Warning and Safety Information

This user manual contains important **warning and safety information**, which must be observed by the user.

The product is only intended for a certain application purpose described in the user manual. In addition, the most important preconditions and safety measures required for use and operation of the product are explained in order to ensure problem-free operation.

No warranty or liability shall be accepted for applications outside the described application purpose and without compliance with the required preconditions and safety measures.

The product may only be used and operated by personnel who are able based on their qualification to comply with the necessary safety measures during use and operation. It may only be operated with the accessories and consumables supplied or approved by AVL DiTEST. As this device involves a product whose measuring results not only depend on correct intrinsic functioning but also on a series of boundary conditions, it is necessary for the results provided by the product to undergo an evaluation (e.g. plausibility check) by an expert before further measures are undertaken in relation to the measured value provided.

Setting and maintenance work on open live devices may only be carried out by appropriately qualified personnel who are aware of the associated danger.

Repair of the product may only be carried out in the supply plant or by personnel specially trained for this.

When using the product, an expert must ensure that the test object or test system is not put into operational states that can cause damage to the objects or endanger persons.
SAFETY INFORMATION

Observe the chapters “Typographic Terms”, “Important Safety Information” and the specific safety notes at the relevant points in the manual.

TYPOGRAPHIC TERMS

⚠️ **DANGER**
Indicates an extremely dangerous hazard which – if it is not avoided – will lead to death.

⚠️ **WARNING**
Indicates imminent hazard which – if it is not avoided – can lead to death or serious injuries.

⚠️ **CAUTION**
Indicates a hazard that can lead to moderate or minor injuries.

Additional warning signs:

⚠️ Danger electric shock.

⚠️ Danger compressed air.
   Compressed air will damage the microphones.

**NOTE**
This text indicates situations or error messages that can lead to material damage or data loss.

**Information**
This text indicates important information or instructions. Failure to comply with these instructions shall prevent or severely inhibit successful completion of the actions described in this documentation.

⚠️ **WARNING**
If the unit is used in a manner not specified by the manufacturer the protection provided by the unit may be impaired!
SUMMARISED SAFETY INFORMATION

WARNING
Read through all instructions carefully!

DANGER
Danger of death due to electrical voltage in vehicles with high-voltage systems
Life-threatening high voltage is present in HV energy accumulators (HB batteries) and the parts connected to these. Make sure than nobody comes into contact with the connections to the HV battery, the connecting cables of the HV battery and other parts under high voltage.

WARNING
Danger of death due to electrical voltage in the ignition system
The ignition system has life-threatening high voltage! Do not touch the ignition system while the engine is running!

WARNING
Danger of death due to electrical voltage in vehicles with xenon light
The lighting system with xenon light has life-threatening high voltage! Do not touch the components of the xenon light when the lighting is switched on!

WARNING
Danger of harmful or irritant substances
Extract the vehicle exhaust gases and ventilate the room adequately when conducting measurements on the running engine in closed rooms (workshops, test halls etc.).
WARNING

Danger of burns from hot parts
Measurements must be carried out at normal engine operating temperature or corresponding to the test specifications! Do not touch hot parts such as the engine, parts mounted on the engine or the entire exhaust system! If necessary, use cooling ventilators!

WARNING

Risk of injury due to rotating parts
Carry out all work in the engine compartment when the engine is not running and the ignition is switched off, if possible!
Do not touch rotating parts such as alternator, cooling ventilator and their drives (e.g. V-belt)!

WARNING

Danger of explosion due to pyrotechnical equipment and retention systems
- Test and installation work may only be carried out by trained personnel!
- Never test the ignition system with a multimeter!
- System test only with approved test devices!
- Unclamp the battery when working on the airbag system!
- When unclamping the battery, the ignition must be switched off and nobody may remain inside!
- Always store the removed airbag unit with the outlet air upwards or corresponding to the storage specifications!
- Do not leave the airbag unit lying around unattended!
- Protect the airbag unit against flying sparks, naked flames and temperatures above 100 °C!
- Do not transport the airbag unit in the passenger compartment!
- Do not bring the airbag unit into contact with oil, grease and cleaning agents!
- An airbag unit that has been dropped from more than 0.5 m height must be replaced!
- Dispose of non-activated airbag units!
- Do not open or repair airbag unit!

WARNING

Danger of explosion or fire due to gases and/or vapours
The device must not be operated close to open fuel tanks or below a minimum height of 460 mm (18 inches) above the workshop floor, as otherwise there is a risk of explosion or fire due to gases and/or vapours.
WARNING

Warning of optical radiation - risk group 2
The device contains a lighting unit whose LEDs belong to risk group 2 according to DIN EN 62471:2009. Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eye!

WARNING

The ACAM must not be deposited on (sensitive) surfaces on the vehicle!
IMPORTANT SAFETY INSTRUCTIONS

When using your garage equipment, basic safety precautions should always be followed, including the following:

1. Read all of the instructions.
2. Care must be taken as burns can occur from touching parts.
3. Do not operate the device with a damaged cable or if the device has been dropped or damaged – wait until it has been inspected by a qualified service technician.
4. Do not let a cord hang over the edge of the table, bench, for counter or come in contact with hot manifolds or moving fan blades.
5. If an extension cable is necessary, a cord with a current rating equal to or more than that of the equipment should be used. Cords rated for less current than the equipment may be overheat. Care should be taken to arrange the cord so that it will not be tripped over the pulled.
6. Always unplug equipment from electrical outlet when not in use. Never use the cord to pull the plug from the outlet. Grasp plug and pull to disconnect.
7. Let equipment cool completely before putting away. Loop cord loosely around equipment when storing.
8. To reduce the risk of fire, do not operate equipment in the vicinity of open containers of flammable liquids (petrol).
9. Adequate ventilation should be provided when working on operating internal combustion engines.
10. Keep hair, loose clothing, fingers and all body parts away from moving parts.
11. To reduce the risk of electrical shock, do not use the device on a wet surface or expose it to rain.
12. Use only as described in this manual. Use only manufacturer’s recommended attachments.
13. ALWAYS WEAR SAFETY GLASSES.
   Everyday eyeglasses only have impact-proof lenses, they are not safety goggles.

SAVE THESE INSTRUCTIONS
Hereby, AVL DiTEST GmbH declares that the radio equipment type ACOUSTIC CAMERA (ACAM) is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address:

Class A Equipment (Industrial Use)
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바랍니다.
라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

CAUTION TO USERS
Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.
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9-1
1 General Information

1.1 General description

The acoustic camera, referred to below as ACAM, can be used to locate interfering noises optimised to the specific target and time. Please familiarise yourself with the safety information before use and pay attention to the information in this user manual.

The ACAM is supplied without integrated display unit. It is recommended to use the Getac T800\(^1\) Tablet for working with the camera. This manual describes the ACAM used with the Getac T800 Tablet.

\(^1\) Available separately.
2 Delivery

2.1 Scope of supply and components of the ACAM

Transport case
The transport case serves for holding and safely transporting the ACAM.
Battery ACAM

For mobile operation, the ACAM has a rechargeable battery built into the device. Also observe the chapters:
Chap. 3.2 “Charging the battery”
Chap. 5.3 “Battery”
Chap. 5.4 “Battery change”
Chap. 7.1.3 “Battery faults”
Chap. 8.6 “Battery operation”

Power adapter

Connect the power cable to the table power adapter and its power supply plug to the power supply socket of the ACAM.

WARNING

Danger due to improper use
The table power adapter may only be connected to networks with earthed protective conductor or power sockets with earthed protective conductor.
Tripod

The enclosed tripod allows stationary measurements from a height of up to 1.80 m without having to hold the acoustic camera in your hands.

External trigger module

The external trigger module is connected to ACAM via the USB port. The 2.5 m long cable ensures corresponding freedom of movement. The trigger module allows markings to be set during the course of a measurement.
**External USB cable 2.0 m**

Fig. 2-7  External USB cable

The enclosed USB cable allows the ACAM to be connected to alternative PC systems. Read the section Chap. 3.3 "Tablet holder".

**Quick Start Manual**

Fig. 2-8  Quick Start Manual

The Quick Start Manual is provided in printed form.
Headphones

The ACAM can also be used as a directional microphone for the targeted suppression of background noises. We recommended using the enclosed headset for this, as only in this way can a corresponding filtration of ambient noises be ensured.

Other standard headsets can be used as an alternative. Highly recommended “over-ear” headphones (fully enclosed ear cups) for better suppression of ambient noise. Of course you can also use Active Noise-Canceling Headphones.

USB Sound Adapter

The USB sound adapter is plugged into the USB socket of the ACAM, see chapter 3.4. The headphones is connected to the USB sound adapter. Please also refer to the “Headphones” section in this chapter.
USB stick

The supplied USB stick contains the ACAM application software and the user documentation in PDF format. When using an alternative PC system, you can install the application software from the USB stick.

Rubber stoppers

The rubber plugs are used to seal unused sealing openings. Please also refer to chapter 3.6, section “Rubber plugs”.
2.2 Front view ACAM

Fig. 2-13  Front view ACAM

(1) Microphone (64 items in total)
(2) Rubber buffer (4 items)
(3) LED for lighting (4 items)
(4) Camera lens
2.3 Rear view ACAM

a) With tablet

Fig. 2-14 Rear view ACAM

(1) Mounting  
(2) Short keys  
(3) Handle  
(4) Tablet GETAC T800  
(5) USB cable  
(6) Mounting  
(7) Power supply connection  
(8) Mounting  
(9) Handle  
(10) Mounting
b) Without tablet

![Diagram of Rear View ACAM](image)

(1) Heat sink
(2) ON/OFF switch
(3) LED for function display
(4) Connection option for Kensington-Lock
(5) 1/4” and M6 thread for mounting a tripod
(6) LEDs, displaying the battery charge state
(7) Power connector
(8) Cover for battery
(9) Cover for the connections
(10) USB port
(11) LAN port (only for service purposes)
ON/OFF button

Press (short) ➔ Battery charge state is displayed
Press (~2 seconds) ➔ ACAM is switched on
Press (>4 seconds) ➔ ACAM is switched off

LED for displaying the operating status

Flash green ➔ Boot process
ON/OFF button was pressed 2 s
Lit up green ➔ Device ready for operation
(Boot process finished)

Quick operation buttons

Tour quick operation buttons are located on the right handle of the acoustic camera. 
These can be operated easily with your right thumb and have the following functions:

Upper button :
Stop or start the current measurement

Left and right button  ➔:
Browsing forwards and backwards in the acoustic image of a stopped measurement (within the recording duration) in order to call up individual measuring results.

Lower button :
Setting markers in the sonogram and hence starting a countdown corresponding to the set memory length.
**LEDs for displaying the battery charge state**

The charge state of the battery is displayed in 5 levels.

If the battery charge state falls below a given threshold, the left LED flashes as a warning that the device has to be charged. Depending on the state of charge, the flashing frequency is increased in two stages. If the acoustic camera is not charged, this will result in an automatic shutdown of the device (without data loss in the event of a current measurement).

If the charger is connected, the battery charge state will be displayed permanently. Each LED flashes in whose charge state range the current value is currently in.

If the battery is in a state of charge so that the device was automatically switched off and charging is in progress, a restart of the camera is prevented for safety reasons until the battery has absorbed a certain amount of charge.

If there is no battery in the system and the power adapter is connected, all five LED will flash 5 times and then go out.
# LED statuses

<table>
<thead>
<tr>
<th>#</th>
<th>LED</th>
<th>Description</th>
<th>Trigger</th>
<th>Detailed description</th>
<th>Flashing frequency</th>
<th>Visualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery pack</td>
<td>Charge level indicator Battery</td>
<td>user controlled - Briefly press the power button - while switching on the ACAM (HW or SW) - Plugging in the power supply</td>
<td>The state of charge area 0-100% is indicated by 5 LEDs. These light up permanently for several seconds. 100 to 81% -&gt; 5 LEDs 80 to 61% -&gt; 4 LEDs 60 to 41% -&gt; 3 LEDs 40 to 21% -&gt; 2 LEDs 20 to 11% -&gt; 1 LED</td>
<td>-</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>2</td>
<td>Battery pack</td>
<td>Low battery charge</td>
<td>Automatically</td>
<td>State of charge between 10 and 6%</td>
<td>Fast</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>3</td>
<td>Battery pack</td>
<td>Critical charge state of the battery</td>
<td>Automatically</td>
<td>State of charge between 5 and 0%</td>
<td>Very fast</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>4</td>
<td>Battery pack</td>
<td>Charging the battery</td>
<td>Plugging in the charger</td>
<td>Depending on the state of charge of the battery, an LED flashes, the lights arranged on the left permanently light up. Exemplary charge state between 80 and 61% and charging.</td>
<td>Slowly</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>5</td>
<td>Battery pack</td>
<td>Battery fully charged</td>
<td>Plugged in charger, battery fully charged</td>
<td>When the battery is fully charged, all LEDs are lit permanently.</td>
<td>-</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>6</td>
<td>Battery pack</td>
<td>No battery available, battery defective.</td>
<td>user controlled - Briefly press the power button - while switching on the ACAM (HW or SW) - Plugging in the power supply</td>
<td>If the battery is faulty or missing, all LEDs flash 5x.</td>
<td>Fast</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>7</td>
<td>Battery pack</td>
<td>Too high or low battery temperature</td>
<td>Automatically</td>
<td>Battery temperature above or below the permissible operating range. Loading only works between 0 and +45 °C, operation between -20 and +50 °C.</td>
<td>Slowly</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>8</td>
<td>Battery pack</td>
<td>Switching off the device (via HW button)</td>
<td>user controlled - longer press of the on / off button</td>
<td>All LEDs light up and go from left to right in sequence (button must be held down)</td>
<td>Slowly</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>9</td>
<td>Status</td>
<td>Start the device</td>
<td>user controlled - switching on the device (HW or SW)</td>
<td>When the ACAM is started, the status LED flashes green until the system is ready to start a measurement.</td>
<td>Fast</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>10</td>
<td>Status</td>
<td>Device ready for operation</td>
<td>Automatically</td>
<td>If the system is ready to start a measurement, the LED is permanently green.</td>
<td>-</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>11</td>
<td>Status</td>
<td>Incorrect starting of the device, no operational ready shaft given</td>
<td>Automatically</td>
<td>If the system could not be started correctly, the LED is permanently red.</td>
<td>-</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
<tr>
<td>12</td>
<td>Status</td>
<td>USB connection to ACAM detected</td>
<td>Connection of the tablet od. PC</td>
<td>If the Getac T800 or another PC system is connected to the ACAM via USB, the status LED flashes 2x white.</td>
<td>Slowly</td>
<td><img src="image" alt="LED statuses" /></td>
</tr>
</tbody>
</table>
Voltage supply of the ACAM

The ACAM can be operated with the voltage supplies indicated below:

- Table power adapter
- Internal lithium ion battery pack

If the ACAM is operated via the table power adapter or vehicle adapter and a functional battery is in the battery, the battery will be charged automatically after connecting a power adapter. If there is no battery in the device and the charge status is checked, all LEDs of the battery charge indicator flash five times and the device can be started.

Shutdown upon overheating

The ACAM has a mechanism for automatic shutdown at too high temperatures (both battery pack and arithmetic unit). To this end, information is displayed on the screen to the user and any current measurement is automatically saved (without data loss). The device automatically switches off, thereby preventing damage due to excess heat loads.

LAN connection

The internal 10/100/1000Base-T LAN (Local Area Network) enables the ACAM to be connected to a network. Data transfer rates up to 1000 Mbps are supported. This mode is only supported for service purposes at present.

USB port

USB devices (mass storage, external trigger etc.) can be connected to the USB port (USB host, type A). This port is not used for a connection between the ACAM and PC system.
3 Commissioning

Scope of supply

Take the ACAM and accessories out of the packaging.
(You can use the packaging to return a defective device. Observe the applicable statutory regulations in the event of disposal.)

Check the scope of supply.

For USA: Select an oil resistant cord set.

Installation site

---

**WARNING**

Danger of explosion or fire due to gases and/or vapours

Owing to the risk of explosion from gases and vapours, the ACAM must be set up at least 460 mm (18 inches) above the workshop floor!

It must not be exposed to direct sunlight, excess heat, humidity or liquid!

The power supply connection must be freely accessible: It must be possible to pull out the power supply plug in emergencies!
3.1 Voltage supply

Fig. 3-1 Connection of the table power adapter

- Push the cover (a) to the right and plug the DC voltage connector into the power supply connection of the ACAM (b).
- Plug the C5 connector into the socket of the table power adapter (c).
- Connect the power supply plug to the power network.

**NOTE**
Only use the power adapter provided as otherwise the device could be damaged! To disconnect the voltage supply, first pull the power supply plug out of the power socket! Only after this are the connections to the table power adapter and ACAM disconnected! A reverse order can damage the table power adapter or the ACAM!
3.2 Charging the battery

As soon as an external voltage source (table power adapter) is connected, the internal battery of the ACAM is charged (LEDs on the device light up or flash green). The charging process is finished as soon as all LEDs light up on the device. Battery replacement (ACAM), see Chap. 5.4.

If the recommended tablet is in the integrated holder for this, the tablet battery will also be charged automatically when connecting the table power adapter. For more information on the table battery, refer to the corresponding manual.

Note:

- The charging process does not start if the battery temperature is < 0 °C (32 °F) or > +45 °C (113 °F).
- The charging process does not start if the battery voltage is too high (97% of the nominal voltage) for recharging. This will prevent the battery from being constantly fully charged and, as a result, from rapidly ageing.
- The ACAM does not start if the battery charge level is < 5%. This improves the service life of your battery.
- Regular charging or discharging is recommended due to the self-discharging of the internal battery.

The battery level display is a guide value. The actual operating time can vary on account of different application and operating scenarios.
3.3 Tablet holder

The acoustic camera is supplied with an integrated holder for the Getac F800 tablet. Proceed as follows to connect the tablet to the acoustic camera.

1. Insert the four plastic parts into the ACAM.

![Plastic parts](image)

Fig. 3-2 Plastic parts

2. Open the flap (a) and unscrew it (b).

![Remove flap](image)

Fig. 3-3 Remove flap

3. Connect the tablet using the USB cable and the power supply cable.

![Connecting the Tablet](image)

Fig. 3-4 Connecting the Tablet
4. Place the tablet on the ACAM as shown.

![Fig. 3-5 Place tablet on tablet](image)

5. Place the four plastic closure parts on top.

![Fig. 3-6 Place the plastic closure parts on the machine](image)

6. Screw the tablet tight with four screws.

![Fig. 3-7 Tighten four screws](image)

To remove the tablet from the holder, follow steps 1 ... 6 in reverse order.
3.4  USB extension interface

Fig. 3-8  Connection of the USB mass storage device/USB trigger/USB sound adapter

The following steps must be followed to use the USB extension interface:

- Fold the cover up.
- Plug the external trigger module into the USB port, for example.

Any device connected to the USB port is logically connected to the PC system. This means that a USB stick connected to this interface will automatically appear as a new drive in the Windows system.
3.5 Switching on/off

Switch the ACAM on with the ON/OFF button (keep pressed ~2 s). The system start is confirmed by a green flashing status LED. The end of the boot process is displayed by a permanently green LED. The ACAM is ready for operation.

Besides the ON/OFF button, the ACAM can also be switched on or off via the PC application. For this, the PC application is started and a measurement initiated. This starts the camera automatically (confirmation by green flashing status LED).

At the end of the PC application, the camera is always switched off automatically.
3.6 Use of an alternative PC system

We recommend always using the ACAM with the officially supported tablet. Alternatively, another display unit may be used which must conform to the system specifications.

1. Loosen the four screws.

Fig. 2-10 Loosen four screws

2. Remove the four plastic closure parts.

Abb. 2-11 Remove plastic closure parts

3. Disconnect the USB cable and the power supply cable. Remove the tablet.

Fig. 3-12 Disconnect cable
4. Remove the four plastic parts.

![Fig. 3-13 Remove plastic parts](image)

5. Loosen the four screws and remove the cover.

![Fig. 3-14 Loosen four screws and remove cover](image)

6. Disconnect the power supply cable and the USB cable.

![Fig. 3-15 Disconnect cable](image)
7. Connect the supplied external USB cable (with angled plug).

![Connecting the USB cable](image)

Fig. 3-16 Connecting the USB cable

8. Reattach the cover and screw it tight.

![Fit the cover and screw in four screws.](image)

Fig. 3-17 Fit the cover and screw in four screws.

9. Connect the USB cable to the alternative PC, on which you have installed the ACAM application software.

   To use the recommended tablet again, follow steps 1 ... 9 in reverse order.

   **Note:**
   Insert a supplied rubber plug into an unused seal opening.
   This will prevent liquid from penetrating!

![Rubber plug inserted](image)

Fig. 3-18
3.7 Handling the tripod

Building
Fold your feet down.

Fold up
Press the flap and hold the flap.
Flip your feet up.
The tripod head must be extended all the way up!
4 Working with the ACAM

4.1 Start screen

After switching on, the start screen will appear. Select ACAM and the desired operating mode. If a measurement application is selected in the main menu, the acoustic camera is automatically switched on and communication established.

Fig. 4-1 Start screen, operating modes

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Chap. 4.2 “Measurement”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preset measurements</td>
<td>Chap. 4.3 “Preset measurements”</td>
</tr>
<tr>
<td>Play</td>
<td>Chap. 4.4 “Play”</td>
</tr>
<tr>
<td>System info</td>
<td>Chap. 4.5 “System information”</td>
</tr>
<tr>
<td>Settings</td>
<td>Chap. 4.6 “Settings”</td>
</tr>
<tr>
<td>Help</td>
<td>Opens the Help pages</td>
</tr>
</tbody>
</table>
Battery status
The charge state of the acoustic camera battery is displayed at the top right of the screen.

If it is not possible to query the state, the corresponding battery symbol is shown crossed out. If the battery is charged, this will be recognisable from an animated charge state bar.

End program
The X button used to end the user program is located at the top right of the screen.
This also ends communication with the acoustic camera and the camera itself is switched off to save energy.
4.2 Measurement

The Measurement menu is used to call up ACAM with a standard setting. This configuration serves as general measuring system access, allowing you to make the relevant settings for the measuring system task yourself. All setting options that the acoustic camera offers can be made here. Of course, all setting options you have made yourself can be managed by calling up again subsequently.

![Screen layout for Measurement (example)](image)

**Display elements**

The live image of the camera is shown in the centre of the screen. The live image deliberately kept in grey scales is displayed in the centre with coloured acoustic information (sound intensity), corresponding to the colour reference scale shown.

![Live image (example)](image)
Acoustic imaging

The scaling of the acoustic information is shown to the right of the live image. The minimum volume occurring in the image in decibels (dB) is shown black or violet depending on the colour coding. The maximum volume occurring in the image in decibels (dB) is shown white or red depending on the colour coding. Further information shown:
The selected scaling type – Standard setting auto (see explanation concerning the scaling type)
The set dynamic range – Standard setting 6.0 dB (see explanation concerning the dynamic range).

Sonogram

A sonogram is a graphic representation of the time progression by the sound spectrum. Here the current spectrum is shown on the right and its time progression on the left. The sonogram is shown directly below the acoustic live image.

Sound spectrum

The volume information (sound intensity) is shown in colour in the sonogram. The minimum volume is shown dark blue or black (0 dB/-20 dB). The maximum volume is shown light yellow and white (100 dB). The colour representation should not be confused with the colour scheme of the sound intensity in the acoustic live image!
The frequency range of the acoustic signal can be shown between 0 Hz and 24 kHz.
Example:
A continuous sound with a corresponding frequency and volume is shown as a horizontal line in the sonogram.
Short sound events with corresponding frequency and volume (e.g. knocking) are shown as a vertical line in the sonogram.
To the right of the sonogram, the current signal spectrum is shown in vertical form.
To suppress ambient noises or interference frequencies, a lower and upper basic frequency can be set using the sliders on the far right. Signals that are in the grey coloured range of the spectrum are attenuated to a significant extent.

Zooming

By clicking on the sonogram this is displayed in full screen mode. Clicking on the zoomed visualisation causes the zoom function to close.
Settings (right, outer image side)

**Distance [m]**
The distance from the camera to the sound source is set here.
The predefined standard distance is 0.5 m. The distance should be set with at least a 10% accuracy so that the sound source can be located as precisely as possible. If the distance is not defined correctly, pseudo sound sources can occur in the acoustic live image. The distance setting is enabled from 0.1 m to 3.5 m in 0.1 m increments. Sound source distances greater than 3.5 m do not have a significant effect on the quality of the localisation. For this, select the maximum setting of 3.5 m.

**Volume**
The playback volume of the acoustic camera is set here. If a headset is connected to the system, feedback and echo effects can result when locating sound sources. We therefore recommend using the headset supplied when activating Directional Microphone Mode (system volume automatically greater than zero).

The loudspeaker reproduction basically needs to be switched on when:
- playing back recorded measurements,
- using the acoustic camera as a directional microphone (required headset).
Size of the buffer memory
The length of the buffered data from the current camera record is set here.

10 s, 20 s, 40 s, 60 s and 120 s can be selected.

A maximum recording time of 20 seconds is set as standard.
In contrast to video cameras, the acoustic camera does not have to be put into a dedicated recording mode! The last events are written into a memory during recording. If the memory is full, the oldest data will be rejected and new data saved.
If a measurement is ended and the memory was full, as much data as was defined in the storage length will be available after the end of the measurement.
A change to the storage length is not possible during Measuring Mode.
The recording time set is also shown as a time bar below the sonogram.
Automatic scaling
The acoustic scaling serves for fine adjustment and evaluation of the acoustic image evaluation.

Scaling type
Three types of scaling can be set: “Manual”, “Auto” and “Expert”. The scaling type “Auto” is set as standard.

Scaling type: Manual
-> No automatic scaling
The user must manually enter the maximum volume (in dB) that is shown in the acoustic image.
The user must manually enter the dynamic range (in dB).

Scaling type: Auto
Automatic scaling of the maximum volume (in dB) from the acoustic signal.
The user must manually enter the dynamic range (in dB).

Scaling type: Expert
Automatic scaling of the maximum volume (in dB) from the acoustic signal.
The user must manually enter the dynamic range (in dB).
The user must manually enter the sensitivity value (in dB).

Dynamic range
This represents the sound intensity range over which the selected colour spectrum is divided. The smaller the dynamic range, the closer the coloured acoustic clouds are to the maximum value.

Example: at a max. volume of 40 dB and a set dynamic of 10 dB, volumes between 30 dB and 40 dB are shown in colour in the acoustic image.

Sensitivity
The arithmetic mean value (in dB) of the entire incoming acoustic raw signals are first determined. Together with the set sensitivity, this yields the maximum volume value (in dB). An artificial volume maximum (in dB) is thus attained. An interfering background noise level can therefore be “filtered away” out of the acoustic live image.
**Frequency range setting**
The upper and lower signal frequencies that are shown in the acoustic live image are set here. This frequency setting is made in parallel with the frequency setting to the right of the sonogram and serves for more convenient operation.

**Directional microphone**
The directional microphone of the acoustic camera is activated or deactivated here. At the same time, the loudspeaker reproduction of the camera is automatically switched on or off. To prevent feedback and an echo effect when locating sound sources in Directional Microphone Mode, corresponding headsets should be used.

**Camera lighting**
The LED-based camera lighting is activated or deactivated here. The camera lighting serves for illuminating faint-light objects during the sound source localisation.
Function buttons (left, outer screen side)

**Stop / Start**
The current measurement is stopped or the stopped measurement is restarted here.
A stopped measurement provides the opportunity to call up individual measuring results with the arrow keys shown in the acoustic image, or using the slider below the sonogram during the recording.

**Create screenshots**
A screenshot (image snapshot) of the current measurement application is created here and saved as a PNG file in the file directory set for this.

**Set marking / Auto-stop measurement**
Here a marker is set in the sonogram of the current measurement and a countdown started, corresponding to the set storage length. After the countdown has finished, the measurement is automatically stopped and can be played back directly with the Player function and edited or also saved as a record.
The measuring results are shown and saved up to a time of 10 seconds before setting the marker (pre-trigger time).
In total, up to 10 markers can be set during the recording time.
The markers can be set by the user and serve for better evaluation of special events recorded in the measurements.
The user can select the countdown time in the Storage Length menu item.
File selection
This takes you to the preset directory in which measurement records are saved. After accepting a measurement record, this is automatically played.

Save measurement
This lets you open the Save menu for saving the record data after the measurement recording has stopped. The current storage directory is displayed in the Save menu, allowing the user to assign a freely selectable file name. The current date and a rolling number are shown as a preassigned standard file name.

The record data can be saved in the following file formats:

.ACAM
– Specific video and audio file format, which can be called up and shown again with the user software (raw data),

.mp4
– Digital video format, based on the Apple QuickTime file format,

.wav
– Digital audio data, based on Windows format (Audio for Windows),

.flac
– Free, lossless audio codec - loss-free audio format.

One or all formats can be selected for saving.

In the menu item "Settings" the user can select a different memory directory.

Optional: Defined settings can also be saved and exported as your own measurement type.
Help
The Help documentation for operating the user software of the acoustic camera is called up here.

Player start / stop
The measurement data playback is started or stopped here after stopping a current measurement or after calling up a saved measurement record.
Settings for the dynamic range or scaling type can be made when playing measurement records. These evaluations are not saved in the raw data but can also be calculated and changed subsequently. This allows you to achieve a better evaluation of the recorded measurement results. Only the functions and setting options that can also be applied are shown in Play Mode.

Edit function
A video edit function for saved measurement data is called up here. Selecting the video edit function activates two sliders below the sonogram. These serve for selecting the range that is retained after confirming the edit.

Deactivate edit function
The video edit function is deactivated.

Confirm edit
The selected range of the video edit function is confirmed and accepted here. After editing the video, the remaining data can be placed again, edited further or saved. The original video always retains its full length, as the new, edited video is created as a copy of the original video.

Deactivate edit function
The video edit last made is reset.

Maximum frequency
Clicking on the frequency scale between the sonogram and current spectrum opens the settings option for the maximum shown frequency (16 to 24 kHz).
4.3  **Preset measurements**

This measurement menu offers ready-made menus for important acoustic or vehicle-relevant measurements. Automatic presettings of the acoustic camera are saved for each defined measurement.

A measurement can be selected from the list.

If a measurement is selected, the button becomes active.

Touching this button opens a window with additional information on the selected measurement.
4.4 Play

This measurement menu provides the option for playing and evaluating saved measuring records. The tablet does not have to be connected to the ACAM for this.

Fig. 4-4 Screen layout for Replay Mode (example)
4.5 System Information

System information on the acoustic camera and tablet or PC system is displayed in this menu.

<table>
<thead>
<tr>
<th>System info</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serial number</strong></td>
</tr>
<tr>
<td><strong>Software version</strong></td>
</tr>
<tr>
<td><strong>Firmware version (SP)</strong></td>
</tr>
<tr>
<td><strong>Bootloader version (SP)</strong></td>
</tr>
<tr>
<td><strong>Firmware version (PM)</strong></td>
</tr>
<tr>
<td><strong>Bootloader version (PM)</strong></td>
</tr>
<tr>
<td><strong>Hardware version</strong></td>
</tr>
<tr>
<td><strong>Devices ID</strong></td>
</tr>
<tr>
<td><strong>SSN</strong></td>
</tr>
<tr>
<td><strong>FPGA version</strong></td>
</tr>
<tr>
<td><strong>MAC address</strong></td>
</tr>
<tr>
<td><strong>Production date</strong></td>
</tr>
<tr>
<td><strong>Calibration date</strong></td>
</tr>
<tr>
<td><strong>IP configuration</strong></td>
</tr>
</tbody>
</table>

Fig. 4-5 System information, system

**System**
Shows general information on the system.

**Instrument**
Checks the functionality of the ACAM (status information and temperatures).

**SSD**
Shows detailed information on the SSD (Solid-State-Drive), such as:
- Model
- Firmware revision
- Serial number

**Battery (tablet and ACAM)**
Shows detailed information on the installed battery, such as:
- Battery, remaining capacity
- Battery, remaining time
- Battery Mode
- Temperature
- Voltage
4.6 Settings

This menu lets you make global settings for the acoustic camera, e.g. storage path for screenshots, file formats etc. Clicking on the “Accept” button accepts and saves the settings made.

The following settings can be made by the user:

**Language:**
Serves for selecting the user language.

**Standard directory:**
During the software installation, a [data directory] * is created for this purpose.

**Resolution:**
Serves for selecting the resolution of the optical camera. We recommend using the standard setting. A higher resolution automatically results in a reduced number of frames per second. This makes it possible to assign very short, impulsive noises in dynamic images worse.

**Colour coding:**
Here advanced users can change the colour coding of the scale intensity shown. We recommend using the standard setting.
5  Maintenance and Care

5.1  Visual inspection

Regularly perform a visual inspection. Examine all components for damage (e.g. fracture points) and dirt contamination. Regularly check all cables for damage.

WARNING

Danger due to defective parts
Always replace the power cable in case of damage!

5.2  Cleaning

WARNING

Danger due to improper use
Before cleaning, switch off the ACAM and pull out all cables!

WARNING

Danger compressed air
Never clean the ACAM with compressed air!

Wipe the ACAM with a lint-free cloth. The cloth can be moistened with water or an alkali-free cleaning agent.
5.3 Battery

Do not store the battery outside the ACAM for a longer time, if possible. This can cause permanent capacity loss and/or even destroy the battery. Batteries that have been damaged or destroyed by improper storage will not be covered by the warranty. Evidence of improper handling can be provided quickly and accurately by the integrated electronics.

If storage is unavoidable, e.g. owing to failure of the ACAM, you should charge the batteries to 40 to 60 % if possible and store at temperatures between 0 and 25 °C. Check and repeat the battery charging after 3 months at the latest.

Always avoid storing the battery in an empty or fully charged state.

Operating and/or charging the battery at ambient temperatures higher than 45 °C is not permissible.

If the ACAM switches off automatically because the battery charge is too low, the battery must be charged to at least 40 to 60 % of its capacity before the ACAM is stored. Otherwise this could result in permanent capacity loss or destruction of the battery.
5.4 Battery change

Only use an original battery, see Chap. 7.3 “Scope of supply”.

Proceed as follows:

1. Switch off the ACAM.
2. Pull out the power supply plug, if connected. Please refer to chapter 3.6, points 1 ... 3.
3. Loosen the five screws and remove the cover.

![Loosen the screws](image1)

4. Remove the battery and unplug the connector.

![Removing the battery](image2)
5. Insert the new battery as shown and close the plug connection.

Fig. 5-3 Removing the battery

6. Attach the cover and tighten the five screws. Please refer to point 4.

Assembly of the tray:
Please refer to chapter 3.3, points 1 ... 5.
6 Warranty

6.1 New devices

The agreements with your suppliers apply. Wearing parts and accessories are basically excluded from the warranty. The date of the delivery note to the end customer applies for the processing.

The warranty shall become void in case of:
- Third party interventions (e.g. repair attempts by unauthorised persons)
- Improper actions (e.g. operation or cleaning with compressed air)
- Incorrect storage, maintenance and care (e.g. cleaning the device with cleaning agents containing solvents)

6.2 Damage case

In case of damage, please contact the respective AVL DiTEST branch / AVL DiTEST partner in your country.
7 Troubleshooting

Call up the System Information, see Chap. 4.5 “System Information”.
If this does not lead to any result, follow Chap. 7.1 “Fault, symptom, cause and remedy”.
# 7.1 Fault, symptom, cause and remedy

## 7.1.1 Basic device

### 7.1.1.1 Hardware faults

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) When switching on the ACAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACAM does not start, No LED lights up.</td>
<td>Battery of the ACM is empty.</td>
<td>Change over to the external voltage supply. Charge the battery. If the error persists, please contact the respective AVL DiTEST branch / AVL DiTEST partner in your country.</td>
</tr>
<tr>
<td>ACAM does not start, battery indicator flashes (5 LEDs), external power supply connected.</td>
<td>ACAM battery not yet sufficiently charged.</td>
<td>Continue charging the battery. Depending on the state of charge, it may take about 30 minutes before the device can be switched on again.</td>
</tr>
<tr>
<td>ACAM does not start, battery indicator flashes (running light).</td>
<td>Battery temperature too high</td>
<td>Let the ACAM cool down and try switching it on again after some time.</td>
</tr>
<tr>
<td>2.) Error during operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection between ACAM and PC system terminates.</td>
<td>Battery is empty.</td>
<td>Change over to the external voltage supply. Charge the battery. If the error continues, please contact Service.</td>
</tr>
<tr>
<td>Charging does not start</td>
<td>Battery voltage is still too high.</td>
<td>The ACAM is equipped with a protective mechanism that prevents the battery from being constantly charged. The battery can only be recharged after some time in operation.</td>
</tr>
<tr>
<td>Charging process is interrupted</td>
<td>Battery temperature is not within the intended temperature window.</td>
<td>Charging of the battery is only possible within the temperature range from 0 °C to +45 °C. If the battery temperature is outside this range, charging is not possible.</td>
</tr>
</tbody>
</table>
3.) Error when establishing the connection

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection between ACAM and PC system cannot be established</td>
<td>Check that the USB cable and the power supply cable are connected correctly. When connecting the tablet, check the status LED - it should light up white twice if the USB connection is correct. Check the battery status icon in the software. If a battery is inserted and the USB connection is OK, the symbol must not appear. Check the status LED for a permanently lit green. Only then can a connection be established. Try the steps in chapter 3.3 again. If the error continues, please contact Service.</td>
<td>Switch the ACAM on and off again, if need be using the forced shutdown (Press ON/OFF button for longer than 4 s). Perform restart. If the error continues, please contact Service.</td>
</tr>
</tbody>
</table>

7.1.1.2 Software faults

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>System remains “frozen”.</td>
<td>Error in the ACAM or the application executed in it.</td>
<td>Switch the ACAM on and off again, if need be using the forced shutdown (Press ON/OFF button for longer than 4 s). Perform restart. If the error continues, please contact Service.</td>
</tr>
</tbody>
</table>
7.1.2 Faults in the standard accessories

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plug does not fit in the socket (LAN cable, power cable, other cables).</td>
<td>Incorrect cable or incorrect cable side.</td>
<td>Use the correct cable or plug the right plug into the appropriate socket.</td>
</tr>
</tbody>
</table>

7.1.3 Faults in the battery

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charging time is not satisfactory (&lt; 2.5 h measuring duration)</td>
<td>Capacity of the battery low</td>
<td>Contact Service. The battery might have to be replaced.</td>
</tr>
<tr>
<td>LED lights up when battery inserted and not green.</td>
<td>Battery defective.</td>
<td>Contact Service. The battery might have to be replaced.</td>
</tr>
<tr>
<td>During charging the LED does not light up green.</td>
<td>Battery is not charged.</td>
<td>Check whether the table power adapter is inserted correctly. Make sure that:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- the battery or the ambient temperature are not too hot or too cold</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- the battery is inserted correctly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- the battery connections are clean</td>
</tr>
</tbody>
</table>
7.2 Fault message / Service addresses

In case of damage, please contact the respective AVL DiTEST branch / AVL DiTEST partner in your country.

7.3 Scope of supply

<table>
<thead>
<tr>
<th>Standard part</th>
<th>Accessory</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACAM</td>
<td>●</td>
</tr>
<tr>
<td>Transport case</td>
<td>●</td>
</tr>
<tr>
<td>Li-ion battery for ACAM 48 Wh</td>
<td>● ●</td>
</tr>
<tr>
<td>Table power adapter 65 Wh</td>
<td>Standard part</td>
</tr>
<tr>
<td>---------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Tripod for ACAM</td>
<td>●</td>
</tr>
<tr>
<td>External trigger module</td>
<td>●</td>
</tr>
<tr>
<td>Quick Start Manual</td>
<td>●</td>
</tr>
<tr>
<td>Headphones</td>
<td>●</td>
</tr>
<tr>
<td>Standard part</td>
<td>Accessory</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>USB stick</td>
<td>●</td>
</tr>
<tr>
<td>USB sound adapter</td>
<td>●</td>
</tr>
<tr>
<td>USB cable 2.0 m</td>
<td>●</td>
</tr>
<tr>
<td>Rubber stoppers</td>
<td>●</td>
</tr>
</tbody>
</table>
7.4 Sending

If an information leaflet is enclosed with the replacement parts, please observe this. It contains important information for the return.

7.4.1 Sending the ACAM

You can use the packaging to return a defective device.

7.4.2 Sending replacement parts

Replacement parts are provided in transport packaging. You can return the defective parts in the packaging with which you received the replacement parts.
8 Technical Data

8.1 Environmental requirement

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-5 °C … +40 °C</td>
</tr>
<tr>
<td></td>
<td>0 °C … +40 °C when charging the battery</td>
</tr>
<tr>
<td>Storage and transport temperature</td>
<td>-30 °C … +60 °C</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>35 % … 95 %</td>
</tr>
<tr>
<td>Operating altitude</td>
<td>max. 3048 m</td>
</tr>
<tr>
<td></td>
<td>max. 9144 m (storage)</td>
</tr>
<tr>
<td>Fall height</td>
<td>1 m (ruggedized MIL STD 810)</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 2.5 kg (without tablet)</td>
</tr>
</tbody>
</table>

8.2 Electrical protection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection class</td>
<td>IP 54</td>
</tr>
<tr>
<td>Standards</td>
<td>UL 201 – Garage Equipment</td>
</tr>
<tr>
<td></td>
<td>CE, EC Declaration of Conformity</td>
</tr>
<tr>
<td></td>
<td>EMC Directive 2014/30/EU</td>
</tr>
<tr>
<td></td>
<td>Current NSRL 2014/35/EU</td>
</tr>
<tr>
<td></td>
<td>EMC. IEC 61326-1, FCC CFR Part 15 Subpart B</td>
</tr>
<tr>
<td></td>
<td>Safety: IEC/UL/CSA 61010-1</td>
</tr>
</tbody>
</table>

8.3 Housing

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Ø 35 cm, 40 mm height (without tablet)</td>
</tr>
<tr>
<td>Anti-theft protection</td>
<td>Kensington locks</td>
</tr>
<tr>
<td>Trip mounting</td>
<td>1/4” and M6 thread</td>
</tr>
<tr>
<td>Sturdiness</td>
<td>Suitable for workshops</td>
</tr>
<tr>
<td>Holder for tablet</td>
<td>Getac T800</td>
</tr>
</tbody>
</table>
8.4 External interfaces

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB</td>
<td>2x USB 2.0 Type A&lt;br&gt;1x USB 2.0 Type B</td>
</tr>
<tr>
<td>LAN</td>
<td>RJ45 port&lt;br&gt;10/100/1000Base-T LAN (Local Area Network)</td>
</tr>
<tr>
<td>Power supply</td>
<td>+19 VDC</td>
</tr>
</tbody>
</table>

8.5 Table power adapter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage range</td>
<td>100 … 240 V~&lt;br&gt;50 … 60 Hz</td>
</tr>
<tr>
<td>Output voltage</td>
<td>+19 VDC</td>
</tr>
<tr>
<td>Power</td>
<td>65 W</td>
</tr>
<tr>
<td>DC cable</td>
<td>Permanently connected to the table power adapter&lt;br&gt;Connection to ACAM via DV voltage plug</td>
</tr>
<tr>
<td>Power cable</td>
<td>Country-specific power cable may be procured by user.</td>
</tr>
</tbody>
</table>
8.6 Battery operation

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Lithium ion battery</td>
</tr>
<tr>
<td></td>
<td>Replaceable</td>
</tr>
<tr>
<td></td>
<td>Protected against deep discharge and overcharging</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>14.4 V</td>
</tr>
<tr>
<td>Capacity</td>
<td>48 Wh</td>
</tr>
<tr>
<td>Operating duration</td>
<td>at least 2.5 h</td>
</tr>
<tr>
<td>Charge time</td>
<td>approx. 3 h</td>
</tr>
</tbody>
</table>

8.7 Disposal

This high-quality electrical and electronic device must not be disposed of as domestic waste.

Always comply with the local statutory obligations during disposal!
CE – Declaration of Conformity

This device corresponds to the required standards. You can find the CE Declaration on our website at: https://www.aviditest.com/index.php/de/downloads-de.html
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