

Short Instruction Manual Ultracam, LD 510 / LD500



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1. Safety instructions

About this document

- Read this document carefully and familiarise yourself with the product before use. Pay particular attention to the safety instructions and warnings to prevent personal injury and product damage.
- Keep this document close at hand so you can refer to it if necessary.
- Pass the document on to future users of the product.

Ensuring safety



- Only use the product in an appropriate manner and for its intended purpose and within the parameters specified in the technical data. Do not use force.
- Never use the device to measure on or in the vicinity of live parts!
 - Maintain an adequate safety distance when performing leak detection operations on electrical systems to avoid dangerous electric shocks!
- Avoid any direct contact with hot or rotating parts.
- Always switch on the device first **before** putting on the headset! At high signal levels (headset bar chart in the red zone), the volume level may also be similarly high.
- Never point the integrated laser directly at the eyes! Strictly avoid directly exposing the eyes of humans and animals!
- **Laser module:** corresponds to DIN EN 60825-1: 2015-07 Class 2 (< 1 mW)
- Observe the prescribed storage and operating temperatures.
- Improper handling or use of force leads to loss of warranty.
- Any form of tampering with the device that does not conform with its designated use and is not described in the procedures will forfeit any warranty and exclude liability.
- The device is exclusively designed for the intended use as described here.

Protecting the environment



- Dispose of defective/empty batteries in accordance with the relevant legal provisions.
- At the end of its useful life, dispose of the product at the separate collection point specified for electrical and electronic equipment (observe local regulations) or return the manufacturer for disposal.

CS INSTRUMENTS GmbH & Co. KG offers no guarantee in relation to the suitability for any other purpose and accepts no liability for any printing errors in this operation manual. The same applies to consequential damage in connection with the delivery, capacity or use of this device.

The following accumulator is included in this electric device

Battery type	chemical system
accumulator	Lilon 2S1P

Information for safe removal of the battery

- Warning: Make sure that the battery is completely empty.
- Removal of the battery



Removing the battery cover



Disconnecting the connector



Carefully pull out the battery

- Carefully remove the accumulator.
- The accumulator and the device can now be disposed of separately.

2. Intended use

The LD 500 is a leak detector for quick and reliable leak detection in/on compressed air systems.

The LD 500 leak detector evaluates the ultrasonic waves generated by the leakage based on distance and pressure.

It is solely designed and constructed for the intended use described here and may only be used for this purpose.

The user must verify that the device is suitable for the intended use. The technical data listed in this datasheet are binding.

Improper handling or operation outside the technical specifications is not permitted. Claims of any kind for damages arising from improper use are excluded.

Disclaimer:

The parameters that determine the “Estimated Leak Flow” value are pressure, distance, and the ultrasound level in dB. Especially the distance is critical and must be parametrized as accurately as possible. Also, ambient ultrasound in the frequency range of 40 kHz can affect the measurement accuracy, including ultrasound of other leaks nearby and leak reflections. Additionally, if the leak’s ultrasound is sealed, this influences the measurement and the measuring angle relative to the air stream of the leak. Thus, it is impossible to guarantee that the measures taken during the assessment period fully represent your current leakage rate. The “estimated Leak Flow” should help you prioritize compressed air leaks since repairing leaks requires spare parts and labor costs.

3. Technical data LD 500

Dimensions hand-held housing	263 x 96 x 280 mm (with preamp module and acoustic trumpet)
Weight	0.55 kg with preamp module and acoustic trumpet, complete set in case approx. 3.0 kg
Operating frequency	40 kHz (+/-2 kHz)
Power supply	Internal 7.2 V lithium-ion battery
Operating time	> 9 h (continuous operation) / UltraCam +LD500 >6h
Charging time	max.4 h
Charging	ext. battery charger (included in scope of delivery)
Laser	Wavelength 645 – 660 nm, output power < 1 mW (laser class 2)
Connections	3.5 mm stereo jack for headset, Power supply socket for connecting an external charger USB connection
Colour screen	3.5" touch panel TFT transmissive
Interface	USB for data export/import, SW update, etc.

Data logger	8 GB memory card storage (micro SD class 4)
Area of use	Indoor
Operating temperature	-5 °C to +40 °C
Storage temperature	-20 °C to +50 °C
Altitude	Up to 4000m above sea level
Max. Humidity	<95% rH, without condensation
Permissible degree of contamination	2
Protection class	IP20
Available attachments	UltraCam, Acoustic Trumpet, Straightening Tube, Gooseneck, Parabolic Mirror
UltraCam	30 Digital Microphones, 5 LED's, 1 Light sensor

4. The LD 500

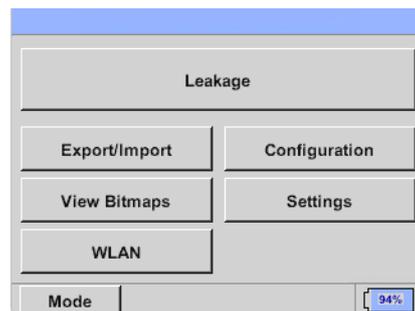


5. Preparing the device

The device must be configured before starting the leakage scan. The user can access the menu by clicking the "Home" button.

5.1 Setting the language

Home → Settings → Device Settings → Set Language → English

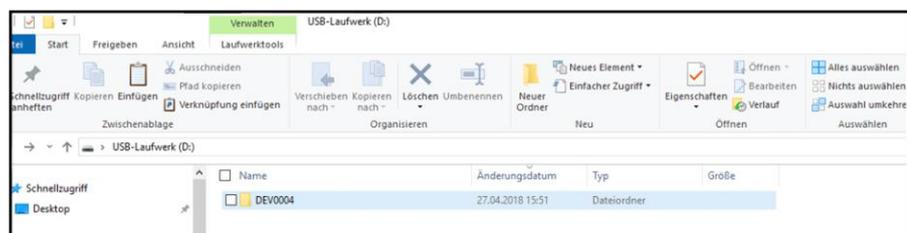


5.2 Checking the current firmware and firmware updates

Regularly check the manufacturer homepage for a new firmware version. We are continuously developing the product so you can use the device with the most up-to-date software version including all available functions.

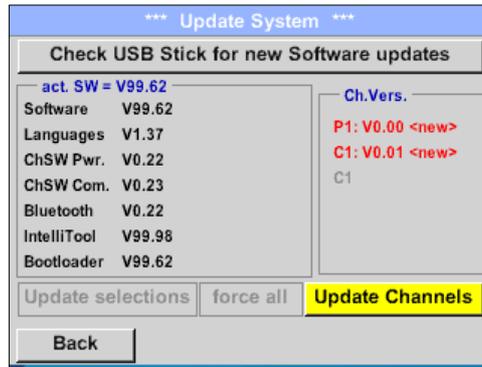
1. Check the firmware status on the homepage and download it from the following URL:
<https://www.cs-instruments.com/de/downloads/software/firmware-leckage-suchgeraete>
2. Check firmware of the LD500
Path: Home → Settings → About LD500 → Software Version
3. Unpack the ZIP file
4. Copy the DEV0004 folder to a USB stick

The folder structure must be as follows: (D:)DEV0004\Update



5. Connect the USB stick to the LD 500 and connect the power supply
6. Perform system update with:

Path: Home → Settings → Device Settings → System Update



7. Click on the "Check USB Stick for new Software updates" box
8. Available update is shown
9. Execute the "Update selections" function to perform the update
10. Restart the device and update the channels

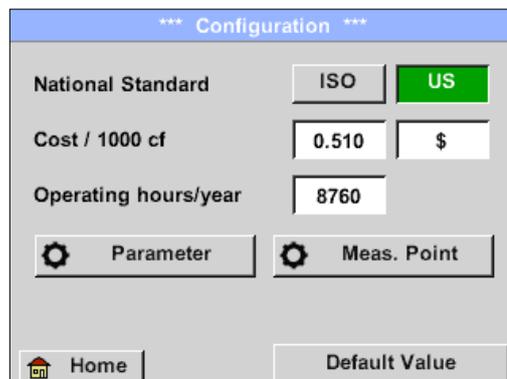
The device is now up-to-date

5.3 Configuration of LD 500

Home → Configuration ↘

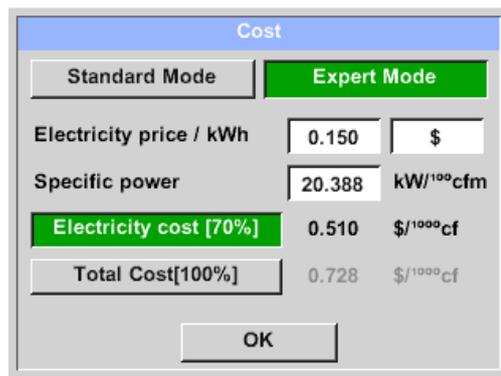
In the configuration settings, the unit system can be selected and the required parameters entered to calculate the leakage costs per year.

- ➔ Select ISO or US unit system
- ➔ To define the costs, call up the text field "Costs/1000 Nm³"
- ➔ Enter working hours per year (compressed air system is operated actively)



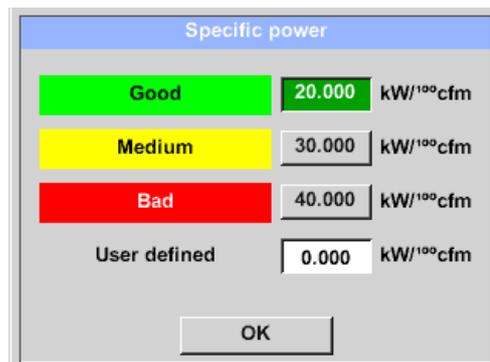
There are 2 variants available to define the costs:

- **Standard mode:** Cost per 1,000 volume units. The costs and the currency can be entered directly. Standard value: €19 / 1,000 m³ or €0.58 / 1,000 cf.
- **Expert mode:** The electricity costs/kWh as well as the specific output of the system can be defined here in detail.



Cost		
Standard Mode	Expert Mode	
Electricity price / kWh	0.150	\$
Specific power	20.388	kW/100cfm
Electricity cost [70%]	0.510	\$/1000cf
Total Cost [100%]	0.728	\$/1000cf
OK		

The specific output refers to the efficiency of the compressor system. For example, how much electrical energy (kWh) is required to produce 1 cubic metre of compressed air (m³). Three predefined system values are created for this, as well as a user-defined input field for individual entry.



Specific power		
Good	20.000	kW/100cfm
Medium	30.000	kW/100cfm
Bad	40.000	kW/100cfm
User defined	0.000	kW/100cfm
OK		

The cost type can also be set in expert mode. The "Electricity costs [70%]" are calculated by the "consumed electrical energy" of the compressed air system, which typically represents 70% of the total costs. For "Total costs [100%]", the investment and maintenance costs are taken into account, which are in addition to the electricity costs over the entire service life of the compressors.

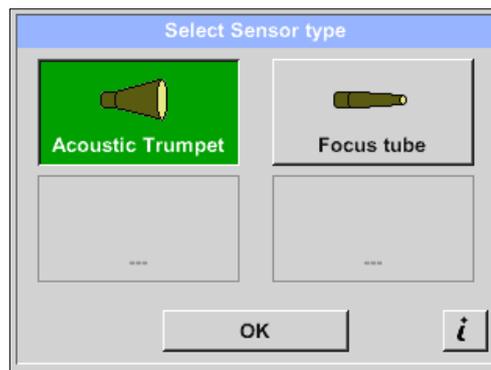
5.3.1 Setting the LD 500 parameters

Entering the parameters is necessary for the calculation of the leak flow rate.

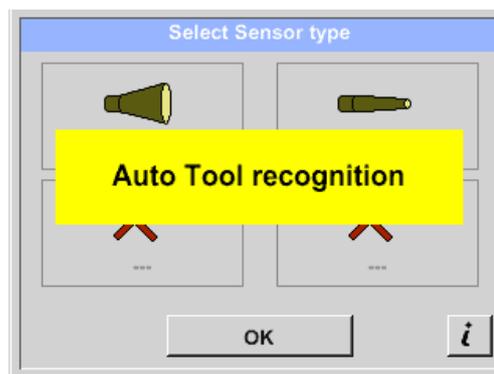
The following settings must be made.

→ Sensor type

(manual selection only necessary for sensor types without autotool recognition)

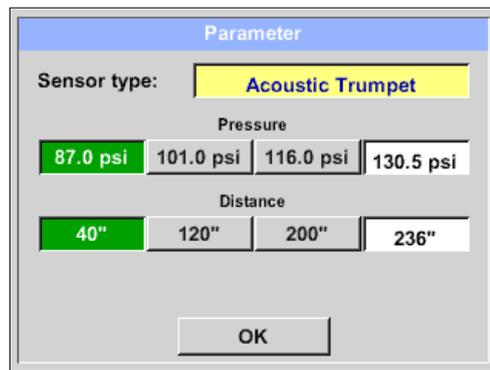


If the auto sensor detection is active, the free selection of the sensor type is blocked. Prerequisite here is an intelligent mainboard of the LD 500 and an intelligent sensor (e.g. Acoustic trumpet).



Home → Configuration → Parameter ↘ Pressure and distance

Values for the pressure and distance can be freely selected in the two fields with the white coloured background, provided these are within the valid selection range. The **pressure** can be set variably between 1 – 10 bar.



Different distances from the LD 500 to the leakage are defined for the different sensor types to calculate valid leakage loss and costs per year. These distances must be adhered to as accurately as possible.

Note on the distance setting for the quantification function:

The distances to be maintained for quantifying the leakage always refer to the front of the respective attachment measured to the leakage.

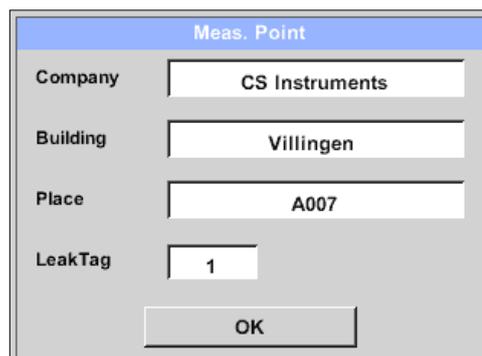
5.3.2 Setting the LD 500 measurement place

Home → Configuration → Measurement place ↘

The measurement place is stored for each leakage in its journal data (xml file). This information can be viewed later in the software leakage report.

The company and building can be recorded upon entering the building, the place identifies the exact position of the leakage so it can be easily found again when doing repairs.

- LeakTag: will automatically increase by one (1) after storing a measurement.



5.3.3 Importing data from the Leak Reporter software

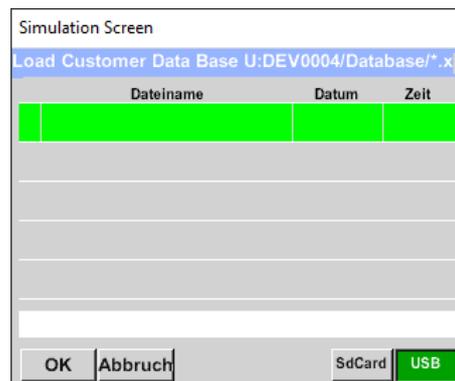
With the CS Leak Reporter or another LD 500 you can export the database. This can contain the following information:

Measuring point:

- Companies
- Buildings
- Places

Error description

- Leakage element
- Action
- Spare part



Before importing into LD 500, you can choose which areas of the database you want to update in LD 500.

Please note that the database (XML file) must be saved in the following directory.

„(D:)\\DEV0004\\Database\\Customers > (XML Database)”

After importing the XML database, you can select which areas of the database will be overwritten or deleted.

- Companies
- Leakage element
- Spare part
- Action

If you select "Delete unselected elements", the objects of the unselected areas will be deleted.

6. Leakage detection

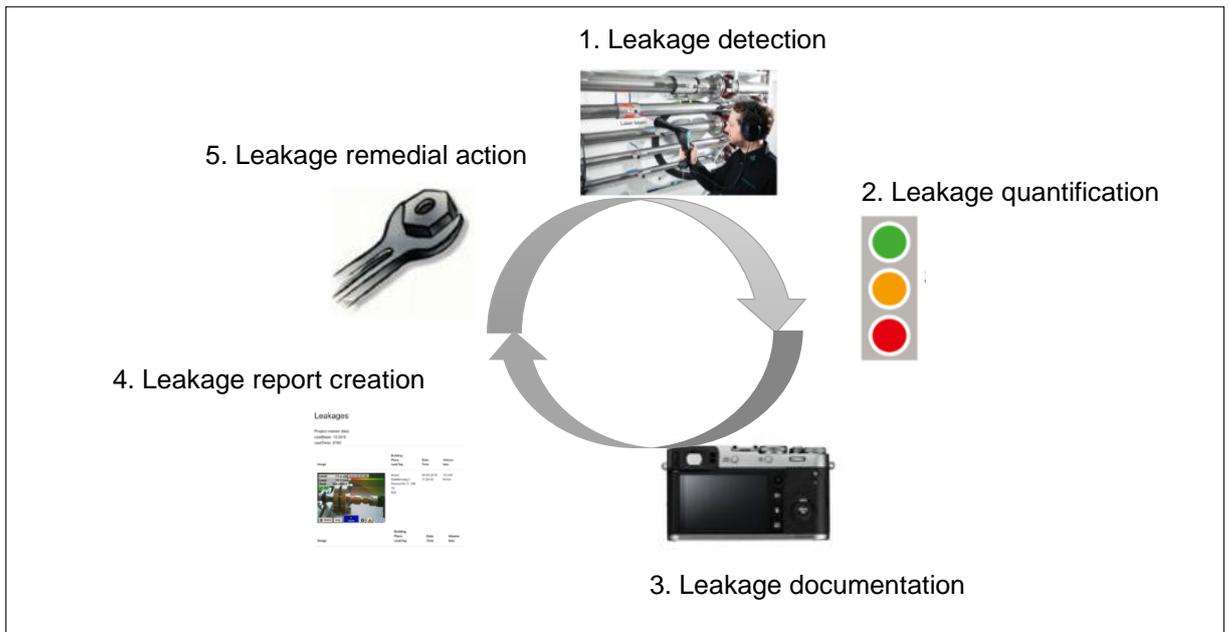
This chapter describes the best use of the device in practice.

6.1 Leakage detection procedure

The following procedure should be performed in the company on a periodic basis to consistently keep the leakage rate to a minimum. The aim should be a sustainable leakage rate of 5 to 10 % as one-time detection and elimination does not permanently reduce the leakage rate and new leakages will occur again afterwards.

Tip: To determine the ideal time, the use of a volume flow sensor in the main pipe behind the tank is recommended. At least one week (Monday to Sunday) is recommended as the measurement period. If an LD510 has been purchased, the flow sensor can be connected to it. During production stops, the volume flow profile shows the leakage rate. If the threshold value is exceeded, leak detection can be contracted.

The volume flow measurement can also be used to validate the result of the leak detection and elimination, as this must reduce the volume flow during stoppages.



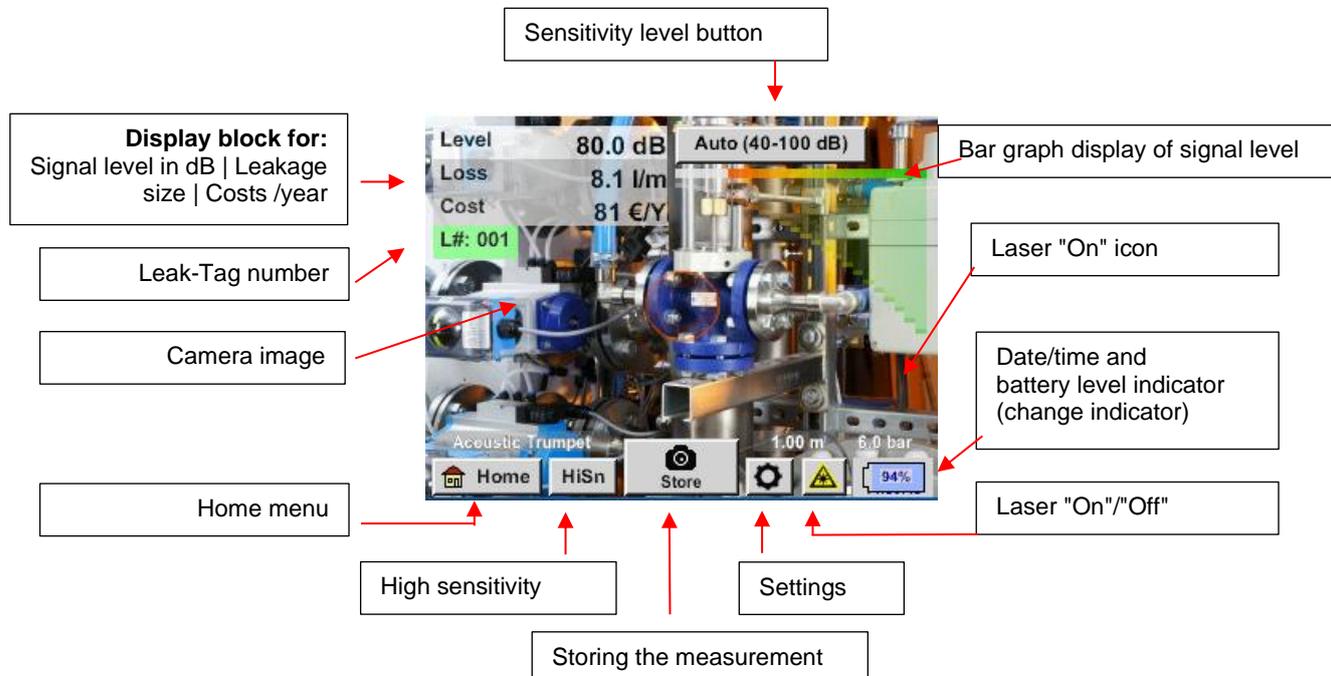
Possible causes of leakage:

Generally, leakages can be found at the connection elements in the compressed air system.

- Leaking couplings and hose clamps
- Leaking screw and flange compressors
- Porous/defective hoses
- Porous/defective seals of tools and machines
- Faulty steam traps
- Leaking or incorrectly installed dryer, filter and maintenance units
- etc.

6.2 Surface leakage detection with the LD 500

After start-up, the device shows the leakage detection view. The following figure lists the various functions and displays.



6.3 Selection of accessories

To simplify leakage detection for the user, several attachments are available for different measuring conditions.

6.3.1 UltraCam

Note on use:

- The openings of the digital microphones must not be cleaned with a compressed air gun.
- The openings of the digital microphones must not be cleaned with liquids.
- The UltraCam must generally be protected from dust and liquids.
- The UltraCam should be transported and stored in its clean case if possible.



The new UltraCam has a digital data interface to the LD 500 LD 510. That the LD 500 / LD 510 can communicate with the UltraCam, the following prerequisites must be met:

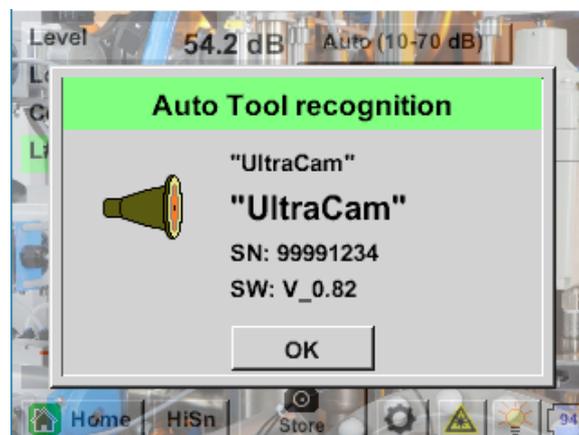
- The main board must be "HW-Stand 2.0" to enable communication between the main body of the LD 500 and the tool. This main board has been installed since approx. August 2020.
- The firmware of the LD 500 / 510 must be at least V5.0, that the interface of the UltraCam is called correctly and that the ultrasonic cards are received.

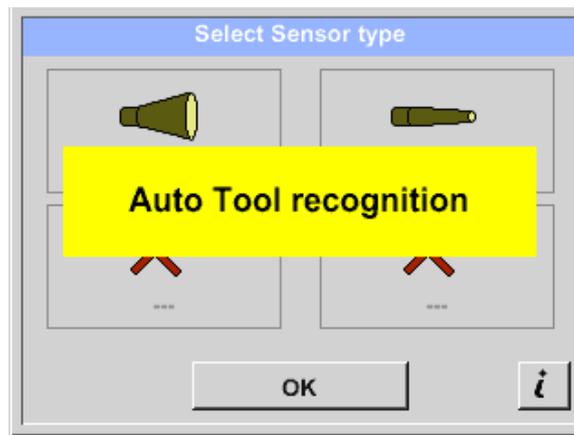
Under Settings > About LD 500 / LD 510 the device shows the data.



In the example the hardware version is 1.00 and therefore not intelligent. → In this case, CS INSTRUMENTS can replace the mainboard.

If both requirements are met, the LD 500 automatically recognizes that a tool with automatic distance measurement is connected.





Functionality

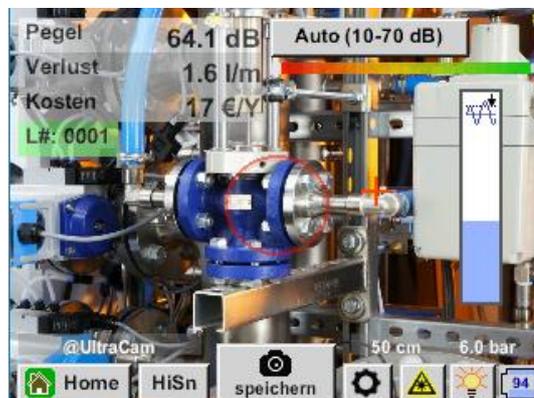
The LD 500 / 510 leak detector measures ultrasound generated by compressed air, steam, gas and vacuum leaks, as well as partial discharge on insulators, transformers, switchgear, high-voltage lines (corona effect).

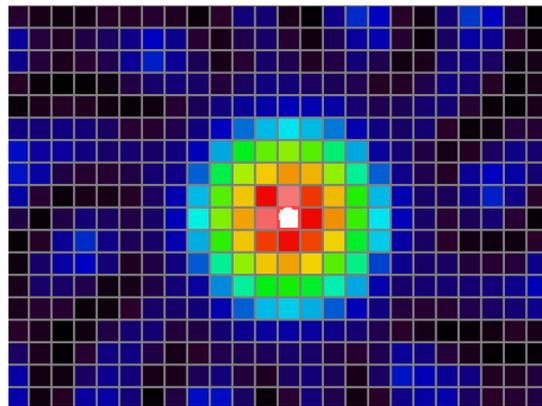
Acoustic leak detection

The ultrasound, which is inaudible to the human ear, is measured by the UltraCam and mixed into the audible sound frequency range in the LD 500/ 510, allowing you to precisely locate the ultrasonic source (the compressed air leak) via the acoustic signal on the headset and the camera image, even in noisy environments.

Optical leak detection

The UltraCam uses 30 digital mems, a camera, an FPGA and a processor to calculate the ultrasound map. The algorithm used is called beamforming and is based on the delay and sum function. Each pixel of the ultrasound map is quickly calculated and transmitted to the LD500.

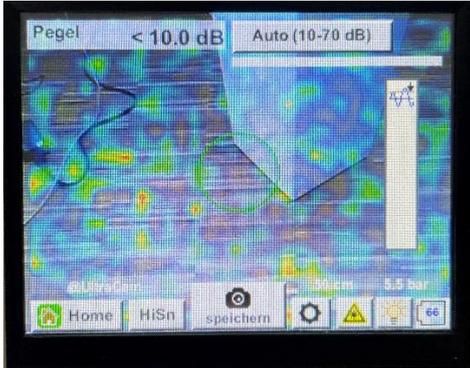
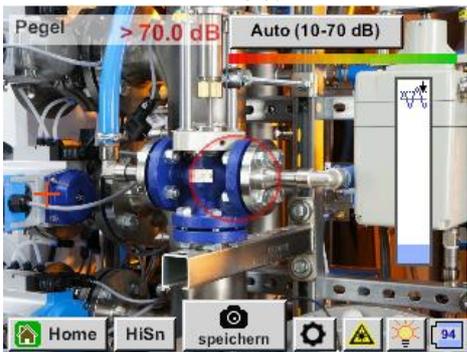


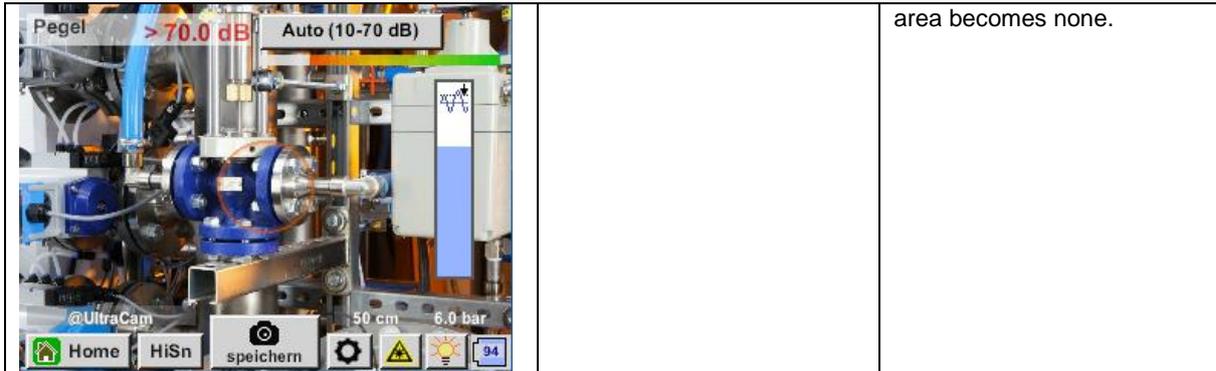


The threshold (slider on the right edge) defines the limit from which the pixels in the image shown on the screen are colored, based on the measured level in the ultrasound map.

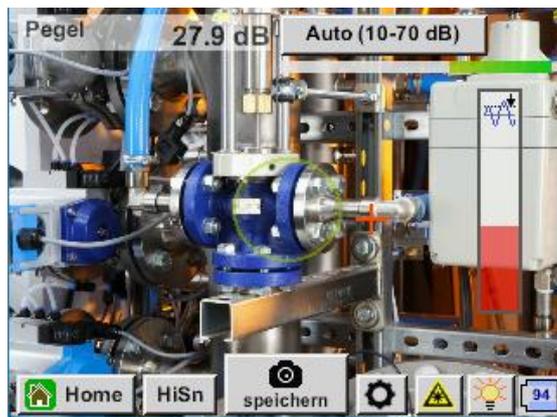
The selected color tone of the coloring depends directly on the intensity of the ultrasound for the corresponding pixel and is controlled by the LD 500 accordingly.

- No coloring = maximum level \leq Threshold
- Blue = little ultrasound
- Green \rightarrow Yellow \rightarrow Orange \rightarrow Red
- White = maximum ultrasound

Threshold	Environment	Meaning
<p style="text-align: center;">0 %</p> 	<p>Find smallest leaks in environments without strong ultrasonic sources</p>	<p>If there is no dominant source, a nebula will be shown on the screen.</p>
<p style="text-align: center;">10 %</p> 	<p>Recommended value!</p>	<p>If there is no ultrasound source, the screen will not be colored</p>
<p style="text-align: center;">30 – 70%</p>	<p>If strong ultrasonic sources are present –</p>	<p>so the sensitivity can be reduced that the colored</p>



If the threshold has been set very high and is significantly above the existing level in the ultrasound card, so that the image is not colored on the screen, the slider for setting the threshold flashes red and a reduction is recommended.



How to find leaks?

1. Start from a distance and point the device in a direction where pressurized air lines are located.
2. Find a hotspot (headphones & screen).
3. Come closer when you hear something! This is because the sensitivity of hearing is higher than imaging.
4. Once the measured ultrasound of the 30 digital mems is sufficiently high, the LD 500 / 510 will display the source on the screen
5. Save the leakage and document how to fix the leakage and where it is located.

Recommended distance for ultrasound imaging

- 0.3 - 5 meters (low ultrasound level environments)
- 0.3 - 2 meters (challenging environments)
- 0.1 meter for small leaks

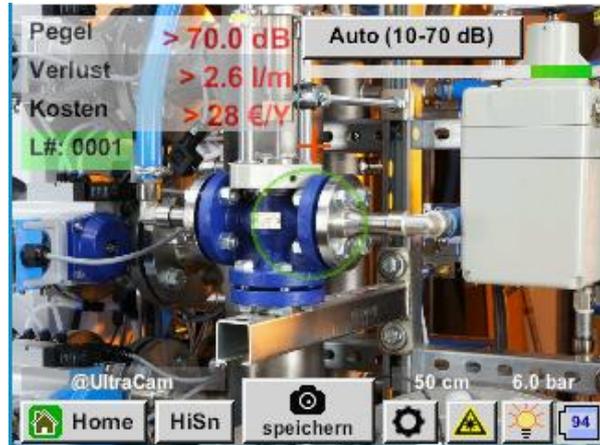
Loss and cost - first indicated

- Leak is in the center of the circle of leak detection
- Click on the left side of the screen

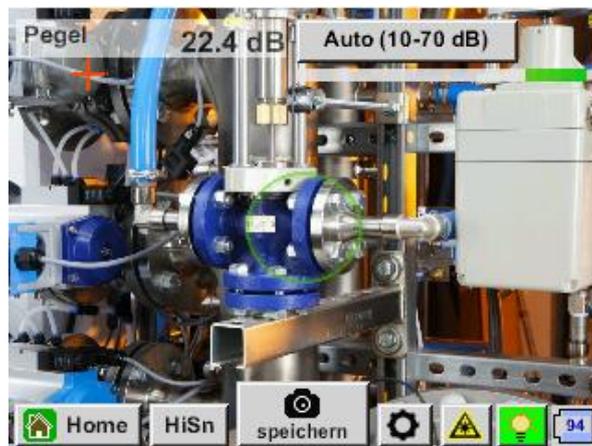
7. LED's and an ambient light sensor

To improve the quality of the captured image, an ambient light sensor measures the amount of light. If there is too little light, the LEDs provide better illumination.

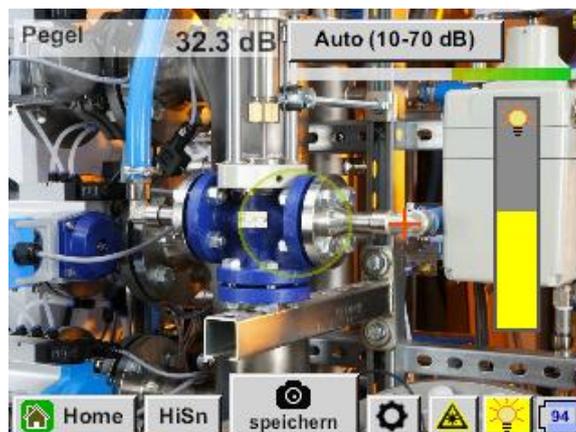
Intelligent illumination off:



Intelligent illumination: automatic



Intelligent illumination: manual



8. Automatic distance measurement

The integrated distance measurement module is available with the UltraCam and optional with the Acoustic Trumpet.

Firmware and hardware requirements

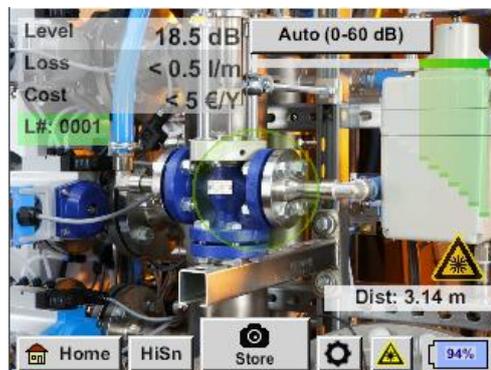
The following requirements must be met to use the functionalities:

- The Main Board must be "intelligent" to enable the communication between the main body of the LD 500 and the tool.
- The Firmware of the LD 500 must be at least V3.02

If these requirements are met, the LD 500 will automatically recognize that a tool with automatic distance measurement is connected.

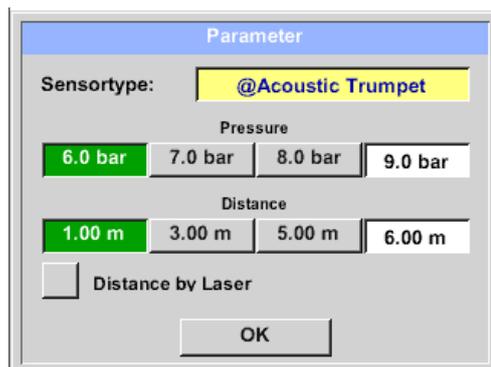
Description of functionality:

- The laser needs to be started to activate the distance measurement as it is done with all other tools.
- The LD 500 will then show the measured distance on the display. In this case, it is 3.14 meters or 124".



- To use the measured distance for the cost quantification, "Distance by Laser" must be activated under "Parameters".

Note: Before "Distance by Laser" can be activated, the laser must be turned on. Otherwise, the icon will blink in yellow and red.



Note: For the trumpet, the valid distance range is 1 – 6 meters or 40" – 236".

- The LD 500 will actualize the distance automatically now. The actual measured distance is shown in the grey bar “Dist:”. The used distance for the cost quantification is shown in the small bar below next to the pressure’s left side.

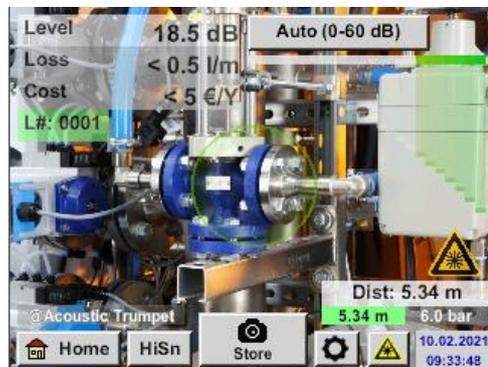
State	Actual distance measurement	Used distance parameter internally:	The certainty that distance is measured correctly
Best case	White	Green	High
Check plausibility of measurement	Yellow	Yellow	Medium
Move into the valid distance range	White	Yellow & showing 1 m or 6 meters	High, but: Out of range: Distance < 1 m Distance > 6 m
Target on another close surface to the leak until "best case" is reached and the measurement is robust	Red	Empty	Low: measuring on a black surface?

Attention: On black surfaces or in very bright environments measuring the distance can be problematic. Thus, it is still possible to enter manual distances. “Distance by Laser” must be disabled, and then manual distances can be entered.

States:

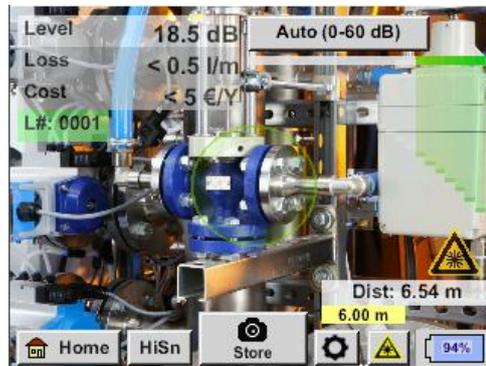
Best-case: Used distance parameter internally:

“Dist:” is green, the distance module's measurement is robust, and the used distance is within the valid range.



Out of range:

Distance measurement = robust, but out of range! Move within the valid distance range



8.1 Acoustic trumpet (standard attachment)

The acoustic trumpet bundles incident ultrasonic waves, thereby extending the range of the device. This behaviour makes it ideal for medium distances.

The leakage can be heard from large distances, for precise detection, the user must approach the leakage and consistently follow the "loudest" point. Individual compressed air components are then checked for precise detection.



Quantification distance (distance) → 1 – 6 m

Use of acoustic trumpet:

- Average distance to pipe/component 0.2 – 6 m
- Low interfering noise
- Leakage freely accessible
- Use at distances of up to 6 metres if no parabolic mirror available

In the case of the intelligent version of the Acoustic trumpet, you do not need to select the type of sensor.

8.2 Straightening tube

The straightening tube permits only very few ultrasonic waves to pass in the direction of the ultrasonic transducer, allowing leakages to be located very precisely.

For this reason, the use of the straightening tube is recommended for small distances, for the precise detection of the corresponding leakage.



Quantification distance: (Distance) → 0.2 m

Use of straightening tube:

- Short distance to pipe/component 0.05 m
- Pipe/component freely accessible
- Pipes and components to be inspected are very close together
- Medium to high noise
- Use when no gooseneck available

8.3 Gooseneck

The gooseneck 2.0 is automatically recognized by an intelligent LD 500 - here you do not have to perform the import.

Before the gooseneck 1.0 can be used, its data – located on the USB stick shipped with the attachment – must first be imported into the LD 500, if it was reordered and cannot yet be selected



Import:

Home → Export/Import → Import → New tool → Gooseneck_ xxxxxxxx

The gooseneck should be used if the pipes and components to be inspected are physically very close. In addition, the shape of the gooseneck can be flexibly adapted to easily inspect hard-to-reach pipes and components.

The sensitivity of the gooseneck has been reduced to dampen noise. This makes it ideal for targeted, local testing of compressed air components at high noise levels, for example in systems using pneumatic cylinders and in compressed air distribution cabinets.

Quantification distance (distance) → 0.05 m

Use of gooseneck:

- Short distance to pipe/component 0.05 m
- Leakage not freely accessible
- Medium to high ultrasonic noise
- Pipes and components to be inspected are very close together

8.4 Parabolic mirror



The Parabolic mirror 2.0 is automatically recognized by an intelligent LD 500 - here you do not have to perform the import.

Before the parabolic mirror 1.0 can be used, its data – located on the supplied USB stick – must be imported into the LD 500, if it was reordered and cannot yet be selected.

Import:

Export/Import → New tool → Parabol_xxxxxxx

The parabolic mirror bundles horizontally incident ultrasound in its focal point where the ultrasonic transducer is located. On the one hand, this leads to a considerable amplification of the measured ultrasound (high range) and, on the other hand, to a very precise directional behaviour, since ultrasound that does not incident horizontally is reflected by the reflector.

The combination of these two characteristics enables the parabolic mirror to precisely locate leaks at large distances.

Quantification distance (distance) → 3 – 12 m

Use of parabolic mirror:

- Large distance to pipe/components 3 – 15 m
- Interfering noise
- Leakage not freely accessible (behind a fence)
- Near leaks (superimposition)

8.5 Selecting the sensitivity levels of the acoustics

Ultrasound levels can be understood as a "loudness" of the leakage.

With the "Sensitivity" button, the sensitivity of the LD 500 can be adjusted to the environment, which strongly influences the acoustic behaviour of the device and increases or decreases the valid value range. A reduction in sensitivity reduces the range of the leakage reading but the "responding area", indicated by the circle in the display, also gets smaller, which considerably simplifies detection.

Sensitivity levels

0 – 60 dB = Highest sensitivity level of the device (use with small leaks and no noise), selection with the "**HiSn**" button or the "**Sensitivity**" button

10 – 70 dB = Leakages and noises get "less noisy", the range is reduced.

20 – 80 dB = Leakages and noises get "less noisy", the range is reduced.

30 – 90 dB = Leakages and noises get "less noisy", the range is reduced.

40 – 100 dB = Most insensitive stage (large leaks, many noises → for heavy-duty application)

50 – 110 dB = Leakage and noise become "quieter" and the range is reduced.

60 – 120 dB = most insensitive level (large leakage, lots of noise → for a heavy-duty application)

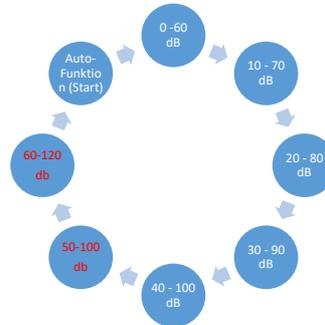
Whether the levels 50 - 110 / 60 - 120 dB are available depends on whether the LD 500 and the sensor are intelligent.

By default, the LD 500 is set to the auto function and will automatically switch between levels (10 – 70 dB to 40 – 100 dB).

The highest sensitivity level 0 – 60 dB of the unit can be set using the "**HiSn**" button or by manually changing the sensitivity level using the "Sensitivity" button. This mode should be used for the detection of small leaks in a quiet environment.

8.5.1 Sensitivity level button

You can manually switch between individual levels with the "Sensitivity" button or use the auto function to adjust the level. The order is shown in the chart on the left.



8.5.2 Auto function (default)

The auto function (automatic change of the sensitivity levels) is activated by default. This means that the measured ultrasound level is used to automatically adjust the optimum measurement range.

Example: Level = 71 dB → Level: 20 – 80 dB

8.5.3 Manual sensitivity adjustment

It is also possible to switch between sensitivity levels. This can be done with the "Sensitivity" button.

It helps the user to reduce interfering noise and detect leakages as easily and quickly as possible. The user should frequently increase and decrease the sensitivity to scan the target surface for leakages with the adjusted sensitivity. Decreasing the sensitivity makes the device react to a smaller area but also reduces the range.

8.5.4 Procedure for leakage detection

Different approaches to leakage detection are recommended depending on the ambient conditions.

Option 1: In what direction can the leakage be heard? This method is used to aim in all directions and find the loudest point. The loudest point should then be approached to precisely locate the leakage. Works well when there is less interference from noise.



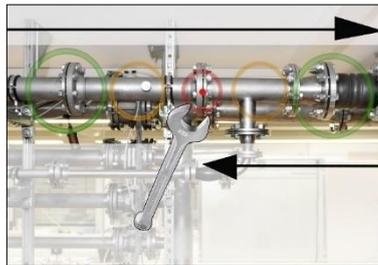
Option 2: Patrol the compressed air network.

Alternatively, in case of increased noise, leakage detection can be facilitated by the user listening to the compressed air network "bit by bit".

This means from the compressor room to the end user. If noise is detected, it is recommended to manually reduce the sensitivity of the device and to use the gooseneck for small distances, and the parabolic mirror for larger distances. The following also applies to this method in general: The shorter the distance to the pipe, the easier it is to detect a leakage.

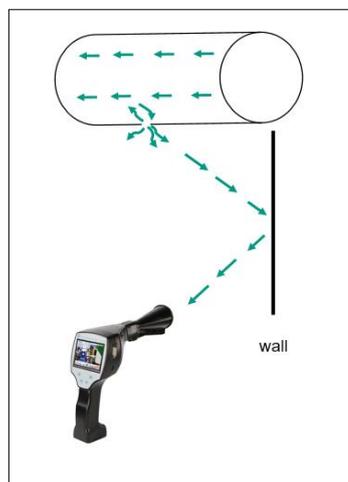
Option 3: Leakage detection during production stoppage

Production and manufacturing processes may give rise to ultrasound noises at times. If, for example, a pneumatic system blows off air at regular intervals, the LD 500 picks up on this.



If leakage detection is severely impeded by these interfering noises, it is recommended to perform leakage detection according to **Option 1** or **Option 2**, if the pipes are pressurised but the manufacturing processes have been stopped. These are the quickest and easiest ways to detect leakages.

8.6 Other problems that can make measuring more difficult



There may be further problems in leakage detection, these are described in the following sub-chapter.

To reduce any problems, we generally recommend to use the correct attachment, as outlined in chapter 6.3 Selection of accessories, and to reduce the sensitivity.

Reflections: If leakages can be heard in walls but there are no pipes, this is a reflected ultrasound of a leakage. In this case, it is recommended to reduce sensitivity (manually switch to a higher range until it can no longer be heard). Additionally, aim should be taken in a direction parallel to the reflection surface as this is where the leakage is located. The

leakage will be noisier than the reflected ultrasound.



Superimposition of leaks: If leaks are close to one another, the emitted ultrasound overlaps. In this case, it is recommended to seal the leakages using a cloth. This enormously increases the accuracy of the measurement, especially for the

quantification of the leakage. At the same time, measurements should be taken in close proximity to the components.

Reducing sensitivity and, in particular, using a parabolic mirror (for large distances) and a gooseneck (for smaller distances) can also make detection a lot easier.

Very large leakages: Very large leakages generate a strong ultrasonic field, which can possibly generate an ultrasonic signal in the entire room. Here again, it is recommended to reduce the sensitivity and check close to the individual components. The aim is to detect leakages by using the volume level of the loudest point.

If the leak cannot be accessed, using a parabolic mirror is recommended, as it has very good directionality.

Lamps and motors:

Interfering noise: Electrical buzzing → do not mix up with leakage!

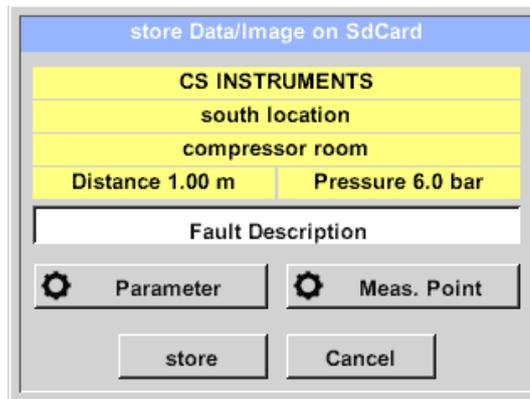
Some systems and machines can also generate ultrasound that is in a similar frequency range, for example fluorescent tubes or motors. These generally "sound" different than the typical "hissing" of leakages and should not be mistaken for them.

If ultrasound can be heard and it clearly does not emanate from the compressed air system, the sensitivity of the device should be reduced in order to suppress the ultrasound. If this does not suffice, the noise must be ignored.

8.7 Documenting the leakage

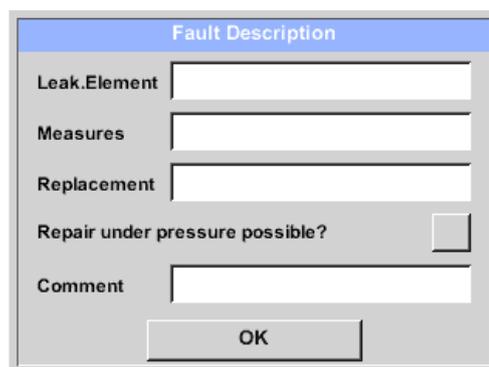
If the leakage has been found, the pressure and distance to the leakage adjusted and the leakage described, it can be "captured" with the "Save" button.

Afterwards it is possible to check the parameters (pressure and distance) and to precisely define the measurement place with company, building and location. It is also possible to enter a short error description (max. 32 characters).



The following error descriptions are available, which make it much easier to eliminate leakages later.

- Leakage element
- Measure
- Spare part
- Repair under pressure possible?



Some suggestions are stored by default to make the input easier for the user.

Entries made by the user are also stored in an internal database and can be used again and again.

1-5 (14)	
Nr.	Leak.Element
001	Air tool
002	Ball valve
003	Filter unit
004	Fitting
005	Flange connection

new delete Cancel OK

All relevant data of the leakage are shown in the image and a final check can be done again before saving. All leakages, including entries made, are saved to the journal file.

This image & data will be saved!

Level 86.2 dB	Auto (0)	Krapf & Lex
Loss 0,575 l/m		New Gstetten st #2
Cost: 236 US\$/Y		Flange nr. 3 - 1/2 inch
L#: 003		L#: 003
		Loss 0,575 cfm
		Cost 236 US\$/Y
		Distance 3,28 ft
		Pressure 116 psi

Are all values correct?

Yes No

8.8 Exporting journal data

Once all leakages have been documented, the data must then be exported to a USB stick.

Here, the user has the option of selecting the start and end time of the exported leakages.



Attention: If the «DELETE leakage data» function is activated, **ALL** leakages in the memory will be irretrievably deleted.

Home → Export/Import → Export → Leakage Data → Change Start Time & Change End Time → Export

To continue with the leakage documentation, please go to section 10.4 Data import.

*** Export Leakage data ***

Company	<input style="width: 90%;" type="text"/>	Change	
	Date Time		
start	<input style="width: 40%;" type="text"/> <input style="width: 40%;" type="text"/>	Change	
end	<input style="width: 40%;" type="text"/> <input style="width: 40%;" type="text"/>	Change	
Files to export:	no Data	export	
Back		ERASE Leakage data	

9. Access to local web server via WLAN

The web server of the device uses IP addresses from the private address range Internet Protocol version 4 (IPv4) (192.168.x.x, according to RFC 1918). The use of a private address range makes unauthorised access from the internet more difficult, as direct addressing is not possible.

The device supports the activation of HyperText Transfer Protocol Secure (HTTPS) for encrypted communication in the local network.

9.1 Establishing a connection

The device can be accessed via WLAN for status queries and data transfer.

- Select the command "Home --> WLAN".

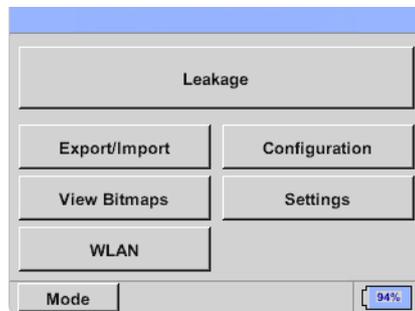


Figure 1: "Leakage" menu (example)

Activate unencrypted connection (optional)

By default, data is transmitted via an encrypted connection (HTTPS). Encrypted communication may reduce the transmission speed in local networks. If required, the default setting can be deactivated and the data can be transferred via an unencrypted connection.

- Deactivate the "HTTPS" setting.



Figure 2: Activate unencrypted transmission (example)

Activate WLAN

- Activate the "WLAN enable" setting.
The WLAN is activated.



Figure 3: Activate WLAN (example)

You can use the "Connect to WLAN" command to dial into an existing WLAN network. Alternatively, a Wi-Fi hotspot can be provided via the device.

- Select the desired access type.



Figure 4: Select access type (example)

9.1.1 Connection via WLAN

Select network

- Tap the "Connect to WLAN" button to dial into an existing WLAN network.
- Tap the "Select network" button.
The device searches for all available networks.



Figure 5: Select network (example)

- Select the desired network.
The "Scan" button can be used to search for all existing networks again in the event of an error (e.g. WLAN router switched off).
- Tap the "OK" button.

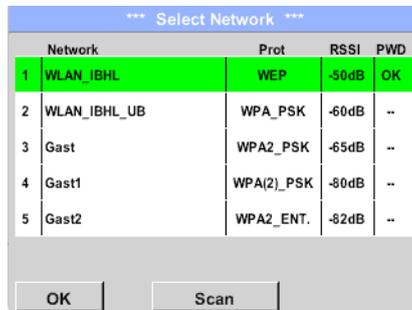


Figure 6: Available networks (example)

Establish connection

When a connection to the selected network is established for the first time, the password for the network must be entered. The password is saved on the device and does not need to be entered again the next time a connection is established.

- Tap the "Connect" button.
- Enter the password.
- Tap the "OK" button.

Once the password has been successfully entered, the connection to the network is established.

In the overview of available networks in the "PWD" column, it is noted that a password is available for the network.



Figure 7: Enter password (example)

NOTE	
	<p>Password with special characters</p> <p>Some special characters are not displayed on the system keyboard due to the system.</p> <ul style="list-style-type: none"> ➤ Establish the connection via a WLAN hotspot. <p style="text-align: center;">or</p> <ul style="list-style-type: none"> ➤ Change the password for the network.



Figure 8: Connection successfully established (example)

If the password for the network is changed, an error message appears the next time you log in.

- Confirm the error message.
- Enter the new password.

For further information on accessing the web server, see chapter "9.2 Accessing the local web server".

Disconnect connection

- To disconnect the connection, tap the "Disconnect" button.

9.1.2 Connection via WLAN hotspot

If the transmission in the network is slow or the signal strength of the WLAN router is low, a WLAN hotspot can be provided via the device.

- Tap the "Start WLAN Hotspot" button to make a WLAN hotspot available.

Use pre-configuration

A pre-configuration is stored on the device for easy setup of a WLAN hotspot.

- Tap the "Activate" button.
The WLAN hotspot is activated.



Figure 9: Activate WLAN hotspot (example)



Figure 10: WLAN hotspot active (example)

**Use own configuration
(optional)**

If required, a customised configuration can be stored.

- Tap on the "Setup Hotspot" button.
- Fill in the form fields.
- Tap the "OK" button.

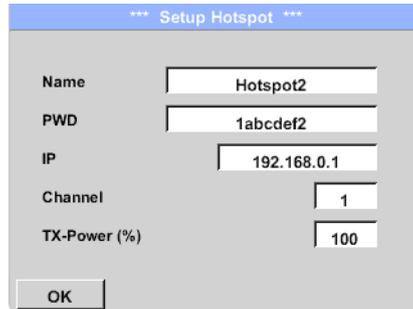


Figure 11: Setting up a WLAN hotspot (example)

**Connect Windows PC
to WLAN network**

- Connect the Windows PC to the WLAN hotspot network.

For further information on accessing the web server, see chapter "9.2 Accessing the local web server".

Disconnect connection

- To disconnect the connection, tap the "Deactivate" button.

9.2 Accessing the local web server

Once the connection between the device and Windows PC has been successfully established, the device's web server can be accessed via an Internet browser.

- Start your internet browser.
- Preferably use Mozilla Firefox for this.

NOTE



Connection problems

Some internet browsers automatically add "https://" to the address line when the URL is entered manually. If the "HTTPS" function is not activated, this can lead to connection problems.

- Enter the corresponding URL (encryption type and IP address) in the address bar of your internet browser.

Example: `https:\\192.168.0.1` (encrypted connection)

`http:\\192.168.0.1` (unencrypted connection)

A self-signed certificate is stored in the device, which cannot be permanently updated for technical reasons. This may result in a security warning in some Internet browsers.

- Accept the certificate manually.
- If the internet browser displays a warning about an insecure certificate, check whether an exception rule needs to be set for the device or whether a separate SSL certificate can be stored.

If the connection setup fails, this can have various causes (incorrect network settings, restrictions due to firewalls, incorrect IP address or missing authorisations).

- Contact your IT department or your network administrator if you have problems establishing a connection.

9.2.1 User interface web server

Once the connection has been successfully established, the main menu of the web server is displayed.



Figure 12: Main menu (example)

The language of the web server corresponds to the language configuration of the device and must be selected via the device.

- Select the desired language on the device.
- Restart the web server.

You can find more general information about the device under the "Info" menu item.

- Select the "Info" menu item.

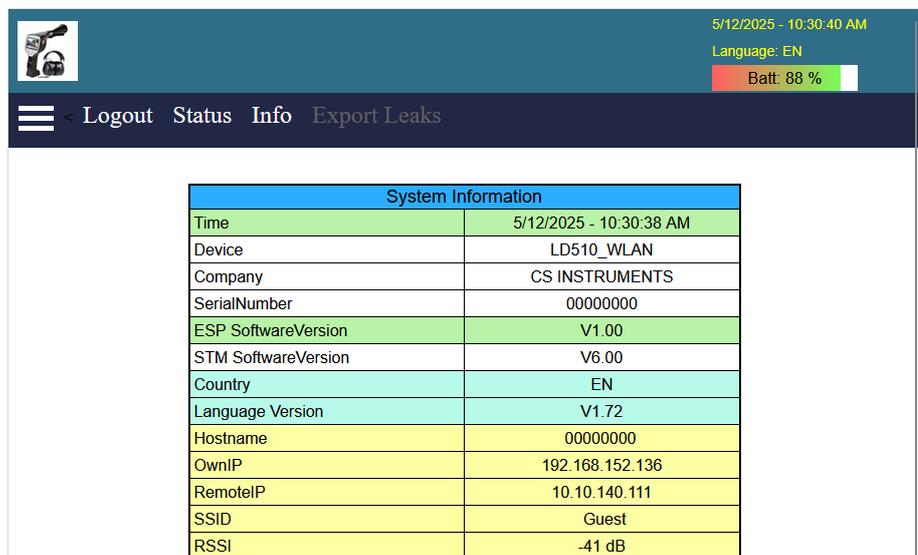


Figure 13: "Info" overview (example)

9.2.2 Exporting leakage data

Log in

To export leakage files, you must log in to the device.

- Select the "Login" menu item.
A security code is displayed on the device.
- Enter this security code in the form field.

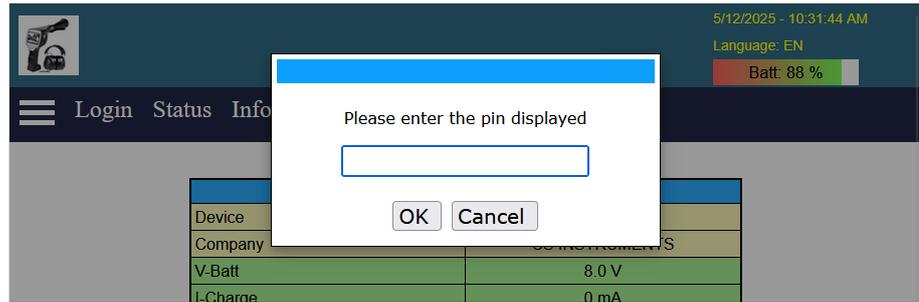


Figure 14: Enter security code (example)

Export data

- Select the "Export leaks" menu item.
- Select the desired company or companies.
- Select the "Update" command to update the number of companies and the number of leakage files to be exported.
- Select the desired time period.
- Select the "Download Data" command.
- Select the desired target directory.
- Select the "Save" command.
The data is exported as a *.zip file.
- Unzip the *.zip file.

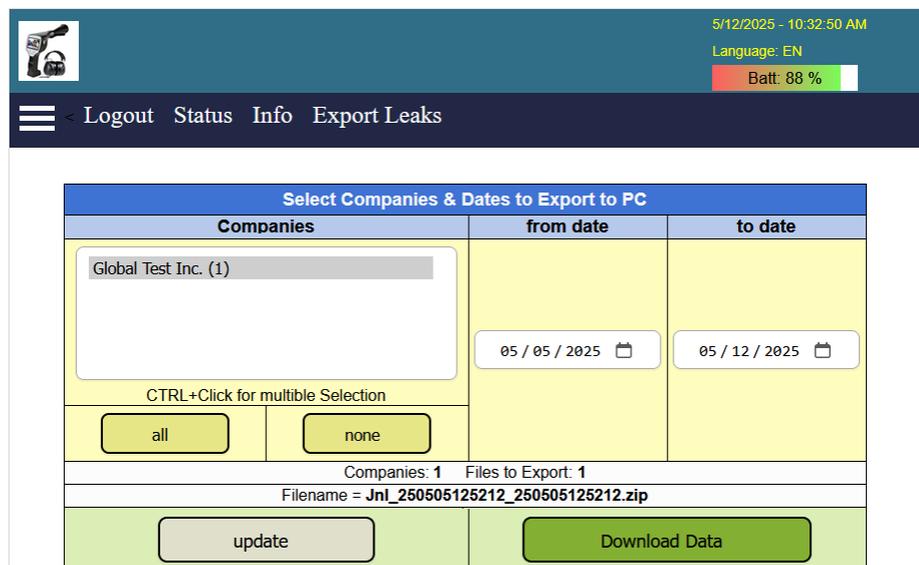


Figure 15: Export data (example)

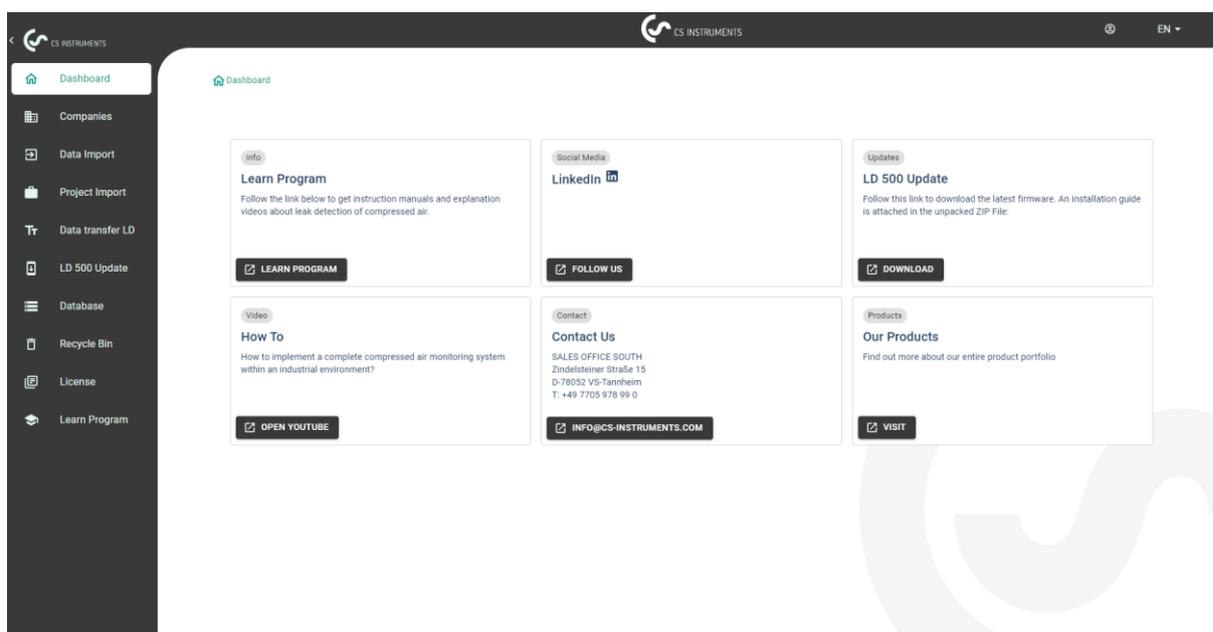
10. CS Leak Reporter software V1 & V2

Main functions:

- Administration of companies/buildings/projects/measurements
- Documentation and reporting

The **V1** user interface is used here as an example. The **V2** has the functionalities of the CS Leak Reporter V1 and additional improvements

Dashboard:



10.1 Installing the Leak Reporter software

The software is executed with the «Setup.exe» application. The file is located on the supplied USB stick or can be downloaded from the homepage at the following URL:

<https://www.cs-instruments.com/downloads/software/computer-evaluation-software>

10.2 Software licensing

Path: [Dashboard](#) → [Licence](#)

Following installation, you will receive a 30-day trial access. For permanent use of the software, you need to purchase a licence key and register it along with your personal data. The licence key is printed on the invoice and the delivery note. Additionally, a digital copy of the licence can be found on the supplied USB stick and is also printed on the stick.

Note: One licence key allows for software activation on two devices. If the SW is subsequently installed on another laptop or computer, the licence on the old device must be deactivated. It can then be used again on the new device.

10.3 Saving your personal data and profile

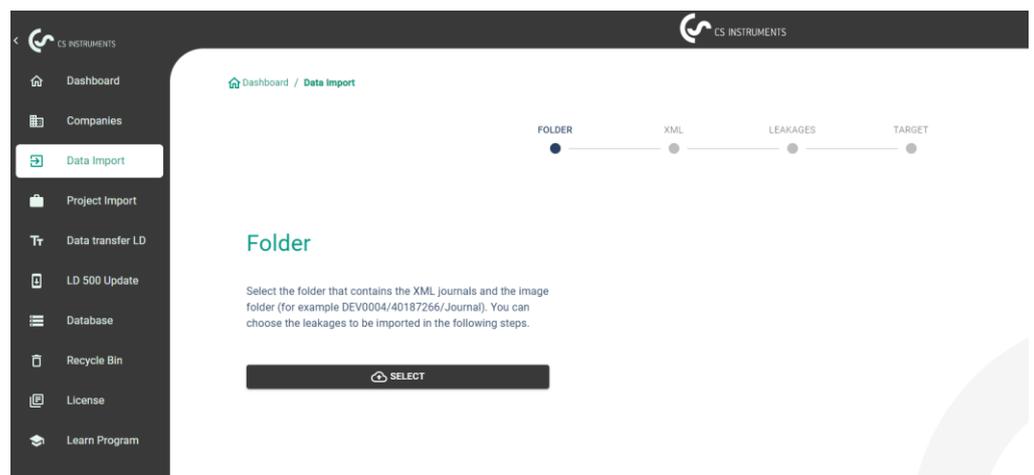
Path: [Dashboard](#) → [Profile](#)

You can enter your contact details in the profile. These are printed on the cover page of the report.

10.4 Leakage data import

The data import takes place as a sequence:

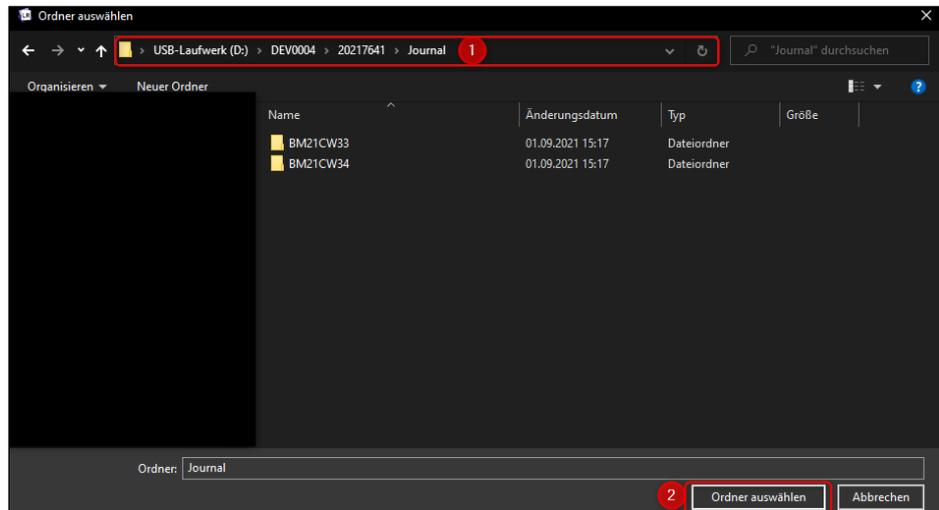
- (1) Selection of a folder
- (2) Selection of an XML file
- (3) Selection of the leaks to be imported
- (4) Destination of the imported leaks



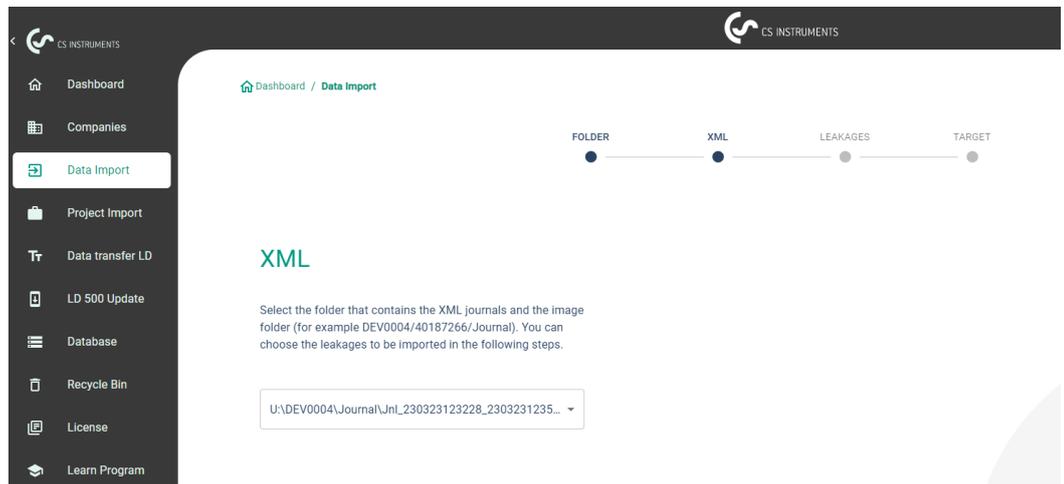
The LD 5X0 exports the leaks on the USB stick. You use then the data import menu item to transfer the exported data from the LD 5X0 of the USB stick into the leak reporter software.

You use the  button to select the journal file.

- (1) Open the “Journal” folder according to the path shown on the USB stick
- (2) Select the folder

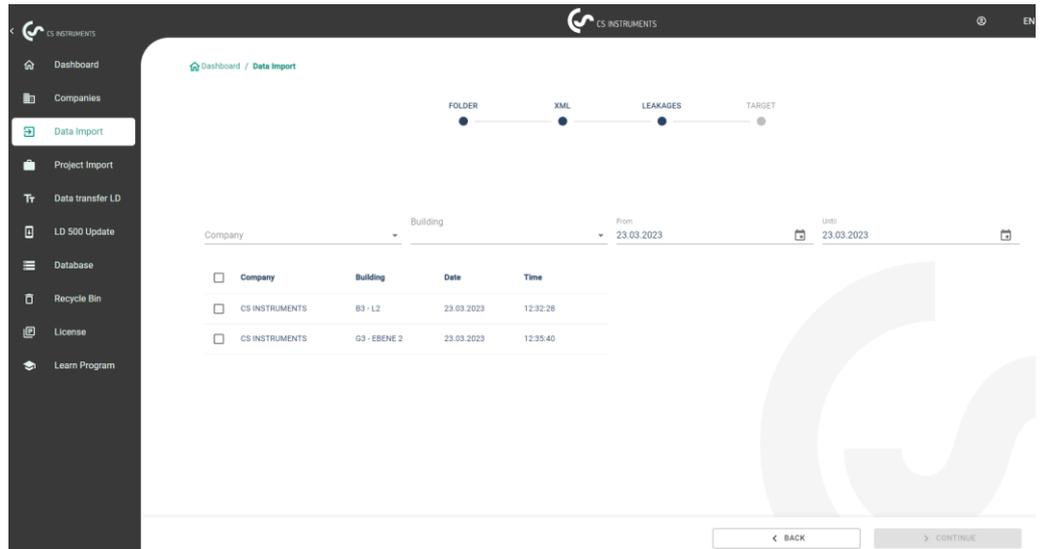


(3) Select the desired XML file that was exported by the leak detector.



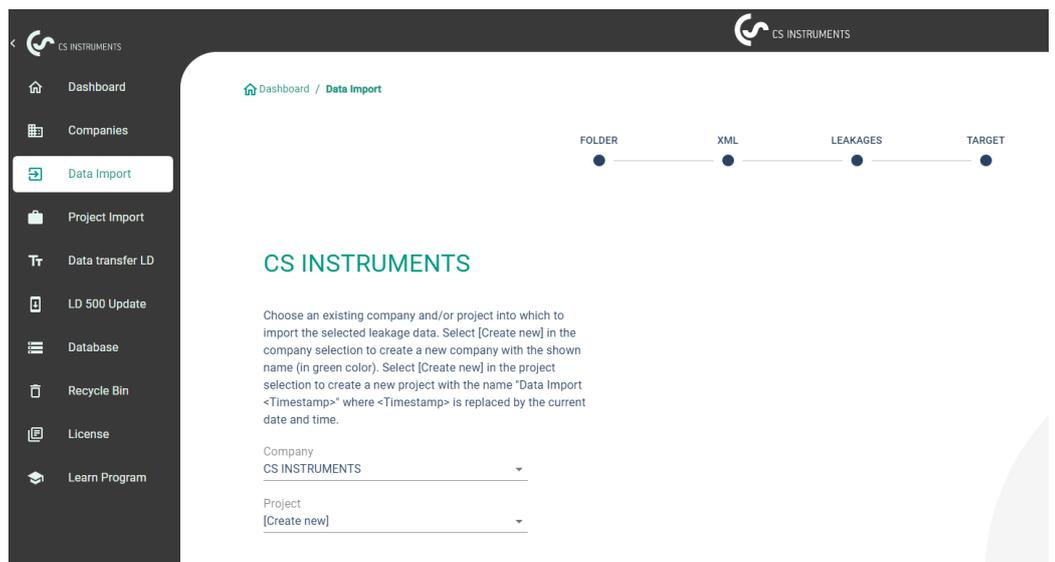
After selecting the XML file, you can filter the leaks according to their “company” and “building” or a freely selectable time period:

- (1) Selecting individual leaks
- (2) Filtering by one or more companies
- (3) Filtering by one or more buildings
- (4) Defining the start period (first leak)
- (5) Defining the end period (last leak)



Options

- (1) For the leaks of each company (Kromer WKA) to be imported, an existing company and/or project can be selected as the destination. At the same time, the buildings of the leaks are created in the selected company.
- (2) If the company already exists, a new project is appended to it or an existing project can be selected. At the same time, the buildings of the leaks are created in the selected company.
- (3) If the company of the data import does not exist yet, a new company with the corresponding name is created along with an initial project. At the same time, the buildings of the leaks are created in the selected company (as shown in the screenshot).

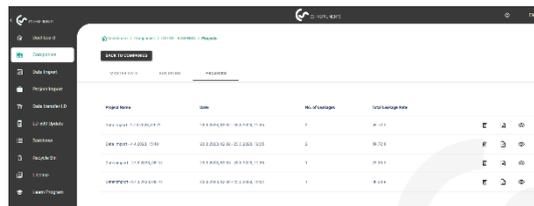


10.5 Selecting projects

Path: [Dashboard](#) → [Companies](#) → [Project](#) (eye of the corresponding project)

Each «Data import» corresponds to a project. Here, the desired project of the company in question must now be selected.

The leakage overview for the project will then be displayed.

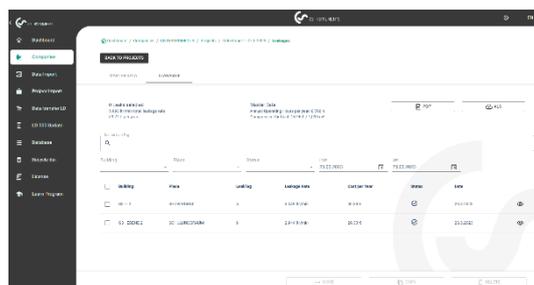


Project Name	Date	No. of Leaks	Total Leaks
TRAVELER 1111111111	10.00000000 - 10.00000000	1	1.000
TRAVELER 1111111111	20.00000000 - 20.00000000	2	2.000
TRAVELER 1111111111	10.00000000 - 10.00000000	1	1.000
TRAVELER 1111111111	10.00000000 - 10.00000000	1	1.000

10.6 Leakage overview

This list now contains all imported leakages from the data import. The relevant parameters of each individual leakage are displayed and can be sorted by header (e.g. Leak tag).

It is also possible to «copy» or «move» leakages to other projects or «delete» them.



ID	Name	Leak tag	Leakage rate	Date of leak	Status	Loss
10.00000000	TRAVELER 1111111111	1	1.000	10.00000000	Active	1.000

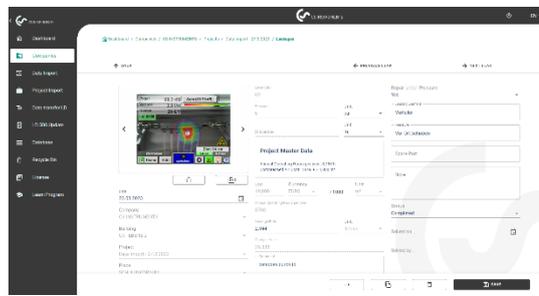
10.7 Editing individual leakages

Using the eye, a detail view of each individual leakage can now be opened and then edited.

Path: [Dashboard](#) → [Companies](#) → [Project](#) → (eye of the corresponding leakage)

In this menu, you can:

- upload an additional image
- add/change a comment
- define the priority
- add/edit details on leakage elimination
- set the status
-



10.8 Creating reports

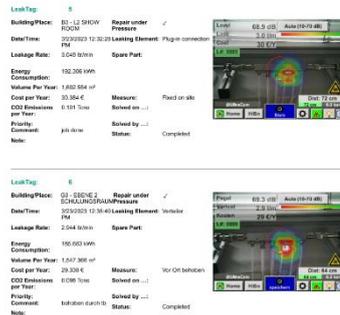
Path: [Dashboard](#) → [Companies](#) → [Project](#) → «PDF» or «XLS»

After editing leakages, an automatic report can be created by pressing the «PDF» or «XLS» buttons in the leakage overview. The report follows the selection of building or place and the sorting of the relevant column. Sorting can be done by LeakTag, leakage rate, costs per year or status.

The first page of the «PDF report» shows a cover page including contact information, project master data and the results of the leakage scan.

Leakage Report		Begin: 3/23/2023	End: 3/23/2023
Contact Data:			
Customer:	CS INSTRUMENTS		Auditor:
Company:	Zürcherstrasse 15, 7002 Zollikon		
Address:	Milo Mutschers		
Contact:	www.mutschers.com		
Email:	info@mutschers.com		
Phone:			
Logo:			
Project Master Data:			
Report Date:	4/6/2023	CO2 Emission:	0.027 kg / kWh
Heat Calculation Base:	Energy Cost (TPC)	Specific Power:	0.123 kWh / m ²
Compressor Air Cost:	18,90 € / 1.000 m ³	Electricity Rate:	0.15 € / kWh
Annual Operating Hours per year:	8.760 h		
Results:			
No. of Leakages:	2	Number Resolved:	2
Total Leakage Rate:	0.583 l/min	Resolved Leakage Rate:	0.583 l/min
Cost per Year:	58.72 €	Cost Saved per Year:	58.72 €
Energy per Year:	277.96 kWh	Energy saved per Year:	277.96 kWh
Volume Per Year:	2.14932 m ³	Saved Volume Per Year:	2.14932 m ³
Total CO2 per Year:	0.189 Tons	CO2 Saved per Year:	0.189 Tons

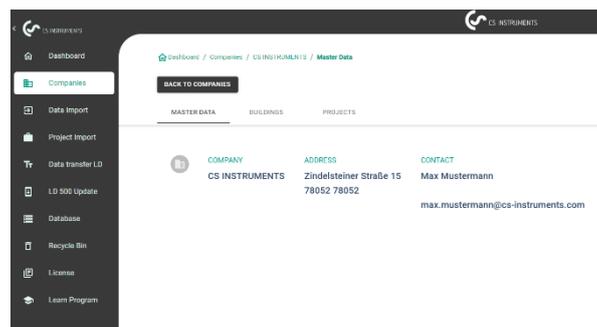
The following pages list the individual leakages:



10.9 Modifying company master data (customer)

Path: [Dashboard](#) → [Companies](#) → [Master data](#)

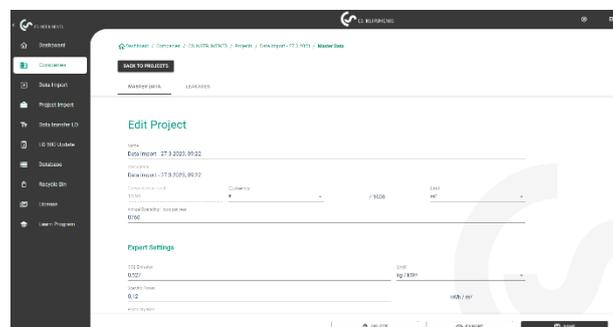
In this screen the contact details of the customer, which will be printed in the report, can be entered.



10.10 Modifying project master data

Path: [Dashboard](#) → [Companies](#) → [Project](#) → [Master data](#)

In this screen, the parameters of the project can be adapted if the configuration of the LD 500 was faulty or incomplete. The entries made there are then used for all leakages in the project.



Further explanations and details can be found at:

Instruction manual: <https://www.cs-instruments.com/downloads/instruction-manuals>

LD500: <https://www.cs-instruments.com/products/d/leak-detection/leak-detector-ld500-to-find-and-calculate-leakages-in-compressed-air-and-gases>

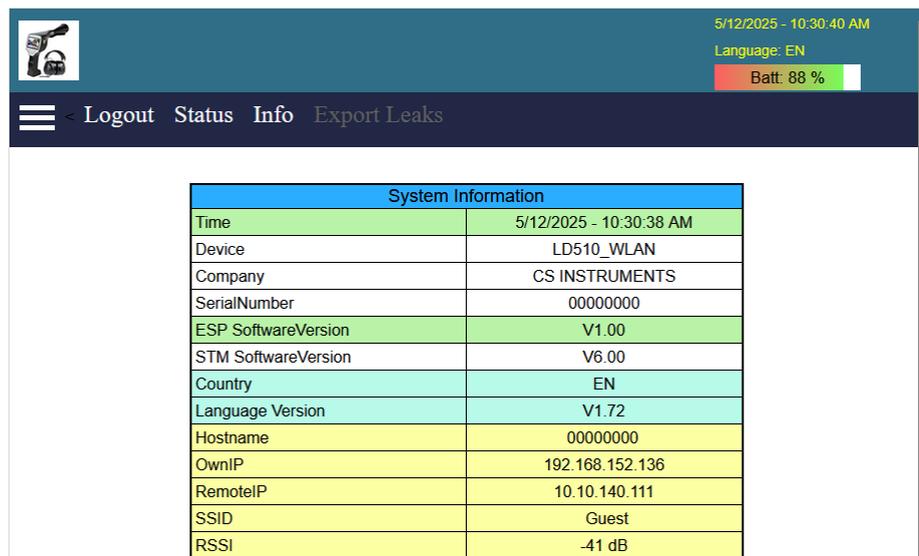
11. Updating the device software

If required, a software update can be carried out via the device's local web server.

Adjust network settings

For security reasons, a software update can only be carried out if the device and the Windows PC are connected to the same network.

- Connect the Windows PC and the device to the same network.
 - Depending on the network environment in which the Windows PC is operated, the network settings (IP address) must be adjusted.
- Select the "Info" menu item to display the IP address of the device.
 - IP address device: „OwnIP“
 - IP address Windows PC: „RemotelIP“
- If necessary, adjust the network settings.



The screenshot shows the 'Info' menu selected in the device's web interface. At the top right, the date and time are 5/12/2025 - 10:30:40 AM, the language is EN, and the battery level is 88%. The navigation menu includes Logout, Status, Info, and Export Leaks. The main content area displays a table titled 'System Information' with the following data:

System Information	
Time	5/12/2025 - 10:30:38 AM
Device	LD510_WLAN
Company	CS INSTRUMENTS
SerialNumber	00000000
ESP SoftwareVersion	V1.00
STM SoftwareVersion	V6.00
Country	EN
Language Version	V1.72
Hostname	00000000
OwnIP	192.168.152.136
RemotelIP	10.10.140.111
SSID	Guest
RSSI	-41 dB

Figure 16: System information (example)

Install software update

- Select the command "Main menu --> SW-Upload --> Browse...".
- Select the desired update file (*.bin).
- Select the command "SUBMIT to ESP32 location".
A security code is displayed on the device.
- Enter this security code in the form field.
After entering the security code, the software update is installed.

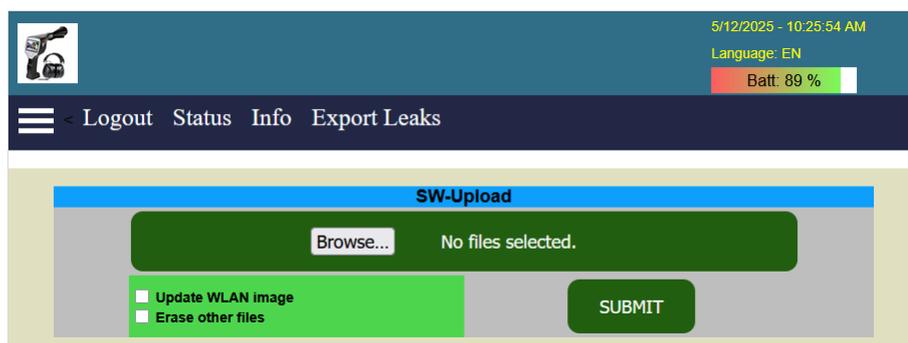


Figure 17: Install software update (example)

12. Scope of delivery

LD 500 is available either as a single unit or in a set. The set contains all the components and accessories that are protected in a rugged and shock-resistant transport case.



Description	Order No.	
Set LD 500 Acoustic trumpet consisting of:	0601 0105	
Set LD 500 Ultracam consisting of:		0601 0205
LD 500 leak detector with acoustic trumpet, and integrated camera (optional Laser distance measuring), 100 leak tags for marking the leakages on site	0560 0105	
LD 500 leak detector with Ultracam, 100 leak tags for marking the leakages on site		0560 0206
Sound-proof headset	0554 0104	
Focus tube with focus tip	0530 0104	
Battery charger (AC adapter plug)	0554 0009	
Transportation case	0554 0106	
Helix cable for connecting the ultrasonic sound sensor	020 001 402	
Gooseneck for leak detection in hard-to-reach areas (optional)	0530 0105	
Parabolic mirror for leak detection at long distances (optional)	0530 0106	

