

# USER MANUAL

## ACOUSTIC IMAGING CAMERA

PCE-AIC 50



ENGLISH



User manuals in various languages (français, italiano, español, português, nederlands, türk, polski) can be found via our product search on:  
[www.pce-instruments.com](http://www.pce-instruments.com)

## SAFETY PRECAUTIONS



### **Danger**

- » The device contains a built-in removable lithium battery, which can be charged via a TYPE-C interface using a 5V adapter. Improper selection of the adapter or an accidental short circuit at the output port may cause an explosion hazard.
- » Do not attempt to open or disassemble the battery at any time. If battery leakage causes liquid to enter the eyes, immediately rinse the eyes with clean water and seek medical attention.
- » During device installation and use, all national and regional electrical safety regulations must be strictly followed.



### **Caution**

- » Do not expose the device to dusty or humid environments. When using in environments with water, avoid splashing water onto the instrument.
- » When not in use, place the instrument and all accessories in the dedicated storage case.
- » For devices stored long-term, check by powering on every six months, with each power-on period lasting no less than 3 hours.
- » When using the device, please try to keep it stable and avoid vigorous shaking.
- » Do not use or store the instrument in environments outside the permitted operating temperature or storage temperature range.
- » Do not use dissolvent or similar liquids on the device or cables, as this may cause damage to the device.
- » The device contains a built-in lithium battery. Do not place the device in high-temperature environments or near high-temperature objects.
- » Do not disassemble the device yourself, as this may cause damage and void the warranty.
- » For devices equipped with an imaging lens, do not point the device directly at very high-intensity thermal radiation sources, such as the sun, lasers, or spot welders, as this may damage the lens.
- » Do not touch the microphone panel with sharp objects to prevent damage to the waterproof and breathable membrane, affecting the device's waterproof and dustproof performance.

# PRODUCT INTRODUCTION

## Product Overview

The PCE-AIC 50 is a specialized device that uses a microphone array to measure the sound field distribution within a certain range. It can be used to measure the location of sound sources and the state of radiation intensity, displaying intuitive images in the form of a cloud map, i.e., acoustic imaging measurement. The instrument supports audible sound and ultrasonic frequency bands and can be used for sound source localization, abnormal sound testing, sound source trajectory tracking and localization, etc. It can achieve excellent detection results for steady-state or highly transient sound sources, as well as stationary or moving objects. It is currently mainly used in scenarios such as compressed gas leak detection and partial discharge detection of power equipment.

## Features

- » Integrated 64-channel MEMS acoustic sensor for accurate sound source localization.
- » Frequency range 2k~100kHz, capable of capturing high-frequency sound signals to meet various scenario requirements.
- » Equipped with a 1200W high-definition camera for clear photo capture.
- » Supports generating analysis reports on the device, significantly improving inspection efficiency.

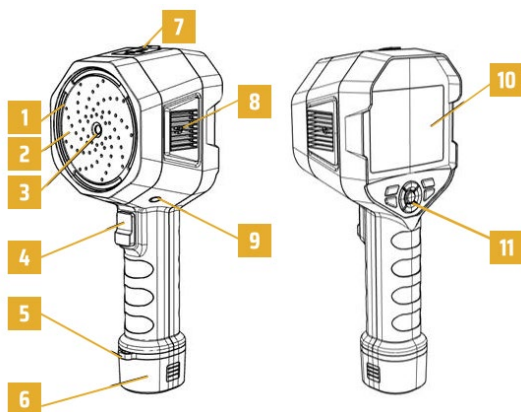
| Technical Specifications           |                                                   |
|------------------------------------|---------------------------------------------------|
| Acoustic Imaging Parameters        |                                                   |
| Sensor Type                        | MEMS Digital Microphone                           |
| Sensor Sensitivity                 | -26 ±1 dBFS                                       |
| Number of Sensors                  | 64 Channels                                       |
| Frequency Range                    | 2kHz ... 100kHz                                   |
| Detection Distance                 | 0.3m ... 50m                                      |
| Imaging Frame Rate                 | ≥25FPS                                            |
| Positioning Error                  | ≤1cm@1m, 40kHz                                    |
| Leak Measurement Sensitivity       | ≤0.05 L/min@6m, 1.2bar                            |
| Measurement and Analysis Functions |                                                   |
| Gas Leak Estimation                | Supports Leak Rate and Leak Loss Estimation       |
| Acoustic Spectrum                  | Supports Spectrogram Display                      |
| Data Analysis                      | Supports On-Device Analysis and Report Generation |

| Visible Light Camera               |                                                                      |
|------------------------------------|----------------------------------------------------------------------|
| Field of View (FOV)                | 72°±3°                                                               |
| Focal Length                       | Fixed Focal Length 3.9mm                                             |
| Pixel                              | 12MP                                                                 |
| Image Storage                      |                                                                      |
| Image Resolution                   | 640*480                                                              |
| Video Resolution                   | 640*480                                                              |
| Storage Capacity                   | 8GB                                                                  |
| Image Display                      |                                                                      |
| Screen Size                        | 3.5-inch LCD Screen                                                  |
| Screen Resolution                  | 640*480                                                              |
| Screen Brightness Adjustment       | Supports Manual Adjustment                                           |
| Image Frame Rate                   | ≥25FPS                                                               |
| Imaging Mode                       | Supports Single Source, Multiple Sources, and Acoustic Holography    |
| Imaging Range                      | Supports Full Screen and Center Area, Adjustable Area Size           |
| Imaging Color                      | Supports Rainbow, Iron Red, White Hot, etc.                          |
| Physical and Electrical Parameters |                                                                      |
| Product Dimensions                 | 243*98*64mm                                                          |
| Product Weight                     | 550g                                                                 |
| Battery Capacity                   | 5000mAh, 3.7V                                                        |
| Charging Method                    | Charging via device Type-C port or directly via battery Type-C port. |
| TF Card Slot                       | Supports TF card insertion and removal                               |
| Fill Light                         | Supported                                                            |
| Buttons                            | Full-function buttons                                                |
| WiFi                               | Supports IEEE 802.11a/b/g/n/ac 2.4G & 5G                             |

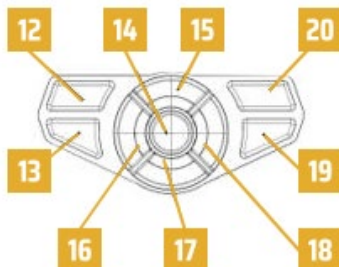
| System Functions      |                                                                                                                                                                                |
|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| System Upgrade        | Supported                                                                                                                                                                      |
| File Transfer         | Supports file transfer via USB and WiFi                                                                                                                                        |
| Device Sleep          | Supported                                                                                                                                                                      |
| Others                |                                                                                                                                                                                |
| Operating Temperature | -20°C ... +55°C                                                                                                                                                                |
| Storage Temperature   | -30°C ... +65°C                                                                                                                                                                |
| Operating Humidity    | 10% ... 95%, Non-condensing                                                                                                                                                    |
| Tripod Mount          | Supports UNC 1/4-20 interface for tripod connection                                                                                                                            |
| System Languages      | Supports Simplified Chinese, English, Spanish, Russian, German, French, Italian, Thai, Polish, Czech, Bahasa, Turkish, Korean, Traditional Chinese, Finnish, Japanese, Swedish |

### Device description

- 1 - Light Strip
- 2 - Microphone Panel
- 3 - Visible Light Camera
- 4 - Trigger Button
- 5 - Wrist Strap Loop
- 6 - Battery
- 7 - External Interface
- 8 - Heat Sink
- 9 - 1/4-inch Threaded Hole
- 10 - Display Screen
- 11 - Operation Buttons



- 12 - Power button
- 13 - Light strip button
- 14 - Confirm button
- 15 - Direction button - Up
- 16 - Direction button - Left
- 17 - Direction button - Down
- 18 - Direction button - Right
- 19 - Album button
- 20 - Back button



## EXTERNAL INTERFACE DESCRIPTION

### Memory card interface

This product requires a Micro TF card for storage. Captured images and videos are recorded on the TF card. This product supports TF cards with a maximum capacity of 512GB.

### Inserting the memory card

- » Open the silicone dust cover outward and insert the memory card.
- » Orient the memory card with the label side facing you and insert it until it clicks into place.

### Removing the memory card

- » Open the silicone dust cover.
- » Press down on the memory card, release it when you hear a click, and the TF card will eject automatically.

### Type-C interface

- » Viewing TF card files.
- » Use a USB data cable to connect to a computer, open My Computer, view the internal storage drive information, click to enter the memory device, and you can see captured images, videos, and other data.

### Exporting data.

An external Type-C interface USB drive can be used to export data from the device.

### Charging the device.

- » A Type-C interface charger can be used to charge the device directly.
- » **Note:** The number of photos that can be taken depends on the remaining capacity of the card, image recording quality, etc.
- » The device must have a TF card properly inserted before it can be mounted as a USB drive when connected to a computer.

## GETTING STARTED

### Battery and Charging

The device is powered by a lithium battery, which is removable. When using the device for the first time or when the battery is low, the battery needs to be charged.

- » Supports direct charging via the Type-C port on the battery.
- » The battery can be charged directly through the device's Type-C port.

### Power On

When the device is off, press and hold the POWER button for about 4 seconds to power it on.

### Power Off

- » When the device is on, press and hold the POWER button for about 2 seconds to bring up confirmation options, where you can choose to power off.
- » When the device is on, press and hold the POWER button for about 5 seconds to force a shutdown.

### Sleep and Wake

- » When the device is on, press and hold the POWER button for about 2 seconds to bring up confirmation options, where you can choose to enter sleep mode.
- » When the device is on, briefly press the POWER button to enter sleep mode; the device screen turns off.
- » In sleep mode, the device screen is off; briefly press the POWER button to wake the device.

### Taking Photos and Recording Videos

- » On the live preview screen, briefly press the trigger button to take a photo.
- » On the live preview screen, press and hold the trigger button to start recording; while recording, briefly press the trigger button again to stop recording.

### Light Strip

Press the light strip button to turn the lights on or off.

### Album

Press the album button to open the album and view photos or videos.

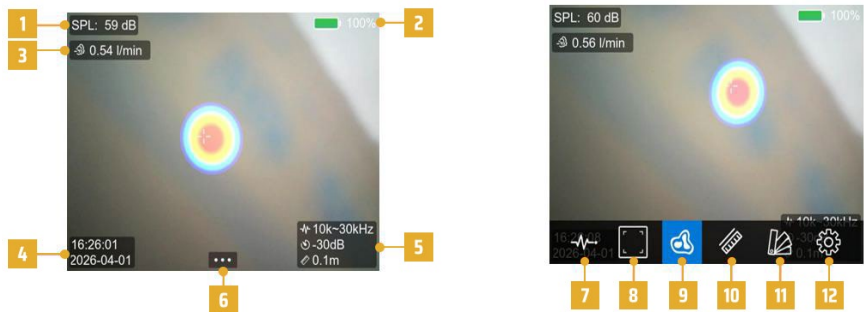
### Hiding/Showing Hidden Buttons

- » On the live preview screen, press the OK button to reveal the hidden buttons at the bottom.
- » Use the directional keys to select a button, press the OK button to perform the action, and press the back button to return to the previous level until the buttons are completely hidden.

# IMAGE INTERFACE INTRODUCTION

## Main Interface

- 1 - Sound Pressure Level: Real-time measured sound pressure level.
- 2 - Battery Level: Displays the current remaining battery power of the device.
- 3 - Leak Measurement Result: Displays the leak measurement result.
- 4 - Date and Time: Shows the current date and time of the device.
- 5 - Imaging Parameters: Displays imaging frequency band, imaging threshold, distance parameters, etc.
- 6 - Hidden Buttons: Press the OK button to reveal hidden operation buttons.
- 7 - Frequency Band Adjustment Button: Adjusts the imaging frequency band range.
- 8 - Imaging Area: Adjusts the imaging area to center or full screen.
- 9 - Imaging Mode: Switches between single target, multi-target, and acoustic holography imaging modes.
- 10 - Distance Adjustment: Adjusts the measurement distance parameter.
- 11 - Imaging Color: Adjusts the color of sound field imaging points.
- 12 - Settings Button: Enters the system settings.



| Battery Level |                    |
|---------------|--------------------|
| Icon          | Status             |
|               | Sufficient battery |
|               | Low battery        |

| WIFI Status |                     |
|-------------|---------------------|
| Icon        | Status              |
|             | Strong WIFI signal  |
|             | Medium WIFI signal  |
|             | Average WIFI signal |
|             | Weak WIFI signal    |

# BASIC MEASUREMENT OPERATIONS

## ACOUSTIC IMAGING OPERATION

### Measurement Frequency Band Adjustment

Select the frequency band adjustment button and confirm to adjust the acoustic measurement frequency band. Frequency band adjustment supports two methods: manual adjustment and quick adjustment using preset frequency bands.

| Frequency Band    | Description                                                |
|-------------------|------------------------------------------------------------|
| 10k ... 30kHz     | Automatically filters out signals outside 10k ... 30kHz    |
| 20k ... 40kHz     | Automatically filters out signals outside 20k ... 40kHz    |
| 30k ... 50kHz     | Automatically filters out signals outside 30k ... 50kHz    |
| Manual Adjustment | Supports manual adjustment within the frequency band range |

When switching to manual adjustment, a spectrum graph will pop up on the right side of the screen. Press the left and right buttons to select the upper frequency band, lower frequency band, or both. After selecting a frequency band, press the up and down buttons to adjust the frequency band range.

**Note:** The minimum width of the frequency band range is 2kHz, and the current maximum supported is 20kHz.

### Target Distance Adjustment

Select the distance adjustment button, press confirm, and then perform the distance adjustment. During leak measurement, when leak estimation is enabled, the leak calculation will be automatically adjusted based on the set target distance. The more accurate the distance setting, the higher the accuracy of the leak estimation.

### Imaging Area Adjustment

Select the  button to adjust the imaging area. You can measure the central area or the full-screen area. In focus mode, interference from the surrounding environment can be suppressed to a certain extent, significantly improving the measurement of weak signals. The focus area size can be adjusted in Settings - Acoustic Settings - Imaging Focus.

### Target Quantity Adjustment

Select the  button to switch between single-target, multi-target, and acoustic holography modes. Single-target mode detects only the largest sound source target. Multi-target mode detects up to 3 targets. Acoustic holography displays all sound field information.

### Sound Field Color Adjustment

Select the  button to switch the sound field color. Currently, three color options are supported.

## **GAS LEAK MEASUREMENT**

### **Operation Steps**

- » Enable Leak Rate Estimation and Leak Loss Estimation in Settings - Acoustic Settings - Leak Estimation Parameters;
- » Adjust the leak estimation parameters according to the actual test conditions;
- » Point the device at the sound source, and after measuring a stable imaging point, observe the leak rate and estimated loss.

### **Measurement Results**

- » Leak Rate: The estimated rate of gas leakage. The unit can be switched in the leak estimation parameters.
- » Leak Loss: The estimated gas leakage loss calculated by the device based on parameters such as the gas leak amount and gas value.

### **Leak Estimation Parameters**

- » Leak Rate Unit: Adjustment of the leak rate unit, supports l/min, ml/s, ml/min.
- » Currency Unit: The currency unit for leak loss estimation, supports multiple currencies.
- » Gas Value: The value of gas per unit volume.
- » Energy cost: The cost per kWh of energy.
- » Specific power: The power that can be generated per unit of time and per unit volume of gas.
- » Operating duration: The total annual operating hours of the device under test. If it operates year-round, the operating duration is 8760 hours.
- » Leak correction factor: When there is a deviation in the estimated leakage amount, a correction factor can be set for adjustment.

## PHOTO AND VIDEO

### Taking Photos

In the live image mode, briefly press the device trigger button to save a photo.

### Recording Video

In the live image mode, press and hold the device trigger button to start recording. Press the trigger button again during recording to end the recording.

During video recording, the status bar at the top displays the video recording timer.

## ALBUM

- » Press the album button to open the album, displaying thumbnails of photos and videos.
- » Select the  button, then press the confirm button to enable multi-file selection mode.
- » Select the  button, then press the confirm button to select all files or deselect all.
- » After selecting files, use the directional buttons to make selections.
- » Select the  button, then press confirm to export files to a USB device. When exporting data, you can choose [Export Image Files Only] to export photo and video files.
- » Alternatively, you can choose [Export as Compressed File] to compress and export the data.
- » Select the  button, then press confirm to delete the selected data.

### Photo Preview

After selecting a file thumbnail, press the confirm button to enlarge and view the file.

- » In the photo preview interface, press the confirm button to bring up photo operation options.
- » Select the  button, then press the confirm button to view photo details.
- » Select the  button, then press the confirm button to add text annotations to the current photo.
- » Select the  button, then press the confirm button to add image annotations to the current photo, supporting up to 4 images.
- » Select the  button, then press the confirm button to analyze the current photo.
- » Select the  button, then press the confirm button to export the file to a USB device. When exporting data, you can choose [Export Image Files Only] to export photo files. Alternatively, you can choose [Export as Compressed File] to compress and export the data.
- » Select the  button, then press the confirm button to delete the selected data.

### Image Analysis

- » In the photo preview interface, select the  button, and confirm to analyze the current photo.
- » Select the  button and confirm to directly generate an analysis report for the current photo.
- » Select the , then press the confirm button to export the file to a USB device.

### Video Preview

In the album preview, select a video thumbnail, then press the confirm button to enlarge and preview the video file. During video playback, press the confirm button to pause video playback.

When video playback is paused, video operation options appear.

- » Select the , then press the confirm button to view photo details.
- » Select the progress bar, then press the left or right buttons to adjust the video playback progress.
- » Select the , then press the confirm button to export the file to a USB device.
- » Select the , then press the confirm button to delete the selected file.

## SETTINGS

### DISPLAY SETTINGS

Display settings are primarily used to adjust the display content and effects during live preview.

#### Screen Brightness Setting

Screen brightness can be manually adjusted, ranging from 1% to 100%. The higher the number, the brighter the screen.

#### Real-time Preview Display Setting

- » Date and Time: When enabled, the system time is displayed in real time on the preview interface.
- » Parameters: When enabled, measurement parameters are displayed on the real-time preview interface.

### ACOUSTIC SETTINGS

#### Imaging Threshold

Set the threshold range for acoustic imaging. When the maximum sound pressure level exceeds the set threshold, the sound field imaging result is displayed.

#### Dynamic Range

Adjust the display range of the sound field, meaning the display area covers the range above [Sound Field Maximum - Dynamic Range Threshold]. Generally, it is recommended to set it to Auto. At the same frequency, the larger the dynamic range, the larger the displayed area of the sound field cloud map.

### **Sound Field Image**

- » Sound Source Mode: Supports two display modes: Sound Source Markers and Sound Field Cloud Map. In Sound Source Marker mode, detected sound source positions are indicated by pseudo-color marker points, with fixed marker point size. In Sound Field Cloud Map mode, the pseudo-color sound field cloud map is displayed in real time, and the cloud map display range can be adjusted via the dynamic range threshold.
- » Sound Field Color: Adjusts the color of sound source markers and the sound field cloud map. Currently supports Rainbow, Iron Red, and Gray White.

### **Imaging Focus**

- » Imaging Focus: When enabled, only the central focus area is scanned, which can block some interference outside the area and significantly improves weak signal measurement. The switch state is synchronized with the shortcut adjustment on the main acoustic imaging interface.
- » Focus Area: Sets the size of the central focus area, supporting two fixed range adjustments: Large and Small.

### **Leak Estimation Parameters**

- » Leak Rate Estimation: When enabled, the leak rate estimation is displayed on the acoustic imaging real-time preview interface.
- » Leak Loss Estimation: When enabled, the leak loss is displayed on the acoustic imaging real-time preview interface.
- » Leak Rate Unit: Adjusts the unit for leak rate, supporting l/min, ml/s, and ml/min.
- » Currency Unit: The currency unit for leak loss estimation, supporting multiple currencies.
- » Gas Value: The value of gas per unit volume.
- » Energy Cost: The cost per kWh of energy.
- » Specific Power: The power that can be generated per unit time per unit volume of gas.
- » Working Hours: The total annual working hours of the device under test. If the device operates year-round, the working hours are 8760h.
- » Leak Correction Coefficient: When there is a deviation in leak estimation, it can be corrected by setting the correction coefficient.

### **Imaging Enhancement**

When imaging enhancement is enabled, the imaging measurement time is extended, which improves weak signal measurement but reduces imaging speed. It is recommended to use only for weak signal measurements.

## FILE SETTINGS

### Image Watermark

Select the watermark content superimposed on photos when taking pictures, including date, time, and parameters.

### Image Notes

When image notes are enabled, a note option will automatically pop up after taking a photo.

- » Click the button to add text annotations to the current photo.
- » Click the  button to add image annotations to the current photo. Supports adding up to 4 photos. After completing the notes, click the return button, and the notes information will be automatically saved.

## CONNECTION

### WLAN

- » When WLAN is enabled, available wireless networks can be searched.
- » Select the network name from the available network list, enter the password, and connect to the wireless network.
- » **Tip:** FTP data transfer function depends on network connectivity.

### FTP

When FTP is enabled, data in the device's TF card can be accessed and downloaded directly via FTP within the same local area network.

- » Connect the device and computer to the same WIFI. After starting the FTP service on the device, the FTP service address, username, and password will be displayed on the device's interface.
- » Open Windows File Explorer, enter the FTP address from the device in the address bar, and press Enter. A pop-up window for entering the username and password will appear. Enter the username and password from the device. After successful verification, the internal data of the device can be accessed.
- » **Note:** Photo and video data is stored in the SaveData directory.

Local system updates can be performed by connecting to the FTP server, uploading the update package to the root directory of the TF card.

- » After connecting to the FTP service, place the software update package in the root directory.
- » During system upgrade, the device detects the upgrade package in the root directory of the TF card. If a new version is available, a software upgrade can be performed.

## SYSTEM SETTINGS

### System Parameters

- » Unit Switching: Switch the current measurement unit.
- » Language Settings: Switch the current system language. The device must be restarted for the change to take effect.
- » Date and Time: Set the system date, time, and date display format. After modifying the display format, the date display format on the real-time preview page will change synchronously.
- » Storage Management: Display the current storage usage.
- » Parameter Reset: Restore all device parameters to factory default settings.
- » Format: Clear all data on the device.

### System Upgrade

Perform a system upgrade via the upgrade package in the root directory of an external USB drive.

### About This Device

Display device-related information, including the device serial number, software and firmware versions, etc.

## FREQUENTLY ASKED QUESTIONS

### Q: Unstable sound field localization

A: This may be due to the target signal being too weak or incorrect frequency band settings, where the imaging frequency band is not the ultrasonic range for gas leakage/partial discharge, leading to incorrect localization and unfocused sound field. Try modifying the frequency band for testing or use automatic mode.

### Q: Two sound field points appear when there is a single sound source

A: This may be caused by reflection. If the reflected signal strength is comparable to the direct signal, two sound field points may appear. In this case, rotate the device and observe from multiple angles. The direction of the direct signal remains unchanged, but the reflected signal will change.

### Q: Unable to detect the upgrade package in the USB drive

A: First, confirm that the USB drive format is FAT32; Second, confirm that the upgrade package name in the USB drive has not been modified, and the version number of the upgrade package is higher than the current device version number; Finally, confirm that the upgrade package is in the root directory of the USB drive.

### Q: No sound field localization point appears

A: This may be due to the imaging threshold being set too high. Lower the threshold to below the current sound pressure level and try again.

## DISPOSAL

For the disposal of batteries in the EU, the (EU) 2023/1542 directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose. In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law. For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations. If you have any questions, please contact PCE Instruments.

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