

    c. Tap **Back**.

2. Select the frequency weighting.

    a. Tap **Weighting**.

    b. Select the desired frequency weighting.

       See **Spectrum parameters on page 72** for more information.

    c. Tap **Back**.

3. Enable measurement parameters.

    a. Tap a parameter.

    b. Tap **On** to enable or **Off** to disable the parameter.

   See **Spectrum parameters on page 72** and **Spectrum parameters on page 72** for more information.

4. Tap **Done** to return to the project menu or tap **Back** to return to the instrument settings menu.

About bandwidth

The bandwidth of the frequency analysis. You can choose 1/3-octave (third-octave) or 1/1-octave (full-octave). 1/3-octave will give you a finer analysis of the frequency than 1/1-octave.

The range of the centre frequencies are:

- 1/3-octave: 12.5 Hz to 16 kHz
- 1/1-octave: 16 Hz to 8 kHz

About parameters

- **Leq** = equivalent continuous sound level

  This parameter calculates a constant level of noise spectrum with the same energy content as the varying acoustic noise signal being measured.

- **Lmax** = maximum sound level

  This parameter gives you the highest time-weighted sound level per frequency band that occurs during the measurement time.

  Lmax is often used in conjunction with another noise parameter (for example, Leq) to ensure a single noise event does not exceed a limit.

- **Lmin** = minimum sound level

  This parameter gives you the lowest time-weighted sound level per frequency band that occurs during the measurement time.

- **L** = instantaneous sound level

  This parameter shows the instantaneous time-weighted sound level spectrum as measured by the instrument.

✎ **Note:** L is an instantaneous spectrum, as such it is for display only and is not saved with the measurement.

About time weightings

The instrument uses three standard-defined time weightings: F, S and I. Time weightings define the exponential averaging in the root-mean-square (RMS) measurement to average the fluctuations in sound levels and create useful readings.

Time weightings use time constants. Time constants define the time it takes for the instrument to respond to a change in sound levels.

- **F** = 125 ms time constant, decay of 34.7 dB/s

  The fast rise and decay of this time weighting means it will show a lot of the variations in the acoustic signal. You can use this weighting to measure sounds that fade rapidly, such as a dog bark.

  ✎ **Note:** F time weighting can be used for most measurements.

- **S** = 1 s time constant, decay of 4.3 dB/s

  The relatively slow rise and decay of this time weighting means it will smooth the variations in the acoustic signal. You can use this weighting to measure sounds that fade slowly, such as a bell toll.

- **I** = 35 ms time constant, decay of 2.9 dB/s

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- Mainly used to assess peak values of high sound pressure levels (LCpeak)

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- No frequency weighting
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✏ **Note:** An **equal loudness curve** is a frequency response curve. Equal loudness curves are the experimental results of presenting pure tones and levels at different frequencies to young people with no hearing impairment. Along a contour line the young, average, normal listener will judge tones presented with different combinations of frequency and dB to be equally loud.

Table of parameters

This table gives an overview of all the possible parameter / frequency weighting combinations.

✎ **Note:** The parameters are listed as they appear in the Spectrum parameters menu.

	A	C	Z	B
Leq	LAeq	LCeq	LZeq	LBeq
LFmax	LAFmax	LCFmax	LZFmax	LBFmax
LSmax	LASmax	LCSmax	LZSmax	LBSmax
LFmin	LAFmin	LCFmin	LZFmin	LBFmin
LSmin	LASmin	LCSmin	LZSmin	LBSmin
LF	LAF	LCF	LZF	LBF
LS	LAS	LCS	LZS	LBS

Statistical parameters

Statistics can be calculated for broadband measurements. Broadband statistics are calculated with 0.2 dB class with over 130 dB range.

Go to: **Measurement settings** > **Statistical parameters**.

Basis parameter

Basis parameter specifies the parameter to sample. In other words, the parameter you choose will characterize the statistical data that the instrument collects.

- **LAF** is sampled every 16 ms.

    LAF is the instantaneous time-weighted (F) sound level with frequency weighting A.

- **LAS** is sampled every 128 ms.

    LAS is the instantaneous time-weighted (S) sound level with frequency weighting A.

- **LAeq** is sampled every 1 s.

    LAeq is the equivalent continuous sound level with frequency weighting A.

Percentiles

You can set up to five percentile levels (LN values).

Percentile level values are calculated for the total measurement. The percentile levels that you specify will tell you the distribution of sound levels in your measurement. For example, if you set a percentile level of 90, the result is the sound level that is exceeded for 90% of the measurement period.

Audio recording

Audio signal can be recorded and stored as listen-quality MP3 files (compressed to 3 % of original signal). When enabled, the audio will record for the duration of the measurement time.

You can listen to audio recordings in the PC application, which has controls for playback, digital gain settings, and playback speed options.

Record audio

1. Go to: **Measurement settings** > **Audio recording**.
2. Set **Listen quality** to *Enabled* to record audio for listening purposes (as opposed to analysing purposes).

Listen to audio

Playback in the PC application

When post-processing projects in the PC application, the Measurement window contains the controls for playing back audio recordings.

1. Open a project.

    See **Work with a project** for more information.

2. Select a measurement.
3. Open the Measurement window.
4. Use the controls at the bottom of the window to play back the recording.

Display settings

Display settings control how the instrument screen looks (brightness, colour scheme), the brightness of the light ring, and the data that is displayed.

Go to: **Display settings**.

Screen brightness

Screen brightness controls how bright the screen on the instrument is. You can choose from six levels of brightness.

Light ring brightness

Light ring brightness controls the brightness of the light ring on the instrument. Choose from four settings: *Off*, *Low*, *Normal* or *High*.

Colour scheme

This setting controls the colour of the screen and text.

- *Light* is a light background with dark text.
- *Dark* is a dark background with light text.

Display views

SLM view

Set up the instantaneous display (bar graph) and the readout for one broadband parameter (single measurement).

List view

Set up the instantaneous display (bar graph) and readouts for multiple broadband parameters (single measurement). You can display three parameters on the instrument and five parameters on the mobile app.

Spectrum view

Set up the display of frequency analysis spectra.

About data view

Display information about the instrument and the data.

Display view settings

The following list contains information about the settings for the different views.

- **Graph parameter** (SLM view, List view)

  Choose the parameter for the bar graph; that is, the instantaneous (or fast) display of instantaneous sound levels.

- **Parameter** (Spectrum view)

  Choose the parameter for the spectrum display; that is, the display of the sound level for each frequency band.

- **Graph max level**, **Graph min level** (SLM view, List view, Spectrum view)

  Define the range (maximum and minimum levels) for the bar graph in dB.

  The range that you define should match the dynamics of the signal you are measuring. In other words, it should include all the sound levels that are present.

- **Parameter** (SLM view)

  Choose the parameter to display in the area below the bar graph.

- **Parameter 1**, **2** and **3** (List view)

  Choose the parameters to display as a list below the bar graph. You do not have to define all three, choose *None* to leave a list item blank.

- **Display**

  Enable or disable the display.

About data view

About data view displays information about the instrument with which you are measuring. It can also include the location of the instrument (latitude and longitude) using GPS (global positioning system).

To enable latitude and longitude coordinates in About data view:

1. Enable Service mode on the instrument.

    a. Press ⊜ briefly to open the menu.

    b. Go to: **System settings** > **Advanced settings** > **Service mode**.

    c. Select **Enabled**.

2. Using the instrument or the mobile app, go to: **System settings** > **Advanced settings** > **GPS location**.

3. Select **Enabled**.

✎ **Note:** To use the mobile app to enable latitude and longitude coordinates in About data view, Service mode must be enabled on the instrument. You cannot use the mobile app to enable Service mode.

Regional settings

Regional settings allow you to choose the language, date and time settings of the instrument.

Go to: **System settings** > **Regional settings**.

Language

Choose the language of the user interface of the instrument.

✎ **Note:** From the home screen, go to About > Preferences > Language.

Time zone

Set the time zone in which you are measuring.

✎ **Note:** It is very important that the instrument, mobile device and PC are all set to the same time zone. Otherwise, you may not be able to import measurements from the instrument to the PC application.

Date format

Choose the order of day, month, year (in numerical format).

Time format

Display time as a 24- or 12-hour clock.

Date separator

Choose the symbol that separates the day, month and year.

Decimal point

Choose the decimal separator: decimal comma or decimal point.

Decimal places

Choose the number of decimal places to display: *1* or *2*.

Power management

Use the Power management settings to switch off the screen or instrument after periods of inactivity. These settings can be helpful if you want to maximise battery life for long, unattended measurements.

Go to: **System settings** > **Power management**.

Switch screen off after

Use this setting to switch off the screen on the instrument automatically after a period of inactivity (that is, when you are not pushing its buttons). The instrument will stay on and continue to measure even if the screen is off.

- *Never*: The screen will not switch off.
- *2, 5 or 10 minutes*: After 2, 5 or 10 minutes, the screen switches off.

Shut down after

Use this setting to shut down the instrument automatically after a period of inactivity (that is, when you are not pushing its buttons).

- *Never*: The instrument will not turn off.
- *2, 5 or 10 minutes*: After 2, 5 or 10 minutes, the instrument turns off.

✎ **Note:** If the instrument is measuring, it will not shut off. If the instrument is charging, it will shut off.

Data management

Data management settings include settings for storing a backup and for data retention.

Go to: **System settings** > **Data management**.

Backup settings

You can set up your instrument to store backups of your data to a USB stick or network storage (either a network attached storage (NAS) device or a shared folder). Data transfers automatically when the storage device is available. An icon on the instrument indicates the status of the backup.

Store a backup on network storage

You will need:

- Network storage
- Your instrument

✏ **Note:** If you are using NAS, you will need to set it up according to the manufacturer's instructions first.

Procedure:

1. Go to: **Backup settings** > **Backup**.
2. Select **Disabled**.
3. Enter the host name or IP address of the device or network (so the instrument can find it).
4. Enter the user name and password (so the instrument can access the device or network).
5. Specify the path (so the instrument knows where to upload the data.)
6. Specify the domain if the network belongs to a domain.
7. Set **Backup** to *Network storage*.

Store a backup on a USB stick

You will need:

- A USB-C™ (or USB-A with an adaptor) memory stick with at least 16 GByte formatted as FAT32 or exFAT
- Your instrument

Procedure:

1. Go to: **Backup settings** > **Backup**.
2. Select **USB stick**.
3. Connect the USB stick. The transfer will start automatically.

Data retention

Data retention is set to *Manual* by default. This means that you will need to manually move data to Trash.

To set the instrument to remove data automatically:

1. Set **Data retention** to *Automatic*.
2. Use the **Retention period** setting to specify how long to keep the data.

After the specified time, data will be moved to Trash.

✏ **Note:** Data that is in the Trash folder is deleted only when you empty the folder or if space is needed.

Network settings

Network settings enable you to control your local (or remote) network connections. There are also settings to give the instrument a nickname, to protect it with a password and to view the instrument GUI in a web broswer.

See **Local connections on page 25** and **Remote connections on page 26** for more information.

Go to: **System settings** > **Network settings**.

Nickname

A nickname can make your instrument easier to identify if you have multiple instruments. This is because the default name of an instrument is based on its type and serial number, so they all look very similar.

Add a nickname using the mobile app

1. Tap **Nickname**.

2. Use the keypad to enter a nickname.

3. Tap **Done**.

💡 **Hint:** You can also use emojis!

Add a nickname using the instrument

1. Select **Nickname**.

2. Use the arrow keys to enter a name.

3. Press ⏚ to exit the dialog.

💡 **Hint:** Use the mobile app, it is much easier.

Tips for nicknames

- Make the nickname short.
- Make the nickname unique.
- Use a naming pattern such as the phonetic alphabet.
- Use the location of the instrument.

Password

This setting allows you to password protect your instrument. The password will be required to connect to the instrument through Wi-Fi or Ethernet.

You can add or change the password using either the instrument or the mobile app.

Add a password using the instrument

1. Go to: **System settings** > **Network settings**

2. Select **Password**.

   ✏ **Note:** If the instrument is already password protected, you will need to confirm that you want to enter a new password.

3. Use the arrow keys to enter a password.

4. Press ⏚.

💡 **Hint:** Use the mobile app, it is much easier.

Add a password using the mobile app

1. Tap **Password**.

2. Use the keypad to enter a password.

3. Tap **Done**.

Web server display

Web server display is a setting that allows you to view the instrument GUI on a web browser that is connected to the same network as the instrument. This can be useful if more than one person wants to be able to monitor a measurement from a distance.

✎ **Note:** The display is not interactive, it is for viewing purposes only.

The setting can be accessed from either the instrument or the mobile app. See **Web server display on page 19** for more information.

Wi-Fi settings

Wi-Fi settings control the wireless connections of the instrument.

Wi-Fi mode: Airplane mode

Use this setting to switch off Wi-Fi and Bluetooth on the instrument.

Wi-Fi mode: Connect to network

Use this setting to connect your instrument to your local wireless network, such as your work or home network. The instrument will be able to communicate with the other devices on the network, that is your iOS device or PC.

1. Set **Wi-Fi mode** to *Connect to network*.

2. If you are using the instrument, select **Wi-Fi name**.

   If you are using the mobile app, the iOS device will search for the available networks.

3. Select your network from the list of available networks.

4. Enter the network password.

Wi-Fi mode: Act as hotspot

Use this setting to enable the instrument's hotspot to which you can connect your iOS device or PC so they can communicate.

1. Set **Wi-Fi mode** to *Act as hotspot*.

2. Connect your iOS device or PC to the hotspot as per the manufacturer's instructions. If you are using the mobile app, follow the prompts to connect your iOS device to the hotspot.

Change the hotspot password on the instrument

1. Select **Password**.

2. Use ▲ and ▼ to scroll through the character menu.

3. Press ⊜ to confirm the changes.

✎ **Note:** Restart the instrument to apply the new password.

Change the hotspot password using the mobile app

✎ **Note:** To edit the hotspot password on the mobile app, the mobile device must be connected to the instrument's hotspot.

1. Tap the text box for Password.

2. Use the keypad to enter a new password.

3. Tap **Done**.

   ✎ **Note:** There are two instances of Done while the keypad is open, be sure to tap the upper instance or your changes will not be saved.

4. Tap the back arrow.

   This will cause the mobile device to lose connection to the hotspot.

The instrument and mobile app will reconnect automatically.

Reset network settings

You can reset the network settings so that the instrument will forget all networks to which it has connected. This will not affect any settings that have been saved on your iOS device.

This setting can only be accessed from the instrument.

How to reset network settings

1. Select **Reset network settings**.

2. Select **Yes**.

Voltage output

This setting allows you to output an anologue signal. The USB-C™ socket on the bottom of the instrument is also an output channel. To use the socket as an output channel requires an output cable such as AO-0846, which has a stereo-mini plug for connecting headphones.

Go to: **System settings** > **Voltage output**.

Source

Input X-weighted: Output the frequency-weighted input signal for listening purposes.

LXF: Output the frequency-weighted instantaneous sound level with time weighting F as 10 mV/dB.

X = the frequency weighting.

✎ **Note:** The frequency weightings available correspond to the parameters that the instrument is set to measure.

Lock the settings

After you have finished setting up the instrument, you can lock the measurement, display and system settings to prevent changes.

✎ **Note:** This setting is only accessible on the instrument.

1. Go to: **System settings** > **Advanced settings** > **Service mode**.
2. Select **Enabled**.
3. Go to: **Lock settings**.
4. Select **Enabled**.

TERMINOLOGY

A-weighting filter	Frequency weighting corresponding approximately to the 40 dB equal loudness curve, that is to say, the human ear's response at low to medium sound levels. It is by far the most commonly applied frequency weighting and is used for all levels of sound.
B-weighting filter	Frequency weighting corresponding approximately to the 70 dB equal loudness curve, that is to say, the human ear's response at medium sound levels.
C-weighting filter	Frequency weighting corresponding to the 100 dB equal loudness curve, that is to say, the human ear's response at fairly high sound levels. Mainly used when assessing peak values of high sound pressure levels.
Decibel (dB)	The measurement unit for expressing the relative intensity of sound. A direct application of linear scales (in Pa) to the measurement of sound pressure leads to large and unwieldy numbers. As the ear responds logarithmically rather than linearly to stimuli, it is more practical to express acoustic parameters as a logarithmic ratio of the measured value to a reference value. This logarithmic ratio is called a decibel or dB. The advantage of using dB can be clearly seen in the below illustration. Here, the linear scale with its large numbers is converted into a manageable scale from 0 dB at the threshold of hearing (20 μPa) to 130 dB at the threshold of pain (~100 Pa). Our hearing covers a surprisingly wide range of sound pressures - a ratio of over a million to one. The dB scale makes the numbers manageable.
E	Sound Exposure is the energy of the A-weighted sound calculated over the measurement time. The unit is Pa^2h.
Fast Max	Maximum time-weighted acceleration, velocity, displacement or voltage level measured with Linear frequency weighting and Fast time weighting. It is the highest level occurring during the measurement time.
Fast Min	Minimum time-weighted acceleration, velocity, displacement or voltage level measured with Linear frequency weighting and Fast time weighting. It is the lowest level occurring during the measurement time.
'F', 'S' or 'I' time weighting	A time weighting (sometimes called a 'time constant') defines how the exponential averaging in root-mean-square (RMS) measurement is done. It defines how heavily fluctuating sound pressure variations are smoothed or averaged to allow useful readings. The standards define three time weightings: F (Fast), S (Slow) and I (Impulse). Most measurements are carried out using the F time weighting, which uses a 125 ms time constant.
Frequency	The number of pressure variations per second. Frequency is measured in hertz (Hz). The normal hearing for a healthy young person ranges from approximately 20 Hz to 20000 Hz (20 kHz).
Frequency weighting	Our hearing is less sensitive at very low and very high frequencies. In order to account for this, weighting filters can be applied when measuring sound. The most commonly used weighting is the 'A-weighting', which approximates the human ear's response to low -

	medium noise levels. A 'C-weighting' curve is also used, particularly when evaluating very loud or low-frequency sounds.
LAE	Sound Exposure Level - sometimes abbreviated SEL and sometimes called Single Event Level, is the Sound Exposure expressed as a level. The letter 'A' denotes that the A-weighting has been included.
LAeq	A widely used noise parameter that calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured. The letter 'A' denotes that the A-weighting has been included and 'eq' indicates that an equivalent level has been calculated. Hence, LAeq is the A-weighted equivalent continuous noise level.
LAF	The instantaneous time-weighted sound level, Lp, is available at any time. 'A' denotes that the A-frequency weighting is used. 'F' denotes that the Fast time-weighting is used.
LAFmax	Maximum time-weighted sound level measured with A-frequency weighting and Fast time weighting. It is the highest level of environmental noise occurring during the measurement time. It is often used in conjunction with another noise parameter (for example LAeq) to ensure a single noise event does not exceed a limit.
LAFmin	Minimum time-weighted sound level measured with A-frequency weighting and Fast time weighting. It is the lowest level of environmental noise occurring during the measurement time (time resolution is 1 s).
LA90.0	The noise level exceeded for 90% of the measurement period with A-frequency weighting. The level is based on statistical analysis of LAeq sampled at 1 s intervals into 0.2 dB wide classes. The percentage is user-definable.
LAF(SPL)	The Sound pressure Level (maximum time-weighted sound level during the latest second) is available at any time. 'A' denotes that the A frequency weighting is used. 'F' denotes that the Fast time-weighting is used.
LCpeak	Maximum peak sound level during a measurement. 'C' denotes that the C frequency weighting is used. Used for assessing possible damages to human hearing caused by very high short-duration noise levels.
LCpeak,1s	Maximum peak sound level during the latest second - is available at any time. 'C' denotes that the C frequency weighting is used. Used for monitoring the peak levels.
Linear Weighting	'Linear' frequency weighting is without any frequency weighting, that is, equivalent to LIN, Z or FLAT.
Linear	Time-averaged (RMS) weighted acceleration (or voltage) value, averaged over the entire measurement period with frequency weighting Linear.
Loudness	Loudness is the subjective judgement of intensity of a sound by humans. Loudness depends upon the sound pressure and frequency of the stimulus and whether the sound field is diffuse- or free-field. The unit is the sone. The Zwicker method of calculation of stationary loud-

	ness based on 1/3-octave measurements is described in ISO 532 - 1975, Method B.
Loudness Level	Loudness Level = 10*log2(Loudness) + 40. The unit is the phon.
Overload	When the broadband sound level is above the measuring range of the instrument. The light ring will flash red quickly for intermittent overloads and will be solid purple for latched overloads.
Peak	Maximum peak of the acceleration, velocity, displacement signal or voltage input with frequency weighting Linear.
Peak-peak	The real peak-to-peak value (difference between the most positive value of the signal and the most negative value of the signal). Available for Displacement only.
Sound	Any pressure variation that the human ear can detect. Just like dominoes, a wave motion is set off when an element sets the nearest particle of air into motion. This motion gradually spreads to adjacent air particles further away from the source. Depending on the medium, sound extends and affects a greater area (propagates) at different speeds. In air, sound propagates at a speed of approximately 340 m/s. In liquids and solids, the propagation velocity is greater - 1500 m/s in water and 5000 m/s in steel.
Sound level or sound pressure level	The level in decibels of the pressure variation of a sound. See also decibel.
TCpeak	The time when the peak sound level occurred. 'C' denotes that the C frequency weighting is used.
Underrange	When the broadband sound level is below the measuring range of the instrument. Underrange is only indicated on the screen; no underrange information is saved with the final result of the measurement.
Z-weighting	'Zero' frequency weighting is without any frequency weighting, that is, equivalent to Linear, LIN or FLAT.