SEWERIN
Technologies for leak detection.

RMLD-CS

Operating instructions

18.12.2019 a – 107854 en

Detector

Fig. 1: Rear view with USB cable connected

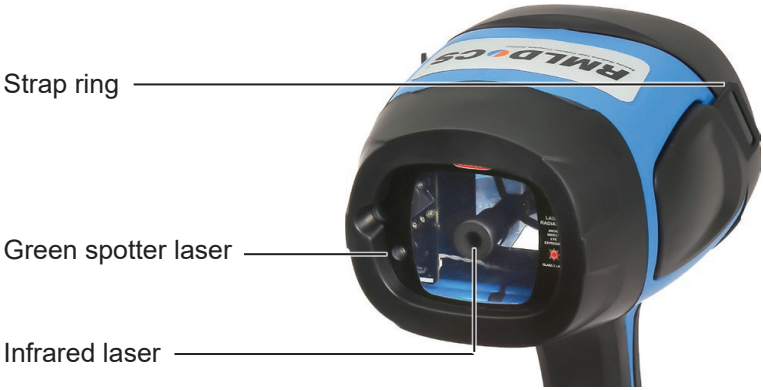

Fig. 2: Front view

Display

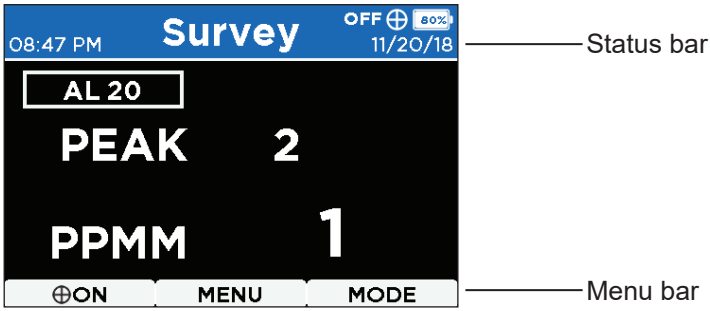

Fig. 3: Display (*here*: **Survey** display mode)

Illustration of warnings in this document

WARNING!
Risk of personal injury. Could result in serious injury or death.

CAUTION!
Risk of personal injury. Could result in injury or pose a risk to health.

NOTICE!
Risk of damage to property.

1 Introduction

1.1 Information about this document

This document is a component part of the product.

- Read the document before putting the product into operation.
- Keep the document within easy reach.
- Pass this document on to any subsequent owners.
- Unless otherwise specified, the information in this document refers to the product as delivered (factory settings) and applies to all product variants.
- Contradictory national legal regulations take precedence over the information in this document.

Translations

Translations are produced to the best of our knowledge. The original German version is authoritative.

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1.2 Purpose

The **RMLD-CS** (Remote Methane Leak Detector) is intended for remote detection of methane gas leaks. The detector allows safe measurements of methane gas clouds, even in areas that may be difficult to reach, using an infrared (IR) laser beam.

1.3 Intended use

The **RMLD-CS** is suitable for the following uses:

- professional
- industrial
- commercial

The **RMLD-CS** must only be used for the applications specified in section 1.2.

Note:
The appropriate specialist knowledge is required for using this product.

1.4 Safety information

This product was manufactured in keeping with all binding legal and safety regulations.

The product is safe to operate when used in accordance with the instructions provided. However, when handling the product, there may be risks to persons and property. For this reason, observe the following safety information without fail.

- Observe all the applicable safety standards and accident prevention regulations.
- Use the product only as intended.
- Do not make any changes or modifications to the product unless these have been expressly approved by Hermann Sewerin GmbH.
- Do not operate the product in potentially explosive atmospheres.
- Always observe the permitted operating and storage temperatures.
- Handle the product carefully and safely, both during transport and when working.
- Always adequately cordon off the work area.
- Do not use the product if it is damaged or faulty.
- Protect the ports and sockets against dirt, and electrical ports in particular against moisture.

2 Product description

2.1 RMLD-CS

Fig. 4: Manufacturer's sticker

2.1.1 Controls

The **RMLD-CS** has three keys below the display.

Fig. 5: Rear of the detector, with keys

2.1.2 Ports

The **RMLD-CS** has one USB port in the handle. The USB port is protected by a sealing cover against moisture and dirt.

On the sides of the **RMLD-CS** there are rings for attaching the carrying strap.

2.1.3 Power supply

On the bottom of the **RMLD-CS** there is a battery compartment for a lithium ion rechargeable battery pack which supplies power to the detector.

Fig. 6: Detector with the battery compartment open

The rechargeable battery pack is designed for an operating time of approx. 8 hours when fully charged.

Fig. 7: Battery pack from above and below

The remaining battery capacity is shown at the top right of the display.

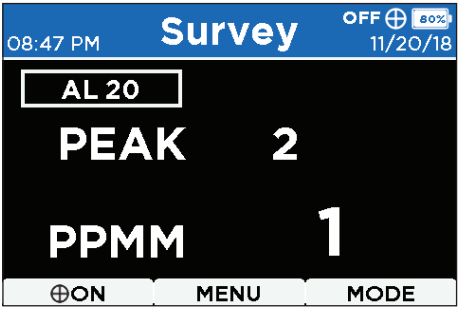

Fig. 8: Display in **Survey** display mode: The status bar on the right shows the remaining battery capacity (*here:* 80 %).

Information about charging the rechargeable battery, and how to deal with faulty lithium ion rechargeable batteries can be found in section 5.1 on page 34.

2.2 Battery charger

A battery charger is included in the scope of supply of the **RMLD-CS** . Two slots allow two battery packs to be charged at the same time.

The battery charger has a socket to receive the power supply from the AC/DC adapter.

Fig. 9: Battery charger with AC/DC adapter

Two LEDs indicate the charge status. Further information can be found on section 5.1 on page 34.

2.3 Carrying case

The carrying case protects the **RMLD-CS** and accessories during transportation and storage. When the **RMLD-CS** is not in use it should always be stored in the carrying case. A gas calibration cell for the self test is integrated in the carrying case.

Fig. 10: Carrying case for all system components

2.4 AC/DC adapter

The **RMLD-CS** is supplied with a universal AC/DC adapter suitable for 110 – 240 V~, 1.6 A and 50 – 60 Hz.

2.5 Carrying strap

The carrying strap makes it easier to use the **RMLD-CS**. It is attached to the two rings on the **RMLD-CS** .

2.6 USB cable

The USB cable (USB2 A-micro) can be used for connection to a computer.

Fig. 11: Rear of the detector, with USB port

2.7 Glasses (optional)

Glasses available as optional accessories. They allow the green spotter laser beam to be distinguished more clearly from the background, e.g. in strong sunlight or a against a green background.

3 Functions and settings

3.1 Switching on and off

WARNING!
The **RMLD-CS** uses class 2 laser beams in the visible range. Lasers can permanently damage the eyes.

- Never look directly into the laser beam.
- Do not use optical instruments such as binoculars or a magnifying glass to view the laser beam.
- Never aim the laser beam at people.

- To switch the detector on, hold down the middle key for 3 seconds.
- To switch the detector off, hold down the middle key for 3 seconds.

3.2 Audible warning signals

A low-pitched acoustic signal warns of weak light intensity of the IR laser beam, or indicates a detector fault. A warning message appears in the display, reporting that the light intensity is too weak or there is signal oversaturation.

In the event of weak light intensity:

- Approach closer to the methane cloud so that it is within detection range.

In the event of oversaturation:

- Move away from the target area.

or

- Align the laser to a less reflective surface.

If the **RMLD-CS** continues to indicate a warning, there may be a detector fault. Information on overcoming interference can be found in section 5.3 on page 35.

3.3 Keys and symbols

Use the three keys under the display to operate the **RMLD-CS**. The three fields in the variable menu bar at the bottom of the display indicate the function of the keys below them.

Display	Function
	**Navigation** Move the cursor or change the value
	**Back** Switch to a higher level
	**Camera** Take a photo
⊕ON	**ON** Switch the spotter laser on
⊕OFF	**OFF** Switch the spotter laser off
SELECT	**SELECT** Confirm selection
MENU	**MENU** Open the menu
MODE	**MODE** Change the display mode
Ok	**OK** Acknowledge the message

3.4 Menu Structure

Use **MENU** to open the menu to make settings or access information.

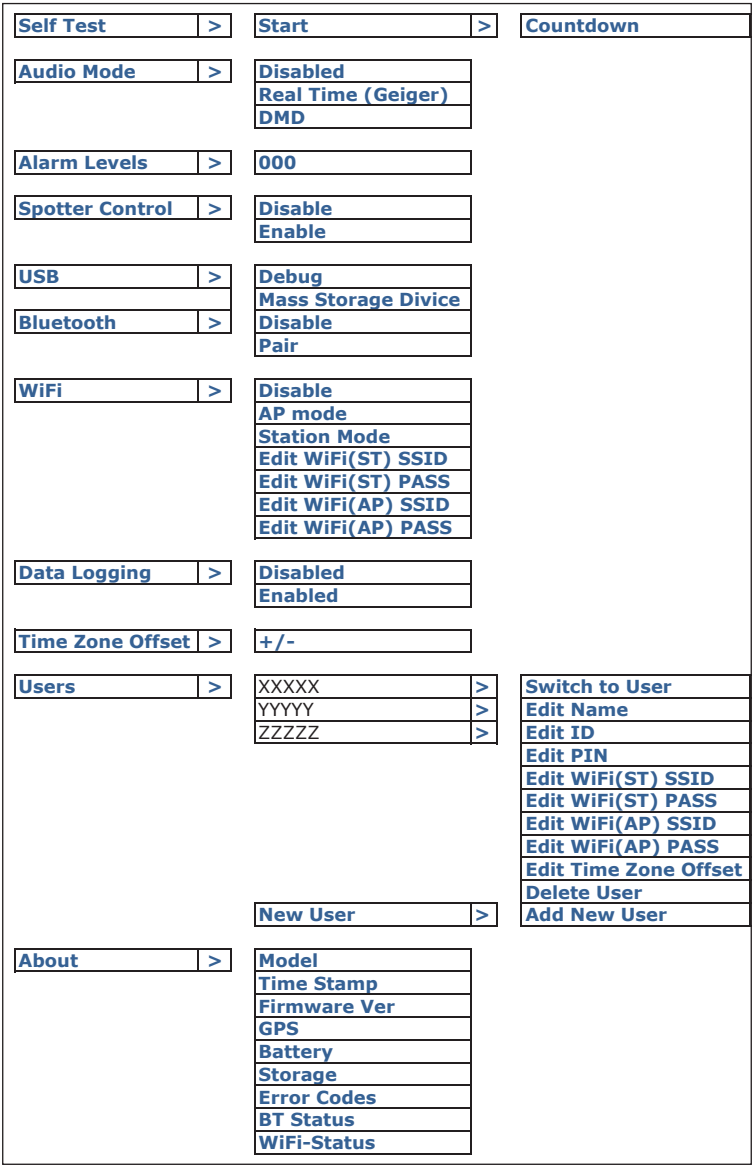

Fig. 12: **RMLD-CS** menu structure

3.5 Self test

The **RMLD-CS** features an integrated function for carrying out a self test. This ensures that the **RMLD-CS** can provide accurate measurement data. A self test log file is automatically recorded and saved.

NOTICE!
A self test must always be performed before commencing work.

The self test takes about 1 – 3 minutes. To perform the self test, proceed as follows:

The **RMLD-CS** must be switched on and ready for use.

1. Select **MENU** > **Self Test**.

   The following will appear in the display: **Press Start to Begin Self Test**.

2. Select **Start**.

   A countdown of 10 seconds begins.

3. Within 10 seconds, place the **RMLD-CS** in the compartment provided in the carrying case .

   - Make sure the **RMLD-CS** is lying flat as intended in the compartment.
   - During the self test, do not move the carrying case.

   During the self test, the display shows: **Self Test in progress**

   The test result is indicated by acoustic signals.

   - A single acoustic signal once a second indicates a successful self test result. **Self Test passed** appears on the display.
   - A double acoustic signal once a second indicates an unsuccessful self test result. **Self Test failed** appears on the display.

If the self test was unsuccessful, what should be done?

The most common causes of a failed self test are:

- The **RMLD-CS** was not placed correctly in the carrying case.
  - − make sure the **RMLD-CS** is lying flat as intended in the compartment in the carrying case.
- The carrying case was moved during the test.
  - − do not move the carrying case during the test.
- The rechargeable battery charge level was too low for the test procedure.
  - − check that the rechargeable battery is sufficiently charged.
- The laser wavelength has drifted away.
  - − repeat the self test.

  After three unsuccessful tests, contact SEWERIN Service.

Note:
Laser wavelength drift is a normal characteristic of the **RMLD-CS**. As a rule, the drift is slight and does not affect the regular self test.

3.6 Audio modes

3.6.1 DMD

In **DMD** audio mode, the measurement value is displayed in red if the measured ppm-m value exceeds the average background value plus the alarm threshold (section 3.7). To activate **DMD** audio mode:

- Select **MENU** > **Audio Mode** > **DMD**.

Even if the weak intensity warning signal is sounding, the **RMLD-CS** can still detect a very high gas concentration. The gas concentration is indicated by successive short signal beats.

3.6.2 Real Time mode

Real Time mode is most effective when used over short distances and can be helpful in detecting low concentrations or in identifying the location of the highest gas concentration.

In Real Time mode a continuous sequence of beats sounds as a function of the measured methane gas concentration. The quicker the acoustic signal beat frequency, the higher the methane gas concentration. Note that due to the amount of natural methane present in the air the signal beat frequency will increase as the distance increases.

- To activate Audio Mode, select **MENU** > **Audio Mode** > **Real Time (Geiger)**.

3.7 Setting the alarm threshold value

The alarm threshold value governs the sensitivity in **DMD** audio mode. The user can adjust the alarm threshold value. Set the alarm threshold so that the false detection rate is low, but at the same time the methane clouds are reliably detected.

Note:
The higher the threshold value setting, the higher the methane concentration must be to trigger an alarm.

This is how to set the alarm threshold value:

1. Select **MENU** > **Alarm Levels**.
2. To change the threshold, select **Navigation**.
3. Select **SELECT** to select the first digit. The cursor moves to the next placeholder.
4. Select **Back** to save the alarm threshold value and return to the menu.

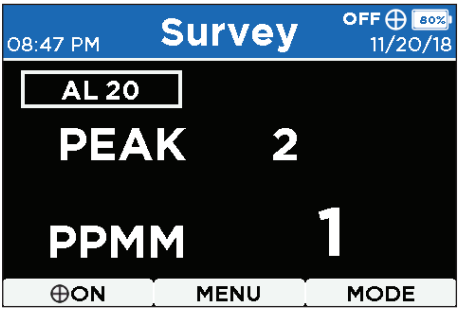

Fig. 13: Display in **Survey** display mode and in **DMD** audio mode: The alarm threshold set value is displayed in a rectangle to the left below the status bar (*here*: AL 20).

3.8 Using the Spotter Laser

The green spotter laser is used for orientation, to indicate which area is being surveyed by the **RMLD-CS**.

CAUTION!

The spotter laser for the visible green wavelength is a class II laser product.

- Do not look into the laser beam.
- Do not use optical instruments such as binoculars or a magnifying glass to look directly into the laser beam.
- Never aim the spotter laser beam into the eyes of other people.
- Be careful not to distract the drivers of vehicles.

To make the spotter laser available for use it must be activated and switched on. The spotter laser switches itself off automatically after 1 minute.

Enabling/disabling the Spotter Laser

Enabling:

- Select **MENU** > **Spotter Control** > **Enable**.

  The **Spotter Laser** symbol appears in the status bar. The **ON** option is shown in the menu bar on the left.

Disabling:

- Select **MENU** > **Spotter Control** > **Disable**.

Switching the spotter laser on/off

The spotter laser must be enabled.

To switch it on:

- Select **ON**.

  The **Spotter Laser** symbol in the status bar switches from white to green. The **OFF** option is shown on the left-hand menu bar.

  After 1 minute, the spotter laser switches itself off automatically.

If you wish to switch the spotter laser off manually:

- Select **OFF**.

Fig. 14: The activated spotter laser is switched on and off using the left-hand key.

3.9 Connectivity

The **RMLD-CS** can be connected to Apple/Android mobile devices and computers. This allows access to information stored on the **RMLD-CS**, such as self test logs, data logs, error codes and screen captures.

3.9.1 USB connection

A connection to a computer can be established by means of a USB cable (USB2 A-micro). This allows you to access the stored data on the **RMLD-CS** from the computer:

1. Select **MENU** > **USB-Mode** > **Mass Storage Device**.
2. Use the USB cable to connect the **RMLD-CS** to the computer that is going to be used.

The file manager on the computer automatically opens when the detector is ready for data access.

Note:
The first time the **RMLD-CS** is connected to the computer, you may have to wait some time until the **RMLD-CS** is detected by the computer. First, the required drivers are installed.

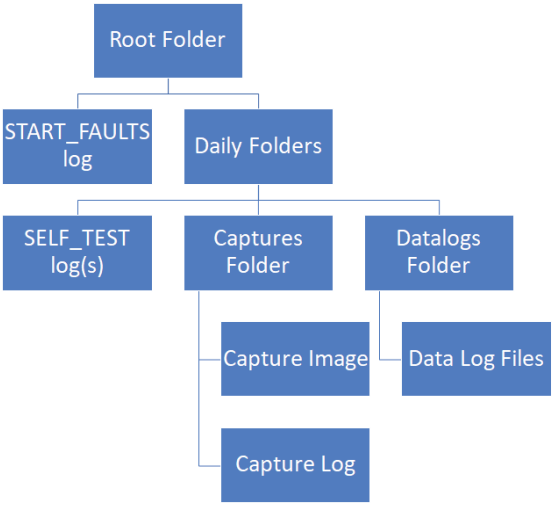

Fig. 15: File management structure of the **RMLD-CS**

Files saved automatically

Formats of the files saved automatically

- Date folder: YYMMDD
- Self-test logs: hhmmss-SELF_TEST.txt
- Data logs: JJMMDD-hhmmss_‘USER’_Datalog.txt

3.9.2 Bluetooth

The Bluetooth function of the **RMLD-CS** allows you to connect to Apple/Android mobile devices and computers. For further information please contact SEWERIN.

To activate the Bluetooth function, the **RMLD-CS** must be connected to a suitable device (BLE).

How to connect the **RMLD-CS** to a device:

1. Select **MENU** > **Bluetooth** > **Pair** > **SELECT**.

   The **RMLD CS** sends a signal for detection.

A pop-up message informs you if:

- a Bluetooth device is connected

  OR

- no Bluetooth device could be connected.

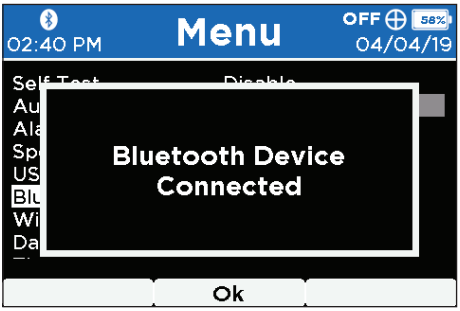

Fig. 16: Popup message: Bluetooth Device Connected

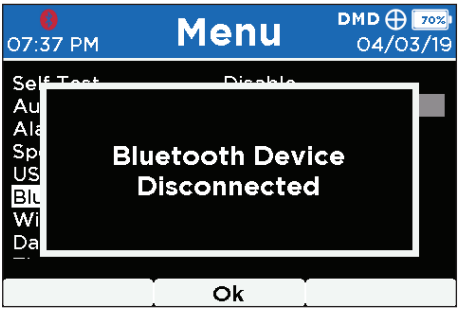

Fig. 17: Popup message: Bluetooth Device Disconnected

- After successful connection, the status bar displays the Bluetooth symbol in a white field.
- If the Bluetooth connection could not be established or was interrupted, the Bluetooth symbol appears in a red field.

3.9.3 WLAN

Warnings, errors and detector readings sent by the **RMLD-CS** can be issued directly via WLAN. For further information please contact SEWERIN.

For establishment of a WLAN connection:

1. Select **MENU** > **WiFi** > **AP mode** or **Station mode**.

   Once the connection has been established, the WLAN symbol will be displayed in the status bar in white.

   If there is no connection or the detector is attempting to establish the connection, the WLAN symbol is red.

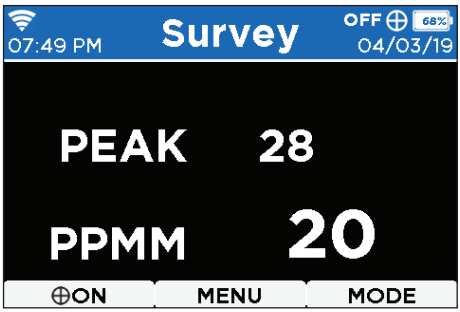

Fig. 18: Display in the **Survey** display mode. The WLAN symbol (on the left in the status bar) displays the connection status.

Access Point WLAN mode

A WLAN network is provided by the **RMLD-CS** in Access Point Mode (AP mode). For example to connect a mobile terminal device, the user can log in directly with the WiFi SSID network name and password.

Telemetry streaming

Live data can be streamed to a computer or mobile terminal device. These data include, for example, ppm-m measurement values, time stamps and system status information.

File access

The files stored in the detector can be retrieved via a computer. To display and download the files:

1. Connect the **RMLD-CS** to a computer via WLAN or USB.
2. Open any Internet browser.
3. Enter the following address: 10.123.45.1:80

3.10 Data logging

When the detector is switched on it can save the complete telemetry data by means of data logging.

To enable this function:

- Select **MENU** > **Data Logging** > **Enabled**.

To disable the function:

- Select **Menu** > **Data Logging** > **Disabled**.

Note:
Errors, self test logs and screen captures are recorded by the **RMLD-CS** even if the data logging is not enabled.

Telemetry data are saved in multiple log files during operation. Log files contain the following measurement information:

- CH4 ppm-m measurement values
- Rechargeable battery charge level

- Rechargeable battery voltage
- GPS location
- Time stamp
- Detector serial number

Log files also contain various system status fields and values that can be used to evaluate detector power or to make corrections in the event of errors.

3.11 Setting the time zone

The time zone can be set to a value that deviates from the UTC time specified by the GPS.

How to adjust the time zone:

1. Select **MENU** > **Timezone**.
2. Use **Navigation** to set the desired time zone.
3. To finish, select **Back**.

Fig. 19: Display **Timezone**

3.12 User profiles

User profiles allow multiple people to use the **RMLD-CS** with their own user-defined settings.

3.12.1 Adding a user

To add a user, proceed as follows:

1. Select **MENU** > **Users** > **New User** > **Add New User** > **Edit Name**.

2. Select the first character using **Navigation** .
3. Select **SELECT** to select the first character. The cursor moves to the next placeholder.
4. Select all the other letters you require.
5. To stop entering the letters, select an empty field
6. Select **Back** to add the user.

3.12.2 Renaming a user

To rename a user, proceed as follows:

1. Select **MENU** > **Users**.

   A list of the saved users is displayed.
2. Select the user name you wish to change.
3. Select **Edit Name**.
4. To change the name, proceed as described in points 2. -6. of section 3.12.1.

3.12.3 Changing user ID settings

To change user ID settings, proceed as follows:

1. Select **MENU** > User name > **Edit ID**.
2. Select a digit using the **Navigation** .
3. Select **SELECT** to select the first digit. The cursor moves to the next placeholder.
4. Proceed as described in points 2 and 3 to specify more digits.
5. Select **Back** to apply the change.

3.12.4 Setting the user PIN

To set a user PIN, proceed as follows:

1. Select **MENU** > **Users** > User name > **Edit PIN**.
2. Select a digit using the **Navigation** .
3. Select **SELECT** to select the first digit. The cursor moves to the next placeholder.
4. Proceed as described in points 2 and 3 to specify more digits.
5. Select **Back** to apply the change.

3.12.5 Deleting a user

To delete a user, proceed as follows:

- Select **MENU** > **Users** > User name > **Delete User**.

3.13 Call up the detector status

Information about the current detector status is displayed under **ABOUT**:

1. Select **MENU** > **About** > **SELECT**.
2. Select **Navigation** to access the desired information:
   - Product name and serial number
   - Current time and date
   - Firmware version
   - GPS status
   - Remaining rechargeable battery charge level as a percentage
   - Available memory capacity
   - Error codes
   - Bluetooth status
   - WLAN status

3.14 Display modes

Use **MODE** to change the display mode. The sequence is **Survey** > **Graph** > **Image**.

The peak value (**PEAK**) is held for 2 seconds before being reset to a lower current measurement value. The **PEAK** value changes immediately if the detector records a higher value.

3.14.1 Survey

The **Survey** display mode shows numeric ppm·m measurement values. This allows clear measurement using the detector.

In **DMD** audio mode the values are displayed red when the alarm threshold value is exceeded.

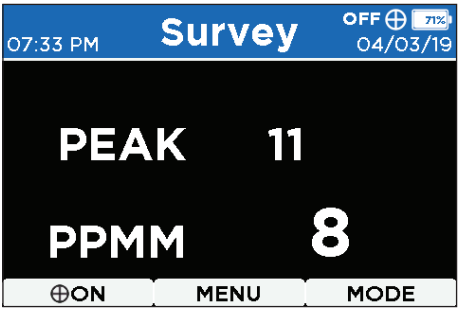

Fig. 20: Display in **Survey** display mode

3.14.2 Graph

In **Graph** display mode there is a bar display in addition to the numeric display of the ppm-m measurement values . This allows the user to easily see any changes in values that occur during the measurement.

In **DMD** audio mode, the bars are displayed in red when the alarm threshold value is exceeded.

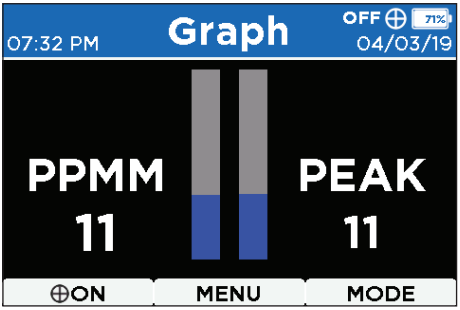

Fig. 21: Display in **Graph** display mode

3.14.3 Image

In **Image** display mode, a live image of the area being surveyed is displayed, together with the current and maximum ppm-m measurement values. This function is particularly useful in bright sunlight when the green spotter laser is hard to detect.

Fig. 22: Display in **Image** display mode

Note:
The image displayed in **Image** display mode provides information about the position of the IR laser beam. The beam may not be exactly in the middle of the image.

- Perform an S-shaped sweep through the image area in order to ensure coverage by the beam.

Taking and saving a photo:

- Select **Camera**.

In addition to the photo, the **RMLD-CS** also saves a text file containing the current measurement values, the time stamp, the location and any other information.

4 Detecting methane gas

4.1 Functional principle

The **RMLD-CS** makes it possible to detect methane gas from a safe distance. When IR light passes through a methane cloud, the methane absorbs a specific wavelength of the light. The detector detects the absorption due to methane in the reflected IR light of the laser. The signal is processed and displayed as the relative gas concentration expressed as ppm-m .

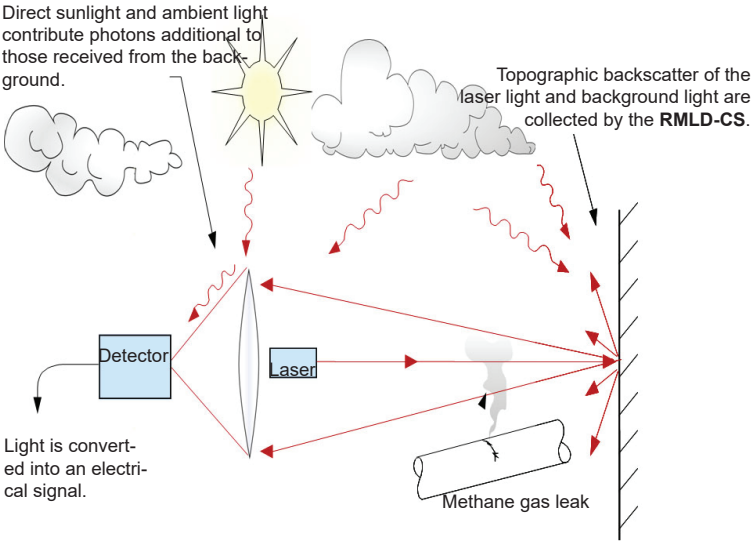

Fig. 23: Detection occurs when light from the IR laser beam that has passed through a methane cloud is reflected by the background, received by the detector and converted into an electrical signal. This allows the concentration of methane to be determined.

Note:
The **RMLD-CS** is designed exclusively for detecting methane and has no cross-sensitivity with other hydrocarbons.

4.2 Requirements

For detecting methane gas using the **RMLD-CS**, three requirements must be satisfied:

- The methane cloud and methane concentration must be greater than the minimum sensitivity of the detector.
- The IR laser beam must penetrate the methane cloud.
- The target background (i. e. ground, buildings, etc.) must reflect the IR laser beam.

Methane gas clouds and methane concentrations are influenced by various factors:

- Low-volume leaks can produce low gas concentrations which may be too low to be measurable.
- Cracks and apertures in surfaces such as concrete often cause the methane gas clouds to appear at places well away from the actual leak.
- Weather conditions such as strong winds and high temperatures can result in the gas cloud being dispersed quickly.

Consider these factors and the corresponding effects on the measurement.

The correct control and alignment of the IR laser beam are important factors when using the detector.

- Abrupt motions can lead to incorrect measurements due to rapid changes in the distance or the background sensed by the laser.
- Rapid motions can result in the area not being thoroughly scanned by the laser.

4.3 Measurement calculation

The methane gas concentration is calculated according to the amount of IR light absorbed by the gas. If for example the methane cloud has an extent of 1 m and a methane content of 100 ppm, the result is a value of 100 ppm-m. If the extent of the methane cloud is only 0.5 m with a methane content of 100 ppm, the measurement value is 50 ppm-m.

The invisible IR laser beam has a maximum range of up to 30 m against a normal background such as brick, concrete or grass. The actual range may vary depending on the surface condition.

The measuring point size of the IR laser beam increases as the range increases (Fig. 24). For this reason, methane clouds can be pinpointed more precisely from a closer range. At a range of 30 m the diameter of the IR laser beam is approx. 55 cm.

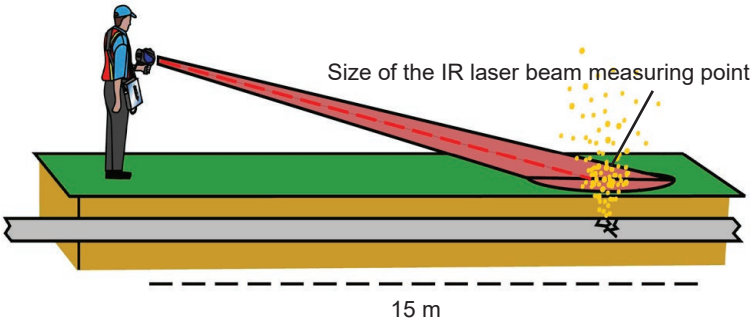

Fig. 24: The greater the range the larger the measuring point of the IR laser beam.

Note:
Atmospheric air always contains a low level of methane. This natural background methane level is also measured by the **RMLD-CS**. The ppm-m measurement value therefore increases as the scanning distance is increased.

Note:
The shape of a methane cloud can be highly variable. Some leaks cause a high concentration directly at ground level without any measurable methane cloud above it.

Ppm-m measurement value

The ppm-m measurement value is the product of the methane concentration multiplied by the distance of the IR laser beam

passing through the methane concentration, plus the background gas concentration.

Example:

Parameter	Value
Scanning distance	15 m
Background methane gas level	1 ppm
Average methane concentration in the methane gas cloud	20 ppm
Distance for which the IR laser beam is passing through the methane cloud	2 m
Calculation (methane gas background + methane cloud)	(15 m × 1 ppm) + (2 m × 20 ppm)
Measurement value	**55 ppm-m**

4.4 Start measurement

NOTICE!
A self test must always be performed before commencing work.

To perform a measurement, proceed as follows:

1. Switch on the **RMLD-CS**.
2. Select the desired display mode.
3. Use the spotter laser to select the area where you suspect a methane cloud may be present.
4. Scan the pipes with an S-shaped motion. If necessary, also scan them in the opposite direction.
5. If an area is too far away, or if obstructions create dark zones which the IR laser beam cannot reach, move closer.
6. Change your location to determine more accurately the extent of a methane cloud.

4.5 Practical tips for detection

Please note the following general points for all measurements:

- Use a smooth sweeping motion.
- If the target distance of the IR laser beam is approx. 5 to 7 m, ensure that the measuring point size in the target is large enough for good coverage.
- Scan pipework joints and valves as you approach them.
- Direct the laser at likely leak locations (e.g. cracks, damaged vegetation, etc.).

4.5.1 Measuring in unfamiliar locations

Please note when measuring in unfamiliar locations:

- Focus on typical gas vent areas such as the edges of roads, pavements and foundations of buildings.
- Perform scans at points where valves may be present.

4.5.2 Taking measurements close to a gas meter

Please note when measuring close to a gas meter:

- Keep a distance of at least 3 m from the gas meter so that the measuring point size is not too small.
- Thoroughly scan the ground in the area around the meter.
- Aim the device at the gas meter from the angle that provides a suitable background behind the meter.
- Scan the meter with an S-shaped motion:
  - if the meter is in the open

    or
  - if the angle is so restricted that there is no appropriate background directly behind the meter.
- Keep a constant distance when sweeping.

If the methane concentration is elevated in the area of the gas meter, proceed as follows to determine whether the leak is underground or at the meter.

1. Select **Real Time (Geiger)** audio mode.

2. As far as possible, position yourself with the wind at your back at a distance of approx. 1.5 to 3 m from the meter.
3. Aim the beam initially downwards on to the ground.
4. Then sweep the beam upwards with an S-shaped motion along the pipeline.
5. If you suspect a leak underground, clear the area.

4.5.3 Measuring at low methane gas concentrations

To measure low methane gas concentrations, proceed as follows:

1. Select **Real Time (Geiger)** audio mode.
2. As far as possible, position yourself with the wind at your back at a distance of approx. 3 m.
3. Sweep the laser beam over the suspected area of leakage, maintaining a constant distance.
4. Listen to the acceleration of the signal beat frequency. Small increases in methane concentration cause only a slight increase in the signal beat frequency.

The highest methane concentration is in the area where the signal maintains the highest constant beat frequency.

4.5.4 Detecting the highest methane concentration

To detect the highest methane concentration, proceed as follows:

1. Select **Real Time (Geiger)** audio mode.
2. As far as possible, position yourself with the wind at your back at a distance of approx. 3 m.
3. Move the laser in the direction of the wind, starting from the side of the suspected area of the leak.
4. Identify where the signal beat frequency is highest.
5. Change the angle of the sweep slightly and rescan the area around the leak.

If the signal beat frequency is not constant, continue scanning the area. It is possible that the methane gas cloud may be drifting around, which will produce inconsistent readings. In some cases, the methane gas cloud may be so large that precise pinpointing of the source is not possible.

4.5.5 Measuring from a long range

The **RMLD-CS** can be used to determine methane clouds at distances of up to 30 m. The actual maximum distance will depend on the characteristics of the target surface and the environmental conditions. As the distance is increased, the intensity of the laser light will become lower. When the maximum measurement range is reached, an audible signal indicates that the signal is too low. In that event, move closer to the target.

The best results are achieved when scanning from ranges of more than 15 m:

- Reduce the scanning speed.
- Handle the laser particularly carefully.
- Use the spotter laser or the camera function to aim at the target.
- Watch out for dark zones caused by undulations in the ground or by buildings or objects.

Note:
Scanning across the peak of a mound or the corner of a building can cause the beam to skip (a sudden change in range), which may lead to false measurements.

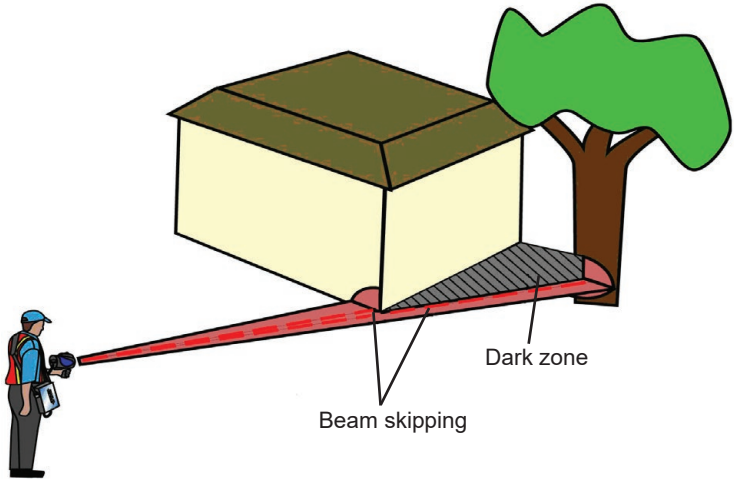

Fig. 25: Beam skipping: The beam moves abruptly from a close object to a distant object.

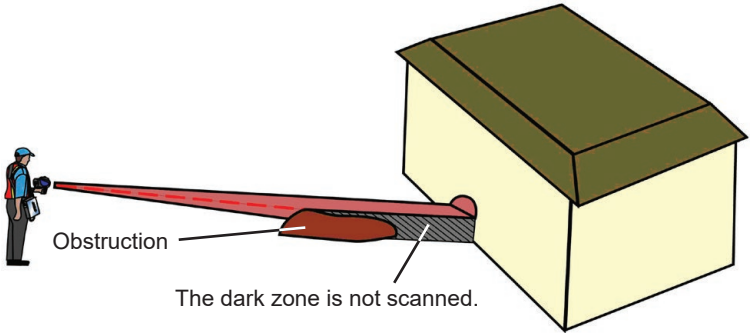

Fig. 26: Select the best angle to survey all areas during the measurement.

4.6 Avoid incorrect measurements

There are several conditions that may occur when using **DMD** audio mode that can lead to the algorithm giving a false detection indication.

At the 15 m range the measuring point size of the beam becomes very large. Abrupt motions or changes to the background surface can cause a weak gas concentration to be signalled.

- Avoid sudden or jerky motions that can lead to an abrupt change in scanning range.
- If the background is highly reflective, excessively high measurement values can be obtained. Therefore watch out for backgrounds such as:
  - reflecting plastics
  - water
  - glass
  - polished surfaces
  - stones
  - vehicle identification numbers
  - reflectors
- If necessary, scan the area again from another angle.
- When scanning, slowly reduce the distance from a suspected leak.

5 Maintenance

A battery charger is included in the scope of supply of the **RMLD-CS** . Two slots allow two battery packs to be charged at the same time.

WARNING!
If lithium ion rechargeable batteries are defective there is a risk they can explode.

- Never charge defective rechargeable batteries.
- Remove defective rechargeable batteries immediately.
- Charge batteries only in environments where there is no increased risk of fire or explosion.

NOTICE!
The battery pack or the battery charger can be damaged or destroyed if it is improperly charged.

- Use only the rechargeable battery charger to recharge the battery pack.
- Use the battery charger only to charge the battery pack supplied.

Note:
If rechargeable batteries are not used for long periods of time, chemicals in the battery cells can decompose irreversibly and the battery can then be permanently damaged.

- Before you place the **RMLD-CS** or the rechargeable battery pack in store for longer than one month , charge the battery pack to 40 - 50 %.
- Store the **RMLD-CS** or battery pack at room temperature (approx. 15 - 21 ºC).

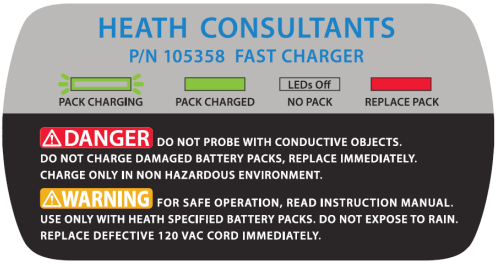

Fig. 27: Sticker with charging instructions

5.1 Charging the battery pack

The battery charger is connected directly to the power supply using the AC/DC adapter.

The **RMLD-CS** must be switched off to remove the battery pack.

Charge the battery pack as follows:

1. Undo the two screws on the bottom of the **RMLD-CS**
2. Remove the battery pack.
3. Place the battery pack in the charger. Make sure it is fully inserted.
   - If necessary, tighten the screws to clamp the battery pack to the housing of the battery charger and ensure the battery pack is correctly seated.

Display of the charge level on battery charger

LED	Status
green flashing	Battery pack is being charged
green constantly lit	Battery pack is fully charged
off	Battery pack not inserted correctly
red constantly lit	Charging error

If the LED lights up red due to a charging error:

a) Check that the battery pack is securely positioned.

b) Insert the battery pack into the other compartment.

If after this the LED still lights up red, the battery is not suitable for use. Contact SEWERIN Service.

The battery pack has a typical charging time of approximately 3 hours. The battery pack is protected against overcharging. Therefore the charger can be left connected to the power supply even after the battery pack is fully charged.

5.2 Handling faulty lithium ion rechargeable batteries

Lithium ion rechargeable batteries are always classed as dangerous goods for transport purposes.

The transportation of faulty lithium ion rechargeable batteries is only permitted under certain conditions (e.g. must not be transported as air freight). Where transportation is permitted (e.g. by road or rail), it is subject to strict regulations. Faulty lithium ion rechargeable batteries must therefore always be removed before shipping the **RMLD-CS** . Transportation by road or rail must occur in compliance with the current applicable version of the ADR[1] regulations.

Identifying faulty batteries

A lithium ion rechargeable battery is considered to be faulty if one of the following criteria applies:[2]

- Housing damaged or badly deformed
- Liquid leaking from battery
- Smell of gas from battery
- Rise in temperature with the receiver switched off (more than hand-hot)
- Plastic parts melted or deformed
- Connection leads melted

5.3 Faults and troubleshooting

The table below contains a list of possible faults, their causes and suggestions for remedying them.

[1] French abbreviation for: Accord européen relatif au transport international des marchandises dangereuses par route, Engl.: European Agreement concerning the International Carriage of Dangerous Goods by Road

[2] According to: EPTA – European Power Tool Association

- Contact SEWERIN Service if you cannot fix a fault yourself.
- Do not use the **RMLD-CS** whilst there is a fault.
- The **RMLD-CS** may be repaired only by persons qualified to do so.

Fault	Possible cause	Corrective action
Higher measurement values than usual for short range measurements. At longer distances, the measurement values are lower than usual.	laser calibration drift	perform a self test
Measurement value for the gas concentration is too low and self test did not complete successfully.	laser calibration drift	perform a self test (up to 3 times); if the fault persists, contact SEWERIN Service
The detector will not switch on.	battery pack discharged	replace or recharge the battery pack
Continuous warning sound or message on the display when scanning.	scanning beyond range	move closer to the target or change the angle to the target in order to gain a better reflecting background
	the background surface is absorbing or reflecting the IR light	
	battery pack discharged	check the charge level of the battery pack and recharge if necessary

Fault	Possible cause	Corrective action
An excessive number of false detections occur when scanning at long range.	scanning too fast	scan more slowly; pause at long range and if necessary sweep the beam from a closer point
	alarm threshold value set too low	increase the alarm threshold value
	scanning beyond range	move closer to the target
An excessive number of false detections occur when scanning at short range.	scanned too fast	avoid sudden motions whilst scanning
	alarm threshold value set too low	increase the alarm threshold value
Excessive number of false detections and loss of sensitivity.	laser calibration drift	perform a self test
	alarm threshold value not adjusted to ambient conditions	check the alarm threshold value
Error/warning is constantly displayed.	battery pack discharged	check the charge level of the battery pack and recharge if necessary
	condensation on the mirror due to rapid temperature change	wait until the temperature has stabilised
	internal component failed	make a note of the error code and contact SEWERIN Service

Fault	Possible cause	Corrective action
Battery indicator shows that the battery is not fully charged after charging.	battery pack not fully charged	charge the battery until the green LED on the charger is permanently lit
	battery charge indicator calibration error	operate the detector until it switches off automatically; then fully charge battery pack without interruption
Low signal or low light intensity.	the background surface is absorbing the IR light	change the angle of the laser to the target to take advantage of a better reflecting background
	scanning beyond range	move closer to the target
Oversaturation	the background surface is reflecting the IR light too strongly	change the angle of the laser to the target to take advantage of a better reflecting background
No WLAN connection.	wrong login data	check the login data
	outside the WLAN range	bring the **RMLD-CS** closer to the WLAN router
	WLAN deactivated	activate the WLAN
No Bluetooth connection	Bluetooth deactivated	activate Bluetooth
	RMLD-CS not connected	connect the **RMLD-CS** to the other device

Fault	Possible cause	Corrective action
USB is not being detected.	USB cable faulty	use another USB cable
	USB port faulty	use another USB port or update the USB driver
	battery pack discharged	charge or replace the battery pack
	USB driver not properly installed	uninstall the USB driver on the computer and then reinstall it
	limited user rights	contact local IT support

5.4 Maintenance

In order to maintain the **RMLD-CS** in proper working order, the following maintenance tasks must be carried out at the specified intervals.

Maintenance task	Frequency
Clean outer surfaces with a damp cloth.	as required
Clean the detector window with a damp cloth or a special lens cleaning cloth.	as required to remove built-up dust or water marks
Self test	before use to verify that the detector is working properly
Charge the battery pack	recharge fully after use. recharge to 40 – 50 % before long storage

6 Appendix

6.1 Technical data

Weight	approx. 1.4 kg
Display	3.5″ LCD
Operating temperature	-17 – 50 °C
Humidity	5 – 90 % r.h., non-condensing
Protection rating	IP54
Non-permitted operating environments	in potentially explosive areas
Power supply	rechargeable lithium-ion battery, 12 – 15 V [9006-0001]
Operating time, typical	8 h at 0 °C
Energy	28.1 Wh
Charging time	2 – 3 hours until charging is complete
Charger	external, 110-240 V, 50/60 Hz
Communication	Bluetooth 4.2 BLE, WiFi, USB
Detection method:	TDLAS
Self test and calibration	integrated self test and calibration function for checking correct operation and adjusting the laser wavelength for best sensitivity; gas test cell integrated into the carrying case
Measuring range	0 – 99999 ppm
Sensitivity	5 ppm-m at distances 0 – 15 m
Detection range	30 m
Beam size	conical beam, width 56 cm at 30 m
Alarm modes for detection	DMD: ● audible signal, variable pitch according to concentration when the alarm activation threshold is exceeded. ● alarm activation threshold adjustable from 1 – 999 ppm Real Time: ● continuous audible signal, variable beat frequency according to concentration
System fault warning	audible signal and display on screen
Laser classification	IR laser: Class 1, Spotter: Class 2
Shipping instructions	UN 3481: Lithium-ion batteries contained in equipment, or lithium ion batteries, packed with equipment net weight of battery/batteries: 0.253 kg

6.2 Accessories

Part	Order number
Glasses	9006-0001
Spare rechargeable battery pack	9066-3001

6.3 Declaration of conformity

Hermann Sewerin GmbH hereby declares that the product fulfils the requirements of the following guidelines:

- 2011/65/EU
- 2014/53/EU

Gütersloh, 2019-12-18

Dr. S. Sewerin (General Manager)

The complete declaration of conformity can be found online.

6.4 Terminology and abbreviations

Dark zone

Area that is not in the direct line of sight due to an obstruction. This can be raised ground, the side of a building, the area behind a kerb, etc.

DMD (Digital Methane Detection)

Detection Mode in which the user is alerted when methane concentration changes suddenly.

Laser calibration drift

The characteristic of laser diodes that wavelength calibration can change slowly over time. The **RMLD-CS** features a self test/calibration function to maintain the correct calibration.

Infrared (IR)

Light wavelength outside the spectrum of visible light.

Measuring point size

Area on the surface covered by the **RMLD-CS** IR laser beam. The area increases as the distance increases. At a range of 30 m, this area has a diameter of approximately 55 cm when the beam is aimed horizontally at vertical target.

ppm-m (parts per million meter)

Product of the line traced by the IR laser beam in a methane cloud multiplied by the methane concentration.

Real Time

Audio mode that continuously displays the measured gas concentration by a variable signal tone.

Spotter Laser

Green laser beam that indicates to the user the alignment of the IR laser beam.

Beam skipping

Occurs when the IR laser beam jumps between a near and a distant object. This can lead to faulty measuring results. The effect can also occur on highly reflective surfaces (glass, water, ice, etc.).

TDLAS (Tunable Diode Laser Absorption Spectroscopy)

A spectroscopic method of gas detection using laser beam. When a beam of light passes through a gas, it is selectively absorbed. The gas concentration can be calculated from the extent of absorption.

6.5 Advice on disposal

The European Waste Catalogue (EWC) governs the disposal of devices and accessories in accordance with EU Directive 2014/955/EU.

Waste	EWC-Code
Device	16 02 13
Disposable battery, rechargeable battery	16 06 05

Alternatively, devices can be returned to Hermann Sewerin GmbH.

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