User Manual

Noise Level and Frequency Logger

Sebalog N3

Mess- und Ortungstechnik
Measuring and Locating Technologies

Elektrizitätsnetze
Power Networks

Kommunikationsnetze
Communication Networks

Rohrleitungsnetze
Water Networks

Abwassernetze
Sewer Systems

Leitungsortung
Line Locating

1 (08/2011) - ENG

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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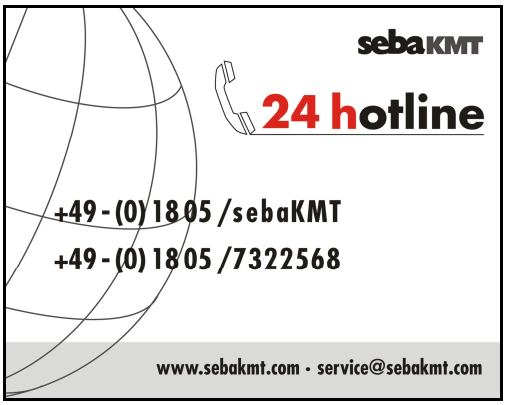


Terms of Warranty

SebaKMT accept responsibility for a claim under warranty brought forward by a customer for a product sold by SebaKMT under the terms stated below.

SebaKMT warrant that at the time of delivery SebaKMT products are free from manufacturing or material defects which might considerably reduce their value or usability. This warranty does not apply to faults in the software supplied. During the period of warranty, SebaKMT agree to repair faulty parts or replace them with new parts or parts as new (with the same usability and life as new parts) according to their choice.

SebaKMT reject all further claims under warranty, in particular those from consequential damage. Each component and product replaced in accordance with this warranty becomes the property of SebaKMT.

All warranty claims versus SebaKMT are hereby limited to a period of 12 months from the date of delivery. Each component supplied by SebaKMT within the context of warranty will also be covered by this warranty for the remaining period of time but for 90 days at least.

Each measure to remedy a claim under warranty shall exclusively be carried out by SebaKMT or an authorized service station.

To register a claim under the provisions of this warranty, the customer has to complain about the defect, in case of an immediately detectable fault within 10 days from the date of delivery.

This warranty does not apply to any fault or damage caused by exposing a product to conditions not in accordance with this specification, by storing, transporting, or using it improperly, or having it serviced or installed by a workshop not authorized by SebaKMT. All responsibility is disclaimed for damage due to wear, will of God, or connection to foreign components.

For damage resulting from a violation of their duty to repair or re-supply items, SebaKMT can be made liable only in case of severe negligence or intention. Any liability for slight negligence is disclaimed.

Contents

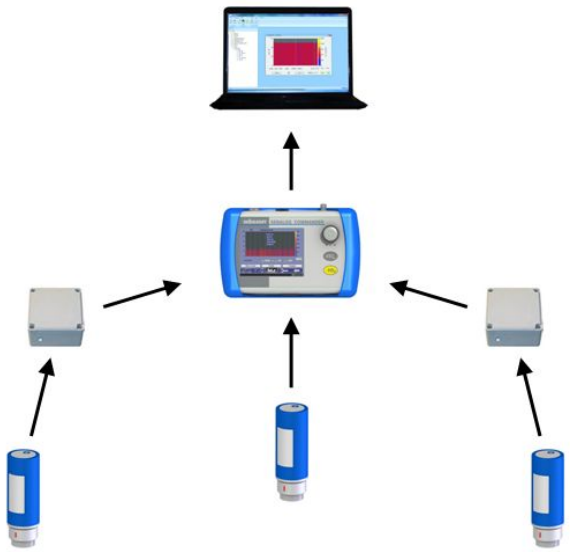
1 Technical description

Function Sebalog N-3 is a system for acoustically monitoring pipe systems. It has Log N-3 noise level loggers and the Commander-3 as its basis. The Commander is used for programming the loggers as well as reading out and analysing the recorded measurements.

To monitor a zone, you can attach as many noise level loggers along the pipe as you wish. They then perform regular noise measurements within a certain time window. The user can set the exact measurement time window and other parameters before measuring begins. The level and frequency of the individual measurements are saved in the logger. Even the quietest noise is saved as an audio recording.

After measuring, you can collect the loggers, call up the readings and check for leak noises, and then put them back in a new zone, for example. This allows all the zones in a pipe system to be checked in succession for leaks.

However, the loggers can also be left in the same zone to monitor it permanently. The measurements from the individual loggers are then read out on site. Just approaching the installed loggers with the Commander or another reader will suffice. Wireless data transfer takes place automatically. Ideally, all you have to do is drive by where the loggers are being used.



Features The Sebalog N-3 system has the following features:

- Loggers can be used temporarily, permanently or in the network
- Wireless communication between all components
- Audio data recorded directly in the logger
- “Commander-3” with colour display, USB port, large memory capacity, and much more.
- Complete group/logger management without a PC
- History function
- Extended wireless range using repeater
- Logger available as TNC version with external antenna

Components The Sebalog N-3 system consists of the following components:

Component	**Use**
Log N-3 noise loggers	measures regularly the volume level and frequency of the noise in the pipe during the programmed measuring window.
Commander-3	is the portable device for programming the loggers before measuring, and for reading out and analysing the recorded data after measuring.
Repeaters-3	forward the radio signals from the loggers and therefore extend the wireless link between the loggers and Commander.
GSM box-3	is used as the interface between the logger network and control centre during wireless remote data transmission.
SebaDataView-3 software	is the application software for programming the loggers before measuring, and for reading out and analysing the recorded data with a PC or laptop.
Reader-3	is a convenient device for reading out the measurements taken by the Sebalog series of loggers.
Log RI	is used as the wireless interface to the loggers or repeaters when connected to a PC/laptop.

1.1 Technical data

Logger The noise level loggers in the Sebalog N-3 system are specified by the following technical parameters:

Parameter	Value
Wireless interface (bidirectional) • Frequency • Transmitting power • Range	 868 MHz (915 MHz optional) 10 mW Approx. 80 m (depends on the surroundings)
Memory capacity	Max. 100 measuring days
Audio recording	Possible
Power supply	Lithium battery
Battery life	Max. 5 years (depending on use)
Operating temperature	-20 to 60°C (-4°F to 140°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (W x H)	115 x 45 mm
Weight	400 g
Degree of protection	IP68

Commander-3 The Sebalog N-3 Commander is specified by the following technical parameters:

Parameter	Value
Display	6'' VGA colour display, 640 x 480 pixels
Wireless interface (bidirectional) • Frequency • Transmitting power • Range	 868 MHz (915 MHz optional) 10 mW Approx. 100 m (depends on the surroundings)
USB port	USB 2.0 for connecting to a PC
Memory capacity	2 GB (corresponding to approx. 1,000 groups, each with 1,000 loggers, including audio data, etc.)
Power supply	Li-ion rechargeable battery (7.4 V / 12.25 Ah); connection to 110-240 V supply using charger (input: 50-60 Hz, 700 mA)
Operating time	Approx. 20 hours
Operating temperature	-20 to 60°C (-4°F to 140°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	250 x 190 x 100 mm
Weight	2,100 g
Degree of protection	IP65

Reader-3 The Reader-3 reading device in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	Value
Display	LCD display (b/w), 128 x 32 pixels
Wireless interface (bidirectional) • Frequency • Transmitting power • Range	 868 MHz (915 MHz optional) 10 mW Max. 100 m (depends greatly on the surroundings)
USB port	USB 2.0 for connecting to a PC via docking station
Memory capacity	1 GB (SD memory card)
Power supply	Li-ion rechargeable battery (7.2 V / 12 Ah)
Operating time	10 hours
Operating temperature	-20 to 60 °C (-4 °F to 140 °F)
Storage temperature	-25 to 70 °C (-13 °F to 158 °F)
Dimensions (L x W x H)	200 x 100 x 60 mm
Weight	450 g
Degree of protection	IP22

Repeater-3 The repeaters in the Sebalog N-3 system are specified by the following technical parameters:

Parameter	Value
Display	Status LED
Wireless interface (bidirectional) • Frequency • Transmitting power • Range	 868 MHz (915 MHz optional) 10 mW Max. 400 m (depends on the surroundings)
Power supply	Lithium battery (replaceable)
Battery life	Max. 5 years (depending on use)
Operating temperature	-20 to 70 °C (-4 °F to 158 °F)
Storage temperature	-25 to 70 °C (-13 °F to 158 °F)
Dimensions (L x W x H)	80 x 80 x 55 mm
Weight	250 g
Degree of protection	IP67

GSM box-3 The GSM box in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	**Value**
Wireless interface (bidirectional) • Frequency • Transmitting power • Range	 868 MHz (915 MHz optional) 10 mW Max. 400 m (depends on the surroundings)
Memory capacity	2 GB (corresponds to the data from approx. 50 loggers)
Power supply	Lithium battery (replaceable)
Battery life	Up to 4 years
Operating temperature	-20 to 70°C (-4°F to 158°F)
Storage temperature	-25 to 70°C (-13°F to 158°F)
Dimensions (L x W x H)	170 x 140 x 100 mm
Weight	1,000 g
Degree of protection	IP67

Log RI The Log RI wireless interface in the Sebalog N-3 system is specified by the following technical parameters:

Parameter	**Value**
Display	Status LED
Wireless interface (bidirectional) • Frequency • Transmitted power • Range	 868 MHz (915 MHz optional) 10 mW Max. 10 m (depending on surroundings)
USB port	USB 2.0 for connecting to a PC
Power supply	Via USB
Operating temperature	0 to 40°C (32°F to 104°F)
Storage temperature	0 to 40°C (32°F to 104°F)
Dimensions (L x W x H)	83 x 17 x 47 mm
Weight	50 g
Degree of protection	IP22

1.2 Scope of delivery and accessories

The Sebalog N-3 system is delivered with the following as standard:

Logger set A logger set consists of the following components:

Designation	Description	Item No.:
LOG N-3	Noise level logger (number depending on set size)	820019682
LOG TB-240	Transport box	118303892
MWA LOG N-3	Magnetic angle adaptor	118303355
	Thread cap M6	118304578

Commander set A Commander is delivered with the following components:

Designation	Description	Item No.:
LOG CDR-3	Commander-3	820024391
LOG CDR-3-T	Carrier bag for Commander-3	820025752
LK 14	Vehicle charger cable (3.5 m long)	81003758
	Antenna 868 MHz with magnet (MAG3-900 TNC)	122010060
LG SEBALOG	Charger for Commander-3	810919
VK 77	Connection cable (USB output)	820012451
KR 22-5	Stereo headphone	810002087

User software The SebaDataView-3 software for PC/laptop is part of the scope of delivery:

Designation	Description	Item No.:
CSW DATAVIEW-3	*SebaDataView-3* user software	118302210

1.3 Optional accessories

The following optional accessories are available:

Designation	Description	Item No.:
	GPS module	

2 Important and common terms

User mode The Commander-3 can be operated in two different user modes (see page 23):

- Easy mode
- Professional mode

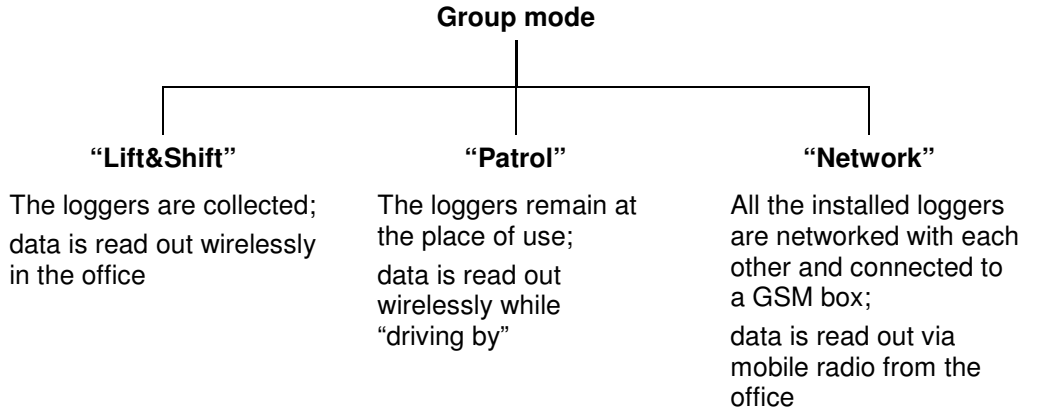
You can switch between these modes in system settings menu (see page 25).

Level and frequency These two values are identified each time a noise logger performs a measurement:

- "Level" … is the noise level (volume) of a measurement
- "Frequency" … is the frequency in the measurement's frequency spectrum with the greatest deflection

ESA value ESA stands for "Extended Spectral Analysis" and means that noise level and frequency are combined in one reading using a mathematical formula. This results in an extended view of the measured data, which makes the leak probability and position visible in relation to other loggers. The dimensionless ESA value can be between 0 and 100. The higher the ESA value, the higher the leak probability and the shorter the distance from the logger to the leak.

Group mode In order to analyse the recorded measurements, the noise loggers must be read after measuring, i.e. the data in the loggers is accessed wirelessly with a reading device (Commander/Reader/PC). It is possible to do this in the following ways:



The method must be chosen for reading out the measured data before the measuring work is performed. Before measuring, the mode decided on is permanently assigned to the loggers or logger groups. After that, only loggers that have been configured for reading using "Patrol" can be read with "Patrol", for example, and not with "Lift&Shift" or "Network". The same applies to the other group modes.

Workgroup The Commander can only ever interact with a single registered logger group. This group is called the “workgroup”. It is not possible to program or read loggers from another group.

Measuring window The “measuring window” is the time during which a logger is programmed to carry out measurements, e.g. from 2 a.m. until 4 a.m. in the morning.
A measuring window could also be referred to as a “measuring day”.

Measuring period A measuring period refers to the time span that passes between programming and reading a logger. A measuring period can therefore last 1 to 100 measuring days.

Leak threshold There is a certain basic noise level in each pipe system. This basic noise level is referred to as the “leak threshold”. This level may be known or estimated based on experience. If the lowest measured noise level in a section of pipe is above the leak threshold, there is presumed to be a leak.

Leak status If the level of the quietest noise in a measuring window is above the previously found leak threshold (see above), the logger goes into “leak status”. This means, for example, that when this logger is read, a warning appears on the reader indicating that there is an increased probability of a leak close to the logger.

Leak value The term “leak value” combines the three measurement results – level, frequency and ESA value – determined for the quietest noise in a measuring period.

Configuration mode If a noise logger has been switched off (i.e. it has stood “on its head” for at least 3 minutes), it is in “configuration mode” after it is switched back on. This means:

- The previous programming has been deleted. The logger is now unprogrammed.
- Switching off has not deleted the previously saved measurement results. They are still in the logger’s memory and can be accessed by a reading device, but only by single interrogation (see page 54).
- The logger is ready for wireless operation and waiting to be contacted by the Commander or PC.

The logger remains in configuration mode until it is reprogrammed.

Identification number Each device in the Sebalog N-3 series has a unique serial number (SN). You will find it on the type plate of the device.

All loggers, repeaters and GSM boxes also have an identification number (ID) which can be used by the Commander or the SebaDataView software to manage them. You will also find the ID on the type plate, or on a separate plate on the device. The identification number is identical to the last six digits of the serial number.

When inputting an ID, the preceding zero digits can be omitted.
Thus, if the ID is “000815”, you need only enter “815”.

3 The loggers

3.1 Function

The noise loggers are installed along a section of pipe directly on the pipe, or directly on fittings on the pipe.

Within the configured measuring window, they perform regular noise measurements, each 3 seconds in length. The volume level and frequency of each measurement are saved in the logger. While the noise level alone only records the general existence of a leak, together with the frequency it also provides information on the approximate distance in relation to other loggers.

The measurement results gathered by the logger can be queried later using a reading device (Commander/Reader/PC).

The quietest noise of the last measuring window is saved as an audio file. After reading out the data, you can actually listen to the assumed leak noise and immediately decide if it is a leak noise or background noise.

The “Real time measurement” function can be used to observe a logger “live” as it measures (see page 58).

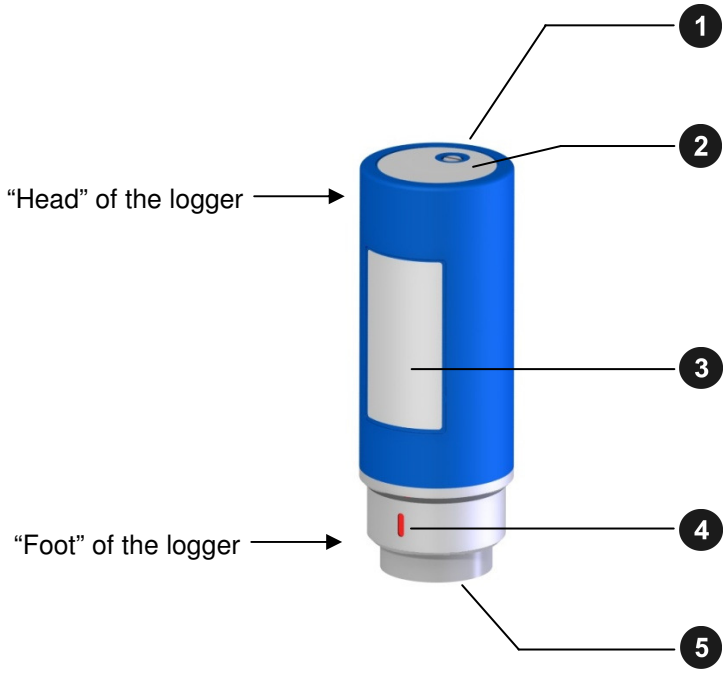
With the “Direct recording” function can be used to listen to a noise in a pipe (see page 63).

Communication with the loggers is performed with short range radio only.

3.2 Design

Introduction All noise loggers have a highly sensitive microphone with a large dynamic range, a data memory and a lithium battery inside. The standard loggers also have an internal radio antenna.

Standard version The loggers have the following external characteristics:



Element	Description
1	**Hole (M5 thread)** For fitting the supplied ring, which can be used for carrying the logger and pulling it out of the shaft.
2	**Label with identification number (ID)** Each logger has its own six-digit identification number.
3	**Type plate** The last six digits of the serial number (SN) on the type plate of the device are identical to the ID.
4	**Marking** Must always face upwards when the logger is fitted horizontally.
5	**Magnetic foot** Can be unscrewed and replaced by an adapter, or similar, from the assembly accessories.

TNC version The special TNC version of loggers have no internal antenna. Instead of the hole for the assembly ring 1 they have an antenna socket for connecting an external antenna.

3.3 Switching on and off

The noise loggers have an internal tilt switch and are switched on and off simply by turning them over.

Loggers standing on their foot are **switched on**.

Loggers standing on their head for longer than 3 minutes are **switched off**.

Each time a logger is switched on, its configuration data is reset to the default values. The time internally is also lost. Therefore, whenever the logger is switched back on, it must be reprogrammed (see page 50).

3.4 Memory

A logger's internal memory allows a maximum of 100 pairs of values (the level and frequency of a measurement) to be recorded.

Furthermore, the quietest recording of the last measuring window is saved as an audio file (3 seconds in length).

Circular buffering is used, with the oldest stored measuring window being deleted after 100 measurements.

3.5 Power supply

Each logger has an internal lithium battery.

The actual battery lifetime depends on the intensity of use.

If a logger is always operated using the default configuration data, factory-set in the Commander, a battery lifetime of up to 5 years is possible.

Longer measuring periods and increased wireless activity/availability shorten the life of the logger battery. Severe fluctuations in climatic conditions also have a negative impact.

Flat batteries cannot be recharged. They must be replaced.

SebaKMT or an authorised service partner must change the batteries.
Otherwise, water- and dirt-resistance of the logger cannot be guaranteed.

4 The Commander

4.1 Function

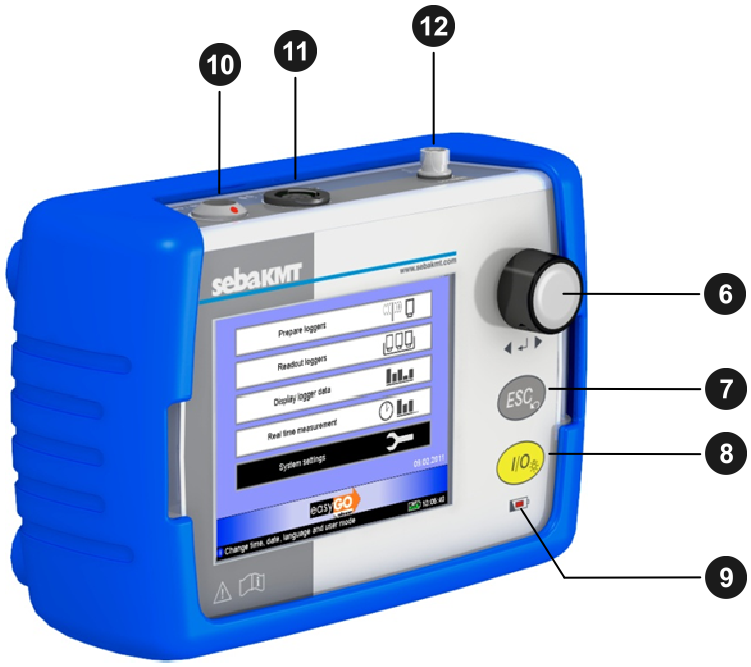
The Sebalog Commander 3 is the mobile programming and reading device for noise loggers in the Sebalog N-3 series. The Commander is used to program the noise loggers before measuring. After measuring, the recorded data in the loggers can be queried with the Commander. Both current and older data can be displayed on the device's screen and analysed in greater detail. Furthermore, a real time measurement can be performed (see page 58).

After connecting the supplied headphones, you can play back audio files of leak noises. It is also possible to listen to the current noise in a pipe (see page 63).

4.2 Device design

Controls and connections

The Commander has the following controls and connections:



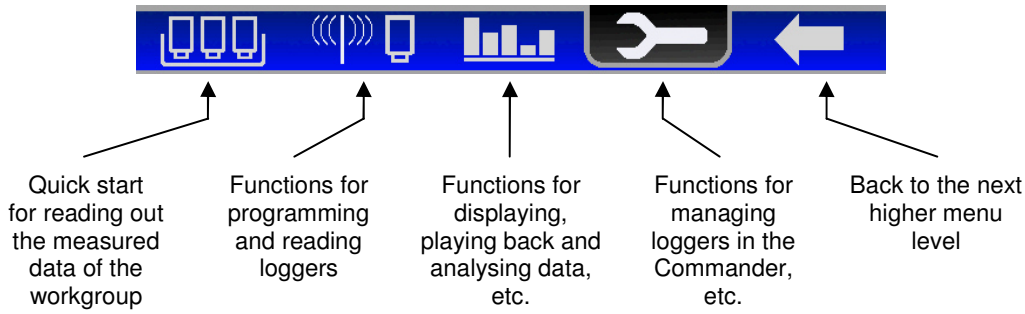
Element	Description
6	**Selector knob**
7	**ESC button**
8	**I/O button** • Device on/off • Backlight on/off
9	**Charging indicator light** • Lights up red … external supply, battery is being charged
10	**Socket for USB link to PC and for connecting an optional GPS module (combined)**
11	**Headphone and charging socket (combined)**
12	**Antenna socket**

4.3 Design of the user interface

All the menu levels on the Commander's user interface consist of a large display area and an infobar on the bottom edge of the screen. The content and structure of the display area change depending on the system status.

Main menu In Easy Mode, the main menu can be selected in the display area of the start screen.

In Professional Mode, the "Main menu bar" is between the display area and infobar. You can access the individual functions of the device using the symbols shown.



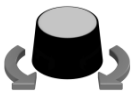
Infobar The infobar structure remains the same in each menu and continuously provides the user with the following information (from left to right):

- A help text gives short explanations on the selected element or on how to proceed further.
- A coloured symbol indicates the group mode (see page 13) of the workgroup
  L … "Lift&Shift"
  P … "Patrol"
  N … "Network"
- The battery symbol indicates the charge level of the battery.
- The Commander's internal time.

4.4 Basics of operation

Navigation within the menus

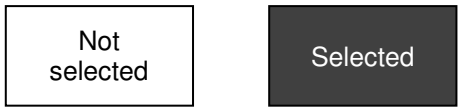
The Commander is very simple to operate and intuitive in principle. Navigation within the menus is done exclusively with the aid of the selector knob as follows:



Turning = select

Pressing = open/confirm (ENTER function)

The selected element appears on a black background:



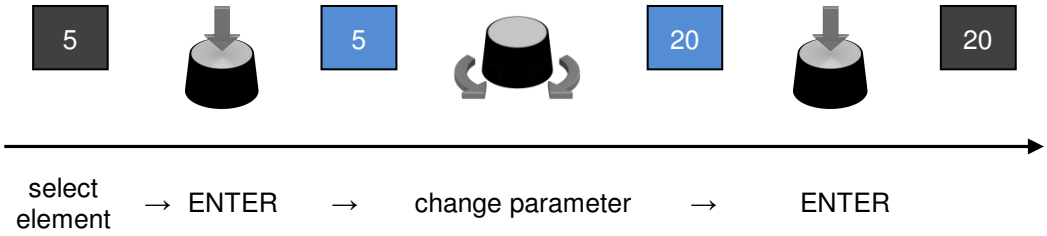
Exiting the menu

In Easy Mode, use the **ESC button** ❼ to exit each menu. This immediately returns you to the start screen. Any functions started are cancelled.

In Professional Mode, you can use the  symbol at any time to return to the previous menu level. Pressing the **ESC button** ❼ once makes the hidden main menu bar reappear. Pressing it a second time takes you back directly to the start screen.

Adjustable parameters

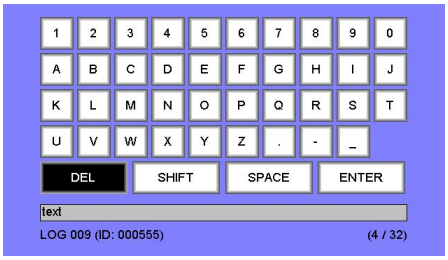
With the aid of the selector knob, not only can individual menu items be accessed but also settings can be changed and parameters adapted. Please proceed as follows:



In some cases, the parameter can be changed directly in the input field. In others, a pull-down list opens where you can select a new setting.

If in doubt, you can always cancel a procedure with the **ESC button**.

Virtual keyboard To input comments or similar, a virtual keyboard appears on the screen, which is also operated with the selector knob.



DEL … deletes last character

SHIFT … switches between upper- and lower-case

SPACE … inserts space

ENTER … confirms and completes input

Sorting loggers Various menus list the individual loggers of a logger group. This appears in a table-like form. You are able to re-sort these loggers by the criteria “Comment”, “Time of data read-out” or “ESA value”. This can be useful for identifying certain loggers straightaway, e.g. all loggers where a leak is suspected, etc.

To change the sort, apply the **Sort** button repeatedly. A small triangular symbol in the header of a column indicates which criterion is selected and whether the loggers are arranged in descending ▼ or ascending ▲ order.

Examples of possible settings:

“ESA ▼” … sorting by ESA value (descending),
i.e. the loggers with a suspected leak are at the top of the list

“Date/time ▼” … sorting by time of the data read-out (descending),
i.e. the loggers most recently read are at the top of the list

“Date/time ▲” … sorting by time of the data read-out (ascending),
i.e. the loggers not yet read are at the top of the list

Entering an identification number Various functions require the identification numbers (IDs) of loggers, repeaters or GSM boxes to be given. When inputting an ID, all the preceding zero digits can be omitted. Thus, if the ID is “000815”, you need only enter “815”.

4.5 User mode

Introduction The Commander-3 can be operated in two different user modes.

Easy mode	Professional mode
In Easy mode all the main functions of the device are available. They can perform most day-to-day work quickly and simply - from programming a logger group to analysing measured data on the Commander. The individual applications are structured very clearly; the user is partly guided step-by-step from one action to the next. Easy mode is therefore not just suited to first-time users but also experienced operators who prefer to use its simpler menu structure.	In Professional mode all the functions of the device are available to the user. This allows the system to be better adapted to the user's requirements and conditions on site. Difficult measurements can be prepared more exactly and the results evaluated and documented in more different ways, etc. Some applications can only be used in Professional mode, such as using Repeaters or building a logger network.

How to identify the user mode? If the Commander is in Easy mode, the following symbol is permanently displayed above the infobar:

If the EasyGo symbol isn't shown on the screen, the Commander is in Professional mode.

How to change the user mode? The user mode can be switched in the system settings (see page 26).

4.6 Making a connection

4.6.1 Connection between the Commander and logger

Short range radio is used for communication between the Commander and loggers.

The Commander has an integrated radio module. After the antenna is connected (standard or vehicle antenna), the device is ready for wireless operation.

The loggers must be switched on and wirelessly available (see page 52). The radio range of a logger is affected by the conditions where it is used. To extend the range a repeater can be used (see page 64).

4.6.2 Connection between the Commander and PC

Purpose The connection between the Commander and a PC/laptop is made using the VK 77 connection cable supplied and is needed for the following tasks:

- Transferring measured data from the Commander to the PC.
- Transferring configuration data from the SebaDataView-3 software to the Commander.
- Installing a firmware update on the Commander.

Making a connection The Commander must be operated in Professional mode to connect it to the PC. Proceed as follows:

Step	Description
1	Select the  button in the main menu bar.
2	In the next menu, select the **Connect to PC** button.
3	Use the USB socket ⑩ on the Commander for connecting the cable to the PC. Markings on the plug and socket ensure that the plug is lined up correctly. You must feel the plug engage.
4	Select the **Connect** button on the Commander.
	Result: The connection is made. The Commander is automatically detected by the PC as a mass storage device. As soon as the **Connected** message on the Commander's screen appears, data can be transferred between the Commander and PC.

If no connection is made, check the cable connection again. If necessary, disconnect the Commander from the PC, restart it again, or perform a reset, and follow steps 1 to 4 once again.

Disconnection To end the connection, select the **Disconnect** button on the Commander.

As soon as the **Disconnected** message on the Commander's screen appears, the connection cable can be removed.

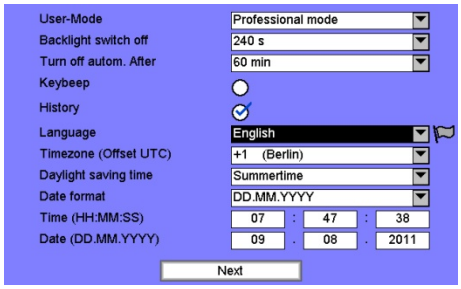
4.7 Switching on the display lighting

The Commander's screen has a backlight. It is activated by using the selector knob or briefly pressing the **I/O button** 8. The lighting then remains on for a certain time period. The length of this period (a maximum of 4 minutes) can be adjusted in the system settings (see page 26).

4.8 System settings

You can use the **System settings** menu to customise various device settings to the needs of the user.

Beginning at the start screen, follow the  symbols. The **System settings** menu opens:



When the Commander is in Professional mode, more settings can be changed than in Easy mode. Use the **Next** button to go to the second page of the menu.

4.8.1 Basic settings

The following basic settings can be made in both Professional mode and Easy mode:

Line	Description
User mode	Select a user mode for the device (see page 26).
Language	Select a language for the user interface. If you cannot read the preset language, you can go to the language selection - starting from the main menu - via the following symbols: 
Time and date settings	In the **Timezone** line, select the timezone for where you are. In the **Daylight saving time** line select whether it is currently winter or summer time. In the **Date format** line, select the date format to be used by the Commander. DD … Day MM … Month YYYY … Year In the **Time** line, enter the current time for the Commander (hour:minutes:seconds). In the **Date** line, enter the current date for the Commander (day:month:year).
Backlight switch off	Select a period of time for the backlight until it is switched off automatically (**never** = continuous backlight).
Turn off autom. after	Select a period of time for the auto-off function. If no entry is made for longer the specified time, the Commander switches off automatically (**never** = automatic switch off deactivated).
Keybeep	Activate/deactivate the key tone that sounds when the selector knob is pressed.
History	Activate/deactivate the “History” function. If the “History” function is activated, the measured data from loggers remains stored in the Commander after they are read out. They can then be called up at any time and displayed again. If the function is deactivated, the previous data set is overwritten when new data is read. Deactivating the function can be useful because this saves memory space and the Commander can work faster in certain situations.

4.8.2 Extended settings in Professional mode

The following extended settings are only available in Professional mode:

Line	Description
Logger list visibility	Select table columns to be shown/hidden. Various menu levels list the loggers of a group in a table on the screen. The columns contain information about the loggers, such as the logger ID and logger comment. To make the table clearer, you can specify which columns are actually shown.
Logger found beep	Switch the acoustic signal on/off that occurs when a logger is found. An acoustic signal sounds each time the Commander detects a logger when reading out data. A corresponding message is shown briefly on the screen. When “patrolling”, this can happen several times in succession because the loggers send data packets to the Commander at regular intervals. You can specify how often there is a signal or a message: • **always** … acoustic signal each time the Commander detects a logger • **only once if logger found** … acoustic signal only when a logger is detected the first time • **never** … no acoustic signal • **beep and display only once** … acoustic signal and message on the screen only when a logger is detected the first time
Additional hints	Decide if additional information shall be shown or not. At various positions in the menu, special displays appear on the screen, providing additional information about the current functions. These displays can be deactivated.
Sorting order	Select the standard sorting order for loggers in tables. Various menu levels list the loggers of a group in a table on the screen. The criterion by which the loggers are sorted within the table as standard can be specified..
Factory settings	Restore factory settings. The settings on the Commander can be reset to the factory settings, to the state when the Commander was delivered.

4.8.3 System info

When the Commander is operated in Professional mode, the **System settings** menu has the following information on the device and the firmware currently in use:

Line	Description
Free space	Commander's free memory space in MB
Software version	Firmware version of the Commander
Software date/time	When the firmware was last updated
ID	Identification number of the Commander

4.8.4 Saving settings

To save any changed settings in Easy mode, apply the **OK** button before exiting the **System settings** menu with the ESC button ❼.

In Professional mode, saving is automatic when exiting the menu.

4.9 Performing a hardware reset

If the Commander stops responding to inputs (from the selector knob or buttons), a hardware reset can be performed.

Hold down the selector knob ❻ and the ESC button ❼ at the same time for about one second. The Commander restarts automatically. This usually rectifies the malfunction.

If the malfunction persists after this normal reset, try the following: Hold down the selector knob ❻ and the ESC button ❼ at the same time for about three seconds. The Commander switches off. Wait about a minute before switching the Commander back on with the I/O button ❽. The device should now function correctly again.

4.10 Updating the firmware

Visit regularly the Downloads section at *www.sebakmt.com* for information about new versions of firmware. You can install any updated versions of the firmware on the Commander if they are available.

The current version of the Commander firmware installed can be found in the system settings (see page 28).

To update the firmware, proceed as follows:

Step	Description
1	First ensure that the Commander's battery has sufficient power to update the firmware (at least one bar on the battery symbol on the infobar (see page 20)). If in doubt, recharge the battery first (see page 30).
2	Download the latest firmware archive from *www.sebakmt.com* and extract it to a directory on your PC.
3	Connect the PC and Commander together via USB- (see page 24).
4	Copy the extracted files directly into the Commander's main directory.
5	Disconnect the Commander from the PC (see page 24).
6	Switch the Commander off and then on again, or perform a reset (see above).
	Result: The firmware update begins. A bar indicator shows the progress on the screen.

 **CAUTION**	During the update, no entries whatsoever must be made on the Commander! This could cause the device irreparable damage.

After the procedure is complete, the device switches back on automatically. Check the version number in the start screen to see if the Commander is actually using the new firmware.

4.11 Memory

The Commander has a 2 GB internal memory. This is sufficient to manage the data of up to 1,000 logger groups, each with 1,000 loggers.

You can query the available memory space at any time in the system settings (see page 25).

4.12 Power supply

Internal supply

The Commander is fitted with an internal Li-ion rechargeable battery. This can power the device for approximately 20 hours. The battery's present charge level is shown continuously by the battery symbol in the infobar on the screen.

If the battery is low, a warning on a coloured background appears on the screen:

- Yellow background … device can still operate for a few hours
- Red background + warning sound ... device will shortly switch off

External supply

The Commander can be operated using an external electricity source. Connect it to the mains voltage or to your vehicle's 12 volt socket. A guide on the round plug of the charging cable and a groove on the charging socket ⑩ of the Commander specify the correct alignment of the plug.

As soon as the Commander is connected to the external power supply, its battery is charged up automatically. This is shown by the red charging indicator light ⑨ and by the arrow in the battery symbol at the bottom right of the screen. Charging takes approximately 12 hours. The battery is fully charged once four bars are shown in the battery symbol. After the battery is fully charged, the Commander switches to trickle charging.

 **CAUTION**	During charging, the ambient temperature should be between 10 °C and 40 °C (50 °F and 104 °F). Otherwise the device could be damaged! Only use the supplied charging cable to connect the Commander to external power sources. If you experience problems with the battery, please contact your SebaKMT sales partner. Do not open the device yourself. The stated water- and dirt-resistance can only be guaranteed if any work on the device is performed solely by service departments authorised to do so.

Automatic switch off

The Commander automatically switches off if no input is made within a specified time period. This timespan can be configured in the system settings (see page 26).

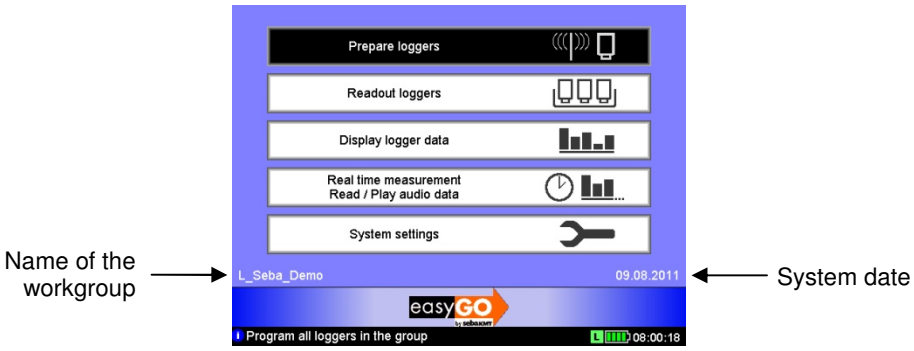
5 Working in Easy mode

5.1 Starting up the Commander

5.1.1 Switching on the Commander

Switch on the Commander by pressing the I/O button 8.

The Easy mode main menu appears on the screen:



Changing the user mode

In Easy mode, the easyGO symbol is continuously shown at the bottom of the screen. If you do not see this symbol, the Commander is in Professional mode. To switch to Easy mode, open the system settings menu. Starting from the start screen, follow the → symbols and, in the first line of the menu, select the “Easy mode” setting from the list.

Changing the language

The screen might not be displaying the correct language. The language can be changed in the system settings menu. Beginning at the start screen, follow the → → symbols and select your language from the list.

5.1.2 Checking the basic settings

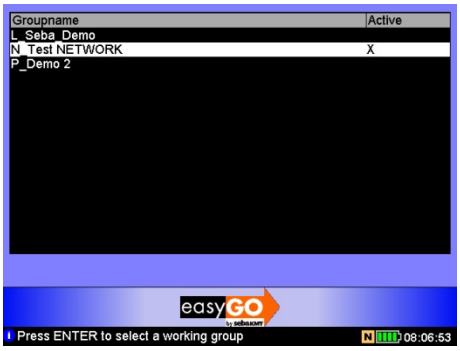
Before a measuring session, check that the Commander’s system settings are up-to-date and correct (see page 26). The date and time settings in particular must be correct.

Beginning at the start screen, follow the → symbols to open the system settings menu.

5.1.3 Defining a workgroup

More than one group of loggers can be registered in the Commander. However, the Commander can only work with one of these groups at a time. This group is called the "workgroup".

Specify the workgroup for the impending measurement session. Please proceed as follows:

Step	Description
1	In the main menu, select the **System settings** button.
2	In the next menu, select the **Change group** button.
	Result: A list with all the registered logger groups opens. The current workgroup is indicated by an **X**. 
3	Select a logger group for the measurement session.
	Result: The selected group is now registered in the Commander as the workgroup. In the main menu, the name of the workgroup is shown at the bottom left of the display area.

Each logger group in the list has already been assigned its group mode (see page 13).

Groups with an "L" before the name can only be read using "Lift & Shift", i.e. all the loggers in the group are collected and then read together.

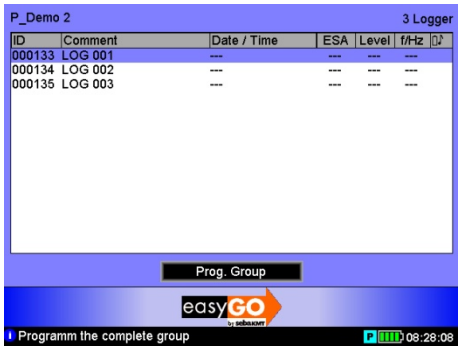
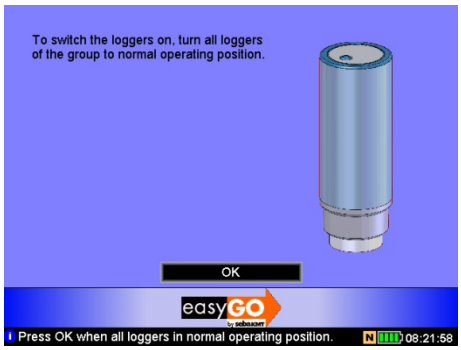
Groups with a "P" before the name can only be read using "Patrol", i.e. all the loggers in the group remain in the shaft and are read on location individually.

The loggers of a group with an "N" before the name are networked together and connected to a GSM-Box. These loggers can't be read by a reading device but send their data regularly to a FTP server.

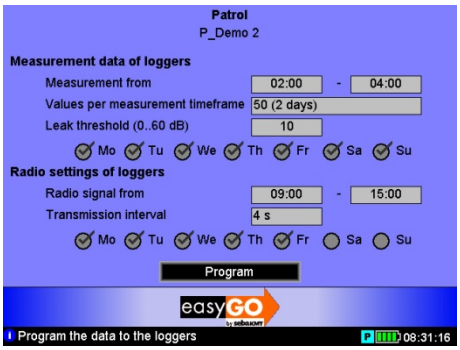
5.2 Programming the loggers

Introduction The loggers in the workgroup must be reprogrammed before each session. This means that the Commander sends basic data for the session wirelessly to the loggers (e.g. the measuring window).

Procedure To program the workgroup proceed as follows:

Step	Description
1	In the main menu, select the **Prepare loggers**  button.
	Result: The workgroup is shown. The name of the group is at the very top of the display, and all the loggers in the group are listed underneath. 
2	Select the **Prog. Group** button.
	Result: The next step is shown. 
3	Switch off all the loggers in the group, i.e. place them “on their head” for about three minutes. As an aid, a three-minute countdown on the screen can be started with the **Start** button. Then select the **OK** button.
	Result: The next step is shown. 

(continued on the next page)

Step	Description
4	Switch on all the loggers in the group, i.e. place them “on their foot”. Select the **OK** button to confirm.
	Result: The next display provides information about the data used to program the loggers.  (It is not possible to change this configuration data in Easy mode).
5	Select the **Program** button.
	Result: The next display opens and the Commander automatically begins transferring data to the loggers.  The flashing antenna symbol on the bottom left of the display area indicates that the data transfer is in progress. The left-hand window shows all the loggers in the group already programmed. The right-hand window contains all the loggers with which no contact has yet been possible. The **Stop** button can be used to cancel programming at any time. It can be recommenced with the **Start** button. The procedure ends automatically once all the loggers in the group have been successfully programmed. The loggers are now ready to be installed for use on location. Use the **ESC** ❼ button to return to the main menu.

From now on, do not place the loggers on their head because switching off would cause them to lose their configuration data and they would need to be reprogrammed.

Possible sources of error

If a logger could not be programmed, it may be because it was not in “Configuration mode” at the time of programming, (see page 14) i.e. it had not been properly switched off and switched back on 3 minutes later. It is also possible that the logger is not within the wireless range of the Commander. The ideal distance between a logger and the Commander is about one meter.

5.3 Installing the loggers

Basics Install the loggers of the workgroup in succession along the stretch of pipe. It is best to fit them directly on the pipe. However, you can also attach the loggers to valve rods or hydrants, for example, or any other position along the pipeline that is easily accessible.

There must be the best possible contact between the logger foot or the mounted adapter (see below) and the pipe.

If the logger is attached to a valve rod, for example, make sure the surface is as flat as possible. Clean the rod thoroughly (preferably with a wire brush).

Horizontal installation Due to their powerful magnet, the loggers can also be attached horizontally to ferromagnetic surfaces. You must however make sure the red mark on the logger is facing upwards. Otherwise the internal tilt switch will switch the logger off after 3 minutes.

Loggers with the mark facing upwards are switched on.

Loggers with the mark facing downwards are switched off.

Special cases If the logger cannot be attached anywhere directly, the accessories for the Sebalog N-3 set have various adapters.

If, for example, the surface of the valve rod is not flat, or not magnetic, unscrew the magnet on the foot of the logger and fit the 20 mm or 42 mm valve rod adapter (optionally available) instead.

When installing the logger on an underground hydrant, you can fit it on the valve rod or on the side of the rod, depending on the height of the shaft. Use the magnetic angle adapter, for example, for side mounting.

For underground hydrants with bayonet fittings, you can use the underground hydrant adapter. Fit the adapter in the hydrant claw.

For plastic domestic pipes (water meter fittings), use the plastic fitting, if necessary in combination with the angle adapter.

Installation examples The following pictures show a few methods for installing N-3 noise loggers:

Logger on the valve rod of an underground hydrant

Logger on an underground hydrant

Logger with an angle adapter on the valve rod

Logger with an angle adapter on the hydrant claw

Logger with an angle adapter horizontally on the valve rod

5.4 Reading out the measured data

After the loggers have been installed on location for at least one measuring day, the recorded measured data can be read out with the Commander. The exact same group mode (“Lift&Shift”/“Patrol”/”Network”) for which the workgroup was programmed is used.

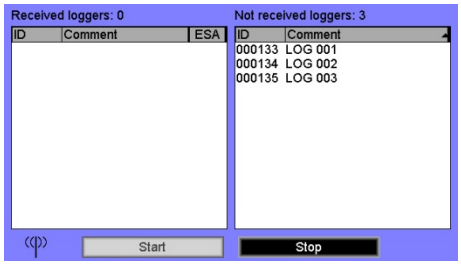
Groups with an “L” before the name can only be read using “Lift & Shift”, i.e. all the loggers in the group are collected and then read together.

Groups with a “P” before the name can only be read using “Patrol”, i.e. all the loggers in the group remain in the shaft and are read on location individually.

The loggers of a group with an “N” before the name are networked together and connected to a GSM-Box. These loggers can’t be read by a reading device but send their data regularly to a FTP server.

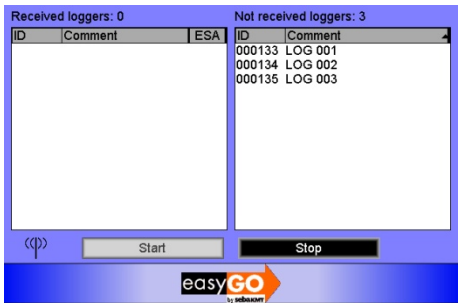
5.4.1 Reading out a “Lift&Shift” group

To read out the measured data in the loggers, proceed as follows:

Step	Description
1	Collect up all the loggers of the group and place them next to the Commander. Avoid placing the loggers on their head! The stored data would not be lost if the loggers were switched off, but it would no longer be indicated if a logger is in leak status or not (see page 14).
2	In the main menu of the Commander, select the **Readout loggers** button.
	Result: The Commander and the loggers are connected. Data transfer begins automatically. The antenna symbol in the bottom left of the display flashes. As soon as the Commander detects a logger, it receives its measured data. The corresponding logger switches from the right-hand to the left-hand window on the screen.  The coloured background of the read data in the left-hand window reflects the probability of a leak. No colour … Leak probability low, leak threshold was not exceeded Grey … Leak probability not available, logger in configuration mode (was switched off during or after the measurement) Other colour … Leak probability high! Leak threshold exceeded! The colour reflects approximately the frequency of the leak noise: **Blue** **Yellow** **0 Hz** **2,500 Hz** If a logger’s comment is on a red background, this means that its battery is weak.
3	The **Stop** button can be used to cancel reading at any time. It can be continued with the **Start** button. The procedure finishes automatically once the Commander has received and saved the measured data from all the loggers in the group. If a logger could not be read, it may have been switched off, not ready for wireless operation or it was outside the Commander’s wireless range.
4	You can immediately view the data of a logger that has just been read. To do so, select the left-hand window on the screen and then select the respective logger.
	Result: The logger’s measured data is shown (see page 42). Use the ESC button ❼ to return to the main menu.

5.4.2 Reading out a “Patrol” group

To read out the measured data in the loggers, proceed as follows:

Step	Description
1	In the main menu of the Commander, select the **Patrol Loggers** button.
	Result: The Commander is ready to receive the measured data from the individual loggers. The antenna symbol in the bottom left of the display flashes.
2	Move into the wireless range of each logger one after the other. If the radio signals of the loggers are strong enough, the data can also be collected while in the car, simply by driving past where the loggers are installed. The Commander’s standard antenna can be replaced with the supplied vehicle antenna to do this.  As soon as the Commander has detected a logger, the following message appears on the screen:  ← Logger comment ← Logger ID ← Level/frequency of the quietest noise in the measuring period The message has a coloured background. The colour shows straightaway whether the programmed leak threshold has been exceeded or not during the measuring period. • Yellow … Attention! Leak threshold exceeded! • Blue ... Leak threshold not exceeded There is an acoustic signal along with the message: • Long tone ... Attention! Leak! • Short tone … No leak As standard, the tone sounds each time a logger is detected. It can be deactivated in the system settings of Professional mode (see page 27). If the displayed message contains a battery symbol, this means the battery of the particular logger is weak. If the displayed message contains a clock symbol, this means the logger’s internal clock differs from the system time of the reading device by more than 30 minutes. The logger group concerned should be reprogrammed. The logger’s clock is synchronised with that of the Commander. It is only possible to change the time of individual loggers in Professional mode.

(continued on the next page)

Step	Description
	The detected logger switches from the right-hand to the left-hand window on the Commander screen. The coloured background of the read data reflects the probability of a leak. No colour … Leak probability low, leak threshold was not exceeded Grey … Leak probability not available, logger in config. mode, (was switched off during or after the measurement) Other colour … Leak probability high! Leak threshold exceeded! The colour reflects approximately the frequency of the leak noise:  **Blue** **Yellow** **0 Hz** **2,500 Hz** If a logger's comment is on a red background, this means its battery is weak.
3	The **Stop** and **Start** buttons can be used to cancel and continue reading at any time. The procedure finishes automatically once the Commander has received and saved the measured data from all the loggers in the group. During "Patrolling", the complete measured data set is only transferred to the Commander from loggers in leak status (see page 14). To save power, if the quietest noise in a measurement is below the programmed leak threshold, the loggers will only send a small packet to the Commander, with the level and frequency of this noise. If necessary, the complete measured data of these loggers can be called up using single interrogation in Professional mode (see page 54). If a logger could not be read, it may have been switched off, not ready for wireless operation or it was outside the Commander's wireless range.
4	You can immediately view the data of a logger that has just been read. To do so, select the respective logger in the left-hand window on the screen.
	Result: The logger's measured data is shown (see page 42). Use the ESC button ❼ to return to the main menu.

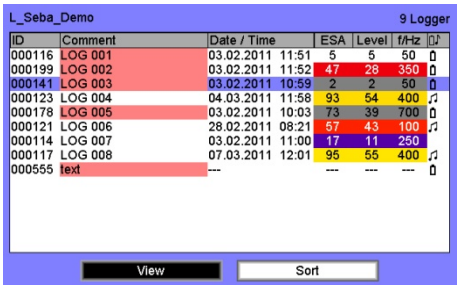
5.5 Evaluating the measured data

You can use the Commander to view the measured data read out from a logger and to analyse it in greater detail.

5.5.1 Calling up the measured values

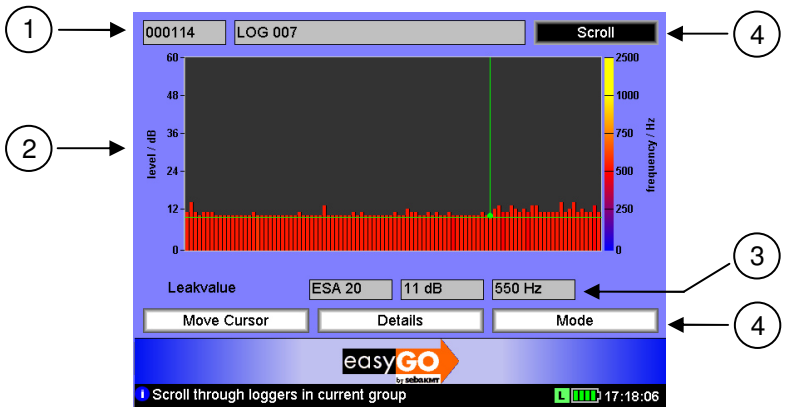
To call up the measured data of a logger, proceed as follows:

Step	Description
1	In the main menu, select the **Display logger data** button.
	Result: The loggers in the workgroup are listed in the next view.
2	Call up the data of the highlighted logger using the **View** button or select another logger in the list.
	Result: The logger's measured data is shown (see page 42).



5.5.2 Displaying the measured values

View The measured data from the loggers are shown as a bar diagram on the screen.



Element	Description
①	**Identification number** and **comment** of the displayed logger
②	**Diagram** Each bar represents a single noise recording. X-axis ... course of measurement over time Y-axis ... noise level in dB The colour of the bar shows the approximate frequency of the noise. **Blue** … **Yellow** **0 Hz** … **2,500 Hz** The point where the two green lines intersect marks the quietest recording in the displayed measurement, the so-called “leak value”.
③	**Leak value (lowest value to be displayed)** The leak value refers to the quietest recording in the displayed measuring period. The values of this recording are shown in the three fields directly under the diagram: Left-hand field … ESA value of the recording Centre field … Noise level in dB for the quietest measurement Right-hand field … Frequency of the noise in Hz
④	**Buttons to access individual functions** (see below)

Functions There are the following functions for analyzing the displayed data:

Button	Description
Scroll	You can use this function to view in the diagram the measurement results of the other loggers in the group. To do so, apply the button and turn the selector knob to select a logger. Apply the button again to confirm your selection.
Move Cursor	You can use this function to move the vertical green line in the diagram from one bar to the next. The values of the particular noise measurement (volume, frequency, ESA) and the time of the recording are shown. To do so, apply the button and turn the selector knob. Apply the button again to end the function.
Details	This function opens a new window on the screen. It shows the configuration data of the particular logger at the time of the measurement. You can use the **Scroll** button to view the configuration data of the other loggers in the group. Use the **OK** button to return to the measured data display.
Mode	You can use this function to change the measurement unit on the Y-axis in the diagram. Standard view … The Y-axis shows the volume of the noises. Each bar in the diagram represents a single recording. ESA view … The Y-axis shows the ESA value. Each bar represents the quietest recording of a measuring day.

6 Working in Professional mode

6.1 Starting up the Commander

6.1.1 Switching on the Commander

Switching on

Use the **I/O button** ❽ to switch on the Commander.

The Professional mode start image appears on the screen:

Main menu bar

Workgroup

Firmware version,
System date,
Identification number of the Commander

Changing the user mode

If the easyGO symbol is shown at the bottom in the middle of the screen, the Commander is not in Professional mode but Easy mode instead. To switch to Professional mode, open the system settings menu. Beginning at the start screen, follow the ➔ symbols and, in the first line of the menu, select the “Professional mode” setting from the list.

Changing the language

The screen might not be displaying the correct language. The language can be changed in the system settings. Beginning at the start screen, follow the ➔ ➔ symbols and select your language from the list.

6.1.2 Checking the system settings

Before a measuring session, check that the Commander’s system settings are up-to-date and correct (see page 25). The date and time settings in particular must be correct.

6.1.3 Registering loggers in the Commander and specifying the workgroup

The loggers to be used for an impending measurement must be registered and combined in a group (see page 23) in the Commander.

To specify the workgroup (see page 14), select the symbol in the main menu bar, open the **Group Management** menu and select a group in the list of registered logger groups (marked with an X).

However, a lot of menus in Professional mode also have a drop-down list at the very top of the screen. It can be used to access a group list directly and select a workgroup.

6.2 Managing the loggers

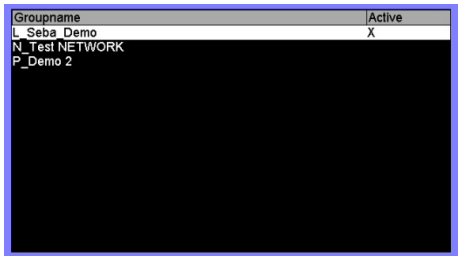
All loggers to be used for a measurement must be registered in the Commander beforehand. Only registered loggers can be programmed and read. Registration is performed either by manually inputting the logger ID or by automatic wireless detection. The registered loggers are combined in groups.

6.2.1 Managing logger groups in the Commander

Introduction All loggers registered in the Commander must be assigned to a group. The Commander can only communicate with one of the logger groups created, the so called “workgroup” (see page 14).

Managing groups Logger groups can be created, deleted, copied and renamed directly on the Commander.

Select the symbol in the main menu, and the **Group Management** button in the next view, to go to the menu for managing logger groups. All the registered logger groups are listed.



Defining a workgroup The workgroup is marked with an **X** in the view. To turn another logger group into the workgroup, select the list and then a group.

Creating a new group To create a completely new logger group in the Commander, proceed as follows:

Step	Description
1	Select the **Add** button.
	Result: A new view opens.
2	Select the group mode (see page 13) for the new group and confirm with OK.
	After the group is created, the group mode can no longer be changed. All loggers in a group must belong to the same group mode as the group itself (e.g. a “Lift&Shift” group may only contain “Lift&Shift” loggers).
	Result: A new view opens.
3	Enter a name for the new group. Use the virtual keyboard for this. To complete the input, select the **ENTER** button.
	Result: The new group is now created in the Commander. The display jumps automatically to the **Logger Management** menu.
4	Use this menu to assign loggers to the newly created group (see page 47).

Renaming a group You can rename an existing logger group.

First select the particular group in the list and then select the **Rename** button. In the following screen views, enter a group mode (see page 13) and the new name of the group.

The group then appears with the new name in the group list.

Copying a group You can copy an existing logger group, with all its loggers, within the list and allocate a new name and new group mode to this copy. (This can be useful if, for example, you wish to use the loggers of an existing “Lift&Shift” group for the next measuring assignment, but would like to read out data by “Patrolling”.) The new group automatically adopts the configuration data of the original group but contains no measured data at all.

First select the particular group in the list and then select the **Copy** button. In the following screen views, enter the group mode (see page 13) and the name of the new group.

The new group then appears in the group list. If needed, more new loggers can now be allocated to it (see page 47).

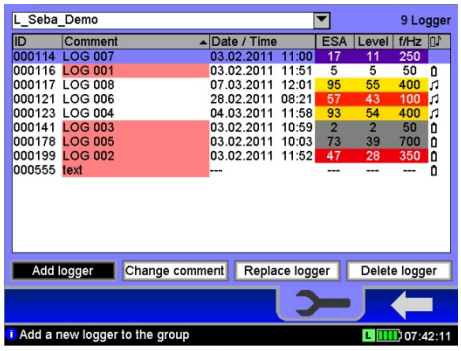
Deleting a group You can delete a logger group from the Commander.

First select the particular group in the list. Then select the **Delete** button and answer the confirmation query with **Yes**.

If the loggers in this group are not contained in any other existing groups, deleting simultaneously de-registers them from the Commander. The measured data of the group is retained in the history as long as the “History” function is active (see page 26). Otherwise the data will be lost.

6.2.2 Managing the loggers in the Commander

Select the symbol in the main menu, and the **Logger Management** button in the next view, to go to the menu for managing loggers. The loggers of the workgroup (see page 45) are listed.



If the incorrect group is displayed, you can use the pull-down menu at the top edge of the screen to change the workgroup.

If you do not wish to allocate a new logger to an existing but to a completely new group instead, this new group must be created beforehand (see page 45).

Registering loggers using automatic detection

A logger can be **registered using "automatic detection"**. For this purpose, it has to be close to the Commander and switched off. Proceed as follows:

Step	Description
1	Apply the **Add logger** button.
2	Switch the logger on.
	Result: Directly after it is switched on, the logger sends a signal with its identification number a few times. Once the logger is detected by the Commander, **New ID found** appears on the screen. The ID of the logger is displayed underneath.
3	Select **Accept** to add the logger to the group or **Decline** to discard it.
4	If you want to number the loggers consecutively, stick the supplied self-adhesive label with the number of the automatically assigned comment on the logger (see below).
5	Use the same method to add all the other new loggers to the group. When loggers need to be switched on, always bring them close to the Commander singly. This is because only the last detected ID is shown on the screen and able to be registered.
6	Apply the **Finish** button to complete the procedure.
	Result: The registered loggers are now shown in the list.

Registering loggers manually

A logger can be **registered manually by entering its ID**. Proceed as follows:

Step	Description
1	Apply the **Add logger** button.
2	Type in the logger's six-digit ID using the displayed keyboard (see page 14). Confirm the input with the **ENTER** button.
	Result: The registered logger is now shown in the list.
3	If you want to number the loggers consecutively, stick the supplied self-adhesive label with the number of the automatically assigned comment on the logger (see below).
4	To add further loggers to the group, repeat steps 1 to 3.

Numbering loggers

A comment is automatically left on every logger, when it is registered. The first registered logger gets the comment "LOG001", the second one "LOG002" and so on. This way, the loggers of a group are consecutively numbered.

Self-adhesive labels with the same numbers come supplied. Sometimes it can be helpful to put the labels, with the relevant numbers, on the loggers directly after registration. Thus, the loggers can easier be identified on-site.

Changing a comment

You are able to change the automatically assigned comment of a logger in the displayed group. Proceed as follows:

Step	Description
1	Select the logger in the list to change its comment.
2	Apply the **Change comment** button and use the displayed keyboard to change the text in the following view. Confirm the input with the **ENTER** button.
	Result: The changed comment is now shown in the list.

Exchanging loggers

You are able to delete a logger in one step from the displayed group and to replace it with another logger. This may be necessary if, for example, an individual logger develops a fault and needs to be replaced with a new one. Proceed as follows:

Step	Description
1	Select the logger that needs to be replaced in the list.
2	Apply the **Replace logger** button and use the displayed keyboard to enter the ID of the new logger to be put in the group.
	Result: The new logger appears in the list instead of the old one.

If the old logger is not contained in any other existing group, deleting simultaneously de-registers it from the Commander.

The measured data of the old logger is deleted within the group. However, it is retained in the history as long as the "History" (see page 26) function is active. Otherwise the data will be lost.

Deleting loggers You can delete a logger from the displayed group. Proceed as follows:

Step	Description
1	Select the logger in the list.
2	Apply the **Delete** button and answer the confirmation query with **Yes**.
	Result: The logger is no longer contained in the list.

If the logger is not contained in any other existing group, it is simultaneously de-registered from the Commander.

The measured data of the logger is deleted within the group. However, it is retained in the history as long as the “History” (see page 26) function is active.

6.3 Programming the loggers

Introduction

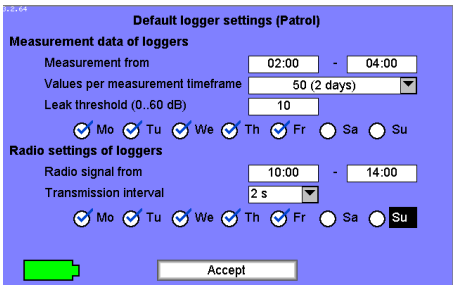
Each logger must be configured before each measuring session. They are assigned with all the relevant parameters before the impending measurement.

Even loggers that have already been programmed and installed can usually be reprogrammed. However, to save power, all loggers in group mode “Patrol” can only receive the Commander’s signal every 10 seconds, even in the time when they are ready for wireless operation. It can therefore take a very long time to program these loggers.

Where possible, we recommend that all the loggers are changed to configuration mode before programming, i.e. to switch them off for at least 3 minutes and then to switch them back on again. Loggers can be reliably programmed in configuration mode.

Opening the configuration window

Proceed as follows to open the configuration window for a logger:

Step	Description	
1	Select the  symbol in the main menu bar.	
2	In the next menu, select the **Program Logger** / **Group** button.	
	Result: The menu for logger programming opens. The loggers in the current workgroup are listed here. If you would like to program loggers not in the workgroup, you can use the drop-down list at the very top of the screen to call up another registered logger group.	
3	If you wish to program all the loggers in the displayed group, apply the **Prog. Group** button.	If you wish to program a single logger in the group, first select the list and then choose the logger. Then apply the **Prog. Single** button.
	Result: The input window for configuring the loggers opens on the screen. 	

Measuring parameters The following parameters must be stated in order to define the measuring window:

Parameter	Description
Measurement (from … to)	Beginning and end of the daily measuring window. **Select from:** 0:00 to 24:00 hours **Default:** 2 a.m. to 4 a.m. **Explanation:** The logger performs measurements and saves the measurement values within the stated window. Interference from background noise (traffic, water use, etc.) should be at a minimum at this time.
Values per measuring window	Number of saved measured values per day. **Select from:** All 100 measured values or the 50/20/10/5 lowest values of the measuring window **Default:** 50 **Explanation:** A logger performs 100 measurements in each measuring window. A maximum of 100 pairs of values (noise level and frequency) can be saved in the internal memory. The pull-down menu is used to specify whether all 100 measured values in the logger are to be saved or just the lowest 50/20/10/5 values in the period. If, for example, “100 pairs per measuring window” is specified, the logger must be read after each measuring day so that no measured data is overwritten in the subsequent day. If “20 measurement values per measuring window” is specified, the logger only has to be read after 5 measuring days.
Leak threshold value	Noise level from which to classify a noise as a leak. **Select from:** 0 to 60 dB **Default:** 10 dB **Explanation:** If the lowest measured noise level in a measuring period is above this threshold, this is an indication to the user that there is a leak in the pipe system. Loggers where the threshold is exceeded are pointed out in particular during the data read-out and analysis.  Experience shows that it is often sensible to have a value of 10 dB as the leak threshold. In order to gain an impression of the average noise level in the pipe and to gauge whether the default leak threshold of 10 dB is too high or too low, one possibility would be to perform a real time measurement before programming the loggers at the place of use (see page 58). If, during the first few measuring days, the selected leak threshold is always far too low or far too high, you should once again reprogram the loggers concerned and adjust the leak threshold.
Measuring days (Mon to Sun)	Days of the week when measurements are to be taken. **Select from:** Monday to Sunday **Default:** Monday to Sunday **Explanation:** No measurements are performed on the other days.

Radio parameters

Continuous wireless availability and frequent wireless exchange of data have a detrimental effect on the lifetime of a logger's battery. To spare the battery, the periods of wireless availability and activity can be restricted. To do this, the following parameters must be entered:

Parameter	Description
Radio signal (from … to)	Beginning and end of the daily transmission window. **Select from:** 0:00 to 24:00 hours **Default:** 9:00 to 15:00 hours (in group mode "Patrol") or 8:00 to 17:00 hours (in group mode "Lift&Shift") **Explanation:** The logger is ready to receive during this time and can be configured or read. Furthermore, when a logger is in group mode "Patrol", it regularly transmits packets with measured data during this time.  It is not possible to communicate with the logger outside the given transmission window.
Transmission interval	Transmission interval in "Patrol" mode. **Select from:** 2/3/4/5/10/15 seconds **Default:** 4 sec. **Explanation:** Number of seconds after which a logger in group mode "Patrol" repeats the transmission of the recorded measured data (during the time span entered in **radio signal** only!). The shorter the transmission interval, the faster a logger is detected by the reading device as it passes by. However, long transmission intervals spare the battery of the logger.
Transmission days (Mon to Sun)	Days of the week when the set transmission window applies. **Select from:** Monday to Sunday **Default:** Monday to Friday **Explanation:** It is not possible to communicate with the logger on the other days of the week.

Battery symbol

The colour of the battery symbol on the bottom left of the input window indicates how much the entered configuration will affect the service life of the logger's battery.

 Green … battery lifetime not or hardly affected

 Yellow … battery lifetime badly affected

 Red … battery lifetime very badly affected

If the factory-set, default configuration is used, a noise logger can be operated for about 5 years without interruption. Any extension of the measuring window or transmission window reduces the battery's life accordingly.

Continuing programming

Proceed as follows to continue the programming process:

Step	Description	
1	Enter the data in turn for the group or the single logger.	
2	Apply the **Program** button in order to finish the programming.	
	Result: The configuration data is transferred from the Commander to the group. A new view opens on the screen with two windows: The left-hand window shows the loggers in the group that have been successfully programmed. The right-hand window shows the loggers that have yet to be programmed. The antenna symbol indicates that the Commander is wirelessly operational. The **Stop** and **Start** buttons can be used to cancel and continue the procedure at any time. Data transfer ends automatically once all the loggers in the group have been successfully programmed.	**Result:** The configuration data is transferred from the Commander to the individual logger. A blue bar shows the progress of the data transfer.
	From now on, do not place the loggers on their head because switching off would cause them to lose their configuration data and they would need to be reprogrammed.	
	If a logger could not be programmed, it may have been switched off, not ready for wireless operation or it was outside the Commander's wireless range. The loggers are now ready to be installed for use on location.	

6.4 Installing the loggers

You can find detailed information on installing the loggers in the previous chapter (see page 35).

6.5 Reading out the measured data

After a group has been installed for at least one measuring day, the recorded data can be called up with the Commander.

The same group mode for which the workgroup was configured is used (see page 13).

Furthermore, you can always read just a single logger instead of a group.

6.5.1 Quick query of the workgroup

The button on the very left of the main menu bar is always used as a quick-start button for reading the workgroup. Depending on the workgroup's group mode, the quick-start symbol is as follows:

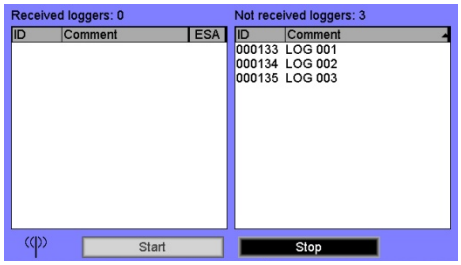
Starts reading a "Lift&Shift" group

Starts "Patrol"

Starts reading data of a "Network" group from the GSM-Box

When this button is applied, reading immediately begins for the current workgroup. Make sure a wireless connection with the loggers or the GSM-Box can be established. The Commander and logger are connected and the measured data is transferred.

The following view opens:



The left-hand window shows the loggers in the group that have been successfully read. The right-hand window contains all the loggers that have yet to be reached. The antenna symbol indicates that the Commander is wirelessly operational.

Reading finishes automatically once the Commander has received and saved the measured data from all the loggers in the group.

If a logger cannot be read, it may be switched off, not ready for wireless operation or it may be outside the Commander's wireless range.

6.5.2 Standard query of a single logger

If you only wish to read a single logger with the commander, proceed as follows:

Step	Description
1	Select the  symbol in the main menu bar.
2	In the next menu, select the **Read measurement data** button.
	Result: The loggers in the workgroup are listed in the next view.
3	If necessary, call up another logger group using the drop-down list at the very top of the screen.
4	Select the concerning logger in the list. Then apply the **Read Single** button.
	Result: The identification number and name of the logger are shown in the next view.
5	Apply the **Read** button.
	Result: The Commander and logger are connected and the measured data is transferred. A blue bar shows the progress of the data transfer. After the transfer has been successfully completed, the display automatically switches to the menu for showing the measured data (see page 42). An error message appears if the data transfer fails. Ensure the Commander is in the wireless range of the logger/group/GSM-Box concerned. The logger must be ready for wireless operation. Press **Read** again to repeat the procedure.

6.5.3 Standard query of a “Lift&Shift” group

If you wish to read a “Lift&Shift” group, proceed as follows:

Step	Description
1	Select the  symbol in the main menu bar.
2	In the next menu, select the **Read measurement data** button.
	Result: The loggers in the workgroup are listed in the next view.
3	If necessary, call up the group concerned using the drop-down list at the very top of the screen.
4	Apply the **Read Group** button.
	Result: The Commander and logger/GSM-Box are connected and the measured data is transferred. The same view opens on the screen as with the “Quick query”.

It is not possible to read a “Patrol” group or a “Network” group using this method. For them, please use the “Quick query” (see page 54).

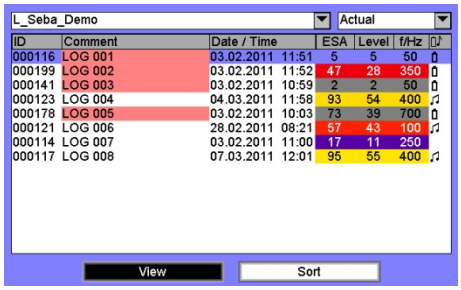
6.6 Evaluating the measured data

6.6.1 Calling up the measured values

Calling up recent measured data

To view the measured values from a logger on the Commander's screen, select the  symbol in the main menu and then the **Display logger data** button.

The loggers in the workgroup are listed in the next view:



If necessary, you can call up a different group using the drop-down list at the very top of the screen.

Use the **View** button to call up the measured data of the highlighted logger. To call up the data of another logger in the list, select the list and then the logger. The measured data is shown.

Calling up older measured data

If the History function has been activated in the Commander's system settings (see page 26), you are not only able to access recent data read from the logger but also older sets of data.

To do so, select the **Actual** line and then, from the drop-down list, the date of the data set that you wish to view. The date refers to the day of the read-out.

6.6.2 Displaying the measured values

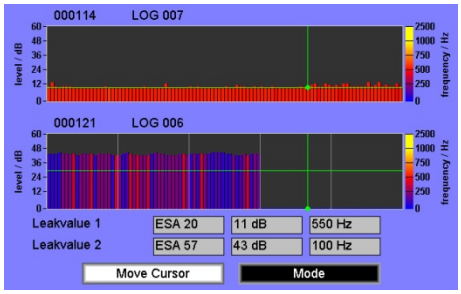
Introduction

In Professional mode the measured data from the loggers is shown as a bar diagram on the screen just as in Easy mode (see page 42). But, additionally the Professional mode provides the opportunity to compare the measured data of two loggers.

Comparing measured data

After the measured data of a logger has been called up, this data can be compared to the data of another logger in the group.

To do so, select the **Compare** button. The list of loggers in the workgroup opens on the screen. Select the table and choose a logger for comparison. The following view appears on the screen:



The two diagrams show the values of the loggers graphically. The values of the logger selected first are above, the values of the logger for comparison below.

The leak value of the first and second logger are shown numerically under the diagrams.

After applying the **Move Cursor** button, you can move the vertical green line in the diagrams to view the values of the individual recordings in greater detail.

You can use the Mode button to change the measurement unit on the Y-axis in the diagram (see page 43).

To choose another logger in the group for comparison, use the arrow key to return to the logger list and select a different logger.

7 Additional measuring functions

7.1 Real time measurement

Introduction The “Real time measurement” function allows you to follow, in real time, the current noise level and the frequency in a pipe directly on location and without additional measuring devices. A logger measures continuously and immediately transfers the data to the Commander.

Purpose The real time measurement can be useful in many situations. Here are some examples:

- Before a measurement session, you can use the real time measurement to gain a first impression of the noises in the section of pipe concerned. This enables you, for example, to estimate a sensible leak threshold for the measurement.
- With real time measurements at various points on the pipe network, you can already distinguish during the day the non-critical pipe sections from the potentially critical ones. They can then be examined more closely using a night measurement.
  If the pipe noise in a section is already very low during the day, the probability of a leak is not very high. A night measurement may then no longer be necessary at this position and the logger can be used at a more critical point in the pipe network.
- When “patrolling”, you can use a real time measurement to check the results there and then from the loggers indicating a high leak probability.

Requirements The logger used for the real time measurement must be switched on and ready for wireless operation. You can install a logger in configuration mode (see page 14) at a position on the pipe or use a logger already installed for the function. The logger does not have to be programmed for the function!

Procedure in Easy mode In Easy mode, proceed as follows to perform the real time measurement:

Step	Description
1	In the main menu, select the **Real time measurement**  button.
	Result: The loggers in the workgroup are listed in the next view.
2	Select the list and there select the logger that you wish to observe.
	Result: Observation of the logger begins. The view for the real time measurement appears on the screen (see further down in the text).

Procedure in Professional mode In Professional mode, proceed as follows to perform the real time measurement:

Step	Description
1	Select the  symbol in the main menu.
2	In the next menu, select the **Real time measurement** button.
	Result: The loggers in the workgroup are listed in the next view.
3	If necessary, you can call up another group using the drop-down list at the very top of the screen.
4	Select the list and there select the logger that you wish to observe.
	Result: Observation of the logger begins. The view for the real time measurement appears on the screen (see further down in the text).

Display of measured data

The course of the real time measurement is shown on the Commander's screen with a running bar diagram:

Element	Description
①	**Identification number** and **comment** of the observed logger
②	**Diagram** Each bar represents a single noise recording. X-axis ... course of measurement over time Y-axis ... noise level in dB The colour of the bar represents the frequency of the noise. **Blue** … **Yellow** **0 Hz** … **2,500 Hz** The point where the two green lines intersect marks the quietest recording in the displayed measurement, the so-called "leak value".
③	**Antenna symbol** indicates that the Commander is wirelessly operational
④	**Minimum value of the display (leak value)** Left-hand field … ESA value of the recording Centre field … Noise level in dB for the quietest measurement Right-hand field … Frequency of the noise in Hz
⑤	**Current value of the display** Noise level (bar height) and frequency (bar colour) of the current measuring value (including numeric values).
⑥	**Buttons** **Stop** and **Start** can be used to cancel and continue the observation at any time. However, the time gap between cancellation and continuation is not shown.

Use the ESC button ❼ to end the function and return to the main menu.

The permanent wireless connection during the real time measurement requires a lot of power. This has a detrimental effect on the lifetime of the logger's battery. Please consider this when using the function.

7.2 Audio recordings

Loggers in the Sebalog N-3 series are able to save recorded noises as audio files and to send them to the reading device. This means the user is no longer reliant on the measurement values alone (level/frequency/ESA value) when evaluating a noise. You can actually listen to the suspected leak.

Firstly, the loggers automatically save the quietest noise in the measuring period as an audio file. This file can, for example, be called up later with the Commander and replayed.

Secondly, you can get a recording of the current noise in the pipe from each installed logger. This allows you to listen on a pipe, almost in real time, without any additional equipment (sensor rod microphone or similar).

7.2.1 Reading out the audio data

Introduction Each logger automatically records the quietest noise (leak noise) in a measuring period and saves it as an audio file. To spare the logger's battery, this file is not automatically sent to the reading device when the logger is read. It must be queried separately.

Procedure To query audio data in a logger, proceed as follows:

Step	Description	
1	In Easy mode …	In Professional mode …
	… select the  button in the main menu.	… select the  symbol in the main menu bar.
2	Select the **Read** / **Play audio data** button.	Select the **Read audio data** button.
	Result: The loggers in the workgroup are listed in the next view.	
3		If necessary, you can call up another group using the drop-down list at the very top of the screen.
4	Select the logger list and then the logger from which you wish to call up the leak noise.	
5	Apply the **Read audio data** button to continue.	
	Result: The ID and comment of the logger, from which the audio data is called up, are shown once again in the next view. Data transfer starts automatically. A blue bar shows the progress of the transfer. After the transfer has been successfully completed, the display automatically switches to the menu for playing back audio data (see page 61). You can then listen to the leak noise that has just been read. An error message appears on the screen if the data transfer fails. Ensure the Commander is in the wireless range of the logger concerned. Press **Start** to repeat the procedure.	

7.2.2 Playing back the audio data

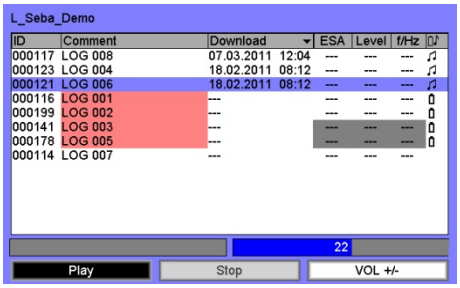
Introduction

After an audio file is sent from a logger to the Commander, it can be played back with the Commander and listed to over headphones.

First, connect the supplied headphones to the Commander via the 5-pin headphone socket ⑩. White markings on the plug and socket show the correct position of the plug. You must feel the plug engage.

Procedure

To play back an audio file, proceed as follows:

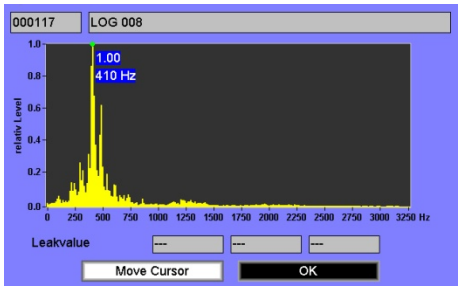
Step	Description	
1	In Easy mode …	In Professional mode …
	… apply the button in the main menu of the Commander.	… select the symbol in the main menu bar of the Commander.
2	Select **Read** / **Play audio data** once again in the next view.	Apply the **Play audio data** button in the next view.
3	Apply the **Play** button.	If necessary, you can call up another group using the drop-down list at the very top of the screen.
	Result: The menu for playing back audio files opens. 	
4	Select the logger list and then the logger from which you wish to play back the audio data. A note symbol ♫, on the very right of the list indicates the loggers from which audio data is saved in the Commander. Only loggers with this symbol have a leak noise saved.	
5	Apply the **Play** button.	
	Result: The three-second recording of the leak noise is played back and continuously repeated. The yellow bar indicates the playback. You can adjust the headphone volume. To do so, apply the **VOL +/-** button and turn the selector knob. The blue bar above the button shows the current setting. Before playing an audio file, it is advisable to first have the headphone volume on a medium setting (e.g. level 18). In Professional mode the frequency range of the recorded noise can be displayed using the **Spectrum** button (see next page). Playback can be ended at any time with the **Stop** button.	

7.2.3 Displaying the frequency spectrum of the leak noise (in Professional mode only)

Introduction In Professional mode, you can view the frequency spectrum of the saved leak noise for an even more in-depth analysis.

Purpose Sometimes the assumed leak noise stems from a known source of interference (e.g. 50 Hz/100 Hz mains voltage or a pump in operation). However, you should not prematurely believe the conspicuous noise to be non-critical because there could still be a real leak noise next to the background noise. By analysing the frequency spectrum, you can check the saved noise for frequency peaks other than those of the interference.

Procedure Apply the **Spectrum** button in the menu for playing back audio files (see previous page). The following view opens on the screen:



The diagram shows the spectrum of frequencies producing the saved leak noise (0 to about 3,250 Hz).

X-axis	…	Frequency spectrum of the leak noise
Y-axis	…	The most dominant frequency of the noise corresponds to “1” on the dimensionless scale. All the other frequencies occurring are shown in relation to this.

You can move the vertical green line in the diagram in order to view in greater detail the frequencies at individual points on the curve. To do so, apply the **Move Cursor** button and turn the selector knob.

Close the view with the **OK** button and return to the menu for playing back audio files.

The recorded frequency spectrum of a noise is influenced by many factors (position of the logger, logger’s contact with the pipe, reflections in the pipe, etc.). Even small changes in these factors can considerably change the displayed frequency spectrum of the same noise. The inexperienced user can quickly make misjudgements. Therefore, the frequency spectrum analysis should above all be performed by experienced users who, for example, know how to use correlators.

Sometimes the frequency shown under “leak value” can diverge slightly from the maximum frequency in the diagram display. This is not an error. This is caused by the finer graduation of the displayed frequency band in the Commander, compared to the internal graduation in the loggers. The value shown in the diagram is therefore somewhat more precise.

7.2.4 Recording a noise directly (in Professional mode only)

Introduction

The “Direct recording” function of a Log N-3 logger enables you to listen in on the current noise in a pipe without using additional equipment (sensor rod microphone or similar).

If “Direct recording” is performed with a logger already installed, you do not even have to open the shaft to listen to the pipe.

With this function, the logger creates a three-second recording of the current noise in the pipe. This audio file is then immediately sent to the Commander where it can be replayed. The pipe noise can thus be tracked almost in real time.

Requirements

You can perform “Direct recording” with any logger already installed, if it is programmed in “Lift&Shift” or “Patrol” group mode and if it is within its programmed “Wireless on” time. (Unfortunately, the system will not allow loggers in “Network” group mode to be used for this.)

However, you can also use a logger that has not been installed yet. The logger does not have to be programmed after being switched on. It can simply remain in configuration mode instead (see page 14).

To record a noise directly, a logger must be switched on, installed on the pipe and located within the wireless range of the Commander. The distance is preferably between 1 and 10 m.

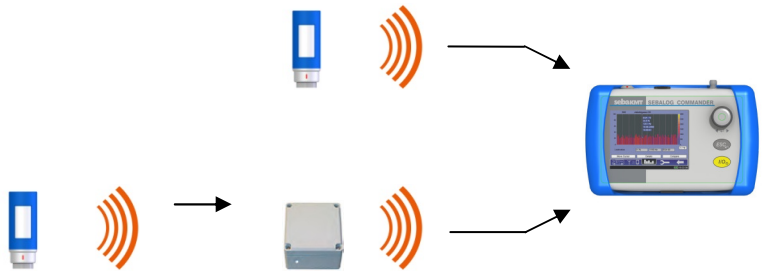
Procedure

Proceed as follows to record the pipe noise directly:

Step	Description
1	Select the  symbol in the main menu and the **Direct recording** button in the next view.
	Result: The loggers in the workgroup are listed in the next view.
2	If necessary, you can call up another logger group using the drop-down list at the very top of the screen.
3	Select the table and then the logger for recording the current noise.
4	Apply the **Start recording** button.
	Result: The ID and comment of the logger to perform the recording are shown once again in the next view. The Commander and the logger are connected. The noise recording and following transfer of the audio file to the Commander take place automatically. A bar shows the progress. After the data has been transferred successfully, the menu for playing back audio files opens automatically on the Commander’s screen (see page 61).

8 Increasing the wireless range of the loggers with repeaters when patrolling (in Professional mode only)

Introduction The actual wireless range of a noise logger depends on the conditions at the place of use. If a logger is installed in a shaft, its radio signal sometimes does not reach far enough above the surface to be received properly during “patrolling”. In such cases a repeater can be used. The repeater passes on the logger’s radio signal, therefore extending the wireless link.

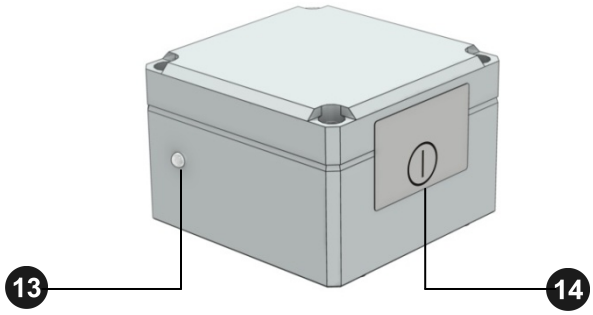


In principle, any repeater can work with any Log N-3 noise logger. However, a repeater in “Patrol” group mode can **only ever pass on the signal of a single logger**.

Requirements The particular logger must be “paired up” with the repeater before the measurement. The logger must already have been programmed beforehand (group mode: “Patrol”). The logger should already be installed at the place of use.

8.1 Repeater design

Design A repeater has the following features:



Element	Description
13	**Status LED** • Flashes blue … ready to receive • Lights up blue … receiving data • Flashes red … transmitting data • Lights up yellow then red … switching off • Lights up red then quickly flashes blue … update is being installed • No light … switched off
14	**On/Off contact field** ⏻

Switching on/off The repeater is switched on using a magnetic switch.

Move the supplied magnet over the On/Off contact field 14 of the repeater. The status LED 13 first lights up red; after the magnet is removed it flashes green three times. Regular blue flashing then indicates that the repeater is switched on and ready to receive.

To switch off the repeater, keep the magnet at the On/Off contact field for a few seconds. The LED first lights up yellow. As soon as it lights up red, you can remove the magnet. The repeater then switches off and the LED goes out.

Power supply Each repeater has an internal lithium battery. It can power the device for up to five years. The actual battery lifetime depends on the wireless settings of the “paired” loggers.

When you query a repeater’s configuration, its battery status is also shown.

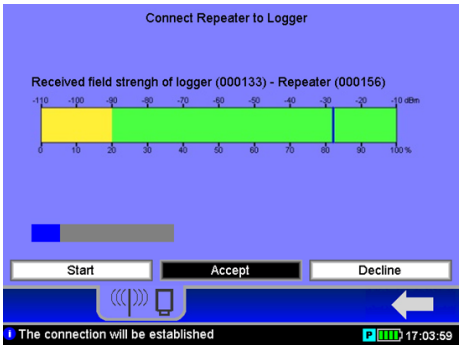
Flat batteries cannot be recharged. They must be replaced.

SebaKMT or an authorised service partner must change the batteries.
Otherwise, water- and dirt-resistance of the repeater cannot be guaranteed.

8.2 Installing the wireless extension

Before the wireless extension via repeaters can be set up, the logger concerned must already be programmed and installed at its place of use.

Proceed on location as follows:

Step	Description	
1	Select the  symbol in the main menu and the **Connect Repeater to Logger** button in the next view. If this button is not shown, the current workgroup is probably not a “Patrol” group. In this case you must first specify a new workgroup (see page 45).	
	Result: The loggers in the workgroup are listed.	
2	If necessary, you can call up another logger group using the drop-down list at the very top of the screen.	
3	Select the logger list and then the logger to be connected to the repeater. If the respective reader is already preset, apply the “**Select Repeater**” button.	
	Result: A window for registering the repeater in the Commander automatically opens on the screen.	
4	Use one of these two methods to register the repeater:	
	Automatic detection: Move the switched off repeater close to the Commander and switch it on. Once the repeater is detected, **New ID found** appears on the screen. The ID of the repeater is displayed underneath. Use the **Accept** button to confirm.	**Manual input:** Enter the repeater’s six-digit ID with the virtual keyboard. Use the **ENTER** button to confirm.
	Result: The following display opens on the screen:  This display can be used to test the quality of the wireless connection between the logger and repeater and to find a suitable location for the repeater.	

Step	Description
5	Apply the **Start** button.
	The logger and repeater are connected. The vertical blue line in the bar indicator shows the strength currently of the wireless connection between the logger and repeater. • Green area … good connection • Yellow area … poor connection
6	Look for a suitable place around the installed logger for fitting the repeater. When doing so, keep an eye on the signal strength indicator on the Commander, or watch the status LED ⓫ on the repeater: • Lights up green … good connection • Lights up yellow … poor connection • Flashes blue … no connection to the logger
7	When you have found a suitable position for the repeater, apply the **Accept** button on the Commander.
	Result: The logger and repeater are now “paired” with each other. Any communication with the logger now automatically takes place via the repeater. This is the case until the repeater is switched back off.

Installing the repeater

When installing the repeater, you should observe the following:

- The wireless signal between the logger and repeater should be as strong as possible (green); if the connection is poor (yellow) interference can easily occur, causing the read-out to fail.
- The place of installation should be somewhat elevated, e.g. at a height of 2 m on a lamp post, or similar.
- The repeater should not be too easily accessible, to prevent theft or vandalism.
- The repeater must not be a nuisance to anyone or infringe any property laws.
- While measurement takes place, no impairment of the wireless connection should be expected due to external influences.

You can, for example, attach the repeater to a street lamp, house wall or, if necessary, to a tree. To do so, use the supplied cable ties, for example, or any other form of fastening that does not cause damage.