Sorama

make sound insightful

Sorama CAM iV64 – User Manual

Document version 2.4.3 - 7/10/2022

Contents

Conformity

Sorama B.V.

Achtseweg Zuid 153H

5651 GW Eindhoven

The Netherlands

This document is subject to change without notice.

Declare under our sole responsibility that the products:

Product name	**Acoustic Camera**
Model number	**CAM iV64**

Are in conformity with the requirements of the following EU Directive or other normative documents. This declaration is based on the full compliance of the products with the following European standards:

- **General Safety**
  - **IEC 61010-1**
- **For Electromagnetic compatibility directive (EMC)**
  - **EN 301 489-17 V3.2.4 referring to EN 301 489-1 V2.2.3**
  - **EN 55032:2015 Class B**
  - **EN 61000-4-3:2006**
  - **EN 61000-4-2:2009**
- **RoHS3 Restriction of Hazardous Substances**
  - **EU2011/65/EU RoHS2**
  - **EU2015/863**

Technical Compliance Data held by:

Sorama B.V.

Achtseweg Zuid 153H

5651 GW Eindhoven, NL

https://www.sorama.eu/

info@sorama.eu

Signed for and on behalf of Sorama B.V.

Address: Achtseweg Zuid 153H, 5651 GW, Eindhoven

Safety Information

This document contains important information, which should always be available to the operator(s) of the instrument during its operational life. Eventual updates to this digital manual will be added regularly. It is therefore always advised to consult the latest available version of the manual which can be found on the Sorama website. The revision number and date can be found on the first page of this document. The instrument can only be operated in accordance with these instructions and local safety regulations.

This instrument is intended only for the measurement of sound and vibration. The instrument operates reliably in demanding conditions as described in the manual. Compliance with the operating instructions is necessary to ensure the expected results.

Physical Damage

If any physical damage occurs to the device and there is visible damage, do not use the device anymore and remove the battery. Specify the damage details and contact Sorama for further support to assess the damage severity.

Replacement Parts and Accessories

Use only original parts and accessories approved by the manufacturer. The use of other products can compromise the operation safety and functionality of the instrument.

To prevent possible electrical shock, fire, or personal injury follow these guidelines:

• Read all safety information before you use the Product.

• Use the Product only as specified, or the protection supplied by the Product can be compromised.

• Do not use the Product around explosive gases, vapor, or in damp or wet environments.

• Do not use and disable the Product if it is damaged.

• Do not use the Product if it operates incorrectly.

• Do not disassemble or crush battery cells and battery packs.

• Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.

• Have an approved technician repair the Product.

• Contact Sorama when the battery leaks.

• Remove the batteries if the Product is not used for an extended period of time, or if stored in temperatures above 35 °C. The Product can be damaged If the batteries are not removed.

• Use only Sorama approved power adapters to charge the battery.

• Do not keep cells or batteries in a container where the terminals can be shorted.

• Do not short circuit the battery terminals together.

• Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.

• Disconnect the battery charger and move the Product or battery to a cool, non-flammable location if the rechargeable battery becomes hot (>50 °C) during the charge period.

Battery

Specifications:

Type	RRC2057
Voltage	7.20V
Capacity	6.90Ah
Max. Charge current	4.83A
Max. Charge voltage	8.40V
Max. discharge current	9.50A
Dimensions (L x W x H)	85.35mm x 77.65mm x 23.0 mm
Weight	230g

⚠⚠Warning

To prevent personal injury and for safe operation of the Product:

- Do not put battery cells and battery packs near heat or fire.
- Do not put in sunlight.
- Do not disassemble or crush battery cells and battery packs.
- Remove batteries to prevent battery leakage and damage to the Product if it is not used for an extended period.
- Connect the battery charger to the main power outlet before the charger.
- Use only the power adapters approved by Sorama to charge the battery.
- Keep cells and battery packs clean and dry. Clean dirty connectors with a dry, clean cloth.

⚠Caution

To prevent damage to the battery:

- Do not expose battery to heat sources or high-temperature environments such as an unattended vehicle in the sun.
- Do not store the battery on the charger for more than 24 hours as reduced battery life may result.
- Charge the battery for a two-hour minimum at six-month intervals for maximum battery life. Without use, the battery will self-discharge in approximately six months.
- Always operate in the specified temperature range.
- Do not incinerate the Product and/or battery.

A Li-ion battery powers the Acoustic Camera. The Acoustic Camera includes two batteries for a quick-change during operation.

The battery charges on a single bay charging base. The power supply powers the charging base. Country-specific adapters are included.

The battery is successfully tested and complies with:

- UN Model regulations, Manual of Tests and Criteria Part III Subsection 38.3
- FCC part 15
- UL2054/UL60950-1
- IEC62133
- RoHS
- CE

And has been manufactured under a quality management program as specified in 2.9.4 of the UN Model regulations.

Symbols

Symbol	Description
	The product has been assessed by the manufacturer and complies with EU safety, health and environmental protection requirements
	Certifies that the electromagnetic interference from the product is under the limits approved by the Federal Coimmunostains Commission.
	Dispose of this product according to local Regulations. Do not dispose of this product as unsorted municipal waste.
	Cautionary notice !
	consult accompanying documents

Contacts

Supplier will, during the warranty period in office hours (GMT +1), provide the required first line support when possible technical faults occur. Customers can request support by sending an email to support@sorama.eu. After receiving the defect checklist, the customer should send this document filled out back to support@sorama.eu. Sorama will then evaluate the problem. When the issue does not have any relation to the services of Sorama or is outside the warranty period, costs will be charged to the customer.

1 Description

The Sorama CAM iV64 is a state-of-the-art acoustic camera, which enables you to show both highly accurate sound levels and localize where sound is coming from on the 7-inch touch display.

Specifically designed for users who want mobility and have instant reliable acoustic information available to them, in order to perform in-field measurements with confidence.

1.1 Features

- Class 1 performing sound level meter functionalities
- Realtime spectrum
- Realtime spectrogram
- Far-Field sound source localization and visualization
- Measurement workflows for norm measurements
- Sorama Portal compatible data for in-depth analysis

2 Technical Data

2.1 Physical Properties

Size (LxWxD)	42 x 32 x 16 cm	L x W x D
Weight	2.33 kg	Including battery
Connectivity	USB-C	USB 3.0
Battery	Rechargeable & swappable smart battery	Battery life ±4 hours
Hardware connections	1/4” screw connection	Tripod mountable

2.2 Storage

Internal	Approx. 7Gb	
External	Up to 1Tb	Storage expandable with USB-C fast drive or Additional purchasable SSD storage memory
Storage formats	Sorama File Format (.sor file) containing video-, acoustic data and measurement specific metadata. And .Jpeg or .PNG image files.	Sorama data format is compatible with Sorama Portal for data analysis

2.3 Display & Camera

Touch display	7-inch LCD capacitive touchscreen
Display resolution	720x1280
Camera Resolution	1280x960

2.4 Microphones

Type	MEMS	Digital Bottom Port
SNR (A-weighted, at 1 kHz)	66 dB for 94 dB SPL	At 1 kHz per channel
Sensitivity	-37 dBFS +/- 1 dB	At 1 kHz, 94 dB SPL
Acoustic Overload Point	132 dB SPL	At 1 kHz, <10% THD

2.5 Measurement Features

Sampling rate	240 kHz	
Spectrum analysis	29 Hz – 27 kHz*	
Spectrogram analysis	0-10s+ 29 Hz - 27 kHz*	Streaming + recording
Beamforming (far-field)	500 Hz – 27 kHz*	Streaming + recording

*Upgradeable frequency ranges up to 54 kHz or up to 108 kHz on special request

3 Environment

3.1 Ambient Temperature

The CAM iV64 is capable of operating in ambient temperatures between 2°C to 50°C (35.6 °F to 122°F). Note that water can cause condensation, which can lead to damage in the device, the ambient operating relative humidity is between 10-90% RH (non-condensing).

3.2 Protection

⚠ **Warning**

The AOP (Acoustic Overload Point) of the microphones is 132 dB and a user could potentially damage the microphones if the microphones are subjected to sound sources higher than the AOP.

⚠ **Warning**

The USB-C connector port is not used for charging, and it is solely used for data communication.

Any water entering the MEMS microphones may cause the device to show incorrect measurement output values. Water entering the holes of the microphones should always be avoided. In case water was in contact with the microphones, place the sensor head such that any water can drip out from the microphone holes and let it dry in this position.

4 Getting Started

4.1 List of Items

Items listed below are included when you receive the Product.

Number	Description	Quantity
1	External Battery Charger	1
2	Rechargeable Lithium-ion Battery Pack	2
3	Country-Specific Adapters for Battery Charger	1
4	USB-C to USB-A Cable (1.5m)	1
5	CAM iV64 Acoustic Camera	1
6	Protective Case	1
7	Accessory Bag	1
8	Shoulder Strap	1
9	Hand Strap	1

4.2 Hardware feature and configuration

Item	Function	Item	Function
1	LED Indicator	5	Battery Compartment/ Tripod Connector
2	USB-C Connector	6	Acoustic Sensor/ Webcam
3	Touchscreen Display	7	- Power on / Measurement Trigger Button - Force Shut Down
4	Shoulder Strap Anchor	8	Hand Strap Anchor and Screw Point

⚠ **Warning**

The USB-C connector port is not used for charging, and it is solely used for data communication.

4.3 Terms to know

1. **Sound Pressure Level**
   The sound is defined as pressure variations in the air which is generally quantified by the sound pressure. Sound Pressure Level (SPL) is a weighted sum of the frequency components of acoustic signals. SPL is expressed in decibels (dB SPL).
2. **SLM (Sound Level Meter)**
   Sound Level Meter indicates the Sound Pressure Level (SPL) as measured by the Product.
3. **Frequency Spectrum**
   Frequency Spectrum is the distribution of the amplitudes (dB SPL) of each frequency component against frequency (Hz). In other words: Your signal recording consists of different frequency components which all contribute to the sound.
4. **Spectrogram**
   Spectrogram can show a sudden onset of a sound. Often it can be easier to see clicks and other glitches in this view rather than in a time or spectrum analysis.
5. **Field of view (FOV)**
   Horizontal/Vertical observation angels of the webcam. The FOV depends on how many features are opened (Spectrum, Spectrogram and dB SPL meter). When opening more features on the Sorama CAM iV64 screen, the horizontal FOV will increase and the vertical FOV will reduce slightly.
   No features open: Horizontal FOV 23.8° and Vertical FOV 41°
   All features open: Horizontal FOV 53° and Vertical FOV 38.2°.
6. **Beamforming**
   A signal processing technique used to identify the location of sound by using an array of microphones. The localization of sound is determined by the difference in time at which sound reaches the microphones in the array.
7. **Frequency and Time Weightings**
   When measuring sound pressure level variations, it is important that the sound level meter can give an accurate representation of what the human ear hears. Frequency weightings are used to correlate the SPL at each frequency component for different applications. Frequency weightings that can be applied are Z, A, B and C.
   The streaming SPL varies rapidly in time on display, time weightings act like a buffer for desired time-engagement. The time weightings that can be applied are Impulse, Fast and Slow.
8. **Frequency Band Selection**
   Frequency band selection acts like a window, focusing on the selected frequency range in the spectrum, the frequency ranges of the sound, other than the selection are filtered out and not visible on the display.

4.4 Power up and LED Indicator

Push the trigger button on the pistol grip to power up the device. The led above the USB-C connector will indicate that the device is turned on.

The CAM iV64 currently has 3 LED colors. The table below explains the meaning of each color.

LED Color	Description
Red	The device is booting
Green	The device is fully booted, and the default user interface is running
Blue	The device is still switched ON, but the application is not running anymore

4.5 Home screen

When the device is fully booted, the home screen contains several icons. The meaning of the icons is as follows;

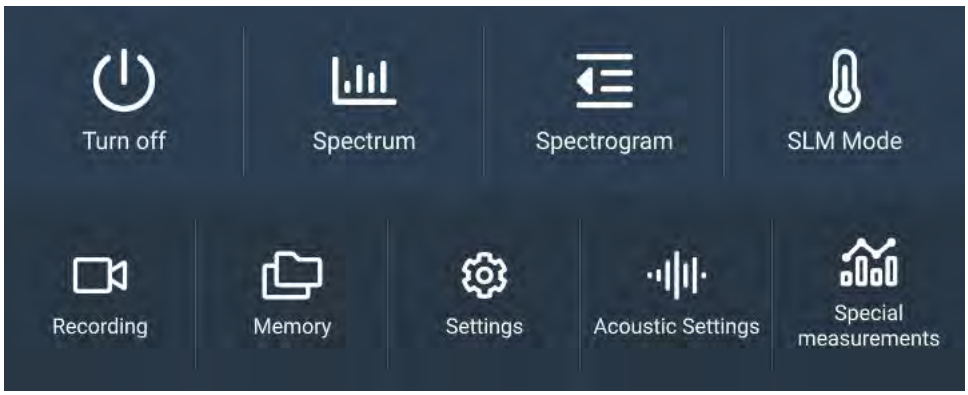
External USB drive connected

Battery level

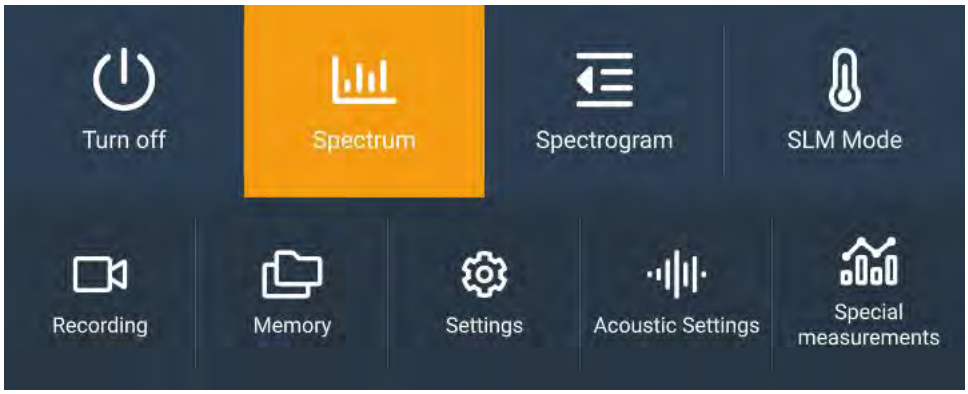
Recording disabled, because the memory is full.

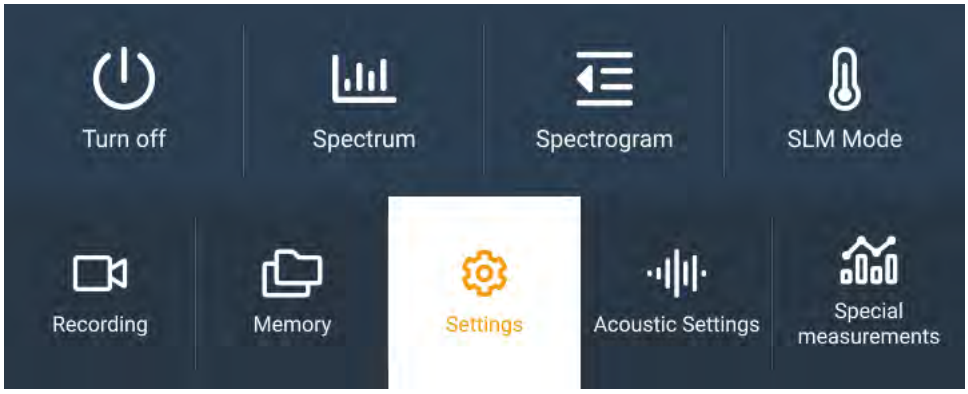
4.6 Menu

To reveal the menu, swipe down from the top. The following menu is shown.



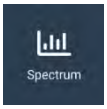
You can easily gain access to the different features and settings of the device. The required feature or setting can be selected by touching the related icon on the device. When the icon is selected it will turn orange (upper row) or white (bottom row). You can touch the icon again or press the “X” to close the feature or setting.



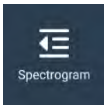


The following features and settings are included.

Turn off: with this feature the device can be turned off

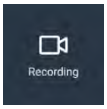


Spectrum: this feature shows the spectrum of the microphone data obtained by the microphone array



Spectrogram: this feature shows the spectrogram of the microphone data obtained by the microphone array

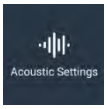
SLM Mode: this feature shows the sound pressure levels of the microphone data obtained by the microphone array Recording: In this menu the type and duration of a sound measurement can be set.



Recording: In this menu the type and duration of a sound measurement can be set.

Memory: This is the menu showing the saved recordings and enables to transfer, rename and/or delete recordings.

Settings: In this menu the settings of the device can be viewed and/or adjusted



Acoustic Settings: In these menus you can adjust the acoustic settings of the device

Special Measurements: with this feature the formats for special measurements can be chosen

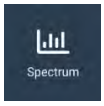
4.6.1 Turn off

Tap 

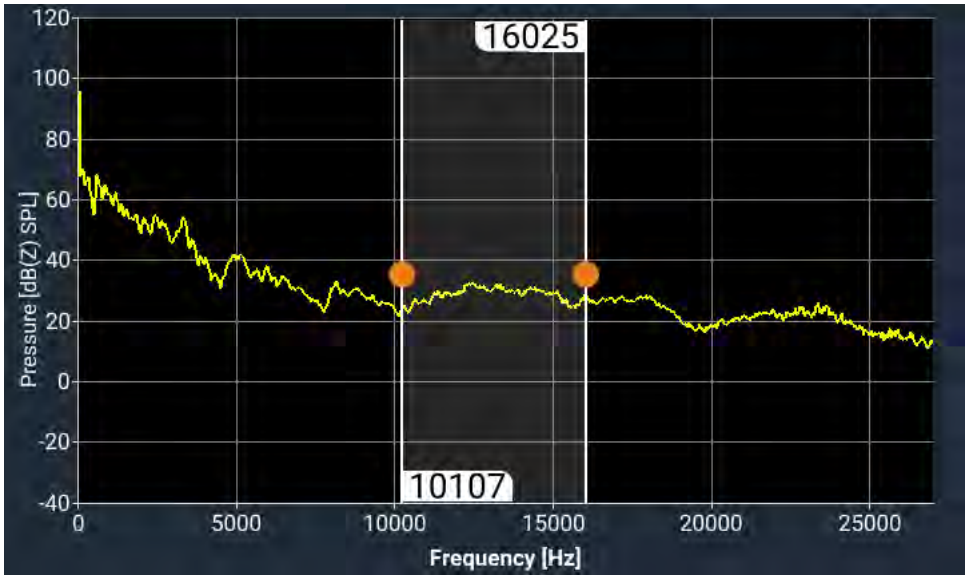
to power off the device.

When a hard reset is needed for the device, press the trigger button for 5 sec.

4.6.2 Spectrum

Tap 

to view the spectrum. This feature shows the spectrum of the sound.

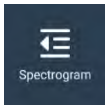


The microphone data obtained by the microphone array can be shown on the screen for a specific frequency bandwidth. When the spectrum is visible in the display, the bandwidth can be selected by touching the orange dot and drag this dot to the preferred frequency. Execute this for the lower and higher frequency. You can also move the selected frequency band by touching it in the middle and drag it to the preferred area of the spectrum.

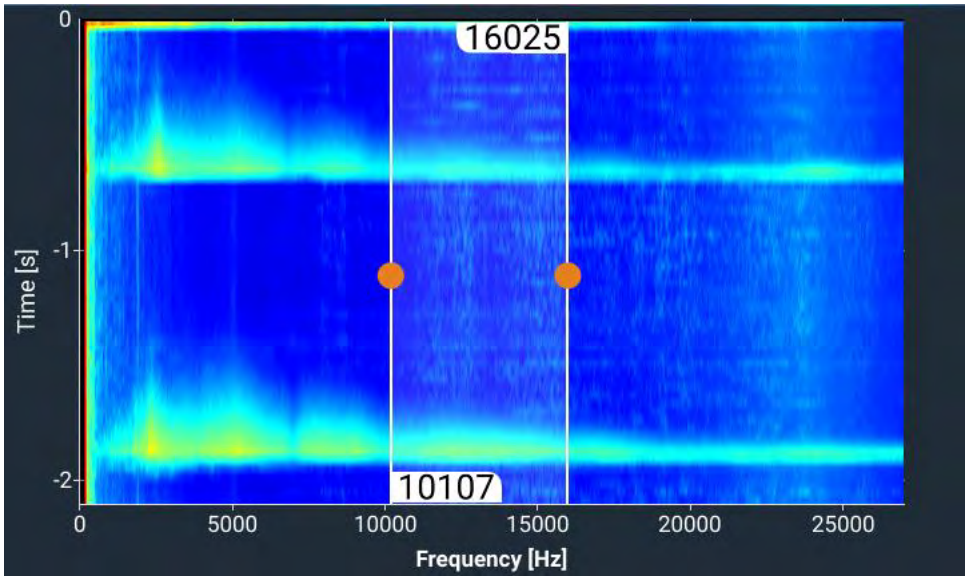
Spectrum zoom

By double tapping in the spectrum module you can zoom in on the selected frequency band for a more detailed view.

4.6.3 Spectrogram

Tap 

to view the spectrogram.



To select a specific bandwidth, please review the explanation described in the previous paragraph §4.5.3 Spectrum Basics.

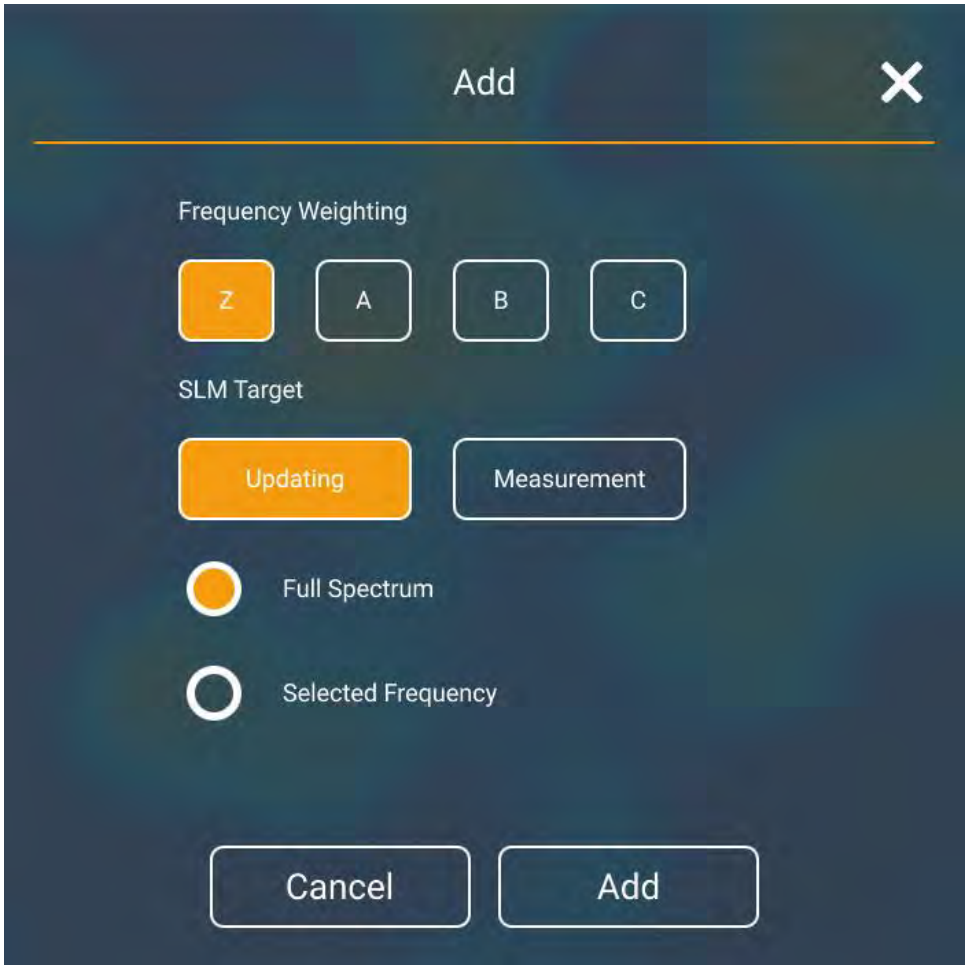
4.6.4 SLM mode

Tap 

to view the sound pressure level of the microphone data obtained by the microphone array.

Tap 

to add another weighting for the SPL measurement.



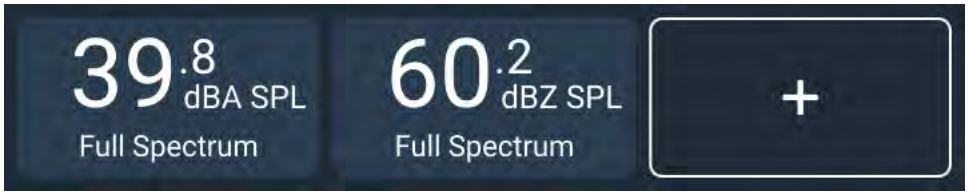
Frequency Weighting
Choose a weighting (Z, A, B or C), SLM target ('Updating' or 'Measurement') and choose the option 'Full Spectrum' or 'Selected Frequency'.

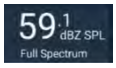
SLM Target
Selecting 'Updating' SLM target, will refresh the displayed dB value every second. Selecting 'Measurement' SLM target, will start to collect dB levels when a measurement is started until the measurement is stopped. After the measurement is stopped it will average these levels over the measurement duration and show the corresponding value.

'Full spectrum' will collect sound pressure level data for frequencies over the entire spectrum available on the device. 'Selected Frequency' will only take the frequencies into account that are currently selected (selectable in spectrum and spectrogram modules). By changing the selected frequencies, the selection in this SLM entry will automatically change too.

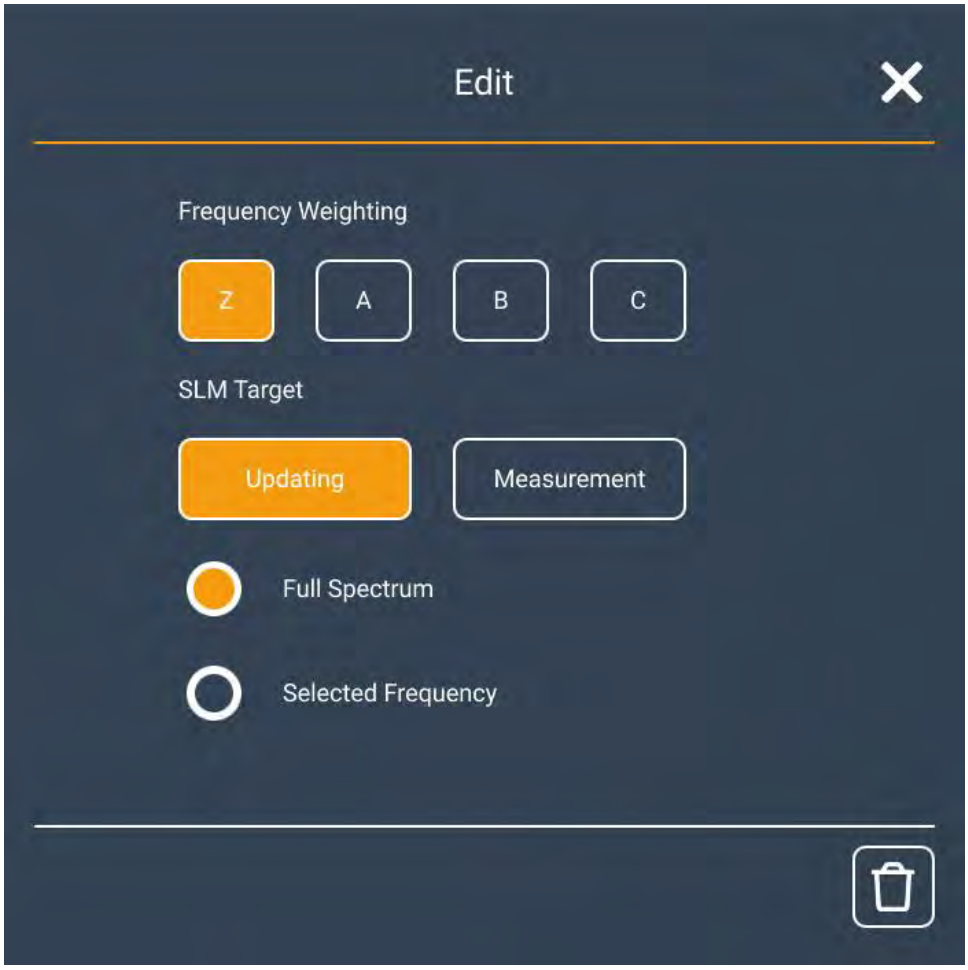
Press 'Add' to add the new entry into the SLM module.

Adjusting SPL values

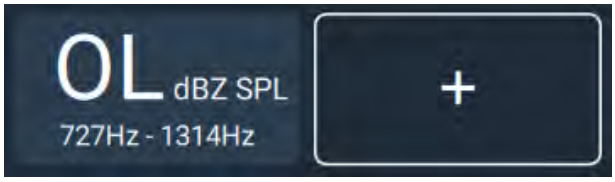


Tap  to adjust the settings in the screen.

Tap  to close the tab or  to remove the SPL mode.



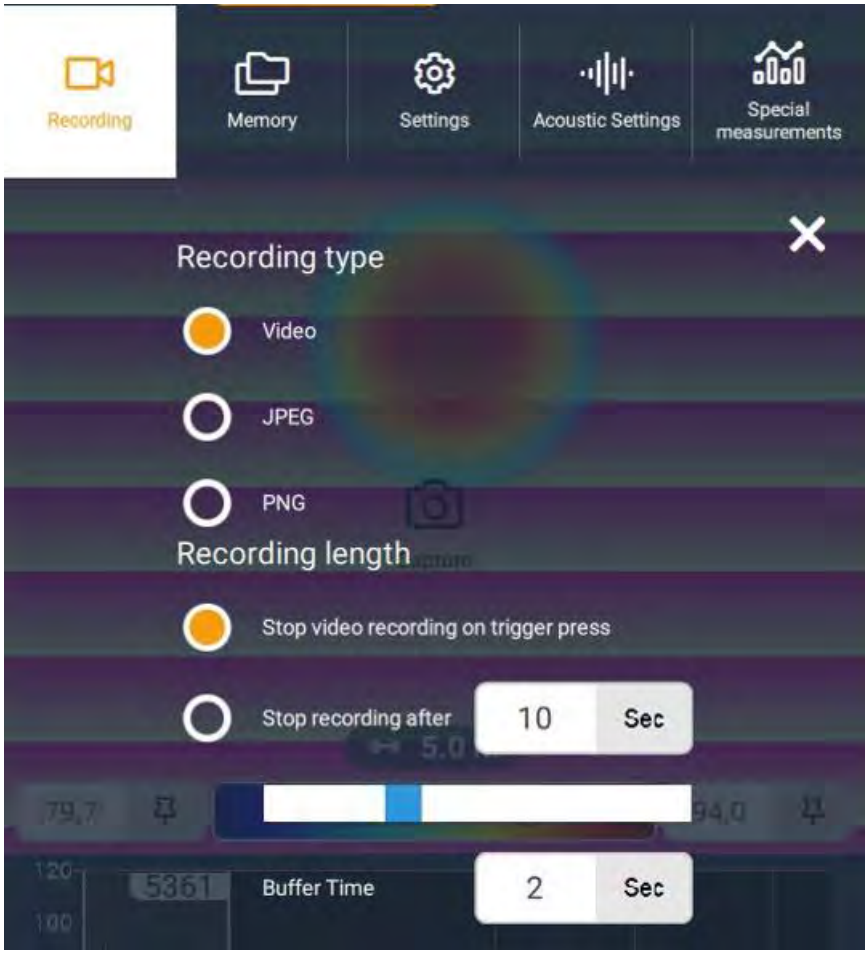
Whenever the acoustic overload point of one of the microphones is reached which is specified at 132 dBSPL, the SLM will indicate this using ‘OL’, short for Overload.



4.6.5 Recording

Tap 

to adjust the recording settings of the sound measurement.



Firstly, you can select the recording type of the measurement you will perform. You can choose between a screenshot in the supported formats of .JPEG and .PNG or a video in the format of .SOR.

A screen shot (.JPEG or .PNG) can be taken by pressing the trigger button of the CAM iV64.

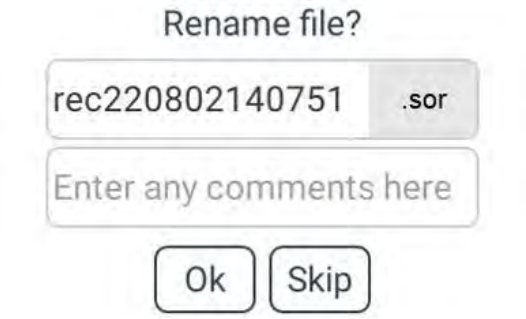
Whenever recording a video, by default the 'Stop video recording on trigger press' is selected.
To start recording you can press the trigger button. The icon in the home screen will show the record time.

If you use the setting 'Stop video recording on trigger press' the recording will automatically stop after the selected duration has passed.

The buffer time is an amount of seconds that will be kept in memory at every moment. When a recording is started, this buffer will be available in the recording. This is especially useful at times you wish to record an event that happens at random intervals.

After you have performed a measurement, a window will appear on the screen in which you can set the measurement name. This can be done by tapping on the measurement name in the text box and changing the default name to a desired name. Press on ‘Ok’ to store the measurement under the new measurement name. There is also an option to use the default measurement name. Whenever this is desired you can tap on the ‘Skip’ button.

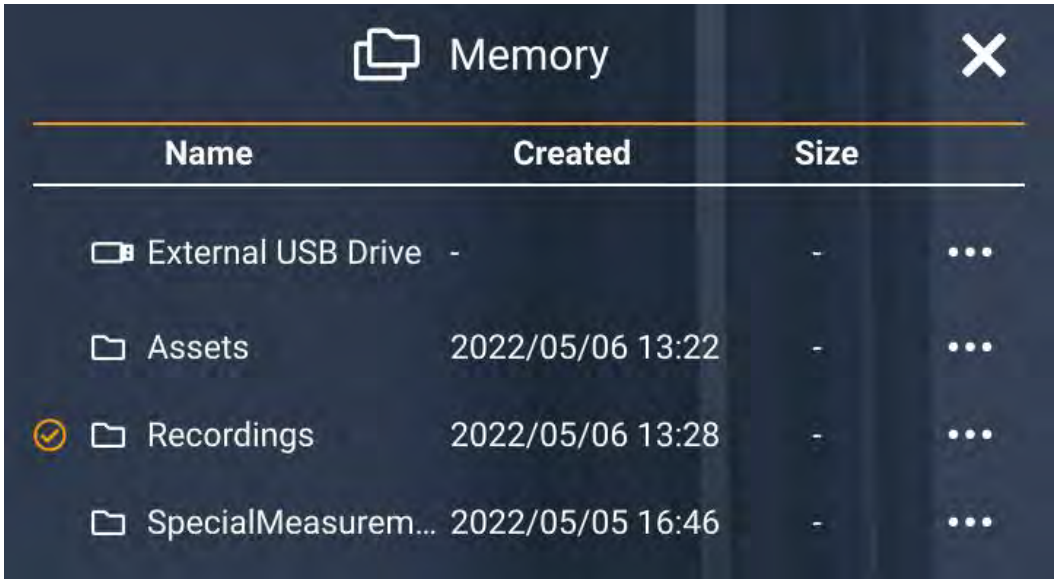
Furthermore, there is an option to add notes to the performed measurement. This can be done by typing text in the text box saying ‘Enter any comments here’.



4.7 Memory

Tap 

to select the memory setting.

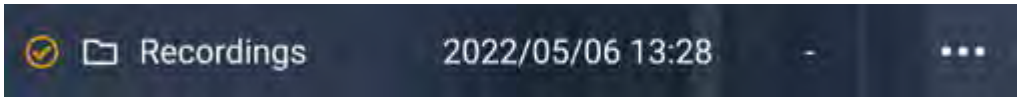


Tap 

to adjust the setting for the USB-C or the ‘Recordings’.

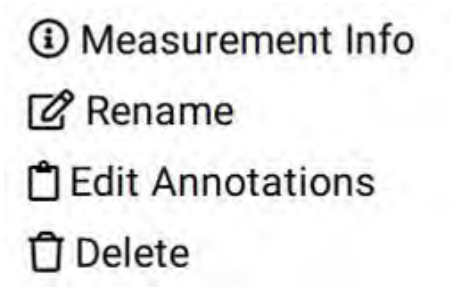
For the external USB drive, choose the ‘Destination Folder’ or to ‘Eject’ the USB drive.

When the ‘Destination Folder’ is selected then an orange checkmark is shown.

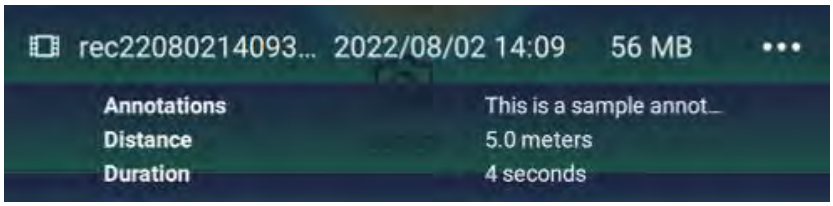


For the ‘Recordings’ setting, choose to ‘Rename’ the recording, choose the ‘Destination Folder’ or to ‘Delete’ the file.

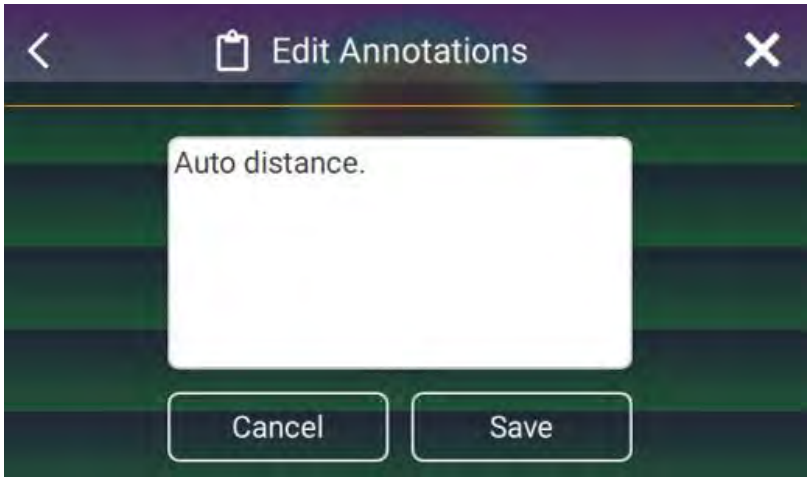
Extra information about performed measurements can be visualized by tapping the three dots on the right side of the measurement name.



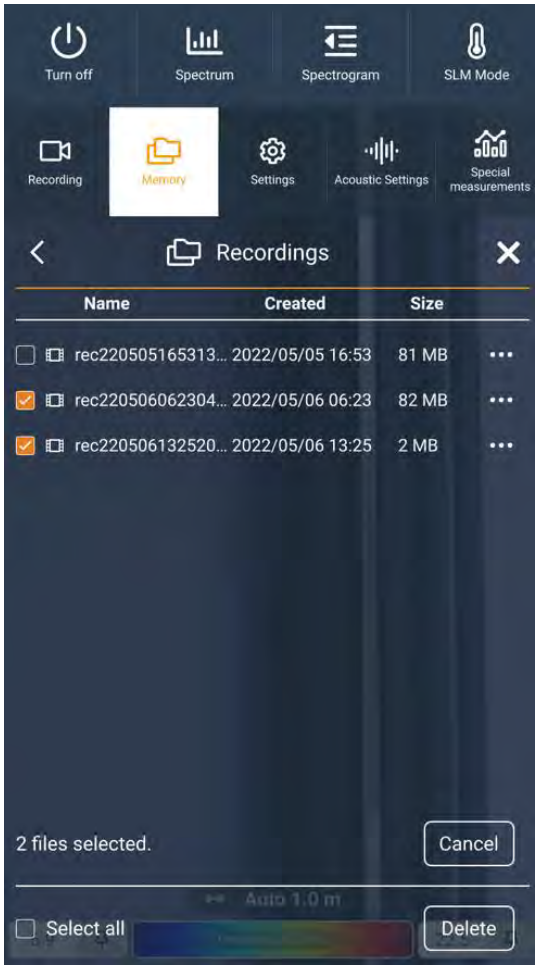
After tapping on the three dots, choose ‘Measurement Info’. Rows will appear below the measurement name containing information in the form of ‘Annotations’, ‘Distance’ and ‘Duration’. All topics will contain information about the selected measurement.



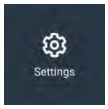
Whenever you have not added any annotations yet to your measurement, you can still do this by tapping the three dots on the right side of the measurement name and choosing ‘Edit Annotations’. A text box will appear in which you can describe the measurement conditions.



Additionally, when you press and hold a file or directory then you will enable the multiselect mode. You can select multiple files and folders to either delete or copy to an external USB drive at the same time.

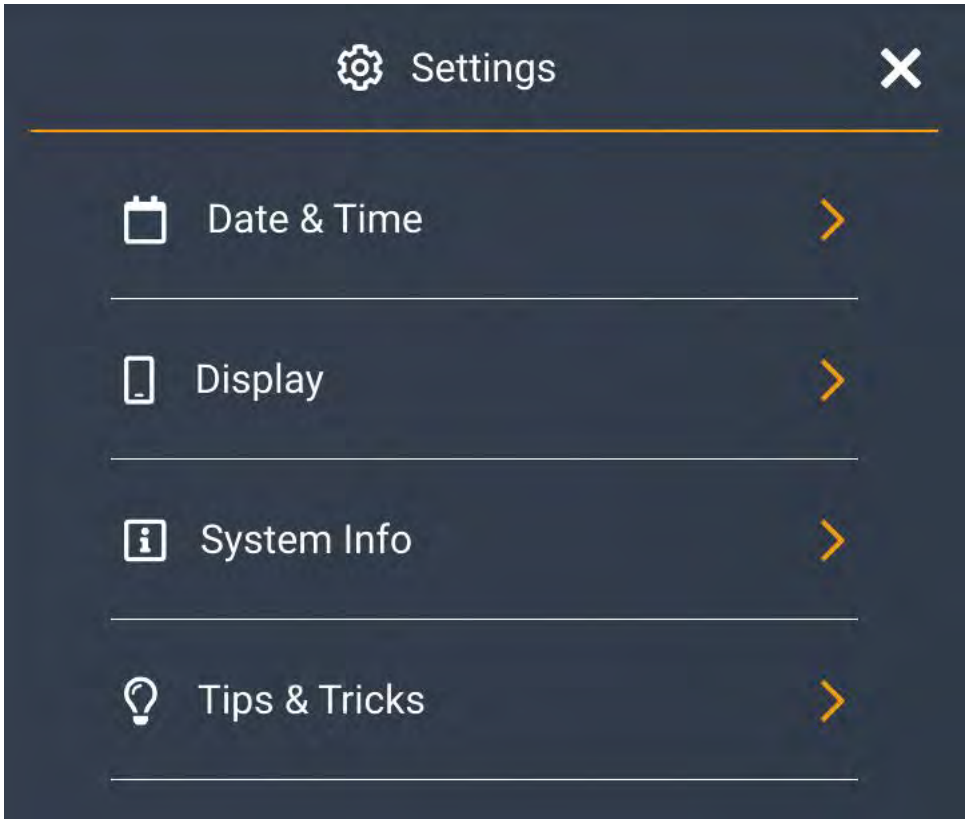


4.7.1 Settings

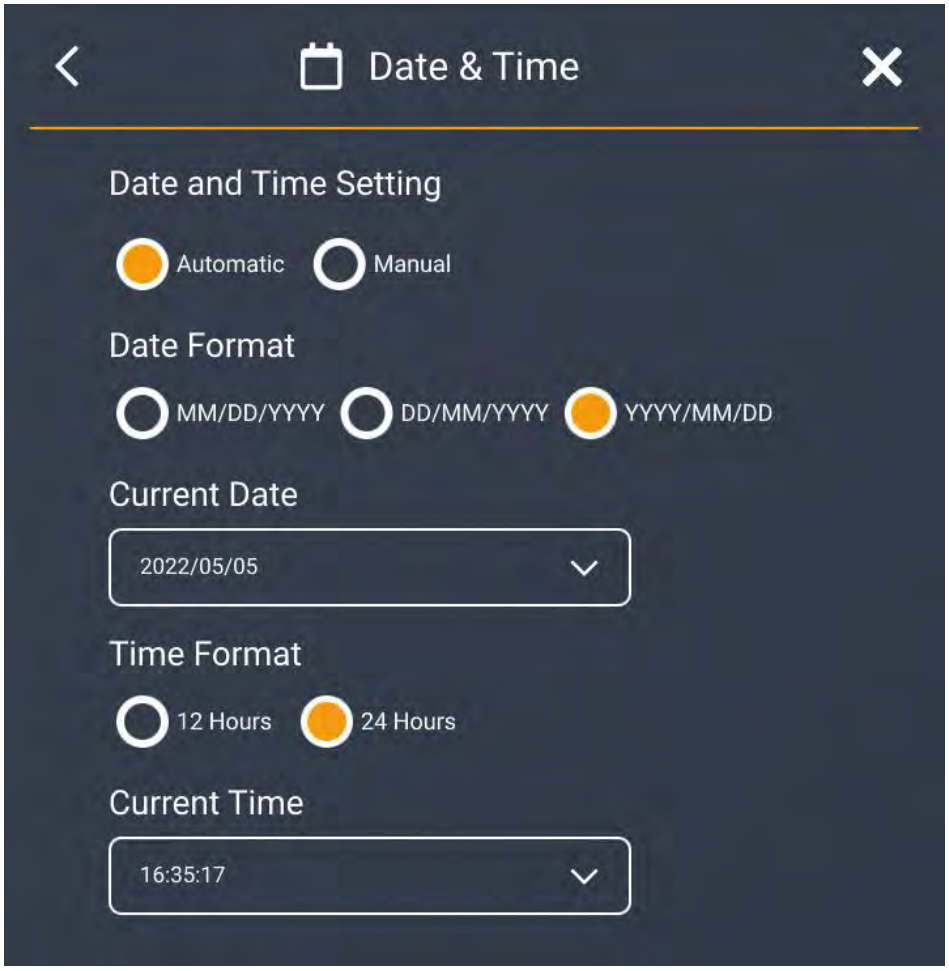
Tap 

to adjust the ‘Date & Time’, ‘Display’ settings, to reveal the ‘System Info’.

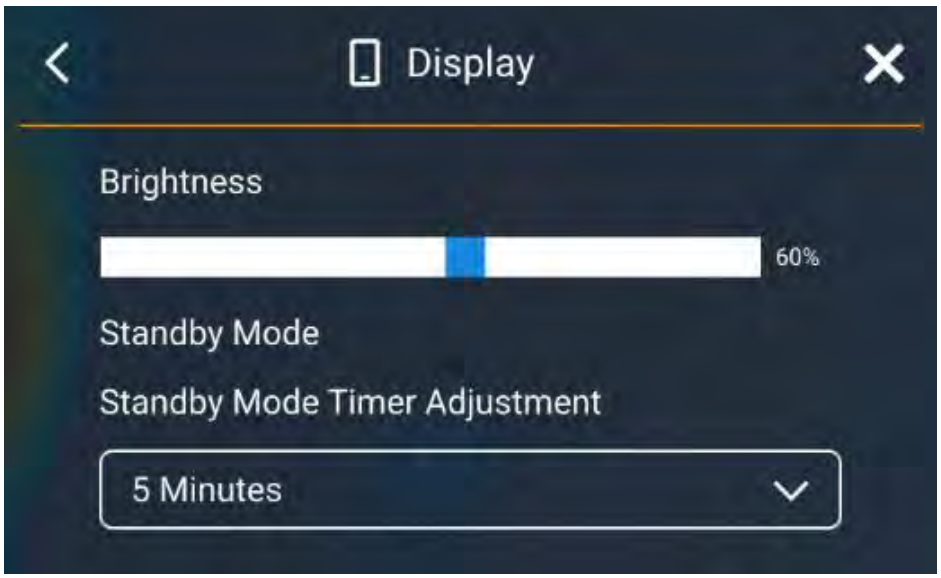
Also ‘**Tips & Tricks**’ can be viewed within this setting.



Date & Time Select ‘Date & Time’ to adjust the setting to ‘Automatic’ or ‘Manual’. For the ‘Automatic’ setting you need a connection to the internet.

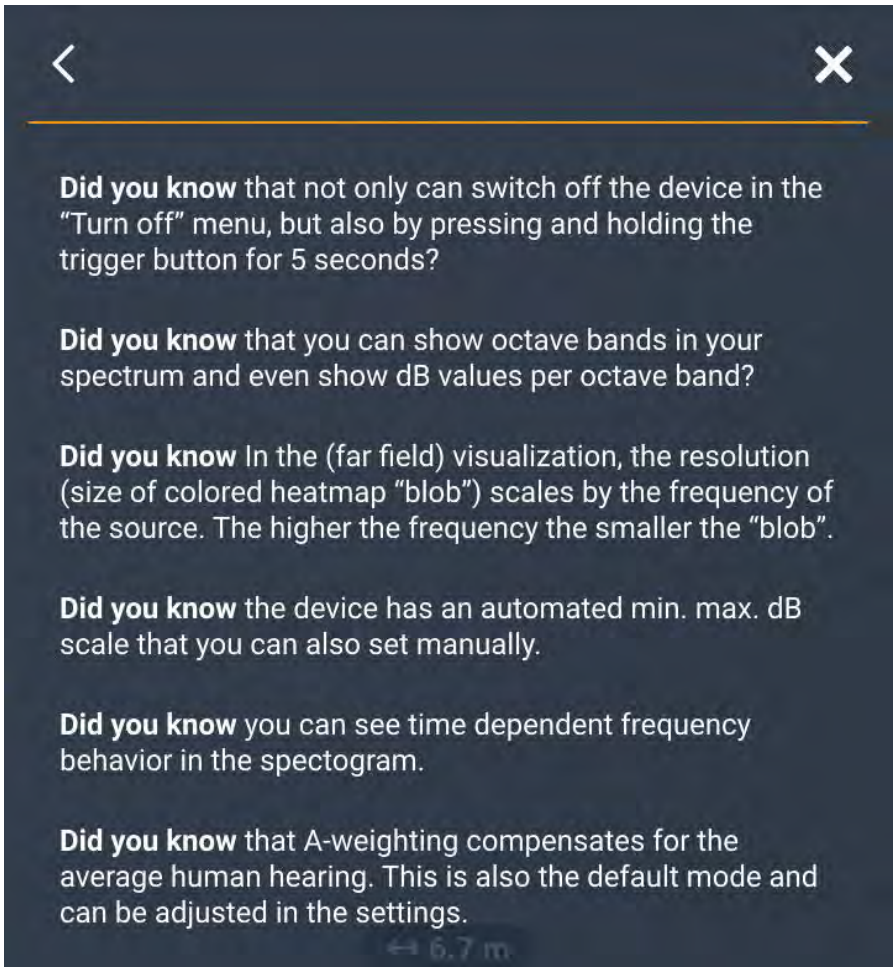


Display Select 'Display' to adjust the 'Brightness' of the screen. Less Brightness will save battery. Furthermore, the standby time can be set in the 'Standby Mode'. This is the time after which the device will automatically switch of after no activity has taken place on the device.

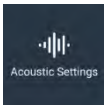


System Info Select ‘System info’ to view the ‘Firmware version’, ‘Installation date’, ‘Device name’ and ‘Device Serial number’.

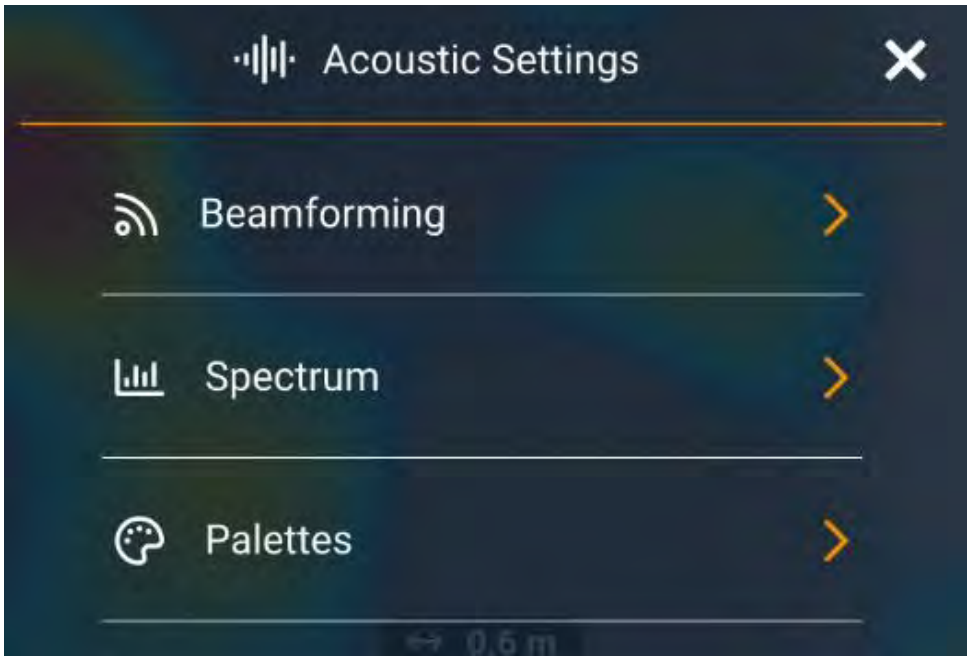
Tips & Tricks Select ‘Tips & Tricks’ to view tips and tricks that can be helpful for executing a measurement.



4.7.2 Acoustic settings

Tap 

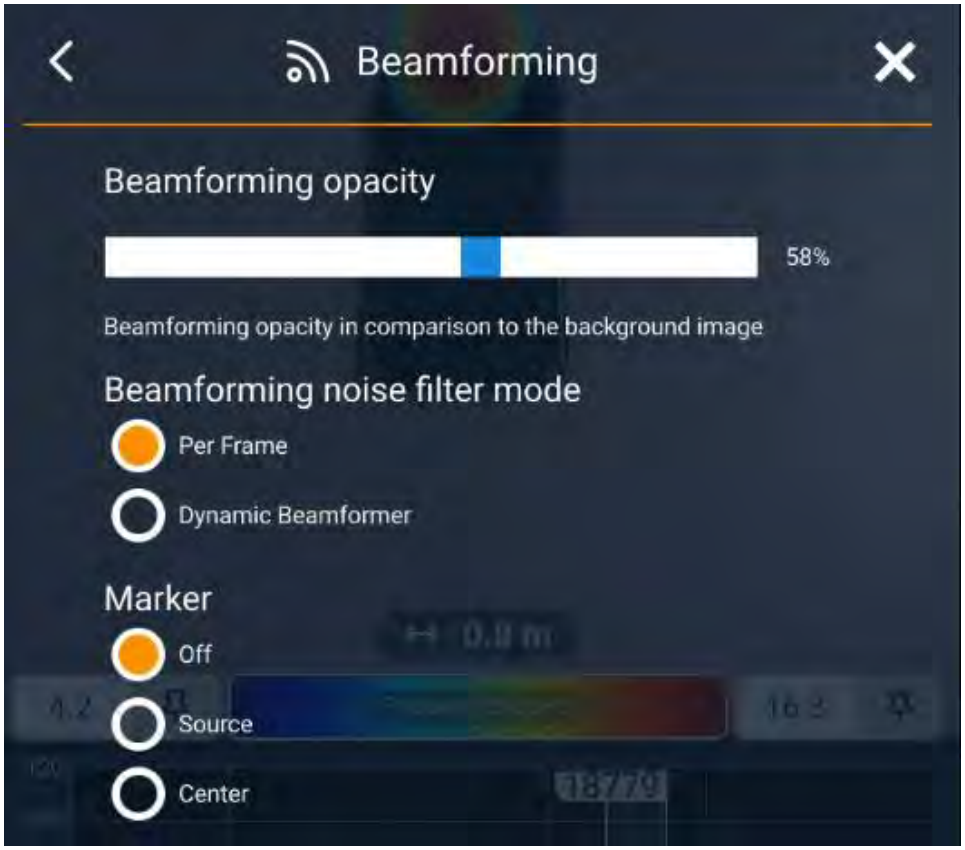
to adjust the acoustic settings for ‘Beamforming’, ‘Spectrum’ and ‘Palettes’.



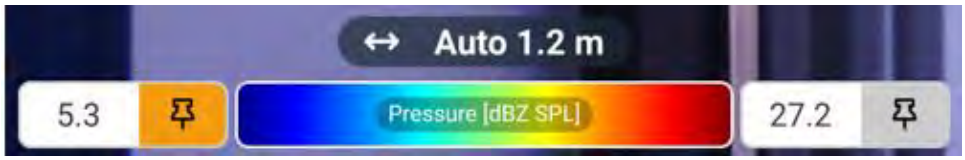
Beamforming Select ‘Beamforming’ to adjust the ‘Beamforming opacity’, to choose the noise filter mode ‘Per Frame’ or ‘Dynamic Beamformer’ and to add a ‘Marker’ showing an indication of the dB level (which is unweighted) at the marker point.

By default, the ‘Per Frame’ noise filter is selected, this is the most generic filter optimized for use for this camera.

The ‘Dynamic Beamformer’ noise filter is used for a single sound source detection and filters out unwanted background noise.

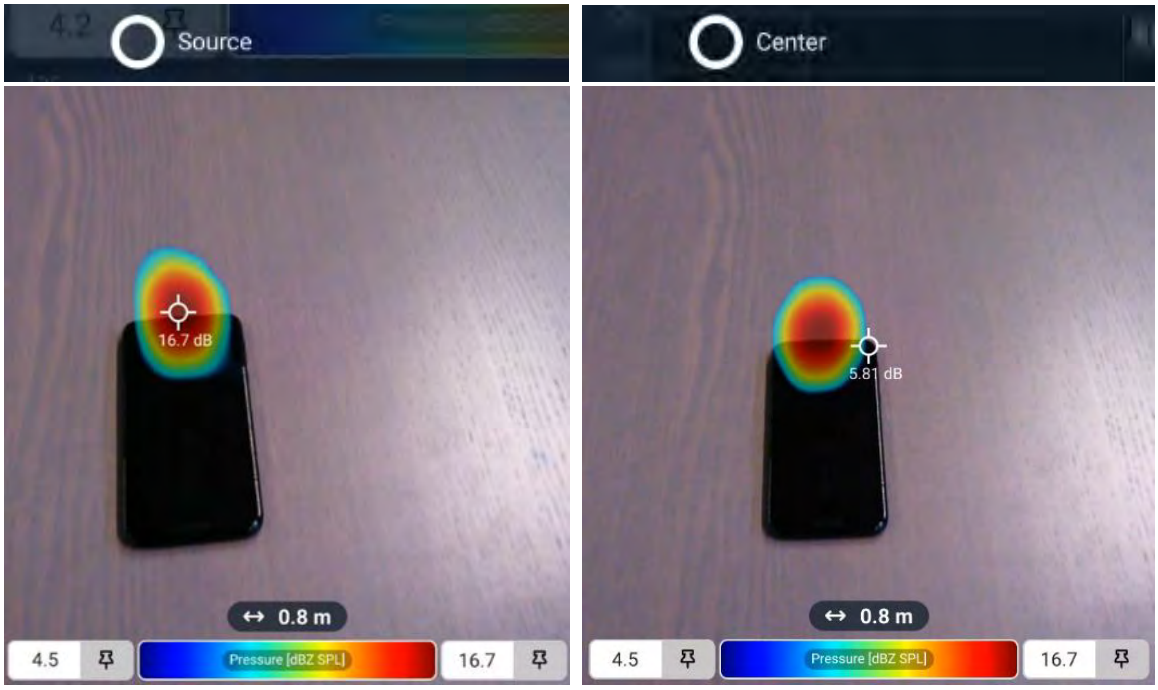


In addition, when the 'Dynamic Beamformer' is selected, the measurement distance will automatically adjust to the source location. If the 'Per Frame' is selected, the measuring distance needs to be adjusted manually in the home screen.

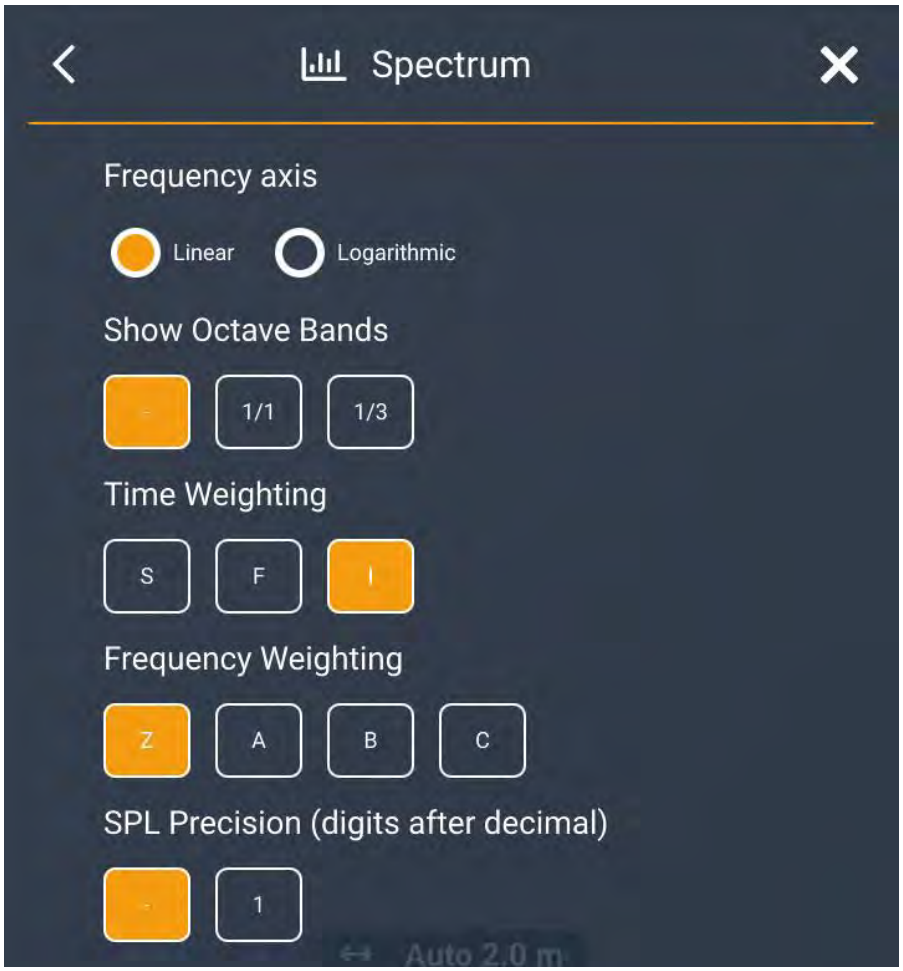


Tap  and tap  to type the preferred pressure manually.

By default, the ‘Marker’ is switched ‘Off’, which means no marker will be visible on the screen. A marker can be added by pressing on ‘Source’ or on ‘Center’. The ‘Source’ marker indicates the dB level at the target point that has the maximum dB value in the sound map.

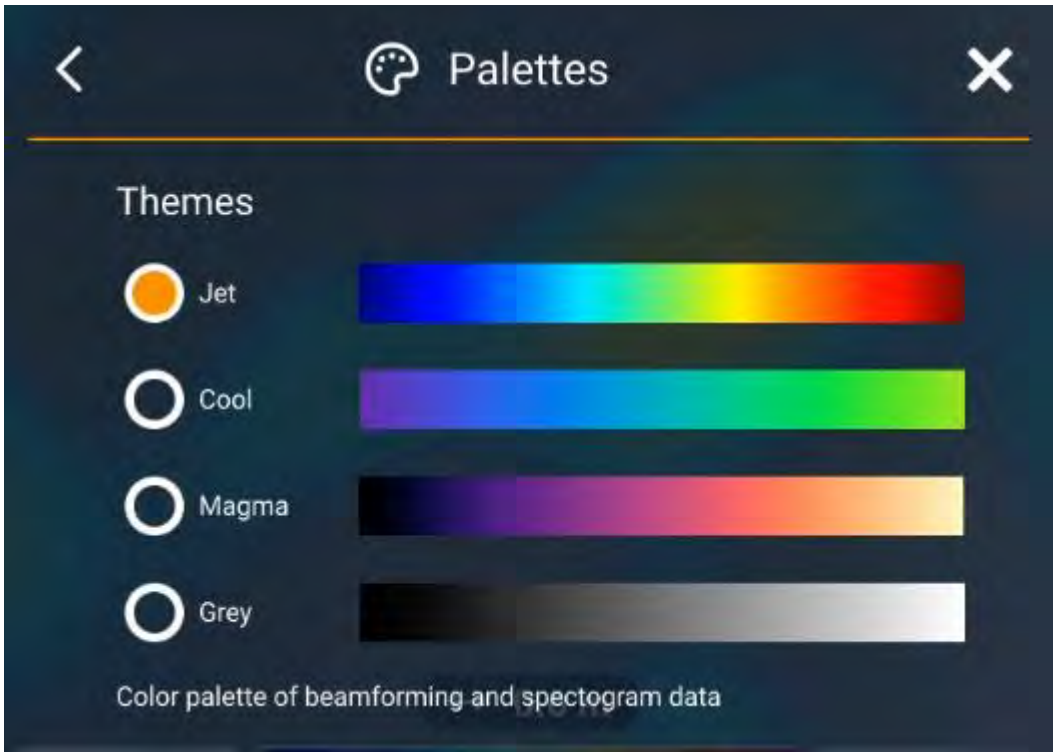


Spectrum Select ‘Spectrum’ to adjust the preferred specific acoustic settings, such as ‘Frequency Axis’, ‘Octave Bands’, ‘Time Weighting’, ‘Frequency Weighting’ and ‘SPL Precision’.



Palettes Select ‘Palettes’ to adjust the beamforming color scale, indicating the sound pressure level values of the beamformer.

By default, the ‘Jet’ color scale is selected, since this color scale is also used in the Sorama Portal. Other palettes consist of ‘Cool’, ‘Magma’ and ‘Grey’.



4.7.3 Special measurements

The CAM iV64 contains special measurement workflows that will support the user to perform measurements according to NEN/ISO standards. These include workflows for the Sound Reduction Index and the Reverberation Time. These special measurement workflows are paid features which can be temporarily made available but will eventually need to be purchased.

4.7.3.1 SOUND REDUCTION INDEX MEASUREMENT

The CAM iV64 contains a special measurement workflow for the Sound Reduction Index measurements. To select the format, first reveal the drop-down menu, by swiping down from the top.

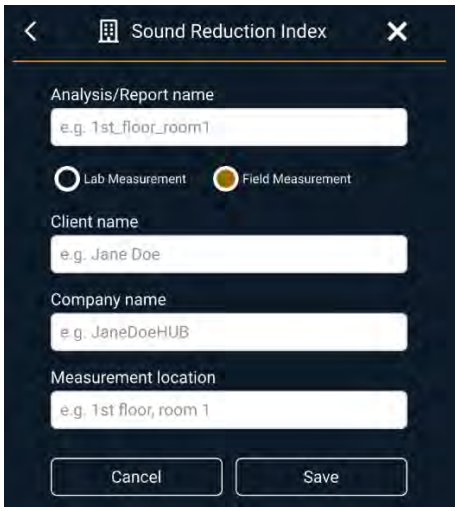
Step 1: Tap 

to reveal the special measurements format.

Step 2: Select the Sound Reduction Index.

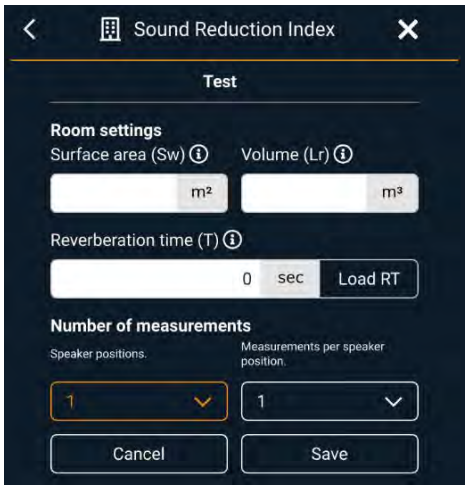
Step 3: Make a ‘New measurement’ or load results from an existing measurement in ‘View previous result’.

Step 4: When making a new measurement, tap ‘New Measurement’. The following screen will be displayed.



Create a project by entering the ‘Analysis/Report name’ and by choosing a measurement type. If ‘Lab measurement’ is chosen, the sound reduction index is denoted by R and if ‘Field measurement’ is chosen, the same index is denoted by R'. For further report purposes you can also input the ‘Client name’, the ‘Company name’ and the ‘Measurement location’. Tap on ‘Save’ to save the measurement or press ‘Cancel’ to stop.

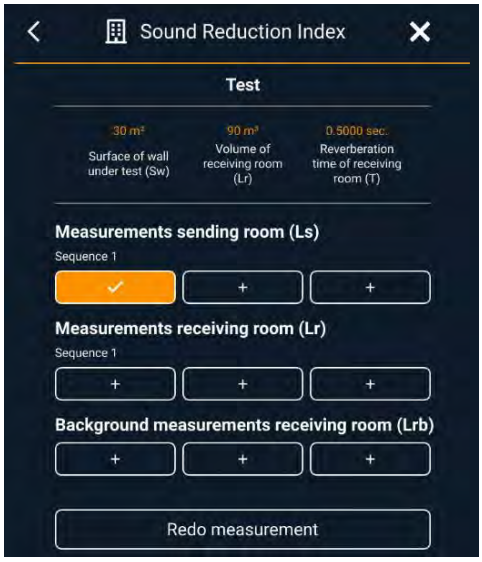
Step 5: Input for the room dimensions, the reverberation time and the number of measurements. The next screen shows the input project name at the top, in this case, ‘Test’.



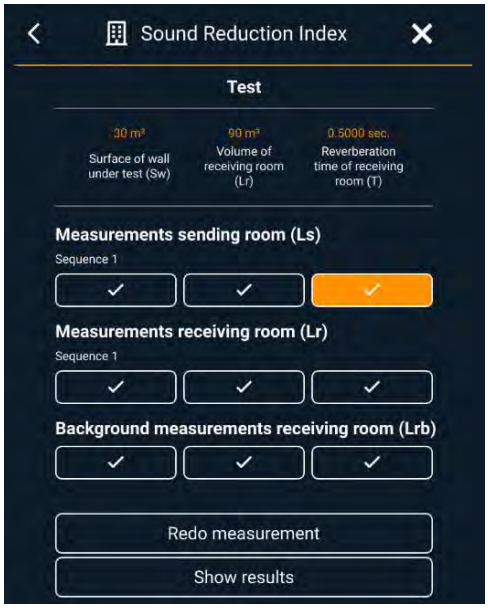
Enter the receiving room dimensions, the reverberation time of the receiving room, the number of speaker positions and the number of measurements per speaker position. The reverberation time can be loaded when you have performed a reverberation time measurement beforehand. This can be done by tapping the ‘Load RT’ button. Click on ‘Save’ once done.

Step 6: Perform measurements in the source room and receiving room.
The total number of measurements depends on the number of speaker positions and the number of measurements per speaker position you have given as input. As an example we have selected 1 speaker position and 3 measurements per speaker position. This would give us a total 9 measurements. The first row of measurements is to be performed for speaker position 1 in the sending room and the second row for speaker position 1 in the receiving room. The final row displays the background noise measurements which should be performed in the receiving room.

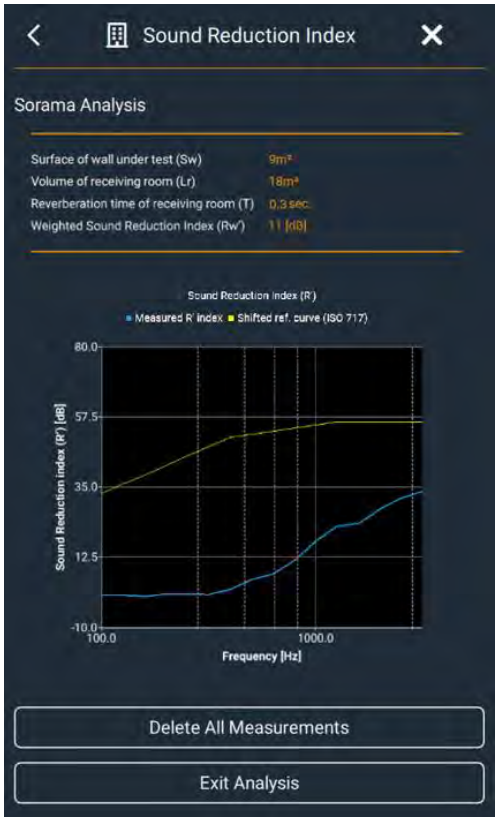
When one of the boxes is tapped, a button ‘Start measurement’ appears at the bottom. Click on ‘Start measurement’, and the 1/3 octave band values will be measured for 15 seconds and saved. After the measurement is finished, a checkmark appears on the box in place of +. If a measurement is already done, the user can redo the measurement if needed by tapping the box again.



Step 7: View results
After all the measurements have been performed, the button to ‘Show results’ appears. When the user clicks on this, the results are shown.

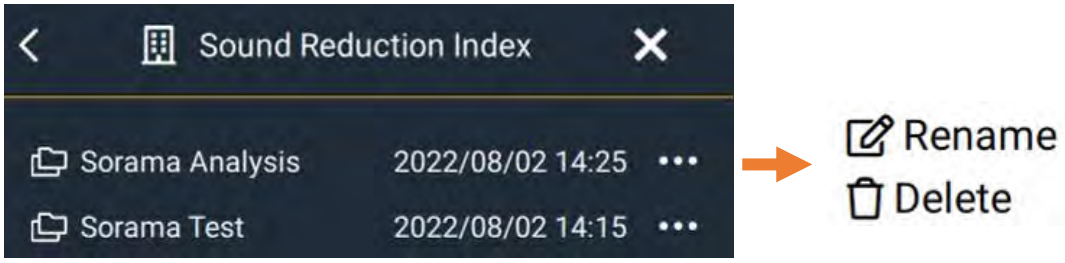


Tap on ‘Show results’ and the results will appear on the screen. An example is shown in the following picture.



View results from a previous measurement
When the user taps on ‘View previous result’ in step 3, the screen shows all the projects related to sound reduction index. Upon selecting a folder, the results of this measurement will be shown.

Previous measurements can be deleted by tapping on the three dots next to the measurement name and thereafter tap on the ‘Delete’ button. In the same way, measurements can also be renamed.

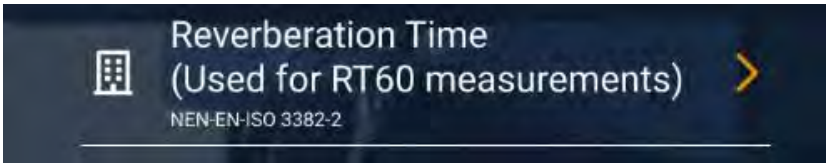


4.7.3.2 REVERBERATION TIME MEASUREMENT

The CAM iV64 contains a special measurement workflow for the Reverberation Time measurements. To select the format, first reveal the drop-down menu, by swiping down from the top.

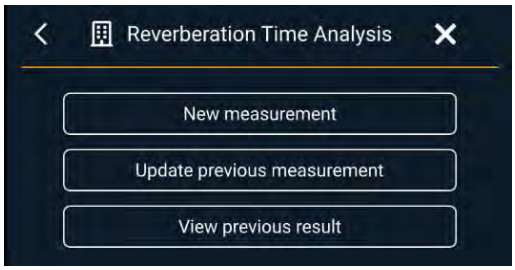
Step 1: Tap 

to reveal the special measurements format.

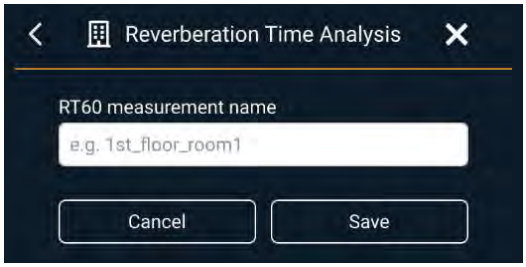


Step 2: Select the Reverberation time.

Step 3: Make a 'New measurement', change a previously performed measurement in 'Update previous measurement' or load results from an existing measurement in 'View previous result'.



Step 4: When making a new measurement, tap 'New Measurement'. The following screen will be displayed.



Create a project by entering the 'RT60 measurement name'. Tap on 'Save' to save the measurement or press 'Cancel' to stop.

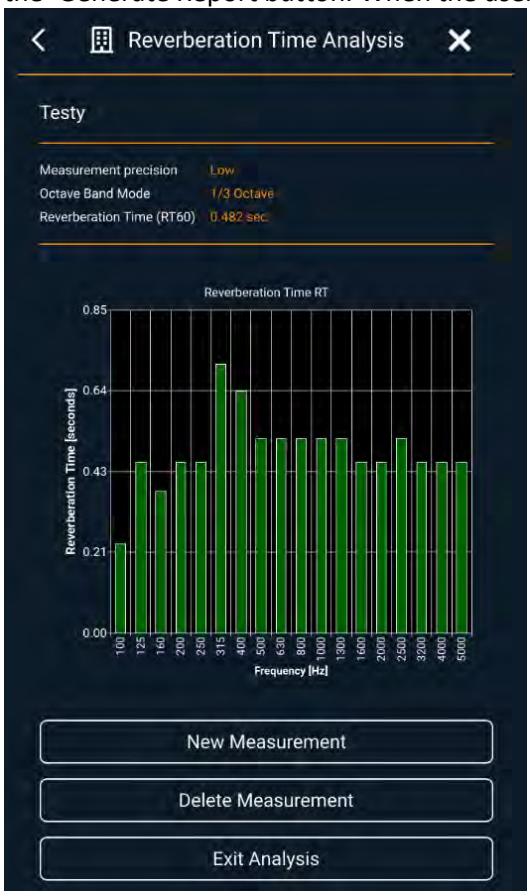
Step 5: Select whether you want to display the reverberation time measurement results in 'Octave bands' or in 'One third octave bands', by tapping on one of the circles next to the two options. The two options can be found below the 'RT measurement settings' header.

Afterwards, perform a background noise measurement by tapping on the 'New Measurement' button, which can be found underneath the 'Background noise information' header. The background noise measurement can be performed more than once. Whenever you have performed a background noise measurement and afterwards tap on 'Update measurement', an average 'Background noise level' of the two performed measurements will be displayed. The 'Current SPL level' will always display the sound pressure level of each individual background noise measurement.

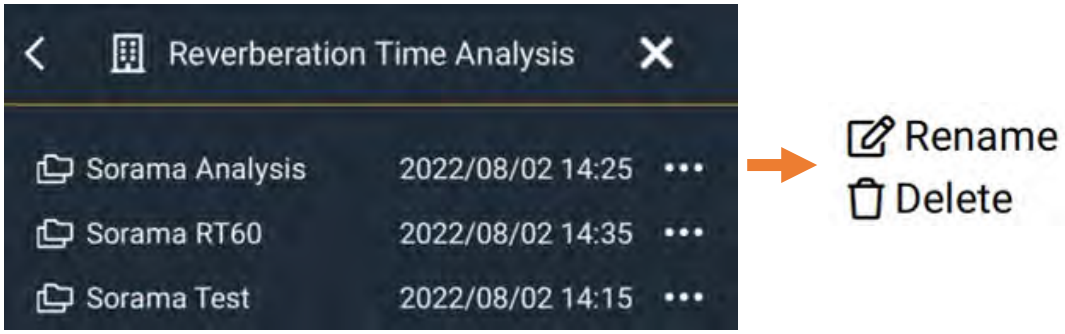
Subsequently, the reverberation time measurements can be performed. A measurement can be started by tapping on the ‘New Measurement’ button, which can be found on the bottom of the screen. Similar to the background noise measurements, the reverberation time measurement can also be performed more than once. Whenever you have performed a reverberation time measurement and afterwards tap on ‘Update measurement’, an average ‘Reverberation Time (RT60)’ of the two performed measurements will be displayed.

The ‘Status’ indicates whether a reverberation time measurement is active or not.
The ‘Precision’ indicates the precision of the reverberation time measurement(s) performed. Performing more reverberation time measurements will increase the precision.

Step 6: View results
After the desired number of reverberation time measurements have been performed, you can tap on the ‘Generate Report button. When the user clicks on this, the results are shown.



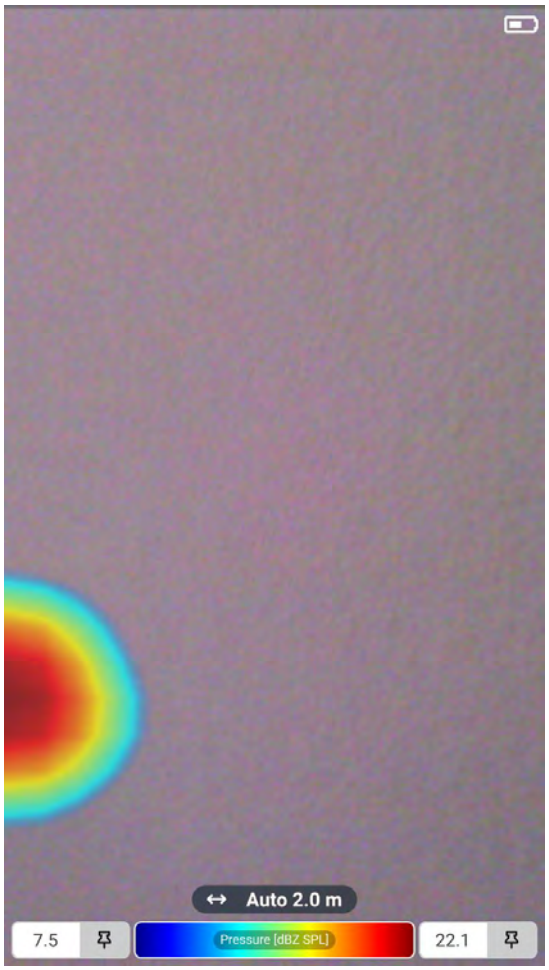
View results from a previous measurement
When the user taps on ‘View previous result’ in step 3, the screen shows all the projects related to airborne sound insulation. Upon selecting a folder, the results of this measurement will be shown. The user also has the option to change a previous measurement by tapping on ’Update previous measurement’. Previous measurements can be deleted by tapping on the three dots next to the measurement name and thereafter tap on the ‘Delete’ button. In the same way, measurements can also be renamed.



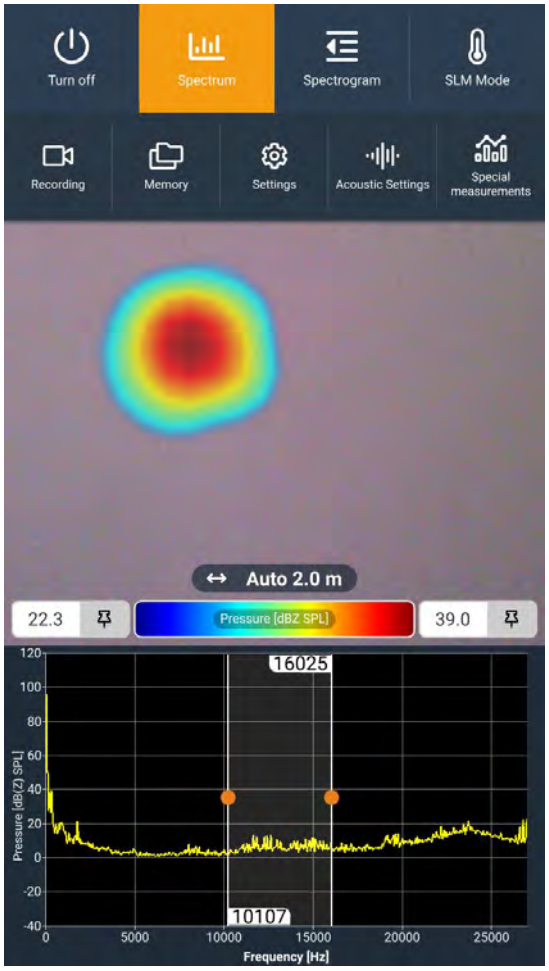
5 Operation

5.1 Basics

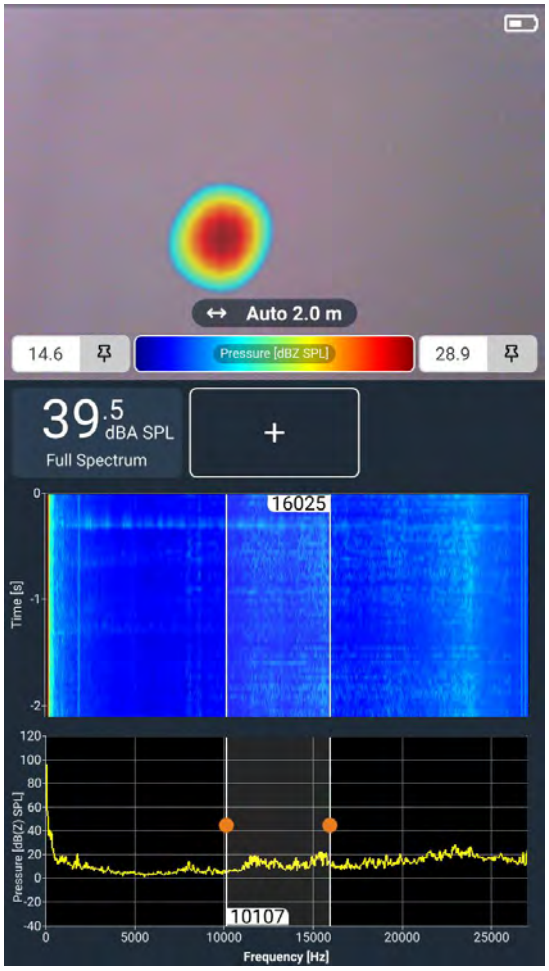
Power on the device by pressing the trigger button. A LED light, on the left side above the USB-C connector, will be activated when the device is powered on. It takes approximately 30 seconds to boot.



To show the menu, swipe down from the top. Tap to activate the spectrum feature.



The microphone data obtained by the microphone array can be shown on the screen for a specific frequency bandwidth. When the spectrum is visible in the display, the bandwidth can be selected by touching the orange dot and drag this dot to the preferred frequency. Execute this for the lower and higher frequency. You can also move the selected frequency band by touching it in the middle and drag it to the preferred area of the spectrum.
If you would like to view the spectrum, spectrograph and SLM mode simultaneously, you can tap the related icons. The spectrum, spectrograph and SLM mode are now visible on the screen.



If you want to perform and store a measurement, please refer to paragraph 4.6.5.

5.2 Mount CAM iV64 on a tripod

⚠ **Caution:** As the weight of the Product is heavier than normal cameras, choose a tripod that is steady and firm for the Product. Be aware of the balance before mounting the Product on the tripod. Sorama is not accountable for any damage or harm caused by misuse of a tripod.

A tripod stand with **¼" inch UNC camera screw** is needed for the Product.

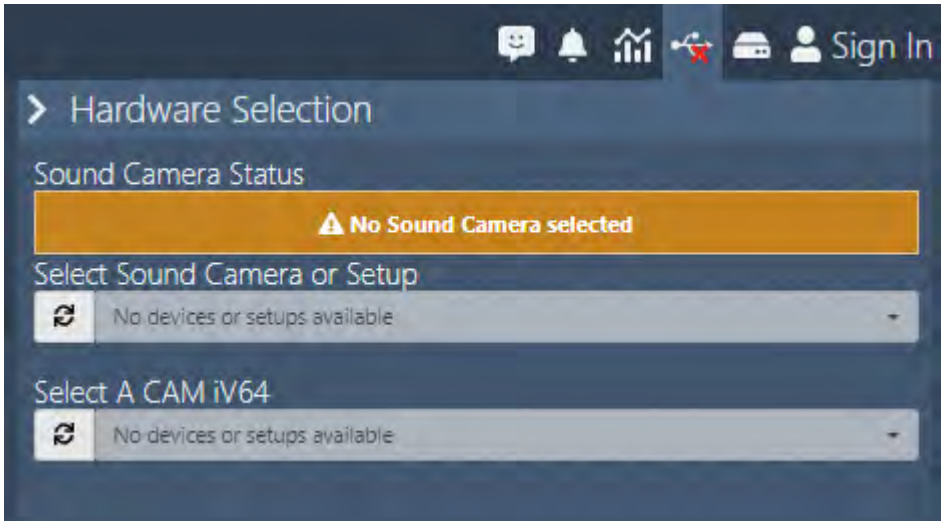
Adjust and secure the legs of the tripod accordingly before mounting the product. Place and mount the tripod under the bottom insert of the Product.

5.3 Sorama Portal

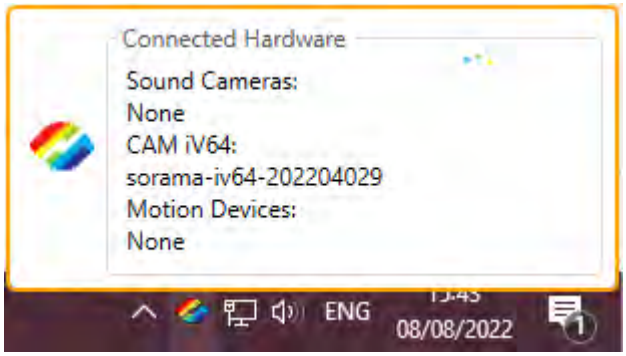
You can upload performed measurements, saved images and special measurement data in the Sorama Portal for in-depth analysis and digital reports generation.

When opening the Sorama Portal you will first need to select the Hardware selection icon  .

Afterwards you can select your connected CAM iV64 from the dropdown menu.



If you cannot find your CAM iV64 device, you can press the refresh button next to it.
Make sure you have downloaded and installed the latest version of the Sorama Acquisition Client.
When hovering over the Sorama Acquisition Client you can see the connected devices as shown in the example below.



5.3.1 Uploading measurement data to Sorama Portal

Your measurement data can be uploaded to the Sorama Portal. The Sorama Acquisition Client is required for this and can be downloaded from the Sorama Portal.
There are two options to upload the data.

1. Connect your CAM iV64 to your computer with the supplied USB-C cable.

   In the Sorama Portal visit the 'Manage' 

tab. If your CAM iV64 is connected properly, you will see a file structure of your recordings. From this view, you can download the measurements to your device, or you can import the measurements directly into your Sorama Portal account.

2. Use an external memory drive. By plugging this drive into the CAM iV64, you can either record directly to this drive or copy the files afterwards. Plug the external drive into the device on which you are visiting the Sorama Portal. In the "Manage" 

tab the "Import External Files" 

functionality allows you to drag and drop the .sor files from your external drive into the Portal.

5.3.2 Portal Analysis Modules

The analysis modules include Time-, Spectrum-, Spectrogram-, Far-field-, Directional- and Time selection analysis features.

5.3.3 Exporting measurement results from Portal

Once analysis is done in the portal, the measurement results can be exported as .CSV, .PNG, .JPEG, .MP4, .WebM video. Any analysis result that is bookmarked can also easily be exported into a full .pdf report.

6 Data Transfer

6.1 How to save the data and what is the format type?

The Product streams audio and video data continuously by default. A short press of the trigger button at the top of the Handgrip will start and save a measurement in a .sor format with a length of up to 30 seconds.

6.2 How to export measurement data?

Measurement data is stored in the Product's internal memory in a .sor file. It can also be stored on an external memory drive that can be connected via a USB-C port.

You can either export data from the external drive to a computer or connect the supplied USB-C cable from the device to your PC to download the data and further analyzed on Sorama Portal once it is exported.

If you want to export and upload measurement data to Sorama Portal, please refer to paragraph 5.3.1.

7 Firmware Update / Factory Reset

To keep the Product up-to-date and perform at its best, be sure to update your firmware when new versions are available.

When you have your CAM iV64 connected through USB, firmware updates and Factory resets are available through the Sorama Portal in the ‘Sorama Services’  tab. Whenever a new firmware version is available, Sorama will notify you in 'Connected Hardware' 

at the bottom of the 'services' tab. Click on 'Update' or 'Recover' 

for firmware updates or factory reset.

To update firmware/reset the Product:

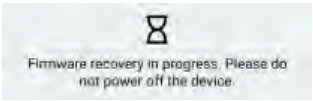
Use the USB-C cable included in the flight case to connect your Product with a computer. Make sure the cable is snapped into place during the update.

After the Product is synced, a firmware update/ factory reset request will show up in the device display.

Select Yes. The update/ reset is installed (may take up to 5 minutes) and the Product restarts.

Corrupted firmware on your CAM iV64:

In extraordinary cases (such as sudden loss of power) the firmware on the CAM iV64 can become corrupted. The CAM iV64 is able to detect when this happens and automatically triggers a firmware recovery to ensure that the device stays functional. The following notification will appear on the screen of the CAM iV64 when the firmware recovery is triggered. The firmware recovery process takes a few minutes to complete. During the process you should not power off the CAM iV64.



After the firmware recovery is complete, the CAM iV64 will return to an older version of the firmware. This can be recognized by seeing the notification on the screen as shown below. To regain the latest features, you must conduct a firmware update through the Sorama Portal using the workflow described above.

8 Maintenance

8.1 The imager

⚠ Caution

The imager does not require routine maintenance.
The optical surfaces of the lens are equipped with high-quality optical layers. Avoid any contact with these surfaces and protect these surfaces against dirt and damage.

8.2 The case

Clean the case with a clean, damp cloth. Do not use abrasives isopropyl alcohol, or solvents to clean the case or lens/window.

8.3 Acoustic sensor care

⚠ Caution

The imager has highly sensitive acoustic sensors. Do not expose the sensors to water or fluids, dust, and other contaminates. Accumulation of these in the sensor will affect the performance.

8.4 Environmental

The Product has electronic printed circuit boards. These components must be disposed of specifically when the device is at the end of its use.

The manufacturer offers to take back the Product from the customer to ensure that the device is disposed of in an environmentally friendly manner when it is at the end of its use.

Contact Sorama if you require more information.

8.5 Service

Contact Sorama for information.

8.6 Specifications

Complete specifications are at www.sorama.eu. See the CAM iV64 Product specifications.