



Operating Instructions Leak Locator HL5000

HL5000-C
HL5000-C+GM
HL5000-CGH
HL5000-H₂

(English Edition)

Version 1.0

P/N: 4.04.000048



Consultation with SebaKMT

The present system manual has been designed as an operating guide and for reference. It is meant to answer your questions and solve your problems in as fast and easy a way as possible. Please start with referring to this manual should any trouble occur.

In doing so, make use of the table of contents and read the relevant paragraph with great attention. Furthermore, check all terminals and connections of the instruments involved.

Should any question remain unanswered, please contact:

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Table of Contents

Safety Advices	1
Technical Description.....	2
2.1 Version Overview	2
2.2 Construction	2
2.3 Technical Data.....	2
2.4 Scope of Delivery	3
Design.....	4
3.1 Control Panel.....	4
3.2 Connector Sockets	4
3.3 Batteries	5
3.4 Backlight.....	5
3.5 Headphones	5
3.6 Microphones.....	5
3.6.1 Ground Microphone PAM W-2 / GM-80.....	5
3.6.2 Universal Microphone PAM B-2.....	6
3.7 Gas Sensor	7
Commissioning in Leak Location Mode.....	8
4.1 Connecting Accessory Parts	8
4.2 Switching the Device On	8
4.3 Adjusting the Headphone Volume	8
4.4 Setting the Gain.....	9
4.5 Performing a Measurement and Reading the Values Displayed	9
4.6 Adjusting the Frequency Range	10
4.6.1 Opening the Filter Settings Menu	10
4.6.2 Adjusting the Cut-Off Frequencies.....	10
4.6.3 Filter Selection in Practice	11
4.7 Comparing Measured Values (Histogram Function).....	11
4.8 Performing a Long-Term Measurement.....	12
4.9 Switching the Device Off	13
Line Location Mode.....	14
Commissioning of HL5000-H2 in Gas Mode only	15
6.1 Connecting Accessory Parts and Switching the Device On.....	15
6.2 Adjusting the Volume.....	15
6.3 Adjusting the Sensitivity.....	16
6.4 Performing a Zero Balance.....	16
6.5 Performing a Measurement	16
6.6 Comparing Measured Values in Gas Mode (Histogram Function)	17
6.7 Performing a Long-Term Measurement in Gas Mode	18
Trouble-Shooting	19

Safety Advices

This manual contains basic advice for the operation of the measuring system. It is essential to make this manual accessible to the authorized and skilled operator. He needs to read this manual closely. The manufacturer is not liable for damage to material or humans due to non-observance of the instructions and safety advices provided by this manual.



Local regulations have to be considered.

General Cautions

- Do not drop the device or subject it to strong impacts or mechanical shocks.
- The limits described under Technical Data may not be exceeded.
- The device must be in a technically perfect condition for measurement.
- The indicated degree of protection can only be ensured if plugs or the provided protection caps are put in all sockets of the device.
- The plugs of the supplied connection cables are only compliant to the indicated degree of protection as long as they are plugged in. Plugs which are not connected or which are connected in a wrong way are not protected from water and dust ingress.
- Original accessories ensure safe operation of the equipment. It is not allowed and the warranty is lost if other accessories than the original ones are used with the equipment.
- Maintenance and repair must be carried out by SebaKMT or authorized service partners only.

Symbols Used in this Manual

Important instructions concerning the protection of staff and equipment as well as technical safety within this document are labelled with one of the following symbols:

Symbol	Description
	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or material damage.
	Notes have important information and useful tips on the operation of your equipment. Non-observance may result in useless measurement results.

Technical Description

2.1 Version Overview

HL 5000 (Acoustic Sensors: PAM-B-2; GM-80/ PAM-W-2)

The HL 5000 provides all necessary functions for acoustic leak location on pipe systems. By means of different connectable microphones noises can be recorded directly on the pipe as well as from the ground. The recorded noise is reproduced on the connected headphones and the noise level is also displayed on the screen of the device in form of a bar graph as well as numerically. Thereby the ambient sound insulation of the headphones protects the user's sense of hearing against impulse type disturbances.

Furthermore, the HL 5000 provides various functions for the target-oriented use of the device and for easy interpretation of the measuring results.

- **filter function** - for limiting the device's bandwidth by setting a lower and an upper cut-off frequency - 9 levels selectable
- **histogram function** - for comparing measured values at a glance
- **long-term measurement function** - for recording a noise over a longer period of time and for displaying its progress in the form of a graph
- **line locating function** - for detecting the location and the course of a pipeline - especially a non-metallic pipe - in connection with an acoustic pulse generator, such as the 'Pipe Knocker RSP3' from SebaKMT

HL 5000-H₂ (Tracer Gas Sensor: PAM-H2)

The HL 5000-H₂ combines acoustic and tracer gas (H₂) sensing abilities. For use in the tracer gas detecting mode the sensor (PAM-H₂) has to be plugged in before the unit is turned on.

2.2 Construction

The leak location device is in a splash-proof housing made of robust plastic. The few control buttons can be operated wearing gloves. The display is equipped with backlighting what allows working under poor lighting conditions or at night.

The connections for the microphone / gas sensor and headphones are on two opposing sides of the device so accessories can quickly be plugged in or removed.

The batteries (10 x AA) are in the base of the device and can easily be replaced.

2.3 Technical Data

The Hydrolux leak locator series are specified by the following technical parameters:

Analysis bandwidth:	0 – 4000Hz
Filter cut-off frequencies:	0 - 70Hz, 106Hz, 160Hz, 240Hz, 360Hz, 540Hz, 800Hz, 1200Hz, 1800 – 4000Hz
Histogram recordings:	Endless; 9 are displayed
Long-term measurement:	3, 10, 30min
Display:	5.1" x 1.4" (130 x 36mm) LCD display
LCD illumination:	available
Power supply:	10 x AA batteries, (1.5V) or alternatively 10 x rechargeable batteries (1.2V, >1000mAh)
Operating time:	> 35h (battery), > 18h (rechargeable battery)
Storage max:	9 measurements or 30min sound graph
Mute button:	Built in; Push to activate
Operating temperature:	14 to 122°F (-10 to +50°C)
Storage temperature:	14 to 158°F (-10 to +70°C)
Protection class when in operation:	IP54
Dimensions (L x W x D):	8.5" x 3.7" x 4.3" (215 x 95 x 110mm)

2 Technical Description

Weight: HL 5000 (receiver)	2.6lbs (1.2kg) (with batteries)
Weight: PAM W-2/ GM-80	7.7lbs (3.5kg) (with carrying pole)
Weight: PAM B-2	1.1lbs (0.5kg)

Additional data for HL 5000-H₂ operation:

Sensitivity of sensor PAM-H ₂ :	1ppm H ₂ in air
Analysis bandwidth of sensor:	0 – 1% H ₂ in air
Analysis bandwidth displayed:	0 – 10000 divisions
Response time:	< 1sec
Warm-up time:	6sec
Operating time:	> 12h (batteries), > 8h (rechargeable batteries)
Operating life of the replaceable gas sensor if kept dry:	2 to 5 years (depending on intensity of use)

2.4 Scope of Delivery

HL 5000 Device

Leak location device with batteries	HL 5000
Headphones (best passive noise cancelling)	David Clark
Carrying strap	
Carrying case	
Operating instructions	

Acoustic Sensor Sets

Professional set:

Piezo ground microphone with wind protection	PAM W-2 / GM-80
Connection cable to PAM W-2 / GM-80	VK 65
Tripod for PAM W-2 / GM-80	
Carrying handle for PAM W-2 / GM-80	
Piezo contact microphone with 10ft cable	PAM B-2
Magnet	
Tripod for PAM-B-2	
Extension rod	VST T-1

Ground microphone set:

Piezo ground microphone with wind protection	PAM W-2 / GM-80
Connection cable to PAM W-2 / GM-80	VK 65
Tripod for PAM W-2 / GM-80	
Carrying handle for PAM W-2 / GM-80	

Contact microphone set:

Piezo contact microphone with 10ft cable	PAM B-2
Magnet	
Tripod for PAM-B-2	
Extension rod	VST T-1

Gas Sensor Set

Standard sensor for the HL 5000-H₂:

Handheld sensor including telescopic rod with bell-shaped receptacle made of rubber	PAM-H ₂
Connection cable	VK 95

Optional Accessories

Heavy duty contact microphone	PAM T-3
Foot Step- in for PAM T-3	

Design

3.1 Control Panel

The following picture shows the upper side of the Hydrolux device with its display and control buttons.

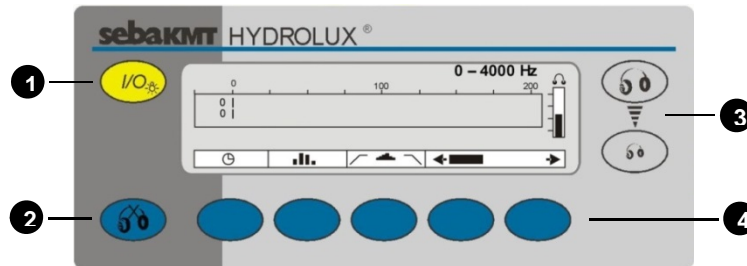


Fig.: Control panel

Element	Description
1	ON/OFF button of the device and of the backlight
2	Mute button By pressing this button the headphone sound is interrupted and the currently displayed value is 'frozen'. Pressing the button once again unmutes the headphones and updates the displayed value.
3	Volume control for headphones
4	Function keys The symbol above each blue, oval shaped button describes the following from left to right: "Record over time"; "Histogram mode"; "Filters"; "Gain control"

3.2 Connector Sockets

The sockets to connect sensors and headphones are on both sides of the Hydrolux device.

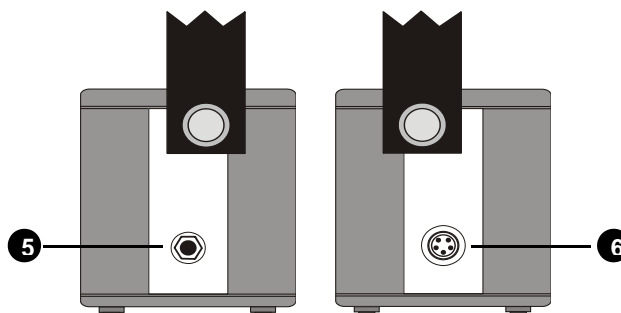



Fig.: Headphone socket on the left and sensor socket on the right hand side of the device

Element	Description
5	6,35mm headphone socket
6	5-pole socket for sensor connection (acoustic or gas sensor)
	Caution Connecting other accessories to the Hydrolux device than the ones delivered by SebaKMT can cause malfunctions or even damage the device.

3.3 Batteries

Low battery is indicated by a flashing battery symbol in the top right corner of the display. From that point on you have less than 4hrs of battery life remaining.

In order to change the batteries loosen the locking screws at the bottom of the device and open the base flap.

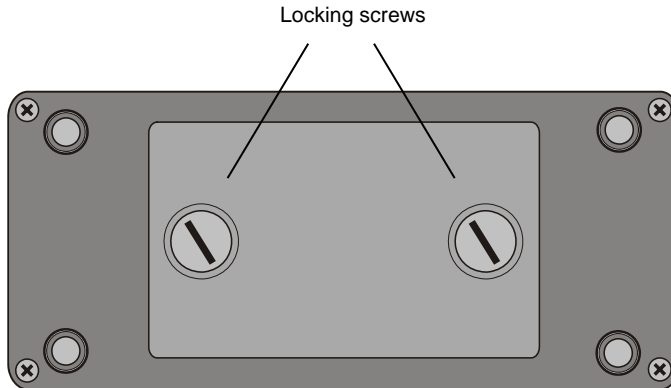



Fig.: Base flap with locking screws

	It is recommended to change always all batteries at one time. When fitting the batteries make sure that the polarity is correct.
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Low rechargeable batteries have to be removed from the device to be recharged by means of an external charger.

3.4 Backlight

The display of the Hydrolux device has a backlight which can be activated if needed.

If the device is on, you can switch the backlight ON or OFF by pressing the **ON/OFF button** **1** briefly.

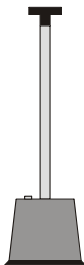
3.5 Headphones

Vivax-Metrotech supplies passive noise cancellation headphones from David Clark or equivalent. Those are aviation grade headphones and require the operator to look left and right before crossing any traffic road to ensure his own safety.

3.6 Microphones

There are various acoustic sensors available for leak noise recording.

3.6.1 Ground Microphone PAM W-2 / GM-80




The PAM W-2 / GM-80 is an active piezo-electric ground microphone for roads and hard ground coverings.

The microphone is particularly well shielded from the wind using a bell-shaped guard.

The carrying handle can be removed with a quarter turn to the left. This is particularly useful in reducing ambient noise to a minimum when there is a strong wind.

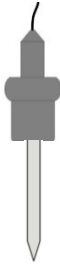
(A VK65 connection cable is required for the PAM W-2 / GM-80)

 CAUTION	Caution Piezo-electric microphones should not be subject to shocks - so always put them gently on the ground!
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3.6.2 Universal Microphone PAM B-2

The PAM B-2 is a very versatile acoustic sensor.

Sensor tip variant:



Here the PAM B-2 is suitable for listening to valves, hydrants or even directly on a pipe. Furthermore, it can be used as a ground microphone on soft ground (soil, meadow etc.). Push the tip into the ground as deep as possible to get optimum acoustic contact to the source of the noise.

In order to get a more comfortable working posture an extension rod can be mounted between microphone body and sensor rod. Please note: As a result the system becomes more sensitive to wind and surrounding sources of noise.



Caution

When pulling the microphone out of the ground always pull on the body of the microphone and **not** on the cable. If done otherwise you may damage the cable.

Sensor magnet variant:



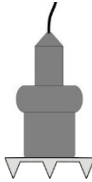
If the magnetic adapter is mounted, the PAM B-2 can easily be put directly on ferromagnetic valves, hydrants or pipes. Due to the high holding force of the magnet an excellent acoustic coupling is achieved. A clean access point is always recommended.



Caution

While removing the contact microphone, always pull on the body of the microphone and **not** on the cable. If done otherwise you may damage the cable.

Sensor tripod variant:



If the tripod is mounted, the PAM B-2 can be used as a simple ground microphone and quick survey tool.

3.7 Gas Sensor

For leak location by means of tracer gas the Hydrolux version HL 5000-H₂ is available. It comes with a gas sensor placed in a telescopic rod.

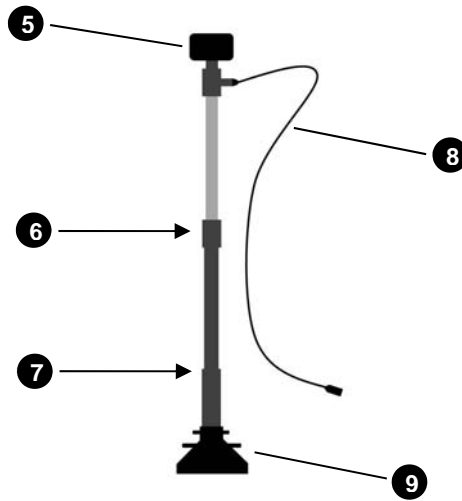


Fig.: Gas sensor with telescopic rod

Element	Description
5	Handle
6	Locking mechanism of the extension (thread)
7	Access to the sensor (thread)
8	Connection cable
9	Bell-shaped receptacle (rubber)

Due to the telescopic function, the sensor rod can be adapted to the user's individual height. In order to loosen / fix the locking mechanism, hold the lower part of the rod tight and screw the upper part to the left / right.

The gas sensor is located at the bottom of the rod right behind the receptacle.

Commissioning in Leak Location Mode

As soon as an acoustic sensor is connected, the Hydrolux device turns automatically into acoustic leak location mode - hereinafter called 'leak location mode'.

The picked up sensor sound is amplified and reproduced through the headphones. At the same time the noise level is shown in the display in the form of a graph as well as numerically.

4.1 Connecting Accessory Parts

It's important to connect the microphone and the headphones to the Hydrolux device before it is switched on. Connect the microphone via the 5-pole socket on the right hand side of the device. Make sure that the guide on the plug fits in the groove in the socket.

Connect the headphones via the 6.35mm headphone socket on the left hand side of the unit. Make sure you feel the plugs latch in.

4.2 Switching the Device On

Prior to the start the microphone and the headphones have to be connected.

The device is switched on by pressing the **ON/OFF button** **1** briefly. The initial screen is displayed.

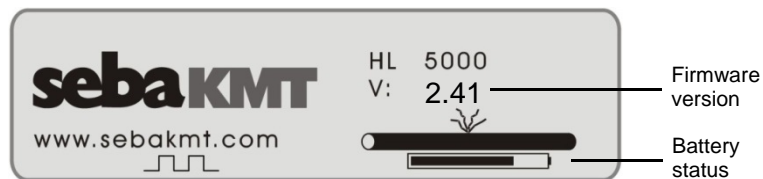


Fig.: Initial screen

After a few seconds the main menu of the leak location mode appears with default equipment settings. The frequency range is reset to the full bandwidth.

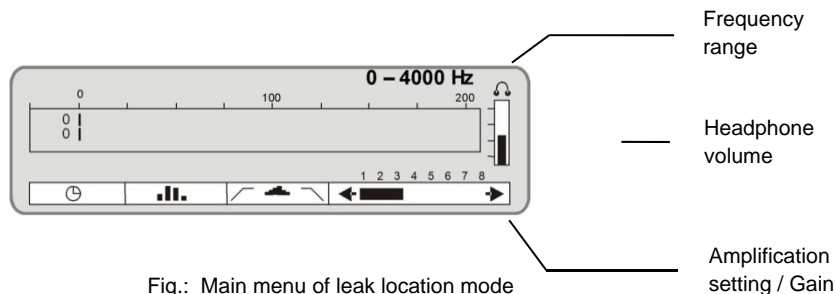


Fig.: Main menu of leak location mode

4.3 Adjusting the Headphone Volume

The headphone volume can be set using the two buttons to the right of the display.

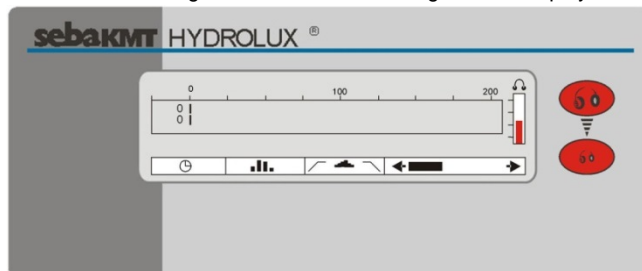


Fig.: Headphone volume adjustment

4 Commissioning in Leak Location Mode

The current volume level is shown by the level bar on the right in the display.
At the beginning of a measurement a medium volume (3 scale units) is recommended.

4.4 Setting the Gain

The microphone signal is amplified by the Hydrolux device. The gain level can be adjusted in 8 steps using the two buttons to the right below the display.

- left button - lower amplification
- right button - higher amplification

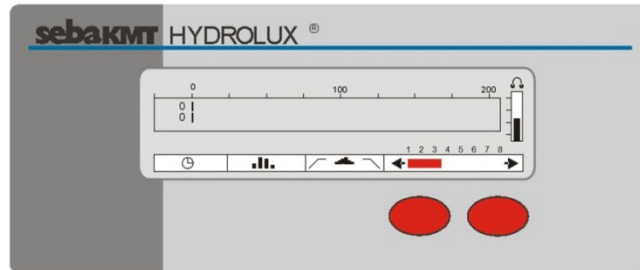


Fig.: Signal gain adjustment

The active gain level is displayed by the level bar at the bottom right of the display.
At the beginning of a measurement a medium gain level (3 or 4) is recommended. Changing the gain level has an instant impact on the noise level heard and displayed.

4.5 Performing a Measurement and Reading the Values Displayed

Proceed in the following steps:

Step	Action
1	Press the Mute button 2 in order to deactivate the headphones temporarily.
2	Go to a measuring point and place the microphone.
3	Press the Mute button 2 in order to reactivate the headphones and to start the measurement.
4	Read the measured values displayed or listen to the noise through the headphones.
5	Press the Mute button 2 in order to deactivate the headphones.
6	Repeat steps 2 to 5 at the remaining measuring points.

Muting the system:

By pressing the **Mute button 2** the sound in the headphones is interrupted and the currently displayed measuring value is 'frozen'. This is to protect the user's ear when moving the microphone from one measuring point to another. Pressing the button once more switches the headphones back on and updates the displayed values.

Data displayed:

There are two values shown in the display. The upper bar represents the currently measured and amplified noise level (instantaneous value).

The lower bar shows the lowest value heard during that measurement period (minimum value). When considering the nature of a leak sound, which is a continuous noise, the display of this value provides a much better result and is much less susceptible to pulses of interference.

The scale graduation of the noise level from 0 to 200 is arbitrarily chosen and has no unit.

4 Commissioning in Leak Location Mode

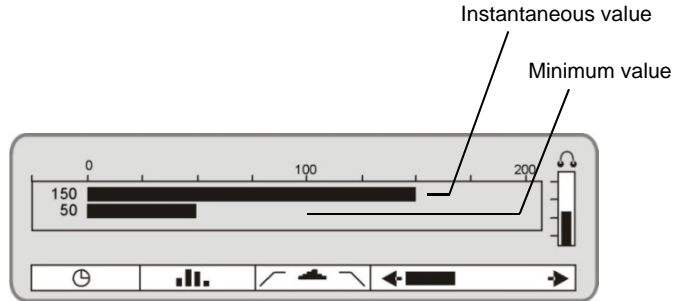


Fig.: Display of measured values in leak location mode

4.6 Adjusting the Frequency Range

The Hydrolux device covers a frequency range of 0 to 4000 Hz. Sometimes it can be useful to limit the frequency spectrum for pure focus on the leak sound.

The device provides the opportunity to specify a lower and an upper cut-off frequency in order to limit the analysis bandwidth. Setting these filters is simple. Just proceed as described in the following sections.

4.6.1 Opening the Filter Settings Menu

Press the button beneath the filter symbol  in the main menu briefly. The filter settings menu opens.

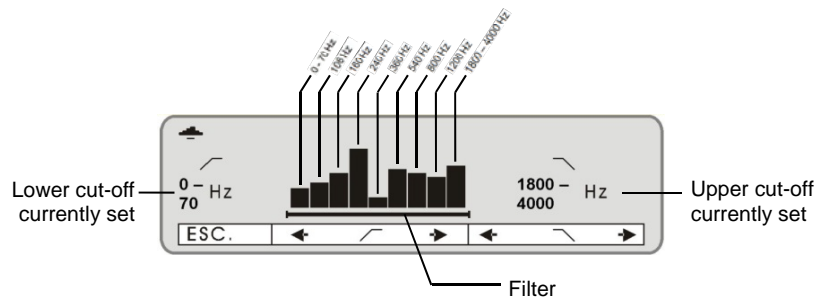


Fig.: Filter settings menu

There are 9 vertical level bars displayed, each of them representing the current noise level of a certain frequency range.


Underneath, there is a horizontal bar, which defines the selected filter range.

The lower and the upper cut-off selected are shown to the left and to the right of the bars numerically.

4.6.2 Adjusting the Cut-Off Frequencies

The following 9 cut-off frequencies can be set:

0 - 70 Hz, 106 Hz, 160 Hz, 240 Hz, 360 Hz, 540 Hz, 800 Hz, 1200 Hz, 1800 - 4000 Hz

In order to adjust the lower cut-off frequency, use the two buttons beneath the  symbol.

- left button - moves the cut-off to the left
- right button - moves the cut-off to the right

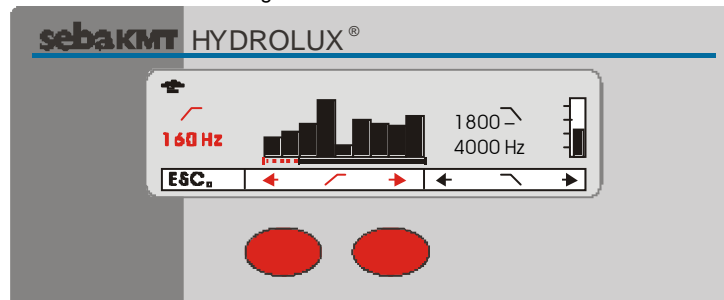



Fig.: Adjusting lower cut-off frequency

4 Commissioning in Leak Location Mode

In order to adjust the upper cut-off frequency, use the two buttons beneath the  symbol.

- left button - moves the cut-off to the left
- right button - moves the cut-off to the right

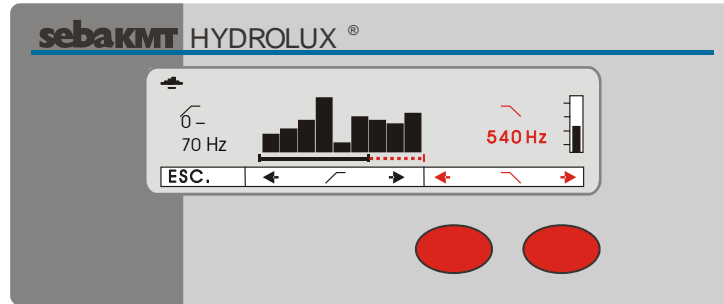


Fig.: Adjusting upper cut-off frequency

After the filter range has been set, you can return to the main menu using the button beneath **ESC.**

4.6.3 Filter Selection in Practice

In general, one can say that, for measurements with ground microphones, lower frequency ranges should be selected. For measurements directly on the pipe or valve using the sensor rod higher frequency ranges should be selected. If a measurement was not successful, then a broadband setting is recommended to ensure that none of the leak sounds is filtered away.



The frequency range to be used always depends on the specific conditions on site. Several factors have to be taken into account: pipe material, pipe diameter, water pressure, leak size, depth of the pipe, etc.

Since a general recommendation cannot be given, the user has to decide for him-self, which frequency range he wants to use.

4.7 Comparing Measured Values (Histogram Function)

With help of the histogram function recorded measurements can be compared to each other at a glance. This can be useful when pre-locating a burst pipe with a contact microphone as well as pinpointing the leak with a windshield bell microphone.

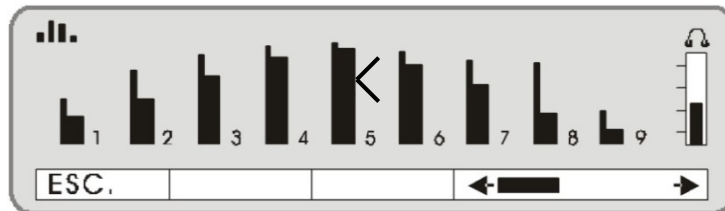


Fig.: Histogram menu in leak location mode

The last 9 values recorded are displayed in form of vertical bars side by side. Each bar consists of two segments - so called 'Dual Segment Analysis' (DSA).

- wide bar - minimum value (lowest value of the measurement so far)
- narrow bar - instantaneous value (currently measured noise level)

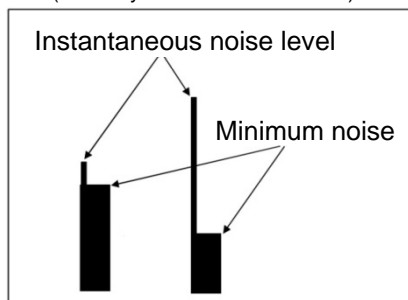






Fig.: Dual segment analysis (DSA) of the histogram function

4 Commissioning in Leak Location Mode

Proceed in the following steps:

Step	Action
1	Press the button below the histogram symbol  briefly in order to open the histogram menu.
2	Perform your first measurement at the first measuring point.
3	Press the Mute button  . Result: The current measurement values - instantaneous and minimum noise level - are stored and displayed. The headphones are deactivated.
4	Go on to the next measurement point, place the microphone and press the Mute button  in order to reactivate the headphones and to start a new measurement.
5	Press the Mute button  to store the current values.
6	Carry out the measurements at the remaining positions by repeating the steps 4 and 5.

If more than 9 measurements are performed, the first stored value will be deleted and all the other values in the display will be shifted one position to the left. Thus, always the last 9 values recorded are visible. A small arrow symbol on the right of a bar indicates the maximum measurement for easy recognition. You finish the histogram function and return to main menu by pressing the button under **ESC** briefly.



It is recommended not to change the gain of the signal (see section 4.4) during histogram measurement. Otherwise the displayed bars would no longer be comparable to each other.

Example: The histogram measurement as shown in the figure on the previous page shows very different instantaneous values. On the other hand the 5th DSA shows a clear maximum for the minimum values. The leaking pipe is thus in the vicinity of the 5th measurement location.

4.8 Performing a Long-Term Measurement

This function allows recording a sound over a programmable period of time. The progress of the measurement is displayed as a graph. Thus, e.g., the identity of a water pipe or a possible leak can be proved (see the example below).

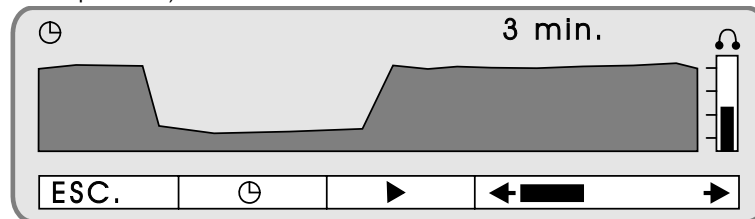





Fig.: Long-term measurement menu

Proceed in the following steps:

Step	Action
1	Press the button beneath the long-term measurement symbol  briefly in order to open the long-term measurement menu.
2	Press the same button again and again until the required recording duration - 3 or 10 or 30 minutes - is shown on the upper right in the display.
3	Press the button beneath the start symbol  in order to start the long term measurement. Result: The noise level recorded is continuously displayed as a graph.

By pressing the button beneath the stop symbol  the measurement can be finished at any time. By pressing the button beneath **ESC** briefly you finish the function and return to main menu.

4 Commissioning in Leak Location Mode



It is recommended not to change the gain of the signal (see section 4.4) during a long-term measurement since this would have an impact on the displayed graph.

Example: The identity of a water pipe or a leak can be proved by recording the flow noise of a valve. To do that, the microphone is put onto the pipe and the long-term measurement is started. Then, you close the valve for a certain time (at least 2 minutes) and then open it again. If the pipe at the listening location is identical to the shut-off pipe, this should be visible on the displayed sound level curve (see the figure above).

4.9 Switching the Device Off

In order to switch the Hydrolux device off, press the **ON/OFF button 1** for approximately 3 seconds. The display goes out.

After 35 minutes in operation, the equipment switches off automatically.

While using the histogram function the device will also switch off automatically after 35 minutes, unless the

Mute button 2 or the **ON/OFF button 1** (turning the backlight on button) are pressed.

The microphone and the headphones are not to be removed before the Hydrolux device is switched off.



Please note that any measurements stored will be lost after switch off.


Line Location Mode

The Hydrolux device can be used for acoustic pipe location or line tracing purposes. Recorded impulse noise - such as the tapping of the pipe knocker RSP-3 or the PWG 2000 (thumper) from SebaKMT - is reproduced by the headphones and also displayed on the screen.

For this purpose the device is operated in a special 'Line Location Mode'. The horizontal level bars respond particularly sensitive to impulses, the instantaneous level bar is delayed more and the filters are set to very lower frequencies. If required, the filter frequencies can be altered as usual (see section 4.6).

The histogram function as well as the long-term measurement function are also available in line location mode and can be used as described in sections 4.7 and 4.8.

Proceed as follows to perform a line location:

Press the button beneath the line location mode symbol  in the initial screen right after switch on for approximately 3 seconds, even before the main menu appears

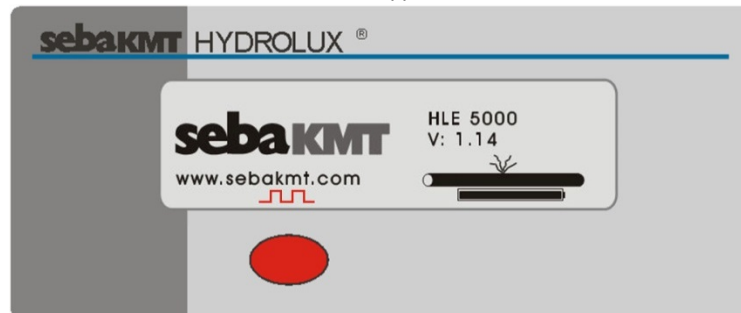


Fig.: Starting the device in line location mode

Then the main menu of line location mode opens instead of the leak location main menu.

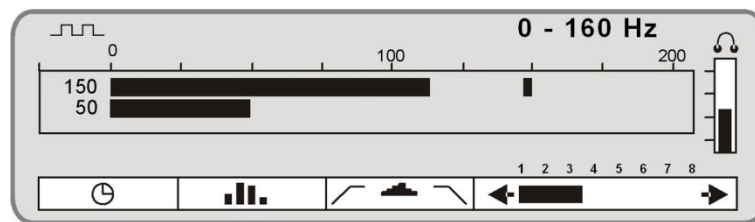



Fig.: Main menu of line location mode

The procedure of locating a line actually doesn't differ from leak location using a ground microphone: Record various measurement points measuring the noise level of the pulses emitted by the knocking device or thumper. Use the **Mute button**  between the single measurements in order to protect your ear. After sweeping an area in a "Z" shape the pipe supposed to be below the highest measured peak.

The Hydrolux device stays in line location mode until it is switched off. After being turned on again, it will be in leak location mode.

Commissioning of HL5000-H2 in Gas Mode only

The HL 5000 in 'H₂' (<5%) version can be used for leak location by means of tracer gas. For this purpose, a gas sensor (see section 3.7) is connected to the device instead of a microphone. If the gas sensor is connected, the Hydrolux device automatically works in gas mode. The gas concentration recorded is displayed in the form of a bar as well as numerically. At the same time it is reproduced through the headphones in the form of a "Geiger counter" sound.



The measured gas concentration can have a value between 0 and 10000. It is a relative value which does not correspond to an actual unit like ppm.

6.1 Connecting Accessory Parts and Switching the Device On

It's important to connect the gas sensor and the headphones to the Hydrolux device before it is switched on. Connect the gas sensor via the 5-pole socket to the right hand side of the device. Make sure that the guide on the plug fits in the groove in the socket.

Connect the headphones via the 3.5 mm headphone socket on the left hand side of the device. Make sure you feel the plugs latch in.

Switch the device on by pressing the **ON/OFF button 1** briefly. First the initial screen and then the main menu of the gas mode appears in the display.

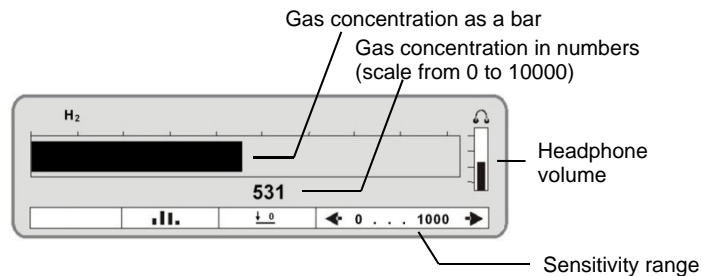


Fig.: Main menu of gas mode

6.2 Adjusting the Volume

The headphone volume can be set using the two buttons to the right of the display.

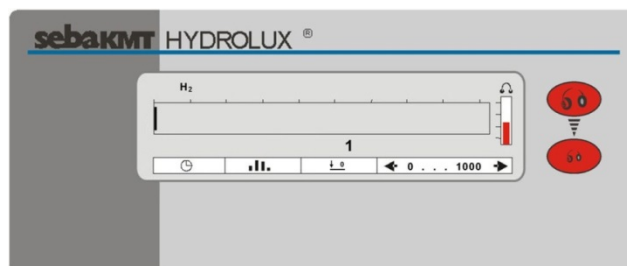


Fig.: Headphone volume adjustment

The current volume level is reported by the level bar on the right in the display. At the beginning of a measurement a medium volume (3 scale units) is recommended.

6.3 Adjusting the Sensitivity

The sensitivity of the device can be set using the two buttons to the right below the display.

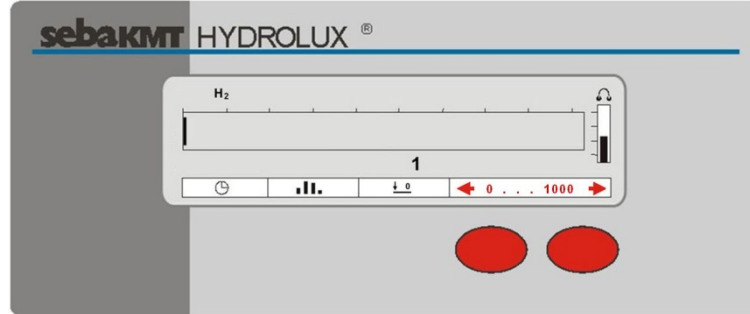


Fig.: Sensitivity range adjustment

One of the following ranges can be selected:

- | | | | |
|------------|------------|-------------|-----------|
| 0 ... 20 | 0 ... 50 | 0 ... 100 | 0 ... 500 |
| 0 ... 1000 | 0 ... 5000 | 0 ... 10000 | |

The active range is reported at the bottom right of the display.


At the beginning of a measurement a medium setting is recommended. Changing the sensitivity has an impact on the displayed bar and also on the headphone volume.


6.4 Performing a Zero Balance

The zero balance function can be used to adjust the device to the naturally occurring hydrogen level in the air on site. Then, during the measurement this natural value is deducted from each measured hydrogen level. Thus, always an adjusted result is displayed.

The zero balance function can be switched on and off.

In order to use the zero balance function, perform the following steps on site prior to the measurement:


Step	Action
1	Hold the gas sensor rod up in the air, far from the ground.
2	Wait until the displayed concentration is at its lowest.
3	Press the button beneath the zero balance symbol  briefly. Result: The ambient hydrogen concentration now is determined and will from now on be filtered out of the measuring results. This applies until the zero balance function is switched off.

To switch the zero balance function off, press the button beneath the symbol  once again.

6.5 Performing a Measurement

Proceed in the following steps:

Step	Action
1	Put the gas sensor on a measuring point on the ground
2	Read measured value from the display or listen to the sound on the headphones: <ul style="list-style-type: none"> • deep sound and long interval - low gas concentration • high sound and short interval - high gas concentration Always wait until the displayed value is balanced and remains constant.
3	Move on with other measurements in order to compare the single gas concentrations.

On your way from one measuring point to another you can mute the sound on the headphones in order to protect your ear by pressing the **Mute button**  briefly.

The leaking opening is supposed to be at the peak-value measuring point.

6.6 Comparing Measured Values in Gas Mode (Histogram Function)

As in leak location mode, the histogram function is available in gas mode, too.

As described in section 4.7, by the help of the histogram function the last 9 recorded measurements can be displayed in form of vertical bars side by side. Thus, they can easily be compared to each other.

Proceed in the following steps:





Step	Action
1	Press the button beneath the histogram symbol  briefly in order to open the histogram menu.
2	Go to the first measuring point and place the sensor. Wait for the displayed value to level out and press the Mute button  in order to store the value.
3	Go to the next point and press the Mute button  to start a new measurement. Wait for the displayed value to level out then press the Mute button  again to store the value.
4	Go on with the remaining measure points one after the other in order to measure each gas concentration and to store the values as described.



Fig.: Histogram menu in gas mode

The last 9 values recorded are displayed in form of vertical bars side by side. Each bar consists of two segments - so called 'Dual Segment Analysis' (DSA).

- wide segment - maximum value of the measurement
- narrow segment - instantaneous value

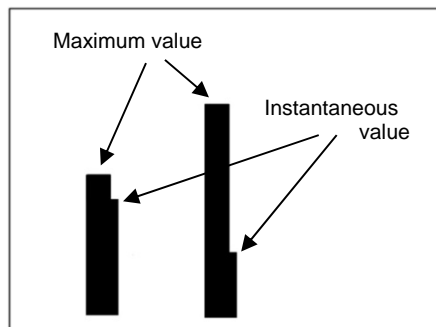


Fig.: Dual segment analysis (DSA) of the histogram function in gas mode

The highest bar indicates the measuring point with the highest gas concentration.

A maximum of 9 measured values can be displayed side by side. With any further measurement, the oldest value is deleted.

By pressing the button beneath **ESC** briefly you finish the function and return to main menu.





It is recommended not to change the sensitivity of the device (see section 6.3) during histogram measurement. Otherwise, the displayed bars would no longer be comparable to each other.

6.7 Performing a Long-Term Measurement in Gas Mode

As in leak location mode, the long-term measurement function is available in gas mode, too.

By the help of this function the concentration of tracer gas in the air at one measuring point can be monitored over a longer period of time. The progress of the measurement is displayed as a graph. Thus, one can find out if the measured value is stable and reliable or if it is not.

Proceed in the following steps:

Step	Action
1	Carry out all the measurements at the various measuring points as described in section 6.5.
2	Go back to the measuring point that shows a peak value (suspected leak position).
3	Place the sensor and press the button beneath the long-term measurement symbol  briefly in order to open the long-term measurement menu.
4	Press the same button again and again until the required recording duration - 3 or 10 or 30 minutes - is shown on the upper right in the display.
5	Press the button beneath the start symbol  in order to start the long term measurement. Result: The recorded gas concentration is continuously displayed as a graph. If this graph remains stable and doesn't fall significantly during the long-term measurement, the measuring value is considered reliable.

By pressing the button beneath the stop symbol  the measurement can be finished at any time.

By pressing the button beneath **ESC** briefly you finish the function and return to main menu.



In order to check whether the gas sensor is still functional and did not 'hang up' during the long-term measurement, you can take the sensor away from the measuring point, hold it up in the air for some seconds and then put it back on the ground. If the displayed graph falls and then rises again, the sensor is functional and the measurement can be considered reliable.

Trouble-Shooting

Can't switch the device on

Presumably the headphones are not plugged in or headphones are used which do not belong to the system.



Low battery is shown in the initial screen and the device switches itself off shortly after the start

One or more batteries are incorrectly fitted. Open the base flap and check the polarity of the batteries (see section 3.3).

If the polarity of all of the batteries is OK, the state of every single battery must be checked.

No sound can be heard

There are two possibilities:

- a. Headphones are not fitted or fitted incorrectly.
- b. The **Mute button**  is active, which means that the headphones are switched off. Press the **Mute button**  again to restore the sound.

Scratching sounds in the headphones

This is usually caused by a poor contact. Check all contacts.

Gas mode: high deflection doesn't go down

Possibly an amount of gas is situated under the rubber bell that cannot escape. Put the sensor away from the measuring point, turn it around and hold it into the air in order to allow the gas to escape.

Gas mode: full deflection doesn't go down lastingly

The gas sensor is saturated and cannot be used for a period of time (approx. 1 hour depending on the degree of saturation).

Gas mode: no deflection (display constantly shows '0')

There are two possibilities:

- a. Perhaps the gas sensor came into contact with water. In this case the sensor is most likely damaged and should be replaced.
- b. Maybe the end of the sensor's operating life (between 2 and 5 years) is reached. It has to be replaced.

