Instruction and operation manual

S531

Ultrasonic Leak Detector

Dear Customer,

Thank you for choosing our product.

Before you start up the device, please read this manual in full and carefully observe instructions stated. The manufacturer cannot be held liable for any damage that occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure that is described and specified in the manual, the warranty is void and the manufacturer is exempt from liability.
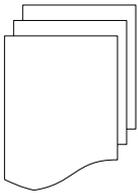
The device is destined exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

Table of Contents

1 Safety instructions

Please check if this instruction manual matches the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information which must be observed before and during installation, operation and maintenance. Therefore this instruction manual must be read carefully by the technician as well as by the responsible user or qualified personnel.

This instruction manual must be available at the operation site of the leak detector at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.
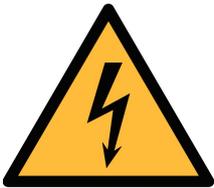
WARNING!

Compressed air!

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!

- Avoid that persons get hit escaping air or bursting parts of the system.

WARNING!

Laser pointer!

Do not point into the eyes with the laser. it can lead to serious injuries particularly on lens and retina or even blindness!

- Never look directly at the laser

- Never point the laser at persons.

- Never point the laser at smooth and reflective surfaces. This can lead to a reflection of the laser.

WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to a electrical shock which can lead to serious injuries or even death!

ATTENTION!

Permitted operating parameters!

Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument.

- Do not exceed the permitted operating parameters.

- Make sure the product is operated in its permitted limitations.

- Do not exceed or undercut the permitted storage and operation temperature and pressure.

General safety instructions

- It is not allowed to use the product in explosive areas.

- Please observe the national regulations before/during operation.

Remarks

- It is not allowed to disassemble the product.

ATTENTION!

Measurement values can be affected by malfunction!

The device must be used properly and frequently maintained, otherwise it may lead to wrong measurement values that can lead to wrong results.

- Avoid condensation on the leak detector sensor because this will affect the accuracy enormously.

Storage and transportation

- Ensure the transportation temperature is between -20 ... +50°C.

- For transportation it is recommended to use the packaging that comes with the leak detector.

- Please ensure that the storage temperature of the sensor is between -10 ... +50°C.

- Avoid direct UV and solar radiation during storage.

- For the storage the humidity must be <90%, no condensation.

2 Application

S531 is a hand-held ultrasonic leak detector that helps you quickly find and record leakages in compressed air or any gas systems.

When gases leak through tubes and tanks, an ultrasonic sound is produced. S531 can detect these sound from several-meter away, and transform these inaudible signals into a frequency that can be easily heard by ears.

In unpressurised systems, you can use an ultrasonic tone generator to generate sound that can be detected by S531.

3 Features

- Finds leaks in the compressed air or gas system easily even from distance

- High resolution 3.5" color touch screen, easing operations in leak detection

- Almost unlimited memory for leak records

- Wireless connection with headset

- Built-in camera to take photo of leak locations

- Voice recorder for voice memos

- Laser pointer to pinpoint leak locations

- Records leak information for statistics and repair

- Calculates air loss in l/min, m^3/h or cfm and in the local currency

- Integrated noise reduction technology

- Battery capacity for up to 8 hours

4 Technical data

4.1 General data

CE	
Principle of measurement	Ultrasonic leak detection
Measuring medium	Compressed Air, refrigerants and any compressed gases
Plug	3.5 mm stereo phone jack for headset
Operating temperature	0 ... +40°C
Battery life	About 8 hours without wireless on
Charging temperature	+10 ... +45°C
Charging time	Around 3 hours
Materials of the detector	PC + ABS
Dimensions	See section 6.3.
Interface	Wireless connection to headset USB port for charging and data exchange
Display	3.5" color LCD
Laser pointer	Wavelength: 640 ... 660 nm Output power: < 1.0 mW
Camera	5.0 megapixels
Headset	Noise isolated and wireless
Weight	3.65 kg (full set)

4.2 Electrical data

Power supply	Internal lithium-ion battery

4.3 Performance data

The table shows the detection distance of various hole diameters at different pressures in the lab environment and with the trumpet on.

Pressure / diameter	0.1 mm	0.2 mm	0.5 mm
0.5 bar	0.5 m	1.7 m	7 m
5.0 bar	3.6 m	11.5 m	18 m

5 Scope of delivery

The S531 layout in the transportation case is shown as below.

Please make sure that all components listed below are included in your package.

Qty	Description	Item No.
1	S531 leak detector	P560 0104
1	Noise isolated/canceling wireless headset (page 28)	A554 0119
1	Focus tube and focus tip	A530 0101
1	Trumpet to increase sensitivity and isolate from environmental noise	A554 0123
1	Battery charger	A554 0117
1	Type-C USB stick	A554 0124
1	Transport case	A554 0118
1	Leak tags to mark found leaks, 100 pieces	A554 0122
1	Instruction manual	NA
1	Calibration certificate	NA

Optional accessories not included in the set:

Qty	Description	Item No.
1	Ultrasonic tone generator	A554 0103
1	Calibration for S531	R200 0070

6 Learning about the device

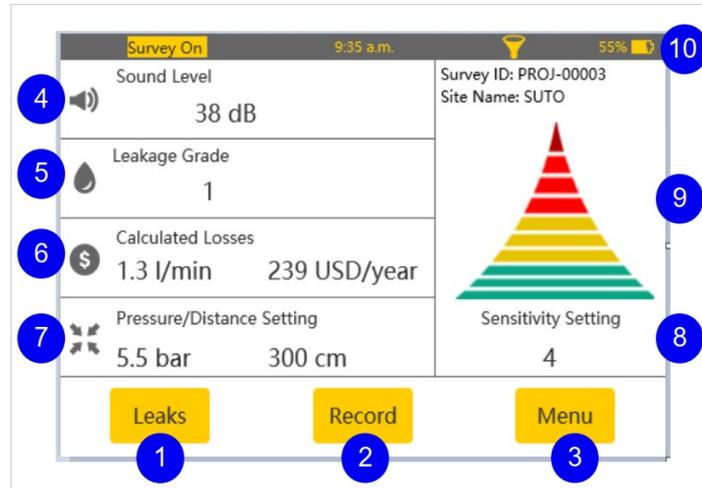This chapter introduces the S531 components and their functions.

6.1 Components

Part	Function
1	**Power button**: Long press to turn S531 on or off. It also works as a shortcut button for taking photos in leak detection.
2	**Voice recording button**: Press to record voice memos in leak detection.
3	**Laser button**: Press to turn laser on or off.
4	**Sensitivity wheel**: Turn the wheel to fine tune the sensitivity level.
5	**Touchscreen**: for further functions
6	**Sensor unit**: To detect the ultrasonic sound level. To increase the sensor sensitivity, mount on the trumpet.

6.2 Touch screen display

The 3.5" touch screen enables you to record and manage leak records as well as configure S531 easily.


Part	Function
1	**Leaks button** Click to view and/or delete the leak records.
2	**Record button** Click to record a detected leak by recording voice memos and taking photos.
3	**Menu button** Click to perform additional actions. For more details, please see the following chapters.
4	**Sound Level** Shows the sound intensity in dB. Range: 0 … 99.
5	**Leakage Grade** Shows the grade of the detected leakage: • Grade 0: Leakage = 0 l/min • Grade 1: 0 < Leakage ≤ 1 l/min • Grade 2: 1 < Leakage ≤ 4 l/min • Grade 3: 4 < Leakage ≤ 9 l/min • Grade 4: Leakage > 9 l/min
6	**Calculated Losses** Shows the detected leakage and the loss amount in cash per year. Leakage is calculated based on the sound level detected as

	well as the pressure and distance settings.
7	**Pressure / Distance Setting** Shows the latest settings for the pressure in the detected object and the distance between the S531 sensor and the leak point. You can change the settings by touching the numbers on the touch screen.
8	**Sensitivity Setting** Shows the sensitivity level. You can adjust the setting by turning the sensitivity wheel.
9	Indicates the intensity of the sound that the S531 detects：Red strongest, yellow the less, and green the least. You can see the actual sound level in DB in the **Sound Level** area.
10	**Status bar** Shows the status, including the following icons: • Survey on: Displayed when a survey is in progress. • Trumpet: Displayed when the trumpet is mounted on and well connected with the sensor. • Battery capacity indicator: Shows the battery percentage. • Laser: Displayed when the laser pointer is turned on.

6.3 Dimension and electrical ports

As shown in the following figure, S531 contains two electrical connectors：

- USB-C port: On the right-hand side of the S531 body, used to charge the S531 and transfer data.

- Headset jack, At the bottom of the S531 handle, reserved to connect the wireless headset in case it has low battery.

Front view　　　　Side view　　　　Bottom view
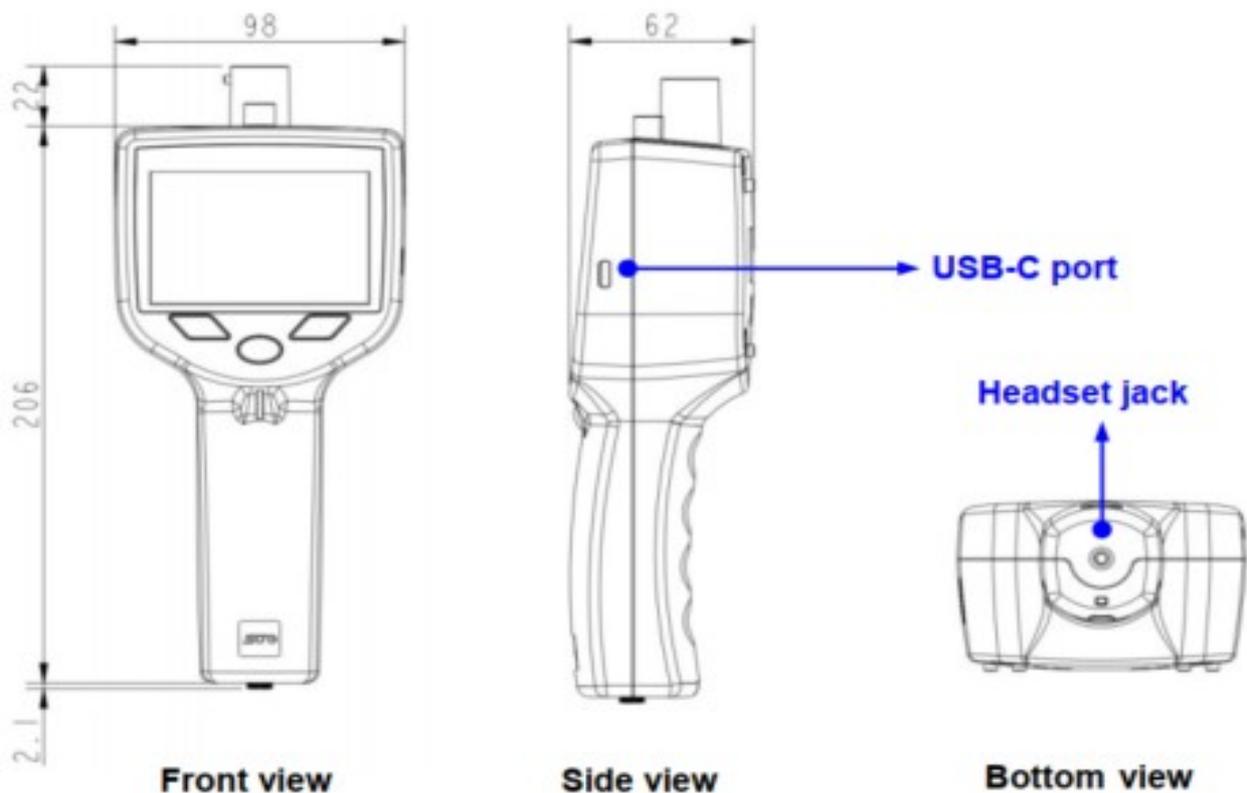
7 Before you start for the first time

Before you use a new S531 to detect leaks for the first time, charge the device and perform the initial device setup.

7.1 Charging the device

S531 is a battery-powered device and shipped with a partially charged battery. If the battery power is low, charge it via the USB-C port on the right-hand side of the device. Please use the USB cable and one of four charging adapters supplied in the delivery package to charge.
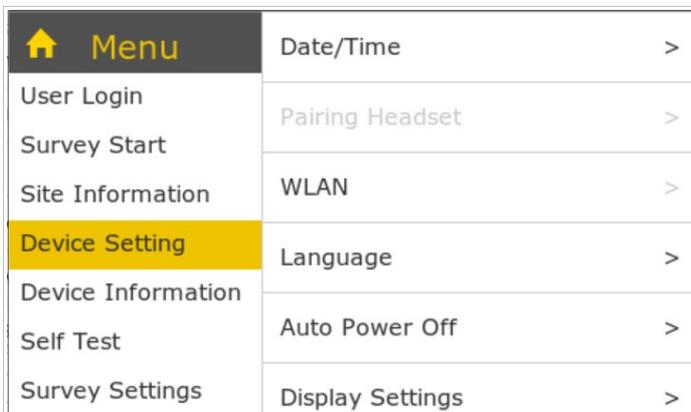
7.2 Performing initial setup

Steps:

1. Turn on the S531 by pressing the Power button for a few moments.
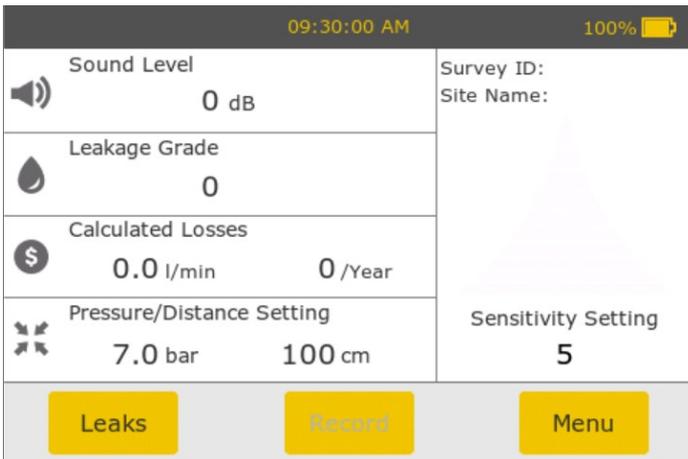
The start-up process starts. When the process is completed the home screen appears, as shown on the left.

2. Access **Menu** > **Device Settings**

3. Click **Language** and specify the device language.

4. Click **Date/Time** and specify the time and date.

5. Click **Speaker Setting** to adjust the volume of the S531 speaker and the headset to a clear and comfortable level. You can switch the **Headset output** toggle to make the sound play from the headset or the S531 speaker.

6. Click **Display Settings** and adjust the display brightness.

7. Click **Beeper Settings** and adjust the volume of pressing buttons.

Note: By clicking the 🏠 icon on the top left side, you can return to the home screen.

8 Configuring and starting a leak survey

Leak detection is managed by surveys. To perform leak detection for a site, you must first configure and start a survey.

8.1 Creating and configuring a survey

Steps:

1. Access **Menu** > **Survey Start**.

2. Enter the survey ID and site name.

3. Click **Create**.

4. In the *Confirmation* pop-up window that appears, check the input information, and if correct, click **Yes**.

5. Access **Menu** > **Survey Settings**.

6. Click **Media Setting**, and configure the gas media to be detected.

7. Click **Pressure setting**, and Configure the pressure of the to-be-detected media.

8. Click **Flow Unit Setting**, and select from m3/h, l/min and cfm (default: l/min).

9. Click **Pressure Unit Setting**, and select from bar, psi, MPa (default: bar).

10. Click **Cost Setting**, and configure cost related settings, such as the operating hours per year (default: 6400), currency unit in the alphabetical code stipulated in ISO 4217 (*for example*, USD for the US currency and CNY for the Chinese currency. Default: USD), and cost per cubic meter (default: 0.02).

8.2 Starting a survey

After you create and configure a survey, now you can start the survey to enable the leak recording.

1. Access **Menu** > **Survey Start**.

2. On the *Survey Start* screen that appears, click **Start**.

3. In the *Confirmation* pop-up window, check the input information. If correct, click **Yes** to confirm.

Note:

Now the *Record* button on the home screen is enabled and the "Survey On" status is shown on the left top of the screen.

For a survey in the "Survey On" status, you cannot change its unit settings like flow unit, pressure unit, and cash unit.

To change unit settings, you must create a survey with a new survey ID.

In case you want to use the previous survey ID in the newly created survey, delete data of the previous survey and then reset the S531. For detailed steps, see .

8.3 Stopping a survey

When a survey is completed, stop the survey to trigger the S531 to store the recorded leak data in this survey into a CSV file.

1. Access **Menu** > **Survey Stop**.

2. Click **Stop**.

   Note: Now the *Record* button is disabled.

9 Detecting leaks

After you create and start a survey, you can use the S531 to detect and record leaks for the survey.

The following steps describe a recommended procedure of detecting a leak.

1. After a survey is started, the home screen is shown as the left-hand side.

Notes:
- The laser pointer is off by default.
- You can change the sensitivity by turning the sensitivity wheel.

2. To turn on the laser, press the **Laser** push button as shown on the left-hand side.

Note: To avoid laser injury, the S531 allows you to turn on the laser only when the home screen is displayed on the touchscreen. If you enter other screens, the laser will be automatically turned off.

3. Point at a suspected leak with the laser. The leakage grade and leak amount are shown on the touch screen.

4. Mount the trumpet on the sensor and locate the rough leak range.

5. When you are close to the leak point, mount the focus tube and focus tip onto the sensor, and scan with the focus tip until the exact location is found.

10 Recording leaks

Once you detect the exact position of a leak point, you begin to record the leak data.

> ⚠️ **ATTENTION!**
>
> **The calculation of leak losses depends on many factors including pressure, distance, background noise and so on. To get accurate results, we recommend you record leaks at a fixed distance of not more than 1 m and with the trumpet on.**
>
> **You can detect leaks from a distance, but keep in mind that recording loss estimation is best done at a close distance.**
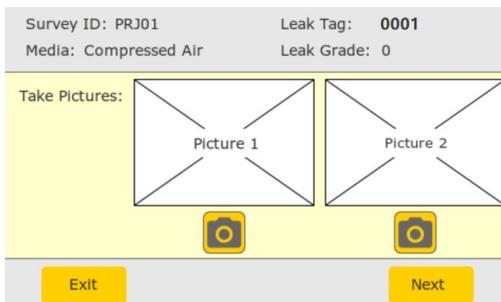
Recommended steps:
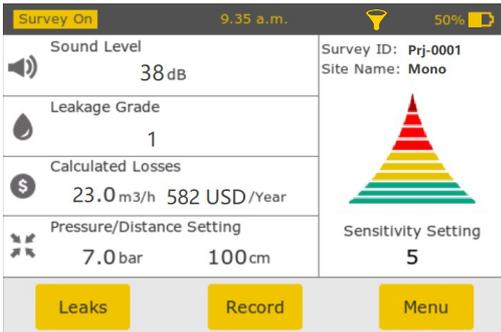
1. Keep the trumpet mounted on.

2. Touch the distance value on the screen and enter an estimated value for the distance between the sensor and the leak point. Not more than 1 meter is highly recommended.

3. Ensure that the pressure value is correct. Otherwise, revise it on the touchscreen.

4. When you find the exact position, click the **Record** button on the screen.

As shown on the left, a leak record is created for the leak point. This record is assigned with a unique leak tag (*for example*, 0001) and has the leak loss calculated.

5. Point the S531 towards the leak point, and click the **Camera** icon or press the ⏻/📷 push button to take a photo of the detected leak point.

6. To highlight areas in the photo, click **Mark.**
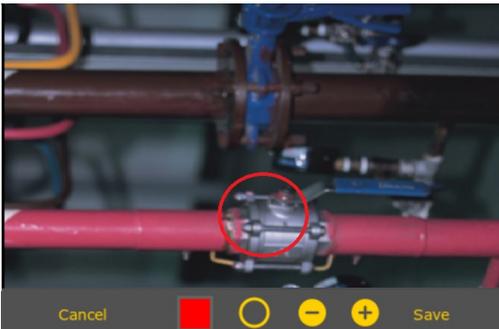
7. Tap the red **Square** icon until it switches to the desired color, and then click the **Circle** icon to add an circle in the chosen color to the photo.

8. Drag the circle to the area that you want to highlight. To adjust the circle size, click the + or − icon.

9. Click **Save** and then **Done** to save the photo.

Note: A maximum two photos are allowed for a leak record.

10. Click the **Next** button.
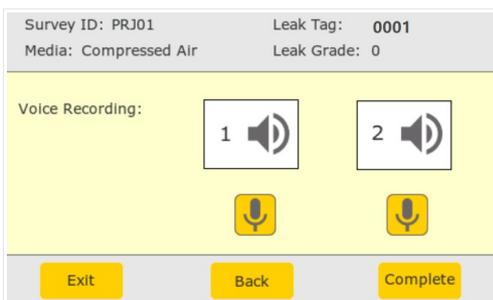
11. On the left-hand screen that appears, click the **Microphone** icon or press the 🎤 push button on the device to record a voice memo for the leak point.
Two voice memos are allowed for a leak, and each can last up to 1 minute.

12. Click the **Complete** button.

13. In the *Confirmation* pop-up that appears, click the **OK** button to save the record and exit.

14. Fill out the paper leak tag, and then tie it near the leak point.
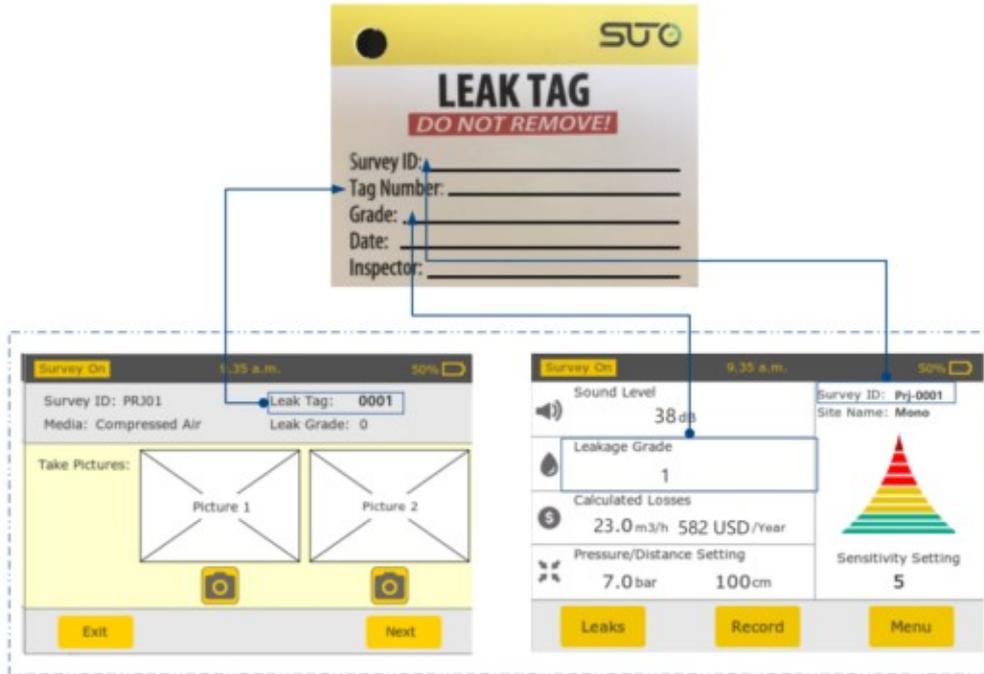
Note:
To view leak data in a recorded leak, click the **Leaks** button on the home screen. For more information, see Chapter 11 Managing leak records.

11 Managing leak records

After a leak is recorded in the S531, you can review the leak record, and if needed delete the leak and record again.

To analyze leaks, you can also download all leak data in a survey from the S531 to a PC.

11.1 Viewing and deleting a leak record

You can view a leak record in the S531, and if you are not satisfied with the leakage data, you can delete the leak record and record again.
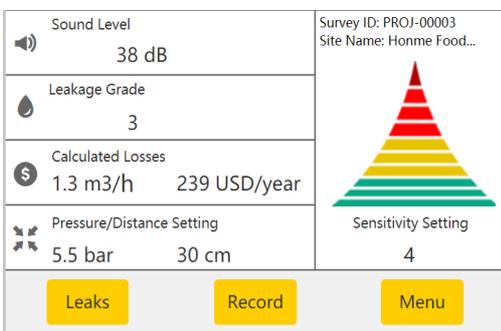
1. On the home screen, click the **Leaks** button.
The *View Leaks* screen appears with the list of leak records displayed.
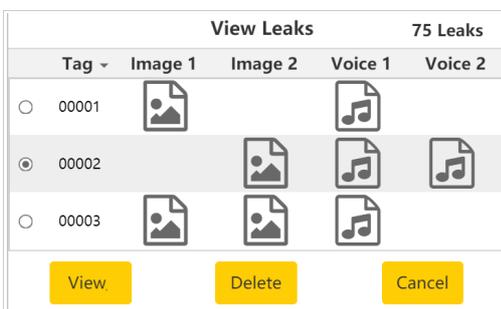
2. To review a photo or a voice recording in a leak record, click the corresponding icon on the screen.

3. To view the leak data stored in a record, select the record, and then click the **View** button.
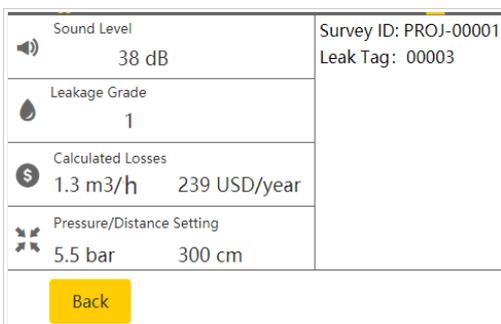
4. View the detailed leak data.

5. (Optional) If you find the pressure or distance setting is not correct, return to the *View Leaks* screen and delete the record. Then you can perform a detection again on the home screen.

11.2 Downloading leak records to a PC

The S531 enables you to download the leak records to a PC for further analysis.

To download leak records to a PC, do the following:

1. Access **Menu**> **Survey Stop**, and then stop the current survey.

   Note: If you do not stop the survey, the .CSV files cannot be updated. If you ever deleted or added any leak records, make sure that you stop the survey before downloading leak records.

2. Connect the S531 to a PC using the supplied USB cable.

3. On the PC, double click **My Computer**.

   On the PC, the S531 is identified as a USB drive.

   Note: When the S531 is connected to a PC for the first time, the S531 driver will be automatically installed on the PC.

4. Access the S531 USB drive.

5. Enter the **.\records** folder.

   This folder contains detected data of all surveys. Each of its sub-folders corresponds to a survey and is named with the survey ID.

6. Enter a survey folder as needed.

   A survey folder stores all leak data that the S531 has recorded for this survey, and is structured as below.
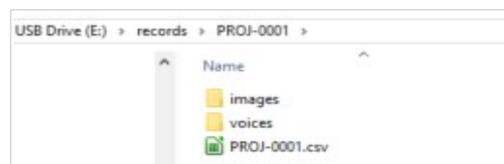
   - *<SurveyID>.csv* stores leak data recorded in this survey.

     Note:The CSV file is generated only after the survey is stopped.

   - The *images* folder contains all photos taken in this survey (One camera snapshot produces photos in two resolutions, *.JPG format for the high resolution and *.bmp for the low resolution).

   - The *voices* folder contains all voice recordings taken in this survey (*.WAV format).

     The image and voice files are named in the form of *<Leak Tag*

No>A or <Leak Tag No>B (for example, 00001A.jpg and 00001B.wav).

7. Copy the desired survey folders to the local.

12 Maintenance

This chapter describes the basic maintenance operations.

12.1 Self-test

When a certain peripheral does not work normally, use the self-test function to test and locate errors. The peripherals supported include:

- Display

- Microphone

- Speaker

- Camera

Access **Menu** > **Self Test**, and perform self-test on a peripheral as needed.

12.2 Updating the firmware

When a new release of the device firmware is launched, the S531 enables you to update the firmware on your own.

Note: After the firmware is updated, the user settings are reset to the factory defaults. In addition, the leak records are not accessible via the device screen, but they are stored in the device and can be downloaded via the USB stick.
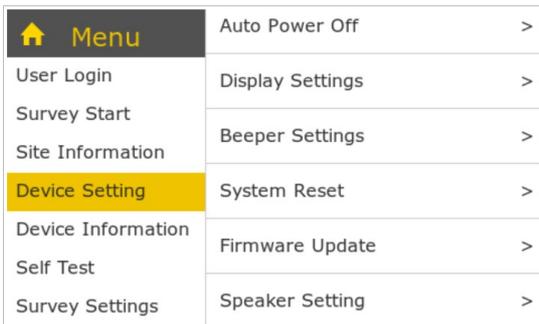
Preparation: Copy the new firmware to the root directory of the Type-C USB stick included in the delivery package.
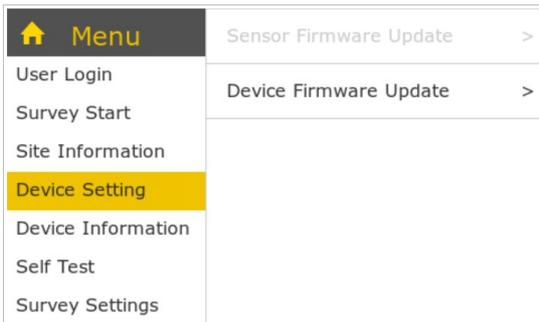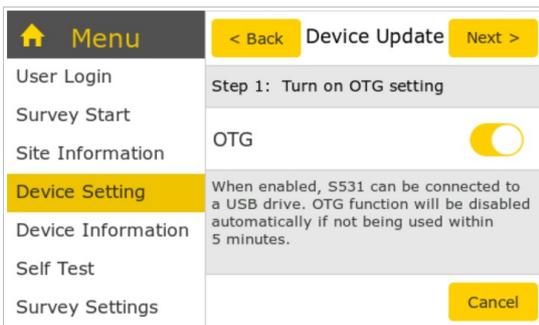
Steps:

1. Access **Menu** > **Device Information** to view the current firmware version.

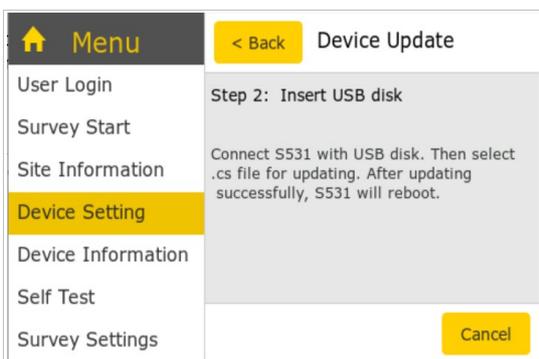2. Access **Menu** > **Device Setting** > **Firmware Update**.

3. On the screen that appears, click **Device Firmware Update** as needed.

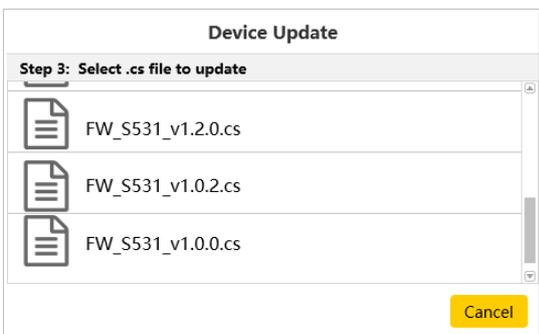4. On the Device Update screen, turn on the **OTG** toggle.

5. Click the **Next >** button on the top right corner to proceed.

6. Insert the prepared USB stick to the S531.

7. On the screen that appears, you can see the files in the root directory of the USB stick. Navigate to the desired firmware file and single click to select.

8. In the *Confirmation* pop-up that appears, click **Yes** to start the update.

Device Update

Step 4: Updating Firmware

Copying file: FW_S531_V1.2.0.cs

60%
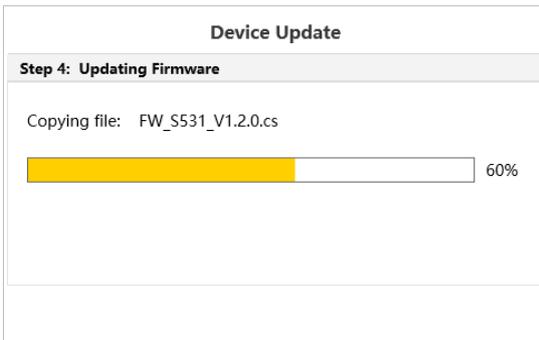
9. Wait until the firmware update is completed.
After the update process is completed, the S531 restarts automatically.

12.3 Resetting the device

In case you want to restore the ex-factory settings, you can perform the system reset.

Access **Menu** > **Device Settings** > **System Reset**. It takes about five seconds to complete the reset process.

Note: All settings will be cleared, but the leak records including photos and voice recordings will not be deleted.

12.4 Reusing a survey ID

S531 provides a workaround to enable you to reuse a survey ID. *For example*, you started a survey but found that there is a wrong unit setting. You have to create a new survey with the unit setting corrected. Meanwhile you want to reuse the previous survey ID in the newly-created survey.

This workaround is to delete data of the previous survey from the S531 and then reset the device. Detailed steps are as follows:

1. Connect the S531 to a PC.

2. On the PC, back up the survey folder from the S531 to a local folder.

3. Delete the survey folder from the S531.

4. Disconnect the S531 and the PC.

5. On the S531, access **Menu** > **Device Settings** > **System Reset**, click **Reset**.

6. Click **Menu** > **Survey Start** to create a new survey. Now you can reuse the ID of the deleted survey.

12.5 Cleaning the sensor

To clean the sensor and its accessories, you are recommended to use moist cloth only.

ATTENTION!

Do not use isopropyl alcohol to clean the sensor and its accessories!
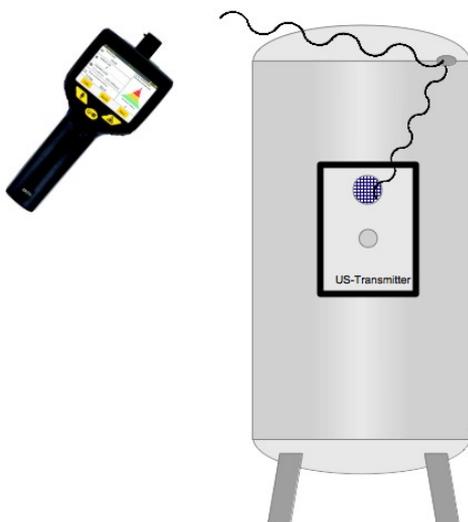
13 Optional accessories

Ultrasonic tone generator is an optional accessory that is used in pressure-less systems. The generator emits ultrasonic waves that can be detected by S531.

Specification

- Frequency: 40 kHz ± 10%

- Automatically shut-down after 10 min ± 20%

- Power supply internal: E-Block 6LR61 9 V

Application example

To detect leaks at a tank, place an ultrasonic tone generator inside the tank, the ultrasonic that is produced by the generator can flow through leaks and be detected by S531.

14 Disposal or waste

Electronic devices are recyclable material and do not belong in the household waste.
The sensor and its accessories and packings must be disposed according to your local statutory requirements. The dispose can also be carried by the manufacturer of the product. Please contact the manufacturer for details.

15 Warranty

SUTO provides a warranty of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery. To protect your rights, please report any findings immediately and within the warranty time. If faults occur during the warranty time, SUTO will repair or replace the defective unit without charge for labour and material costs, but there is a charge for other service such as transport and packing costs.
Excluded from this warranty includes damage caused by:

- Improper use and non-adherence to the instruction manual.

- Use of unsuitable accessories.

- External influences (e.g. damage caused by vibration, damage during transportation, excess heat or moisture).

The warranty is void if any of the following situations occurs:

- A user opens the measurement instrument without a direct request written in this instruction manual.

- Repairs or modifications are undertaken by third parties or unauthorised persons.

- The serial number has been changed, damaged or removed.

Other claims, especially those for damages occurring outside the instrument are not included unless responsibility is legally binding.

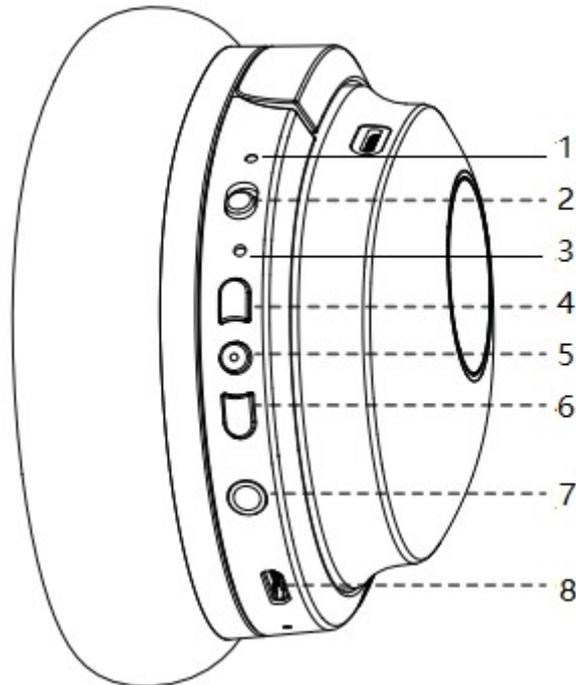Warranty repairs do not extend the period of warranty.

ATTENTION!

Batteries have a reduced warranty time of 12 months.

16 Appendix: Headset overview

16.1 Description

Part	Description
1	Noise cancellation indicator: Solid green: Noise cancellation is switched on.
2	Noise cancellation on/off switch. Keep it switched on when in use.
3	LED Indicator: - Flashing blue and red alternately: Power on & paring mode - Flashing red: Low battery. - Solid red: Charge in process. - Solid blue: Fully charged. - Flashing blue slowly: Paired
4	Volume up button
5	Power button: - To power on, press and hold on for five seconds. - To power off, press and hold on for three seconds.
6	Volume down button
7	3.5 mm Audio jack
8	USB charging port

16.2 Care and maintenance

- Do not drop, crush, bend or apply excessive force to the device.

- Do not expose your device to moisture, extreme or prolonged heat, cold,humidity, or other adverse conditions. Avoid storing it in damp, humid or wet places, as it is not waterproof.

- Clean the unit with a soft cloth or damp chamois leather. Never use solvents.

- The Unit can only be opened by qualified personnel.

- This device contains magnets. Keep magnetic field sensitive products such as credit cards and video screen away from this device to avoid damage.

ATTENTION!

The maximum charging voltage is 5 V. Inappropriate charging may cause severe damage, fire or electrocution hazard.

SUTO iTEC GmbH

Werkstr. 2
79426 Buggingen
Germany

Tel: +49 (0) 7631 936889-0
Fax: +49 (0) 7631 936889-19
Email: sales@suto-itec.com
Website: http://www.suto-itec.com

SUTO iTEC (ASIA) Co., Ltd.

Room 10, 6/F, Block B, Cambridge Plaza
188 San Wan Road, Sheung Shui, N.T.
Hong Kong

Tel: +852 2328 9782
Fax: +852 2671 3863
Email: sales@suto-itec.asia
Website: http://www.suto-itec.com

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