

Translation of the original operating instructions

EN

LeakCam 600

| LEAKAGE |



The completeness and accuracy of this documentation have been carefully checked. We reserve the right to make technical changes at any time. These changes may result in deviations from the information provided in this documentation.

The original document was published in the manufacturer's national language (German). All translations are copies of the original document and are only valid in conjunction with the original.

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1 General information

For the sake of simplicity, this documentation refers to the product "LeakCam 600" simply as the **product**.

1.1 Documentation

This documentation provides important warnings, safety precautions, and instructions for the safe and proper operation of the product.

- ▷ Before operating the product, read this documentation carefully and ensure that you fully understand its contents.
- ▷ Always keep this documentation readily available for reference purposes.

1.2 Symbols and labels used

The following markings and symbols are used in this documentation:







Labeling/symbol	Usage
Text	Important text passages are highlighted
text	Control elements LeakCam 600
Text	Software user interface
Text > Text > Text	User interface click path
 2 Security	Cross-reference to text passage, figure or chapter
•	Enumeration, list element
▷	Call to action as part of an instruction. Can also be numbered.
✓	Final or intermediate result of an action instruction
✗	Final or intermediate result of an instruction that has not been achieved
! (in circle)	Note on an intermediate result

Table 1: Symbols and labels used

1.3 Safety instructions and notes

	DANGER Indicates an imminent danger. Death or very serious injuries may result.
	WARNING Indicates a potentially dangerous situation. Death or serious injury may result.
	CAUTION Indicates a potentially dangerous situation. Slight or minor injuries may result.
	NOTICE Indicates a potentially dangerous situation. Material or environmental damage may result.
	NOTE Indicates important information, application tips, and useful information for proper working.

2 Security

The product has been designed, manufactured, and functionally tested in accordance with applicable safety regulations.

To ensure operational safety, please observe the following:

- Chapter "Intended use"
- Chapter "Organizational measures to be taken by the operator"
- Chapter "Residual hazards"

Regardless of the instructions provided in this manual, all applicable country-specific occupational health and safety regulations must be observed.

2.1 Intended use

The operational safety of the product supplied is only guaranteed if it is used as intended.

The product is intended exclusively for detecting compressed air and compressed gas leaks. Leak detection is based on ultrasonic waves generated by the leaks, which are evaluated with consideration of distance and line pressure.

Reliable leak detection is generally possible when application-specific threshold values are met, such as a relative overpressure greater than 250 mbar **and** a leak flow rate exceeding 0.03 l/min at a test distance of 3 meters. It is important to note that measurement uncertainties and ambient noise (e.g., external sounds or pressure fluctuations) can affect detection performance.

Any use beyond or deviating from this is considered improper use. The manufacturer accepts no liability for any resulting damage.

Intended use also includes:

- Adherence to the supplied documentation
- Compliance with all inspection and maintenance requirements specified by the manufacturer

Reasonably foreseeable misuse or improper handling includes:

- Performing leak testing or leak detection involving flammable or toxic gases
- Conducting measurements on or near live components
- Operating the system outside the technical specifications
- Tampering with the product in any manner that deviates from the intended use or documented procedures
- Continuous operation outdoors in wet conditions or direct exposure to the weather
- Use in potentially explosive atmospheres


2.2 Organizational measures of the operator

The product may only be used if it is in perfect technical condition. It may no longer be used if it has been technically modified or damaged.

Instructions

The information on commissioning, operation, and maintenance provided in these instructions must be followed. These instructions should always be kept accessible with the product.

Personnel

People working on the product must read these instructions, particularly the chapter entitled " 2 Security", before starting work. This also applies to people who only work occasionally.

2.3 Handling class 2 lasers



CAUTION

Laser radiation (class 2 laser)

Direct exposure of the eyes to the laser can cause injury. The natural eyelid closure reflex usually provides adequate protection during brief, unintentional exposure.

- ▷ Do not look directly into the laser beam or its reflection.
- ▷ Never point the laser beam at people or animals.
- ▷ Do not use any optical aids (e.g. magnifying glasses, binoculars) to view the beam.
- ▷ Mark or secure the laser work area appropriately.
- ▷ Always observe the warning and safety instructions provided with the product.

This product contains a class 2 laser. Lasers in this class have a maximum output power of 1 mW. In the case of short-term exposure (less than 0.25 s), the eyelid closure reflex usually provides adequate protection. Proper handling is essential to avoiding unintentional exposure and hazards.

- ▷ Observe all relevant accident prevention regulations.
- ▷ Switch off the product immediately if uncontrolled radiation is suspected.
- ▷ Mark defective products clearly and take them out of service.
- ▷ Have maintenance and repairs carried out by authorized specialist personnel only.

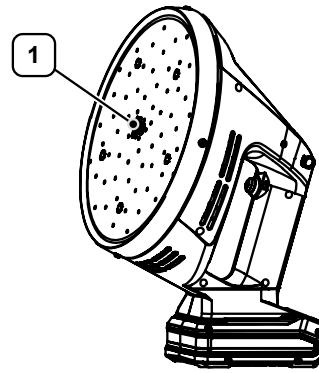


Figure 1: Laser exit point

1 Laser exit point



Figure 2: Product labeling "Class 2 laser"

2.4 Residual risks



CAUTION

General safety instructions

The product is intended exclusively for the described application.

- ▷ Maintain sufficient safety distance during leak detection on electrical systems to avoid dangerous electric shocks.
- ▷ Do not use the product in the vicinity of explosive gases, vapors, or in damp environments.
- ▷ Only use the product for its intended purpose and within the parameters specified in the technical data.
- ▷ Avoid any direct contact with hot and/or rotating parts.
- ▷ Observe the specified storage and operating temperatures.
- ▷ Any tampering with the product that does not comply with the intended or described procedures will void the warranty and release the manufacturer from any liability.

**CAUTION****Lithium-ion battery**

Lithium-ion batteries may only be used, charged, and stored in accordance with the manufacturer's instructions. Improper handling can lead to overheating, fire, or explosion.

- ▷ Follow the battery manufacturer's safety instructions.
- ▷ Do not expose the battery to heat, direct sunlight, or open flames.
- ▷ Avoid physical damage, such as dropping, crushing, or piercing the device.
- ▷ Replace batteries immediately if they have been dropped from a height of more than one meter or exposed to significant impacts - even if the housing appears undamaged. Internal cell damage may have occurred and could pose a safety risk.
- ▷ Do not short-circuit the battery terminals or take the battery apart.
- ▷ Use only the charger supplied with the product or chargers explicitly approved by the manufacturer. Always follow the manufacturer's recommended charging parameters to prevent product damage and ensure safe operation.
- ▷ Do not use the supplied charger to charge other devices.
- ▷ Dispose of damaged, leaking, or inflated batteries immediately.
- ▷ If chemicals get on the skin, wash the area with water and get medical help.
- ▷ Follow local regulations and dispose of lithium-ion batteries at approved collection sites.

3 LeakCam 600

3.1 Product overview

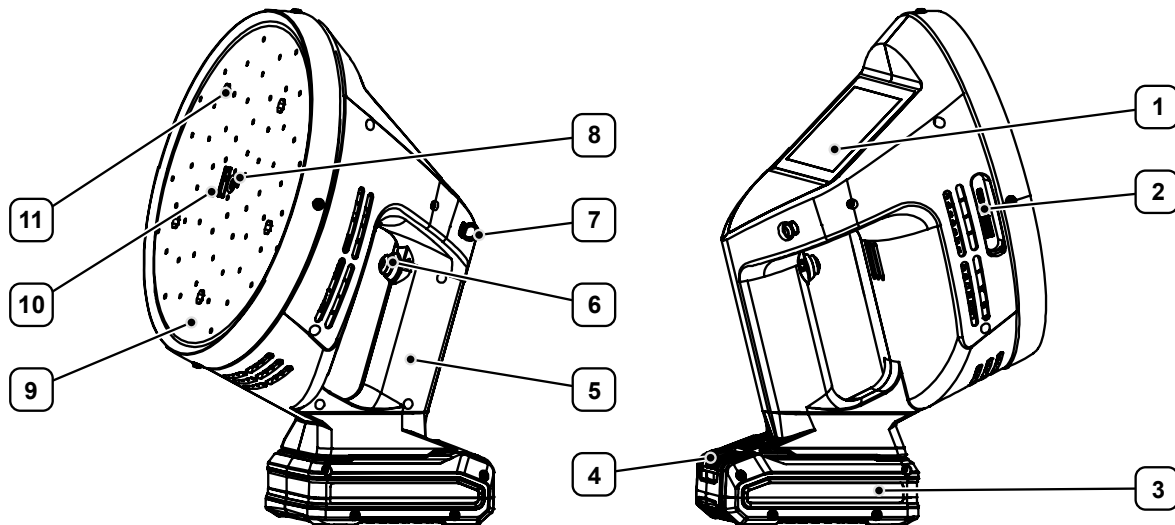


Figure 3: LeakCam 600 (example)

- | | | | |
|---|--|----|---------------------------------------|
| 1 | Touch screen | 7 | Attachment eyelet carrying strap (2x) |
| 2 | USB interface | 8 | Camera |
| 3 | Battery | 9 | Ultrasonic MEMS microphone (64x) |
| 4 | Battery capacity indicator | 10 | Laser distance module |
| 5 | Handle | 11 | LED light source (5x) |
| 6 | On/off switch / camera shutter release | | |

3.2 Product description



NOTE

Further information on terminology in connection with the topic of "leakage" can be found in the chapter "[12.5 Glossary](#)".

LeakCam 600

The product detects, localizes and evaluates compressed air leaks in real time. In addition to compressed air leaks, the product detects leaks of nitrogen, argon, methane and CO₂. The possible detection range depends on the transmission power of the leak source and the surrounding ambient conditions. Under favorable conditions, even greater distances may be achieved.

The integrated ultrasonic MEMS microphones capture a detailed sound level spectrum. The recorded data is used to generate a frequency-dependent ultrasonic map within the defined frequency range, effectively suppressing noise outside this window. This allows for precise leak detection even in noisy or acoustically complex environments. For fast leak localization, the acoustic image is overlaid with the visual image on the touchscreen.

The integrated laser distance module automatically determines the distance to the leak. The measured data is directly incorporated into the evaluation process, enhancing the precision of the leak detection.

Multi-directional ultrasonic transmitter (optional)

A multi-directional ultrasonic transmitter can be used to detect leaks in unpressurized systems. The emitted ultrasonic signal passes through even the smallest openings, which are then detected by the leak detection camera.

Further information can be found in chapter "[8.6 Multi-directional ultrasonic transmitter \(optional\)](#)".

3.3 Type plate

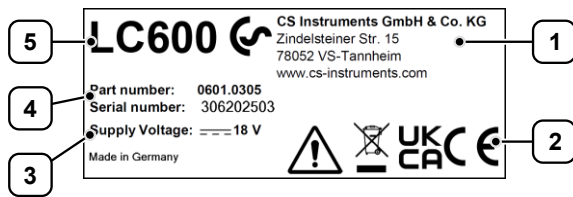


Figure 4: Type plate (example)

- | | | | |
|---|----------------------------------|---|------------------------|
| 1 | Manufacturer information | 4 | Material/serial number |
| 2 | Conformity/certification marking | 5 | Product designation |
| 3 | Electrical connection data | | |

3.4 Scope of delivery

The scope of delivery includes the following components:

- LeakCam 600
- Battery charger
- 18 V 2 Ah lithium-ion battery (incl. suitable battery holder)
- 18 V 4 Ah lithium-ion battery (incl. matching battery holder)
- Adjustable carrying strap
- Carrying case
- Leak tags
- Calibration certificate
- USB storage device
- USB-C to USB-A cable
- Multi-directional ultrasonic transmitter (optional)

3.5 Applicable documents

This Translation of the original operating instructions provides information on the operation of the product "**LeakCam 600**". It primarily covers the following topics:

- Installation and commissioning
- Leak detection
- Data record management
- Maintenance and servicing



NOTE

Data management and the creation of leak reports using the "**Leak Reporter**" reporting software are not included in this document.

Further information can be found in the "Operating instructions - Leak Reporter".



4 Transportation and storage



CAUTION

Danger due to improper transportation of the batteries

There is a risk of short circuit, mechanical damage or thermal reaction if the batteries supplied are transported incorrectly. Heat development, fire or explosion may occur.

- ▷ Only transport rechargeable batteries in designated transport containers with short-circuit protection.
- ▷ Cover the battery contacts and avoid mechanical stress (e.g. crushing, impacts).
- ▷ Follow the battery manufacturer's instructions and comply with legal regulations for transporting lithium-ion batteries.



NOTE

Improper transportation, storage and commissioning are accident-prone and can cause damage or malfunctions to the delivered product, for which the manufacturer (CS INSTRUMENTS) does not grant any liability or warranty.

4.1 Delivery

Transport damage

- ▷ Check the delivered components for any visible transportation damage.
- ▷ Report any transportation damage to the following parties immediately:
 - the carrier
 - the manufacturer's customer service (CS INSTRUMENTS)
- ▷ Ensure that the product is handled properly during transportation.

Packaging

- ▷ Keep the original packaging for any future transportation or storage.

4.2 Storage



CAUTION

Damage to battery cells due to incorrect storage

Incorrect storage can damage the battery cells in rechargeable batteries.

- ▷ Observe the safety instructions provided by the battery manufacturer.
- ▷ Store batteries only in a charged state (at least 40% charged).
- ▷ Keep batteries in a cool and dry place.
- ▷ Protect batteries from humidity and direct sunlight.
- ▷ Prevent batteries from freezing.
- ▷ Dispose of batteries that have been stored below 0°C for more than 60 minutes.

To avoid damage due to environmental influences, the product must be stored properly when not in use.

- ▷ If possible, store the product in its original packaging.
- ▷ Store the product in dry, dust-free rooms.
- ▷ Keep the product away from direct sunlight, heat sources, and corrosive or aggressive chemicals.

5 Installation and commissioning



CAUTION

Danger from commissioning a damaged product

If a damaged product is installed or put into operation, it may result in functional failures, electrical hazards, or mechanical risks.

- ▷ Before each start-up, inspect the product, accessories, and all supply lines for visible damage, loose parts, or missing components.
- ▷ Immediately take any defective product out of operation immediately.

5.1 Fitting accessories (optional)

Fitting the battery holder

The battery holder enhances product stability and when used with the carrying strap, provides ergonomic support, especially when used at stomach height.

- ▷ Slide the battery into the battery holder.
 - ⓘ The battery can be charged in the battery holder when inserted.

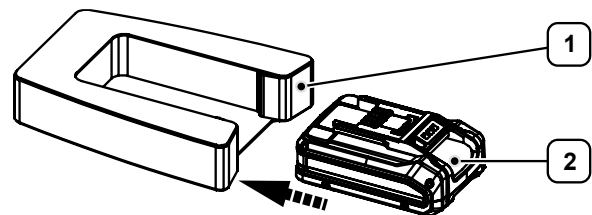


Figure 5: Fitting the battery holder (example)

- 1 Battery holder
- 2 Battery pack

Fitting the carrying strap

A carrying strap can be fitted to the device for ergonomic use.

- ▷ Attach the carrying strap to the two fastening eyelets.
- ▷ Adjust the carrying strap to the desired length.

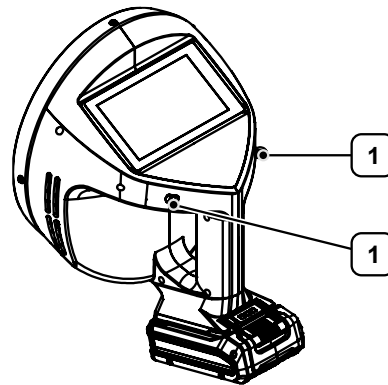


Figure 6: Fitting the carrying strap (example)

- 1 Fastening eyelet carrying strap

5.2 Initial commissioning



NOTE

The batteries are only charged to around 30% on delivery and must be fully charged before first use.

Further information can be found in chapter " 10.3 Removing and charging the battery".

Putting the product into operation

The product and battery are shipped separately for transportation purposes.

- ▷ Push the battery into the handle of the product until it clicks into place.
 - ✓ The product is now ready to use.



Starting the installation wizard

The first time the product is switched on the installation wizard for basic configuration will launch automatically.

- ▷ Follow the instructions on the screen.
- ▷ Choose the desired settings.
 - ⓘ All configurations can be edited via the system settings after commissioning.

5.3 Switching on and off

Switching on

- ▷ Press the on/off switch.
 - ✓ The device will start up.
 - ⓘ This may take a moment.

Switching off

- ▷ Press and hold the on/off switch for approx. 3 seconds.
- ▷ Confirm the message.
 - ✓ The device switches off.

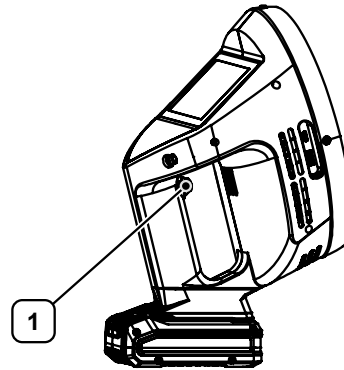


Figure 7: Switching the product on and off (example)

1 On/off switch



WARNING

Danger from removing the battery during operation

Removing the battery during operation can lead to data loss or electrical malfunctions. This can cause damage to the device and may lead to injury due to electrical discharge or uncontrolled system behavior.

- ▷ Ensure that the product is switched off properly before removing the battery.

6 Operation

6.1 Control elements

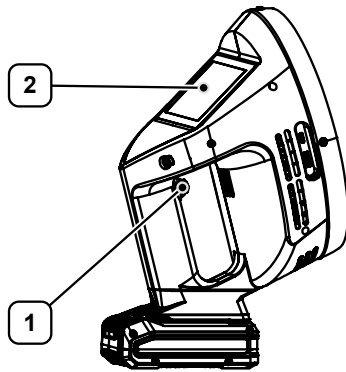


Figure 8: Operating elements (example)

1 Camera shutter release

2 Touch screen

Camera trigger

You can save a measurement using the camera trigger located on the handle.

- ▷ Press the camera trigger to capture and save the measurement.
 - ⓘ Alternatively, a measurement can also be saved using the **Camera** button on the user interface.

Touch screen

The user interface is operated via the touch screen.

- ▷ To navigate, tap menu items using your finger or a soft, rounded stylus.



CAUTION

Damage to the touchscreen

- ▷ Do not use pens or other sharp-edged objects to operate the touchscreen.

6.2 User interface

The following user interface is displayed each time the product is started.



Figure 9: User interface | Camera mode view (example)

- | | | | |
|---|------------------------|---|---|
| 1 | Status bar | 6 | Camera trigger |
| 2 | Adjust threshold value | 7 | Target area (for leakage documentation) |
| 3 | Configuration menu | 8 | Laser distance measurement |
| 4 | Zoom | 9 | LED light source |
| 5 | Measurement parameters | | |

The status bar displays various details related to the current measurement:

- Signal level [dB] (determined value_{max} target area)
- Leak rate estimation
- Cost estimation
- Frequency window (default setting: 40-55 kHz)
- Focus
- Distance to leak
- Signal level [dB] (determined value_{max} opening angle camera)
- Threshold value [dB]

The user interface is equipped with clearly structured buttons. This allows central functions such as threshold value adjustment, calibration, recording and navigation between views to be operated directly and intuitively.

Further information can be found in chapter "[8 Leak detection](#)".

7 Configuration

Opening the Configuration view

To switch from Camera mode view to Configuration view:

- ▷ Tap the Back button.
- ✓ The Configuration view will open.

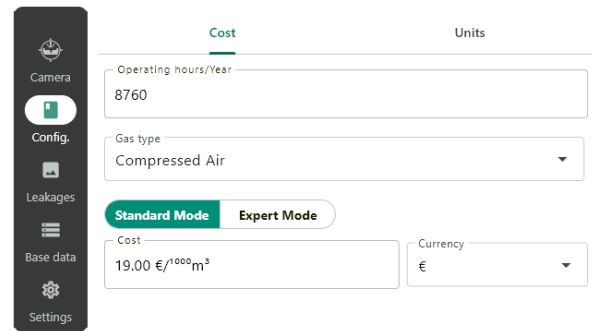


Figure 10: Configuration view (example)

7.1 Set up device settings

The following options can be configured in the Settings menu:

- Camera color setting
- Operating hand
- Display brightness
- Standby mode
- Date and time
- Language setting
- Resetting the product to factory defaults

- ▷ Tap on the Settings button.
- ▷ Select the Basic settings tab.
- ▷ Choose the desired settings.

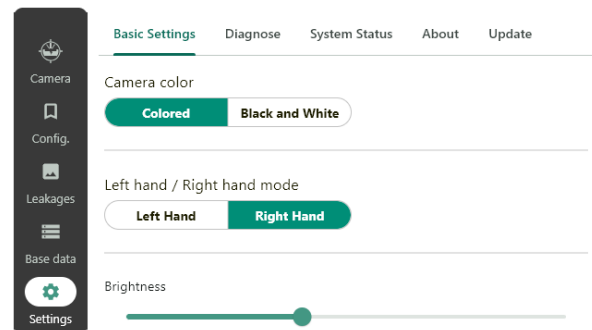


Figure 11: Adjusting the basic settings (example)



NOTE

Reducing screen brightness and setting a shorter screen timeout will help minimize energy consumption and extend the product's operating time.

7.2 Adjust configuration settings

Open configuration settings

- ▷ Tap on the Config. button.



Store parameters for cost calculation

All parameters relevant to cost calculation can be saved directly for optimal leak quantification.

- ▷ Select the **Cost** tab.
- ▷ Choose the desired settings.
- ▷ Tap the **Save** button.
 - ✓ The product is now configured to calculate the annual leakage costs.

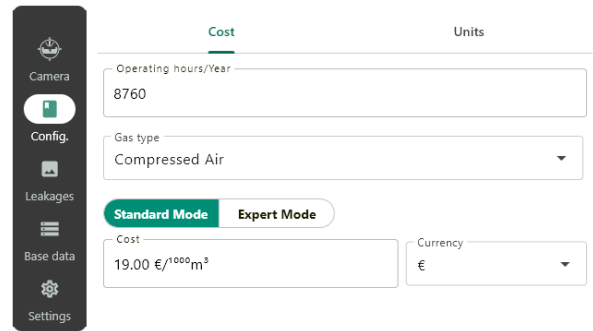


Figure 12: Storing parameters (example)



NOTICE

Expert mode

In Expert mode, you can individually set both the specific system output and the electricity price for the media types "Compressed air" and "Vacuum".

There are three preset values to choose from for the specific output - alternatively, you can enter your own value manually.

The estimation of the Total costs [100%] (life cycle costs) is broken down into 70 % energy costs, 20% installation costs and 10% maintenance costs.

- ▷ Tap on the Expert mode button.
- ▷ Choose the desired settings.

Customize units

The system of units and measured variables can be adjusted to meet country-specific specifications or individual preferences.

- ▷ Select the **Units** tab.
- ▷ Choose the desired settings.
 - ✓ The display units are adopted according to the selection and displayed correctly in all relevant areas.

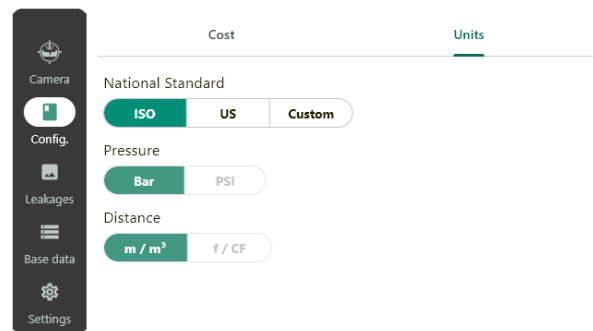


Figure 13: Customize units (example)

8 Leak detection

8.1 Checklist: Settings before starting leak detection

Before you start leak detection, ensure that all relevant settings have been configured. The following checklists will help you with structured preparation and in recording individual leaks.

Checklist: Preparation for leak detection

- Reset or continue leak tag
- Define company name
- Define building (include floor or area subdivisions if needed)
- Confirm and record compressed air costs
- Set operating hours for each area (required for the economic evaluation of leaks)
- Record operating pressure of each area (essential for calculating leak flow rate)
- Check other settings (e.g. language, units, time format, etc.)

The following information should also be documented separately for each identified leak:

Checklist: Details per leak

- Specify the leaks operating time
- Specify the operating pressure at the leak location
- Review measurement parameters and adjust if necessary

8.2 Adjust measurement parameters

Various measurement parameters can be adjusted for optimum detection and analysis of leaks. These include measuring distance, focus range, threshold value and frequency window. The correct parameterization enables better signal separation, minimizes environmental influences and improves the reproducibility of the measurement - especially under varying environmental conditions.

The system includes predefined values that serve as a reliable starting point for the most typical application scenarios.

Parameters	Factory setting
Distance	3,0 m
Focus distance	Focus far
Threshold value	20 dB
Frequency window	40-55 kHz

If the acoustic conditions change during measurement or the location is changed, it is advisable to adjust the measurement parameters.



NOTE

When restarting, all user-defined settings are deleted and replaced by the factory settings.



8.2.1 Select focus area



CAUTION

Laser radiation (class 2 laser)

Direct exposure of the eyes to the laser can cause injury. The natural eyelid closure reflex usually provides adequate protection during brief, unintentional exposure.

- ▷ Do not look directly into the laser beam or its reflection.
- ▷ Never point the laser beam at people or animals.
- ▷ Do not use any optical aids (e.g. magnifying glasses, binoculars) to view the beam.
- ▷ Mark or secure the laser work area appropriately.
- ▷ Always observe the warning and safety instructions provided with the product.

The focus determines the delay times for the internal calculation of the ultrasound map. For optimum image sharpness, the measuring distance and focus range should match as closely as possible.



NOTICE

Inaccurate focusing at a short distance from the leak

The distance to the leak should be **at least 0.3 m** to ensure reliable detection. Incorrect focusing can affect the detection results.

- ▷ If the distance to the leak is short, pay particular attention to determining the distance as precisely as possible.

Using autofocus

Autofocus calculates the optimal focus based on the distance to the leak measured by the laser module.

- ▷ Tap on the **Laser** button.
 - ⓘ Tapping again will deactivate the function.
- ▷ Aim the laser at a light-reflecting surface.
 - ⓘ Do not use glass or deep black objects as target objects.
 - ✓ The focus range is automatically selected based on the distance determined.
 - ⓘ The focus ranges **0.3 m**, **0.6 m** and **1.0 m** are available. At distances of 3 m or more, the system automatically switches to remote focus.
 - ✓ Both the measured distance and the automatically assigned focus range are displayed in the status bar.



NOTICE

- ▷ Reduce or increase the distance to the leak in order to measure optimally within the set focus range.

- ✗ If no stable measured value can be recorded via the laser distance module - e.g. due to strong movements of the leakage camera during the measurement - a warning symbol appears in the status bar. In this case, enter the distance manually.

Adjusting the focus manually

If distance measurement via the laser distance module is not possible, the distance to the leak must be entered manually.

- ▷ Tap the **Measurement parameters** button.
 - ⓘ Tapping again will deactivate the function.
- ▷ Tap the **Distance** button.
- ▷ Choose the desired settings.
 - ⓘ If the distance is entered manually, the laser distance module is automatically deactivated.

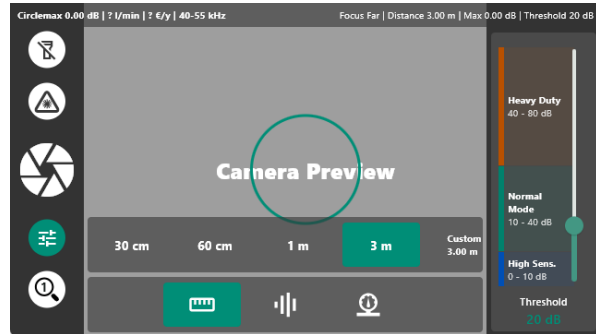


Figure 14: Adjusting the focus manually (example)

8.2.2 Adjust threshold value

The threshold value defines the signal intensity at which an acoustic event (e.g. a leak) is considered relevant. Correct threshold setting is crucial to suppress background noise and at the same time reliably detect weak leak signals. Ideally, the adjustment should be made based on the ambient noise level and the selected frequency window.



NOTE

The threshold value determines the sound level at which a pixel on the ultrasonic map is colored. **The higher the threshold value, the lower the sensitivity.** This means that only loud noises are visible - quiet sound sources can be suppressed.

The current sound intensity is recorded frequency-selectively and displayed in the ultrasound map based on color (blue= lowest volume; white: highest volume).

Adjusting the threshold value

The **Adjust threshold value** buttons can be used to adjust the sensitivity of the measurement to the ambient conditions.

- ▷ Tap the **Adjust threshold** buttons on the right-hand side of the screen to perform the following actions:

Button	Button Description
	Autocalibration: Automatic adjustment to the ambient conditions The button is displayed in yellow if the set threshold value exceeds the maximum sound pressure in the current frequency window. In this case, the threshold value should be adjusted. (Special case: Certain interference should be specifically suppressed).
	+1 dB: Reduce sensitivity (quieter sounds are suppressed)
	-1 dB: Increase sensitivity (quiet noises are also visible)
	Set maximum level: Suppress unwanted noise Example: Ultrasound source is located just outside the camera's aperture angle

Table 2: Adjust threshold value buttons

Threshold value	Environment type
40 - 80 dB	Heavy duty (noisy environments, lots of background noise)
10 - 40 dB	Medium (normal environments)
0 - 10 dB	High (quiet environments, e.g. in the laboratory)

Table 3: Threshold ranges for different types of environments



8.2.3 Select frequency window (expert knowledge)

The FFT-based evaluation (Fast Fourier Transform) makes the frequency components present in the measurement environment visible and enables targeted analysis. By setting the lower and upper limits, a frequency window is defined within which relevant signals are analyzed.

The frequency window can be adjusted to target the analysis of leakage noises. Setting appropriate cut-off frequencies enhances selectivity against ambient noise, especially in industrial environments.

The difference between frequency window and threshold value in leak detection lies in their function within the detection process:

- Frequency window determines **where** to look (which frequencies).
- The threshold value determines **when** the definition is made: "There is a leak here."

Criterion	Frequency window	Threshold value
Function	Defines the frequency range to be analyzed	Defines the minimum signal level for detecting a leak
Target	Fade out irrelevant or interfering frequency components	Avoidance of false alarms / detection of significant signals
Influencing factor	Ambient conditions, typical leakage frequencies	Background level, sensitivity of the system
Example of	Analysis of 25-40 kHz or 40-55 kHz	A leak is detected when the level is > 70 dB within the selected frequency range
Setting option	Freely selectable via slider or via presets (max. 20 kHz)	Via Adjust threshold value buttons
Typical application benefits	Increases signal quality by focusing on relevant frequencies	Decides whether the measured signal represents a leak

Table 4: Function and role of frequency window and threshold value

Select frequency window

In acoustically polluted environments, such as industrial halls with high levels of machine noise, the frequency window can be adjusted to detect only high-frequency signals. Low-frequency ambient noise outside this window is systematically suppressed, improving detection accuracy.

- ▷ Tap on the Measurement parameters button.
 - ⓘ Tapping again will deactivate the function.
- ▷ Tap on the Frequency window button.
- ▷ Set the frequency window so that prominent signals or spectral peaks are fully recorded.
- ▷ Choose the appropriate frequency window using the two predefined values (25-40 kHz / 40-55 kHz).
- ▷ **Or** adjust the frequency window manually using the slider.
 - ⓘ If the frequency window is selected manually, neither the "Leakage rate estimation" nor the "Cost estimation" can be carried out to quantify the leak.

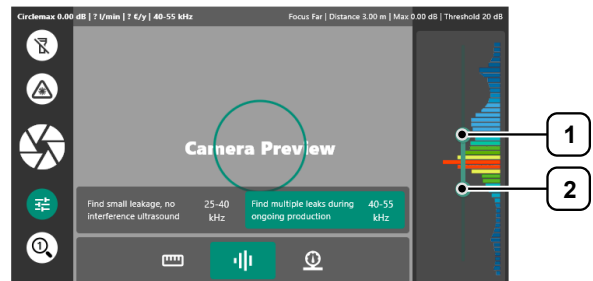


Figure 15: Select frequency window (example)

- 1 Upper frequency limit
- 2 Lower cut-off frequency

Characteristic	25-40 kHz	40-55 kHz	60-80 kHz
Attenuation over distance	Low	Medium	High
Sensitivity ultrasonic microphone	High	Medium	Low
Selectivity / multiple leakage detection	Medium	High	Very high
Interference sensitivity (audible range)	Medium	Low	Very low

Characteristic	25-40 kHz	40-55 kHz	60-80 kHz
Typical application	Quiet environment, small leaks from a large distance (e.g. leak tests)	Small to medium leaks from a greater distance in a production environment (ideal for compressed air)	Medium to large leaks in highly automated areas at a distance of < 6 m

Table 5: Comparison of the ultrasonic frequency ranges

8.2.4 Set operating pressure

The system's operating pressure can be stored to enable optimal quantification of the leaks.

- ▷ Tap on the **Measurement parameters** button.
 - ⓘ Tapping again will deactivate the function.
- ▷ Tap on the **Pressure** button.
- ▷ Choose the desired settings.
 - ✓ The stored operating pressure is factored into the calculation of annual leak costs.

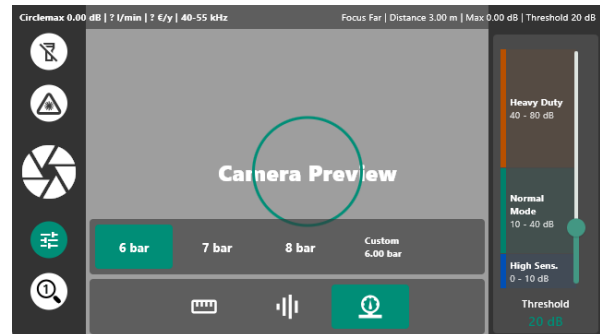


Figure 16: Setting the operating pressure (example)

8.3 Carry out leak detection



DANGER

Injuries or death from touching live parts

Touching live parts can lead to death.

- ▷ Work on electrical systems or equipment may only be performed by qualified electricians or by instructed personnel under the direction and supervision of a qualified electrician in accordance with applicable electrical engineering regulations.
- ▷ When locating leaks in electrical systems, maintain a sufficient safety distance to avoid dangerous electric shocks.

Prerequisite

- The system is in operating mode or is pressurized (depending on the measurement method used).
- All safety requirements are known and complied with.

Materials

- LeakCam 600
- Leak tags (for physically marking detected leaks)
- Personal protective equipment



NOTE

For effective planning and repair, leak data should be recorded and stored directly on site.

Preparation steps

- ▷ Ensure safe and unobstructed access to the measurement area.
- ▷ Pressurize all relevant system components, if this can be done safely.
- ▷ Hold the product in your preferred operating hand and stabilize it with the other hand.
 - ⓘ For ergonomic use: Attach the carrying strap and insert the battery into the battery holder.

Opening the Camera mode view

To switch from Configuration view to Camera mode view

- ▷ Tap the Camera trigger button.
 - ✓ The Camera mode view opens.



Carry out localization

- ▷ Walk systematically along compressed air lines, connections, valves and other typical leakage points.
- ▷ Position the product near the area to be tested.
- ▷ Observe the visual indicators on the user interface.

8.4 Estimate leakage

The estimated leakage volume flow (liters/minute) results from the parameters pressure, distance and ultrasonic level (dB). The distance in particular has a significant effect on the result and should be specified as precisely as possible, as the signal intensity decreases with increasing distance and the source therefore appears quieter.

Measurement accuracy can be influenced by ambient ultrasound within the target frequency range, such as interference from nearby leaks or reflections. Additionally, a sealed leakage point or an unfavorable measuring angle relative to the airflow can also affect the result.

Therefore, it cannot be guaranteed that the measurements taken during the evaluation period fully represent the current leakage rate. The estimated leakage volume flow is intended as a guide to help prioritize compressed air leaks, particularly when considering the potential costs of spare parts and repair work.

Estimate leakage

If the leak is precisely within the target area and the maximum measured value exceeds the defined threshold value, the leakage is recognized as a detected sound source - the target marking will then change from red to green.

- ▷ If there is no color change, adjust the measurement parameters accordingly.
 - ① Further information can be found in chapter "→ 8.2 Adjust measurement parameters".



Figure 17: Leakage optimally detected (example)

1 Target area (for leakage documentation)



NOTICE

Analyze each leak individually

For accurate quantification, each leak should be analyzed individually.

- ▷ If possible, only record **one** leak in the target area to enable an exact calculation.
- ▷ If necessary, swivel the leak camera or zoom in closer to the area to be examined to improve the positioning of the leak in the target area.



NOTICE

Distinguishing between original and reflected sources

To determine whether a displayed sound source is the original signal or a reflection, the source should be viewed from several angles.

- ▷ Genuine sound sources: remain clearly visible
- ▷ Reflections: change their position or disappear completely



NOTICE

Adjusting the threshold value

If the "Threshold" value is displayed in **yellow** in the status bar, the signal detection should be optimized by adjusting the threshold value.

- ▷ Threshold value too high: quiet leaks may remain undetected
- ▷ Threshold value too low: sources of interference outside the field of view can dominate and distort the analysis

**NOTICE****Minimize background noise**

To minimize environmental influences, leak detection over medium to high frequency windows is recommended.

- ▷ In addition, select a frequency window that is as small as possible to suppress nearby interference signals.
- ▷ In noisy environments, select a higher frequency window to more effectively distinguish leak noises from interference signals.

8.5 Document leakage

For optimal analysis, the leak should be positioned in the center of the target area (circle) and the target area should change from red to green.

- ▷ Place the leak in the center of the target area (circle).
- ▷ Tap the **Camera trigger** button or press the button on the handle.
 - ✓ The leak documentation menu opens.
- ▷ If necessary, tap the **Add photo** button to add another image of the leak.
- ▷ Fill in the form fields accordingly.
 - ⓘ All entries are stored in an internal database and can be accessed or reused at any time. A selection of predefined suggestions is already included with the product delivery.

?	l/min	0 €/y	6.00 bar	3.00 m
Loss	Cost	Pressure	Gas type	Distance
8760	0.00 dB			
Op. hours/y	Circle Max			

Figure 18: Document leakage (example)

The following fields are available to describe a leak:

- Leak Tag
- Company, building and measuring point
- Measure and leak element
- Spare part and manufacturer
- Reporting person
- Estimated repair time and repair status (leak repaired on site, repair possible under pressure?)

**NOTE**

Before the measurement is permanently saved to the internal SD card, a summary can be generated, allowing you to review and verify the data for accuracy.

- ▷ Tap the **Preview** button to view an overview of the entered data.
- ▷ Tap the **Edit leak** button to correct values if necessary.
- ▷ Tap the **Save leak** button to store the data on the internal SD card.
 - ⓘ The leak tag number automatically increases by one after each saved measurement.
 - ✓ All entries are saved in an internal database and are permanently available for evaluations, reports and follow-up processes.
- ▷ Or tap the **Discard leak** button to delete the leak without saving it.
- ▷ Attach a leak tag to the leakage point for physical identification.
 - ✓ The leak has been systematically identified, localized and fully documented.



8.6 Multi-directional ultrasonic transmitter (optional)

Leak detection in unpressurized systems

A multi-directional ultrasonic transmitter can be used to detect leaks in unpressurized systems. The device is powered by a rechargeable battery.

Prerequisite

- The multi-directional ultrasonic transmitter is available as an accessory.

Commissioning and use

- ▷ Push the rechargeable battery into the bottom of the transmitter until it clicks into place.
- ▷ Switch the ultrasonic transmitter on using the on/off button.
 - ✓ The LED lights up green.
- ▷ Align the transmitter so that the ultrasonic signal is optimally coupled into the pipe system.
 - ✓ The emitted ultrasonic signal penetrates even the smallest openings in the system. These leaks can then be detected with the leakage camera.
- ▷ Carry out the leak detection as usual.

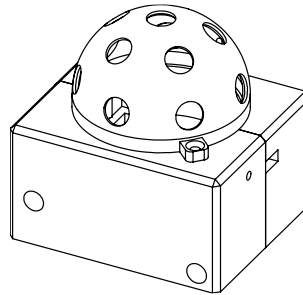


Figure 19: Multi-directional ultrasonic transmitter (example)

9 Data record management

9.1 Manage leakage data

In data record management, all recorded leaks can be systematically displayed, exported, deleted, and restored if required. This area serves as a central administration point for the structured documentation of leaks and the associated measures and repair information.

Open data record management

- ▷ Tap on the **Leakages** button.
 - ✓ The leakage data overview opens.
 - ⓘ Use the **filter** function to narrow down the data records (e.g. by company, building, or status).

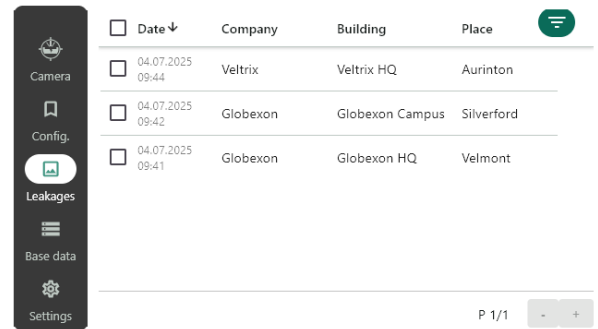


Figure 20: Data record management (example)

Show leakage (detailed view)

The details of a data record are displayed in the preview, depending on the context.

- ▷ Tap and hold the desired data record.
 - ✓ All associated information (e.g. leak tag, measuring point, measure, repair status) is displayed in the preview.
- ▷ Tap the **Next** button to switch to the next leakage.
 - ⓘ Individual leaks can be selected by ticking their checkboxes to add them to a temporary selection for subsequent actions such as export or deletion.

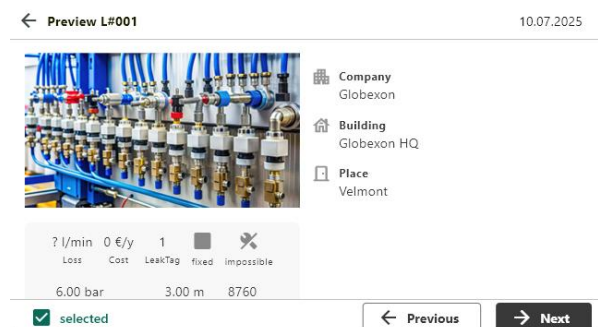


Figure 21: Leakage preview (example)

Delete leakage (soft delete)

When data records are deleted, they are moved to the recycle bin (soft delete) and removed from the standard view but can still be restored if needed.

- ▷ Choose one or more data records.
 - ✓ Selected data records are marked with a tick.
- ▷ Tap the **ove x to recycle bin** button.
- ▷ Confirm by tapping **Yes**.
 - ✓ The selected data records are moved to the recycle bin.

Restore leakage

Deleted data records can be completely restored from the recycle bin.

- ▷ Tap on the **Filter** button.
- ▷ Select **Only deleted leaks**.
- ▷ Tap on the **Apply** button.
- ▷ Select one or more data records
 - ✓ Selected data records are marked with a tick.
- ▷ Tap on the **Restore x leaks** button.
 - ✓ The selected data records are restored.




Permanently delete leaks

Data records that are no longer required can be permanently removed from the internal memory.

- ▷ Tap on the **Filter** button.
- ▷ Select **Only deleted leaks**.
- ▷ Tap the **Apply** button.
- ▷ Select one or more data records
 - ✓ Selected data records are marked with a tick.
- ▷ Tap the **Delete selected leaks** button.
 - ✓ The selected data records are **irrevocably** deleted.

Export leakage

Further information can be found in chapter " 9.3 Transfer data".

9.2 Manage master data

Many input fields use suggestion lists that can be customized, exported, and imported

- ▷ Select the **Base data** command.

Edit default values

- ▷ Select the corresponding tab to edit existing entries or to add new ones:
 - Measuring point: Company, building, location
 - Repair: Leak element, measure, spare part, manufacturer
 - People
- ▷ Tap on the desired entry to edit or delete it.




NOTICE

Deleting entries

Entries can only be deleted if they have not yet been used. This is to avoid inconsistent data.

Exporting and importing default values

The master data lists can be exported and re-imported for archiving, editing or forwarding.

Further information can be found in chapter " 9.3 Transfer data".

9.3 Transfer data

9.3.1 Establish connection

Data can be transferred using one of two methods: via a connection to a computer or via a USB storage device.

Removing the USB protective cover

- ▷ Remove the USB protective cover.
- ▷ Select the desired USB interface for data transfer.

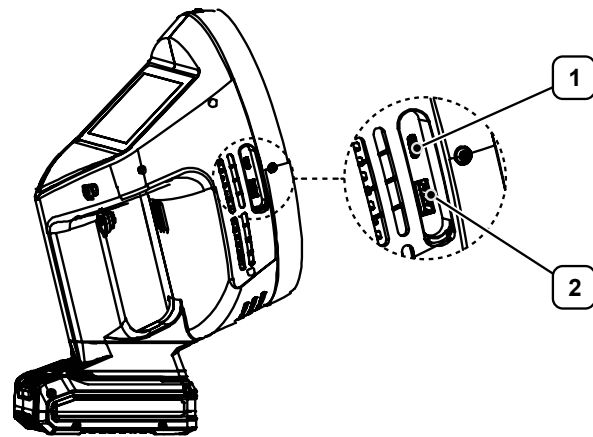


Figure 22: USB interfaces (example)

- 1 USB-C interface
- 2 USB-A interface



WARNING

Malfunctions or damage to the device

After data transfer, the USB protective cover must be completely replaced. This prevents dust, moisture or foreign objects from entering the device.

- ▷ Replace the USB protective cover after the data transfer.

Connection to a computer (via USB-C to USB-A cable)

- ▷ Insert the USB-C plug of the USB-C to USB-A cable into the USB-C port on the product.
 - ✓ The system automatically recognizes the product and mounts it as two drives.
 - ⓘ **Export drive** ("LD-export"): Read only (read-only -> for data export)
 - ⓘ **Import drive** ("LD-import"): Read and write possible (read-write -> for software update)

> LD-export (F:)

> LD-import (D:)

Figure 23: Export and import drive (example)



NOTICE

Avoidance of inconsistent data

The product is locked during an active connection with the computer. This prevents changes to the product and protects against inconsistent or incomplete data transfers.

- ▷ Do not disconnect manually during data transfer.

Connection with a USB storage device

- ▷ Insert the USB storage device into the product via the USB-A port.
 - ✓ The product automatically recognizes the storage device.
 - ⓘ When exporting data, a directory with the name "**DEV0007**" is automatically created on the USB storage device. The exported files are stored in this directory.

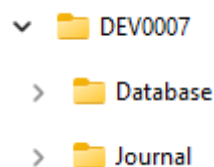


Figure 24: "DEV0007" directory (example)



NOTICE

Updating the data to be exported

Changes to data on the internal memory are not automatically transferred to the USB storage device while it is connected.

- ▷ To export the latest data, briefly disconnect the USB storage device and then reconnect it.

9.3.2 Start transfer



NOTICE

Special feature for data transfer via USB-C to USB-A cable

Changes to data on the internal memory are not automatically transferred to the export drive while the product remains connected to the computer.

- ▷ First export the desired data to the internal SD card.
- ▷ Then connect the product to the computer using the USB-C to USB-A cable.
- ▷ Copy the data from the "LD-export" export drive.



NOTE

Data management and the creation of leak reports using the "Leak Reporter" reporting software are not included in this document.

Further information can be found in the "Operating instructions - Leak Reporter".

Export leakage

Data records can be exported for documentation, archiving or forwarding.

- ▷ Tap on the **Leakages** button.
 - ✓ The leakage data overview opens.
- ▷ Select one or more data records.
 - ✓ Selected data records are marked with a tick.
- ▷ Tap on the **Export x** button.
- ▷ Select the desired storage device.
 - ⓘ When transferring data via USB-C to USB-A cable, first export the desired data to the internal SD card.
- ▷ Tap on the **Next** button.
- ▷ Tap on the **Export** button.
 - ✓ The selected data records are exported to the desired storage device.

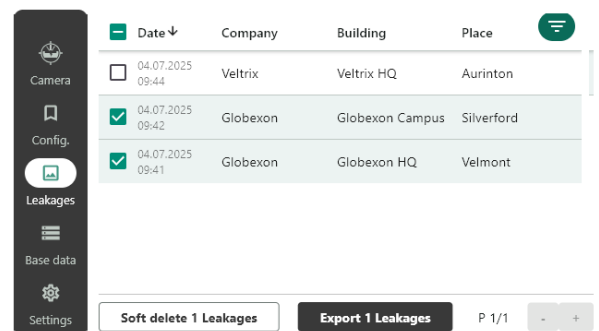


Figure 25: Export leakage (example)

Exporting and importing default values

The base data lists can be exported and re-imported for archiving, editing or forwarding.

- ▷ Select the **Base data** command.
- ▷ Select the **Import / Export** tab.

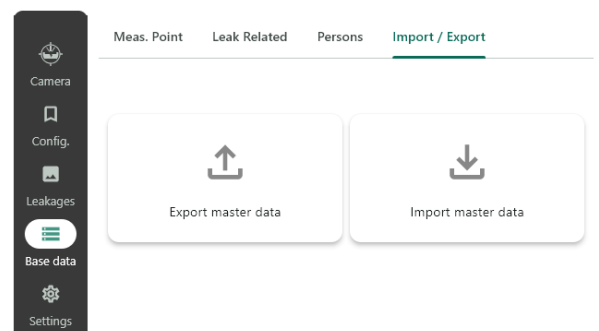


Figure 26: Transferring master data (example)



To export the master data:

- ▷ Tap on the **Export master data** button.
- ▷ Select the desired storage device.
 - ⓘ When transferring data via USB-C to USB-A cable, first export the desired data to the internal SD card.
- ▷ Select the desired entries.
- ▷ Tap on the **Export** button.
 - ✓ The data is exported in XML format.
- ▷ Tap on the **Finish** button.

To import the master data:





- ▷ Create an XML file in the required format.
 - ⓘ Only valid XML files in the intended format can be imported.
 - ⓘ When transferring data via USB-C to USB-A cable, the required data must first be copied to the "**LD-import**" import drive.
- ▷ Tap the **Import master data** button.
- ▷ Select the desired storage device.
- ▷ Select the entries to be imported.
- ▷ Tap on the **Import** button.
 - ✓ The internal database is expanded with the new entries.



10 Maintenance and servicing

10.1 Maintenance intervals

These maintenance intervals are recommendations from the manufacturer. The operator should assess operating conditions and adjust the intervals accordingly, shortening them if necessary.

Interval	Description
Daily (every 10 operating hours)	see chapter "  10.2 Clean product"
Annually (every 3000 operating hours)	see chapter "  10.4 Perform microphone diagnostics"
As required	see chapter "  10.3 Removing and charging the battery"
	see chapter "  10.5 Update software"

10.2 Clean product

Prerequisite

- The product is switched off.

Cleaning the housing

If the housing is dirty, clean it using solvent-free cleaning agents.

- ▷ Remove the battery before cleaning.
- ▷ Use a slightly damp, lint-free cloth to clean the housing regularly.

Cleaning ultrasonic MEMS microphones



WARNING

Risk of damage to the ultrasonic MEMS microphones

The microphones are sensitive and must not be handled improperly.

- ▷ Never insert objects into the microphone openings.
- ▷ Do not use compressed air to clean the microphone openings.
- ▷ Do not apply water or cleaning agents directly to the microphones.
- ▷ Do not use damp or wet cloths.

- ▷ Keep the microphone inputs clean.
- ▷ Vacuum the microphones carefully using a vacuum cleaner with a brush attachment fitted.

10.3 Removing and charging the battery



WARNING

Danger from removing the battery during operation

Removing the battery during operation can lead to data loss or electrical malfunctions. This can cause damage to the device and may lead to injury due to electrical discharge or uncontrolled system behavior.

- ▷ Ensure that the product is switched off properly before removing the battery.

**CAUTION****Lithium-ion battery**

Lithium-ion batteries may only be used, charged, and stored in accordance with the manufacturer's instructions. Improper handling can lead to overheating, fire, or explosion.

- ▷ Follow the battery manufacturer's safety instructions.
- ▷ Do not expose the battery to heat, direct sunlight, or open flames.
- ▷ Avoid physical damage, such as dropping, crushing, or piercing the device.
- ▷ Replace batteries immediately if they have been dropped from a height of more than one meter or exposed to significant impacts - even if the housing appears undamaged. Internal cell damage may have occurred and could pose a safety risk.
- ▷ Do not short-circuit the battery terminals or take the battery apart.
- ▷ Use only the charger supplied with the product or chargers explicitly approved by the manufacturer. Always follow the manufacturer's recommended charging parameters to prevent product damage and ensure safe operation.
- ▷ Do not use the supplied charger to charge other devices.
- ▷ Dispose of damaged, leaking, or inflated batteries immediately.
- ▷ If chemicals get on the skin, wash the area with water and get medical help.
- ▷ Follow local regulations and dispose of lithium-ion batteries at approved collection sites.

**CAUTION****Damage to the battery cells due to deep discharge**

The most common cause of deep discharge of battery packs is extended storage or prolonged non-use of partially discharged batteries.

- ▷ Do not use or charge batteries that were last charged more than 12 months ago.
- ▷ Only store batteries in a charged state (at least 40% charged).
- ▷ Recharge the battery in a timely manner.

**CAUTION****Safety risk due to aged lithium-ion batteries**

Lithium-ion batteries undergo a natural aging process. Over time, cell performance declines. Aged or weakened batteries may no longer meet the required performance standards and can pose a safety risk.

- ▷ Replace batteries when their capacity falls below 80% of the original rated capacity.
- ▷ Dispose of damaged or defective batteries in accordance with applicable regulations and environmental standards.



Display battery capacity

The battery capacity indicator provides information on the battery charge status using a 3-stage LED display.

- ▷ Press the battery capacity indicator button.
 - ✓ The charge status is displayed via the status LEDs.
- ▷ Recharge the battery at regular intervals, even when not in use.
 - ⓘ This extends the service life of the battery and ensures that it is ready for use.

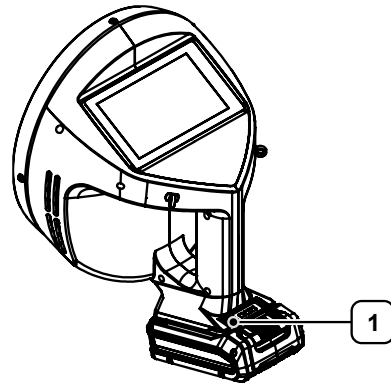


Figure 27: Display battery capacity (example)

1 Battery capacity display

Battery status	Description
All 3 LEDs light up	Battery is fully charged
1 or 2 LEDs light up	Sufficient remaining charge available
1 LED flashes	Battery is empty and must be charged
All LEDs flash	Battery temperature is below the permissible range. <ul style="list-style-type: none"> • Remove battery and store at room temperature for at least 24 hours. • If the error occurs again, the battery is deeply discharged and defective. • Defective batteries must not be reused and must be disposed of properly.



NOTE

To protect the lithium-ion battery, the product issues a warning message when the supply voltage drops to $\leq 15,5$ V and then shuts down automatically.

Removing and charging the battery

Prerequisite

- The product is switched off.

For optimal battery performance, avoid deep discharge cycles and charge the battery in a timely manner.

- ▷ Ensure that the product has been switched off properly before removing the battery.
- ▷ Press the release switch downwards.
- ▷ Pull the battery out of the handle of the product.
 - ⓘ The battery can be charged in the battery holder when inserted.
- ▷ Check whether the mains voltage specified on the charger matches the local mains voltage.
- ▷ Connect the mains plug of the charger to the power supply.
 - ✓ The green LED starts to flash.
 - ✓ The charger is ready for use.
- ▷ Insert the battery onto the charger until it clicks into place.
 - ✓ The red LED lights up continuously. The charging process is active.
 - ⓘ A fully discharged battery is fully charged in a maximum of 12 hours.
- ▷ Remove the fully charged battery from the charger.
- ▷ Insert the battery into the handle of the product until it clicks into place.
 - ✓ The product is ready for use.

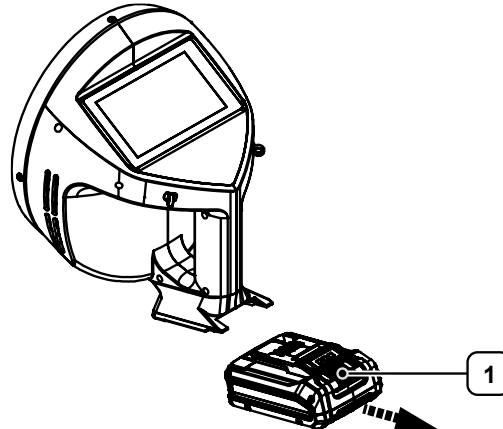


Figure 28: Changing the battery (example)

- 1 Release switch

10.4 Perform microphone diagnostics

The function of the ultrasonic MEMS microphones can be checked using the integrated diagnostic tool. A defective microphone can impact the performance and accuracy of the product.

- ▷ Select the **Settings > Diagnostics** command.
- ▷ Tap the **Start diagnostics** button.
 - ✓ The microphone test is performed automatically.
 - ⓘ The process can take up to three minutes.
- ▷ Clean the microphone inputs if necessary.
 - ⓘ Further information can be found in chapter "[10.2 Clean product](#)".
- ▷ Carry out the microphone test again.
- ▷ Contact customer service if necessary.

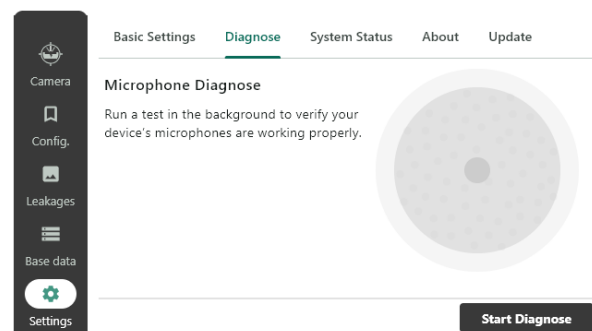


Figure 29: Performing microphone diagnostics (example)



10.5 Update software

10.5.1 Download software package

- ▷ Visit the manufacturer's homepage at (CS INSTRUMENTS).
- ▷ Download the appropriate software package.
 - ⓘ The current hardware and software versions along with the serial number are displayed under the **About** tab.
- ▷ Save the software package in the desired target directory or on the desired USB storage device.

10.5.2 Establish connection

Removing the USB protective cover

- ▷ Remove the USB protective cover.
- ▷ Select the desired USB interface for data transfer.

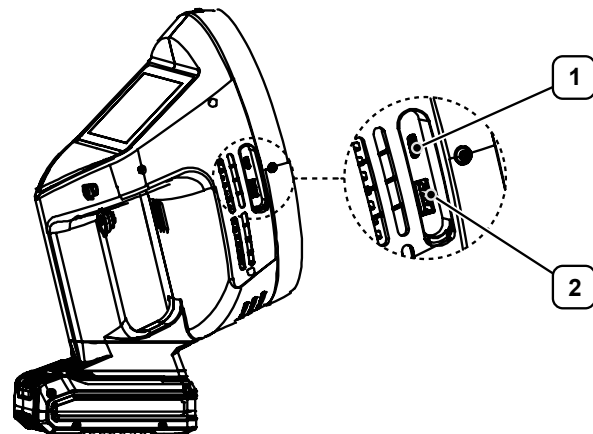


Figure 30: USB interfaces (example)

1 USB-C interface 2 USB-A interface



WARNING

Malfunctions or damage to the device

After data transfer, the USB protective cover must be completely replaced. This prevents dust, moisture or foreign objects from entering the device.

- ▷ Replace the USB protective cover after the data transfer.

Connection to a computer (via USB-C to USB-A cable)

- ▷ Insert the USB-C plug of the USB-C to USB-A cable into the USB-C port on the product.
 - ✓ The system automatically recognizes the product and mounts it as two drives.
 - ⓘ **Export drive** ("LD-export"): Read only (read-only -> for data export)
 - ⓘ **Import drive** ("LD-import"): Read and write possible (read-write -> for software update)

> LD-export (F:)

> LD-import (D:)

Figure 31: Export and import drive (example)



NOTICE

Avoidance of inconsistent data

The product is locked during an active connection with the computer. This prevents changes to the product and protects against inconsistent or incomplete data transfers.

- ▷ Do not disconnect manually during data transfer.



Connection with a USB storage device

- ▷ Insert the USB storage device into the product via the USB-A port.
 - ✓ The product automatically recognizes the storage device.
 - ⓘ When exporting data, a directory with the name "**DEV0007**" is automatically created on the USB storage device. The exported files are stored in this directory.

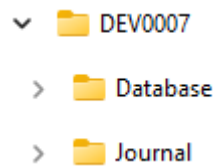


Figure 32: "DEV0007" directory (example)

10.5.3 Performing a software update



CAUTION

Data loss or malfunction due to interrupted update

The update may take several minutes.

- ▷ Fully charge the battery before starting the update.
- ▷ Do not interrupt the process.
- ▷ Do not switch off the product.
- ▷ Do not remove the battery.

Prepare data transfer

Option 1: Via USB storage device

- ▷ Insert the USB storage device into the product via the USB-A port.
 - ✓ The software update can now be carried out.

Option 2: Via computer

- ▷ Copy the software package to the "**LD-import**" import drive.
 - ✓ The software update can now be carried out.

Installing the software update

- ▷ Select the **Settings > Update** command.
- ▷ Tap the **Update** button.
 - ✓ The system compares the versions of the available and the currently installed software package.
 - ✓ If a newer software package is available, the installation button is activated.
- ▷ Tap the **Install update** button.
 - ✓ The installation of the software package is started.
 - ⓘ The installation can take up to five minutes.
 - ✓ The product restarts automatically once it is complete.

10.6 Error states

10.6.1 Correct error states



CAUTION

Data loss

Unsaved data may be lost during a forced restart.

If the device no longer responds (e.g. in the event of a system crash or frozen screen), a restart can be carried out as follows:

Option 1: Restarting the device using the on/off switch

- ▷ Press and hold the on/off switch for at least 10 seconds until the device restarts.



Option 2: Remove the battery

- ▷ Remove the battery.
- ▷ Wait a moment then reinsert the battery.
- ▷ Start the device as usual.

10.6.2 Restore factory settings



CAUTION

Data loss

All saved data and user-defined settings will be deleted when you reset the device.

- ▷ Back up all important data before continuing with the process.

If necessary, the product can be reset to the factory settings to restore the delivery status.

- ▷ Tap on the Settings button.
- ▷ Select the **Basic settings** tab.
- ▷ Tap on the **Factory settings** button.
 - ✓ The device resets all settings and restarts.

10.7 Customer service

For rapid processing by customer service

Prerequisite

- Material number (product rating plate)
- Serial number (product rating plate)
- ▷ Describe the problem as precisely as possible.
- ▷ Make a note of any error messages displayed.
- ▷ Inform customer service about:
 - When does the problem occur?
 - How often does it occur?
 - What changes were last made to the product, the configuration, or the environment?

11 Decommissioning and disposal



CAUTION

Improper disposal of the lithium-ion battery

This product contains a lithium-ion battery that must not be disposed of with regular household waste.

- ▷ Dispose of defective batteries in an environmentally responsible manner, in accordance with local regulations, or through a certified disposal company.

Decommissioning

Decommissioning is defined as an extended period of non-use of the components. The components must then be protected from external influences.

- ▷ If necessary, disconnect the components from the power supply.
- ▷ Properly package the components if they will not be used for an extended period.
- ▷ Store the components in a manner that prevents exposure to significant temperature fluctuations. Resulting condensation can lead to moisture buildup and cause corrosion.

Disposal

Parts and components that have reached the end of their service life, e.g. due to wear, corrosion and mechanical stress, must be properly disposed of after disassembly, in accordance with national regulations.

The product and packaging contain recyclable materials that must not be disposed of with residual waste.

- ▷ Separate the components after recycling.
 - ⓘ Disposal code according to the European Waste Catalog (EWC) 16 02 14, electrical and electronic devices and their components.
- ▷ Dispose of the components in an environmentally responsible manner, in accordance with local regulations or through a certified disposal company.



NOTE

Information on environmentally responsible disposal can be obtained from local authorities, or certified disposal companies.

- ▷ Alternatively, you can return the product to the manufacturer (CS INSTRUMENTS) at the end of its service life.



12 Appendix

12.1 Technical data

LeakCam 600

Parameters	Specification	Unit
Weight	1,13	kg
Power supply	18	V DC
Frequency range	2-80	kHz
Measuring range	Operating pressure: > 250 mbar Detection range: 0.3-120 m (depending on ambient conditions + sound source power) Sensitivity: 0.03 l/min (at 3 m distance)	
Laser class	2 (wavelength 630-660 nm, output power < 1 mW)	
Camera	Resolution: 13 MP Field of view (FOV): 77.3° diagonal 8x digital zoom Autofocus High Dynamic Range (HDR) Illumination: 5 LEDs	
Touch screen	Size: 5" Resolution: 1280 x 720 pixels Touch screen: capacitive (multi-touch)	
USB interface	A + C	
SD memory card capacity	128	GB
Area of use	Indoor use	
Degree of soiling	2	
Operating temperature	-5...+45	°C
Storage temperature	-20...+60	°C
Air humidity	10 to 90% relative humidity, non-condensing	
Altitude clearance	up to 4000 m above sea level	
Protection class	IP 20	

Battery charger

Parameters	Specification	Unit
Battery weight	0,30	kg
Input voltage	200-250 (EU) / 100-120 (US)	V AC
Output voltage	20	V DC
Output current	3	A
Operating temperature	0...+40	°C
Storage temperature	0...+40	°C
Air humidity	5 to 85% relative humidity	

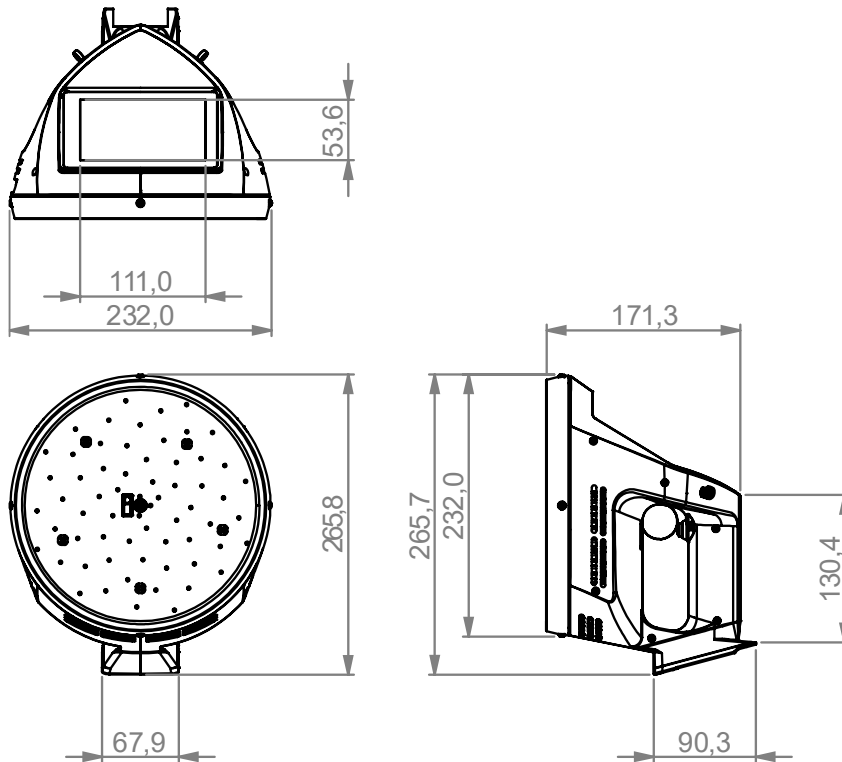
Rechargeable battery | 18 V 2 Ah

Parameters	Specification	Unit
Battery weight	0,41	kg
Battery capacity	2	Ah
Voltage	18	V DC
Charging time	~2,5	h
Operating temperature	-5...+45	°C

Parameters	Specification	Unit
Storage temperature	0...+30 (recommendation: +20...+30)	°C
Air humidity	5 to 85% relative humidity	

Rechargeable battery | 18 V 4 Ah

Parameters	Specification	Unit
Battery weight	0,58	kg
Battery capacity	4	Ah
Voltage	18	V DC
Charging time	~5,0	h
Operating temperature	-5...+45	°C
Storage temperature	0...+30 (recommendation: +20...+30)	°C
Air humidity	5 to 85% relative humidity	

12.2 Dimensions

Figure 33: Dimensions LeakCam 600



12.3 Declaration of conformity



KONFORMITÄTSERKLÄRUNG

DECLARATION OF CONFORMITY

Wir CS Instruments GmbH & Co.KG
We Zindelsteiner Straße 15, D-78052 VS-Tannheim

Erklären in alleiniger Verantwortung, dass das Produkt
Declare under our sole responsibility that the product

Leckage-Suchgerät LeakCam 600 (LC 600)
Leak meter LeakCam 600 (LC600)

den Anforderungen folgender Richtlinien entsprechen:
We hereby declare that above mentioned components comply with requirements of the following EU directives:

Elektromagnetische Verträglichkeit Electromagnetic compatibility	2014/30/EC
Niederspannungsrichtlinie Low Voltage Directive	2014/35/EC
Künstliche optische Strahlung Artificial optical radiation	2006/25/EC
RoHS (Restriction of certain Hazardous Substances)	2011/65/EC

Angewandte harmonisierte Normen:

Harmonised standards applied:

EMV-Anforderungen EMC requirements	EN 55011: 2016 + A1:2017+A11:2020 EN 61326-1: 2013
Lasersicherheitsnorm Safety of laser products	IEC 60825-1:2014
RoHS	EN IEC 63000: 2018

Anbringungsjahr der CE Kennzeichnung: 25
Year of first marking with CE Label: 25

Das Produkt ist mit dem abgebildeten Zeichen gekennzeichnet.
The product is labelled with the indicated mark.



Tannheim, den 23.06.2025

Wolfgang Blessing Geschäftsführer

12.4 Practical examples: Effects of incorrect parameterization

Error	Graphical effect	Solution
<p>Focusing not possible</p> <p>Deviation between set and actual distance</p>		<p>Correct the set distance</p> <p>Note: Use laser distance module for correct distance detection</p>
<p>Visualization not possible</p> <p>Selected setting is outside the valid frequency window - Leakage frequency is above or below the set range</p>		<p>Correct upper and lower limit frequency</p>
<p>Incorrect threshold value</p> <p>Threshold value too high: quiet leaks may remain undetected</p> <p>Threshold value too low: sources of interference outside the field of view can dominate and distort the analysis</p>		<p>Correct threshold value</p> <p>Note: Analyze each leak individually for correct quantification</p>

12.5 Glossary

Term	Description
Distance adjustment	Manual or automatic focusing of the measuring device on the area to be examined. Important if there is no laser support.
Echo reflection	A signal generated by sound reflection that bounces back from solid surfaces (e.g. walls, machines). Can appear incorrectly as a real leakage source during localization.
Frequency window	<p>Defined range within the audible or ultrasound-based frequency spectrum that is used for the targeted analysis of sound signals - e.g. to differentiate between leakage noise and ambient noise.</p> <p>Medium to high frequency windows (ultrasound) are particularly suitable for reducing background noise.</p>
Background noise	<p>Noise level from the environment that is not caused by a leak (e.g. machines, air movements, voices). In general, background noise increases at lower frequencies.</p> <p>In noisy environments, a higher frequency window should be selected to better distinguish leakage noise from interference signals.</p>
Leakage	An unintended escape of compressed air, gases or vacuum that typically generates a high-frequency ultrasonic noise. Leads to energy loss, increased consumption, and additional costs.
Detection distance	<p>The detection distance depends on the intensity of the leak and the ambient conditions. Longer distances are possible under favorable conditions.</p> <p>Typically, up to 20 m for medium leakages.</p>
Reflection	Reflected sound that is visible or invisible depending on the viewing angle. Can be identified by movement or change of perspective.
Sound pressure level [dB]	<p>Measure of the strength of a sound signal, given in decibels [dB].</p> <p>When visualizing ultrasonic leaks, the sound pressure level serves as a measured variable for the leakage intensity - in the audible or ultrasonic range - and can be used for colour representation in the image (e.g. via an adjustable threshold value).</p>



Term	Description
Sound source	Signal origin in the ultrasonic range, e.g. a leakage, a valve or a machine. Real sound sources remain visible when the position changes.
Fast Fourier transformation (FFT)	Efficient algorithm for breaking down a signal into its frequency components. An ultrasonic signal is broken down into individual frequency components using the FFT to identify leakage sources.
Threshold value	Defines the signal level above which the image is displayed in colour. <ul style="list-style-type: none"> • Too high: Quiet leaks go unnoticed. • Too low: Sources of interference can overlay the analysis.
Ultrasound	Sound with frequencies above the human hearing range (> 20 kHz). A range between 20 kHz and 80 kHz is typically used in leak detection. Ultrasound is generated by compressed air leaks, electrical discharges, or mechanical friction, among other things, and can be used specifically to locate such sources of interference. The high frequency enables pinpoint localization but is also more sensitive to attenuation by air and obstacles.
Ultrasonic map	Combination of acoustic sound image (signal distribution in the ultrasonic frequency spectrum) and optical visual image (visual representation of the signal source). Used for precise localization of leaks.
Ultrasonic level [dB]	Measured value for the intensity of ultrasonic signals. Serves as the basis for evaluating the signal strength of a possible leak.
Target area	The defined area in which leaks are searched for. The quality of the detection depends on positioning and focusing in the target area.



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