SePem® 01

Operating Instructions

SEWERIN
Technologies for leak detection.

Measurable success by Sewerin equipment

Congratulations.
You have chosen a quality instrument manufactured by Hermann Sewerin GmbH.
Our equipment will provide you with the highest standards of performance, safety and efficiency. They correspond with the national and international guide-lines.

Please read and understand the following operating instructions before using the equipment; they will help you to use the instrument quickly and competently. If you have any queries we are available to offer advice and assistance at any time.

Yours

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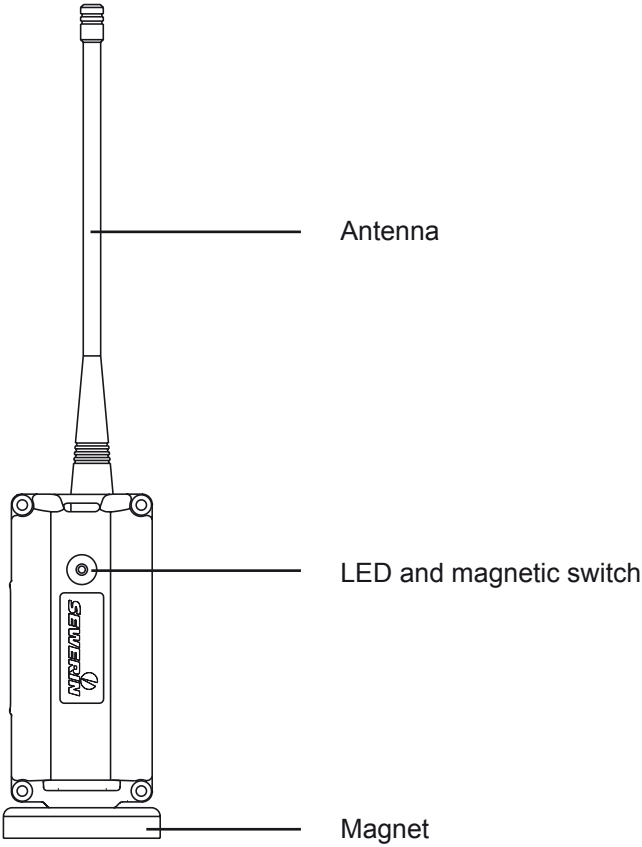

Fig. 1: **SePem 01 Logger**, front view with antenna

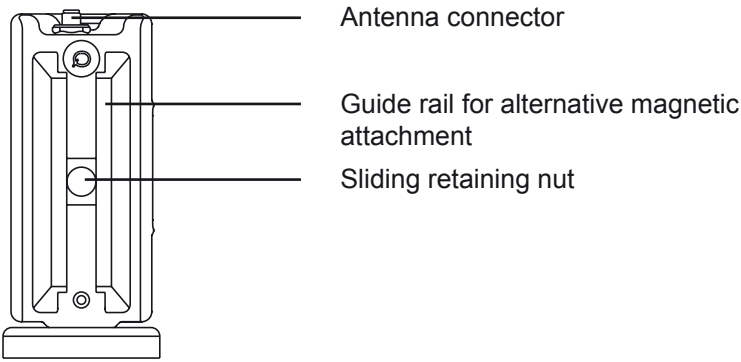

Fig. 2: **SePem 01 Logger**, rear view without antenna

Fig. 3: **SePem 01 Master** without and with antenna

Operating Instructions

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CAUTION!
This symbol is used to indicate dangers which may either result in hazards for the operators or in severe damage – or even destruction – of the product.

Note:
This symbol is used to call attention to information and tips which may be helpful and which are exceeding the basic operating procedures.

1 Introduction

The **SePem 01** system is used for the early detection of leaks in water pipe networks. The design is particularly aimed towards stationary operation, i. e. for use in continuous monitoring of water pipe networks at fixed measurement locations over long periods of time (several years). The system can also be used for mobile monitoring applications.

The **SePem 01 Master** programming and read-out unit allows the system to be operated without the need for a personal computer.

SePem 01 is designed exclusively as a prelocation system. Indications by the system that a leak is present must, therefore, always be verified using an appropriate method (e. g. correlation).

Unlike the **SePem 02** system, the **SePem 01** does not use a modular construction.

2 General information

2.1 Warranty

The following instructions must be complied with in order for any warranty to be applicable regarding functionality and safe operation of this equipment.

Hermann Sewerin GmbH accepts no liability for any damages resulting from non-compliance with these instructions. The warranty and liability provisions of the terms of sale and delivery of Hermann Sewerin GmbH are not affected by the information given below.

- This product must only be operated after the relevant operating instructions have been read and understood.
- This product must only be used for its intended purpose.
- This product is only suitable for use in industrial and commercial applications.
- Repairs must only be carried out by a specialist technician or by other suitably trained personnel.
- Changes or modifications to this product must not be carried out without approval from Hermann Sewerin GmbH. The manufacturer cannot be held responsible for damages if unapproved modifications have been made.
- Only accessories supplied by Hermann Sewerin GmbH may be used with this product.
- All repairs must be carried out using replacement parts that have been approved by Hermann Sewerin GmbH.
- Only approved antennas and batteries (disposable and rechargeable) may be used.
- The manufacturer reserves the right to make technical modifications in the course of further development.

Generally applicable safety and accident-prevention regulations must be complied with, in addition to the information provided in this manual.

2.2 Intended use

SePem 01 is a measurement data recording and evaluation system. The system is designed for use in the stationary and mobile monitoring of water pipe networks.

Only suitably qualified employees (skilled staff, specialists and technicians) of water utility companies may operate the **SePem 01** system.

All applicable safety regulations and accident prevention regulations must be complied with when using the **SePem 01** system and its components.

Detailed information on appropriate operating conditions for the components of the **SePem 01** system when installed are provided in the appendix (Sect. 7.1).

All components used in the **SePem 01** system have been manufactured in accordance with all statutory legal and safety regulations. All components used correspond to the state-of-the-art and conform to EC requirements. The system is safe to operate when used in accordance with the instructions provided.

However, if the system is used incorrectly or not for its intended purpose, the components could present a risk to persons and property.

2.3 Safety information

These operating instructions must be read carefully and in full. All advice given in these operating instructions must be followed.

WARNING!
All applicable accident prevention regulations must be observed.

SePem 01 Logger and SePem 01 Master

- Do not carry out any modifications to the **Logger** and **Master** units or otherwise change or tamper with them in any way. Never open the units. Failure to observe the above instructions will invalidate the warranty.
- Only use SEWERIN-approved replacement parts and accessories.

Antennas on the SePem 01 Logger and SePem 01 Master

Antennas used with the **Logger** and **Master** must be free from damage.

- Never carry a unit by its antenna.
- Never bend, kink or cut the antenna.

Only use SEWERIN-approved replacement antennas and antenna attachments.

SePem 01 Logger only

WARNING! Hazardous to life and property.
The Logger contains a powerful magnet.
Persons with heart pacemakers must avoid close proximity to the Logger.
The **Logger** must be kept away from magnetic storage media (diskettes, hard drives, credit cards, etc.), monitors (PC, TV) and clocks.

- The power supply for the **Logger** is provided by a permanently installed lithium battery. This **battery must only be replaced by SEWERIN Service**.
- Do not expose the **Logger** to temperatures above 70 °C.

SePem 01 Master only

- The **Master** unit is splash-proof to IP 54 standards, but is not waterproof. Do not expose the unit to any source of moisture that could enter the device.
- Keep all connections (power supply, antenna, USB port) free from dirt.
- It is essential to read section 5.3 before attempting to replace batteries. Failure to observe the instructions provided may result in injury to the user and/or damage to the **Master** unit.
- Ensure that units will not be exposed to extremes of temperature during operation or storage (see appendix).

3 SePem 01 system

3.1 System components

The **SePem 01** system (**SePem 01** for short) comprises:

- **SePem 01 Logger, Logger** for short**,** (see Sect. 4) for recording measurement data
- **SePem 01 Master, Master** for short**,** (see Sect. 5) for reading out and evaluating measurement results and for programming the **Loggers**

A single **Master** can be used to manage up to 400 **Loggers**. A wide range of accessories is available for both **Loggers** and **Masters**.

3.2 Mobile operation as an alternative to stationary operation

The aim of stationary applications is to provide **permanent** monitoring over a large area, whereas mobile applications of the **SePem 01 are aimed** at **regular** checks carried out over smaller areas.

Mobile operation represents a cost-effective alternative to stationary operation as only a limited number of Loggers are necessary. The Loggers will typically be installed for a few days to provide comprehensive coverage in the monitoring area. The measurement data that is recorded can then be read out and evaluated at regular intervals. Monitoring of the area is completed when any leaks detected are repaired. The **Loggers** can then be moved to the next monitoring area.

3.3 Operating principle

3.3.1 Monitoring procedure (overview)

The **SePem 01** system operates according to the following principle:

- First, program the **Logger** (see Sect. 5.5.3)

  For each individual **Logger**, establish where it will be used to gather measurement data and at what times.

- Install the **Logger** at the measurement location (see Sect. 4.3)
- The **Logger** works autonomously, i. e. it records data at the predefined times.
- Read out the measurement results using the **Master** (see Sect. 5.5.2)

  The **Logger** will transmit the measurement results at regular intervals within a prescribed period of time. The period of time is referred to as the radio time frame and is specified during programming.
  The operator must transport the **Master** to within the radio transmission range of the **Logger** to read out the data. This can either be done on foot or by driving past the measurement location slowly in a vehicle. The measurement results will be transferred automatically from the **Logger** to the **Master** as soon as the user enters the radio transmission range.

  It is also possible to read out additional information relating to the Logger itself and to display a chart of the measurement (Graphics).

- Evaluate the measurement results immediately or later with the **Master** (see Sect. 5.5.2.2 - 5.5.2.4, 5.5.4)

3.3.2 Radio frequency for data transmission

The data transmission principle used by the **Logger** and **Master** units is the same as when making a call on a mobile telephone.

However, there is an important difference in the **limitation of transmission range**. When it is installed in a shaft, the **Logger** will have to transmit its data out of the shaft. The range of the radio signals is thus heavily dependent on the shielding effects of the shaft, especially the cover. As a general rule, the radio signals

can be expected to have a range of **30 – 70 m** from the installation position. The range may be extended up to 100 – 200 m in the case of plastic covers.

3.3.3 Principles of leak detection

Depending on whether it is used as a stationary or mobile system, the **SePem 01** utilises different techniques to interpret the measurement results to establish whether or not a leak is present.

Note:
Leak alerts will not be issued if there is background noise (frequency 50 Hz or 100 Hz). Please refer also to the information on interpreting the measurement results and leak alerts in Sections 5.5.2.3 **–** 5.5.2.5.

3.3.3.1 Leak detection with mobile operation

In order to determine whether or not the measurement data recorded by a **Logger** used as a mobile unit indicates a leak, an alarm threshold is specified in the **Master** (**absolute value**). If the minimum noise level measured exceeds the specified threshold value then the operator will be alerted to a leak.

The level that is set for the alarm threshold will depend on the material of the pipe in the vicinity of the **Logger**. It is therefore possible to set the alarm threshold in the **Master** for each individual **Logger**.

3.3.3.2 Leak detection in stationary operation

When used in a stationary application, the leak detection method employed by the **SePem 01** is based on a mathematical relationship that compares measurement values at different points in time (detection of **variations).** The following points must be taken into consideration when evaluating results:

- The water pipe network must be leak-free before setting up any **SePem 01** units for stationary use.
- Only leaks that occur after the monitoring has been started will be detected.
- A leak alert will only be issued after three measurements have been taken since the first occurrence of the leak; this avoids false detection of leaks due to short-term fluctuations.
- It is possible that false leak alerts may be issued (e. g. as a result of prolonged heavy rain).

4 SePem 01 Logger

4.1 Functionality and construction

The **SePem 01 Logger** is a noise level logger. It can acquire and save data from water pipe networks. Data is exchanged with the **Master** by radio.

The robust, waterproof, diecast aluminium housing means the Logger is suitable for permanent installation under manhole covers and in hydrants.

An illustration of the **Logger** with all parts labelled is provided on the inside front cover.

Mounting

The unit can be **mounted** on metal objects using the magnet. If it is necessary to monitor a plastic pipe then the **Logger** must be attached to the fittings.

Power supply

The power supply is provided by a permanently installed lithium battery that has a guaranteed lifetime of several years under normal operating conditions. ("Normal operating conditions" correspond to the standard settings stored in the **SePem 01 Master** under **Logger configuration** (see Sect. 5.5.3.6).)

WARNING!
The **SePem Logger** must never be opened by the operator. The unit will be **prone to leakage** if opened.
Used batteries must only be replaced by SEWERIN Service. There is a risk of **explosion and/or poisoning** if batteries are changed incorrectly.

4.2 Specifying a device number (optional)

Every **Logger** is assigned an 11 digit serial number by the manufacturer before shipping. In order to simplify the job of managing the **Loggers** (in the **Master** software and at the measurement location) it is possible to assign each unit a device number. Any **number may be selected**, up to a **maximum of four digits**. This number could, for example, be the same as the last four digits of the serial number.

- It is advisable to decide on a format that can be used as the device number for all **Loggers**.
- Each **Logger** should be labelled with the device number.
- The device numbers should be saved with the corresponding serial number in the **Master** (see Sect. 5.5.4.1).

4.3 Installing the Logger at the measurement location

4.3.1 Suitable installation locations

The **Logger** can be mounted on:

- Pipes
- Fittings (slide gates, underground hydrants, above-ground hydrants)

Note:
Only attach the **Logger** to above-ground hydrants if it is possible to protect the device against theft and vandalism.

The units can be installed in water pipe networks constructed from both metal and **plastic piping**. However, please note the following points relating to plastic water pipe networks:

- The **Logger** cannot be mounted directly on the pipe, instead it has to be attached to a fitting
- Sound is not transmitted as well as in metal pipework systems.

4.3.2 Distance between two Loggers (recommended)

The following spacing between each Logger is recommended to allow systematic monitoring of an area:

Water pipe material	Logger location	Recommended distance between two Loggers
Metal	Fitting	300 – 500 m (mobile) 500 m (stationary)
Plastic	Fitting	50 – 100 m

For highly intermeshed water pipe networks, the distance between Loggers may have to be reduced accordingly.

4.3.3 Logger preparation

The preparatory work required for each **Logger** includes:

- Attaching the magnet and antenna to the **Logger** housing in such a way that it will be easy to install at the planned installation location.
- Initial programming of the **Logger.**

4.3.3.1 Attaching the magnet and antenna to the Logger

There are several possible configurations for attaching magnets and antennas to the housing. Select the most suitable configuration based on the features of the installation location.

Magnet

Attachment options:

- Thread on the side opposite the antenna connector.
- Retaining nut in the guide rail

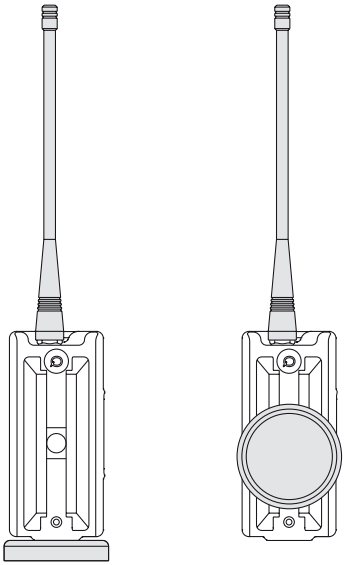


Fig. 4: Mounting points on the housing for attaching the magnet

If the retaining nut in the guide rail is used, there is the additional option to slide the magnet up and down until the optimum position for a given installation location is found. Where the **Logger** is to be mounted in a horizontal position, the magnet should be positioned in the guide rail as far away as possible from the antenna connector in order to maximise the sensitivity of the internal microphone.

Antenna and antenna adapter

The antenna can be screwed directly into the threaded antenna connector.

If there is limited space at the installation location then a magnetic antenna adapter (optional accessory) can be used. This is screwed into place between the antenna connector and the antenna. This provides much more flexibility when positioning the antenna during installation. The magnetic attachment should be fitted at the installation location in such a way that the antenna does not come into contact with any other materials (e. g. walls of the shaft).

Fig. 5: Antenna adapter

- Check carefully to ensure that all **contacts are clean and dry before screwing in the** antenna / antenna adapter.
- The antennas/antenna adapters must be tightened firmly by hand. This is necessary to ensure the unit is properly leak-tight and to guarantee a good radio signal.

WARNING! Risk of damage!
Never use **any tools** to assist in tightening the antenna/antenna adapter. This could lead to damage to the internal contacts.

4.3.3.2 Initial programming of the Logger

Before installing the **Logger** at the measurement location it must be programmed, i. e. data relating to measurement times, measurement duration and the radio time frame etc. must be transferred from the **Master** to the **Logger**. Radio contact between the two devices must be established to carry out programming.

- First prepare the **Master** for programming the **Loggers** (see Section 5.5.3, in particular 5.5.3.3).
- Move a magnet (e. g. the magnet on another **Logger**) over the magnetic switch on the **Logger** to be programmed. The LED will start to flash twice a second. The **Logger** is now in receive mode.

  The **Logger** will remain ready to receive information for one minute after activation.
- Move the **Master** into the transmission range of the **Logger**. Transfer the data (see Sect. 5.5.3.5).

If a radio connection is not established between the **Master** and the **Logger** within the available time frame then the **Logger** will automatically switch off and must be reactivated as required.

Note:
If the device settings for the **Logger** are changed in the course of further work then the radio time frame can be used to transfer the relevant data. The **Logger,** therefore, does not have to be activated manually every time.

4.3.4 Correct installation of the Logger

The **Logger** is fixed into position at the installation location using the magnet (Note: follow instructions in Sections 4.3.1 and 4.3.2).

If an antenna adapter is used then the antenna must also be mounted using the magnetic attachment. It is important in all cases that installation is carried out very carefully, especially when positioning the antenna.

Please note the following points:

- **Never carry the Logger by the antenna;** this can cause damage to the antenna.
- Ensure that a **good metal-to-metal contact** is formed between the **Logger** magnet and the body to which it is attached.

  It is important that structure-borne sound is not damped by dirt, mud or rust. **Clean** the attachment point if necessary before mounting the **Logger** magnet.
- The antenna must not touch any metal parts at the installation location.
- The **antenna** must **not be bent or shortened**. The available space should be evaluated to ensure that the antenna remains straight and will not come into contact with any other object after the shaft cover is closed.

5 SePem 01 Master

5.1 Functionality and construction

The **SePem 01 Master** is the programming and read-out device for the **SePem 01 Loggers**.

The following tasks can be performed using the **Master**:

- Program the **Logger**
- Read out measurement results and device data from the Loggers
- Evaluate the measurement results (including chart)
- Change Logger data

An illustration of the **Master** with all parts labelled is provided on the inside front cover.

Antenna

The **Master** antenna guarantees a reliable bidirectional radio connection between the device and the Loggers. This is important because all measurement data, device data and programming data for the **Loggers** is transmitted using radio signals.

Supporting bracket

The supporting bracket can be used for carrying the unit and as a stand. The supporting bracket can be adjusted to different positions. With the bracket turned to the rear of the unit, the Master can be stood up safely in a convenient position for reading the display.

Display illumination

The duration for which the display is illuminated can be adjusted. The light will come on whenever a key is pressed or the jog dial is moved (except when battery is almost flat).

Memory

The **Master** saves the measurement results in a **ring memory**. This means that when the memory is full i.e. when there is no more storage space available, the oldest data is automatically overwritten by the newest data. The unit will generate a warning to alert the user that memory is low.

5.2 Using the Master in vehicles

The most efficient way to program the **Loggers** and read out data is to drive slowly through the transmission range of the **Loggers** in a vehicle with the **Master**. This is generally preferable to a foot patrol. It is important to ensure a stable radio connection between the **Master** and **Loggers** for the data transmission.

Note:
When programming the **Loggers** from a passing vehicle it is imperative to always maintain the radio connection.

The **Master** antenna can be swapped for a **magnetic antenna attachment which is placed on the vehicle roof** (optional accessory) to improve the reception quality.

It should be noted that the unit will drain power from the vehicle battery when the engine is not running if this is used as an **external power source** for the **Master** (using the TG8 docking station and M4 vehicle cable). The **Master** should therefore always be switched off when not in use.

5.3 Power supply

5.3.1 Options

There are various power supply options available for the **Master**:

- Disposable batteries (x4)
- NiMH rechargeable batteries (x4)
- External, using mains or vehicle battery

> **Note:**
> The **Master** does not include an integral battery charger.

Switch off the device when not in use to prolong the life of the batteries.

5.3.2 Special features of rechargeable batteries

> **WARNING!**
> Only SEWERIN rechargeable batteries may be used for the **Master**.

Rechargeable batteries must be removed from the device for recharging and charged in an external charger.

5.3.3 Changing the batteries

A 2.5 mm Allen key (supplied) is required to open the battery compartment on the back of the device.

- Loosen the two screws securing the battery compartment. Remove the screws by repeatedly turning them alternately a short way; this ensures that the cover does not jam.
- Lift off the cover.
- Remove the disposable/rechargeable batteries and insert new ones. Ensure that the batteries are inserted with the correct polarity.

- Replace the cover so it fits neatly into place and attach firmly with the screws.

Note:
The date and time will need to be reset under **`Master settings`** if it takes longer than four minutes to replace the batteries (see Sect. 5.5.5).

5.3.4 External power supply

External power supply options:

Power source	Accessories required	Use power supply connection on...
Mains socket	M4 AC/DC adapter	**Master**
	TG8 docking station and M4 AC/DC adapter	TG8 docking station
Vehicle battery	TG8 docking station and M4 vehicle cable	TG8 docking station

The **M4 vehicle cable** is available in various models.

5.4 Operation

5.4.1 Keys and jog dial

The ON/OFF key is the only control on the device that does not change its function.

When switched on, the device is operated using the jog dial and function keys to navigate the display.

Control	Action	Function
ON/OFF button	Press	● Switch the device on ● Switch the device off
Function keys F1, F2, F3	Press	● Variable ● As indicated on the display at the bottom of the screen ● Function keys may also have no function assigned in some cases.
Jog dial	Turn	● Select between vertically or horizontally adjacent functions, settings, measurement results, etc. ● Modify values
	Press	● Open the next program level (e. g. menu item, function, measurement results, selectable values) ● Confirm values

5.4.2 Standard functions

The following functions are frequently required to operate the **Master**:

Standard functions		
Back	F3	Return to previous program level
Accept	F2	Save a modified value
Delete **Delete list**	F2	Delete an individual value or a list

5.4.3 Warning prompts

Warning prompts may be displayed in connection with certain functions (e. g. **Delete**). The intention is to prevent the operator from accidentally performing actions that could lead to loss of data.

Every warning prompt is also accompanied by the following:

- **Visual signal:** flashing signal light
- **Audible Signal:** the buzzer will sound

The audible signal can be switched off in the **Master settings**.

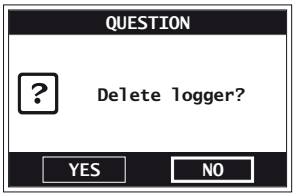


Fig. 6: Warning prompt

Use the jog dial to select **YES/NO** when prompted.

5.4.4 Entering text

You can save **comments** and the **location** for each **Logger** in the **LOGGER DATABASE**. The entry can be up to 20 characters long.

The window for entering text is called **EDIT TEXT**.

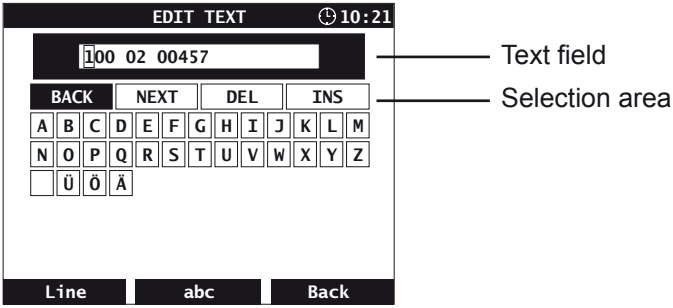


Fig. 7: Edit text

Text field

The text field always contains the last comment/location entered for the **Logger**. The previous entry is overwritten when you enter new text.

The cursor must be moved to each entry position for overwriting. This is done using the jog dial and the functions in the first line of the selection area (**BACK**, **NEXT**, **DEL**, **INS**).

The factory default setting for this field is the serial number.

Selection area

The selection area can be navigated as follows:

- Turn the jog dial forwards or backwards
- Use **F1** **Line** to jump to the next line.

The functions in the first line of the selection area are used to select the cursor position in the text field.

Function	Effect in text field
BACK	Move cursor back one character
NEXT	Move cursor forward one character
DEL	Delete the character at the current cursor position
INS	Insert a character in front of the current cursor position.

Characters and functions in the first line must always be **confirmed** after selection by pressing the jog dial.

Function key assignment

Function keys		
Line	F1	Move to next line in selection area (only forwards)
abc **0-9** **ABC**	F2	Switch to next character set ● **ABC** Upper case ● **abc** Lower case ● **0-9** Numbers and special characters
Back	F3	Return to previous program level

5.4.5 Scrolling in charts

The **Master** can display data in charts. The corresponding windows are called **GRAPHICS** and **HIST. GRAPH**.

The charts always show all the data in one image. If there is a large amount of data, the values will be compressed in the chart.

If you want to study individual values in more detail, you can view the chart in scroll mode. Switch to scroll mode using **F2** **Scroll**. Use **F2** **No scroll** to exit scroll mode again.

Function key F2	
Scroll	Switch to scroll mode
No scroll	Exit scroll mode

Information on scroll mode

A cursor appears in the chart in scroll mode. This can be moved to the left and right by turning the jog dial.

Information relating to the respective cursor position (date and time, current noise level) is displayed above the chart.

If there is a large amount of data available for a measurement, i.e. when the values are compressed, there may be several values at one cursor position. In such cases, the highest and the lowest noise level at the cursor position are shown with the corresponding time.

5.5 Firmware menus and Master - Logger interaction

5.5.1 Main menu (overview)

The main menu is the central starting point for all tasks performed using the **Master**. It is the highest program level.

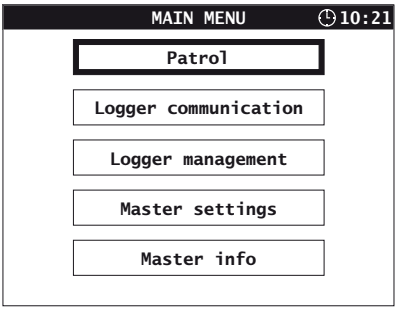


Fig. 8: Main menu

The main menu appears automatically when the unit is switched on, unless the Master settings specify that the program starts in patrol (see Sect. 5.5.5).

The five menu items in the main menu allow the following tasks to be carried out or information to displayed:

MAIN MENU	
Patrol	● Read out measurement results from the Loggers
Logger communication	● Program the **Loggers**; transmit Logger data to the **Loggers** ● Read out measurement results from individual Loggers ● Online measurement
Logger management	● Manage measurement results and Logger data
Master settings	● Configure the **Master**
Master info	● Information about the **Master**

5.5.2 Patrol

Data saved in the **Logger** is read out (collected) by the **Master** during a patrol.

The purpose of a patrol is to:

- Keep track of the locations of leaks detected
- Collect measurement results for viewing and evaluation at a later point in time away from the location.

The **`Patrol`** window will appear as soon as **`PATROL`** is selected from the menu (and confirmed). This will display an overview list of the measurement results for all **Loggers** that have been read.

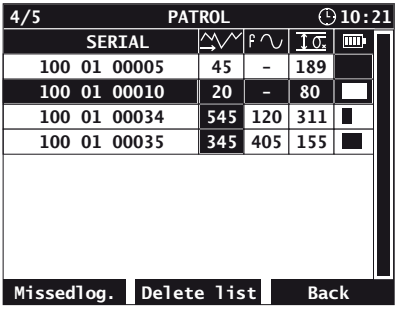


Fig. 9: Patrol - overview of Loggers from which data has been collected

> **Note:**
> The **`Patrol`** window only displays Loggers which have successfully completed a measurement (with the exception of **`Permanent`** measurements, which do not have to be complete.)

The number of **Loggers** read by and known to the **Master** (see Logger database) is shown in the top left-hand corner (in e.g. 4/5, i. e. 4 Loggers read, 5 Loggers known).

The overview will usually be empty at the start of a patrol because the list is automatically deleted from the overview and moved to the **`Patrol lists`** when the unit is switched off.

F1 **`Missed Log`** displays a list of all **Loggers** which have not yet been read out during the current patrol. The **Loggers** must be saved in the Logger database for this to happen.

5.5.2.1 Requirements for a successful patrol

- **Master** is switched on, **PATROL** window is open
- The operator and the **Master** are within the radio transmission range of the **Logger**
- The radio time frame of the **Logger** is open, i. e. the **Logger** is ready to send.

Note:
The **Master** can only receive data when the **PATROL** window is open.

5.5.2.2 Patrol procedure (overview)

1. Operator
- Transports **Master** to within radio transmission range of the **Logger**

2. Logger
- Ready-to-send (radio time frame open)

3. Master
- Receives the most recently stored measurement results - a new line appears in the **PATROL** window
- Synchronises the **Logger** with the time of day stored in the Master (corresponds to **Master settings**)
- Sends an acknowledge signal to the **Logger**, indicating that the radio time frame is to be closed in **5** minutes

4. Operator
- Analyses the measurement results received (see Sect. 5.5.2.3)
- Continues from Step 5 if the measurement results are to be analysed in more detail
- Otherwise repeat from Step 1 with the next **Logger**

5. Operator
- Keeps the **Master** within the radio transmission range of the **Logger** to allow the extended data set to be read out (remember there is only a 5 minute period in which to do this!)
- Chooses the required **Logger** in the **PATROL** window (select and confirm)

6. Logger
- Sends the extended data set for the chosen measurement

7. Master
- Displays the window **SELECTED LOGGER**

8. Operator
- Can analyse the extended data set (see Sect. 5.5.2.4 and 5.5.2.5)
- Can terminate communication with the **Logger** - press **F3 Back**; the **PATROL** window will be displayed.

5.5.2.3 Analysis of measurement results read out

The measurement results read out during the patrol (see Sect. 5.5.2.2, procedure to Step 3) must always be analysed and critically assessed.

The following values give information about the quality of the measurement and any leak:

Value	Indication of	Description
Minimum noise level 	Possible presence of a leak	● Close to zero > no leak ● Much greater than zero > possible leak
Characterising frequency of measurement 	Fault	● 50 Hz or 100 Hz > background noise > usually no leak
	Location of leak	● Low > possible leak is some distance away ● High > possible leak is not far away
Width 	Quality of measurement	● Small > low inference noise > good measurement ● Large > high interference noise > bad measurement

Note:
In the factory settings the **Characterising frequency of measurement** column is hidden. To display the column you will have to change the Master settings.
If graphics are required for analysing the measurement results then the extended data set must be read out. In this case, the patrol should be carried out as per the procedure described in Sect. 5.5.2.2, Step 5 onwards.

The following information is transmitted in addition to the measurement results when data is read out:

Note		Description of alert
Leak alert	Column 	● Numeric value inverted
	Signal light	● Visual signal: lit for long period
	Buzzer	● Audible signal: long signal
Remaining Logger battery power less than 10% (battery needs changing)	Column 	● Field is black ● No segments can be seen

Please note: A **leak alert is not a guarantee that a leak is actually present**.

In cases where the analysis of the measurement results confirms that a leak may be present, this result should be checked using an appropriate method (e. g. correlation) before any excavation work is carried out.

5.5.2.4 Extended data set

The extended data set provides additional information on the following:

- A measurement (e. g. graphics)
- The transmitting **Logger** (e. g. radio times, last seven minimum noise levels recorded).

The extended data set allows the measurements to be analysed in more detail and the **Logger** to be checked for correct functioning.

The extended data set for a measurement can be obtained by carrying out the patrol procedure in Sect. 5.5.2.2 as far as Step 6.

Note:
The extended data set can only ever be read out for the most recent measurement carried out by a Logger or the measurement currently in progress.

Extended data set: values in the Patrol menu	
General	Battery capacity, device number, next service, firmware release, errors (optional)
Radio times	Days, start, duration, patrol style, economy mode
Measurement times	Date, time, duration, interval, type, alarm threshold, status
Measurement results	Minimum level, characterising frequency, width, measurement temperature, sensor
Last minimum noise level (optional)	Displays of the last seven values (maximum)
Graphics	Displays the Graphics

At the end of the patrol part of the extended data set is saved in the **Logger database**.

Extended data set: saved values in the Logger database (History)	
Measurement times	Date, time, duration
Measurement results	Minimum noise level, characterising frequency, width, read-out time
Graphics	Displays the Graphics
Last minimum noise level (optional)	Displays of the last seven values (maximum)

5.5.2.5 Graphics

The graphics component of the extended data set (see Sect. 5.5.2.4) is particularly important for the thorough analysis of a measurement. The shape of the curve can give an indication that a leak may be present.

It is possible to view the graphics either during a patrol or at a later point in time.

Viewing the graphics during a patrol

- Using the **PATROL** menu, select the appropriate **Logger** (and confirm). The **SELECTED LOGGER** window will appear.
- Select **Data / Results** from the menu.
- Turn the jog dial until the **Graphics** window appears (last window).

Viewing the graphics after completing a patrol

- From the main menu select **Logger management** and then **Logger database**. The **LOGGER DATABASE** window will appear.
- Choose the required **Logger** (select and confirm). The **HISTORY** window will appear.
- Choose the required patrol (select and confirm). The **GRAPHICS** window will appear.

Analysis of the graphics

The x-axis corresponds to time, the y-axis is the measurement value (noise level).

A noise level that is continuously much higher than zero may indicate the presence of a leak (Fig. 10).

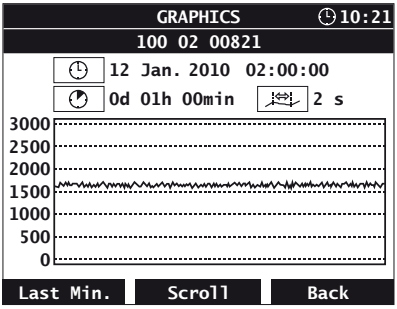


Fig. 10: Graphics showing a high probability of a leak

If the noise level is continuously close to zero then the probability of a leak is low (Fig. 11). Short, high peaks (spikes) may indicate, for example, passing vehicles or water being withdrawn for a short period.

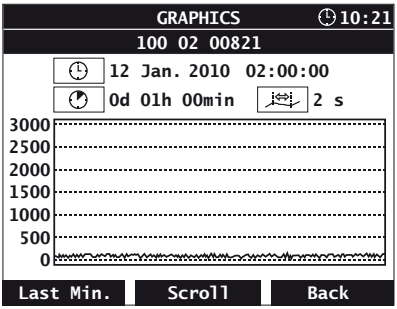


Fig. 11: Graphics showing a low probability of a leak

5.5.3 Logger communication

The **LOGGER COMMUNICATION** is used to control the exchange of data between the **Master** and the **Logger**. Data includes both measurement results and Logger data (see Sect. 5.5.3.1 and 5.5.3.2).

The Logger communication uses different methods for data transmission to a single **Logger** and transmission to multiple **Loggers** (see Sect. 5.5.3.5).

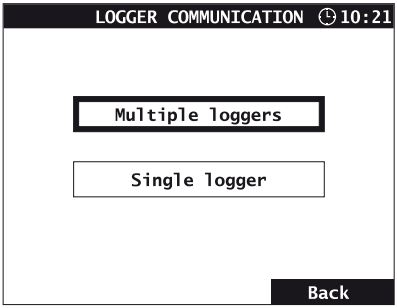


Fig. 12: Logger communication

LOGGER COMMUNICATION	
Multiple loggers	● Configure and program as many Loggers as you wish
Single logger	● Read out Logger data and measurement results ● Online measurement ● Configure and program a single Logger

5.5.3.1 Logger data features

Logger data is either:

- Specified in the **Master** (e. g. radio times and measurement times) or
- Stored internally in the unit (e. g. next service due, firmware release).

Radio times and measurement times must be transmitted to the **Logger**, which results in the **Logger** being programmed.

For monitoring purposes, it is also possible to subsequently read out Logger data from a **Logger** using the **Master**.

LOGGER DATA	
General	Battery capacity, device number, next service, firmware release
Radio times	Days, time, duration, patrol style, economy mode
Measure-ment times	Start of measurement ("Start in" or date), time, duration, interval, type, alarm threshold, status

5.5.3.2 Measurement results features

Measurement results are calculated from the measurement data collected by the **Logger** and can be read out using the **Master**. All measurement results are assigned to the appropriate Logger ID.

MEASUREMENT RESULTS
Logger identification, minimum level, characterising frequency, width Optional, depending on the program settings: battery capacity, leak alert, measurement temperature, sensor

5.5.3.3 Multiple Loggers (Logger configuration)

The menu item **Multiple Loggers** goes directly to the **LOGGER CONFIGURATION** menu. This includes the options **Measurement times**, **Radio times** and **Miscellaneous**. Once entered, the settings can be sent to any desired number of **Loggers** (see Sect. 5.5.3.5).

Please note the following configuration tips:

- The windows **Measurement times**, **Radio times** and **Miscellaneous** are ordered one after the other (turn the jog dial).
- The magnitude of the values set has an influence on the lifetime of the Logger battery. Long radio times, short intervals, etc. reduce the lifetime.
- If values are chosen that are invalid or are not permitted then these cannot be transmitted. They will be automatically corrected.

Measurement times

The settings under **Meas.times** determine how and when a **Logger** will record measurement data.

LOGGER CONFIGURATION	
Measurement times	
Start in	**d** (days) ● Number of days until start of measurement (0-30 d)
Time	**Time** (hours : minutes) ● Time of day at which the measurement should start
Duration	**d h min** (days : hours : minutes) ● Duration of one measurement (meas. type: single and repeat) ● Recording time (Meas. type: permanent)
Interval	**s/min/h** (seconds/minutes/hours) ● Length of time between recording of two measurement values within one measurement period
Type	**SINGLE** > **REPEAT** > **PERMANENT** (meas. type) ● Selection of measurement types (see Appendix)

Radio times

The settings under **Radio times** determine when and for how long a **Logger** is ready to exchange data with the **Master** (**Radio times**). The length of time between two transmission pulses is specified under **Patrol style**.

LOGGER CONFIGURATION	
Radio times	
Days	**SU MO TU WE TH FR SA** ● Days of the week on which the radio time frame will be open ● The ticks can be set or removed using the jog dial
Time	**hrs** (hours : minutes) ● Time of day at which the radio time frame will be open
Duration	**h** (hours) ● Duration of radio connection (1 – 23 h)
Patrol style	**DRIVE > SLOWDRIVE > WALK > STATIC** ● Type of patrol ● specifies the length of time between two transmission pulses ● **DRIVE**: transmission pulse **5 s** equivalent to vehicle at approx. 30 km/h ● **SLOW DRIVE**: transmission pulse **10 s** equivalent to vehicle at less than 10 km/h or stop-and-go traffic ● **WALK**: transmission pulse **30 s** equivalent to foot patrol ● **STATIC**: transmission pulse **60 s** equivalent to stationary measurement

Miscellaneous

The settings available in the **Miscellaneous** option determine the way in which the **Master** operates. It is particularly important to set the correct **Alarm threshold**.

LOGGER CONFIGURATION	
Miscellaneous	
Alarm threshold	**MOBILE** (mobile operation) ● requires a value to be set between 30 and 3000 (in increments of 30). A leak alert is then issued when this value is exceeded (see Sect. 3.3.3.1)
	STATIC (stationary operation) ● There is no alarm threshold for this mode as a different leak detection method is used (see Sect. 3.3.3.2)
Economy mode	**ON** > **OFF** ● **ON**: energy saving mode – **Logger** can still send measurement results (within the radio time frame), but cannot receive data from the **Master** – The **Logger must** be activated with a magnet for programming

5.5.3.4 Single Logger

> **Note:**
> A radio connection must always be established between the **Master** and **Logger** when working with single Loggers.

The **Master will switch to receive mode** as soon as the **`Single Logger`** menu option is chosen (selected and confirmed). The **`LOGGER SELECTION`** options will appear. A selection window will be displayed (initially blank).

- Establish radio connection to the required **Logger** by:
  - Activating the **Logger** with a magnet

  OR

  - Moving the **Master** within the transmission range of the **Logger** (requires the radio time frame to be open).
- Ensure that the **Master** and **Logger** are approx. 1 – 2 m apart.
- Wait a moment. When the internal Logger search has been completed a list will be displayed in the selection window showing up to four **Loggers** detected to which there is a radio connection. (These are **Loggers** with an open radio time frame / manually activated **Loggers**.)

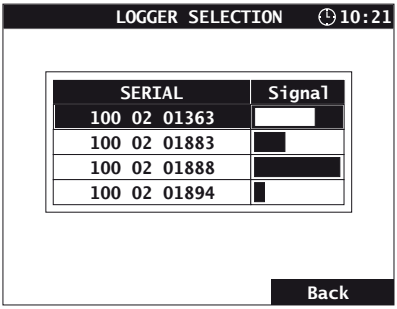


Fig. 13: Logger selection for single Loggers

- Choose the required **Logger** (select and confirm).

Note:
Only select **Loggers** to which there is a radio connection with a good signal quality. These are **Loggers** for which the bar in the Signal column fills at least half of the field.

- The measurement and Logger data for the chosen **Logger** will be read out. The **SELECTED LOGGER** window will then appear.

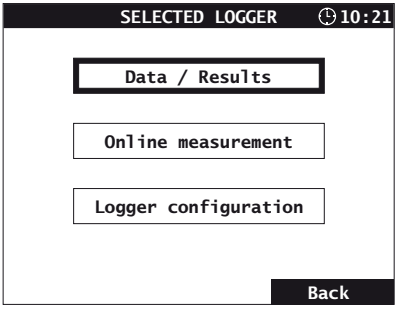


Fig. 14: Selected Logger

The three options in the **SELECTED LOGGER** menu allow the following actions to be performed:

SELECTED LOGGER	
Data/Results	● Display data for the selected **Logger**
Online measurement	● Live recording of measurement data ● Results can be viewed immediately on the **Master** in real time
Logger configuration	● Specify the measurement and radio times for the selected **Logger** (same as **Multiple Loggers**, see Sect. 5.5.3.3)

Data / Results

Data / Results in the menu provides information from the Logger. The Logger data specified in Sect. 5.5.2.4 (1. Table) is listed. Please note that some values are only displayed if the **Logger** has saved corresponding measurements.

Any **Logger errors** detected during read-out will be given under **General** in the last line. The error number given will be important for any contact with SEWERIN Service.

Online measurement

When online measurement is active the measurement data recorded by the **Logger** can be viewed directly on the **Master** in real time.

Note:
Online measurements cannot be saved.

Online measurement is typically used during **mobile monitoring**. This is useful for providing feedback on the noise levels detected by the **Logger** immediately after installation. If the level is close to zero then it will not be necessary to monitor the installation location with a stationary unit. The **Logger** can be removed immediately and reinstalled at another location.

Usually, measurement values are calculated every second. All measurement values are immediately displayed in a chart. The **F2 Stop** key can be used to stop the measurement in order to view the graphics. (Note: The measurement **cannot** be subsequently restarted.) Pressing **F3 Back** will cause the online measurement to be stopped.

Please note the following points:

- The measurement interval (**Logger configuration** > **Meas. times** > **Interval**) specifies the length of time between each measurement that is recorded, and therefore determines the speed at which the Graphics is updated.
- If an online measurement is running at the same time as a predefined measurement then the scale of the time axis will depend on the measurement interval.

5.5.3.5 Transmitting data to the Loggers

To transmit the measurement time and radio time settings to the **Loggers** always use the **F1** `Transmit` option from the `Logger configuration` window. It is imperative to note the following differences between transmission to multiple **Loggers** and transmission to a single **Logger**:

Data transmission to `Multiple Loggers`	
Radio connection	● Must be established with each **Logger** separately: – Use a magnet to activate the **Logger**. Wait until the audible signal is heard. **Warning!** If multiple **Loggers** are active the system will automatically switch off all but one unit. OR – Move the **Master** to within the radio transmission range of the **Logger** (requires the radio time frame to be open).
Start data transmission	● After the radio connection has been established
Destination for transmitted data	● Only the currently active/ready-to-receive **Logger**
Continue data transmission	● Establish a radio connection to the next **Logger**
End of Master's transmission mode	● Radio connection is terminated before the end of data transmission if – The measurement starts within the data transmission time period OR – The connection is terminated by pressing `Back`.
End data transmission	● Ends when no new radio connection is established with a **Logger**

Data transmission to a `Single Logger`	
Radio connection	● Already established
Start data transmission	● Starts as soon as **F1** `Transmit` is pressed
Destination for transmitted data	● Only the selected **Logger**
End data transmission	● Radio connection will be terminated automatically ● Return to main menu
Continue data transmission	● Not possible directly ● Select next **Logger** using `Logger communication – Single Logger` (see also Sect. 5.5.3.4)

Data cannot be transmitted if any invalid entries were made in the `Logger configuration`. A prompt will be displayed to this effect; this must be acknowledged. The system will return to the `Logger configuration` window. The invalid values will be corrected automatically. (Values are adjusted to approximate the requested value wherever possible.) Corrected values are marked to assist with identification. The data can be `transmitted` immediately if the corrected values are acceptable.

Note:
Any existing measurement data will be deleted when transmitting data to `Multiple Loggers`. Please ensure therefore that all measurement results are read out before transmitting.

Loggers programmed (only with `Multiple Loggers`)

After data has been transmitted to `Multiple Loggers` the `LOGGERS PROGRAMMED` screen will be displayed.

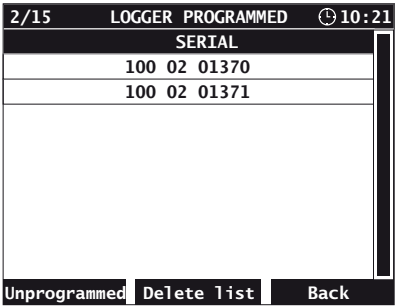


Fig. 15: Loggers programmed

A list of **all Loggers** that have been programmed with the current settings since switching on the **Master** will be displayed.

The **Loggers** are listed using the specified Logger ID (e. g. **FAB**) and sorted according to the time of programming.

In the top left corner is a counter showing the number of programmed **Loggers** and the number of Loggers recognised by the **Master** (see Logger database) - ("2/15" in the example means that 2 Loggers were programmed and the Master has recognised 15 Loggers)

Note:
When the **Master** is switched off the list of programmed **Loggers** will be deleted.

Press **F1** `Unprog. Log.` to display a list of all **Loggers** which have not been programmed since the **Master** was switched on. This will only display **Loggers** that are saved in the Logger database (see Sect. 5.5.4.1). (This means that new **Loggers** that have not yet completed a data transfer will not be shown in the list.)

5.5.3.6 Standard settings

The **Master** has a set of standard settings for the Logger configuration. This set of values has been optimised to provide long battery life for the **Logger**.

Pressing the **F2** `Standard` key will cause all values to be overwritten with the standard settings. No additional warning is provided.

Standard settings for configuration of Loggers	
`Measurement times`	
`Start in`	`1 d`
`Time`	`02 : 00 hrs`
`Duration`	`00 d 01 h 00 min`
`Interval`	`2 s`
`Type`	`REPEAT`
`Radio times`	
`Days`	`TU`
`Time`	`08 : 00 hrs`
`Duration`	`8 h`
`Patrol style`	`DRIVE`
`Miscellaneous`	
`Alarm Level`	`STATIC`
`Economy mode`	`OFF`

Note:
The life of the Logger battery is approx. 40% longer in economy mode (`ON`).

5.5.4 Logger management

Logger management is used for the following:

- Displaying all stored measurement results and Logger data
- Editing Logger data

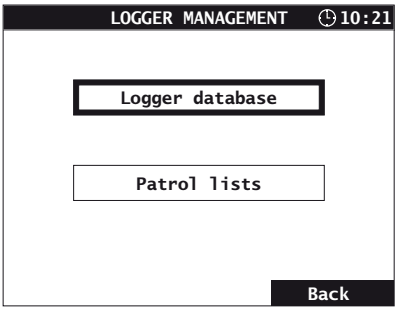


Fig. 16: Logger management

5.5.4.1 Logger database

The **LOGGER DATABASE** option displays a list of all **Loggers** stored. A **Logger** will be identified and saved by the **Master** as soon as there is a radio connection between the two. No distinction is made here between intentional radio connections and those that were established by chance.

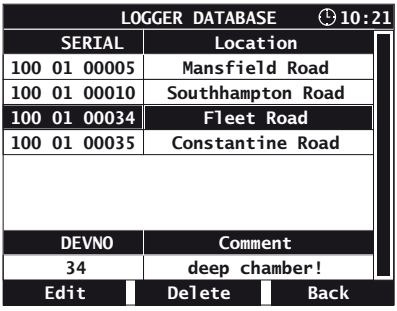


Fig. 17: Logger database

The top section of the window displays a list of **Loggers** sorted by **Serial** number alongside their **Location**.

The bottom section of the window shows the additional Logger data (**DEVNO**, **Comment**) for the **Logger** selected in the list above.

> **Note:**
> All associated **Logger** measurement data will also be deleted when a Logger is deleted from the Logger database.

History

A **History** is saved for each **Logger**. This contains the measurement results for all measurement readings (time of reading, minimum noise level, width, characterising frequency). If the extended data set was read out then this will also be saved (indicated by an 'x' in the last column; see also Sect. 5.5.2.4, second table).

- Select a **Logger** from the **Logger database**.
- Press the jog dial. The **HISTORY** window will appear.

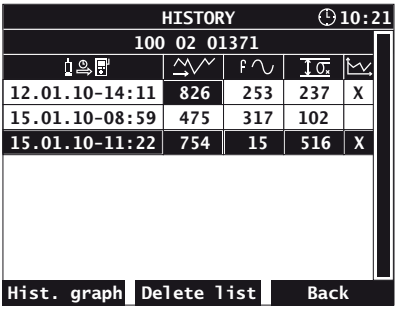


Fig. 18: History

- Optional: **View Graphics**

  Select a measurement result that includes an extended data set (and confirm). The **GRAPHICS** window will appear.

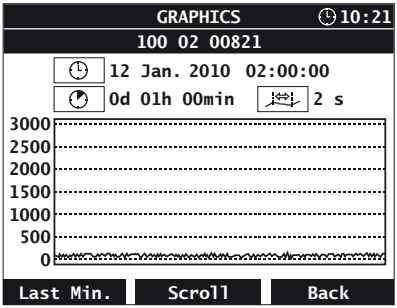


Fig. 19: Graphics in a saved patrol

Pressing the **F1** `Hist. graph` key (in the `History` window) will create a chart plotting the **minimum noise level of all the saved measurements**.

> **Note:**
> The history will be deleted automatically for all **Loggers** if the **Master** memory is deleted.

Edit

Pressing **F1** `Edit` allows you to edit the Logger data saved in the `LOGGER DATABASE`.

EDIT LOGGER	
`Serial`	● Not modifiable
`Device number`	● Any number between 0 and 9999 (see Sect. 4.2)
`Location`	● Text entry possible (see Sect. 5.4.4) ● Factory default setting for this field is the serial number
`Comment`	

5.5.4.2 Patrol lists

During a **PATROL**, all measurement results received will be saved automatically to the **Patrol lists** (see Sect. 5.5.2.2). Whenever

- the **Delete** option is selected in the **PATROL** window
- the **Master** is switched off

the existing data will be saved.

The **Patrol lists** provide the following information:

- Dates of the last four patrols
- The Loggers read during those **patrols**
- Associated measurement results

As soon as you select **Patrol lists** from the menu (and confirm) the **Date / Time** selection window will appear. This will list up to four patrols.

Fig. 20: Selecting patrols

Note:
The **Date / Time** window will not list any patrols the first time the **SePem 01** is used, or when all existing patrol lists have been deleted, or the memory has been erased. A patrol must be carried out in order for a patrol to be recorded! Reading out data from a **Logger** that has been activated manually is not treated as a patrol.

Once a patrol has been selected, a list containing the corresponding measurements will appear (**SAVED PATROL**).

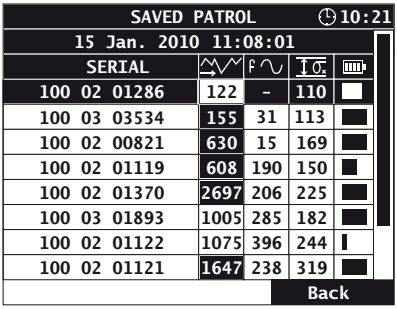


Fig. 21: Saved patrol

The measurements are listed with the Logger ID information (e. g. **FAB**), minimum noise level, characterising frequency, width and remaining Logger battery capacity.

Leak alerts and low logger-battery alerts are indicated using an inverse representation, as described in the **PATROL** section.

It is also possible to access the history for saved patrols (see Sect. 5.5.4.1).

5.5.5 Master settings

The **MASTER SETTINGS** are used to configure the **Master**. The settings will be stored until they are next changed (unless the **memory is deleted**). If it takes longer than four minutes to change the batteries then the date and time must be reset.

MASTER SETTINGS	
Date	(day : month : year) ● Current date
Time	**hrs** (hour : minute) ● Current time
DST	**YES** > **NO** ● **YES:** Change to daylight saving time (for details see Section. 7.5)
Language	**english > deutsch > français > ...** ● Language selection
Illumination	**OFF > 10s > 30s > 1min > 5min > ON** ● Illumination of display ● **ON:** Light permanently on ● **Note:** Long on-times will reduce the lifetime of the battery.
Buzzer	**ON > OFF** ● Switches audible signal off/on
Delete memory	**YES > NO** ● **YES:** Delete **Master** memory ● Affects all data relating to Logger management (Logger data in the **Logger database**, measurement results in the **Patrol lists**) ● **Warning!** This is not a stored setting - effects are immediate.
Contrast	● Sets the contrast of the display
Log. identification	**Serial > DEVNO > LOC** ● Logger ID ● **Master** detects **Loggers** either by the serial number (**Serial**), device number (**DEVNO**) or the location (**Location**)
Auto power off	**OFF > 5min > 10min > 30min** ● Automatic shut down ● Time after which the **Master** switches off if it has not been used ● **OFF**: Automatic shut down disabled

Multiple antennas	**YES** > **NO** ● **YES**: **Master** receives the Logger data from several antennas. **Warning!** If **YES** is selected the **Master** will only be able to receive data, but not send any. **LOGGER COMMUNICATION** is blocked.
Start with patrol	**YES** > **NO** ● **YES**: When the **Master** is switched on the **PATROL** window will appear instead of the **MAIN MENU** window.
Suppress frequency	**YES** > **NO** ● The **Characterising frequency of measurement** column is set to hidden in the factory settings ● Column can be displayed ● Refers to the **PATROL**, **SAVED PATROL** and **HISTORY** windows ● **YES**: column is hidden

Delete memory

The memory can only be deleted if the correct PIN code is entered. This is intended to prevent accidental deletion of the contents of the memory.

- Select **DELETE MEMORY** from the **Master settings** menu (and confirm).
- Select **YES** and press the jog dial.
- Press **F2 Accept**.
- Answer **YES** at the warning prompt.
- Enter the **PIN code 7314**. A message will appear as soon as the last digit is entered to confirm that the memory has been deleted. The unit will then return to the main menu.

5.5.6 Master info

The Master info is solely for information purposes. It is not possible to modify any settings.

MASTER INFO	
	● Serial number
	● Date and time as set in **Master settings**
	● Remaining battery capacity
	● Memory used
	● Release of hardware and firmware
	● Temperature

6 Troubleshooting

The occurrence of an error when working with the **SePem 01** system does not always indicate that a serious problem is present. The following section is designed to help in identifying the cause of a fault and provides advice on correcting the problem.

6.1 Problems with the Logger

Problem/symptom	Solution
Logger cannot be activated (LED does not flash)	● Flat battery > send **Logger** to SEWERIN Service
LED flashes more quickly than 2 flashes/second and Logger switches off again after 3 seconds	● **Logger** faulty > send **Logger** to SEWERIN Service

6.2 Problems with the Master

Problem/symptom	Solution
No radio connection (error message e. g. "Connection to logger terminated!")	● Check radio connection (see Sect. 6.3.1)
Logger 'forgotten' when reading out data	● In future, check under `Patrol` using **F1** `Unprogrammed` that all **Loggers** have been read.
History does not contain any entries	● Memory was deleted OR ● **Logger** is new and no measurements have been read out yet
Not possible to communicate with the Logger	● Economy mode `ON` selected? > If so, then bidirectional radio connection is switched off: **Logger** continues to send measurement results, but **Master** cannot establish contact to **Logger** during the patrol

6.3 Problems with the Master - Logger radio connection

The most common reason for problems with exchanging data between the **Master** and **Logger** is the quality of the radio connection. It is rare for problems to be caused by a device malfunction.

Problem/symptom	Solution
Logger is activated, but the Master does not recognise it	● Check radio connection (see Sect. 6.3.1) ● Improve the radio connection (see Sect. 6.3.2)
Master does not receive data	● Check radio connection (see Sect. 6.3.1) ● Improve the radio connection (see Sect. 6.3.2) ● Check **Logger**: Uninstall **Logger** if required > Move a magnet over the magnetic switch > LED should flash > if not: **Logger** is faulty or battery is flat > send **Logger** to SEWERIN Service ● **Check Master**: antenna on device?
No data received when in vehicle	● Check radio connection (see Sect. 6.3.1) ● Improve the radio connection (see Sect. 6.3.2, Changing the antenna)

6.3.1 Checking the radio connection

Check the following points first if there are problems with radio communication between the **Logger** and **Master**:

- Are all antenna connections clean and dry (**Logger** and **Master**)? Moisture will reduce the quality of the radio connection.
- Are the **Loggers** and **Master** all fitted with SEWERIN-approved antennas?
- Are the **Logger** and **Master** approx. 1 – 2 m apart?
- Are there any other devices nearby that may transmit at the same frequency (433 MHz), e. g. correlators or radio masts?

  Either remove the other transmitting device (e. g. correlator) or select a new installation location (e. g. away from fixed radio mast).

If the interference is not due to one of the causes mentioned above then it will be necessary to establish if the **interference to the radio signal is permanent or intermittent**.

- Test the radio connection between the **Master** and a **Logger** (1. Logger) at another test location that is far away.

Radio communication	Conclusion
OK	Original installation location unsuitable, e. g. due to strong shielding effects or another transmitting device in the area
Not OK	**Master**, **Master** antenna, 1. **Logger** or its antenna faulty

- Test the radio communication between the **Master** and another **Logger** (2. Logger).

Radio communication	Conclusion
OK	1. **Logger** or its **Logger** antenna faulty
Not OK	**Master** or **Master** antenna faulty

6.3.2 Improving the radio connection

There are a number of ways to improve the radio connection between the **Logger** and **Master**:

- **Align the Logger and Master antennas in parallel**

Aligning the antennas	
Logger antenna position	**Required alignment of the Master antenna for data transmission**
Vertical, with tip of antenna upwards	Vertical (with tip of antenna pointing either upwards or downwards)
Vertical, with tip of antenna downwards	
Horizontal	Horizontal
At an angle	At an angle

- **Optimise Logger installation positions**

  It is better to install the **Logger** with the tip of the antenna pointing downwards into the shaft.

- **Replace metal manhole covers with plastic manhole covers**
- **Change the Master antenna when using the unit inside a vehicle** (use a magnetic antenna attachment on the roof instead of the standard antenna on the **Master**)

6.4 Other problems

Problem/symptom	**Solution**
The Master issued a leak alert, but no leak could be found	**SePem 01** is a prelocation system. Leak alerts must always be verified using an appropriate method (e. g. correlation) before carrying out excavation work.

7 Appendix

7.1 Specifications and acceptable operating conditions

SePem 01 Logger

Construction:	Die-cast aluminium housing
Protection rating:	IP68
Power supply:	Lithium battery (must only be replaced by manufacturer)
Operating time:	5 years (guaranteed if standard software settings are used)
Weight:	Approx. 700 g (with antenna and magnet)
Dimensions (W × D × H):	108 × 51 × 50 mm
Operating temperature:	-20 ºC – +55 ºC
Storage temperature:	-20 ºC – +70 ºC
Data memory:	64 kB
Sampling rate	1 s – 1 h
Communication	Bi-directional radio data
Frequency band:	433 MHz
Permitted operating environments:	● Outdoors ● Submersible to 1 m
Non-permitted operating environments:	● In liquids other than water ● In aggressive media ● In potentially explosive areas
Permissible relative humidity:	100 %

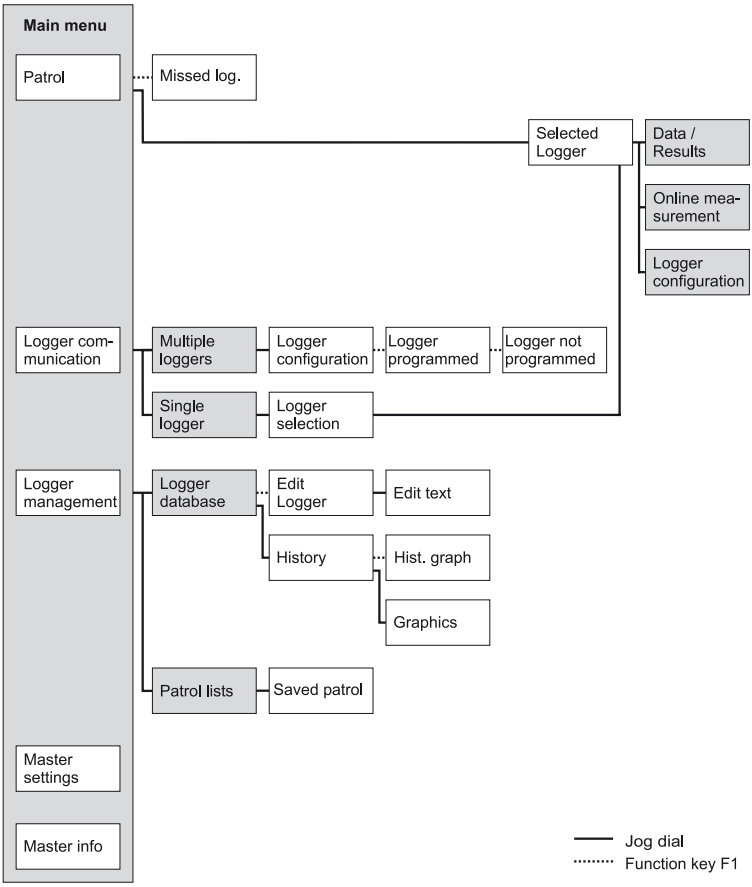
SePem 01 Master

Construction:	Plastic housing
Protection rating:	IP54
Power supply:	External, using mains or vehicle battery OR Internal, using 4 replaceable AA-size batteries, disposable or rechargeable (LR6, AA, AM3), either: ● Alkali-manganese disposable batteries ● Zinc-carbon disposable batteries ● NiMH rechargeable batteries (All four cells must be of the same type)
Operating time:	> 10 h
Weight:	Approx. 850 g (with antenna)
Dimensions (W × D × H):	148 × 57 × 205 mm (253 mm with supporting bracket)
Operating temperature:	● The minimum operating temperature depends on the type of battery used (refer manufacturer's instructions) ● Upper temperature limit: +45 ºC
Storage temperature:	-30 ºC – +70 ºC (without batteries)
Data memory:	8 MB
Communication	Bi-directional radio data
Frequency band:	433 MHz
Permitted operating environments:	● Outdoors ● In vehicle
Non-permitted operating environments:	● In water or other liquids ● In aggressive media ● In potentially explosive areas
Permissible relative humidity:	95 %, non-condensing

7.2 Measurement types (overview)

Measurement type	Features
Single measurement Abbr.: `Single`	● Records a single measurement, with a specified duration, at a specified point in time ● Any previous measurement data stored in the **Logger** will be completely deleted before recording starts. ● This mode is best suited to mobile use of the system
Continuous measurement Abbr.: `Permanent`	● Records an ongoing measurement ● Measurement time is 24 h or a multiple thereof ● Always starts at 00:00 hrs. ● Any previous measurement data stored in the **Logger** will be overwritten ● The first measurement results can be read out after 24 h. ● This mode is best suited to stationary use of the system
Repeat measurement Abbr.: `Repeat`	● Records a measurement at intervals of 24 h. ● Any previous measurement data stored in the **Logger** will be completely deleted before recording starts. ● This mode is best suited to stationary use of the system

7.3 Menu structure



7.4 Display symbols (Master)

Notes

	Wait
	PIN code protected area
	Error
	Warning
	Question
	Information

Measurement

	Number of measurements
	Graphics
	Maximum noise level
	Minimum noise level
	Width
	Characterising frequency of measurement
	Current noise level (online measurement)
	Interval
	Scale for time axis (graphics)
	Evaluation

General information

	Date, time (time of day, meas. time)
	Duration
	Radio time
	Read out time
	Logger
	Serial
	Remaining Logger battery capacity
	Remaining **Master** battery capacity
	Memory for **Master**
	Release of hardware and firmware
	Temperature

7.5 Terminology and general abbreviations

AF	● Width across flat
Attachment point	● Point at which the **Logger** is attached to the pipe or fitting i. e. where it makes physical contact with the water pipe network
Background noise	● Unwanted electromagnetic radiation from various sources (e. g. street lamps)
Character set	● Specifies the character type (upper case, lower case, numbers) for entering text
DST	● Daylight Saving Time ● Adjusts the time on the last Sunday in March (time moved forward by 1 hour; Summer Time) and the last Sunday in October (time moved back by 1 hour; Winter Time) ● Applies to all member countries of the European Union
Extended data set	● Can be read out during a patrol in addition to the measurement results ● Provides further information about the measurement (e. g. graphics)
Firmware	● Term used to refer to software in electronic devices (e. g. **Logger**, **Master**) ● to distinguish it from PC software
Graphics	● Chart of the noise level of a measurement plotted against time

History	● Contains all measurement results read out from each **Logger**: time of reading, minimum noise level, width, characterising frequency, graphics (if read out) ● Can be displayed as a chart (Hist. graph)
History graph	● Chart of the history of a **Logger** ● Shows a chart of minimum noise levels for all saved measurements
Installation location	● Location in the water pipe network where a **Logger** is mounted for recording measurement data
Logger data	● Data that identifies a **Logger** ● A distinction is made between: general data (battery capacity, device number, next service due, firmware release), radio times (days, start, duration, patrol type, economy mode) and measurement times (date, time, duration, interval, type, alarm threshold, status)
Measurement data	● Data that is collected and stored by a **Logger** during a measurement
Measurement location	● Same meaning as installation location
Measurement results	● Calculated from the measurement data ● Comprises: minimum noise level, characterising frequency, width, battery capacity, leak alert ● To avoid data being incorrectly assigned, the **Logger** serial number is also issued with the measurement results.

Online measurement	● A measurement type that allows data measured by the **Logger** to be followed directly on the **Master** in real time (live recording)
Patrol	● Derived from the French verb patrouiller ● Reading out of data recorded by the **Logger** ● The operator must transport the **Master** to within the transmission range of the **Logger**
Radio time frame	● Period of time during which the **Logger** is in the correct mode for data exchange with the **Master**
Read out	● Transmit data from **Logger** to the **Master**
Width	● Mean deviation from the average value of the measurement data

7.6 Abbreviations in the firmware

DEL	● Delete
DEVNO	● Device number
DST	● Daylight Saving Time
Hist. graph	● History graph
INS	● Insert
Last Min.	● Last minimum
LAST MIN. NOISE LEVELS	● Last minimum noise levels
LOC	● Location
Log.identification	● Logger identification
Meas. results	● Measurement results
Meas. temperature	● Measurement temperature
Meas. times	● Measurement times
Min. noise level	● Minimum noise level
Missed log.	● Missed logger
Updat. Log	● Updated Logger

7.7 Accessories

SePem 01 carrying case

Order no.: ZD28-10000

- For carrying the **SePem 01 Master** and 10 **SePem 01 Loggers**

SePem 01 transport box

Order no.: ZD30-10000

- For 20 **SePem 01 Loggers**

Safety line, 1.2 m

Order no.: SF01-Z0300

- For lowering into shafts, incl. spring clamp

Carrying system "Vario"

Order no.: 3209-0012

- For carrying the **SePem 01 Master**
- Two adjustable carrying straps with quick release buttons and padded straps
- Can be worn around the neck or as a chest harness.

Magnetic antenna attachment

Order no.: KR04-Z1200

- For installation on roof of vehicle
- With 5 m cable

Disposable alkaline battery

Order no.: 1353-0001

- For the **SePem 01 Master**
- AA, LR6, 1.5 V

Rechargeable NiMH battery

Order no.: 1354-0003

- For the **SePem 01 Master**

Charger, 4 x AA-size batteries

Order no.: 9042-0026

- For recharging up to four NiMH batteries

Docking station TG8

Order no.: LP11-10001

- For operating and storing the **SePem 01 Master**
- Includes locking mechanism to prevent unit falling out
- An AC/DC adapter or vehicle cable is also required for operation

AC/DC adapter M4

Order no.: LD10-10001

- 100 – 240 V~ / 12 V=
- Type of protection IP 20

M4 vehicle cable, 12 V=portable

Order no.: ZL07-10100

- For operation of the **SePem 01 Master** in a (moving) vehicle**.**
- Includes built in fuse and cigarette lighter adapter

M4 vehicle cable, 12 V=installed

Order no.: ZL07-10000

- For permanently connecting the **SePem 01 Master** to the vehicle electrical system
- Includes built-in fuse and female spade connectors

M4 vehicle cable, 24 V=installed

Order no.: ZL09-10000

- For permanently connecting the **SePem 01 Master** to the vehicle electrical system
- With voltage converter and female spade connectors

7.8 EC Declaration of Conformity

Hermann Sewerin GmbH hereby declares that the **SePem® 01/ SePem® 01 Master** fulfils the requirements of the following guidelines:

- 1999/5/EC
- 2006/28/EC

The product belongs to radio equipment device class 1.

The complete declaration of conformity can be found online (www.sewerin.com > Downloads).

7.9 Information on disposal

The European Waste Catalogue (EWC) governs the disposal of appliances and accessories.

Description of waste	Allocated EWC waste code
Device	16 02 13
Disposable battery, rechargeable battery	16 06 05

End-of-life equipment

Used equipment can be returned to Hermann Sewerin GmbH. We will arrange for the equipment to be disposed of appropriately by certified specialist contractors free of charge.

8 Index

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What would you like to do with the SePem 01?

	Start in the main menu and select...
Program multiple Loggers	**`Logger communication`** > **`Multiple Loggers`** > **`LOGGER CONFIGURATION`**: Enter data > **`Transmit`** data (F1)
Program a single Logger	**`Logger communication`** > **`Single Logger`** > Activate Logger > **`LOGGER SELECTION`**: Confirm Logger > Wait > **`Logger configuration`** > **`LOGGER CONFIGURATION`**: Enter data > **`Transmit`** data (F1)
Read out Logger data	**`Logger communication`** > **`Single Logger`** > Activate Logger > **`LOGGER SELECTION`**: Confirm Logger > Wait > **`Logger data`**
View old measurement results	**`Logger management`** > **`Logger database`**
Carry out an online measurement	**`Logger communication`** > **`Single Logger`** > Activate Logger > **`LOGGER SELECTION`**: Confirm Logger > Wait > **`Online measurement`**
Patrol	**`Patrol`** > Transport the **Master** to within the radio transmission range of the Logger (requires a radio connection)
View patrol lists	**`Logger management`** > **`Patrol lists`** > **`PATROL LISTS:`** Select patrol

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01.03.2010 – 104882 – en