SEWERIN
Technologien für die Lecksuche.

SePem®

SePem® 155

SePem® 01 Master

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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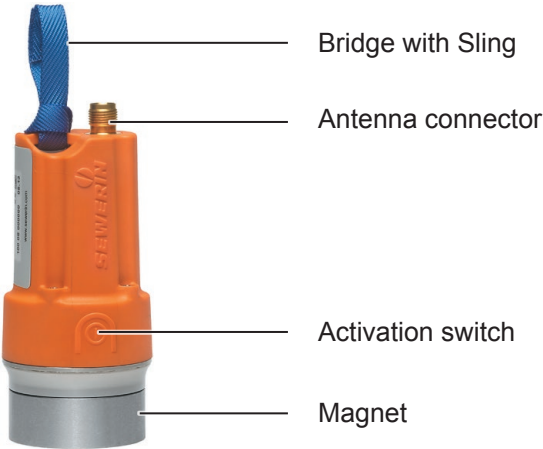Phone: +44 1462-634363
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Logger SePem® 155

Bridge with Sling

Antenna connector

Activation switch

Magnet

Antenna

Connector

Supporting bracket

Buzzer

USB port

ON/OFF key

Connection for power supply

Signal light

Aerial

Display

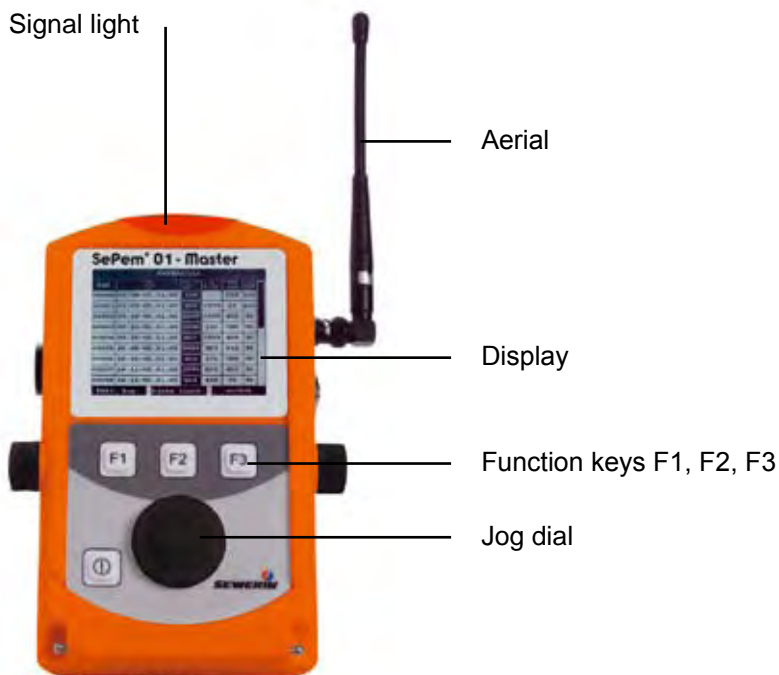Function keys F1, F2, F3

Jog dial

Fig. 3: **SePem 01 Master** with or without aerial

Operating Instructions

SePem®

SePem® 155

06.10.2008 – V 1.XXX – 104882 – en

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.

Contents   **Page**

1 Introduction

The **SePem** system is designed for use in the early detection of leaks in water pipe networks. The design is particularly aimed towards static 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 155 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** 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 in respect of the functionality and safe operation of this equipment.

Hermann Sewerin GmbH cannot be held responsible 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 modified 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 non-approved 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 aerials 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 these operating instructions.

2.2   Intended use

SePem is a measurement data collection and evaluation system. The system is designed for use in static and mobile monitoring of water pipe networks

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

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

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

All components used in the **SePem** system have been manufactured in accordance with all statutory legal and safety regulations. The system is safe to operate when used in accordance with the instructions provided.

Careless or improper use of any of the system components may present a risk of damage or harm to persons or property (see Sect. 2.3).

2.3   Improper use

Any application of the system or its components that does not comply with with the description in Section 2.2. shall be deemed to be improper use.

The manufacturer accepts no responsibility for any damage or harm caused to persons or property as a result of improper use.

Only Hermann Sewerin GmbH approved spare parts are permitted for repairs.

Only the enclosed Antenna is permitted to be used with the system. And can only be ordered directly through the Hermann Sewerin GmbH.

2.4 Additional safety information

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

⚠️ **CAUTION!**
All applicable accident prevention regulations must be complied with.

SePem155 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.

Aerials for the SePem155 Logger and SePem 01 Master

Aerials used with the **Logger** and **Master** must be free of damage.

● Never carry a unit by the aerial.

● Never bend, crease or cut the antenna.

Only use SEWERIN-approved replacement aerials and aerial attachments.

SePem155 Logger only

⚠️ **CAUTION! 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 drive, 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 85 °C (185 ºF).

SePem 01 Master only

- The **Master** unit is water-resistant 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, aerial, USB port) free of dirt.
- It is essential to read Sections 5.2 and 4.4 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 system

3.1   System components

The **SePem system** (abbreviated to SePem 01) comprises:

- **SePem155 Logger**, abbreviated to **Logger** (see Sect. 4)
  for the collection of measurement data

- **SePem 01 Master**, abbreviated to **Master** (see Sect. 5)
  for reading out and evaluating measurement results and for
  programming the **Logger**

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

3.2   Mobile operation as an alternative to static operation

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

Mobile operation represents a cost-effective alternative to static
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 may be completed when
leaks are either detected or repaired. The **Loggers** can then be
moved to the next monitoring area.

3.3 Operating principle

3.3.1 Monitoring procedure (Overview)

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

● First, program the **Logger** (see Sect. 5.7.3)

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** now works autonomously, i.e. it collects data at the predefined times.

● Read out the measurement data using the **Master** (see Sect. 5.7.2)

The **Logger** will transmit 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 transmission range of the **Logger**. 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 **Master** as soon as the user passes into the transmission range.

It is also possible to read out additional information relating to the logger itself and to allow a mode of curve of the measurement (measurement curve) to be produced.

● Measurement results can be evaluated immediately, or at a later time, using the **Master** (see Sect. 5.7.2.2 – 5.7.2.4, 5.7.4)

Note on programming the Logger programming

Changes to the programming of a **Logger** used in a static application can be carried in-situ. The **Logger** does not have to be removed from the installation position. The transmission of the new program data from the **Master** to the **Logger** is carried out during the time window.

3.3.2 Radio frequency 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 installed in a pit, the **Logger** will have to transmit its data out of that pit. The range of the radio signals is 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** (98 – 230 ft) from the installation position. The range may be extended up to 100 – 200 m (328 – 656 ft) for plastic covers. The theoretical maximum range is 1000 m (3280 ft).

3.3.3 Principles of leak detection

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

☞ Note:
Leak alerts will not be given if there is background noise (Frequency 60 Hz or 120 Hz).
Please refer also to the information on interpretation of measurement results and leak alerts in Sections 5.7.2.3 – 5.7.2.5.

3.3.3.1 Leak detection with mobile operation

In order to determine if the measurement data recorded by a **Logger** used as a mobile unit relates to a leak or not, the **Master** makes use of a defined alarm threshold (**absolute value**). If the minimum level measured is below the predefined 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** individually for each **Logger**.

3.3.3.2 Leak detection with static operation

When used in a static application, the leak detection method employed by the **SePem** 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** units for static 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 made since the first occurrence of the leak; this avoids false detection of leaks due to short-term fluctuations.

● It is possible that false leak alert may be issued (e.g. after prolonged heavy rain).

4 Logger SePem 155

4.1 Functionality and construction

The **SePem Logger** is a sound level logger. It is able to collect data from water pipe networks and to store this data. Data is exchanged with the **Master** unit using a built-in radio module.

The robust, waterproof, injection-moulded aluminium housing means the Logger is suitable for permanent installation under manhole covers and in hydrants.
The unit can be **mounted** on metal objects using a magnet. If it is necessary to monitor a plastic pipe then the **Logger** must be attached to the fittings.

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

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 settings stored in the **SePem 01 Master** under **Standard logger configuration** (see Sect. 5.7.3.7))

⚠ **CAUTION!**
The **SePem155 Logger** must never be opened by the operator. The unit will be prone to **leakage** if opened.
Expired batteries must 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 administering the **Loggers** (in the **Master** software and at the measurement location) it is possible for each unit to be assigned 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 must be saved with the corresponding serial number in the **Master** (see Sect. 5.7.4.1).

4.3 Installing the logger at the measurement location

4.3.1 Suitable installation locations

The **Logger** can be mounted on:

- Piping
- 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 install in water pipe networks constructed from both metal and **plastic piping**. 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 Loggers
Metal	Fitting	300 – 500 m (984 – 1640 ft) (mobile) 500 m (1640 ft) (static)
Plastic	Fitting	50 – 100 m (164 – 328 ft)

For highly intermeshed water pipe networks the spacing between Loggers must be decreased appropriately.

- Check carefully to ensure that all **contacts are clean and dry** before screwing in the aerial / aerial adapter.

- The aerial/aerial adapter must be **tightened firmly by hand as until the end stop is reached**. This is necessary in order to ensure that the unit is properly leak-tight and that a good radio signal is guaranteed.

> **CAUTION! Risk of damage!**
> **Never use any tools** to assist in tightening the aerial / aerial 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 must be transferred from the **Master** to the **Logger**. Radio contact between the two devices must be established to carry out programming.

● First, the **Master** must be prepared for programming the **Logger** (see Sect. 5.7.3, particularly 5.7.3.4).

● 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. 5.7.3.6).

If contact 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 utilised for the transfer of the relevant data. The **Logger** 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 aerial adapter is used then the aerial 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 aerial.

Please note the following points:

- **Never carry** the **Logger by the aerial**; this can cause damage to the aerial.

- 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**.

- Although it is necessary for the **Logger** to make good contact with the attachment point, it is essential that the **aerial does not come into contact with the surrounding environment**. When the aerial adapter is used, ensure that the magnetic attachment is positioned so as to ensure that a good distance is maintained between the aerial and any metal items at the installation location.

- The **Logger should preferably be installed with the tip of the aerial pointing downwards** in the shaft.
  One reason for this is that there is usually more space for the aerial pointing downwards than immediately below the cover. The other reason is that a **better radio connection** can be achieved when the radio signal radiates into the earth rather that the manhole cover.

- The **aerial must not be bent or shortened**. The available space should be evaluated to ensure that the aerial will remain 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 **SePem155 Logger**.

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

- Programming the **Logger**
- Reading out measurement data and device data from the Logger
- Evaluating the measurement results (including mode of curve)
- Changing Logger data

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

The **Master** can settings can be changed according to personal preferences (e.g. language, contrast of the display).

The aerial on the **Master** guarantees that reliable radio communication can be established between the Master and the Loggers. This is important because all measurement data, device data and programming data for the **Logger** is transmitted using radio signals.

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.

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 discharged).

The **Master** stores all measurement results in a **circular buffer**, i.e. if the memory is full (no free storage space) then the oldest data will be overwritten by the most recent. The unit will generate a warning to alert the user that memory is low.

Accessories (optional)

When the **Master** is carried in a vehicle, the **TG8 Docking Station** can be used to provide a safer means of operating the unit.

If the **Master** needs to be carried on the person during operation, then the **"Vario" Carrying System** can be fixed to the attachment points on the supporting bracket.

5 SePem 01 Master

5.2   Power supply

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

● Disposable batteries (4)

● NiMH rechargeable batteries (4)

● External power from mains or vehicle battery.

⚠ **Note:**
The Master does not include an integral battery charger. If rechargeable batteries are used then these must be removed for recharging in an external battery charger.

Batteries

⚠ **CAUTION!**
The **Master** must only be operated with **rechargeable batteries** if they are of a type approved by SEWERIN (see Sect. 7.6). The use of other rechargeable batteries is not permitted.

It is advisable to switch the unit off when not in use to extend operating time when the device is powered by batteries.

External power supply

External power supply options:

Power source	Required accessory	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

⚠ **CAUTION!**
Only use the **M4 AC/DC Adapter** from SEWERIN (see Sect. 7.6). The use of other AC/DC adapters is not permitted.

The **M4 Vehicle Cable** is available in various configurations.

5.3   Use of the Master in a moving vehicle

If the **Master** is used in a moving vehicle for collection of data and/or programming of **Loggers** then the aerial can be replaced by a **magnetically attachable aerial that can be fixed to the roof of the vehicle** (optional accessory). This will improve the quality of the radio reception.

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.

5.4   Replacing the batteries

Please refer to the information in Section 5.2!

A 2.5 mm (0.1 in) Allen key (supplied) is required to open the battery compartment.

● 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 and replace the batteries (disposable or rechargeable). 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 **Master settings** will need to be reset if it takes longer than four minutes to replace the batteries (see Sect. 5.7.5).

5.5   Changing the aerial

The aerial is attached to the unit using a BNC connector.

● The aerial should be removed using a twist-and-pull motion.

● Check the **contacts** between the aerial connection and the aerial. Theses must both be **clean and dry**.

● Attach the new aerial using a push-and-twist motion.

5.6   Operation

5.6.1   Keys and jog dial

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

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

Control	Action	Function
ON/OFF key	Press	● Switches the unit on ● Switches the unit off
Function keys F1, F2, F3	Press	● Varies ● 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	● Selects between vertically or horizontally adjacent functions, settings, measurement results, etc. ● Modifies values
	Press	● Open the next program level (e.g. menu item, function, measurement result, selectable values) ● Accept values

5.6.2 Standard functions

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

Standard functions		
`Back`	F3	Return to previous program item
`Accept`	F2	Save a modified value
`Delete / Delete list`	F2	Delete an individual value or a list

5.6.3 Warning prompts

Warning prompts may be displayed in connection to 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.

5.6.4 Freeform text entry

The `Logger management` system provides the option to store a **note** relating to each `Logger` and its `location` in the form of a text field. The entry can be 26 characters long.
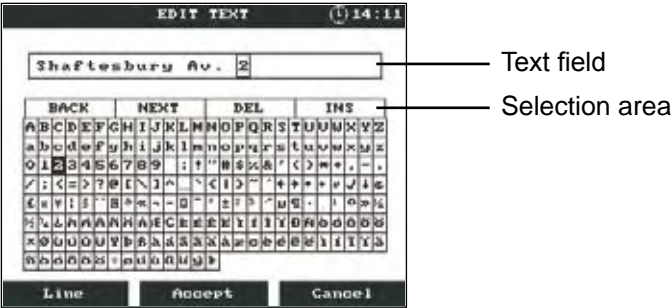
Fig. 7: Editing text

Text field

By default, the **Master** will automatically fill in the text field with the serial number of each **Logger**. This will be overwritten when a text entry is made. The cursor should be moved to the desired entry position using the options in the first line of the selection area (`BACK, NEXT, DEL, INS`).

Selection area

The selection area can be navigated as follows:

● Turn the jog dial forwards or backwards

● Jump to the next line using the `Line` option.

The options in the first line of the selection area are used to control the cursor position in the text field

Options in the selection area	
`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 at the current cursor position.

Characters and options 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)
`Accept`	F2	Exit the text edit screen **with** modified values accepted.
`Cancel`	F3	Exit the text edit screen **without** accepting modified values.

5.7   Menus for firmware and Master - Logger interaction

5.7.1   Main menu (Overview)

The main menu will appear automatically when the unit is switched on. This is the main starting point for all tasks performed using the **Master**.

Fig. 8: Main menu

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 **Logger**; transmit Logger data to the **Logger** ● Read out information from individual loggers ● Online measurement
`Logger management`	● Manage measurement results and Logger data
`Master settings`	● Configure the **Master**
`Info`	● Information about the **Master**

5.7.2 Patrol

Data stored 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 the menu item `PATROL` is selected (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 read

In the top left corner is a counter showing the number of **Loggers** read and the number of Loggers known to the **Master** (Logger database) ("4/5" in the example means that 4 Loggers were read and the Master has a database containing 5 Loggers).

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

Pressing the **F1** `Missed log` key displays a list of **Loggers** that have not yet been read during the current patrol (provided they have been entered into the database previously).

5.7.2.1 Requirements for a successful patrol

● **Master** is switched on, menu item `Patrol` is open

● The operator and the **Master** are within the radio transmission range of the **Logger**

● The radio time frame for the **Logger** is 'open', i.e. the **Logger** is in ready-to-send mode

> **Note:**
> If the `Patrol` menu item is not open (i.e. the display shows the main menu or any other menu) then the **Master** will not receive any data.

5.7.2.2 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 should be closed in **5 minutes**
4. Operator	● Analyses the measurement results received (see Sect. 5.7.2.3) ● Continues from Step 5 if the measurement results need to be analysed in more detail ● Otherwise repeat from Step 1 for the next **Logger**
5. Operator	● Keeps the **Master** within radio 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. 5.7.2.4 and 5.7.2.5) ● Can terminate communication with the **Logger**: press `F3 Back`; the `PATROL` window will be displayed.

5.7.2.3 Analysis of measurement results obtained

The measurement results read out during the patrol (see Sect. 5.7.2.2, Procedure to Step 3) must always be analysed and critically assessed.

The following values give information about the quality of the measurement and the presence of a leak (if appropriate):

Value	Indication of	Description
Min. sound level	Possible presence of a leak	● Close to zero > no leak ● Much greater than zero > possible leak
Frequency	Interference	● 60 Hz or 120 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:

If a measurement curve is required 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. 5.7.2.2, Step 5 onwards.

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

Information alerts		Description of alert
Leak alert	Column ᴬⱽᵛ	• Numeric value inverted
	Signal light	• Visual signal: lit for long period
	Buzzer	• Audible signal: long signal
Remaining 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.

5.7.2.4 Extended data set

The extended data set provides additional information on the following:

● A measurement (e.g. measurement curve)

● The transmitting **Logger** (e.g. radio times, last seven minimum 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 can be obtained by carrying out the procedure in Sect. 5.7.2.2 as far as Step 6 during the patrol.

☞ **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`	Day, start, duration, interval, economy mode
`Meas. times`	Date, time, duration, interval, type, alarm threshold
`Measurement results`	Minimum level, frequency, width, measurement temperature, sensor
`Last minimum levels` (optional)	Displays of the last seven values (maximum)
`Measurement curve`	Displays the measurement curve

At the end of the patrol **a part** of the extended data set will be stored in the `Logger database`.

Extended data set: stored values in the logger database (history)	
`Meas. times`	Date, time, duration
`Measurement results`	Minimum level, frequency, width, read-out time
`Measurement curve`	Displays the measurement curve

5.7.2.5 Measurement curve

The measurement curve component of the extended data set (see Sect. 5.7.2.3) 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 measurement curve either during a patrol or at a later point in time.

Viewing a measurement curve during a patrol

- Using the `PATROL` menu, choose the appropriate **Logger** (select and confirm). The `SELECTED LOGGER` window will appear.

- Select the menu item `Data/Result`.

- Turn the jog dial until `Measurement curve` appears (last window).

Viewing a measurement curve 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 `MEASUREMENT CURVE` window will appear.

Analysis of the measurement curve

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

A sound level that is continuously much higher than zero may indicate the presence of a leak (Fig. 10).
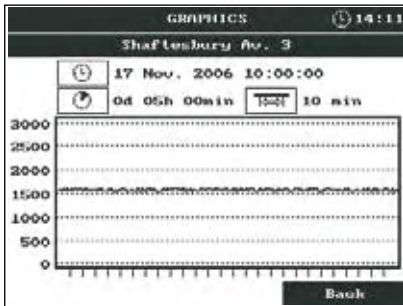
Fig. 10: Measurement curve showing a high probability of a leak

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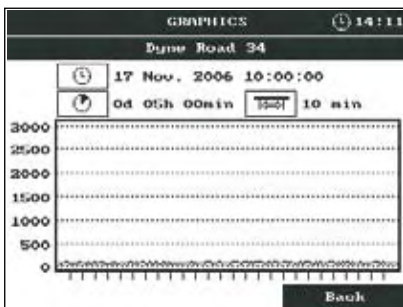
Fig. 11: Measurement curve showing a low probability of a leak

5.7.3   Logger communication

The menu item `Logger communication` is used to control the exchange of data between the **Master** and the **Logger**. This allows the operator to select between measurement results and Logger data, and whether a `Multiple Logger` or a `Single Logger` should be programmed.

The process of **transmitting Logger data** and the **standard settings** are described in Sections 5.7.3.6 and 5.7.3.7.

5.7.3.1 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	Day, time, duration, interval, economy mode
Meas. times	Start of measurement („Start in" or date), time, duration, interval, type, alarm threshold

5.7.3.2 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
Minimum level, frequency, width, read-out time
Optional, depending on the program settings: battery capacity, leak alert, measurement temperature, sensor

5.7.3.3 Difference between Multiple Loggers and Single Logger menus

The `Multiple Loggers` menu only allows Loggers to be configured and programmed, however the `Single Logger` menu also allows:

- Measurement results and Logger data to be read out

- Online measurements to be carried out.

5.7.3.4 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. 5.7.3.6).

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		
Meas. times		
Start in	`d` (days) ● Number of days until start of measurements (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 period (Meas. type: single or cyclical) ● Recording time (Meas. type: duration)	
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 `Radio times` option allows the operator to specify the point in time and length of time that a **Logger** will be on standby for data exchange with the **Master** (**Radio time frame**).

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	**Time** (hours : minutes) ● Time of day at which the radio time frame will be open
Duration	**h** (hours) ● Duration of standby for radio contact (1-23 h)
Interval	**s** (sec.) ● Length of time between two transmission pulses (5-60 s) ● Guideline values: – Walking pace: 60 s – Vehicle at walking pace (traffic-calmed street 30 s – Vehicle at 20 km/h (12 mph) 15 s – Vehicle at 30 km/h (18 mph) 10 s – Vehicle at more than 30 km/h (18 mph) 5 s

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 between 30 and 3000 (in increments of 30); if the value is exceeded then a leak alert will be issued. ● See also Sect. 3.3.2.1 for determining thresholds.
	STATIC　　　　　　　　　　(static operation) ● There is no alarm threshold for this mode as a different leak detection method is used (see Sect. 3.3.2.2)
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

5.7.3.5 Single Logger

> ☞ **Note:**
> A radio connection must be established between the **Master** and **Logger** before further actions can be carried out.

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 smaller selection window will be displayed (initially with no entries). The title (e.g. `Loc.`) follows the same pattern as when specifying the Logger ID in the master settings (see Sect. 5.7.5).

● Initiate radio contact with 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 at least 1 m (3.3 ft) apart.

● Wait for a short time. When the internal Logger search has been completed a list will be displayed in the selection window showing all **Loggers** detected (max. 4).

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

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

Fig. 12: Logger selection – 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** ● See below also
Online measurement	● Live recording of measurement data ● Results can be viewed immediately on the **Master** in real time ● See below also
Logger configuration	● Specification of measurement and radio times for the selected **Logger** (same as **Multiple Loggers**) ● See Sect. 5.7.3.4

Data/Results

The menu item **Data / Results** provides data about the Logger. The logger data described in Sect. 5.7.2.4 (first table) will be 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 Customer Services.

Online measurement

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

Online measurement is typically used during **mobile monitoring**. This is useful for providing feedback on the sound 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 static 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 on the plot. The **F2 stop** key can be used to stop the measurement in order to view the measurement curve. (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 selected (**Logger configuration** > **Meas. times** > **Interval**) specifies the length of time between each measurement that is recorded, and therefore determines the speed at which the measurement curve 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.

5.7.3.6 Transmitting data to the Logger

To transmit the measurement times and radio times chosen to the **Logger** always use the **F1 Transmit** option from the **Logger configuration** window. It is essential that the following differences in transmission behaviour are understood:

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** within the transmission range of the **Logger** (requires the radio time frame to be open).

Start data transmission	● After the radio connection has been established
Target for transmitted data	● Only the currently active/ready-to-receive **Logger**
Continue data transmission	● Establish a radio connection with the next **Logger**

Master ready to transmit	● **Master** remains ready to transmit until
	  – the selected measurement time has expired (a prompt is displayed if time exceeded)
	  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
Target 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. 5.7.3.5)

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 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. 13: Loggers programmed

A list of **all Loggers** that have been programmed since switching on the **Master** will be displayed. The list may also contain **Loggers** that were programmed using the `Single Logger` option prior to using `Multiple Loggers`.

The **Loggers** will be listed alongside the selected Logger ID (e.g. `Location`) and sorted according to the time they were programmed.

In the top left corner is a counter showing the number of **Loggers** and the number of Loggers recognised by the **Master** (see Logger database) - ("2/5" in the example means that 2 Loggers were programmed and the Master has a database containing 5 Loggers).

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

The **F1** `Unprogrammed` option displays a list of the **Loggers** that have not been programmed since the **Master** was switched on. This will only display **Loggers** that are included in the Logger database (see Sect. 5.7.4.1). (This means that new **Loggers** that have not yet completed a data transfer will not be shown in the list.)

5.7.3.7 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	
Meas. times	
Start in	1 d
Time	02 : 00 h
Duration	00 d 01 h 00 min
Interval	2 s
Type	REPEAT
Radio times	
Days	TU
Time	08 : 00 h
Duration	8 h
Interval	5 s
Miscellaneous	
Alarm threshold	STATIC
Economy mode	No preset value

☞ **Note:**
With Economy mode switched on (**ON**) the battery life will be 7 years; with Economy mode switched off (**OFF**) it will be 5 years.

5.7.4 Logger management

Logger management is used for the following:

● Displaying all stored measurement results and Logger data

● Editing Logger data

Fig. 14: Logger management

5.7.4.1 Logger database

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

Fig. 15: 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 data will be also deleted when a Logger is deleted from the Logger database.

History

A **History** will be stored for each **Logger**. This contains the measurement results for all measurements read out (date read, time read, minimum level, width, frequency). If the extended data set was read out then this will also be stored (indicated by a cross in the last column; see also Sect. 5.7.2.4, second table).

● Select a **Logger** from the **Logger database**.

● Press the jog dial. The **HISTORY** window will appear.

Fig. 16: History

● Optional: **Viewing a measurement curve**
Choose a measurement result that includes an extended data set (select and confirm). The **MEASUREMENT CURVE** window will appear.
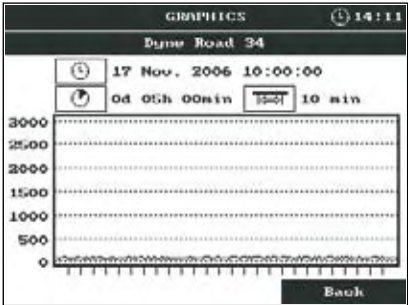
Fig. 17: Measurement curve for a saved patrol

Pressing the **F1 Plot** key (in the **History** window) will cause a graphical plot of **minimum levels for all stored measurements** to be displayed.

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

Edit

Pressing **F1 Edit** allows entries stored in the **LOGGER DATA-BASE** to be edited.

LOGGER EDITING	
Serial	● Not modifiable
Device number	● Any number between 0 and 9999 (see Sect. 4.2)
Location	● Freeform text entry
Comment	● Factory default setting for this field is the serial number

5.7.4.2 Patrol lists

During a `patrol`, all measurement data received will be stored
automatically to the `PATROL LISTS` (see Sect. 5.7.2.2). Data will
always be stored automatically when:

● The `DELETE` option is selected in the `Patrol` window

● The **Master** is switched off

The `Patrol lists` provide the following information:

● Dates of the last four patrols

● The **Loggers** read during those patrols

● Associated measurement results

Selecting the `Patrol lists` option will immediately bring up
the `Date/Time` selection window. This will include a list of up
to four patrols.

Fig. 18: Selecting a patrol

☞ **Note:**
The `Date/Time` window will not list any patrols
the first time the **SePem 01** is used, or 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 associated measurements will appear.

Fig. 19: Stored patrols

The measurements are listed with the following information: Logger ID (e.g. `Location`), minimum level, frequency, width and remaining batter capacity.

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

5.7.5 Master settings

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

MASTER SETTINGS	
`Date`	(day : month : year) ● Current date
`Time`	`Time` (hours : minutes) ● Current time
`DST`	`YES > NO` ● `YES =` Change to daylight savings time (for details see Section. 7.5)
`Language`	`German > English > French > …` ● Language selection
`Light`	`OFF > 10 s > 30 s > 1 min > 5 min > 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 related to Logger management `Logger database` and measurement results in the `Patrol lists`) ● Warning! This is not a stored setting - effects are immediate.
`Contrast`	● Sets the contrast of the display
`Log. Identifi- cation`	`DEVNO > Loc > Serial` ● Logger ID ● The **Loggers** can be identified by the **Master** either using the device number, the location, or the serial number

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: `Master settings` > `DELETE MEMORY` > `YES`.

● 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.

5.7.6   Master information

The menu item `Master info` is for information only. 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
🌡°C	● 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.

The SEWERIN Customer Services team will always be happy to answer any questions you may have by telephone (tel.: +49 5241 934-250).

6.1 Problems with the Logger

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

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 ‚forgotton' 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? > = bi-directional radio communications deactivated: **Logger** continues to send measurement results, but **Master** cannot initiate contact with the **Logger**

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 Customer Services ● Check **Master**: is aerial attached correctly?
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 aerial)

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 aerial 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 aerials?

● Are the **Logger** and **Master** at least **1 m (3.3 ft) 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**. Proceed as follows:

● Test the radio connection between the **Master** and another **Logger** at a test location that is a long way away.

Radio commu-nication at test location	Cause of fault at original installation location
OK	Unsuitable installation location, e.g. due to strong shielding effects or another trans-mitting device in the area
Not OK	**Master** or **Logger** faulty

6.3.2 Improving the radio connection

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

● **Align the Logger and Master aerials in parallel**

Aligning the aerials	
Logger aerial position	**Required alignment for the Master aerial for data transmission**
Vertical, with tip of aerial upwards	Vertical (with tip of aerial pointing either upwards or downwards)
Vertical, with tip of aerial 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 aerial pointing downwards into the shaft.

● **Replace metal manhole covers with plastic manhole covers**

● **Change the aerial when using the unit inside a vehicle** (use a magnetic aerial attachment on the roof instead of the standard aerial 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

SePem155 Logger

Construction:	Injection-moulded aluminium housing
Type of protection:	IP 68
Power supply:	Lithium battery (can only be replaced by manufacturer)
Operating time:	5 years (guaranteed if standard software settings are used)
Weight:	Approx. 700 g (1.54 lb) (with aerial and magnet)
Dimensions (W × D × H):	108 × 51 × 50 mm (4.25 × 2.01 × 1.97 in)

Installation space
(W × D × H):
	● Horizontal: 115 × 60 × 67 mm
	  (4.53 × 2.36 × 2.64 in)
	● Vertical: 60 × 60 × 125 mm
	  (2.36 × 2.36 × 4.92 in)

Operating temperature:	-20 ºC – +55 ºC (-4 ºF – 131 ºF)
Storage temperature:	-20 ºC – +70 ºC (-4 ºF – 158 ºF)
Data memory:	64 kB
Sampling rate:	1 s – 1 h
Communication:	Bi-directional radio data
Frequency band:	461.0375 – 469.5625 MHz
Acceptable operating environments:	● Outdoors ● Submersible to 1 m (3.3 ft)
Unacceptable operating environments:	● In liquids other than water ● In aggressive media ● In potentially explosive areas
Permissible relative humidity:	100 %

SePem 01 Master

Construction:	Plastic housing
Type of protection:	IP 54
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 cells ● Zinc-carbon disposable cells ● NiMH rechargeable cells (All four cells must be of the same type)
Operating time:	> 10 h
Weight:	Approx. 850 g (1.87 lb) (with aerial)
Dimensions (W × D × H):	148 × 57 × 205 mm (5.83 × 2.24 × 8.07 in) (253 mm (9.96 in) 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 (113 ºF)
Storage temperature:	-30 ºC – +80 ºC (-22 ºF – 176 ºF) (without batteries)
Data memory:	8 MB
Communication:	Bi-directional radio data
Frequency band:	461.0375 – 469.5625 MHz
Acceptable operating environments:	● Outdoors ● In vehicle
Unacceptable 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	Notes
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
Permanent measurement Abbr.: **Permanent**	● Records an ongoing measurement ● Measurement time is 24 h or a multiple thereof ● Always starts at 00:00. ● 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 static use of the system
Repeated 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 static use of the system

7.3 Menu structure
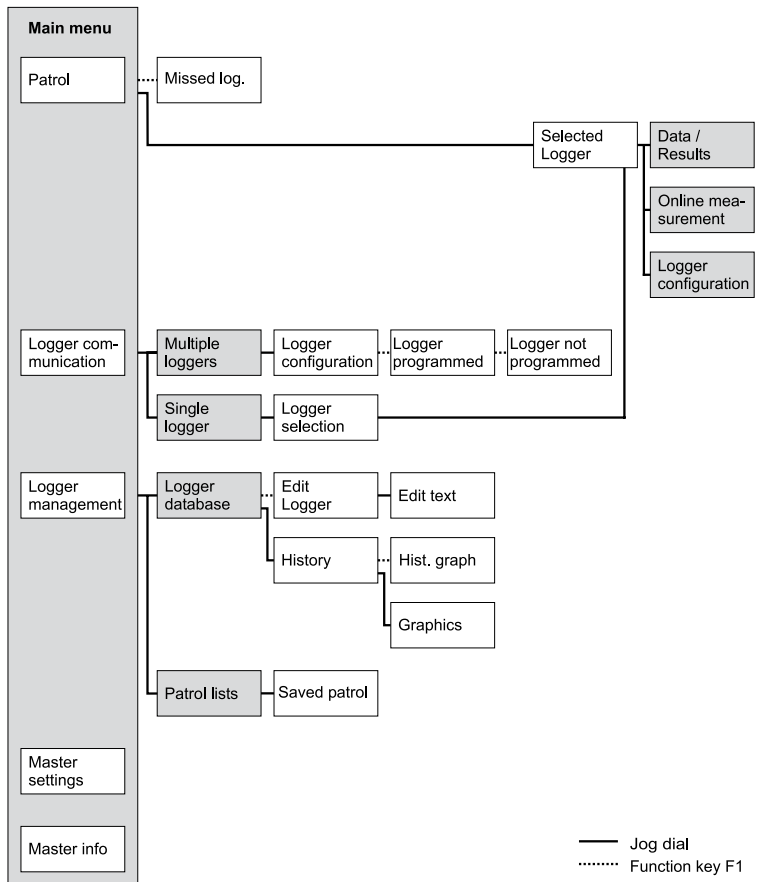
7.4   Display symbols (Master)

Measurement

ꕕ	Number of measurements
ꕥ	Measurement curve
ꕮ	Maximum sound level
ꕯ	Minimum sound level
ꕰ	Width
ꕱ	Maximum sound level in frequency spectrum
ꕲ	Current sound level (online measurement)
ꕳ	Scale for time axis (measurement curve)
ꕴ	Evaluation

General information

ꕶ	Date, time (time of day, meas. time)
ꕷ	Duration
ꕸ	Radio time
ꕹ	Read out time
ꕺ	Logger
ꕻ	Serial number
ꕼ	Remaining Logger battery capacity
ꕽ	Remaining Master battery capacity
ꕾ	Memory for Master
ꕿ	Release of Hardware and Firmware
ꖀ	Temperature

Prompts

	Wait
	PIN code protected area
	Error
	Warning
	Question
	Information

7.5   Terminology and abbreviations

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
Read out	● Transmit data from **Logger** to the **Master**
BNC connector	● Connector with bayonet lock used to attach the aerial
Width	● Mean deviation from the average value of the measurement data
Installation location	● Location in the water pipe network where a **Logger** is mounted for the collection of measurement data
Extended data set	● Can be read out during a patrol in addition to the measurement results ● Provides further information (e.g. measurement curve)
Serial	● Serial number
Firmware	● Term used to refer to software in electronic devices (e.g. **Logger**, **Master**) ● to distinguish it from PC software
Radio time frame	● Period of time during which the **Logger** is in the correct mode for data exchange with the **Master**
DEVNO	● Device number
History	● Contains all measurement results read out from each **Logger**: date read, time read, minimum level, width, frequency, measurement curve (if read out) ● Can be displayed graphically (plot)

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, interval, economy mode) and measurement times (date, time, duration, interval, type, alarm threshold)
Measurement data	• Data that is collected and stored by a **Logger** during a measurement
Measurement results	• Calculated from the measurement data • Comprises: minimum level, frequency, width, battery capacity, leak alert • To avoid data being incorrectly assigned, the **Logger** serial number is also output with the measurement results.
Measurement curve	• Mode of curve of the sound level of a measurement plotted against time
Measurement location	• Same meaning as installation location
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 one hour; Winter Time) • Applies to all member countries of the European Union
Background noise	• Unwanted electromagnetic radiation from other various sources (e.g. street lamps)
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	● Reading out of data collected by the **Loggers** ● The operator must transport the **Master** to within the transmission range of the **Logger**
Plot	● Mode of curve of the history of a **Logger** ● Shows a graph of minimum levels for all measurements stored

7.6 Accessories

SePem 01 carrying case

Order no.: ZD28-10000

● For carrying one **SePem 01 Master** and ten **SePem155 Loggers**

SePem 01 transport box Order no.: ZD30-10000

● For 20 **SePem155 Loggers**

Safety line

Order no.: SF01-Z0300

● For lowering into shafts, incl. clamping spring

"Vario" carrying system

Order no.: 3209-0012

● For carrying the **SePem 01 Master on the body**

● Two adjustable carrying straps with quick release buttons and padded straps

● Can be worn around the neck or as a chest harness.

Alkaline disposable battery

Order no.: 1353-0001

● For the **SePem 01 Master**

● AA, penlight, LR6, 1.5 V

Rechargeable NiMH

Order no.: 1354-0003

● For the **SePem 01 Master**

Charger, 4 × AA-size batteries

Order no.: 9042-0026

● For recharging up to four NiMH batteries

TG8 docking station

Order no.: LP11-10001

● For operating and storing the **SePem 01 Master**

● Includes locking mechanism to prevent unit falling out

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

7.7   Firmware history

SePem155 Logger

Release	Change
1.200	Release version
1.800	Release version

SePem 01 Master

Release	Change
1.200	Release version
1.800	Release version

7.8   FCC/IC Compliance Statements

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

● Reorient or relocate the receiving antenna.

● Increase the separation between the equipment and receiver.

● Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

● Consult the dealer or an experienced radio/TV technician for help.

This Class B digital apparatus complies with Canadian ICES-003.

7.9   Hints on Disposal

The disposal of instruments and accessories is governed by the European Waste Catalogue (EWC).

Type of Waste	Corresponding EWC Code
Instrument	16 02 13
Battery, accu	16 06 05

Old Instruments

Old instruments can be returned to Hermann Sewerin GmbH. We will arrange the qualified disposal free of charge through certified specialists.

8 Index

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`: accept Logger > wait > `Logger configuration` > `LOGGER CONFIGURATION`: enter data > `Transmit` data (F1)
Read out Logger data	`Logger communication` > `Single Logger` > activate Logger > `LOGGER SELECTION`: accept 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`: accept 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 desired patrol

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