



Translation of the original operating instructions

# Ecotec<sup>®</sup> 4000

Multigas Leak Detector

Catalog No.  
530-201

From software version  
1.11 (Basic unit and Operating unit)

kina59en1-04-(2606)



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# 1 About this Manual

This document applies to the software version stated on the title page.

Product names may occur in the document, which are added for identification purposes only and belong to the respective owner of the rights.

## 1.1 Other Associated Documents

| Name                               | Document number |
|------------------------------------|-----------------|
| SL4000 Instructions for use        | lina59          |
| EcoCheck 4000 Instructions for use | linb59          |
| Protocol Descriptions              | kira59          |

## 1.2 Explanation of warnings



### DANGER

Immediate danger with death or serious injuries as a consequence



### WARNING

Dangerous situation with possible death or serious injuries as a result



### CAUTION

Dangerous situation resulting in minor injuries

### NOTICE

Dangerous situation resulting in property or environmental damage

## 1.3 Target group

These operating instructions are intended for the operator of the Ecotec 4000 multigas leak detector and for technically qualified personnel with experience in leak testing technology.

## 2 Safety

### 2.1 Intended use

The Ecotec 4000 is a multigas leak detector, hereinafter also referred to as leak detector or device.

The device is designed for sniffing leak detection. A sniffer line suitable for the intended use is required. The sniffer line is available as an accessory from INFICON.

To locate and quantify leaks on test objects, search the outside of the test objects for escaping gas using the sniffer line (sniffing method). The test objects must contain the gas under overpressure.

Light gases, refrigerants, and natural gases are detected. The search should focus on small leaks that cannot be detected by the human senses such as sight, smell, hearing, and touch.

- For combustible/explosive or toxic gas mixtures, it is recommended to connect an exhaust hose.
- Only operate the device as intended, as described in the operating instructions, in order to avoid hazards due to incorrect use.
- Comply with application limits, see "Technical data".

#### Incorrect usage

Avoid the following unintended uses:

- Use outside the technical specifications, see "Technical data"
- Using the device without a protective earth conductor
- Installing an unsuitable mains fuse whose fuse rating differs from the specifications on the type plate
- Using the device with a closed exhaust
- Use in radioactive areas. Leak detectors could become contaminated.
- Pumping out or sucking up solids
- Using the device in dirty air where conductive particles like carbon fibers can cause internal short circuits
- Testing wet or damp test objects
- Pumping off aggressive, flammable, explosive, corrosive, microbiological, reactive or toxic substances, creating a hazard
- Using the device without considering ergonomic aspects such as fatigue
- Parking of fluids on the leak detector
- Shock loads or vibrations
- Suction of flammable/explosive gas mixtures above the lower explosion limit. The allowable composition of venal gas mixtures can be read in the safety data sheets of the respective manufacturers.
- Aspirate liquids into the device via the sniffer line
- Inspection of cables or objects carrying dangerous electrical voltages with a sniffer line
- Use of damaged sniffer lines



- Use of calibration leaks/test leaks in unventilated rooms and in the presence of ignition sources
- Use of the device in residential areas, which may result in interference with electrical devices
- Operate the leak tester via the touchscreen with gloves that are not electrically conductive if you do not want to use your bare fingers.
- Setting up or operating the device while it is lying on its side

## 2.2 Owner Requirements

### Safety-conscious operation

- Operate the device only when it is in technically perfect working order.
- Only use original parts or parts approved by the manufacturer.
- Keep this instruction manual available on site.
- Do not touch any live parts with the sniffer tip.
- Sniffing unspecified and aggressive gases.
- Only operate the device properly in accordance with this instruction manual, in a safety and risk conscious manner.
- Adhere to the following regulations and observe their compliance:
  - Intended use
  - General applicable safety and accident prevention regulations
  - International, national and local standards and guidelines
  - Additional device-related provisions and regulations

### Personnel qualifications

- Allow only qualified service technicians to work with and on the device. The qualified service technicians must have received training on the device.
- Personnel to be trained must only work with and on the device under the supervision of trained, specialist technical personnel.
- Make sure that authorized personnel have read and understood the operating instructions and all other applicable documents, see "Other Associated Documents [▶ 7]," especially the information on safety, maintenance and repairs, before starting work.
- Regulate the responsibilities, authorizations and supervision of personnel.

## 2.3 Operator requirements

- Read, observe and follow the information in these operating instructions and the working instructions created by the owner, especially the safety instructions and warnings.
- Carry out any work only based on the complete operating instructions.
- If you have any questions regarding operating or maintenance that is not explained in this manual, then please contact INFICON customer services.

## 2.4 Dangers

The measuring instrument was built according to the state-of-the-art and the recognized safety regulations. Nevertheless, improper use may result in risk to life and limb on the part of the user or third parties, or damage to the instrument or other property may occur.

### **Danger due to use in EX/ATEX areas**

If the workplace is classified as a hazardous area according to Ex/ATEX regulations it is mandatory to apply Ex/ATEX certified equipment.

The Ecotec 4000 with the INFICON SL4000 sniffer line is not EX/ATEX certified and therefore not intended for use in potentially explosive atmospheres.

In risk-free areas and non-classified environments Ecotec 4000 can be safely used.

### **Dangers from electric power**

The device is operated with electrical voltages of 100 - 240 V  $\pm 10\%$ . The device contains electric components that can be damaged from high electric voltage.

- ▶ Before connecting to the power supply, ensure that the mains voltage specified on the type plate matches the mains voltage at the installation site.

Touching parts where electrical voltage is present can result in death.

- ▶ Disconnect the device from the power supply prior to any installation and maintenance work. Ensure that the electrical supply cannot be switched back on unintentionally.

Touching live parts with the sniffer tip can result in death.

- ▶ Before starting the leak test, disconnect electrically operated test objects from the power supply. Ensure that the electrical supply cannot be switched back on unintentionally.

### **Dangers from strong exposure to light**

Exposure of the eyes to LED light can lead to lasting eye damage.

- Do not look into the LEDs of the sniffer handle from a short distance or for longer periods of time.

### 3 Scope of Delivery, Transport, Storage

#### Scope of delivery

| Item                                                                                                         | Quantity |
|--------------------------------------------------------------------------------------------------------------|----------|
| Ecotec 4000                                                                                                  | 1        |
| Cover or drawer for the cavity in the front hood                                                             | 1        |
| Unpacking instructions                                                                                       | 1        |
| Mains connection cable, country-specific                                                                     | 1        |
| Fuses                                                                                                        | 10       |
| Digital operating instructions, to download as PDF from <a href="http://www.inficon.com">www.inficon.com</a> | 1        |

- Upon receipt of the device, check the scope of delivery for completeness.

Sniffer lines must be ordered separately according to type and specified length, internal or external calibration leaks

Accessory list: see "Accessories and spare parts [► 113]"

#### Transport

#### WARNING

##### Risk of injury from falling or tipping device

The device weighs 26 kg with the center of gravity towards the back of the device. If not transported properly, the unpacked device can slip out of your hands and cause crushing injuries. A drawer that may be included could fall out.

- If present, remove the drawer from the front of the device or take appropriate measures to prevent it from falling out.
- Lift and transport the device with two people who are physically capable of doing so.
- When lifting and carrying the device, two people should use the recessed handles on both sides of the device to prevent the back of the device from tipping over.

#### NOTICE

##### Damage due to transport in unsuitable packaging

Transport in unsuitable packaging material can damage the device.

- Keep the original packaging.
- Transport the device only in the original packaging.

#### Storage

Always store the device in compliance with the technical data, see "Technical data [► 20]".

## 4 Description

### 4.1 Function and setup of the device

The Ecotec 4000 consists of a base unit and a sniffer line. The Ecotec 4000 can detect and quantify gases that it has sucked in through the sniffer line.

Working in the Ecotec 4000:

- a Quadrupol mass spectrometer as a detection system
- a high-vacuum pump system
- an inlet system for the gas flow
- electrical and electronic sub-assemblies for electrical power supply and signal processing

The mass spectrometer works under high vacuum, i.e. the pressure in the mass spectrometer must always be below  $10^{-4}$  mbar. This vacuum is generated by the turbo molecular pump with the support of a membrane backing pump.

## 4.2 Device

In the following, the Ecotec 4000 will be referred to simply as "the device" if this does not distort the meaning.



Fig. 1: Front view

|   |                                                                                                           |    |                                                                                                               |
|---|-----------------------------------------------------------------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------|
| 1 | Loudspeaker (in the device)                                                                               | 7  | Not included in the delivery:<br>Sniffer line with a maximum<br>length of 15 m, including a sniffer<br>probe  |
| 2 | Touchscreen                                                                                               | 8  | Carry handle                                                                                                  |
| 3 | Ventilation openings (outlet)                                                                             | 9  | Connection for sniffer line.<br>See also "Connecting the SL4000<br>sniffer line to the Ecotec 4000<br>[► 27]" |
| 4 | Carry handle                                                                                              | 10 | Ventilation openings (inlet)                                                                                  |
| 5 | Not included in the delivery:<br>EcoCheck 4000 calibration leak<br>Delivery condition:<br>Drawer or cover | 11 | Knurled screw for the side filter<br>mat cover                                                                |
| 6 | Cover for lower filter mat                                                                                |    |                                                                                                               |

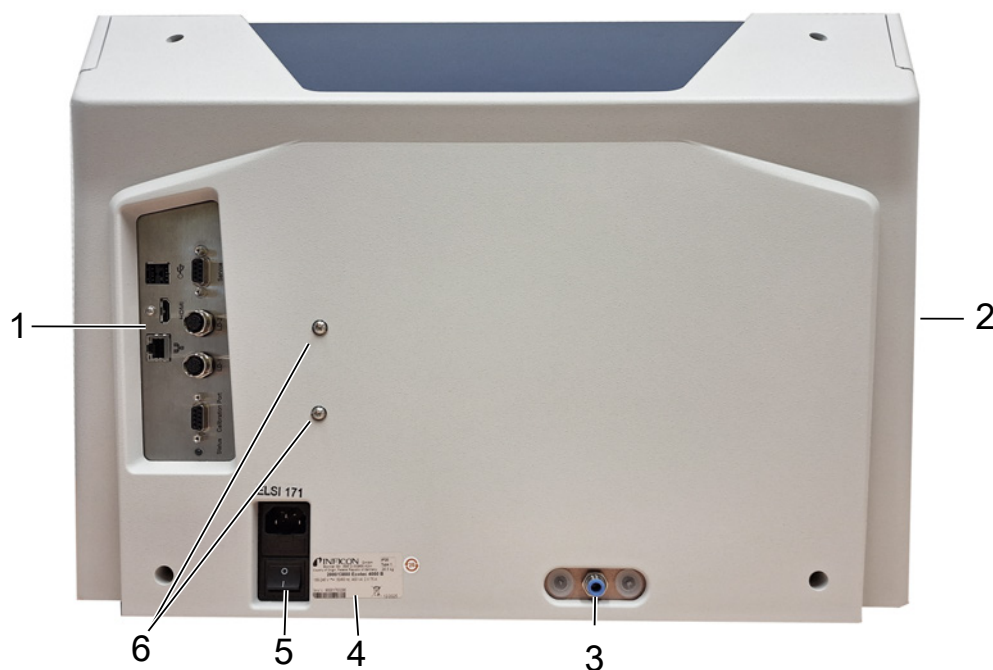


Fig. 2: Back view

|   |                                                                                                               |   |                                                                                                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Connections.<br>For details, see also<br>"Connections for accessories and<br>control signals [► 17]".         | 4 | Nameplate                                                                                                                                                                                                                                                                                               |
| 2 | Connection for sniffer line.<br>See also "Connecting the SL4000<br>sniffer line to the Ecotec 4000<br>[► 27]" | 5 | Power connection with power<br>switch. The power switch is used<br>to switch the device on and off.<br><br>For information on the mains<br>connection, see "Technical data<br>[► 20]".<br><br>Fuses behind cover.<br>For information on replacing the<br>fuses, see "Replacing mains fuses<br>[► 104]". |
| 3 | Exhaust connection. See also<br>"Connecting exhaust hose<br>(optional) [► 32]".                               | 6 | M4 thread, suitable for DIN rail<br>mounting.<br><br>Possible mounting for I/O<br>module. See also "I/O module<br>[► 116]".                                                                                                                                                                             |

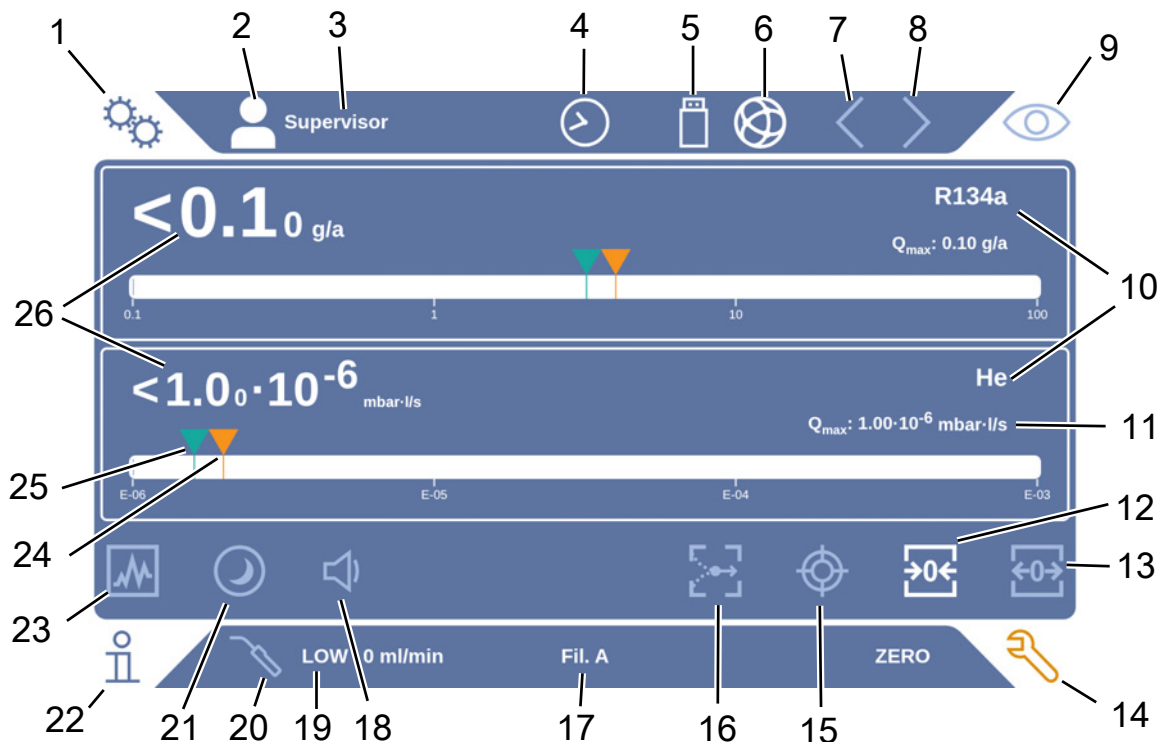
## 4.2.1 Design of touchscreen



The touchscreen responds to being touched lightly. To correctly select the chosen function, avoid strong pressure.

You can always see the icons for navigation on the display.

Depending on the context, you will see additional icons and elements.



|    |                                                                      |    |                                                                              |
|----|----------------------------------------------------------------------|----|------------------------------------------------------------------------------|
| 1  | Navigation button settings                                           | 14 | Navigation diagnostic button                                                 |
| 2  | Access control                                                       | 15 | Calibrate                                                                    |
| 3  | User name                                                            | 16 | Background Canceling, only activatable with SL4000 BC sniffer line           |
| 4  | Time                                                                 | 17 | Active filament (A or B)                                                     |
| 5  | USB stick (if plugged in)                                            | 18 | Volume                                                                       |
| 6  | LAN (if enabled)                                                     | 19 | Gas flow LOW, MEDIUM or HIGH, see also "Changing gas flow for SL4000 [► 64]" |
| 7  | Previous page                                                        | 20 | Sniffer line                                                                 |
| 8  | Next page                                                            | 21 | Standby mode                                                                 |
| 9  | Navigation operation button                                          | 22 | Navigation information button                                                |
| 10 | Active measurement gases, see also "Preset test gases [► 43]"        | 23 | Line chart instead of bar chart                                              |
| 11 | Q <sub>max</sub> : Display of the maximum measured value (Peak Hold) | 24 | Setpoint (Leak)                                                              |
| 12 | ZERO on / ZERO run                                                   | 25 | Search level                                                                 |
| 13 | ZERO OFF                                                             | 26 | Leak rate measured value                                                     |

**Navigation buttons**

The buttons can appear in five different colors:

- Gray: Function is disabled
- Dark blue: Function can be activated
- Light blue: Function is active
- Red: Error is active (navigation button diagnosis)
- Orange: Warning is active (navigation button diagnosis)

 **Settings**

 **Operation**

 **Information**

 **Diagnosis**

**Function buttons**

The buttons can appear in three different colors:

- Gray: Function is disabled
- Light blue: Function can be activated
- White: Function is active

General function symbols

 Cancel ongoing function

 Call up help for the current function

 Confirm entry or selection

 Load

 Save

 Edit

 Copy

 Delete

 LAN

 Page forward

 Page back

**Other symbols**

 Authorization "User"

 Authorization "Operator"

 Authorization "Supervisor"

 View the time or set the time

See also "Overview of rights groups [► 35]".



### 4.2.2 Connections for accessories and control signals

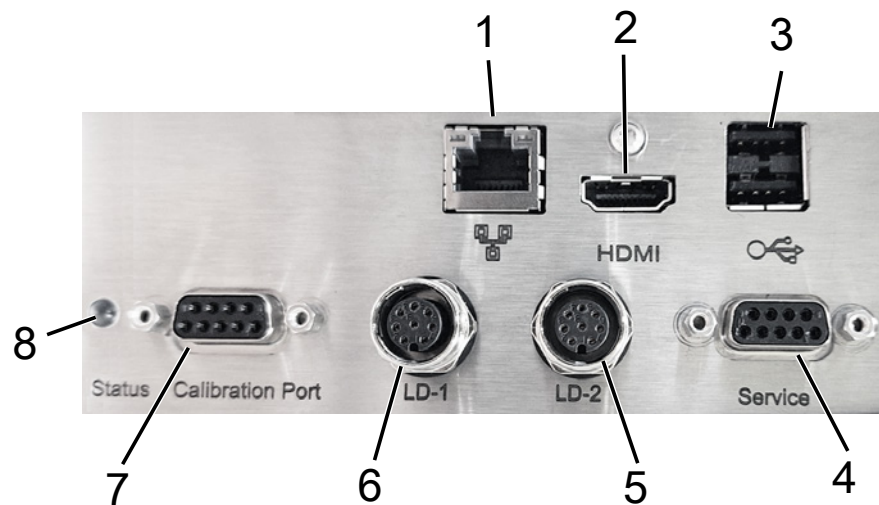


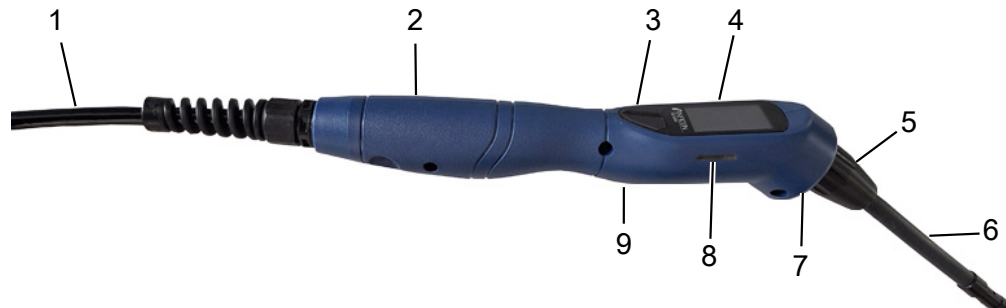
Fig. 3: Ecotec 4000 interfaces. View rotated, see "Device [► 13]", rear view.

|   |                                                                                                             |   |                                                                                                                                                                                                                                                                                                                  |
|---|-------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Ethernet network interface, maximum*) length of LAN cable 30 m                                              | 5 | LD-2 (for connecting bus module or I/O module), maximum*) length of INFICON data cable 30 m                                                                                                                                                                                                                      |
| 2 | HDMI interface, maximum*) cable length 3 m                                                                  | 6 | LD-1 (for connecting bus module or I/O module), maximum*) length of INFICON data cable 30 m                                                                                                                                                                                                                      |
| 3 | 2 x USB 2.0 interfaces, maximum*) cable length 3 m                                                          | 7 | Calibration Port (Calibration interface for connecting external calibration leaks)<br>Up to 4 EcoCheck 4000 calibration leaks can be connected in series (SUB-D 9), with a maximum*) cable length of 3 m.<br>See also "Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional) [► 31]". |
| 4 | Connection for service or accessories, if applicable. RS232 interface (SUB-D 9), maximum*) cable length 3 m | 8 | Status LED                                                                                                                                                                                                                                                                                                       |

\*) To avoid the display of incorrect measurement values, use shielded cables and observe the specified maximum cable lengths.

## 4.3 Sniffer line

You need a sniffer line to operate the device. See also "Connecting the SL4000 sniffer line to the Ecotec 4000 [► 27]".



|   |               |   |                                                                                                                                                                                                           |
|---|---------------|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Line          | 6 | Flexible or rigid sniffer tip. Includes nozzle.<br>An SL4000 sniffer line comes standard with a rigid sniffer tip (ST125: 125 mm rigid tip). Additional rigid or flexible tips can be ordered separately. |
| 2 | Sniffer probe | 7 | LED (underside of product)                                                                                                                                                                                |
| 3 | Push buttons  | 8 | Status display                                                                                                                                                                                            |
| 4 | Display       | 9 | Speaker opening (bottom)                                                                                                                                                                                  |
| 5 | Union nut     |   |                                                                                                                                                                                                           |

### Sniffer lines

Sniffer lines are available in four lengths: 3 m, 5 m, 10 m and 15 m. See also "Accessories and spare parts [► 113]". The sniffer line consists of a multifunctional cable, a handle with controls (sniffer probe), and a sniffer tip.

SL4000 BC series sniffer lines, type "Background Canceling", feature a special handle that allows permanent switching between the reference gas inlet and the measuring gas inlet. This facilitates measurements under unfavorable ambient conditions, for example when the background of the measuring gas is increased. See also "Measuring with Background Canceling [► 67]". Please note that in "Background Canceling" mode, only a single gas can be measured.

### Sniffer tip

There are rigid and flexible sniffer tips with different lengths. See also "Accessories and spare parts [► 113]".

### Sniffer probe: Display and functions

The status display integrated into the sniffer probe shows current information about the measurement process. LEDs inserted in the handle illuminate the test area.

- If the measured value limit is exceeded, the status display changes from green to red. In addition, you can set a speaker in the handle to emit a signal, the handle to vibrate, or LEDs in the handle to flash or light up at maximum brightness, see "Changing the settings of the SL4000 sniffer probe [► 39]".

You can also use the two buttons to operate frequently used functions during a measurement:

- Activate the ZERO function by pressing the left button  (with or without iGuide user guidance)
- Without iGuide user guidance: By pressing the right button on the handle, you can switch the gas flow in the sniffer line between the LOW, MEDIUM or HIGH settings. See also "Changing gas flow for SL4000 [► 64]".
- With iGuide user guidance: Short press on the right button  to move to the next measuring point, long press on the right button to move to the previous point. See also "Introduction to iGuide [► 60]".
- Cancel a calibration with the right button, confirm with the left button
- Acknowledge error messages with the right button

## 4.4 Technical data

### Mechanical data

| Ecotec 4000            |                          |
|------------------------|--------------------------|
| Dimensions (W x H x D) | 615 mm x 420 mm x 270 mm |
| Weight                 | 26.5 kg                  |

### Electrical data

| Ecotec 4000                                   |                                                   |
|-----------------------------------------------|---------------------------------------------------|
| Mains voltages and mains frequencies          | 100 - 240 V $\pm 10\%$ , 50 / 60 Hz               |
| Power consumption                             | 400 VA                                            |
| Protection class                              | EN 60529 IP20<br>UL 50E type 1                    |
| Overvoltage category                          | II                                                |
| Fuses                                         | 2 x 6.3 A slow-blow                               |
| Power cable included in the scope of delivery | 3 m (China)<br>2.5 m (all countries except China) |
| Noise level                                   | < 60 dBA                                          |

### Physical data

| Ecotec 4000 with SL4000 connected                                                                                                                                  |                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Smallest detectable leak rate                                                                                                                                      |                                                                                                                                                                  |
| R134a, flow LOW                                                                                                                                                    | 0.03 g/year (0.001 oz/year)                                                                                                                                      |
| R600a, flow LOW                                                                                                                                                    | 0.03 g/year (0.001 oz/year)                                                                                                                                      |
| Helium                                                                                                                                                             | < $1 \times 10^{-6}$ mbar l/s                                                                                                                                    |
| Measurement range                                                                                                                                                  | 6 decades                                                                                                                                                        |
| Detectable masses                                                                                                                                                  | 2 to 200 amu                                                                                                                                                     |
| Mass spectrometer                                                                                                                                                  | Quadrupole mass spectrometer                                                                                                                                     |
| Ion source                                                                                                                                                         | 2 cathodes                                                                                                                                                       |
| Time constant of the leak rate signal                                                                                                                              | < 1 s                                                                                                                                                            |
| Gas flow through the capillary.<br>Measured at 1 atm (1013 mbar) at sea level at 20 °C. Flow rate varies with altitude, ambient pressure and atmospheric pressure. | 130 - 170 ml/min Low (Precision Mode) (typically)<br>280 - 350 ml/min Medium (Optimum Mode) (typically)<br>2200 - 3000 ml/min High (High Speed Mode) (typically) |
| Time until ready for operation                                                                                                                                     | < 2 min                                                                                                                                                          |
| Minimum measurement time for refrigerants (preliminary data)                                                                                                       |                                                                                                                                                                  |
| 3 m sniffer line                                                                                                                                                   | 0.3 seconds                                                                                                                                                      |
| 5 m sniffer line                                                                                                                                                   | 0.6 seconds                                                                                                                                                      |
| 10 m sniffer line                                                                                                                                                  | 1.6 seconds                                                                                                                                                      |
| 15 m sniffer line                                                                                                                                                  | 2.6 seconds                                                                                                                                                      |

**Ambient conditions**

| <b>Ecotec 4000</b>                                 |                                            |
|----------------------------------------------------|--------------------------------------------|
| Permissible ambient temperature (during operation) | 10 °C to 45 °C                             |
| Permissible storage temperature                    | -20 °C to 60 °C                            |
| Max. relative humidity up to 31 °C                 | 80%                                        |
| Max. relative humidity from 31 °C to 40 °C         | Decreasing on linear basis from 80% to 50% |
| Max. relative humidity above 40 °C                 | 50%                                        |
| Pollution degree                                   | 2                                          |
| Max. altitude above sea level                      | 2000 m                                     |

## 4.5 Ecotec 4000 factory settings

| Displayed name                          | Factory setting       | Access level   |
|-----------------------------------------|-----------------------|----------------|
| Flow rate                               | Medium (Optimum Mode) | Operator       |
| ZERO buttons                            | Activated             | Supervisor     |
| ZERO time                               | 5 s                   | Supervisor     |
| Leak rate filter                        | I-Filter              | Supervisor     |
| Calibration request                     | Deactivated           | Supervisor     |
| Auto Standby                            | 10 minutes            | Supervisor     |
| Automatically switch cathode            | Activated             | Supervisor     |
| Sensitivity test                        | Activated             | Supervisor     |
| Pressure unit display                   | mbar                  | Operator       |
| Pressure unit interface                 | mbar                  | Operator       |
| Leak rate unit interface                | g/a                   | Operator       |
| Volume                                  | 2                     | Operator       |
| Minimum volume direct selection buttons | 0                     | Operator       |
| Audio alarm mode                        | TRIGGER               | Operator       |
| Audio alarm subtype                     | Sound 1               | Operator       |
| Audio alarm delay                       | 0 s                   | Operator       |
| Notification beep                       | Activated             | Operator       |
| Cathode                                 | A                     | Not changeable |
| Background Canceling (gas modulation)   | Off                   | User           |
| Peak Hold (Qmax)                        | Activated             | Supervisor     |
| Peak Hold hold time                     | 20 s                  | Supervisor     |
| Error warning                           | None                  | Supervisor     |
| Clock style                             | Analog                | Supervisor     |
| Diagram type                            | Bar chart             | User           |
| LAN method                              | Off                   | Supervisor     |
| LAN client access                       | Deactivated           | User           |
| <b>Set user</b>                         |                       |                |
| Name                                    | Supervisor            | Dynamic        |
| PIN                                     | 1111                  |                |
| Language                                | English               |                |
| <b>Measured gases</b>                   |                       |                |
| <b>R600a</b>                            | Activated             | User           |
| Measuring mass                          | 41                    | Supervisor     |
| Setpoint                                | 4.0                   |                |
| Leak rate unit                          | g/a                   |                |
| Search level                            | 80%                   |                |
| Leak rate ext. Calibration leak         | 5.0                   |                |
| Leak rate unit ext. Calibration leak    | g/a                   |                |

| Displayed name                        | Factory setting | Access level |
|---------------------------------------|-----------------|--------------|
| Calibration mode                      | If possible     |              |
| Calibration leak action light barrier | MEASURE         |              |
| Increase for display limit            | x2              |              |
| <b>R1234yf</b>                        | Activated       | User         |
| Measuring mass                        | 69              | Supervisor   |
| Setpoint                              | 4.0             |              |
| Leak rate unit                        | g/a             |              |
| Search level                          | 80%             |              |
| Leak rate ext. Calibration leak       | 5.0             |              |
| Leak rate unit ext. Calibration leak  | g/a             |              |
| Calibration mode                      | If possible     |              |
| Calibration leak action light barrier | MEASURE         |              |
| Increase for display limit            | x2              |              |
| <b>R290</b>                           | Deactivated     | User         |
| Measuring mass                        | 41              | Supervisor   |
| Setpoint                              | 4.0             |              |
| Leak rate unit                        | g/a             |              |
| Search level                          | 80%             |              |
| Leak rate ext. Calibration leak       | 5.0             |              |
| Leak rate unit ext. Calibration leak  | g/a             |              |
| Calibration mode                      | If possible     |              |
| Calibration leak action light barrier | MEASURE         |              |
| Increase for display limit            | x2              |              |
| <b>R134a</b>                          | Deactivated     | User         |
| Measuring mass                        | 69              | Supervisor   |
| Setpoint                              | 4.0             |              |
| Leak rate unit                        | g/a             |              |
| Search level                          | 80%             |              |
| Leak rate ext. Calibration leak       | 5.0             |              |
| Leak rate unit ext. Calibration leak  | g/a             |              |
| Calibration mode                      | If possible     |              |
| Calibration leak action light barrier | MEASURE         |              |
| Increase for display limit            | x2              |              |
| <b>R32</b>                            | Deactivated     | User         |
| Measuring mass                        | 51              | Supervisor   |
| Setpoint                              | 4.0             |              |

| Displayed name                        | Factory setting          | Access level |
|---------------------------------------|--------------------------|--------------|
| Leak rate unit                        | g/a                      |              |
| Search level                          | 80%                      |              |
| Leak rate ext. Calibration leak       | 5.0                      |              |
| Leak rate unit ext. Calibration leak  | g/a                      |              |
| Calibration mode                      | If possible              |              |
| Calibration leak action light barrier | MEASURE                  |              |
| Increase for display limit            | x2                       |              |
| <b>CO<sub>2</sub></b>                 | Deactivated              | User         |
| Measuring mass                        | 44                       | Supervisor   |
| Setpoint                              | 4.0                      |              |
| Leak rate unit                        | g/a                      |              |
| Search level                          | 80%                      |              |
| Leak rate ext. Calibration leak       | 5.0                      |              |
| Leak rate unit ext. Calibration leak  | g/a                      |              |
| Calibration mode                      | If possible              |              |
| Calibration leak action light barrier | MEASURE                  |              |
| Increase for display limit            | x2                       |              |
| <b>He</b>                             | Deactivated              | User         |
| Measuring mass                        | 4                        | Supervisor   |
| Setpoint                              | $2.00 \cdot 10^{-5}$     |              |
| Leak rate unit                        | mbar·l/s                 |              |
| Search level                          | 80%                      |              |
| Leak rate ext. Calibration leak       | $1.00 \cdot 10^{-4}$     |              |
| Leak rate unit ext. Calibration leak  | mbar·l/s                 |              |
| Calibration mode                      | Deactivated              |              |
| Calibration leak action light barrier | MEASURE                  |              |
| Increase for display limit            | x10                      |              |
| iGuide                                |                          |              |
| iGuide                                | Deactivated              | User         |
| Program name                          | "Prog. 1" ... "Prog. 10" | Supervisor   |
| Measuring points                      | 4                        |              |
| Idle time                             | 3.0 s                    |              |
| Measuring time                        | 1.0 s                    |              |
| Gas A                                 | R600a                    |              |
| Sum setpoint value A                  | 5.71 g/a                 |              |
| Gas B                                 | Deactivated              |              |
| Sum setpoint value B                  | None                     |              |



| Displayed name                                                          | Factory setting                                   | Access level |
|-------------------------------------------------------------------------|---------------------------------------------------|--------------|
| <b>Sniffer line SL4000</b>                                              |                                                   |              |
| Brightness                                                              | 5                                                 | Operator     |
| Volume                                                                  | 2                                                 | Operator     |
| Vibration                                                               | Activated                                         | Operator     |
| <b>Accessories</b>                                                      |                                                   |              |
| Device at connection LD1                                                | I/O module                                        | Supervisor   |
| <b>I/O module</b>                                                       |                                                   |              |
| <b>Analog output 1</b>                                                  |                                                   |              |
| Configuration                                                           | Leak rate linear                                  | Supervisor   |
| Upper limit                                                             | $3.0 \cdot 10^{-4} \text{ mbar} \cdot \text{l/s}$ |              |
| Gas number                                                              | 1                                                 |              |
| <b>Analog output 2</b>                                                  |                                                   |              |
| Configuration                                                           | Off                                               | Supervisor   |
| Upper limit                                                             | $3.0 \cdot 10^{-4} \text{ mbar} \cdot \text{l/s}$ |              |
| Gas number                                                              | 1                                                 |              |
| <b>Digital inputs</b>                                                   |                                                   |              |
| Digital input 1                                                         | ZERO                                              | Supervisor   |
| Digital input 2                                                         | CAL                                               |              |
| Digital input 3                                                         | Clear                                             |              |
| Digital input 4                                                         | Gas 1                                             |              |
| Digital input 5                                                         | No function                                       |              |
| Digital input 6                                                         | No function                                       |              |
| Digital input 7                                                         | No function                                       |              |
| Digital input 8                                                         | No function                                       |              |
| Digital input 9                                                         | No function                                       |              |
| Digital input 10                                                        | No function                                       |              |
| <b>Digital outputs</b>                                                  |                                                   |              |
| Digital output 1                                                        | Calibration request Inverse                       | Supervisor   |
| Digital output 2                                                        | Error or warning Inverse                          |              |
| Digital output 3                                                        | Setpoint 1 Inverse                                |              |
| Digital output 4                                                        | Setpoint 2 Inverse                                |              |
| Digital output 5                                                        | Measuring                                         |              |
| Digital output 6                                                        | ZERO active                                       |              |
| Digital output 7                                                        | Ready for operation                               |              |
| Digital output 8                                                        | Calibration active                                |              |
| <b>Protocol</b>                                                         |                                                   |              |
| Protocol (Used on the port for service or accessories. RS232 interface) | ASCII                                             | Supervisor   |
| <b>Bus module</b>                                                       |                                                   |              |
| Bus module address                                                      | 126                                               | Supervisor   |

## 5 Installation

### 5.1 Setup



#### **DANGER**

##### **Danger due to electric shock**

If the leak detector is moved and the power cord is thereby put under tension, the power cord connected at both ends may be damaged or the wall socket may be torn out.

Moisture penetrating the device can cause personal injury due to electric shock and property damage due to short circuits.

- ▶ Check the power cord for damage before each use.
- ▶ Make sure that the power cord is never under tension.
- ▶ If you want to move the device, disconnect the power cord from the wall socket. If the device was previously turned on, wait at least 2 minutes for the turbo molecular pump to come to a complete stop.
- ▶ Only operate the device in dry environments and only in buildings.
- ▶ Operate the device away from sources of liquid and moisture.
- ▶ Position the device so that you can always reach the plug for unplugging.



#### **WARNING**

##### **Risk of injury due to improper installation**

If the device is not placed on a flat and non-slip surface, it may fall and cause bodily injury such as crushing.

- ▶ Place the device on a flat, non-slip, and vibration-free work surface.



#### **WARNING**

##### **Fire hazard due to overload, short circuit and overheating**

- ▶ Observe the permissible ambient conditions.
- ▶ Ensure sufficient ventilation, especially on the ventilation slots on the left and right of the device: At least 20 cm of free space at the side.
- ▶ Keep heat sources away from the device.
- ▶ Make sure that the power switch or power plug is always easily accessible.
- ▶ Disconnect the device from the mains immediately if smoke is emitted from the device.



#### **CAUTION**

##### **Risk of stumbling over the power cord or other lines**

- ▶ Lay the power cable and other connected lines so that there is no risk of tripping.

---

**NOTICE****Operating system can be hacked via USB or Ethernet**

The Linux operating system used in the leak detector is not updated automatically and can therefore contain security vulnerabilities. This vulnerability may be exploited through the Ethernet and USB interfaces of the leak detector to provide unauthorized access to the system.

- ▶ Ensure that no unauthorized person has access to these interfaces, for example by using a USB port / Ethernet port lock.
  - ▶ In order not to jeopardize the security of your company network, never connect the leak detector directly to the public Internet. This applies to connections over WLAN as well as over Ethernet.
  - ▶ However, if you want to access the web interface of the leak detector remotely, we recommend an encrypted Virtual Private Network (VPN) connection. We cannot guarantee the security of VPN connections provided by third parties.
- 

## 5.2 Connecting the SL4000 sniffer line to the Ecotec 4000

---

**NOTICE****Material damage due to a missing sniffer line**

The device must not be operated without a connected sniffer line in order to avoid overpressure in pump and measurement system.

- ▶ Connect the sniffer line before you start up the device.
  - ▶ Do not replace the sniffer line while the device is in operation.
- 



The preset orientation of the connection for the sniffer line may only be changed by the service.

- 
- 1 Align the red mark on the sniffer line connector with the red mark on the leak detector socket.
  - 2 Insert the plug of the sniffer line into the socket of the leak detector until it clicks into place. Make sure that the red dot on the plug is aligned with the red dot on the socket.



- 3 To disconnect the sniffer line if necessary, carefully pull on the sniffer line plug. Make sure to grip the knurled ring of the plug with one hand.



### 5.3 Mounting holder for sniffer line (optional)

A mounting holder is available for the sniffer line, see "Accessories and spare parts [► 113]".



#### **⚠ CAUTION**

##### **Risk of injury due to sniffer tip**

If you trip and fall onto the sniffer tip, you could injure your eyes, for example.

- To prevent injuries caused by accidental contact with the sniffer tip, align the sniffer tip in the holder so that it points away from the operator when not in use.



You have several mounting options:

- If you don't want to attach the holder to the leak detector, mount it to an object of your choice using two M6 screws.
- Alternatively, connect the two parts of the holder and hang the pre-assembled holder using its hooks in the ventilation slots on the right or left side of the device.

## 5.4 Installing and removing sniffer tip attachments (optional)

### NOTICE

#### Property damage due to liquids

Liquids such as water or adhesives can clog and destroy the sniffer line.

- ▶ Do not suck up liquids with the device.
- ▶ Install a water protection tip if necessary.

Attachments can be installed and removed from the sniffer tip. For a list of the available attachments, see "Accessories and spare parts [▶ 113]".

- 1 Push the attachment onto the end of the sniffer tip to the stop.



- 2 To avoid incorrect measurements or long response times, check that the attachment is seated all the way to the stop.
- 3 Calibrate the leak detector.
- 4 To remove the attachment if necessary, take it off the sniffer tip.

## 5.5 Using EcoCheck 4000 internally in the Ecotec 4000 (optional)

With the EcoCheck 4000, you can calibrate the Ecotec 4000 leak detector and check the calibration during operation.

The EcoCheck 4000 can be installed in the front cover of the Ecotec 4000. Alternatively, it can be connected to the Ecotec 4000 via a standard 9-pin Sub-D cable and positioned away from the device, e.g., directly at the measuring station.

When you insert the sniffer tip into the opening of the EcoCheck 4000, the interruption of the light barrier triggers an action. By default, a calibration leak measurement (MEASURE) is initiated. Calibration can be performed at a later time. See also "Calibrate with EcoCheck 4000 [► 53]".

Alternatively, you can set "Action upon interruption of light barrier" to immediate calibration (CALIBRATE) or calibration check (PROOF). See also "Configuring the calibration settings for a gas [► 47]".

The EcoCheck 4000 is filled with R1234yf gas. The Ecotec 4000 calculates other refrigerants based on this gas.

### Use internal calibration leak EcoCheck 4000



#### **WARNING**

##### **Risk of explosion due to overpressure and escaping gas**

The gas cartridge of the calibration leak is pressurized and contains flammable gas, which can accumulate to an explosive concentration.

- ▶ Check that all components are in proper working condition before use.
- ▶ In case of major leaks (e.g., significant gas leakage or hissing at the calibration leak), check the leak detector and accessories and dispose of them if damaged. Then ventilate the room and inform INFICON about the leaks.
- ▶ Do not use the calibration leak near ignition sources or in hot environments (e.g., surfaces, sunlight), see also "Technical Data".
- ▶ In an advanced stage of fire, the gas cartridge can explode. Implement appropriate safety precautions.



#### **WARNING**

##### **Health hazards from substances produced during a fire**

If the gas cartridge is overheated or catches fire, toxic decomposition products such as hydrofluoric acid can be formed.

- ▶ Do not inhale any smoke or vapor from the gas cartridge.
- ▶ Take appropriate safety precautions when handling and disposing of the gas cartridge after excessive heat or fire.



The tracer gas continuously flows out of the calibration leak and can collect in the packaging. To avoid affecting the calibration, remove the calibration leak from its packaging before use and store it in a well-ventilated place for 48 hours.

- 1 Remove the cover of the opening for the calibration leak or a drawer that may be inserted on the front cover of the leak detector.
- 2 Insert the calibration leak into the front cover of the leak detector until the calibration leak locks into place magnetically.



## 5.6 Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional)

If you want to connect an EcoCheck 4000 externally to the Ecotec 4000, this is also possible. The maximum length of the cable must not exceed 30 m.

The EcoCheck 4000 has a connector for a standard Sub-D cable (9-pin).



Fig. 4: Rear view EcoCheck 4000

|   |                  |
|---|------------------|
| 1 | D-Sub connection |
|---|------------------|

- Connect the EcoCheck 4000 to the "Calibration Port" of the leak detector via the D-Sub connection, see also "Connections for accessories and control signals [► 17]". The length of the cable must not exceed 30 m.

**See also**

- ▢ Calibrate with EcoCheck 4000 [► 53]
- ▢ Configuring the calibration settings for a gas [► 47]

## 5.7 Connecting exhaust hose (optional)

**⚠ CAUTION****Danger of poisoning due to harmful gases**

Depending on the gases present, harmful gases can escape into the ambient air via the exhaust connection of the leak detector.

- ▶ Make sure you have protection measure to prevent inhaling hazardous gases.
- ▶ Do not pump out toxic, corrosive, or explosive gases that create a hazard.
- ▶ Connect an exhaust hose to the back of the device (plug connection). The exhaust gas connection must be continuously connected to an exhaust gas system and must not be closed.

**See also**

- ▢ Device [► 13]

## 5.8 Connecting to the power supply system

The mains voltage of the Ecotec 4000 is specified on the type plate of the mains switch. The Ecotec 4000 automatically adapts to the specified mains voltages.

**⚠ DANGER****Danger from electric shock**

Improperly grounded or fused products may be dangerous to life in case of a fault. The use of the device is not permitted without a connected protective conductor.

- ▶ Only use the power cord supplied.
- ▶ Do not use damaged power cords.
- ▶ Make sure that the power supply plug is always accessible.
- ▶ Immediately disconnect the device from the mains in case of visible defects. This also applies to the development of smoke.

**NOTICE****Material damage due to excessive mains voltage**

Excessive mains voltage can damage the device and even cause a fire.

- ▶ Ensure that the mains voltage specified on the device (type plate) matches the mains voltage available at the location of use.
- ▶ Connect the device to the electric power supply using the supplied power cable.



## 6 Operation

### 6.1 Switching on

#### NOTICE

##### Risk of damage to property due to jerky movements

The running turbo molecular pump can be damaged by jerky movements or foreign objects.

- ▶ Avoid any jerking movements or vibrations to the device during operation and for up to 2 minutes after switching off.

- ✓ The power cord is plugged in.
- ✓ The sniffer line is connected.
- 1 Switch on the device using the mains switch.
  - ⇒ The Ecotec 4000 starts a start-up process lasting several minutes. The status is displayed.
  - ⇒ After starting up, the Ecotec 4000 already measures the gas concentration at the sniffer tip.



Fig. 5: Measurement screen (example)

- 2 After waiting for the device to warm up, calibrate it; see also "Calibrating [▶ 52]".
- 3 Configure the settings for your intended measurement. Also see "Basic settings [▶ 35]" and "Settings for the measurements [▶ 43]".

#### NOTICE

##### Possible impairment due to longer downtime

- ▶ To ensure the proper functioning of the leak tester including the built-in pumps, you should switch on the device at least once for about 15 minutes after 6 months of standstill.

**Delayed readiness for use after a long period of inactivity**

If the leak detector has not been in operation for more than one year, the bearing resistance of the built-in turbo molecular pump may increase during start-up and its temperature may rise significantly.

In this case, the leak detector therefore automatically preconditions the turbo molecular pump during start-up. This preconditioning accelerates the turbo molecular pump to its maximum speed and slows it down again. This process is carried out 5 times in succession and takes a total of approx. 20 minutes.

Once the preconditioning has been successfully completed, the leak detector is ready for use again without any restrictions.

---

## 6.2 Basic settings

### 6.2.1 Setting the language

#### Setting the language for the first time

According to the factory settings, the language is preset to "English".

- 1 To change from English to another language, tap the Supervisor icon  on the display.
- 2 Tap "Change own language" and select the desired language.
- 3 Save .

#### Setting the language for a user

✓   Operator or Supervisor rights

- 1  > User accounts > Manage user accounts
- 2 Select a user and set the desired language. See "Selecting, editing, creating users [▶ 36]".  
⇒ In the "User Profile" window, you can enter additional user information besides the language.
- 3 Save .

#### Setting your own language as a user with restricted rights

- 1 To switch from the currently set language to another language, tap the icon representing your username on the display. As a "User", tap the button .
- 2 Tap "Change own language" and select the desired language.  
⇒ For more settings, see "Modify personal settings [▶ 37]".
- 3 Save .

### 6.2.2 Setting date, time and time zone

✓  Supervisor rights

- 1  > General > Date and time
- 2 Adjust.
- 3 Save .

Alternatively, press  in the upper window bar and make your settings.

### 6.2.3 Managing user accounts

#### 6.2.3.1 Overview of rights groups

The rights of a user depend upon which group they belong to.

User

Members of the group  User can

- Perform measurements,
- View history of the measurement results,
- View device information,
- View error logs.

**Operator**

Members of the group  **Operator** have all the rights of the group **User**. In addition, they can

- Create/modify/delete users,
- Export/delete measurement data,
- Modify measurement settings.

**Supervisor**

Members of the group  **Supervisor** have all the rights of groups **User** and **Operator**. In addition, they can

- Create/modify/delete operators,
- Create/modify/delete supervisors,
- Perform software updates,
- Modify date/time.

### 6.2.3.2 Selecting, editing, creating users

✓   **Operator** or **Supervisor** rights

1  > User accounts > Manage user accounts

⇒ Existing users and associated groups are displayed in list form.

2 You have the following options:

To create a new user profile, select  at the bottom of the window.

⇒ The window "User profile" will open.

Alternatively, click on an existing username and select the following from the displayed toolbar:

, to load a user profile.

⇒ The login window will open.

, to edit a user profile.

⇒ The window "User profile" will open.

, to delete a user profile.

3 If the "User profile" window opens, enter a user name as required, change it or keep it as it is.

- 4 If the "PIN" field is not filled in or you want to change the content, enter a 4-digit PIN.
- 5 To assign the required rights to the user, select a group. Via < and > select between the groups User, Operator and Supervisor. See "Overview of rights groups [► 35]".
- 6 In the "Language" field, assign a language to the user via < and >.
- 7 Save .

### 6.2.3.3 Modify personal settings

Even as a user with user rights, you can change your language or PIN. The associated user profile is then changed accordingly. Access to the entire user profile is not necessary.

- 1 Press on your name which appears on the top left of the display.  
⇒ The window "User accounts" opens.
- 2 Select the "Change own PIN" or "Change own language" button as required.

#### See also

 Logging off from the device [► 83]

## 6.2.4 Switching off Automatic Login



### Factory setting

Login: Supervisor

PIN: 1111

Language: English

As per factory settings, after switching on the device the user "Supervisor" automatically logs in and the measurement screen is called. This default user also has the permissions of the group "Supervisor". Without changing this setting, any user can operate all functions without restriction.

You can configure the device so that, when it is turned on, the login window appears instead of automatically logging in a user.

In the login window, any user who has already been registered on the device can log in, see "Selecting, editing, creating users [► 36]".

✓  **Supervisor rights**

- 1  > User accounts > Manage Automatic Login
- 2 In the "Manage Automatic Login" window, deactivate the option "Active".
- 3 Save .

⇒ After restarting the device, the current settings are applied.

### 6.2.5 Switching on Automatic Login

You can specify whether a user of your choice is automatically logged in after the device is switched on without the login window.

✓  **Supervisor rights**

✓ The requested user has already been created. See "Selecting, editing, creating users [► 36]".

- 1  > User accounts > Manage Automatic Login
- 2 In the "Manage Automatic Login" window, activate the option "Active".
- 3 Enter the name of the user in the "Name" field. The input is case-sensitive.
- 4 Enter the current PIN of the user profile in the "PIN" field.
- 5 Save .

### 6.2.6 Changing unit settings

You can choose between the following pressure units: "mbar", "Pa", "atm" and "Torr" and leak rate units such as g/a.

✓  **Operator or Supervisor rights**

- 1  > General > Units
- 2 Change the unit of  
"Pressure unit display"  
"Pressure unit interface"  
"Sniffer-Leakrate Unit (Interface)" if necessary.
- 3 Save .

### 6.2.7 Changing the audio settings of the leak detector

In addition to the visual display of the measurement results you can change the settings to the volume, to the Notification beep and to the audio alarm.

#### **CAUTION**

#### **Damage to hearing due to loud audio**

The alarm level of the device can exceed 85 dB(A).

- Set the volume up to a maximum of "8".
- Use suitable hearing protection at volume settings above "8".

✓   **Operator or Supervisor rights**

- 1  > Audio
- 2 In order to change the volume of the audio alarm and the notification sounds, select the desired "Volume". Do not fall below the set value for the "Minimum volume" in the next field.
  - ⇒ Setting range: 0 ... 15
  - ⇒ You can listen to the set volume using the "Test" button.
- 3 If necessary, change the minimum volume.
  - ⇒ The "Minimum volume Direct Selection Keys" is the volume for the acoustic warning signal that cannot be reduced below a certain level. If you select a value greater than 0, the lowest volume level is shown on the measurement screen after pressing the volume icon. This allows you to prevent a non-authorized person from setting a value that is below the ambient noise level.
  - ⇒ Setting range: 0 ... 15
- 4 If you want to define the cause of an alarm or the type of notification beep more accurately, then make your selection with the "Audio alarm mode" between "Proportional leak rate", "PINPOINT", "SETPOINT", "TRIGGER" and "Off".
  - ⇒ "Proportional leak rate": The frequency of the audible signal is proportional to the bar graph display or diagram height. The frequency range is 300Hz to 3300Hz.
  - ⇒ "PINPOINT": The sound of the acoustic signal changes its frequency within a specific range of leak rates. This range extends from a decade below the selected setpoint value to a decade above. Below this leak rate range, the sound is constantly low, above the sound is constantly high.
  - ⇒ "SETPOINT": The pitch is proportional to the leak rate. The sound is emitted when the leak rate exceeds the set setpoint. See also "Adjusting configuration of a gas [► 45]".
  - ⇒ "TRIGGER": If the set setpoint is exceeded, then a two-pitch signal is issued. See also "Adjusting configuration of a gas [► 45]".
- 5 When "TRIGGER" is set (default), you can choose between "Sound 1", "Sound 2" or "Sound 3" under "Audio Alarm Subtype".
- 6 If "TRIGGER" is set (default), you can set a delay under "Audio alarm delay" to specify how long a setpoint value must be exceeded before an acoustic signal sounds. For example: False alarms caused by tracer gas in the environment should be reduced.
- 7 If you wish to have notification beeps, activate the option "Notification beep".
- 8 Save .

## 6.2.8 Changing the settings of the SL4000 sniffer probe

✓   **Operator or Supervisor rights**

- 1  > Setup > SL4000 sniffer line
  - ⇒ Alternatively, press  in the measurement window.
- 2 To change the brightness of the LED in the probe, select "Sniffer line LED Brightness."

- ⇒ Setting range 1 ... 6 or Off, factory setting 4
- 3 To change the volume of the speaker in the sniffer line, select the desired "sniffer line volume".
  - ⇒ Setting range 0 ... 15, factory setting 2
- 4 If you want the sniffer line to vibrate in addition to the warning tones, activate the "Vibration" option.
- 5 If you want to be notified by LEDs on the sniffer line in addition to the display on the touchscreen, select "Sniffer line LED Alarm Configuration."
  - ⇒ The options are "Off" or "Flashing".
- 6 Save .

#### See also

 Changing gas flow for SL4000 [► 64]

## 6.2.9 Activating or deactivating calibration requests

### ✓ Supervisor rights

- 1  > Setup > Miscellaneous
- 2 To switch on further calibration requests activate the option "Calibration request". To switch off deactivate this option.
  - ⇒ If the "Calibration request" option is enabled, you will receive calibration requests in the following cases:
    - The device has been in operation for more than 30 minutes, and the temperature deviation from the last calibration is greater than 5 Kelvin.
    - In the currently selected operation mode, no calibration has been performed within the last 24 hours (factory setting). You can change this period by entering a different number of hours in the "Calibration validity period" field. This check is disabled if the entered value is 0.
    - The gas mass has been changed.
    - The calibration mode has been changed.
    - A new, uncalibrated gas has been activated.
  - ⇒ If the "Calibration request" option is disabled (factory setting), you will only receive a calibration request in the following situation:  
An SL4000 sniffer line with a new serial number has been connected.
- 3 Save .

## 6.2.10 Turning Auto Standby on or off

As per factory setting the device automatically goes into sleep mode after 10 minutes of inactivity. You can turn Auto Standby on or off.

### ✓ Supervisor rights

- 1  > Setup > Miscellaneous
- 2 Use "<" or ">" to select between "ON" (factory setting: 10 minutes) or "OFF".
  - ⇒ In standby mode, "Standby" and the "START" button are displayed. Press the "START" button to restart the Ecotec 4000.  
Alternatively, you can return the device to measurement mode by moving the handle.



- ⇒ The electrical components cannot maintain operating temperature in idle mode. After a restart, precise measurements are therefore possible only after the warm-up time, see "Calibrating [► 52]".

#### See also

- How to put into sleep mode (Standby) [► 83]

## 6.2.11 Automatically switching cathode

### ✓ Supervisor rights

- 1  > Setup > Miscellaneous
- 2 You can use the "Automatically switch cathode" option to enable or disable filament switching. Filament replacement is enabled according to the factory settings.
  - ⇒ When activated, the filament is changed each time the device is switched on.
  - ⇒ When the first cathode (Filament A) of the mass spectrometer is used up and the Ecotec 4000 automatically switches to the second cathode (Filament B), "Filament B" is displayed in the status bar.

## 6.2.12 Setting Peak Hold

### ✓ Supervisor rights

- 1  > Setup > Peak Hold
- 2 To temporarily display the maximum measured value as a number in the measurement window, make sure that the "Peak Hold (Qmax)" option is enabled (factory setting).
- 3 If necessary, change the display duration under "Hold time". The default setting is 20 seconds. After this period, the maximum measured value is discarded and recalculated.

## 6.2.13 Setting sensitivity test

The sensitivity monitoring in the device ensures that the sensitivity of the Ecotec 4000 is always sufficient. The entire gas flow from sniffer tip to sensor is monitored and the software simultaneously checks whether the leak detector can determine the correct signal strength with it.

Monitoring ensures that the quality of the leak detection does not decline without the user noticing, and that leaks are not missed. If the sensitivity decreases, the warning message "Sensitivity too low" is displayed. Recalibration can restore sensitivity in this case, see "Calibrating [► 52]". The message repeats every 15 seconds until a calibration is started.

### ✓ Supervisor rights

- 1  > Setup > Miscellaneous
- 2 Turn the sensitivity test on (factory setting) or off as needed.
  - ⇒ We urgently recommend leaving the monitoring switched on at all times. It should be deactivated only for measurements in an argon-free environment because monitoring requires the argon signal.

## 6.2.14 Using Favorites

To shorten the time spent searching menus for frequently used functions, create freely assignable menu keys in the "Favorites" window.

### Use Favorites:

- ▶ Press the icon with your permission , ,  and then the "Favorites" button or choose alternatively
- ▶  > User accounts > Favorites
- ⇒ The Favorites window with 9 buttons is displayed. Assigned buttons can be used to quickly call up desired functions.

### Create Favorites:

- 1 In the Favorites window, press an empty button.
- 2 Select the desired menu name from the displayed list overview and confirm your selection with .
- 3 Alternatively, you can press  in the "Favorites" window, mark an empty entry and select the desired menu name from the list overview using the  shown.

### Change or delete Favorites:

- 1 In the Favorites window, press .
- ⇒ This will open the "Manage" window, where you can tap on the desired entry.
- ⇒ The icon  and the icon  for deletion are displayed.
- 2 After pressing the icon , the list overview is displayed with the menu names from which you make your selection and save it by pressing .

## 6.3 Settings for the measurements

### 6.3.1 Selecting gas, changing gas and calibration parameters, activating measurement



#### WARNING

##### Explosion hazard

The suction of combustible or explosive gases can cause an explosion. The permissible composition of commercially available gas mixtures can be found in the safety data sheets of the respective manufacturers.

- ▶ Do not suck in any combustible or explosive gases above the lower explosion limit.
- ▶ Connect an exhaust hose for safety.

#### 6.3.1.1 Preset test gases

1 > Measured gases

⇒ The “Measuring gases” window opens.

| Gas     | Meas. mass [amu] | Setpoint | Unit     | Search level [%] | Cal. Mode   |
|---------|------------------|----------|----------|------------------|-------------|
| R600a   | 41               | 4.00     | g/a      | 80               | If possible |
| R290    | 41               | 4.00     | g/a      | 80               | If possible |
| R134a   | 69               | 4.00     | g/a      | 80               | If possible |
| R1234yf | 69               | 4.00     | g/a      | 80               | If possible |
| R32     | 51               | 4.00     | g/a      | 80               | If possible |
| CO2     | 44               | 4.00     | g/a      | 80               | If possible |
| He      | 4                | 2.00E-5  | mbar-l/s | 80               | Deactivated |

⇒ The following are displayed:

- Deactivated gases with a blue dot
- Activated gases with a green dot. In its factory default state, 2 of the 7 displayed gases are activated
- the respective mass position [Measured mass]
- the respective setpoint [Setpoint] with unit [Unit]
- the search level [Search level]
- the calibration mode [Cal. Fashion]

2 To change the stored values for a gas of your choice or to replace a gas, press the line with the desired gas.

## Standard case

The following context menu opens by default:



- 

Activates the marked gas. The activated gas is indicated by a green dot. A maximum of 4 gases can be activated at the same time, and these can then be detected.

If you want to suppress detections of the interfering gases cyclopentane, isopentane, and any mixtures thereof when searching for refrigerants R600a or R290, activate IGS. For details see "R600a or R290: Suppressing disruptive gases with IGS [▶ 57]".

If an "IGS" gas is activated, only a second gas can also be activated (IGS or non-IGS).

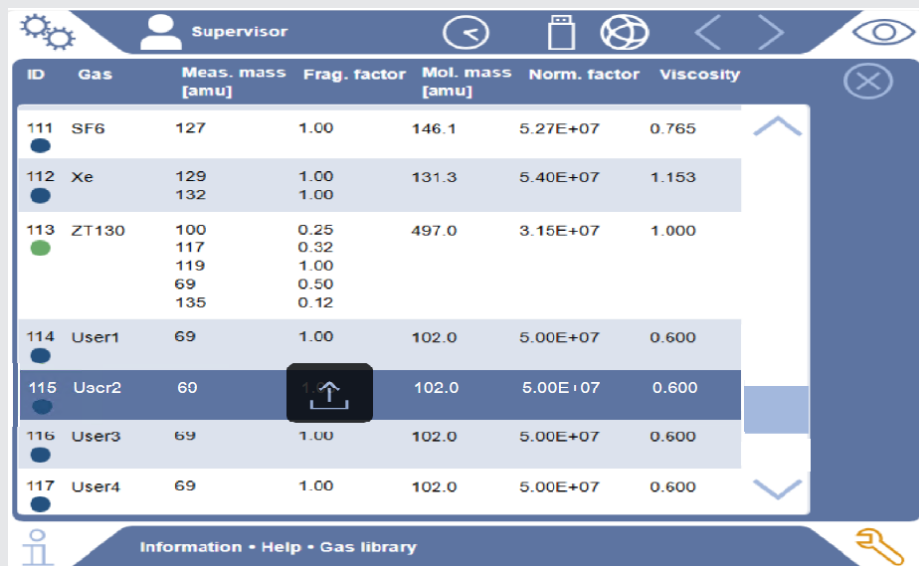
If the Background Canceling function of a sniffer line is enabled, only a single gas can be activated.
- 

Deactivates the marked gas. The deactivated gas is indicated by a dark blue dot.
- 

Go to the settings for the selected gas. See also "Adjusting configuration of a gas [▶ 45]". For example, to change the setpoint value for a measurement display to "leaky".
- 

Replace a previously marked gas by loading a selectable gas from the gas library. See also "Gas library [▶ 126]".

Use this button to open the gas library and choose from about 100 gases. User-defined gases are displayed at the end of the list.

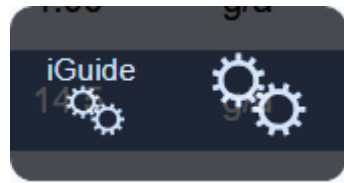


| ID  | Gas   | Meas. mass [amu]               | Frag. factor                         | Mol. mass [amu] | Norm. factor | Viscosity |
|-----|-------|--------------------------------|--------------------------------------|-----------------|--------------|-----------|
| 111 | SF6   | 127                            | 1.00                                 | 146.1           | 5.27E+07     | 0.765     |
| 112 | Xe    | 129<br>132                     | 1.00<br>1.00                         | 131.3           | 5.40E+07     | 1.153     |
| 113 | ZT130 | 100<br>117<br>119<br>69<br>135 | 0.25<br>0.32<br>1.00<br>0.50<br>0.12 | 497.0           | 3.15E+07     | 1.000     |
| 114 | User1 | 69                             | 1.00                                 | 102.0           | 5.00E+07     | 0.600     |
| 115 | User2 | 60                             | 1.00                                 | 102.0           | 5.00E+07     | 0.600     |
| 116 | User3 | 69                             | 1.00                                 | 102.0           | 5.00E+07     | 0.600     |
| 117 | User4 | 69                             | 1.00                                 | 102.0           | 5.00E+07     | 0.600     |

To define your own gas, see "Setting Custom Gas [▶ 49]".

## Special case

If an iGuide program is active, the following context menu opens instead of the standard case:



- By pressing iGuide  (left button) you switch to the iGuide settings, see “Setting up individual iGuide programs [► 62]”, figure “Setting options for an iGuide program in the iGuide window”.
- Alternatively, you can edit the measurement gases by clicking the  (right button).

### 6.3.1.2 Adjusting configuration of a gas

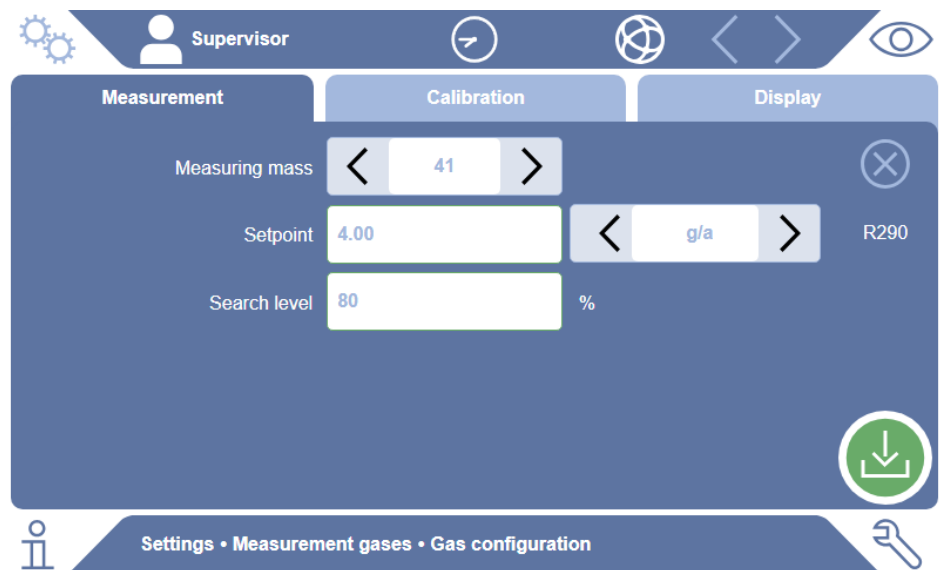
✓  Supervisor rights

✓ The desired gas is displayed in the measurement gas list; see “Preset test gases [► 43]”.

If the desired gas is not displayed, tap a gas you do not need in this list and use the button  to replace it with a gas from the gas library.

1 Press on the desired gas name and select in the context menu .

⇒ The “Measurement” tab is open.



|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Measuring mass                                                                      | <p>With the selection of a gas from the gas library, a standard mass position is automatically selected for gas to be measured.</p> <p>If the device could respond to other substances in the leak test environment, it is recommended to select a different mass position for the detection of the desired gas.</p> <p>You can find a list of all possible gases with their normal and alternative mass positions in the Appendix, see "Gas library [▶ 126]".</p> <p>Below the selected mass is the information whether it is the preferred mass or not. The molecular mass of the gas and the height of the peak relative to the largest peak is also shown for this gas. The standard factor is a measure for the sensitivity of the device to the gas at the set mass position.</p> |
| Setpoint                                                                            | <p>The limit above which a test object is to be considered "leaking". The user should adjust the setpoint value according to their own needs. See also the following table.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Unit                                                                                | <p>Optionally g/a, oz/year, ppm, mbar l/s, Pa m<sup>3</sup>/s, atm cc/s, Torr l/s, sft<sup>3</sup>/year</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Search level                                                                        | <p>The search level is a percentage of the setpoint and serves as an additional warning level. This allows even minor leaks, below the setpoint, to be reported if necessary.</p> <p>The absolute value of the search level is calculated and displayed by the device.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | <p>Reset to default settings. See also "Ecotec 4000 factory settings [▶ 22]", "Gas library [▶ 126]" and "Protocol descriptions".</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

2 If necessary, change the existing settings.

3 Save .

The following table shows the adjustable units and the corresponding setpoint limits.

| Unit                 | Lower limit setpoint | Upper limit setpoint |
|----------------------|----------------------|----------------------|
| g/a                  | 0.05                 | 999.99               |
| oz/yr                | 0.002                | 99.99                |
| ppm                  | 0.5                  | 999999               |
| mbar l/s             | $1 \times 10^{-7}$   | $9.9 \times 10^{-2}$ |
| Pa m <sup>3</sup> /s | $1 \times 10^{-9}$   | $9.9 \times 10^{-3}$ |
| atm cc/s             | $1 \times 10^{-7}$   | $9.9 \times 10^{-2}$ |
| Torr l/s             | $1 \times 10^{-7}$   | $9.9 \times 10^{-2}$ |
| sft <sup>3</sup> /yr | $1 \times 10^{-4}$   | $9.9 \times 10^{+1}$ |

Table 1: Setpoint depending on the unit

#### See also

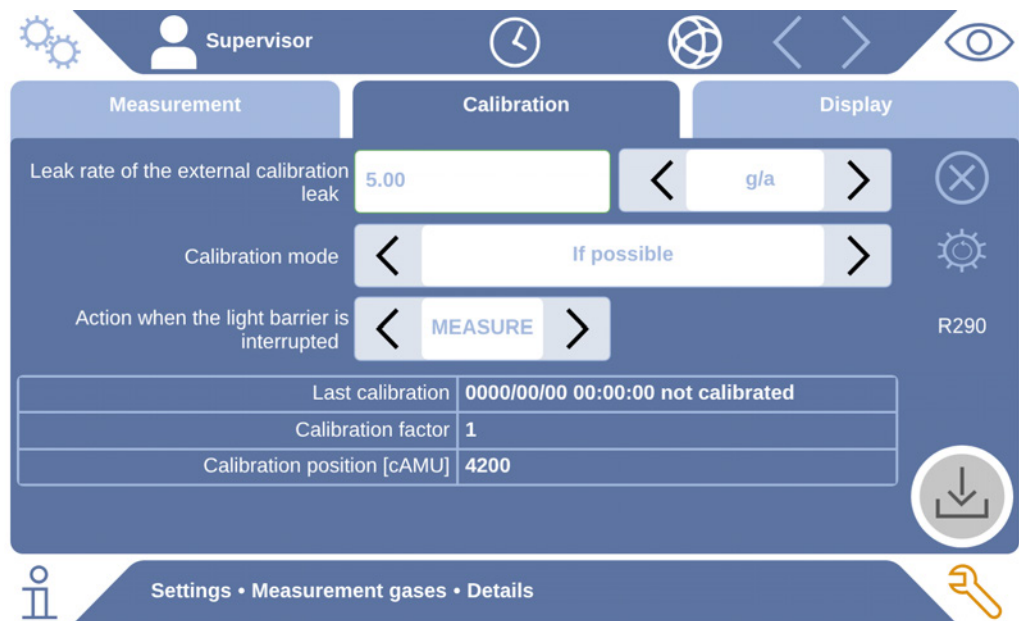
 Setting Custom Gas [▶ 49]

 Calibrating [▶ 52]

 R600a or R290: Suppressing disruptive gases with IGS [▶ 57]

### 6.3.1.3 Configuring the calibration settings for a gas

- ✓ The desired gas is displayed in the measurement parameter list, see above.  
If the desired gas is not displayed, press on a gas that is not required in this list and replace it with a gas from the gas library using the button .
- 1** Press on the desired gas name and select in the context menu .
- 2** Select the "calibration" tab.
- 3** Adjust.



|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leak rate of the external calibration leak   | Leak rate and unit of the external calibration leak. Optionally "g/a", "oz/year", "ppm", "mbar l/s", "Pa m <sup>3</sup> /s", "atm cc/s", "Torr l/s", "sft <sup>3</sup> /year".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Calibration mode                             | <p><b>Disabled (internal calibration leak):</b> This setting should be used if the internal calibration leak is not to be used, for example because the external one is more accurate or has a leak rate optimized for the application. See also "Calibrating [► 52]".</p> <p><b>Same gas only:</b> Gas is calibrated only when using the same gas. This makes sense, as it ensures that only the gas that is also present as the calibration leak is calibrated. Again, it may be that external leaks are a better match for the application and you don't want to degrade the calibration by calibrating with an internal standard gas.</p> <p><b>If possible:</b> Gas is always calibrated, provided that the calibration parameters can be calculated from the calibration using the standard gas (R1234yf). The gas to be measured is not absolutely necessary for calibration.</p> <p><b>CalMate:</b> In order to be able to calibrate using the external calibration leak on which a CalMate adapter is attached, CalMate must be set as the calibration mode. This applies to the gas contained in the calibration leak.</p> |
| Action when the light barrier is interrupted | <p>When you insert the sniffer tip into the calibration opening of the internal calibration leak, the selected action is performed. Optionally MEASURE, CALIBRATE or PROOF.</p> <p><b>MEASURE (factory setting):</b> If you want to measure the calibration leak. Direct switching to calibration is possible. This activation can be helpful if you want to measure the internal calibration leak as if it were an external calibration leak without electronics.</p> <p><b>CALIBRATE:</b> If you want to calibrate.</p> <p><b>PROOF:</b> If you want to verify the calibration completely, select this option in the "Calibration" window.</p> <p>For an overview, see also "Calibrate with EcoCheck 4000 [► 53]".</p>                                                                                                                                                                                                                                                                                                                                                                                                             |
| Last calibration                             | Date of last calibration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Calibration factor                           | See also "Setting Custom Gas [► 49]"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



Calibration position  
(AMU)

AMU=Atomic Mass Unit. See also "Gas library [▶ 126]"

#### See also

📖 R600a or R290: Suppressing disruptive gases with IGS [▶ 57]

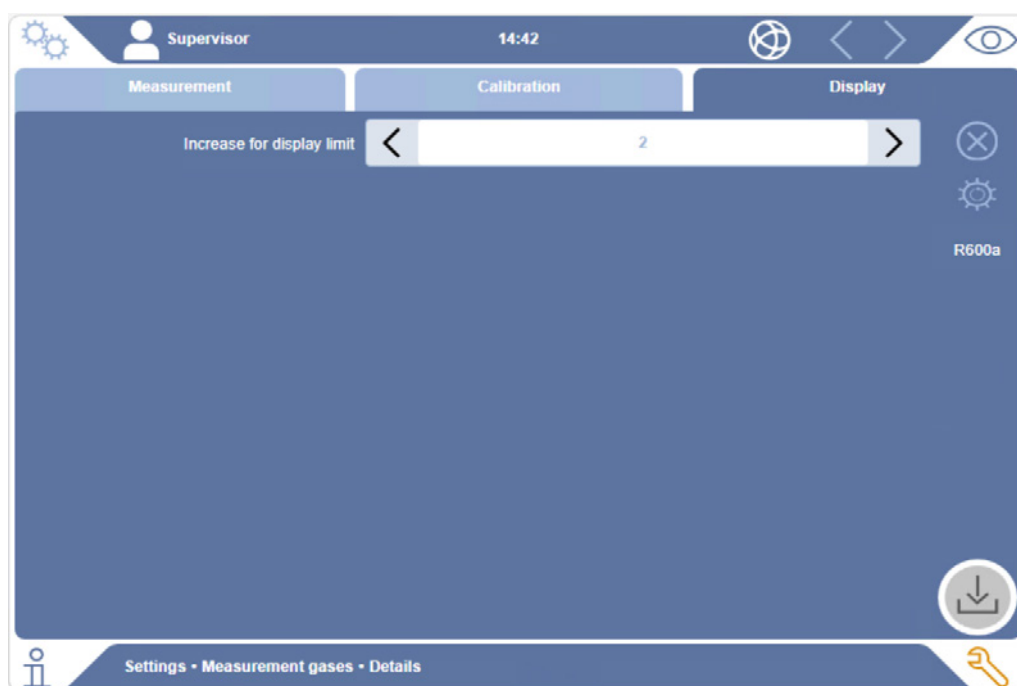
### 6.3.1.4 Setting the lower display limit of a gas

✓ The desired gas is displayed in the measurement parameter list, see "Preset test gases [▶ 43]".

If the desired gas is not displayed, press on a gas that is not required in this list and replace it with a gas from the gas library using the button . See "Preset test gases [▶ 43]".

1 Press on the desired gas name and select in the context menu .

2 Select the "Display" tab.



Increase for display limit

With the "Display limit" function, you can hide measurement results that are below the expected leak rate. This makes the measurement view clearer especially in view of the measurement bar because smaller measurement results are hidden.

You can define the lower display limit as a multiple of the lowest measurable leak rate (1 x, 2 x, 5 x, 10 x, 20 x, 50 x, 100 x).

#### See also

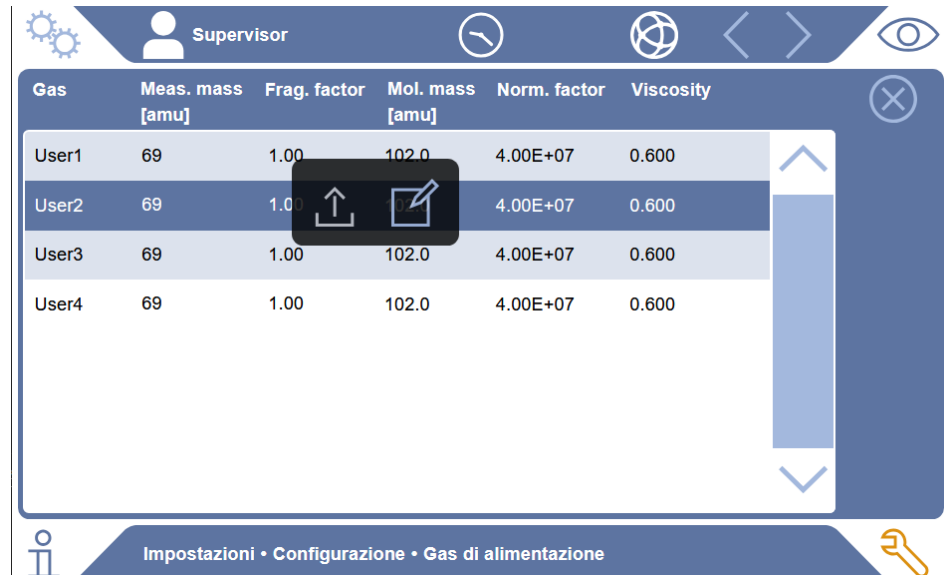
📖 Gas library [▶ 126]

### 6.3.1.5 Setting Custom Gas

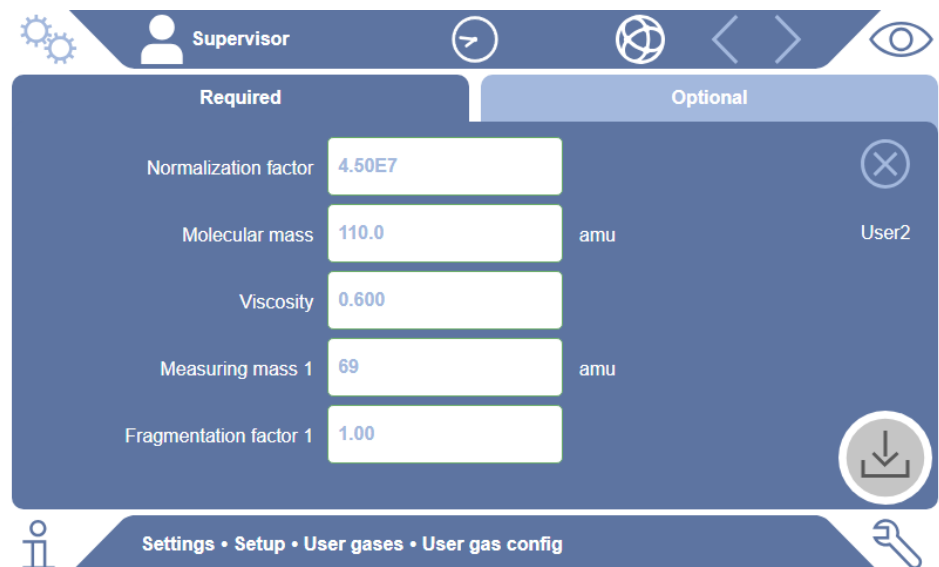
You can configure and store settings for four of your own gases.

✓  **Supervisor rights**

- 1  > Setup > user gases  
⇒ Four user gases are set up as standard.
- 2 In the "User Gases" window, select the desired gas and select in the context menu .



- 3 Enter the required parameters for your gas.



⇒ **Normalization factor**

The normalization factor is used to convert the current supplied by the sensor into a leak rate signal. When setting a user-defined gas, the Ecotec 4000 should be calibrated with an external calibration leak if possible. If calibration is successful, do not change the normalization factor. If calibration fails and the error message "Calibration factor too high" is displayed, the normalization factor must be reduced by one decade, e.g. from 1.0E+08 to 1.0E+07. If the error message "Calibration factor too small" appears, increase the normalization factor by one decade, e.g. from 1.0E+08 to 1.0E+09. Repeat this process until the Ecotec 4000 could be calibrated.

⇒ **Molecular mass**

Enter the molecular mass of the gas to be measured with the arrow buttons (usually included in the data sheet for the gas).

⇒ **Viscosity**

Thickness or viscosity of liquids or gases. Usually found in the material's technical data sheet as "dynamic viscosity".

⇒ **Measuring mass 1**

The mass determines the position of the peak at which the user-defined gas is measured. The Ecotec 4000 can detect masses ranging from 2 to 200 amu.

The buttons are labeled with numbers, and you can enter a mass between 2 and 200.

⇒ **Fragmentation factor 1**

The fragmentation factor describes the probability of detecting the set measurement mass per molecule of the gas to be measured. Typically  $\leq 1$ .

- 4 Depending on your gas, you can enter up to four additional measuring masses/fraction factors. Use "+" to add a pair of parameters and "-" to remove it. Enter the values.

The screenshot shows the 'User gas config' screen in the Ecotec 4000 interface. The top navigation bar includes a 'Supervisor' user icon and several control icons. The main area is split into 'Required' and 'Optional' tabs. In the 'Required' tab, there are two input fields: 'Measuring mass [amu]' with a value of 2 and 'Fragmentation factor' with a value of 1.00. Below these fields are '+' and '-' buttons for adding or removing parameters. The 'Optional' tab is currently empty. The bottom status bar displays the navigation path 'Settings • Setup • User gases • User gas config' and a green save icon.

- 5 Save .

- 6 If necessary, edit further gases.

⇒ The configured user gases are available at the end of the gas library when selecting gases for selected measuring gases. See also Chapter "Preset test gases [▶ 43]".

### 6.3.2 Calibrating



#### ⚠ CAUTION

##### Risk of injury from flammable gases

If the calibration leak contains flammable gas, it may ignite and cause injury.

- ▶ Use only INFICON gas cartridges.
- ▶ Do not attempt to refill empty gas cartridges.
- ▶ Use and store calibration leaks or gas cartridges only in well-ventilated rooms.
- ▶ Before use, check that all components, including visible gaskets and sealing surfaces, are in good condition.
- ▶ If you suspect a serious leak, for example due to hissing noises, check the device and accessories immediately. Do not inhale the gas, ensure that the installation site is well ventilated, and inform INFICON.
- ▶ Keep calibration leaks away from ignition sources and hot environments (> 50 °C).

#### NOTICE

##### Danger of property damage due to contact with live parts

Because the operating voltage for the sniffer line and the EcoCheck 4000 is  $\leq 24\text{ V}$ , there are no dangerous voltages for humans. To protect the leak detector and calibration leak, observe the following:

- ▶ Do not open the calibration leak housing.
- ▶ Only use the EcoCheck 4000 with approved INFICON devices in undamaged condition and with an undamaged adapter cable (for external use).
- ▶ If the EcoCheck 4000 is wet or damp, do not use the device or insert it into the leak detector.



##### Incorrect calibration due to low operating temperature or short runtime

If the device is calibrated while cold or after a short runtime, it may produce incorrect measurement results.

- ▶ The device must have been switched on for at least 60 minutes before calibration for hydrogen measurement.
- ▶ The device must have been switched on for at least 20 minutes before calibration for the measurement of all gases.

The easiest way to calibrate the leak detector is to supplement it with an EcoCheck 4000 calibration leak. It compensates temperature fluctuation and thus enables the accuracy required for calibration.

The EcoCheck 4000 calibration leak is supplied with R1234yf. The contained gas can be used for the calibration of other gases with a mass position of 40 to 105 amu, because the leak detector converts the calibration result for the measurement of these gases.

The most accurate calibration is achieved with external calibration leaks. The calibrated leaks are valid for one gas each and temperature-insensitive.

**When to calibrate?**

The device should be calibrated daily and after a change of operator, taking into account the warm-up times. Calibration is also required after the following actions:

- Replacing the sniffer line
- Replacing the sniffer tip
- Switch between gases (if you calibrate with an external calibrated leak)
- Change filter
- Calibration request by the system

**6.3.2.1 Calibrate with EcoCheck 4000**

*Fig. 6: Built-in EcoCheck 4000 calibration leak*

If a gas measurement cannot be calibrated with the EcoCheck 4000 because the gas mass position is outside the range of 40 to 105 amu, the message "Int. calibration impossible" is displayed for this gas after calibration.

If a gas was blocked for internal calibration in the "Gas settings" menu, the message "Gas deactivated" is displayed, see also "Selecting gas, changing gas and calibration parameters, activating measurement [► 43]".

When you insert the sniffer tip into the opening of the EcoCheck 4000, the interruption of the light barrier triggers an action. By default, a calibration leak measurement (MEASURE) is initiated. Calibration can be performed at a later time. If you wish to take advantage of the calibration option, you will be guided through the calibration process with messages.



Alternatively, you can set "Action upon interruption of light barrier" to immediate calibration (CALIBRATE) or calibration check (PROOF). See also "Configuring the calibration settings for a gas [► 47]".

A warning is displayed if the device has not been switched on for 20 minutes yet. Simply confirm the warning and then continue with calibration if you know that the device has reached operating temperature because it was switched off only briefly before calibration. Otherwise remove the sniffer tip again and start calibration later.

After measuring and a short calculation period, the results of calibration are shown in the display. The old and new calibration factors are displayed.

**Measure calibration leak (MEASURE), factory setting**

- ✓ The EcoCheck 4000 must be installed. See also "Using EcoCheck 4000 internally in the Ecotec 4000 (optional) [► 30]", "Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional) [► 31]" or the separate operating instructions for EcoCheck 4000.

- ✓ The device has warmed up.  
(The device must have been turned on for at least 60 minutes before calibration for hydrogen measurements, and for at least 20 minutes for measurements of all other gases.)
- ✓ A calibration had been performed earlier; see below.
- ✓ The measurement display is called up.
- ▶ Insert the sniffer tip into the opening of the EcoCheck 4000 until you feel some resistance.
  - ⇒ By default, a calibration leak measurement (MEASURE) will be initiated unless you have specified a different setting for the gas in question under the "Calibration" tab. See "Configuring the calibration settings for a gas [► 47]".
  - ⇒ If the displayed leak rate of the calibration leak deviates by more than 20% from the stored calibration value, the status indicator changes color to indicate that calibration is recommended.

- Calibrate (CALIBRATE)**
- ✓ The EcoCheck 4000 must be installed. See also "Using EcoCheck 4000 internally in the Ecotec 4000 (optional) [► 30]", "Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional) [► 31]" or the separate operating instructions for EcoCheck 4000.
  - ✓ The device has warmed up.  
(The device must have been turned on for at least 60 minutes before calibration for hydrogen measurements, and for at least 20 minutes for measurements of all other gases.)
  - ✓ The measurement display is called up.
    - 1 Insert the sniffer tip into the opening of the EcoCheck 4000 until you feel some resistance.
      - ⇒ By default, a calibration leak measurement (MEASURE) will be initiated unless you have specified a different setting for the gas in question under the "Calibration" tab. See "Configuring the calibration settings for a gas [► 47]".
    - 2 Press the button to switch to calibration (CALIBRATE) on the display of the leak detector or sniffer probe.
    - 3 Wait until further calibration steps are performed. Follow the instructions.
    - 4 Remove the sniffer tip from the EcoCheck 4000 when prompted to do so on the display.
    - 5 Wait until the calibration result is displayed.
    - 6 If you want to accept the new values, press the "Confirm" button. Otherwise, press the "Cancel" button.

**Check calibration (PROOF)**

If you want to perform a full verification of the set calibration instead of a measurement (MEASURE), use PROOF.

- ✓ The EcoCheck 4000 must be installed. See also "Using EcoCheck 4000 internally in the Ecotec 4000 (optional) [► 30]", "Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional) [► 31]" or the separate operating instructions for EcoCheck 4000.
- ✓ The device has warmed up.  
(The device must have been turned on for at least 60 minutes before calibration for hydrogen measurements, and for at least 20 minutes for measurements of all other gases.)

- ✓ A calibration had been performed earlier.
- ✓ You have selected the PROOF setting for the gas in question. See "Configuring the calibration settings for a gas [► 47]".
- ✓ The measurement display is called up.
  - 1 Insert the sniffer tip into the opening of the EcoCheck 4000 until you feel some resistance.
  - 2 Wait until further PROOF steps are performed. Follow the instructions.
    - ⇒ Do not press the button to switch to calibration on the display of the leak detector or sniffer probe.
  - 3 Remove the sniffer tip from the EcoCheck 4000 when prompted to do so on the display.
  - 4 Wait until the result of the check is displayed.
  - 5 To return to measurement mode after a positive check, press the "Confirm" button.
  - 6 If the check was not successful, perform a calibration.

### 6.3.2.2 Status display for EcoCheck 4000

The calibration opening of the calibration leak has an LED status display. The status display shows the following statuses:

| Status display                    | Meaning                                                                                                                                                                                                                                   |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Flashing green, then blue         | Calibration leak powers up.                                                                                                                                                                                                               |
| Quick switch between colors       | Calibration leak is being updated.                                                                                                                                                                                                        |
| Glowing green                     | Calibration leak is ready.                                                                                                                                                                                                                |
| Glowing yellow                    | <ul style="list-style-type: none"> <li>• Calibration leak is currently calibrating.</li> <li>• Gas cartridge of the calibration leak must be replaced, see also "Replacing EcoCheck 4000 or gas cartridge (optional) [► 105]".</li> </ul> |
| Glowing blue.                     | Sniffer line can be removed from calibration leak again.                                                                                                                                                                                  |
| Flashing green                    | New values taken over for calibration                                                                                                                                                                                                     |
| Flashing yellow                   | New values not taken over for calibration                                                                                                                                                                                                 |
| Flashing white                    | Calibration check correct                                                                                                                                                                                                                 |
| Error messages                    |                                                                                                                                                                                                                                           |
| Flashing red 1x short and 1x long | Calibration opening already covered when starting the leak detector                                                                                                                                                                       |
| Flashing red 2x short and 1x long | Light barrier detector of the calibration opening defective                                                                                                                                                                               |
| Flashing red 3x short and 1x long |                                                                                                                                                                                                                                           |
| Flashing red 4x short and 1x long | Light barrier of the calibration opening overexposed                                                                                                                                                                                      |
| Flashing red 5x short and 1x long | Light source of the light barrier defective                                                                                                                                                                                               |

### 6.3.2.3 Calibrating with external calibration leak

For external calibration of the leak detector, we recommend calibration leaks with leak rates  $> 2 \text{ g/a}$ . If there are significantly elevated background concentrations in the test environment, a calibrated leak with a high leak rate is required.

External calibration is a semi-automatic process. Text messages in the display guide you through the calibration process. Calibration can be stopped at any time with the "Cancel" button.

A warning is displayed if the device has not been switched on for 20 minutes yet. Simply confirm the warning and then continue with calibration if you know that the device has reached operating temperature because it was switched off only briefly before calibration. Otherwise start calibration again later.

Normally, the gas measurement to be calibrated will be active. If you want to calibrate a deactivated measurement, activate the gas in the "Measuring parameters" menu.

After measuring and a short calculation period, the results of calibration are shown in the display. The old and the new calibration factor as well as the old and the new relative peak position are displayed.

#### Procedure

- ✓ The device has warmed up.  
(The device must have been turned on for at least 60 minutes before calibration for hydrogen measurements, and for at least 20 minutes for measurements of all other gases.)
- ✓ The measurement display is called up.
  - 1 Press the  button.
    - ⇒ The list of gases currently set for measurement is displayed (up to four gases).
  - 2 Select the gas that the measurement is to be calibrated for.
  - 3 Check whether the gas and the displayed leak rate match the data of the calibrated leak. If the leak rate does not match, select "Change leak rate" and correct the value. Alternatively, the leak rate can also be set using the measurement parameters, see "Preset test gases [► 43]".
  - 4 Select "Start."
  - 5 Hold the sniffer tip in the center of the calibration leak opening and follow the instructions on the display.
  - 6 Confirm the new values with the button on the bottom right.

### 6.3.2.4 Automating external calibration with CalMate 4000 (optional)



#### WARNING

##### Danger to pacemaker wearers from magnets

The calibration adapter contains magnets that allow it to attach to the calibration leak.

- If you wear a pacemaker, do not perform the installation yourself.
- If you wear a pacemaker, always maintain a distance of at least 10 cm from the calibration adapter when operating the device.

You can automate calibrations using an external calibration leak.





- ✓ The CalMate 4000 calibration adapter is mounted on an external INFICON calibration leak in such a way that the opening in the adapter is positioned directly above the outlet of the calibration leak.
- ✓ The calibration adapter is connected to the Calibration Port of the Ecotec 4000 via a cable. Also see "Accessories and spare parts [▶ 113]" and "Connections for accessories and control signals [▶ 17]".
- ✓ In the "Calibration" window, the "Calibration Mode" for the gas in question is set to "CalMate". The calibration mode can only be selected for one gas from the list. See also "Configuring the calibration settings for a gas [▶ 47]".
- ✓ The leak rate of the external calibration leak has been set. Make sure that CalMate is set to the correct gas for the external calibration leak.
  - 1 Start the calibration of the leak detector by inserting the sniffer tip into the calibration opening on the CalMate 4000.
    - ⇒ A light barrier in the CalMate 4000 detects when a sniffer tip is held in the calibration opening.
  - 2 Perform the calibration according to the instructions displayed.

### 6.3.3 R600a or R290: Suppressing disruptive gases with IGS

IGS causes the detection of interfering gases cyclopentane, isopentane and any mixtures thereof to be suppressed when searching for refrigerants R600a or R290. Up to an interfering gas concentration of 50g/a, the error is only 1% at most.

If IGS is activated, only one additional gas can be added to the list of measured gases. If more than two gases are activated when IGS is activated for R600a or R290, further gases (starting with the highest gas number from 1 to 4) are automatically deactivated, so that only two gases remain.

If R600a or R290 is measured with IGS and R134a is set as the second gas, select mass position 83 for R134a, otherwise interference between the propellant and R134a will occur.

The IGS setting behaves the same for both R600a and R290.

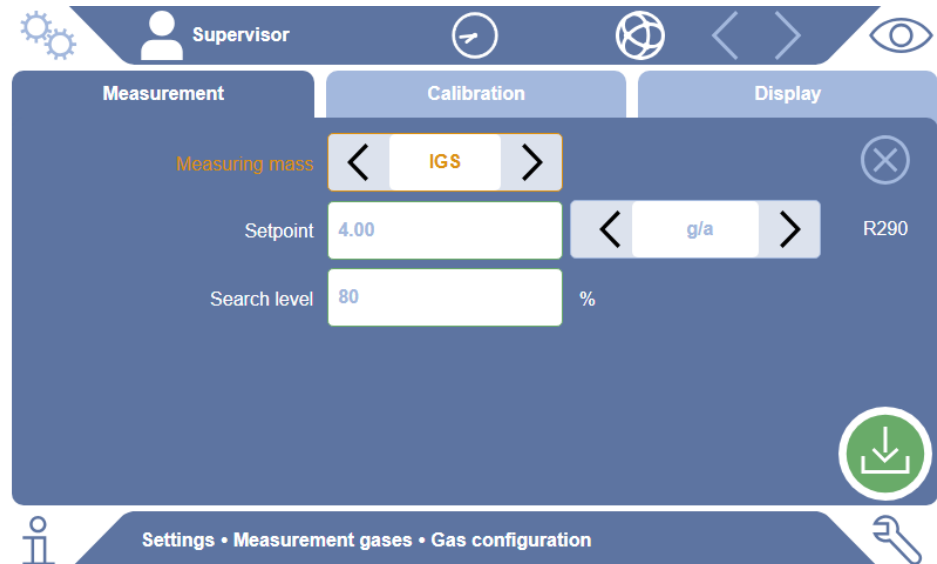
If it is desired to measure both with IGS, this must be set individually for each gas. With each measurement, the leak detector checks which of the two gases is currently being measured and indicates this with a green border on the display.

The IGS function requires very little maintenance. If repeated false alarms occur during the sniffing with IGS, calibration must be set to interfering gases, see below.

#### Set IGS

- ✓  Supervisor rights

- 1  > Measured gases
- 2 Press R290 as the gas to be searched for.  
 ⇒ The desired gas is displayed in the measurement parameter list.  
 If the desired gas is not displayed, press on a gas that is not required in this list and replace it with a gas from the gas library using the button .
- 3 Press R290 and select from the context menu .
- 4 The "Measurement" tab is open.



- 5 Set the measurement unit to "IGS".
- 6 Save .

To also measure R600a, set IGS there as described above.

## IGS alignment

As with other gases, the preceding actual calibration is performed using an external calibration leak. For the additional IGS adjustment, you will need a calibration leak containing cyclopentane and a calibration leak containing isopentane, which are available as the "Calibration Kit for IGS Mode" (Order No. 531-003).

The Ecotec 4000 detects when the sequence of gases is not followed during calibration and signals this with a flashing gas indicator.

1. Enable IGS, see above.
2. Select "Calibration"  in the measurement window.
3. Select "IGS adjustment" in the "Calibration" window and press .
4. Follow the instructions.

### 6.3.4 Setting and using the function ZERO

#### Why should you use ZERO?

To measure small leaks more accurately, use the ZERO function.

During every leak test, there is a "background signal" that interferes with the detection or measurement of leaks.

- To hide the background signal, activate the function ZERO.
- You can also use ZERO to hide a currently displayed leak rate, which interferes with searches for other or even smaller leaks.



#### A currently displayed leak is hidden through ZERO.

By using the function ZERO not only is the background signal hidden, but also the representation of a current leak.

- If you want to prevent this, select the function ZERO only if not measuring a leak at the same time.

If the gas concentration drips after setting the ZERO point, a negative measured value should be displayed. In order to avoid that, the ZERO point is revised downward if the measured value is negative for the duration of the "ZERO time," see below.

The ZERO point is not automatically revised up(wards). It is therefore important to regularly reset the ZERO point.

The ZERO point can be set with the left button on the handle and with the "ZERO" button in the measurement view.

You can activate or deactivate the buttons here in this menu. Deactivation prevents the function from being triggered inadvertently and an incorrect absolute measured value from thus being displayed.

The button on the sniffer line handle can also be activated or deactivated by pressing the button longer.

#### ZERO time

ZERO time is the time during which the leak rate must be negative so that the ZERO point can be revised downward automatically. The best setting depends on your measurement conditions (sampling speed, gas background, test specimen). See also "Ecotec 4000 factory settings [► 22]".

Setting range: 1 to 9.9 s

#### Activate or deactivate ZERO

✓  **Supervisor rights**

1  > Setup > ZERO and filter

2 If necessary change "ZERO mode". The factory setting is ZERO buttons "Enabled".

⇒ You can choose between "Enabled" and "Disabled".

⇒ If you select "Disabled", the ZERO button does not work.

3 Save .

⇒ If ZERO is activated, start the function by pressing the ZERO button.

**How do you activate the ZERO function during a measurement?**

- ✓ ZERO is activated, see above.
- ▶ During a measurement, activate the ZERO function on the SL4000 sniffer line by pressing the left button. Alternatively, press  on the touchscreen.
  - ⇒ When you press the ZERO button, the current leak rate value is set to the lower display limit.

**How do I switch the ZERO function OFF?**

- ▶ Press the ZERO button on the SL4000 sniffer line for longer than 2 seconds or press the button  on the touchscreen.

**See also**

 Design of touchscreen [► 15]

### 6.3.5 Changing leak rate filter

- ✓  **Supervisor rights**
- 1  > Setup > ZERO and filter
- 2 Make a selection between "I-Filter" and "Fixed" under "Leakage rate filter".
  - ⇒ The I-Filter is an intelligent filter algorithm that delivers the best results regarding interference suppression and stability of the leak rate signal.
  - ⇒ With the leak rate filter "Fixed" there is also a filter with a fixed time constant available.
- 3 Save .

### 6.3.6 User guidance with iGuide

#### 6.3.6.1 Introduction to iGuide

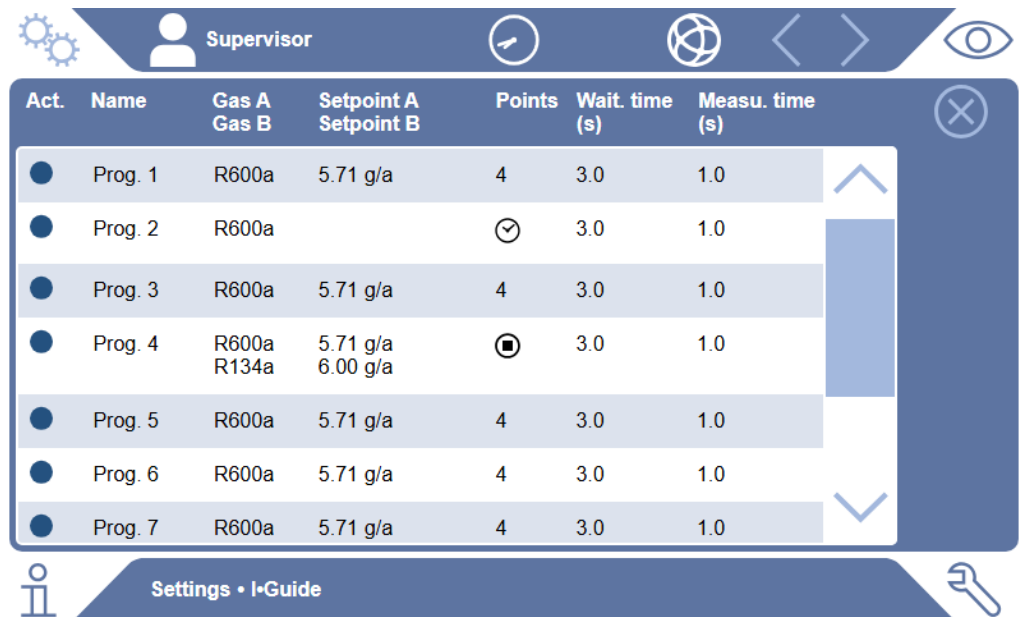
iGuide was developed to help operators use the correct technique for leak detection.

With the iGuide program, a time sequence and a repetition rate are specified when detecting one or two gases. The following details can be set:

- one or two gases
- Setpoints for gases
- Number of measuring points
- measurement time per measuring point
- idle time between measurements (transition to next measuring point)
- maximum permissible overall leak rate for the part to be tested

You can set a maximum of ten iGuide programs on the leak detector.

- ▶  > iGuide



| Act. | Name    | Gas A<br>Gas B | Setpoint A<br>Setpoint B | Points | Wait. time<br>(s) | Measu. time<br>(s) |
|------|---------|----------------|--------------------------|--------|-------------------|--------------------|
| ●    | Prog. 1 | R600a          | 5.71 g/a                 | 4      | 3.0               | 1.0                |
| ●    | Prog. 2 | R600a          |                          | ⌚      | 3.0               | 1.0                |
| ●    | Prog. 3 | R600a          | 5.71 g/a                 | 4      | 3.0               | 1.0                |
| ●    | Prog. 4 | R600a<br>R134a | 5.71 g/a<br>6.00 g/a     | ⊕      | 3.0               | 1.0                |
| ●    | Prog. 5 | R600a          | 5.71 g/a                 | 4      | 3.0               | 1.0                |
| ●    | Prog. 6 | R600a          | 5.71 g/a                 | 4      | 3.0               | 1.0                |
| ●    | Prog. 7 | R600a          | 5.71 g/a                 | 4      | 3.0               | 1.0                |

Fig. 7: Display of 10 set iGuide programs

Only one program can be active at a time. This is indicated by a green dot at the beginning of the line.

#### iGuide as a timer signal

You can also do without the calculation of an overall leak rate. The iGuide program then serves only as a guideline for time-controlled measurement (timer function). Set the number of measuring points to ZERO for this.

#### Capture results from a long measurement series with iGuide

You can use iGuide to summarize the leak rates from up to 98 measurement points. Set the number of measuring points to 98. If you then press the right-hand button on the sniffer handle for two seconds during the measurement, a results window with the individual measurements and the total leak rate is displayed. After the 98th measuring point, the result is displayed automatically.

### 6.3.6.2 Setting up individual iGuide programs

✓ The desired gas(es) is in your list overview, see also "Preset test gases [► 43]".

1  > iGuide



Fig. 8: Program list with context menu open.

2 To edit a program, click on the desired line and select .

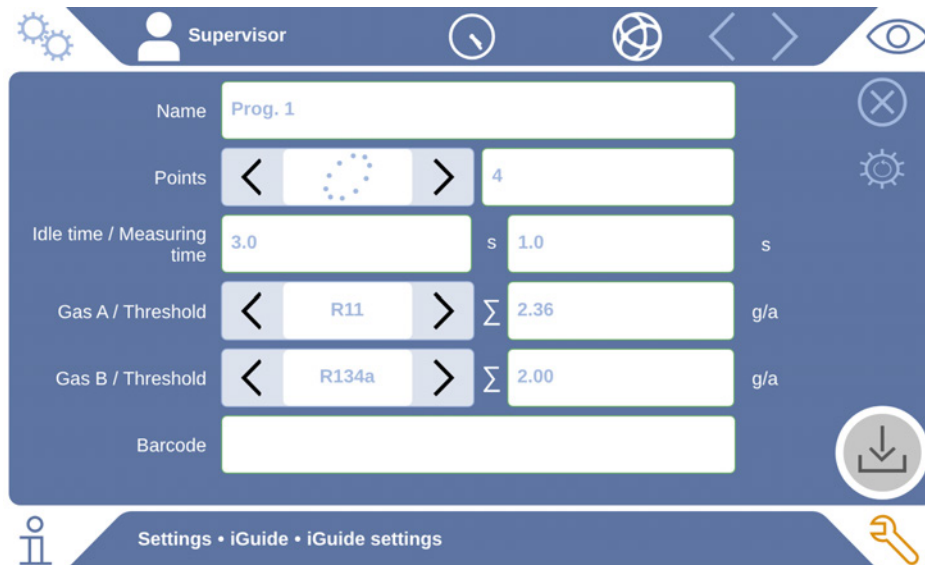


Fig. 9: Settings for an iGuide program in the "iGuide Settings" window

3 Adjust. Explanations of the individual fields can be found in the next chapter, see "Caption for the "iGuide Settings" window [► 63]".

4 Save .

5 To activate iGuide for one or two gases, select a line in the list overview shown above containing a program that can detect a maximum of two gases. Select  from the context menu.

⇒ The line with the activated program is marked with a green dot.

6 If you want to deactivate an active program, press  in the context menu of the activated program.

### 6.3.6.3 Caption for the "iGuide Settings" window

|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name                                           | The name is limited to 8 characters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                    |
| Points                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Select the point symbol and number of measuring points. Number of measuring points "1" to "98". The entry of a 99th measurement point corresponds only to a stop symbol.</p> <p>(Recommended use: When the number of measuring points is known)</p> <p>After processing the measuring points, each measuring point and the measured value are displayed in a list overview.</p> |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Time-controlled measurement (timer function). Therefore, only the waiting time, measuring time, and gases need to be set. No sum leakage rate.</p> <p>(Recommended application: If no individual measuring points are to be set)</p>                                                                                                                                            |
|                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Measurement is only stopped by pressing the stop button. Maximum 99 measuring points.</p> <p>(Recommended application: If the number of measuring points is not known in advance. Or if the same program is to be used with a different number of measuring points.)</p>                                                                                                        |
| Waiting time<br>[Wait time (s)]                | <p>Specifies how much time you have to move to the next point. Specification in s.</p> <p>You can set a time between 0.1 and 25 s for the transition to the next measuring point.</p>                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                    |
| Measuring time<br>[Measuring time (s)]         | <p>Specifies how long a point must be measured. Specify in 1 to 25 s. Do not set the measuring time shorter than the response time of the device, see "Technical data [► 20]".</p>                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                    |
| Gas A/<br>Setpoint A<br>[Gas A/<br>Setpoint A] | <p>The first measurement gas is specified here and the setpoint value is set. Gas A cannot be deactivated.</p> <p>As a gas, one of the 7 gases selected for the search can be selected, see "Preset test gases [► 43]".</p> <p>Setpoint A or B (<math>\Sigma</math>): This is where the maximum permissible leak rate for the sum of all measurements from an iGuide program is set.</p> <p><b>The setpoint value for a single measurement, on the other hand, corresponds to the setpoint originally set for a gas, see also "Preset test gases [► 43]".</b></p> |                                                                                                                                                                                                                                                                                                                                                                                    |
| Gas B/<br>Setpoint B<br>[Gas B/<br>Setpoint B] | <p>The second measured gas is specified here and the setpoint is set. Gas B can be deactivated.</p> <p>Gas B: Pre-set to "Disabled" if the field is not edited.</p>                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                    |
| Barcode                                        | <p>To store a barcode for the desired iGuide program via the USB interface of the leak detector. Enables quick switching between iGuide programs from within the measurement window using barcodes.</p>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                    |

### 6.3.7 Changing gas flow for SL4000

The sniffer line contains two capillaries with different diameters for minimum and maximum gas flow. The Ecotec 4000 allows for various gas flow settings for the SL4000:

- Low (Precision Mode)
- Medium (Optimum Mode) as factory setting
- High (High Speed Mode)

See also "Technical data [► 20]".



#### Sniffer lines with Background Canceling

Once Background Canceling is enabled, these sniffer lines automatically switch to the "LOW" flow. With Background Canceling enabled, switching to a higher flow rate level is not possible.

- To turn Background Canceling on or off, press and hold the right button  for a few seconds.

#### Adjusting the gas flow on the sniffer probe

✓ The button on the sniffer probe used to switch between different gas flow settings has not been deactivated via the leak detector. See further down in this chapter for details.

- 1 Adjust the flow rate in the sniffer line as needed by briefly pressing the right button  on the handheld probe.
  - ⇒ Each time the button is pressed, the flow rate increases by one level: Low (Precision Mode) -> Medium (Optimum Mode) -> High (High Speed Mode), after that again Low (Precision Mode).
- 2 After each flow change, wait a short time (3 seconds) and press ZERO once. See also "Setting and using the function ZERO [► 59]".

#### Changing the gas flow on the leak detector (advanced setting options)

✓  Operator or Supervisor rights

- 1  > Setup > Flow rate
- 2 Under Flow, use the "<" or ">" buttons to select the desired gas flow through the capillary of the sniffer line.
  - ⇒ Low (Precision Mode)
  - ⇒ Medium (Optimum Mode)
  - ⇒ High (High Speed Mode)
- 3 If you wish to deactivate or reactivate the switching option on the sniffer probe, adjust the "Flow button operable" option as desired.
- 4 Ensure that each desired flow mode is activated as a separate field and thus available.
- 5 Save .

⇒ After each flow change, wait a short time (3 seconds) and press ZERO once.



## 6.4 Measuring

- The Ectotec 4000 can basically detect 4 different gases in one measurement process, for example in mixed production lines. See also "Preset test gases [▶ 43]".  
Depending on the type of gas or intended use, there may also be a maximum of 2 different gases. See also "R600a or R290: Suppressing disruptive gases with IGS [▶ 57]" or "Introduction to iGuide [▶ 60]". In such a case, it may be advisable to store further two-gas combinations for changing the analysis. See "Setting up individual iGuide programs [▶ 62]".
- In a sniffer line with Background Canceling, an additional air inlet in the sniffer line allows for comparison with the tracer gas already present in the ambient air. If you have such a sniffer line, see "Measuring with Background Canceling [▶ 67]". In this mode, you can select only one measurement gas.
- If your sniffer line does not have Background Canceling, refer to "Standard measurements [▶ 66]".
- If you intend to perform recurring measurements on similar test objects, it is advisable to implement an assistance function for the sniffer line user. See also "Introduction to iGuide [▶ 60]", "Setting up individual iGuide programs [▶ 62]" and "Measuring with iGuide [▶ 69]".

### WARNING

#### Risk of electric shock

Electrical voltages can be transmitted via the sniffer probe and cause damage to property or personal injury.

- ▶ Do not touch live parts with the sniffer probe.
- ▶ Disconnect electrically operated test objects from the mains before starting the leak detection and secure them against being restarted without authorization.

### WARNING

#### Risk of eye damage

LEDs generate a bundled light that can damage your eyes.

- ▶ Do not look into the LEDs from a short distance or for longer periods of time.

### CAUTION

#### Risk of electric shock

Sucked up liquids can trigger short circuits and cause property damage or personal injury.

- ▶ Do not suck up liquids into the device.
- ▶ Use the water protection tip in humid environments.

**NOTICE****Material damage due to a missing sniffer line**

The device must not be operated without a connected sniffer line in order to avoid overpressure in pump and measurement system.

- ▶ Connect the sniffer line before you start up the device.
- ▶ Do not replace the sniffer line while the device is in operation.

**NOTICE****Melting of the sniffer tip on contact with very hot surfaces**

- ▶ Do not bring the sniffer tip into contact with very hot surfaces or open flames.

## 6.4.1 Standard measurements

- ✓ A sniffer line is connected to the leak detector.
  - ✓ The device has started up and warmed up, see also "Switching on [▶ 33]".
  - ✓ You have configured the device settings required for measurement, see "Basic settings [▶ 35]".
  - ✓ You have configured the measurement settings required for your measurement, see also "Settings for the measurements [▶ 43]".
  - ✓ The device is calibrated, see also "Calibrating [▶ 52]".
- 1 Keep the sniffer tip away from any potential gas sources and press the left button on the sniffer probe (ZERO). See also "Setting and using the function ZERO [▶ 59]".
  - 2 Perform sniffing of the test object.
    - ⇒ Measuring position and speed: Hold the sniffer tip to the potential leak as close as possible. The tip may even touch the test object. If a weld or similar component needs to be tested, the tip should be moved along the track at a speed of less than 10 cm/s. Please also note the minimum measurement times when searching for helium, see also "Special features of individual gases [▶ 75]".
    - ⇒ If necessary, adjust the flow rate at the sniffer line by pressing the right button  on the sniffer probe. With each press, the flow is increased by one step (Low (Precision Mode) -> Medium (Optimum Mode) -> High (High Speed Mode)), then returned Low (Precision Mode).
    - ⇒ If there is a leak, this is indicated in the displays, by flashing LEDs in the sniffer probe and - depending on your settings - also by an acoustic signal. You can choose between a bar chart (default setting) or a line chart. See "Design of touchscreen [▶ 15]".
  - 3 Because of the high measuring sensitivity of the device and because interfering gases can falsify the measurement result, you should repeat the measurement if a leak has been reported. Remember to suppress the background again beforehand (press the left button on the sniffer probe).

### Measurement in unstable subsurface conditions

In case of very unstable background conditions, it may be best to issue an alarm only if the setpoint is exceeded for a specified period of time, see also "Changing the audio settings of the leak detector [▶ 38]".

## 6.4.2 Measuring with Background Canceling

Influences on the measurement result caused by gases that are present in the environment in uneven concentrations should be minimized. For example, when detecting a CO<sub>2</sub> source in the simultaneous presence of breathing air (suppression of the same gas), see also "Special features of individual gases [► 75]".

In sniffer lines equipped with Background Canceling, a valve switches back and forth between the signal at the sniffer tip (test object) and the signal at the sniffer probe (ambient air), thereby generating an alternating signal (Background Canceling). For best performance when using the Background Canceling function, we recommend using a 3 or 5 m sniffer line.

This signal is automatically evaluated and the measurement result is determined in relation to the environment. Since the measurement process takes into account the tracer gas already present in the environment as well as other interfering gases, a ZERO function is not required when using Background Canceling.



Background Canceling only works with one gas being measured and only with a flow rate of LOW.

If you select another gas, the other one is automatically deactivated.

If Background Canceling is enabled, no gas can be used in IGS mode, as the two functions are mutually exclusive.

---

- ✓ You have connected a sniffer line with Background Canceling to your Ecotec 4000.
- ✓ The device has started up and warmed up, see also "Switching on [► 33]".
- ✓ You have configured the device settings required for measurement, see also "Basic settings [► 35]".
- ✓ You have configured the measurement settings required for your measurement, see also "Settings for the measurements [► 43]".
- ✓ You have set the desired measuring gas in the Ecotec 4000.
- ✓ You will see the start screen of the Ecotec 4000.
  - 1 Press the button "Background Canceling".
    - ⇒ The states of Background Canceling are indicated by colors.
      - No "Background Canceling" button is present: The sniffer probe does not support Background Canceling
      - Background Canceling cannot be activated (greyed out): Button not responding (e.g., when interfering gas suppression with IGS is active)
      - Background Canceling can be enabled (blue)
      - Background Canceling on (orange): Calibration is recommended.
      - Background Canceling on (white): Everything is working
  - 2 To achieve maximum sensitivity, perform a calibration. See also "Calibrating [► 52]".
    - ⇒ The modulated signal is generated and evaluated. This synchronization remains active as long as the device is running.
  - 3 Perform sniffing of the test object.
    - ⇒ With Background Canceling, the flow rate at the sniffer line is automatically set to Low (Precision Mode).

⇒ If there is a leak, this is indicated in the displays, by flashing LEDs in the sniffer handle and - depending on your settings - also by an acoustic signal. You can choose between a bar chart (default setting) or a line chart. See also "Design of touchscreen [► 15]".

### 6.4.3 Measuring with iGuide

Messages on the leak detector display, messages on the sniffer probe display, and beeps guide you through the program.



To confirm the measurement at a single measuring point, press the right button on the sniffer probe.

---

- ✓ A sniffer line is connected to the leak detector.
- ✓ The device has started up and warmed up, see also "Switching on [▶ 33]".
- ✓ You have configured the device settings required for measurement, see also "Basic settings [▶ 35]".
- ✓ You have configured the measurement settings required for your measurement, see also "Settings for the measurements [▶ 43]".
- ✓ The device is calibrated, see also "Calibrating [▶ 52]".
- ✓ You have set the desired gas flow through the sniffer line, see also "Changing gas flow for SL4000 [▶ 64]".

1  > iGuide

2 Ensure that the desired program is activated with a maximum of 2 gases entered (green dot). See also "Setting up individual iGuide programs [▶ 62]".

⇒ If the green dot is missing, activate the desired program by clicking on "Play" in the context menu for that line.

⇒ A message indicates that the iGuide program has been changed.

3 Switch to the main menu. Measurement will start immediately.

4 Follow the messages.

| Process                                  | Message in main device display                                                                                                                                                                                                        | Message in handle display                                                                                                                                                                                                                                     | Acoustic basic unit | Acoustic signal handle |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------------|
| Next measuring position                  | Move the sniffer tip to the next measuring point                                                                                                                                                                                      |                                                                                                                                                                             | -                   | -                      |
| Idle time to move to the measuring point | Measurement in progress! Hold the sniffer tip at the measuring point.                                                                                                                                                                 |                                                                                                                                                                             | -                   | -                      |
| Request to confirm position              | Confirm that the sniffer tip is at the measurement point.                                                                                                                                                                             |                                                                                                                                                                             | -                   | -                      |
| Measure                                  | Measurement in progress! Hold the sniffer tip at the measuring point.                                                                                                                                                                 |                                                                                                                                                                             | Ticking             | Ticking                |
| Measurement complete                     | <p>All points are okay! (Green)<br/>or<br/>Some points not okay! (Red)<br/>or<br/>Total leak rate too high (red)</p>  <p>Open/close iGuide Log</p> |  <p>The total of gas A/B is displayed with a green or red background color.</p> <p>All points are OK if the bottom field is green. Otherwise, some points are faulty.</p> | -                   | -                      |

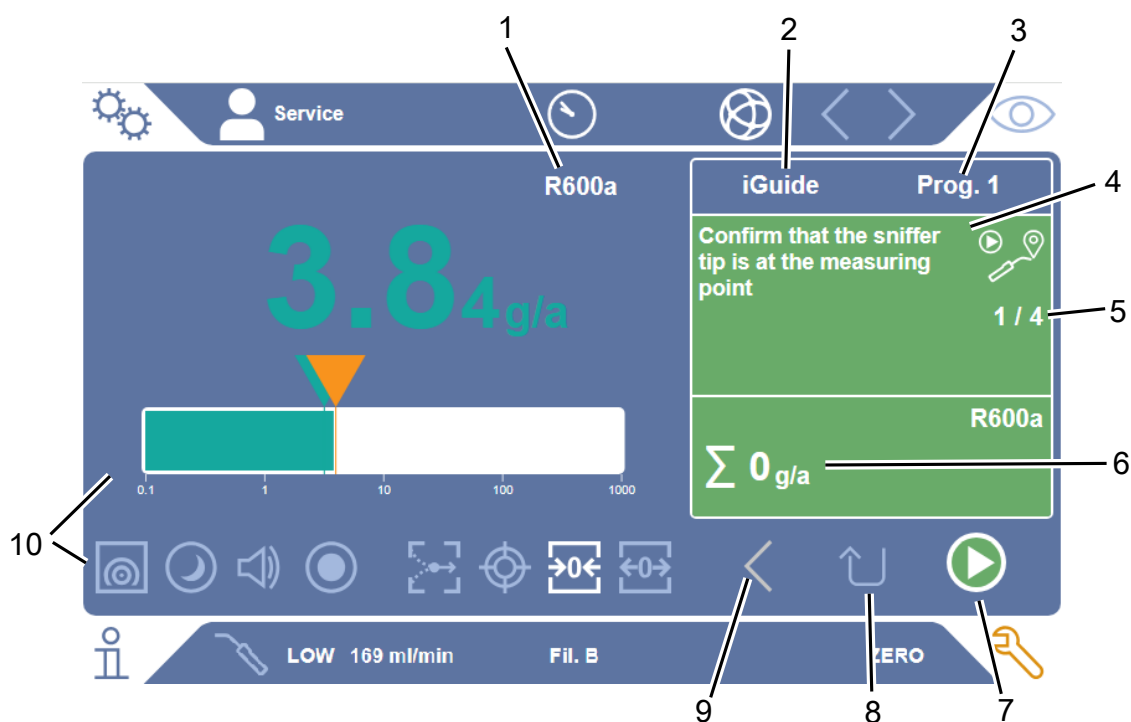
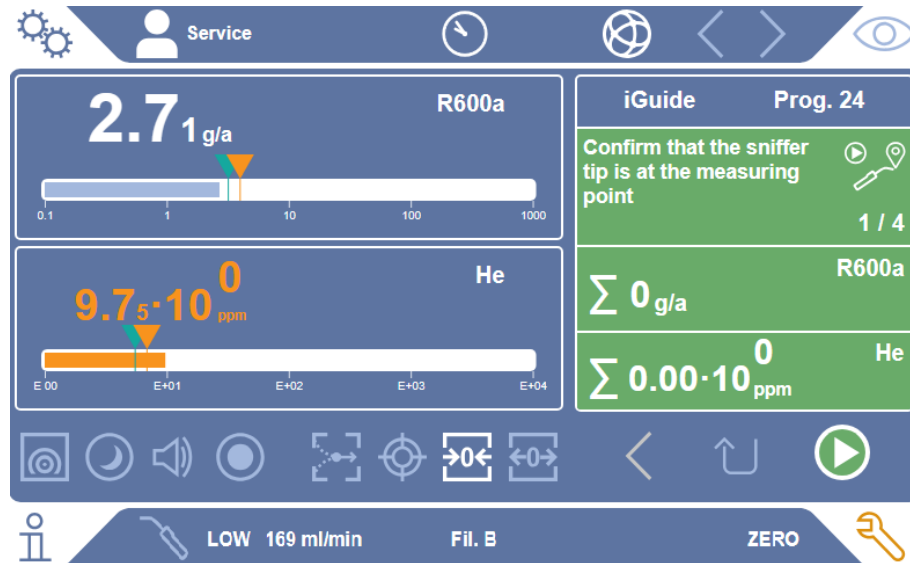


Fig. 10: Display when gas is active.

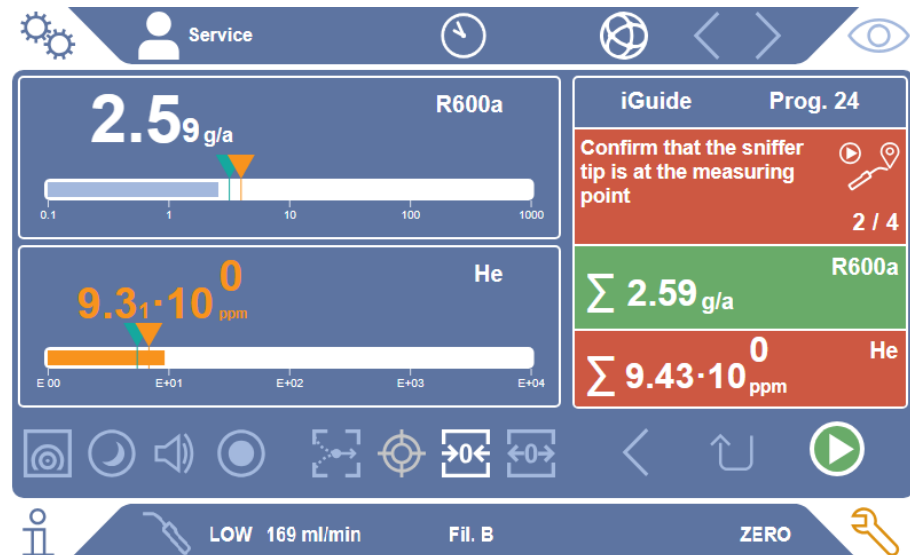
|   |                                                                              |    |                                                                                                                                                                                                                         |
|---|------------------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Measured gas                                                                 | 6  | Total amount of gas. Below the setpoint, the background is green; above the setpoint, the background is red.                                                                                                            |
| 2 | Display for iGuide                                                           | 7  | The play button confirms the point and the device measures the point.                                                                                                                                                   |
| 3 | Program name. Click on the program name to jump to the settings page         | 8  | The middle symbol restarts the entire program.                                                                                                                                                                          |
| 4 | Instruction                                                                  | 9  | The left symbol "<" indicates that you can go back one step.                                                                                                                                                            |
| 5 | Display indicating which of several points you are at. Further action steps. | 10 | Display as a bar chart  or as a line chart  . |

### Before confirming the first measuring point



- Example with detection of 2 gases
- Even if the measured value for He exceeds the set setpoint here, this does not result in a red color in the right result field before the first measuring point is confirmed.
- The first measuring point must be confirmed when the program starts (press the right button on the sniffer line or press )

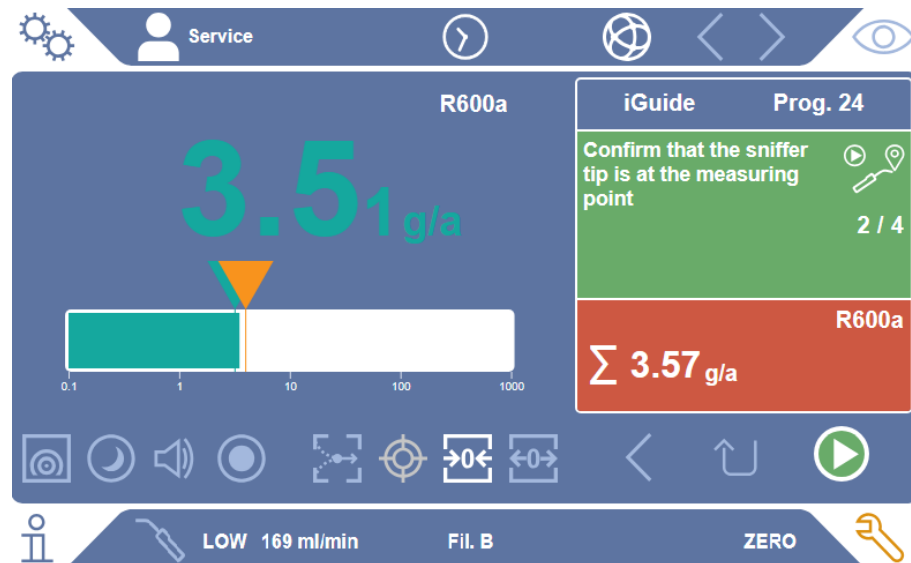
### Before confirming another measuring point



- Because the measured value for helium (He) exceeds the set setpoint at a measuring point, this leads to a red coloring in the right result field.
- The measurement can already be terminated at a measuring point that is "leaky".
- If you still want an overall result, continue with the measurements.



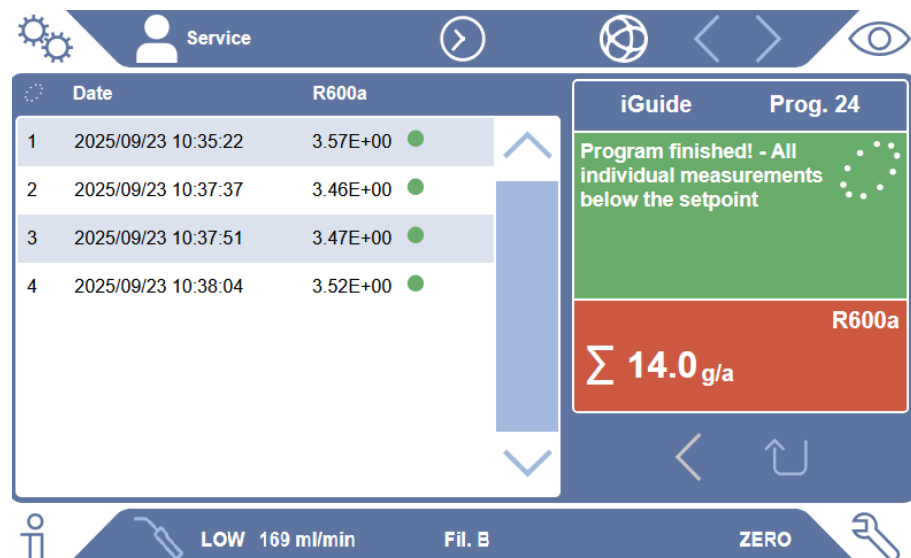
### Only total value outside tolerance



### Measurement history (iGuide Log)

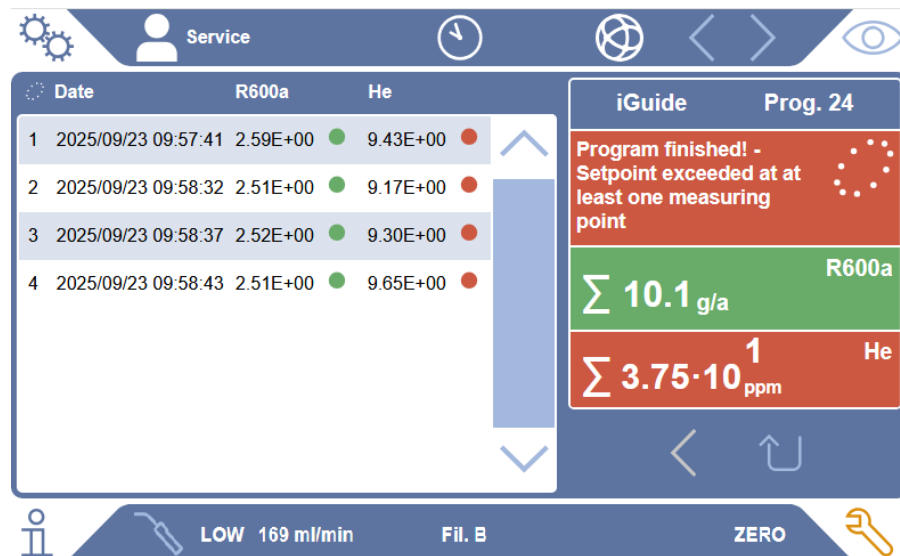
The measurement history with the measurement results of the individual measurement points is opened in the following cases:

- The program has been run
- iGuide has been restarted
- Green areas were clicked (even during a measurement)



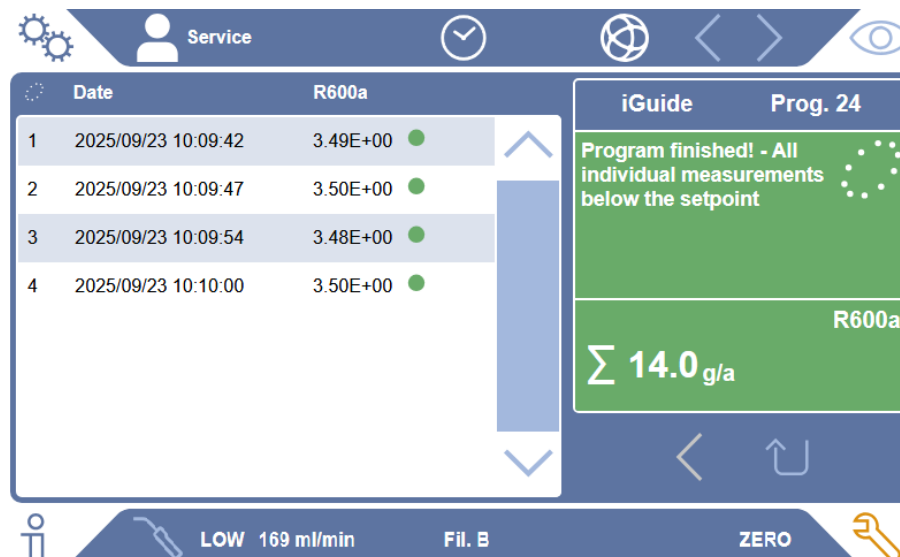
- In the example shown, the leak rate at all measuring points is within the tolerable range.
- However, the total gas leakage exceeds the specified limit.
- The test object is leaking.

All measuring points have been checked, total of all measuring points outside tolerance



- The program has been run.
- At least one individual measuring point exceeds the setpoint, therefore the test object is leaking.
- If measurement is continued, the total value is also outside the tolerance.
- The test object is leaking.

All measuring points checked. Everything OK.



- Example with detection of a single gas
- The program has been run.
- Both individual measuring points and total evaluation are OK
- Test object is tight.

## 6.5 Special features of individual gases

### R134a: Influencing by cyclopentane and R245fa

When sniffing for R134a, the presence of cyclopentane and R245fa can lead to false measurement results. Search for R134a with alternative mass position 83 if cyclopentane and R245fa could be sniffed. Setting a different mass, see also "Setting Custom Gas [► 49]".

### R600a: Influencing by cyclopentane and isopentane

When sniffing for R600a, the presence of cyclopentane and isopentane can lead to false measurement results. Search for R600a with the IGS mass position if cyclopentane and isopentane could be sniffed. Setting the IGS mass position, see also "R600a or R290: Suppressing disruptive gases with IGS [► 57]".

### Special features with helium

When sniffing for helium, the Ecotec 4000 takes longer for analysis than for refrigerants. Therefore, observe the following times during which you must not move the sniffer tip.

| Length of sniffer line | Minimum measurement time |
|------------------------|--------------------------|
| 3 m                    | 0.5 s                    |
| 5 m                    | 0.8 s                    |
| 10 m                   | 1.8 s                    |
| 15 m                   | 2.8 s                    |

Table 2: Minimum measurement times for helium

The smallest detectable leak rate of the Ecotec 4000 for helium is  $1 \times 10^{-6}$  mbar l/s (higher than for refrigerant).

### Special features with hydrogen / forming gas

When sniffing for hydrogen/forming gas, the Ecotec 4000 takes longer for analysis than for refrigerants. Therefore stick to the following minimum measurement times.

| Length of sniffer line | Minimum measurement time |
|------------------------|--------------------------|
| 3 m                    | 0.6 s                    |
| 5 m                    | 0.7 s                    |
| 10 m                   | 1.9 s                    |
| 15 m                   | 2.9 s                    |

Table 3: Minimum measurement times for hydrogen

If you want to verify hydrogen, the warm-up phase of the device must be extended to 1 hour before the first calibration.

The smallest detectable leak rate of the Ecotec 4000 for hydrogen is  $1 \times 10^{-6}$  mbar l/s (higher than for refrigerants).

### Methane

Methane (R50) cannot be calibrated with the built-in EcoCheck 4000, as methane is only detected at mass 15 (which is outside the range for the allowed internal calibration of 40 to 105).

Therefore use the external calibrated leak "TL4-6 for methane" for calibration. See also "Accessories and spare parts [► 113]".

### Carbon dioxide (CO<sub>2</sub>)

When sniffing for carbon dioxide (R744), the presence of carbon dioxide from the environment, and especially from sources such as combustion engines and the user's own breathing gas, can lead to false measurement results.

To suppress the same gas, it is best to use a sniffer line with the option of Background Canceling; see also "Measuring with Background Canceling [► 67]". Avoid direct, directed entry of gas clouds with a high carbon dioxide content into the sniffer line (for example, through breathing).

For best performance when using the Background Canceling function, we recommend using a 3 or 5 m sniffer line.

## 6.6 Information

### 6.6.1 Calling the latest information to the current measurement value

- ▶  > Measurement values
  - Tab “Leak rate and pressure”: The leak rate and different pressure values are shown.
  - Tab “Temperature”: Various temperature values are displayed.
  - Tab “Run times”: The current runtime information is displayed.

### 6.6.2 Information on connected accessories

- ▶  > Accessories > I/O module
  - ⇒ If an I/O module is connected, you will find details.
- ▶  > Accessories > Bus module
  - ⇒ If a bus module is connected, you will find details.

### 6.6.3 Retrieving information about the device

Diverse information on the device is shown: Software and serial numbers, network information and operating hours.

- ▶  > Device
  - Tab “Identification”
  - Tab “Network”
  - Tab “Operating hours”
  - Tab “Controller”

### 6.6.4 Calling information on the assemblies

Diverse measurement values and information to the following assemblies is shown: Preamplifier, ion source, turbo molecular pump (TMP), processor assembly MSB, backing pump and its frequency converter.

- ▶  > Assemblies > Miles per Hour
- ▶  > Assemblies > Emission
- ▶  > Assemblies > TMP
- ▶  > Assemblies > MGM

- ▶  > Assemblies > Backing pump

### 6.6.5 Calling the energy data information

Various measured supply voltages and electrical powers are displayed.

- ▶  > Energy > Voltage (1)
  - ⇒ In this window the first part of the information to the voltage is shown.
- ▶  > Energy > Voltage (2)
  - ⇒ In this window the second part of the information to the voltage is shown.
- ▶  > Energy > Current

### 6.6.6 Viewing information about calibration leaks

- ▶  > Calibration leak
  - ⇒ If one or more calibration leaks are connected, you will find details about them.

### 6.6.7 Calling information on the SL4000 sniffer line

- ▶  > Sniffer line

## 6.7 Logs

Logs contain historical data that is automatically recorded by the leak detector.

### 6.7.1 Viewing the error and warning log

- ▶  > Logs > Errors and warnings

If there are more than 20 entries always the oldest entry is deleted.

You can find a list of all possible error and warning messages at:

- ▶  > Help > Errors and warnings

### 6.7.2 Viewing calibration log

The entries are for the entire period of use of the device. If there are more than approx. 20 entries always the oldest entry is deleted.

- ▶  > Logs > Calibrations

### 6.7.3 Viewing maintenance log

- ▶  > Logs > Maintenance

If there are more than 20 entries always the oldest entry is deleted.

### 6.7.4 Viewing emissions log

See also "Automatically switching cathode [► 41]".

-  > Logs > Emission

### 6.7.5 Viewing IGS log

See also "R600a or R290: Suppressing disruptive gases with IGS [► 57]".

-  > Logs > IGS

### 6.7.6 Viewing K1 log

-  > Logs > K1

## 6.8 Device settings

### 6.8.1 Viewing and customizing individual parameters

You are able to get a quick overview of the actual settings of the device and you can make modifications, if needed.

- ✓ You have the required right to change the specific parameter.

- 1  > Parameter sets > Parameter list  
⇒ The device settings will be displayed as a list.
- 2 Modify individual parameters, if needed.
- 3 Save .

- To modify parameters, press alternatively a subheading in the list. A separate setting window will be opened, where you can change and save.

⇒ After changing a parameter setting in a separate window press  to return to the list of parameters.

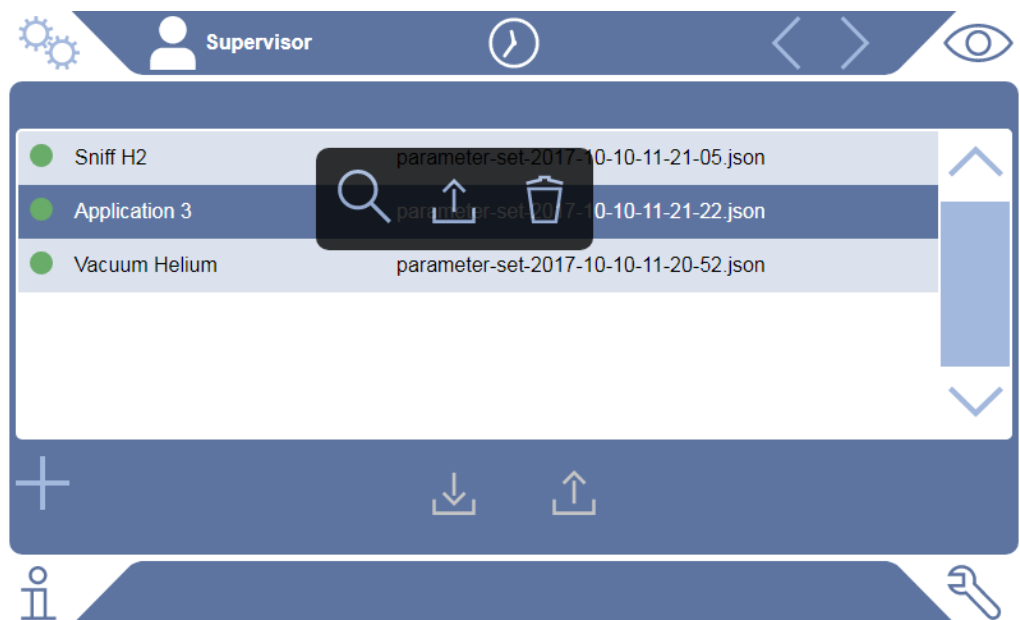
### 6.8.2 Saving and managing sets of parameters

A set of parameters is a collection of parameters with the relevant settings of the device. You are able to save sets of parameters in text-based files at any time. The parameters can be viewed in clearly arranged form.

- ✓  **Supervisor rights**

- 1  > Parameter sets > Manage parameter sets  
⇒ Sets of parameters already created will be displayed as a list.  
If the values of a saved set of parameters match the actual settings of the device 100 %, a green dot will be displayed.
- 2 To create a new set of parameters, press .

- ⇒ In the next window you can insert a free text description. The prefix "parameter-set" and the date of saving are used for the file name. Save . You are able to save max 10 sets of parameters.
- 3 To open the context menu of a created set of parameters, press the desired set of parameter and choose
- , to view further details concerning the parameters contained. If parameters do not match actual device settings, an orange dot will be displayed.
- If there is a missing setting, a red dot will be displayed (after a software update for example). We recommend to view the missing setting, to create a new set of parameters and to delete the old set of parameters.
- , to activate a set of parameters.
- , to delete a set of parameters.



### 6.8.3 Exporting or importing sets of parameters

You are able to transfer saved sets of parameters from the internal memory to an attached USB flash drive and to import the sets again.

✓  **Supervisor rights**

- 1  > Parameter sets > Manage parameter sets
- 2 To export all sets of parameters to a USB flash drive (formatted in FAT32) if needed, press  below the list.
- 3 To import all sets of parameters from a USB flash drive into the device, press  below the list.
 

⇒ All sets of parameters on the USB flash drive will be saved in the device, if the number of 10 is not exceeded. Using a PC you can delete redundant sets of parameters on the USB flash drive before transferring.

- ⇒ You must not modify parameters of a set of parameters on the USB flash drive before importing. You cannot transfer these files to the device after the modification.

## 6.9 Updating the software

3 updates are required to update the software of the leak detector:

- User interface (Operating unit)
- Basic unit
- MGM (Gas inlet module)

3 additional update options are available for updating the software of the connected components:

- Calibration leak
- Sniffer line
- I/O module

### 6.9.1 Updating the user interface software

Import software updates using a USB flash drive.

#### NOTICE

##### Loss of data due to disconnection

- ▶ Do not switch off the device and do not remove the USB flash drive while the software is being updated.

#### ✓ Supervisor rights

- 1 Copy the update file in question to the root directory of a FAT32-formatted USB flash drive.
    - ⇒ The files for additional individual updates can also be copied to the main directory at the same time.
  - 2 Connect the USB flash drive to a USB port on the device.
  - 3  > Update > Update operating unit
    - ⇒ The active software version of the user interface is displayed at the top of the window.  
If there are one or more software versions on the USB flash drive, the latest version found will be displayed in the line below. If this is the same as the version already installed the background is green, otherwise it is red.
  - 4 In order to load the new software version, press on the button "Update".
- ⇒ After completion there is an automatic restart of the operating unit.

### 6.9.2 Updating the software of the basic unit

Import software updates using a USB flash drive.



## NOTICE

### Loss of data due to disconnection

- ▶ Do not switch off the device and do not remove the USB flash drive while the software is being updated.

#### ✓ Supervisor rights

- 1 Copy the update file in question to the root directory of a FAT32-formatted USB flash drive.
  - ⇒ The files for additional individual updates can also be copied to the main directory at the same time.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update > Update Basic Unit
  - ⇒ The active software version of the basic unit is displayed at the top of the window.  
If there are one or more software versions on the USB flash drive, the latest version found will be displayed in the line below. If this is the same as the version already installed the background is green, otherwise it is red.
- 4 In order to load the new software version, press on the button "Update".
  - ⇒ After completion there is an automatic restart of the system.

## 6.9.3 Updating the software in expert mode

#### ✓ Supervisor rights

- 1  > Update > Update operating unit/basic unit > Operating unit expert update
    - ⇒ Software versions already available on the device are shown in a list.
  - 2 To activate a specific software version if needed, select that software version and proceed to step 5.
    - ⇒ Reverting to an older software version is possible.
  - 3 If alternatively you want to add a new software version, connect a FAT32 formatted USB flash drive with the update file to one of the USB ports of the device.
  - 4 In order to load the new software version, press on .
  - 5 To activate the new version, select the desired list entry and press .
- ⇒ After completion there is an automatic restart of the system.

## 6.9.4 Updating the MGM (Gas inlet module)

#### ✓ Supervisor rights

- 1 Copy the update file in question to the root directory of a FAT32-formatted USB flash drive.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update > Update MGM
- 4 Follow the instructions.

## 6.9.5 Updating software of connected components

You can update the software for each component individually:

- Calibration leak EcoCheck 4000 internal
- Sniffer line
- I/O module

Import software updates using a USB flash drive.

### NOTICE

#### Loss of data due to disconnection

- ▶ Do not switch off the device and do not remove the USB flash drive while the software is being updated.

#### ✓ Supervisor rights

- ✓ The desired component is connected to the leak detector.

- 1 Copy the update file for the desired component to the root directory of a FAT32-formatted USB flash drive.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update
- 4 Choose between calibration leak, sniffer line and I/O module.
  - ⇒ The active software version is displayed at the top of the window.  
If there are one or more software versions on the USB flash drive, the latest version found will be displayed in the line below. If this is the same as the version already installed the background is green, otherwise it is red.
- 5 In order to load the new software version, press on the button "Update".

⇒ After completion there is an automatic restart of the system.

## 6.10 Using external monitor

In addition to the view on the internal monitor, you have the option of displaying a second view on an external monitor. The external monitor always displays the measurement screen.

The touch function of a touchscreen monitor is not supported.

- ✓ You have a display monitor with an HDMI port and a corresponding power supply.

- 1 Connect the display monitor to the HDMI port of the leak detector using an HDMI cable, see "Connections for accessories and control signals [▶ 17]".  
You can connect the external monitor at any time.
  - ⇒ The measurement screen image will also be displayed on the external monitor.
- 2 If you wish to use a computer mouse on the touchscreen or display monitor, connect the mouse via the USB port on the leak detector.

## 6.11 Disconnecting external monitor

You can disconnect the connection to the external display monitor at any time.

## 6.12 Resetting settings, measurement gases, or system data

You can reset one or more settings. This will not reset the leak detector's software.

✓  **Supervisor rights**

1  > Reset

2 Make your choice:

- ⇒ If you want to reset all settings (parameters), press the "Reset settings to default values" button.
- ⇒ If you want to reset the measurement gases to their default values, press the "Reset measurement gases" button. See also "Preset test gases [▶ 43]".
- ⇒ If you want to delete all saved data, press the "Delete all stored data" button.

## 6.13 Logging off from the device

- 1 Press your name, which is displayed in the upper left corner of the display, or select  > User accounts.
  - ⇒ The window "User accounts" opens. See also "Modify personal settings [▶ 37]".
- 2 You log off from the device via the button "Log off".
  - ⇒ The login window opens.

## 6.14 Switching off

### NOTICE

#### Turbo molecular pump can be damaged

The running turbo molecular pump can be damaged by jerky movements or foreign objects.

- ▶ Avoid any jerking movements or vibrations to the device during operation and for up to 2 minutes after switching off.
- 
- ▶ Switch off the device at the desired time using the power switch.
    - ⇒ The parameters set in the device remain saved.

## 6.15 How to put into sleep mode (Standby)

- ▶ To put the leak detector into sleep mode, press the Standby button  in the device's main menu.
  - ⇒ The speed of the fore pump is reduced.

- ⇒ In standby mode, "Standby" and the "START" button are displayed. Press the "START" button to restart the Ecotec 4000.  
Alternatively, you can return the device to measurement mode by moving the handle.
- ⇒ The electrical components cannot maintain operating temperature in idle mode.  
After a restart, precise measurements are therefore possible only after the warm-up time, see "Calibrating [► 52]".

**See also**

- 📄 Turning Auto Standby on or off [► 40]

## 7 Warning and error messages

During operation, the display shows information that helps you operate the device. Measurement values are displayed along with current device modes, operating instructions as well as warnings and error messages. The device is equipped with extensive self-diagnostic functions. If the electronics detect a faulty state, the device will show this as far as possible on the display and will interrupt operation when necessary. Warning and error messages consist of a number, a descriptive text, and often an associated measured value (e.g., a measured voltage).

|                                   |                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Warnings</b>                   | <p>Warnings warn of device states that can impair the accuracy of measurements. The device will continue to operate.</p> <p>To view details about the cause and how to resolve the issue, press .</p> <p>To close a warning message, press the "Clear" button after reading it.</p> |
| <b>Error messages</b>             | <p>Errors are events that force the interruption of the operation.</p> <p>To view details about the cause and how to resolve it, press .</p> <p>Once you have resolved the cause of the error, resume operation by pressing the "Clear" button.</p>                                 |
| <b>Active errors and warnings</b> | <p>This menu item is only displayed when the template contains errors or warnings:</p> <p>▶  &gt; Errors and warnings</p>                                                                                                                                                             |
| <b>Confirmed warnings</b>         | <p>If an active warning is acknowledged without rectifying the cause, it is displayed under "Confirmed warnings".</p> <p>▶  &gt; Confirmed warnings</p>                                                                                                                              |
| <b>Reference on the display</b>   | <p>An overview of possible errors and warnings can be found at:</p> <p>▶  &gt; Help &gt; Errors and warnings</p>                                                                                                                                                                    |

### 7.1 Displaying warnings as errors

Up to 8 arbitrary warning messages can be upgraded to error messages.

Unlike warnings, errors lead to an interruption in the operation of the device. Thus, by upgrading warnings to errors, you can prevent an operator from ignoring these warnings and continuing to work with the device.

#### Upgrading selected warnings to errors

- 1  > General > Display warnings as errors
- 2 Make your settings in the "Display warning as error" window.
  - ⇒ Select the desired "List entry no." from the numbers 1 - 8.
  - ⇒ From the number list of warnings below, select the number that should become an error message. If the numbers are held down longer for selection, the number is incremented in steps of ten.
  - ⇒ To change a warning that has been upgraded to an error, enter the desired new warning number under the same "List entry no.".
  - ⇒ For your overview, the text of the warning in question is displayed in the lower part of the window.
- 3 Confirm with "OK."
  - ⇒ Alternatively, exit the window without saving by pressing the "X" button.

## Undoing the upgrading of warnings to errors

- 1  > General > Display warnings as errors
- 2 Make your settings in the "Display warning as error" window.
  - ⇒ Select the used "List entry no." with the assigned warning number from the digits 1 - 8.
  - ⇒ Set a value below 100 in the displayed number overview of warnings. This will cause "No entry" to be displayed.
- 3 Confirm with "OK."

## 7.2 List of warning and error messages

| Type | Notification                                         | Possible sources of error                                 | Remedy                                                                                                                                                                                                                                                           |
|------|------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W102 | Timeout during communication with EEPROM on VI-Board | The EEPROM on the VI-Board is defective or does not exist | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                                                     |
| W104 | One EEPROM parameter has been initialized            | A new parameter was introduced by a software update       | <ul style="list-style-type: none"> <li>• Confirm the warning message</li> <li>• Check that the message does not appear when you restart the device</li> <li>• Check whether the factory setting of the new parameter corresponds to your application</li> </ul>  |
|      |                                                      | The EEPROM on the VI-Board is defective                   | <ul style="list-style-type: none"> <li>• Confirm the warning message</li> <li>• Check if the message occurs each time when you restart the device</li> <li>• Contact customer service</li> </ul>                                                                 |
| W105 | Note: Gas library has been modified                  | Gas parameters were changed via an interface              | <ul style="list-style-type: none"> <li>• No troubleshooting available</li> </ul>                                                                                                                                                                                 |
| W106 | Several EEPROM parameters have been initialized      | A software update introduced new parameters               | <ul style="list-style-type: none"> <li>• Confirm the warning message</li> <li>• Check that the message does not appear when you restart the device</li> <li>• Check whether the factory setting of the new parameters corresponds to your application</li> </ul> |
|      |                                                      | The EEPROM on the VI-Board was replaced                   | <ul style="list-style-type: none"> <li>• Confirm the warning message</li> <li>• Check that the message does not appear when you restart the device</li> <li>• Check whether the factory setting of the new parameters corresponds to your application</li> </ul> |
|      |                                                      | The EEPROM on the VI-Board is defective                   | <ul style="list-style-type: none"> <li>• Confirm the warning message</li> <li>• Check if the message occurs each time when you restart the device</li> <li>• Contact customer service</li> </ul>                                                                 |
| E107 | Internal IIC communication error                     | Internal IIC communication error                          | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                                                     |
| E108 | Internal IIC2 communication error                    | Internal IIC2 communication error                         | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                                                     |
| W109 | Real-time clock error                                | The real-time clock may be defective                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                                                     |

| Type | Notification                                       | Possible sources of error                                                                                                     | Remedy                                                                                                                                                            |
|------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W110 | Real-time clock was reset!<br>Enter date and time  | The real-time clock has not been set                                                                                          | <ul style="list-style-type: none"> <li>• Enter the correct date and time</li> <li>• Check that the message does not appear when you restart the device</li> </ul> |
|      |                                                    | Jumper for battery not plugged into motherboard                                                                               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
|      |                                                    | Battery on MSB is discharged or defective                                                                                     | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
|      |                                                    | Real-time clock defective                                                                                                     | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
| W111 | Many EEPROM write cycles within the last 6 minutes | A very large number of write commands were issued through interfaces. Over time, this reduces the service life of the EEPROM. | <ul style="list-style-type: none"> <li>• Remove the excess write accesses from your control program</li> </ul>                                                    |
| E112 | Impermissible DIP switch setting                   | A DIP switch on the motherboard is in an invalid position.                                                                    | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
|      |                                                    | The component is defective.                                                                                                   | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
| W122 | No response from bus module                        | Connection to BUS module interrupted                                                                                          | <ul style="list-style-type: none"> <li>• Check the connection to the bus module</li> <li>• Replace the connection cable to the bus module</li> </ul>              |
|      |                                                    | Bus module defective                                                                                                          | <ul style="list-style-type: none"> <li>• Replace the bus module</li> </ul>                                                                                        |
|      |                                                    | Bus module connection on the device defective                                                                                 | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
| W124 | The device only supports one bus module.           | A second bus module was connected.                                                                                            | <ul style="list-style-type: none"> <li>• Remove the second bus module.</li> </ul>                                                                                 |
| W125 | I/O module no longer connected                     | Connection to I/O module interrupted                                                                                          | <ul style="list-style-type: none"> <li>• Check the connection to the I/O module</li> <li>• Replace the connection cable to the I/O module</li> </ul>              |
|      |                                                    | I/O module defective                                                                                                          | <ul style="list-style-type: none"> <li>• Replace the I/O module</li> </ul>                                                                                        |
|      |                                                    | I/O module connection on the device defective                                                                                 | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |
| W127 | Wrong bootloader version                           | The bootloader is not compatible with application                                                                             | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                      |



| Type | Notification                                 | Possible sources of error                                                                                                                    | Remedy                                                                                                              |
|------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| E129 | EEPROM contains data from wrong device class | The software of the basic unit does not match the EEPROM                                                                                     | • Contact customer service                                                                                          |
|      |                                              | The EEPROM does not match this device class                                                                                                  | • Contact customer service                                                                                          |
| W130 | Sniffer line not connected                   | The sniffer line cannot be addressed by the device                                                                                           | • Check the connection between sniffer line and the device (disconnect and reconnect)<br>• Contact customer service |
|      |                                              | Sniffer line defective                                                                                                                       | • Use another sniffer line, if possible<br>• Contact customer service                                               |
| W132 | Sniffer line is not supported                | Sniffer line is not supported                                                                                                                | • Replace the sniffer line with a sniffer line type supported by the device                                         |
| W151 | No communication with operating unit         | A software update or a parameter reset has been executed                                                                                     | • Confirm the warning message<br>• Check that the message does not appear when you restart the device               |
|      |                                              | Internal connection problem between the basic unit and the operating unit                                                                    | • Contact customer service                                                                                          |
| W152 | No communication with control panel          | Internal connection problem between the basic unit and the control panel                                                                     | • Contact customer service                                                                                          |
| W153 | Operating unit software version is obsolete  | A more up-to-date operating unit software is available. For trouble-free operation, it is recommended to update the operating unit software. | • Contact the customer service for the latest operating unit software                                               |
| W156 | Incorrect ID for unlock code                 | Incorrect ID for unlock code                                                                                                                 | • Check whether the activation code is correct.                                                                     |
| W158 | Sniffer version is outdated                  | There is more up-to-date software available. For trouble-free operation, it is recommended to update the software.                           | • Install the latest software                                                                                       |
| W159 | Calibration leak version is outdated         | There is more up-to-date software available. For trouble-free operation, it is recommended to update the software.                           | • Install the latest software                                                                                       |

| Type | Notification                                                            | Possible sources of error                                                                                          | Remedy                                                                                        |
|------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| W160 | Gas inlet module version is outdated                                    | There is more up-to-date software available. For trouble-free operation, it is recommended to update the software. | <ul style="list-style-type: none"> <li>• Install the latest software</li> </ul>               |
| E167 | Run-up blocked, the 'Interlock' function is active                      | The dongle is not connected to the ACCESSORIES port                                                                | <ul style="list-style-type: none"> <li>• Plug the dongle into the ACCESSORIES port</li> </ul> |
|      |                                                                         | The dongle connected to the ACCESSORIES port is defective                                                          | <ul style="list-style-type: none"> <li>• Use another module if possible</li> </ul>            |
|      |                                                                         | The 'Interlock' function was activated unintentionally                                                             | <ul style="list-style-type: none"> <li>• Deactivate the 'Interlock' function</li> </ul>       |
| W171 | CU1000 not supported                                                    | A CU1000 cannot be used with this device                                                                           | <ul style="list-style-type: none"> <li>• Disconnect the CU1000 from this device</li> </ul>    |
| W201 | Internal U24V voltage too low                                           | Overload in the power supply                                                                                       | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W202 | Internal U24V voltage too high                                          | Short circuit in the power supply                                                                                  | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W206 | 24V operating unit supply voltage out of range                          | Malfunction of operating unit                                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
|      |                                                                         | Short circuit or overload in the 24V operating unit supply                                                         | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W208 | 24V fan supply voltage out of range                                     | Malfunction of a fan                                                                                               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
|      |                                                                         | Short circuit or overload in the 24V fan supply                                                                    | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W210 | Supply voltage of gas inlet module / calibration leak outside the range | Short circuit or overload in the power supply                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W212 | Supply voltage of the service interface outside the range               | Short circuit or overload in the power supply                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W215 | 3.3V internal supply voltage out of range                               | Short circuit or overload in the power supply                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |
| W220 | Transpector supply voltage 24V outside the range                        | Short circuit or overload in the power supply                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                  |

| Type | Notification                                                   | Possible sources of error                                                                                       | Remedy                                    |
|------|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| W221 | Internal voltage 24V_RC voltage out of range                   | The remote control is defective                                                                                 | • Use another remote control, if possible |
|      |                                                                | The cable connected to REMOTE CONTROL connector is defective                                                    | • Use another cable, if possible          |
|      |                                                                | The accessory connected to ACCESSORIES connector is defective                                                   | • Use another accessory, if possible      |
|      |                                                                | The cable connected to ACCESSORIES connector is defective                                                       | • Use another cable, if possible          |
|      |                                                                | Short circuit or overload in the 24V_RC supply                                                                  | • Contact customer service                |
| W222 | Internal voltage 24V_IO voltage out of range                   | The module connected to LD connector is defective                                                               | • Use another module, if possible         |
|      |                                                                | The cable connected to LD connector is defective                                                                | • Use another cable, if possible          |
|      |                                                                | Short circuit or overload in the 24V_IO supply                                                                  | • Contact customer service                |
| W223 | Internal voltage 24V_TMP1 voltage out of range                 | Short circuit or overload in the 24V_TMP1 supply                                                                | • Contact customer service                |
| W224 | Supply voltage of the backing pump interface outside the range | Short circuit or overload in the power supply                                                                   | • Contact customer service                |
| W255 | Fan current is out of range                                    | Fan not connected                                                                                               | • Contact customer service                |
|      |                                                                | Fan blocked or defective                                                                                        | • Contact customer service                |
| E256 | Note: Sniffer cable has been removed                           | Note: Sniffer cable has been removed                                                                            | • Confirm the warning message             |
| W309 | Burn In not performed                                          | A burn-in must be performed during initial commissioning and when replacing the transpector or the backing pump | • Perform the burn-in                     |
| E339 | No thermal emission on either filament                         | Filaments are burnt out                                                                                         | • Contact customer service                |
|      |                                                                | Transpector is defective                                                                                        | • Contact customer service                |
|      |                                                                | Pressure is too high                                                                                            | • Contact customer service                |

| Type | Notification                                   | Possible sources of error                                                                                                         | Remedy                                                                                                                                                                                     |
|------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E340 | Emission error                                 | Filaments are burnt out                                                                                                           | • Contact customer service                                                                                                                                                                 |
|      |                                                | Transpector is defective                                                                                                          | • Contact customer service                                                                                                                                                                 |
|      |                                                | Pressure is too high                                                                                                              | • Contact customer service                                                                                                                                                                 |
| E345 | Transpector hardware fault                     | Transpector malfunction                                                                                                           | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W346 | Transpector hardware warning                   | Transpector malfunction                                                                                                           | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| E347 | Transpector overpressure                       | The sniffer line cannot be addressed by the device                                                                                | <ul style="list-style-type: none"> <li>• Check the connection between sniffer line and the device (disconnect and reconnect)</li> <li>• Contact customer service</li> </ul>                |
|      |                                                | Transpector is defective                                                                                                          | • Contact customer service                                                                                                                                                                 |
| E349 | No thermal emission on either filament         | Filaments are burnt out                                                                                                           | • Contact customer service                                                                                                                                                                 |
|      |                                                | Transpector is defective                                                                                                          | • Contact customer service                                                                                                                                                                 |
|      |                                                | Pressure is too high                                                                                                              | • Contact customer service                                                                                                                                                                 |
| E352 | No communication with Transpector              | Component is not connected correctly or cable is defective                                                                        | • Contact customer service                                                                                                                                                                 |
| E353 | Transpector Communication has been interrupted | Component is not connected correctly or cable is defective                                                                        | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W354 | Sensitivity of the leak detector too low       | Transpector is defective                                                                                                          | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W357 | Transpector firmware is outdated               | There is a more recent Transpector firmware available. The Transpector firmware must be updated to ensure trouble-free operation. | • Contact customer service                                                                                                                                                                 |
| E400 | TMP error message                              | Unhandled error message from the TMP                                                                                              | • Contact customer service                                                                                                                                                                 |

| Type | Notification                               | Possible sources of error              | Remedy                                                                                                                                                                                              |
|------|--------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W401 | TMP warning message                        | Unhandled warning message from the TMP | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| E402 | No communication with turbo pump converter | TMP cable defective or not connected   | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
|      |                                            | TMP converter defective                | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
|      |                                            | Motherboard defective                  | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| E404 | TMP current consumption too high           | Pressure in the TMP is too high        | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| W405 | No TMP run-up                              | Inlet pressure during run-up too high  | <ul style="list-style-type: none"> <li>• Check that the backing pump is working during run-up</li> <li>• Check that the pressure drops during run-up</li> <li>• Contact customer service</li> </ul> |
|      |                                            | TMP bearing damage                     | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| E410 | TMP temperature too high                   | The ambient temperature is too high    | <ul style="list-style-type: none"> <li>• Turn off the device and let it cool down</li> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                       |
|      |                                            | Air filter dirty                       | <ul style="list-style-type: none"> <li>• Clean the air vents or replace the filter plates</li> </ul>                                                                                                |
|      |                                            | Fan blocked or defective               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| W411 | High TMP temperature                       | The ambient temperature is too high    | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                           |
|      |                                            | Air filter dirty                       | <ul style="list-style-type: none"> <li>• Clean the air vents or replace the filter plates</li> </ul>                                                                                                |
|      |                                            | Fan blocked or defective               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| W421 | TMP voltage too low                        | Power supply to TMP not sufficient     | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| E422 | No TMP run-up                              | Inlet pressure during run-up too high  | <ul style="list-style-type: none"> <li>• Check that the backing pump is working during run-up</li> <li>• Check that the pressure drops during run-up</li> <li>• Contact customer service</li> </ul> |
|      |                                            | TMP bearing damage                     | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |
| E423 | TMP pressure rise                          | Inrush of air into TMP                 | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                        |

| Type | Notification                                              | Possible sources of error                                  | Remedy                                                                                                                                                                                     |
|------|-----------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E452 | No communication with backing pump                        | Backing pump control cable defective or not connected      | • Contact customer service                                                                                                                                                                 |
|      |                                                           | Backing pump has no power supply                           | • Contact customer service                                                                                                                                                                 |
|      |                                                           | Backing pump converter defective                           | • Contact customer service                                                                                                                                                                 |
|      |                                                           | VI-Board or MSB defective                                  | • Contact customer service                                                                                                                                                                 |
| E453 | Software version of the fore-vacuum pump is not supported | The software is not compatible with the system.            | • Contact customer service                                                                                                                                                                 |
| E463 | Temperature error of backing pump                         | The ambient temperature is too high                        | • Reduce the temperature in the environment where the device is located                                                                                                                    |
|      |                                                           | Fan blocked or defective                                   | • Contact customer service                                                                                                                                                                 |
|      |                                                           | Ambient temperature is too low                             | • Increase the temperature in the environment where the device is located                                                                                                                  |
|      |                                                           | Temperature sensor of backing pump is defective            | • Contact customer service                                                                                                                                                                 |
| E464 | Power consumption of backing pump too high                | Exhaust connection sealed                                  | • Make sure that the exhaust hose is correctly connected                                                                                                                                   |
|      |                                                           | Heavy duty operation                                       | • Contact customer service                                                                                                                                                                 |
| E465 | Incorrect flow direction in backing pump                  | Gas flow into device due to pressure at exhaust connection | • Remove the pressure from the exhaust connection                                                                                                                                          |
| W468 | Unhandled warning message of backing pump                 | Unhandled error message from the backing pump              | • Contact customer service                                                                                                                                                                 |
| E469 | The fore-vacuum pump has switched off.                    | Unhandled error message from the backing pump              | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| E470 | Pre-vacuum pump reports blocked rotors                    | Unhandled error message from the backing pump              | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W500 | Pressure sensor malfunction, p1                           | Pressure sensor p1 defective                               | • Contact customer service                                                                                                                                                                 |
| W502 | Pressure sensor malfunction, p2                           | Pressure sensor p2 defective                               | • Contact customer service                                                                                                                                                                 |
| W504 | Pressure sensor malfunction, p3                           | Pressure sensor p3 defective                               | • Contact customer service                                                                                                                                                                 |

| Type | Notification                                                                                                                          | Possible sources of error                                                                                                             | Remedy                                                                                                                                                                                     |
|------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E506 | Gas inlet module could not read the ambient pressure                                                                                  | Pressure sensor defective                                                                                                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                                                                       | Sniffer tip or capillary blocked                                                                                                      | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
|      |                                                                                                                                       | The sniffer line cannot be addressed by the device                                                                                    | <ul style="list-style-type: none"> <li>• Check the connection between sniffer line and the device (disconnect and reconnect)</li> <li>• Contact customer service</li> </ul>                |
| W508 | Note: The deviation in ambient pressure after standby exceeds 10%                                                                     | The current ambient pressure differs too much from the ambient pressure measured when the device started up                           | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> </ul>                                     |
| W510 | You have activated High Speed Mode. The smallest measurable leak rate (sensitivity) is 10 times greater (worse) than in Optimum Mode. | You have activated High Speed Mode. The smallest measurable leak rate (sensitivity) is 10 times greater (worse) than in Optimum Mode. | <ul style="list-style-type: none"> <li>• No troubleshooting available</li> </ul>                                                                                                           |
| E539 | No communication with the gas inlet module                                                                                            | There is an internal connection problem.                                                                                              | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W540 | Flow through capillary is too low! Leaks may not be detectable (Precision mode)                                                       | Filter is dirty                                                                                                                       | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                                         |
|      |                                                                                                                                       | Sniffer tip or capillary blocked                                                                                                      | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul>            |
|      |                                                                                                                                       | The pressure limit for a blocked capillary is set too high                                                                            | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                                      |
| W541 | Flow through capillary is much too low! Leaks may not be detectable (Precision mode)                                                  | Filter is dirty                                                                                                                       | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                                         |
|      |                                                                                                                                       | Sniffer tip or capillary blocked                                                                                                      | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul>            |
|      |                                                                                                                                       | The pressure limit for a blocked capillary is set too high                                                                            | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                                      |

| Type | Notification                                                                          | Possible sources of error                                  | Remedy                                                                                                                                                                          |
|------|---------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E542 | No flow through capillaries (Precision mode)                                          | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                              |
|      |                                                                                       | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                       | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                           |
| W545 | Fluss durch Kapillare für Modulation zu klein                                         | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                              |
|      |                                                                                       | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                       | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                           |
| W550 | Flow through capillary is too low! Leaks may not be detectable (High speed mode)      | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                              |
|      |                                                                                       | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                       | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                           |
| W551 | Flow through capillary is much too low! Leaks may not be detectable (High speed mode) | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                              |
|      |                                                                                       | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                       | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                           |
| W552 | No flow through capillaries (High speed mode)                                         | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                              |
|      |                                                                                       | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul> |
|      |                                                                                       | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                           |



| Type | Notification                                                                       | Possible sources of error                                  | Remedy                                                                                                                                                                                     |
|------|------------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W553 | Flow through capillary is too low! Leaks may not be detectable (Optimum mode)      | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                                         |
|      |                                                                                    | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul>            |
|      |                                                                                    | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                                      |
| W554 | Flow through capillary is much too low! Leaks may not be detectable (Optimum mode) | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                                         |
|      |                                                                                    | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul>            |
|      |                                                                                    | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                                      |
| W555 | No flow through capillaries (Optimum mode)                                         | Filter is dirty                                            | <ul style="list-style-type: none"> <li>• Replace the sniffer tip filter</li> </ul>                                                                                                         |
|      |                                                                                    | Sniffer tip or capillary blocked                           | <ul style="list-style-type: none"> <li>• Remove the blocking of the sniffer tip</li> <li>• Use another sniffer line, if possible</li> <li>• Contact customer service</li> </ul>            |
|      |                                                                                    | The pressure limit for a blocked capillary is set too high | <ul style="list-style-type: none"> <li>• Check and change the pressure limit, if necessary</li> </ul>                                                                                      |
| W567 | Real-time clock was reset! Enter date and time                                     | Pressure sensor p3 defective                               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| E568 | Pressure sensor p3 measures too higher a pressure                                  | Pressure sensor p3 defective                               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
|      |                                                                                    | Pressure sensor p3 defective                               | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W571 | 3.3V internal supply voltage out of range (gas inlet module)                       | The component is defective.                                | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W572 | 5V internal supply voltage out of range (gas inlet module)                         | The component is defective.                                | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W573 | 24V supply voltage out of range (gas inlet module)                                 | The component is defective.                                | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| E574 | Internal IIC communication error (gas inlet module)                                | The component is defective.                                | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |

| Type | Notification                                               | Possible sources of error                         | Remedy                                                                                                                                                                                                                            |
|------|------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E575 | Internal IIC2 communication error (gas inlet module)       | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W576 | IIC reinitialization (gas inlet module)                    | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W577 | IIC2 reinitialization (gas inlet module)                   | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W578 | Wrong bootloader version (gas inlet module)                | The bootloader is not compatible with application | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                      |
| W579 | Some EEPROM parameters are not set (gas inlet module)      | A software update introduced new parameters       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W580 | An EEPROM parameter is incorrect (gas inlet module)        | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W581 | Several EEPROM parameters are incorrect (gas inlet module) | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W582 | Temperature too high (gas inlet module)                    | The ambient temperature is too high               | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                                                         |
|      |                                                            | The component is defective.                       | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W583 | Unknown error (gas inlet module)                           | The software is not compatible with the system.   | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Install the latest software</li> <li>• Contact customer service</li> </ul> |
| W625 | Leak rate of internal calibration leak not yet set         | EEPROM parameter was reset                        | <ul style="list-style-type: none"> <li>• Enter the correct leak rate for the internal calibration leak</li> </ul>                                                                                                                 |
| W633 | Gas calibration request (1)                                | Gas requires calibration                          | <ul style="list-style-type: none"> <li>• Perform a calibration</li> </ul>                                                                                                                                                         |

| Type | Notification                                                 | Possible sources of error                         | Remedy                                                                                                                                                                                 |
|------|--------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W634 | Gas calibration request (2)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W635 | Gas calibration request (3)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W636 | Gas calibration request (4)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W637 | Gas calibration request (5)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W638 | Gas calibration request (6)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W639 | Gas calibration request (7)                                  | Gas requires calibration                          | <ul style="list-style-type: none"> <li>Perform a calibration</li> </ul>                                                                                                                |
| W641 | 3.3V internal supply voltage out of range (Calibration leak) | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| W642 | 5V internal supply voltage out of range (Calibration leak)   | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| W643 | 24V supply voltage out of range (Calibration leak)           | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| E644 | Internal IIC communication error (Calibration leak)          | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| E645 | Internal IIC2 communication error (Calibration leak)         | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| W646 | IIC reinitialization (Calibration leak)                      | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| W647 | IIC2 reinitialization (Calibration leak)                     | The component is defective.                       | <ul style="list-style-type: none"> <li>Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>Contact customer service</li> </ul> |
| W648 | Wrong bootloader version (Calibration leak)                  | The bootloader is not compatible with application | <ul style="list-style-type: none"> <li>Contact customer service</li> </ul>                                                                                                             |

| Type | Notification                                                           | Possible sources of error                       | Remedy                                                                                                                                                                                                                            |
|------|------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W649 | Some EEPROM parameters are not set (Calibration leak)                  | A software update introduced new parameters     | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W650 | An EEPROM parameter is incorrect (Calibration leak)                    | The component is defective.                     | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W651 | Several EEPROM parameters are incorrect (Calibration leak)             | The component is defective.                     | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W652 | Calibration leak Light barrier is faulty                               | Calibration leak Light barrier is faulty        | <ul style="list-style-type: none"> <li>• Refer to the user manual for troubleshooting.</li> </ul>                                                                                                                                 |
| W653 | Temperature too high. Component switches itself off (Calibration leak) | The ambient temperature is too high             | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                                                         |
|      |                                                                        | The component is defective.                     | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul>                                        |
| W655 | Unknown error (Calibration leak)                                       | The software is not compatible with the system. | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Install the latest software</li> <li>• Contact customer service</li> </ul> |
| E709 | Temperature of basic unit too low                                      | Ambient temperature is too low                  | <ul style="list-style-type: none"> <li>• Increase the temperature in the environment where the device is located</li> </ul>                                                                                                       |
|      |                                                                        | Temperature sensor is defective                 | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                      |
| W710 | Temperature of basic unit too high                                     | The ambient temperature is too high             | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                                                         |
|      |                                                                        | Air filter dirty                                | <ul style="list-style-type: none"> <li>• Clean the air vents or replace the filter plates</li> </ul>                                                                                                                              |
|      |                                                                        | Fan blocked or defective                        | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                      |
| E711 | Maximum temperature of basic unit exceeded                             | The ambient temperature is too high             | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                                                         |
|      |                                                                        | Air filter dirty                                | <ul style="list-style-type: none"> <li>• Clean the air vents or replace the filter plates</li> </ul>                                                                                                                              |
|      |                                                                        | Fan blocked or defective                        | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                                                                      |

| Type | Notification                                             | Possible sources of error                               | Remedy                                                                                                                                                                                     |
|------|----------------------------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| W800 | 3.3V internal supply voltage out of range (Sniffer line) | The component is defective.                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W801 | 5V internal supply voltage out of range (Sniffer line)   | The component is defective.                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W802 | 24V supply voltage out of range (Sniffer line)           | The component is defective.                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W803 | Several EEPROM parameters are incorrect (Sniffer line)   | The component is defective.                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W804 | Temperature outside the range (Sniffer line)             | The ambient temperature is too high                     | <ul style="list-style-type: none"> <li>• Reduce the temperature in the environment where the device is located</li> </ul>                                                                  |
|      |                                                          | The component is defective.                             | <ul style="list-style-type: none"> <li>• Turn the power off to the device and check if the message appears again when you turn on the power</li> <li>• Contact customer service</li> </ul> |
| W901 | Maintenance: TMP bearing/lubricant                       | Maintenance interval for TMP bearing/lubricant exceeded | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W902 | Maintenance: Calibration leak                            | The gas cartridge is almost empty.                      | <ul style="list-style-type: none"> <li>• Replace the gas cartridge</li> </ul>                                                                                                              |
| W903 | Maintenance: Calibration leak                            | The gas cartridge is empty.                             | <ul style="list-style-type: none"> <li>• Replace the gas cartridge</li> </ul>                                                                                                              |
| W904 | Maintenance: Sniffer tip filter                          | Maintenance interval for sniffer tip filter exceeded    | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W905 | Maintenance: Sniffer tip filter                          | Maintenance interval exceeded                           | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W906 | Maintenance: Sniffer line                                | Maintenance interval exceeded                           | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W907 | Maintenance: Sniffer tip filter                          | Maintenance interval exceeded                           | <ul style="list-style-type: none"> <li>• Perform maintenance</li> </ul>                                                                                                                    |
| W910 | Maintenance: Backing pump                                | Maintenance interval for backing pump exceeded          | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |
| W920 | Maintenance: Exhaust filter                              | Maintenance interval for exhaust filter exceeded        | <ul style="list-style-type: none"> <li>• Contact customer service</li> </ul>                                                                                                               |

| Type | Notification            | Possible sources of error                    | Remedy                                                                     |
|------|-------------------------|----------------------------------------------|----------------------------------------------------------------------------|
| W925 | Maintenance: Air filter | Maintenance interval for air filter exceeded | <ul style="list-style-type: none"><li>• Contact customer service</li></ul> |

## 8 Cleaning, Maintenance and Service

All cleaning and maintenance work described here must be carried out without opening the device!



### **DANGER**

#### **Risk of death from electric shock**

There are high voltages inside the device. Touching parts where electrical voltage is present can result in death.

- ▶ Disconnect the device from the power supply prior to any cleaning and maintenance work. Ensure that the electrical supply cannot be switched back on unintentionally.
- ▶ Don't open the device!

### 8.1 Cleaning the housing

- Wipe the housing of the leak detector with a soft damp, soft cloth.
- Only use water for moistening. Avoid cleaning agents that contain alcohol, fat or oil.
- Make sure that the side ventilation grille (knurled screw) and the bottom ventilation grille are not dirty. To open the ventilation grilles, see "Replacing the side filter mat of the Ecotec 4000 [▶ 103]" and "Replacing the filter mat on the bottom of the Ecotec 4000 [▶ 104]".
- Take special care when cleaning the opening of a calibration leak. Do not flush it with liquids.

### 8.2 Replacing the side filter mat of the Ecotec 4000

- ✓ The device has been in operation for 5,000 hours, previously in a dusty environment. See also "Retrieving information about the device [▶ 76]".
- ✓ You have a new filter mat (order no. 200014727).
  - 1 Make sure that the device is disconnected from the power supply by disconnecting the power supply plug.
  - 2 To access the filter mat, loosen the knurled screw on the side of the device. See also "Device [▶ 13]".
  - 3 Fold the ventilation grille outwards a little and pull it upwards.
  - 4 Change the filter mat.
  - 5 Reattach the ventilation grille to the device and press it firmly against the housing.
  - 6 Tighten the knurled screw by hand.

## 8.3 Replacing the filter mat on the bottom of the Ecotec 4000



### CAUTION

#### Risk of injury from sharp edges of the ventilation grille

- Wear protective gloves when handling the ventilation grille.

- ✓ The device has been in operation for 5,000 hours, previously in a dusty environment. See also "Retrieving information about the device [► 76]".
- ✓ You have a new filter mat (order no. 200014726).
- ✓ The device has been turned off for at least 2 minutes.
  - 1 Make sure that the device is disconnected from the power supply by disconnecting the power supply plug.
  - 2 To access the filter mat on the underside, carefully lay the leak detector on its side.
  - 3 Loosen the screw on the ventilation grille.



- 4 Open the ventilation grille and pull it sideways.
- 5 Change the filter mat.
- 6 Slide the ventilation grille into place and tighten the screw.

## 8.4 Replacing mains fuses

- 1 Make sure that the device is disconnected from the power supply by disconnecting the power supply plug.
- 2 Use a suitable tool to lever the flap open from above. The fuses are located behind the flap.





Fig. 11: Lever off the cover

- 3 Pull out the cover with the fuses.



Fig. 12: Cover with fuses

- 4 Replace the fuses.  
The fuse rating is 6.3 A. The mains fuses are available under order no. 52 025 321. Two identical fuses must be inserted in both drawers.
- 5 Replace the cover with the new fuses.

## 8.5 Replacing EcoCheck 4000 or gas cartridge (optional)

### Replace EcoCheck 4000

- 1 To replace the EcoCheck 4000, pull it out of the front panel of the Ecotec 4000.
- 2 Insert a filled EcoCheck 4000 back into the slot.

### Replace the gas cartridge of the EcoCheck 4000

- 1 If the calibration leak is inserted in the leak detector, pull the calibration leak out of the leak detector.
- 2 Unscrew the gas cartridge counterclockwise.



- 3 Screw the new gas cartridge hand-tight into the casing clockwise. Make sure the thread is inserted straight.
- 4 Insert the calibration leak into opening for the calibration leak on the front cover of the leak detector or connect the calibration leak externally to the leak detector, see "Using EcoCheck 4000 internally in the Ecotec 4000 (optional) [► 30]" or "Alternatively: Connecting EcoCheck 4000 externally to the Ecotec 4000 (optional) [► 31]".
- 5  > Setup > Replace gas cartridge



- 6 To initialize the gas cartridge for use as an internal or external calibration leak, select the calibration leak where you replaced the gas cartridge.
- 7 Enter the replacement code for the gas cartridge. Take the replacement code for the gas cartridge from the certificate supplied.  
Alternatively, scan the QR code on the supplied inspection certificate or on the gas cartridge with a scanner connected to the leak detector.  
⇒ A confirmation screen appears on the display of the leak detector.
- 8 Save .
- ⇒ The gas cartridge is initialized.
- 9 Dispose of the old gas cartridge in accordance with national regulations. Please be aware that the old gas cartridge may still contain gas.

## 8.6 Replacing the SL4000 sniffer line filter



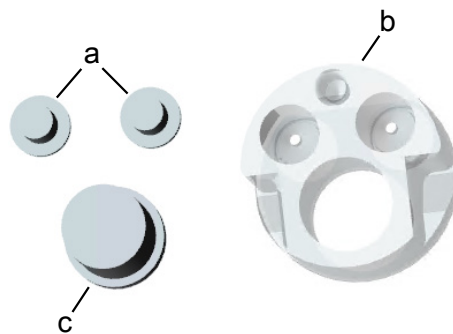
### ⚠ CAUTION

#### Danger due to harmful substances

Contaminated filter holders or filters in the sniffer probe can pose a health risk through skin contact.

- ▶ When handling hazardous substances, wear personal protective equipment such as protective clothing or gloves.
- ▶ During disposal, observe the environmental and safety regulations of your country.

The sniffer probe contains a filter holder. The filter holder and the individual filters can be replaced if necessary, see "Accessories and spare parts ▶ 113".



|   |               |   |           |
|---|---------------|---|-----------|
| a | Filter normal | c | Filter XL |
| b | Filter holder |   |           |

✓ The connected leak detector is switched off.

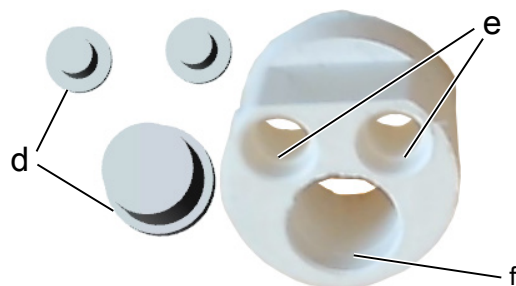
- 1 Unscrew the union nut from the sniffer probe and remove the sniffer tip.
- 2 Remove the filter holder from the sniffer probe.



- 3 Remove the filters from the filter holder using the filter ejector. Alternatively, use a new filter holder.



- 4 Insert the new filters with the ribs into the recesses of the filter holder. Make sure you fill all filter containers.



|   |                      |   |           |
|---|----------------------|---|-----------|
| d | Rip                  | f | Filter XL |
| e | Recess filter normal |   |           |

- 5 Place the filter holder onto the sniffer tip. Make sure that the orientation of the sniffer tip matches the orientation of the recess in the filter holder.



- 6 Place the sniffer tip with the filter holder onto the sniffer probe.



- 7 Place the union nut over the sniffer tip onto the sniffer probe and tighten the union nut by hand.



- 8 To avoid incorrect measurements or long response times, visually check that the union nut is flush with the stop on the sniffer probe.



- 9 Calibrate the leak detector.

## 8.7 Replacing the nozzle of the sniffer tip

A nozzle is installed at the front end of the sniffer tip. The nozzle can be replaced if it is worn or blocked, see also "Accessories and spare parts [► 113]".

- 1 To remove the nozzle, unscrew the nozzle from the sniffer tip.



- 2 To install a new nozzle, screw the nozzle onto the sniffer tip.

## 8.8 Preparing to contact support

### 8.8.1 Taking screenshots of the user interface

You can save the current screen content of the device to an image file. You can use such a file for service communication, for example.

- 1  > USB stick
- 2 Select the "Enable Screenshot" option.
- 3 Create a folder named "Screenshots" on a USB flash drive (formatted as FAT 32).
- 4 To take a screenshot, connect the USB stick to one of the USB ports of the leak detector, see also "Connections for accessories and control signals [► 17]".
  - ⇒ A screenshot is automatically taken and stored in the directory on the USB stick. The date and time are also saved.
- 5 To take another screenshot, disconnect the USB stick from the USB port and then reconnect it to the leak detector.
  - ⇒ A screenshot saved earlier will not be overwritten when another screenshot is taken.

### 8.8.2 Exporting service-related data

After consulting with INFICON, you can export service-related data, for example, for remote diagnostics.

- 1 Connect a USB flash drive to the leak detector. See also "Connections for accessories and control signals [► 17]".
- 2  > Service export
- 3 Follow the instructions.

## 8.9 Maintenance plan

| Maintenance work                                                                                           | Component                                   | Spare part number      | Operating hours* |      |      |       | Years in operation | Service level |
|------------------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------|------------------|------|------|-------|--------------------|---------------|
|                                                                                                            |                                             |                        | 2500             | 5000 | 7500 | 10000 |                    |               |
| Replace the Normal and XL filter in the sniffer line if necessary (SL4000)                                 | Filter normal<br>Filter XL                  | 200014653<br>200014654 | X                | X    | X    | X     |                    | I             |
| Replace the filter mat on the side                                                                         | Filter mat, side                            | 200014727              |                  | X    |      | X     |                    | I             |
| Replace the bottom filter mat                                                                              | Filter mat, bottom                          | 200014726              |                  | X    |      | X     |                    | I             |
| Clean the ventilation openings                                                                             | -                                           | -                      | X                | X    | X    | X     |                    | I             |
| Replace the EcoCheck 4000 gas cartridge after 2 years                                                      | EcoCheck 4000                               | 533-011                |                  |      |      |       | 2                  | I             |
| Check that the exhaust hose is connected properly                                                          | -                                           | -                      |                  |      |      |       | 3                  | I             |
| Replace two internal filters                                                                               | Filter disc<br>Filter purge gas             | 200012919<br>200000683 |                  | X    |      | X     |                    | II            |
| Replace the diaphragms in the diaphragm pump                                                               | Maintenance kit for KNF standard pump PJ338 | 200010076              |                  |      |      | X     |                    | III           |
| Functional test of the valve for Background Canceling on the SL4000 sniffer line with Background Canceling | -                                           | -                      |                  |      |      |       | 3                  | III           |
| Check the Shimadzu TB70 turbo molecular pump through the manufacturer                                      | -                                           | -                      |                  |      |      |       | 4                  | III           |

\* Maintenance intervals in accordance with the manufacturer's specifications and the environmental conditions described in the operating instructions. If these conditions differ, the maintenance intervals must be adjusted.

Explanation of the maintenance plan:

- Service level I: Customer or higher level
- Service level II: Customer with training or higher level
- Service level III: INFICON service technician

## 9 Decommissioning

### 9.1 Disposing of the device

The owner can dispose of the device or it can be sent to INFICON.

The device consists of materials that can be recycled. This option should be exercised to prevent waste and also to protect the environment.

- During disposal, observe the environmental and safety regulations of your country.



Device cannot be disposed of as normal domestic waste.

### 9.2 Returning the device for maintenance, repair or disposal



#### **WARNING**

##### **Danger due to harmful substances**

Contaminated devices could endanger health. The contamination declaration serves to protect all persons who come into contact with the device. Devices sent in without a return number and completed contamination declaration will be returned to the sender by the manufacturer.

- Fill in the declaration of contamination completely.

- 1 Contact the manufacturer and send in a completed declaration of contamination before return shipment.  
⇒ You will then receive a return number and the shipping address.
- 2 Use the original packaging when returning.
- 3 Before shipping the instrument, attach a copy of the completed contamination declaration to the outside of the package.

## Declaration of Contamination

The service, repair, and/or disposal of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.  
This declaration may only be completed (in block letters) and signed by authorized and qualified staff.

|                                                                                              |                                                       |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>1 Description of product</b><br>Type _____<br>Article Number _____<br>Serial Number _____ | <b>2 Reason for return</b><br>_____<br>_____<br>_____ |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------|

|                                                                                       |
|---------------------------------------------------------------------------------------|
| <b>3 Operating fluid(s) used</b> (Must be drained before shipping.)<br>_____<br>_____ |
|---------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                                 |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------|------------------------------|--|---------|--------------------------------|------------------------------|--|-------------------|-----------------------------|---------------------------------|--|-----------|-----------------------------|---------------------------------|--|-------------|-----------------------------|---------------------------------|--|--------------------------|--------------------------------|------------------------------|--|-----------------------------------------------------------------------------------------------------|
| <b>4 Process related contamination of product:</b><br><table style="width: 100%;"> <tr> <td style="width: 40%;">toxic</td> <td style="width: 20%;">no <input type="checkbox"/> 1)</td> <td style="width: 20%;">yes <input type="checkbox"/></td> <td style="width: 20%;"></td> </tr> <tr> <td>caustic</td> <td>no <input type="checkbox"/> 1)</td> <td>yes <input type="checkbox"/></td> <td></td> </tr> <tr> <td>biological hazard</td> <td>no <input type="checkbox"/></td> <td>yes <input type="checkbox"/> 2)</td> <td></td> </tr> <tr> <td>explosive</td> <td>no <input type="checkbox"/></td> <td>yes <input type="checkbox"/> 2)</td> <td></td> </tr> <tr> <td>radioactive</td> <td>no <input type="checkbox"/></td> <td>yes <input type="checkbox"/> 2)</td> <td></td> </tr> <tr> <td>other harmful substances</td> <td>no <input type="checkbox"/> 1)</td> <td>yes <input type="checkbox"/></td> <td></td> </tr> </table> | toxic                          | no <input type="checkbox"/> 1)  | yes <input type="checkbox"/> |  | caustic | no <input type="checkbox"/> 1) | yes <input type="checkbox"/> |  | biological hazard | no <input type="checkbox"/> | yes <input type="checkbox"/> 2) |  | explosive | no <input type="checkbox"/> | yes <input type="checkbox"/> 2) |  | radioactive | no <input type="checkbox"/> | yes <input type="checkbox"/> 2) |  | other harmful substances | no <input type="checkbox"/> 1) | yes <input type="checkbox"/> |  | <br>2) Products thus contaminated will not be accepted without written evidence of decontamination! |
| toxic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | no <input type="checkbox"/> 1) | yes <input type="checkbox"/>    |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
| caustic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | no <input type="checkbox"/> 1) | yes <input type="checkbox"/>    |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
| biological hazard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | no <input type="checkbox"/>    | yes <input type="checkbox"/> 2) |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
| explosive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | no <input type="checkbox"/>    | yes <input type="checkbox"/> 2) |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
| radioactive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | no <input type="checkbox"/>    | yes <input type="checkbox"/> 2) |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |
| other harmful substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | no <input type="checkbox"/> 1) | yes <input type="checkbox"/>    |                              |  |         |                                |                              |  |                   |                             |                                 |  |           |                             |                                 |  |             |                             |                                 |  |                          |                                |                              |  |                                                                                                     |

The product is free of any substances which are damaging to health  
 yes ☐

1) or not containing any amount of hazardous residues that exceed the permissible exposure limits

|                                                                                                                                                                |                           |                                       |                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------|-------------------------|
| <b>5 Harmful substances, gases and/or by-products</b><br>Please list all substances, gases, and by-products which the product may have come into contact with: |                           |                                       |                         |
| Trade/product name                                                                                                                                             | Chemical name (or symbol) | Precautions associated with substance | Action if human contact |
|                                                                                                                                                                |                           |                                       |                         |
|                                                                                                                                                                |                           |                                       |                         |
|                                                                                                                                                                |                           |                                       |                         |
|                                                                                                                                                                |                           |                                       |                         |

|                                                                                                                                                                                                                                                                                |                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>6 Legally binding declaration:</b><br>I/we hereby declare that the information on this form is complete and accurate and that I/we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations. |                                     |
| Organization/company _____<br>Address _____<br>Phone _____<br>Email _____<br>Name _____                                                                                                                                                                                        | Post code, place _____<br>Fax _____ |
| Date and legally binding signature _____                                                                                                                                                                                                                                       | Company stamp _____                 |

Copies:  
Original for addressee - 1 copy for accompanying documents - 1 copy for file of sender



# 10 Accessories and interfaces

## 10.1 Accessories and spare parts

| Accessory part                                                          | Order no. |
|-------------------------------------------------------------------------|-----------|
| <b>Sniffer line</b>                                                     |           |
| SL4000, 3 m length                                                      | 527-001   |
| SL4000, 5 m length                                                      | 527-002   |
| SL4000, 10 m length                                                     | 527-003   |
| SL4000, 15 m length                                                     | 527-004   |
| <b>Sniffer line with Background Canceling</b>                           |           |
| SL4000 BC, 3 m length                                                   | 526-001   |
| SL4000 BC, 5 m length                                                   | 526-002   |
| SL4000 BC, 10 m length                                                  | 526-003   |
| SL4000 BC, 15 m length                                                  | 526-004   |
| <b>Sniffer tips</b>                                                     |           |
| FT125, 125 mm length, flexible                                          | 528-001   |
| FT250, 250 mm length, flexible                                          | 528-002   |
| FT390, 390 mm length, flexible                                          | 528-003   |
| FT600, 600 mm length, flexible                                          | 528-004   |
| ST125, 125 mm length, rigid                                             | 528-005   |
| ST250, 250 mm length, rigid                                             | 528-006   |
| ST390, 390 mm length, rigid                                             | 528-007   |
| <b>Attachments for sniffer tips</b>                                     |           |
| Attachment plug connection                                              | 531-033   |
| Attachment water protection tip                                         | 531-035   |
| I•Tip SENS<br>20 base bodies / 200 replacement brushes                  | 531-040   |
| I•Tip SENS<br>5 base bodies / 50 replacement brushes                    | 531-041   |
| I•Tip RUGGED<br>24 base bodies / 120 replacement rubber lips            | 531-042   |
| <b>Accessories for the SL4000 sniffer line</b>                          |           |
| Holder for SL4000 sniffer line                                          | 531-012   |
| <b>Replacement parts for the SL4000 sniffer line</b>                    |           |
| Union nut, flexible                                                     | 200014648 |
| Union nut, rigid                                                        | 200014649 |
| Hand strap                                                              | 200014651 |
| Connection plate SL4000                                                 | 200014971 |
| <b>Replacement parts for filter holders for the SL4000 sniffer line</b> |           |
| Filter ejector                                                          | 200014650 |

| Accessory part                                                                                                                                                                                    | Order no. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Filter holder (25 units)                                                                                                                                                                          | 200014652 |
| Filter normal (25 units)                                                                                                                                                                          | 200014653 |
| Filter XL (10 units)                                                                                                                                                                              | 200014654 |
| <b>Spare part for all sniffer tips</b>                                                                                                                                                            |           |
| Nozzle 0.8 mm SL4000 (5 units)                                                                                                                                                                    | 200015067 |
| <b>Calibration leak</b>                                                                                                                                                                           |           |
| EcoCheck 4000 (calibration leak R1234yf)                                                                                                                                                          | 531-006   |
| Gas cartridge EcoCheck 4000, R1234yf                                                                                                                                                              | 531-011   |
| Calibration kit for IGS mode, consisting of a cyclopentane calibration leak and an isopentane calibration leak                                                                                    | 531-003   |
| <b>Calibration leaks for individual refrigerants, leak rate 2–5 g/year</b>                                                                                                                        |           |
| R134a                                                                                                                                                                                             | 122 20    |
| R600a                                                                                                                                                                                             | 122 21    |
| R404A                                                                                                                                                                                             | 122 22    |
| R152a                                                                                                                                                                                             | 122 27    |
| R407C                                                                                                                                                                                             | 122 28    |
| R410A                                                                                                                                                                                             | 122 29    |
| R1234yf                                                                                                                                                                                           | 122 35    |
| R452A                                                                                                                                                                                             | 123 05    |
| Xe                                                                                                                                                                                                | 123 14    |
| <b>More calibration leaks</b>                                                                                                                                                                     |           |
| Calibrated leak for R290, leak rate 7–8 g/a                                                                                                                                                       | 122 31    |
| Calibration leak with 100% hydrogen, leak rate $1,00 \times 10^{-4}$ mbarl/s with 100% hydrogen.<br>Additionally, calibration leak with 95/5 forming gas, leak rate $2,00 \times 10^{-3}$ mbarl/s | 123 22    |
| Calibration leak for Helium S-TL 4, leak rate range $10^{-4}$ mbar l/s                                                                                                                            | 122 37    |
| Calibration leak for Helium S-TL 5, leak rate range $10^{-5}$ mbar l/s                                                                                                                            | 122 38    |
| Calibrated leak for methane, TL4-6                                                                                                                                                                | 122 49    |
| Additional calibration leaks for other refrigerants are available upon request                                                                                                                    |           |
| <b>Adapter for external calibration leak</b>                                                                                                                                                      |           |
| CalMate 4000 Calibration Leak Adapter, including a connection cable (1.5 m) for the leak detector                                                                                                 | 520-300   |
| CalMate 4000 Connection Cable (1.5 m) as a replacement part                                                                                                                                       | 520-310   |
| <b>Module</b>                                                                                                                                                                                     |           |
| IO1000                                                                                                                                                                                            | 560-310   |

| Accessory part                       | Order no. |
|--------------------------------------|-----------|
| Data cable 0.5 m                     | 560-334   |
| Data cable 5 m                       | 560-335   |
| Data cable 10 m                      | 560-340   |
| BM1000 PROFIBUS                      | 560-315   |
| BM1000 PROFINET IO                   | 560-316   |
| BM1000 DeviceNet                     | 560-317   |
| BM1000 EtherNet/IP                   | 560-318   |
| <b>Spare parts for leak detector</b> |           |
| Filter mat, side                     | 200014727 |
| Filter mat, underside                | 200014726 |

## 10.2 I/O module

### 10.2.1 Creating a connection between the device and the I/O module

✓  **Supervisor rights**

✓ The leak detector is turned off.

- 1 Connect the INFICON I/O module to the LD-1 or LD-2 port on the device using a data cable; see "Connections for accessories and control signals [► 17]".
- 2  > Setup > Accessories > Device selection
- 3 To connect the data cable to the leak detector at the LD-1 or LD-2 interface, select the field "Device @LD-1" or "Device @LD-2" and set it to "IO module".
- 4 Save .

### 10.2.2 Configuring analog outputs

✓  **Supervisor rights**

- 1  > Setup > Accessories > I/O module > Configuration of analog outputs
- 2 Make your desired settings according to the table below.
- 3 Save .

| Output                                   | Function                               | Occupancy / Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog output 1<br>or<br>Analog output 2 | Off                                    | The analog outputs are switched off.<br>Output voltage = 0 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                          | Leak rate linear with upper limit      | 0 ... 10 V; linear; in the selected unit<br><br>The upper limit (= 10 V) is set in whole decades via the parameter "Analog Output 1/2 upper limit". The lower value is always 0 (leak rate), which corresponds to 0 V output voltage.<br><br>This setting is for both analog outputs, if an appropriate output function is selected. Depending on the selected leak rate unit there is a different absolute limit.<br><br>The selected range can be additionally narrowed by the limits, which is valid for all interfaces.                                                                                                                                                                                                                                                                                |
|                                          | Leak rate logarithmic with upper limit | 0 ... 10 V, logarithmic, in selected unit<br><br>The upper limit (= 10 V) and the scaling (V / decades) are set via the parameter "Analog Output 1/2 upper limit".<br><br>For example:<br><br>Upper limit set to $1 \times 10^{-5}$ mbar l/s (= 10 V). Scale set to 5 V / decade. This means the lower limit is $1 \times 10^{-7}$ mbar l/s (= 0 V).<br><br>The logarithmic output function of both the slope in V / decade as well as the upper limit (10 V limit) can be set. This results in the minimum displayable value. The following slopes are available: 0.5, 1, 2, 2.5, 3, 5, 10 V/decade: The higher the selected step size, the smaller the display range. The upper limit is the same for both analog outputs. Depending on the selected leak rate unit there is a different absolute limit. |
|                                          | Voltage set via command                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                          | Leak rate linear                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                          | Leak rate logarithmic                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Analog output 1 upper limit              |                                        | Limit for output 1:<br><br>Voltages above 1 V indicate that the trigger level has been exceeded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Analog output 2 upper limit              |                                        | Limit for output 2:<br><br>Voltages above 1 V indicate that the trigger level has been exceeded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Output                     | Function                                       | Occupancy / Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analog output 1 Gas number | Display gas number on channel 1 <sup>*1)</sup> | <p>Gas numbers are listed in the order of the gases shown on the display (1: top left, 2: top right, 3: bottom left, 4: bottom right)</p> <p>If gases are activated or deactivated, the order may change!</p> <p>The order is determined by the sorting in the list of measured gases. Thus, an entry at the top of the list will always have an index before the entry below it.</p> <p>Example: Gas 2 active, Gas 5 active<br/>-&gt; Gas 2 Index 1, Gas 5 Index 2</p> <p>Gas 3 is now being activated:<br/>-&gt; Gas 2 Index 1, Gas 3 Index 2, Gas 5 Index 3</p> <p>Gas 2 is deactivated:<br/>-&gt; Gas 3 Index 1, Gas 5 Index 2</p> |
| Analog output 2 Gas number | Display gas number on channel 2 <sup>*2)</sup> | See above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

<sup>\*1)</sup> See HMI, for analog output only 2)

<sup>\*2)</sup> See HMI, for analog output only 1)

### 10.2.3 Configuring digital inputs

These inputs can be used to operate the device with a programmable logic controller (PLC).

The digital inputs PLC-IN 1 ... The available functions can be assigned in any way necessary to the 10 I/O module.

- Active signal: typically 24V
- Inactive signal: typically 0 V.

The 24V output of the I/O module can be used as an active signal.

Every function except "No function" can be inverted.

✓  **Supervisor** rights

- 1  > Setup > Accessories > I/O module > Configuration of digital Inputs
- 2 Select the desired "Digital input" and the corresponding function according to the table below.
  - ⇒ For every entry except "No function," an "Inverse" mode is also available. (For example: "ZERO" and "ZERO Inverse")
- 3 Save .

| Input     | Function    | Transition       | Description                                                         |
|-----------|-------------|------------------|---------------------------------------------------------------------|
| PLC IN 1  | No function | -                | The input is not functioning. Recommended setting of unused inputs. |
| PLC IN 2  | ZERO        | inactive→ active | Switch ZERO on                                                      |
| PLC IN 3  |             | active→ inactive | Switch ZERO off                                                     |
| PLC IN 4  | ZERO Update | inactive→ active | ZERO on or ZERO updated                                             |
| PLC IN 5  |             | active→ inactive | No function                                                         |
| PLC IN 6  | Clear       | inactive→ active | Confirm warning                                                     |
| PLC IN 7  | CAL         | inactive→ active | Start external calibration                                          |
| PLC IN 8  |             | active→ inactive | Apply value for background and finish calibration                   |
| PLC IN 9  | CAL Abort   | inactive→ active | Cancel CAL                                                          |
| PLC IN 10 | Gas 1       | inactive→ active | Gas 1 on                                                            |
|           |             | active→ inactive | Gas 1 off                                                           |
|           | Gas 2       | inactive→ active | Gas 2 on                                                            |
|           |             | active→ inactive | Gas 2 off                                                           |
|           | Gas 3       | inactive→ active | Gas 3 on                                                            |
|           |             | active→ inactive | Gas 3 off                                                           |
|           | Gas 4       | inactive→ active | Gas 4 on                                                            |
|           |             | active→ inactive | Gas 4 off                                                           |
|           | Gas 5       | inactive→ active | Gas 5 on                                                            |
|           |             | active→ inactive | Gas 5 off                                                           |
|           | Gas 6       | inactive→ active | Gas 6 on                                                            |
|           |             | active→ inactive | Gas 6 off                                                           |
|           | Gas 7       | inactive→ active | Gas 7 on                                                            |
|           |             | active→ inactive | Gas 7 off                                                           |
|           | High Flow   | inactive→ active | Switch to High Flow                                                 |
|           |             | active→ inactive | Disable High Flow. Switch to Low Flow                               |
|           | Mid Flow    | inactive→ active | Switch to Medium Flow (Optimal Mode)                                |
|           |             | active→ inactive | Switch to Low Flow (Precision Mode)                                 |
|           | Standby     | inactive→ active | Standby                                                             |
|           |             | active→ inactive | Start                                                               |
|           | Purge       | inactive→ active | Purge mode                                                          |
|           |             | active→ inactive | Start                                                               |

## 10.2.4 Configuring digital outputs

The digital outputs PLC-OUT 1 ... The available functions can be assigned in any way necessary to the 8 I/O module.

✓  **Supervisor rights**

- 1  > Setup > Accessories > I/O module > Configuration of digital outputs
- 2 Select the desired "digital output" and the associated function according to the table below.  
  
⇒ For every entry except "Off (open)", an "Inverse" mode is also available. In the table overview the description of the state "open" must be replaced with the description of the state "closed".
- 3 Save .



| Output    | Function            | Status | Description                                                                                                         |
|-----------|---------------------|--------|---------------------------------------------------------------------------------------------------------------------|
| PLC OUT 1 | Off (open)          | open   | always open                                                                                                         |
| PLC OUT 2 | Open                | open   | open                                                                                                                |
| PLC OUT 3 |                     | closed | closed                                                                                                              |
| PLC OUT 4 | Setpoint 1          | open   | Measured leak rate undercuts the setpoint 1                                                                         |
| PLC OUT 5 |                     | closed | Measured leak rate exceeds the setpoint 1                                                                           |
| PLC OUT 6 | Setpoint 2          | open   | Measured leak rate undercuts the setpoint 2                                                                         |
| PLC OUT 7 |                     | closed | Measured leak rate exceeds the setpoint 2                                                                           |
| PLC OUT 8 | Ready for operation | open   | Emissions off, active calibration on or off                                                                         |
|           |                     | closed | Emissions switched on, no calibration process, no error, normal measurement operation                               |
|           | Warning             | open   | No warning                                                                                                          |
|           |                     | closed | Warning                                                                                                             |
|           | Error               | open   | No error                                                                                                            |
|           |                     | closed | Error                                                                                                               |
|           | Calibration active  | open   | Device is not being calibrated                                                                                      |
|           |                     | closed | The device is being calibrated.                                                                                     |
|           | Calibration request | open   | No request: Calibration not required                                                                                |
|           |                     | closed | Calibration required                                                                                                |
|           | Run-up              | open   | The device is not in the startup phase                                                                              |
|           |                     | closed | The device is in the startup phase                                                                                  |
|           | ZERO active         | open   | ZERO switched off                                                                                                   |
|           |                     | closed | ZERO switched on                                                                                                    |
|           | Emission on         | open   | Emissions switched off                                                                                              |
|           |                     | closed | Emissions switched on                                                                                               |
|           | Measuring           | open   | Standby or emissions switched off (ZERO is not possible, all setpoint outputs return "Leak rate setpoint exceeded") |
|           |                     | closed | Measuring (ZERO is possible outside of modulation, all setpoint outputs switch depending on the leak rate)          |
|           | Standby             | open   | Standby status not active                                                                                           |
|           |                     | closed | Standby status active                                                                                               |
|           | iGuide Wait         | open   | Not in iGuide mode or device is not waiting for user confirmation                                                   |
|           |                     | closed | Device awaits user confirmation in iGuide mode                                                                      |
|           | Error or warning    | open   | No error and no warning                                                                                             |
|           |                     | closed | Error or warning                                                                                                    |
|           | Calibration stable  | open   | Assignment not stable or calibration is inactive                                                                    |
|           |                     | closed | Calibration completed                                                                                               |
|           | Cathode             | open   | Filament 1 is active                                                                                                |
|           |                     | closed | Filament 2 is active                                                                                                |

## 10.2.5 Setting up the I/O module protocol

To switch between ASCII and LD protocol.

✓  **Supervisor rights**

- 1  > Setup > Accessories > I/O module > I/O module protocol
- 2 Adjust.
- 3 Save .

## 10.3 Bus module

You can find additional files on the subject of bus module on our website "<https://www.inficon.com>". This also includes the GSD file for PROFIBUS.

For the different bus modules from INFICON see also "Accessories and spare parts [► 113]".

### 10.3.1 Creating a connection between the device and the bus module

To establish the connection between the leak detector and the bus module, proceed as follows:

- ✓  **Supervisor rights**
- ✓ The leak detector is turned off.
  - 1 Connect the INFICON bus module to the LD-1 or LD-2 port on the device using a data cable, see "Connections for accessories and control signals [► 17]".
  - 2 Switch on the leak detector.
  - 3  > Setup > Accessories > Device selection
  - 4 Select the "Device @LD-1" or "Device @LD-2" field depending on which LD-1 or LD-2 interface the data cable is connected to on the leak detector, and set it to "Bus Module."
  - 5 Confirm with .

### 10.3.2 Setting a bus module address

You can set the setpoint for the field bus address. With PROFIBUS® this is the node address. DeviceNet is the MAC ID.

This setting is irrelevant for Profinet and EtherNet/IP.

- 1  > Setup > Accessories > Bus module
  - 2 Enter the desired address in the "Bus module address" field.
  - 3 Confirm with .
- ⇒ The value set is first carried over when restarting the leak detector. To do this, switch the power supply off and back on.

## 10.4 Network

### 10.4.1 Operating leak detector via web browser (LAN)

#### NOTICE

##### Operating system can be hacked via USB or Ethernet

The Linux operating system used in the leak testing is not updated automatically and can therefore contain security gaps. This vulnerability may be exploited through the Ethernet and USB interfaces of the leak testing to provide unauthorized access to the system.

- ▶ Ensure that no unauthorized person has access to these interfaces, for example by using a USB port / Ethernet port lock.
- ▶ In order not to jeopardize the security of your company network, never connect the leak testing directly to the public Internet. This applies to connections over WLAN as well as over Ethernet.
- ▶ However, if you want to access the web interface of the leak testing remotely, we recommend an encrypted Virtual Private Network (VPN) connection. However, we cannot assume any guarantee for the security of VPN connections, which are provided by third parties.

#### 10.4.1.1 Configuring the LAN connection of the leak detector

##### ✓ Supervisor rights

- 1  > General > Network > LAN
  - ⇒ Alternatively press  in the menu bar.
- 2 In the "Method" field, select your LAN setting:
  - ⇒ Disabled: Even when the network cable (RJ45 socket) is connected, no network connection is established.
  - ⇒ DHCP: The leak detector automatically obtains an IP address through the network into which it is integrated.
  - ⇒ Static: The IP address, as well as the network mask and gateway have to be configured manually, so that the leak detector can be reached in the network. If necessary, contact a network administrator.
- 3 Save .

#### 10.4.1.2 Setting the LAN connection in the PC or tablet



##### LAN connection - Quick start

If you have performed the steps described here once, it is sufficient to enter the IP address for many devices in case of repetition.

- ✓ The PC is connected to the same network as the leak detector.
- ✓ A LAN setting has been set up in the configuration of the leak detector, see also "Configuring the LAN connection of the leak detector [▶ 124]".

- ✓ You have noted down the IP address of the leak detector. It can be found in the leak detector under "Information > Device > Network".
- ✓ Java Script is enabled in the web browser. We recommend using a current version of the web browser Chrome™, Firefox® or Safari®.
- ▶ To access the leak tester from the PC or tablet web browser, enter the IP address of the leak detector as follows:  
http://<IP address>
- ⇒ The current active user interface of the leak detector is called.
- ⇒ The same functionality is available on the PC or Tablet as on the touchscreen of the leak detector.

### 10.4.1.3 Allow client access

- ✓  **Supervisor rights**
  - 1  > General > Network > Client access
  - 2 To allow the leak detector to be operated by PC or Tablet, activate the "Client Access" option.
    - ⇒ If the option "Client Access" is not activated, the leak detector cannot be operated via PC or Tablet.
  - 3 If the leak detector is to be controlled via the network interface instead of the I/O module, activate "API Access".
  - 4 Save .

### Display of all connected clients

- ✓ The network connection between the leak detector and one or more PCs or Tablets has been established, see "Setting the LAN connection in the PC or tablet [▶ 124]".
- ▶  > General > Network > Connected clients

# 11 Appendix

## 11.1 Gas library

The software of the Ecotec 4000 includes a list with approx. 100 gases that can be relevant for the refrigeration industry. These gases are stored in a ROM (read-only memory) and can be selected from the list in the corresponding menus. Mass number (measuring position), molecular mass, normalization factor and viscosity are stored for each one. The data in this ROM cannot be changed. The program additionally provides four empty memory spaces (user library RAM memory). The user can save personally defined gases to them, see "Setting Custom Gas [► 49]".

For each gas, the default measurement position is indicated in bold.

| Gas   | Formula                         | Other designation | Measuring position<br>(xxx amu) | Molecular mass<br>(xxx.x amu) | Fragmentation factor | Normalization factor<br>(x.xExx) | Viscosity |
|-------|---------------------------------|-------------------|---------------------------------|-------------------------------|----------------------|----------------------------------|-----------|
| R11   | CFCl <sub>3</sub>               |                   | <b>101</b>                      | 137.4                         | 1.00                 | 3.15E+07                         | 0.515     |
|       |                                 |                   | 103                             |                               | 1.00                 |                                  |           |
| R12   | CF <sub>2</sub> Cl <sub>2</sub> |                   | <b>85</b>                       | 120.9                         | 1.00                 | 2.66E+07                         | 0.591     |
|       |                                 |                   | 87                              |                               | 0.30                 |                                  |           |
|       |                                 |                   | 50                              |                               | 0.12                 |                                  |           |
| R12B1 | CF <sub>2</sub> ClBr            | Halon 1211        | <b>85</b>                       | 165.4                         | 1.00                 | 6.30E+07                         | 0.523     |
|       |                                 |                   | 87                              |                               | 0.32                 |                                  |           |
|       |                                 |                   | 50                              |                               | 0.12                 |                                  |           |
|       |                                 |                   | 129                             |                               | 0.15                 |                                  |           |
|       |                                 |                   | 131                             |                               | 0.15                 |                                  |           |
| R13   | CF <sub>2</sub> ClBr            |                   | <b>69</b>                       | 104.5                         | 1.00                 | 3.15E+07                         | 0.857     |
|       |                                 |                   | 85                              |                               | 0.35                 |                                  |           |
| R13B1 | CF <sub>3</sub> Br              | Halon 1301        | <b>69</b>                       | 149                           | 1.00                 | 1.58E+07                         | 0.852     |
|       |                                 |                   | 129                             |                               | 0.12                 |                                  |           |
|       |                                 |                   | 131                             |                               | 0.12                 |                                  |           |
|       |                                 |                   | 148                             |                               | 0.10                 |                                  |           |
|       |                                 |                   | 150                             |                               | 0.10                 |                                  |           |
| R14   | CF <sub>4</sub>                 |                   | <b>69</b>                       | 80.0                          | 1.00                 | 3.15E+07                         | 0.857     |
|       |                                 |                   | 50                              |                               | 0.70                 |                                  |           |
| R21   | CHFCl <sub>2</sub>              |                   | <b>67</b>                       | 102.9                         | 1.00                 | 3.15E+07                         | 0.535     |
|       |                                 |                   | 69                              |                               | 0.35                 |                                  |           |
| R22   | CHF <sub>2</sub> Cl             |                   | <b>51</b>                       | 86.5                          | 1.00                 | 3.42E+07                         | 0.632     |
|       |                                 |                   | 67                              |                               | 0.11                 |                                  |           |
| R23   | CHF <sub>3</sub>                |                   | <b>69</b>                       | 70.0                          | 1.00                 | 1.08E+08                         | 0.704     |
|       |                                 |                   | 51                              |                               | 0.93                 |                                  |           |
|       |                                 |                   | 50                              |                               | 0.17                 |                                  |           |
| R32   | CH <sub>2</sub> F <sub>2</sub>  |                   | <b>51</b>                       | 52                            | 1.00                 | 1.24E+08                         | 0.632     |
|       |                                 |                   | 52                              |                               | 0.12                 |                                  |           |

| Gas    | Formula                                         | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|--------|-------------------------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R41    | CH <sub>3</sub> F                               |                   | 34                           | 34                         | 1.00                 | 3.15E+07                      | 0.551     |
|        |                                                 |                   | 33                           |                            | 1.00                 |                               |           |
| R50    | CH <sub>4</sub>                                 | Methane           | 15                           | 16                         | 1.00                 | 6.30E+07                      | 0.556     |
| R113   | C <sub>2</sub> F <sub>3</sub> Cl <sub>3</sub>   |                   | 101                          | 187.4                      | 1.00                 | 3.15E+07                      | 0.484     |
|        |                                                 |                   | 151                          |                            | 1.00                 |                               |           |
| R114   | C <sub>2</sub> F <sub>4</sub> Cl <sub>2</sub>   |                   | 85                           | 170.9                      | 1.00                 | 3.15E+07                      | 0.545     |
|        |                                                 |                   | 135                          |                            | 1.00                 |                               |           |
| R115   | C <sub>2</sub> F <sub>5</sub> Cl                |                   | 85                           | 154.5                      | 1.00                 | 3.15E+07                      | 0.627     |
|        |                                                 |                   | 119                          |                            | 1.00                 |                               |           |
| R116   | C <sub>2</sub> F <sub>6</sub>                   |                   | 69                           | 138                        | 1.00                 | 3.15E+07                      | 0.709     |
|        |                                                 |                   | 119                          |                            | 1.00                 |                               |           |
| R123   | C <sub>2</sub> HF <sub>3</sub> Cl <sub>2</sub>  |                   | 83                           | 152.9                      | 1.00                 | 3.15E+07                      | 0.540     |
|        |                                                 |                   | 85                           |                            | 1.00                 |                               |           |
| R124   | C <sub>2</sub> HF <sub>4</sub> Cl               |                   | 67                           | 136.5                      | 1.00                 | 3.15E+07                      | 0.581     |
|        |                                                 |                   | 51                           |                            | 1.00                 |                               |           |
| R125   | C <sub>2</sub> HF <sub>5</sub>                  |                   | 51                           | 120                        | 1.00                 | 3.02E+07                      | 0.653     |
|        |                                                 |                   | 69                           |                            | 0.27                 |                               |           |
|        |                                                 |                   | 101                          |                            | 0.35                 |                               |           |
| R134a  | C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>    |                   | 69                           | 102                        | 1.00                 | 9.03E+07                      | 0.591     |
|        |                                                 |                   | 83                           |                            | 0.58                 |                               |           |
|        |                                                 |                   | 51                           |                            | 0.22                 |                               |           |
| R141b  | C <sub>2</sub> H <sub>3</sub> FCF <sub>2</sub>  |                   | 81                           | 117                        | 1.00                 | 3.15E+07                      | 0.464     |
|        |                                                 |                   | 67                           |                            | 1.00                 |                               |           |
| R142b  | C <sub>2</sub> H <sub>3</sub> F <sub>2</sub> Cl |                   | 65                           | 100.5                      | 1.00                 | 7.20E+07                      | 0.494     |
|        |                                                 |                   | 85                           |                            | 0.19                 |                               |           |
| R143a  | C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>    |                   | 69                           | 84                         | 1.00                 | 3.15E+07                      | 0.561     |
|        |                                                 |                   | 65                           |                            | 0.35                 |                               |           |
| R152a  | C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>    |                   | 51                           | 66.1                       | 1.00                 | 4.84E+07                      | 0.515     |
|        |                                                 |                   | 65                           |                            | 0.44                 |                               |           |
| R170   | C <sub>2</sub> H <sub>6</sub>                   | Ethane            | 26                           | 30.1                       | 1.00                 | 3.90E+08                      | 0.479     |
| R218   | C <sub>3</sub> F <sub>8</sub>                   |                   | 69                           | 188                        | 1.00                 | 1.31E+07                      | 0.627     |
|        |                                                 |                   | 169                          |                            | 0.25                 |                               |           |
| R227ea | C <sub>3</sub> HF <sub>7</sub>                  |                   | 69                           | 170                        | 1.00                 | 3.96E+07                      | 0.627     |
|        |                                                 |                   | 51                           |                            | 0.18                 |                               |           |
|        |                                                 |                   | 82                           |                            | 0.15                 |                               |           |
| R236fa | C <sub>3</sub> H <sub>2</sub> F <sub>6</sub>    |                   | 69                           | 152                        | 1.00                 | 1.76E+07                      | 0.550     |
|        |                                                 |                   | 64                           |                            | 0.34                 |                               |           |
|        |                                                 |                   | 133                          |                            | 0.30                 |                               |           |
|        |                                                 |                   | 113                          |                            | 0.06                 |                               |           |

| Gas    | Formula                                      | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|--------|----------------------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R245fa | C <sub>3</sub> H <sub>3</sub> F <sub>5</sub> |                   | 64                           | 134                        | 0.58                 | 2.93E+07                      | 0.520     |
|        |                                              |                   | 51                           |                            | 1.00                 |                               |           |
|        |                                              |                   | 69                           |                            | 0.32                 |                               |           |
|        |                                              |                   | 95                           |                            | 0.03                 |                               |           |
|        |                                              |                   | 115                          |                            | 0.13                 |                               |           |
| R290   | C <sub>3</sub> H <sub>8</sub>                | Propane           | 41                           | 44.1                       | 0.91                 | 6.91E+08                      | 0.433     |
|        |                                              |                   | 39                           |                            | 1.00                 |                               |           |
|        |                                              |                   | 42                           |                            | 0.32                 |                               |           |
|        |                                              |                   | IGS                          |                            | 0.91                 |                               |           |
| R356   | C <sub>4</sub> H <sub>5</sub> F <sub>5</sub> |                   | 77                           | 166.1                      | 1.00                 | 3.15E+07                      | 0.561     |
|        |                                              |                   | 69                           |                            | 1.00                 |                               |           |
| R400   | 50 % R12<br>50 % R114                        |                   | 85                           | 141.6                      | 1.00                 | 3.15E+07                      | 0.571     |
|        |                                              |                   | 135                          |                            | 0.35                 |                               |           |
| R401A  | 53 % R22<br>13 % R152a<br>34 % R124          |                   | 51                           | 94.4                       | 1.00                 | 3.15E+07                      | 0.607     |
|        |                                              |                   | 67                           |                            | 1.00                 |                               |           |
|        |                                              |                   | 101                          |                            | 0.35                 |                               |           |
| R401B  | 61 % R22<br>11 % R152a<br>28 % R124          |                   | 51                           | 92.8                       | 1.00                 | 3.15E+07                      | 0.612     |
|        |                                              |                   | 67                           |                            | 1.00                 |                               |           |
|        |                                              |                   |                              |                            |                      |                               |           |
| R401C  | 33 % R22<br>15 % R152a<br>52 % R124          |                   | 51                           | 101.0                      | 1.00                 | 3.15E+07                      | 0.602     |
|        |                                              |                   | 67                           |                            | 1.00                 |                               |           |
|        |                                              |                   |                              |                            |                      |                               |           |
| R402A  | 38 % R22<br>60 % R125<br>2 % R290            |                   | 51                           | 101.6                      | 1.00                 | 3.15E+07                      | 0.647     |
|        |                                              |                   | 101                          |                            | 0.35                 |                               |           |
|        |                                              |                   |                              |                            |                      |                               |           |
| R402B  | 60 % R22<br>38 % R125<br>2 % R290            |                   | 51                           | 94.7                       | 1.00                 | 3.15E+07                      | 0.642     |
|        |                                              |                   | 101                          |                            | 0.35                 |                               |           |
|        |                                              |                   |                              |                            |                      |                               |           |
| R403A  | 75 % R22<br>20 % R218<br>5 % R290            |                   | 51                           | 92.0                       | 1.00                 | 3.15E+07                      | 0.642     |
|        |                                              |                   | 69                           |                            | 0.35                 |                               |           |
|        |                                              |                   |                              |                            |                      |                               |           |



| Gas   | Formula      | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xE <sup>xx</sup> ) | Viscosity |
|-------|--------------|-------------------|------------------------------|----------------------------|----------------------|--------------------------------------------|-----------|
| R403B | 56 % R22     |                   | 51                           | 103.3                      | 1.00                 | 3.15E+07                                   | 0.647     |
|       | 39 % R218    |                   | 69                           |                            | 1.00                 |                                            |           |
|       | 5 % R290     |                   |                              |                            |                      |                                            |           |
| R404A | 44 % R125    |                   | 69                           | 97.6                       | 1.00                 | 5.78E+07                                   | 0.607     |
|       |              |                   | 51                           |                            | 0.54                 |                                            |           |
|       | 52 % R143a   |                   | 101                          |                            | 0.18                 |                                            |           |
|       | 4 % R134a    |                   | 65                           |                            | 0.16                 |                                            |           |
| R405A | 45 % R22     |                   | 51                           | 111.9                      | 1.00                 | 3.15E+07                                   | 0.622     |
|       | 7 % R152a    |                   | 100                          |                            | 1.00                 |                                            |           |
|       | 5.5 % 142b   |                   |                              |                            |                      |                                            |           |
|       | 42.5 % RC138 |                   |                              |                            |                      |                                            |           |
| R406A | 55 % R22     |                   | 51                           | 89.9                       | 1.00                 | 3.15E+07                                   | 0.566     |
|       | 4 % R600a    |                   | 65                           |                            | 1.00                 |                                            |           |
|       | 41 % R142b   |                   |                              |                            |                      |                                            |           |
| R407A | 20 % R32     |                   | 51                           | 90.1                       | 1.00                 | 3.15E+07                                   | 0.637     |
|       | 40 % R125    |                   | 69                           |                            | 1.00                 |                                            |           |
|       | 40 % R134a   |                   |                              |                            |                      |                                            |           |
| R407B | 10 % R32     |                   | 51                           | 102.9                      | 1.00                 | 3.15E+07                                   | 0.647     |
|       | 70 % R125    |                   | 101                          |                            | 1.00                 |                                            |           |
|       | 20 % R134a   |                   |                              |                            |                      |                                            |           |
| R407C | 10 % R32     |                   | 51                           | 86.2                       | 1.00                 | 8.36E+07                                   | 0.627     |
|       | 70 % R125    |                   | 69                           |                            | 0.35                 |                                            |           |
|       |              |                   | 83                           |                            | 0.14                 |                                            |           |
|       | 20 % R134a   |                   | 101                          |                            | 0.22                 |                                            |           |
| R407D | 23 % R32     |                   | 69                           | 91                         | 1.00                 | 3.15E+07                                   | 0.612     |
|       | 25 % R125    |                   | 83                           |                            | 1.00                 |                                            |           |
|       | 52 % R134a   |                   |                              |                            |                      |                                            |           |

| Gas   | Formula     | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|-------|-------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R407E | 25 % R32    |                   | 51                           | 83.8                       | 1.00                 | 3.15E+07                      | 0.622     |
|       | 15 % R125   |                   | 69                           |                            | 1.00                 |                               |           |
|       | 60 % R134a  |                   |                              |                            |                      |                               |           |
| R407F | 40 % R134a  |                   | 51                           | 82.1                       | 1.00                 | 8.36E+07                      | 0.670     |
|       |             |                   | 69                           |                            | 0.35                 |                               |           |
|       | 30 % R125   |                   | 83                           |                            | 0.14                 |                               |           |
|       | 30 % R32    |                   | 101                          |                            | 0.22                 |                               |           |
| R408A | 7 % R125    |                   | 51                           | 87                         | 1.00                 | 3.15E+07                      | 0.602     |
|       | 46 % R143a  |                   | 69                           |                            | 1.00                 |                               |           |
|       | 47 % R22    |                   |                              |                            |                      |                               |           |
| R409A | 60 % R22    |                   | 51                           | 97.4                       | 1.00                 | 3.15E+07                      | 0.607     |
|       | 25 % R124   |                   | 67                           |                            | 1.00                 |                               |           |
|       | 15 % R142b  |                   |                              |                            |                      |                               |           |
| R409B | 65 % R22    |                   | 51                           | 96.7                       | 1.00                 | 3.15E+07                      | 0.612     |
|       | 25 % R124   |                   | 67                           |                            | 1.00                 |                               |           |
|       | 10 % R142b  |                   |                              |                            |                      |                               |           |
| R410A | 50 % R32    |                   | 51                           | 72.6                       | 1.00                 | 6.97E+07                      | 0.673     |
|       | 50 % R125   |                   | 69                           |                            | 0.15                 |                               |           |
| R410B | 45 % R32    |                   | 51                           | 75.6                       | 1.00                 | 3.15E+07                      | 0.673     |
|       | 55 % R125   |                   | 101                          |                            | 0.35                 |                               |           |
| R411A | 1.5 % R1270 |                   | 51                           | 82.4                       | 1.00                 | 3.15E+07                      | 0.617     |
|       |             |                   | 67                           |                            | 0.70                 |                               |           |
|       | 87.5 % R22  |                   |                              |                            |                      |                               |           |
| R411B | 11 % R152a  |                   |                              | 83.1                       |                      | 3.15E+07                      | 0.622     |
|       | 3 % R1270   |                   | 51                           |                            | 1.00                 |                               |           |
|       | 94 % R22    |                   | 67                           |                            | 0.70                 |                               |           |
|       | 3 % R152a   |                   |                              |                            |                      |                               |           |

| Gas   | Formula                                             | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xE <sup>xx</sup> ) | Viscosity |
|-------|-----------------------------------------------------|-------------------|------------------------------|----------------------------|----------------------|--------------------------------------------|-----------|
| R411C | 3 % R1270<br>95.5 % R22<br>1.5 % R152a              |                   | 51                           | 83.4                       | 1.00                 | 3.15E+07                                   | 0.627     |
|       |                                                     |                   | 67                           |                            | 0.70                 |                                            |           |
| R412A | 70 % R22<br>5 % R218<br>25 % R142b                  |                   | 51                           | 92.2                       | 1.00                 | 3.15E+07                                   | 0.602     |
|       |                                                     |                   | 65                           |                            | 0.35                 |                                            |           |
| R413A | 9 % R218<br>88 % R134a<br>3 % R600                  |                   | 69                           | 104                        | 1.00                 | 3.15E+07                                   | 0.581     |
|       |                                                     |                   | 83                           |                            | 1.00                 |                                            |           |
| R414A | 51 % R22<br>28.5 % R124<br>4 % R600a<br>16.5 % R142 |                   | 51                           | 96.9                       | 1.00                 | 3.15E+07                                   | 0.586     |
|       |                                                     |                   | 67                           |                            | 1.00                 |                                            |           |
| R415A | 82 % R22<br>18 % R152a                              |                   | 51                           | 81.7                       | 1.00                 | 3.15E+07                                   | 0,622     |
|       |                                                     |                   | 67                           |                            | 0.70                 |                                            |           |
| R416A | 59 % R134a<br>39.5 % R124<br>1.5 % R600             |                   | 69                           | 111.9                      | 1.00                 | 3.15E+07                                   | 0.576     |
|       |                                                     |                   | 57                           |                            | 1.00                 |                                            |           |
| R417A | 50 % R134a<br>46 % R125<br>4 % R600a                |                   | 51                           | 106.7                      | 1.00                 | 8.10E+07                                   | 0.610     |
|       |                                                     |                   | 69                           |                            | 0.70                 |                                            |           |
|       |                                                     |                   | 83                           |                            | 0.22                 |                                            |           |
| R422D | 65.1 % R125<br>31.5 % R134a<br>3.4 % R600a          |                   | 51                           | 112.2                      | 1.00                 | 3.95E+07                                   | 0.622     |
|       |                                                     |                   | 69                           |                            | 0.36                 |                                            |           |

| Gas   | Formula      | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|-------|--------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R438A | 45 % R125    |                   | 51                           | 104.9                      | 1.00                 | 8.90E+07                      | 0.617     |
|       |              |                   | 69                           |                            | 0.61                 |                               |           |
|       | 44.2 % R134a |                   | 83                           |                            | 0.25                 |                               |           |
|       | 8.5 % R32    |                   |                              |                            |                      |                               |           |
| R441A | 1.7 % R600   |                   |                              | 49.6                       |                      | 1.75E+08                      | 0.398     |
|       | 0.6 % R601a  |                   |                              |                            |                      |                               |           |
|       | 54.8 % R290  |                   | 43                           |                            | 1.00                 |                               |           |
|       |              |                   | 41                           |                            | 0.46                 |                               |           |
| R442A | 36.1 % R600  |                   | 42                           | 81.8                       | 0.19                 | 8.70E+07                      | 0.629     |
|       | 6 % R600a    |                   |                              |                            |                      |                               |           |
|       | 3.1 % R170   |                   |                              |                            |                      |                               |           |
|       | 31 % R32     |                   | 51                           |                            | 1.00                 |                               |           |
| R448A | 31 % R125    |                   | 69                           | 99.3                       | 0.56                 | 8.79E+07                      | 0.625     |
|       | 30 % R134a   |                   | 83                           |                            | 0.18                 |                               |           |
|       | 5 % R227ea   |                   |                              |                            |                      |                               |           |
|       | 3 % R152a    |                   |                              |                            |                      |                               |           |
| R448A | 26 % R32     |                   | 51                           | 99.3                       | 1.00                 | 8.79E+07                      | 0.625     |
|       | 26 % R125    |                   | 69                           |                            | 0.57                 |                               |           |
|       | 21 % R134a   |                   | 64                           |                            | 0.23                 |                               |           |
|       | 20 % R1234yf |                   | 83                           |                            | 0.13                 |                               |           |
|       | 7 % R1234ze  |                   |                              |                            |                      |                               |           |

| Gas   | Formula                                                                | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|-------|------------------------------------------------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R449A | 25.7 %<br>R134<br>25.3 %<br>R1234yf<br>24.7 %<br>R125<br>24.3 %<br>R32 |                   | 51                           | 87.2                       | 1.00                 | 9.93E+07                      | 0.622     |
|       |                                                                        |                   | 69                           |                            | 0.72                 |                               |           |
|       |                                                                        |                   | 64                           |                            | 0.30                 |                               |           |
|       |                                                                        |                   | 101                          |                            | 0.23                 |                               |           |
|       |                                                                        |                   | 83                           |                            | 0.20                 |                               |           |
| R449C | 29 %<br>R134a<br>31 %<br>R1234yf<br>20 %<br>R125<br>20 % R32           |                   | 51                           | 90.3                       | 1.00                 | 1.14E+08                      | 0.622     |
|       |                                                                        |                   | 69                           |                            | 0.48                 |                               |           |
|       |                                                                        |                   | 64                           |                            | 0.15                 |                               |           |
|       |                                                                        |                   |                              |                            |                      |                               |           |
|       |                                                                        |                   |                              |                            |                      |                               |           |
| R450A | 58 %<br>R1234ze<br>42 %<br>R134a                                       |                   | 69                           | 109                        | 1.00                 | 9.67E+07                      | 0.592     |
|       |                                                                        |                   | 83                           |                            | 0.28                 |                               |           |
|       |                                                                        |                   | 64                           |                            | 0.42                 |                               |           |
|       |                                                                        |                   | 114                          |                            | 0.27                 |                               |           |
|       |                                                                        |                   | 95                           |                            | 0.25                 |                               |           |
| R452A | 59 %<br>R125<br>30 %<br>R1234yf<br>11 % R32                            |                   | 51                           | 103.5                      | 1.00                 | 6.72E+07                      | 0.612     |
|       |                                                                        |                   | 69                           |                            | 0.41                 |                               |           |
|       |                                                                        |                   | 64                           |                            | 0.21                 |                               |           |
|       |                                                                        |                   | 101                          |                            | 0.31                 |                               |           |
| R452B | 67 % R32<br>26 %<br>R1234yf<br>7 % R125                                |                   | 51                           | 72.9                       | 1.00                 | 1.10E+08                      | 0.639     |
|       |                                                                        |                   | 69                           |                            | 0.33                 |                               |           |
|       |                                                                        |                   | 64                           |                            | 0.30                 |                               |           |
|       |                                                                        |                   | 114                          |                            | 0.16                 |                               |           |
| R454B | 69 % R32<br>31 %<br>R1234yf                                            |                   | 51                           | 62.6                       | 1.00                 | 1.42E+08                      | 0.638     |
|       |                                                                        |                   | 64                           |                            | 0.42                 |                               |           |
|       |                                                                        |                   | 69                           |                            | 0.40                 |                               |           |
|       |                                                                        |                   | 95                           |                            | 0.13                 |                               |           |
|       |                                                                        |                   | 114                          |                            | 0.22                 |                               |           |
| R454C | 22 % R32<br>78 %<br>R1234yf                                            |                   | 69                           | 90.8                       | 0.98                 | 1.94E+08                      | 0.620     |
|       |                                                                        |                   | 64                           |                            | 0.99                 |                               |           |
|       |                                                                        |                   | 51                           |                            | 0.95                 |                               |           |
|       |                                                                        |                   | 95                           |                            | 0.28                 |                               |           |
|       |                                                                        |                   | 114                          |                            | 0.53                 |                               |           |
| R500  | 74 % R12<br>26 %<br>R152a                                              |                   | 85                           | 99.3                       | 1.00                 | 3.15E+07                      | 0.581     |
|       |                                                                        |                   | 51                           |                            | 0.35                 |                               |           |

| Gas   | Formula                        | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|-------|--------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R501  | 75 % R22                       |                   | 51                           | 93.1                       | 1.00                 | 3.15E+07                      | 0.627     |
|       | 25 % R12                       |                   | 85                           |                            | 0.35                 |                               |           |
| R502  | 49 % R22                       |                   | 85                           | 111.6                      | 1.00                 | 5.85E+07                      | 0,647     |
|       | 51 %                           |                   | 51                           |                            | 0.80                 |                               |           |
|       | R115                           |                   | 69                           |                            | 0.58                 |                               |           |
| R503  | 40 % R23                       |                   | 69                           | 87.3                       | 1.00                 | 3.15E+07                      | 0.709     |
|       | 60 % R13                       |                   | 51                           |                            | 0.35                 |                               |           |
| R504  | 48 % R32                       |                   | 85                           | 79.3                       | 1.00                 | 3.15E+07                      | 0.678     |
|       | 52 % R115                      |                   | 51                           |                            | 1.00                 |                               |           |
| R505  | 78 % R12                       |                   | 85                           | 103.5                      | 1.00                 | 3.15E+07                      | 0.612     |
|       | 22 % R31                       |                   | 87                           |                            | 1.00                 |                               |           |
| R506  | 55 % R31                       |                   | 68                           | 93.7                       | 1.00                 | 3.15E+07                      | 0.561     |
|       | 45 % R143a                     |                   | 85                           |                            | 1.00                 |                               |           |
| R507  | 50 % R125                      |                   | 69                           | 98.9                       | 1.00                 | 3.65E+07                      | 0.612     |
|       |                                |                   | 51                           |                            | 0.58                 |                               |           |
|       | 50 % R143a                     |                   | 65                           |                            | 0.17                 |                               |           |
| R508A | 39 % R23                       |                   | 69                           | 100.1                      | 1.00                 | 3.15E+07                      | 0.729     |
|       | 61 % R116                      |                   | 51                           |                            | 0.35                 |                               |           |
| R508B | 46 % R23                       |                   | 69                           | 95.4                       | 1.00                 | 3.87E+07                      | 0.729     |
|       | 54 %                           |                   | 51                           |                            | 0.20                 |                               |           |
|       | R116                           |                   | 119                          |                            | 0.23                 |                               |           |
| R513A | 44 % R134a                     |                   | 69                           | 108.7                      | 1.00                 | 8.64E+07                      | 0.582     |
|       |                                |                   | 64                           |                            | 0.54                 |                               |           |
|       | 56 % R1234yf                   |                   | 83                           |                            | 0.28                 |                               |           |
|       |                                |                   | 114                          |                            | 0.29                 |                               |           |
|       |                                |                   | 95                           |                            | 0.14                 |                               |           |
| R515B | CHF                            |                   | 69                           | 52.02                      | 1.00                 | 1.62E+08                      | 0.619     |
|       |                                |                   | 64                           |                            | 0.58                 |                               |           |
|       |                                |                   | 95                           |                            | 0.36                 |                               |           |
|       |                                |                   | 114                          |                            | 0.42                 |                               |           |
|       |                                |                   | 113                          |                            | 0.24                 |                               |           |
| R600  | C <sub>4</sub> H <sub>10</sub> | Butane            | 41                           | 58.1                       | 0.47                 | 3.44E+07                      | 0.377     |
|       |                                |                   | 42                           |                            | 0.36                 |                               |           |
|       |                                |                   | 43                           |                            | 1.00                 |                               |           |

| Gas     | Formula                                        | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|---------|------------------------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R600a   | C <sub>4</sub> H <sub>10</sub>                 | Isobutane         | 41                           | 58.1                       | 1.00                 | 1.64E+08                      | 0.377     |
|         |                                                |                   | 42                           |                            | 0.75                 |                               |           |
|         |                                                |                   | 43                           |                            | 2.00                 |                               |           |
|         |                                                |                   | 58                           |                            | 0.14                 |                               |           |
|         |                                                |                   | IGS                          |                            | 0.91                 |                               |           |
| R601    | C <sub>5</sub> H <sub>12</sub>                 | Pentane           | 41                           | 72.2                       | 1.00                 | 3.15E+07                      | 0.341     |
|         |                                                |                   | 42                           |                            | 1.00                 |                               |           |
|         |                                                |                   | 43                           |                            | 1.00                 |                               |           |
| R601a   | C <sub>5</sub> H <sub>12</sub>                 | Isopentane        | 41                           | 72.2                       | 0.60                 | 3.60E+07                      | 0.336     |
|         |                                                |                   | 42                           |                            | 0.84                 |                               |           |
|         |                                                |                   | 43                           |                            | 1.00                 |                               |           |
|         |                                                |                   | 57                           |                            | 0.36                 |                               |           |
|         |                                                |                   | 56                           |                            | 0.12                 |                               |           |
| R601b   | C <sub>5</sub> H <sub>12</sub>                 | Neopentane        | 57                           | 72.2                       | 1.00                 | 3.15E+07                      | 0.337     |
| R601c   | C <sub>5</sub> H <sub>12</sub>                 | Cyclopentane      | 41                           | 70.1                       | 0.30                 | 3.15E+07                      | 0.337     |
|         |                                                |                   | 42                           |                            | 1.00                 |                               |           |
|         |                                                |                   | 70                           |                            | 0.29                 |                               |           |
|         |                                                |                   | 55                           |                            | 0.28                 |                               |           |
|         |                                                |                   | 39                           |                            | 0.21                 |                               |           |
| R1150   |                                                |                   | 26                           | 28.0                       | 1.00                 | 1.86E+08                      | 0.479     |
| R1233zd | C <sub>2</sub> H <sub>2</sub> ClF <sub>3</sub> |                   | 95                           | 130.5                      | 1.00                 | 1.39E+08                      | 0.558     |
|         |                                                |                   | 69                           |                            | 0.54                 |                               |           |
|         |                                                |                   | 80                           |                            | 0.28                 |                               |           |
|         |                                                |                   | 130                          |                            | 0.44                 |                               |           |
|         |                                                |                   | 111                          |                            | 0.25                 |                               |           |
| R1234yf | C <sub>3</sub> H <sub>2</sub> F <sub>4</sub>   |                   | 69                           | 114                        | 0.98                 | 8.74E+07                      | 0.624     |
|         |                                                |                   | 64                           |                            | 0.96                 |                               |           |
|         |                                                |                   | 114                          |                            | 0.53                 |                               |           |
|         |                                                |                   | 95                           |                            | 0.28                 |                               |           |
|         |                                                |                   | 113                          |                            | 0.20                 |                               |           |
| R1234ze | C <sub>3</sub> H <sub>2</sub> F <sub>4</sub>   |                   | 69                           | 114                        | 1.00                 | 1.00E+08                      | 0.619     |
|         |                                                |                   | 64                           |                            | 0.83                 |                               |           |
|         |                                                |                   | 114                          |                            | 0.55                 |                               |           |
|         |                                                |                   | 95                           |                            | 0.49                 |                               |           |
|         |                                                |                   | 113                          |                            | 0.30                 |                               |           |
| R1243zf | C <sub>3</sub> H <sub>3</sub> F <sub>3</sub>   |                   | 95                           | 96                         | 1.00                 | 1.31E+08                      | 0.600     |
|         |                                                |                   | 77                           |                            | 0.52                 |                               |           |
|         |                                                |                   | 51                           |                            | 0.48                 |                               |           |
|         |                                                |                   | 69                           |                            | 0.41                 |                               |           |
|         |                                                |                   | 96                           |                            | 0.85                 |                               |           |

| Gas                | Formula                       | Other designation | Measuring position (xxx amu) | Molecular mass (xxx.x amu) | Fragmentation factor | Normalization factor (x.xExx) | Viscosity |
|--------------------|-------------------------------|-------------------|------------------------------|----------------------------|----------------------|-------------------------------|-----------|
| R1270              | C <sub>3</sub> H <sub>6</sub> | Propene           | 41                           | 44.1                       | 1.00                 | 1.58E+08                      | 0.433     |
|                    |                               |                   | 39                           |                            | 0.70                 |                               |           |
|                    |                               |                   | 42                           |                            | 0.62                 |                               |           |
| Ar                 |                               | Argon             | 40                           | 40                         | 1.00                 | 3.15E+07                      | 1.127     |
| CO <sub>2</sub>    |                               | R744              | 44                           | 44                         | 1.00                 | 4.50E+07                      | 0.744     |
| H <sub>2</sub>     |                               | Hydrogen          | 2                            | 2                          | 1.00                 | 1.36E+07                      | 0.448     |
| H <sub>2</sub> 5%  |                               | Forming gas       | 2                            | 2                          | 0.05                 | 1.36E+07                      | 0.878     |
| H <sub>2</sub> 10% |                               | Forming gas       | 2                            | 2                          | 0.10                 | 1.36E+07                      | 0.871     |
| H <sub>2</sub> O   |                               | R718              | 18                           | 18                         | 1.00                 | 3.15E+07                      | 0.459     |
| He                 |                               | Helium            | 4                            | 4                          | 1.00                 | 3.26E+08                      | 1.000     |
| HT135              |                               | Galden HT135      | 100                          | 610                        | 0.08                 | 5.40E+06                      | 1.000     |
|                    |                               |                   | 69                           |                            | 1.00                 |                               |           |
|                    |                               |                   | 119                          |                            | 0.45                 |                               |           |
|                    |                               |                   | 169                          |                            | 0.42                 |                               |           |
|                    |                               |                   | 131                          |                            | 0.03                 |                               |           |
| Kr                 |                               | Krypton           | 84                           | 84                         | 1.00                 | 3.15E+07                      | 1.275     |
| N <sub>2</sub>     |                               | Nitrogen          | 28                           | 28                         | 1.00                 | 3.15E+07                      | 0.892     |
| Ne                 |                               | Neon              | 20                           | 20.2                       | 1.00                 | 3.15E+07                      | 1.586     |
| NH <sub>3</sub>    |                               | R717              | 17                           | 17                         | 1.00                 | 3.15E+07                      | 0.505     |
| O <sub>2</sub>     |                               | Oxygen            | 32                           | 32                         | 1.00                 | 3.15E+07                      | 1.030     |
| SF <sub>6</sub>    |                               |                   | 127                          | 146.1                      | 0.80                 | 5.27E+07                      | 0.765     |
| Xe                 |                               | Xenon             | 129                          | 131.3                      | 1.00                 | 5.40E+07                      | 1.153     |
|                    |                               |                   | 132                          |                            | 1.00                 |                               |           |
| ZT130              |                               | Galden ZT130      | 100                          | 497                        | 0.25                 | 3.15E+07                      | 1.000     |
|                    |                               |                   | 117                          |                            | 0.32                 |                               |           |
|                    |                               |                   | 119                          |                            | 1.00                 |                               |           |
|                    |                               |                   | 69                           |                            | 0.50                 |                               |           |
|                    |                               |                   | 135                          |                            | 0.12                 |                               |           |

Table 4: Gas library



## 11.2 CE Declaration of Conformity



### ***EU Declaration of Conformity***

We – INFICON GmbH - herewith declare that the products defined below meet the basic requirements regarding safety and health and relevant provisions of the relevant EU Directives by design, type and the versions which are brought into circulation by us. This declaration of conformity is issued under the sole responsibility of INFICON GmbH.

In case of any products changes made, this declaration will be void.

The products meet the requirements of the following Directives:

***Directive 2006/42/EG (Machinery)***

***Directive 2014/30/EU (EMV)***

***Directive 2011/65/EU (RoHS)***

Designation of the product:

**Multi-gas leak detector**

Applied harmonized standards:

***EN ISO 12100 :2010***

***EN IEC 61010-1:2020***

***EN 61326-1:2013***

***Klasse A nach EN 55011***

***EN IEC 63000:2018***

Models:

**Ecotec 4000**

Catalogue number: **530-201**

Authorised person to compile the relevant technical files:

H. Rauch, INFICON GmbH, Bonner Strasse 498, D-50968 Cologne, Germany

Cologne, December 12, 2025

p.p.  
Dr. H. Bruhns, Vice President LDT

Cologne, December 12, 2025

pro  
J. Khaoudi, Research and Development

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Tel.: +49 (0)221 56788-0  
www.inficon.com  
E-mail: leakdetection@inficon.com

## 11.3 Certificates (TÜV Rheinland)

Page 1

# Certificate

Certificate no.

CU 72605558 0001

**License Holder:**

INFICON GmbH  
Bonner Str. 498  
50968 Köln  
Deutschland

**Manufacturing Plant:**

INFICON GmbH  
Bonner Str. 498  
50968 Köln  
Deutschland

**Report Number:** DE263AR0 001**Client Reference:** Winfried Schneider**Certification acc. to:** UL 61010-1:2012 R11.24

CSA C22.2 No. 61010-1-12 R11.24

**Product Information****Certified Product:** Multigas leakage detector**Model Designation:** Ecotec 4000 (530-201)

**Technical Data:** Input voltage: AC 100 - 240 V, 50/60 Hz  
Input power: 400 VA  
Protection class: I

**Remarks:** Pressure vessel with test gas is not part of the certificate.

**Appendix:** CDF (Page 1-13)

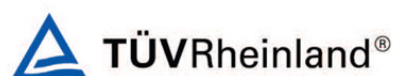
**Date of issue:** 2026-03-31  
(yr/mo/day)

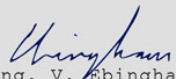


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[www.tuv.com](http://www.tuv.com)



|                                                                                                          |                                                                       |                                                                                                                            |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
|                         |                                                                       | <b>Ref. Certif. No.</b><br><br>DE 2-046549                                                                                 |
| <b>IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME</b> |                                                                       |                                                                                                                            |
| <b>CB TEST CERTIFICATE</b>                                                                               |                                                                       |                                                                                                                            |
| Product                                                                                                  | Multigas leakage detector                                             |                                                                                                                            |
| Name and address of the applicant                                                                        | INFICON GmbH<br>Bonner Str. 498 50968 Köln<br>Deutschland             |                                                                                                                            |
| Name and address of the manufacturer                                                                     | INFICON GmbH<br>Bonner Str. 498 50968 Köln<br>Deutschland             |                                                                                                                            |
| Name and address of the factory<br><i>Note: When more than one factory, please report on page 2</i>      | INFICON GmbH<br>Bonner Str. 498 50968 Köln<br>Deutschland             |                                                                                                                            |
| Ratings and principal characteristics                                                                    | AC 100 - 240 V, 50 / 60 Hz, 400 VA<br>Class I, IP 20 / Type 1 (UL50E) |                                                                                                                            |
| Trademark / Brand (if any)                                                                               | Inficon                                                               |                                                                                                                            |
| Customer's Testing Facility (CTF) Stage used                                                             | CTF Stage 1                                                           |                                                                                                                            |
| Model / Type Ref.                                                                                        | Ecotec 4000 (530-201)                                                 |                                                                                                                            |
| Additional information (if necessary may also be reported on page 2)                                     | The pressure vessel with test gas is not part of this certificate.    |                                                                                                                            |
| A sample of the product was tested and found to be in conformity with                                    | IEC 61010-1:2010+A1<br>for national differences see test report       |                                                                                                                            |
| As shown in the Test Report Ref. No. which forms part of this Certificate                                | DE26I0K1 001                                                          |                                                                                                                            |
| This CB Test Certificate is issued by the National Certification Body                                    |                                                                       |                                                                                                                            |
|  <b>TÜVRheinland®</b> |                                                                       | TÜV Rheinland LGA Products GmbH<br>Tillystr. 2, 90431 Nürnberg, Germany<br>Mail: cert-validity@de.tuv.com                  |
| Date:                                                                                                    | 2026-03-31                                                            | Signature: <br>Dipl.-Ing. V. Ebinghaus |

Disclaimer: This is an electronically released document. The authenticity can be verified on the IECEE Website "http://certificates.iecee.org" (1.3s / 0)

10/0615MD 2024-12 rke-simplified

# 11.4 RoHS

产品中有害物质的名称及含有的信息表

Table of Hazardous Substance Names and Content Information in Products

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |                      |                      |                                           |                                                    |                                                                   |                                                    |                                                    |                                                       |                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|----------------------|-------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------|
| Ecotec 4000: 有害物质                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                      |                      |                                           |                                                    |                                                                   |                                                    |                                                    |                                                       |                                                                         |
| Ecotec 4000: Hazardous Substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                      |                      |                                           |                                                    |                                                                   |                                                    |                                                    |                                                       |                                                                         |
| 部件名称<br>Part Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 铅<br>Lead<br>(Pb) | 汞<br>Mercury<br>(Hg) | 镉<br>Cadmium<br>(Cd) | 六价铬<br>Hexavalent<br>Chromium<br>(Cr(VI)) | 多溴联苯<br>Poly-<br>brominated<br>biphenyls<br>(PBBs) | 多溴联苯<br>醚<br>Poly-<br>brominated<br>diphenyl<br>ethers<br>(PBDEs) | 邻苯二甲<br>酸二正丁<br>酯<br>Dibutyl<br>phthalate<br>(DBP) | 邻苯二甲酸<br>二异丁酯<br>Diisobutyl<br>phthalate<br>(DIBP) | 邻苯二甲<br>酸丁苄酯<br>Benzyl<br>butyl<br>phthalate<br>(BBP) | 邻苯二甲酸<br>二(2-乙基<br>)己酯<br>Bis (2-<br>ethylhexyl)<br>phthalate<br>(DEHP) |
| 隔膜泵<br>Diaphragm<br>pump                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | X                 | O                    | O                    | O                                         | O                                                  | O                                                                 | O                                                  | O                                                  | O                                                     | O                                                                       |
| 风扇<br>Fan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | X                 | O                    | O                    | O                                         | O                                                  | O                                                                 | O                                                  | O                                                  | O                                                     | O                                                                       |
| 组装的印<br>刷电路板<br>Assembled<br>printed<br>circuit<br>boards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | X                 | O                    | O                    | O                                         | O                                                  | O                                                                 | O                                                  | O                                                  | O                                                     | O                                                                       |
| 节流阀<br>Throttle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | X                 | O                    | O                    | O                                         | O                                                  | O                                                                 | O                                                  | O                                                  | O                                                     | O                                                                       |
| <p>注 1: O: 表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。</p> <p>X: 表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。</p> <p>注 2: 以上未列出的部件, 表明其有害物质含量均不超出电器电子产品有害物质限制使用国家标准要求。</p> <p>Note 1: O: Indicates that said hazardous substances contained in all the homogeneous materials for this part is below the limit requirement of the national standard for the restriction of hazardous substances in electrical and electronic products.</p> <p>X: Indicates that said hazardous substances contained in at least one homogeneous material used for this part is above the limit requirement of the national standard for the restriction of hazardous substances in electrical and electronic products.</p> <p>Note 2: Parts not listed above indicate that their hazardous substances are below the limit requirement of the national standard.</p> |                   |                      |                      |                                           |                                                    |                                                                   |                                                    |                                                    |                                                       |                                                                         |

