Leak Locators of Montana

SEWERIN
Technologies for leak detection.

EX-TEC® HS 680/660/650/610

20.04.2016 a – 105734 – en

Operating instructions

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Fig. 1: **EX-TEC HS 680** device overview

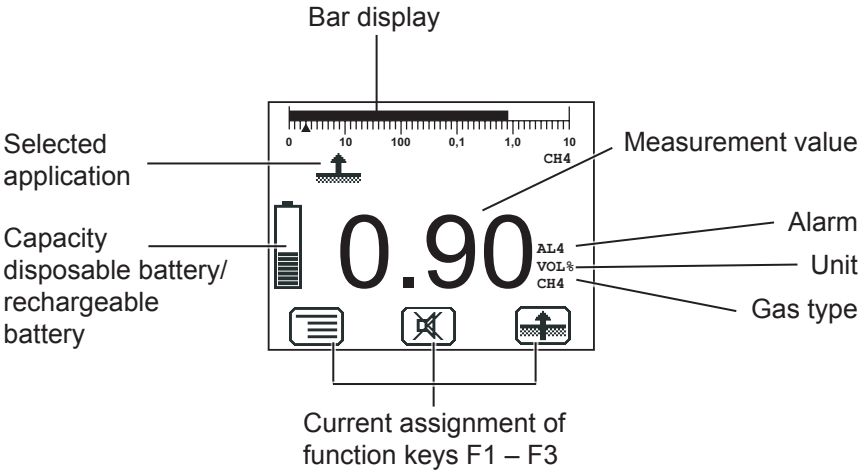

Fig. 2: **EX-TEC HS 680** display

Display symbols

General

Menu

OK

Cancel

Buzzer off

Take sample

Save

Clear

Capacity disposable battery/rechargeable battery

Fault

Carry out device inspection

Tab
(jump to next input field)

Set zero point

Purge

Stop measurement

Information

Open stored comment
Open stored inspector

Applications

Inspection above ground

Measuring in bar holes

Enclosed spaces

House

Gas measuring

Warning %LEL

Warning ExTox

Ethane analysis

Information about this document

The warnings and notes in the document mean the following:

DANGER!
Risk of personal injury. Results include serious injury or death.

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

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

CAUTION!
Risk of damage to property.

Note:
Tips and important information.

Enumerated lists (numbers, letters) are used for:

- Instructions that must be followed in a specific sequence

Bulleted lists (bullet points, dashes) are used for:

- Lists
- Instructions comprising only one action

Numbers enclosed by forward slashes /.../ refer to referenced documents.

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1 General

1.1 Warranty

The following instructions must be complied with in order for any warranty to be applicable regarding functionality and safe operation of this equipment. This product must only be commissioned by qualified professionals who are familiar with the legal requirements (Germany: DVGW).

- Read these operating instructions prior to operating the product.
- Use the product only as intended.
- Repairs and maintenance must only be carried out by specialist technicians or other suitably trained personnel. Only spare parts approved by Hermann Sewerin GmbH may be used when performing repairs.
- Use only suitable battery types, otherwise the device will not be explosion-proof.
- Changes or modifications to this product may only be carried out with the approval of Hermann Sewerin GmbH.
- Use only Hermann Sewerin GmbH accessories for the product.

Hermann Sewerin GmbH shall not be liable for damages resulting from the non-observance of this information. The warranty conditions of the General Terms and Conditions (AGB) of Hermann Sewerin GmbH are not affected by this information.

In addition to the warnings and other information in these Operating Instructions, always observe the generally applicable safety and accident prevention regulations.

The manufacturer reserves the right to make technical changes.

1.2 Purpose

The **EX-TEC HS 680** and the models **660**, **650** and **610** are hand-held measuring devices which can be used for all gas pipeline testing applications.

The devices are designed for professional industrial use and require the necessary specialist knowledge for working in gas pipelines. Example applications are described in /3/.

All devices are fitted with infrared sensors for measuring hydrocarbons C_XH_Y and carbon dioxide CO_2 as standard. Models **680** and **660** also feature a gas-sensitive semiconductor.

Models **680** and **660** can also be fitted with a detector for ethane gas analysis to ensure a reliable distinction between natural gas and swamp gas.

All devices can also be individually fitted with electrochemical sensors.

The infrared sensors operate on the principle of absorption via infrared-active gases, and the electrochemical sensors operate on the electrochemical cell principle. The gas-sensitive semiconductor reacts to changes in conductivity brought about by reducible gases.

Note:
These operating instructions describe the **EX-TEC HS 680** with all additional equipment (firmware version 1.XXX). All descriptions refer to the device as delivered (factory settings) and apply to all models. The manufacturer reserves the right to make changes.

1.3 Intended use

This device is intended for professional residential and commercial use including small firms and commercial operations. The appropriate specialist knowledge is required to operate the device.

The device may only be used to measure the following gases (depending on the device model and additional equipment):

- Methane CH_4 / propane C_3H_8 / butane C_4H_{10}
- Carbon dioxide CO_2
- Oxygen O_2
- Hydrogen sulphide H_2S
- Carbon monoxide CO

The device must **not** be used for:

- Gas analysis of technical processes
- Monitoring liquids

The device can be used up to a temperature of 40 ºC. However, high temperatures reduce the lifetime of the sensors and rechargeable batteries.

If a device with an electrochemical sensor is exposed to gas concentrations above the measuring range limit, this can reduce the lifetime of the sensor.

1.4 General safety information

- The device has been tested to ensure that it is explosion-proof in accordance with European standards (CENELEC).
- The device must only be switched on with fresh air.
- Do not use this device in oxygen-enriched atmospheres, otherwise it will not be explosion-proof.
- Only probe hoses with a hydrophobic filter may be used.

  Exception:
  If the probe has a built-in hydrophobic filter, the hose does not require any other filters.
- The device must only be tested and adjusted with test gases in well ventilated rooms or in the open air. Test gases must be handled in a professional manner.
- Always carry out a device inspection after the device has suffered an impact (for example, if dropped accidentally) (see Section 5.1).
- The device complies with the limits of the EMC directive. Always observe the information in the manuals of (mobile) radio equipment when using the device close to (mobile) radio equipment.

Note:
Follow the advice regarding explosion protection
(see Section 2.3).

1.5 Allocation of tasks to applications

Refer to the table below to help you select the appropriate application for a given activity (according to /3/).

Location	Activity	Application
Gas lines, gas systems, …	• Measuring the gas concentration – Purge to verify gas purity or absence of gas, for example, when commissioning or decommissioning gas systems	Gas measuring
Buried gas lines	• Measuring minimal gas concentrations above: – Ground – Gas line – Possible leakage points	Inspection above ground
	• Distinguishing between natural gas and swamp gas	Ethane analysis
Gas lines, gas systems, etc. In houses, in enclosed spaces and shafts	• Warning against explosive gas concentrations through work area monitoring	Warning %LEL
	• Warning against explosive and toxic gases through work area monitoring	Warning ExTox
In the ground	• Measuring the gas concentration to: – Determine gas dispersion (detection limit) – Classify leaks – Locate a probable gas escape (repair point) – Prevente possible dangers	Measuring in bar holes
In enclosed spaces and shafts with an increased potential of gas dispersal	• Measuring the gas concentration	Enclosed spaces
In the house	• Measuring very low gas concentrations • Locating the source of gas • Finding leaks at internal connections	House

2 Features

The device comes in four models:

EX-TEC HS 680

EX-TEC HS 660

EX-TEC HS 650

EX-TEC HS 610

The models are suitable for the following applications:

Application	HS 680	HS 660	HS 650	HS 610
Inspection above ground	×	×		
Measuring in bar holes	×	×	×	×
O_2	○	○	○	○
Enclosed spaces	×	×		
House	×	×		
Gas measuring	×	×	×	×
Warning %LEL	×		×	
Warning ExTox	×		×	
CO	○		○	
H_2S	○		○	
O_2	○		○	
Ethane analysis	○	○		

× Standard ○ Optional

2.1 Visual and audible signals

The device features two alarms:

- Signal light on top of device (visual signal)
- Buzzer on side of device (audible signal)

The signals indicate alarms and faults. The device also emits signals when it is switched on and off.

If this symbol appears on the display, the audible signal can be switched off.

When an audible signal has been switched off it cannot be switched back on while the concentration level remains above the alarm threshold.

This symbol appears at the top left of the display as soon as the audible signal has been switched off. It disappears automatically if the level falls below the alarm threshold.

Operating signal

When using the **Warning %LEL** and **Warning ExTox** applications, the device emits a visual and audible signal at regular intervals. This indicates that the device is working properly.

Alarm

The device can monitor several gases at the same time. If the measured gas concentration of one or more gases exceeds specified limit values (alarm thresholds) the device gives a warning. It emits both audible and visual signals, which are distinctly different from the operating signal.

WARNING! Danger of death due to hazardous gas concentrations

An alarm always indicates danger.

- Take all necessary measures for your own safety and the safety of others immediately.

There is detailed information on alarms in Section 7.2.

2.2 Sensors

The device features three types of sensor:

- Gas-sensitive semiconductor (SC)
- Infrared sensor (IR)
- Electrochemical sensor (EC)

Application	Gas	Measuring range	Sensors
Inspection above ground	CH_4	1 ppm – 10 % vol.	SC, IR
Measuring in bar holes	CH_4	0.0 – 100 % vol.	IR
	CO_2	0 – 30 % vol.	IR
Enclosed spaces	CH_4	1 ppm – 100 % vol.	SC, IR
House	CH_4	1 ppm – 100 % vol.	SC, IR
	CO	0 – 500 ppm	EC
Gas measuring	CH_4	0.0 – 100 % vol.	IR
Warning %LEL and Warning ExTox	CH_4	0 – 100 % LEL	IR
	CO	0 – 500 ppm	EC
	CO_2	0 – 5 % vol.	IR
	O_2	0 – 25 % vol.	EC
	H_2S	0 – 100 ppm	EC
Ethane analysis	CH_4	---	Gas chromatograph, SC
	C_2H_6		
	C_3H_8		

2.3 Explosion protection

2.3.1 Passive explosion protection

The device is assigned to the following explosion-proof groups:

Explosion-proof group	For the following atmospheres	When using
II2G Ex d e ib IIB T4 Gb	– Methane CH_4 – Propane C_3H_8 – Butane C_4H_{10} – Hydrogen sulphide H_2S – Carbon monoxide CO	Device **without** carrying bag TG8
II2G Ex d e ib IIC T4 Gb	– Methane CH_4 – Propane C_3H_8 – Butane C_4H_{10} – Hydrogen sulphide H_2S – Carbon monoxide CO – Hydrogen H_2	Device **with** carrying bag TG8

EC type-examination certificate: TÜV 07 ATEX 553353 X

DANGER! Risk of explosion due to sparks

- Only open the battery compartment outside of explosive areas.
- Only charge the device outside of explosive areas.
- Only use the USB port outside of explosive areas.
- Use only suitable battery types.
- When working with hydrogen, always use the carrying bag TG8 for the device.

2.3.2 Active explosion protection

The functional safety test applies to:

Applications:	Warning %LEL Warning ExTox	
Gas types:	Measuring range:	
– Methane CH_4	0 – 100 % LEL	
– Propane C_3H_8	0 – 100 % LEL	
Gases:	Measuring range:	As per:
– Oxygen O_2	0 – 25 % O_2	/7/
– Carbon dioxide CO_2	0 – 5 % CO_2	/5/
– Carbon monoxide CO	0 – 500 ppm CO	/5/
– Hydrogen sulphide H_2S	0 – 100 ppm	/5/
Tested accessories:	– Test set SPE VOL – Flexible hand probe, 1 m – Floating probe 2 m, 6 m	

Type examination

Testing institute:	DEKRA EXAM GmbH
Certificates:	PFG 08 G 002 X BVS 09 ATEX G 001 X

The following points were not part of the type examination:

- Saving measurement data (see Section 3.2.12)
- Saving protocols from the integrated device inspection (see Section 5.1.1.4)
- Disposable alkaline batteries for the power supply (see Section 4.1)

3 Operation

3.1 General information on operation

3.1.1 Keys and jog dial

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

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

Control	Action	Function
ON/OFF key	Press	● Switches the device on ● Switches the device off
Function keys F1, F2, F3	Press	● Variable ● As indicated on the display at the bottom of the screen ● Function keys may also have no function assigned in some cases
Jog dial	Turn	● Selects functions, settings, measurement data, etc. ● Modifies values
	Press	● Opens the next program level (e.g. menu item, function, measurement data, selectable values) ● Accepts values

3.1.2 Selecting/exiting menus and menu items

Functions, applications and settings etc. are selected via the main menu (for short: **Menu**). This **menu** has submenus and menu items. Refer to Section 3.2.1 for information on accessing the menu.

Selecting submenus/menu items

Submenus and menu items are selected and opened using the jog dial and/or function keys.

In measuring mode the name of the selected application is indicated by the symbol at the top left of the display. You can find detailed information on how to select or switch applications in Section 3.1.4.

Exiting menus/menu items

There are generally two ways to exit open menus/menu items and go back up a level:

- **Press Esc**
- Select **Exit** menu item

3.1.3 Switching the device on

Note:
Always switch the device on with fresh air.

1. Press the ON/OFF key. The device switches on.

   The switching on process involves an internal check.

Process	Test purpose
Buzzer emits audible signal.	Is the audible signal working?
Signal light gives visual signal.	Is the visual signal working?
Display is inverted.	Are there pixels missing from the display?

   The start screen appears on the display.

Fig. 3: Start screen

Display:
- Device type: EX-TEC HS 680
- User:
  Frank Smith
  City Council
  Leakage Delivery
- Firmware version: V1.200
- Date and time
- Capacity disposable battery/ rechargeable battery

   The start screen for the application set under **Autostart** then appears (see Section 3.3.4).

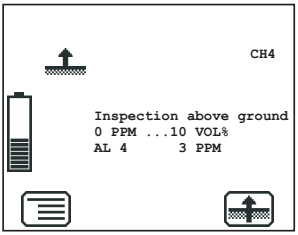


Fig. 4: Start screen for inspection above ground application

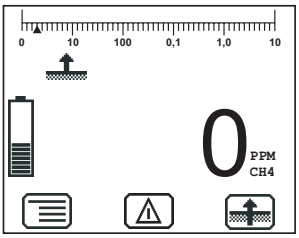
Display:
- Gas type: CH_4
- Application as symbol (top left) and text: Inspection above ground
- Measuring range: 0 ppm ... 10 % vol.)
- Alarm threshold: AL4, 3 ppm
- Symbol for next application that can be selected via function key F3: Measuring in bar holes

The device switches to measuring mode. The device warms up. The reading flashes.

While the device is warming up, the prompt **Add fresh air!** is displayed as a reminder.

2. Make sure the device is actually drawing in fresh air. Change its location if necessary.
3. Wait until the reading stops flashing.

   The device is ready for use.



Display:
- Current reading: zero when device is switched on with fresh air

Fig. 5: Inspection above ground measuring mode

WARNING! Danger of death due to incorrectly adjusted or faulty devices

Gas warning instruments must be inspected before use at regular intervals.

- Carry out a device inspection every day before starting work.

3.1.4 Selecting/switching application

WARNING! Danger of death due to incorrectly adjusted or faulty devices

If the device is used as a gas warning instrument (**Warning %LEL** and **Warning ExTox** applications), it must be regularly inspected before use.

- Carry out a device inspection every day before starting work.

Note:

You may only switch applications when the device is drawing in fresh air.

The current application is indicated by the symbol at the top left of the display. The symbol at the bottom right shows the next application that can be selected via function key **F3**. The **Settings** under **System** (see Section 3.3.4) are used to specify which application is first activated when you switch the device on.

- Press **Menu**. Select the menu item for the application you want to use.

  OR

  a) Press function key **F3**. The device switches to the next application.

  b) Repeat until the symbol for the application you want to use appears at the top left.

3.1.5 Differences between measuring mode and settings mode

The device is operated in two modes:

- **Measuring mode** (see Section 3.2)

  Measurements are taken in measuring mode. All functions needed to take readings can be accessed from one menu.

- **Settings** (see Section 3.3)

  The device settings can be changed in settings mode. Information about the device can also be retrieved. Measurements cannot be taken in settings mode.

  Settings are accessed via the menu in measuring mode. The settings are access-protected by a PIN code.

WARNING!
Danger of death due to lack of alarm signal
The device only issues alarms in measuring mode. As soon you access the menu, alarms are no longer triggered.
- Only change the settings outside of explosive areas and away from toxic or low-oxygen atmospheres.

3.2 Measuring mode

When switched on, the device is in measuring mode. The current measurement values are always shown in measurement mode (Fig. 5). Depending on the application, measurements will have to be saved or started and then stopped (see Section 3.2.12).

WARNING!
Danger of death due to operating signal failure
When the device is used as a gas warning device (**Warning %LEL** and **Warning ExTox** applications), an operating signal must always sound in measuring mode. If the operating signal fails, the device is not safe to use.
- Stop using the device immediately.
- Move away from explosive areas or toxic or low-oxygen atmospheres immediately.

3.2.1 Accessing the menu (measuring mode menu structure)

In measuring mode **F1** can be used to access the **menu**.

Zero point
Inspection above ground
Measuring in bar holes
Ethane analysis
Enclosed spaces
House
Gas measuring
Warning %LEL
Warning ExTox
Settings
Start measurement
Protocol
Purge
Device inspection
Gas type CxHy
Device information
Exit

Fig. 6: **Menu** with submenus (menu items)

Once you have started a measurement, **Start measurement** in the menu becomes **Stop measurement**. In some applications this menu item is called **Save measurement**.

You can find detailed information on starting, stopping and saving measurements in Section 3.2.12.

Protocol does not appear in the menu until you save a protocol for the first time.

Purging only appears in the menu in the ethane analysis application.

Gas type CxHy only appears in the menu if the device is equipped for at least one further gas type apart from methane CH4.

3.2.2 Zero point

The zero point can be set manually in the **Zero point** menu item. This is only necessary if the displayed fresh air measurement is not zero after the end of the warm-up period.

Gas	Content in fresh air	Correct zero point on device
CH_4	0 % vol.	0.0 % vol.
CO	0 ppm	0 ppm
CO_2	0.04 % vol.	0.04 % vol.
O_2	20.9 % vol.	20.9 % vol.

The manual zero point setting is not saved. The zero point can be corrected by adjustment as often as zero point deviations occur (see Section 5.2).

Requirements for correct setting of the zero point

- Device has been switched on with fresh air.
- Device continues to draw in fresh air.

Setting zero point (manual zero point setting)

1. Press **Menu**.
2. Select **Zero point** from the menu. The values are automatically adjusted. The device returns to measuring mode.

The **Setting zero point** function can also be accessed using the relevant symbol in the **Inspection above ground**, **Enclosed spaces** and **House** applications.

3.2.3 Inspection above ground

This menu item allows you to change the measuring mode to **Inspection above ground** .

Range of use

– Measuring minimal gas concentrations above the ground, the gas pipe or possible leakage points

Symbol

Unit

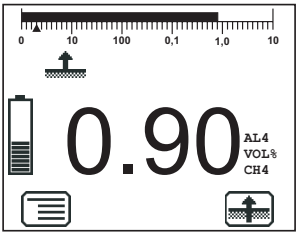
– ppm (parts per million)
– % vol.

Measuring range

Gas-sensitive semiconductor 0 to 10,000 ppm

Infrared sensor 1 to 10 % vol.

Measurement data display



– Digit, e.g. 0.90 % vol. CH_4
– Bar graph with quasi-logarithmic scale

Fig. 7: Inspection above ground measuring mode

3.2.4 Measuring in bar holes

This menu item allows you to change the measuring mode to **Measuring in bar holes**.

Range of use

– Measuring gas dispersal in the ground
– Locating the possible leakage point and classifying the leak

Symbol

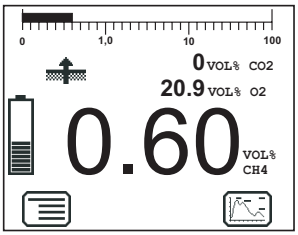
Unit

– % vol.

Measuring range

Infrared sensor (hydrocarbons C_XH_Y)	0.0 to 100 % vol.
Infrared sensor (carbon dioxide CO_2)	0.0 to 30 % vol.
Electrochemical sensor (oxygen O_2)	0.0 to 25.0 % vol.

Measurement data display



– Digit, e.g.
  0 % vol. CO_2
  20.9 % vol. O_2
  0.60 % vol. CH_4
– Bar display with quasilogarithmic scale (for CH_4)

Fig. 8: Measuring in bar holes measuring mode

3.2.5 Ethane analysis

Selecting **Ethane analysis** from the menu opens an overview of the detectable gases. The device automatically returns to measuring mode.

Note:
The ethane analysis cannot be started with the **Ethane analysis** menu item.
Information about carrying out the ethane analysis can be found in Section 3.2.5.3.

Range of use

– Distinguishing between natural gas and swamp gas

Symbol

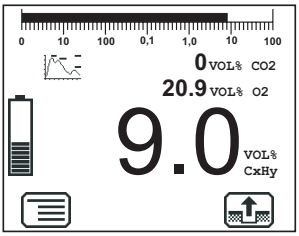
Unit

– ppm (parts per million)
– % vol.

Measuring range

Infrared sensor (hydrocarbons C_XH_Y)	0.0 to 100 % vol.
Infrared sensor (carbon dioxide CO_2)	0 to 30 % vol.
Electrochemical sensor (oxygen O_2)	0.0 to 25.0 % vol.
Gas chromatograph/ gas-sensitive semiconductor	1 ppm to 1.2 % vol.

Measurement data display



– Digit, e.g.
  0 % vol. CO_2
  20.9 % vol. O_2
  9.0 % vol. C_xH_y
– Bar display with quasilogarithmic scale (for C_xH_y)

Fig. 9: Ethane analysis measuring mode

3.2.5.1 General information on ethane analysis

Ethane analysis is used to demonstrate the presence of natural gas and to distinguish between natural gas and swamp gas. This analysis utilises the fact that natural gas contains ethane, but swamp gas does not. Thus, if ethane is detected, it can be concluded that natural gas is present.

Note:
Ask the network operator about the composition of natural gas. Request an analysis certificate.

Ethane can definitely be detected in natural gas at a minimum concentration of 1 % vol. If the concentration of ethane in natural gas is less than 0.5 % vol., the gas cannot be detected. If the concentration falls between these two values, the analysis can be carried out, but the result must be assessed subsequently.

During the ethane analysis, the gas sample is always analysed for the presence of the following three gases:

- Methane CH_4
- Ethane C_2H_6
- Propane C_3H_8

Requirement

The ethane analysis only works if the gas sample exhibits a specific concentration.

The device checks the concentration at the start of the analysis and prevents the analysis being carried out if the concentration is too low.

Gas sample concentration	Analysis is …	Device response
> 1 % vol.	Definitely possible	Analysis can be carried out
1 % vol. - 0.5 % vol.	Technically possible	Analysis can be carried out, but **Ethane analysis critical** message appears
< 0.5 % vol.	Not possible	Analysis cannot be carried out because **Take sample** symbol is not displayed

Displayed measurement values

In **measuring mode**, the device displays the actual concentrations (Fig. 9).

During the **analysis**, the device automatically dilutes the gas sample to 1 % vol. to ensure optimal utilisation of the semiconductor sensor's measuring range. This means:

- The concentration ratios of all components of the gas sample are retained.
- The maximum concentration of a gas component is 1 % vol., even if the actual concentration in the gas sample is higher. In the graph, the maximum peak may be cut off as necessary (Fig. 12 right).

Number of measurements

Always carry out 2 – 3 measurements in the same location to obtain certain results. Note the information on evaluation in Section 3.2.5.3.

3.2.5.2 Purging the detector

The detector for ethane analysis must be kept clean at all times to prevent distortion of measurement results. When the device is in use, however, higher hydrocarbons (e.g. propane, butane) can accumulate in the detector and contaminate it.

The detector is automatically purged after every ethane analysis. An additional purge of the detector is required in these situations:

- Cancelled ethane analysis

  If an ethane analysis is cancelled, the message **Purging required** and the **Take sample** symbol appear automatically.
- Detector contamination suspected

Note:
The purge always takes 4 minutes. A new ethane analysis can only be started when the purge cycle has been completed.

The device is in measuring mode.

1. Only when detector contamination is suspected:

   a) Press **Menu**.

   b) Select **Purging** from the menu. The message **Purging required** and the **Take sample** symbol appear.

CAUTION! Risk of damaging the sensor
The ethane detector will be damaged if the air supply is contaminated or moist.
- Always add clean, dry fresh air.

---

2. Make sure the device is drawing in fresh air.
3. Press **Take sample**.

   The purge cycle starts automatically as soon as the gas concentration drops below 50 ppm. The time remaining until the end of the purge cycle is displayed.

After the purge cycle is complete, the device will revert to measuring mode.

3.2.5.3 Carrying out an ethane analysis

The device is in measuring mode.

1. Make sure the device is drawing in fresh air.
2. Change to the **Ethane analysis** application.
3. The ethane analysis is generally performed on a bar hole. Use the localisation probe and a probe hose.

   a) Insert the probe into the bar hole.

   b) Connect the probe hose to the device.

   As soon as the measurement value satisfies specific conditions (gas concentration > 1% vol., stable measurement value), the **Take sample** symbol appears.
4. Press **Take sample**. A message appears.

Note:
An ethane analysis takes approximately four minutes. After **Esc** is used to cancel the analysis, the detector must be purged (see Section 3.2.5.2). This purge cycle also takes 4 minutes.

---

5. Confirm the **Take sample?** prompt by pressing **OK**. The gas sample is taken.

   The **Add fresh air** note appears.
6. Add fresh air.

   a) To do so, remove the probe hose from the device.

   b) Move away from the bar hole. Note the direction of the wind.

   As soon as the gas concentration drops below 50 ppm, the analysis of the gas sample taken starts automatically. The gas sample analysis is plotted on the display.

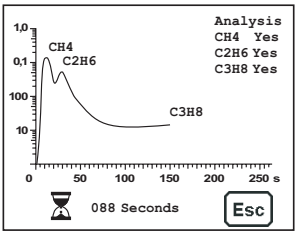


Fig. 10: Graph of an analysis in progress

When the analysis is complete, the **Save** symbol appears.

7. Press **Save**.
8. If necessary enter a **Comment** on the analysis.
   a) Select the characters required using the jog dial. Confirm each character using the jog dial.

      OR

      − Press **Open stored comments**. A list of the stored comments will appear.
      − Select the desired comment. Open the comment with **OK**.

   b) Then confirm your entry/selection with **OK**.

      OR

      Press **Esc** if you do not wish to enter a comment.
9. Confirm your entry with **OK**. The comment is saved together with the protocol name (date, time).

3.2.5.4 Evaluating an ethane analysis

Fully completed ethane analyses are saved as protocols. These can be accessed and cleared at any time.

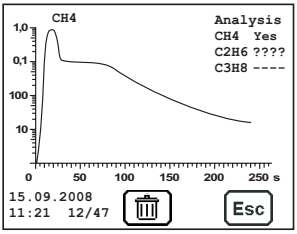


Fig. 11: Ethane analysis protocol

A protocol contains the following information about the gas sample:

– Analysis of the gas components:
  CH_4 Yes
  C_2H_6 ????
  C_3H_8 ––––
– Curve; peaks of the gas components definitely present in the sample are labelled: CH_4
– Date and time the protocol was saved
– Protocol number: 12/47, i.e. 12th protocol of 47 protocols in total

The symbols next to the analysed gas components are defined as follows:

Symbol	Gas component is …
Yes	Definitely present
????	Possibly present
––––	Not present

Ideally, the result of the ethane analysis is a curve with at least one clear, steep peak (Fig. 12 left). However, occasionally, the analysis does not provide a clear determination of the gas components present (Fig. 12 right). In such cases, you must decide whether the analysis quality is sufficient.

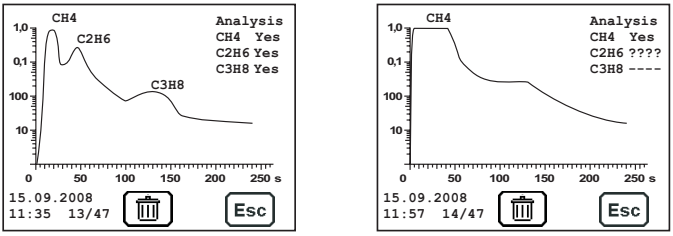


Fig. 12: Quality assessment of an ethane analysis; left: good quality, right: poor quality

Criteria for determining good analysis quality

- Methane is definitely present.
- Methane concentration is 1 % vol.
- Peaks of the gas components present are clearly recognisable.

Criteria for determining the presence of natural gas

- Good analysis quality (see above)
- Ethane is definitely present.

Ethane analyses of insufficient quality

Note:
Never use poor-quality ethane analyses to demonstrate the presence of natural gas.

Poor-quality ethane analyses can exhibit the following features, for example:

- Curve does not contain any clear peaks (smooth concentration plot)

  Reason: Residual gases from previous analyses have accumulated.

  Corrective action: Purge with test gas, e.g.:
  – 1 % vol. CH_4 in synthetic air
  OR
  – 100 ppm C_2H_6 and 1 % vol. CH_4 in synthetic air

- Curve and symbols (**Analysis**) provide contradictory information about gas components

  Reason: Extremely high or low temperatures (optimal working temperature: 20 °C)

3.2.6 Enclosed spaces

This menu item allows you to change the measuring mode to **Enclosed spaces**.

Range of use

– Measuring gas concentrations in enclosed spaces where there is increased potential of gas dispersal

Symbol

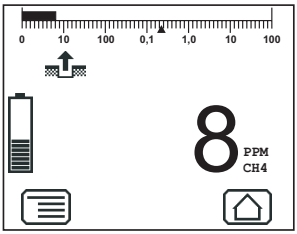
Unit

– ppm (parts per million)
– % vol.

Measuring range

Gas-sensitive semiconductor	0 to 10,000 ppm
Infrared sensor	0.1 to 100 % vol.

Measurement data display



– Digit, e.g. 8 ppm CH_4
– Bar graph with quasi-logarithmic scale

Fig. 13: Enclosed spaces measuring mode

3.2.7 House

This menu item allows you to change the measuring mode to **House**.

Range of use

– Measuring minimal gas concentrations in buildings
– Locating the source of gas

Symbol

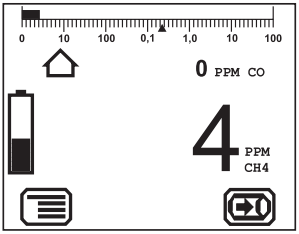
Unit

– ppm (parts per million)
– % vol.

Measuring range

Gas-sensitive semiconductor	0 to 10,000 ppm
Infrared sensor	0.1 to 100 % vol.
Electrochemical sensor (carbon monoxide CO)	0 to 500 ppm

Measurement data display



– Digit, e.g.
  0 ppm CO
  4 ppm CH_4
– Bar display with quasilogarithmic scale (for CH_4)

Fig. 14: House measuring mode

3.2.8 Gas measuring

This menu item allows you to change the measuring mode to **Gas measuring**.

WARNING!
Danger of death due to lack of alarm signal
In gas measuring, the device does not issue alarms.
- Before switching to this application, you must check that the there are no ignition sources nearby.
- Do not smoke.
- Exercise extreme care.

Range of use

– Demonstrating gas purity/absence of gas in gas pipes

Symbol

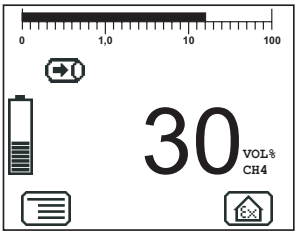
Unit

– % vol.

Measuring range

Infrared sensor	0 to 100 % vol.

Measurement data display



– Digit, e.g. 30 % vol. CH_4
– Bar graph with quasi-logarithmic scale

Fig. 15: Gas measuring mode

3.2.9 Warning %LEL

This menu item allows you to change the measuring mode to **Warning %LEL**.

WARNING!
Danger of death due to operating signal failure
If the operating signal fails, the device is not safe to use.
- Stop using the device immediately.
- Move away from explosive areas or toxic or low-oxygen atmospheres immediately.

Range of use

– Testing work environments where explosion is possible, e.g. working on gas pipes or gas systems

Symbol

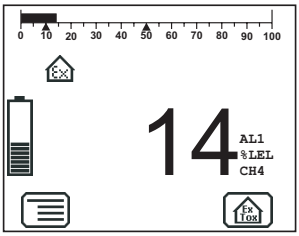
Unit

– % LEL or % vol.

Measuring range (methane CH_4)

Infrared sensor	0 to 100 % LEL or 0.00 to 4.40 % vol.

Measurement data display



– Digit, e.g. 14 % LEL CH_4
– Bar display with linear scale, alarm thresholds marked AL1 and AL2

Fig. 16: Warning %LEL measuring mode

3.2.10 Warning ExTox

This menu item allows you to change the measuring mode to **Warning ExTox**.

WARNING!
Danger of death due to operating signal failure
If the operating signal fails, the device is not safe to use.
- Stop using the device immediately.
- Move away from explosive areas or toxic or low-oxygen atmospheres immediately.

Range of use

– Warning of explosive and toxic gas concentrations as well as lack of oxygen

Symbol

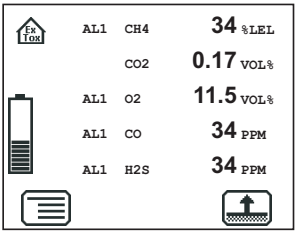
Unit

– % LEL (methane CH_4)
– % vol. (carbon dioxide CO_2, oxygen O_2)
– ppm (carbon monoxide CO, hydrogen sulphide H_2S)

Measuring range (methane CH4)

Infrared sensor	0 to 100 % LEL

Measurement data display



– Digit, e.g.
34 % LEL CH_4
0.17 % vol. CO_2
11.5 % vol. O_2
34 ppm CO
34 ppm H_2S

Fig. 17: Warning ExTox measuring mode

CAUTION!
Health risk due to late alarm
If you switch from **Warning ExTox** to another application, data which may have triggered an STEL or LTEL alarm is reset.

- Only switch from **Warning ExTox** to another application once you have left the work area being monitored.

3.2.11 Settings

Settings in the menu allows you to change the device settings and view information about the device (see Section 3.3).

3.2.12 Start/stop/save a measurement

Depending on the application, measurements will have to be saved or started and then stopped. The ethane analysis is an exception (see Section 3.2.5.3).

Application	Measurement	
	start/stop	save
Inspection above ground	×	
Measuring in bar holes		×
Enclosed spaces		×
House	×	
Gas measuring		×
Warning %LEL	×	
Warning ExTox	×	

Difference between starting/stopping and saving

Selecting **Start measurement** followed by **Stop measurement** saves a measurement plot.

Selecting **Save measurement** saves an individual measurement, the current one.

Note:
Measurements cannot be cancelled. The only way to cancel a measurement is to stop it.

Up to 80 measurements can be saved.

The measured values can be saved with or without a comment. Comment entries are saved automatically (ring memory with max. 10 entries).

Once the first comment has been entered, the **Open stored comments** function will become available.

The stored measurements can be displayed on a computer using a **readout program**. The program is available at www.sewerin.com.

Starting a measurement

1. Press **Menu**.
2. Select **Start measurement** from the menu. This starts measurement plot recording.

Measurement plot recording must always be concluded with **Stop measurement**.

Stopping a measurement

1. Press **Stop measurement**.

   OR

   a) Press **Menu**.

   b) Select **Stop measurement** from the menu.
2. Answer **Yes** to the warning prompt.

3. Enter a **comment** for the measurement.
   a) Select the characters required using the jog dial. Confirm each character using the jog dial.

      OR

      − Press **Open stored comments**. A list of the stored comments will appear.
      − Select the desired comment. Open the comment with **OK**.

   b) Then confirm your entry/selection with **OK**.

      OR

      Press **Esc** if you do not wish to enter a comment for the measurement.

   The measurement is saved as a protocol. The protocol name is formed from the date, time and comment.

Saving a measurement

1. Press **Menu**.
2. Select **Save measurement** from the menu.
3. Enter a **comment** for the measurement.
   a) Select the characters required using the jog dial. Confirm each character using the jog dial.

      OR

      − Press **Open stored comments**. A list of the stored comments will appear.
      − Select the desired comment. Open the comment with **OK**.

   b) Then confirm your entry/selection with **OK**.

      OR

      Press **Esc** if you do not wish to enter a comment for the measurement.

   The measurement is saved as a protocol. The protocol name is formed from the date, time and comment.

3.2.13 Protocols

You can retrieve or clear protocols of saved data under **Protocol** in the menu. When saved, the protocols are assigned to different protocol types.

The following protocol types are available:

- Ethane analysis
- Device inspection
- Measurements

Protocols can only be cleared individually.

You can find information on how to clear all protocols in one protocol type in Section 3.3.7.

3.2.14 Device inspection

The **device inspection** can be used to check the general status and the indication accuracies. **Device inspection** only appears in the menu when the integrated device inspection is switched on.

Note:
The integrated device inspection is switched off in the factory settings. More detailed information about the device inspection can be found in Section 5.1.

The frequency of the device inspection depends on the application (see Section 5.1.1.2).

If the integrated device inspection is switched on, the device will remind you to perform a device inspection.

The **Device inspection** symbol will appear when the inspection is due. It is visible in the display until the complete integrated device inspection has been carried out successfully.

3.2.15 Gas type CxHy

You can temporarily change the gas type under **Gas type C**x**H**y in the menu if the device is equipped for other gas types. Gas types available for selection:

- Methane CH_4
- Propane C_3H_8
- Butane C_4H_{10}

The temporary gas type change is not saved. If you need to set a different default gas type, you can do this in the **Settings** menu under **System**.

3.2.16 Device information

The following device information is shown under **Device information** in the menu:

- Installed electrochemical sensors: gas, installation date, warranted/expected lifetime
- Firmware: version, date
- Service: date of the last service, date of the next service

3.3 Settings

The following menus and menu items are included under Settings:

- Adjustment
- System
- Alarms
- Date/time
- Memory

You can find information on selecting and exiting menus and menu items in Section 3.1.2.

3.3.1 Opening Settings

1. Press **Menu**.

WARNING!
Danger of death due to lack of alarm signal
The device only issues alarms in measuring mode. As soon you access the menu, alarms are no longer triggered.
- Only change the settings outside of explosive areas and away from toxic or low-oxygen atmospheres.

---

2. Select **Settings** from the menu.

   Access is protected by a PIN code. The **default setting** is always **PIN code 0001**.

Note:
You can change the PIN code at any time.
SEWERIN recommends setting a different PIN code after initial start-up, so only authorised personnel have access to the settings.

---

3. Enter the PIN code from left to right. The active digit is always displayed with a black background.

Digit	To change	To confirm
1st digit	Turn the jog dial	Press the jog dial
2nd digit		Press the jog dial
3rd digit		Press the jog dial
4th digit		✓

   If the PIN code has been entered correctly, the **Settings** menu will appear once the last digit has been confirmed (Fig. 18). Otherwise the device will revert to measuring mode.

Adjustment
System
Alarms
Date/time
Memory
Exit

Fig. 18: **Settings** menu

3.3.2 Settings menu structure

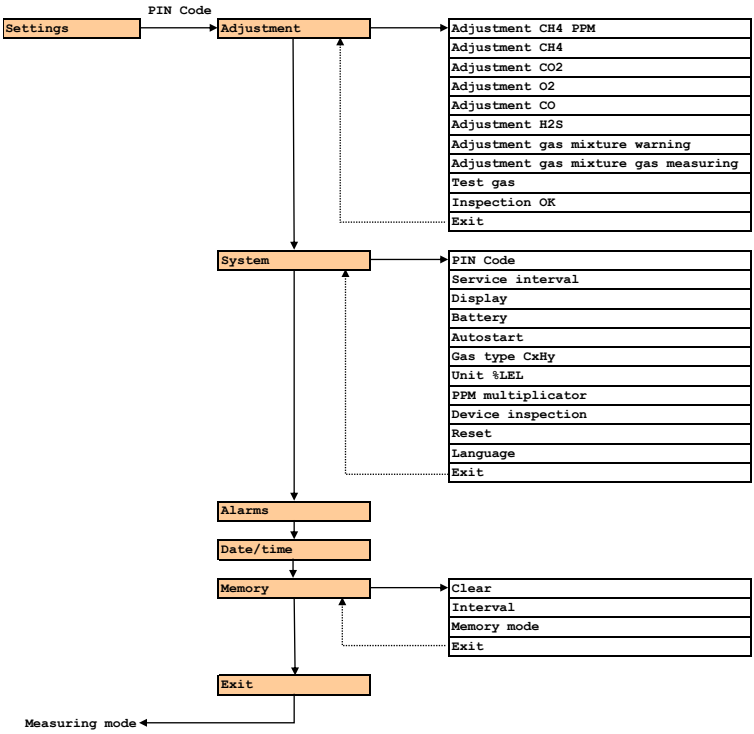


Fig. 19: **Settings menu structure for EX-TEC HS 680**
(gas type: methane)

Note:
The number and names of available menu items depend on the device model and optional additional equipment.

3.3.3 Adjustment

The Adjustment menu is used to set the sensors.

WARNING! Danger of death due to incorrect adjustment

Incorrect adjustment can lead to incorrect measurement results. This means that the user may not be warned about dangerous gas concentrations in time.

- Only specialist technicians may perform adjustments
- Adjustments must be made in well ventilated rooms or in the open air.

A detailed description of adjustment along with important information is provided in Section 5.2.

Adjustment CxHy ppm

Used to adjust the gas-sensitive semiconductor for gas type C_xH_y (methane CH_4, propane C_3H_8, butane C_4H_{10}) in the ppm range.

Applications:
- Inspection above ground
- Ethane analysis
- Enclosed spaces
- House

Adjustment CxHy

Used to adjust the infrared sensor for gas type C_xH_y (methane CH_4, propane C_3H_8, butane C_4H_{10}) in the % vol. range / LEL range.

Applications:
- Inspection above ground
- Measuring in bar holes
- Ethane analysis
- Enclosed spaces
- House
- Gas measuring
- Warning %LEL
- Warning ExTox

Adjustment CO2

Used to adjust the infrared sensor for carbon dioxide CO_2 in the % vol. range.

Applications:
- Measuring in bar holes
- Ethane analysis
- Warning ExTox

Adjustment O2

Used to adjust the electrochemical sensor for oxygen O_2 in the % vol. range.

Applications:
- Measuring in bar holes
- Ethane analysis
- Warning ExTox

Adjustment H2S

Used to adjust the electrochemical sensor for hydrogen sulphide H_2S in the ppm range.

Application:
- Warning ExTox

Adjustment CO

Used to adjust the electrochemical sensor for carbon monoxide CO in the ppm range.

Application:
- Warning ExTox

Adjustment gas mixture warning

Used to adjust the infrared and electrochemical sensors for all components of the test gas (gas mixture).

Applications:
- Warning %LEL
- Warning ExTox

Adjustment gas mixture gas measuring

Used to adjust the infrared sensors for methane CH_4 and carbon dioxide CO_2.

Applications:
- Measuring in bar holes
- Ethane analysis
- Gas measuring

Test gas

Used to adjust the concentration of the test gases used.

Inspection OK

Confirms the device is in proper working order. This extends the service interval.

3.3.4 System

General information and specifications for operation are set in the System menu.

PIN code

Used to change or reset the PIN code.

Note:
If you lose the PIN code, you must contact SEWERIN Service.
If the PIN code is set to **0000**, you will not be asked to enter it. The settings can then be accessed by anyone.

Service interval

Specifies the regular inspections/maintenance required for the device. You can also activate the automatic switch-off function once the set interval has passed.

Display

Used to set how long the display remains illuminated after any key is pressed as well as the display contrast.

Battery

Used to set the type of disposable/rechargeable battery used.

CAUTION! Damage possible due to device overheating

If the battery type is not correctly set, the device can overheat.

- Always enter the correct battery type.

Autostart

Sets the application that is automatically activated when the device is switched on.

Gas type CxHy

Sets the gas type (methane CH_4, propane C_3H_8, butane C_4H_{10}) which is automatically used when the device is switched on.

Unit %LEL

Used to set the unit of measurement. Only applies to **Warning %LEL** and **Warning ExTox** applications.

PPM multiplicator

Sets the amplification factor for the lower ppm range.

Measurement × factor = displayed measurement

Application: – Inspection above ground

Device inspection

Used to switch the integrated device inspection on or off.

Reset

Used to reset the device settings to the factory settings.

Language

Sets the language.

3.3.5 Alarms

Sets the alarm thresholds for the gas types and gases.

Alarm **AL3** cannot be set. It always occurs at the end of the measuring range.

There is detailed information on alarms in Section 7.2.

AL1 alarm

Used to set the pre-alarm.

Applications:
- Enclosed spaces
- House
- Warning %LEL
- Warning ExTox

AL2 alarm

Used to set the main alarm.

Applications:
- Enclosed spaces
- House
- Warning %LEL
- Warning ExTox

AL4 alarm

Used to set the alarm threshold in excess of significant gas concentrations which indicate a gas leak.

Application:
- Inspection above ground

3.3.6 Date/time

Used to set the time, day, month and year. There are two formats available for the date.

3.3.7 Memory

The Memory menu is used to specify how measurement data and protocols are handled.

Clear

Used to clear protocols.

The different protocol types must each be cleared separately. All protocols in one protocol type are cleared at once.

You can find information on clearing individual protocols in Section 3.2.13.

Interval

Sets the interval at which measurement data is automatically saved.

Memory mode

Switches between ring memory and stack memory.

4 Power supply

This device can be operated using:

- Disposable (non-rechargeable) alkaline batteries
- Rechargeable NiMH batteries

The device comes with nickel metal hydride rechargeable batteries. The corresponding settings are stored.

WARNING! Risk of explosion due to leaking batteries
Leaking electrolytes can shorten the creepage distance and air gap between the poles. As a result, the requirements for the batteries may no longer be met.

- Replace leaking batteries immediately.
- Clean the battery compartment (and, if necessary, the device) before inserting the new disposable/rechargeable batteries.

4.1 Suitable disposable/rechargeable battery types

WARNING! Risk of explosion due to unsuitable batteries
To ensure that the device remains explosion-proof as per /16/, only certain disposable/rechargeable batteries may be used.

- Only use batteries supplied by SEWERIN. Other disposable/rechargeable batteries, which have not been supplied by SEWERIN, may only be used if they meet the specifications in /8/.
- In each battery compartment use only batteries that are identical with respect to type (disposable or rechargeable), capacity and manufacturer.

Disposable battery requirements

- Alkaline disposable batteries
- Size: AA, type: LR6 as per /11/
- The creepage distance and air gap between the poles must not be less than 0.5 mm in accordance with /8/.

Rechargeable battery requirements

- NiMH rechargeable batteries
- Size: AA, type: HR6 as per /13/
- The creepage distance and air gap between the poles must not be less than 0.5 mm as per /8/.
- The rechargeable batteries must be fast charging (I > 1.25 A) and remain within the temperature range.

Note:
A device operated with disposable alkaline batteries cannot be charged. A note to this effect is shown on the display.

4.2 Operation with rechargeable batteries

The operating time of the device depends on the battery capacity.

If the device is not used or not kept in the docking station, the batteries will lose their charge due to self-discharge. The self-discharge intensity depends on the battery type.

4.2.1 Charging

The device can be charged via:

- Connection for power supply
- Docking station TG8

DANGER! Risk of explosion due to sparks
When batteries are charged in potentially explosive areas, high charging current occurs.
The power supply is not explosion-proof.
- Only charge the device outside of explosive areas.

For charging you will need either:

- AC/DC adapter M4
- Vehicle cable M4

Please note the following points:

- The device or docking station must not be directly connected to a 24-V on-board power supply in the vehicle. The voltage is too high for the charging process.
- The battery should be charged at approximately room temperature.

4.2.2 Rechargeable battery maintenance

If the device is not used for a long period of time, it is advisable to fully discharge the battery before recharging it again.

A full discharging and recharging process takes approx. 11 hours (8 hours to discharge + 3 hours to recharge). The duration depends on the capacity of the rechargeable batteries used.

DANGER! Risk of explosion due to sparks
When batteries are charged in potentially explosive areas, high charging current occurs.
The power supply is not explosion-proof.
- Only charge the device outside of explosive areas.

- Connect the device (switched on) to the power supply via the side connection

  OR

  Place the device (switched on) into the docking station.

  The rechargeable batteries will be fully discharged. Once the device has been discharged, it will automatically switch to charging mode.

4.3 Battery alarm

As soon as the remaining capacity of the batteries gets low, a battery alarm will go off:

Level 1: Battery almost empty
- – **Capacity disposable battery/rechargeable battery** symbol flashes
- – Audible signal (one-off)
- – Operating signal doubles
- – Remaining operating time: approx. 15 min

Level 2: Battery empty
- – Blank display apart from **Capacity disposable battery/rechargeable battery** symbol
- – Continuous audible signal
- – Measuring mode unavailable
- – Device shuts off

4.4 Replacing disposable/rechargeable batteries

DANGER! Risk of explosion due to sparks
When the housing is open, the device is not explosion-proof.

- Only open the battery compartment outside of explosive areas.

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

1. Loosen the two screws securing the battery compartment. Remove the screws by repeatedly turning them alternately a short way; this ensures that the battery compartment does not twist.
2. Lift out the battery compartment.
3. Remove the disposable/rechargeable batteries and insert new ones. Ensure that the batteries are inserted with the correct polarity.
4. Replace the battery compartment so it fits neatly into place and secure firmly with the screws.
5. When you switch the device back on again, you will be asked which battery type is in use. Enter the correct battery type.

If it takes longer than 120 seconds to replace the batteries, the date and time will have to be reset the next time you switch the device on. All the other data will be saved.

5 Maintenance

In accordance with the legal regulations, device maintenance comprises the following elements:

- Device inspection including test of indication accuracy
- Adjustment
- Maintenance

All inspections must be documented. The documentation must be retained for at least one year.

WARNING! Danger of death due to incorrectly adjusted or faulty devices

If the device is used as a gas warning instrument (**Warning %LEL** and **Warning ExTox** applications), it must be regularly inspected before use.

- Carry out a device inspection every day before starting work (as per /1/, /2/, /6/, /10/).

5.1 Device inspection

5.1.1 General information on the device inspection

5.1.1.1 Scope

The device inspection includes the following tests:

- Analysis of the general status
- Test of the indication accuracy with supply of fresh air
- Test of the indication accuracy with supply of test gas

5.1.1.2 Frequency

The frequency of the device inspection depends on the application.

Application	When to test	Legal basis
Inspection above ground	Before starting work and if out of use for long periods	/3/
Measuring in bar holes	Weekly to every six months	/3/
Enclosed spaces		
House		
Gas measuring		
Warning %LEL	Every day before starting work	/2/, /10/
Warning ExTox		/1/, /2/, /6/, /10/
Ethane analysis	Quarterly	

If the integrated device inspection is switched on, the device will remind you to perform a device inspection.

The applications are grouped together for the device inspection. The device inspection must be carried out separately for each group.

Devices with multiple gas types

For devices that are designed for multiple gas types, the device inspection must be carried out for the gas type currently being used. The device inspection can also be carried out for other available gas types.

Note:
If the device inspection symbol appears after changing the gas type, the device inspection must always be carried out immediately.

5.1.1.3 Documentation

The device inspection procedure must be documented. There are two ways of doing this:

- On paper
- Saved electronically supported by the device (**integrated device inspection**)

Only the integrated device inspection is described in these operating instructions.

Note:
If the integrated device inspection is switched off, the device inspection must be documented on paper.

5.1.1.4 Integrated device inspection

The integrated device inspection is accessed via the **menu** (Fig. 6).

The results of the device inspection are stored in the device as a protocol.

The device inspection protocols can be opened in the device at any time (see Section 3.2.13). They can also be displayed on a computer using a **readout program**. The program is available at www.sewerin.com.

The **Carry out device inspection** symbol appears when a device inspection is due. It is visible in the display until the complete integrated device inspection has been carried out successfully for the selected application. If the device inspection was completed but the device failed on some points, the symbol will remain visible.

The integrated device inspection is switched off in the factory settings. The integrated device inspection has to be switched on (once only) before it can be performed.

Switching on the integrated device inspection

1. Press **Menu**.
2. Select **Settings**.
3. Enter your **PIN code**.
4. Select **System**.
5. Select **Device inspection**.
6. Select **Yes**.
7. Accept the setting with **OK.**
8. Exit the **settings** with **Exit**.

5.1.1.5 Order

You can carry out the device inspections and the associated tests for the applications (groups) that are due to be inspected in any order you wish. You can repeat the tests as often as you wish provided you have not yet concluded the device inspection for a group.

5.1.1.6 Test gases for the device inspection

The following variables depend on the application:

- Number of tests with test gas
- Test gases to be used

The following test gases can be used to check the indication accuracy when supplying test gas:

Application (group)	Test	Recommended test gases
Inspection above ground	Test gas 10 ppm in 10 seconds	10 ppm CH_4 *)
Bar holes/ measuring	Test gas CH4	100 % vol. CH_4
	Test gas CO2	20 % vol. CO_2
	Test gas C3H8	100 % vol. C_3H_8
House/Spaces	Test gas CH4	1 % vol. CH_4 *)
	Test gas CO	40 ppm CO*)
	Test gas C3H8	1 % vol. C_3H_8 *)
Warning	Gas mixture	ExTox IR
	Test gas C3H8	1 % vol. C_3H_8
	Test gas C4H10	1 % vol. C_4H_{10}
Ethane analysis	Test gas 50/100 ppm C2H6	100 ppm C_2H_6 in 1 % vol. CH_4 (Rest: synthetic air)

*) in synthetic air

If a test can be carried out either with a gas mixture or with an individual gas, SEWERIN recommends you use the gas mixture.

If a gas mixture is used, but the device is equipped for other gas types and gases which are not contained in the gas mixture, these must be additionally tested with the relevant individual gas.

Note:
Use of test gases not provided by SEWERIN can cause interference.
The concentration of the test gas used must match the specified test gas concentration.

Changing the test gas concentration

If there is no test gas with the specified concentrations available for the inspection, the values can be adjusted to the test gas used in the adjustment menu under **Test gas** (see Section 3.3.3).

5.1.2 Carrying out the device inspection

5.1.2.1 Accessing the device inspection

The device is in measuring mode.

1. Press **Device inspection**.

   OR

   a) Press **Menu**.

   b) Select **Device inspection** from the menu.

   The **Device inspection** menu appears.

Inspection above ground
Bar holes/measuring
Houses/Spaces
Warning
Ethane analysis

Fig. 20: **Device inspection** menu

2. Select an application (group).

   The **Dev. Test ...** menu appears.

3. Select a test (under **General status**, **Fresh air**, **Test gas …**).

Note:
The number and names of the available menu items depend on the device features.

---

4. Carry out the test.

   For detailed information, refer to the following sections:

- General status Section 5.1.3
- Fresh air Section 5.1.4
- Test gas … Section 5.1.5

5.1.2.2 Concluding the device inspection

After all the tests have been carried out as described in Section 5.1.3 to 5.1.5, the **Save** symbol will appear in the display.

An integrated device inspection is concluded by saving it. Up to 40 device inspections can be saved. The following information can be stored along with the device inspection:

- Inspector (e.g. inspector's name or initials)
- Password to protect the protocol from being accessed by unauthorised people

Inspector entries are saved automatically (ring memory with max. 10 entries).

Once the first inspector has been entered, the **Open stored inspectors** function will become available.

1. Press **Save**.
2. Enter the name of the **inspector**.
   a) Select the characters required using the jog dial. Confirm each character using the jog dial.

      OR

      - Press **Open stored inspectors**. A list of the stored inspectors will appear.
      - Select the desired inspector. Open the inspector with **OK**.

   b) Then confirm your entry/selection with **OK**.

      OR

      Press **Esc** if you do not wish to enter an inspector for the device inspection.

3. Enter a **password**.

   a) Select the characters required using the jog dial. Confirm each character using the jog dial.

   b) Then confirm your entry with **OK**.

      OR

      Press **Esc** if you do not wish to enter a password for the device inspection.

   The device inspection is saved as a protocol. An overview with the device inspection results is displayed.

   This overview includes a list of all gas types for which the device is configured. Gas types for which the indication accuracy has been successfully tested as part of the device inspection are marked with **OK**. Gas types that are available but have not been tested are flagged with **----**.

4. Confirm the overview by pressing **OK**. The device returns to measuring mode.

5.1.3 Testing the general status

The general status test is part of the device inspection (see Section 5.1.1.1). It is based on estimations by the user. The following must be tested:

- Housing
- Signals
- Probe
- Filter
- Pump

The battery charge status and the working condition of the controls are automatically tested during the integrated device inspection.

The device inspection has been opened.

1. Select **General status** from the **Dev. Test ...** menu.
2. Test all associated subitems as described in Section 5.1.3.1 to 5.1.3.5.
3. Confirm the prompt **General status OK?** by pressing **Yes** if **all** subitems show no faults during testing. **General status OK** appears on the display.

This concludes the **General status** test.

5.1.3.1 Housing

- Is the housing free from external damage?

5.1.3.2 Signals

During the integrated device inspection the signals are emitted at short intervals.

- Can the audible signal be heard?
- Is the visual signal visible?

5.1.3.3 Probe

Probes are accessories. They only need to be tested if they are likely to be used in the course of the working day.

- Are the probes free from external damage?

Probe hoses are tested with a simple leak check.

1. Connect the probe hose to the gas input.
2. Seal the free end of the probe hose.

   An error message should appear after approx. 10 seconds. This indicates that the probe hose is in good condition.

5.1.3.4 Filter

The fine dust filter is located behind the gas input. It is tested by means of a visual inspection.

1. Unscrew the gas input.
2. Remove the fine dust filter.
3. Check that there is no dirt in the fine dust filter.

   As soon as there are any signs of deposits, the filter must be replaced. If you do not replace the filter, you must reinsert it exactly as you found it.

5.1.3.5 Pump

The pump function is tested with a simple leak check.

1. Seal the gas input.

   After a maximum of 10 seconds an error message should appear. This indicates that the pump is working correctly.

   If the error message does not appear, the pump may be faulty. The device must be tested by SEWERIN Service.

2. Release the gas input again.

   After approximately 5 seconds, the error message should disappear again. Otherwise there is a fault (see Section 6).

5.1.4 Testing indication accuracy with supply of fresh air

The indication accuracy with supply of fresh air test is part of the device inspection (see Section 5.1.1.1).

The device inspection has been opened.

1. Make sure that only fresh air is being drawn in.
2. Select **Fresh air** from the **Dev. Test ...** menu.
3. Wait until the displayed readings are stable. A **Status: OK** message will appear.
4. Press **OK** to confirm. **Fresh air OK** will appear on the display.

This concludes the **Fresh air** test.

If the **Status: OK** message does not appear within a reasonable amount of time, the air inflow does not correspond to the limit values stored in the device (see Section 7.3). Move the device to another location and repeat the test.

If the **Status: OK** message still does not appear when the test is repeated, the device must be re-adjusted (see Section 5.2).

5.1.5 Testing indication accuracy with supply of test gas

The indication accuracy with supply of test gas test is part of the device inspection.

All test gases specified in the device must be tested. The number of specified test gases depends on the model and the optional additional equipment.

The following resources are needed for the test:

- Test gas (e.g. gas mixture **ExTox IR**)

  Information on test gases for the device inspection can be found in Section 5.1.1.6.

- Test set for the supply of test gas (e.g. **SPE VOL**)

Note:
Details of how to use the test set can be found in the accompanying operating instructions.

The procedure for testing with a gas mixture and individual gas is the same.

The device inspection has been opened.

1. On the **Dev. Test …** menu, select the menu item to be tested (e.g. **Gas mixture**, **Test gas C3H8**, etc.).
2. Check whether the test gas concentration specified by the device matches the test gas you intend to use. To do this press **Information**.

Note:
When testing the indication accuracy for **Inspection above ground** using **test gas 10 ppm in 10 seconds** it is not possible to check the test gas. Instead, a message will appear explaining what steps need to be carried out.

3. Add the test gas
4. Wait until the displayed readings are stable. A **Status: OK** message will appear.
5. Press **OK** to confirm.
6. Stop the test gas supply.

   The device switches back to the **Dev. test...** menu. A **Test gas OK** message will appear.
7. Repeat for further test gases if applicable.

Once all tests have been successfully completed, the complete test of the indication accuracy with supply of test gas is also complete.

Test gas test unsuccessful

If a **Test gas …** test was not carried out successfully, the message **Test gas not OK** appears.

A test may be unsuccessful for the following reasons:

Cause	Corrective action
Connections leaking	Repeat check, checking the seal on the connections
Measurement values outside the specified limit values (see Section 7.3)	Adjustment required (see Section 5.2)

5.2 Adjustment

WARNING! Danger of death due to incorrect adjustment

Incorrect adjustment can lead to incorrect measurement results. This means that the user may not be warned about dangerous gas concentrations in time.

- Only specialist technicians may perform adjustments
- Adjustments must be made in well ventilated rooms or in the open air.

5.2.1 Scope

Adjustments must be made separately for each measuring range.

- Zero point
- Sensitivity

Note:
For each measuring range always adjust the zero point first, followed by the sensitivity.

When carrying out an adjustment only adjust the gases whose measurement values are outside the specified limits (see Section 7.3).

5.2.2 Test gases for the adjustment

The following test gases can be used for adjustment:

Gas	Suitable test gases for ...	
	Zero point	Sensitivity
CH_4	• Fresh air	• Gas mixture • 10 ppm CH_4 *) • 100 ppm CH_4 *) • 1000 ppm CH_4 *) • 1.0 % vol. CH_4 *) • 2.2 % vol. CH_4 *) • 100 % vol. CH_4
C_3H_8	• Fresh air	• 1 % vol. C_3H_8 *) • 100 % vol. C_3H_8
C_4H_{10}	• Fresh air	• 1 % vol. C_4H_{10}
CO	• Fresh air	• Gas mixture • 40 ppm CO
CO_2	• Fresh air	• Gas mixture • 2.0 % vol. CO_2 • 20 % vol. CO_2
H_2S	• Fresh air	• Gas mixture • 40 ppm H_2S
O_2	• Gas mixture (free from O_2) • 100 % vol. CH_4	• Fresh air

*) in synthetic air

If more than one test gas can be used to adjust a gas, it does not have to be adjusted with all test gases. However, adjusting with more than one test gas increases the measurement quality.

Every gas must be adjusted separately, except for adjustment with a gas mixture (see Section 5.2.3).

Fresh air contains 20.9 % vol. O_2 and is therefore used with oxygen to adjust the sensitivity.

Propane C_3H_8 and butane C_4H_{10} can only be adjusted with individual gas.

Note:
Use of test gases not provided by SEWERIN can cause interference.
The concentration of the test gas used must match the specified test gas concentration.

5.2.3 Special features of adjustment with gas mixture

If a SEWERIN gas mixture is used as a test gas, several gases can be adjusted **in a single step**.

SEWERIN recommends a gas mixture comprising the test gas **ExTox IR** (2.2 % vol. CH_4, 2.0 % vol. CO_2, 40 ppm CO and 40 ppm H_2S in N_2).

Gases which can be adjusted simultaneously with a SEWERIN gas mixture

Test gas: **ExTox IR** Menu item: **Adjustment** **gas mixture warning**	Test gas: 60 % vol. CH_4, 20 % vol. CO_2 in N_2 Menu item: **Adjustment** **gas mixture gas measuring**
● Methane CH_4 ● Carbon dioxide CO_2 ● Oxygen O_2 ● Hydrogen sulphide H_2S ● Carbon monoxide CO	● Methane CH_4 ● Carbon dioxide CO_2 ● Oxygen O_2

Zero point

The **zero point** is adjusted under **Fresh air** in the menu. The following parameters are adjusted in a single step:

- Zero points of CH_4, CO_2, H_2S and CO
- Sensitivity of O_2

Sensitivity

The **sensitivity** is adjusted under **Gas mixture** in the menu. The following parameters are adjusted in a single step:

- Sensitivities of CH_4, CO_2, H_2S and CO
- Zero point of O_2

5.2.4 Preparation

An adjustment always requires time. Leave yourself plenty of time to prepare the necessary steps of the procedure.

- Have all necessary tools available.
- Let the device run for several minutes to guarantee that the temperature is correct, for example.

Note:
When adjusting the gas-sensitive semiconductor (**Inspection above ground** and **House/Spaces** groups) a **conditioner** must be applied.

- SEWERIN recommends applying separate conditioners for methane CH_4 on the one hand and propane C_3H_8/butane C_4H_{10} on the other.
- The conditioner must already be connected during the running-in period.

5.2.5 Performing the adjustment

The zero point and sensitivity are adjusted following the same procedure for all gases. The adjustment of **oxygen** is an **exception**. For this reason it is described separately (see Section 5.2.6).

You can find detailed information on the adjustment of various gases (for example, test gas concentration, installation date of the sensor, date of last adjustment) under **Information**.

The symbol appears after the corresponding **Adjustment…** menu item has been selected.

5.2.5.1 Adjusting the zero point

For all gases except oxygen O_2, the zero point is adjusted following the same procedure.

Note:
When adjusting the zero point of carbon dioxide CO_2 a carbon dioxide filter must be used.
This applies to both the zero point adjustment for **Adjustment CO2** in the menu and **Adjustment gas mixture warning**.

---

1. Make sure that only fresh air is being drawn in.
2. Open **Settings**.
3. Select **Adjustment** from the menu.
4. Select the desired adjustment (e.g. **Adjustment CH4, Adjustment gas mixture warning**).
5. Wait at least 1 minute. The displayed reading must be stable.

Note:
For **Adjustment gas mixture warning** and **Adjustment gas mixture gas measuring**, **all** values must be stable. The time required for this can vary depending on the specific gas.

---

6. From the menu select the method you wish to use to adjust the zero point.
   - e.g. for **Adjustment CH4**: **Zero point**
   - e.g. for **Adjustment gas mixture warning**: **Freshair**
7. Press **OK** to confirm.

   This adjusts the zero point. The reading shows zero (0.00 % vol. / 0 ppm). (Except for **Adjustment gas mixture**: the value for oxygen O_2 is 20.9 % vol.)

5.2.5.2 Adjusting the sensitivity

For all gases except oxygen O_2, the sensitivity is adjusted following the same procedure.

The following resources are needed for adjusting the sensitivity:

- Test gas

  Information on test gases for adjustment can be found in Section 5.2.2.

- Test set for the supply of test gas (e.g. **SPE VOL**)

Note:
Details of how to use the test set can be found in the accompanying operating instructions.

Note:
A carbon dioxide filter must never be used when adjusting the sensitivity.

---

1. Connect the device to the test set.
2. Open **Settings**.
3. Select **Adjustment** from the menu.
4. Select the desired adjustment (e.g. **Adjustment CH4, Adjustment gas mixture warning**).
5. Select the menu item that specifies the sensitivity to be tested.
   - e.g. for **Adjustment CH4**: **2.20 % VOL. CH4**
   - e.g. for **Adjustment gas mixture warning**: **Gas mixture**

   Do not confirm with OK yet.
6. Press and hold the release button on the test set. The test gas is added. **Do not let go of the release button**.
7. Wait at least 1 minute. The displayed reading must be stable.

Note:
For **Adjustment gas mixture warning** and **Adjustment gas mixture gas measuring**, **all** values must be stable. The time required for this can vary depending on the specific gas.

8. Press **OK** to confirm. The device is adjusted. The reading shows the specified value (e.g. 2.20 % vol. CH_4).
9. Let go of the release button on the test set.

5.2.6 Carrying out an oxygen adjustment

As oxygen is a component of fresh air, the procedure for adjusting oxygen is different from the procedure for all other gases.

5.2.6.1 Adjusting the zero point for oxygen

The zero point of oxygen must be adjusted using a gas that does not contain any oxygen and which will not damage the sensor.

The following resources are needed for adjusting the zero point of oxygen:

- Test gas

  Information on test gases for adjustment can be found in Section 5.2.2.
- Test set for the supply of test gas (e.g. **SPE VOL**)

Note:
Details of how to use the test set can be found in the accompanying operating instructions.

1. Connect the device to the test set.
2. Open **Settings**.
3. Select **Adjustment** menu item.
4. Select **Adjustment O2** menu item.
5. Select **Zero point** menu item. **Do not confirm with OK yet**.

6. Press and hold the release button on the test set. The test gas is added. **Do not let go of the release button**.
7. Wait at least 1 minute. The displayed reading must be stable.
8. Press **OK** to confirm. The device is adjusted. The reading shows zero (0.0 % vol.).
9. Let go of the release button on the test set.

5.2.6.2 Adjusting the sensitivity for oxygen

The sensitivity for oxygen is adjusted with fresh air.

1. Make sure that only fresh air is being drawn in.
2. Open **Settings**.
3. Select **Adjustment** from the menu.
4. Select **Adjustment O2** from the menu.
5. Wait until the displayed reading is stable. (The reading may still flash.)
6. Select **20.9 % VOL. (fresh air)** from the menu (select and confirm with **OK**). This adjusts the sensitivity. The reading shows 20.9 % vol.

5.3 Servicing

The device must only be serviced and repaired by SEWERIN Service.

- Send the device to SEWERIN for repairs and for annual maintenance.

Note:
If there is a service agreement in place, the device can be serviced by the mobile maintenance service.

The inspection plate on the device shows confirmation of the last maintenance and the next scheduled maintenance.

Fig. 21: Inspection plate

6 Faults

If a fault occurs during operation, an error message will appear on the screen.

Error messages are displayed in the order in which they occur. Up to five errors can be displayed.

Error messages continue to be displayed until the error is corrected.

Overview of possible error messages

Error code	Error message on the display	Error correction
8	No calibration PPM sensor adjustment	**Adjustment CxHy ppm** required
9	No calibration IR sensor adjustment	Adjustment required (**adjustment CxHy**, **adjustment CO2**, **adjustment gas mixture**)
10	Adjustment failed Test gas	Check test gas
11	Zero point Adjustment required	Adjustment required
52	XFLASH SEWERIN Service	Error can only be corrected by SEWERIN Service
59	Error unknown SEWERIN Service	Error can only be corrected by SEWERIN Service
62	IR sensor	Error can only be corrected by SEWERIN Service
100	Pump error Probe/filter	Check all filters, probes and hose connections for porosity and dirt
200	I2C HOST – IR SEWERIN Service	Error can only be corrected by SEWERIN Service
201	I2C HOST – EC SEWERIN Service	Error can only be corrected by SEWERIN Service
202	I2C HOST – EX SEWERIN Service	Error can only be corrected by SEWERIN Service

7 Appendix

7.1 Specifications and permitted operating conditions

Dimensions (W×D×H):	Approx. 148 × 57 × 205 mm Approx. 148 × 57 × 253 mm with supporting bracket
Weight:	approx. 1000 g, depending on equipment
Operating position:	any
Protection rating:	IP54
Power supply:	4 cells, either: – Rechargeable batteries: NiMH – Disposable batteries: Alkaline
Operating time:	Minimum 8 h
Charging time for re-chargeable batteries:	Approx. 3 h (full charge), depending on capacity
Charging voltage:	12 V DC (max. 1 A)
Operating temperature:	-20 ºC – +40 ºC
Storage temperature:	-25 ºC – +60 ºC
Pressure:	950 – 1100 hPa
Permissible relative humidity:	5 – 90 % r.h., non-condensing
Sensors:	– IR for flammable gases (CH_4, C_3H_8, C_4H_{10}) – IR for CO_2 Optional: – EC for O_2, H_2S, CO
Adjustable gas types:	– Methane CH_4 Optional: – Propane C_3H_8 – Butane C_4H_{10}
Warm-up time:	– < 30 s – Up to 90 s for EC – Up to 5 min for gas-sensitive semiconductor
PC connection:	USB
Memory:	8 MB
Display:	320 × 240 pixels
Buzzer:	Frequency: 2.4 kHz Volume: 80 dB (A) / 1 m
Signal light:	Red
Pump:	Vacuum: > 250 mbar Volume flow: Typically 50 l/h ±20 l/h Pump error (F100) dependent on volume flow: – ≤ 20 l/h F100 certain – > 20 l/h – ≤ 35 l/h F100 possible

Pressure at gas input:	100 mbar, maximum
Operation:	– ON/OFF key – Jog dial – 3 function keys

7.2 Alarms

WARNING! Danger of death due to hazardous gas concentrations

An alarm always indicates danger.

- Take all necessary measures for your own safety and the safety of others immediately.

The type of action depends on the situation. In the event of a pre-alarm, it may be sufficient to ventilate thoroughly. In the event of a main alarm, it may be necessary to leave the danger zone immediately.

7.2.1 Features

AL1

Type:	Pre-alarm
Adjustable:	Yes
Latching:	No
Trigger:	Alarm threshold AL1 exceeded
Indicator:	– Audible signal – Visual signal – **AL1** message on display
Acknowledge-ment:	– Possible for audible signal when alarm threshold AL1 is exceeded
Reset:	– Automatic when level falls below alarm threshold AL1

Exception for **oxygen**: alarm AL1 is triggered when the level falls below alarm threshold AL1.

AL2

Type:	Main alarm
Adjustable:	Yes
Latching:	Yes
Trigger:	Alarm threshold AL2 exceeded
Indicator:	– Audible signal – Visual signal – **AL2** message on display
Acknowledge-ment:	– Possible for audible signal when alarm threshold AL2 is exceeded – Possible overall after level falls below alarm thresh-old AL2
Reset:	– By acknowledgement after level falls below alarm threshold AL2 – By switching device off

Exception for **oxygen**: alarm AL2 is not latching.

AL3

Type:	End of measuring range
Adjustable:	No
Latching:	Yes
Trigger:	Alarm threshold AL3 exceeded
Indicator:	– Audible signal – Visual signal – **AL3** message on display – Reading flashes
Acknowledge-ment:	– Possible after level falls below alarm threshold AL2
Reset:	– By acknowledgement after level falls below alarm threshold AL2 – By switching device off

AL4

Type:	Warning of gas concentration in ppm range
Adjustable:	Yes
Latching:	No
Trigger:	Alarm threshold AL4 exceeded
Indicator:	– Audible signal – Visual signal – AL4 notification on display
Acknowledge-ment:	– Possible for audible signal when alarm threshold AL4 is exceeded
Reset:	– Automatically when level falls below alarm threshold AL4

STEL

Type:	Main alarm (short-time exposure limit)
Adjustable:	No
Latching:	Yes
Trigger:	Sum of the concentrations of a gas is greater than the product of the OEL and the excess factor over the averaging time
Indicator:	– Audible signal – Visual signal – **STEL** message on display
Acknowledge-ment:	– Not possible
Reset:	– By changing to another application – By switching device off

LTEL

Type:	Main alarm (long-time exposure limit)
Adjustable:	No
Latching:	Yes
Trigger:	Sum of the concentrations of a gas is greater than the OEL over the averaging time
Indicator:	– Audible signal – Visual signal – **LTEL** message on display
Acknowledge-ment:	– Not possible
Reset:	– By changing to another application – By switching device off

7.2.2 Occupational exposure limits (OELs) and excess factors (STEL and LTEL)

The short-time exposure limit (STEL) is calculated by multiplying the OEL value by the excess factor over an averaging time of 15 minutes, as per /15/.

The long-time exposure limit (LTEL) is obtained from the OEL over an averaging time of 8 hours, as per /15/.

Gas	OEL	Excess factor
CO_2	0.50 % vol.	2
H_2S	5 ppm	1
CO	30 ppm	1
NH_3	50 ppm	1

7.2.3 Alarm thresholds (factory settings)

Gas	AL1	AL2	AL3	AL4	STEL	LTEL
CH_4	10 % LEL	50 % LEL	100 % LEL	3 ppm	—	—
C_3H_8	10 % LEL	50 % LEL	100 % LEL	3 ppm	—	—
C_4H_{10}	10 % LEL	50 % LEL	100 % LEL	3 ppm	—	—
CO_2	0.50 % vol.	1.00 % vol.	5 % vol.	—	1.00 % vol.	0.50 % vol.
O_2	18.0 % vol.	23.0 % vol.	25 % vol.	—	—	—
H_2S	5 ppm	20 ppm	100 ppm	—	5 ppm	5 ppm
CO	30 ppm	60 ppm	500 ppm	—	30 ppm	30 ppm

7.2.4 Setting ranges for gas types

LEL values are specified as per /12/ and /14/.

The setting for AL1 must not exceed the setting for AL2.

Gas type		AL1	AL2
All C_xH_y in % LEL	Threshold	**10 % LEL**	**50 % LEL**
CH_4	Threshold	**0.45 % vol.**	**2.20 % vol.**
	Setting range	0.20 – 2.60 % vol.	0.25 – 2.65 % vol.
	Increment	0.05 % vol.	0.05 % vol.
C_3H_8	Threshold	**0.17 % vol.**	**0.86 % vol.**
	Setting range	0.08 – 1.00 % vol.	0.10 – 1.02 % vol.
	Increment	0.02 % vol.	0.02 % vol.
C_4H_{10}	Threshold	**0.14 % vol.**	**0.7 % vol.**
	Setting range	0.08 – 0.82 % vol.	0.10 – 0.84 % vol.
	Increment	0.02 % vol.	0.02 % vol.
CO_2	Threshold	**0.5 % vol.**	**1.0 % vol.**
	Setting range	0.1 – 4.99 % vol.	0.11 – 5.0 % vol.
	Increment	0.01 % vol.	0.01 % vol.
O_2	Threshold	**18.0 % vol.**	**23.0 % vol.**
	Setting range	0.5 – 20.5 % vol.	21.2 – 25.0 % vol.
	Increment	0.1 % vol.	0.1 % vol.
H_2S	Threshold	5 **ppm**	**20 ppm**
	Setting range	5 – 99 ppm	6 – 100 ppm
	Increment	1 ppm	1 ppm
CO	Threshold	**30 ppm**	**60 ppm**
	Setting range	5 – 499 ppm	6 – 500 ppm
	Increment	1 ppm	1 ppm

Factory settings in **bold**

7.3 Limit values for the device inspection

Gas	Zero point		Sensitivity	
	Specification	Deviation	Specification	Deviation
CH_4	0.00 % vol.	±0.15 % vol.	2.20 % vol.	±0.20 % vol.
C_3H_8	0.00 % vol.	±0.12 % vol.	1.00 % vol.	±0.16 % vol.
C_4H_{10}	0.00 % vol.	±0.12 % vol.	1.00 % vol.	±0.16 % vol.
CO_2	0.04 % vol.	±0.06 % vol.	2.00 % vol.	±0.20 % vol.
O_2	0 % vol.	±0.5 % vol.	20.9 % vol.	±0.5 % vol.
H_2S	0 ppm	±3 ppm	20 ppm	±3 ppm
CO	0 ppm	±3 ppm	40 ppm	±3 ppm

7.4 Memory capacity

The total memory capacity of the device is divided up as follows:

Protocol type	Maximum number of storable protocols
Ethane analysis	40
Device inspection	40
Measurement	160

There is a choice of two memory modes (see Section 3.3.7). The selected memory mode applies for all protocol types.

Measurements

Note:
A file is saved after each **Start measurement** – **Stop measurement** cycle, regardless of whether the memory capacity is exhausted.

Each file has a maximum memory capacity of 1800 data records. This means that a file can record data for 30 mins (0.5 h) at a save interval of 1 second. After this, data recording continues automatically in the next file.

Save interval	Save time for 1 file (1800 data records)	Save time for 80 files (max. memory capacity)
1 s	0.5 h	40 h
2 s	1 h	80 h
5 s	2.5 h	200 h
10 s	5 h	400 h
20 s	10 h	800 h

Factory settings in **bold**

7.5 Sensors

Note:
Probes increase the stated response times.

7.5.1 Infrared sensors (IR)

7.5.1.1 Methane CH_4, propane C_3H_8, butane C_4H_{10} for Warning %LEL and Warning ExTox

Type:	Infrared sensor
Measuring range:	0 – 100 % LEL
Measuring error: – CH_4 – C_3H_8	As per /9/ ±1 % LEL (short-term stability) ±4 % LEL (long-term stability) ±1 % LEL (short-term stability) ±1 % LEL (long-term stability)
Response times: – CH_4 – C_3H_8, C_4H_{10}	 t_{50} < 8 s t_{90} < 14 s t_{50} < 9 s t_{90} < 17 s
Temperature range:	-20 ºC – +40 ºC
Interference:	All hydrocarbons C_xH_y
Lifetime: – Warranted – Expected	 2 years 5 years
Test gases: – Zero point – Sensitivity	 Fresh air 2.20 % vol. CH_4 1.00 % vol. C_3H_8 1.00 % vol. C_4H_{10}

7.5.1.2 Methane CH_4, propane C_3H_8 for gas measuring

Type:	Infrared sensor
Measuring range:	0 – 100 % vol.
Measuring error CH_4:	±3 % vol.
Response times: – CH_4 – C_3H_8	 t_{50} < 9 s t_{90} < 17 s t_{50} < 11 s t_{90} < 22 s
Temperature range:	-20 ºC – +40 ºC
Interference:	All hydrocarbons C_xH_y
Lifetime: – Warranted – Expected	 2 years 5 years
Test gases: – Zero point – Sensitivity	 Fresh air 100 % vol.

7.5.1.3 Carbon dioxide CO_2 for Warning ExTox

Type:	Infrared sensor
Measuring range: – Lower limit	0 – 5 % vol. 0.02 % vol.
Measuring error:	±0.04 % vol. (long-term stability) As per /4/
Zero point deviation:	0.04 % vol.
Response time:	t_{90} < 20 s
Decay time:	t_{10} < 14 s
Temperature range:	-20 ºC – +40 ºC
Interference:	None
Lifetime: – Warranted – Expected	 2 years 5 years
Test gases: – Zero point – Sensitivity	 Fresh air 2.00 % vol. CO_2

7.5.1.4 Carbon dioxide CO_2 for measuring in bar holes

Type:	Infrared sensor
Measuring range:	0 – 30 % vol.
Measuring error:	±1.04 % vol.
Response time:	t_{90} < 20 s
Temperature range:	-20 ºC – +40 ºC
Interference:	None
Lifetime: – Warranted – Expected	 2 years 5 years
Test gases: – Zero point – Sensitivity	 Fresh air 20 % vol. CO_2

7.5.2 Electrochemical sensors (EC)

7.5.2.1 Oxygen O_2

Type:	Electrochemical sensor
Measuring range:	0 – 25 % vol.
Resolution:	0.1 % vol.
Measuring error:	±3 % / ±0.3 % vol. (±3 digits)
Response time:	t_{90} < 15 s
Drift:	< 2 % within 3 months
Temperature range:	-20 ºC – +40 ºC
Interference:	None
Lifetime: – Warranted – Expected	 2 years 3 years
Test gases: – Zero point – Sensitivity	 100 % vol. CH_4 or 100 % vol. N_2 Fresh air (20.9 % vol.)

7.5.2.2 Carbon monoxide CO

Type:	Electrochemical sensor
Measuring range: – Lower limit	0 – 500 ppm 4 ppm
Resolution:	1 ppm
Measuring error:	±3 % / ±3 ppm (±3 Digit) ±5 ppm (long-term stability) as per /4/
Zero point deviation:	7 ppm
Response time:	t_{90} < 30 s
Decay time:	t_{10} < 24 s
Drift:	< 10 % within 6 months
Temperature range:	-20 ºC – +40 ºC
Interference at 20 ºC. – 3000 ppm H_2 – 100 ppm NO	 Approx. 1000 ppm CO Approx. 25 ppm CO
Lifetime: – Warranted – Expected	 24 months 36 months
Test gases: – Zero point – Sensitivity	 Fresh air 40 ppm CO

7.5.2.3 Hydrogen sulphide H_2S

Type:	Electrochemical sensor
Measuring range: – Lower limit	0 – 100 ppm 1 ppm
Resolution:	1 ppm
Measuring error:	±3 % / ±3 ppm (±3 Digit) ±2 ppm (long-term stability) in accordance with /4/
Zero point deviation:	1 ppm
Response time:	t_{90} < 30 s
Decay time:	t_{10} < 27 s
Drift:	< 10 % within 6 months
Temperature range:	-20 ºC – +40 ºC
Alarm thresholds (factory settings):	AL1: 10 ppm AL2: 20 ppm AL3: 100 ppm
Interference at 20 ºC. – 100 ppm CO – 1 % vol. H_2 – 100 ppm NO_2	 Approx. 1 ppm H_2S Approx. 10 ppm H_2S Approx. 3 ppm H_2S
Lifetime: – Warranted – Expected	 2 years > 3 years
Test gases: – Zero point – Sensitivity	 Fresh air 40 ppm H_2S

7.5.3 Gas-sensitive semiconductor

Methane CH_4, propane C_3H_8

Type:	Gas-sensitive semiconductor
Measuring range:	0 – 1 % vol.
Resolution:	1 ppm / 2 ppm / 20 ppm / 200 ppm
Measuring error:	±30 %
Alarm thresholds (factory settings):	3 ppm
Interference at 20 ºC.	All hydrocarbons C_xH_y
Lifetime: – Warranted – Expected	 1 year 5 years
Test gases: – Zero point – Sensitivity	 Fresh air 10 ppm / 100 ppm / 1000 ppm / 1.0 % vol.

7.6 Technical information

7.6.1 Identification sticker (back of device)

The symbols on the sticker mean the following:

Only ever open the battery compartment outside of explosive areas.

Read the operating instructions.

7.6.2 Cleaning

The device must only be cleaned with a damp cloth.

CAUTION! Damage possible due to unsuitable cleaning agents

Unsuitable cleaning agents can cause chemical corrosion on the housing surface. Vapours from solvents and substances containing silicone can penetrate the device and damage the sensors.

- Never clean the device with solvents, petrol or cockpit spray containing silicone or similar substances.

7.6.3 Electrostatic charge

Avoid electrostatically charging the device. Electrostatically unearthed objects (e.g. including metallic housing without an earth connection) are not protected against applied charges (e.g. through dust or dispersed flows).

DANGER! Risk of explosion due to sparks

When working with hydrogen, electrostatic charging can occur.

- When working with hydrogen, always use the TG8 carrying bag.

7.7 Accessories and consumables

Accessories

Part	Order number
Docking station TG8	LP11-10001
AC/DC adapter M4	LD10-10001
Vehicle cable M4, 12 V= portable	ZL07-10100
Vehicle cable M4, 12 V= installed	ZL07-10000
Vehicle cable M4, 24 V= portable	ZL09-10000
"Vario" carrying system	3209-0012
Carrying bag TG8	3204-0040
Case TG8-RÜ	ZD29-10000
Carpet probe PRO	ZS01-12000
Bell probe D80	ZS05-10500
Localisation probe 345 mm	ZS03-10300
Flexible hand probe	ZS32-10000
Floating probe	ZS21-10100
Probe hose	ZS25-10000 (e.g.)
Test set SPE VOL	PP01-90101
Test set SPE DUO	PP01-60001
Test case kit PPM	ZP03-12001
Test plate	ZP06-10000

Consumables

Part	Order number
Fine dust filter	2499-0020
Hydrophobic filter	2491-0050
Carbon dioxide filter	ZG02-11000
Hose filter	2499-0010
Probe filter element	2499-0005
Rechargeable NiMH battery	1354-0009
Disposable alkaline battery	1353-0001
Test gas ExTox IR, test gas can 1 l, pressure approx. 12 bar	ZT47-10000
Test gas 10 ppm CH_4 in synthetic air, test gas can 1 l, pressure approx. 12 bar	ZT24-10000

Other accessories and consumables are available for the product. Please contact our SEWERIN sales department for further information.

7.8 EU declaration of conformity

Hermann Sewerin GmbH hereby declares that the **EX-TEC® HS 680/660/650/610** systems fulfil the requirements of the following guidelines:

- 2014/34/EU
- 2014/30/EU

Gütersloh, 2016-04-20

Dr. S. Sewerin
(General Manager)

The complete declaration of conformity can be found online.

7.9 Inspection protocols

7.9.1 Test with individual gases

INSPECTION PROTOCOL **EX-TEC® HS 680**

Manuf. no. (e.g.: 064 01 0501)

SEWERIN

18.12.2008

1.0	**General status**										
1.1	– Perfect condition (e.g.: Y / N)										
1.2	– Fine dust filter correct (e.g.: Y / N)										
1.3	– Disposable/rechargeable battery capacity (e.g.: ¼)										
2.0	**Pump check**										
2.1	– Pump error F100 in seal										
3.0	**Inspection above ground**										
3.1	Zero point – Display with fresh air										
3.2	Test gas 10 ppm CH_4 – Display ≥ 10 ppm in 10 seconds										
4.0	**House**										
4.1	Zero point – Display with fresh air										
4.2	Test gas 1.00 % vol. CH_4 – Display 0.80 – 1.20 % vol.										
5.0	**Enclosed spaces**										
5.1	Zero point – Display with fresh air										
5.2	Test gas 2.20 % vol. CH_4 – Display 2.00 – 2.40 % vol.										
6.0	**Warning %LEL (work area monitoring)**										
6.1	Zero point – Display -3 – +3 % LEL or – Display -0.15 – +0.15 % vol.										
6.2	Test gas 50 % LEL ≙ 2.20 % vol. CH_4 – Display 45 – 55 % LEL or – Display 2.00 – 2.40 % vol.										
6.3	Visual alarm (e.g.: Y / N)										
6.4	Audible alarm (e.g.: Y / N)										
7.0	**Warning ExTox**										
7.1	Zero point – Display -0.15 – +0.15 % vol.										
7.2	Test gas 2.20 % vol. CH_4 – Display 2.00 – 2.40 % vol.										
7.3	Test gas 2.00 % vol. CO_2 – Display 1.80 – 2.20 % vol.										
7.4	Visual alarm (e.g.: Y / N)										
7.5	Audible alarm (e.g.: Y / N)										

8.0	Gas measuring (absence of gas)										
8.1	Zero point – Display -0.3 – +0.3 % vol.										
8.2	Test gas 100 % vol. CH_4 – Display 98 – 102 % vol.										

9.0	Measuring in bar holes										
9.1	Zero point – Display -0.3 – +0.3 % vol.										
9.2	Test gas 100 % vol. CH_4 – Display 98 – 102 % vol.										
9.3	Test gas 20.0 % vol. CO_2 – Display 18.0 – 22.0 % vol.										

10.0	Further gases (optional)										
10.1	Oxygen O_2										
	Zero point (test gas 100 % vol. CH_4) – Display -0.5 – +0.5 % vol.										
	Test gas 17.5 % vol. – Display 17.0 – 18.0 % vol.										
	Test gas fresh air (20.9 % vol.) – Display 20.4 – 21.4 % vol.										
10.2	Carbon monoxide CO										
	Zero point fresh air – Display -3 – +3 ppm										
	Test gas 40 ppm – Display 37 – 43 ppm										
10.3	Hydrogen sulphide H_2S										
	Zero point fresh air – Display -3 – +3 ppm										
	Test gas 20 ppm – Display 17 – 23 ppm										
	Test gas 40 ppm – Display 37 – 43 ppm										

11.0	Ethane analysis (optional)										
11.1	Test gas 50 ppm C_2H_6 in synth. air – CH_4: No, C_2H_6: Yes, C_3H_8: No										
11.2	Test gas 100 ppm C_2H_6, 1 % vol. CH_4 – CH_4: Yes, C_2H_6: Yes, C_3H_8: No										

12.0	Comments – Housing damaged – Adjustment, repair – Inspection at factory – or similar										

13.0	Inspection										
	– Day										
	– Month										
	– Year										
	– Signature										

7.9.2 Test with gas mixture

INSPECTION PROTOCOL **ExTox IR** **€X-T€C® HS 680**

Manuf. no. (e.g.: 064 01 0501)

SEWERIN

01.10.2010

1.0	**General Status**										
1.1	- Perfect condition (e.g.: Y / N)										
1.2	- Fine dust filter correct (e.g.: Y / N)										
1.3	- Disposable/rechargeable battery capacity (e.g.: ¼)										

2.0	**Pump check**										
2.1	- Pump error F100 in seal										

3.0	**Inspection above ground**										
3.1	Zero point - Display with fresh air										
3.2	Test gas 10 ppm CH_4 - Display ≥ 10 ppm in 10 seconds										

4.0	**House / Enclosed spaces**										
4.1	Zero point - Display with fresh air										
4.2	Test gas 1.00 % vol. CH_4 – Display 0.80 – 1.20 % vol.										

5.0	**Warning %LEL / Warning ExTox (test gas fresh air)**										
5.1	Zero point CH_4 – Display -3 – +3 % LEL or – Display -0.15 – +0.15 % vol.										
5.2	Zero point CO_2 (0.04 % vol.) – Display -0.02 – +0.10 % vol.										
5.3	Fresh air O_2 (20.9 % vol.) – Display 20.4 – 21.4 % vol.										
5.4	Zero point CO – Display -3 – +3 ppm										
5.5	Zero point H_2S – Display -3 – +3 ppm										

6.0	Warning %LEL / Warning ExTox (test gas ExTox IR)										
6.1	CH_4 (2.20 % vol.) – Display 45 – 55 % LEL or – Display 2.00 – 2.40 % vol.										
6.2	CO_2 (2.00 % vol.) – Display 1.80 – 2.20 % vol.										
6.3	O_2 (0 % vol.) – Display -0.5 – +0.5 % vol.										
6.4	CO (40 ppm) – Display 37 – 43 ppm										
6.5	H_2S (40 ppm) – Display 37 – 43 ppm										
6.6	Visual alarm (e.g.: Y / N)										
6.7	Audible alarm (e.g.: Y / N)										

7.0	Measuring in bar holes / Gas measuring										
7.1	Zero point CH_4 / CO_2 – Display -0.3 – +0.3 % vol.										
7.2	Test gas 60 % vol. CH_4 – Display 98 – 102 % vol.										
7.3	Test gas 20.0 % vol. CO_2 – Display 18.0 – 22.0 % vol.										

8.0	Ethane analysis										
	Test gas 100 ppm C_2H_6, 1 % vol. CH_4 – CH_4: Yes, C_2H_6: Yes, C_3H_8: No										

9.0	Comments										
	– Housing damaged – Adjustment, repair – Inspection at factory – or similar										

10.0	Inspection										
	– Day										
	– Month										
	– Year										
	– Signature										

7.10 Advice on disposal

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

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

End-of-life equipment

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

7.11 Terminology and abbreviations

% vol.	● Percent concentration of a gas in a gas mixture with respect to the volume
AL	● Alarm
CENELEC	● European Committee for Electrotechnical Standardization
EC	● Electrochemical sensor
Gas type	● Hydrocarbon C_xH_y, which can be measured with the IR ● One of the available gas types must always be set at a time, as it is not possible to measure more than one gas type at the same time.
IR	● Infrared sensor
LEL	● Lower Explosion Limit
LTEL	● Long-time exposure limit
NiMH	● Nickel metal hydride
OEL	● Occupational exposure limit
ppm	● Parts per million
Ring memory	● Type of data storage in the device ● If the available storage space is full, the oldest file is automatically overwritten by the current file.
SC	● Gas-sensitive semiconductor
Stack memory	● Type of data storage in the device ● If the available storage space is full, you are prompted to confirm whether the oldest file should be overwritten by the current file.
STEL	● Short-time exposure limit

7.12 Referenced documents

The following standards, guidelines and regulations are referred to in these operating instructions:

/1/ BGI T 021
Berufsgenossenschaft Chemie (Chemical Employers' Liability Insurance Association); Code of Practice T 021: Gaswarneinrichtungen für toxische Gase/Dämpfe und Sauerstoff – Einsatz und Betrieb (Gas Warning Devices for Toxic Gases/Vapours and Oxygen – Use and Operation)
Available for download at: www.bgchemie.de

/2/ BGI T 023
Berufsgenossenschaft Chemie (Chemical Employers' Liability Insurance Association); Code of Practice T 023: Gas Warning Devices for Explosion Protection – Use and Operation
Available for download at: www.bgchemie.de

/3/ DVGW G 465-4
Deutsche Vereinigung des Gas- und Wasserfaches e. V. (German Association of Gas and Water Specialists); Regulation G 465-4: Gasspür- und Gaskonzentrationsmessgeräte für die Überprüfung von Gasanlagen (Gas-Detection and Gas-Concentration Measurement Devices for Inspection of Gas Systems)
Available for download at: www.dvgw.de

/4/ EN 45544

/5/ EN 45544-2

/6/ EN 45544-4

/7/ EN 50104:2010

/8/ EN 60079-7:2007

/9/ EN 60079-29-1

/10/ EN 60079-29-2

/11/ EN 60086-1

/12/ EN 61779-1

/13/ EN 61951-2

/14/ IEC 60079-20

/15/ TRGS 900: 2006
Technical regulations for hazardous substances: Occupational exposure limits
Available for download at: www.baua.de

/16/ 94/9/EC (ATEX 100a)

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