



**USER**  

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**GUIDE**  

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LKS  
1000  
**V2+**  
**V3+**

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## PACK LKS1000 V2+

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## PACK LKS1000 V3+

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# WHAT IS A LEAKSHOOTER®?

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LEAKSHOOTER® **LKS1000 V2+** is a portable detection device that helps **locate, hear, view, measure and record leaks which emit ultrasounds**. It can also estimate the leak flow and the leak cost.

LEAKSHOOTER® **LKS1000 V3+** is a **V2+**, plus a special program dedicated to STEAM TRAP condition analysis and with an embedded thermal imaging camera.

Main industrial applications are:

- ✓ Compressed air leak detection
- ✓ Compressed process gases leak detection
- ✓ Vacuum leak detection
- ✓ Steam trap or valve condition analysis
- ✓ High voltage capacitive default detection (corona, arcing, tracking...)
- ✓ Tightness checking and seal integrity test (with ultrasonic emitter)

# HOW TO WORK WITH LEAKSHOOTER®?

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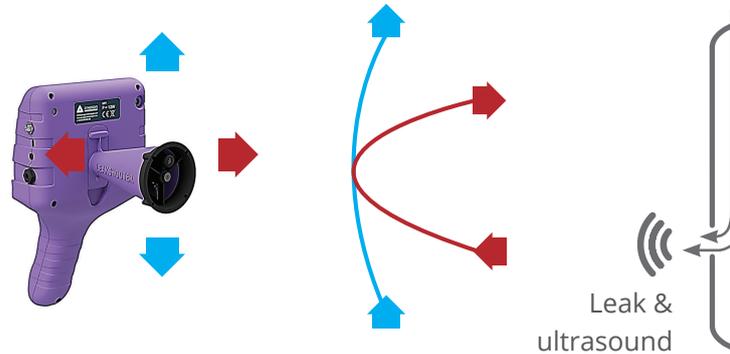
LEAKSHOOTER® **LKS1000** has been designed to display in real time the fusion of images of the scene being scanned and the detected ultrasounds coming from a leak (ultrasound received = white or colored dynamic target).

Depending on the leak size (intensity of ultrasonic waves received around 40 kHz) and on the settled sensitivity (GAIN), the dynamic target will be big or small (white).

Of course if you want to know the leak severity, please click on the K function button. The target will then have a severity color (LEAKSCORE from 0 to 100 is made for a 1 meter distance detection).

LEAKSHOOTER® **LKS1000** is equipped with a special MAX RMS value function which thanks to the target, shows you if you are close to the leak (simple round target) or in front of the leak (round target + cross in its center).

The method consists of scanning the scene, conscientiously. From far to close location. Do not forget to decrease GAIN slowly to avoid saturation.



Start with the maximum of sensitivity (GAIN=106 dB, settled when the device is switched ON).

Sweep the scene for example from left to right and from top to bottom, with the aim of going in front of the leak and thus activating the special MAX value, which will remain frozen a few seconds (bold vertical line in the bargraph).

If you still have the white target with cross, everywhere,

it is because you are in a saturated zone. Look on the ground with LEAK**SHOOTER**®, slightly decrease the GAIN to be in the green part of the bargraph and scan again in such a way as to find a direction in which to go.

Thus, go back to the area to find this special MAX value (align RMS real time and MAX). You will see a cross in the center of the dynamic target. You are in front of the leak.

# DETAIL OF A LEAKSHOOTER®

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LEAKSHOOTER®  
LKS1000 V2+

LEAKSHOOTER®  
LKS1000 V3+



# DETAIL OF A LEAKSHOOTER®



# DETAIL OF KEYBOARD

With LEAKSHOOTER® LKS1000 V3+ Keyboard



# DETAIL OF SCREEN

The screenshot shows a complex interface with several data fields and graphical elements. Annotations on the left side point to specific features:
 

- INT or EXT**: Points to the 'INT' label in the top left corner.
- Internal (cone) or External sensor**: Points to the '66 dB' value.
- Sensitivity (Gain) level**: Points to the '66 dB' value.
- Target which is white or colored (if K is activated or not)**: Points to a red crosshair target overlaid on a pipe.
- Bargraph which is white or colored if K is activated or not**: Points to a vertical color bar on the right side of the screen.

 Annotations on the right side point to:
 

- Battery level**: Points to the '89%' value in the top right corner.
- Flow/Cost estimation**: Points to the '- 8.46 m3/h' and '- 1438 €' values.
- K value position**: Points to a specific position on the vertical color bar.
- K estimator Severity (0>100)**: Points to the vertical color bar.
- K value**: Points to the bottom of the vertical color bar.

 At the bottom, three data points are labeled:
 

- Max RMS « Large » cursor**: Points to a red bar at the bottom left.
- Real time RMS « Thin » cursor**: Points to a thin red line at the bottom center.
- dB RMS value**: Points to the '57.8' and '67' values in the bottom right corner.

# BATTERY CHARGING

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LEAKSHOOTER® LKS1000 V3+ and V2+ have an internal NiMH (Nickel Metal Hybrid) battery pack technology (6x 1,2V-2600 mAh). To charge this battery pack, please only do it with the delivered charger DC 12V-1,5A.

We recommend to charge it only when the battery capacity is about **< 30 %** (see on LEAKSHOOTER® screen). Maximum recommended charging time is about 2H30. Do not leave your device unattended.

**Please be careful not to charge several times (connect - disconnect - connect...) within a few hours. It could disturb the automatic ending charge detection.**

Feeling some heat at the end of the charging process is normal.

**Note:** Please charge and discharge 3 times completely before to have correct % values of battery state on screen. Autonomy is about 5 hours.

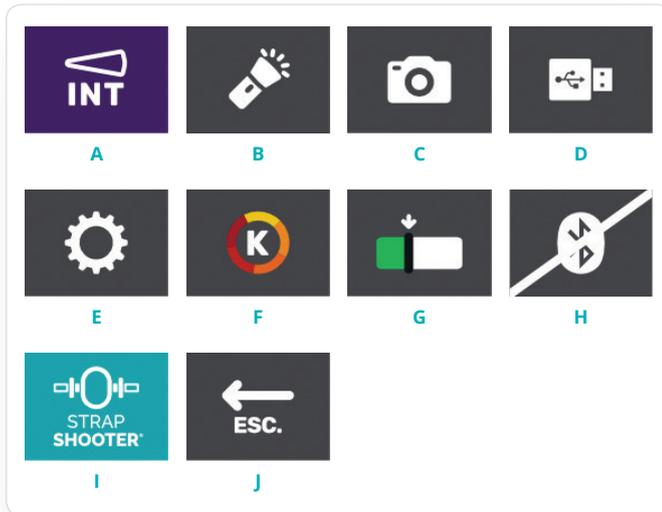
# ON/OFF

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- Switching ON:  
Briefly press the button , LEAKSHOOTER® starts 5 seconds after initialization.
- Switching OFF:  
Press for a longer time (> 3 seconds) the button , LEAKSHOOTER® goes to switch OFF.

# MAIN MENU (VIA OK BUTTON)

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- A. INT (cone) or EXT (flexible or contact) sensor
- B. LED light activation
- C. Memory with leakage photos
- D. USB LINK activation
- E. General settings
- F. K (Severity and Estimator of leak flow/cost) settings
- G. Limit of green/white part of bargraph adjustment
- H. Bluetooth activation
- I. STRAPSHOOTER program (only in **V3+**)
- J. Escape icon

- A.** It confirms the used sensor between cone (INT) or flexible/contact (EXT).
- When you connect an external sensor, it is automatically detected as EXT (same when removing it).
- B.** To help you to have a better light to take a picture in a dark situation.
- C.** To be able to review stored leakage photos (READ or CANCEL).
- You can navigate with **+** or **-** buttons and escape with **OK**.
- To cancel a photo, click on the PHOTO button .
- D.** To download photos to PC or to update device.
- Connect your device (ON) to PC with USB cable, activate USB LINK and wait with WINDOWS function.
- Copy / Paste / Delete your photos. Before disconnecting, be sure to eject USB with WINDOWS function.
- E.** To set clock/date, luminosity (5 per default), Auto off, frequency mixing (42 kHz per default).
- F.** K (Severity and Estimator of leak flow/cost) settings.
- If you need a flow/cost estimation, please fulfill h/Y compressor use and Nm<sup>3</sup> cost. To do that, click on the icon and go to the virtual keyboard with . Choose your number and valid it with the virtual keyboard Enter button.
- G.** Limit of green/white part of bargraph adjustment.
- Select this icon and add +0,5 or +1 or +1,5 dB to your cursor with **+** or **-** button, to make it more closed to white part than green part of bargraph when you do not have ultrasounds. It will help for small leak detection (target will be more reactive to small ultrasounds). Valid value with **OK**.
- H.** Bluetooth activation
- Select this icon and put your headphones or your speaker in pairing mode. Wait some seconds and it will be OK.
- I.** STRAPSHOOTER® program (only in V3+) for STEAM TRAP analysis with contact probe.
- J.** Escape icon to go back to measure mode.

# K, HOW IT WORKS?

Only for industrial compressed air (5 to 8 Bar (72 to 116 Psi)).

On screen, target will go from white (standard mode) to K colored value.

Of course, you can switch OFF/ON this K function with  button.



# K, CONDITION OF USE

Only for industrial compressed air (5 to 8 Bar (72 to 116 Psi)).

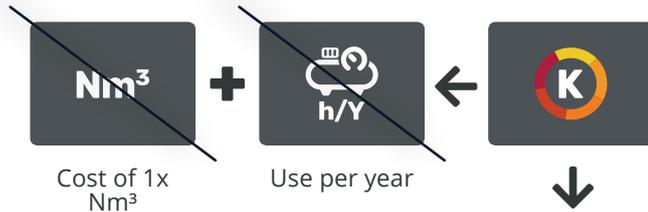


**1,0m**  
40 in.



# K, WITHOUT SETTINGS

IF IN K MENU, SETTINGS ARE = « 0 »



LEAKSCORE NUMBER:

0 to 100, from very small to very big leakage

5 colored levels:

- 0-20 ;
- 20-40 ;
- 40-60 ;
- 60-80 ;
- 80-100

(for about :

- 0.2 m<sup>3</sup>/h;
- 0.6 m<sup>3</sup>/h;
- 3.5 m<sup>3</sup>/h;
- 14.5 m<sup>3</sup>/h;
- 31.7 m<sup>3</sup>/h)

# K, WITH SETTINGS

IF IN K MENU, SETTINGS ARE BOTH  
DIFFERENT THAN « 0 »



LEAKSCORE NUMBER:

0 to 100, from very small to very big leakage

5 colored levels:

- 0-20 ;
- 20-40 ;
- 40-60 ;
- 60-80 ;
- 80-100

+ Flow m<sup>3</sup>/h

+ Cost/year estimations

# THERMAL CAMERA (V3+) HOW IT WORKS?



Out of STRAPSHOOTER® program

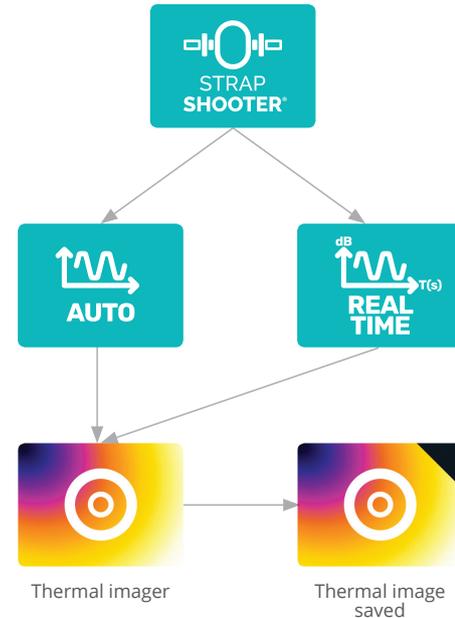
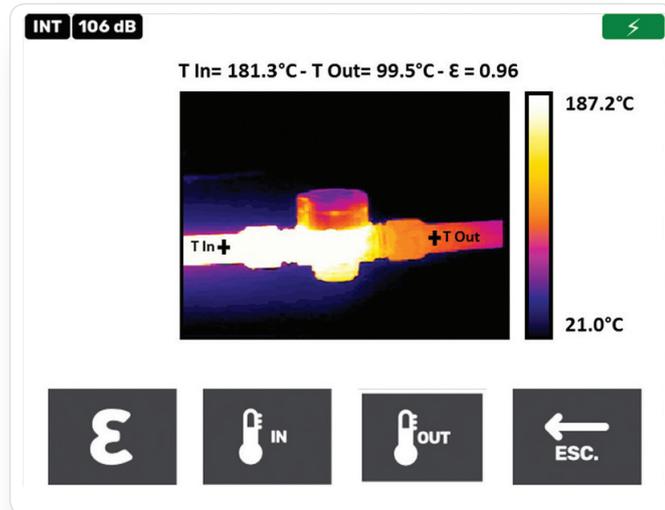


- (-10°C to +400°C range) with AUTO thermal imaging mode
- $\epsilon$  can be adjusted with  and  buttons
- Photo can be taken with 2x clicks on the PHOTO button  and a name validated with Enter button on the virtual keyboard
- ESC to go back in measurement mode

# THERMAL CAMERA (V3+) HOW IT WORKS?



In STRAPSHOOTER® program



In STRAPSHOOTER® **REAL TIME** or **AUTO** mode, select THERMAL icon and wait some seconds to have a stable thermal image (wait after first shutter activation):

- Take/freeze your trap thermal picture with the PHOTO button .
- Select T° IN icon and valid it with **OK** to place the T° IN cursor with joystick keyboard. Valid it with **OK**.
- Select T° OUT icon and valid it with **OK** to place the T° IN cursor with joystick keyboard. Valid it with **OK**.
- Now you can save thermal image if necessary with the PHOTO button . If not (ESC), only T° IN and T° OUT values are stored in the **REAL TIME** or **AUTO** mode program.
- You can continue with your ultrasonic measurements.
- Do not forget to save all of your data at the end with the PHOTO button  again to take your STEAM TRAP photo and give it a name before final storage in memory (with Enter button on the virtual keyboard).

# STRAPSHOOTER® (V3+) HOW IT WORKS?

STRAPSHOOTER® is made for a combination of ultrasonic and temperature measurements.

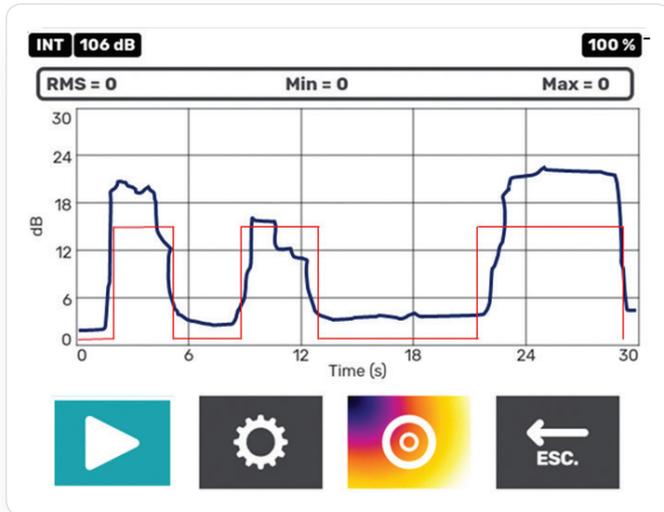
From main MENU, click on STRAPSHOOTER® icon  :

- Choose between **AUTO** or **REAL TIME** modes (before to do AUTO, check REAL TIME results).

**Note:** For mechanical ball float trap, you need to find modulation in ultrasounds or sometimes cycles. For thermodynamic or thermostatic, you will probably find cycles. If you have a low level and constant, it is probably a closed situation and if you have a high level and constant, it is probably an open leaking situation.



# STRAPSHOOTER® (V3+) – REAL TIME



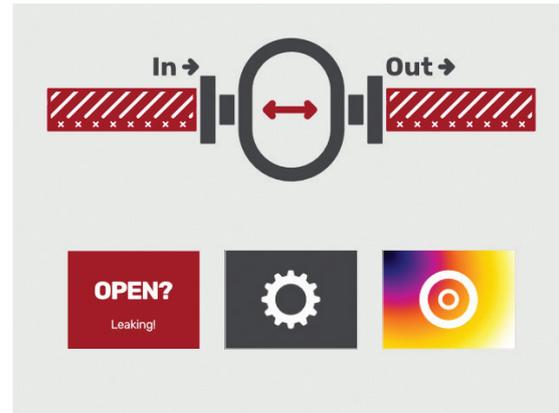
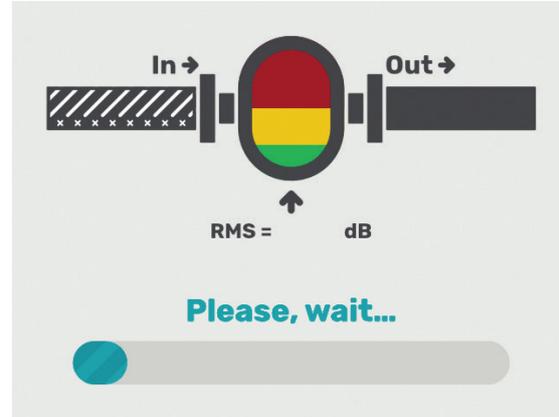
- Click on **REAL TIME** icon.
- Put your probe in contact with your trap.
- Click on **START**, wait some seconds and look at your curve.
- If necessary, adapt **GAIN** and **SCALE** (settings) for high level of ultrasounds.
- **STOP** it. (Refreshed every 30s) and set your Low level and Delta (Settings):  
→ *Low level=Min level+2 and Delta=2 (in general applications).*
- Click again on **START/STOP** when you have understood the problem.
- Measure **T° IN** and **T° OUT** with thermal camera and save results.
- Click on PHOTO button  to take your trap photo and 2x times on OK button to save all in memory with virtual keyboard (name+Enter).

**Note:** Blue curve is the REAL TIME ultrasonic noise in the trap and red curve is the threshold evolution (if Low level and Delta are OK). Red curve is not necessary if you do not use AUTO mode.

# STRAPSHOOTER® (V3+) – AUTO



- Click on **AUTO** mode icon (It is recommended to do REAL TIME first).
- Wait 30 to 300s (See settings) depending your needs (trap size or flow).
- See **OK** or **OPEN?** or **CLOSED?** results.
- Measure T° IN and T° OUT with thermal camera.
- Click on PHOTO button  to take your trap photo and save all in memory with 2x OK.



# STRAPSHOOTER® (V3+)

## CLASSIC CASES OF TRAP CONDITION:

US RESULT	T° IN	T° OUT	CONCLUSION
<b>CLOSED?</b> With constant US			<b>Really blocked closed (careful-danger)</b> Potential water hammer.
<b>CLOSED?</b> With constant US			Not in service (no steam presence)
<b>CLOSED?</b> With constant US			<b>Evacuation of large amount of water</b> (probably thermodynamic-thermostatic system OK). Check again later.
<b>CLOSED?</b> With modulated US			<b>Evacuation of large amount of water</b> (probably float mechanical system OK). Check again later.
<b>OPEN?</b> With constant US			Really blocked open (energy losses)
<b>OPEN?</b> With constant US			<b>Not in service (no steam presence)</b> . Probably US high noise level comes from other pipes
<b>OPEN?</b> With constant US			<b>Evacuation of large amount of water</b> (probably thermodynamic-thermostatic system OK). Check again later.
<b>OPEN?</b> With modulated US			<b>Evacuation of large amount of water</b> (probably float mechanical system OK). Check again later.
<b>CYCLING OK</b>			Trap in good condition of work

LEGENDE :

STEAM T° 

HOT WATER T° 

NO STEAM - NO WATER 

# MAIN ICONS USED IN LEAKSHOOTER®

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BLUETOOTH setting  
(Headphones or speaker pairing)



AUTO OFF setting



White LED light ON/OFF



Internal or external  
probes



Your use of compressed air / year  
(8.760 h/year for 24h/24h use)



Your Nm<sup>3</sup> compressed air cost  
(for example 0.02 €).  
Use # for special non standard money.



Frequency mixer setting  
(42 kHz per default)



Clock & date settings



Memory to access to stored photos (Visible+IR), 1 directory for leaks, 1 directory for STRAPSHOOTER®



K settings



↑ Temperature unit for thermal camera



USB link



↑ STRAPSHOOTER® modes



Trigger settings: Low level (= Your MIN level+2) & Delta (2 in general)



FLIR thermal imager (black corner means temperatures T°IN and T°OUT have already been saved)



Scale setting for REAL TIME curve (0-30, 10-40, 20-50, 30-60, 40-70 dB)

# ACCESSORIES LEAKSHOOTER® DETAIL

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- Flexible 400mm
- Flexible 1500mm
- Contact probe
- 12V external battery
- Bluetooth headphones
- Bluetooth speaker
- Holster
- Ultrasonic dome





LKS  
1000  
V2+  
V3+

USER

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GUIDE

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SYNERGYS TECHNOLOGIES has been established in 1996 in France, to offer innovative and professional solutions for preventive and predictive maintenance.

SYNERGYS TECHNOLOGIES is the inventor of the ultrasonic visualization concept with the LEAKSHOOTER®, the thermal contour concept with the TSHOOTER® and of the MCP (Machine Condition Picture) concept with the VSHOOTER®.

We are present worldwide with professional and trained distributors.



**SYNERGYS**  
TECHNOLOGIES

LEAKSHOOTER®,  
VSHOOTER® & TSHOOTER®  
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