

SR2-BIO

Operating Instructions




SEWERIN

Measurable success by Sewerin equipment

Congratulations.

You have chosen a quality instrument manufactured by Hermann Sewerin GmbH.

Our equipment will provide you with the highest standards of performance, safety and efficiency. They correspond with the national and international guide-lines.

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

Yours

Hermann Sewerin GmbH

Robert-Bosch-Straße 3
33334 Gütersloh, Germany
Tel.: +49 5241 934-0
Fax: +49 5241 934-444
www.sewerin.com
info@sewerin.com

Sewerin Ltd.

8, Walsworth Road
Hitchin
Hertfordshire
SG4 9SP, UK
phone: +44 1462-634363
www.sewerin.co.uk
info@sewerin.co.uk

Sewerin USA, LLC

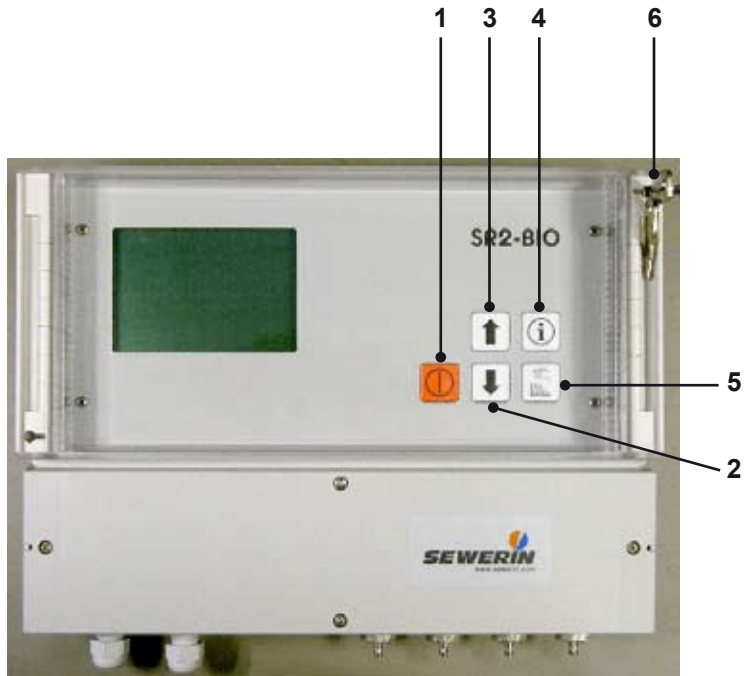
13551 W. 43rd Drive, Unit R
Golden, CO 80403-7272
phone: +1 303-424-3611
fax: +1 303-420-0033
www.sewerin.net
jerry.palmer@sewerin.net

SEWERIN Sarl

17, rue Ampère - BP 211
67727 HOERDT CEDEX, France
Tél. : +33 3 88 68 15 15
Fax : +33 3 88 68 11 77
www.sewerin.com
sewerin@sewerin.fr

SEWERIN IBERIA S.L.

c/ Cañada Real de Merinas, 17
Centro de Negocios „Eisenhower“
Edificio 5; Planta 2 - C
28042 Madrid, España
Tel.: +34 91 74807-57
Fax: +34 91 74807-58
www.sewerin.com
info@sewerin.es



Console

- Pos. 1 Instrument switch on/off; confirmation key in the „Info“ menu
- Pos. 2/3 Changing the instrument parameters in the „Info“ menu
- Pos. 4 Requesting various instrument parameters
- Pos. 5 Manually connecting the sensors for measurements

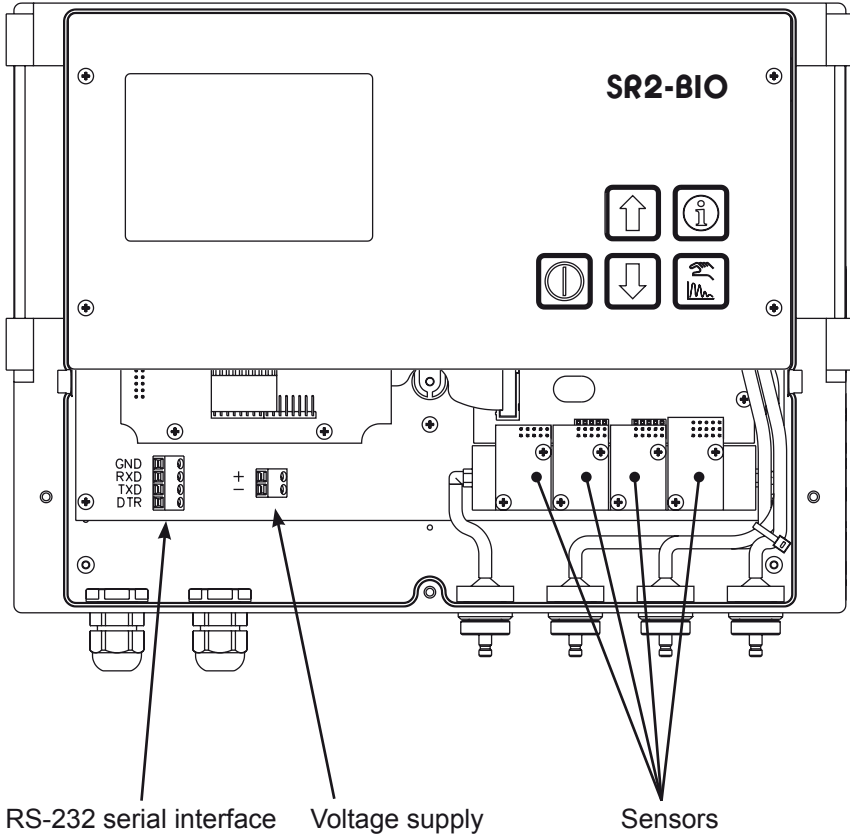
Miscellaneous

- Pos. 6 Key for locking the front cover



Illustration SR2-BIO

Front view of the opened lower front cover.
The interfaces and sensors can be seen.



Operating Instructions

SR2-BIO

11.10.2006 – V 1.0 – 104871 – en

Warranty & Used symbols

To ensure reliable operation and safety, it is required to pay attention to the following notes.

Hermann Sewerin GmbH is not liable for damage caused by failure to comply with these notes. The guarantee and liability conditions of the sales and delivery conditions of Hermann Sewerin GmbH are not extended by the following notes.

- This product may only be taken into operation after reading thoroughly the accompanying operating instructions.
- This product may only be used for intended applications.
- This product is destined for industrial and commercial applications.
- Repairs may only be performed by the manufacturer or appropriately trained staff.
- The manufacturer is not liable for damage resulting from arbitrary modifications of the product.
- Only spare parts may be used which are approved by Hermann Sewerin GmbH.
- Only approved battery types may be used.

Technical changes within the scope of further development reserved.

Used symbols:



CAUTION!

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



Note:

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

1	SR2-BIO System	1
1.1	Multiple gas detector	1
1.2	Fields of application	2
2	Safety	3
2.1	Use	3
2.2	Safety notes	4
3	Measuring operation	6
3.1	Switching on	6
3.2	Measuring operation	9
3.2.1	Info key	10
3.2.2	Measurement key	11
3.2.3	Illumination	11
3.2.4	Interface	11
4	Testing the instrument	12
4.1	Tests / servicing	12
4.2	Test equipment	14
4.3	Test set	15
4.4	Test gases	16
4.5	Testing the pump power, zero point and sensitivity	17
5	Info menu	19
5.1	Menu structure	19
5.2	Overview	20
6	Adjustment menu	22
6.1	Menu structure	22
6.2	Setting the H ₂ S-sensor	23
6.3	Setting the O ₂ -sensor	24
6.4	Setting the CH ₄ /CO ₂ -sensor	25
6.5	Setting the measurement quantity	27
6.6	Inspection confirmation	28
6.7	Leaving the adjustment menu	29

7	Memory menu	30
7.1	Menu structure	30
7.2	Clearing memory	31
7.3	Setting the memory mode	33
7.4	Leaving the memory menu.....	34
8	System menu	35
8.1	Menu structure	35
8.2	Setting the date/clock.....	36
8.3	Setting measurement interval (BIO-INT).....	38
8.4	Setting the inspection interval	39
8.5	Setting the PIN-code	40
8.6	Checking the LCD	42
8.7	Language	42
8.8	Leaving the system menu	43
9	Technical aspects	44
9.1	Technical notes	44
9.2	Technical data	45
9.3	Error messages.....	51
9.4	Wearing parts	54
9.5	Spare parts.....	54
9.6	EC-sensor disposal	54
10	Hints on Disposal	55
	Appendix	56
	Declaration of conformity.....	56
	Inspection protocol	57
	SR2-BIO – Installation and use	58

1 SR2-BIO System

1.1 Multiple gas detector



The **SR2-BIO** is a fixed measuring instrument for a number of different gases. It consists of:

- the basic instrument ,incorporating a pump and a data memory for documentation purposes
- 4 sensor sockets for the measurement of up to 5 different gases

There are two variants of the basic instrument:

- with a gas sample inlet (Type 1)
- with two gas sample inlets (Type 2), for measuring H₂S before and after a desulphurization unit

The following sensors are available:

- Methane CH₄/carbon dioxide CO₂ (combination sensor)
- Oxygen O₂
- Hydrogen sulphide H₂S
- Ammonia NH₃
- Carbon monoxide CO

1.2 Fields of application

The **SR2-BIO** is suitable for the following fields of application:

- for biogas plants
 - monitoring and optimisation of the fermentation
- for land-fill sites
- for plants to recover mine gas

2 Safety

2.1 Use

The **SR2-BIO** is envisaged for wall mounting. Select a suitable site. The **SR2-BIO** housing is dust-proof and jet-water resistant (IP 66). Open the front flap and take off the cover from the lower half of the housing. There are six oval fastening holes on the bottom of the housing.

The **SR2-BIO** requires 24 V D.C. The power input is 12 VA. Do note the protection class if using a separate power supply unit. The power supply unit may have to be accommodated in a protective housing or in a drier room.

**Note:**

If the **SR2-BIO** is unplugged from the voltage supply, all the stored measurements are lost!

No data is lost when the instrument is switched off!

The terminals for the electrical connections are in the lower half of the housing under the separately removable cover.

The 24 V cable is led through the underside PG connection to the housing and connected with the jack on the printed wiring board.

The RS-232 interface can be wired in the same way (see Appendix).

Hoses with **hydrophobic filters** must be connected to the gas sample inlets (marked: „GAS 1“, „GAS 2“, „AIR“) !

For safety's sake, the gas from the gas sample outlet (marked „OUT“) is to be directed in a hose from the building.

Following switch-on the date and time are to be re-set. This is to be done as in Section 8.2. The same procedure is to be adopted with the other instrument parameters.

2.2 Safety notes



CAUTION!

Please note that when the **SR2-BIO** is in measuring operation the gas sample is released into the ambient air through its outlet.

Especially when using in enclosed spaces it is to be ensured that no explodable or toxic gas mixture arises.

The advice therefore is to direct the gas sample to the atmosphere through an exhaust air hose.



CAUTION!

Always use original SEWERIN accessories with the **SR2-BIO!**



CAUTION!

Always use a probe hose with a hydrophobic filter.



CAUTION!

Do not operate outside the permissible temperature range of -10 °C – +40 °C!



CAUTION!

Use the test gases only in well-ventilated areas, as some concentrations exceed the pertinent MAK values.



CAUTION!

The **SR2-BIO** satisfies the limits of the EMV regulation. When using it near (mobile) radio equipment please also observe the instructions in their manuals.

3 Measuring operation

3.1 Switching on

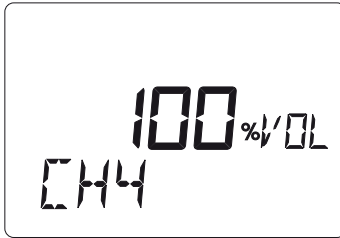


- press the **on/off key** for about 3 seconds
- the LC display illumination automatically switches on for about 4 minutes
- the built-in pump runs at constant power
- the software version number (e.g. 2.1) and instrument type (**SR2-BIO**) are displayed



Note:

All the following instrument displays assume that the **SR2-BIO** is fully equipped for the measurement of 4 gases (CH₄ - CO₂ - O₂ - H₂S).



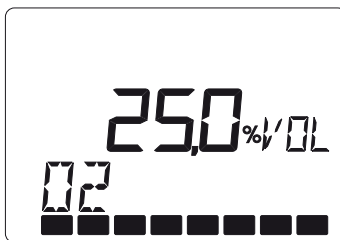
CH₄ - methane

- the measurement range for methane is displayed:
0,0 – 100 %VOL
- depending on your last setting a display in the %VOL, %GAZ quantities may also be possible cf. section 6.5 “Setting the measurement quantity”)



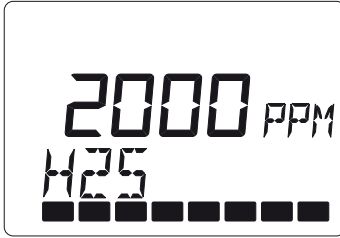
CO₂ - carbon dioxide

- the measurement range for carbon dioxide is displayed:
0 – 100 %VOL
- depending on your last setting a display in the %VOL, %GAZ quantities may be possible (cf. section 6.5 „Setting the measurement quantity“)



O₂ - oxygen

- the measurement range for oxygen is displayed:
0,0 – 25,0 %VOL
- depending on your last setting a display in the %VOL, %GAZ quantities may be possible (cf. section 6.5 „Setting the measurement quantity”)
- display of the sensor lifetime in the form of bars (cf. section 9.2 „Technical data“):
8 bars = 100 %



H₂S - hydrogen sulphide

- the measurement range for hydrogen sulphide is displayed

0 – 2000 ppm

- display of the sensor lifetime in the form of bars (cf. section 9.2 „Technical data“):

8 bars = 100 %

- for instruments with two gas sample inlets (Type 2) „H₂S.1“ and „H₂S.2“ are displayed one after the other

H₂S.1: **Measured value Gas inlet 1**

H₂S.2: **Measured value Gas inlet 2**



Time / Date

- the current time (e.g. **17:49**) and date (e.g. **24.02.2000**) are displayed
- properly-set values are important for the documentation of your readings
- you can correct any variances (cf. section 9.2: “Setting the date/time”)

3.2 Measuring operation

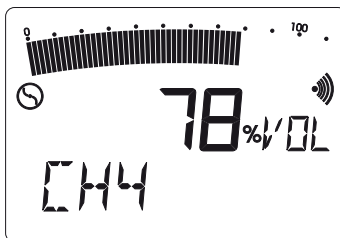
- The first measurement is automatically started after switch-on.

For the following measurements the sensors are connected at the measuring interval selected (see Section 8.3 „Measurement interval“). Measurement at each gas inlet takes some 2 minutes – thus 4 minutes for instruments with two gas inlets (Type 2). The readings are frozen up to the next measurement and shown on the display. In instruments with two gas inlets, arrows in the display point to the gas inlet which is momentarily active during measurement:

Right-hand arrow: measurement via gas inlet 1 („GAS 1“)

Left-hand arrow: measurement via gas inlet 2 („GAS 2“)

At the end of the measurement cycle, fresh air is drawn in via the „AIR“ inlet for sensor purging.



- each gas present is displayed for about 3 seconds; the display then switches to the next

Sequence:

CH₄ - CO₂ - O₂ - H₂S.1 - H₂S.2

- the pump runs at maximum power

- on instruments that are only fitted with the CH₄/CO₂ sensor, both readings are displayed simultaneously.

In this example the readings are 8.7 %VOL CH₄ and 4 %VOL CO₂.

3.2.1 Info key



- By pressing the Info key a number of instrument parameters can be shown in the following order when measuring:
 - time
 - date
 - year
 - inspection interval
 - actual measurement value CH₄
 - actual measurement value CO₂
 - actual measurement value O₂
 - actual measurement value H₂S.2
 - bio interval
 - O₂-Inspection
 - H₂S.2-Inspection
 - pump power

Bio interval indicates the currently set measuring interval (see Section 8.3 „Measurement interval“)

O₂-inspection and H₂S.2-inspection indicate the probable remaining life of the sensors.

Operation of the Info key between two measurement cycles results in indication of the current measurement values of fresh air since this air is being aspirated via the „AIR“ inlet.



Caution!

Please note that the instruments with two gas sample inlets (Type 2) only have an H₂S sensor. The H₂S.1 and H₂S.2 measurement values are simply determined one after the other.

3.2.2 Measurement key



- irrespective of the measurement interval set (see Section 8.3 „Measurement interval“), pressing the measurement key immediately starts a measurement. This is useful if you want to take a current measurement without having to wait for the next measurement cycle. This measurement is **not stored!**

3.2.3 Illumination

- The illumination is switched on when any key is pressed
- the illumination automatically switches off again after about 4 minutes

3.2.4 Interface

The instrument can be connected to a PC via the RS-232 interface. For details please consult the manual for the PC software required.

4 Testing the instrument

4.1 Tests / servicing

What?	Who?	When?
display-accuracy test (adjustment)	user, expert or specialist firm	every 3 – 6 months
servicing (maintenance, if needed repair)	SEWERIN, expert or authorised specialist firm	annually, in the case of defective instruments

Checking display sensitivity (adjustment)

Testing frequency must be specified as a function of the sensors fitted and the use of the instrument. It is to be done within a monthly to six-monthly interval.

Servicing - maintenance and repair

The instrument must be maintained at least once a year by **SEWERIN Service**, a **specialist firm** authorised by SEWERIN or a SEWERIN-authorised **expert**.

Certificates must be issued accordingly.



The test disc on the instrument confirms when maintenance was last carried out and indicates the next scheduled date (e.g. 5/00 =May 2000).

Annual maintenance and repair must cover at least the specialist care and adjustment of the instrument and the replacement of components with a limited useful life.



Note:

Technicians responsible for servicing must have been entrained and instructed by Sewerin.

4.2 Test equipment

The following accessories are available for monitoring and testing the pump performance and sensitivity of the **SR2-BIO**:



Test set SPE VOL

- for mobile vehicle mounting,
- connection for all SEWERIN test gas cans, flow-rate control, release key and connecting hose



Test gas cans

- for testing and adjusting display sensitivity,
- various test gas concentrations in 1-litre cans under pressure of approx. 12 bar



Test set SPE2

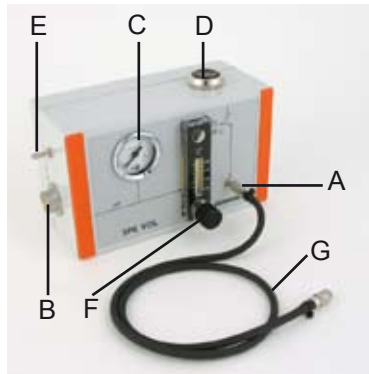
- for non-mobile use in the workshop,
- with connections for several SEWERIN pressure cylinders, pressure and flow meter, release key and connection hoses

Pressure cylinders

- for testing and adjusting display sensitivity,
- various test gas concentrations in 0.4 / 2.0 / 10.0 litre steel cylinders at pressures of 100 – 150 bar

4.3 Test set

The test set **SPE VOL** is available to test the pump power, zero-point and sensitivity:



(fig. 1)

Item	description	function
A	device connection	connection with: <ul style="list-style-type: none"> ● probe connection ● test heads
B	test gas connection	connection for: <ul style="list-style-type: none"> ● test gas cans ● pressure hose adapter (in conjunction with pressure cylinder and pressure reducer)
C	manometer	Display of remaining pressure inside the test gas container
D	release button	release of test gas
E	fresh-air supply	opening for: <ul style="list-style-type: none"> ● aspirating fresh-air ● fresh-air hose
F	needle valve with flowmeter	reading the pump power in litres per hour (l/h)
G	connection hose	connected to: <ul style="list-style-type: none"> ● device

4.4 Test gases

The following test gases are used in conjunction with the test set **SPE VOL** to test the zero point and sensitivity:

Methane CH₄

- zero point:	fresh air
- sensitivity:	100 vol.% CH ₄

Carbon dioxide CO₂

- zero point:	fresh air
- sensitivity:	100 vol.% CO ₂

Oxygen O₂

- zero point:	100 vol.% CH ₄
- sensitivity:	fresh air

Hydrogen sulphide H₂S

- zero point:	fresh air
- sensitivity:	40 ppm H ₂ S in synthetic air

Carbon monoxide CO

- zero point:	fresh air
- sensitivity:	40 ppm

Ammonia NH₃

- zero point:	fresh air
- sensitivity:	50 ppm

These gases are supplied in 5 test gas cans:

- 100 vol.% CH₄
- 100 vol.% CO₂
- 40 ppm H₂S in synthetic air
- 50 ppm NH₃ in nitrogen
- 40 ppm CO in synthetic air

4.5 Testing the pump power, zero point and sensitivity

Proceed as follows:

- screw the selected test gas can onto the test set SPE VOL as far as it will go (fig. 1 - item. B)
- connect gas inlet 1 („GAS 1“) with the hose of the SPE VOL test set (fig. 1 - item. A)
- switch the instrument on; the pump aspirates **fresh air** through the test set SPE VOL (fig. 1 - item. E)
- enter your test results in the Inspection protocol

Pump power

- use the needle valve (fig. 1, item 5) to set the flow to maximum; it must be greater than 30 l/h (fig. 1 - item 6)

Zero point

- wait for the instrument to settle at a stable zero point; permissible tolerances with fresh air are:

Gas	Tolerance
Methane CH ₄	-1.0 – +1.0 vol.%
Carbon dioxide CO ₂	-1.0 – +1.0 vol.%
Hydrogen sulphide H ₂ S	-10 – +10 ppm
Carbon monoxide CO	-3 – +3 ppm
Ammonia NH ₃	-3 – +3 ppm

In a fresh air environment, the display of the oxygen sensor will indicate a nominal value of 20.9 vol.%.

For zero calibration, the sensor is exposed to a pure CH₄ environment (100 % by volume).

Tolerances:

Oxygen O₂ -0,5 – +0,5 vol.%

If display values are outside these tolerances the pertinent sensor must be readjusted (cf. section 6: Settings menu)

Sensitivity

- press the release key (fig. 1, item D) on the test set SPE VOL and adjust the flow to the fresh air value (fig. 1, item F)
- hold down the release key until the displayed concentration has settled at a stable value; permissible tolerances with test gases:

Gas	tolerance
Methane CH ₄	97 – 103 vol.%
Carbon dioxide CO ₂	97 – 103 vol.%
Hydrogen sulphide H ₂ S	36 – 44 ppm
Carbon monoxide CO	37 – 43 ppm
Ammonia NH ₃	47 – 53 ppm

The oxygen sensor is tested for its sensitivity in a fresh air environment.

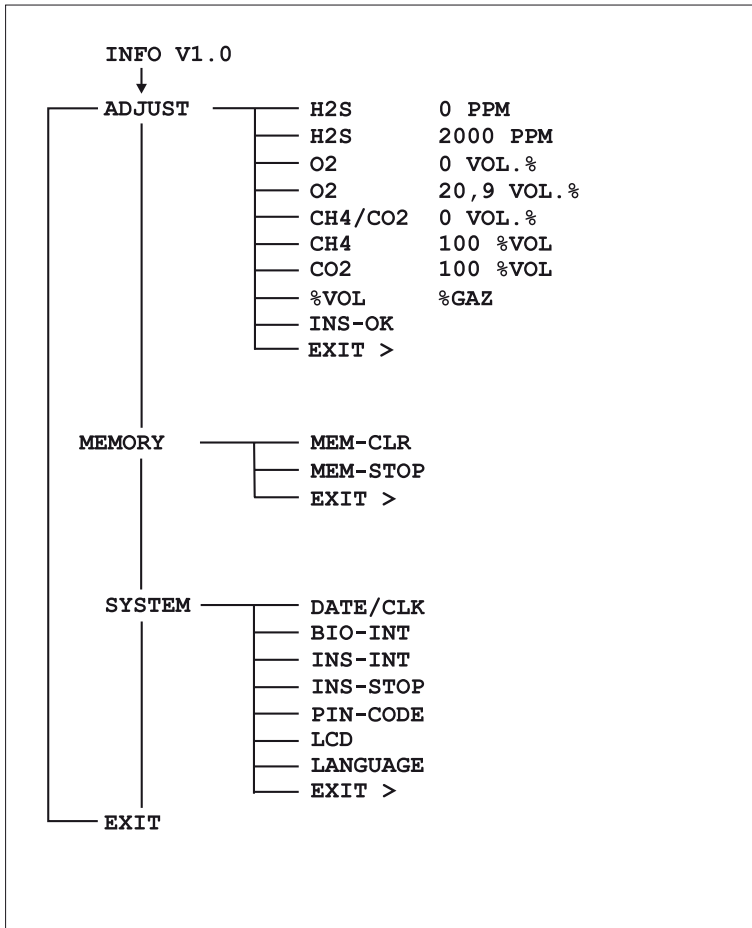
Tolerances:

Oxygen O₂ 20,4 – 21,4 vol.%

If display values are outside these tolerances the pertinent sensor must be readjusted (cf. section 6: Settings menu).

5 Info menu

5.1 Menu structure

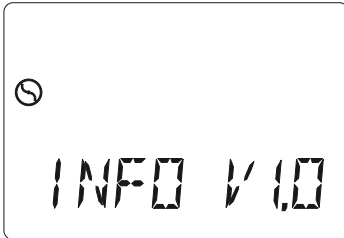


5.2 Overview

The info menu is accessible only when the **SR2-BIO** is switched off.



- now simultaneously press the following **3 keys**



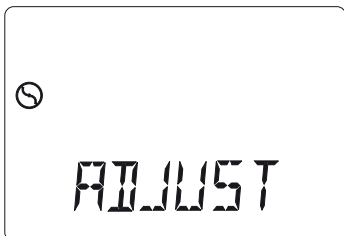
- you are now in the **INFO** menu item (cf. section 5.1 „Menu structure“)
- the software version number (e.g. V1.0) is displayed and the LCD illumination automatically switches on for about 4 minutes



- you must now enter your PIN code (cf. section 8.5 “Setting the PIN code”)
- **0001** = factory settings
- only now do you have access to all menu items



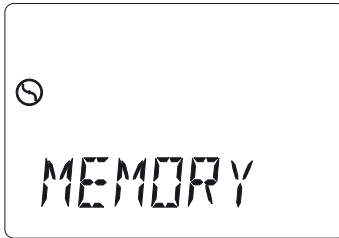
- the **arrow-up key** returns you to the menu structure



- you are now in the **ADJUSTMENT** menu item (cf. section 6 “Adjustment menu”)



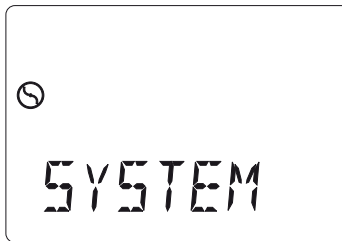
- the **arrow-up key** brings you to the next display



- you are now in the **MEMORY** menu item (cf. section 7 „Memory menu“)



- the **arrow-up key** brings you to the next display



- you are now in the menu item **SYSTEM** (cf. section 8 „System menu“)



- the **arrow-up key** brings you to the next display



- you are now in the **EXIT** menu item



There are two possibilities here:

- pressing the **arrow-up key** returns you to the **ADJUSTMENT** menu item (cf. section 5.1 „menu structure“)

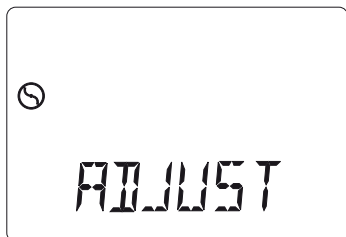
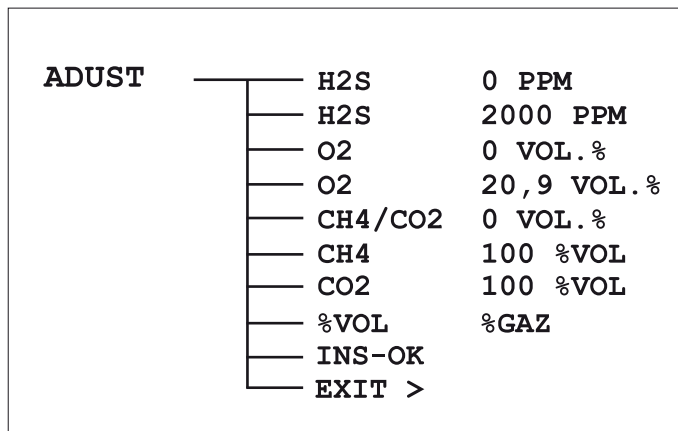
... or



- briefly pressing the **on/off key** leaves the menu structure and the instrument switches to measuring operation

6 Adjustment menu

6.1 Menu structure



- you are in the **ADJUSTMENT** menu item



- briefly pressing the **on/off key** brings you to the adjustment menu



- by briefly pressing the **info key** you can switch the instrument pump on and off

6.2 Setting the H₂S-sensor



Note:

The pump always runs during adjustment of the H₂S-sensor.

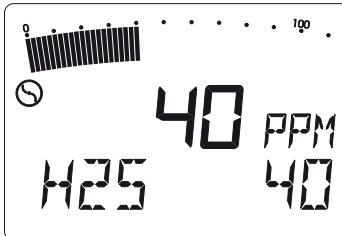


H2S- zero point 0 ppm

- release **fresh air** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)



- pressing the **arrow-up key** brings you to the next display

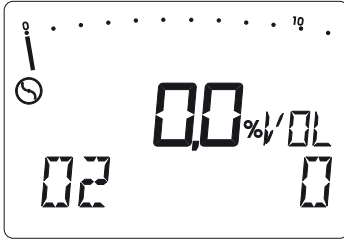


H2S - sensitivity 40 ppm

- now release **test gas 40 PPM H2S** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)
- once this has happened, turn off the test gas feed
- pressing the **arrow-up key** brings you to the O₂-sensor setting facility

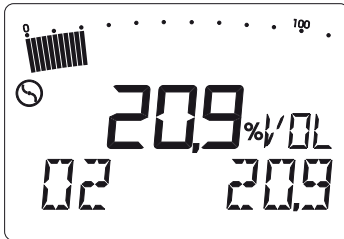


6.3 Setting the O₂-sensor



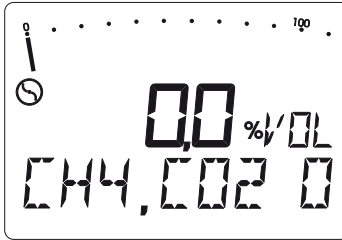
O2 - zero point 0 %VOL

- now release **test gas 100 vol.% CH₄** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)
- once this has happened, turn off the test gas feed
- pressing the **arrow-up** key brings you to the next display

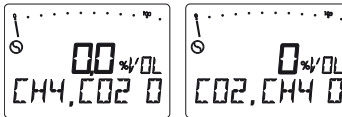


O2 - sensitivity 20,9 %VOL

- now release **fresh air** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)
- pressing the **arrow-up key** brings you to the CH₄/CO₂-sensors setting facility
- the oxygen content can vary slightly depending on the quality of the aspirated fresh air

6.4 Setting the CH₄/CO₂-sensor**CH₄/CO₂ - zero point 0 %VOL**

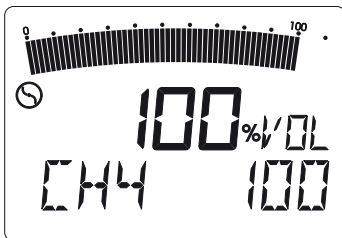
- the instrument aspirates fresh air via the „Air“ inlet
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)



- the **display** switches between **CH₄** and **CO₂**



- pressing the **arrow-up key** brings you to the next display

**CH₄ - sensitivity 100 %VOL**

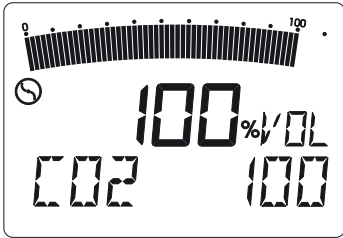
- now release **test gas 100 %VOL CH₄** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)
- once this has happened, turn off the test gas feed

**Note:**

Before switching to the next step, please wait until the displayed concentration has reached the value of 0 vol. %!



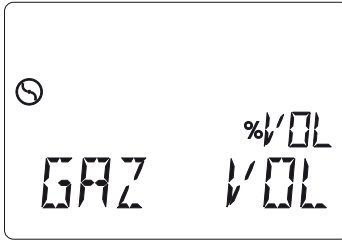
- pressing the **arrow-up key** brings you to the next display



CO2 - sensitivity 100 %VOL

- now release **test gas 100 %VOL CO2** from the SPE VOL
- wait for the display to settle at a stable value and confirm the adjustment with the on/off key (**OK** appears in the LCD)
- once this has happened, turn off the test gas feed

6.5 Setting the measurement quantity



CH₄, CO₂, O₂ - %VOL-range language

- repeatedly pressing the on/off key switches between the following displays in the **%VOL** range:

%VOL - display in **%VOL** (D/GB)

%GAZ - display in **%GAZ** (F)

- confirm the display, e.g. **%VOL**, with the on/off key (**OK** appears in the LCD)
- this setting is preserved even when the instrument is switched off
- pressing the **arrow-up key** brings you to the inspection confirmation function



6.6 Inspection confirmation



INSPECTION OK

- the **SR2-BIO** can remind you of scheduled inspection and adjustment dates
- this requires the **inspection interval** to be set in the system menu (cf. sections 8.4 „Setting the inspection interval“)
- confirm the inspection or adjustment you have carried out with the **on/off key (OK)** (OK appears in the LCD):
- this date is stored as a function of the set date (cf. section 8.2 „Setting the date/time“)
- the next inspection or adjustment date is calculated in accordance with the set inspection interval
- pressing the **arrow-up key** brings you to the exit from the adjustment menu

6.7 Leaving the adjustment menu

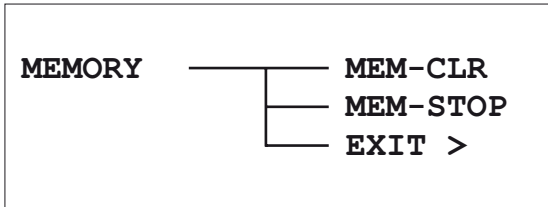


EXIT >

- signpost (>) to menu level 1
- pressing the **on/off key** leaves the adjustment menu
- you are now back at the top main-menu level and can switch between the following menu items:
 - **ADJUST**
 - **MEMORY**
 - **SYSTEM**
 - **EXIT**

7 Memory menu

7.1 Menu structure



- the **SR2-BIO** continuously stores readings from the sensors that are present
- these can later be read out with the appropriate evaluation software (separate user manual) via the RS-232 interface
- you are in the **MEMORY** menu item



- briefly pressing the **on/off key** brings you to the memory menu

7.2 Clearing memory



MEMORY CLEAR

- This functions clears the entire memory



- confirm the clearance with the **on/off key** (**OK** appears in the LC display)



- pressing the arrow-up key gets you to the next menu item

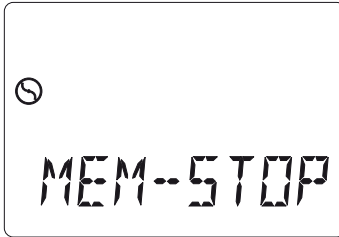
Data-memory capacity

- the **SR2-BIO** stores the following values in its data memory:
 - readings for each gas (instantaneous values at the moment of scanning)
 - Events (error messages, etc.)
- depending on the set measurement interval (see Section 8.3 „Setting measurement interval“) and the number of gases, data memory can continuously record for the following periods:

Memory interval	Recording duration
0.5 hours	64 days
1 hour	128 days
2 hours	256 days
3 hours	384 days
6 hours	768 days
12 hours	1537 days
24 hours	3074 days

The above figures show the average achievable length of recording. The length of recording can be reduced by the number of on/off cycles and events occurring.

7.3 Setting the memory mode

MEMORY-STOP

- briefly pressing the **on/off key** brings you to the memory mode setting facility
- by repeatedly pressing a **arrow-key** you can select the following memory modes:

OFF (ring memory)

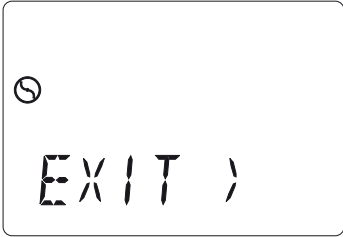
readings are continuously written to memory; when memory is full the oldest values are overwritten

ON (stack memory)

readings are only written to memory until it is full, thus write-protecting the oldest values

- confirm the memory mode with the **on/off key**
- this setting is preserved even when the instrument is switched off
- pressing the **arrow-up key** brings you to the exit from the memory menu

7.4 Leaving the memory menu



EXIT >

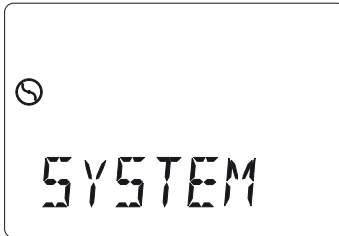
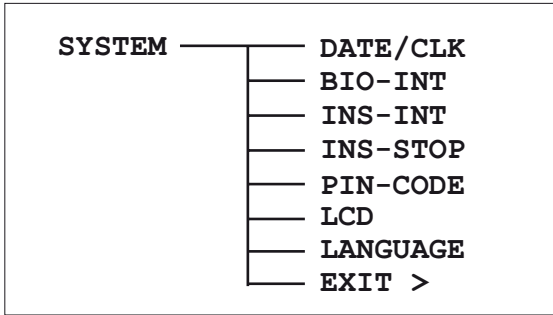
- signpost (>) to menu level 1



- pressing the **on/off key** leaves the memory menu
- you are now back at the top main-menu level and can switch between the following menu items:
 - **ADJUST**
 - **MEMORY**
 - **SYSTEM**
 - **EXIT**

8 System menu

8.1 Menu structure

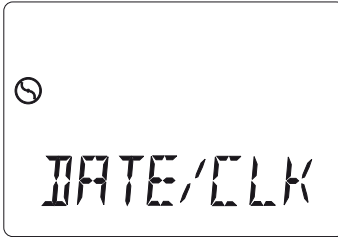


- you are in the **SYSTEM** menu item



- briefly pressing the **on/off key** brings you to the system menu

8.2 Setting the date/clock



DATE/CLOCK



- briefly pressing the **on/off key** brings you to the date/clock setting



DATE

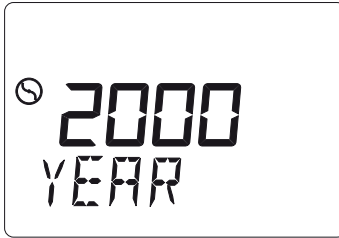
- the last **day** (24 - flashing) and **month** (02) to be set are displayed



- by repeatedly pressing or holding down a **arrow key** ...



- ... and confirming with the **on/off key** you can set first the day and then the month to the current date



YEAR

- the last **year** (2000 - flashing) to be set is displayed

- by repeatedly pressing or holding down a **arrow key** ...

- ... and confirming with the **on/off key** you can set the current year

CLOCK

- the last **hours** (17 - flashing) and **minutes** (49) to be set are displayed

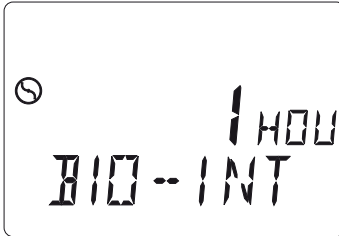
- by repeatedly pressing or holding down a **arrow key** ...

- ... and confirming with the **on/off key** you can first set the hours and then the minutes to the current time

- these settings are preserved even when the instrument is switched off

- pressing the **arrow-up key** gets you to the next menu item

8.3 Setting measurement interval (BIO-INT)



BIO-INT

- Quickly press the **on/off key** to get to the measurement interval setting (BIO-INT)

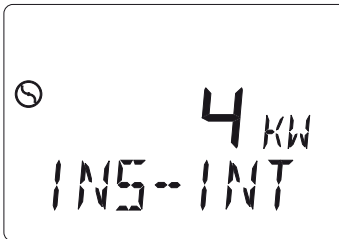
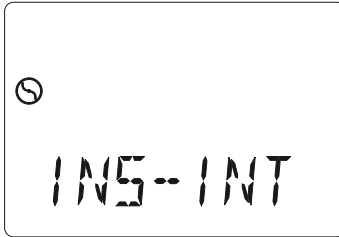
- you can select the following memory intervals by pressing an **arrow-key** a number of times or for longer:

Intervals:

- 0.5 hours
- 1 hour
- 2 hours
- 3 hours
- 6 hours
- 12 hours
- 24 hours

- Use the **on/off key** to confirm your choice

8.4 Setting the inspection interval

INSPECTION INTERVAL

- the **SR2-BIO** can remind you of regular scheduled tests (e.g. inspections, adjustments)
- this reminder is based on the inspection interval
- briefly pressing the **on/off key** brings you to the inspection interval setting facility

Inspection interval = 0 – 52 KW

- the last interval to be set is displayed in KW (calendar weeks), e.g.:
 - **0 KW** = function inactive
 - **4 KW** = monthly
 - **52 KW** = annual
- by repeatedly pressing or holding down a **arrow key** ...
- ... and confirming with the **on/off key** you can set the desired interval

8.5 Setting the PIN-code



PIN-CODE

- you can set your **SR2-BIO** so that only authorised persons, e.g.
 - instrument technicians
 - expertshave access to the info menu with all its subfunctions
- this involves setting a PIN that must be entered every time the info menu is called
- when an incorrect PIN is entered the instrument reverts to its switch-on routine
- briefly pressing the **on/off key** brings you to the PIN-code setting facility

Setting the PIN-CODE

- the last PIN to be set (**0001** = factory setting) appears in the LC display
- we recommend you to use a different PIN
- by repeatedly pressing or holding down a **arrow key** ...
- ... and confirming with the **on/off key** you can set each of the 4 digits from left to right to the desired PIN

PIN-code = 0000

- the function is inactive, every user has access to the info menu

PIN-code = 0001 – 9999

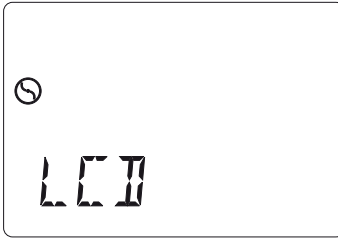
- the function is active, only persons who know the set PIN have access to the info menu
- this setting is preserved even when the instrument is switched off
- pressing the **arrow-up key** brings you to the LC display check facility



Note:

Make a note of your PIN and only give it to authorised persons!
If you forget your PIN, please contact SEWERIN Service!

8.6 Checking the LCD



- with this function you can carry out a **visual check** that all segments of the LCD are in working order



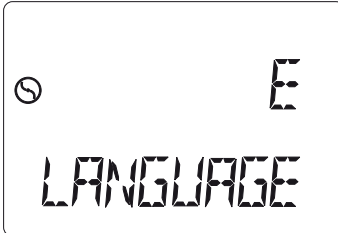
- confirm the LCD check with the **on/off key**



- all the possible LCD characters and symbols are activated

- pressing the **arrow-up key** brings you to the exit from the menu

8.7 Language



- the **SR2-BIO** operating language can be changed



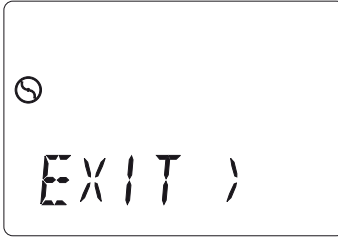
- the following languages can be chosen by pressing an **arrow key** a number of times or for longer: German (D) , English (E) and French (F)



- Confirm your choice using the **on/off key**



8.8 Leaving the system menu



EXIT >

- signpost (>) to menu level 1
- pressing the **on/off key** leaves the system menu
- you are now back at the top main-menu level and can switch between the following menu items:
 - **ADJUST**
 - **MEMORY**
 - **SYSTEM**
 - **EXIT**

9 Technical aspects

9.1 Technical notes

Probe hoses

The rule of thumb is: the concentration display is delayed by about 1 second for every metre of hose.

Always use SEWERIN probe hoses 1 m, 2 m or 6 m long. 25 m is the maximum length, which should not be exceeded.

Cleaning

The instrument should be cleaned with a damp cloth. Use no solvents, benzene or similar substances!

Static charge

Electrostatic charges should generally be avoided. Electrostatically floating objects (like metallic housings with no earth connection, for example) are unprotected against charges transferred from dust, aerosols and the like.

Fine dust filters

There are fine dust filters in the removable probe connection (item 3) and in most probes.



Note:

Heavily-soiled filters should be replaced (cf. section 9.4: Parts subject to wear)!

9.2 Technical data

Instrument data

Serial number:	047 01 XXXX (type-model-number) <u>one</u> gas inlet (type 1)
Serial number:	047 02 XXXX (type-model-number) <u>two</u> gas inlets (type 2)
Dimensions:	323 x 237 x 84 mm (W x H x D)
Weight:	approx. 2.000 g (depending on sensor equipment)
Type of protection:	IP 66

Einsatzbereiche

Operating temperature:	-10 °C – +40 °C
Storage temperature:	-20 °C – +40 °C
Humidity range:	15 % r.h. – 90 % r.h. (not condensing) (5 % r.h. – 90 % r.h. short-time)
Pressure range:	800 hPa – 1.200 hPa

Power supply

Voltage:	24V=
Ballast:	12 VA

Pump power: > 50 l/h and >150 mbar

Serial interface: RS-232, 9600 Bit/s

Methane/carbon dioxide CH₄/CO₂ sensor

Sensor data

- measurement principle: thermal conductivity (TC)
- measurement range: 0 – 100 vol.% (AL3) in steps of 0.1 vol.% to 9.9 vol.% (CH₄) or in steps of 1 vol.% (CO₂)
- t₉₀ time: < 30 seconds
- storage temperature: -20 °C – +60 °C (for replacement sensors)

Lifetime

- guaranteed: 1 year
- expected: 5 years

Test gases

- zero point: fresh-air
- sensitivity: 100 vol.% CH₄
- sensitivity: 100 vol.% CO₂

AL3 : Alarm at end of measurement range

Oxygen O₂ sensor

Sensor data

- measurement principle: electrochemical sensor (EC)
- measurement range: 0 – 25,0 vol.% (AL3) in steps of 0.1 vol.%
- t₉₀ time: < 30 seconds
- storage temperature: 0 °C – +20 °C
(for replacement sensors)

Temperature influence

- sensitivity: < 0.3 % signal/°C

Cross-sensitivity

- CO₂: at 5 vol.% CO₂ in 23 vol.% O₂ ≤ 1 % O₂
- no others known

Lifetime

- guaranteed: 20 months
- expected: 24 months

Test gases

- zero point: 100 vol.% CH₄
- sensitivity: fresh-air

AL3 : Alarm at end of measurement range

Hydrogen sulphide H₂S sensor

Sensor data

- measurement principle: electrochemical sensor (EC)
- measurement range: 4 – 2000 ppm (AL3)
up to 998 ppm in steps of 2 ppm
from 1000 ppm in steps of 10 ppm
- t_{90} time: < 30 seconds
- storage temperature: 0 °C – +20 °C
(for replacement sensors)

Lifetime

- guaranteed: 2 years
- expected: 3 years

Test gases

- zero point: fresh-air
- sensitivity: 40 ppm H₂S in synthetic air

AL3 : Alarm at end of measurement range

Carbon monoxide CO sensor

Sensor data

- measurement principle: electrochemical sensor (EC)
- measurement range: 2 – 500 ppm (AL3) in steps of 1 ppm
- zero point drift: 4 ppm
- t_{90} time: < 30 seconds
- storage temperature: 0 °C – +20 °C
(for replacement sensors)

Temperature influence

- zero point: < 5 ppm
- sensitivity: 1,4 % signal/°C

Time drift: < 0,3 ppm/month

Cross-sensitivity at 20 °C

- 1000 ppm H₂: ~ 450 ppm CO
- 100 ppm NO: ~ 25 ppm CO
- no others known

Lifetime

- guaranteed: 2 years
- expected: 3 years

Test gases

- zero point: fresh-air
- sensitivity: 40 ppm CO in synthetic air

AL3 : Alarm at end of measurement range

Sensor - Ammoniak NH₃

Sensor data

- measurement principle: electrochemical sensor (EC)
- measurement range: 2 – 100 ppm (AL3) in steps of 1 ppm
- zero point drift: 1 ppm
- t₉₀ time: < 90 seconds
- storage temperature: 0 °C – +20 °C
(for replacement sensors)

Alarm thresholds (factory settings)

- NH₃: AL1 = 50 ppm AL2 = 75 ppm

Temperature influence

- zero point: < 2 ppm
- sensitivity: no temperature influence

Time drift: < 0,3 ppm/month

Cross-sensitivity at 20 °C

- none known

Lifetime

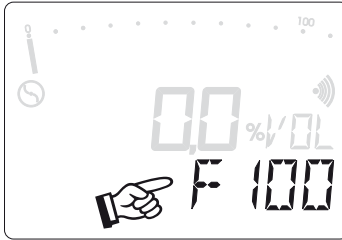
- guaranteed: 1 year
- expected: 2 years

Test gases

- zero point: fresh-air
- sensitivity: 50 ppm NH₃ in nitrogen

AL3 : Alarm at end of measurement range

9.3 Error messages



- the **SR2-BIO** detects faults itself and displays an error code in the LCD

Error code Cause, remedy and error properties

- F1..... Sensor error: no sensor detected
Remedy: switch the device off/on again, contact SEWERIN-Service
Error properties: the device switches off
- F22, 24..... Adjustment error: zero point in the CH₄/CO₂ range
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F23, 25..... Adjustment error: sensitivity in the CH₄ range
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F26 – 28..... Adjustment error: sensitivity in the CO₂ range
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F32..... Adjustment error: zero point in the O₂ range (EC)
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F33..... Adjustment error: sensitivity in the O₂ range (EC)
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F34..... Adjustment error: zero point in the EC range (H₂S, NH₃, CO)
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting
- F35..... Adjustment error: sensitivity in the EC range (H₂S, NH₃, CO)
Remedy: check test gas, repeat the adjustment
Error properties: 3s alarm, self-resetting

Error code Cause, remedy and error properties

F42.....	O ₂ sensor error: Range undercut Remedy: adjust or replace O ₂ sensor Error properties: self-resetting, not clearable
F43.....	CO sensor error: Range undercut Remedy: adjust or replace CO sensor, Error properties: self-resetting, not clearable
F44.....	H ₂ S sensor error: Range undercut Remedy: adjust or replace H ₂ S sensor Error properties: self-resetting, not clearable
F45.....	NH ₃ sensor error: Range undercut Remedy: adjust or replace NH ₃ sensor Error properties: self-resetting, not clearable
F50.....	Instrument test: faulty automatic test Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F51.....	Instrument test: faulty automatic test Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F52.....	Instrument test: read-write error found Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F53.....	A/D converter: A/D converter defective Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F54.....	Instrument test: faulty automatic test Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F55.....	Clock module: clock error Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable

Error code Cause, remedy and error properties

F56.....	LCD driver: LCD driver error Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F60.....	O ₂ sensor error: Sensor error in measuring Remedy: switch the device off/on again, contact SEWERIN-Service, Sensortausch Error properties: self-resetting, not clearable
F67,68.....	CH ₄ /CO ₂ sensor error: Sensor error in measuring Remedy: adjust or replace CH ₄ /CO ₂ sensor Error properties: self-resetting, not clearable
F75 – F78....	Sensor-component error: Remedy: switch the device off/on again, contact SEWERIN-Service Error properties: self-retaining, not clearable
F100.....	Pump power too low: Remedy: switch the device off/on again, check the filters in the device and in probes Error properties: self-retaining, not clearable
F101.....	Adjustment error - pump Remedy: Check flow Error properties: self-resetting
F102.....	Adjustment error - pump Remedy: Set pumping capacity to 100 % Error properties: self-resetting
F105.....	Error - pump Remedy: Check hoses at outlet Error properties: self-retaining, not clearable
F255.....	Data memory: Memory end reached in setting stack-memory (see INFO/MEM/MEM-STOP) Error properties: clearable

9.4 Wearing parts

Fine dust filter..... in the **SR2-BIO** gas inlets

Hydrophobic filter..... in the 1 m, 2 m and 6 m probe hoses

Test gas can..... various concentrations for monitoring and adjustment



Note:

Test gas cans are under pressure, do not store above 50 °C! Do not exceed storage time limits!

9.5 Spare parts



Note:

When ordering replacement parts, please take these from the relevant Service instructions!

9.6 EC-sensor disposal



Note:

EC-sensors must be disposed of by a specialist disposal company!

10 Hints on Disposal

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

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

Old Instruments

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

Konformitätserklärung / Declaration of Conformity

Gerätebezeichnung: Type of Product:	Stationäres, mit Niederspannung betriebenes Gasmeßgerät Stationary, with low voltage operated gas measuring device
Geräte-Typ: Product Name:	SR2-BIO
Fabrikations-Nr.: Fabr.No.:	047 01 xxxx // 047 02 xxxx

Hiermit erklären wir, daß oben genanntes Produkt mit der / den folgenden Norm(en) oder normativen Dokument(en) übereinstimmt. Bei einer mit uns nicht abgestimmten Änderung des Produkts verliert diese Erklärung ihre Gültigkeit.

We hereby declare that the above product complies with the following norms or standardized directives. In case of any modification of this product which has not been authorized by us, this declaration becomes invalid.

Norm(en) / Norm(s):

DIN EN 61000-6 - 2	<i>EMV - Fachgrundnorm Störfestigkeit Generic Immunity Standard</i>
DIN EN 61000-6 - 4	<i>EMV - Fachgrundnorm Störaussendung Generic Emission Standard</i>

Gemäß den Bestimmungen der Richtlinie(n) / The unit is in accordance with:


89/336/EWG	<i>EG-Richtlinie : Elektromagnetische Verträglichkeit EG-Directive: Electromagnetic Compatibility</i>
92/31/EWG	<i>Änderung dazu /amendment to above</i>
93/68/EWG	<i>Änderung dazu /amendment to above</i>

Gütersloh, den 26.05.2003

HERMANN SEWERIN GMBH



(Geschäftsführer/Managing Director)

<p>INSPECTION PROTOCOL</p> <p>Sensors</p> <p>Serial number (e.g. 047 02 0001)</p>	<p>SR2-BIO</p> <table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">CH₄</td> <td style="padding: 2px;">CO₂</td> <td style="padding: 2px;">O₂</td> <td style="padding: 2px;">H₂S</td> <td style="padding: 2px;">CO</td> <td style="padding: 2px;">NH₃</td> </tr> <tr> <td style="height: 15px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	CH ₄	CO ₂	O ₂	H ₂ S	CO	NH ₃							
CH ₄	CO ₂	O ₂	H ₂ S	CO	NH ₃									

12.10.2006

1.0	Device status																			
1.1	- status correct (e.g.: Y / N)																			
1.2	- fine dust filters ok (e.g.: Y / N)																			

2.0	Pump test																			
2.1	- low pressure > 150 mbar																			
2.2	- volumen flow > 30 l/h																			

3.0	CH₄-range																			
3.1	zero point (fresh-air) - display -1.0 – +1.0 vol. %																			
3.2	test gas 100 vol. % CH ₄ - display 97 – 103 vol. %																			

4.0	CO₂-range																			
4.1	zero point (fresh-air) - display -1 – +1 vol. %																			
4.2	test gas 100 vol. % CO ₂ - display 97 – 103 vol. %																			

5.0	O₂-range																			
5.1	zero point (test gas 100 vol. % CH ₄) - display -0,5 – +0,5 vol. %																			
5.2	test gas (fresh-air) - display 20,4 – 21,4 vol. %																			

6.0	H₂S-range																			
6.1	zero point (fresh-air) - display -10 – +10 ppm																			
6.2	test gas (40 ppm H ₂ S) - display 36 – 44 ppm																			

7.0	CO-range																			
7.1	zero point (fresh-air) - display -3 – +3 ppm																			
7.2	test gas (40 ppm CO) - display 37 – 43 ppm																			

8.0	NH₃-range																			
8.1	zero point (fresh-air) - display -3 – +3 ppm																			
8.2	test gas (50 ppm NH ₃) - display 47 – 53 ppm																			

9.0	Observations																			
	- housing broken																			
	- adjustment, repair																			
	- factory inspection																			
	- or the like																			

10.0	Test																			
	- day																			
	- month																			
	- year																			
	- signature																			

SR2-BIO – Installation and use

Additional information on the correct installation and use of the SR2-BIO gas measuring instrument

This technical information complements the **SR2-BIO** operating instructions. Read through this information carefully and all relevant manual sections before installing the **SR2-BIO** gas measuring instrument. This is a prime requirement for trouble-free and dependable **SR2-BIO** operation.

Measuring gas moisture

Most of the problems in using the **SR2-BIO** are associated with biogas moisture

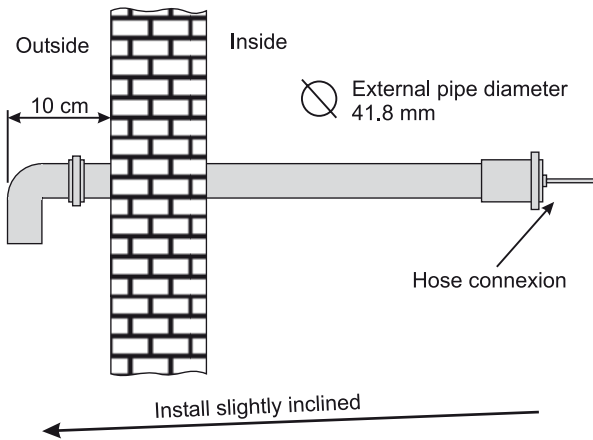
To protect the sensors, the **SR2-BIO** is provided with a connecting hose complete with hydrophobic filter at all gas inlets (GAS 1/GAS 2/AIR). These filters stop water droplets getting into the instrument.

Even so, water can still get in due to the air humidity of the biogas. This always arises when there is a difference in temperature between gas sample and measurement chamber. In such an instance, the air humidity condenses in the measurement chamber.

To offset the difference in temperature, i.e. bringing gas sample and fresh air to the same temperature (ambient temperature), at least 6 metres of thin PVC hosing (5 mm in diameter) must be connected in front of every gas inlet.

We would also recommend the use of a condensate precipitator or measuring gas cooler if the biogas is extremely moist.

The exhaust gas hose should be of a larger diameter at the lead-in point to stop it freezing in winter. This lead-in can, if needed, be purchased from SEWERIN.



High temperatures

Never subject the **SR2-BIO** to temperatures above 40 °C as this will considerably reduce the service life of the electrochemical sensors.

Filters

Replace the superfine dust filters at regular intervals. This is particularly important should the biogas have a high proportion of hydrogen sulphide H_2S and ammoniac NH_3 . The filters are only to be used once. Do not insert filters that have been rotated.

Readings memory

Readings remain stored even when the instrument is switched off. However the stored data is lost should the voltage supply be interrupted.

Test gases

In view of their design and chemical properties, the display precision of the gas sensors must be regularly checked with test gas. Findings have shown that every 1 to 2 months is best.

Immediately afterwards the instrument can, if needed, be very easily re-adjusted with the same test equipment.

Data transmission

There are two ways of reading measured data from the instrument:

- online, i.e. during measuring operations.
The data is sent at intervals of a second. It does not need to be requested (polled) separately.
- with the help of GasIS software.
Caution! Data disappears if the voltage supply is interrupted during read-out.

For read-out purposes, the SEWERIN data cable (Art No.: MG03-Z0100) must be connected to the RS-232 interface.

Connection allocation:

RS-232 interface Connexion term on the printed circuit breaker (also see image in the operating instruction appendix)	SEWERIN data cable Conductor colour
TXD	brown
RXD	blue
DTR	black
GND	yellow/green

Transmission:

The transmitting record is sent once every second, with a bit being sent every 20 ms.

Interface configuration:

- Data rate (Baud rate): 9600 bit/s
- 10 bit total data with:
 - 1 start bit
 - 8 bit data
 - 1 stop bit
 - no parity bit

Transmitting record:

Byte	Data	Range	Note	Example
1	83	–	ASCII for „S“	83 = „S“
2	82	–	ASCII for „R“	82 = „R“
3	50	–	ASCII for „2“	50 = „2“
4	66	–	ASCII for „B“	66 = „B“
5	73	–	ASCII for „I“	73 = „I“
6	79	–	ASCII for „O“	79 = „O“
7	Measured value CH ₄	0 – 100 vol. %	MSB	for 64 vol. %: MSB = 0; LSB = 64
8			LSB	
9	Measured value CO ₂	0 – 100 vol. %	MSB	for 32 vol. %: MSB = 0; LSB = 32
10			LSB	
11	Measured value O ₂	0 – 25,0 vol. %	MSB	for 20,9 vol. %: MSB = 0; LSB = 209
12			LSB	
13	Measured value H ₂ S	0 – 2000 ppm	MSB	at 1000 ppm: MSB = 3; LSB = 232
14			LSB	
15	free EC-sensor	–	MSB	–
16			LSB	
17	free EC-sensor	–	MSB	–
18			LSB	
19	Year	jjjj	MSB	for 2006: MSB = 7; LSB = 214
20			LSB	
21	Month	mm	–	
22	Day	tt	–	
23	Hour	hh	–	0 – 23
24	Minute	mm	–	0 – 59
25	Second	ss	–	0 – 59
26	Error notification	0 – 255	see operating instructions	100 (for F100)
27	Check total	Total of the byte sequence 7 – 26	MSB	–
28			LSB	

- The first 6 bytes are for coding. They form the starting sequence.
- With 2 bytes the following applies for (value < 0): value = value – 65535.
- Bytes 15 to 18 are reserved for other EC sensors (optional).

Hermann Sewerin GmbH
Robert-Bosch-Straße 3 · 33334 Gütersloh · Germany
Telefon +49 5241 934-0 · Telefax +49 5241 934-444
www.sewerin.com · info@sewerin.com