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SONAPHONE〰ⅠⅠⅠ

Ultrasonic Testing Device for Preventive Maintenance

User Documentation

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Subject to technical modifications.

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Parts of the user documentation

The complete user documentation for the SONAPHONE® consists of the following individual documents, taking into account the modular design.

Please also observe the quick reference guides for the SONAPHONE® and the LevelMeter® and LeakExpert® Apps.

I   SONAPHONE® ultrasonic testing device

I - I   Safety

I - II   Device equipment, sets and accessories

I - III   SONAPHONE® device description

I - IV   SONAPHONE® device operation

II   Sensors

II - I   Airborne sound sensor BS10

II - II   Structure-borne sound sensor BS20

II - II   Parabolic Sensor BS30

III   Software - apps on the SONAPHONE®

III - I   'LevelMeter®' testing software

III - II   'LeakExpert®' testing software (optional)

IV   Software for evaluating the data on the computer

IV - I   "DataViewer" for evaluating the test values from the LevelMeter® app on the computer (optional)

User documentation online

In addition to this documentation, you will find further information on our website:

SONAPHONE® DataSuite

... modular software platform for preventive maintenance

Software installation

www.sonotec.de/doc/sonaphone/en_sonaphone_datasuite_installation/index.html

Reference guide

www.sonotec.de/doc/sonaphone/en_sonaphone_datasuite/index.html

SONAPHONE® AssetExpert

... specialized app for route-based data collection with the SONAPHONE® handheld unit

Reference guide

www.sonotec.de/doc/sonaphone/en_sonaphone_assetexpert/index.html

Display-Adapter for SONAPHONE®

… for connecting a monitor to the SONAPHONE® testing device

Description and installation of Display Link Adapter
(including description of the SONAPHONE® operating system update)

www.sonotec.de/doc/sonaphone/en_sonaphone_display_adapter/index.html

Register your SONAPHONE® now and you will qualify for exclusive benefits:
mySONAPHONE.com

Further contents you can found on our websites: SONAPHONE® Support.

- Leak calculator
- Sound library: Images and sound samples for leak detection, electrical inspection, mechanical inspection, steam trap inspection
- Press releases, case studies, white paper
- Trainings

If you have any **questions or problems**, our team will be happy to help you: mySONAPHONE@sonotec.de.

SONAPHONE

Ultrasonic Testing Device for Preventive Maintenance

User Documentation: Safety Information

1 Information on this document

1.1 General

This manual forms part of the ultrasonic testing device and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the information needed to ensure proper and efficient use, along with all the instructions to ensure safe operation of the SONAPHONE. It must therefore be read prior to first use and before carrying out any further steps.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data, and is not liable for errors or omissions.

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2 Symbols used

Hazards or special information are indicated in the following ways:

⚠ WARNING	Warns of possible **imminent danger** which, if ignored, may lead to **lasting adverse health effects and/or serious material damages**.
⚠ CAUTION	Warns of dangers which, if ignored, may lead to **injury and/or material damages** – including financial losses due to operational interruptions.
ATTENTION	Warns of dangers which, if ignored, may lead to **material damage** – including financial losses due to operational interruptions.
i	**Note** This section provides information or draws attention to specific features.

2 Notes on your safety

The following safety instructions must be complied with when working with the SONAPHONE and its accessory parts.

- **The safety instructions in documents describing the sensors and other accessory parts must also be complied with.**

- **The handling-related safety information at the start of the individual operating steps must be observed.**

Failure to observe the safety information can lead to serious injury of personnel, and to the destruction of, or damage to, systems or device components.

⚠ WARNING The SONAPHONE ultrasonic testing device must only be operated by users who have read (in full) and understood the safety information and the provided user documentation.

2.1 User qualifications

⚠ WARNING **Risk of incorrect test data and incorrect system evaluation**

In the event that defects in compressed air systems, malfunctioning steam traps or damage areas in electrical installations are not detected or are incorrectly evaluated, this can lead to huge levels of system damage that could cause life-threatening injuries.

Errors with uncertain consequences can only be ruled out if testers have good knowledge and experience. Tests with the SONAPHONE can only be carried out correctly if the following conditions are met:

- Selection of suitable accessories
- Complete and correct adjustment of parameters within the device
- Selection of a suitable testing method
- Correct interpretation of displayed test values
- Logical deductions on the system condition

Training sessions are offered by SONOTEC. Contact our Service team for more information.

2.2   General notes

Always observe the following safety information:

⚠ CAUTION   **Risk of injury**

Incorrect use of the SONAPHONE and its accessories may pose a risk to the user.

- During operation, charging and storage, protect the SONAPHONE and the sensors from extreme or unusual heat exposure (strong sunlight, storage in a heated vehicle, direct vicinity of open flames or heaters). Always observe the temperature ranges specified in the technical data.
- Take the device and sensors out of operation immediately if malfunctions make you suspect that the device or sensors are no longer working perfectly or if there is visible damage to the device or sensors.
- Do not open the SONAPHONE or the sensors. They do not contain any parts that need to be cleaned, maintained or repaired by the user.
- Conversions and modifications to the device and sensors are not permitted.

ATTENTION   **Risk of damage to the device**

Incorrect use of the SONAPHONE and its accessories can lead to damage, or in a worst-case scenario to the destruction of the device.

- Only ever connect sensors and accessories to the SONAPHONE that you have received from SONOTEC.
- The SONAPHONE and the sensors comply with protection class IP40 and are not water-tight; do not immerse the device in liquid.
- The SONAPHONE and sensors should also be protected against the ingress of moisture, as it will otherwise not be possible to rule out the risk of damage to the device.
- Damaged equipment can reduce the diagnostic quality and can even lead to incorrect diagnoses in a worst-case scenario. Handle the equipment with care and protect it against strong vibrations. Use the transportation case to transport and store the device.
- Avoid using the SONAPHONE in strong electromagnetic fields.

2.3   Working with the SONAPHONE

⚠ WARNING   **Hazards in an industrial setting**

Risk of death or severe injury.

- When locating ultrasonic signals in electrical systems, a sufficient safety distance must be kept from detected electrical defects. Contact your safety representative for more information.
- Use the carry strap when using ladders, stairs etc. so that you can keep your hands free to support yourself.
- The SONAPHONE carry strap (optional) is designed to protect the device against being dropped and is very sturdy. However, it can become caught on protruding system components and can cause serious injuries. Always carry the SONAPHONE so that the carry strap cannot become caught, and always be aware of potential hazards such as open shafts or transmission belts.

⚠ CAUTION   **Risk of falling**

Do not walk through the facility while reading the SONAPHONE screen or operating the device.

Risk of injury or damage to the device

When locating ultrasonic signals in areas that are not easily visible or that are not visible at all, there is a risk of personal injury or of damage to the sensors. Work in a way that ensures that your hands and the sensors are always visible. Use the torch function on the sensors where necessary to illuminate test points.

ATTENTION   **Risk of damage to the device**

Incorrect use may damage the device display. Do not use any sharp or pointed items to operate the device. As well as touchscreen operation, standard styluses or touchscreen gloves can also be used.

In addition to the instructions in this manual, please also note the generally applicable legal and other regulations on accident prevention and environmental protection.
These may include:

- Working with hazardous materials

- Wearing the required and prescribed personal protective clothing and safety equipment

- Noting and following all national and regional working safety regulations

- Noting and following all company operating and safety regulations

2.4 Safety when using the airborne sound sensor BS10

⚠ WARNING	**Risk of injury to eyes**
⚠ (laser symbol)	The target laser (laser class 2) can cause serious eye damage. Never look into the laser beam. Never direct the laser at other people or vehicles. Please note that reflected laser light can cause eye injuries in the event of prolonged use.

ACHTUNG	**Risk of damage to sensor attachments**
	The material of the airborne sound sensor BS10 attachments may be damaged as a result of contact with gasoline.

- Always avoid contact with gasoline. Remove any contamination thoroughly and as quickly as possible.
- Do not use any cleaning agents that contain gasoline.

2.5 Safety when using the structure-borne sound sensor BS20

⚠ WARNING	**Danger of injury**

- The sharp ends of the waveguides BS20-1 and BS20-2 can cause injuries, and even serious injuries in the case of the long waveguide. Make sure never to injure anyone with the sharp ends of the waveguides. Never direct the tip at other people.
- Carrying the sensor on the body can lead to serious injury. When waveguides are fitted, always carry the structure-borne sound sensor with the tip facing away from the body in order to prevent injury.
- The high magnetic force of the waveguide BS20-3 can lead to crushing injuries to the hands. Place the magnetic waveguide onto the test object at an incline and as slowly as possible.

2.6 Notes on data security

| ATTENTION | **Risk of data loss or misuse** |

Apps with unknown origin may be dangerous to your device, your personal data and your test data.

- Regularly back up the test data onto other data carriers in order to prevent the risk of data loss in the rare event of device malfunctions.
- Disconnect SD cards correctly using the corresponding function within the device settings before removing them from the card slot.
- Always back up data before resetting the device to factory settings or re-formatting an SD card.

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Ultrasonic Testing Device for Preventive Maintenance

User Documentation:
Device Equipment, Sets and Accessories

Content

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1 Overview of device equipment and accessories

For the typical application of the SONAPHONE, device sets are available that have been specially adapted to the testing work. These sets vary in terms of their sensors, software equipment and accessories. Please consult the delivery note for the scope of supply. Following receipt, check the device and accessory parts for damage and check that all items in the scope of supply have been delivered!

1.1 Device equipment

SONAPHONE digital ultrasonic testing device

- Bandwidth 20 to 100 kHz

- Two available methods of making the ultrasonic signals audible

- 5-inch TFT display with multi-touch controller

- Integrated 5 MP flash-light camera

- Lithium-ion battery

- Operating system: Android 4.4.2

- Integrated speaker and microphone

- Micro-USB 2.0 port

- 4-pin LEMO port for sensors

- 16 GB internal data storage

- Slot for external microSD card

- User documentation

Sensor module

- 1-channel

- Wired

SONAPHONE sensor cable

- Spiral cable with 4-pin LEMO plug connector (not shown)

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Capsule ear protection headphones

- Audio output: stereo

- Insulation value (SNR) 26 dB

- 2x AAA batteries included

- Exchangeable audio cable

- Manufacturer's operating manual

Audio cable

- For capsule ear protection headphones

Universal charger

- 2 Amp, various international attachments

- Manufacturer's operating manual

Micro-USB cable 2.0

- USB-A and micro-B plug

- Length: 1 m

1.2 Sensors and accessories - airborne sound

Broadband - airborne sound sensor BS10

- Bandwidth 20 to 100 kHz

- Function buttons for the remote control of the SONAPHONE

- Integrated target laser and LED light

- User documentation included

Applications (depending on the app):

- Detection and evaluation of leaks in compressed air, gas and vacuum systems

- Verification of leaks in windows, doors, vehicles or containers

- Detection of electrical partial discharges and insulation damage

Precise locator BS10-1

Attachment for airborne sound sensor BS10

Applications:

Precise location of damage areas in the vicinity

Small acoustic horn BS10-2

Standard accessory for airborne sound sensor BS10

Applications:

Location of damage areas in the central removal area

Large acoustic horn BS10-3

Attachment for airborne sound sensor BS10

Applications:

Location of damage areas at large distances

Parabolic sensor BS30 to pinpoint leakages over long distances up to 25 m

- Bandwidth 20 to 100 kHz

- Function button for the remote control of the SONAPHONE

- Integrated target laser and red/green dot sight

- User documentation

- Carrying bag

Applications (depending on the app):

- Detection of leaks in compressed air, gas and vacuum systems

- Detection of electrical partial discharges and insulation damage

- Tightness testing of windows, doors, cabins, vehicles or containers

1.3   Sensors and accessories - structure-borne sound

Broadband - structure-borne sound and temperature sensor BS20

- Bandwidth 20 to 100 kHz

- Function buttons for the remote control of the SONAPHONE

- Integrated LED light

- Infrared thermometer for an object temperature of -70 to +380°C

- User documentation included

Applications:

- Status monitoring of machines and systems

- Function checking of steam traps and valves

- Monitoring of bearing wear and malfunctions

- Monitoring of lubrication conditions

Short waveguide BS20-1

Standard accessory for structure-borne sound and temperature sensor BS20

Applications:

Standard tests without any special requirements

Long waveguide BS20-2

Waveguide for structure-borne sound and temperature sensor BS20

Applications:

Tests on hard-to-access points and high-temperature applications

Magnetic waveguide BS20-3

Waveguide for structure-borne sound and temperature sensor BS20

Applications:

For connection at the test point for long-term testing and for ensuring even contact pressure

Wrench set for structure-borne sound and temperature sensor BS20

For assembling and disassembling waveguides
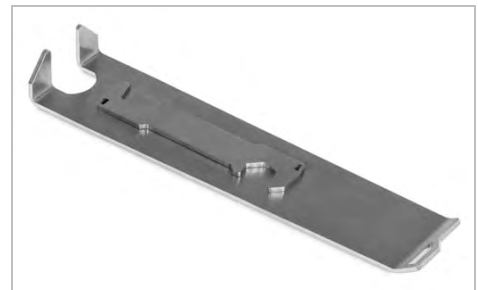
1.4 Additional optional accessories

Protection set for the SONAPHONE

- Protective housing cover

- Protective display film

- Carry strap to protect the device against falling

- Retaining eyelet for the carry strap with fixing screw

Leak tags set

(to identify leaks)

- 25 pcs

- incl. attachment wire

Socket wrench

(not shown)

- For assembling and disassembling the retaining eyelet for the carry strap

2 Software applications for the SONAPHONE

2.1 SONAPHONE apps

LevelMeter app

For various airborne and structure-borne sound applications (standard application on the SONAPHONE)

- Determination of sound levels

- Recording and logging of ultrasonic signals

- Graphic representation of levels, level curves and spectrogram

- Adding of photos, comments and voice memos

- User documentation included in PDF format on the device

- Data export for processing in DataViewer
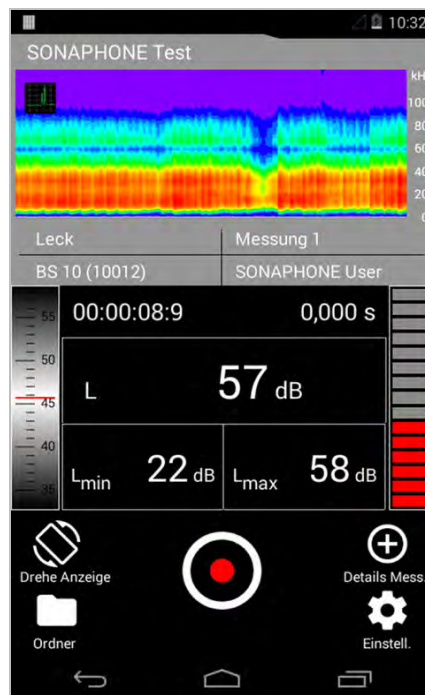
LeakExpert app

Special app for leak detection and evaluation

- Determination of sound levels

- Recording and logging of leaks

- Graphic representation: Spectrogram

- Output of leak classes and volume flow

- Adding of photos, comments and voice memos

- Storing of additional information on the test point and the repair

- User documentation included in PDF format on the device

2.2   Software for evaluating the data on the computer

SONAPHONE DataViewer for the LevelMeter app

- Display of the LevelMeter recordings on the computer (Windows 7 and higher)

[i] Note!

Exported data from the LeakExpert app cannot be viewed using the DataViewer.

- Detailed depiction of the level curve, spectrogram and spectrum

- Simultaneous playback of audio data

- Display of the photos, notes and voice memos for the measurement data

- CSV export of the measurement data

- User documentation included

3 Device sets

3.1 Device equipment layout in the transportation case

Box for storing accessories (behind the cover)

Space for documents

Sensors and accessories

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Capsule ear protection headphones

Cable routing, space for connected sensors with fitted accessories (without large acoustic horn)
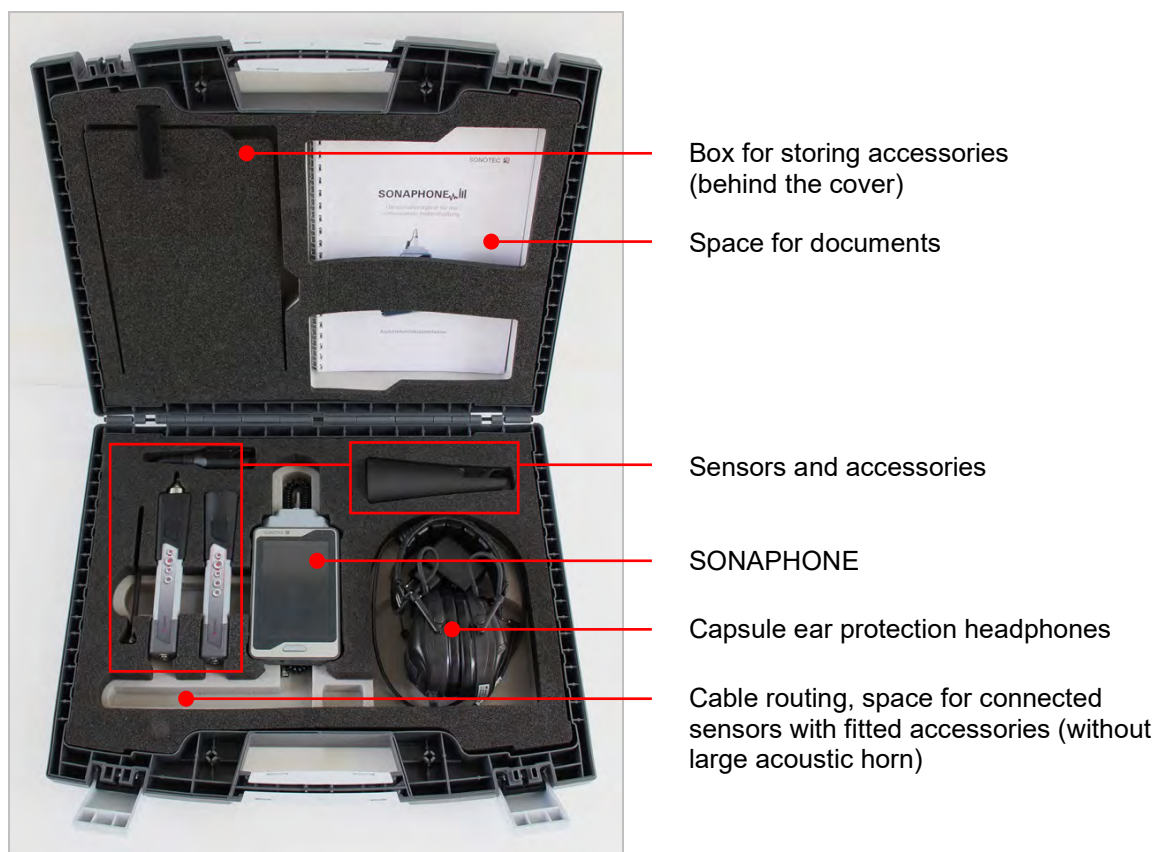
3.2   SONAPHONE basic set (without sensors)

- SONAPHONE digital
  ultrasonic testing device

- Sensor module, 1 channel

- SONAPHONE sensor cable

- Capsule ear protection headphones

- Audio cable for headphones

- Carrying case

- Universal charger and micro-USB cable

- LevelMeter app software

- Socket wrench

- User documentation (English)
  in PDF format on the device

3.3   SONAPHONE sensor set - airborne sound

- Broadband - airborne sound sensor BS10

- Sensor attachment
  Precise locator BS10-1 incl. adapter cover

- Sensor attachment
  Small acoustic horn BS10-2

- Sensor attachment
  Large acoustic horn BS10-3

3.4   LeakExpert application set

- Broadband - airborne sound sensor BS10

- Sensor attachment
  Precise locator BS10-1 incl. adapter cover

- Sensor attachment
  Small acoustic horn BS10-2

- Sensor attachment
  Large acoustic horn BS10-3

- LeakExpert app software

3.5   Sensor set - structure-borne sound and temperature

- Broadband - structure-borne sound and temperature sensor BS20

- Short waveguide 22 mm BS20-1

- Long Waveguide 150 mm BS20-2

- Magnetic waveguide BS20-3

- Wrench set for changing the waveguides

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Ultrasonic Testing Device for Preventive Maintenance

User Documentation: Device Description

Content

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1   Notes on the user documentation

1.1   General

Thank you for choosing the SONAPHONE ultrasonic testing device.

This document forms part of the ultrasonic testing device and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the information needed to ensure proper and efficient use, along with all the instructions to ensure safe operation of the SONAPHONE. It must therefore be read prior to commissioning and before carrying out any further steps.

⚠ **WARNING**   The SONAPHONE ultrasonic testing device must only be operated by users who have read (in full) and understood the safety information and the provided user documentation.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data and is not liable for errors or omissions.

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2   Symbols used

Hazards or special information are indicated in the following ways:

⚠ WARNING   Warns of possible **imminent dangers** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**.

⚠ CAUTION   Warns of dangers which, if ignored, may lead to **injury and/or material damage** - including financial losses due to operational interruptions.

ATTENTION   Warns of dangers which, if ignored, may lead to **material damage** - including financial losses due to operational interruptions.

ⓘ   **Note**
This section provides information or draws attention to specific features.

2 Device functions

2.1 Designated use

The SONAPHONE is a testing device for the verification, recording and evaluation of ultrasonic signals. (See section 2.3 for information on the device functionality).

Ultrasound can be created during a wide range of processes, including:

- At leaks in compressed air, steam and vacuum systems

- During the operation of steam traps

- At leaking valves, gates, barriers or taps in pipe systems

- During the normal function of slide or rolling bearings

- During cavitation caused by pumps and compressors

- In the event of flashovers or corona discharges in electrical systems

Depending on the device version and equipment, there are many other possible applications for the device for processes where ultrasonic signals can be verified.

Any use other than the designated use is prohibited and can result in personal injury or damage to property. SONOTEC Ultraschallsensorik Halle GmbH accepts no liability for damage, including to third parties, caused by improper handling of the device.

2.2 Range of functions

The SONAPHONE can be used for the evaluation of system conditions wherever ultrasonic signals are created and wherever the evaluation of these signals allows for conclusions to be drawn regarding correct functioning. Applications range from "simple" leak detection through to monitoring tasks for complex processes. The device concept of the SONAPHONE has been developed to support the user with optimal evaluation for a range of different processes by means of an adapted sensor system and flexibility in the output of the recorded data.
The mobile testing unit forms the basis of the system and has a range of different sensor connections and interfaces. There is function and application software installed on the device. The LevelMeter app (basic version) already includes powerful functions for testing, recording and data display,

allowing for the execution of a range of different basic tasks:

- Planning testing work

- Recording signal curves

- Saving and playing back signal curves

- Making ultrasonic signals audible

- Documenting (photographing) test points and marking damage areas

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For special tasks, the system can be expanded by the addition of the following:

- Sensors that meet the special requirements of the testing work

- Application-specific software with extended functions allowing for the recording, evaluation and management of testing and measurement data for special tasks.

2.3 Functioning

For a variety of different processes, ultrasonic signals are created in different frequency ranges, which the SONAPHONE makes visible and audible:

For tests carried out with the SONAPHONE, a distinction is made between two types of ultrasound with regard to the use of sensors:

Airborne sound – these sound waves spread via air, and can be verified in leak detection on compressed air lines, for example,

Structure-borne sound – these sound waves occur in mechanical processes, spread via solid structures, and can be used to verify bearing wear, for example.

The SONAPHONE can be used to evaluate ultrasonic signals that inevitably occur in the observed processes (leaks in compressed air or vacuum systems).
Alternatively, the SONAPHONE can be used to record ultrasonic signals that are actively generated by a corresponding transmitter. This procedure is used for leak detection in non-pressurized systems and containers, for example.

The level curve is depicted by averaging the ultrasound with very short time intervals. The level data is output in the form of a level graph. The spectra are calculated directly from the high-resolution ultrasound data, and are displayed as a function of time (spectrograms). Up to 5 additional level values can be output via the display in order to meet individual requirements.

At the same time, the signals are made audible via the integrated speaker or the headphones (for working in areas with high levels of background noise). The volume can be adjusted using the buttons on the device or on the sensors.

For documentation purposes, voice memos can be recorded for each test, and text comments can be added. Photos can also be taken, with damage areas marked.

The saved data and additional information can be used to create PDF reports within the device. There is also the option of transferring all data (individual data as well as reports) to other devices for further processing via the USB interface.

Extended functionalities are possible in the form of adapted sensors and the associated special software (see relevant documentation).
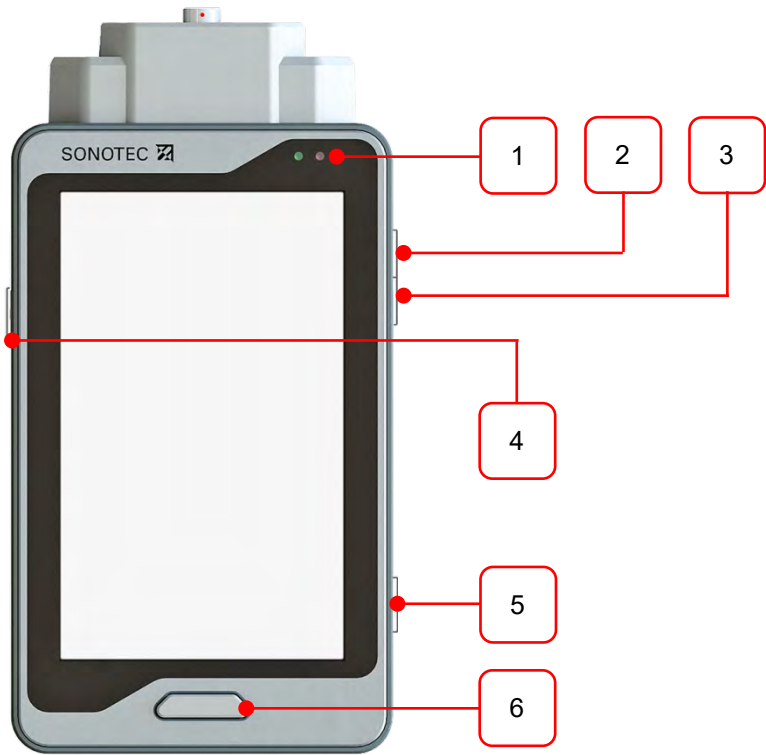
3 Device construction

## 3.1 Connections, interfaces and additional device elements
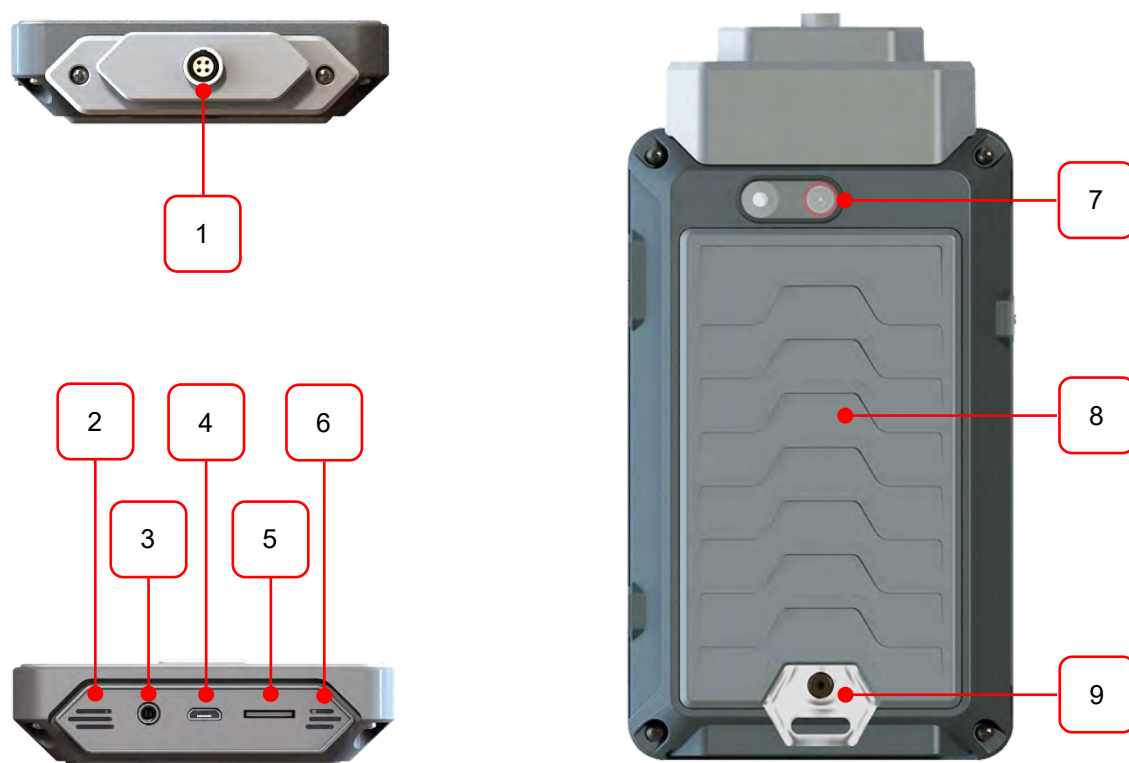
No.	Function of the connections, interfaces and device elements
1	4-pin LEMO connection for airborne and structure-borne sound sensors
2	Speaker
3	Headphone slot
4	Micro USB connection (for charger/power supply/data transfer)
5	Micro SD card slot
6	Microphone
7	Camera and flash
8	Battery compartment cover
9	Carry strap bracket (bracket and carry strap are optional accessories)

3.2 Functions of the device buttons

No.	Button functions		
1	Left: SONAPHONE status LED	Green: Device is starting up	
		Red: Recording with LevelMeter app active	
	Right: Charge state status LED	Orange: Device is connected via USB, battery is charging	
		Green: Device is connected via USB, battery is charged	
2	Increase the volume of the sound signals		
3	Decrease the volume of the sound signals		
4	Longer press: device on/off; shorter press: standby mode When device is switched on: mute mode on/off		
5	When the camera app is active: take photo When the SONOTEC app is active: activate camera app When the LevelMeter app is locked: unlock the device		
6	Brief press: testing device "Home" button Longer press: overview of active applications		

3.3 Start screen and apps for quick access (on delivery)
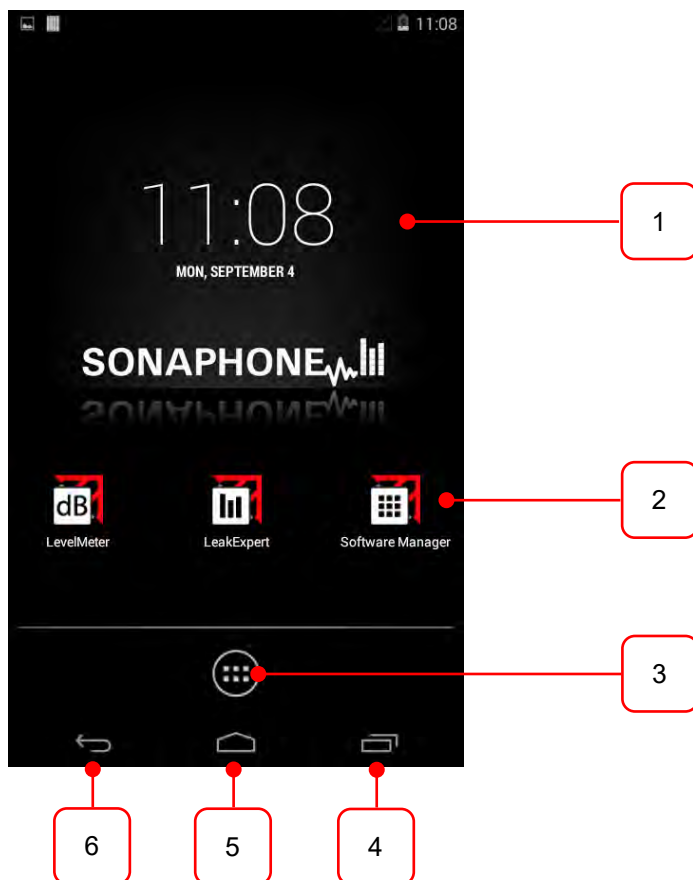
No.	Functions/meaning of the display elements
1	Time and date (digital clock widget)
2	Apps available via quick access (see page 15 for additional apps)
3	Overview of all installed apps and widgets
4	Apps activated by the user
5	"Home" – closes the current window and shows the start screen (activated apps remain active)
6	"Back" – closes the current window and returns to the previous one

Note!

Display elements 4, 5 and 6 are shown or hidden according to the active application. Tap on the bar to show these elements.

3.4   Displays and functions via the status bar

Icon	Meaning
12:05	Current device time
	Charge state: full/empty
	Charge state – device is being charged
	Device volume state: mute
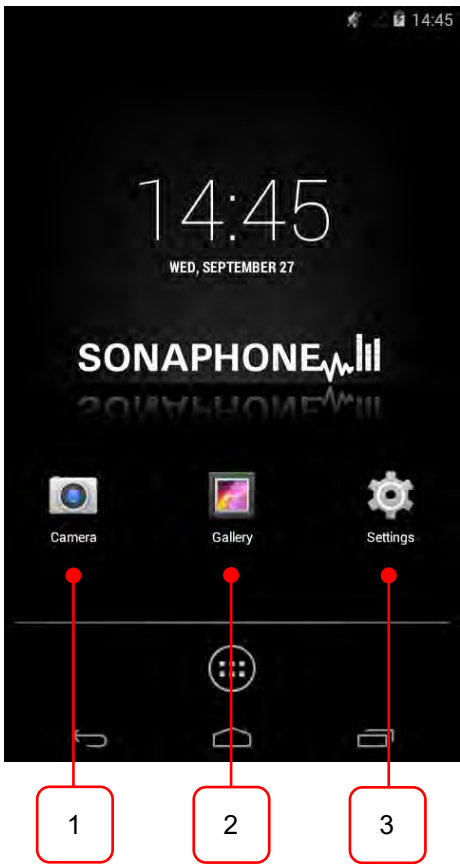
No.	Apps and widgets for quick access (swipe the start screen to the side)
1	Settings (for a list of parameters see page 17)
2	Camera
3	Gallery (overview of photos and screenshots)

3.5   Device identification/type label

The type label is located on the back of the device, and should be to hand in the event of a service call.

4 Headphone description

⚠ CAUTION	**Risk of damage to hearing**
	Always observe the manufacturer's original operating manual and the applicable instructions for safe working with ear protection in noisy areas.

4.1 Function of the operating buttons

No.	Button functions
1	Switching the headphones on/off: Press the button on the right-hand capsule for approx. 3 seconds; an acoustic signal will indicate operation/switch-off
Controlling noise suppression in the headphones	
2	- Play ambient noise more quietly
3	+ Play ambient noise louder

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5 Device applications (apps)

5.1 Notes on the operating system and valid licenses

The SONAPHONE applications are based on the Android 4.4.2 operating system. The source code can be disclosed on request (contact: www.sonotec.de).

Licenses that are valid for the applications on the SONAPHONE are stored on the device (once the app has been started up, the licenses can be found under the "Settings" menu item).

5.2 Software applications on the SONAPHONE

The SONAPHONE provides different types of software applications:

- Applications or settings provided by the Android operating system (e.g. 'Calculator')

- Applications used to carry out tests with the SONAPHONE (e.g. 'LevelMeter') and that are pinned to the start screen as the default setting

- Applications for managing installed testing software (Software Manager): available via the app overview

5.3 Overview of device applications

5.3.1 Apps

Settings

Gallery

Camera

Calculator

Clock (the set time is used for the testing applications)

5.3.2 Widgets

Analog clock/Digital clock

Settings shortcut

Photo gallery

5.4 Overview of SONAPHONE apps

Software Manager

5.5 Overview of SONAPHONE testing applications

'LevelMeter' software

'LeakExpert' software*

License (limited/unlimited)

* optional: depending on the device application

5.6 Overview of device settings

The device settings are available from the "Settings" menu item as possible:

ℹ	**Note!**
	To make changes: Tap on a menu item, tap in a checkbox and/or actuate a slide control. Additional settings can be adjusted for some parameters by tapping on the ⛭ icon.

5.6.1 Device

Sound

    Volumes:
Music, video, games & other media / Notifications / Alarms
(adjusted via slide control)

    Default notification sound:
(selection from the sound library)

    Touch sounds: On/off

    Screen lock sound: On/off

Display

    Brightness:
Adjusting the background lighting

    Wallpaper:
Selection of background graphics – photos from the gallery or background image from the overview

    Auto-rotate screen: On/off

    Sleep:
Define the time interval for automatic switching to standby mode (possible values: 15/30 seconds, 1/2/3/5/10/30 minutes with no activity)

    Font size:
Selection of predefined values (small/normal/large/very large)

Storage	<u>Total space:</u> Information about the available and used storage space (Available / App data & media content / Pictures, videos / Downloads / Cache data / Miscellaneous)
	<u>SD card:</u> Add/delete SD card Available and used storage space on the SD card
Battery	Display of charge state and remaining battery life
Apps	Overview of all applications on the device (with information on storage space)
	<u>Downloaded:</u> Installed apps (SONAPHONE apps or additionally installed apps)
	<u>Running:</u> active apps
	<u>All:</u> all apps

5.6.2 Personal

Security	<u>Screen lock:</u> Selection between: None/move finger/pattern/PIN/password
	<u>Enable widgets:</u> Yes/no
	<u>Owner info:</u> Store owner information for display on the lock screen
	<u>Passwords visible:</u> Yes/no

Language & input	
	<u>Language:</u> Selection from a list
	<u>Spell checker:</u> Yes/no
	<u>Personal dictionary</u>
	<u>Keyboard & input methods:</u> Selection of keyboard and definition of keyboard settings
	<u>Mouse/Trackpad pointer speed:</u> (adjusted via slide control)

5.6.3 System

Date & time   Set date
                           (entry via keyboard or selection of stored values)

                           Set time:
                           (entry via keyboard or selection of stored values)

                           Select time zone

                           Use 24-hour format: Yes/no

                           Choose date format:
                           Selection between various display versions

About the SONAPHONE
                           Status: Battery state and other information

                           Legal information

                           Model

                           Serial number

                           Android version

                           Kernel version

                           Build number

6   Disposal

Electrical and electronic devices may pose a risk to health and the environment if disposed of incorrectly. They cannot therefore be disposed of as domestic waste according to WEEE directive 2012/19/EU (Waste Electrical and Electronic Equipment Directive). Instead they must be taken to designated collecting points or returned to the manufacturer.

The following symbol on the device indicates the legal duty to dispose of electronic devices separately.

They must undergo specified recycling processes (e.g. with respect to batteries or circuit boards) which enable safe, environmentally-compatible re-use or separate disposal of different device elements.

The return of used devices is regulated differently in different places. Find out from your local council about the return conditions for used electronic devices. The device, including the battery, does not contain any toxic substances requiring separate identification for disposal such as mercury (Hg), cadmium (Cd), lead (Pb) or chrome 6 (e.g. in galvanized parts or circuit boards).

7   Warranty

The SONAPHONE ultrasonic testing device and its corresponding sensors comply with the current state of the art and the safety regulations. All devices and accessory parts are factory tested and are delivered in a safe condition for operation. We reserve the right to make modifications to the device as part of ongoing product development, and to make changes to the shape and color.

Within the warranty period, SONOTEC Ultraschallsensorik Halle GmbH will rectify, free of charge, all defects caused by material or manufacturing errors. At its own discretion, SONOTEC Ultraschallsensorik Halle GmbH will provide a guarantee in the form of either a repair or the replacement of the defective device or component. The warranty does not cover the internal batteries or damage caused by improper use, wear or interventions in the device or sensors. The warranty also does not cover any defects that have only a negligible impact on the value or usability of the device.

The recording of valid test results, the interpretation of these results and any measures that are derived as a result are exclusively the responsibility of the user. SONOTEC does not assume any guarantee for the correctness of the recorded test values or test results. SONOTEC accepts no liability for any errors or damages that arise as a result of the further use of the recorded test and measurement values.

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SONAPHONE

Ultrasonic Testing Device for Preventive Maintenance

User Documentation: Device Operation

Content

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1 Notes on the user documentation

1.1 General

This manual forms part of the ultrasonic testing device and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the information needed to ensure proper and efficient use, along with all the instructions to ensure safe operation of the SONAPHONE. It must therefore be read prior to commissioning and before carrying out any further steps.

⚠ **WARNING**   The SONAPHONE ultrasonic testing device must only be operated by users who have read (in full) and understood the safety information and the provided user documentation.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data, and is not liable for errors or omissions,

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2   Symbols used

Hazards or special information are indicated in the following ways:

WARNING   Warns of possible **imminent dangers** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**.

CAUTION   Warns of dangers which, if ignored, may lead to **injury and/or material damage** - including financial losses due to operational interruptions.

ATTENTION   Warns of dangers which, if ignored, may lead to **material damage** - including financial losses due to operational interruptions.

Note
This section provides information or draws attention to specific features.

2   Basic device operation

This section describes the operating functions provided by the operating system (Android). Operation from within individual apps or menu items may vary from the operation described here.

2.1   Operation via touchscreen in the Android operating system

A large proportion of the device operation is performed using the touchscreen. The basic operations are explained in more detail below.

Android touch operation	
Lightly tapping on icons or functions:	**Carrying out a standard action**
	On icons or active menu items (white writing): Opens the respective applications Navigates one level further within a menu
	In text fields: Activates text input via the on-screen keyboard (to confirm text input: ⌄)
	On an icon with an underlying function: Switches functions "On" or "Off" (indicated by a color change or a different frame)
Pressing and holding on an icon or menu item:	**Often shows additional actions, similar to the context menu in Windows (right-hand mouse button)**
	On apps in the overview: Activates the application for creating a link to the start screen: Tap on the icon, keep your finger held down and move it to where you want to position the icon.
	On icons on the start screen: Activates the deletion of icons: Tap on the icon, keep your finger held down and move to the "Remove X" field

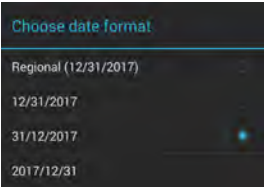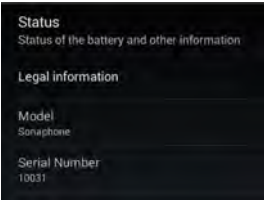| Vertical or horizontal swiping:	Shows additional content or deletes content from the display
	Sideways: to the start screen Shows additional apps for quick access or additional widgets
	Sideways: Notifications in the status bar Deletes the message from the display
	Vertically: in the menu overview Scrolling in the display
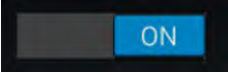
2.2   General icons and control elements

Control elements and their functions in the Android environment:

Element	Operation
	Display locked/ Unlock display: Swipe to the side with your finger
	Additional content/settings: Tap on the icon
	Continuously variable slide control: Select between minimum and maximum by holding down and moving the control
	Slide control for selecting between two values: Swiping activates [ON]/deactivates [OFF] the stored function
	Checkbox: A brief tap activates/deactivates the stored function
	Selection of a value from a pre-defined list (only one value can be defined): Tap to activate a new value
	Selection of values from a pre-defined list: Slide values upward or downward (active value highlighted in the center) Manual entry of values: Press on the active value for longer and enter the new value using the keyboard (only plausible values can be entered)
	Active menu items (white writing): Tap on the menu item to navigate to the sub-menu or to change the stored values Inactive menu items (gray writing): Information for the user

2.3   Functions in the status bar

As well as status displays (see device description: Displays and functions via the status bar), the status bar also includes functions for quick access:

⇨ Swipe down from the status bar to manage notifications.

↳ The notifications (e.g. "Screenshot captured") are displayed.

⇨ Swipe the notifications to the side or tap on the 　▬ icon to delete them from the display.

▦ Show additional functions and displays (icon changes)

▤ Hide functions and displays again

Possible adaptations via the status bar:

⚙ Display brightness (adjustable via the slide control)
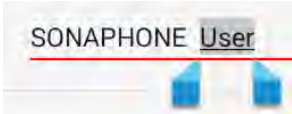
⚙ Settings (quick access to the device settings)
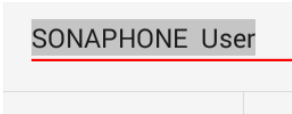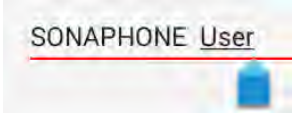
Additional displays:

▮ Battery status

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
2.4 Entering text using the touchscreen

Input screen	Meaning and operation
SONAPHONE User	Highlighted text – text field will be overwritten when text is entered
SONAPHONE User	Cursor in position: Text will be entered from the indicated point Positioning the cursor: Tap at the appropriate place within the text field
SONAPHONE User	Highlighting text: tapping twice on a word (the highlighted text will be overwritten when text is entered)
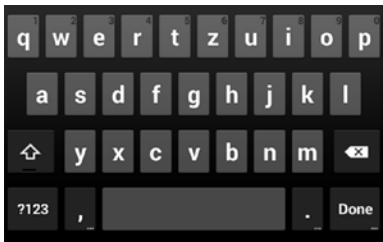
⇨ To enter characters: tap on the corresponding letters.

⇨ To change the character set: tap on the icon (see table below for options).

↳ The character set is changed according to the selected option.

Icon	Meaning and character input
	Text entry in lower-case: active when the keyboard is opened
	The option to upper-case the first character is activated (keyboard switches back to lower-case text entry automatically after the first character has been entered)
	Tap twice or tap and hold to activate small upper-case text entry
	Text entry in small capitals is active (only upper-case letters):
	Tap twice or tap and hold to deactivate the function again
	Character entry is active when the keyboard is started up. To activate number or special character entry: tap on the icon
When number or special character entry is activated, the following functions are available:	
	Switch to special character entry
	Switch back to character entry

Note!

Text entry is ended by pressing a key to confirm the entered text ("OK", "Start" or "Done"). Alternatively, text entry can be confirmed by pressing the "⌄" icon on the on-screen keyboard.

2.5   Starting up apps

⇨ Tap on the corresponding icon to start up an app.

Relevant for SONAPHONE apps:

⇨ Enter a username.

ℹ️ **Note!**
The username is stored in and output from the test data for the report, meaning that the tester can be verified for all stored data.

⇨ Confirm your entry by pressing "Done".

↳ The app is then started and the content will be available.

2.6   Hiding or shutting down apps

A distinction is made between:

Moving an active app to the background:

▪ The application remains active and can be re-started quickly

▪ The user data (username, selected folders or applications, audio settings) is retained

▪ Some test values (depending on the app) are retained: Minimum value and maximum value

Shutting down apps

▪ The system memory is available for other applications (this is necessary for apps that require a lot of memories)

▪ System stability is improved as the app processes will not be impacting on one another

---

ℹ️ **Note!**
Always shut down a SONAPHONE app before starting another app.

To move an app to the background:

⇨ Press the SONAPHONE "Home" button ⬭ or tap on the
  "Back" icon ⬑.

↳ The start screen will be displayed.

ℹ️	**Note!** Please note that applications will remain active in the background even if login is canceled.

To shut down apps that are active in the background:

⇨ Press and hold the SONAPHONE "Home" button ⬭.

↳ The device shows the name of any apps that are active in the background, together with a preview image.

⇨ Swipe the display to the side to shut down the app.

↳ The app will be shut down.

Alternative, the Task Manager can be opened by tapping the ⬛ icon.

More information on operation using Android can be found on sites such as https://www.droidwiki.org.

3 Commissioning

3.1 Charging the rechargeable battery

The device is shipped with a partially charged battery. If the battery becomes discharged as a result of transport or use of the device, charge it using the supplied power supply unit.

⇨ Connect the SONAPHONE to the power supply using the charger.

✇ The status LED on the right-hand side will light up orange to indicate that the device is charging, which will take around 4 hours when the battery is fully discharged and the device is switched off.

✇ When charging is complete, the status LED on the right-hand side will light up green, or if the device is switched on, the battery status will be displayed in the status bar.

3.2 Attaching the carry strap to the SONAPHONE

3.2.1 Fitting the carry strap bracket

The carry strap bracket is pre-assembled. If this is not the case, however, proceed as follows:

⇨ Use the socket head wrench (included with delivery) to undo the cylinder head screw on the back of the SONAPHONE.

⇨ Use the supplied countersunk screw (see illustration below) to attach the retaining eyelet and tighten it hand-tight using the socket head wrench.

| **ATTENTION** | **If the wrong screw is used, the carry strap may not be sufficiently secure!**
Always use the countersunk screw to attach the retaining eyelet. |

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3.2.2 Attaching the carry strap

1. Undo the end of the carry strap from the plastic adjustment buckle

2. Pull the adjustment buckle until the end of the carry strap is long enough to be attached to the bracket.

3. Place the carry strap onto the red side so that the back of the adjustment buckle is visible.

4. Position the SONAPHONE such that the retaining eyelet is pointing upward, and thread the strap downward through the retaining eyelet

5. To fix in place, push the end of the strap through the two openings on the adjustment buckle, tighten the end of the carry strap and check that the fastening is secure.

3.3 Connecting sensors

ATTENTION	**Risk of damage to the connectors!**
	Take note of the red dots indicating the plug-in position on the plug and socket.

⇨ Connect the sensors to the SONAPHONE in accordance with the red dots, making sure to only ever use the supplied cable.

✍ The sensors are powered via the cable, and the test data is transferred to the SONAPHONE automatically.

✍ The sensors are ready for operation when the status LED on the sensor lights up green.

Please read the relevant sensor description for information on fitting accessories.

3.4   Connecting and switching on the headphones

⚠ **CAUTION**   **Risk of damage to hearing!**
Always observe the manufacturer's original operating manual and the applicable instructions for safe working with ear protection in noisy areas.

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1. Connect the headphones to the SONAPHONE using the appropriate cable.

2. Switch on the headphones by pressing the ⏻ button on the right-hand capsule by pressing and holding the button for approx. 3 seconds.

3. Use the two other buttons to adjust the noise cancellation (➖ quieter, ➕ louder).

✍ Switch-on/switch-off is indicated by an acoustic signal

4. Switch off the headphones after use.

ATTENTION   **Risk of damage to the connectors!**
Always disconnect headphone cables when storing headphones in the case, as otherwise the cable connectors could be easily damaged.

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4 Preparing Tests

4.1 Learning about device equipment and apps

In order to achieve optimal testing results with the SONAPHONE, it is important to be familiar with the device equipment and the ways in which it can be used.

It is also useful to be aware of the basic properties and the propagation of ultrasound:

- How does ultrasound propagate in air and solid bodies?

- What are the influencing factors on the propagation of ultrasound?

- To what extent do ultrasound reflections influence the displayed test values?

It is also valuable to have background knowledge of the systems to be tested:

- Are there ultrasound sources in the system that could falsify the test results?

- Where in the compressed air system are there distributors or deflections that have an impact on the air flow, or where are the weak points in the system (e.g. at connecting elements)?

- How does a steam trap work: when does it open and close in accordance with its purpose?

i	**Note!**
	Using the correct sensor accessories and the correct device settings can be decisive in whether or not it is possible to locate any damage areas within the system.
	The recorded test data is used as a basis for the system evaluation. Accordingly, it is important to ensure that the device equipment and accessories are used correctly.

Make sure you are familiar with the operation of the SONAPHONE and the associated sensors. Read the supplied documents to find out about the correct use of the different sensors and associated attachments.

Find out about the differences between the different methods of making content audible that are provided by the SONAPHONE apps.

Test out the options provided by the respective app for documenting damage areas. The more detailed and accurate the documentation regarding the test points, the easier it will be to plan and carry out the repairs.

SONOTEC provides training sessions on the use of the SONAPHONE. Contact our Service team for more information.

4.2 Planning service calls and documentation

Define in advance which systems you wish to test in what order. Use the opportunity to structure the data within the device to meet your requirements. If necessary, define folder names (e.g. "Leak detection Hall 1", "Steam trap #10 … 20 test") before the start of testing, in order to make it easier to evaluate and archive the test data following the service call. Save the associated tests in a folder so that they can be output in a report at a later date.

> **i** **Note!**
> The structure of the data is defined when creating and activating folders. It is no longer possible to move data to create reports or prior to export.

You can also define standards (spellings, fixed terms) to be complied with for documentation within your company, as well as the quantity and type of photos (e.g. photo of the system and detailed view each with highlighted damage area (see 7.2 Additional camera functions with the active SONAPHONE app).

4.3 Ensuring the operational capability of the device equipment

Before the start of testing, make sure that:

- The device equipment is ready for operation and is not damaged
- The device battery is charged (see Section 3.1 Charging the rechargeable battery)
- There is sufficient storage on the SONAPHONE
- The necessary accessories (sensor attachments) for testing work are present in the case
- The sensor is correctly connected (see Section 3.3 Connecting sensors),
- The attachments are correctly fitted on the sensor
- The headphones are switched on (see Section 3.4 Connecting and switching on the headphones; manufacturer's operating manual).

Also make sure that all important device settings (see following section) have been adjusted correctly.

# 5 Important device settings prior to testing

5.1 Switching on the SONAPHONE

1. Switch on the SONAPHONE by pressing the On/Off button on the left-hand side of the device: Hold down the button for a few moments.

✥ The start screen appears and the status LED (green) on the left-hand side lights up, indicating that the SONAPHONE is starting up.

ATTENTION | **Risk of damage to the device!**

Incorrect use may damage the device display.

Do not use any sharp or pointed items to operate the device with the touchscreen display. Suitable items are the standard stylus pens for operating touchscreen displays.

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2. Move the key symbol (🔒) on the touchscreen to one side.

✥ This unlocks the device, and the following menu appears for initial commissioning: (For subsequent starts, see the next display illustration)
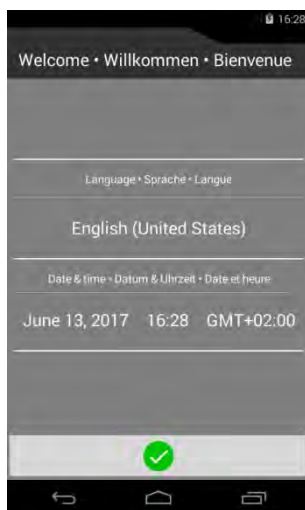
✥ Tap on the device language ("English") to change the language settings for the SONAPHONE.

3. Select a language from the list.

✥ The list will close and the menu for initial commissioning will be displayed again.

4. Tap on the time information to update it.

5. Enter the date, time, time zone, time format and date format and confirm the entries by pressing "Done".

↳ The sub-menu will close and the menu for initial commissioning will be displayed again in order to check the entries.

6. Confirm the entries by tapping on the ✅ icon.

↳ The menu will close, and will not be displayed again when the device is switched on on subsequent occasions. The menu items will then be accessible via the general device settings ⚙.

Once unlocked, the device will display the available software applications:

7. Tap on the required icon to start up the application.

↳ The software will start up.

The software description can be found in the corresponding documents.

The display will automatically switch to Standby mode to save energy if it is not used for 10 minutes (this can be adjusted by going to Settings - Display - Standby mode).

5.2 Changing the language

The SONAPHONE device language is set to "English" on delivery.

i	**Note!** Shut down all apps before changing the language settings.

To change the device language, proceed as follows:

1. Go to ⊞ Overview ⇨ ⚙ Settings ⇨ **A** "Language & input" ⇨ "Language" menu item

2. Select a language from the list.

↳ Once the language has been selected, the list will close and the "Language & input" menu will be displayed.

3. Tap on the ⇦ icon to return to the main screen.

If a language is activated that you do not understand, you can use the icons to differentiate between the different menu items. The selection list can always be accessed via **A** in the first menu item.

5.3 Changing the time and date

i	**Note!** Always check the time settings **before starting a test**. The time is recorded in the measurement data and is output into a report.

1. Select ⊞ Overview ⇨ ⚙ Settings ⇨ 🕐 "Date & time"

2. Tap on the "Define date/define time" menu item to change the settings.

3. Confirm by tapping on "Done" or the ⇦ icon.

4. Tap on the ⇦ icon to return to the measurement screen.

5.4   Adjusting the volume

When assessing machine or system states using the SONAPHONE, the interpretation of the converted audible ultrasonic signals play a vital role (as well as the observation of the level indicators and the spectrogram).

Before the start of testing, make sure that the following have been optimally adjusted:

- The volume in the device

- The cancellation of background noise at the headphones.

Regulating the device volume:

⇨ Make sure that you are familiar with the SONAPHONE before recording tests:

i	**Note!** Test the audio impression in combination with the different display options for the respective app by generating active ultrasonic signals. (Airborne sound: rub your fingers together or blow into the airborne sound sensor; Structure-borne sound: carefully rub the tip of the structure-borne sound sensor on a hard surface).

⇨ Use the buttons on the right-hand side of the device to adjust the volume that best allows you to evaluate the signals via audio impression.

Adjusting the background noise cancellation at the protective headphones:

The headphone settings can be adjusted in order to completely cancel out or gradually adjust any background noises, such as that from industrial equipment. If you are working in a team or training employees, you can adjust the headphone settings to allow for conversation without having to remove the headphones. Select the setting that best allows you to evaluate the ultrasound settings via audio impression (see also Section 3.4 Connecting and switching on the headphones and the headphone manufacturer's operating manual).

i	**Note!** The headphones have an automatic safety function. If there is a lot of background noise, the headphones will automatically reduce the background noise in order to protect the user's ears.

5.5 Adjusting the display brightness

	Note!
[i]	A reduced display brightness can significantly reduce the power consumption, thereby increasing the device's running time.

To adjust the display brightness:

1. Go to ⊞ Overview ⇨ ⚙ "Settings" ⇨ ☼ "Display" ⇨ "Brightness" menu item.

2. Use the slide control to select the desired brightness.

3. Tap on the ↩ icon to return to the measurement screen.

For information on adjusting the settings via the status bar, see Section 2.3 Functions in the status bar.

6   Tests with the SONAPHONE

6.1   Device application

In order to carry out tests using the SONAPHONE, there are a variety of apps with functionalities and tools that have been optimized for different applications. A description of these apps can be found in the corresponding documents. The basic procedure for carrying out testing is described below. Always observe the special features and the detailed information provided in the description of each app.

⚠ WARNING	**Hazards in industrial equipment!**

Risk of death or severe injury.

The SONAPHONE carry strap (optional) is designed to protect the device against unintentionally falling, and is therefore designed to be particularly sturdy. It can become caught on protruding system components and can cause serious injuries. Always carry the SONAPHONE such that the carry strap cannot become caught, and always be aware of potential hazards.

⇨ Prepare the device as described in the previous sections.

To carry out tests with the SONAPHONE:

1. If the device is fitted with a carry strap (optional accessory), use this to carry the device around your neck and to protect it against unintentionally falling.

2. Start up the app by tapping on the corresponding icon.

3. Enter the username stored in the test data and the report.

⇨ The app will start up in test mode, and the ultrasonic test values will be shown on the display in a number of different forms.

Numerical values will be displayed (e.g. current level, minimum values, maximum values) as well as the time progression (e.g. by means of a level curve or spectrogram).

4. Define the storage location for the data (folder) and adapt the measured value output on the screen to meet your requirements as necessary.

5. Define the important test parameters – these can be found in the app description.

⚠ CAUTION	**Risk of falling!**
	Do not walk through the system while reading the SONAPHONE screen or operating the device.
	Risk of injury or damage to the device!
	When locating ultrasonic signals in areas that are not easily visible or that are not visible at all, there is a risk of personal injury or of damage to the sensors. Work in a way that ensures that your hands and the sensors are always visible.

6. Use the different sensor accessories and the numerical values and graphic output on the screen to find the position that allows for optimal documentation of the test results.

7. Record the test values using the relevant function.

8. Add additional information such as photos (see Section 7 Creating photos and screenshots) or text comments to the recorded test values.

9. Use the export function to combine the test values or to create a report.

When carrying out tests, make sure to also observe the information in the SONOTEC app descriptions.

7 Creating photos and screenshots

The SONAPHONE has a camera for documenting test points. Photos can be allocated to specific jobs (folders) or individual test data (measurements) in the SONAPHONE apps, and damage areas can be highlighted in the images.

Please note that the range of functions offered by the camera app differ from the camera functions available within the activated SONAPHONE app.

7.1 Taking photographs with the camera app

To start up the camera app:

⇨ Swipe the start screen to the left-hand side to start up the camera app 📷 via quick access.

✎ The camera opens, and the basic camera functions are now available.

> **i** **Note!**
> The control elements in the bottom display area ("Back", "Home" and "Active applications") are hidden during camera operation. Tap on the bar to show these elements.

Available functions:

Zoom

Place two fingers on the display, and spread them or bring them together to select the section you wish to photograph. The zoom level is shown during this process, and is then hidden when the photo is taken.

Auto focus

Auto focus is active automatically when the app is started up, and is displayed when the photo is taken:

Camera focusing: ⟳ The display rotates and shows the focusing operation

◯ Focusing is complete, and photo capture is triggered

Additional camera settings:

To open the settings menu: Tap on the ⭕ icon:
(The icon will show some settings that differ from the standard values, such as:
automatic flash: ⟳ᶠ)

⊘   Adjusting the exposure:

            Default value: 0
            Tap on a value between -3 and +3 to adjust the setting

⊡   Adjusting the image size (tap on 🎛 for additional settings):

            Select a value from the list to change the setting

⚡̸ ⚡ᴬ ⚡   Adjusting the flash mode (the icon in the overview always shows the active setting):

            Default value: Flash is deactivated
            Tap on the icon to activate automatic flash or flash ON

1. Choose an object to photograph.

2. Tap on the 🔵 field (shutter button) to take a photo.

↳ The camera will indicate that it is focusing, and will then take the photo, with the thumbnail view being displayed for a short time at the top right-hand side of the screen.

All photos and videos taken using the camera app can be found in the gallery or in the "Sonaphone/Internal memory/DCIM/Camera" folder.

7.2 Additional camera functions with the active SONAPHONE app

When the SONAPHONE app is active, additional documentation functions are available for use:

1. Once test data has been recorded, tap on the 📷 icon to add images to a recording. (Images can also be added to folders).

2. Choose a view where the damage area is clearly identifiable on the display. If necessary, include several images containing details that are relevant to the repair, such as images taken during removal, images that show the rough location within the system or close-up images.

3. Tap on the 🔵 field (shutter button) to take a photo.

↳ The camera will indicate that it is focusing, and will then take the photo.

↳ The preview will be displayed, and the following options are available:

✕   Close the camera and return to the data overview.

↻   Discard the photo and take another photo.

✓   Save the current photo.

Damage areas can be highlighted on saved images:

4. Tap on "New marker"

5. Tap on an area within the selection to choose a color for the current marker.

↳ The marker will be shown in the selected color at the center of the display.

6. Move the marker to the required position.

⇨ Tap on "New marker" again to mark additional areas within the image.

⇨ Tap on "Remove marker" to delete existing markers.

↳ The most recently created marker will be deleted first. Tap on "Remove marker" again to remove the markers one after the other. The button will remain active as long as there are markers on the image.

ℹ️ **Note!**

Before finishing this step, check that all markers are in the correct positions. Markers are permanently stored within the image, and cannot be moved, deleted or added at a later date.

---

7. Confirm the addition of the markers by tapping on "OK" to return to the data overview.

↳ The images will be displayed as thumbnails in the overview.

8. Tap on the 📷 icon in the data overview again to add additional images.

7.3 Recording videos or taking panoramic images

i	**Note!** Please note that this function is only available via the camera app; it is not available when using the camera function within the SONAPHONE apps.

1. Tap on the 📷 icon.

↳ The selection list for additional camera app functions will open.

2. Select a function by tapping on the relevant icon:

   ⋈   Take panoramic image

   🎥   Record video

The selected function is activated, and the corresponding functions are now available.

7.4 Taking screenshots

⇨ Press the Power ON button (left-hand side of the device) and the "Quiet" button (on the right) on the SONAPHONE at the same time to take a screenshot of the current display.

↳ The image will be briefly displayed as a thumbnail image, and the 🖼 icon and "Saving screenshot" text in the status bar will indicate that the screenshot has been saved.

All screenshots can be found in the gallery or in the "Sonaphone/Internal memory/Pictures/Screenshots" folder.

SONOTEC ▨

8 Data management

In order to manage the test results, test values can be combined for export (as a .zip file) or output as reports (.pdf) together with photos, comments and voice messages.

8.1 Data structure on the SONAPHONE

SONAPHONE

Portable media player:

Internal memory

▶ DCIM	▶ Camera:	**Camera images (.jpg)**
▶ Pictures	▶ Screenshots	**Screenshot (.png)**
▶ **Sonaphone**	Software applications for installation (.apk) or licenses (.lic)	
▶ **Reports**	▶ **LevelMeter** (or other app)	.zip .pdf …

SD card (if connected)

▶ **Reports**	▶ **LevelMeter** (or other app)	.zip .pdf …

Please note that additional folders will be provided by the operating system that are not relevant to testing with the SONAPHONE.

8.2 Transferring data via USB

Before the data can be transferred, it will need to be combined for export in the relevant app (.zip), or saved as a report (.pdf). A description of this process can be found in the corresponding document.

1. Using the USB cable, connect the device to the end device to which you wish to transfer the data.

> **Note!**
>
> System messages relating to the USB connection and device driver software have no influence on functionality and can be ignored.

2. Select and copy the data to be transferred from within the SONAPHONE structure.

✥ The data can be added to a folder on the end device.

8.3 Transferring test data to an external memory card

1. Insert the SD card (with contacts facing downward) into the designated slot on the bottom of the device until the card can be felt clicking into place.

✥ The message "Preparing SD card" indicates that the card has been recognized by the SONAPHONE. The status of the card can be retrieved from within the SONAPHONE settings.

2. Transfer the data as described in the user documentation for the relevant app.

> ⚠ **CAUTION**   **Risk of data loss and damage to the SD card!**
>
> Never remove the SD card
> - while data is being transferred or
> - before you have correctly removed the memory card via the SONAPHONE settings.

To remove the SD card from the SONAPHONE correctly:

3. Wait until data transfer is complete. This is indicated by means of a status report specifying the data type and the storage location.

4. In the overview ⊞, tap on "Settings" ⚙ and then the "Memory" menu item ▤.

<table>
<tr>
<td>ℹ</td>
<td>

Note!

Please note, that

- the following menu item is only active when the device is not connected to a computer via USB and when
- the internal SD card for which the following option is unavailable is included in the memory list.

</td>
</tr>
</table>

---

5. Tap on "Remove SD card" in the list.

6. When a message appears, tap on "OK" to confirm and complete the process.

7. The status message "Removing SD card" indicates that the disconnection process is being carried out.

8. Remove the SD card by pushing on the card in the slot until the lock mechanism disengages.

↳ A message in the status bar indicates that the card has been removed and is no longer available in the device.

9 Managing software applications (apps)

9.1 Installing or updating apps

Installation files can be transferred to the SONAPHONE via USB interface. The applications (apps) can be installed via the Software Manager.

The following files are provided for installation or updates:

- License files: .lic (e.g.: LeakExpert_App_XXXXX_permanent.lic)

- Software applications: .apk (e.g.: leakexpert-vX.XX.apk)

---

i	**Note!** So as not to jeopardize the stability of the device, installation is only supported for apps that have been developed or approved by SONOTEC.

The installation (update) procedure is described below, using the example of the LeakExpert app:

1. Switch on the SONAPHONE.

2. Connect the device to your computer using the USB cable.

3. Open the SONAPHONE device on your computer by double clicking on the icon, and open the "Internal memory" folder.

↳ The following folder structure will be displayed:

4. Open the "Sonaphone" folder and place the files (.apk, .lic) to be installed inside this folder. The SONAPHONE can now be removed from your computer.

5. Unlock the SONAPHONE by swiping the (🔒) symbol to the side, and open the device's Software Manager by tapping on the corresponding icon.

☞ All available software applications are displayed in the Software Manager.

	Note!
ⓘ	The Software Manager is required in order to install applications on the SONAPHONE, and cannot be deleted.
	The uninstallation icon ⬆ is deactivated on delivery.
	All installed applications can be updated via the update icon ↻ by following the described procedure as soon as the update file has been saved to the SONAPHONE.
	For the installation of new applications (e.g. LeakExpert), the installation icon ⬇ is automatically activated as soon as the installation file has been saved to the SONAPHONE.
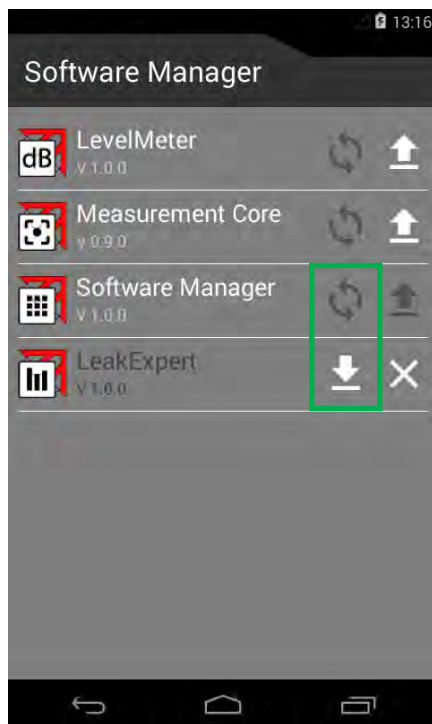
6. Tap on the corresponding icon to start the Installation ⤓ / Update ↻ .

The following window will then open:
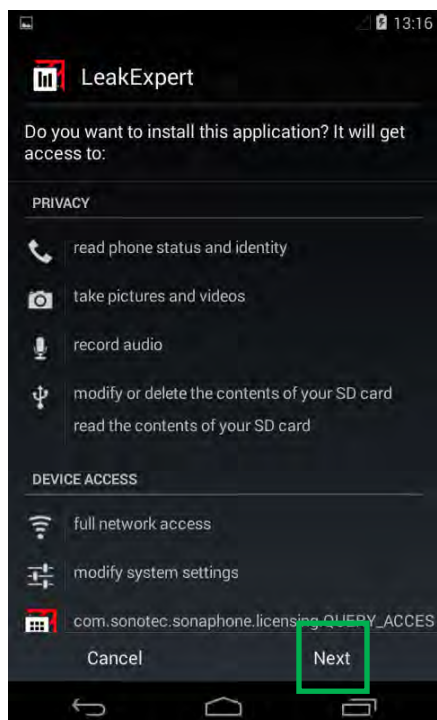
7. Confirm the installation by tapping on "Continue".

↻ The installation process is indicated by the following messages:
"Installing LeakExpert…" ⇨ "App has been installed".

8. Complete installation by tapping on "Done", or open the installed app by tapping on "Open".

9.2 Adjusting the start screen and quick access for apps

All apps, including updated apps, can be found by tapping on the ⊞ icon.

To save an application to the start screen:

⇨ In the app overview, tap on the app icon and hold this down until the start screen appears. Move the icon to where you want to save it, and then release it.

The icon will then be permanently saved to the start screen for quick access to the app.

10 Error rectification and support

Error	Possible cause and remedy
Software can no longer be operated	Restart required: Press and hold the Power ON button until the SONAPHONE starts up again
The app does not start up after installation	App installation has failed: Delete the app via the Software Manager and carry out installation again
The signals from the sensor are not displayed	Sensor detection is not working correctly: Disconnect the sensor from the device and then reconnect it. Switch the device off and on again to restart the sensor detection
The headphones are not working	The headphones are not switched on: Switch on the headphones at the right-hand capsule
	The headphone batteries are discharged: Replace the batteries (2 x AAA) as described in the manufacturer's operating manual.
	The headphones are incorrectly connected: check the connectors for correct fit.

If the error is not rectified by the solutions above, please contact our Service team.

Please have the following information to hand:

▪ Model ID of the device and sensors (located on the type label)

▪ Serial number of the device and sensors

▪ Version of the measuring core and installed app (located in the app overview in the Software Manager)

The following information may also be useful:

▪ Date of purchase and dealer name

▪ Active applications at the time of the error

11 Cleaning and maintenance

| ⚠ CAUTION | **Risk of injury**

Incorrect use of the SONAPHONE and its accessories may pose a risk to the user.

- Do not open the SONAPHONE or the sensors. They do not contain any parts that need to be cleaned, maintained or repaired by the user.

| ATTENTION | **Risk of damage to the device!**

Incorrect use of the SONAPHONE and its accessories can lead to damage, or in a worst-case scenario to the destruction of the device equipment.

- The SONAPHONE and the sensors are not water-tight; do not immerse the device equipment in liquid.
- The SONAPHONE and sensors should also be protected against the ingress of moisture, as it will otherwise not be possible to rule out the risk of damage to the device.
- Do not use any heavily corrosive or abrasive cleaning agents.

Use damp cloths to clean the device and all accessories. Aggressive cleaning agents may corrode the plastic housing of the SONAPHONE and impair the mechanical stability.

The device does not contain any parts that need to be maintained by the user.

12   Personal notes

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SONAPHONE

Ultrasonic Testing Device for Preventive Maintenance

User Documentation:
Airborne Sound Sensor BS10

Content

SONOTEC

1 Information on this document

1.1 General

This document forms part of the airborne sound sensor BS10 and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the instructions to ensure safe operation of the airborne sound sensor with the SONAPHONE, as well as all the information needed to ensure proper and efficient use. It must therefore be read prior to first use and before carrying out any further steps.

⚠ **WARNING**   The airborne sound sensor BS10 must only be operated by users who have read (in full) and understood the safety information in the corresponding document and the provided user documentation.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data, and is not liable for errors or omissions.

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2   Symbols used

Hazards or special information are indicated in the following ways:

⚠ WARNING	Warns of possible **imminent dangers** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**.
⚠ CAUTION	Warns of dangers which, if ignored, may lead to **injury and/or material damage** - including financial losses due to operational interruptions.
ATTENTION	Warns of dangers which, if ignored, may lead to **material damage** - including financial losses due to operational interruptions.

i	**Note** This section provides information or draws attention to specific features.

2   Description of the airborne sound sensor BS10

2.1   Applications and designated use

The airborne sound sensor with accessories for different testing work has been specially designed for the following tasks:

▪ Detection and evaluation of leaks in compressed air, gas and vacuum systems (depending on the app)

▪ Tightness Testing of windows, doors, vehicles or containers (in combination with the SONAPHONE T ultrasonic transmitter)

▪ Detection of electrical partial discharges and insulation damage

2.2   Functioning

The sensor attachments guide the ultrasound to the ultrasonic microphone.

The ultrasonic microphone inside the sensor converts sound pressure fluctuations in the air to an electrical signal over a wide frequency range. This electrical signal is amplified and digitalized within the sensor. Further data processing and output takes place in the testing device.

The target laser helps with the precise location of damaged areas:
If the sensor points towards the damaged area during the search, the precise location can be detected by means of acoustic signals, by pivoting the sensor and searching for a local maximum sound level. The target laser marks the approximate position of the damaged area.

The LED light serves as a torch, making it easier to search for damaged areas in poorly lit environments.

2.3 Connections, operating and display elements
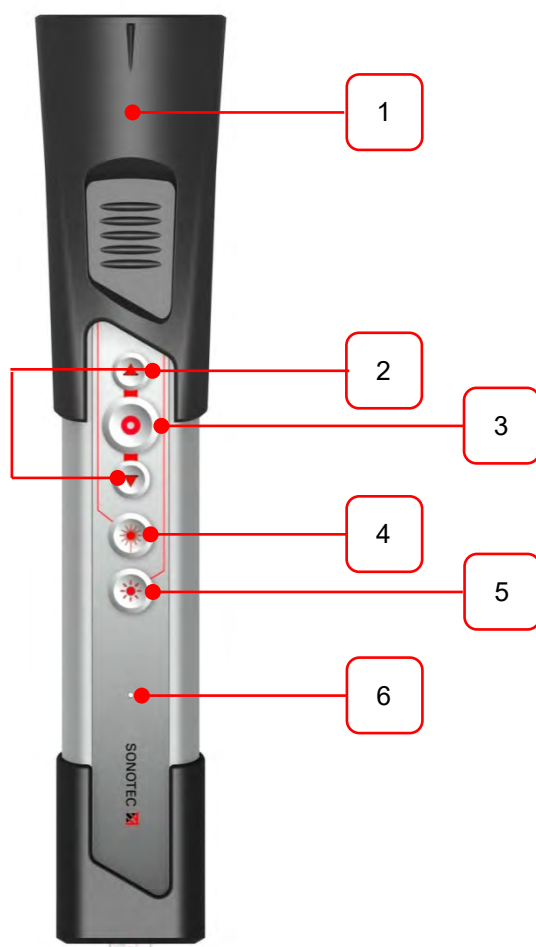
No.	Operating and display elements
1	Sensor accessory: Small acoustic horn (standard)
2	Adjusting the volume
3	Starting/stopping the measurement recording
4	Target laser on (press and hold)
5	LED light (torch) on/off
6	Status LED
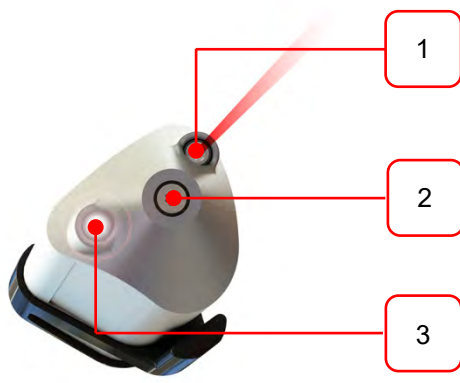
No.	Sensor elements
1	Target laser (do not look into the beam! Laser class 2)
2	Ultrasonic microphone
3	LED light (torch)
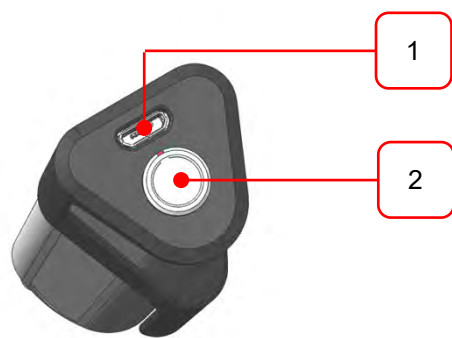
No.	Connections
1	USB connection (for service work only)
2	Socket for sensor cable with marked plug-in position

2.4 Airborne sound sensor BS10 accessories

The intensity and behavior of ultrasonic signals depend on factors such as the process during which they are generated. Options for verifying and recording the signals and for providing these to the user in high-quality format so that sensible statements can be made with regard to system conditions are also dependent upon a number of different factors.

In order to guide signals to the ultrasonic microphone on the airborne sound sensor BS10 in a high-quality format, a number of different attachments are available for different testing tasks. In order to ensure optimal results, please observe the fields of application for the accessories as well as the corresponding instructions.

Small acoustic horn BS10-2

Attachment for airborne sound sensor BS10 (standard)

The channeling and directing of the ultrasonic signals via the small, funnel-shaped horn BS10-2 improves the signal strength at the ultrasonic microphone. This allows for the verification of damaged areas at medium distances. Using the target laser allows the area to be narrowed down for subsequent precise location.

Note: Use the precise locator BS10-1 for extremely accurate verification.

Large acoustic horn BS10-3 (optional)

Attachment for airborne sound sensor BS10

Application:

Location of damaged areas at large distances

If the systems and system components being tested are large distances apart, the large acoustic horn should be used to narrow down the search area. The funnel pools the ultrasonic signals over large distances, allowing for verification with the SONAPHONE. Areas where ultrasonic signals can be verified in this way can then undergo precise location using the precise locator BS10-1.

Note: Continue with precise location using the small acoustic horn BS10-2 or use the precise locator BS10-1 to accurately locate damaged areas.

Precise locator BS10-1 (optional)

Attachment for airborne sound sensor BS10

Application:

Precise location of damaged areas
at close range

The precise locator BS10-1 is used in close range applications for the accurate verification of ultrasonic signals. The attachment consists of two parts that are connected and can be rotated, meaning that the tip can be rotated towards the damaged area being located.

Note: Mark the damaged area with a leak tag.

2.5   Device identification/type label

Laser class identification:

LASER RADIATION - DO NOT STARE INTO BEAM
CLASS 2 LASER PRODUCT IEC 60825-1:2014 | P < 1 mW ; λ = 630 - 680 nm

The type label is located on the back of the device, and should be to hand in the event of a service call. As well as the sensor designation, the following information can also be found on the housing:

Model - ID: Sensor 12345 │ Serial - No.: 12345 │ CE
SONOTEC ⊠ Nauendorfer Str. 2 06112 Halle Germany

3 Operation of the airborne sound sensor

⚠ WARNING

Risk of injury to eyes

The target laser (laser class 2) can cause serious eye damage. Never look into the laser beam. Never direct the laser at other people or vehicles. Please note that reflected laser light can cause eye injuries in the event of prolonged use.

3.1 Connecting the sensor and attaching accessory parts

ATTENTION

Risk of damage to the connectors

Take note of the red dots indicating the plug-in position on the plug and socket.

⇨ Connect the sensor to the SONAPHONE in accordance with the red dots, making sure to use the designated cable.

✋ The sensor is powered via the cable, and the test data is transferred to the SONAPHONE automatically.

✋ The sensor is ready for operation when the operating display LED lights up green.

The sensor accessory parts are simply attached onto the sensor shaft for assembly, and removed for disassembly.

ℹ

Note

Make sure that the accessory parts are securely positioned on the sensor shaft. The ultrasound is guided to the microphone by the attachments. Misaligned sensor attachments may have an impact on the signals.

The directional characteristics of the target laser may also be affected.

3.2   Operation via the buttons on the sensor

Measurements can be controlled via the touchscreen on the device or via the buttons on the sensor itself.

The acoustic playback volume can be adjusted using the function buttons. Testing can also be started and stopped. The integrated target laser and the LED light (torch) also help with the precise location of damaged areas.

3.3   Cleaning and maintenance

The sensor is maintenance-free. It can be cleaned externally using a damp cloth and a mild, non-abrasive cleaning agent.

4   Disposal

Electrical and electronic equipment can pose serious health and environmental risks if it is not properly disposed of. For this reason it must not be disposed of in domestic waste according to WEEE directive 2012/19/EU (Waste Electrical and Electronic Equipment Directive) but separately at designated collection points or has to be sent back to the manufacturer.

The following symbol on the device refers to the legal obligation in Germany to arrange a separate disposal for electronic equipment.

It has to be handled according to specific processes (e.g. concerning the batteries or circuit boards) to ensure a safe, environmentally-friendly recycling or the separate disposal of different device components.

The taking back of used equipment is regulated differently in the various countries and regions. Consult the local authorities and other competent public authorities to inform yourself about the taking back conditions of commercially used electrical equipment. The device and also the battery do not contain harmful substances that have to be labelled separately regarding the disposal as mercury (Hg), cadmium (Cd), lead (Pb) or hexavalent chromium (e.g. in galvanized parts or circuit boards).

5   Warranty

The SONAPHONE ultrasonic testing device and its corresponding sensors comply with the current state of the art and the safety regulations. All devices and accessory parts are factory tested and are delivered in a safe condition for operation. We reserve the right to make modifications to the device as part of ongoing product development, and to make changes to the shape and color.

Within the warranty period, SONOTEC Ultraschallsensorik Halle GmbH will rectify, free of charge, all defects caused by material or manufacturing errors. At its own discretion, SONOTEC Ultraschallsensorik Halle GmbH will provide a guarantee in the form of either a repair or the replacement of the defective device or component. The warranty does not cover the internal batteries or damage caused by improper use, wear or interventions in the device or sensors. The warranty also does not cover any defects that have only a negligible impact on the value or usability of the device.

The recording of valid test results, the interpretation of these results and any measures that are derived as a result are exclusively the responsibility of the user. SONOTEC does not assume any guarantee for the correctness of the recorded test values or test results. SONOTEC accepts no liability for any errors or damages that arise as a result of the further use of the recorded test and measurement values.

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SONAPHONE ∿‖‖

Ultrasonic Testing Device for Preventive Maintenance

User Documentation:
Structure-Borne Sound Sensor BS20

Content

SONOTEC

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1 Information on this document

1.1 General

This document forms part of the structure-borne sound sensor BS20 and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the instructions to ensure safe operation of the structure-borne sound sensor with the SONAPHONE, as well as all the information needed to ensure proper and efficient use. It must therefore be read prior to first use and before carrying out any further steps.

⚠ WARNING   The structure-borne sound sensor BS20 must only be operated by users who have read (in full) and understood the safety information in the corresponding document and the provided user documentation.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data and is not liable for errors or omissions.

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2   Symbols used

Hazards or special information are indicated in the following ways:

| ⚠ WARNING | Warns of possible **imminent dangers** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**. |

| ⚠ CAUTION | Warns of dangers which, if ignored, may lead to **injury and/or material damage** - including financial losses due to operational interruptions. |

| ATTENTION | Warns of dangers which, if ignored, may lead to **material damage** – including financial losses due to operational interruptions. |

| ℹ | **Note**
This section provides information or draws attention to special features. |

2   Sensor description

2.1   Applications and designated use

The structure-borne sound sensor with exchangeable waveguides is used for applications including:

- Status monitoring of machines, systems and plant components

- Function checking of steam traps and valves

- Monitoring of wear and malfunctions in bearings

- Monitoring of lubrication conditions

2.2   Functioning

The **waveguide** conducts the ultrasonic waves from the test point to the ultrasonic transducer.

The **ultrasonic transducer** converts ultrasonic waves (vibrations) to an electrical signal over a wide frequency range. This electrical signal is amplified and digitalized within the sensor. Further data processing and output takes place in the testing device.
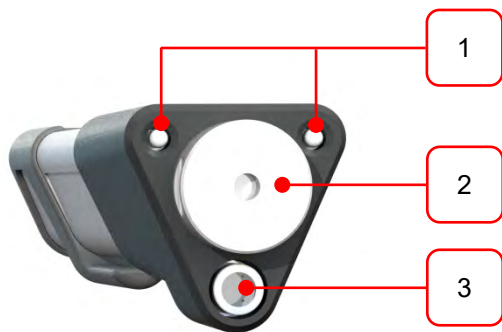
The integrated **infrared temperature sensor** allows for contactless and quick recording of the test object's surface temperature. The size of the visual recording field depends on the distance between the sensor and the test object.

The **LED lights** act as a torch, making it easier to connect the sensor to test points in poorly lit environments.

2.3 Connections, operating and display elements
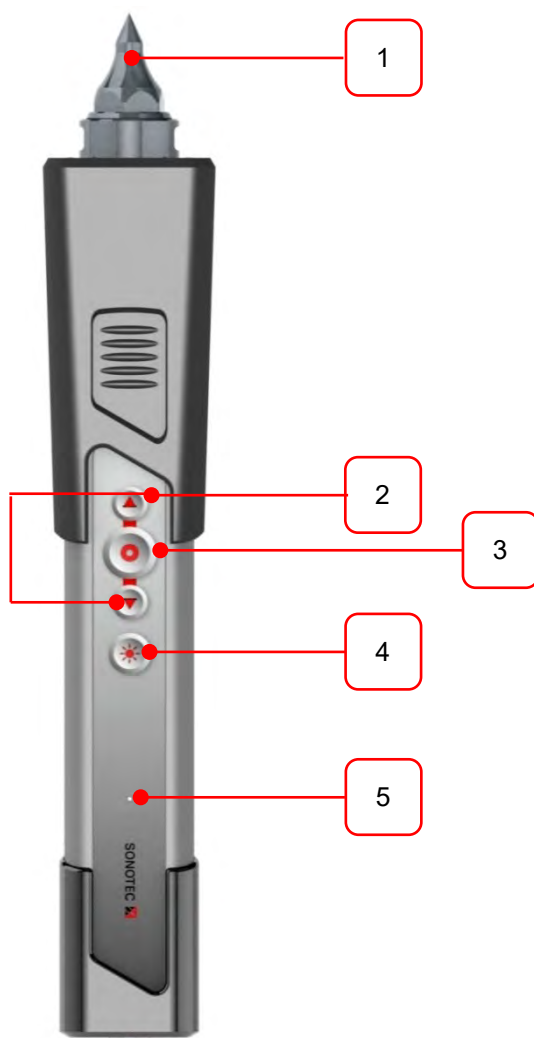
No.	Operating and display elements
1	Sensor accessory: Short waveguide (standard)
2	Adjusting the volume
3	Starting/stopping the measurement recording
4	LED lights (torch) on/off
5	Status LED

No.	Sensor elements and connections
1	LED lights (torches)
2	Ultrasonic transducer – coupling surface (internal thread M5)
3	Infrared temperature sensor
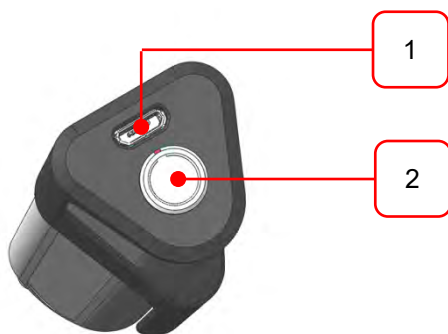
No.	Connections
1	USB connection (for service work only)
2	Socket for sensor cable with marked plug-in position

2.4   Accessories for the structure-borne sound & temperature sensor BS20

The intensity and behavior of ultrasonic signals depend on factors such as the process during which they are generated. Options for verifying and recording the signals and for providing these to the user in high-quality format so that useful statements can be made with regard to system conditions are also dependent upon a number of different factors.

In order to record high-quality signals for processing in the structure-borne sound & temperature sensor BS20, waveguides are available for different testing tasks.

In order to ensure optimal results, please observe the fields of application for the accessories as well as the corresponding instructions.

Short waveguide BS20-1

Accessory for structure-borne sound and temperature sensor BS20 (standard)

Fig. 1: Short waveguide BS20-1

The waveguide is used to record ultrasonic waves that spread in solid structures, and to pass these on for processing in the sensor. Sufficient contact pressure is required in order for this to work correctly.

Note: For comparable results, sound should always be recorded from the same position. It may be useful to attach a punch point at the required position.

**Long waveguide BS20-2
(optional)**

Accessory for structure-borne sound and temperature sensor BS20

Application:

Tests on hard-to-access points

Fig. 2: Long waveguide BS20-2

This waveguide, which is longer than the BS-20-1, makes it possible to reach test points that are harder to access. The long waveguide also makes it possible to carry out tests on hot surfaces.
The signals will be slightly modified as a result of the longer sound path, and this will need to be taken into account in the evaluation.

**Magnetic waveguide BS20-3
(optional)**

Accessory for structure-borne sound and
temperature sensor BS20

Application:

For connection at the test point for long-term testing
and for ensuring even contact pressure

Fig. 3: Magnetic waveguide BS20-3

In order to ensure usable test results with long-term testing or comparative tests, even contact
pressure is required. This can be achieved using the magnetic waveguide. Following connection
to the test point, the magnetic coupling ensures even recording of ultrasonic signals.

2.5 Device identification/type label

The type label is located on the back of the device, and should be to hand in the event of a
service call. As well as the sensor designation, the following information can also be found on
the housing:

Model - ID: Sensor 12345 │ Serial - No.: 12345 │ CE
SONOTEC ⌧ Nauendorfer Str. 2 06112 Halle Germany

3 Sensor operation

⚠ WARNING	**Danger of injury!**

- The sharp ends of the waveguides can cause injuries, and even serious injuries in the case of the long waveguide. Make sure never to injure anyone with the sharp ends of the waveguides. Never direct the tip at other people.
- The high magnetic force of the waveguide can lead to crushing injuries to the hands. Place the magnetic waveguide onto the test object at an incline and as slowly as possible.

3.1 Connecting the sensor

ATTENTION	**Risk of damage to the connectors!**

Take note of the red dots indicating the plug-in position on the plug and socket.

⇨ Connect the sensor to the SONAPHONE in accordance with the red dots, making sure to use the designated cable.

↳ The sensor is powered via the cable, and the test data is transferred to the SONAPHONE automatically.

↳ The sensor is ready for operation when the operating display LED lights up green.

3.2 Assembling and disassembling waveguides

ACHTUNG	**Risk of device damage and incorrect test values!**

- Risk of destruction of the waveguide holder as a result of incorrect assembly and disassembly. Always use the two elements of wrench set BS20 (see image below) to assemble and disassemble the waveguides.
- Make sure that the waveguides are securely screwed into the holder. The ultrasound is guided to the ultrasonic transducer by the waveguides. Loose waveguides may have an impact on the signals.

The screw thread in the waveguide holder is used to attach the sensor accessory parts onto the sensor shaft. The wrench set BS20 prevents damage when screwing the waveguides on and off.
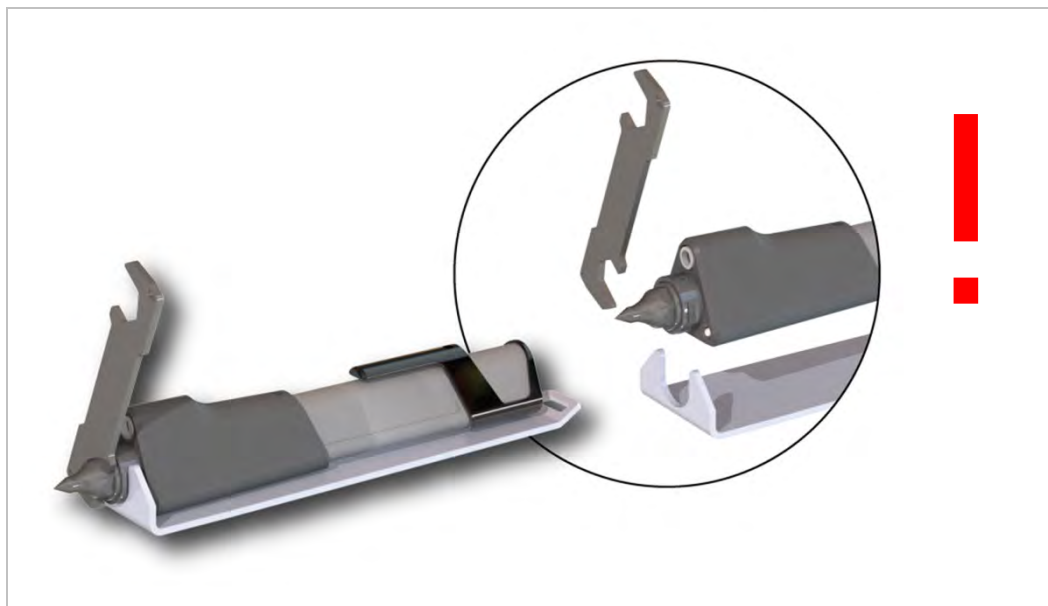

Fig. 4: Assembly and disassembly of the waveguides using the wrench set BS-20

---

i	**Note!**

The warranty will become invalid in the event of damage due to removing the waveguides without the wrench set BS20.

3.3 Using the waveguides

During testing, the sensor should be pressed against the object being tested in as vertical a position as possible and using gentle, even pressure.
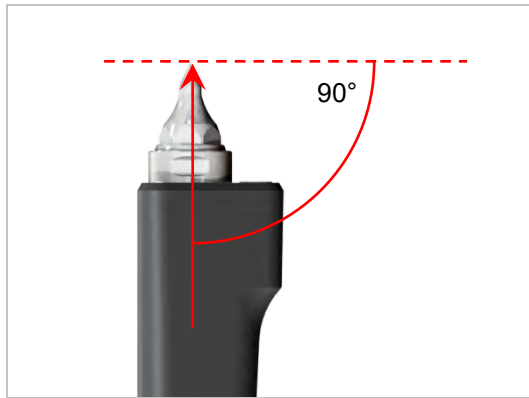

Fig. 5: Optimal contact angle for testing with waveguides

3.4 Operation via the buttons on the sensor

Measurements can be controlled via the touchscreen on the device or via the buttons on the sensor itself.

The acoustic playback volume can be adjusted using the function buttons. Testing can also be started and stopped. The LED lights (torches) also help with the precise location of damage areas.

The internal thread on the sensor and the magnetic waveguide BS20-3 make it possible to carry out quasi-stationary tests using the SONAPHONE.

3.5 Temperature measurements

	Note!
[i]	For correct temperature measurements, make sure that the surface of the temperature sensor is free from contamination.
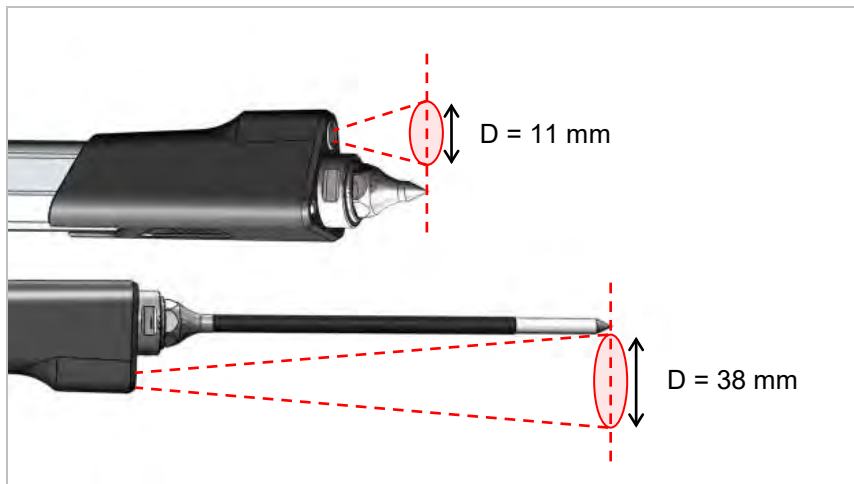
The infrared temperature sensor is calibrated on a black emitter that emits the maximum possible temperature (100 % emission → emissivity value ε = 1). As the emission characteristics of the surfaces of measurement objects will deviate from this value, this will need to be taken into account for the contactless temperature measurement.

Painted or oxidized surfaces usually have an emissivity value of 0.9. This setting is suitable for many measurement tasks. Additional values for frequently used materials can be found in emissivity value tables.

The emissivity value can be set at the SONAPHONE as follows:
In the LevelMeter app, under the

⇨ ⚙ Settings ⇨ Temperature measurement

menu item, a material with a stored emissivity value can be selected, or an emissivity value specified manually.

3.6 Cleaning and maintenance

The sensor is maintenance-free. It can be cleaned externally using a damp cloth and a mild, non-abrasive cleaning agent.

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4   Disposal

Electrical and electronic equipment can pose serious health and environmental risks if it is not properly disposed of. For this reason it must not be disposed of in domestic waste according to WEEE directive 2012/19/EU (Waste Electrical and Electronic Equipment Directive) but separately at designated collection points or has to be sent back to the manufacturer.

The following symbol on the device refers to the legal obligation in Germany to arrange a separate disposal for electronic equipment.

It has to be handled according to specific processes (e.g. concerning the batteries or circuit boards) to ensure a safe, environmentally-friendly recycling or the separate disposal of different device components.

The taking back of used equipment is regulated differently in the various countries and regions. Consult the local authorities and other competent public authorities to inform yourself about the taking back conditions of commercially used electrical equipment. The device and also the battery do not contain harmful substances that have to be labelled separately regarding the disposal as mercury (Hg), cadmium (Cd), lead (Pb) or hexavalent chromium (e.g. in galvanized parts or circuit boards).

5 Warranty

The ultrasonic testing device and its corresponding sensors comply with the current state of the art and the safety regulations. All devices and accessory parts are factory tested and are delivered in a safe condition for operation. We reserve the right to make modifications to the device as part of ongoing product development, and to make changes to the shape and color.

Within the warranty period, SONOTEC Ultraschallsensorik Halle GmbH will rectify, free of charge, all defects caused by material or manufacturing errors. At its own discretion, SONOTEC Ultraschallsensorik Halle GmbH will provide a guarantee in the form of either a repair or the replacement of the defective device or component. The warranty does not cover the internal batteries or damage caused by improper use, wear or interventions in the device or sensors. The warranty also does not cover any defects that have only a negligible impact on the value or usability of the device.

The recording of valid test results, the interpretation of these results and any measures that are derived as a result are exclusively the responsibility of the user. SONOTEC does not assume any guarantee for the correctness of the recorded test values or test results. SONOTEC accepts no liability for any errors or damages that arise as a result of the further use of the recorded test and measurement values.

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Ultrasonic Testing Device for Preventive Maintenance

User Documentation:
Parabolic Sensor BS30

Revision: 1.4 | 2020-09-14
Subject to technical modifications.

Content

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1   Information on this document

1.1   General

This document forms part of the parabolic sensor BS30 and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains all the instructions to ensure safe operation of the parabolic sensor with the SONAPHONE , as well as all the information needed to ensure proper and efficient use. It must therefore be read prior to commissioning and before carrying out any further steps.

⚠ WARNING   The parabolic sensor BS30 must only be operated by users who have read (in full) and understood the safety information in the corresponding document and the provided user documentation. Also observe the information in the technical data sheet.

This document has been created with all due care. SONOTEC does not assume any guarantee of the completeness, correctness and current validity of the provided data, and is not liable for errors or omissions,

Please note that the user documentation for the SONAPHONE is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

1.2   Symbols used

Hazards or special information are indicated in the following ways:

⚠ WARNING	Warns of possible **imminent danger** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**.
⚠ CAUTION	Warns of dangers which, if ignored, may lead to **injury and/or material damage** – including financial losses due to operational interruptions.
ATTENTION	Warns of dangers, which, if ignored may lead to **material damage** - including financial losses due to operational interruptions.
ℹ	**Note!** This section provides information or draws attention to special features.

2 Sensor description

2.1 Applications and designated use

The parabolic sensor is used for the accurate detection of ultrasonic waves over distances of up to 35 m. The following testing work can be carried out in combination with the SONAPHONE:

▪ Detection of leaks in compressed air, gas and vacuum systems

▪ Detection of electrical partial discharges and insulation damage

▪ Tightness testing of windows, doors, vehicles or containers
(in combination with the SONAPHONE T ultrasonic transmitter)

2.2 Functioning

The parabolic reflector reflects ultrasonic waves and bundles these together for the ultrasonic microphone.

The ultrasonic microphone in the sensor converts sound pressure fluctuations in the air into an electrical signal over a wide frequency range. This electrical signal is amplified and digitalized within the sensor. Further data processing and output takes place in the testing device.

The target laser and the **red/green dot sight** also help with the precise location of damage areas. If the sensor points towards the damage area during the search, the precise location can be detected by means of acoustic signals, by pivoting the sensor and searching for a local maximum sound level. The target laser and the red/green dot sight highlight the position of the damage.

2.3 Sensor elements
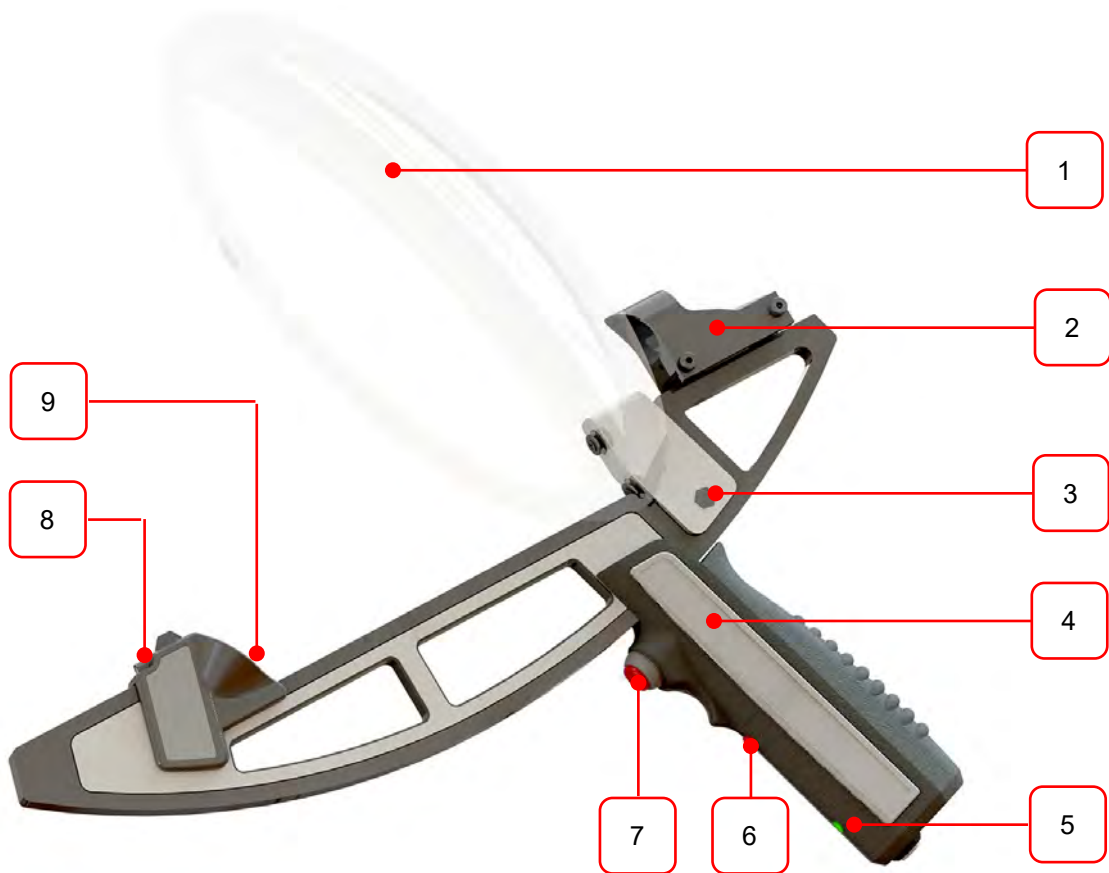
No.	Sensor elements
1	Parabolic reflector
2	Red / green dot sight (changes may occur over the course of device development; see manufacturer's operating manual)
3	Parabolic reflector holder with locking screw (on the rear)
4	Handle with control and display elements
5	Status LED: Sensor on/off
6	Target laser on/off (press and hold)
7	Starting/stopping the measurement recording
8	Integrated target laser
9	Ultrasonic microphone with acoustic horn

2.4   Sensor connections
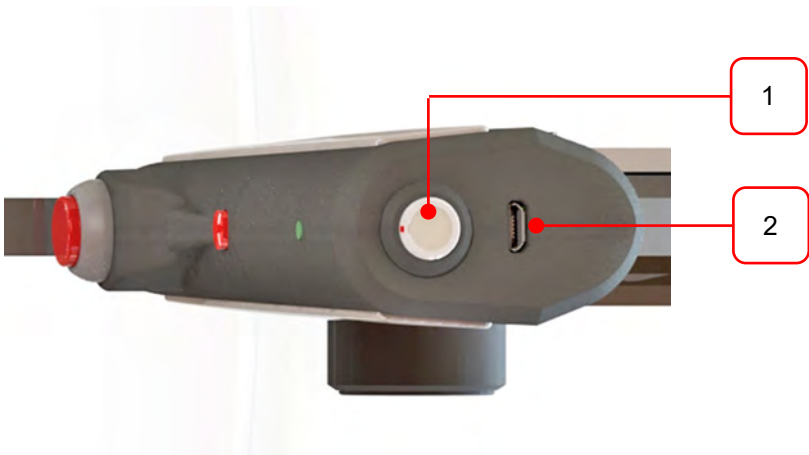
No.	Connections
1	Socket for sensor cable with marked plug-in position
2	USB connection (for service work only)

2.5 Device identification/type label

Laser class 2 identification:

The type label is located on the back of the device, and should be to hand in the event of a service call. As well as the sensor designation, the following information can also be found on the housing:

3 Operation of the parabolic sensor

⚠ WARNING	**Risk of injury to eyes**
⚠ (laser symbol)	The target laser (laser class 2) can cause serious eye damage. Never look into the laser beam. Never direct the laser at other people or vehicles. Please note that reflected laser light can cause eye injuries in the event of prolonged use.

ATTENTION	In the very rare event that the parabolic reflector breaks, there may be sharp edges that can cause cutting injuries. When using the sensor, make sure not to damage the parabolic reflector.

ℹ	**Note!**
	The material of the parabolic reflector may be damaged by scratches. These do not have any impact of the functionality of the sensor. Scratches can be avoided by careful handling of the sensor.

3.1 Assembling and disassembling the parabolic reflector

To assemble the parabolic reflector:

1. Hold the sensor handle with one hand, and the parabolic reflector onto the parabolic reflector holder with the other hand, so that the reflector is pointing in the sensor's testing direction.

2. Guide the parabolic reflector holder into the insertion position on the sensor from above, and slide the holder towards the handle and red/green dot sight using light pressure before fixing it in place so that is always in the same position on the sensor for the location of damage areas.

3. Rotate the locking screw to attach the holder.

✋ The sensor is ready to operate.

To disassemble the parabolic reflector:

1. Hold the sensor handle with one hand, and use the other hand to undo the locking screw on the parabolic reflector holder.

2. Take hold of the parabolic reflector holder from above, and carefully pull it out of the insertion position on the sensor.

3.2 Connecting the sensor to SONAPHONE

ATTENTION	**Risk of damage to the connectors!**
	Take note of the red dots indicating the plug-in position on the plug and socket.

⇨ Connect the sensor to the device using a SONAPHONE sensor cable in accordance with the dots.

✋ The sensor is powered via the cable, and the test data is transferred to the SONAPHONE automatically.

✋ The sensor is ready for operation when the operating display LED lights up green.

3.3 Using the laser and the red/green dot sight

With the laser and the red/green dot sight, the BS30 offers two **independent methods** of precisely locating leaks. For information of using these device, please refer to Section "3.1 Assembling and disassembling the parabolic reflector" on page 11, the information in the technical specifications and the manufacturer's documentation relating to the red/green dot sight.

Usage will depend on factors such as the size of the system, the distance to the leak, the light conditions and personal preferences.

⇨ Use the laser (button on the sensor handle) for leak detection if:

- there is **no risk** of dazzling people with the laser beam

- the target laser for locating in the testing area is clearly visible.

For precise locating at close range and for the evaluation, the airborne sound sensor BS10 can then be used with the precise locator attachment, for example.

⇨ Use the red/green dot sight to locate the leak if:

- there is a risk of dazzling or obstructing people with the laser beam

- the dot from the target laser for locating the leak is not visible

- the damage area for laser-bearing is too far away.

1. Remove the protective caps from the red/green dot sight.

2. Use the brightness control to select the required color and intensity (see also the manufacturer's operating manual).

3. Switch the red/green dot sight off again after use, and put on the protective rubber caps to protect the lens.

3.4 Operation via the buttons on the sensor

Measurements can be controlled via the touchscreen on the device or via the button on the sensor itself.

Testing can be started or stopped via the "Start/stop recording" function key. The integrated target laser and the red/green dot sight also help with the precise location of damage areas.

3.5 Cleaning and maintenance

ATTENTION	The parabolic reflector on the sensor may be damaged by incorrect cleaning and aggressive cleaning agents. Never use cleaning agents that contain solvents to clean the parabolic reflector.

The sensor and the parabolic reflector are maintenance-free. They can be cleaned externally using a damp cloth and a mild, non-abrasive cleaning agent.

4   Disposal

Electrical and electronic equipment can pose serious health and environmental risks if it is not properly disposed of. For this reason it must not be disposed of in domestic waste according to WEEE directive 2012/19/EU (Waste Electrical and Electronic Equipment Directive) but separately at designated collection points or has to be sent back to the manufacturer.

The following symbol on the device refers to the legal obligation in Germany to arrange a separate disposal for electronic equipment.

It has to be handled according to specific processes (e.g. concerning the batteries or circuit boards) to ensure a safe, environmentally-friendly recycling or the separate disposal of different device components.

The taking back of used equipment is regulated differently in the various countries and regions. Consult the local authorities and other competent public authorities to inform yourself about the taking back conditions of commercially used electrical equipment. The device and also the battery do not contain harmful substances that have to be labelled separately regarding the disposal as mercury (Hg), cadmium (Cd), lead (Pb) or hexavalent chromium (e.g. in galvanized parts or circuit boards).

5 Warranty

The SONAPHONE ultrasonic testing device and its corresponding sensors comply with the current state of the art and the safety regulations. All devices and accessory parts are factory tested and are delivered in a safe condition for operation. We reserve the right to make modifications to the device as part of ongoing product development, and to make changes to the shape and color.

Within the warranty period, SONOTEC GmbH will rectify, free of charge, all defects caused by material or manufacturing errors. At its own discretion, SONOTEC GmbH will provide a guarantee in the form of either a repair or the replacement of the defective device or component. The warranty does not cover the internal batteries or damage caused by improper use, wear or interventions in the device or sensors. The warranty also does not cover any defects that have only a negligible impact on the value or usability of the device.

The recording of valid test results, the interpretation of these results and any measures that are derived as a result are exclusively the responsibility of the user. SONOTEC does not assume any guarantee for the correctness of the recorded test values or test results. SONOTEC accepts no liability for any errors or damage that arise as a result of the further use of the recorded test and measurement values.

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Ultrasonic Testing Device for Preventive Maintenance

User Documentation:

Description of the LevelMeter® App $\boxed{\text{dB}}$

Content

1 Notes on the SONAPHONE® user documentation

1.1 General

This document forms part of the ultrasonic testing device and should therefore be stored in its immediate vicinity where it can be accessed by all operators at any time. It contains important information for the safe recording and evaluation of data with the SONAPHONE®, along with all the instructions to ensure safe operation of the SONAPHONE®. It must therefore be read prior to commissioning and before carrying out any further steps.

This document has been created with all due care. SONOTEC® does not assume any guarantee of the completeness, correctness and current validity of the provided data and is not liable for errors or omissions.

Please note that the user documentation for the SONAPHONE® is made up of different sections due to the device's modular construction. The scope of supply will vary depending on the device and accessory options that have been ordered.

Register your SONAPHONE® now and you will qualify for exclusive benefits: mySONAPHONE.com

Further contents you can found on our websites: SONAPHONE® Support.

- Leak calculator

- Sound library: Images and sound samples for leak detection, electrical inspection, mechanical inspection, steam trap inspection

- Press releases, case studies, white paper

- Trainings

If you have any **questions or problems**, our team will be happy to help you: mySONAPHONE@sonotec.de.

1.2 Notes to the document

This document describes the LevelMeter® app in version 1.6.1.

The document is not subject to a revision service.
You can find the current version on our homepage under:
https://www.sonotec.eu/products/preventive-maintenance/ultrasonic-testing-devices/sonaphone/
in section „Downloads".

1.3   Symbols used

Hazards or special information are indicated in the following ways:

| **⚠ WARNING** | Warns of possible **imminent dangers** which, if ignored, may lead to **lasting adverse health effects and/or serious material damage**. |

| **⚠ CAUTION** | Warns of dangers which, if ignored, may lead to **injury and/or material damage** - including financial losses due to operational interruptions. |

| **ATTENTION** | Warns of dangers which, if ignored, may lead to **material damage** - including financial losses due to operational interruptions. |

| **i** | **Note**
This section provides information or draws attention to specific features. |

2   User interface and functions of the LevelMeter® app

2.1   Designated use

The LevelMeter@ app for the SONAPHONE® ultrasonic testing device allows for the performance and documentation of various different maintenance tasks:

- Leak detection in compressed air, vacuum and gas systems

- Leak detection in non-pressurized systems

- Steam trap and valve testing
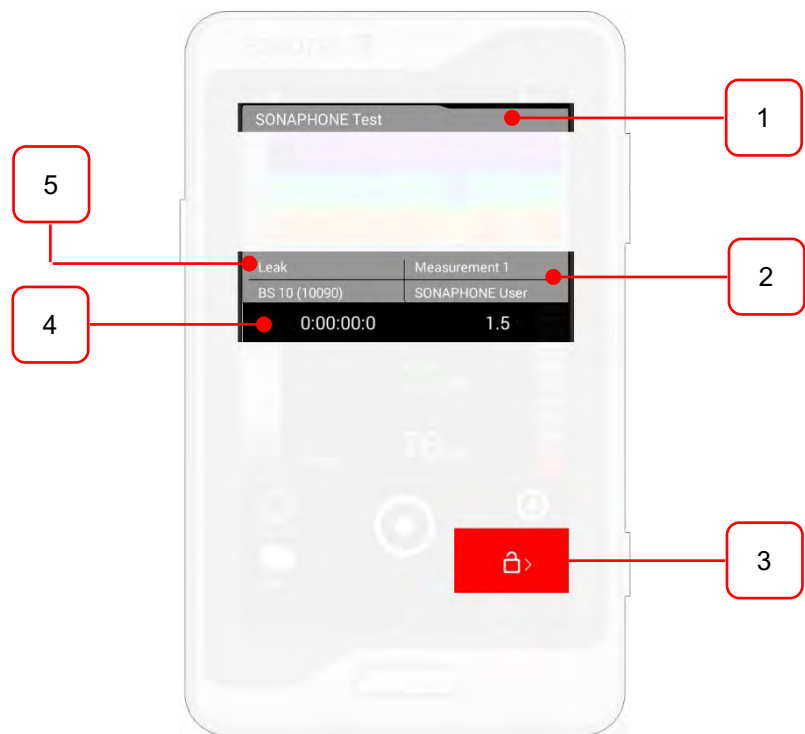
- Machine diagnosis

- Detection of partial discharges

The way in which the test values are displayed on the screen can be adapted to meet individual requirements. All test data can be expanded to include photos, text comments or voice memos.

The software is installed on the SONAPHONE® as a standard application. For typical applications, additional independent software solutions are available that have been specially tailored to the testing work.

### 2.2   System requirements and data compatibility

- Measurement Core Version 1.6.0

- DataViewer Version 1.6.0

2.3 Meaning of the status displays

No.	Status displays in the LevelMeter® app
1	Folder where the current test is being saved (e.g.: "SONAPHONE Test")
Test meta data	
2	Airborne sound sensor BS10: Sensor identification (automatic detection)
	Measurement 1: Last measurement (consecutive number, adjusted at start-up)
	Name of user (to be entered when the app is started up)
Device lock is activated	
3	Protection against incorrect device operation: This is activated when the device is detected as being at a steep angle (hanging by the carry strap). To unlock the device, push the button next to the display on the right-hand side of the device.
Test time status bar	
4	Left: time of current test; Right: time of last test

| No.	Status displays with quick access
5	Search for "Leak" – adjust active application: tap on the field (see also chapter 4.1 Specifying an application)

2.4 Test value display on the display
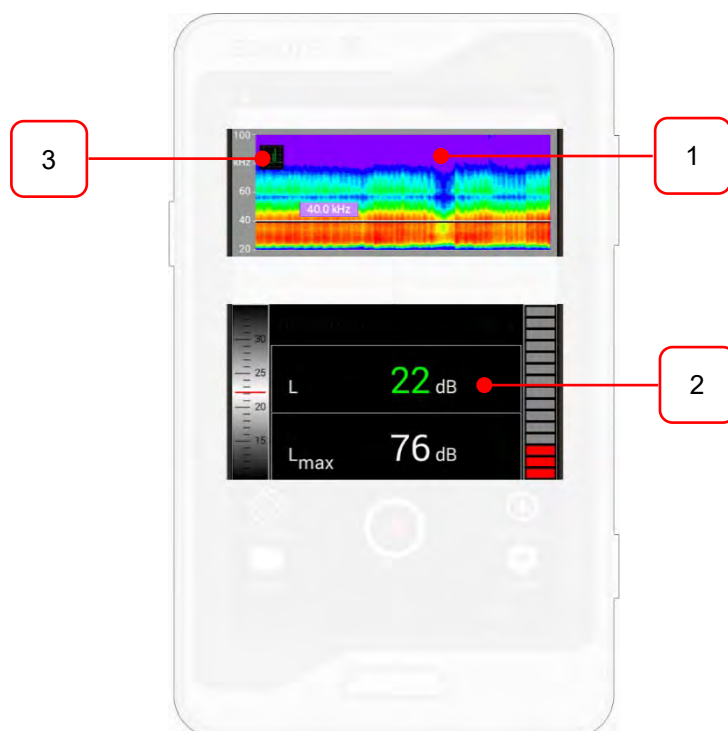
No.	Test values on the display
1	Graphical output: Display from level graph / spectrogram **Spectrogram:** Frequency range between 20 to 100 kHz over time with display of carrier frequency (40kHz) or limits of zoom area (not shown) **Level graph:** Selected ultrasonic level over time (not shown; see section 3.3).
2	Numerical output: Display of different level values (adjustable); Level wheel (left) and level bar (right) for the current level L

| No.	Quick access function in the test value display
1	**Adjust spectrogram colors** (when spectrogram is active): press for approx. 3 sec. to set the limits for color ranges individually **Define zoom area** (only with activated audio 'Phase Vocoder'): press for approx. 1 sec. to redefine the limits
2	Adjusting the numerical output for the level Grid: tap on the output area for a longer period (display of up to max. 5 values) Value in the field: Briefly tap on the field
3	Switch between level graph and spectrogram or display the defined zoom area (only with audio setting 'Phase Vocoder': tap on the icon at the top left

2.5 Control elements and operating modes
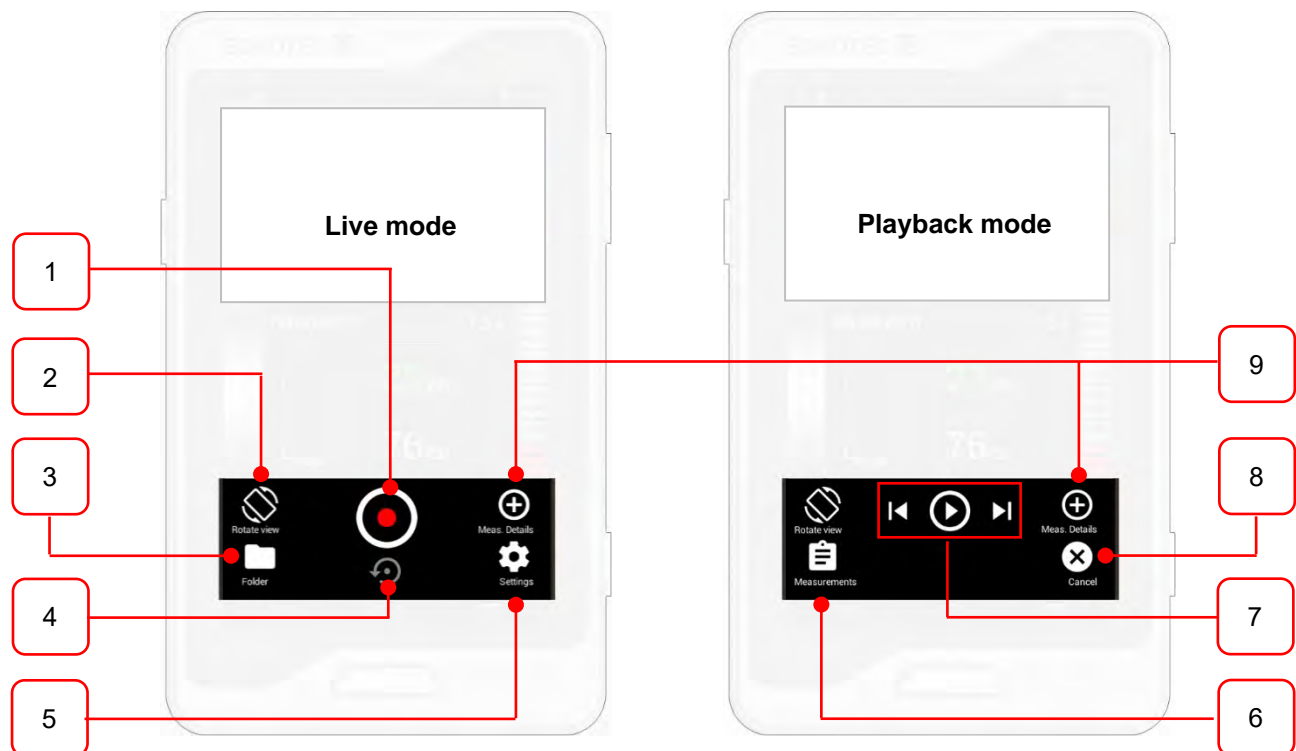
No.	Control elements in the two operating modes
1	**Start and stop Measurements** (the measurement time is adjustable; see Section 4.2)
2	**Rotate the display:** Tilt the display 90° clockwise and show a magnified level or spectrogram
3	**Open the folder overview:** Create/delete folders; play, expand or delete recordings; combine all data for the report or for exports (see next page)
4	**Reset display of Live mode** (spectrogram and level graph, level values)
5	**Measurement settings:** Choose the application, adjust the measurement duration, audio settings, temperature measurement settings, information on the device status: Available memory, licenses, app version
6	**Measurement overview** display in the current folder
7	**Play recordings:** Select previous recording, play/stop current recording, select next recording
8	**End playback mode:** Switch to Live mode
9	**Details of the last measurements** Display or add (photos, text comments or voice memos)

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2.6 Displays and control elements in the folder overview

The folder overview contains a list of all folders, with the name, creation date and number of saved recordings (measurements). The active folder where the measurements are being saved is highlighted in green. Available functions within the overview are shown below.
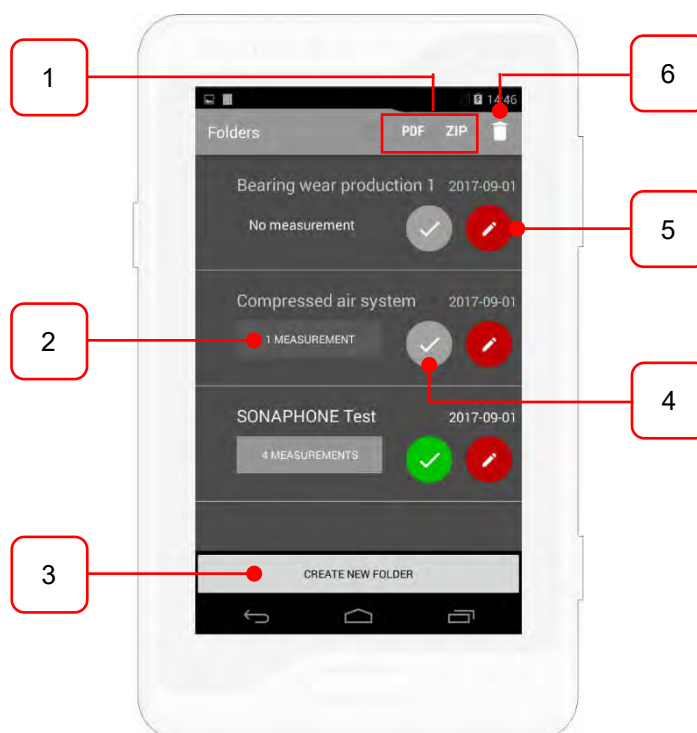
No.	Functions in the folder overview
1	**Export data:** Select data for export as a PDF report or ZIP file
2	**Display measurements in the folder:** (see next page for functions)
3	**Create a new folder**
4	**Activate folder**: The selected folder is activated and the application switches to Live mode
5	**Edit folder details:** Change the name, or add photos, comments or voice memos to the folder
6	**Delete:** Select the folders you wish to delete

2.7 Overview of measurements in a folder

The overview contains a list of all recordings, with the folder name, tester, recording date and measurement duration. The most recent measurement is displayed first. Available functions are shown below.
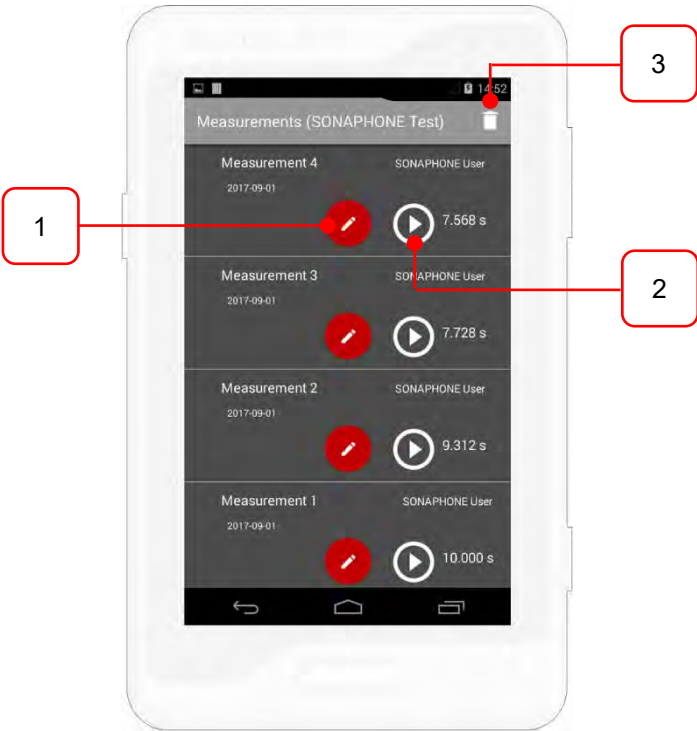
No.	Function in the measurement overview
1	**Edit measurement details:** Add photos, comments or voice memos
2	**Play back recording:** The application switches to Playback mode
3	**Delete recording:** Select the measurements you wish to delete

2.8   Functions in the detailed overview

The detailed overview shows all additional information saved with a measurement.

Meta data that is automatically recorded by the device or that is stored in the settings and cannot be changed: Name of measurement, creation date, measurement duration

Settings that have been made by the user, some of which can be changed: Audio settings, tester, application

Details that have been added to the measurement and that can be changed or expanded upon: Photos, text comments and voice memos
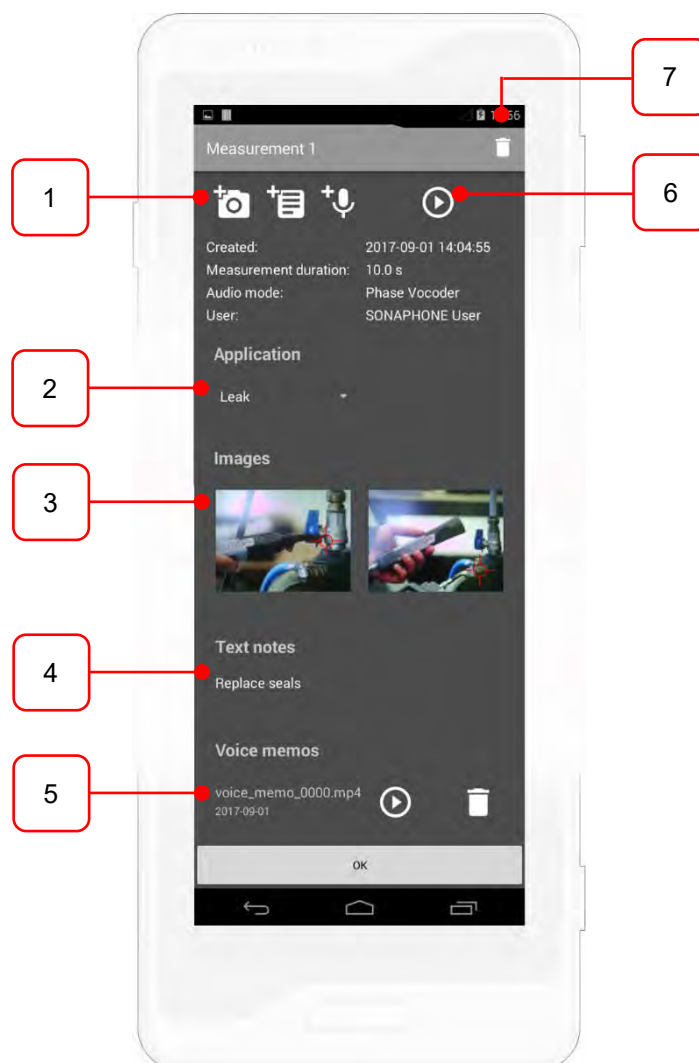
No.	Functions in the detailed overview
1	**Add additional details to a measurement:** take photos, add photos from the gallery, comments or voice memos
2	**Subsequently change the application** (select a value from the list)
3	**Subsequently delete photos:** Tap to activate the function
4	**Subsequently edit a text note:** Tap to activate text entry for changes
5	**Play back or delete a voice memo**
6	**Play back the measurement recording** The application switches to Playback mode
7	**Delete recording**: Delete the selected measurement with all relevant details

2.9   Status displays and information about the app

1. Tap on the ⚙ icon (settings) and select from the following menu items:

   "Storage" to access free storage space for test data OR
   "Licenses" to read license information OR
   "About" to check the version of the app.

↳ The selected information is displayed.

2. Tap on "Close" to close the display.

Important settings will be described in the following chapter.

3 Preparing tests

3.1 Important device settings

Please observe the information on preparing for testing and on the device settings in the "Device operation" section of the user documentation, and make sure that the device equipment is ready for testing in accordance with the specifications.

> **i** **Note!**
> Some of the following settings need to be made before the start of recording.

3.2 Starting the test software

1. Tap on the "Level Meter" icon [dB] to start up the application.

2. Enter your username.

The name will be shown on the display and in the exported data. Choose a unique name.

3. Confirm your entry by tapping on "Start".

↳ The software will start up, and the currently recorded sound level will be displayed when in default setting.

> **i** **Note!**
> The registered ultrasonic test values will be shown on the screen but will not be recorded. The recording process will first need to be started.

If you don't want to start up the app, discard your entry by tapping on "Cancel".

> **i** **Note!**
> The application will have nevertheless been activated in the background. Shut down the LevelMeter® app in Task Manager before starting up another app (see information on device operation).

3.3   Adjusting the test value output on the display

Different display formats and values can be derived from the sound signals recorded at the ultrasonic microphone. The output on the display can be adjusted to meet individual requirements and the requirements of the testing work.

> **ℹ️ Note!**
> The output of the data on the display has no impact on the recording of the signals. All level types are stored.

Adjusting the level values on the display:

As a default setting, three values are shown on the display:
Current level (green in this example), minimum and maximum current level

The way in which the test values are displayed in the center of the screen can be adapted to meet individual requirements.

1. Tap and hold for a few seconds on the area of the test value output (as shown) in order to display the different options.
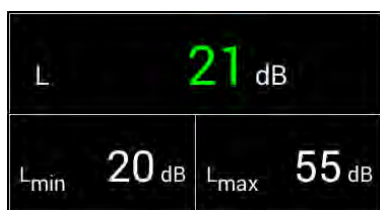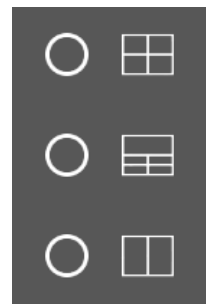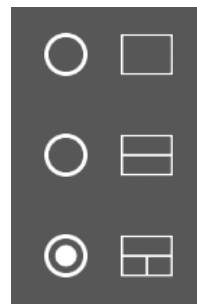
2. Select the required option by tapping on one of the entries in the list.

3. Briefly tap on individual fields to defined level values to be shown.

✎ The application switches to Live mode, and the selected display format is applied.

The settings are stored and the device will show the active grid with the assigned values the next time it is started up.

> **ℹ️ Note!**
> The settings will be reset to the default settings when the app is updated.

The following values can be assigned to the fields:

---	No value assigned
L	Instantaneous level [standard]
Lmin	Minimum value of instantaneous level [standard]
Lmax	Maximum value of instantaneous level [standard]
Leq	Equivalent continuous sound level
LF	Instantaneous level with time weighting
Lpk	Peak level
T	Temperature (only active when the structure-borne sound sensor is connected)

Details can be found on our homepage under 'FAQs: Frequently asked questions and answers'.
https://www.sonotec.eu/products/preventive-maintenance/support/resources/faqs/

3.4 Display of spectrogram and level graph

⇨ Tap on the icon in the top left-hand corner.

↳ The display switches between the spectrogram and the ultrasonic level.
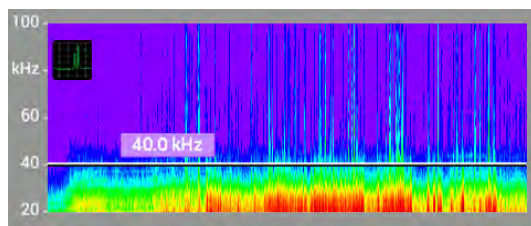
The display can be rotated for a detailed view of the level graph and the spectrogram:

⇨ Tap on the ⬙ icon.

↳ Magnified views of the spectrogram or level graph are shown.
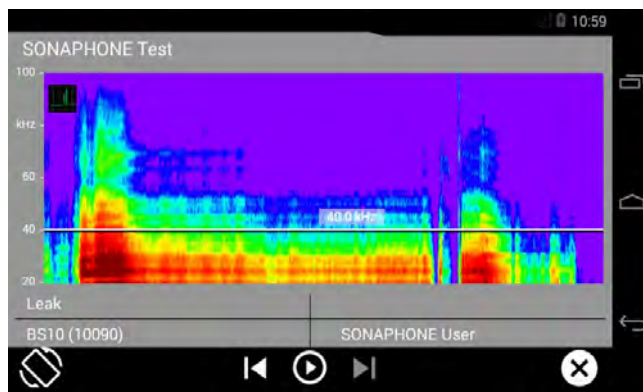
3.5   Adjusting spectrogram colors

> ℹ️ **Note!**
> The following changes are applied to all recordings during playback, data export and report generation. Before carrying out the above steps, check which settings are active.

The color of the spectrogram can be adjusted according to the inspection task or the prevailing signal intensity:

1. Press for about 3 seconds on the spectrogram area.

↳ The window for adjusting the values opens.

2. Define the assignment of level values (-100 to max. 200 dB) for color scaling according to your requirements by overwriting the 6 level values for color assignment.

   Note that when you enter the upper and lower level values, the intermediate values will be automatically redistributed according to the relative standard distances (empirical values for optimal assessment). To change individual values, the sliders [1] can be used as well. In this case the adjacent values will not be adjusted automatically.

   a. To set the scale intervals automatically, define a new upper and lower level value. The intermediate values will be adjusted automatically.

   b. If you want to define all values independently or correct intermediate values without automatic adjustment, enter the upper and lower level values and then set the values for the intermediate range using the sliders.


(Default values)

3. Finish entering values with "Done" and confirm your changes by touching the icon ✅. Press ❌ to discard the changes.

⇨ To restore the delivery state, tap on "Reset" before.

3.6   Adjusting the level graph:

The level graph always shows the level stored in the field highlighted in green in the test value output. This changes depending on the active grid.

This is set to the current level as the default setting (see image).
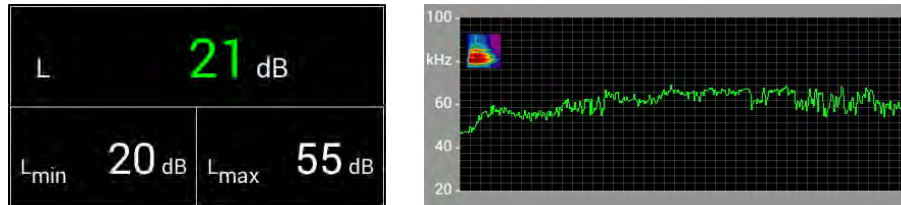
The output can be adjusted in both Live and Playback mode.

To adjust the level display:

⇨ Tap on the field highlighted in green in the grid, and select the level you want to be displayed.

↳ The application switches to a view of the level graph, and shows the time progression of the selected level and the associated value in the corresponding field.

## 3.7   Defining the zoom area in the spectrogram (for audio 'Phase Vocoder')
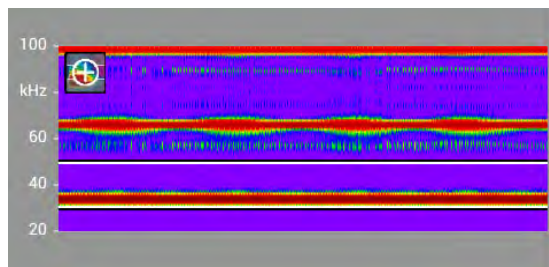
When the audio setting 'Phase Vocoder' is activated, the view can be enlarged for a previously defined frequency range. The upper and lower limits are displayed as lines in the spectrogram comparable to the carrier frequency (in audio mode 'Heterodyne'). By tapping on the icon the zoom can be faded in and out.

The settings have no influence on the recording of data. For playback, the settings can be adjusted at any time.

1. Ensure, that audio mode 'Phase Vocoder' is activated (for the selection see chapter 4.3).

2. Tap briefly (for about 1 second) on the spectrogram area.

↳ The window for defining the zoom range opens.

3. Use the sliders (see figures below) to define a new zoom range:
   move range within the spectrogram
   adapt upper and lower frequency limit
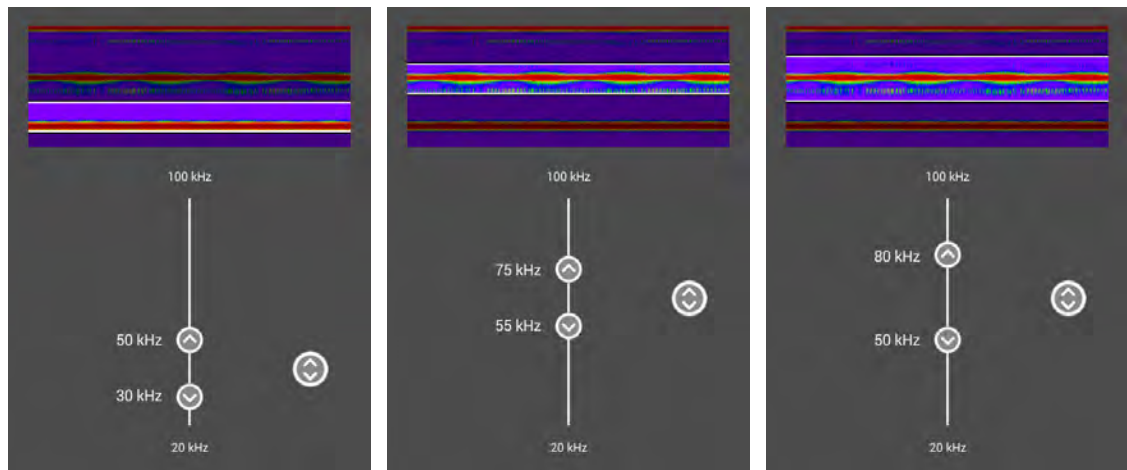
4. Confirm your adjustments by tapping the icon ✓ or discard the changes with ✗.

5. The application returns to Live mode and the newly defined limits are displayed in the spectrogram
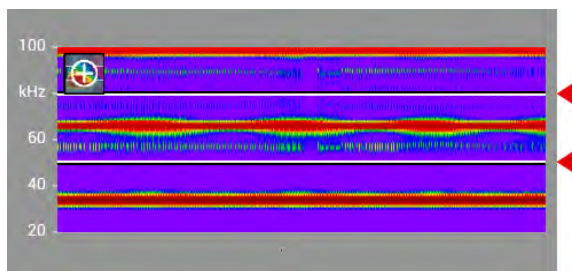
6. Tap on the icon ⊕ to enlarge the display for the defined area:
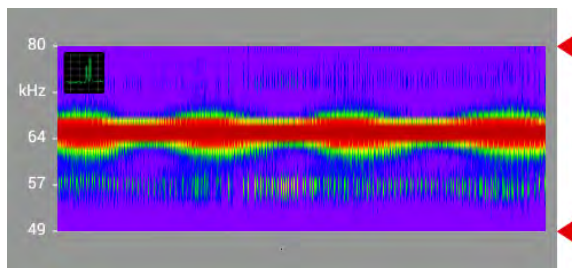
7. Tap on the icon ▥ to switch to level graph and then tap on 🌡 to display the spectrogram again over the full frequency range.

The defined settings are retained after closing the application.

3.8   Creating a folder in which to save the recordings

	Note!
i	Please note:

- Recordings can only be started once the storage location (a folder) has been specified.
- If no other name is specified, the folders will be automatically named with consecutive numbers.
- Folder names must not contain any special characters.
- Recordings cannot be moved within folders. For the report are always combined the measurements of one folder. Plan your data structure accordingly.
- The coding of the spectrogram colors always applies to one folder when exporting data and creating reports. Capture recordings, for which a different coding is useful, in folders together (see also 3.5, page 18)
- Any saved notes will be included in the report as a comment that appears before the list of test results.

Grouping measurements into folders and giving these folders clear names means that test data within the device can be clearly structured for subsequent evaluation. We recommend always giving folders clear names in order to allow individual recordings to be assigned to test points at a later date.

The following naming system is one possibility:

Name of system, hall or factory area: (it may be sensible to use abbreviations due to the restriction to 40 characters)

Name of test object (compressed air system, steam trap)

Each time the app is started up, *No active folder* will be displayed above the spectrogram.

To create a new folder:

1. Tap on the ▬ icon (folders) and then tap on the "Create new folder" field.

   ↳ The folder name entry window will open, and the default name of "Folder X" will be selected.

2. Using the keyboard, enter a new name (maximum 40 characters, no special characters) and then tap on "Continue" to confirm.

   ↳ The folder name will be overwritten and the entry field for notes will open.

3. Add any additional information here that is important for the documentation of the planned tests.

> **Note!**
>
> Notes or comments can be added to a folder by tapping on the ⊞ icon in the folder overview.
>
> Please note that if a folder contains multiple comments, only the first comment that appears in the "Text notes" overview will be included in the report. All of the comments will be available when carrying out the evaluation in "DataViewer".

4. Tap on the ⌣ icon to hide the keyboard, and tap on "Save" to confirm.

✎ The created folder will be shown in the folder overview, and will be marked as active ✅.

5. Tap on the ↩ icon to return to Live mode.

To select an existing folder:

1. Tap on the ▇ icon (folders) and tap on the ✅ icon to select an existing folder.

2. The application switches to Live mode and shows the active folder above the spectrogram.

3.9   Activate device lock

The device lock protects the device against incorrect operation when it is carried with the carrying strap and not operated.

1. Tap on the ⚙ icon "Settings" and the "Device" menu item.

2. Tap the box to enable the "Display Lock while tilting" feature.

✎ The application locks the screen against incorrect operation and shows the lock when activated on the display:

🔓›

⇨ To unlock the device, push the button next to the display on the right-hand side of the device.

The feature is active as long as the app is displayed on the screen. Tap on the checkmark in the box to deactivate the function again.

4 Measurement settings

4.1 Specifying an application

For documentation and evaluation purposes, all test data should be allocated a specific application. Standard maintenance applications are available to choose from in the device, and additional applications can be defined by the user.

The application is output in the report. No specific application ("Other") is activated as default setting.

⇨ Select Settings ⚙ and the menu item "Application" to specify an application for future recordings.

✤ The list opens. You can select an application or define a new one.

To select an application for subsequent tests under "Settings":

1. Tap on the ⊘ icon to select an application from the list.

✤ The icon will turn green ✅, the LevelMeter® App will return to Live mode and the active application will be shown in the status display. The specified application will be saved for reports and data export.

To create a new application name under "Settings" - "Application:

1. Tap on the "Create new application" field below the list.

✤ The entry window for new applications will open.

2. Tap in this text field to open the keyboard and enter a designation for the new application.

3. Confirm the entries by tapping "Done" and the creation of the entry with "Save".

✤ The LevelMeter® App displays the active new application in the list.

Tap on the icon 🚫 to edit or delete an added entry..

4. Tap on ↩ to return to Live mode.

✤ The activated application is shown in the status display on the left below the spectrogram

---

ℹ	**Note!**
	Alternatively, tap on the left status display below the spectrogram ("Other" or the name of the active application) to access the application list via quick access.

4.2   Defining sampling time, measurement duration & data resolution (meas. settings)

⇨ Go to the "Settings" menu ⚙ and select the "Measurement settings" menu item.

Define the "Sampling time" (factory setting = 16 ms)

To adjust the value for the sampling time:

⇨ Tap in the text field where the value for the sampling time is set. Select the desired value from the list (4 | 8 | 16 | 32 | 64 | 128 ms).

✎ The sampling time is fixed for each following recording.

Determine the "Measurement duration" (factory setting = 10 s)

To set the time after which recordings are automatically stopped:

⇨ Tap in the text field in which the value for the measurement duration is set. Enter the desired value and confirm with "Done".

Alternatively, select the option "unlimited" via checkbox.

✎ The measurement duration is fixed and each new recording stops after the fixed time.

Recordings can be stopped manually at any time regardless of the stored values by tapping the icon ⊙ or the key with the same symbol on the sensor (see chapter 5.1 Starting and stopping ultrasonic signal recordings).

Recording of high-resolution data (optional, with extended license)

For a detailed description of the functions: see the document „SONAPHONE® DataReader".

⇨ Select, if available, the option "Use high-resolution data" by checkbox to change the recording of the data.

✎ For each new recording the defined setting is applied.

⇨ Tap "Close" twice to return to live mode.

4.3   Selecting the method of making signals audible (audio settings)

The ultrasonic signals are transferred by the device into the frequency range that can be heard by the user. The signals can be output either via the headphones or the integrated speaker.

---

i	**Note!**
	The method that is used to make the signals audible has an impact on whether the signals are output via the headphones or the speaker, depending on which audio setting is selected. For evaluation, the signal is only available in the format in which it was recorded.
	With recordings using the Heterodyne method, the carrier frequency cannot be changed retroactively for acoustic playback.

In the audio settings, there is a choice of two different methods of making signals audible:

PhaseVocoder (broadband method):

The entire frequency range of between 20.0 and 100.0 kHz is compressed. The signal's time progression remains unchanged. This method allows for the immediate evaluation of the audio impression of all measured ultrasonic frequencies.

Heterodyne (mixer method):

With this method, only frequencies in a narrow frequency band around a carrier frequency (adjustable, e.g. 40 ± 2 kH) are made audible. The acoustic information for the entire signal is not used here, and the signal's time progression (volume adjustment) remains unchanged.

The audio impression differs from that produced using the PhaseVocoder method and also from the usual, day-to-day audio impression.

The method can be used to remove interference signals, for example, or to listen to different frequency ranges separately. The carrier frequency can be freely selected between 20.0 kHz and 100.0 kHz in increments of 0.5 kHz.

Adjusting the audio setting:

1. Tap on the "Settings" icon ⚙ and select the "Audio" menu item.

2. Tap on the required method to activate it.

3. If you have decided to use the "Heterodyne" audio method, tap in the entry field for the carrier frequency to change the value, and then tap on "Done" to confirm.

4. Tap on "Close" twice to confirm the changes and return to measuring mode.
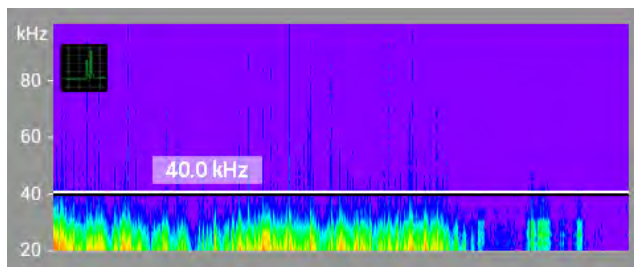
✎ The output (via headphones or integrated speaker) is changed and the carrier frequency will be displayed as a line together with the current value in the spectrogram.

ℹ️ **Note!**
After returning to measuring mode, the carrier frequency can be easily adjusted by moving the line within the spectrogram (in increments of 0.5 kHz).

4.4 Define system for units

1. Tap on the "Settings" icon ⚙ and select the menu item "Units".

2. Select

   → for temperature measurements between "Metric [°C]" or "Imperial [°F]

   → for the voltage between „dBµV [L_U | L_{Umin} | L_{Umax} | L_{Ueq} | L_{Upk}]" or „mV [U_{rms} | U_{min} | U_{max} | U_{eq} | U_{pk}]" and

   → for acceleration between „dB [L_a | L_{amin} | L_{amax} | L_{aeq} | L_{apk}]" or „m/s^2 [a_{rms} | a_{min} | a_{max} | a_{eq} | a_{pk}]".

3. Tap "Close" to return to the settings and tap "Close" again to display the Live mode.

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4.5 Temperature display for tests with the BS20 structure-borne sound sensor

Temperature values and temperature progression are not automatically displayed after connecting the structure-borne sound sensor. To display the values, a field of the test value output must be defined.

To show the temperature curve on the display:

1. Tap for a few seconds on a field in the test value output on which the temperature is to be displayed.

2. Select the value T* to activate the display in the corresponding field.

✥ The application switches to live mode and displays the current temperature reading (marked yellow) in °C (or °F) in the defined field. The temperature curve is recorded as a yellow line parallel to the level graph.
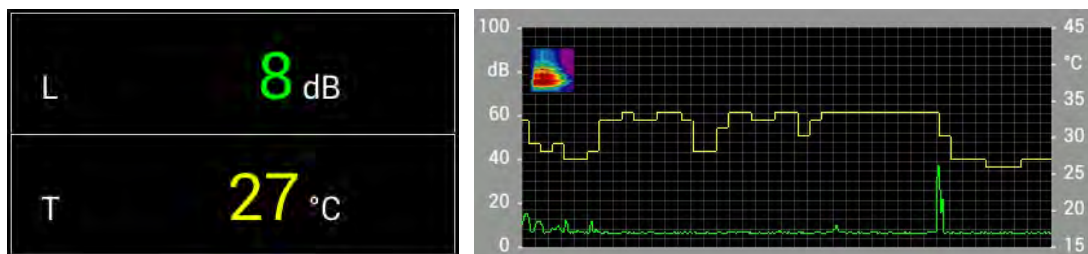
To change the unit: see chapter 4.4 Define system for units.

3. Tap "Close" twice to return to live mode.

4.6 Adjust temperature scale (Right Y axis)

> **Note!**
>
> When making adjustments, take into account the resolution of the display and the limited display area. If the range is defined too large, minimal changes in temperature cannot be displayed.
>
> Also note that temperature course outside the defined scale cannot be displayed.
>
> For the report, the temperature is output over the entire range. T_{min} and T_{max} are automatically set as lower and upper limits and the curve is scaled accordingly.

---

* Only available if a structure-borne sound sensor BS20 is connected and detected.

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1. Tap on the ⚙ icon (settings) and then choose the "Temperature measurement" menu item.

2. Select via the menu item "Temperature Scale" a scaling within the sensor measuring range of -50 °C and +380 °C, in which the temperature curve is to be shown on the display (see illustration on page27).

Temperature Scale (Right Y axis)

Minimum	15 °C
Maximum	45 °C

3. Confirm the input of the numerical value with "Done" and adjust the emissivity as described in the following chapter or tap "Close" twice to return to live mode.

4.7   Adjust emissivity of the surface for temperature measurements

For accurate temperature measurements the correct surface emissivity must be set (see also description of the structure-borne sound sensor, chapter "Temperature measurements"). In the settings a material can be selected for which the corresponding emissivity is stored in the SONAPHONE®. Alternatively a value for the emissivity can be set manually.

Painted or oxidized surfaces usually have an emissivity of 0.9. This setting is practical for many measuring tasks.

1. Tap on the ⚙ icon (settings) and then choose the "Temperature measurement" menu item.

2. Activate in the menu "Surface Emissivity" via checkbox one of the two options:
▪ "Use predefined material" to select a material with the corresponding value from the list OR
▪ "Set degree of emission" to enter a value for the degree of emission manually.

Surface Emissivity

🔘 Use predefined material

Gray cast iron   ε = 0.94   ▾

⭕ Set degree of emission

0.90

3. Tap
▪ on the currently selected material to display the material list and then tap on an entry to activate the predefined value OR
▪ tap on the numerical value to activate the keyboard and to define an own value.

4. Confirm the input of the numerical value with "Done" and tap "Close" twice to return to live mode.

5 Carrying out tests with the LevelMeter® app

| ⚠ WARNING | **Hazards in industrial equipment!** |
| When carrying out tests, please observe all information in the safety document. |

| ⚠ CAUTION | **Risk of falling!** |
| Do not walk through the system while reading the SONAPHONE® screen or operating the device. |
| | **Risk of injury or damage to the device!** |
| | When locating ultrasonic signals in areas that are not easily visible or that are not visible at all, there is a risk of personal injury or of damage to the sensors. Work in a way that ensures that your hands and the sensors are always visible. |

| ℹ | **Note!** |
| Make sure that the device equipment is prepared in compliance with the specifications in the device operation document. Please also observe the information provided in Section 2 on preparing for testing. |

5.1 Starting and stopping ultrasonic signal recordings

1. Hold the sensors so that the ultrasonic signals can be easily detected by the sensor attachment.

2. Start the recording by tapping on the ⊙ icon or by pressing the button on the sensor with the same symbol.

↳ Recording is indicated by the appearance of the current measurement (consecutive number) in the status bar, the colored ⊙ icon, the active measurement time counter and the red illuminated left-hand status LED.

3. Tap on the icon or press the button on the sensor again to stop the measurement prematurely, or wait until the measurement interval has elapsed (10 seconds as the default setting).

↳ The application opens the measurement details window (see following section).

If the device lock is activated, press the button on the bottom right side of the housing, which is located directly next to the corresponding stats display, to unlock the device (see also chapter 2.3 Meaning of the status displays).

5.2 Adding photos, comments or voice memos

Additional information about the measurement can be added by tapping on the corresponding icons:

📷	Photos of the damage area
🖼️	Existing photos from gallery
📋	Text comments
🎤	Voice memo: Audio recording

ℹ️	**Note!** Before the start of testing, it may be necessary to define standards regarding the way in which damage areas should be documented. If the same data is always available in the same quality, this can save time and make evaluations and repairs easier.

Adding photos of test points:

Photos can be added to the recording by tapping on the 📷 icon, via the icon 🖼️ photos from the gallery can be assigned. Markers can be added to photos once they have been taken. A detailed description of the camera functions can be found in the document entitled "Device description".

Adding comments:

1. Tap on the 📋 icon to add comments to the recording.

↳ The entry window for comments will open, and the keyboard will be displayed.

2. Enter your comment and hide the keyboard by tapping on the ⌣ icon.

3. Confirm your entry by tapping on "Save".

Adding a voice memo:

1. Tap on the 🎤 icon to add voice memos to the recording.

↳ The entry window for voice memos will open.

2. Tap on the ⏺ icon to start the recording, and tap on the ⏺ icon again to stop recording.

3. Tap on "Save" to return to the detailed overview.

6 Managing test data in the LevelMeter® app

All recorded data in the device can be combined for export for the purpose of evaluation and further processing.

6.1 Prepare test data for export

In order to evaluate the test results, the recordings can be combined for data export (as a .zip file) or output as reports (.pdf) together with photos, comments and voice memos.

| ATTENTION | The current color coding of the spectrogram is used for all recordings when exporting the data. Before data export and report generation, check with which values the spectrogram should be processed later. |

1. Tap on the ▮ icon "Folder" to display the overview.

2. Select either "PDF" or "ZIP" to combine the data for export.

↳ The window for folder selection will appear (see picture)

3. Select individual folders to create a report, or tap on the ⊡ icon to select all folders in view.
   ℹ The procedure is similar for exporting data as a ZIP file.

4. Confirm your entry by tapping on "OK".
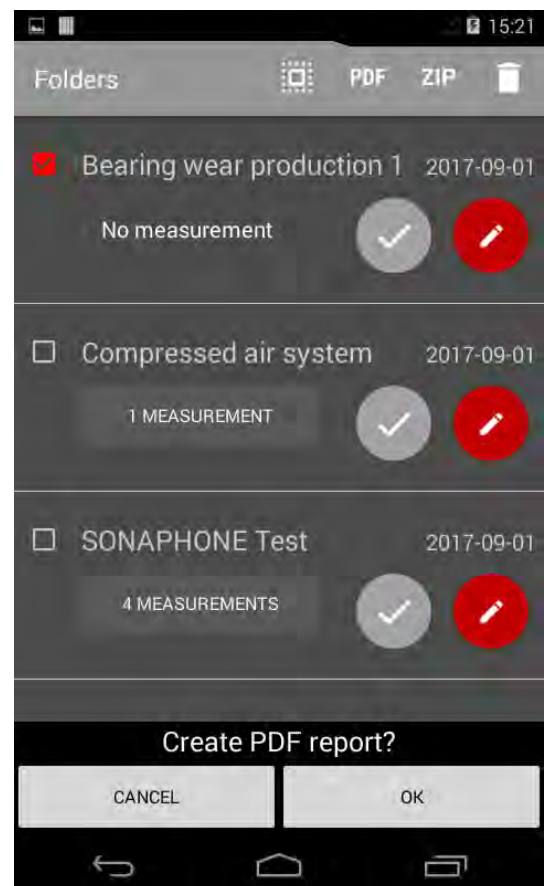
5. Adjust the following settings:

Storage location (folder in which the PDF or ZIP is to be saved).
The "External SD card" option is only active if there is an SD card in the device
(see following section).

---

i	**Note!**
	Always observe the information in the following section when saving data onto an external SD card.

Type of data being combined for the PDF report
(spectrogram, level curve and/or images)

Format for the PDF report (A4/letter)

6. Tap on "Create" to combine the data.

↳ The creation process is indicated by the message "Writing PDF report"/"Exporting". The process may take some time depending on the amount of data. The progress is indicated by a bar and the remaining time is displayed. The data is saved in the defined folder with a time stamp.

↳ A status message specifying the data type and the storage location indicates that the process is complete.

The transfer of data via USB is uniform for all app applications on the SONAPHONE® and is described in the document "Device operation".

6.2   Combining test data onto an external memory card

1. Insert the SD card (with contacts facing downward) into the designated slot on the bottom of the device until the card can be felt clicking into place.

   ↳ The message "Preparing SD card" indicates that the card has been recognized by the SONAPHONE®. The status of the card can be retrieved from within the SONAPHONE® settings.

2. To transfer the data, proceed as described above. In the settings menu, tick the "External SD card" checkbox, define a folder name if necessary, and then tap on "Create" to confirm that you wish to combine the data.

⚠ **CAUTION**   **Risk of data loss and damage to the SD card!**

Never remove the SD card

- while data is being transferred or
- before you have correctly removed the memory card via the SONAPHONE® settings.

↳ The creation process is indicated by the message "Writing PDF report"/"Exporting". Progress is shown by the bar on the display.

To remove the SD card from the SONAPHONE® correctly:

3. Wait until data transfer is complete. This is indicated by means of a status report specifying the data type and the storage location.

4. From the start screen, select the overview ⊞ then tap on "Settings" ⚙ and then the "Memory" menu item ▤.

5. Tap on "Remove SD card" in the list.

6. Remove the SD card by pushing on the card in the slot until the lock mechanism disengages.

A detailed description of this procedure can be found in the document entitled "Device description".

6.3 PDF report of test data – contents and structure for evaluation

The PDF report will be saved in the defined folder with a time stamp: YYYY-MM-DD_hh:mm:ss - LM-Report-[folder name].pdf

Title page with the following information:

- Folder name
- Creation date
- Author
- Device serial number
- App version
- Number of measurements
- First comment in the folder

Individual recordings with the following content (see image)

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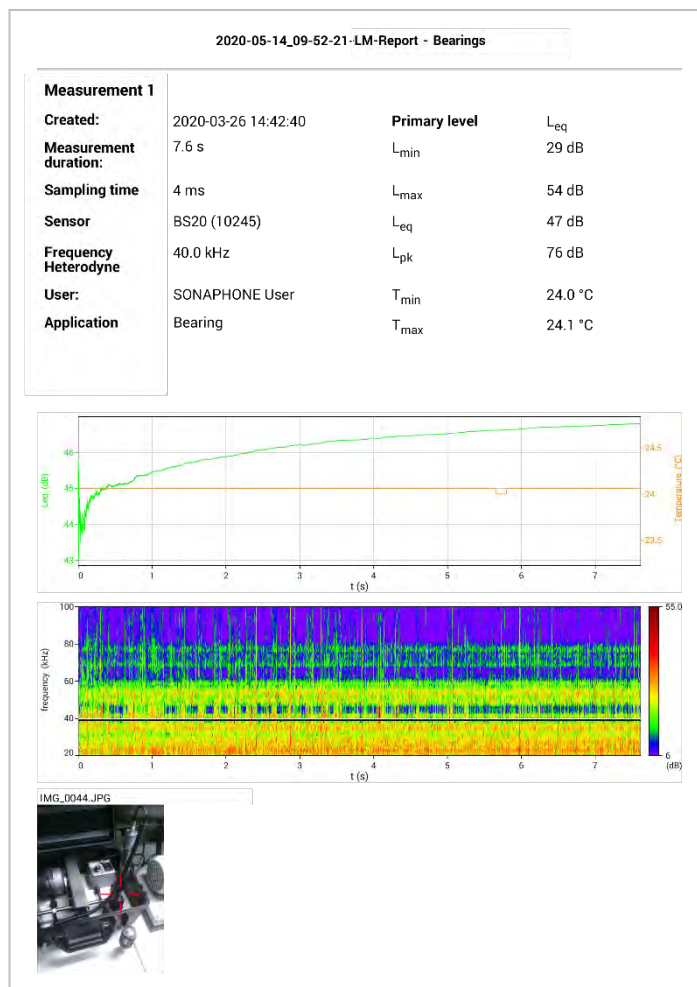
6.4   ZIP file of test data – contents and structure for further processing

> [i] **Note!**
> In order for the test data to be processed on different platforms, it is also all provided in the following format. Please note that it must be possible to further process the data in an appropriate manner for evaluation. Contact our Service team for more information.

The ZIP file will be stored in the defined folder with a time stamp:
levelmeter-datarecords- YYYY-MM-DD_hh:mm:ss.zip

The following data will be available:

- Audio data [.wav]

- Photos [.jpg] in original resolution

- Voice memos [.mp4]

7   Troubleshooting

If you have any **questions or problems**, our team will be happy to help you:
mySONAPHONE@sonotec.de.

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8   Personal settings / notes

MANUFACTURER

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User Documentation:
DataViewer for Test Data from LevelMeter App
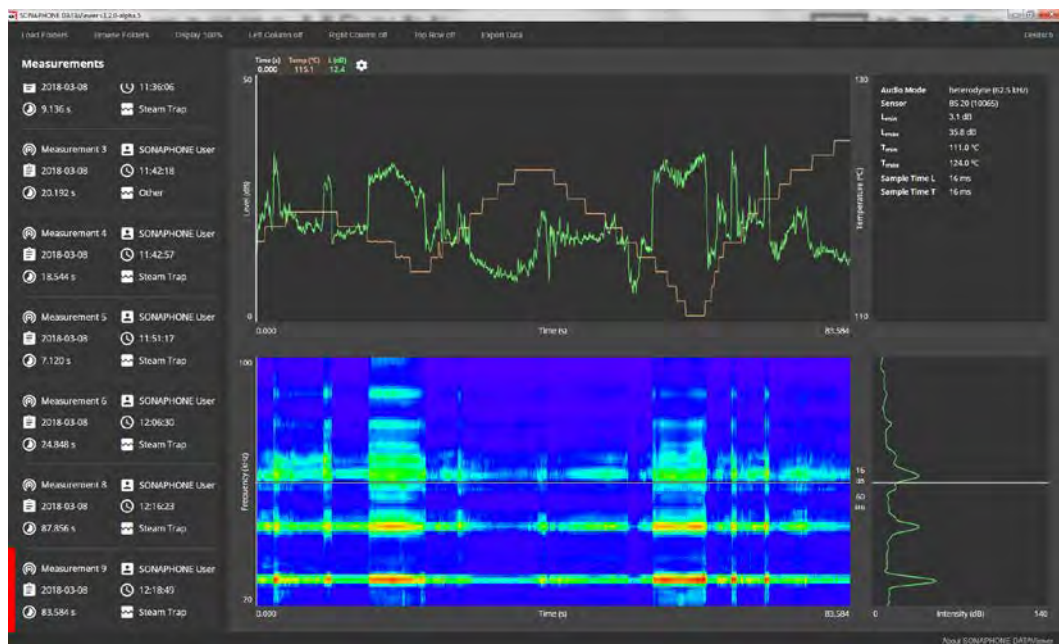
Content

1 Notes on the software

1.1 Brief description

The SONAPHONE DataViewer software can be used to evaluate test data recorded with the LevelMeter app on a Windows PC or tablet.

	Note!
i	Please note that only test data from the LevelMeter app can be loaded onto the software.
	Some display options depend on the version of the app used to record the test data (there may be minor deviations from the following figures).

The folders and measurements selected when exporting test data are clearly listed together with the associated photos, text comments and voice memos in order that individual measurements can be retrieved more quickly.

Recorded test data can be played back and is represented by means of suitable diagrams for level graph and spectrogram. Individual areas can be focused on here over the time progression of the test data, and can be exported for further processing.

Language settings can be adjusted as described in Chapter 5.1.

1.2 Open-source software

SONAPHONE DataViewer uses components from open-source software projects. The names, license conditions and copyright notices for these projects can be found in the enclosed file 3RD-PARTY-NOTICES.

Alternatively, these may also be displayed within the application (see Chapter 5.4).

2   Installation

System requirements

PC or Tablet, Windows 7 upwards

You receive the SONAPHONE DataViewer on a USB flash drive. For the installation an activation key is required. You will find the key on the delivered plastic card or you will receive it via email from the SONOTEC support.

	Note!
ⓘ	There is no update service for the software. The latest release of the software and the related description you can download on www.sonotec.de/dataviewer.

⇨ Insert the USB flash drive into a free USB port and save the ZIP file locally on your device.

  Example: C:\Programme\SONOTEC\DataViewer

⇨ Unpack the ZIP file.

⇨ Start the EXE file to initiate the installation of the software.

⇨ Insert the activation key in the dialog box.

↳ The software starts, shows the list view and is ready for loading test data.

For loading test data see chapter 5.2.

3 Structure of the user interface

SONAPHONE DataViewer has two selectable main displays. One display has a compact list view (following chapter) for the selection of folders and measurements and the display of associated photos, voice memos and text comments. The other has a detailed view (see Chapter 3.2) for the audiovisual evaluation of measurements using suitable diagrams (Chapters 3.2 and 3.4).

3.1 List view
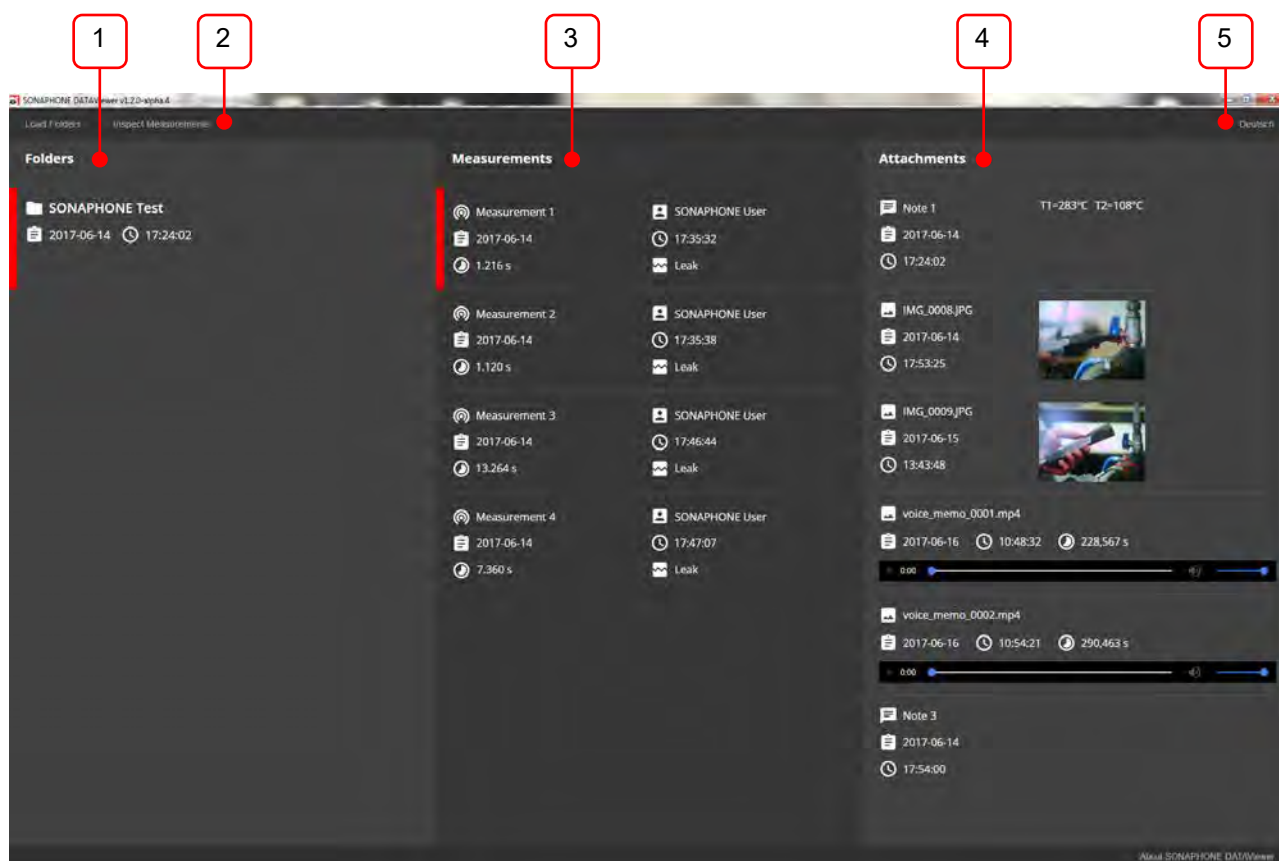
1	List of folders containing loaded test data (active folder: red bar)
2	Menu bar
3	Measurements in the selected folder (select to show attachments)
4	Attachments for the selected folder/measurement
5	Set language: German/English

3.2 Detailed view
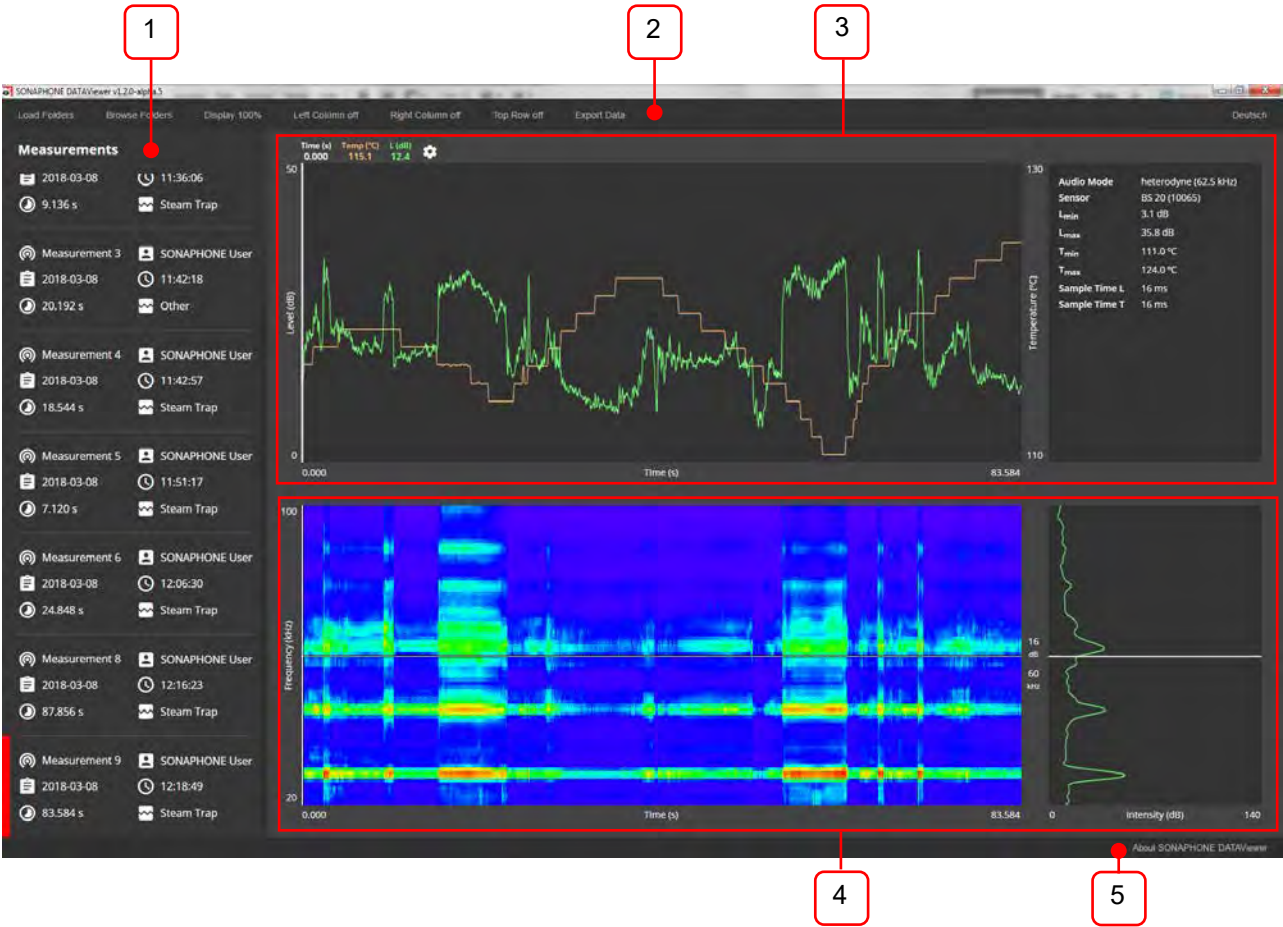
1	Measurements in the active folder (active measurement: red bar)
2	Menu bar
3	Level graph and temperature curve (Chapter 3.3)
4	Spectrogram and spectrum (Chapter 3.4)
5	Status bar for the display of error messages; Notes on open-source software (Section 5.3)

3.3 Diagram for level graph and temperature

1	Level axis [dB], (to adjust: click on the value and change/use the mouse wheel)
2	Legend with time and level values (selection/display of the different levels: ⚙ Settings)
3	Time cursor (to change position: click and drag)
4	Main area with curve progressions (color-coded, see legend)
5	Time axis (to adjust: click on the value and change/use the mouse wheel)
6	Temperature axis (°C)
7	Meta data for the measurement

The scaling of time and level axis can be adjusted by entering new values (see chapter 7.2)

3.4   Spectrogram and spectrum
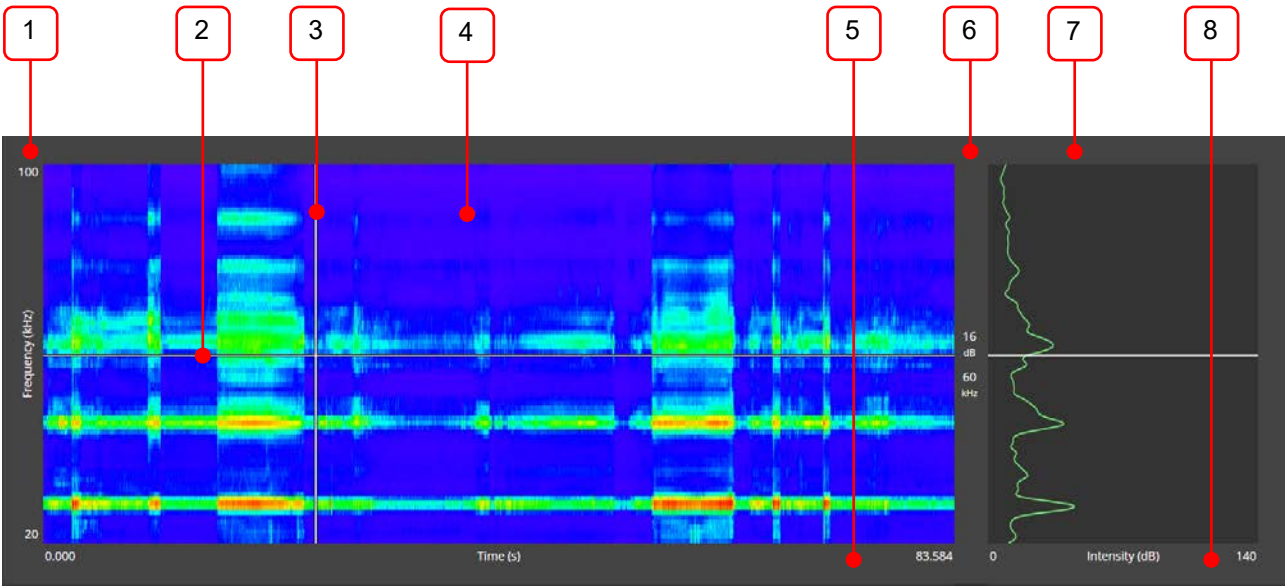
1	Frequency axis [kHz], (to adjust: click on value and change/use mouse wheel)
2	Frequency cursor (to change position: click and drag)
3	Time cursor (to change position: click and drag)
4	Main area for the spectrogram
5	Time axis (to adjust: click on the value and change/use the mouse wheel)
6	Frequency and dB value of the time cursor in the spectrum (kHz, dB)
7	Spectrum (power spectral density) with indication of selected frequency (cursor: click and drag)
8	dB scaling of spectrum

The spectrum (power spectral density, right window) is shown in dB. The displayed frequency range relates to the spectrogram and the relevant spectrum at the selected time (time curser position). The corresponding values (frequency and dB value of the time cursor in spectrogram) are displayed on the left of the spectrum. The scaling of time and frequency can be adjusted by entering new values (see chapter 7.2).

> **Note!**
> Depending on the app version, dB values cannot be displayed for older SONAPHONE measurement data. The spectrally resolved data is shown without the specification of a dB value.

4 First steps

This section will start by describing the basic elements involved in operating the SONAPHONE DataViewer.

4.1 Preparing test data on the SONAPHONE for export

In order to evaluate test results using the SONAPHONE DataViewer, the results will firstly need to be exported as a ZIP file onto your SONAPHONE using the LevelMeter app. More information on this can be found in the description of the LevelMeter app.

4.2 Providing the test data on the target device

Make sure that your exported test data is available in the file system of the target device on which you wish to use the SONAPHONE DataViewer. You may need to connect your SONAPHONE to your target device via USB.

4.3 Starting up the SONAPHONE DataViewer

The SONAPHONE DataViewer software is started up directly from where it is saved (hard drive or USB dongle).

1. Click on the file SONAPHONE-DataViewer-vx.x.x.exe with the icon to start up the software.

↳ The application starts up and the test values can be loaded as a ZIP file (see also the description of the LevelMeter app).

5 General functions

5.1 Changing the language

The language for the user interface can be set to German or English.

Tap or click on the control element "English" or "German" on the right-hand edge of the menu bar to set the desired language.

5.2 Loading test data

1. Tap or click on the control element "Load folders" in the menu bar.

2. In the window dialog, open the ZIP file in the storage location of your exported data.

✎ The folders contained in the test data will be displayed in the left-hand column in the list view; see position 1 in Chapter 3.1.

5.3 Tracking status messages

In the status bar at the bottom edge of the user interface (position 5 in Chapter 3.2), messages on the loading progress will be shown with a blue background, and any errors with a red background.

To hide error message, tap or click anywhere on the user interface.

5.4 Displaying information on open-source software

Tap or click on the control element "About SONAPHONE DataViewer"
on the right-hand edge of the status bar to open a window with all relevant information.

6 List view functions (overview of loaded folders)

6.1 Selecting folders and measurements, displaying the attachments

If you have loaded test data (as per Chapter 5.2), the contained folders will be displayed in the left-hand column of the list view (Folders) (position 1 in Chapter 3.1).

⇨ To select a measurement folder or a required measurement, tap or click on the element.

↳ The active element is marked in red (see figure).

Measurements recorded in the folder will be displayed in the middle column of the list view (position 3 in Chapter 3.1).

Photos, voice memos and text comments (attachments) for the active folder will be displayed in the right-hand column of the list view (position 4 in Chapter 3.1).

Click or tap on a photo to enlarge. Click or tap anywhere in the user interface to exit the enlarged photo display.
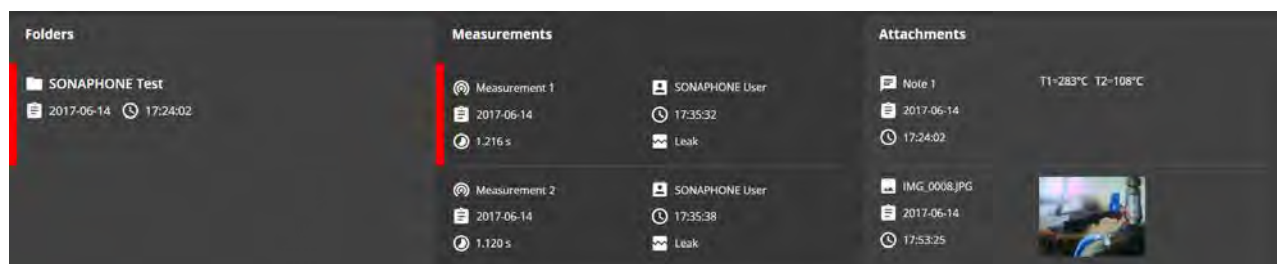
6.2 Changing to the detailed view

⇨ Tap or click on the control element "Inspect measurements" in the menu bar to go to the detailed view for single measurements in a selected (red) measurement folder.

| ℹ | **Note!**
This menu item will only be available if a folder is active (marked in red). . |

---

7 Detailed view functions (overview of measurements)

7.1 Selecting a measurement

In the same way as the folder view, available measurements for the active folder will be displayed in the left-hand column (position 1 in Chapter 3.2).

You may need to firstly show the left-hand column (see next chapter).

⇨ Tap or click on a measurement to select it.

✷ The selected measurement will be marked in red. After the loading process, the associated diagrams and information will be displayed, provided that you have not chosen to hide them.

7.2 Editing diagram axes

The limits for all diagram axes can be edited directly:

⇨ Click or tap on the numerical value on an axis limit and edit the value in the input field that appears.

i	**Note!**
	When a measurement is loaded, the axis limits will be defined automatically by the min. and max. value for the recording. They can then be edited as described.

The time axis can also be modified using the mouse or finger movements.

⇨ Tap or click either in the main area for the spectrogram or the main area for the diagram for level graph and temperature. Do not release your finger or the mouse, and drag the cursor horizontally to the desired position.

OR

⇨ To modify the view, either scroll downwards with the mouse wheel or move two fingers towards each other, or scroll upwards with the mouse wheel or move two fingers apart.

✷ The display will change based on the selected option.

i	**Note!**
	To cancel the selection, release your finger or the mouse outside of the diagram in which you set the starting position.

7.3 Resetting diagram axes

⇨ Tap or click on the control element "Display 100 %"
in the menu bar to reset all axis limits at the same time.

7.4 Displaying and hiding columns and rows

To maximize the display of the level curve and in particular the spectrogram on the screen, individual areas can be hidden from the detailed view.
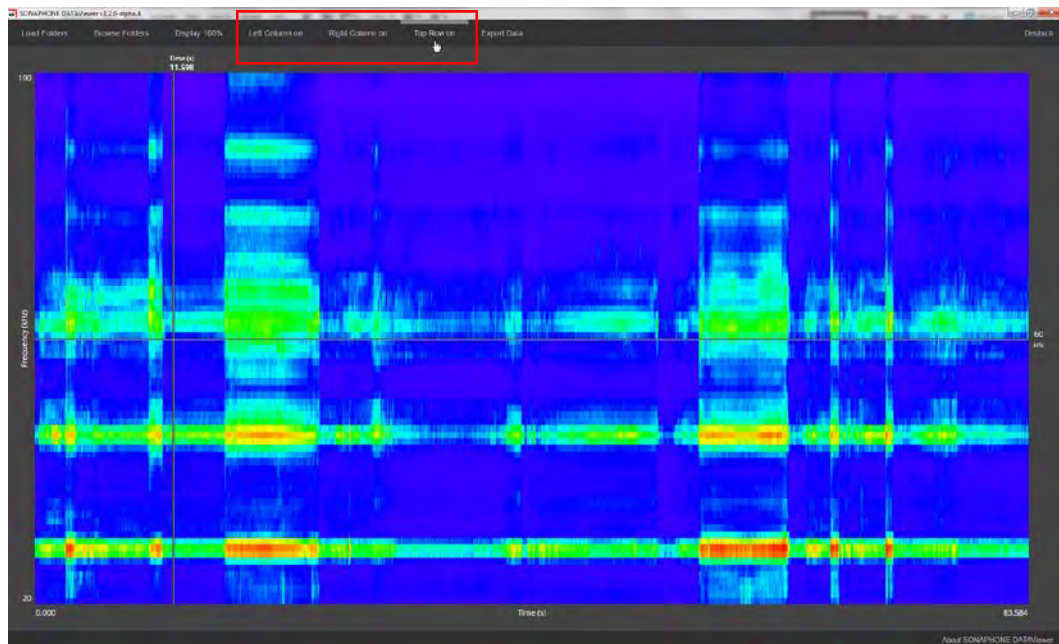
⇨ Tap or click on the corresponding function, e.g. "Left column off" or
"Left column on" to display or hide the elements.

7.5   Displaying and hiding different level types

1. Tap or click on the Settings icon ⚙ in the legend for the diagram for level graph and temperature

Time (s)	Temp (°C)	L (dB)	LF (dB)	Leq (dB)	Lmax (dB)	Lmin (dB)	Lpk (dB)	
0.000	106.1	30.3	29.6	26.1	32.4	21.3	43.1	✓
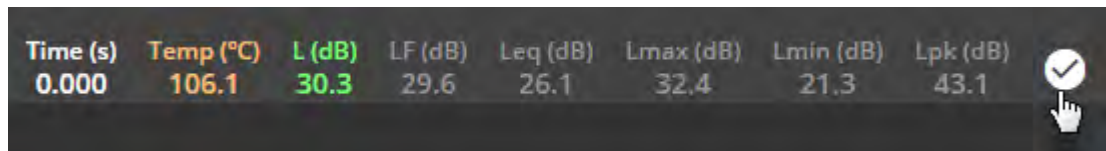
2. Tap or click on a value to display it in the diagram or to hide it:

    Colored element = active: Tap or click to hide the associated level graph
    Gray element = inactive: Tap or click to display the level graph

3. Tap or click on the tick in the legend to hide the list of available level types.

7.6   Starting audio playback

⇨   Briefly tap or click in the main area for the spectrogram or in the main area for the diagram for level graph and temperature in order to play back the audible audio data for the selected measurement.

⮎   The playback will start at the position of the time cursor and will end when this has reached the end of the time axis at the latest. During playback, the time cursor and the legend for the diagram for level graph and temperature will move in line with the playback position.

ℹ	**Note!**
	The volume of audio playback can be adjusted externally via the Computer settings.

Once the time cursor has reached the end of the time axis, it will move to the start of the time axis and playback will stop.

⇨   Click or tap in an area again to manually stop playback.

7.7 Exporting data in CSV format

Measurement data can be exported via the software for further processing as a CSV file as follows:

1. Display a level on the screen that you want to be taken into account for the data export (see Chapter 7.5 Displaying and hiding different level types).

2. Tap or click on the control element "Export data" in the menu bar.

3. In the window dialog that appears, change the path and file name if necessary and then click "Save" to confirm.

↳ The saved CSV file contains the data for all displayed levels.

7.8 Changing to the list view (overview of loaded folders)

⇨ Tap or click on the control element "Browse folders" in the menu bar to display the list view.

8   Error rectification and error messages

> **Note!**
>
> In very rare cases (if the application or computer crashes), there may be irregularities in the saving process when writing large amounts of data to the cache. In this case, inconsistent/incorrect data will be stored in the cache.
>
> In order to ensure that the application can be started up correctly, it may be necessary to reset the cache for the application using the following key combination:
>
> Ctrl + Shift + F8.

Status and error messages are displayed in the footer (see Chapter 5.3).

For any other problems or malfunctions, please contact our Service team. If possible, please have the software version and any error messages to hand.

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SONAPHONE ultrasonic testing device

The **SONAPHONE** digital ultrasonic testing device and the associated sensors are used to carry out a wide range of preventive maintenance tasks.

- Detection and evaluation of leaks in compressed air, gas and vacuum systems
- Status analysis of machines and systems
- Function checking of steam traps or valves
- Verification of tightness
- Detection of partial discharges

The device saves a variety of different test values. At the same time, spectra are recorded as a function of time (spectrograms). Photos, voice memos or comments can also be saved for each procedure. A customized test report can be created with just a few clicks. Each application is optimally supported by software that has been specially tailored to the testing work combined with adapted sensor technology.

GENERAL DATA	
Design	Digital ultrasonic testing device with touchscreen
Processor	ARM Cortex-A9 Dual Core 1.2 GHz
Display	5" TFT display, resolution WVGA 800 x 480 pixel
Touchscreen	PCT, 5-point multi-touch controller
Acoustic signal output	Via speaker or wired headphones
Memory	8 GB flash system memory; 16 GB flash internal measurement data memory 2 GB SDRAM
Connections and interfaces	Ultrasonic sensors: Lemo; Charger: USB 2.0 micro-B; Stereo headphone jack: 3.5 mm; Memory for data export: Slot for microSD card (up to 32 GB)
Operating system	Android 4.4.2
Miscellaneous	5-megapixel camera on the back of the device, integrated microphone; Integrated position sensor
Dimensions (W x H x D)	90 x 174 x 25 mm

Weight	370 g (incl. battery)
Materials	Polycarbonate, ABS, chemically hardened glass

ELECTRICAL DATA	
Battery	Type: Lithium polymer battery; 3.7 V; 4.05 Ah (7.75 Wh)
Power supply	Charger with micro-USB connection (5 V, 2 A)
Running time	8 … 12 h in practical use, 4 h with continual use
Charge time	Typically 4 h

SOFTWARE LevelMeter app	
Functions	- Taking photos to add to data sets or measurements - Adding markers directly after taking a photo - Recording voice memos to add to data sets or measurements - Adding text comments - Selecting the current application (leak, bearing etc.) as context for measurements - Creating PDF reports of selected data sets - Exporting selected data sets for further processing on the computer (e.g. in DataViewer)

Saving and recording	Format audio data: *.wav
	Storage location: Internal measurement storage

Memory requirements	Per second of measurement time	Per minute of measurement time
Level	1 kB	88 kB
Spectra	31 kB	2 MB
Audio	16 kB	1 MB

Data organization: Hierarchical in data sets and measurements

Displays	• Level graph (only the "main" level – highlighted in green, freely selectable)
	• Level wheel and level bars (instantaneous level only)
	• Level table, configurable in terms of layout, number (max. 5) and type of displayed levels
	The following sound pressure levels can be displayed, as well as the temperature (T, only active with structure-borne sound sensor BS20): L – Instantaneous level L_F – Instantaneous level with time weighting L_{pk} – Peak level L_{eq} – Equivalent continuous sound level L_{min} – Minimum value of instantaneous level L_{max} – Maximum value of instantaneous level (in dB, reference p_0 = 20 µPa, temporal resolution: 16 ms per level value)
	• Spectrogram (temporal resolution: 16 ms per frequency spectrum)
	• Portrait/landscape changeover
	• Measurement time, playback position
Operating modes	Live – display of current measured values Recording – display and saving of current measured values Playback – playing of saved measured values
Languages	German, English, Spanish, French, Italian, Japanese, Dutch, Polish, Portuguese, Russian, Turkish, Chinese

AMBIENT CONDITIONS

Operating temperature	-10 °C … +40 °C
Temperature when charging the battery	0 °C to +20 °C
Storage temperature	-20 °C … +60 °C
Protection type	IP40
Standards and guidelines	EMC Directive 2014/30/EU; WEEE Directive 2012/19/EU; RoHS Directive 2011/65/EU; ASTM E1002-2005

Accessories (some of which are optional)	▪ Sensors: Airborne-sound sensor BS10 with various attachments, structure-borne sound sensor BS20 with integrated temperature sensor and different waveguides
	▪ Software: LevelMeter app for basic maintenance tasks, DataViewer for processing data on computer (Windows 7 and higher), LeakExpert App for leak detection and evaluation
	▪ Ear protection headphones, device case, charger, protective cover, protective film, carry strap

Subject to technical modifications!

Airborne sound sensor BS10

The airborne sound sensor BS10 with comprehensive accessories has been specially designed for the following testing work in combination with the SONAPHONE:

- Detection and evaluation of leaks in compressed air, gas and vacuum systems
- Tightness testing of windows, doors, vehicles or containers (in combination with the SONAPHONE T ultrasonic transmitter)
- Detection of electrical partial discharges and insulation damage

The acoustic playback volume can be adjusted using the function buttons. Testing can also be started and stopped. The integrated target laser and the LED lights help with the precise location of damage areas.

GENERAL SENSOR DATA	
Design	Sensor for the detection of airborne ultrasonic signals with exchangeable attachments, target lasers and LED lights
Operation	Via buttons on the sensor or on the device; Buttons: Start/stop testing, laser, LED lights, volume
Frequency range	20 … 100 kHz
Measurement resolution	1 dB
Power supply and communication	Cable connection with the SONAPHONE (160 cm): LEMO connection
Dimensions (W x H x D)	30 x 155 x 30 mm
Weight	80 g (without accessories)
Materials	Sensor housing: plastic (polycarbonate: ABS), gray; Attachments: synthetic rubber (EPDM), black

AMBIENT CONDITIONS	
Operating temperature	-10 °C … +40 °C
Storage temperature	-20 °C … +60 °C
Protection type	IP40

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Standards and guidelines	EMC Directive 2014/30/EU; WEEE Directive 2012/19/EU; RoHS Directive 2011/65/EU; ASTM E1002-2005
Accessories (some of which are optional)	Attachments to boost the acoustic signal strength: Small acoustic horn BS10-2 for close range Large acoustic horn BS10-3 for larger distances Precise locator BS10-1 for the precise location of damage areas

Subject to technical modifications!

Structure-borne sound and temperature sensor BS20

The structure-borne sound sensor BS20 with exchangeable attachments is used in connection with the SONAPHONE for applications including:

- Condition monitoring of machines, systems and plant components
- Function checking of steam traps and valves
- Monitoring of wear and malfunctions in rolling or slide bearings, for example
- Monitoring of lubrication conditions

The acoustic playback volume can be adjusted using the function buttons. Testing can be started and stopped in the same way. The integrated temperature sensor improves the evaluation reliability of the test data for a wide range of different test sequences, such as tests on steam traps.

GENERAL SENSOR DATA	
Design	Contact sensor for the detection of structure-borne sound with exchangeable waveguides, contactless infrared temperature sensor, LED light
Operation	Via buttons on the sensor or on the device Buttons: Start/stop testing, LED light, volume
Frequency range	20 … 100 kHz
Temperature measurement range	-70 … +380 °C object temperature
Measurement resolution	Ultrasound: 1 dB, temperature: 1 K
Power supply and communication	Cable connection with the SONAPHONE (160 cm): LEMO connection
Dimensions (W x H x D)	30 x 155 x 30 mm
Weight	140 g (without accessories)
Materials	Sensor housing: plastic (polycarbonate: ABS), gray; waveguides: stainless steel

AMBIENT CONDITIONS	
Operating temperature	-10 °C … +40 °C
Storage temperature	-20 °C … +60 °C
Protection type	IP40

Standards and guidelines	EMC Directive 2014/30/EU; WEEE Directive 2012/19/EU; RoHS Directive 2011/65/EU
Accessories (some of which are optional)	Short waveguide BS20-1: Length: 22 mm, diameter: 18 mm, weight: 15 g Long waveguide BS20-2: Length: 150 mm, diameter: 18 mm, weight: 33 g Magnetic holder BS20-3 Wrench set for assembling and disassembling waveguides

Subject to technical modifications!

Parabolic sensor BS30

The parabolic sensor is used for the accurate detection of ultrasonic waves over distances of up to 35 m. The following testing work can be carried out in combination with the SONAPHONE:

- Detection of leaks in compressed air, gas and vacuum systems
- Detection of electrical partial discharges and insulation damage
- Tightness testing of windows, doors, vehicles or containers (in combination with the SONAPHONE T ultrasound transmitter)

Testing can be easily stopped and started using the function key on the sensor handle. The target laser can be switched on via a separate button. The target laser and a light spot target device allow for the precise location of damage areas.

GENERAL SENSOR DATA	
Design	Sensor with parabolic reflector for the detection of airborne ultrasound signals at distances of up to 35 m, target laser (class 2) and red/green dot sight
Operation	Via buttons on the sensor or on the device: Start/stop testing │ Laser on/off (press and hold button)
Frequency range	20 … 100 kHz
Measurement resolution	1 dB
Power supply and communication	Cable connection with the SONAPHONE (160 cm): LEMO connection
Dimensions (W x H x D)	270 x 440 x 390 mm (when assembled)
Reflector diameter	270 mm
Weight	750 g
Materials	Sensor: Aluminum, polycarbonate, ABS

AMBIENT CONDITIONS	
Operating temperature	-10 °C … +65 °C
Storage temperature	-20 °C … +65 °C
Protection type	IP40

Standards and guidelines	EMC Directive 2014/30/EU; WEEE Directive 2012/19/EU; RoHS Directive 2011/65/EU; ASTM E1002-2005
Sensor accessories:	Light spot target device, transport case
Optional accessories	Sensor cable

TARGET LASER	
Wavelength λ	630 … 680 nm
Laser dot size	< 20 mm at 10 meters
Deviation	2 mrad (divergence angle: 0.11°)

(The technical specifications for the laser target device can be found in the corresponding document).

Drawings are not to scale. Dimensions in mm, unless otherwise specified. Information is subject to change without notice.

C E

E.U. DECLARATION OF CONFORMITY
STANDARD ROUTE TO COMPLIANCE

SONOTEC GmbH
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Germany

declares under our sole responsibility, that the product

SONAPHONE
with sensors BS10/BS20/BS30

to which this declaration relates is in conformity with the following standards, including the valid changes at time of declaration:

2011/65/EU   Restriction of Hazardous Substances (RoHS)

2014/30/EU   Electromagnetic Compatibility

in agreement with the following standard:

DIN EN 61326-1:2013   Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

The SONAPHONE is used to detect leakages in compressed air or vacuum systems, to verify steam pipes seals, to seal integrity of fittings and condenser drains and to verify ultrasonic sources.

The correspondence of the product mentioned above with the directives and laws of the EU-directives are guaranteed by means of a quality management system.

Halle, 29th April 2019

Michael Münch
Managing Director

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