



SoundCam product manual



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1 About these instructions

Read this manual carefully and follow the instructions given.

This will provide you with usable measurement results and ensure safe, reliable operation as well as a long service life of the device.

Keep the manual in a safe place. If you pass the device on, also give this manual with it.

The instructions for operating the SoundCam are based on the control via the integrated touch screen.

When connected to a personal computer, the functions can also be controlled via the PC application SoundCam.exe. Its user interface differs only slightly from the SoundCam touchscreen in terms of functionality. Where necessary, the manual points out deviating operating methods.

Marking symbols and notes



Warning - general danger!

Warnings that you must follow to avoid injury, personal injury and damage to property.



Warning - Danger due to electric current!



Attention!

Important information that you should follow to avoid damage to property, faults or malfunctions.



Useful information on the operation of the SoundCam and technical background.

1.1 Performance description

The SoundCam is a portable, stand-alone device. It is used to localise sound sources in a frequency range of up to **24 kHz (SoundCam)** or **100 kHz (SoundCam 2.0 & SoundCam Ultra)**. The sound is visualised as an acoustic image.

This can be interpreted and analysed on the device itself or on a computer.

- (1) Power supply unit
- (2) Recess for the tripod
- (3) Mains cable
- (4) Headphones
- (5) Carrying strap
- (6) Tripod accessories



Figure 1: SoundCam with carrying case (58 x 39 x 27 cm)



Figure 2: SoundCam Ultra with carrying case (51 x 43 x 19 cm)

1.2 Scope of delivery

The SoundCam comes with a matching power supply and power cord. A case containing headphones, strap and tripod (tripod not included with SoundCam Ultra) is optionally available.

2 Security

2.1 Intended use

With the unit in its original configuration and with the help of the installed proprietary software, you can locate sound sources indoors or outdoors. It is suitable for both commercial and private use.

2.2 General safety instructions

The unit is built according to the current state of the art and is safe to operate. Nevertheless, there are residual dangers. Read and observe the safety instructions to avoid hazards. CAE Software und Systems GmbH accepts no liability for personal injury or damage to equipment caused by failure to observe safety instructions.



Figure 3: Safe use - always be aware of your surroundings



Warning!
In case of improper use - danger due to electrical voltage!

- Do not open the unit, make any modifications or repairs to the unit, its components and accessories.



Attention!
Cleaning and storage.

- Always handle your appliance with care, follow the instructions in [Chapters 9 and 10](#)

Among other things:

- To clean, wipe the outer surface with a soft, lint-free cloth.
- Do not touch the diaphragm of the microphones. Do not clean the device with strong, aggressive, corrosive or solvent-based cleaning liquids.
- Do not clean with high-pressure cleaners or other machines. Do not clean with compressed air.
- Store the unit with charged battery in a dry and clean place.



Warning!
Safe use of the power supply unit!

- Use only power supplies that were purchased when your SoundCam was delivered or from CAE or authorised dealers.
- Only draw power from AC mains, not from other power sources such as inverters or generators.



Warning!
Damage due to improper handling of batteries, risk of explosion!

- The unit contains a rechargeable battery. To avoid personal injury, damage to property and the environment, do not remove it. Avoid damaging the battery with sharp objects or disposing of it in a fire.
- Do not expose the unit to direct sunlight for long periods of time.
- Battery replacement by the user is not intended. If you see the need for replacement, contact your CAE partner.



Caution!
Trip hazard!

- When setting up experiments, ensure that cables are laid securely.
- When using a tripod, ensure a safe stand on solid ground and do not leave the unit unattended



Warning!
Mindfulness prevents injuries!

- When using the SoundCam in a non-stationary position, always be aware of your surroundings, especially car traffic and terrain conditions.
- The SoundCam is not a toy. Only allow children to operate the device under the supervision of knowledgeable persons.



Warning!
Areas subject to explosion hazards!

- Do not use the unit in areas with explosive atmospheres (such as fuel and chemical storage areas or areas where the air contains chemicals or particles, such as fine dust or metal powder).



Caution!
Malfunctions due to heat accumulation!

- The device may become warm during normal use.
- If possible, place your device on a stable work surface that allows sufficient air circulation under and around the device.
- Do not cover the device with pillows, blankets or any other soft material. This may block the airflow, causing the unit to overheat.

3 Controls

3.1 Hardware

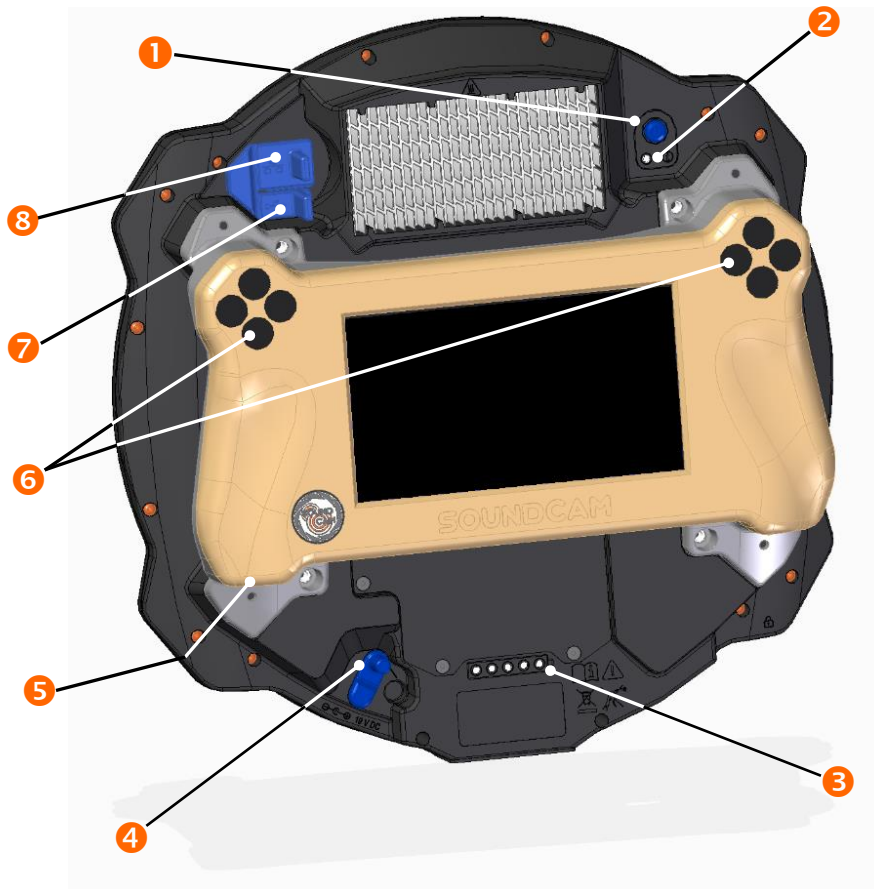


Figure 4: Controls of the SoundCam and SoundCam Ultra



- (1) On/off switch
- (2) Status-LED
- (3) Battery level indicator
- (4) Power connector
- (5) Headphone jack on the bottom of the handle
- (6) Function keys - user-definable in the settings menu
- (7) USB-port
- (8) Ethernet port

3.2 Software

3.2.1 Start menu of the SoundCam

Start the SoundCam by pressing and holding the on/off switch for at least 2 seconds. A green flashing of the status LED indicates that the system is booting.

After booting completed this menu is displayed:

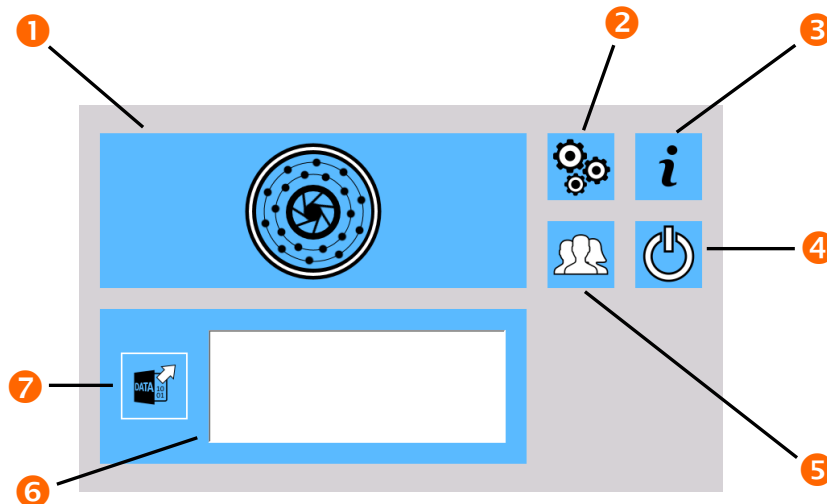



Figure 5: Start menu

- (1) Switch to main menu
- (2) Make settings
- (3) System information and update
- (4) Switch off the unit
- (5) Profile settings
- (6) Display / select stored measurements
- (7) Open measurements

From the other menus, you can return to the previous menu at any time by pressing the

 – Button.



To switch off the unit, press and hold the on/off switch until all LEDs of the charging indicator have gone out

You will find an overview of the settings menus (2) in the chapter **The Settings Menu** on p. 36

3.2.2 SoundCam as a PC application

The functions of the SoundCam can also be controlled via the SoundCam.exe application on a PC.

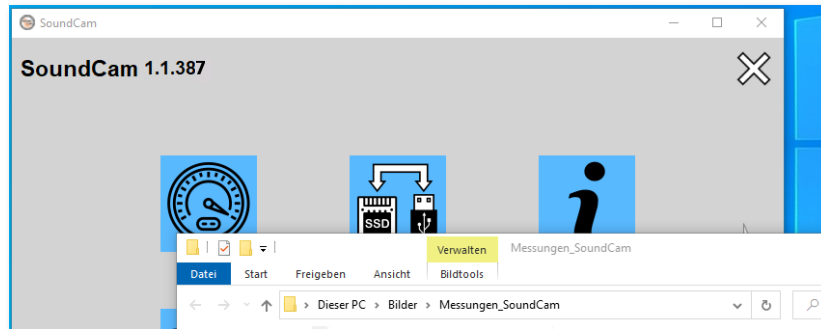


Figure 6: Windows user interface - example section

Data transmission with self-defined path

Data from measurements with the SoundCam can be stored in any location from within the application.

With the PC application, measurements with a duration longer than 60 seconds are possible.

Via the Ethernet interface and with the help of the SoundCam application, the SoundCam can be connected to any computer in your local network.

The PC version of the SoundCam is intended for use with a Windows operating system.

- o Download the .zip archive of the PC software from the website www.cae-systems.de/en/soundcam-owners.html.
- o Unpack the archive at your preferred storage location.
- o Start the file SoundCam.exe (for example via Windows Explorer).



If the application cannot connect to the SoundCam, make sure that the communication is not blocked in the firewall. Windows 10 usually indicates this with a message when the application is called up. Configure the firewall setting accordingly or contact your system administrator.

How to connect the SoundCam to the PC is described in **chapter Connecting to a PC** on **page 42**.

4 Perform measurements

A sound source is to be localised.

1. Call up the main menu via the button (1) in the start menu (illustration 4):

Basic functions:

Start measurement
(Wait for activation)

Screenshot

Set marker

Open
measurements

Save measurement

Turn lighting on/off

Playback

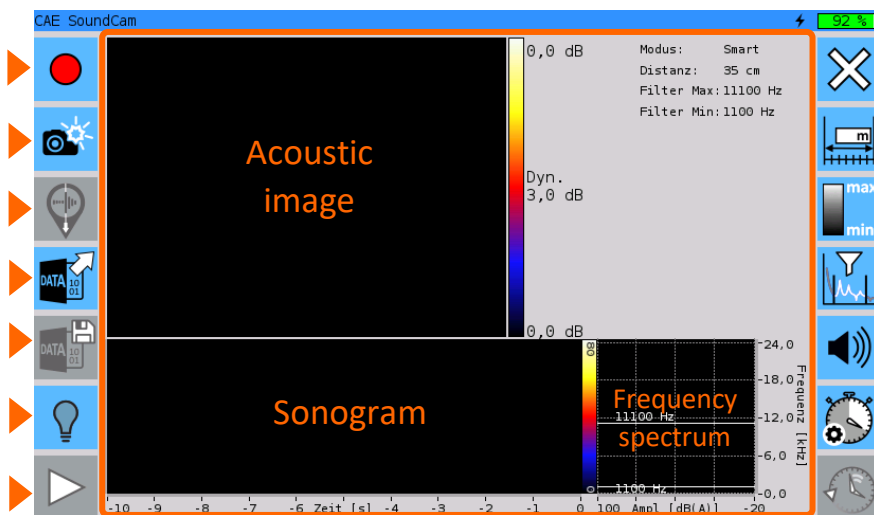



Figure 7: Main menu

Display range

The SoundCam is ready to record when -  Button (start menu) in the side menu is filled in red.

2. Touch this to start a measurement.

The acoustic image and the graphic representation of the continuous spectra appear in the display area.



Figure 8: Selection of the operating mode.

If you have an ultrasound-capable SoundCam (SoundCam 2.0 / SoundCam Ultra), you can long-click (Windows: right-click) on the "Start measurement" button to open a context menu (see Figure 8) in which you can select the measurement mode.



Measuring range up to 24 kHz.



Measuring range up to 100 kHz.

End measurements

To stop the measurement, touch 

The recorded measurement is now available for analysis (see "Analyse measurement", p. 24). To do this, press the playback button that is now activated in the left side menu.

Before your next measurement, remember to save the completed measurement so that you can view it again later (see "Save measurement", p. 23).

4.1 Settings

It is worthwhile to make some situational settings on the unit to get good results quickly. These settings can be made before or during the measurement.

The following pages describe in detail the settings that you can access via the buttons on the right-hand side of the screen (see Figure 9).

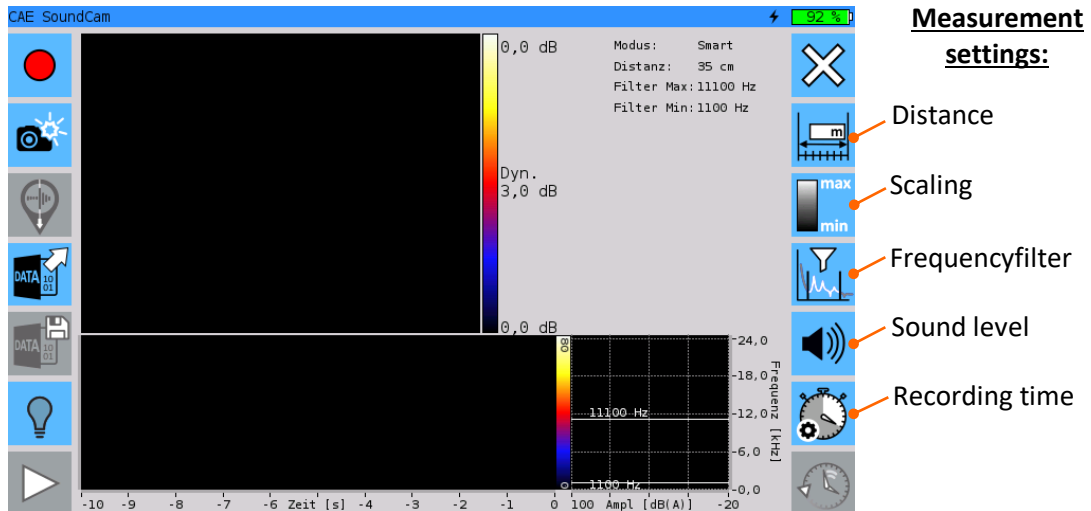


Figure 9: Setting options on the main menu



Setup optimisation: Even with usually small dynamic ranges used for visualisation, reflections of sound waves can become visible as a sound source in the acoustic image. See Figure 10. If the reflections are not the subject of the measurement, take care to dampen reflecting surfaces in the field of view.

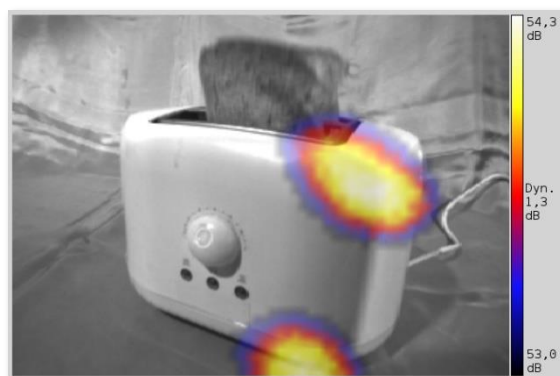
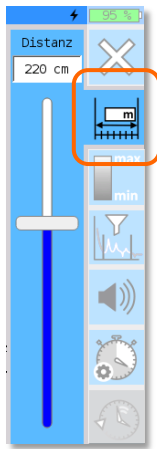


Figure 10: The noise originates from the side of the enclosure. The signal registered at the bottom of the picture is sound reflected from

4.1.1 Distance

For this as well as for all other settings listed in this section, you will find the respective button in the right-hand side menu.



1. Tap the Button
2. Set the distance to the sound source using the slider in the drop-down menu.
3. The slider must be released, only then is the value set.

Or:

1. Tap in the field above the slider and enter the value using the virtual keyboard that appears.
2. Press „Enter“. The minimum settings is 10 cm.



If the origin of the sound is unknown, a setting of 100 cm (factory setting) or above is not critical.

Only for more precise location of an identified source at close range do you have to adjust the distance setting.

Changes to the setting are not possible in the analysis after the measurement has been completed.

4.1.2 Scaling

Three different modes are available.

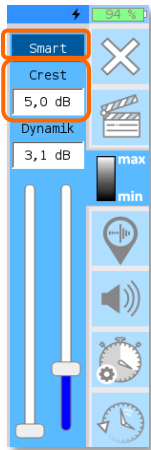
Tap on the blue highlighted field (1) in the drop-down menu to change the scaling mode. The modes change cyclically.



- Scaling mode „Auto“

The sound source that produces the strongest level in the set frequency band (see **Frequency filter**, p. 15) is shown. The image area with the highest level is assigned the colour white, the level at the lower limit of the set dynamic range a dark blue.

In a complex acoustic environment, adjust the dynamic range setting for selective localisation. Here, the use of the "Smart" scaling mode can also be advantageous.



- Scaling mode „Smart“

Smart mode provides suppression of background noise that would result in a diffuse image.

The level of background noise is determined continuously. Raised by the "crest value" - adjustable between 5 and 15 dB in the drop-down menu - the result is the dynamic threshold value.

If the level exceeds the dynamic threshold value, the acoustic image is displayed according to the set dynamic range, as in the "Auto" mode. Otherwise, the dynamic threshold is interpreted as the maximum level.

Subtracting the set dynamic range results in the threshold below which the signal is not visible in the acoustic image.

Compare the signals Q1 and Q2 in the graph (Figure 11).

Ensure that the dynamic range shown does not extend into the background noise, the crest value should always be greater than the dynamic value.

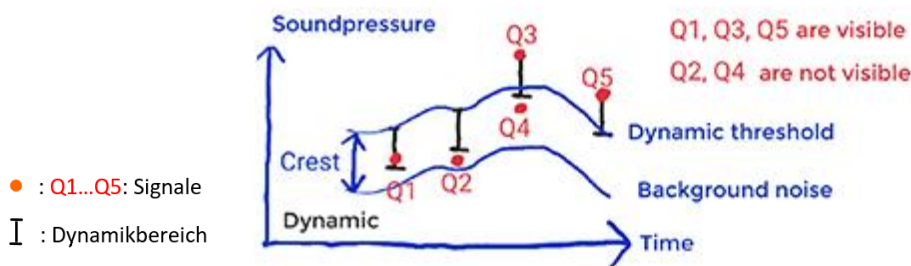
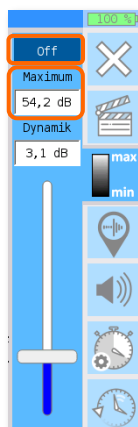


Figure 11: Scaling in smart mode



- Scaling mode „Off“

This mode allows comparative measurements with a reference level. If the user has not set a value for the maximum, it is determined automatically.

Running measurements:	Maximum = Maximum value of the last 10 seconds.
Sonst:	Maximum = maximum value of the entire measurement.

You can change this value by making an entry in the "Maximum" field.

A favourable initial value can also be determined from a stored measurement.

Changes to the scaling mode and dynamic range are also possible afterwards when analysing the measurement results.

4.1.3 Frequency filter

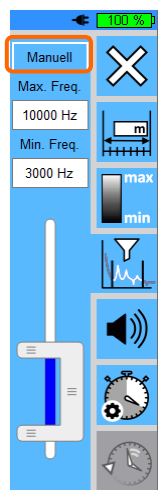


Figure 12: Manual frequency selection

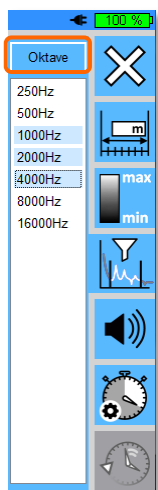


Figure 13: Frequency selection (octaves)

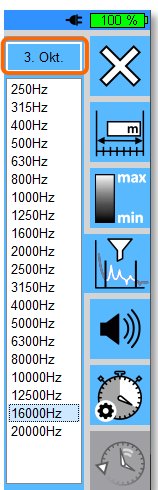


Figure 14: Frequency selection (third-octaves)



Lower selectivity when low frequencies are set.
The condition for the development of low-frequency noise components is a larger radiating area. The resulting large colour area can cover several high-frequency noise sources that could possibly be located more precisely.
The lower slider is highlighted in red at a setting below 1 kHz to make this clear.
In new measurements you can adjust the frequency filter step by step to achieve a satisfactory selectivity.

The button at the top left (see Figure 12 - Figure 14) switches between different methods for entering the minimum and maximum filter frequency:

Manual:	Adjusting the filter frequencies with the slider. If you hold the frequency slider (see Figure 12) to the left of the centre, you can adjust the upper and lower cut-off frequencies separately. If you touch the slider to the right of the centre, you can change the upper and lower cut-off frequencies together and at the same time while maintaining the relative distance between the minimum and maximum filter frequencies. Alternatively, the desired frequencies can also be entered directly into the fields above the slider.
Octave filter:	The minimum and maximum filter frequency can be set by selecting one or more frequency bands directly following each other (see Figure 13 and Figure 14).
Third octave filter 1/3 octave filter:	

Changes to the setting are not possible in the analysis after the measurement has been completed.

4.1.4 Recording time



Here you set the maximum recording time for your measurement.

- **Select a recording time of 10, 30 or 60 seconds.**

The measurement data is only stored permanently after the save function has been activated (see **Save measurement**, p. 23).

Note that the time required to save or open a file increases proportionally to the set recording duration.

When using the PC application, longer recording durations (up to 180 s) are possible.

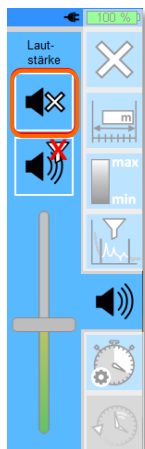


The capacity of the internal memory of 32 GB is sufficient for about 400 recordings with a duration of 10 s, 80 recordings of 60 s, or 25000 screenshots.

4.2 Listening - focused sound

In addition to visualisation in the acoustic image, you can use the audio output of the SoundCam. This is a suitable method for localising a known sound in a complex acoustic environment.

Here, the focus is on the center of the acoustic image, and the surrounding sound is suppressed (local sound).




Connect headphones. The socket is located on the device on the underside of the left handle (see **Figure 4**, p. 8).



Warning!

- Excessive sound pressure can cause hearing damage. You should only use the headphones at high volume for short periods of time and otherwise set an appropriate volume.

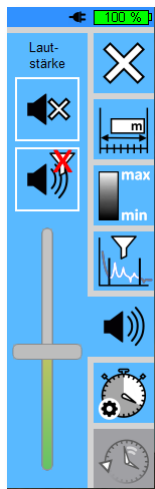
- i. If  is displayed in the menu, the output is muted. **This corresponds to the factory setting of the SoundCam.**





1. Touch this button.
2. Now adjust the playback volume with the slider.
3. With the measurement running, point the SoundCam at the object to be measured and „scan“ it.



Extensive calculations take place. Therefore, the audio signal is output with a slight delay.

Further setting options:



	Audio output is activated.
	Audio output is disabled.
	The audio output and the local spectrum are filtered according to the set minimum and maximum frequency (see Figure 15).
	The audio output and the local spectrum are not filtered . (see Figure 16).

The **global spectrum** is the unaveraged, A-weighted spectrum of the raw signal from a single microphone (microphone 0).



The **local spectrum** is the unaveraged, A-weighted spectrum of the delay and sum beamformed noise signal focused on the centre of the display (local / focused sound, corresponding to the audio output).

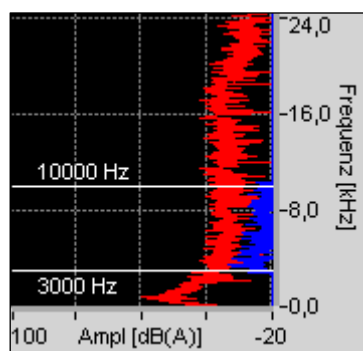


Figure 15: Local spectrum filtered

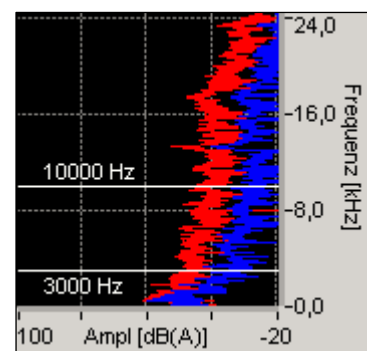


Figure 16: Local spectrum unfiltered

4.3 Triggering recordings (self-timer)

This function enables the SoundCam to automatically save sections of these measurements while the measurement is running. You can configure the trigger yourself.

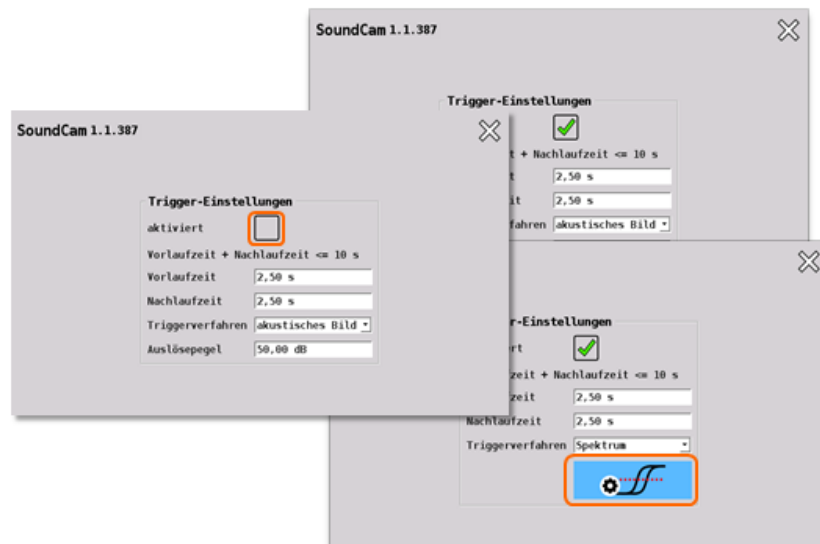


Figure 17: Settings menu for the trigger

Trigger method „acoustic image“

Parameters:

Pre-trigger time	The period before the trigger point that is covered by the recording.
Post-trigger time	The period after the trigger point that is covered by the recording.
Trigger level	Limit value above which the trigger is released. Please note that you are working with the acoustic image as the trigger. Accordingly, the trigger can only react to events within the minimum and maximum filter frequency.

The trigger is activated as soon as the trigger level entered in the dialogue box (see **Figure 17**) is reached or exceeded during the measurement.

A marker is then automatically set to mark the event in the measurement.

As soon as the follow-up time has elapsed, the section of the measurement given by the trigger time plus the **pre- and post-** time is automatically saved.



The appropriate trigger level for the application can be determined, for example, with the help of a previous measurement.

Trigger method „Spectrum“

With this triggering method, the spectrum serves as the trigger.

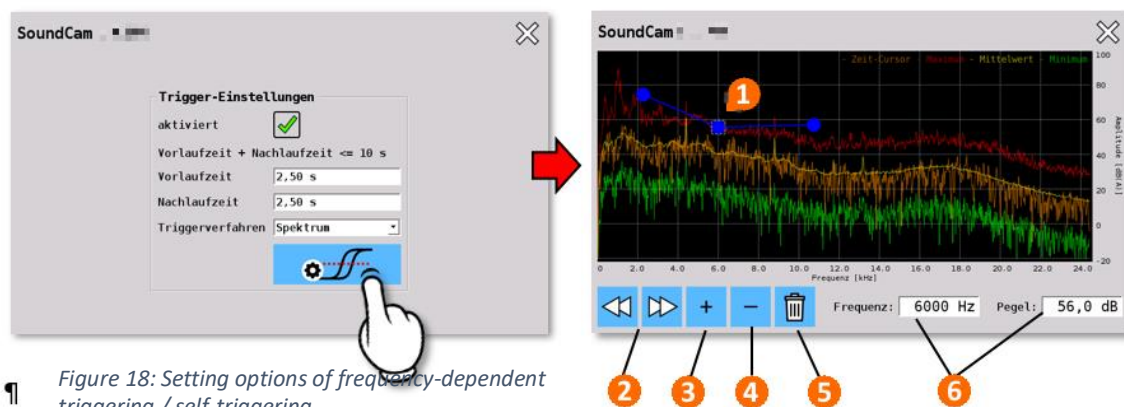
In contrast to the triggering method acoustic image, where a single trigger level is sufficient, several trigger points (trigger level / frequency) are defined for the triggering method spectrum.

A reference spectrum is generated from these reference points.

The trigger is activated as soon as at least one value of the current spectrum is greater than or equal to the corresponding value in the reference spectrum.

A marker is then automatically set to mark the event in the measurement.

As soon as the post time has elapsed, the section of the measurement given by the trigger time plus the **pre- and post** time is automatically saved.



Set the desired values for frequency and level by tapping in the spectral diagram.

The last measurement or the currently loaded measurement is displayed.

The individual **curves - time cursor, maximum, average and minimum** - can be shown or hidden by tapping the legend entry of the same colour at the top right of the screen.

When tapping a point in the diagram, the fields for frequency and level (6) take on its values. The values can also be entered manually in the fields.




By pressing the button— **+** (3) the values are entered as interpolation points in the trigger curve.

By tapping on a grid point (1), you select it. You can also use the direction buttons (2) to switch between grid points and view their values. By dragging on the touch screen or changing the values (6) you change them.

Pressing the **-** button (4) removes a previously selected interpolation point, (5) irreversibly removes all previously entered interpolation points.

Return to the start menu to apply the trigger (self-timer) to the measurements.

Brief overview for the trigger method Spectrum.

Pre-trigger time	The period before the trigger point that is covered by the recording.
Post-trigger time	The period after the trigger point that is covered by the recording.
+	Adding the current coordinates (frequency / level) as marker point.
–	Removes a previously selected marker point.
	Select the previous marker point.
	Select the next marker point.
	Delete all markers.
Time cursor	Show/hide the spectrum in which the time cursor is currently located.
Maximum	Show / hide the maximum curve. This curve is based on the last measurement.
Mean value	Show / hide the mean value curve. This curve is based on the last measurement.
Minimum	Show / hide the minimum curve. This curve is based on the last measurement.

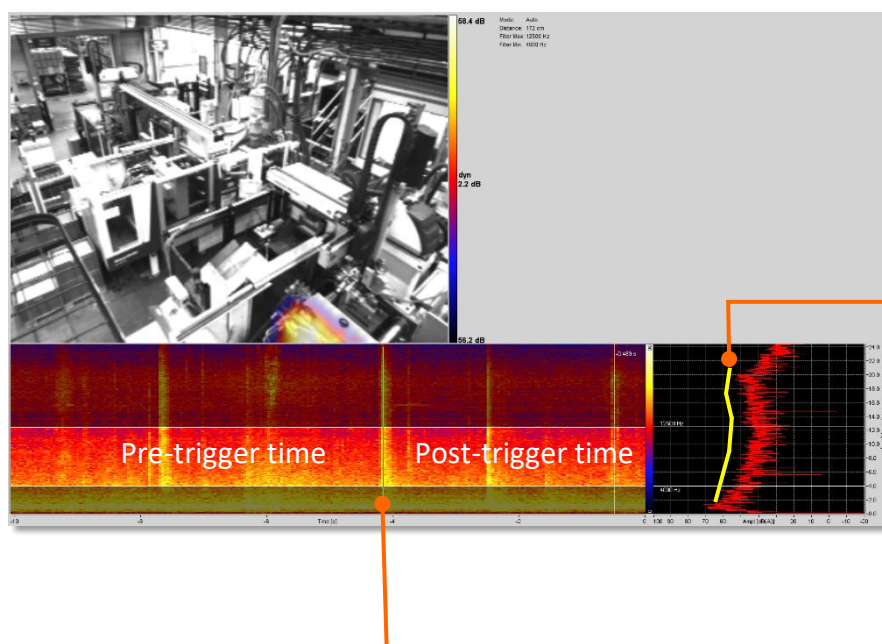


Figure 20: Display area for triggering via spectrum - the SoundCam triggers on the switching of a valve because the spectrum (red) exceeds the trigger line (yellow)....

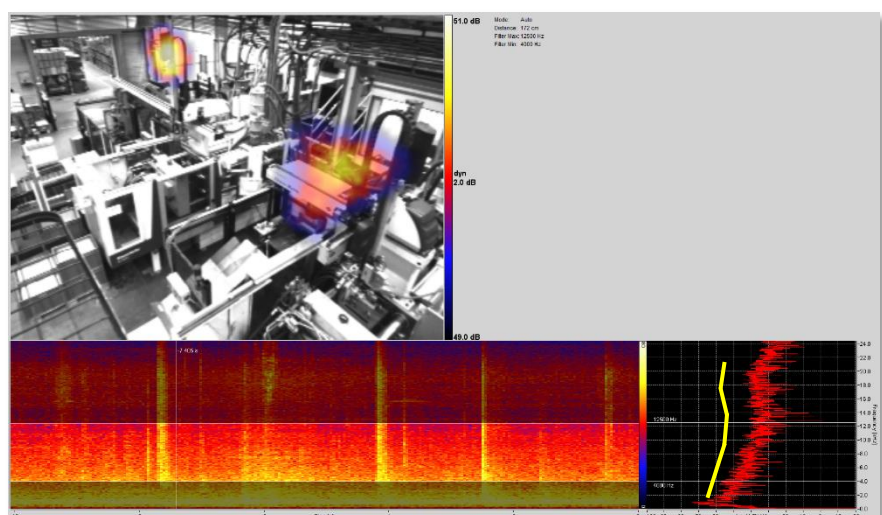


Figure 19: The SoundCam has not yet triggered - no frequency line of the spectrum (red) exceeds the trigger line (yellow).

4.4 Long-term measurement (LTM)

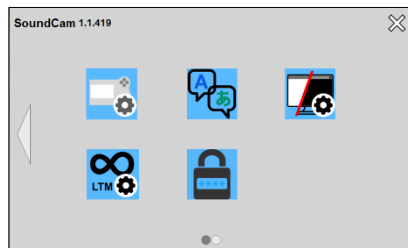


Figure 21: Settings menu

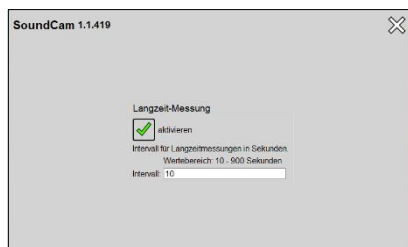


Figure 22: LTM menu

The long-term measurement can be activated in the settings (see **Figure 21** and **Figure 22**).

In the LTM menu, a recording interval can be set in the range between **10 and 900** seconds.

For each interval, the following data are determined and stored in a TDMS file:

- **Averaged acoustic image (mean values of the individual acoustic images)**
- **Acoustic peak hold image (maxima of the acoustic frames)**
- **Mean value spectrum**
- **Peak-Hold-Spectrum (maxima)**
- **Camera image**

The display of the data can be adjusted. Pressing and holding on the acoustic image (Windows: **right-click**) opens the associated context menu (see **Figure 23**).

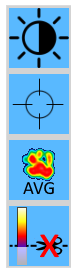


Figure 23:
Context menu
for the
acoustic

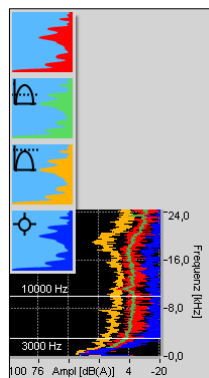








Figure 24:
Context menu for
the spectrum

This offers the following options for long-term measurement:

	Currently, the acoustic average image is displayed. If you click on this button, it switches to the acoustic peak hold picture.
	Currently, the acoustic peak hold picture is displayed. If you click on this button, it switches to the acoustic average picture.


Pressing and holding on the spectrum (Windows: right click) also opens the corresponding context menu (see **Figure 24**).

This offers the following options:

	Show / hide the global spectrum (red curve).
	Show / hide the averaged spectrum (green curve).
	Show / hide the peak hold spectrum (yellow curve).
	Show / hide the local spectrum (blue curve).

4.5 Save measurement

You can save the results of each completed measurement as a TDMS file (".tdms") for later use. You can set the storage location in the settings menus (see **The Settings Menu, p. 38**); when you select the storage location, you are always initially in this directory. By default, the SoundCam root directory is set as the storage location. When using the PC application, this is your current download directory.

! Note that if you press the  - button again, the data temporarily stored in the unit during the previous measurement will be overwritten and cannot be recovered.

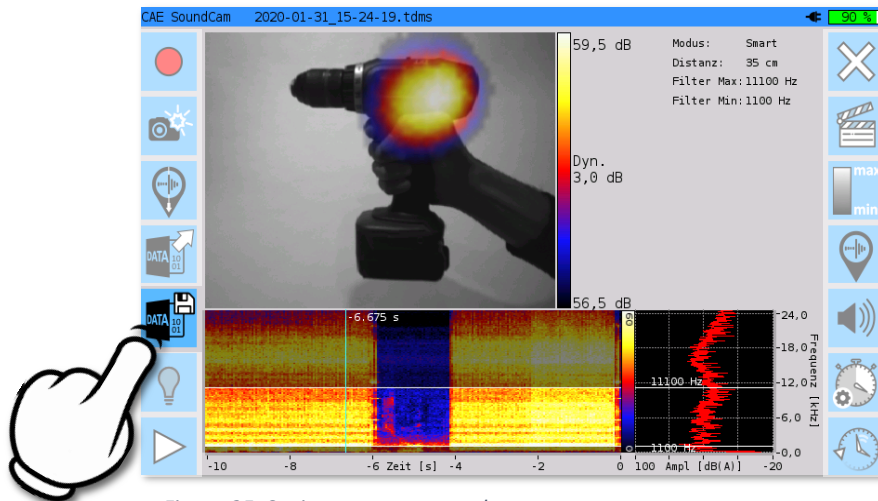


Figure 25: Saving measurement data

The storage location selection is displayed:

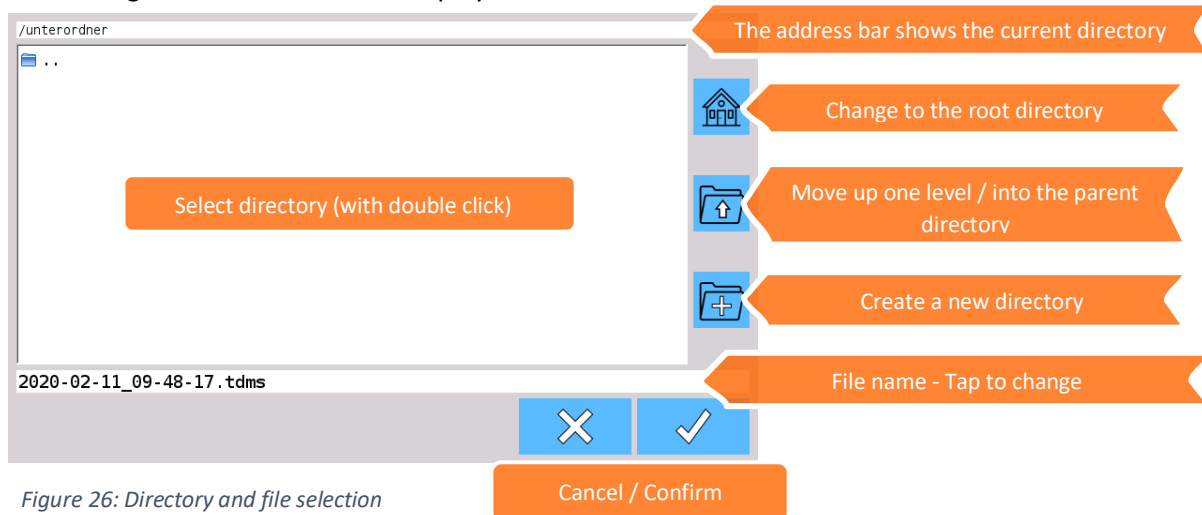


Figure 26: Directory and file selection

Tap the "Confirm" button to save the recording. You can call up the saved file via the main menu.

- To do this, press the  -button.


You can also find this in the start menu, where the recording appears in a list.

5 Analyse measurement

You can play back a measurement that has just been recorded or that has already been saved as a file on the unit as a video or display it individually in still images.

- You can open saved measurements via the start menu (**Figure 4, p 9**) and the main menu (**Figure 6, p 11**). Then touch the playback button on play them back.

Playback modes (slow motion)

If you hold down the button  for a longer time (Windows: hold down left click), you can choose between **full**, **half** and a **quarter** of the **normal playback speed**. Both picture and sound are slowed down in slow motion.

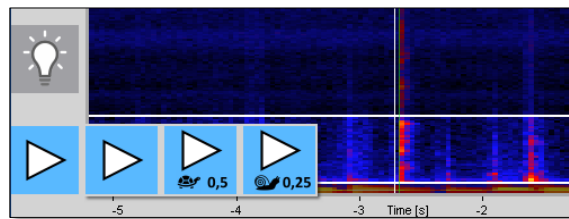


Figure 27: Control panel for slow motion mode

View modes (full screen mode)

You can also display the acoustic image or the spectra separately in full screen mode.

- The default setting is the **combination mode (1)**. In addition to the acoustic image, this offers the sonogram and the spectrum as a graphical view of the acoustic data.
- To change, double-click on any point in the display area. The displays change cyclically.
- The **combined mode** offers two different window sizes (**1,4**) for the acoustic image, in addition there is a **full screen mode for the acoustic image (2)** and for the **sonogram & frequency spectrum (3)**.

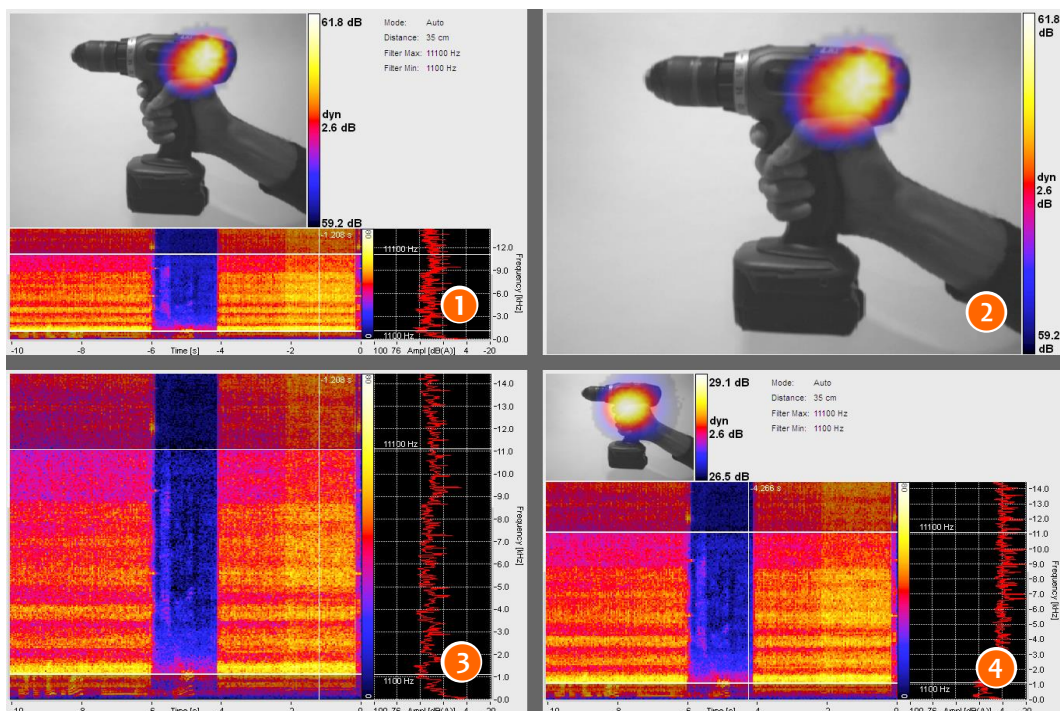


Figure 28: Cyclical change of view in the display area

5.1 Display window and view options

The display of the measurement results is roughly divided into three sub-areas in the display area: They visualise three measurement parameters in different ways, each of which is assigned a scalable axis (X, Y, Z).

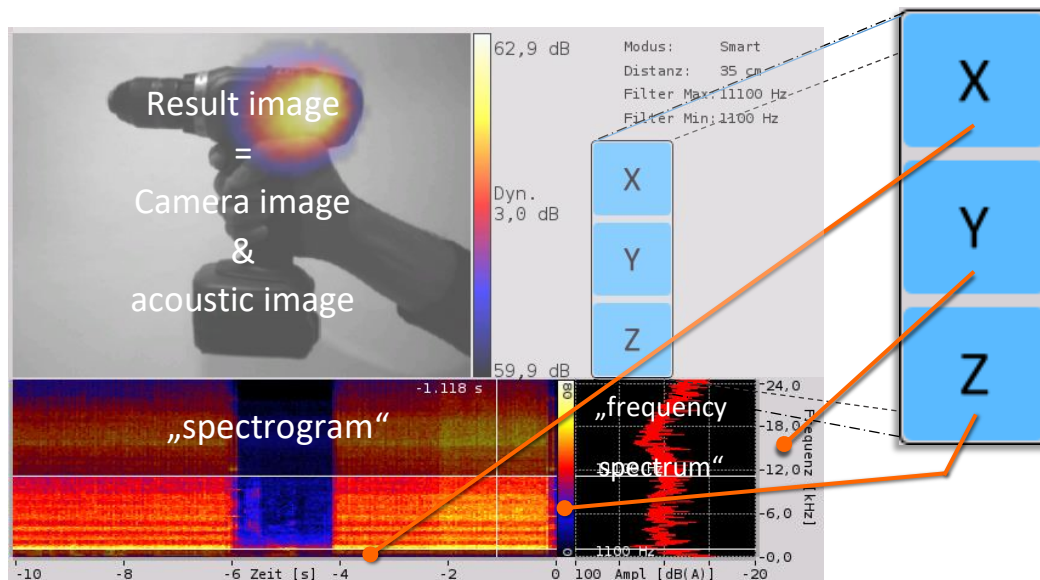


Figure 29: Measurement parameters in the display area and their axes.

X: Timeline (in seconds)

Y: Frequency (in kHz)

Z: Amplitude (in dB, influences e.g. the colour ranges in the sonogram)







- **Result image:** In the result image, the camera image is overlaid with the acoustic image.
 - **Acoustic image:** The acoustic image is similar to the image of a thermal imaging camera. Instead of heat, sound is visualised.
 - **Camera image:** grayscale image of the installed camera.
- **Sonogram:** Here, the level (amplitude) per frequency is shown in colour for a certain period of time. A scale displayed on the right edge provides information about the colours assigned to the sound level. Here the time axis (X), the frequency axis (Y), which is to the right of the frequency spectrum, and the amplitude or level scale (Z) can be scaled.
- The set frequency range for the acoustic image (see **Frequency filter**, p. 15) is highlighted brightly in the sonogram and set off with white lines.
- **Frequency spectrum:** The graph to the right of the sonogram shows the level (amplitude) per frequency at the current time. The frequency axis (Y) here is also the one for the sonogram and can be scaled.
- For further settings to improve the acoustic image, see **Listening - focused sound**, p. 12.

Context menus for acoustic image and frequency spectrum



Figure 30: Context menu for the acoustic image.

Pressing and holding on the acoustic image (Windows: right-click) opens the corresponding context menu (see **Figure 30**).

	Target brightness of the video camera: If you click on this button, a menu with a slider opens. You can use this to set the target brightness of the video camera while the measurement is running.
	Activate / deactivate crosshairs: You can use the crosshairs as an aiming aid when working with the local spectrum, for example.
	Acoustic mean image: Currently the acoustic average image is displayed, clicking this button will switch to the acoustic peak hold image. This option is only available if a long-term measurement is running or a saved LTM-TDMS has been loaded.
	Acoustic peak hold image: Currently the acoustic peak hold image is displayed, if you click on this button it will switch to the acoustic average image. This option is only available if a long-term measurement is running or a saved LTM-TDMS has been loaded.
	Low cut is deactivated. Clicking on this button activates the low-cut function. In the menu that follows, you can set a limit value. All levels that are below the set limit value are no longer displayed in the acoustic image.
	Low cut is activated. Clicking this buttons deactivates the low-cut function.

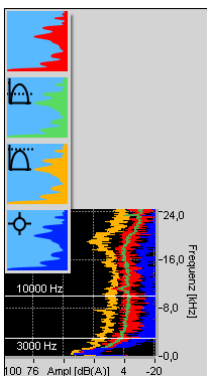






Figure 31: Context menu for the spectrum.

Pressing and holding on the spectrum (Windows: right-click) opens the corresponding context menu (see **Figure 31**).

	By clicking on this button, the global spectrum (red curve) can be shown or hidden.
	By clicking on this button, the averaged spectrum (green curve) can be shown or hidden. This option is only available if a long-term measurement is running or a saved LTM-TDMS file has been loaded.
	By clicking on this button, the peak hold spectrum (yellow curve) can be shown or hidden. This option is only available if a long-term measurement is running or a saved LTM-TDMS file has been loaded..
	By clicking on this button, the local spectrum (blue curve) can be shown or hidden.

Scale display axes

All three axes are scalable. In the standard view, the **spectrum** or **sonogram** covers the entire frequency range from **0 - 24 or 0 - 100 kHz**. In addition, the **sonogram** shows the entire recording duration and the level range between **0 and 80 dB**.

For some applications, an enlarged, "zoomed-in" display is desirable in order to be able to capture the relevant areas more precisely.

A quick method that also works during measurement:

In the sonogram display window, use two fingers on the touch screen to spread or narrow the frequency spectrum. The time axis can only be zoomed during analysis, not in live mode.

The zoomed section can be moved with two fingers.

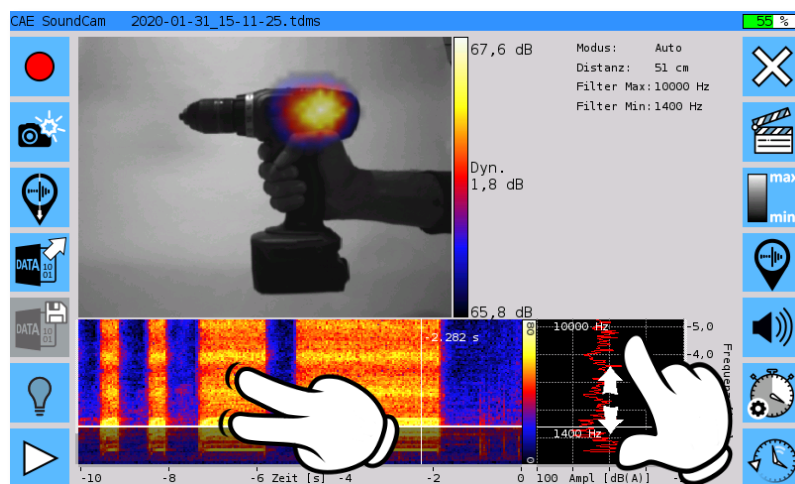


Figure 32: fast scaling of the display areas



You can only adjust the amplitude scale (**Z**) by numerical input, this is described below. Shifting the upper and lower limits for the amplitude scale affects the colour spectral representation of the sonogram.

Adjustment via context menus:

If you hold down any point in the **sonogram** (Windows: right-click), the context menu for the parameters opens, labelled according to the assigned **X, Y and Z** axes.



Figure 33: Context menu "Display parameters".

As an example, the scaling of the frequency axis (Y) in the sonogram and frequency spectrum is to be set.

1. Select the desired parameter. The corresponding context menu opens for numerical input.

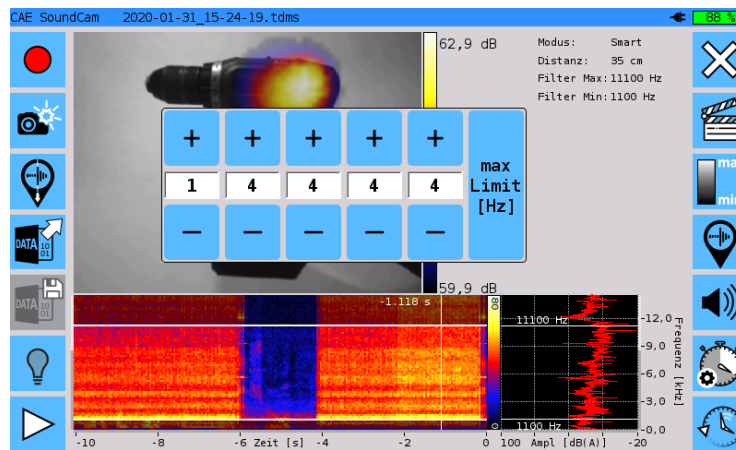


Figure 34: Scale display - numeric input

2. Enter the value for the maximum digit by digit using the „+“ and „-“, button.
3. Touch the "max Limit" button. The display changes. Now you can enter the minimum.

After the input, the context menu closes automatically by tapping the screen or after a few seconds.

Here is a summary of the input options:

GUI	X Timeline	Y Frequency axis	Z Amplitude in dB
SoundCam	Multi-touch horizontal; Context menu	Multi-touch vertical; Context menu	Context menu
PC	Mouse wheel (simultaneous zoom of X- & Y-axis)		Context menu
	(X-axis zooming only) Ctrl + mouse wheel ; Context menu	(only Y-axis zooming) Shift + mouse wheel ; Context menu	

Table 1: Input options for scaling the display

5.2 Timeline control

You can play the recording from any point on the timeline. To do this, place the cursor at the desired point in the sonogram by tapping on it and move it by dragging it..

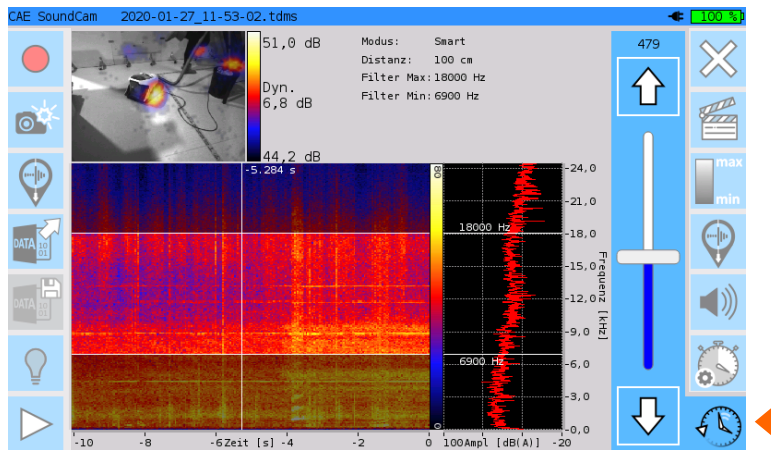


Figure 35: Timeline tool

An alternative access to the timeline is offered by the lowest button in the right-hand side menu.

- 1.** Move the slider to search for the desired measurement phase or a specific acoustic event on the timeline.
- 2.** Use the arrow buttons to navigate between the acoustic images frame by frame.

The acoustic frames are numbered. This numbering is displayed at the top of the drop-down menu. The frame rate is set to 50 or 100 fps in the settings (see **The Settings Menu, p. 37**).

5.3 Working with markers

It can be useful to mark the occurrence of an acoustic event on the timeline to make it easier to find again.

The marker positions are shown as green lines in the sonogram.

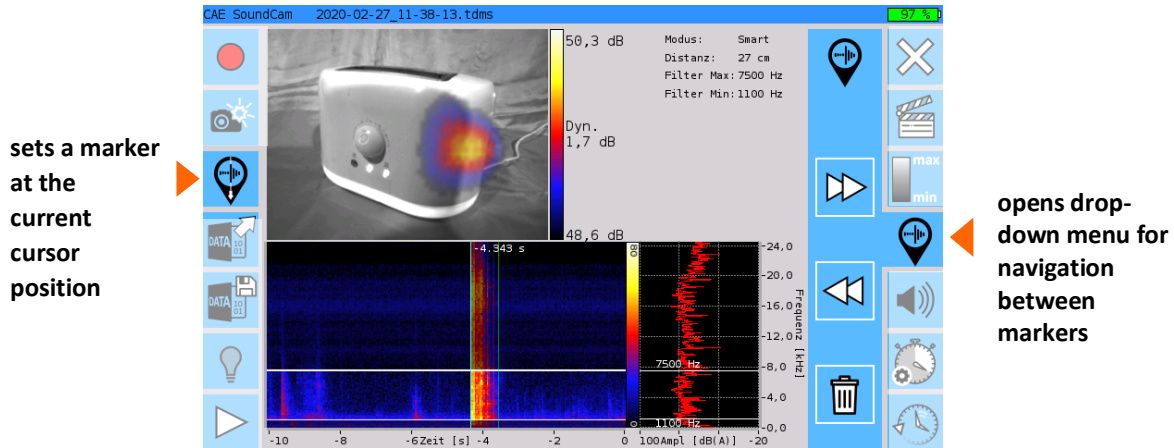



Figure 36: Set and use markers

If markers are set (loaded or stopped measurement), use the left / right arrow in the right drop-down menu to jump to the next / previous set marker. Use the  - button to delete the currently selected marker.

You can set as many markers as you like. These are written to the file when the measurement is saved.

6 Export functions

You can export recordings of your measurements in full length or shortened.

The selectable formats are supported by a variety of playback programmes and web browsers.

To transfer the created videos to your PC, use a USB stick or a comparable medium that you connect to the interface of the SoundCam set up for this purpose (see **The Settings Menu, p. 36**).

Furthermore, it is possible to create screenshots (snapshots of the measurement displays) from measurements.

In addition, saved measurements can also be viewed and edited again in the PC application.

For optimum compatibility, we recommend a medium formatted in the **NTFS file system**.





6.1 Creating a Video

Selecting the screen view

The currently active view of the display area is shown in the exported video (see **Analyse measurement, p. 24**).

In addition, as with the analysis of measurements, the slow-motion display is also available here in two adjustable levels.

Specify section to be exported (optional)

-  Opens the submenu for video creation.
-  Set initial marker.
-  Set end marker.
-  Set end marker.

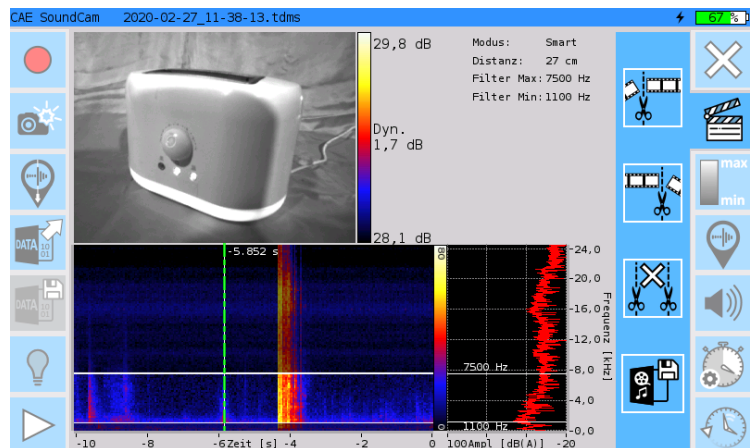


Figure 37: Create a video; set a section and export it

Navigate in the sonogram or by playing and stopping the recording and optionally set **start and end markers** to export only a section.

The green dashed lines in the sonogram serve as a visual control.

Start Export



Opens a dialogue window. Here you can make the following settings:

- Set file path
- Name file
- Output options
 - Video only
 - Audio only
 - Audio and Video
- Display speed (tempo)
 - Realtime (25 / 50fps)
 - Slow motion (0,5x / 0,25x)
- Video quakity settings
- Audioformats:
 - Ogg Vorbis (*.ogg)
 - **PCM (*.wav)**
Can only be used with "audio only" output
 - Opus (*.webm)
- Audio gain: from 0 to + 42 dB, in steps of 6 dB

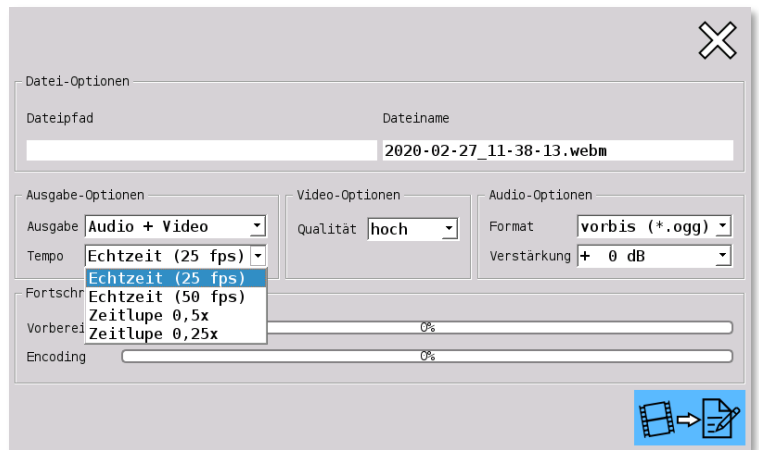



Figure 38: Creating a video; settings




Gain factors at which overload occurs are marked with "(clip)" in the drop-down list. Recommended is the highest level boost of that list without this marking

Press the button  and the video is saved. The green bars show the progress of the saving.

Then close the dialogue window to return to the main menu.

Transfer the video to your PC with a USB stick to play it in the browser or playback programme.

6.2 Screenshots

6.3 Press the  button in the left sidebar.

The saving process is displayed on the title bar. The screenshots are stored in the currently set working directory in the subfolder Screenshots.

The screenshots are saved in the ".png" file format.

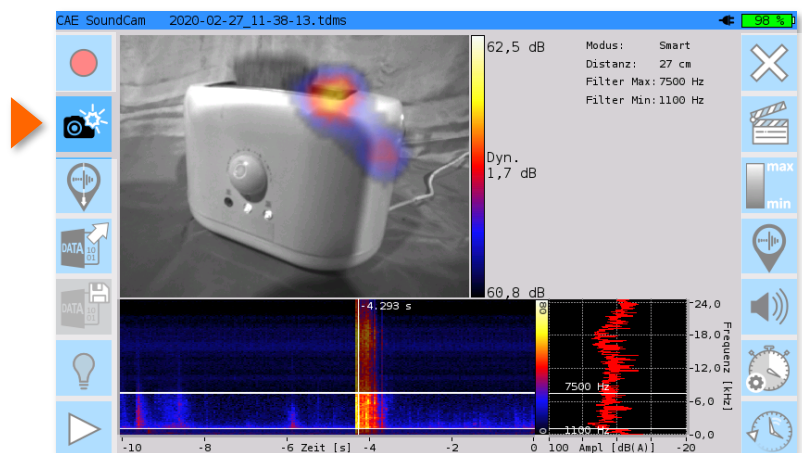


Figure 39: Create a screenshot

Transfer these screenshots to your PC with a USB stick and use any image viewer to view them.

7 Working with profiles

Profiles make it possible to reuse proven, already used settings for similar measurement situations. In addition, settings adapted to the needs of different users can be stored in them. Several profiles are predefined ex works.

The settings saved in the profiles include, in addition to the measurement parameters

- **Recording distance**
- **Scaling**
- **Frequency filter**
- **Recording time**
- **Playback volume**
- **resolution and frame rate**
- **the active file path for recordings, screenshots and videos**
- **and the user-defined assignment of the function keys.**

You make these settings in the settings menu as described in **Chapter 8.1 (p. 36)**.

You can access the profile settings via the start menu or the settings menu:

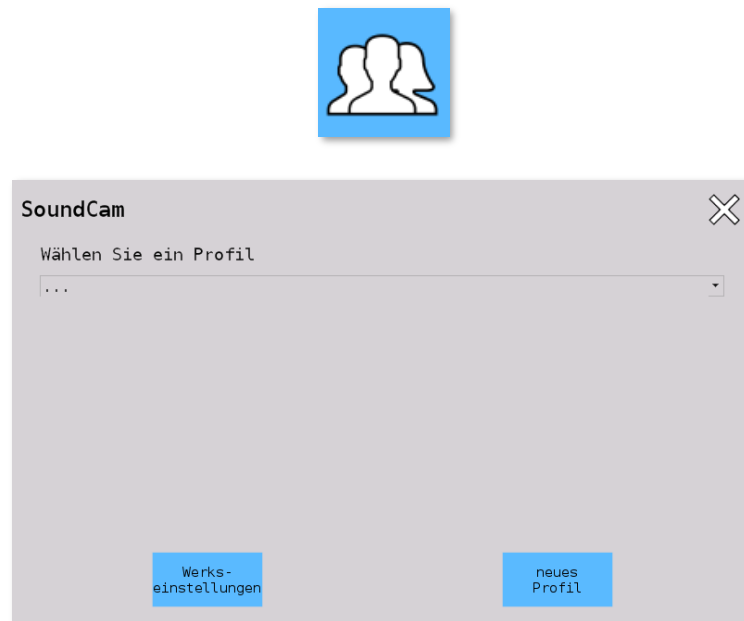


Figure 40: Profile settings

You have the following options in the profile settings:

new profile:	With this function you have the possibility to save your current settings as a new profile. Please give your profile a meaningful name and, if desired, a short description.
Factory settings:	All settings are reset to the delivery status. All predefined profiles are restored as long as they have not been replaced by profiles with the same name.
Delete profile:	Delete a profile previously selected in the selection list.
load profile:	Load a profile previously selected in the selection list.

7.1 Select and load profiles

If you want to access already created or predefined profiles:

1. Select the desired profile from the drop-down list by tapping on it.

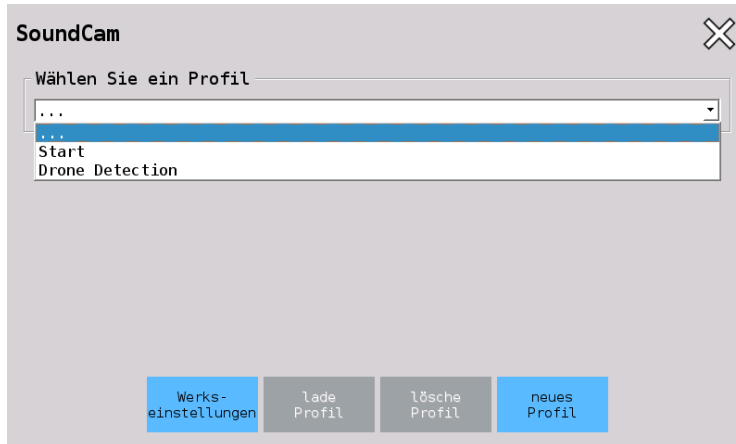


Figure 41: Menü zur Profilauswahl

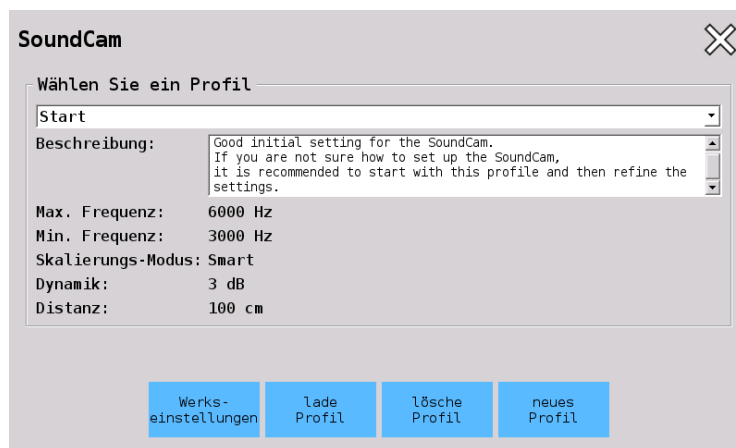



Figure 42: Summary of the settings of a profile

2. A summary of the settings of the profile is displayed for checking purposes..
3. Press the "Load profile" button to activate the profile“.
4. Confirm with "OK" in the dialogue box that appears.
Then exit the menu with 

The selected profile is now loaded.

7.2 Create a new profile

1. Tap "New profile" to save the last used settings.
2. Give the new profile a name in the field provided in the dialogue. In addition, you can enter a description, such as instructions for use. If you have already entered a name, you can update the profile by overwriting it or cancel the process.

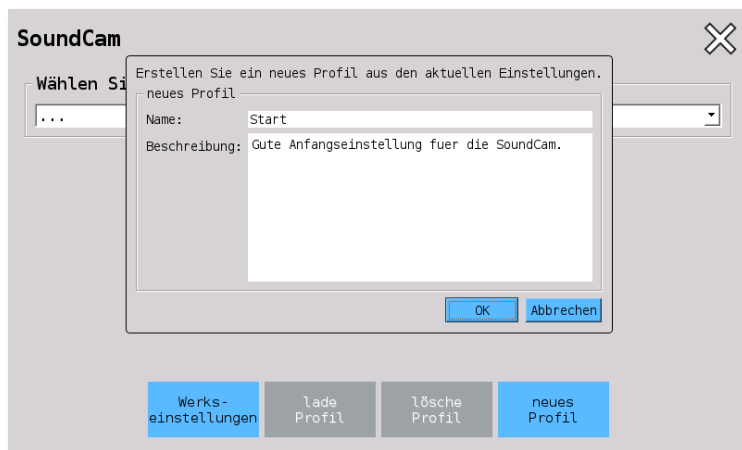


Figure 43: Text fields in the profile storage menu

3. Confirm with "OK" in the dialogue box that appears.

The currently used settings are saved as a profile.

7.3 Reset to factory settings

! Attention!

- If you press the "Factory settings" button, all individual settings are deleted. Profiles that have already been created, however, remain saved and can continue to be used. Measurement data and screenshots also remain saved.

If you are sure that you do not want to continue using any of the current settings, reset them to the factory settings in this menu. This may also be helpful in case of memory problems.

Factory settings:

- Recording distance: 100 cm
- Frequency filter: min. 3 kHz, max. 10 kHz
- Scaling mode "Smart", dynamic range: 3 dB, crest value: 5 dB
- Headphone output muted
- Recording time: 10 s
- Acoustic frame rate: 100 fps
- Camera resolution: 320 x 240
- File path: SoundCam root directory;
- when using the PC application:
- current download directory
- Measurement series not activated
- The function keys are assigned in a standardised way

8 Other settings

8.1 The Settings Menu

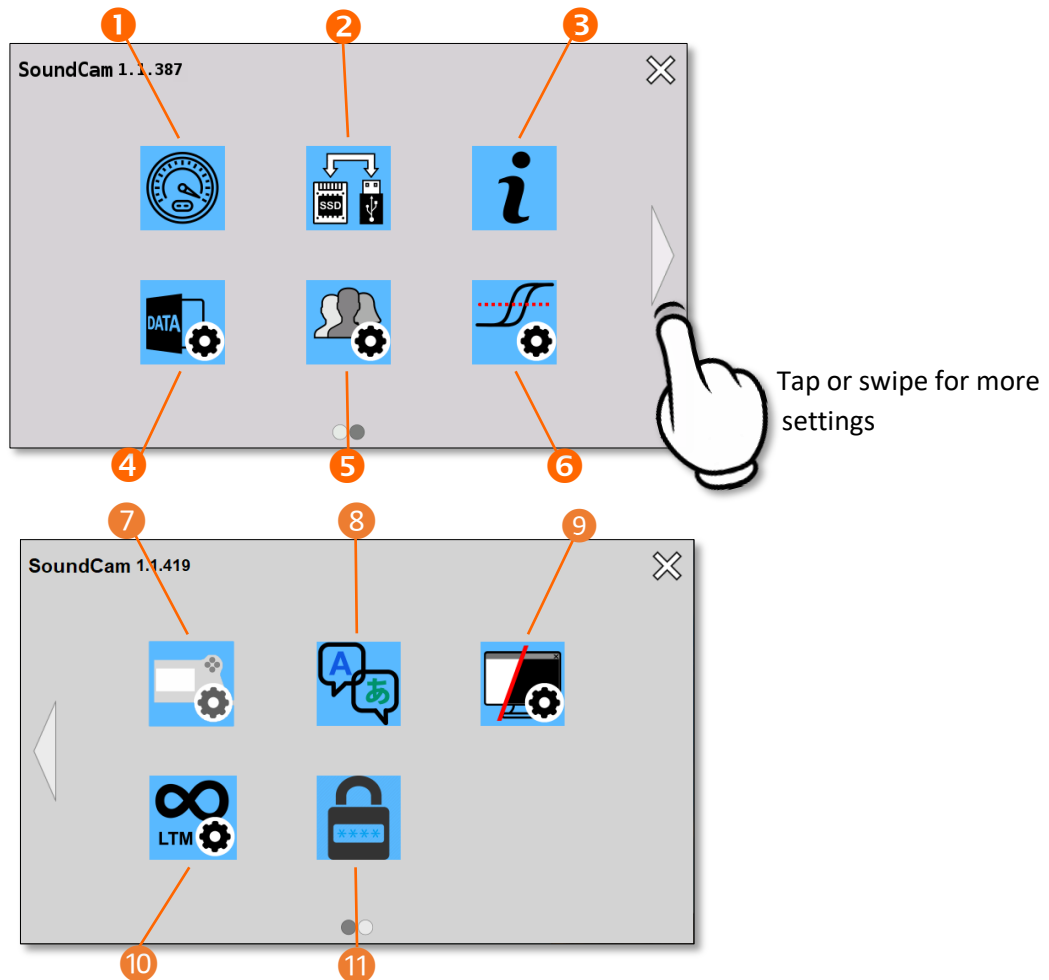


Figure 44: Settings menu

- (1) Resolution, frame rate, acoustic averaging & time settings.
- (2) Data management / data export
- (3) System information / update
- (4) Recording path, measurement series and screenshots
- (5) Profile settings
- (6) Trigger settings (self-timer)
- (7) Assignment of function keys
- (8) Language settings
- (9) Colour design
- (10) Long-term measurement (LTM)
- (11) Password protection

(1) Resolution, frame rate, acoustic averaging & time settings

On this page of the settings you can set the following parameters:

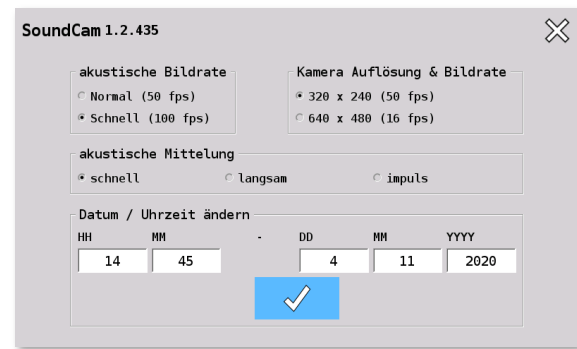


Figure 45: Setting resolution and frame rate

- **acoustic frame rate**

Normal	With this setting, you get approx. 50 acoustic images per second during a measurement.
Quick	With this setting, you get approx. 100 acoustic images per second during a measurement.

- **Camera resolution**

320 x 240	If you select a resolution of 320 x 240 pixels, you will receive approx. 50 camera images per second during a measurement.
640 x 480	If you select the resolution 640 x 480 pixels, you will receive approx. 16 camera images per second during a measurement.

- **acoustic averaging**

The acoustic images are calculated on the device in real time, with each new value of the microphone signals, and averaged exponentially.

Different averaging times can be set. The averaging is similar to the usual acoustic settings "Fast", "Slow" and "Impulse", but the time constants are much smaller, as the acoustic image would be much too sluggish with the usual values.

fast	With the " Fast " setting, the display is very responsive. The setting is suitable for very dynamic processes.
slow	With the " Slow " setting, the display is a little more sluggish, the image is calmer. The setting is suitable for quasi-stationary conditions.
impulse	With the setting " Impulses ", the level in the display rises quickly and falls slowly, thus the location of the event is visible in the image for longer. However, if highly dynamic processes with a sequence of impulse-like sounds are to be examined, it is recommended to use the "Fast" setting and to go through the recording step by step after the measurement.

Time constants

	SoundCam 1.0	SoundCam 2.0 & SoundCam Ultra
fast	21 ms	25 ms
Slow	168 ms	200 ms
impulse	21 ms (Increase) 168 ms (Waste)	25 ms (Incrase) 200 ms (waste)

- **Time settings:**

Here you can set the **date and time** of the system.

These are needed to generate the file names of the measurements.

The file names are normally structured as follows:

YYYY-MM-DD_HH-MM-SS.tdms

To change the **date and time**, click on the fields (**HH, MM, DD, MM or YYYY**) and enter the desired values. To apply the settings, click on the button with the tick (see **Figure 45**).

This function is only available on the SoundCam, but not under Windows.

(2) Data management / data export

Two selection windows are available:

On the left, the file listing of the SoundCam's internal memory;

On the right, the listing of the files on your USB stick or other medium.

1. Select the storage location for your files on the external medium in the right-hand selection window by double-clicking on the desired directory.
2. Mark the files and directories you want to copy (1) or move (2) to the external medium. (1) or move (2) in the left-hand selection window by tapping on them.
3. Press the button (1) or (2).

The transmission also works in the opposite direction, visible by the opposite orientation of the buttons (1) and (2).

The button (4) is used to mark all files of a selection area. Pressing it again also adds the directories, pressing it a third time removes the marking.

Tapping the button (3) deletes the selected files and directories.

Before removing the storage medium, exit the data export menu.

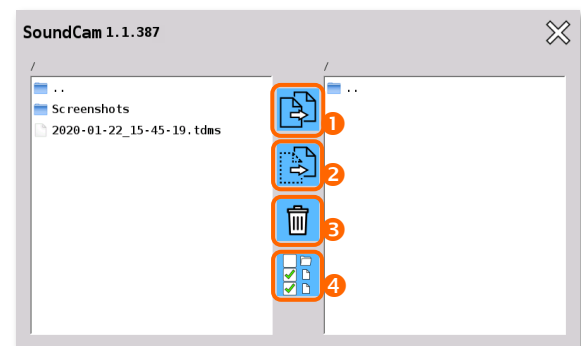


Figure 46: Data transmission

(3) System information / Update

Here you can find information on customer service and learn more about the hardware and operating status of your SoundCam.

If there is new software for your unit, carry out the update (see **Software update, p. 43**) via this menu.

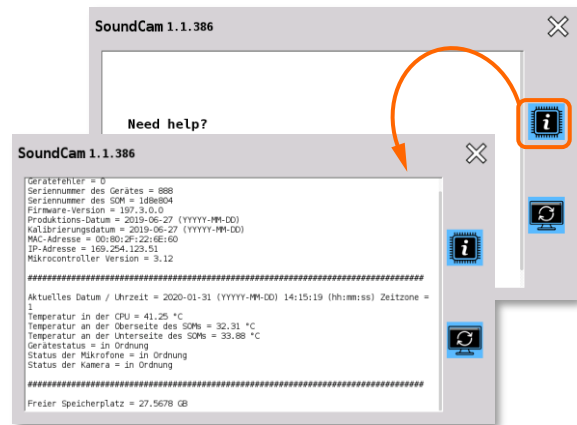


Figure 47: System Information Menu

(4) Recording path, measurement series and screenshots

Set the default storage location for your recordings here if it is not to be the SoundCam root directory.

A tap on the folder symbol opens the directory and file selection

(see **Figure 25, p. 23**) with the option of changing or creating new directories.



Figure 48: Settings menu for recording path, measurement series and screenshots



The total length of the file path must not exceed 256 characters, otherwise saving is not possible (an error message is displayed).

In addition, comments can be created for screenshots. To do this, check the box Comment under Screenshots. If this function is activated, the user is prompted to enter a text after creating the screenshot. This comment is saved in a text file with the same name as the file of the screenshot.

(5) Profile settings

See **Working with profiles, p. 33**

(6) Trigger settings (self-timer)

See **Triggering recordings (self-timer), p. 18.**

(7) Assignment of the function keys

Functions often needed by the user can be controlled via the keypads on the right and left handles of the SoundCam.

In this menu, you can set the quick access to the desired functions.

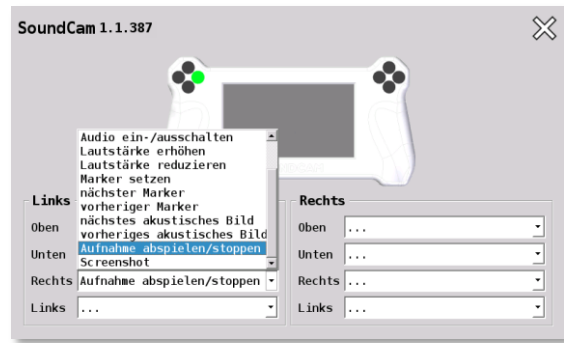


Figure 49: Einstellungsmenü Tastenbelegung

(8) Language settings

On this page of the settings you have the following options:

- **Language selection**

The SoundCam is delivered with some pre-installed languages.

Here you have the possibility to select one of these languages for the user interface.

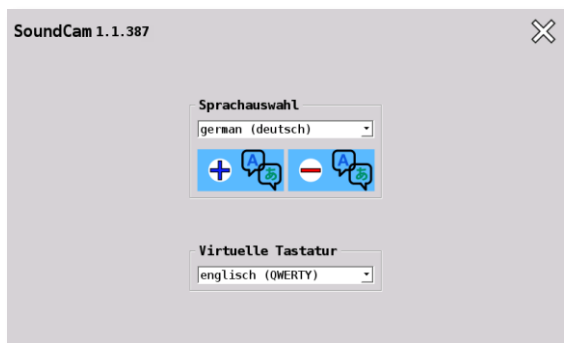


Figure 50: Language settings

- **Add language**

With the + button you can install an additional language file (*.qm) previously copied to the SoundCam.

- **Delete language**

With the - button you can delete one of the installed languages. Delete languages only if you are sure you have no use for them.

- **Virtual keyboard**

Here you have the option of changing the virtual keyboard so that it is compatible with English, Chinese or Korean.

(9) Colour design

The user interface can be displayed in a light or dark design.

Choose your preferred colour design here.

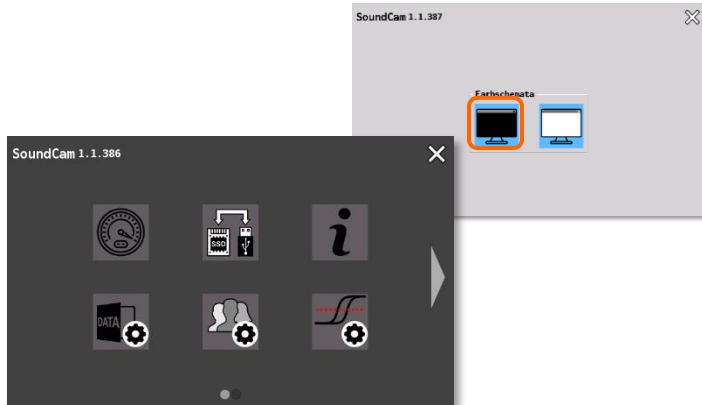


Figure 51: Example image for the dark design

(10) Long-term measurement (LTM)

See **Long-term measurement (LTM)**, p. 22.

(11) Password protection

The SoundCam can be protected against unauthorised access with a **password**.

To do this, you must set the check mark

(see **Figure 52**) and enter and confirm the desired password..

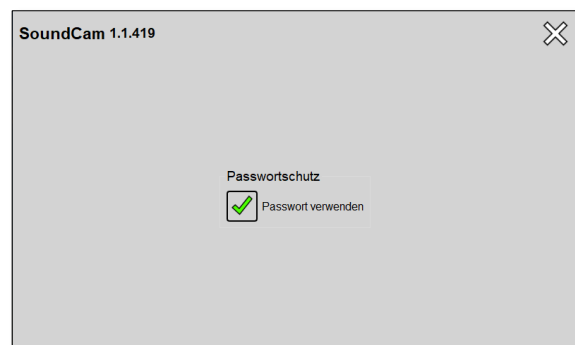


Figure 52: Use password

When the password is set, the SoundCam starts in the lock screen (see **Figure 53**).

Pressing the middle button prompts the user to enter the password and, if the entry is correct, the user is redirected to the start menu of the software.

For help with forgotten or lost passwords, press the info button on the right.

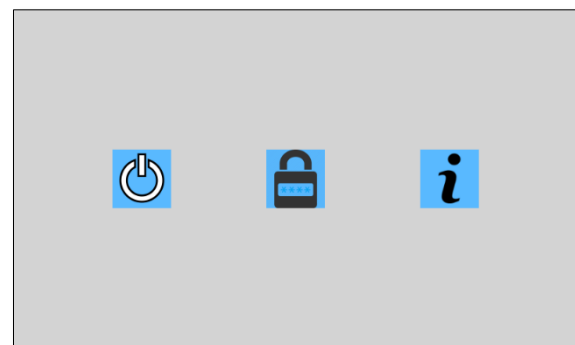


Figure 53: Lock screen

8.2 Connecting to a PC

The SoundCam.exe application must be installed on your PC (see **SoundCam as a PC application**, p. 10).

1. Connect the PC via an Ethernet cable to the corresponding interface (8) on the switched-off SoundCam (see **Figure 4**, p. 8).
2. Call up the "SoundCam.exe" application on the PC.
 1. the title bar signals "Waiting for connection".
3. Start the SoundCam.



If the application cannot connect to the SoundCam, make sure that the communication is not blocked in the firewall or by a virus scanner.

Now you can control all functions from the PC as described in the previous chapters.

Do not make any settings on the unit itself. The start menu must be selected in order to access the SoundCam from the PC.

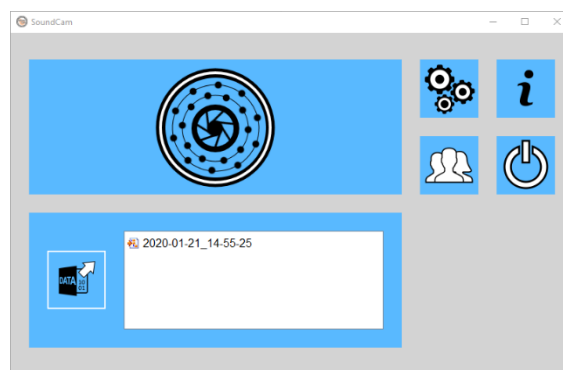


Figure 54: Start screen, Windows

You cannot access the internal memory of the SoundCam from the application.



For remote access, the same software version should be installed on the SoundCam and on your PC. This can be recognised by the identical version number. If there is a discrepancy, the application indicates this in a dialogue window as soon as a TCP/IP connection is to be established.

Cannot establish a connection due to incompatible versions on camera and PC (error message)?

The following are steps to update the SoundCam software to the level required by the PC application.

You can do the same if you are forced to connect your SoundCam to a computer with older software..

8.3 Software update

Software updates are available for download to registered users at www.cae-systems.de/soundcam-besitzer.

i For updating the software, it is necessary that the SoundCam is supplied with power via the power supply unit. It is necessary that the battery is charged to more than 20%. To be on the safe side, create a backup of your data before updating.

1. Save the ".swupd" file on a USB stick that you connect to your SoundCam..
2. In the data transfer menu, mark the file in the right-hand window and copy it to the internal memory of the SoundCam. (see Chapter 8.1, "(2)Data management / Data export", Pg. 36(2) Data management / Data export
3. **Close the menu. The button for starting the update can be found in the system information menus, accessible via the button **i** in the start or settings menu..**

! Attention! Device damage!

- To ensure the functionality of the system, do not disconnect the SoundCam from the mains power supply during the update process.

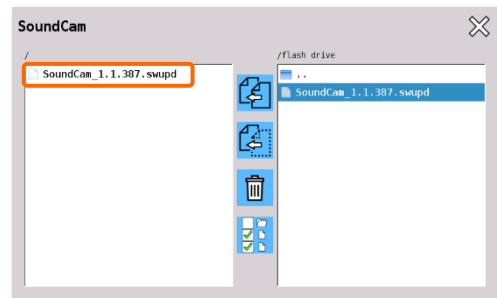


Figure 55: File is transferred, ready for update

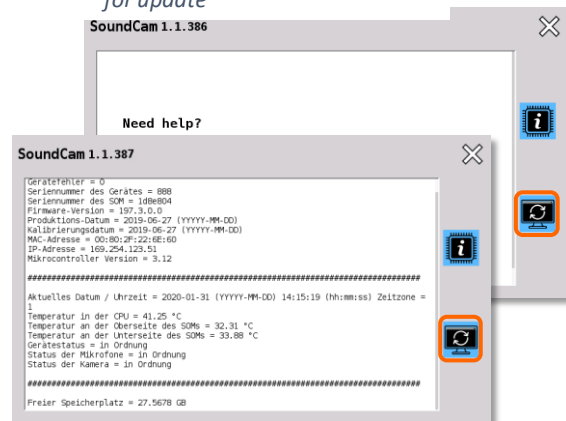


Figure 56: Starting the update from the system settings menu

4. The dialogue window for file selection is displayed. Mark the update file by tapping on it. The file name is displayed in the lower bar.
5. Confirm and follow the instructions on the screen.

A restart of the system is necessary to apply the changes.

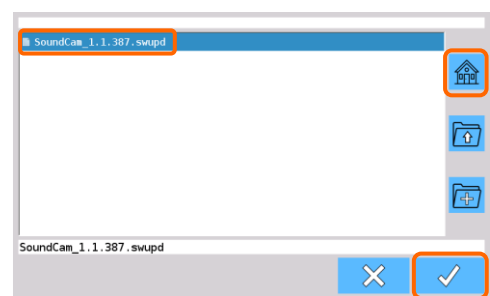


Figure 57: Selecting the update file

You may be asked to install optional updates in a further step. This installation may take a little more time and require another restart, but is recommended.
Please follow the instructions on the screen.

9 Troubleshooting

If the SoundCam software is no longer executable, a rescue program is started. This offers two options that restore an executable software version.

It is also possible to start the recovery program manually. To do this, press and hold the **function key in the upper left corner** until the following screen is displayed (see **Figure 58**).

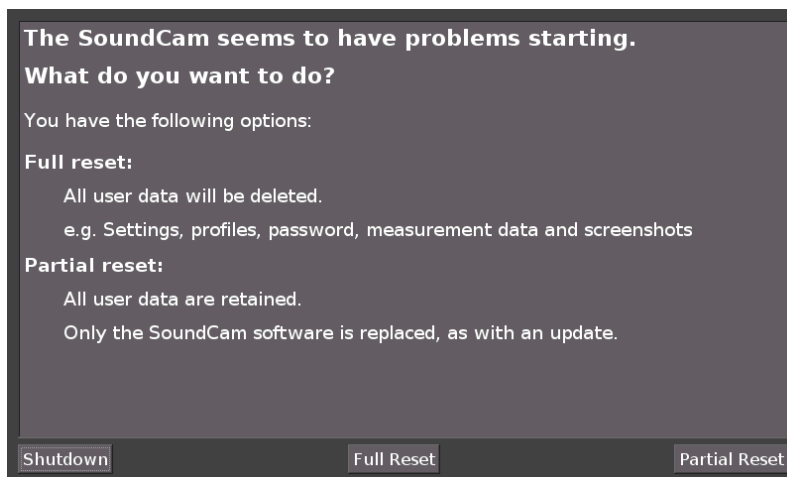


Figure 58: Rescue program

The following options are available:

- **Full reset:**
All (user) data on the SoundCam will be deleted.

This concerns e.g. settings, profiles, measurement data, screenshots and a possibly set up password.
- **Partial reset**
All (user) data on the SoundCam is retained.

Only the SoundCam software is replaced, as with an update.
- **Shutdown**
If you do not want to use either of the other two methods, you can simply exit the program with this option and turn off the system. If the SoundCam software is still functional, you should be able to start SoundCam normally.

10 Storage

10.1 Notes for reliable operation of the device

In daily use

If you want to put the SoundCam aside for a short time, place it on a stable surface with the front of the housing facing down. The attached rubber buffers ensure a secure position and damping to protect the microphones.

**Attention!**

- Dust and water protection is only given when all connections are sealed with their silicone covers.

To avoid mechanical damage, always remove the power cord, Ethernet cable, and USB storage device when not in use. Close the respective ports tightly with the silicone cover.

When not in use for a long time

- 1. Store the device in a dry and clean place.**
- 2. Remove the power cable, the Ethernet cable and the USB storage medium. Close the respective connectors tightly with the silicone cover.**
- 3. Make sure that the battery is as fully charged as possible, especially if you will not be using the SoundCam for a long time.**

**Caution!**

Deep discharge damages the battery. Under the most unfavorable circumstances, there is a risk of fire.

If the discharge is too deep, the lithium-ion battery installed in the device is permanently deactivated by an integrated safety circuit and must be replaced.



Lithium-ion batteries are subject to a low self-discharge. A fully charged battery can be completely discharged after 200 days without a consumer being connected.

- 4. You can check the charging status by briefly pressing the On/Off switch.
The charge status display shows the charge status in steps of 20%.**



If the charge level is below 10%, the remaining LED flashes permanently. You should establish the power supply via the power supply unit.

If the charge level falls below 5%, the flashing frequency doubles. The SoundCam can no longer be started and must be recharged.

The charging time is about 1.5 hours.

11 Cleaning



Figure 59: Power connection cover

- **Remove all cables as well as the USB stick and close the ports tightly with the silicone cover.**
- **To clean, wipe the SoundCam housing with a soft, lint-free cloth.**
- **Do not touch the diaphragms of the microphones.**



Very thin and sensitive Gore-Tex diaphragms are used. They protect the microphones and ensure the SoundCam is protected against dust and splash water according to IP54. Touching the diaphragm can damage it, causing the SoundCam to lose its dust and water protection.

- **Do not clean the SoundCam with strong, aggressive, corrosive or solvent-based cleaning agents, dripping wet or pre-treated cleaning cloths and strong cleaning sprays.**
- **Do not clean with high-pressure cleaners or other machines.**
- **Do not clean with compressed air.**
- **Do not dry the SoundCam with hot air or in microwave ovens under any circumstances.**

12 Note on environmental protection

Think about protecting the environment! Do not dispose of used batteries, electrical and electronic equipment in household waste.

The device contains valuable raw materials that can be reused.

Therefore, return the device to an appropriate collection point.

13 Technical

In the interest of continuous improvement, changes are made at certain intervals which may not have been taken into account at the time of publication of this manual.

The latest technical data sheets can be found on our website:

<https://www.cae-systems.de/en/downloads.html>

Declaration of Conformity

This device complies with the requirements of the following EU directives:

2014/35/EU (NSR),

2014/30/EU (EMV-directives),

2011/65/EU (RoHS-directives)



Conformity with the above mentioned directives is confirmed by the CE mark.

The EU Declaration of Conformity can be viewed, if desired, at the manufacturer's address.

Imprint

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