

Translation of the original operating instructions



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# Ecotec E3000

Leak detector

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Reprint, translation and duplication need to be approved in writing by INFICON GmbH.

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# 1 About this manual

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This document applies to the software version stated on the cover page. Documents for other software versions are available from our sales department.

## 1.1 Target group

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These operating instructions are intended for the owner of the leak detection unit E3000 and for technically qualified personnel with experience in leak detection technology and integration of leak detection devices in leak detection systems.

## 1.2 Other applicable documents

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- ECO-Check installation instructions, document no. liqa10
- Interface description, document no. kins22

## 1.3 Presentation of information

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### 1.3.1 Warnings

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## 2 Safety

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### 2.1 Intended use

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The device is a leak detector for sniffer leak detection. With the device you locate and quantify leaks on test objects. The device sniffs for light gases, refrigerants and natural gases.

The test objects must contain the gas under overpressure. The outsides of the test objects are checked for escaping gas with a sniffer line (sniffing method).

The sniffer line is available as an accessory (see "10.1 Accessories", page 77).

- ▶ You must install, operate and service the device only in compliance with these operating instructions.
- ▶ Adhere to the restrictions of use (see "4.4 Technical data", page 14).

#### **Unauthorized use**

- ▶ Do not suction in liquids with the device.
- ▶ Never hold the sniffer probe into liquids but sniff only for gases.

### 2.2 Owner requirements

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#### **Safety-conscious operation**

- ▶ Operate the device only in technically perfect working order.
- ▶ Operate the device exclusively as specified, in a safety-conscious and hazard-conscious manner and in compliance with these operating instructions.
- ▶ Fulfill the following regulations and monitor their compliance:
  - Intended use
  - Generally applicable safety and accident prevention regulations
  - International, national and local standards and guidelines
  - Additional provisions and regulations that are specific to the unit
- ▶ Use only original parts or parts approved by the manufacturer.
- ▶ Keep these operating instructions available at the equipment location.

#### **Personnel qualifications**

- ▶ Allow only qualified technical staff to work with and on the device. The qualified technical staff must have received training on the device.
- ▶ Allow personnel in training to work with and on the device only under the supervision of trained qualified technical staff.
- ▶ Make sure that the authorized personnel have read and understood the operating instructions and all other applicable documents (see "1.2 Other applicable documents", page 5), especially the information on safety, maintenance and repairs, before starting work.
- ▶ Define responsibilities, authorizations and supervision of personnel.

## 2.3 Operator requirements

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- ▶ 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 questions regarding operation or maintenance that you cannot find answers for in these instructions, please contact the INFICON customer service.

## 2.4 Dangers

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The unit was built according to the state of the art and the recognized safety regulations. Nevertheless, improper use can result in danger to life and limb of the operator or other persons and damage to the unit and other property.

### ***Dangers due to electric power***

The device is operated with electrical voltages of up to 265 V. Touching parts where electric voltage is applied can result in death.

- ▶ Disconnect the device from the power supply prior to any installation and maintenance work. Make sure that the electric power supply cannot be reconnected unauthorized.

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

- ▶ Before starting the leak test, disconnect electrically operated test objects from the power supply. Make sure that the electric power supply cannot be reconnected unauthorized.

The device contains electric components that can be damaged from high electric voltage.

- ▶ Before connecting the device to the power supply, make sure that the supply voltage specified on the device is the same as the local power supply.

### ***Dangers due to liquids and chemical substances***

Liquids and chemical substances can damage the unit.

- ▶ Adhere to the restrictions of use (see ["4.4 Technical data", page 14](#)).
- ▶ Do not suction in liquids with the device.
- ▶ Never try to find toxic, caustic, microbiological, explosive, radioactive or other harmful substances with the device.

Hydrogen and air form a highly explosive mixture.

- ▶ Use the device only outside of explosive areas.
- ▶ You may not smoke. Do not subject the device to open fire and avoid sparking.

### ***Dangers due to strong light irradiation***

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 a longer period of time.



### 3 Shipment, transport, storage

#### Scope of delivery

Table 1: Scope of delivery

Article	Quantity
Ecotec E3000 (main unit)	1
Power supply cable, 3 m length	1
Fuses	30
Replacement air filter	1
8 mm Allen wrench	1
19 mm box wrench	1
Operating instructions	1
Interface description	1

► Check the scope of delivery of the product for completeness after receipt.

The following must be ordered separately:

- sniffer lines with the desired length,
- ECO-Check calibrated leak,
- for device version E3000RC: display and connecting cable.

Accessory list: [see "10.1 Accessories", page 77](#)

#### Transport

## NOTICE

### Damage from transport

Transport in unsuitable packaging material can damage the unit. Parts inside the device can be damaged during transportation without transport restraint.

- Store the original packaging.
- Transport the device only in the original packaging.
- Screw the transport restraint into the device floor before transportation, [see "5.1 Setup", page 17](#).

#### Storage

Store the device adhering to the specifications, [see "4.4 Technical data", page 14](#).



## 4 Description

### 4.1 Function and setup of the device

The Ecotec E3000 is comprised of main unit and sniffer line.

The Ecotec E3000 can verify and quantify gases sucked in by the sniffer line with the help of a selective mass spectrometer.

Working in the Ecotec E3000:

- 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 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 created by the turbo molecular pump with the help of a diaphragm pump.

### 4.2 Main unit

The main unit will be called "device" only in the following so long as this does not falsify the meaning.



Fig. 1: Front view

- |                                    |                                           |
|------------------------------------|-------------------------------------------|
| ① Display                          | ④ ECO-Check calibrated leak               |
| ② Handles and ventilation openings | ⑤ Lemo plug-in connector for sniffer line |
| ③ Speaker                          |                                           |

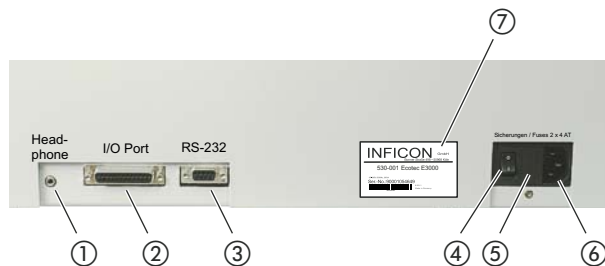


Fig. 2: Rear view

- |                                     |                      |
|-------------------------------------|----------------------|
| ① Headphone connection, 3.5 mm jack | ⑤ Fuses behind cover |
| ② Inputs/outputs (I/O port)         | ⑥ Power supply       |
| ③ RS-232 connection                 | ⑦ Rating plate       |
| ④ Mains plug                        |                      |

① *Headphone connection, 3.5 mm jack*

In order to better hear signals in a loud environment, you can connect head phones.

② *Inputs/outputs (I/O port)*

The I/O port enables communication with a PLC. Some functions of the Ecotec E3000 can be controlled from the outside and measurement results and device states of the Ecotec E3000 can be transmitted to the outside.

Relay changeover contacts allow monitoring of the trigger values and the operating status of the Ecotec E3000. Please refer to the "Interface description Ecotec E3000" (doc. no. kins22e1) for further information.

③ *RS-232 connection*

A PC can read out all data and measurement results of the device and control the device via the RS-232 connection. Please refer to the "Interface description Ecotec E3000" (doc. no. kins22e1) for further information.

④ *Mains plug*

The mains plug serves to switch the device on and off.

⑤ *Fuses behind cover*

For information on replacing the fuses, see "8.2.3 Replacing mains fuses", page 71.

⑥ *Power supply*

For information on the power supply, see "4.4 Technical data", page 14, as well as the labeling on the power supply (rating plate).

⑦ *Rating plate*

The rating plate contains the supply voltage specification and other information with which the device can be clearly identified.

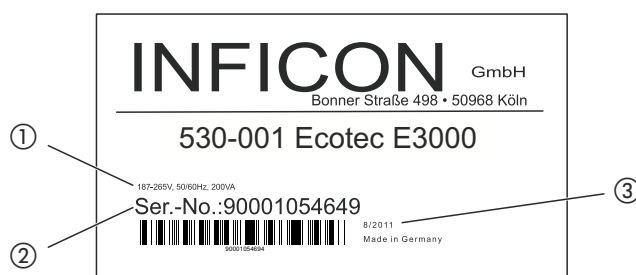


Fig. 3: Rating plate

- ① *Supply voltage*
- ② *Serial number*
- ③ *Production date*

## 4.3 Sniffer line

You need a sniffer line to operate the device. Sniffer lines are available in four lengths: 3 m, 5 m, 10 m and 15 m.

The sniffer line is made of a flexible tube (multi-function cable), a handle with controls (sniffer handle) and a sniffer probe.

There is a special sniffer line for robotic applications (see “10.1 Accessories”, page 77).

### **Sniffer probe**

There are rigid and flexible sniffer probes with different lengths.

### **Sniffer handle display and functions**

The display on the sniffer handle shows current information on the measuring process.

You can operate functions frequently used during measurement with both buttons.

LEDs inserted in the handle illuminate the test area.



Fig. 4: Handle: display and functions

- ① *Display*
- ② *ZERO adjustment*
- ③ *LEDs*
- ④ *Speaker (on the rear)*
- ⑤ *I-Guide operation*

If the measuring value limit is exceeded, the display switches from green to red. You can additionally set one speaker in the handle to output a signal and the LEDs in the handle to flash or shine with maximum brightness, see “6.3 Settings before measurements”, page 28.

## 4.4 Technical data

Table 2: Technical data

<b>Mechanical data</b>	
Dimensions (W × H × D)	610 mm × 370 mm × 265 mm
Weight	34 kg
<b>Ambient conditions</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	Linearly dropping from 80 % to 50 %
Max. relative humidity above 40 °C	50 %
Pollution degree	II (according to IEC 61010/part 1: “Usually, only non-conducting soiling may occur. However, temporary conductivity caused by condensation is tolerable at times.”)
Max. altitude above sea level	2000 m
<b>Electrical data</b>	
Supply voltages and frequencies	Country-specific, see rating plate on device rear
Power consumption	≤ 300 VA
Protection class	IP 20
Overvoltage category	II
Mains fuse	2 × 4 A slow-blow
Power supply cable	2.5 m
Noise level	< 54 dBA
<b>Physical data</b>	
Minimum detectable leak rate	
R134a	0.05 g/a (0.002 oz/yr)
R600a	0.05 g/a (0.002 oz/yr)
Helium	< 1 × 10 <sup>-6</sup> mbar l/s
Measurement range	6 decades
Detectable masses	2 to 200 amu
Mass spectrometer	Quadrupol mass spectrometer
Ion source	2 cathodes
Time constant of the leak rate signal	< 1 s
Gas flow through the capillary Measured at 1 atm (1013 mbar) at sea level. The flow rate changes with geographical height and barometric pressure.	120 to 200 sccm
Time until ready for operation	< 2 min

Table 2: Technical data (cont.)

Response time	
3 m sniffer line	0.7 sec.
5 m sniffer line	0.9 sec.
10 m sniffer line	1.4 sec.
15 m sniffer line	3.0 sec.

Table 3: Factory settings

Alarm profile	Trigger alarm
Alarm delay	Deactivated
Number of measuring points (I•Guide)	4
Functions	Activated
Internal	Activated
Recording output	Auto
Baud rate and blank flange	9600 CR+LF
Pressure unit	mbar
Flow rate	
Lower limit	100 sccm
Upper limit	250 sccm
Sensitivity test	Activated
Gas, definition	Gas 1, gas 2, gas 3, gas 4, gas 5, gas 6
Device speaker	Activated
Handle speaker	Trigger value
Selecting a cathode	A
I•Guide	Deactivated
Calibration (cal), internal	Activated
Contrast	Not inverted, setting 30
Volume	2
Minimum volume	2
Leak rate, selected, highest	Automatic
Leak rate filter	I•Filter
Menu PIN	Deactivated, 0000
Measuring time (I•Guide)	1 second
Measuring mass	69
Peak value	Deactivated, 5 seconds
ECO-Check	Activated
Relay outputs	See interface description
RS-232 protocol	ASCII
Sniffer probe, light	Activated, Level 4
Sniffer probe, filter, maintenance	100 hours
Recorder, gas	Auto
Scaling of the recorder	Logarithmic
Language	English
SPS outputs and inputs	See interface description

Table 3: Factory settings (cont.)

Control location	Local and RS-232
Search threshold	90 %
Trigger value, sum (I-Guide)	10 g/a
Trigger and unit	4 g/a
Idle time (I-Guide)	3 seconds
Maintenance, sniffer probe filter	100 hours
Zero time	5 seconds
Zero key sniffer line	Activated
ZERO key main unit	Activated



## 5 Installation

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### 5.1 Setup

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#### WARNING

##### **Danger due to moisture and electricity**

Moisture getting into the device can lead to personal injury from electric shocks and to material damage from short circuits.

- ▶ Operate the Ecotec E3000 only in a dry environment.
- ▶ Operate the Ecotec E3000 away from sources of liquid and moisture.



#### CAUTION

##### **Danger due to dropping heavy loads**

The device is heavy and can damage persons and items through tilting or dropping.

- ▶ Place the device only on a sufficiently sturdy surface.

#### NOTICE

##### **Material damage due to vibration.**

Parts of the measurement technology rotate and must not be shaken. The parts continue to rotate for several minutes after the device is shut down.

- ▶ Place the device only on a sturdy, vibration-free surface.
- ▶ The device must not be shaken during operation and at least five minutes after being switched off.

#### NOTICE

##### **Material damage due to an overheated device**

The device heats up during operation and can overheat without sufficient ventilation.

- ▶ Please note the specifications, [see page 14](#).
- ▶ Ensure sufficient ventilation especially on the ventilation openings on the left and right of the device: free space on the side at least 20 cm, in front and in the rear at least 10 cm.
- ▶ Keep heat sources away from the device.
- ▶ Do not subject the device to direct sunlight.

## NOTICE

### Material damage due to transport restraint that has not been removed

The transport restraint blocks the mechanical system in the device.

- ▶ Remove the transport restraint before the start-up.

The transport restraint is on the bottom of the Ecotec E3000 and consists of a yellow star screw.



Fig. 5: Unscrew the yellow transport restraint before the start-up

## 5.2 Connecting the sniffer line

## 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.

Align the red marking on the sniffer line plug with the red marking on the socket. Push the sniffer line plug into the socket on the device until it locks into place.

Pull the grooved ring on the plug to release it. The ring opens the lock and you can pull out the plug.

### 5.2.1 Replacing the capillary filter of the sniffer probe

The metal capillary filter is the standard filter. With the plastic capillary filter there is less danger of scratching the surfaces to be sniffed. The water conservation tip is used if there is a danger of suctioning in liquids.

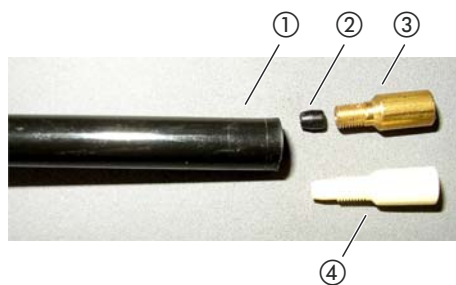


Fig. 6: Capillary filter

- ① Sniffer probe end
- ② Plugwasher
- ③ Metal capillary filter
- ④ Plastic capillary filter

### 5.2.1.1 Replacing the plastic capillary filter with the metal capillary filter

- 1 Turn off the Ecotec E3000.
- 2 Unscrew the plastic capillary filter.
- 3 Insert the plugwasher, see [fig. 6 on page 19](#).
- 4 Screw in the metal capillary filter on the sniffer probe end.
- 5 Calibrate the Ecotec E3000, see [“6.4.2 Calibration”, page 37](#).

### 5.2.1.2 Replacing the metal capillary filter with the plastic capillary filter

If you want to switch from a capillary filter made of metal to a capillary filter made of plastic, you have to remove the plugwasher. The plugwasher sits on the steel capillary in the sniffer probe.

- 1 Turn off the Ecotec E3000.
- 2 Unscrew the filter.
- 3 Unscrew the two cross-head screws in the sniffer probe flange and take out the sniffer probe.
- 4 Push the capillary out of the plastic sheath a bit from the top with a narrow pin or a thin needle (about 0.5 mm). Make sure that the sinter filter in the sniffer probe flange does not get lost in doing so.
- 5 Remove the plugwasher from the sniffer probe.

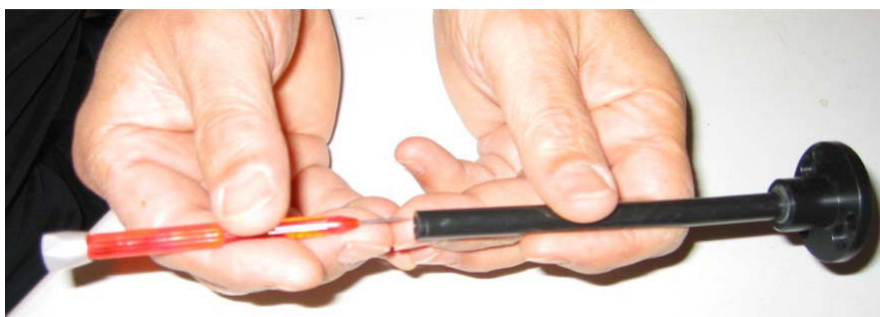


Fig. 7: Pushing out the capillary

- 6 Put the sinter filter back in and tighten the sniffer probe on the handle.

- 7 Screw the plastic capillary filter on the sniffer probe.
- 8 Calibrate the Ecotec E3000, [see "6.4.2 Calibration", page 37.](#)

### 5.2.1.3 Water conservation sniffer probe mounting and remove

---

With the help of the water conservation sniffer probe, you can check test objects with low surface moisture, e.g. condensation moisture, for tightness.

## NOTICE

### Short circuit hazard

Sucked in liquid can destroy the device.

- ▶ Do not suction in liquids with the device.

The water conservation sniffer probe is screwed onto the sniffer probe end like the metal capillary filter. The small plugwasher must also be placed below the end, [see "5.2.1.2 Replacing the metal capillary filter with the plastic capillary filter", page 19.](#)



Fig. 8: Tightening the water conservation sniffer probe

For renewed mounting of the plastic capillary filter, [see "5.2.1.1 Replacing the plastic capillary filter with the metal capillary filter", page 19.](#)

## 5.2.2 Attaching the sniffer lines holder

A holder is available for the sniffer probe. The holder can be installed on the right or the left of the device.



Fig. 9: Sniffer line holder mounting

The holder has two hooks that are inserted into two slits on the front panel of the device. The holder is pulled to the front panel of the device with a magnet on its rear.

## 5.3 Connecting the ECO-Check calibrated leak

A built-in calibrated leak (ECO-Check) and different external calibrated leaks are available as accessories available for the Ecotec E3000, see [“10.1 Accessories”, page 77](#).

Please refer to the ECO-Check installation manual on how to connect the ECO-Check.

## 5.4 Connecting the external display unit to the Ecotec E3000RC

Connect the external display unit and the Ecotec E3000RC with the appropriate connecting cable. Secure the plug on the socket by tightening the screws.



Fig. 10: The Ecotec E3000RC with external display unit as a table device (left), for rack mounting (right)

## 5.5 *Connecting to the power supply system*

---

The supply voltage of the Ecotec E3000 is specified on the labeling of the mains plug (rating plate). The Ecotec E3000 cannot be switched for other supply voltages.



### **CAUTION**

#### **Danger due to incorrect supply voltage**

Incorrect supply voltage can destroy the device and injure persons.

- ▶ Check whether the supply voltage specified on the Ecotec E3000 matches the supply voltage available on site.

Connect the device to the electric power supply with the supplied power cable.

### 5.5.1 *Connecting to a PC*

---

The connection is made with a commercially available 9-pin SUB-D plug. Please refer to the "Interface description Ecotec E3000" (doc. no. kins22e1) for further information on data exchange.

### 5.5.2 *Connecting with a PLC*

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The connection is made with a commercially available 25-pin SUB-D plug.

Please refer to the "Interface description Ecotec E3000" (doc. no. kins22e1) for further information on data exchange.

## 6 Operation

### 6.1 Start-up

Connect a sniffer line and switch on the device with the mains plug.

The Ecotec E3000 starts a self-test lasting several minutes. The display shows the headline "Running up" and the individual steps of the self-test.

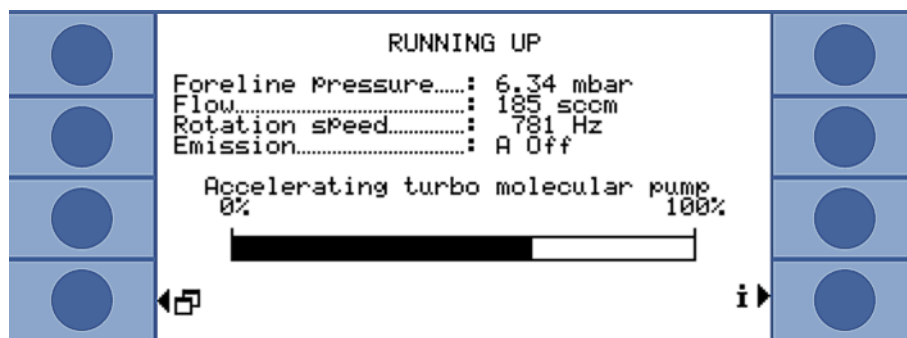


Fig. 11: The device runs up

After running up, the Ecotec E3000 already measures the gas concentration in the environment. There is no separate start function. But you have to still calibrate the device and make different settings for your intended measurement.

If the ECO-Check calibrated leak is not in the Ecotec E3000, an acoustic warning signal and the warning 71 are output during the first start-up.

To stop the alarm quickly, press the key on the bottom right (labeled "OK"). If you are working without the ECO-Check, you should deactivate the alarm permanently, see "ECO-Check", page 34.

### 6.2 Operating the device

#### 6.2.1 Display and keys

All settings are made with the eight keys to the left and the right of the display. The function allocations of the keys change depending on the current operating step. The function allocation is shown directly next to the key which allows fast and purposeful operation after a short learning period.

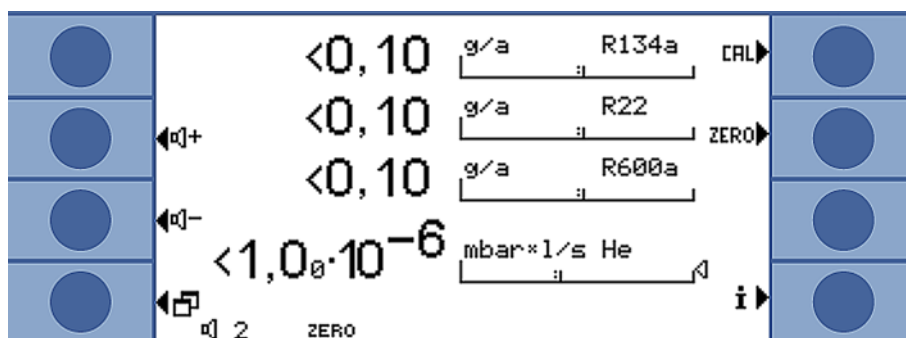






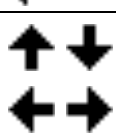






Fig. 12: Start display after the self-test

### 6.2.1.1 Recurring function symbols

The keys are always assigned with the following functions and labeled with the shown symbols.

	Setting the volume for speakers and head phones.
	Set volume: The set volume is displayed on the bottom edge of the display.
	Value range: 0 (off) to 10 (max.)
	<ul style="list-style-type: none"> <li>– Calling the main menu.</li> <li>– Calling a window again that was closed with .</li> </ul>
<b>CAL</b>	Calling up calibration.
<b>ZERO</b>	The lower edge of the display shows "Zero" if a zero point has been set since the device start-up.
	Calling up information: software version, operating hours, serial number, date & time, alarm profile.
<b>← Back</b>	Back to last menu level.
	Navigating in a list box.
	Pressing the key assigns the allocation "0" to that key and "1" to an adjacent key. The same setting option exists for the numbers "2/3", "4/5", "6/7", and "8/9".
	Closing the window and calling up the measurement view. Back to the window with  .
	<ul style="list-style-type: none"> <li>– Calling up the list of gases.</li> <li>– Measurement with I-Guide: calling up the list of I-Guide programs.</li> </ul>
<b>?</b>	Calling up help for the current function.
<b>OK</b>	Confirming an entry or selection.



## 6.2.2 Elements of the measurement view

The measured leak rates are shown numerically and with logarithmically divided bar graph displays.

The other elements of the measurement view are shown in the following figure.

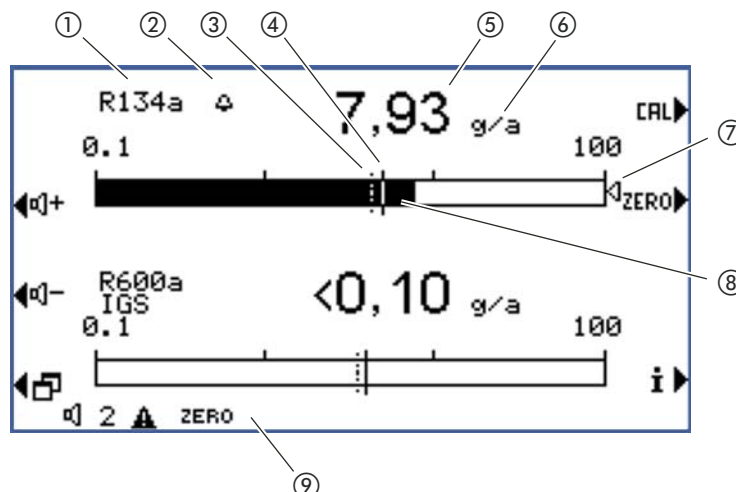


Fig. 13: Elements of the measurement view

- |                                                                          |                                                                                    |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| ① Gas                                                                    | ⑥ Leak rate unit                                                                   |
| ② Bell: search threshold exceeded; flashing bell: trigger value exceeded | ⑦ Marking arrow: marks the measurement displayed on the sniffer handle             |
| ③ Search threshold (broken line)                                         | ⑧ Bar graph, logarithmic                                                           |
| ④ Trigger value                                                          | ⑨ Status bar: symbols and text overlay provide information about the device status |
| ⑤ Numerical leak rate display                                            |                                                                                    |

The two center keys on the left side of the display can be used to adjust the volume of the alarm signal at any time. If one of the two keys is pressed, the device emits a sound with the selected volume through the speaker and shows the setting with a bar graph in the status line. The set value is also the first entry in the status line on the bottom of the display and applies only to the speaker of the main unit. To adjust different alarm profiles, [see page 29](#).

### Menu key

The key on the bottom left of the display has two functions:

- Calling the main menu.
- Returning you to the last window that was closed with .

### Calibration key (CAL)

The key on the top right next to the display can be used to start a calibration of the Ecotec E3000 with an external test leak at any time. Additional information on completing an external calibration, [see "6.4.2.2 External calibration with external calibrated leak", page 39](#).

### ZERO key

Pressing the ZERO key briefly stores the currently displayed leak rate as zero point for all selected refrigerants. Pressing the ZERO key for more than 2 seconds switches off the ZERO function. The display ZERO disappears from the status line in this case. For more information on the ZERO function, [see "Zero", page 31](#).

#### Information key

Pressing the information key **i** (to the bottom right of the display) shows information on the status of the Ecotec E3000. Details: see [“6.4.6.1 Calling up information on the measurement”](#), page 45.

#### Status line

Status information is displayed in the lower line of the measurement window. The set volume for the alarm is displayed in the left of the line.

If the small speaker flashes, it indicates that the device speaker is switched off.

If the number flashes, it indicates that the alarm delay is switched on, see [“Alarm delay”](#), page 29

A small black triangle with an exclamation point next to it can indicate an active warning.

If the ZERO function is activated, the word “ZERO” follows in the status line.

If the first cathode (filament A) of the mass spectrometer has been consumed and the Ecotec E3000 switches automatically to the second cathode (filament B), the display will show “Fil. B” in the status line.

If you working with an activated IGS, “IGS” will be shown in the status line.

### 6.2.3 Operating elements and display on the sniffer handle

The display of the sniffer handle shows the most important information for the current measurement. Measurements can be controlled with the two keys.

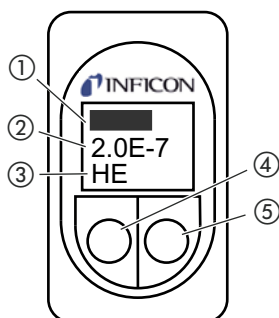


Fig. 14: Operating elements and display on the sniffer handle

- ① Leak rate as bar graph
- ② Leak rate, numerical. Unit, as shown on the main unit
- ③ Measured gas
- ④ Left key, assigned “Zero”
- ⑤ Right key, different assignments

The measured leak rate is shown as an increasing or decreasing bar. The second line shows the leak rate as a numerical figure (with the same measurement unit as in the main display). The third line shows the abbreviation for the measured gas.

Depending on the measurement, the display can also show something else, e.g. “Error” or the number of a warning.

If you search for several gases simultaneously, you can switch between individual measurement results with the right key. The right key can also be used to confirm messages or states during a measurement cycle.

You can trigger the ZERO function with the left key, see [“Zero”](#), page 31.

The key can be deactivated to prevent accidental triggering: Press the key until you hear a signal. The key is reactivated by pressing it longer.

#### 6.2.4 Special features of the Ecotec E3000RC

---

The Ecotec E3000RC has a connection panel for the external display unit instead of the built-in display. Two LEDs (to the left of the plug) provide information on the status of the Ecotec E3000RC, even if the external display unit is not connected.

The green LED shows that the Ecotec E3000RC is switched on. It has a steady green light if an external display is connected and flashes if no external display can be detected.

The red LED flashes in case of an error message; a steady red light indicates a warning.

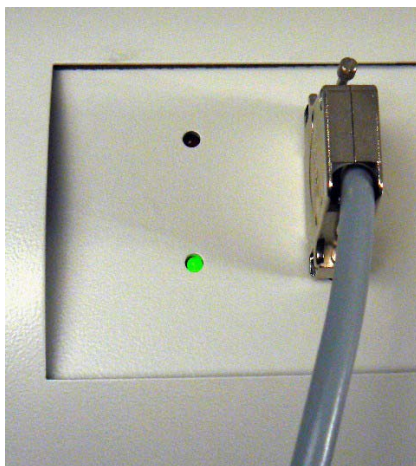


Fig. 15: Connection panel with LEDs

If no display unit is connected, you can confirm error messages and warnings by pressing both keys on the sniffer line simultaneously.

The external display unit has four keys:


- The menu key opens the main menu.
- The current measured background value is set as zero point with the ZERO key, [see "Zero", page 31](#).
- The START / STOP keys do not have any function (the external display unit can also be used with other leak detectors made by INFICON that require these keys).

## 6.3 Settings before measurements

---

Before the first measurements, you should make different device settings in the following menus:

- Miscellaneous
- Display
- Audio
- Vacuum & access control
- Interfaces (for control via interfaces and if you use an ECO-Check)

You can access the menus via the main menu 

### 6.3.1 Miscellaneous

---

#### **Language**

You can select one of the following languages:

- English (factory setting)
- German
- French
- Italian
- Portuguese
- Spanish
- Japanese (Katakana)
- Chinese (Mandarin, simplified Chinese)

To set the language to English temporarily, press keys two and six during the run-up of the Ecotec. Call up the language setting after the run-up and set the required language.

#### **Time & Date**

- First page: internal date with the format DD.MM.YYYY
- Second page (press key on the bottom right →) time with the format SS:MM.

#### **Sniffer light**

- Activate/deactivate light
- Adjust brightness from 1 (min) to 6 (max)

#### **Pressure unit**

- atm
- Torr
- Pa
- mbar

#### **Leak rate filter**

- Auto
- Fixed
- I-Filter


The I-Filter is an intelligent filter algorithm that delivers the best results regarding interference suppression and stability of the leak rate signal. It was especially developed for the use in the Ecotec E3000.

Only in cases in which the older Ecotec II model was replaced with an Ecotec E3000 and the Ecotec E3000 is used in a fixed test device can it be necessary to select the older filter settings "Auto" or "Fixed".

### **Alarm delay**

With very unstable surface conditions, it can be expedient to emit an acoustic alarm only if the trigger value is exceeded for a specified period of time. If the function is activated, the number indicating the volume of the device speaker flashes in the status bar.

Setting range: 0 to 9.9 seconds, in tenths of a second



## WARNING

**Danger due to undetected leaks.**

If the alarm delay is activated, there may be no acoustic alarm even though a leak is detected.

- ▶ Please note the measurement display in the device and the handle.
- ▶ Deactivate the function when surface conditions are stable again.

### **Wake up**

If the Ecotec E3000 is in idle state (sleep), a time can be set for it to start automatically. This way you can set the Ecotec up to run through its warm-up phase already before the shift starts.

You can set a separate wake-up time exact to the minute for each day of the week.

To deactivate the wake up again, set the wake-up time to 00:00.

## **6.3.2 Audio settings**

---

### **Beep sound**

You can switch off the signals that indicate the completion of specific functions.

### **Device speaker**

You can switch off the speaker installed in the main unit. This does not influence the speaker connection.

### **Audio sniffer**

You can choose whether the speaker in the sniffer handle should signal the exceedance of search threshold or trigger value.

You can also switch off the speaker completely.

### **Alarm profile**

You can assign one of three alarm profiles to the device speaker:

- Pinpoint
- Setpoint
- Trigger/alarm

Table 4: Features of the alarm profiles

	Alarm profile pinpoint	Alarm profile setpoint	Alarm profile trigger/alarm
Search value exceeded	–	Acoustic signal low frequency	Acoustic signal low frequency
Trigger value exceeded	–	Acoustic signal high frequency	Two-tone signal
Acoustic tracing of the measurement result	< 1/10 trigger value: low frequency	–	–
	>1/10 trigger value up to 10 × trigger value: rising frequency		
	> 10 × trigger value: high frequency		
Comment	Recommended, for precise leak localization	–	Three different two-tone signals available for selection.  This allows identification with a signal for devices that are used together.

**Volume** You can adjust the volume that cannot be set lower with the plus and minus keys next to the display. This way you can prevent the acoustic signals from being switched off accidentally during the measurement.

The adjustment applies to the speaker in the main unit and the head phones.

You can also set the current volume of speaker and head phones here.

Setting range: 0 to 15

## WARNING

**Hearing damage from excessively loud signals**

The volume of signals can exceed 85 dB(A).

- ▶ Keep away from the device if the volume has been set to high.
- ▶ Wear ear protection, when needed.

### 6.3.3 Display settings

In the menu “Settings > Display”, you can set the display details of the device display and the display in the sniffer handle.

**Contrast** Increase or decrease the display contrast using the arrow buttons. Holding the button scrolls through the values. The new setting takes immediate effect in the display.

- ▶ To adjust the contrast to the currently displayed menu, select “Automatic”.
- ▶ To display a dark background and the script in bright characters, select “Invert display”.

If the display is no longer legible because it is too dark or too bright, you can reset the setting as follows:

- 1 Switch the device off and back on.
- 2 Press keys 3 and 7 during the run-up until the display can be recognized again.
- 3 Call up the window for the contrast setting and confirm the new value. The device will otherwise use the old, unrecognizable setting after the next start-up.

The factory setting with black font on light background can be inverted. This causes the display to emit less light overall.

**Peak hold**

You can set if and how long the highest measured value is to be displayed additionally below the current leak rate.

Setting range: 0 to 20 seconds.

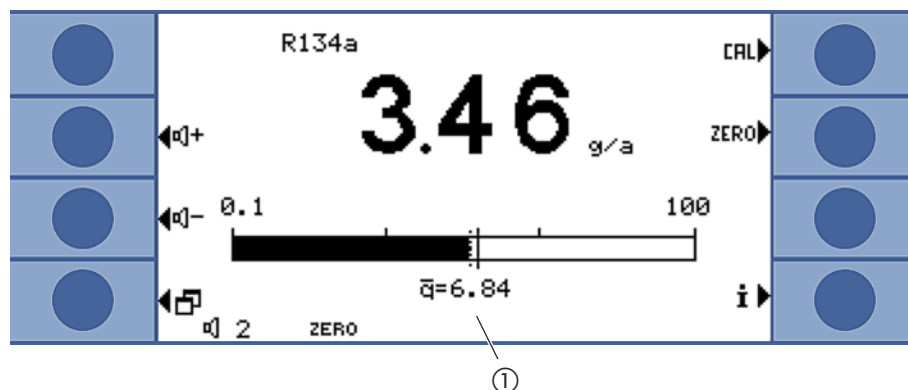


Fig. 16: Measurement view with maximum value display

① Maximum value

**6.3.3.1 Gas display handle**

In the menu “Settings > Display > Gas display handle” you can define which gas is shown in the display in the sniffer handle.

**Automatic**

The display always shows the gas that the most of is measured currently. If a trigger value is exceeded, this gas will be displayed.

**Manual**

You can switch between gases with the right key on the handle.

**Auto with hold**

You can switch to another gas with the right key on the handle. After the hold time has elapsed, the display again shows the gas that the most of is measured currently.

**Hold time**

The hold time can be set to 5, 10, 15, or 20 seconds.

**6.3.4 Vacuum & access control**

**Zero**

The gas concentration contained in the measurement environment can be set as zero point for measurement (background suppression). The function has the brief name “Zero”.

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 key on the handle and with the key “Zero” in the measurement view.

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

The key on the sniffer line handle can also be activated or deactivated by pressing the key 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).

Setting range: 1 to 9.9 s

**Flow limits**

To detect a leak on the 160-sccm capillary, an upper limit value is set. If the value is exceeded, the system issues the warning "Capillary broken". With longer exceedance, device components are also switched off to protect them.

To detect a clogging of the 160-sccm capillary, a lower limit value is set. If the value is fallen short of, the system issues warning "Changed flow!". With a strong lower deviation, the error message "Flow through capillary too low" is issued.

Possible settings range from 160 to 999 sccm or 0 to 160 sccm.

The closer the lower limit value is set to the actual flow rate, the more sensitive the Ecotec E3000 reacts to a beginning clogging of the filter and the sniffer line.

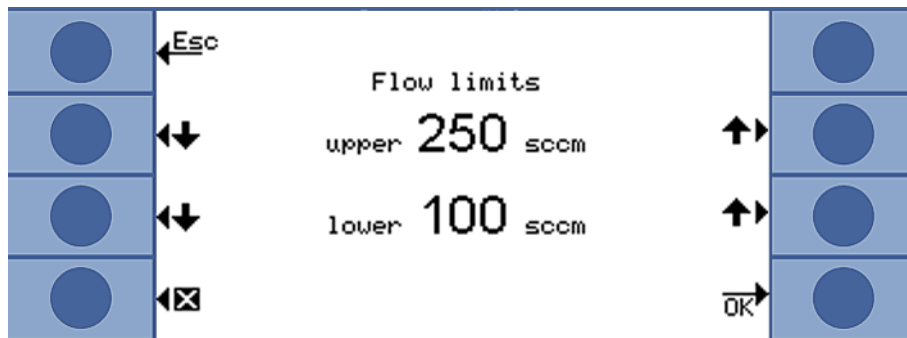


Fig. 17: Setting flow limits

The flow through the sniffer line depends on the atmospheric pressure of the environment. If you operate the device at great height, the flow rate through the sniffer line can drop considerably, approx. 20 % per 1000 m height. Reset the flow limits accordingly in this case.

**Monitoring check**

The sensitivity check in the device ensures that the sensitivity of the Ecotec E3000 is always sufficient. The entire gas flow from sniffer probe to sensor is monitored and the software simultaneously checks whether the Ecotec E3000 can determine the correct signal strength with it. The monitoring ensures that the Ecotec E3000 does not become insensitive and that leaks are not detected without the user noticing. If the sensitivity is reduced, the error message "Sensitivity too low" is issued. Recalibration can restore sensitivity in this case, see "6.4.2 Calibration", page 37. The error message is repeated every 15 seconds until calibration is started.

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.

**Calibration**

In the window "Calibration", you can activate or deactivate external calibration. If calibration is deactivated, you can calibrate only internally with a built-in ECO-Check calibrated leak. The command "Cal" in the measurement window is no longer displayed.

This prevents a previously executed external calibration from being overwritten accidentally. Details on calibration, see "6.4.2 Calibration", page 37.



### Changing the menu PIN

You can protect access to the settings with a PIN.

To prevent entry errors, you have to enter the PIN twice. After confirmation with "OK", the main menu is displayed and the PIN is effective immediately.

To cancel protection again, enter "0000" as the new PIN (factory setting).



Fig. 18: Defining the menu PIN

## 6.3.5 Interfaces

In "Settings > Interfaces", you enter the settings for the interfaces and for the ECO-Check. Please refer to the interface description (kins22e1) for detailed information on interfaces.

### Control location

- Local
- RS-232
- Local and RS-232

Local: Only measurements can be read out via the RS-232 interface. They are not available to control the device.

RS-232: The Ecotec E3000 is controlled almost exclusively via the interface. The display serves only for a visual check. Some settings can be changed on the device. Please use the protection via access PIN if all functions on the device are to be inaccessible, see "Changing the menu PIN", page 33.

Local and RS-232: The Ecotec E3000 can be controlled via interface and entries on the device.

### Recorder outputs > Recorder output scale

- Linear
- Logarithmic

The output is on channel 1 (pin 1 of the I/O connection).

### Recorder outputs > Recorder output gas

- Gas 1 to 4
- Auto

### PLC Setup > Define PLC inputs (outputs)

- You will assign different commands to the pins of the I/O connection here.

### PLC setting > Baud rate & End sign

- Baud rate 1200/2400/4800/9600/19200
- End sign LF/CR/CR + LF

### RS-232 protocol

- ASCII
- Diagnosis
- Printer Auto
- Printer Manual

### ECO-Check

If you do not use an ECO-Check calibrated leak, you should choose “Deactivate” here. Otherwise, warning 71 “No communication with ECO-Check” will be issued at every start of the Ecotec E3000.

If you use an ECO-Check calibrated leak, you can set up a warning for the intended time of use here: 14/30/60/90 days.

## 6.4 Settings for the measurements

With delivery, the data are programmed for the following gases and the measurement results are shown below each other in the display:

- R134a
- R22
- R600a
- He

The gas selection can be changed at any time.

### 6.4.1 Selecting the gas, changing gas parameters, activating measurement

You can access the settings via the main menu

- Select “Measuring parameters”

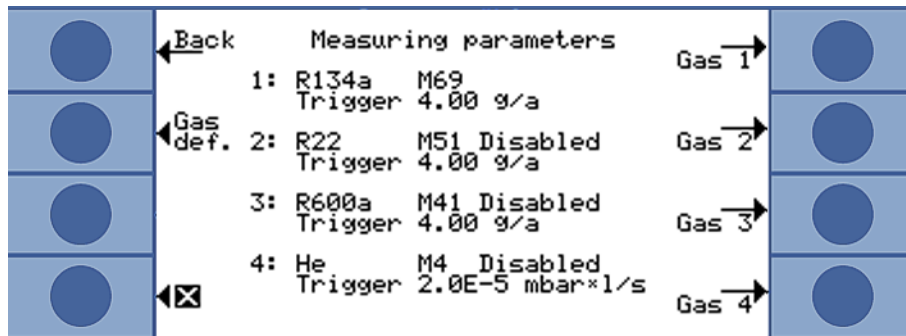


Fig. 19: Gas information for the measurement

The display shows:

- four gases
- the respective mass position
- the respective trigger value
- the addition “Deactivated” if the associated gas is currently not searched for, see below.

You can also define your own gas with the key “Gas def.”, see “6.4.5 Setting a user-defined gas”, page 42.

Press the key to the right of the gas whose parameters you want to change. The window “Measuring param. gas ...” will open.

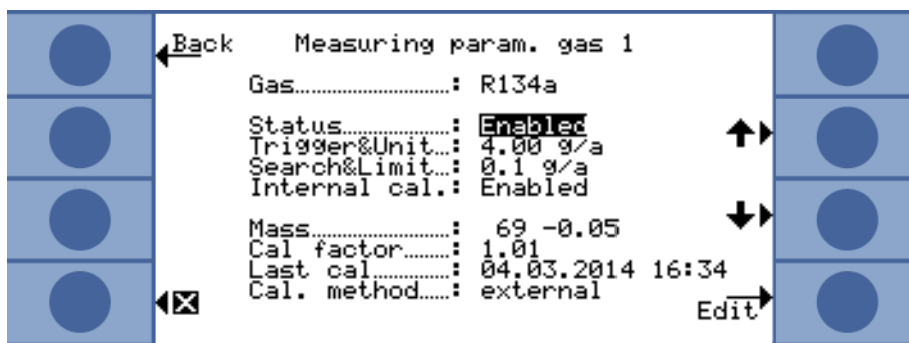


Fig. 20: Changing the settings for gas 1

With the keys up and down you select a setting. Pressing the key “change” on the bottom right opens the associated settings menu.

**Gas**

The gas to search for is displayed. You can open the gas library with “change” and choose from approx. 100 gases there.

User-defined gases are displayed at the end of the list.

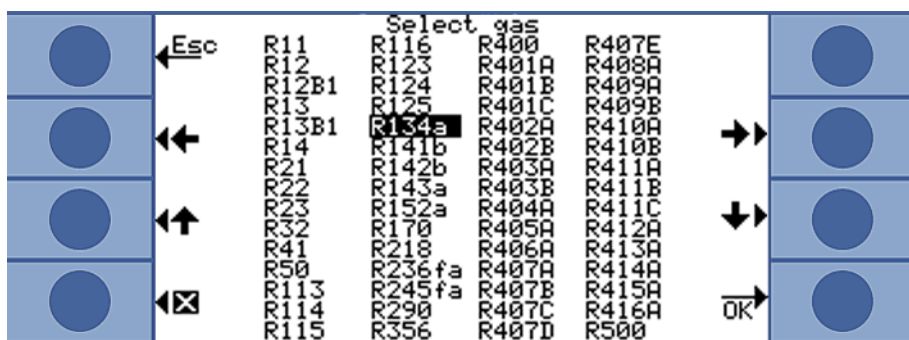


Fig. 21: The gas library

**Status**

“Status” shows whether the search for this gas is activated or deactivated. You can change the setting at any time. If the search for a gas is deactivated, it will also be displayed in the window “Measuring parameters”.

In the measurement window, the display of the measurement result for a deactivated gas is dropped and the display is clearer.

**Trigger and unit**

In the window “Trigger & unit”, you can set the trigger value with the keys on the left and select the unit with the keys on the right.

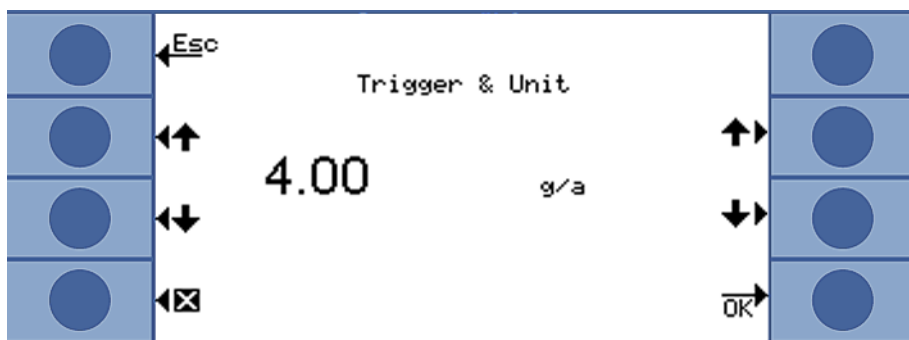


Fig. 22: Setting trigger value and unit

The following table shows the adjustable units and the associated limits for the trigger value.

Table 5: Trigger value according to unit

Unit	Lower trigger value limit	Upper trigger value limit
g/a	0.1	1000
oz/yr	0.004	100
ppm	1	999999
mbar l/s	$2 \times 10^{-7}$	$9.9 \times 10^{-2}$
Pa m <sup>3</sup> /s	$2 \times 10^{-8}$	$9.9 \times 10^{-3}$
atm cc/s	$2 \times 10^{-7}$	$9.9 \times 10^{-2}$
Torr l/s	$2 \times 10^{-7}$	$9.9 \times 10^{-2}$

**Search & Limit (search threshold and display limit)**

In the window “Search threshold display limit”, you can set the search threshold with the keys on the left and select the factor for the lower display limit with the keys on the right.

The search threshold is a percentage of the trigger value and serves as an additional warning level. Smaller leaks that are even below the trigger value can also be reported, when needed, see “Alarm profile”, page 29.

The absolute value of the search threshold is calculated by the device and displayed.

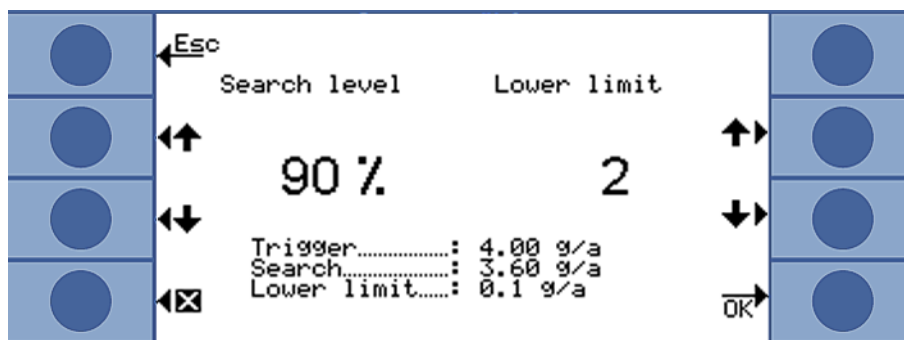


Fig. 23: Setting display limit and search threshold

With the function “Display limit”, 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 ×, 2 ×, 5 ×, 10 ×, 20 ×, 50 ×, 100 ×).

**Internal calibration**

You can deactivate internal calibration. If it is deactivated, only the more precise external calibration can be made for the gas, see “6.4.2 Calibration”, page 37.

Internal calibration is precluded from the start if the mass position of a gas is outside the range from 40 to 105 amu.

**Mass and position**

With the selection of a gas from the gas library, a standard mass position is automatically selected for gas to be measured. If the device could respond to other substances in the working environment for the leak test, we recommend selecting another mass position for the verification of the required gas. You can find a list of all possible gases with their normal and alternative mass positions in the Appendix, see page 78.

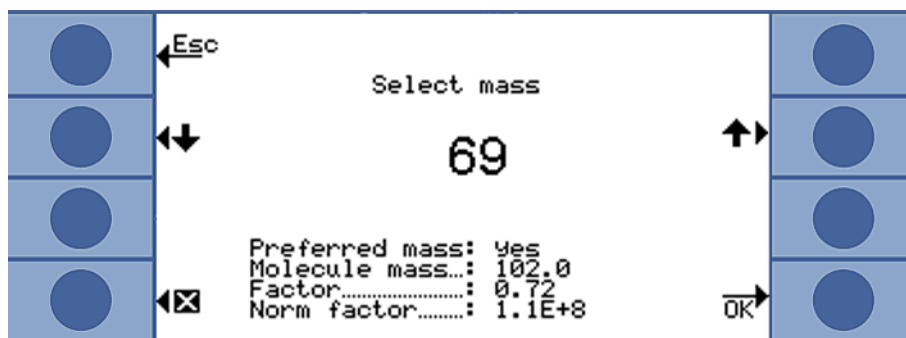


Fig. 24: Selection of another mass position

Below the selected mass is the information whether it is the preferred mass or not. In addition, the molecular mass of the gas as well as the height of the peak in relation to the highest peak for this gas are displayed. The standard factor is a measure of the sensitivity of the device for the gas at the set mass position.

**Cal. factor**

The calibration factor is displayed in this line.

**Last cal.**

Based on this line, you can check when the last calibration took place.

**Cal. method**

The line shows whether calibration was external or internal.

## 6.4.2 Calibration

The Ecotec E3000 can be calibrated most conveniently by adding an ECO-Check calibrated leak. The ECO-Check can be integrated in the front panel of the device or set up at the testing position. It compensates temperature fluctuation and thus enables the accuracy required for calibration.

The ECO-Check calibrated leak includes R134a. It can be used for the calibration of gases with a mass position from 40 to 105 amu because the Ecotec E3000 converts the calibration result for the measurement of these gases.

You get the most accurate calibration with the external calibrated leak. The calibrated leaks are valid for one gas each and temperature-insensitive.

**When to calibrate?**

The device should be calibrated daily and after every operator change. Calibration is additionally required after the following events:

- Sniffer line replacement
- Sniffer line probe replacement
- Switch between gases (if you calibrate with an external calibrated leak)
- Filter replacement
- Prompt for calibration by the system

### 6.4.2.1 Internal calibration with ECO-Check

## NOTICE

### Incorrect calibration because of operating temperature that is too low

Calibrating the device in the cold state can deliver 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 ECO-Check must be installed; refer to installation manual of the ECO-Check.



Fig. 25: Built-in ECO-Check calibrated leak

If a gas measurement cannot be calibrated with the ECO-Check because the gas mass position is outside of 40 to 105 amu, the message "Int. calibration impossible" is displayed for this gas subsequent to calibration.

If a gas was blocked for internal calibration in the menu "Settings gas", the message "Gas deactivated" (see "Internal calibration", page 36) is displayed.

The Ecotec E3000 notices if you insert the sniffer tip in the opening of the calibrated leak and starts calibration automatically. Messages subsequently guide you through the calibration process.

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 probe again and start calibration later.

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.

In order to prevent that an earlier external and thus more accurate calibration is accidentally overwritten, you have to press the key "Confirm new values" to complete the calibration.

- 1 Switch to measurement view.
- 2 Insert the sniffer tip in the opening of the ECO-Check until you feel some resistance.

- 3 Press the right key on the sniffer handle as soon as the display shows the line "Calibration: Press right key".
- 4 Remove the sniffer tip from the reference leak if the display shows the line "Remove sniffer from cal-opening".
- 5 Confirm the new values with the key on the bottom right.

### **Check calibration (Test function)**

If you insert the sniffer tip in the opening of the ECO-Check during measurement operation, an examination of the calibration is started automatically (test function). The device checks the measured value of the ECO-Check while the sniffer probe is inside the opening of the calibrated leak. The operator is subsequently prompted to remove the sniffer tip from the opening of the calibrated leak.

For gases released for internal calibration, either "Test o.k." or "Recalibration required!" will appear. For gases not activated for internal calibration, "Gas deactivated" will be displayed. For gases that cannot be calibrated with the ECO-Check because of very high or very low mass positions, "Gas spec. test not possible" is shown.

Press the key "OK" or the right key on the handle to return to measurement operation.

### **6.4.2.2 External calibration with external calibrated leak**

For external calibration of the Ecotec E3000, we recommend calibrated leaks with leak rates  $> 2$  g/a. If background concentrations in the testing environment are clearly increased, a calibrated leak with a higher 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 key "Cancel".

## **NOTICE**

### **Incorrect calibration because of operating temperature that is too low**

Calibrating the device in the cold state can deliver 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.

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.

The gas measurement to be calibrated is generally activated. If you want to calibrate a deactivated measurement, activate the gas in the menu "Measuring parameters".

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.

- 1 Switch to measurement view.
- 2 Press the key "Cal". The list of gases currently set for measurement is displayed (up to four gases).
- 3 Select the gas that the measurement is to be calibrated for.

- 4 Check whether the gas and the displayed leak rate match the data of the calibrated leak. If the leak rate does not match, select "Leak rate change" and correct the value.
- 5 Select "Start".
- 6 Hold the sniffer tip into the center of calibrated leak opening and follow the instructions in the display.  
If you have to wait until the air signal has stabilized then this can take up to 30 seconds with a helium or hydrogen calibration.
- 7 Confirm the new values with the key on the bottom right.

### 6.4.3 Gas equivalent to helium and hydrogen, settings for diluted gas

If you are looking for helium or hydrogen, you can have also have the determined leak rate for the gas equivalent displayed, e.g. as R134a.

If you have an equivalent set, all displays will show the original gas followed by the equivalent in brackets. Example: He (R134a)

Proceed as follows to set a gas equivalent:

- 1 Select helium or hydrogen from the gas library.
- 2 Select the line "Status" in the window "Settings gas ..." and press "Change".
- 3 Select "Equivalent name" in the window that opens. The gas library will be displayed again.
- 4 Select the equivalent name and confirm with "OK".

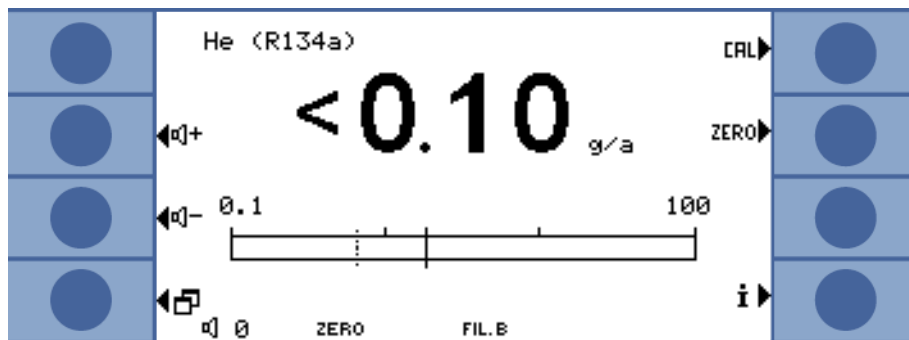


Fig. 26: Example for a measurement view with helium as refrigerant equivalent

You can also take a different pressure and/or different concentration between original gas and gas equivalent into consideration.

An internal conversion of the measurement result thus allows the Ecotec E3000 to approximate the result of a leak pre-check close to the result of a main leak examination.

Enter the settings for concentration and pressure in the window "Settings gas ... > Status > Change > Equivalent settings".



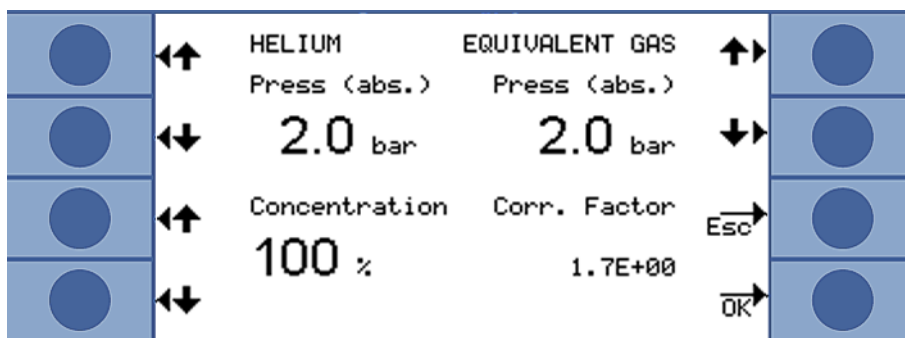


Fig. 27: Setting the parameters for gas equivalent and diluted gas

In this window, you can enter the helium or hydrogen filling pressure. You can enter the pressure for the equivalent gas next to that.

The bottom right shows the correction factor of helium/Hydrogen based on the gas equivalent. If a set of parameters that exceeds the limits of the Ecotec E3000 is entered, the correction factor is displayed with inverted colors. In this case, adjust the parameter until the correction factor display returns to normal.

On the bottom left, you can enter the value for the gas concentration. If you are looking for diluted helium or hydrogen, you can take the dilution into consideration in this setting. The leak rate for the undiluted gas is then displayed as the measured value.

Select "OK" when all parameters are set correctly.

Please note: If you are working with diluted gas, you have to select the original gas as gas equivalent, i.e. gas and gas equivalent are identical.

**Switching off the gas equivalent function**

To switch off the gas equivalent setting, select the last entry from the gas library (Settings gas ... > Status > Change > Equivalent name).

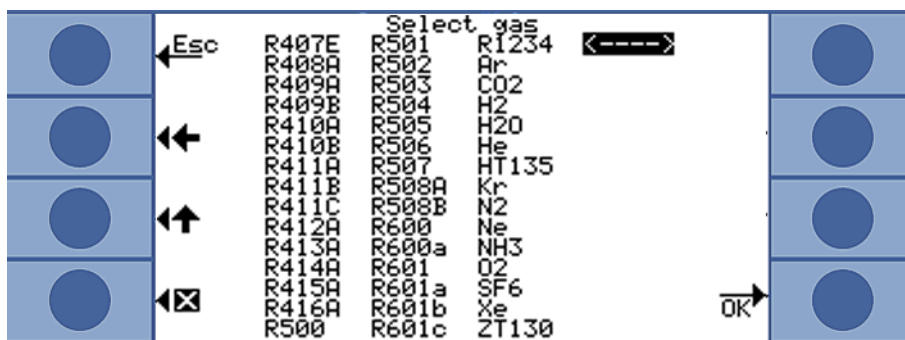


Fig. 28: The last entry switches off the gas equivalent function

**6.4.4 Suppressing interfering gases (Sophisticated interfering gas suppression - IGS)**

IGS causes the findings of the interfering gases cyclopentane, isopentane as well as any mixture thereof to be suppressed during the search for refrigerant R600a. Up to an interfering gas concentration of 50 g/a, the error is only 1 % at most.

If IGS is activated, only one additional gas can be entered in the list of sample gases. If more than two gases are activated for R600a when IGS is activated, the additional gases (starting with the highest gas number from 1 to 4) will automatically be deactivated so that there are only two gases left.

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

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

### Activating IGS

- 1 Select R600a as the gas to be searched for: "Measuring parameters > Gas... > Gas > Change > R600a > OK".
- 2 Switch to mass setting in the window "Measuring param. gas ...".
- 3 Browse the available mass positions until "IGS" is displayed in the line for the preferred mass.
- 4 Confirm with "OK".

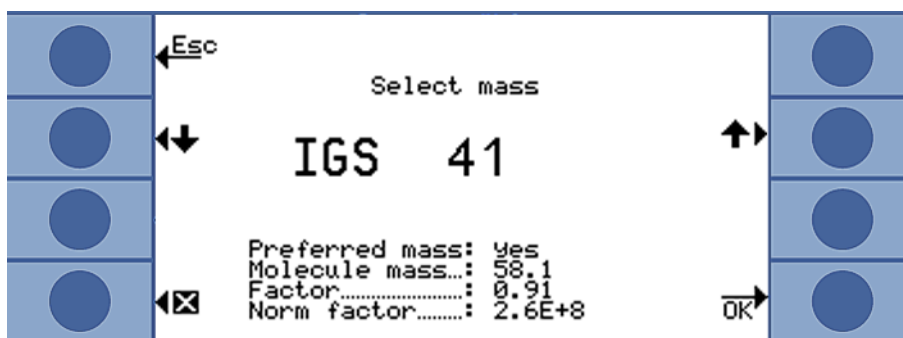


Fig. 29: Selection of the IGS mode for R600a

### IGS alignment

The previous, actual calibration is carried out with an external test leak as it is with other gases. For the additional IGS alignment, you need a cyclopentane test leak and an isopentane test leak, available as "Calibration set for IGS mode".

The Ecotec E3000 recognizes errors you make in the gas sequence during the alignment and notifies you with a flashing gas display.

- 1 Activate IGS, see above.
- 2 Select "Cal" in the measurement window.
- 3 Select the gas R600a in the window "Select gas". The entry should be expanded with IGS.
- 4 Select "IGS alignment" in the window "Start external calibration" and follow the instructions on the display.
- 5 Confirm the calibration with "OK".

## 6.4.5 Setting a user-defined gas

You can save the settings for six individual gases.

- ▶ In the main menu, select "Measuring parameters > Gas def.", then one entry and "Change".

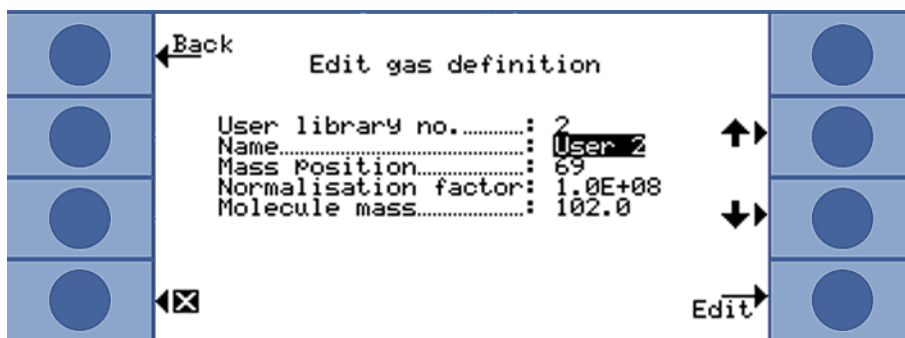


Fig. 30: Settings for a user-defined gas

You can switch between settings with the arrow keys and open a settings window by pressing the “change” key.

**User library no.**

Shows the number of the gas definition to be edited currently.

**Name**

You have to enter a name for the gas to be defined.

The buttons are assigned with letters and you can assign names with six characters with them. Once you have entered the sixth character, you can leave the window by selecting “OK”.

**Mass position**

The mass determines the position of the peak at which the user-defined gas is measured. The Ecotec E3000 can verify masses from 2 to 200 amu.

The buttons are with assigned with numbers and you can enter masses between 2 and 200.

**Normalisation factor**

The standard factor is used to convert the current supplied by the sensor into a leak rate signal. If you are setting a user-defined gas, the Ecotec E3000 should subsequently be calibrated with an external test leak, if possible. If calibration is successful, you will not modify the standard factor. If calibration fails and the error message “Calibration factor too high” is displayed, the standard factor must be reduced by decade, e.g. from 1.0E+08 to 1.0E+07. If the error message “Calibration factor too low” is displayed, increase the standard factor by a decade, e.g. from 1.0E+08 to 1.0E+09. Repeat this process until Ecotec E3000 calibration is completed successfully.

**Molecule mass**

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


**6.4.6 Measuring**

## WARNING

**Electric shock hazard**

Electrical voltages can be transmitted via sniffer tip and can 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 test and secure them against being restarted without authorization.


WARNING

**Danger of eye damage**

LEDs generate a bundled light that can damage eyes.

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


CAUTION

**Electric shock hazard**

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

- ▶ Do not suction in liquids with the device.
- ▶ Use the water conservation tip in humid environments, see [“5.2.1.3 Water conservation sniffer probe mounting and remove”](#), page 20.

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.

### Requirements

Measurement requires:

- A sniffer line connected to the main unit.
- The device has run up and warmed up, see [“6.1 Start-up”](#), page 23.
- The device is calibrated, see [“6.4.2 Calibration”](#), page 37.
- You have made the device settings requires for measurement, see [“6.3 Settings before measurements”](#), page 28.
- You have made the measurement settings requires for measurement, see [“6.4 Settings for the measurements”](#), page 34.

### Measuring position and speed

Hold the sniffer probe to the possible leak as close as possible. The tip may even touch the test specimen. If a weldseam or the like is to be tested, the tip should be moved along the path at a speed of less than 10 cm/s. Please also note the minimum measurement time for the search for helium, see [“Special features with helium”](#), page 53.

### Test sequence

- 1 Keep the sniffer probe away from possible gas sources and press the left key on the sniffer handle (ZERO).
- 2 Sniff the test specimen.

If there is a leak, it will be reported in the displays, with flashing LEDs in the sniffer handle and - depending on your settings - also with an acoustic signal.

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 key on the sniffer handle).

### Measuring with unstable surface conditions

With very unstable surface conditions, it can be expedient to emit an alarm only if the trigger value is exceeded for a specified period of time, see "Alarm delay", page 29.

#### 6.4.6.1 Calling up information on the measurement

Press the **i** key to obtain information on the current measurement:

- Software version
- Operating hours
- Serial number
- Date and time
- Alarm profile
- Selected gases with mass position and trigger value. Gases that are set but that are not currently sought for are marked.

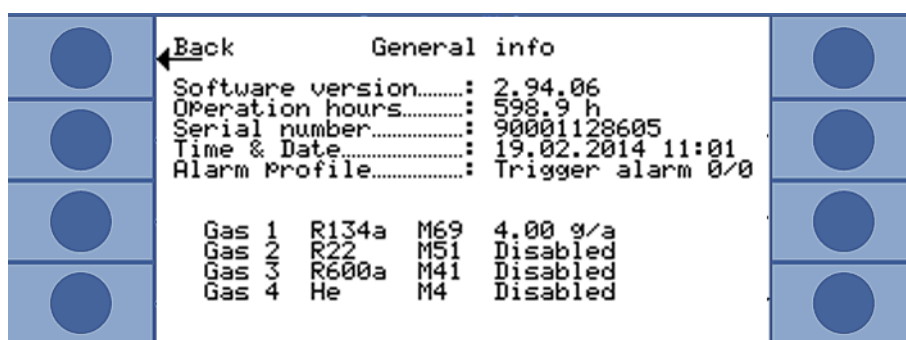


Fig. 31: Information on the measurement

If there is an error message or a warning then this will be displayed instead of the gases.

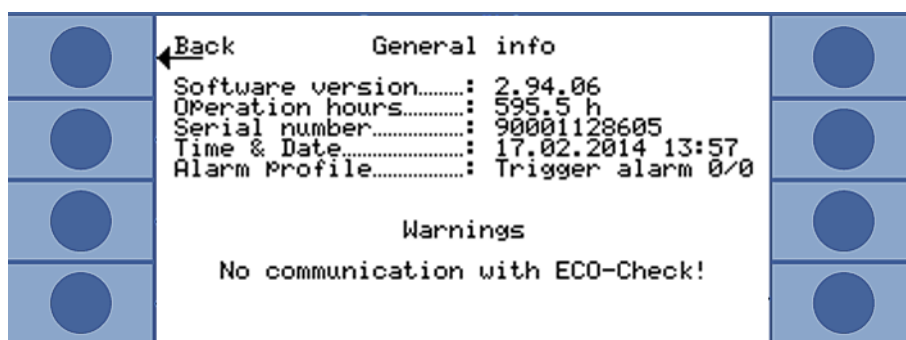


Fig. 32: Information page with warning

#### 6.4.7 Measuring with I-Guide

I-Guide was developed to support the operator in the application of the correct technique for leak tests.

With an I-Guide program, a time sequence and a repetition rate are predefined for sniffing for one or two gases. The following details can be set:

- one or two gases
- trigger values for the 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

The right key on the sniffer handle must be pressed in order to confirm the measurement at an individual measuring point. Confirmation can alternatively take place via the interface programming.

You can set ten I-Guide programs.

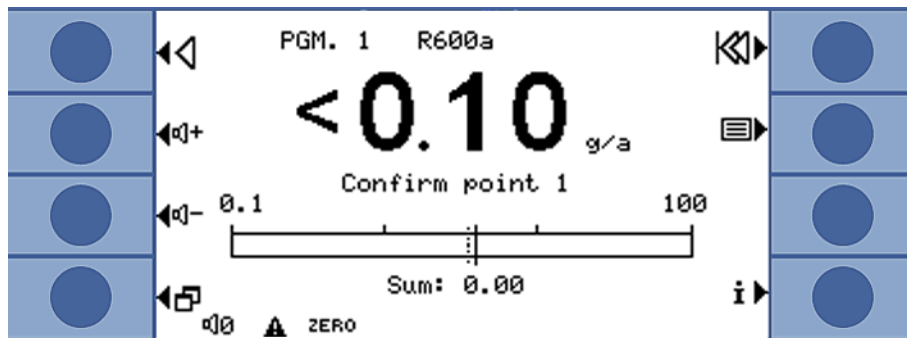


Fig. 33: Measurement view in an I-Guide program

#### **I-Guide as a timer signal**

You can also do without the calculation of an overall leak rate. The I-Guide program then serves merely as a default for time-controlled measuring. Set the number of measuring points to zero for this.

#### **Capturing the results of a long measurement series with I-Guide**

You can combine the leak rates of a maximum of 99 measurements with I-Guide. Set the number of measuring points to 99 for that. If you subsequently press the right key on the sniffer handle for two seconds during the measurement, a result window with the individual measurements and the overall leak rate will be displayed. After the 98th measuring point, the result is displayed automatically.

#### **6.4.7.1 Setting the I-Guide program**

- 1 Select "Main menu > Settings > Setup I-Guide".
- 2 To activate I-Guide select "Activate".
- 3 To enable confirmation with the right key on the sniffer handle, select "Key on". Control is otherwise possible only via interface.
- 4 Select one of the 10 programs with the arrow keys and then press "Change".

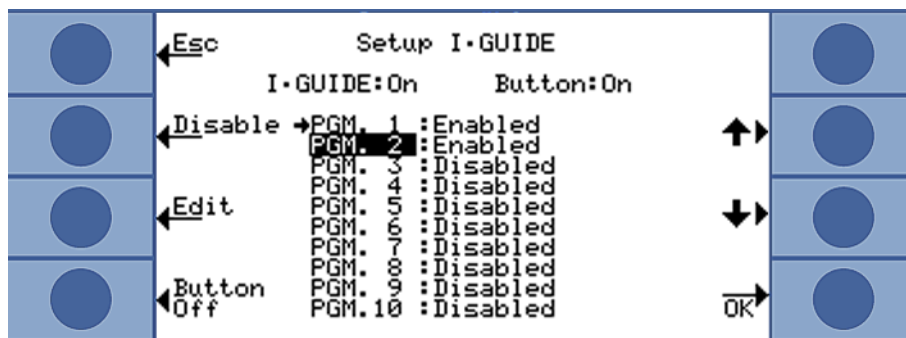


Fig. 34: List of I-Guide programs

- 5 Select the setting you want to change with the arrow keys and press "Change".
- 6 Adjust the setting as described in the following are and confirm with "OK".

**Name** Name of the program. A name comprises six characters. After you have entered the last character, you can confirm with "OK".

**Gas A** One of the four gases can be selected for the search, see "6.4.1 Selecting the gas, changing gas parameters, activating measurement", page 34.

**Gas B** See above. If no second gas is to be searched for, set this to "0".

**Glob. Trigger A/  
Glob. Trigger B** The maximum permissible leak rate for the addition of all measurements of an I-Guide program can be set here. The trigger value for a single measurement complies with the trigger value originally set for a gas.

**Number of measuring points** 0 to 99.

**Measuring time** 1 to 25 seconds. You must not set the measurement time to be shorter than the response time of the device, see "Table 2: Technical data" on page 14.

**Wait time** You can set a time between 0.1 and 25 seconds for the transition to the next measuring point.

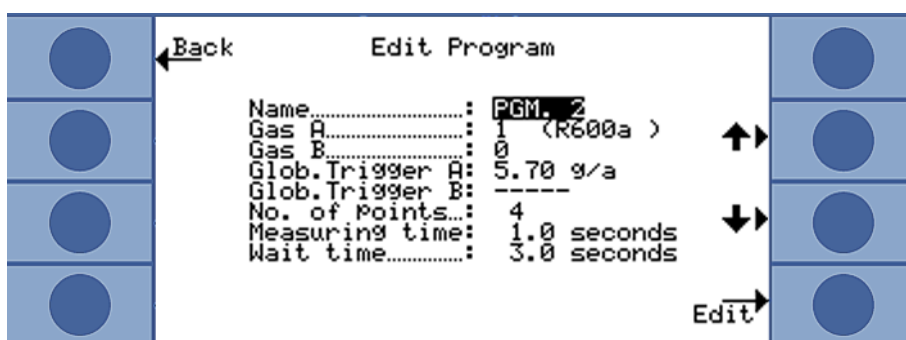


Fig. 35: Settings for an I-Guide program

### 6.4.7.2 Starting the I-Guide program

Messages in the display of the main unit, messages in the display of the handle and acoustic signals guide you through the program.

- 1 If due, calibrate the device externally. During the work with I-Guide, the device can be calibrated internally only.
- 2 Activate I-Guide in the I-Guide menu, see above. A message shows the gas that is being searched for. It is the gas from the first activated I-Guide program. Confirm with "OK".
- 3 Switch to the main menu. Measurement will start immediately.
- 4 Follow the messages.

Table 6: User prompts I-Guide program

Process	Message in main device display	Message in handle display	Acoustic signal main unit	Acoustic signal handle
Idle time to move to the measuring point	Tip to point ...	For pos. ...	–	–
Prompt to confirm the position.	Confirm point ...	OK? Pos. ... Confirm with the right key if the sniffer probe is at the measuring point.	–	–
Measuring	Measure point ...	Measure pos. ...	Ticking	–
Measurement time elapsed	Tip to point ...	For pos. ...	Short signal	Short signal
Cycle completed	<ul style="list-style-type: none"> <li>– Cycle number of measurement</li> <li>– Measured gas</li> <li>– Single leak rates and sum of measured leak rates</li> <li>– "OK!" with a total leak rate below the limit value</li> <li>– "Leak in the cycle!" with a total leak rate above the limit value or if the trigger value was exceeded in a single measurement.</li> </ul>	<ul style="list-style-type: none"> <li>– Measured gas</li> <li>– Sum of measured leak rates</li> <li>– "OK!" with a total leak rate below the limit value</li> <li>– "Error!" with a total leak rate above the limit value or if the trigger value was exceeded in a single measurement.</li> </ul>	Long signal	Long signal  Constant signal in case of an error
	If you are searching for two gases: you can switch between the displays for the two gases with the keys "A" and "B".	If you are searching for two gases: the display switches automatically between the displays for the two gases.		

"Please wait" or "Wait" is displayed if you want to start the next measurement by pressing the button before the idle time has elapsed.

During a cycle, you can use the key to move back one measuring point.

The key takes you back to the beginning of the cycle.

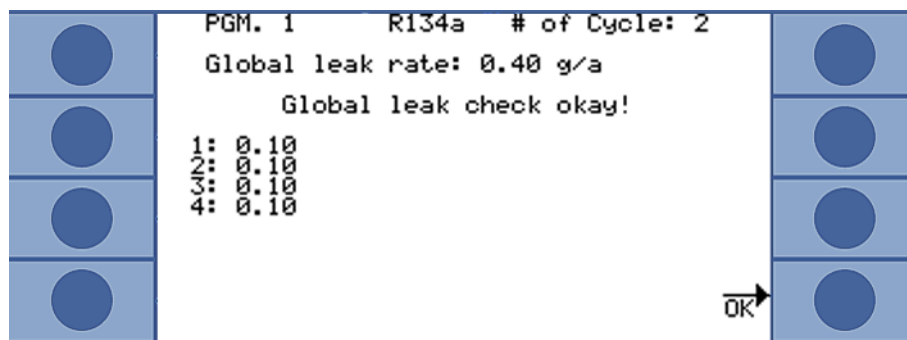


Fig. 36: Display after a successful measurement



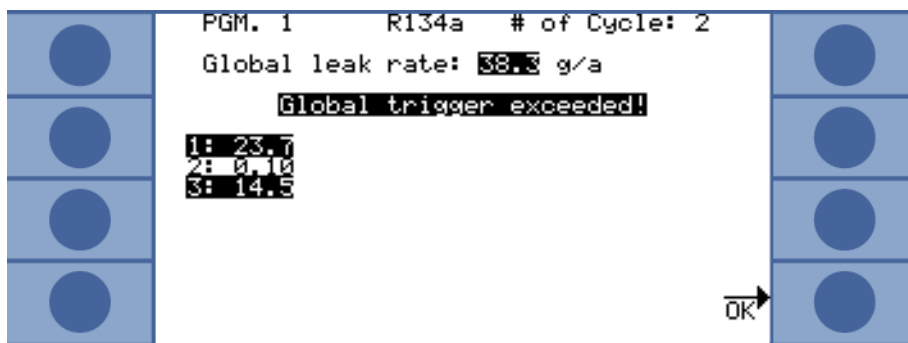


Fig. 37: Search for gas R134a with I-Guide program 1: The trigger value and the overall leak rate were exceeded at measuring points 1 and 3

The next measurement cycle starts if you confirm with "OK" or press the right key on the sniffer handle.

**Changing the I-Guide program**

The new I-Guide program must be set and activated in the I-Guide settings, see above.

- ▶ Open the list of I-Guide programs in the main menu with and select one. Measurement will start immediately.

**Resetting the I-Guide cycle counter**

In the window "Setup I-Guide", you can reset the I-Guide cycle counter manually with the key "Reset counter".

The cycle counter is always set to zero when the device is switched off.

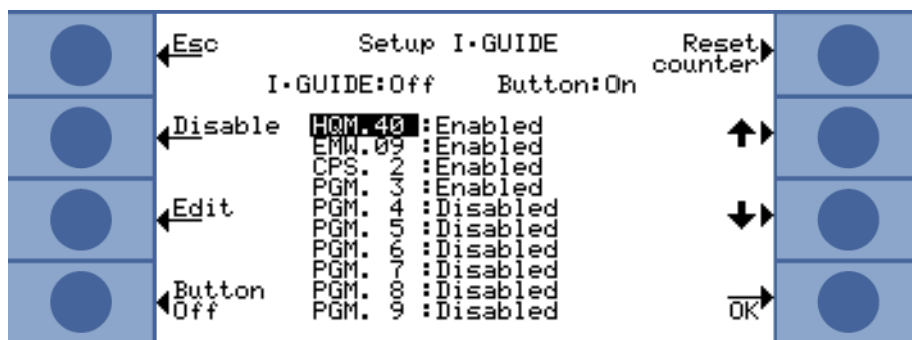


Fig. 38: Cycle counter reset

### Calling up information on the I-Guide program

Press the **i** key to obtain information on the current measurement:

- Software version
- Operating hours
- Serial number
- Date and time
- Alarm profile
- Information on the current I-Guide program

If two gases were selected for the I-Guide program, gas type A/B and leak rate sums A/B are displayed alternately.

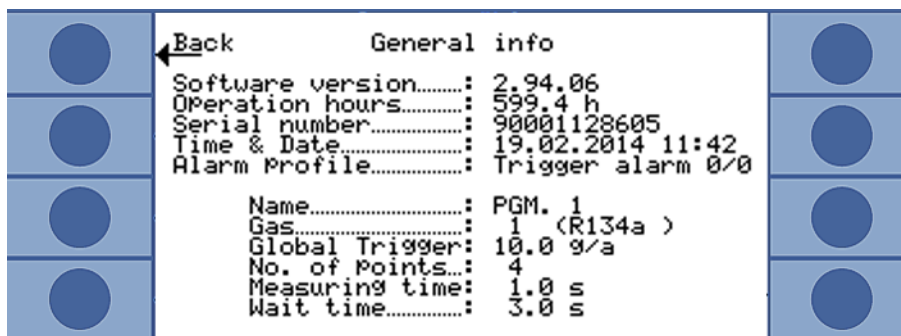


Fig. 39: I-Guide information page

If there is an error message or a warning then this will be displayed instead of the I-Guide program information.

## 6.5 Idle state (sleep)

The idle state is a meaningful alternative to switching the device off only if you allow the device to run up automatically with the wake-up function, see [“Wake up”, page 29](#).

If you press the SLEEP key in the main menu of the device, the device goes into idle state. The mass spectrometer is switched off and the pumps are stopped.

“Sleep” is replaced with “START” In the main menu and the Ecotec E3000 is run up again with “START” or the wake-up function.

The electrical components cannot maintain operating temperature in the idle state. After a restart, precise measurements are therefore possible only after the warm-up time, see [“6.4.2 Calibration”, page 37](#).

## 6.6 Service

The service menu is password-protected. Settings in the service menu can be made only after a special INFICON service training.

## 6.7 Calling up information about the device

You can call up all information about the device by selecting “Info” in the main menu. The information is spread out over nine pages. The key on the bottom right switches you to the next page and the key on the bottom left takes you back one page. The page number is displayed in the upper right corner.

Table 7: Device information

Menu item	Format	Description
<b>Page 1: General data</b>		
Backing pressure	mbar	Pressure on the mass spectrometer inlet
Flow	sccm	Flow through the sniffer line
Total pressure	mbar	Pressure in the mass spectrometer
Time since power on	min	
Operating hours	h	
Serial number	9000 XXX XXXX	
Software version	x.xx.xx	
Electronic system temp.	°C / °F	Temperature of CPU board
TSP temperature	°C / °F	Temperature of mass spectrometer
Calibrated leak temperature	°C / °F	Temperature of ECO-Check
<b>Page 2: Turbo molecular pump data</b>		
State	On / Off / Run-up	
Curr. error code		
Speed	Hz	
Current	A	
Voltage	V	
Driving power	W	
Operating hours of the TMP	h	Operating hours of the turbo molecular pump
Operating Hours TC	h	Operating hours of the frequency converter for TMP
Run-up time	s	
Software version	XXXXXX	
<b>Page 3: Transpector data</b>		
Configuration		
Box version	x.xx	
Control SW version	x.xx	
Measure SW version	x.xx	
Filament	A or B/A or B	Set cathode / active cathode
Power on time	h	
Emission on time A	h	
Emission on time B	h	
TSP temperature	°C / °F	Temperature of mass spectrometer
Argon position	+ / - x.xx	
<b>Page 4: ECO-Check Data</b>		
Gas	Rxxx	Gas of internal leak
Leak rate nom. / at T	x.x g/a / x.x g/a	Nominal leak rate / leak rate at current temperature
Version / Checks.	x.x / hexadecimal code	Software version with checksum
Serial no.	9000 XXX XXXX	
Serial no. reservoir	9000 XXX XXXX	
Filling date	DD.MM.YYYY	
Expiration date	DD.MM.YYYY	
Gain / Offset		Parameters for the temperature measurement in the ECO-Check

Table 7: Device information (cont.)

Menu item	Format	Description
Test leak temperature	°C / °F	
Status of light barrier		
<b>Page 5: Sniffer line information</b>		
Type	SL3000 / system	
Software version	x.x	
Length	3 m / 5 m / 10 m / 15 m	
Serial no.	9000 XXX XXXX	
Key left		
Key right		
Background light	Green/red	Background light
Bar graph		
Flow (calibration)	sccm	
<b>Page 6: I/O port data</b>		
Recorder A	V	
Recorder B	V	
Sleep	Low / High	
Zero	Low / High	
Gas a/b/select	Low / Low / Low High / High / High	
Input reserved	Low / High	
Leak/Ready/Error	Low / Low / Low High / High / High	
Relay "Leak"	Low / High	
Relay "Leak"	Low / High	
Output reserved	Low / High	
<b>Page 7: Analog data</b>		
AIN3 sniffer length	V	
AIN4 +5V II leak	V	
AIN5 +24V III ext.	V	
AIN6 +5V I sniffer	V	
AIN8 -15V MC50	V	
AIN9 +15V MC50	V	
AIN10 +24V MC50	V	
AIN11 +24V I TSP	V	
AIN12 +24V II TMP	V	
<b>Page 8: Analog data (2)</b>		
AIN0	V	
AIN0 offset	V	
Foreline pressure	mbar	
AIN1	V	
Flow	sccm	
AIN2	V	

Table 7: Device information (cont.)

Menu item	Format	Description
<b>Page 9: Info RS-232</b>		
Ecotec E3000 → Sniffer	ASCII string	Command sent from main device to sniffer line
Sniffer → Ecotec E3000	ASCII string	Command sent from sniffer line to main device
The information in the first two lines can be switched with the keys "Sniffer" and "Leak":		
Ecotec E3000 → Leak	ASCII string	Command sent from main device to test leak
Leak → Ecotec E3000	ASCII string	Command sent from test leak to main device
Host → Ecotec E3000	ASCII string	Command sent from mainframe to Ecotec E3000
Ecotec E3000 → Host	ASCII string	Command sent from Ecotec E3000 to mainframe

## 6.8 Special features of individual gases

### **R134a: Influence of cyclopentane and R245fa**

If you are sniffing for R134a, the presence of cyclopentane and R245fa can lead to incorrect measurement results. Search for R134a with alternative mass position 83, if cyclopentane and R245fa could be sniffed. Setting another mass, see ["Mass and position", page 36](#).

### **R600a: Influence of cyclopentane and isopentane**

If you are sniffing for R600a, the presence of cyclopentane and isopentane can lead to incorrect measurement results. Search for R600a with the IGS mass position, if cyclopentane and isopentane could be sniffed. Setting the IGS-mass position, see ["6.4.4 Suppressing interfering gases \(Sophisticated interfering gas suppression - IGS\)", page 41](#).

### **Special features with helium**

If you are sniffing for helium, the Ecotec E3000 needs longer for an analysis than with refrigerants. Therefore stick to the following times during which you will not move the sniffer tip.

Table 8: Minimum measurement times for helium

Length of sniffer line	Minimum measurement time
3 m	2.2 s
5 m	2.5 s
10 m	3.3 s
15 m	4.5 s

The smallest detectable leak rate of the Ecotec E3000 for helium is  $1 \times 10^{-6}$  mbar l/s (higher than for refrigerant).

You can use a PRO-Check calibrated leak for the internal calibration of helium. Because the PRO-Check calibrated leak does not fit into the opening on the front panel of the Ecotec E3000, you have to connect it with a SUB -D cable, see installation manual of the ECO-Check.

If you are working with diluted helium, you can have the determined leak rate also displayed as the gas-equivalent leak rate. For additional details, see ["6.4.3 Gas equivalent to helium and hydrogen, settings for diluted gas", page 40](#).

### **Special features with hydrogen / forming gas**

If you are sniffing for hydrogen / forming gas, the Ecotec E3000 needs longer for an analysis than with refrigerants. Therefore stick to the following minimum measurement times.

Table 9: Minimum measurement times for hydrogen

Length of sniffer line	Minimum measurement time
3 m	2.7 s
5 m	3.0 s
10 m	3.8 s
15 m	5.0 s

If you work with hydrogen (forming gas), you can have the determined leak rate also displayed as gas-equivalent leak rate, see “6.4.3 Gas equivalent to helium and hydrogen, settings for diluted gas”, page 40.

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 E3000 for hydrogen is  $1 \times 10^{-6}$  mbar l/s (higher than for refrigerant).

You can use a PRO-Check calibrated leak for the internal calibration of hydrogen / forming gas. Because the PRO-Check calibrated leak does not fit into the opening on the front panel of the Ecotec E3000, you have to connect it with a SUB –D cable, see installation manual of the ECO-Check.

### **Methane**

Methane cannot be calibrated with the built-in ECO-Check because methane can be detected only on mass 15 (which is outside the range for the permissible internal calibration from 40 to 105).

Therefore use the external calibrated leak “TL4-6 for methane” for calibration.

## **6.9 Switching off the device**

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You can switch off the Ecotec E3000 at any time with the mains plug (position “0”). It takes a few minutes for the turbo molecular pump to come to a standstill. The Ecotec E3000 must not be moved during that time.

The parameter set in the Ecotec E3000 are saved. After the start-up, the Ecotec E3000 returns to the same state that it was in before it was switched off.

## 7 Warnings and error messages

During operation, the display shows information that supports you in the operation of the Ecotec E3000. Measurements are displayed along with current device states, operating instructions as well as warnings and error messages.

The Ecotec E3000 is equipped with extensive self-diagnosis functions. If the electronic system detects a faulty state, the device will show this insofar as possible on the display and will interrupt operation, if necessary.

### Error messages

Errors are events that the Ecotec E3000 cannot remedy itself and that force an interruption of operation. The error message consists of a number and a description.

After you have removed the cause of the error, start operation again with the restart key.

### Warnings

Warnings warn of device states that can impair the accuracy of measurements. Operation of the device is not interrupted.

Confirm acknowledgment of the warning with the OK key or the right key on the sniffer handle.

The following table shows all warnings and error messages. It lists possible causes for the malfunction and directions for fault clearance.

Please note that work marked with an asterisk must be carried out only by service staff that is authorized by INFICON.

Table 10: Warning and malfunction messages

No.	Message	Possible error sources	Fault clearance
E1	Input voltage 24 V on the MC50 is too low	Fuse F1 on the wiring board is blown.	Replace the fuse.*
		CPU board MC50 is defective.	Contact the INFICON customer service.
E2	Input voltage 24 V on the Transpector is too low	Fuse F2 on the wiring board is blown.	Replace the fuse.*
		The Transpector is defective.	Contact the INFICON customer service.
E3	Input voltage 24 V on the frequency converter is too low	Fuse F3 on the wiring board is blown.	Replace the fuse.*
		The turbo molecular pump is defective.	Contact the INFICON customer service.
W4	Voltage 24 V on OPTION output is too low	Fuse F4 on the wiring board is blown.	Replace the fuse.*
		Power input through external wiring is too high.	Check the wiring.
W5	Voltage 5 V on sniffer line is too low	Fuse F5 on the wiring board is blown.	Replace the fuse.*
		The sniffer line is defective.	Replace the sniffer line.
W6	Voltage 5 V on the ECO-Check is too low	The electronic system of the ECO-Check calibrated leak is defective.	Replace the ECO-Check calibrated leak, see installation manual of the ECO-Check calibrated leak.
		CPU board MC50 is defective.	Contact the INFICON customer service.
E7	Input voltage -15 V on the MC50 is too low	CPU board MC50 is defective.	Contact the INFICON customer service.
E8	Input voltage 15 V on the MC50 is too low	CPU board MC50 is defective.	Contact the INFICON customer service.
W12	Turbo pump frequency during run-up not reached or TMP current too high!	The humidity is too high.	If W12 is displayed with very high humidity or after very long idle periods, allow the device to warm up longer. If the problem still exists, restart the device.  Contact the INFICON customer service if the problem still exists.
		The turbo molecular pump is defective.	Contact the INFICON customer service.

Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
W14	Maintenance interval for filter in sniffer probe elapsed	The change interval for the sniffer probe air filter is reached.	Replace the filter, <a href="#">see page 72</a> . Confirm the work, <a href="#">see page 65</a> .
W16	Maintenance interval for turbo molecular pump elapsed	The change interval for the operating fluid reservoir of the turbo molecular pump is reached.	Replace the reservoir, <a href="#">see page 69</a> . Confirm the work, <a href="#">see page 65</a> .
W17	Maintenance interval for diaphragm pump elapsed	Diaphragm pump maintenance is due.	Replace the membranes of the diaphragm pump!* Confirm the work, <a href="#">see page 65</a> .
W18	Maintenance interval for main air filter elapsed	The change interval for the main air filter is reached.	Clean or replace the filter, <a href="#">see page 68</a> . Confirm the work, <a href="#">see page 65</a> .
E20	Temperature on CPU board MC50 too high (>60°)	The ambient temperature is too high	Please note the ambient conditions, <a href="#">see page 14</a> .
		One fan failed.	Check the air stream through the ventilation openings on both sides of the housing (left inlet, right outlet).
		The main air filter is soiled	Clean or replace the filter, <a href="#">see page 68</a> . Confirm the work, <a href="#">see page 65</a> .
E22	TMP frequency is too low!	The sniffer line is incorrectly connected.	Check the connection.
		The turbo molecular pump is defective.	Contact the INFICON customer service.
E23	Turbo pump frequency too high!	The turbo molecular pump is defective.	Contact the INFICON customer service.
W24	Voltage 24 V of the external display unit is too low	Only for Ecotec E3000RC: The fuse on driver board "External operation of the device" is blown.	Replace the fuse.*
		The RC control panel is drawing too much power.	Contact the INFICON customer service.
E25	Remove the sniffer probe from the opening of the calibrated leak!	The sniffer probe is in the calibration opening of the ECO-Check.	Remove the sniffer probe.
		The light barrier of the ECO-Check is soiled.	Blow out the calibration opening with fresh air or clean it with a cotton cloth.
W28	Real-time clock was reset! Please enter date and time.	CPU-board MC50 was replaced.	Enter the date and the time, <a href="#">see page 28</a> .
		The battery on CPU-board MC50 is defective.	Contact the INFICON customer service.
W29	Voltage 24 V on the audio output is too low!	Fuse F6 on the wiring board is blown.	Replace the fuse.*
		The speaker is defective.	Replace the speaker.*
E30	Sensitivity too low	The sensor in the Transpector is defective.	Contact the INFICON customer service.
W31	Factor K1 outside of the range (0.9 to 1.1)!	Other interfering gases, not cyclopentane or isopentane, were detected, e.g. alcohols.	Recalibrate the IGS, <a href="#">see page 42</a> .
W34	Changed flow! (The flow rate has been reduced by more than 30 % since the last calibration. The warning goes out if the flow change is less than 20 % again.)	The sniffer line is incorrectly connected.	Check the connection.
		The sniffer line filters are clogged.	Replace the sniffer line filters, <a href="#">see page 66</a> . Confirm the work, <a href="#">see page 65</a> . Recalibrate the device, <a href="#">see page 37</a> .



Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
W35	Flow through capillary is too low (The lower limit value is fallen short of longer than 2 s.)	The lower limit value is set too high.	Lower the lower flow rate limit value, <a href="#">see page 32</a> .
		The capillary filter in the sniffer line is clogged.	Replace the capillary filter, <a href="#">see page 72</a> . Confirm the work, <a href="#">see page 65</a> . Recalibrate the device, <a href="#">see page 37</a> .
		The sinter filter in the sniffer handle is clogged.	Replace the sinter filter, <a href="#">see page 73</a> . Confirm the work, <a href="#">see page 65</a> . Recalibrate the device, <a href="#">see page 37</a> .
		The capillary is clogged.	– Replace the sniffer line. Recalibrate the device, <a href="#">see page 37</a> . – Replace the multi-function cable of the sniffer line.* Recalibrate the device, <a href="#">see page 37</a> .
		The internal filters in the main unit are clogged	Replace the internal filters (three pieces).* Confirm the work in the service menu. Recalibrate the device, <a href="#">see page 37</a> .
E36	Flow through capillary too high. (The upper flow rate limit value is exceeded longer than 2 s.)	The sniffer line is incorrectly connected.	Check the connection.
		The upper limit value is set too low.	Set the upper limit value for the flow higher, <a href="#">see page 32</a> .
		The capillary is broken or leaking.	– Replace the sniffer line. Recalibrate the device, <a href="#">see page 37</a> . – Replace the multi-function cable of the sniffer line. Replace the multi-function cable of the sniffer line.* Recalibrate the device, <a href="#">see page 37</a> .
E37	Capillary broken! (>10 s) (The upper limit value is exceeded longer than 10 s. The emission is switched off to protect the cathodes.)	The upper limit value is set too low.	Set the upper limit value for the flow higher, <a href="#">see page 32</a> .
		The capillary is broken or leaking.	– Replace the sniffer line. Recalibrate the device, <a href="#">see page 37</a> . – Replace the multi-function cable of the sniffer line. Replace the multi-function cable of the sniffer line.* Recalibrate the device, <a href="#">see page 37</a> .
E38	Capillary broken! (>60 s) (The upper limit value is exceeded longer than 60 s. The pumps are switched off to protect the cathodes.)	The upper limit value is set too low.	Set the upper limit value for the flow higher, <a href="#">see page 32</a> .
		The capillary is broken or leaking.	– Replace the sniffer line. Recalibrate the device, <a href="#">see page 37</a> . – Replace the multi-function cable of the sniffer line. Replace the multi-function cable of the sniffer line.* Recalibrate the device, <a href="#">see page 37</a> .
E39	Emission failed (The emission on both cathodes cannot be switched on.)	– If the device was switched off for a longer period of time, this error can occur during the first 10 minutes after start-up. – Both cathodes are defective. – The Transpector is defective.	Confirm the error message and restart the device. If the problem still exists: Contact the INFICON customer service.

Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
E40	Emission failed (The emission failed during operation.)	<ul style="list-style-type: none"> <li>– If the device was switched off for a longer period of time, this error can occur during the first 10 minutes after start-up.</li> <li>– The input pressure is too high.</li> <li>– The Transpector is defective.</li> </ul>	Confirm the error message and restart the device. If the problem still exists: Contact the INFICON customer service.
E41	No communication with Transpector!	The software cannot establish the connection with the Transpector.	<ul style="list-style-type: none"> <li>– Check the connection between Transpector and wiring board.*</li> <li>– Contact the INFICON customer service.</li> </ul>
		The Transpector is defective.	Contact the INFICON customer service.
E42	Transpector temperature > 70 °C or < 0 °C!	The main air filter is soiled.	Clean or replace the filter, <a href="#">see page 68</a> . Confirm the work, <a href="#">see page 65</a> .
		<ul style="list-style-type: none"> <li>– The ambient temperature is too high.</li> <li>– The ambient temperature is too low.</li> </ul>	Please note the ambient conditions, <a href="#">see page 14</a> .
E43	Transpector limit value exceeded!	Internal Transpector data error	Contact the INFICON customer service.
E44	Transpector communication error!	Internal Transpector data error	Contact the INFICON customer service.
E45	Transpector hardware error!	Internal Transpector data error	Contact the INFICON customer service.
E46	Transpector hardware warning!	Internal Transpector data error	Contact the INFICON customer service.
E47	Transpector overpressure!	If the device was switched off for a longer period of time, this error can occur during the first 10 minutes after start-up.	Confirm the error message and restart the device. If the problem still exists: Contact the INFICON customer service.
		The sniffer line is not connected.	Connect the sniffer line and confirm the error message. Restart the device.
E48	Emission failed (The emission failed during operation.)	<ul style="list-style-type: none"> <li>– The input pressure is too high.</li> <li>– The Transpector is defective.</li> </ul>	Confirm the error message and restart the device. If the problem still exists: Contact the INFICON customer service.
W49	No emission with first cathode	Start-up of the Emission failed. The device has switched to the second cathode.	You can continue to measure but need to have the cathodes checked.
E50	Control of turbo pump or electronic system!	There is an error in the control of the turbo molecular pump.	Contact the INFICON customer service.
E51	No communication with the turbo controller!	<ul style="list-style-type: none"> <li>– Wiring board defective</li> <li>– CPU board MC50 defective</li> </ul>	Contact the INFICON customer service.
W59	Overflow of EEPROM parameter queue!	EEPROM defective.	Contact the INFICON customer service.
W60	All EEPROM parameters lost! Please check your settings!	A new wiring board was installed.	All settings are reset to factory settings. Make your settings again.
		If the message occurs constantly during running up, the EEPROM on the wiring board is defective.	Contact the INFICON customer service.
W61	0 EEPROM parameters initialized! Please check the settings!	A software update introduced new parameters. The new parameters are listed in the warning.	Confirm the warning. Check whether the factory settings comply with the new parameters of your application.
		If the message occurs constantly during running up, the EEPROM on the wiring board is defective.	Contact the INFICON customer service.

Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
W62	0 EEPROM parameters lost! Please check the settings!	Changed parameters were detected during the running up.  The affected parameters are listed in the warning.	Check the settings of the listed parameters.
		If the message occurs constantly during running up, the EEPROM on the wiring board is defective.	Contact the INFICON customer service.
W63	TSP parameters inconsistent! Please check!	The Transpector was replaced.	– Check the Transpector parameters. – Contact the INFICON customer service.
		The wiring board was replaced.	
		The EEPROM on the wiring board is defective.	
W64	There are warnings pending!	Confirmed but not yet valid warnings are repeated every two hours or at every new start-up.	– Remedy the cause of the warning. – Deactivate the warning reminder, see <a href="#">“Warning reminder”</a> , page 66.
W65	TSP serial number inconsistent! Please check!	The Transpector was replaced.	– Contact the INFICON customer service.
		The wiring board was replaced.	
		The EEPROM on the wiring board is defective.	
W66	ECO-Check brand-new!	A new ECO-Check calibrated leak was connected.	Enter the serial number and the code of the calibrated leak, refer to the installation manual of the calibrated leak.
W67	ECO-Check expires on DD.MM.YYYY!	The validity of the ECO-Check gas store expires in three months.	Order an ECO-Check gas store.
W68	ECO-Check expired!	The validity of the ECO-Check gas store is expired (2 years operation or older than 3 years).	Replace the ECO-Check gas store, see installation manual of the ECO-Check.
W70	All EEPROM parameters of the ECO-Check lost!	The EEPROM in the ECO-Check calibrated leak is empty or defective.	Replace the ECO-Check calibrated leak, see installation manual of the ECO-Check.
W71	No communication with ECO-Check!	The ECO-Check calibrated leak cannot be addressed by the main unit.	Check the connection to the ECO-Check calibrated leak. If the problem still exists: Contact the INFICON customer service.
		No ECO-Check calibrated leak connected.	Connect an ECO-Check calibrated leak. If you do not want to connect the ECO-Check calibrated leak, deactivate the warning, see page 34.
W72	No communication with sniffer line!	The sniffer line cannot be addressed by the main unit.	Check the connection of sniffer line to main unit (separate and reconnect; try another sniffer line, if possible). If the problem still exists, contact the INFICON customer service.
E73	Unsuitable sniffer line!	The SL3000XL of Protec P3000 was connected accidentally.	Connect the correct sniffer line.
W77	Changed calibration factor! (Possible message while the calibration is being tested.)	The calibration has changed by more than 15 % since the last calibration changed.	Recalibrate the device, see page 37.
W78	Signal difference between test leak and air too small. (1.25 with R134a)	– The calibrated leak is too small. – The calibrated leak is defective.	Check the leak rate of the calibrated leak or use a calibrated leak with a higher leak rate.
		The background signal during calibration is too high.	Check the background signal by switching off the ZERO function (press the ZERO key longer than 2 s).
		The air signal was not steady during calibration (confirmed too early).	Recalibrate the device, see page 37.

Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
W79	Factor outside the range!	An invalid factor was detected during IGS calibration.	Repeat the IGS-calibration, see "IGS alignment", page 42.  If the problem still exists: Contact the INFICON customer service.
W80	Cathode switched over!	The device was switched over to another cathode without calibration.	Recalibrate the device, see page 37.
W81	Calibration factor too small!	During the internal calibration, the calibration factor was determined to be < 0.1 or < 0.01 during the external calibration.	Check the entry for the leak rate, see "6.4.2 Calibration", page 37.
		It was incorrectly calibrated.	Recalibrate the device, see page 37.
		The leak rate of the calibrated leak is incorrect (especially during external calibration).	Replace the external calibrated leak.
W82	Calibration factor too large!	During the internal calibration, the calibration factor was determined to be > 10 or > 99.9 during the external calibration.	Check the entry for the leak rate, see "6.4.2 Calibration", page 37.
		It was incorrectly calibrated.	Recalibrate the device, see page 37.
		The leak rate of the calibrated leak is incorrect (especially during external calibration).	Replace the external calibrated leak.
		The Transpector sensor is not sensitive.	Contact the INFICON customer service.
E83	Baseline of Transpector not found	The Transpector has a defect.	Contact the INFICON customer service.
E84	Test leak signal too small (Flow of test leak absolutely too small, approx. 1 g/a with R134a)	The calibrated leak is too small.	Use a calibrated leak with a higher leak rate.
		The calibrated leak is defective.	Check the leak rate of the calibrated leak.
		– The Transpector sensitivity is too low. – The gas flow to the sensor is blocked, the flow divider is clogged.	Contact the INFICON customer service.
W85	Problem during peak finding!	The Transpector cannot find the peak. Calibration impossible.	Replace the calibrated leak. If the error still exists contact the INFICON customer service.
W86	Internal calibration impossible	You are trying to calibrate while the device is not ready to measure.	– Wait for calibration until the device has run up. – Call up the measurement view with the menu.
W87	Unsupported gas in the ECO-Check!	– EEPROM in ECO-Check not programmed. – The ECO-Check is defective.	Use another ECO-Check.
E90	Overspeed (of TMP, E001)	The rotational speed of the turbo molecular pump is too high.	Contact the INFICON customer service.
E91	Overvoltage (on TMP, E002)	Error in the electric power supply of the turbo molecular pump	Contact the INFICON customer service.
E92	Run-up time error (E006)	The turbo molecular pump does not run up correctly.	Contact the INFICON customer service.
E93	Connection electronic drive unit - pump defective (E008)	The connection between the control and the turbo molecular pump is faulty.	Contact the INFICON customer service.
E94	Error in the TC control unit (E015)	Defective turbo molecular pump control.	– Switch the device off. Wait until the pump has stopped (> 5 min). Switch the device back on. – Contact the INFICON customer service.
E95	Electronic drive unit does not recognize pump. (E021)	Error in the communication between turbo molecular pump and control.	Contact the INFICON customer service.

Table 10: Warning and malfunction messages (cont.)

No.	Message	Possible error sources	Fault clearance
E96	Error in the temperature control of the TC (E025)	The main air filter is soiled.	Clean or replace the filter, <a href="#">see page 68</a> . Confirm the work, <a href="#">see page 65</a> .
		The ambient temperature is too high.	Please note the ambient conditions, <a href="#">see page 14</a> .
E97	Error of the temperature sensor in the TC (E026)	The temperature sensor is defective.	Contact the INFICON customer service.
E98	Error in the motor stage or the control (E037)	There is an error in the motor stages or the control.	Contact the INFICON customer service.
E99	Error on the power supply (F007)	The supply voltage has failed.	Contact the INFICON customer service.

\* The work may be carried out only by service personnel who have been authorized by INFICON.



## 8 Maintenance

### 8.1 Calling up and managing maintenance information

In the main menu you can call up information regarding the last operational states of the device and its maintenance by selecting "History & maintenance". Here you will find especially the list of the last error messages. You will also determine which maintenance work has to be confirmed and confirm maintenance.

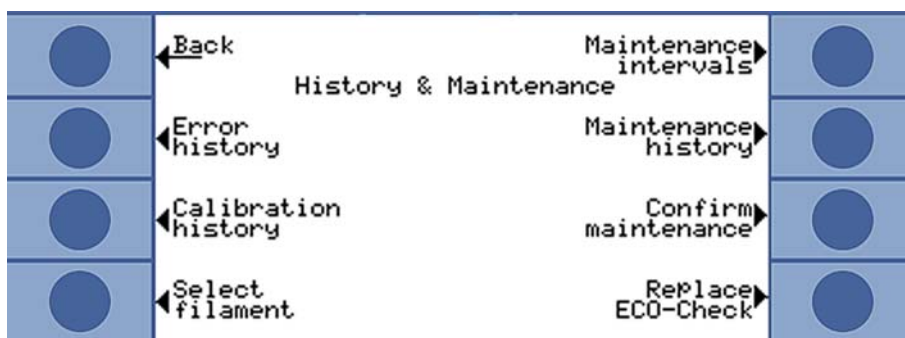


Fig. 40: Selection options in "History & maintenance"

#### Error history

The error history includes the errors and warnings that occurred during the operation of the Ecotec E3000. Date and time are shown followed by an identification for the error or the warning (E... with errors and W... with warnings), with a brief description of the error or the warning.

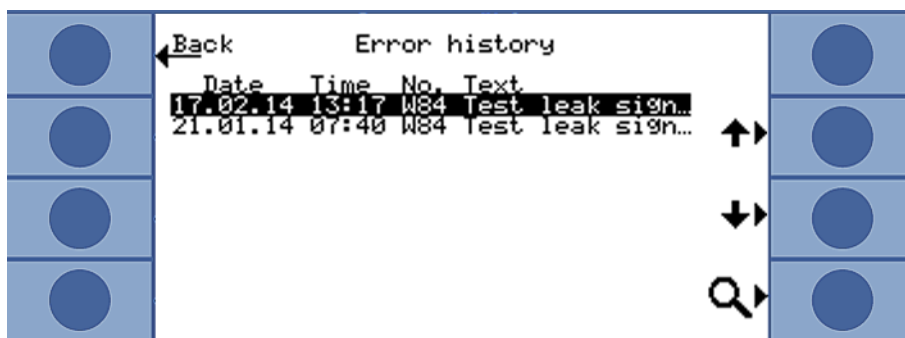


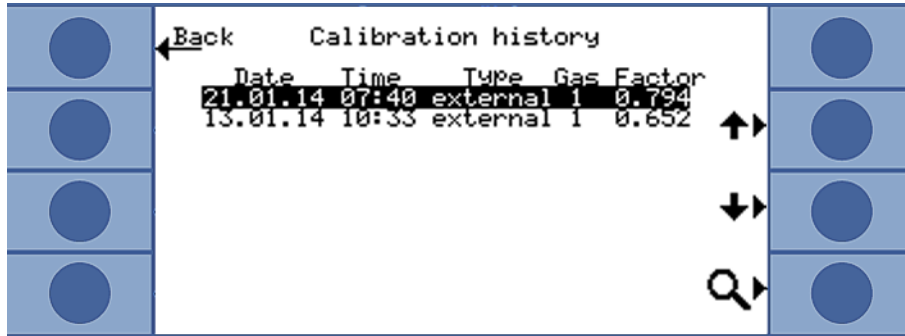
Fig. 41: List with errors and warnings

To have the full warning or error message displayed, select the appropriate line and press the key with the magnifying glass. Detailed information for possible causes is also specified for many messages.

#### Calibration history

This list shows all calibrations that were carried out during the operation of the Ecotec E3000. Information provided includes

- Date and time
- Type of calibration (internal or external)
- Number of gases (only with external calibration)
- Calibration factor



Date	Time	Type	Gas	Factor
21.01.14	07:40	external	1	0.794
13.01.14	10:33	external	1	0.652

Fig. 42: Calibration list

To have the complete calibration information displayed, select the appropriate line and press the key with the magnifying glass. The calibration information includes:

- Calibration mode (internal or external); for internal: gas in calibrated leak
- Gas
  - Internal calibration: one or more gas numbers
  - External calibration: gas number, mass position, gas
- Date and time of calibration
- Number of operating hours at the time of calibration
- Calibration factor
- Peak position (if different from mass position)
- Flow through sniffer line at the time of calibration
- Cathode that was in use at the time of calibration (A/B)
- Size of the calibrated leak that is used (external calibrated leak for external calibration and ECO-Check for internal calibration)
- Argon flow and mass deviation at the time of calibration
- Flow of the gas that was calibrated and background signal

### **Maintenance intervals**

To call up the elapsed operating hours of the device since the start-up, select "Maintenance intervals". The information does not apply to the sniffer line because different lines could have been used.

The remaining operating hours up until the next maintenance work are displayed below.

The times below "Next maintenance for ..." are based on confirmations that you enter after maintenance work, see "Confirm maintenance", page 65.



**Maintenance history**

The maintenance history shows all maintenance work that was confirmed within the scope of the work. Shown are date and time of completed works, the number of operating hours of the device at the time of the maintenance work and the type of work performed. To have the complete entry displayed, select the appropriate line and press the key with the magnifying glass.

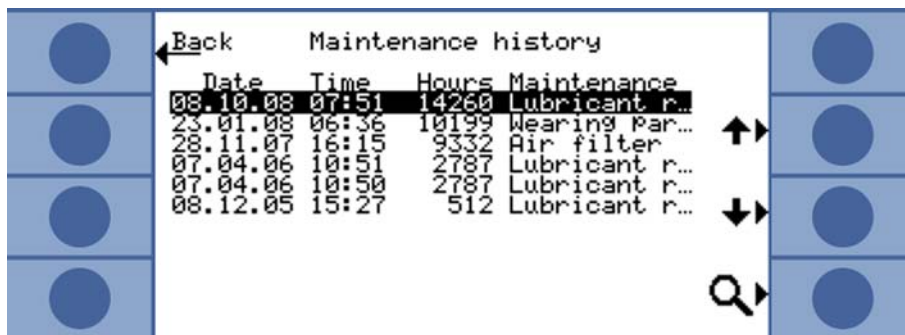


Fig. 43: Entries in a maintenance list

The detailed view also shows maintenance work that you as operator cannot confirm. In order to explain and confirm this work, you have to have special technical knowledge and access to the "Service" menu.

**Confirm maintenance**

In the menu "Confirm maintenance", confirm the replacement of the lubricant (operating fluid) reservoir and the main air filter replacement.

Select "Lubricant reservoir" or "Main air filter" and then press "OK". You are then prompted to state whether you want to confirm the maintenance, i.e. make an entry in the maintenance list.

The maintenance intervals for the operating fluid reservoir and the air filter of the main unit are specified and the system will remind you when the interval has elapsed.

*Sniffer line filter*

Because the device can be operated with different sniffer lines, any replacement of the filter in the sniffer probe is not subject to the maintenance schedule. Instead, you can enter a period in "Sniffer filter" after which the device will ask you to replace the filter.

Setting range: 10 to 1000 hours and infinite (∞).

Set ∞ if you do want to suppress the request for replacement.

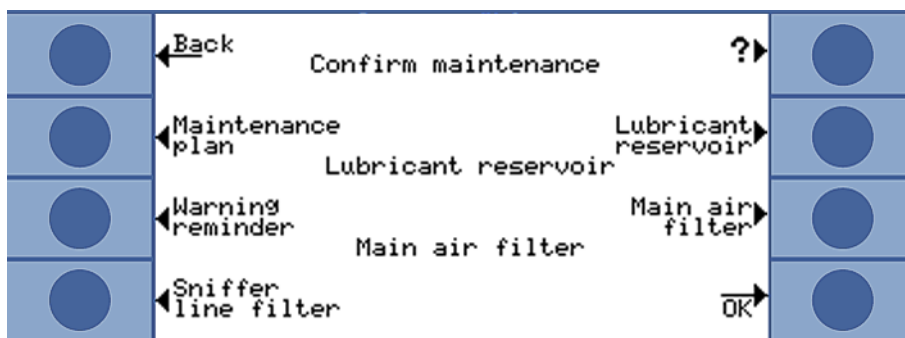


Fig. 44: Confirming maintenance work

*Maintenance plan*

If you select "Maintenance plan", you have the option of deactivating the plan and thus the reminder messages.

*Warning reminder*

If the maintenance plan is activated but no maintenance work is confirmed, the warning "Reminder of pending maintenance work" will be displayed every two hours. You can deactivate the repeated display of this warning in "Warning reminder".

**Select filament (cathode)**

In this window, you can switch from cathode B back to cathode A if the device has independently selected cathode B. The setting can only be made in the idle state and with a stopped turbo molecular pump.

Select the cathode and confirm with "OK".

**Replacing ECO-Check**

If an ECO-Check calibrated leak is connected or the gas store of the ECO-Check is replaced, you have to enter the serial number as well as the identification with the calibration data. The installation of the ECO-Check in the Ecotec E3000 as well as the gas store replacement are described in the ECO-Check manual.

The ECO-Check must be connected to the device. You must write down the serial number and the identification on the gas store or you can refer to the supplied certificate for that information.

The appropriate entry window opens with "Replacing the ECO-Check".

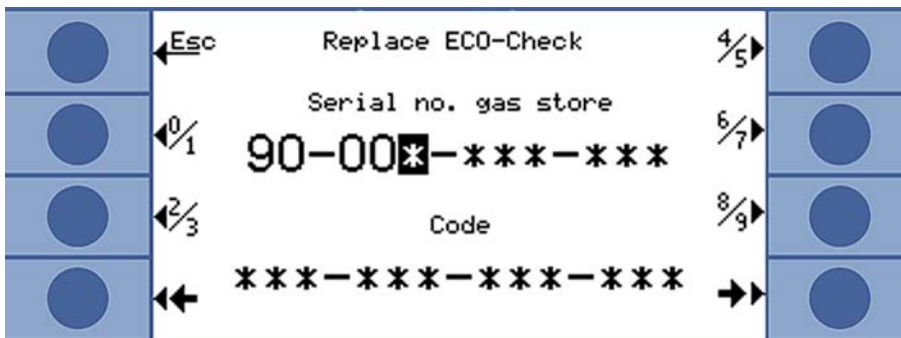


Fig. 45: Enter serial number and identification of the gas store.

The Ecotec E3000 checks the entered number. It will report "Invalid entry" if the ECO-Check cannot be identified with the number.

**8.2 Maintenance work**

Failure to perform the maintenance work specified in the maintenance schedule will void the warranty.

DANGER

**Danger to life due to electric shock**

Inside the device there are voltages of considerable magnitude. Touching parts where electric voltage is applied can result in death.

- ▶ Disconnect the device from the power supply prior to any maintenance work. Make sure that the electric power supply cannot be reconnected unauthorized.

## NOTICE

### Material damage from rotating parts

The turbo molecular pump requires 5 minutes to power down.

- ▶ Allow the turbo molecular pump to power down before any maintenance work is performed or before moving the device.

You will need the following tool for maintenance:

- 2 screwdrivers, size 2
- Box wrench, 19 mm (included in the delivery scope)
- Allen wrench, 8 mm (included in the delivery scope)
- Allen wrench, 3 mm (not included in the delivery scope)
- Tweezers

Table 11: Maintenance schedule

Maintenance	Material description	Parts number	Operating hours			Period	Maintenance level
			500	2000	10,000		
Check the sinter filter of the sniffer probe and replace, if necessary.	Sinter filter for sniffer probe	200 03 500	X <sup>1</sup>				I
Replace the filter inserts of the capillary filters and the water conservation tip.	Felt for capillary filter	200 001 116		X			I
Clean or replace the main air filter in the floor of the housing.	Air filter Ecotec E3000 (104 x 154 mm; 5 pcs.)	200 001 552			X		I
Check the internal filter and replace, if necessary (three pcs.).	Internal filter	200 03 679			X		II
Replace operating fluid reservoir of the turbo molecular pump.	Operating fluid reservoir The date on the packaging is the latest possible installation date.	200 003 801				3 years	II
Replace the membranes of the diaphragm pump.	Wear parts set for diaphragm pump	200 03 504			X		III
Replace gas store no later than after 2 years of operation. Maximum durability, storage plus operation: 3 years	Replacement gas store	531-010				2 years	

<sup>1</sup> Heavier soiling of the measurement environment can also require earlier replacement.

Explanation of maintenance levels:


Maintenance level I: Customer without any technical training

Maintenance level II: Customer with technical and INFICON training

Maintenance level III: INFICON Service

### 8.2.1 Replacing the air filter of the main unit

The air filter is inside a duct that is accessible from the bottom of the device. The duct is closed with a cover plate. The cover plate is held in place with a 3-mm hexagon socket screw.


DANGER

**Danger to life due to electric shock**

Inside the device there are voltages of considerable magnitude. Touching parts where electric voltage is applied can result in death.

- ▶ Disconnect the device from the power supply prior to any maintenance work. Make sure that the electric power supply cannot be reconnected unauthorized.

NOTICE

**Material damage from rotating parts**

The turbo molecular pump requires 5 minutes to power down.

- ▶ Allow the turbo molecular pump to power down before any maintenance work is performed or before moving the device.

- 1 Remove the sniffer line and the ECO-Check from the main unit.
- 2 Place the main unit with the front panel on a soft surface.
- 3 Loosen the screw of the cover plate until you can rotate the cover plate to the side.



Fig. 46: Loosening the air filter cover

- 4 Pull out the air filter and replace it with a new one.



Fig. 47: Air filter in the air filter duct

- 5 Retighten the cover plate in front of the duct.
- 6 Put the device back on its feet and connect sniffer line and ECO-Check, if needed.
- 7 Confirm the work, see ["Confirm maintenance"](#), page 65.

## 8.2.2 Replacing the operating fluid reservoir

The operating fluid reservoir supplies the turbo molecular pump with lubricant. It consists of a plastic container with a soaked liner and 8 soaked sticks (Porex rods). Plastic container and Porex rods are below the turbo molecular pump and accessible from the bottom of the Ecotec E3000.

The bore for the operating fluid reservoir is closed with an aluminum plug and a plastic screw.

The operating fluid reservoir has a limited service life and storage period; see the maintenance schedule.



### DANGER

#### Danger to life due to electric shock

Inside the device there are voltages of considerable magnitude. Touching parts where electric voltage is applied can result in death.

- ▶ Disconnect the device from the power supply prior to any maintenance work. Make sure that the electric power supply cannot be reconnected unauthorized.



### CAUTION

#### Danger of poisoning

The operating fluid reservoir can contain toxic substances from the pumped medium.

- ▶ Wear appropriate protective clothing, when needed.
- ▶ Dispose of the operating fluid reservoir as stipulated by local regulations.
- ▶ A data safety sheet for the lubricants is available upon request.

- 1 Remove the sniffer line and the ECO-Check from the main unit.
- 2 Place the main unit with the front panel on a soft surface.
- 3 Unscrew the plastic screw with a 19 mm box wrench.



*Fig. 48: Fastener of the operating fluid reservoir*

- 4** Lever out the aluminum plug with one or two narrow screw drivers.
- 5** Hook something into the center bore of the plastic container and pull out the plastic container.



*Fig. 49: Opened operating fluid reservoir*

- 6** Pull the eight Porex rods out of the front side of the bore with tweezers.



*Fig. 50: Porex rods of the operating fluid reservoir*

- 7** Insert the new Porex rods with tweezers.

- 8 Place the plastic container in the bore with the soaked liner first and close it with the aluminum plug.
- 9 Tighten the plastic screw again. Ensure that the o-ring is placed correctly in the groove of the plastic screw and that the bore is lined up properly.
- 10 Confirm the work, see ["Confirm maintenance"](#), page 65.

### 8.2.3 Replacing mains fuses

The fuses are behind a flap near the mains plug. They are in two slots.

The mains fuses are available with order no. 200 000 914. Two identical fuses must be used at all times.

## DANGER

**Danger to life due to electric shock**

Inside the device there are voltages of considerable magnitude. Touching parts where electric voltage is applied can result in death.

- ▶ Disconnect the device from the power supply prior to any maintenance work. Make sure that the electric power supply cannot be reconnected unauthorized.

- 1 Lever out the cover of the mains plug to the right with a screwdriver.



Fig. 51: Levering out cover to the right

- 2 Pull out the two slots and replace the fuses.



Fig. 52: Slot with fuse

- 3 Push the slots back in. Ensure that the arrows point up.
- 4 Close the flap.

## 8.2.4 Replacing the filter inserts of the capillary filter and the water conservation tip

The plastic capillary filter, the metal capillary filter and the water conservation tip are equipped with filter inserts.

There is a plugwasher below the metal capillary filter and the water conservation tip. This seal is already integrated into the plastic capillary filter.

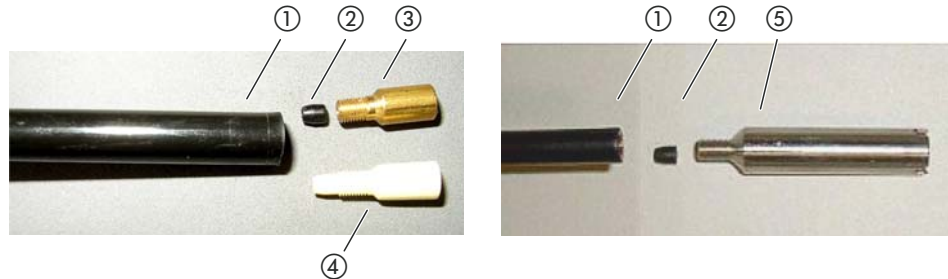


Fig. 53: Capillary filter

- |                          |                            |
|--------------------------|----------------------------|
| ① Sniffer line end       | ④ Plastic capillary filter |
| ② Plugwasher             | ⑤ Water conservation tip   |
| ③ Metal capillary filter |                            |

Capillary filter and water conservation tip are screwed onto the sniffer line end.

The filter inserts are pushed inside and are in front of a small metal grill that is also pushed inside.

To replace filter inserts, proceed as follows:

- 1 Turn off the Ecotec E3000.
- 2 Unscrew the capillary filter or the water conservation tip. Make sure that the plugwasher does not fall out.
- 3 Push out the old filter pads and the metal grill from the rear.

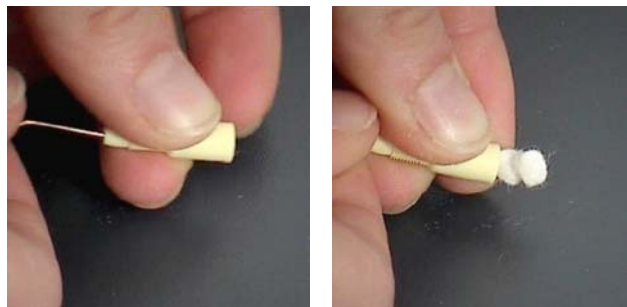


Fig. 54: Pushing the filter inserts out of the capillary filter

- 4 Dispose of the old inserts and clean the metal grill.
- 5 Push the metal grill and then the two new inserts into the filter from the front. Make sure that grill and inserts do not cant.
- 6 Turn on the Ecotec E3000.



- 7 Close the sniffer probe with your finger. With the water conservation tip, you have to also cover the opening on the side. You should then be able to feel a vacuum. If not then there is a leak somewhere and you have to check the screw connection. The plugwasher may also have fallen out.
- 8 Confirm the work, see ["Confirm maintenance"](#), page 65.
- 9 Calibrate the Ecotec E3000, see ["6.4.2 Calibration"](#), page 37.

### 8.2.5 Replacing the sinter filter of the sniffer handle

The sinter filter is in the sniffer handle. To replace filter inserts, proceed as follows:

- 1 Turn off the Ecotec E3000.
- 2 Unscrew the two cross-head screws that hold the sniffer probe in place.
- 3 Remove sinter filter including o-ring.



Fig. 55: Sinter filter in the sniffer handle

- 4 Check the filter for visible soiling.
- 5 Insert a new sinter filter with o-ring in the base of the filter tip.
- 6 Tighten the sniffer probe again.
- 7 Turn on the Ecotec E3000.
- 8 Close the sniffer probe with your finger. You should be able to feel the vacuum. If not then there is a leak somewhere and you have to check sniffer probe and handle.
- 9 Confirm the work, see ["Confirm maintenance"](#), page 65.
- 10 Calibrate the Ecotec E3000, see ["6.4.2 Calibration"](#), page 37.



## 9 Taking out of service

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### 9.1 Disposal of the Ecotec E3000

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The device can be disposed of by the owner or sent to INFICON.

The device is made of materials that can be reused. You should use this option to avoid waste and protect the environment.

- ▶ For disposal, comply with the environmental and safety regulations of your country.

### 9.2 Returning the Ecotec E3000

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## WARNING

**Danger due to harmful substances**

Contaminated devices can threaten the health of INFICON staff.

- ▶ Fill in the declaration of contamination completely.
- ▶ Attach the declaration of contamination to the outside of the packaging.

The declaration of contamination is a legal requirement and serves to protect our employees. Devices submitted without an enclosed declaration of conformity will be returned to the sender by INFICON.

Declaration of Contamination: see below.

## 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.

**1 Description of product**

Type \_\_\_\_\_

Article Number \_\_\_\_\_

Serial Number \_\_\_\_\_

**2 Reason for return**

\_\_\_\_\_

\_\_\_\_\_

**3 Operating fluid(s) used (Must be drained before shipping.)**

\_\_\_\_\_

**4 Process related contamination of product:**

toxic	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>	<p>2) Products thus contaminated will not be accepted without written evidence of decontamination!</p>
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

**5 Harmful substances, gases and/or by-products**

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

**6 Legally binding declaration:**

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 \_\_\_\_\_

Address \_\_\_\_\_ Post code, place \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

Email \_\_\_\_\_

Name \_\_\_\_\_

Date and legally binding signature \_\_\_\_\_ Company stamp \_\_\_\_\_

This form can be downloaded from our website.

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

**INFICON GmbH**

Bonner Str. 498,50968 Cologne, Germany  
 Tel: +49 221 56788-112 Fax: +49 221 56788-9112  
 www.inficon.com leakdetection.service@inficon.com

zisa01e1-b (1106)

## 10 Appendix

### 10.1 Accessories

Table 12: Accessories and order no.

Accessory part	Order no.
Sniffer line	
SL3000-3, 3 m length	525-001
SL3000-5, 5 m length	525-002
SL3000-10, 10 m length	525-003
SL3000-15, 15 m length	525-004
Sniffer line for system integration (robotic application)	525-015
Sniffer probes	
ST 312, 120 mm length, rigid	122 13
FT 312, 120 mm length, flexible	122 14
FT 200, 200 mm length, rigid	122 18
FT 250, 250 mm length, flexible	122 66
ST 385, 385 mm length, rigid	122 15
FT 385, 385 mm length, flexible	122 16
FT 600, 600 mm length, flexible	122 09
ST 500, 500 mm length, rigid, 45° angled	122 72
Water conservation tip	122 46
Holder for SL3000 sniffer line	525-006
ECO-Check calibrated leak for R134a	531-001
ECO-Check gas store for R134a	531-010
PRO-Check calibrated leak	521-001
Calibration set for IGS mode	531-003
Calibrated leak for individual refrigerants, leak rate/leak rate 2–5 g/a, leak rate 16 g/a also available	
R134a	122 20
R600a	122 21
R404A	122 22
R502a	122 23
R22	122 25
R23	122 26
R152a	122 27
R407C	122 28
R410A	122 29
R401A	122 30
Halon 1301 (R13B1)	122 34
HFO-1234yf	122 35
Calibrated leak for R290, leak rate 7–8 g/a	122 31

Table 12: Accessories and order no. (cont.)

Accessory part	Order no.
Calibrated leak for forming gas (hydrogen), 10 % hydrogen/90 % helium, leak rate range $10^{-5}$ mbar l/s	122 33
Calibrated leak for helium	
S-TL 4, leak rate range $1 \times 10^{-4}$ mbar l/s	122 37
S-TL 5, leak rate range $10^{-5}$ mbar l/s	122 38
S-TL 6, leak rate range $10^{-6}$ mbar l/s	122 39
Calibrated leak for methane, TL4-6	122 49
Calibrated leaks for other refrigerants on request	
External display unit for Ecotec E3000RC	
for use as table device	551-100
for rack mounting	551-101
Connecting cable for external display unit	
for Ecotec E3000RC, 5 m	551-102
for Ecotec E3000RC, 1 m	551-103

## 10.2 Gas library

The software of the Ecotec E3000 includes a list with approx. 100 gases that can be relevant for the refrigeration industry. These gases are saved to ROM (read only memory) and can be selected from the list in the appropriate menus for gases and trigger values. 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 six empty memory spaces (user library RAM memory). The user can save personally defined gases to them, see “6.4.5 Setting a user-defined gas”, page 42.

The pre-set mass number (measuring position) has a grey background for each gas.

Table 13: Gases and their mass position

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xExx)	Viscosity
R11	CFCl <sub>3</sub>		101	137.4	1.00	7.0E+07	0.515
			103				
R12	CF <sub>2</sub> Cl <sub>2</sub>		85	120.9	1.00	5.9E+07	0.591
			87				
			50				
R12B1	CF <sub>2</sub> ClBr	Halon 1211	85	165.4	1.00	1.4E+08	0.591
			87				
			50				
			129				
			131				
R13	CF <sub>3</sub> Cl		69	104.5	1.00	7.0E+07	0.857
			85				

Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xExx)	Viscosity
R13B1	CF <sub>3</sub> Br		69	149.0	1.00	3.5E+07	0.852
			129		0.12		
			131		0.12		
			148		0.10		
			150		0.10		
R14	CF <sub>4</sub>		69	80.0	1.00	7.0E+07	0.857
			50		0.70		
R21	CHFCl <sub>2</sub>		67	102.9	1.00	7.0E+07	0.535
			69		0.35		
R22	CHF <sub>2</sub> Cl		51	86.5	1.00	7.6E+07	0.632
			67		0.11		
R23	CHF <sub>3</sub>		69	70.0	1.00	2.4E+08	0.704
			51		0.93		
			50		0.17		
R32	CH <sub>2</sub> F <sub>2</sub>		51	52.0	1.00	1.7E+08	0.632
			52		0.70		
R41	CH <sub>3</sub> F		34	34.0	1.00	7.0E+07	0.551
			33		1.00		
R50	CH <sub>4</sub>	Methane	15	16.0	1.00	7.0E+07	0.556
R113	C <sub>2</sub> F <sub>3</sub> Cl <sub>3</sub>		101	187.4	1.00	7.0E+07	0.484
			151		1.00		
R114	C <sub>2</sub> F <sub>4</sub> Cl <sub>2</sub>		85	170.9	1.00	7.0E+07	0.545
			135		1.00		
R115	C <sub>2</sub> F <sub>5</sub> Cl		85	154.5	1.00	7.0E+07	0.627
			119		1.00		
R116	C <sub>2</sub> F <sub>6</sub>		69	138.0	1.00	7.0E+07	0.709
			119		1.00		
R123	C <sub>2</sub> HF <sub>3</sub> Cl <sub>2</sub>		83	152.9	1.00	7.0E+07	0.540
			85		1.00		
R124	C <sub>2</sub> HF <sub>4</sub> Cl		67	136.5	1.00	7.0E+07	0.581
			51		1.00		
R125	C <sub>2</sub> HF <sub>5</sub>		51	120.0	1.00	6.7E+07	0.653
			69		0.27		
			101		0.35		
R134a	C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>		69	102.0	0.72	1.1E+08	0.591
			83		0.46		
			51		0.12		
R141b	C <sub>2</sub> H <sub>3</sub> FCl <sub>2</sub>		81	117.0	1.00	7.0E+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	1.6E+08	0.494
			85		0.19		

Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xExx)	Viscosity
R143a	C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>		69	84.0	1.00	7.0E+07	0.561
			65		0.35		
R152a	C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>		51	66.1	1.00	8.7E+07	0.515
			65		0.47		
R170	C <sub>2</sub> H <sub>6</sub>	Ethane	26	30.1	1.00	7.0E+07	0.591
R218	C <sub>3</sub> F <sub>8</sub>		69	188.0	1.00	7.0E+07	0.627
			169		0.25		
R227ea	C <sub>3</sub> HF <sub>7</sub>		69	170.0	1.00	8.8E+07	0.6
			51		0.18		
			82		0.15		
R236fa	C <sub>3</sub> H <sub>2</sub> F <sub>6</sub>		69	152.0	1.00	3.9E+07	0.550
			64		0.34		
			133		0.30		
			113		0.06		
R245fa	C <sub>3</sub> H <sub>3</sub> F <sub>5</sub>		64	134.0	0.58	6.5E+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	1.00	7.0E+08	0.433
			39		1.00		
			42		0.35		
R356	CF <sub>3</sub> (CH <sub>2</sub> ) <sub>2</sub> x CF <sub>3</sub>		77	166.1	1.00	7.0E+07	0.561
			69		1.00		
R400	50 % R12 50 % R114		85	141.6	1.00	7.0E+07	0.571
			135		0.35		
R401A	53 % R22 13 % R152a 34 % R124		51	94.4	1.00	7.0E+07	0.607
			67		1.00		
			101		0.35		
R401B	61 % R22 11 % R152a 28 % R124		51	92.8	1.00	7.0E+07	0.612
			67		1.00		
R401C	33 % R22 15 % R152a 52 % R124		51	101.0	1.00	7.0E+07	0.602
			67		1.00		
R402A	38 % R22 60 % R125 2 % R290		51	101.6	1.00	7.0E+07	0.647
			101		0.35		
R402B	60 % R22 38 % R125 2 % R290		51	94.7	1.00	7.0E+07	0.642
			101		0.35		



Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xExx)	Viscosity
R403A	75 % R22		51	92.0	1.00	7.0E+07	0.642
	20 % R218		69		0.35		
	5 % R290						
R403B	56 % R22		51	103.3	1.00	7.0E+07	0.647
	39 % R218		69		1.00		
	5 % R290						
R404A	44 % R125		69	97.6	1.00	9.3E+07	0.607
	52 % R143a		51		0.52		
	4 % R134a		101		0.23		
R405A	45 % R22		51	111.9	1.00	7.0E+07	0.622
	7 % R152a		100		1.00		
	5.5 % R142b 42.5 % RC318						
R406A	55 % R22		51	89.9	1.00	7.0E+07	0.566
	4 % R600a		65		1.00		
	41 % R142b						
R407A	20 % R32		51	90.1	1.00	7.0E+07	0.637
	40 % R125		69		1.00		
	40 % R134a						
R407B	10 % R32		51	102.9	1.00	7.0E+07	0.647
	70 % R125		101		1.00		
	20 % R134a						
R407C	23 % R32		51	86.2	1.00	2.1E+08	0.627
	25 % R125		69		0.75		
	52 % R134a		83		0.38		
R407D	15 % R32		69	91.0	1.00	7.0E+07	0.612
	15 % R125		83		1.00		
	70 % R134a						
R407E	25 % R32		51	83.8	1.00	7.0E+07	0.622
	15 % R125		69		1.00		
	60 % R134a						
R407F	40 % R134a		51	82.1	1.00	1.9E+08	0.627
	30 % R125		69		0.35		
	30 % R32						
R408A	7 % R125		51	87.0	1.00	7.0E+07	0.602
	46 % R143a		69		1.00		
	47 % R22						
R409A	60 % R22		51	97.4	1.00	7.0E+07	0.607
	25 % R124		67		1.00		
	15 % R142b						
R409B	65 % R22		51	96.7	1.00	7.0E+07	0.612
	25 % R124		67		1.00		
	10 % R142b						
R410A	50 % R32		51	72.6	1.00	1.2E+08	0.673
	50 % R125		101		0.26		
				69		0.14	

Translation of the original operating instructions Ecotec E3000, kina22en1-19; 1507

Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xE <sup>xx</sup> )	Viscosity
R410B	45 % R32		51	75.6	1.00	7.0E+07	0.673
	55 % R125		101		0.35		
R411A	1.5 % R1270		51	82.4	1.00	7.0E+07	0.617
	87.5 % R22 11 % R152a		67		0.70		
R411B	3 % R1270		51	83.1	1.00	7.0E+07	0.622
	94 % R22 3 % R152a		67		0.70		
R411C	3 % R1270		51	83.4	1.00	7.0E+07	0.627
	95.5 % R22 1.5 % R152a		67		0.70		
R412A	70 % R22		51	92.2	1.00	7.0E+07	0.602
	5 % R218 25 % R142b		65		0.35		
R413A	9 % R218		69	104.0	1.00	7.0E+07	0.581
	88 % R134a 3 % R600		83		1.00		
R414A	51 % R22		51	96.9	1.00	7.0E+07	0.586
	28.5 % R124 4 % R600a 16.5 % R142b		67		1.00		
R415A	82 % R22		51	81.7	1.00	7.0E+07	0.622
	18 % R152a		67		0.70		
R416A	59 % R134a		69	111.9	1.00	7.0E+07	0.576
	39.5 % R124 1.5 % R600		67		1.00		
R417a	50% R134a 46% R125 4% R600a		51	106.7	1.00	1.8E+08	0.627
			69		0.70		
			83		0.22		
R449a	25.7 % R134a 25.3 % R1234y(f) 24.7 % R125 24.3 % R32		51	87,2	1.00	2.1E+08	0.627
			69		0.20		
			64		0.23		
R452a	59 % R125a 30 % R1234y(f) 11 % R32		51	103.5	1.00	1.3E+08	0.627
			69		0.32		
			64		0.12		
R500	74 % R12		85	99.3	1.00	7.0E+07	0.581
	26 % R152a		51		0.35		
R501	75 % R22		51	93.1	1.00	7.0E+07	0.627
	25 % R12		85		0.35		
R502	49 % R22 51 % R115		85	111.6	1.00	7.0E+07	0.647
			51		1.00		
			119		1.00		

Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xExx)	Viscosity
R503	40 % R23		69	87.3	1.00	7.0E+07	0.709
	60 % R13		51		0.35		
R504	48 % R32		85	79.3	1.00	7.0E+07	0.678
	52 % R115		51		1.00		
R505	78 % R12		85	103.5	1.00	7.0E+07	0.612
	22 % R31		87		1.00		
R506	55 % R31		68	93.7	1.00	7.0E+07	0.561
	45 % R114		85		1.00		
R507	50 % R125		69	98.9	1.00	8.1E+07	0.612
	50 % R143a		51		0.58		
				65		0.17	
R508A	39 % R23		69	100.1	1.00	7.0E+07	0.729
	61 % R116		51		0.35		
R508B	46 % R23		69	95.4	1.00	8.6E+07	0.729
	54 % R116		51		0.20		
				119		0.23	
R600	C <sub>4</sub> H <sub>10</sub>	Butane	41	58.1	1.00	7.0E+07	0.377
			42		1.00		
R600a	C <sub>4</sub> H <sub>10</sub>	Isobutene	41	58.1	1.00	2.6E+08	0.377
			42		0.75		
			43		1.00		
			58		0.08		
			1G5		0.91		
R601	C <sub>5</sub> H <sub>12</sub>	Pentane	41	72.2	1.00	7.0E+07	0.341
			42		1.00		
			43		0.00		
R601a	C <sub>5</sub> H <sub>12</sub>	Isopentane	41	72.2	0.60	8.0E+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	7.0E+07	0.337
R601c	C <sub>5</sub> H <sub>12</sub>	Cyclopentane	41	70.1	0.30	7.0E+07	0.337
			42		1.00		
			70		0.29		
			55		0.28		
			39		0.21		
R1234y(f)	C <sub>3</sub> H <sub>2</sub> F <sub>4</sub>		69	114.0	1.00	1.6E+08	0.600
			64		0.99		
			95		0.36		
			114		0.50		

Translation of the original operating instructions Ecotec E3000, kina22en1-19, 1507

Table 13: Gases and their mass position (cont.)

Gas	Formula	Other designation	Measuring position (xxx amu)	Molecular mass (xxx.x amu)	Fragmentation factor	Normalization factor (x.xE <sup>xx</sup> )	Viscosity
R1234z(e)	C <sub>3</sub> H <sub>2</sub> F <sub>4</sub>		69	114.0	1.00	3.4E+08	0.600
			64		0.82		
			95		0.48		
R1243z(f)	C <sub>3</sub> H <sub>3</sub> F <sub>3</sub>		95	96.0	1.00	2.9E+08	0.600
			77		0.52		
			51		0.48		
			69		0.41		
			96		0.85		
Ar	Argon		40	40.0	1.00	7.0E+07	1.127
CO <sub>2</sub>	R744		44	44.0	1.00	1.0E+08	0.744
H <sub>2</sub>	Hydrogen		2	2.0	1.00	1.8E+06	0.448
H <sub>2</sub> O	R718		18	18.0	1.00	7.0E+07	0.459
He	Helium		4	4.0	1.00	2.4E+07	1.000
HT135	Galden HT135		100	610.0	0.08	1.2E+07	1.000
			69		1.00		
			119		0.45		
			169		0.42		
			131		0.03		
Kr	Krypton		84	84.0	1.00	7.0E+07	1.275
N <sub>2</sub>	Nitrogen		28	28.0	1.00	7.0E+07	0.892
Ne	Neon		20	20.2	1.00	7.0E+07	1.586
NH <sub>3</sub>	R717		17	17.0	1.00	7.0E+07	0.505
O <sub>2</sub>	Oxygen		32	32.0	1.00	7.0E+07	1.030
SF <sub>6</sub>			127	146.1	0.80	9.1E+07	0.765
Xe	Xenon		129	131.3	1.00	7.0E+07	1.153
			132		1.00		
ZT130	Galden ZT130		100	497.0	0.25	7.0E+07	1.000
			117		0.32		
			119		1.00		
			69		0.50		
			135		0.12		

### 10.3 Menu tree

Main menu	2 Start / sleep			
	3 Service	Service PIN		
	5 Measuring parameters	5 Gas 1	Gas	8 Edit
		6 Gas 2	Status	
		7 Gas 3	Trigger&Unit	
		8 Gas 4	Search & Limit	
			Internal calibration	
			Mass and position	
			Cal. factor	
			Last calibration	
			Cal. Method	
			Gas definition	
			Name	
			Massposition	
			Normalisation factor	
			Molecule mass	
	6 Settings	2 Vacuum & access	2 Zero	
			3 Zero time	
			5 Flow limits	upper flow limit
				lower flow limit
			6 Sensitivity check	
			7 Calibration	
			8 Change Menu-PIN	
			3 Audio	2 Beep sound
		3 Device speaker		
		5 Audio Sniffer		
		5 Setup I-Guide	6 Alarm profile	
			7 Volume	
			2 I-Guide ON/OFF	
			PGM. 1...10	3 Edit:
			Name	
	Gas A			
	Gas B			
	Glob. Trigger A			
	Glob. Trigger B			
	Number of measuring points			
	Measuring time			
	Wait time			
	4 Button ON/OFF			
6 Miscellaneous	2 Language			
	3 Time & Date			
	4 Sniffer light			
	5 Pressure unit			
	6 Leak rate filter			
	7 Alarm delay			
	8 Wake up			
7 Display	2 Contrast			
	3 Peak hold			
	6 Gas display handle			
8 Interfaces	2 Control location			
	3 Recorder outputs	6 Recorder output scale		
		7 Recorder output gas		
	5 Setup PLC	6 Define PLC inputs		
		7 Define PLC outputs		
	6 RS232 protocol			
	7 Baud rate & End sign			
	8 ECO-Check			
7 History&Maintenance	2 Error history			
	3 Calibration history			
	4 Select filament			
	5 Maintenance intervals			
	6 Maintenance history			
	7 Confirm maintenance	2 Maintenance plan		
		3 Warning reminder		
		4 Sniffer line filter		
		6 Lubricant reservoir		
		7 Main air filter		
8 Replace ECO-Check				
8 Info	1/9 General data			
	2/9 Turbo molecular pump data			
	3/9 Transpector data			
	4/9 ECO-Check data			
	5/9 Sniffer line information			
	6/9 I/O port data			
	7/9 Analog data			
	8/9 Analog data (2)			
	9/9 RS232			
	CAL -->	External calibration Adjust IGS		

Translation of the original operating instructions Ecotec E3000, kina22en1-19, 1507

## 10.4 CE-Declaration of Conformity



CE

### EC Declaration of Conformity

We – INFICON GmbH - herewith declare that the products defined below meet the basic requirements regarding safety and health of the relevant EC directives by design, type and the versions which are brought in to circulation by us.

In case of any products changes made without our approval, this declaration will be void

Designation of the product:  
**Multigas-Lecksucher**

Models: **ECOTEC E3000**  
**ECOTEC E3000RC**  
**ECOTEC E3000A**

Catalogue numbers:  
**530-001, 530-002**  
**530-101, 530-102**  
**530-103, 530-104**

Authorised person to compile the relevant technical files:  
Helmfried Johann, INFICON GmbH, Bonner Strasse 498, D-50968 Köln

Cologne, February 2, 2015

  
 Dr. Döbler, President LDT

The products meet the requirements of the following directives:

- *Directive on Low Voltage (2006/95/EC)*
- *Directive on Electromagnetic Compatibility (2004/108/EC)*
- *Directive on Machinery (2006/42/EC)*

Applied harmonized standards:

- *EN 61010 - 1 : 2010*
- *EN 61326 - 1 : 2013 Parts EN 55011 Class B*
- *EN 61000-4-2*
- *EN 61000-4-3*
- *EN 61000-4-4*
- *EN 61000-4-5*
- *EN 61000-4-6*
- *EN 61000-4-11*
- *DIN EN ISO 12100-1 / DIN EN ISO 12100-2*

Cologne, February 2, 2015

  
 Kilian, Research and Development

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## 10.5 RoHS-Declaration of Conformity



### Declaration of RoHS Conformity\*

### Multi-Gas Sniffer Leak Detector Ecotec E3000

Part Name	Toxic or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated biphenyl ethers (PBDE) (PBB)
Housing	o	o	o	o	o	o
High vacuum block	o	o	o	o	o	o
Power supply	o	o	o	o	o	o
Turbo molecular pump	o	o	o	o	o	o
Diaphragm pump	o	o	o	o	o	o
Motherboard	o	o	o	o	o	o
MC50 controller board	o	o	o	o	o	o
Printed circuit board gauge adapter	o	o	o	o	o	o
Transpector™ mass spectrometer	o	o	o	o	o	o
Cable set	o	o	o	o	o	o
Control panel with display	o	o	o	o	o	o

o: Indicates that this toxic or hazardous substance contained in all of the homogeneous material for this part is below the limit requirement in SJ/T11363-2006.

\* according to SJ-T11363-206

#### INFICON GmbH

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kiua22e1-b (14/07)





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