



Translation of the original operating instructions

# BES4000

Leak detector

Catalog No.  
610-001

From software version  
V1.11 (Operating unit)

mine90en1-01-(2603)



INFICON GmbH  
Bonner Straße 498  
50968 Cologne, Germany

# Table of Contents

<b>1</b>	<b>About this Manual .....</b>	<b>6</b>
1.1	Explanation of warnings .....	6
1.2	Target Groups .....	6
<b>2</b>	<b>Safety .....</b>	<b>7</b>
2.1	Intended use .....	7
2.2	Duties of the operator .....	8
2.3	Owner requirements .....	8
2.4	Dangers .....	9
<b>3</b>	<b>Shipment, Transport, Storage .....</b>	<b>10</b>
<b>4</b>	<b>Description .....</b>	<b>11</b>
4.1	Function .....	11
4.2	Design of device .....	12
4.3	Display .....	13
4.3.1	Measurement display elements .....	16
4.4	Sniffer line .....	17
4.4.1	Display on the sniffer line .....	17
4.5	Technical data .....	18
4.6	Factory settings .....	19
<b>5</b>	<b>Installation .....</b>	<b>23</b>
5.1	Setup .....	23
5.2	Connecting the sniffer line .....	24
5.3	Sniffer tip .....	24
5.3.1	Replacing the sniffer tip .....	24
5.3.2	Using flexible sniffer tip .....	25
5.3.3	Using an extension hose for a sniffer tip .....	25
5.4	Using calibration leaks .....	26
5.5	Connecting to the power supply system .....	26
5.6	Using a USB stick .....	27
5.7	Connecting a PC .....	27
<b>6</b>	<b>Operation .....</b>	<b>28</b>
6.1	Switch ON .....	28
6.2	Basic settings .....	29
6.2.1	Setting the language .....	29
6.2.2	Setting date and time .....	30
6.2.3	Adjust volume .....	30
6.2.4	Setting auto standby .....	30
6.2.5	Setting the display .....	31
6.2.6	Set time interval for calibration request .....	32

6.2.7	Setting the filter change request .....	32
6.2.8	I/O module .....	32
6.2.8.1	Create a connection between the device and the I/O module .....	32
6.2.8.2	Configuring analog outputs .....	32
6.2.8.3	Setting the upper scale value for 10 V of the analog output.....	32
6.2.8.4	Setting up the I/O module protocol.....	33
6.2.8.5	Configuring digital outputs .....	33
6.2.8.6	Configure digital inputs .....	34
6.2.8.7	Setting the interface unit.....	35
6.2.9	Bus module .....	35
6.2.9.1	Creating a connection between the device and the bus module.....	35
6.2.9.2	Setting a bus module address .....	36
6.2.10	Setup scope of error messages.....	36
6.2.11	Access to the settings .....	36
6.2.11.1	Protecting settings via PIN assign.....	37
6.2.11.2	Switch from supervisor to operator .....	37
6.2.11.3	Switch from operator to supervisor .....	37
6.2.11.4	Changing parameter access controls.....	37
6.2.12	Save parameters .....	38
6.2.13	Load parameters .....	38
6.2.14	Switching the "Screenshot" function on or off.....	38
6.3	Settings for the measurements.....	38
6.3.1	Setting setpoints.....	38
6.3.2	Setting up an alarm profile for setpoints.....	39
6.3.3	Setting up the sniffer probe .....	40
6.3.4	Calibrating .....	40
6.3.4.1	Time and type of calibration .....	40
6.3.4.2	Calibration with an internal COOL-Check .....	41
6.3.4.3	Checking the calibration with an internal COOL-Check.....	42
6.4	Measuring .....	42
6.5	Measurement data .....	43
6.5.1	Measurement data recording .....	43
6.5.2	Evaluating measured data .....	44
6.5.3	Transferring measured data from the internal memory to a USB stick .....	45
6.5.4	Deleting measurement data .....	45
6.6	Standby .....	45
6.7	Diagnosis .....	46
6.8	Retrieve information about the device .....	46
6.9	Parameter list .....	47
6.10	Resetting to factory settings .....	48
6.11	Updating the software.....	49
6.11.1	Updating the software of the basic unit .....	49

6.11.2	Updating the software of the operating unit .....	50
6.11.3	Updating the software of the I/O module.....	50
6.12	Switch OFF .....	51
<b>7</b>	<b>Warning and error messages.....</b>	<b>52</b>
<b>8</b>	<b>Cleaning and Maintenance .....</b>	<b>59</b>
8.1	Basic unit .....	59
8.1.1	Replacing the filter plates.....	59
8.1.2	Cleaning the calibration opening.....	60
8.1.3	Replacing the fuses.....	60
8.1.4	Cleaning the device.....	61
8.1.5	Change calibration leak .....	62
8.2	Sniffer line.....	63
8.2.1	Replacing the filter holder (all sniffer lines) .....	63
8.2.2	Replacing the sealing block (all sniffer lines).....	64
8.3	Sending for repair or maintenance.....	64
8.4	Maintenance table .....	64
<b>9</b>	<b>Decommissioning .....</b>	<b>65</b>
9.1	Disposing of the device .....	65
9.2	Returning the device for maintenance, repair or disposal .....	65
<b>10</b>	<b>Appendix.....</b>	<b>67</b>
10.1	Accessories and spare parts.....	67
10.2	Menu path.....	68
10.2.1	Diagnosis.....	68
10.2.2	Settings .....	68
10.2.3	Information .....	69
10.3	CE Declaration of Conformity .....	70
10.4	RoHS.....	71

# 1 About this Manual

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

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

## 1.1 Explanation of warnings



### DANGER

Imminent hazard resulting in death or serious injuries



### WARNING

Hazardous situation resulting in potential death or serious injuries



### CAUTION

Hazardous situation resulting in minor injuries

### NOTICE

Hazardous situation resulting in damage to property or the environment

## 1.2 Target Groups

This instruction manual is intended for the operator of the device and for technically qualified specialists, with experience in the field of leak testing technology.

## 2 Safety

### 2.1 Intended use

The device is a leak detector for sniffer leak detection. Use the device to locate and quantify leaks on test objects. The BES4000 uses a special sniffer line to detect leaking electrolytes that contain a solvent, e.g. dimethyl carbonate (CAS number 616-38-6) or ethyl methyl carbonate (CAS number 623-53-5).

- The BES4000 is suitable for use in dry rooms. Please contact INFICON for further information.
- Only operate the device as intended, as described in the operating instructions, in order to avoid hazards due to incorrect use.

#### Incorrect usage

Avoid the following unintended uses:

- Use outside the technical specifications, see "Technical Data"
- Installing an unsuitable mains fuse whose fuse rating differs from the specifications on the type plate
- Use of the device in case of detectable defects
- Use in radioactive areas. Leak detectors could become contaminated.
- Use of the device in dry environments (relative humidity < 30%) without consulting INFICON
- Use of accessories or spare parts, which are not listed in this manual
- Testing wet or damp test objects
- Testing of test objects on which gross leaks can already be detected visually, acoustically or by smell
- Pumping off aggressive, flammable, explosive, corrosive, microbiological, reactive or toxic substances, creating a hazard
- Suction of flammable/explosive gas mixtures above the lower explosion limit. The allowable composition of venal gas mixtures can be read in the safety data sheets of the respective manufacturers.
- Using the device in potentially explosive atmospheres
- Aspirate liquids into the device via the sniffer line
- Use of the device outside the specified area of use
- Inspection of cables or objects carrying dangerous electrical voltages with a sniffer line
- Using the sniffer tip on very hot surfaces or on open flames
- Connecting dangerous electrical voltages to the device interfaces
- Intake of flammable or toxic substances, if no pumps are connected for suction of the exhaust gas in particularly long exhaust pipes, e.g. refrigerants, propane, substances from batteries
- Use of damaged sniffer lines
- Using the device without a filter holder on the sniffer tip
- Using the device in automated systems
- Use of the device in residential areas, which may result in interference with electrical devices

- Using the device in places with strong electromagnetic fields from third-party devices that may affect measurement results

## 2.2 Duties of the operator

- Read, observe, and follow the information in this manual and in the work instructions provided by the owner. This concerns in particular the safety and warning instructions.
- Always observe the complete operating instructions for all work.
- If you have any questions about operation or maintenance that are not answered in this manual, contact customer service.

## 2.3 Owner requirements

The following notes are for companies or any person who is responsible for the safety and effective use of the product by the user, employee or third party.

### Safety conscious operation

- Operate the device only if it is in perfect technical condition and has no damage.
- Only operate the device in accordance with this instruction manual, in a safety and risk conscious manner.
- Adhere to the following regulations and observe their compliance:
  - Intended use
  - General applicable safety and accident prevention regulations
  - International, national and local standards and guidelines
  - Additional device-related provisions and regulations
- Only use original parts or parts approved by the manufacturer.
- Keep this instruction manual available on site.

### Personnel qualifications

- Make sure that authorized personnel have read and understood the operating instructions and all other applicable documents, especially the information on safety, maintenance and repairs, before starting work.
- Only have qualified personnel make the basic settings on the device. The handling of the sniffer line can also be done by laymen according to instructions.

## 2.4 Dangers

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

### Hazards due to liquids and chemicals

Liquids and chemical substances can damage the instrument.

- Adhere to the restrictions of use.
- Do not suck up liquids with the instrument.
- Never try to find toxic, caustic, microbiological, explosive, radioactive or other harmful substances with the device.
- Only use the device away from areas with a risk of explosions.
- Do not expose the device to a naked flame and avoid spark formation, for example, by smoking.

### Dangers from electric power

There is a danger to life from the contact of conductive parts inside the device.

- Disconnect the device from the power supply prior to any installation and maintenance work. Make sure that the electric power supply cannot be reconnected without authorization.

Contact of the sniffer tip with live parts may result in danger to life.

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

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

- Before connecting to the power supply, make sure that the mains voltage on site is within the permitted operating voltage range.  
The permitted operating voltage range is indicated on the device.

### Risk of injury by tripping

Cables or hoses can become tripping hazards on a leak detector: Mains cable, hoses to the "Vent", "Exhaust" and sniffer line.

- Prevent tripping hazards when placing the device and connecting lines.
- Don't block any roads with a sniffer line.

## 3 Shipment, Transport, Storage

### Scope of delivery

Item	Quantity
BES4000	1
Sniffer line (4.8 m) with sniffer tip (100 mm)	1
Mains connection cable, country-specific	1
Exhaust air hose (2 m)	1
Fuses	4
Calibration leak	1
Centering ring for calibration leak	1
Extension hose for sniffer tip (21 mm)	1
Extension hose adapter for sniffer tip	1
Filter holder for sniffer tip	5
Sealing block for sniffer tip	5
Digital operating instructions, to download as PDF from <a href="http://www.inficon.com">www.inficon.com</a>	1

- ▶ Check the scope of delivery of the product for completeness after receipt.

### Transport

#### NOTICE

##### Damage caused by transport

Transport in unsuitable packaging material can damage the device.

- ▶ Keep the original packaging.
- ▶ Only transport the device in its original packaging.

### Storage

Always store the device in compliance with the technical data, see "Technical data [▶ 18]"

## 4 Description

### 4.1 Function

The BES4000 consists of a basic unit and a sniffer line.

To find leaks, pass the tip of the sniffer line over places where electrolyte may be leaking.

Traces of the electrolyte may already be present in the ambient air. The BES4000 measures the air in the atmosphere and takes the background concentration of the electrolyte and other unwanted gases into account when calculating the measured value.

To be able to find leaks that exceed a specific electrolyte concentration, set one or two setpoints on the basic unit. If you work with two setpoints, you can toggle between both values whilst measuring by pressing a button.

## 4.2 Design of device

The main unit is only called a "device" in the following as long as the meaning remains clear.

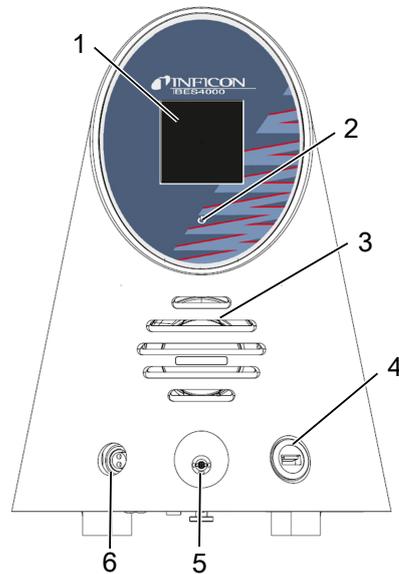


Fig. 1: Front

1	Touchscreen	4	USB port
2	Status indicator (LED)	5	Calibration opening
3	Speaker	6	Connection sniffer line

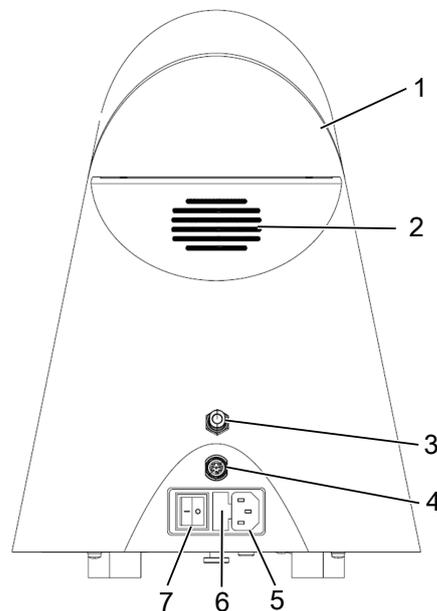


Fig. 2: Rear side

1	Carry handle	5	Power supply
2	Ventilation	6	Electrical fuse behind cover
3	Exhaust air connection 6 mm	7	Power switch
4	Connection for interfaces		

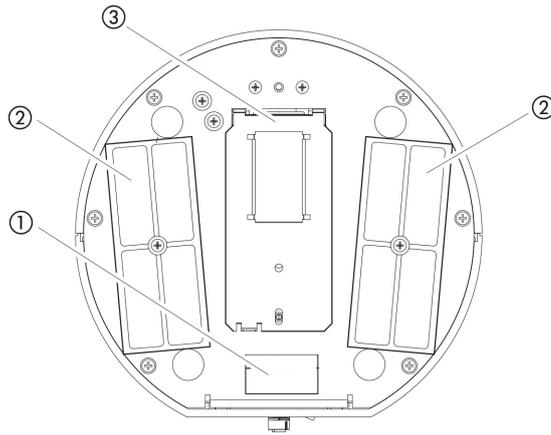


Fig. 3: Bottom

1	COOL-Check calibration leak behind cover	3	Nameplate
2	Filter plate	4	Filter plate

### 4.3 Display

The display primarily works with symbols. Four symbols are always shown on the display: the navigation buttons . In addition, depending on the context, you will see additional symbols and elements, see "Function Keys" table below.

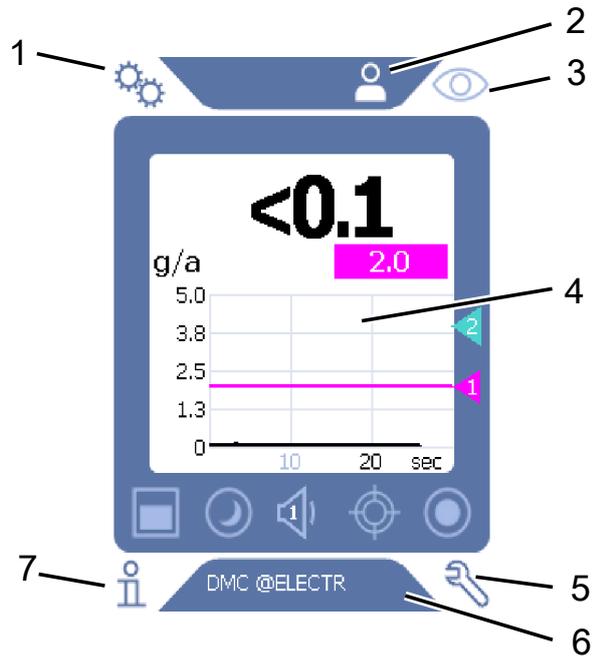


Fig. 4: Start screen after starting up

1	Navigation button settings	5	Navigation diagnostic button
2	Menu bar user	6	Status bar
3	Navigation operation button	7	Navigation information button
4	Display area		

## Navigation buttons

Four navigation buttons are located in the four corners of the display. Use the navigation buttons to control the various areas and functions of the device.

To get an overview of the setting options, note the display of the menu trees see "Menu path [▶ 68]".

The buttons can appear in five different colors:

- Gray: Function is disabled
- Dark blue: Function can be activated
- Light blue: Function is active
- Red: Error message displayed
- Orange: Warning displayed

	<ul style="list-style-type: none"> <li>• Settings symbol</li> <li>• Change settings on the device</li> <li>• Back one settings level</li> </ul>
	<ul style="list-style-type: none"> <li>• Symbol for operation</li> <li>• Call up measurement display</li> <li>• Display active error or warning message</li> </ul>
	<ul style="list-style-type: none"> <li>• Information symbol</li> <li>• Display information regarding the unit such as the software version, operating hours, serial number, date and time</li> <li>• Navigate back to the previous information layer</li> </ul>
	<ul style="list-style-type: none"> <li>• Diagnostics symbol</li> <li>• Call up diagnostic functions: Service settings, history lists, software update</li> <li>• Navigate back to the previous diagnosis layer</li> <li>• Show active, confirmed warning</li> </ul>

Table 1: Navigation buttons

## Menu bar

The blue menu bar shows you whether you are logged in as a supervisor  or as an operator , see "Access to the settings [▶ 36]".

## Main display area

The function buttons are located in the blue margin of the main display area.

The buttons can appear in three different colors.

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

### Symbol buttons for measuring and for standby

	Change display from bar graph to line graph
	Change display from line graph to bar graph
	Change between being in standby or out of standby
	Set the volume for speakers The set volume is displayed on the bottom edge of the display. Value range: 0 (off) to 15 (max.).
	Call up external calibration see "Calibrate with external calibration leak"
	Starting or stopping the data record see "Measurement data [▶ 43]"

### Function symbols during calibration

	Cancel calibration
	Calling up help for calibration

### General function symbols

	Cancel ongoing function
	Call up help for the current function
	Confirm entry or selection

Table 2: Function buttons

The measurement display is also located within the range. For more information see "Measurement display elements [▶ 16]".

## Status bar

A text appears in the blue status bar with information about the main display area.

## Recalibrating the touchscreen

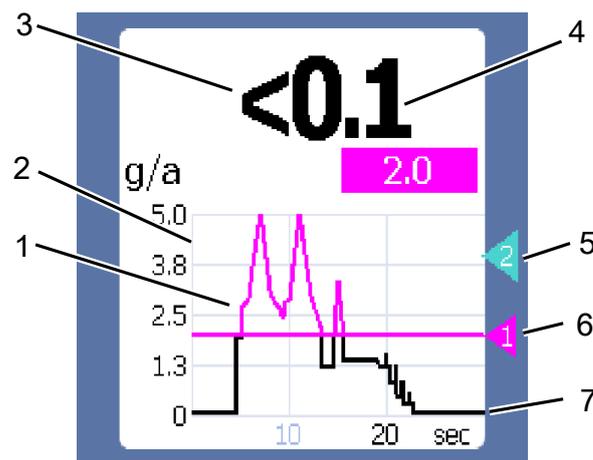
The BES4000 is delivered with a calibrated touchscreen. If required, you can recalibrate the touchscreen.

- ✓ Device is switched off.
  - 1 Remove the sniffer line.
  - 2 Switch on the device without connected sniffer line.
  - 3 If error message 130 is displayed, guide the sniffer tip into the calibration opening at the front of the basic unit within 30 seconds.
    - ⇒ Touch calibration is started.
  - 4 Follow the instructions on the touchscreen.
  - 5 Switch the device off and reconnect the sniffer line.

### 4.3.1 Measurement display elements

The measured leak rates are displayed numerically and with a linearly subdivided graph. Exceeding the setpoint which is set up is illustrated in color, see "Setting setpoints [▶ 38]".

The following diagram shows additional elements relating to the measurement display:



1	Measurement value history	5	Setpoint 2
2	Value axis	6	Setpoint 1
3	If the measured value is lower than that of the lower display limit, the "<" sign is used.	7	Time axis
4	Numeric display of the leakage rate		



After switching off warning 630 "Calibration request", the message "Calibration required!" is displayed flashing above the measurement display diagram.

This message disappears after recalibration, see "Calibrating [▶ 40]".

## 4.4 Sniffer line

You need a sniffer line for electrolytes to operate the device. The sniffer line which is delivered as standard is 4.8 m long.

A sniffer line is made of a line, a sniffer probe, and a sniffer tip. The filter holder at the end of the sniffer tip is made of plastic.

### Sniffer tip

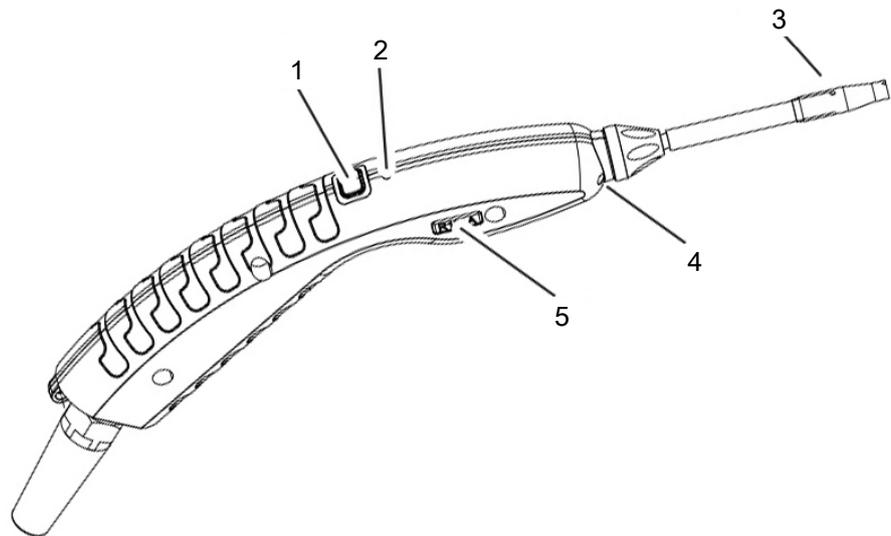
There are rigid and flexible sniffer tips of different lengths, see "Accessories and spare parts [▶ 67]".

### Sniffer probe

During measurement it is possible to switch the setpoint using the button on the sniffer probe, provided that this function is activated, see "Setting up the sniffer probe [▶ 40]". The button on the sniffer probe is also used during calibration, see "Calibration with an internal COOL-Check [▶ 41]".

### 4.4.1 Display on the sniffer line

A status LED is mounted on the handle of the sniffer line, from which you can read off the different operating states, also see section "Signals of the LED on the handle".



1	Button for calibrating and switching the threshold value	4	Illumination LED
2	Status LED	5	Designation of the sniffer line
3	Filter holder on the sniffer tip		

You can also set the illumination LEDs to flash at the lower end of the sniffer tip, see "Setting up the sniffer probe [▶ 40]".

### Signals of the Status LED on the handle grip

Operating status	LED
Not connected	Off
No communication	Blue, flashing
Run-up	Blue
Standby	Blue, flashing

Operating status	LED
Measuring mode	Green
Leakage rate > 40 % of the setpoint	Yellow
Leakage rate > 100 % of the setpoint	Yellow, flashing
Calibrate	Blue, flashing
Error/Warning	Red, flashing
Error/Warning and leakage rate > 40 % of the setpoint	Red/green, flashing
Error/Warning and leakage rate > 100 % of the setpoint	Red/yellow, flashing

#### See also

 Time and type of calibration [▶ 40]

## 4.5 Technical data

Mechanical data	
Basic unit	
Dimensions (height, diameter)	365 mm; Ø 260 mm
Weight	4.1 kg
Length of sniffer line	4.8 m
Weight sniffer handle with 4.8 m cable	790 g

Ambient conditions	
Permissible ambient temperature (during operation)	5 °C to 50 °C
Permissible storage temperature	0 °C to 50 °C
Max. relative humidity up to 31 °C	80%
Max. relative humidity from 31 °C to 40 °C	Decreasing on linear basis from 80% to 50%
Max. relative humidity above 40°C	50%
Pollution degree	II (according to DIN EN 61010-1: Only non-conductive contamination. Occasionally, temporary conductivity may occur due to condensation.)
Max. altitude above sea level	2000 m

Electrical data	
Power supplies and frequencies	100 - 240 V ±10%, 50 / 60 Hz
Power consumption	55 VA
Protection class	EN 60529 IP30 UL 50E Type 1
Overvoltage category	II

Electrical data	
Fuses	2 x 1 A slow-blowing (Ø 5 x 20 mm)
Power supply cable	2.5 m
Length of the data cable on the M12 plug	Max. 30 m
Noise level without signal tones	< 54 dBA

Physical data	
Minimum detectable leak rate	0.5 g/a DMC (1 ppm)
Time constant of the signal from the leakage rates	< 1 s
Gas flow Measured at 1 atm (1013 mbar) at sea level. The flow rate changes with the geographical height and barometric pressure.	320 sccm (typical for a standard sniffer line),
Time to readiness for measurement of a BES4000 with a standard sniffer line	< 30 s
Time to readiness for measurement of a BES4000 with sniffer line	30 minutes (typical)
Response time	< 1 s

### Materials in the gas flow

- Nickel-plated brass
- PTFE (polytetrafluorethylen)
- PU (polyurethane)
- PA (polyamid)
- PE (polyethylene)
- POM (polyacetal)
- PVC (polyvinyl chloride)
- NR (natural rubber)
- EPDM (elastomer)
- CR (elastomer)
- TPE (thermoplastic elastomer)
- Aluminum
- Silicone
- Stainless steel (1.4301, 1.4305)
- CaF<sub>2</sub> (calcium fluoride)
- FKM / FPM (fluororubber)
- Adhesive (Loctite E3520)

## 4.6 Factory settings

For current device settings, see "Parameter list [▶ 47]"

<b>General factory settings</b>	
Analog output upper limit	100 g/a
Display off after	1 h
Display brightness	100 %
Display upper limit (lin.)	300.0 g/a
Display upper limit (log.)	+3
Display unit leakage rate	g/a
Autoscale	on
Diagram maximum value (log.)	+3
Diagram maximum value (lin.)	300.0 g/a
Bus module address	126
Data recording	Off
Diagram of the leakage rate	Line chart
Factor user gas 1	0.0
Factor user gas 2	0.0
Factor user gas 3	0.0
Error information operator	No. and text
Error information supervisor	No., text and info
Filter change request	On
Filter change interval	40 hours
Gas in the ELECTR sniffer line	DMC
I/O module protocol	ASCII
Auto standby interval	2 min.
Calibration request interval	60 min.
Config. Analog output 1	Leakage rate linear
Config. Analog output 2	Leakage rate linear
Configuration PLC Output 1	Setpoint 1 (inverse)
Configuration PLC Output 2	Setpoint 2 (inverse)
Configuration PLC Output 3	Open
Configuration PLC Output 4	Open
Configuration PLC Output 5	Measure
Configuration PLC Output 6	Error (inverse)
Configuration PLC Output 7	CAL request (inverse)
Configuration PLC Output 8	Open (inverse)
Configuration PLC Input 1	No function
Configuration PLC Input 2	No function
Configuration PLC Input 3	Start/Stop (inverse)
Configuration PLC Input 4	No function
Configuration PLC Input 5	CAL external
Configuration PLC Input 6	No function
Configuration PLC Input 7	Delete
Configuration PLC Input 8	No function
Configuration PLC Input 9	No function

General factory settings	
Configuration PLC Input 10	No function
Volume	5
Leakage rate setpoint 1	5.0 g/a
Leakage rate setpoint 2	10.0 g/a
Show measured value	On
Module at M12 connector	I/O
Name user gas 1	User 1
Name user gas 2	User 2
Name user gas 3	User 3
External calibration leak	10.0 g/a
Interface unit leakage rate	g/a
Sniffer light alarm configuration	Flashing
Sniffer light brightness	4
Probe key configuration	Setpoint
Setpoint audio alarm	Setpoint
Screenshot with probe key	Off
Record interval	500 ms
Memory location	USB
Language	English
Show warnings	On
Value axis decades	3
Value axis grid	Linear
Time axis scale	10 s / div

Factory settings for access authorization	
Analog output upper limit	Supervisor
Display off after	Operator
Display brightness	Operator
Diagram maximum value (log.)	Operator
Diagram maximum value (lin.)	Operator
Display upper limit (lin.)	Operator
Display upper limit (log.)	Operator
Display unit leakage rate	Operator
Autoscale	Operator
Bus module address	Supervisor
Data recording	Operator
Date and time	Supervisor
Diagram of the leakage rate	Operator
Factor user gas	Supervisor
Error information operator	Supervisor
Error information supervisor	Supervisor
Filter change request	Supervisor

Factory settings for access authorization	
Filter change interval	Supervisor
Gas in the ELECTR sniffer line	Operator
I/O module protocol	Supervisor
Auto standby interval	Supervisor
Calibration request interval	Supervisor
Calibration factor	SERVICE
Config. Analog output	Supervisor
Configuration PLC Output	Supervisor
Configuration PLC Input	Supervisor
Volume	Operator
Leakage rate setpoint	Supervisor
Show measured value	Operator
Module at M12 connector	Supervisor
Name user gas	Supervisor
Phase	SERVICE
Interface unit leakage rate	Supervisor
Sniffer light alarm configuration	Supervisor
Sniffer light brightness	Supervisor
Probe key configuration	Supervisor
Setpoint audio alarm	Supervisor
Screenshot with probe key	Supervisor
Record interval	Operator
Memory location	Operator
Language	Operator
Show warnings	SERVICE
Value axis decades	Operator
Value axis grid	Operator
Time axis scale	Operator

# 5 Installation

## 5.1 Setup



### WARNING

#### Risk of injury due to improper installation

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

If you do not lay cables and other connected lines properly, there is a risk of tripping over them.

- ▶ Place the device on a flat, non-slip, and vibration-free work surface.
- ▶ Lay the power cable and other connected lines so that there is no risk of tripping.

### WARNING

#### Danger from moisture and electricity

Moisture entering the device can lead to personal injury due to electric shocks as well as damage to property due to short circuiting.

- ▶ Only operate the device in a dry environment.
- ▶ Operate the device away from liquids and sources of moisture.

### NOTICE

#### Property damage due to overheated device

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

- ▶ Please note the technical data, see “Technical data [▶ 18]”.
- ▶ Ensure sufficient ventilation, especially on the ventilation slots on the left and right of the device: At least 20 cm of free space on the sides, at least 10 cm in the front and rear.
- ▶ Keep heat sources away from the device.
- ▶ Do not expose the device to direct sunlight.

## 5.2 Connecting the sniffer line



If the sniffer line is not connected then the device reports an error.  
 If you remove the sniffer line during operation, the device also reports an error.

Connect the sniffer line before you start up the device.

- 1 Align the red marking on the plug of the sniffer line with the red marking on the socket of the device (for the position of the socket, see "Design of device [▶ 12]", Fig. 1).
- 2 Push the sniffer line plug into the socket on the device until it locks into place.  
 ⇨ The plug may no longer be easy to move.

## 5.3 Sniffer tip

### 5.3.1 Replacing the sniffer tip

#### NOTICE

##### Material damage from pollution

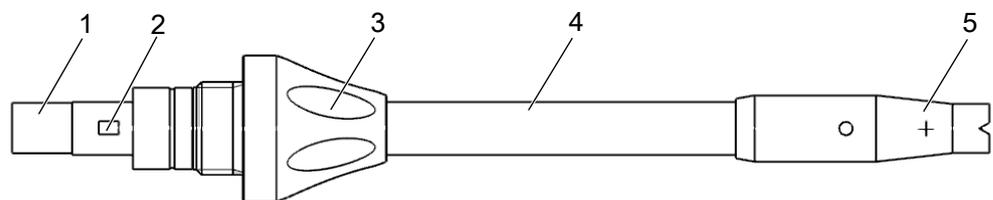
Particles in the air intake can destroy the sniffer line.

- ▶ Always switch off the device before every installation!
- ▶ Make sure that no particles enter into the air intake when replacing sniffer probe parts.



##### Incorrect measurement result due to filter block installed

If you order a new sniffer tip, you will need sealing blocks (order number 611-001).  
 Replace the originally installed filter block with the sealing block.



1	Sealing block
2	Guide
3	Union nut
4	Sniffer tip
5	Filter holder

✓ Switch the instrument off.

- 1 Loosen the cap nut until the sniffer tip can be pulled out.

- 2 Insert the new sniffer tip into the sniffer probe in such a way that the guide pin runs into the groove of the sniffer probe opening.
  - 3 Tighten the cap nut.
  - 4 Calibrate the device see "Time and type of calibration [▶ 40]".
- ⇒ Further sniffer tips see "Accessories and spare parts [▶ 67]".
- ⇒ To replace the filter see "Sniffer line [▶ 63]".

### 5.3.2 Using flexible sniffer tip

If you are examining test objects which have already been packed or test objects with areas that are difficult to access then an extended sniffer tip can be used, see "Accessories and spare parts [▶ 67]".

In addition to the rigid sniffer tip what comes delivered with the BES4000, you can also use a you can also use flexible tip. By bending the flexible tip accordingly, hard-to-reach areas can also be accessed.

### 5.3.3 Using an extension hose for a sniffer tip

To get into hard-to-reach areas, attach an extension hose to the sniffer tip, see "Accessories and spare parts [▶ 67]".

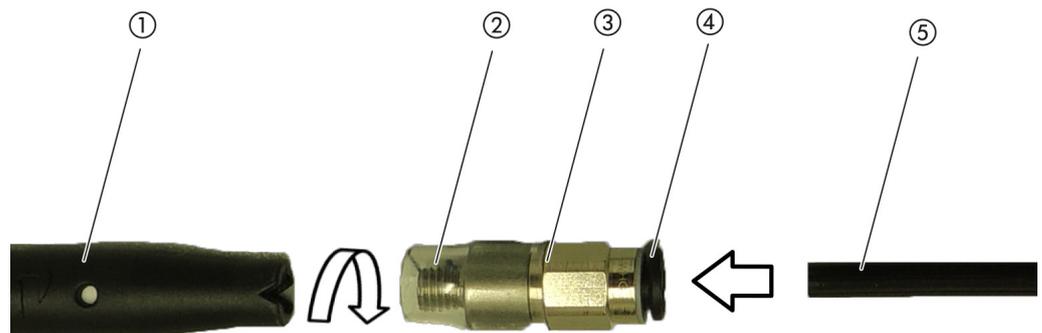


Fig. 5: Attach the extension hose

1	Filter holder on the sniffer tip
2	Short extension hose
3	Adapter
4	Release ring
5	Extension hose

If it is necessary to shorten the extension hose, cut off the end of the extension hose that you use to sniff the test object at an angle of about 45°.

- 1 To attach the extension hose to the sniffer tip, screw the adapter from the set with the extension hose to the filter holder at the end of the sniffer tip.
  - ⇒ Make sure that the short extension hose at the end of the adapter encloses the filter holder.
- 2 Insert the extension hose into the rear opening of the adapter.
  - ⇒ The extension hose is automatically locked into position.
- 3 To connect the extension hose to the calibration opening for internal calibration for the COOL-Check, insert the centering ring into the calibration opening on the device to make the COOL-Check opening smaller.

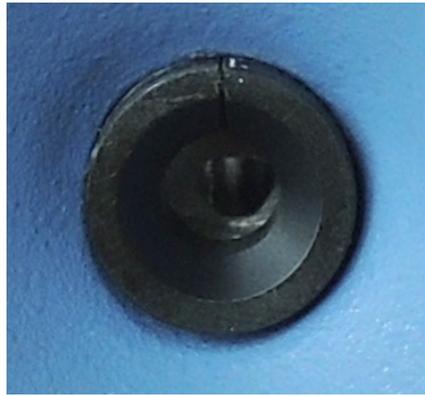


Fig. 6: Insert centering ring

#### Disassembly

- ▶ To remove the extension hose press the release ring in the direction of the adapter so that the locking device releases and thus enables the extension hose to be removed.

## 5.4 Using calibration leaks

An attachable calibration leak (COOL-Check) is available for the device, see "Accessories and spare parts [▶ 67]".

To change the COOL-Check, see "Change calibration leak [▶ 62]".

## 5.5 Connecting to the power supply system

The mains voltage of the BES4000 is specified on the type plate of the mains switch.



### **⚠ DANGER**

#### **Danger from electric shock**

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

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

### **NOTICE**

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

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

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

## 5.6 Using a USB stick

### NOTICE

#### Risk of external control of the device by malware

If malware gains access to the device, third parties can gain access and control over it.

- ▶ Do not connect any unknown removable media to the device.
- ▶ Check removable storage devices for malware before connecting them to the device.

You can save the following data on a USB stick:

- Record measured data, see "Measurement data recording [▶ 43]",
- Save settings, see "Save parameters [▶ 38]",
- Save histories, see "Diagnosis [▶ 46]",
- Store measured data, see "Transferring measured data from the internal memory to a USB stick [▶ 45]".

The USB stick must be formatted in the FAT file system.

## 5.7 Connecting a PC

Connection is done with a PC using the I/O module, see "Accessories and spare parts [▶ 67]".

Further information on data exchange can be found in the "Interface description BES4000".

## 6 Operation



### **⚠ DANGER**

#### **Danger for wearers of implants such as pacemakers**

There is a magnet in the device. Strong electric or magnetic fields can interfere with the function of the implant. Metal parts of the implant can trigger an alarm.

- ▶ As a wearer of such devices, keep at least 10 cm distance between the leak detector and the implant.
- ▶ Furthermore, take into account distances specified by the manufacturer of the implant.



### **⚠ CAUTION**

#### **Health risk due to gases and vapors**

Operation of the battery leak detector may produce hazardous vapors.

- ▶ Connect device to a functional exhaust line.
- ▶ Avoid inhaling harmful gases or vapors.
- ▶ Observe the safety instructions in the safety data sheets for the test objects.
- ▶ Provide an installation location where blockage of the exhaust lines is not possible or can be detected.
- ▶ Provide an installation location with adequate ventilation or alternatively an installation location where air quality is tested and monitored for harmful substances.



### **NOTICE**

#### **Property damage due to overheated device**

The battery leak detector becomes warm during operation and may overheat without adequate ventilation.

- ▶ Do not block the ventilation opening for the filter.
- ▶ Make sure that there is adequate ventilation at the Gas device
- ▶ Keep heat sources away from the battery leak detector.
- ▶ Do not expose the battery leak detector to direct sunlight.
- ▶ Please note the technical specifications.

### 6.1 Switch ON

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

The device will start up and, after a short time, display "Reading data".

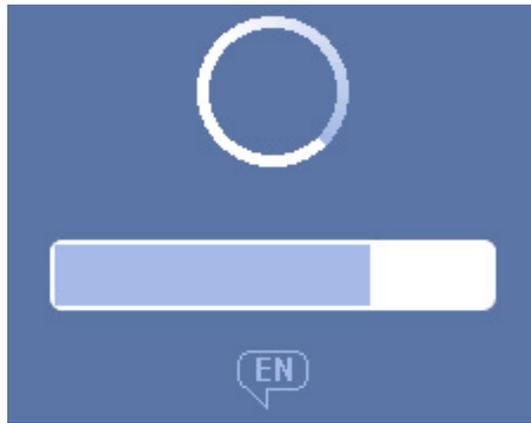


Fig. 7: The device starts up

- ▶ In order to switch to English from another language, press "EN" on the depicted window.

After the run-up, the device will measure the leakage rate on the sniffer line. There is no separate Start function.



### Measurement inaccuracy after switching on

The device must typically be in operation for at least 30 minutes to achieve all measuring and filtering characteristics. The measurement sensitivity may change within the first 30 minutes.

- ▶ Do not calibrate or measure until 30 minutes after switching on the device.

If desired,

- 1 make basic settings, see "Basic settings [▶ 29]".
- 2 make adjustments to settings for the measuring process and calibrate the device, see "Settings for the measurements [▶ 38]".

If the COOL-Check calibration leak is not located in the device, an acoustic warning signal sounds and the 163 warning message is issued during the initial start-up.

If calibration is required, the warning 630 "Calibration request" is issued, see "Measurement display elements [▶ 16]".

- ▶ To close this warning message, press the ⊗ button.

## 6.2 Basic settings

- To get an overview of the setting options, note the display of the menu trees see "Menu path [▶ 68]".
- You can either carry out your own changes or keep the factory settings, also see "Technical data [▶ 18]".
- Your settings can be saved at any time to restore to an earlier state if required, see "Save parameters [▶ 38]".

### 6.2.1 Setting the language

You can choose from the following languages for the touchscreen display:

- English (factory setting)
  - German
  - French
  - Italian
  - Spanish
  - Portuguese
  - Chinese
  - Japanese
- ▶  > Setup > Language

In order to switch to English from another language directly after switching on the device, press "EN" on the device's touch screen during run-up.

## 6.2.2 Setting date and time

Date and time are stored in the following formats:

- Date in the DD.MM.YY format
  - Time in the HH:MM format
- ▶  > Setup > General > Date and Time

## 6.2.3 Adjust volume



### CAUTION

#### Damage to hearing due to loud audio

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

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

- ▶  > Volume

⇒ Volume

You can adjust a volume. The setting applies to the speaker in the basic unit.

Adjustment range: 0 to 15

⇒ Test

A tone at the set volume is issued.

⇒ Alternatively, when on the touchscreen select the button .

## 6.2.4 Setting auto standby

As well as having the option to manually switch over into standby mode, see "Standby [ 45]", it is also possible to set up an auto standby function. This setting defines the period of time after that the device automatically enters standby mode when not in use.

- ▶  > Setup > Auto Standby
  - ⇒ Standby off  
To turn off the automatic standby function
  - ⇒ Set the time between one and 15 minutes.  
To switch on the automatic standby function

## 6.2.5 Setting the display

If necessary, change the type of display.

- ▶  > Display Settings
  - ⇒ "Value display"  
For displaying the measurements as a bar or line graph  
For switching the measurement display on or off
  - ⇒ "Value axis"  
"Value axis grid": For switching between a linear and logarithmic view  
"Value axis decades": If the logarithmic view is selected for "value axis grid" then you can choose whether 1, 2, 3, or 4 decades are displayed.
  - ⇒ "Scaling value axis"  
"Auto scale": To switch the automatic scaling on or off  
"Maximum value (log.) exponent diagram": If the automatic scaling is switched off and the logarithmic view is selected then you can set the exponent of the upper display value.  
"Maximum value (lin.) diagram": If the auto scale is switched off and the linear view is selected then you can set the upper display value.
  - ⇒ "Time axis"  
For changing the time axis between 15 s, 30 s, 60 s, 120 s, 240 s, 480 s, 960 s
  - ⇒ "Units" (for displaying the leakage rate)  
g/a (factory setting)  
lb/yr  
oz/yr  
ppm
  - ⇒ "Brightness"  
"Display brightness": To select the brightness between 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 100%  
"Display off after": For setting whether the display is switched off after 30 s, 1 min., 2 min., 5 min., 10 min., 30 min., 1 h.  
The time runs after the last time a button on the touchscreen was pressed or a status change occurred (exceeding the setpoint, occurrence of a warning message, etc.).
  - ⇒ "Display limits"  
"Display upper limit (log.) exponent": The displayed value is limited to this value.  
The values 0, 1, 2 or 3 are possible.  
"Display upper limit (lin.)": This is for establishing an upper limit (lin.), for example between 5, 10, 20, 50, 100, 200 or 300 g/a.

## 6.2.6 Set time interval for calibration request

You can switch off the time-controlled calibration request or set intervals between 30 minutes and 24 hours, after which a calibration request is displayed.

- 1  > Setup > Request
- 2 Select "off" or input a time interval.
- 3 Save .

## 6.2.7 Setting the filter change request

See also "Replacing the filter holder (all sniffer lines) [▶ 63]".

- 1  > Setup > Request
- 2 Choose "on" or "off".
- 3 If you have chosen the setting "On", you can set the timespan between two requests.
- 4 Save .

## 6.2.8 I/O module

Introduction information: Instruction manual IO1000 I/O module, document no. jiqc10

### 6.2.8.1 Create a connection between the device and the I/O module

- 1 Switch the instrument off.
- 2 Connect the INFICON I/O module with a data cable to the M12 socket on the rear of the device, see "Design of device [▶ 12]".
- 3 Switch on the BES4000 .
- 4  > Setup > Interfaces > Device selection
- 5 Select "I/O".
- 6 Save .

### 6.2.8.2 Configuring analog outputs

You can determine how the voltage of the analog outputs is set.

- 1  > Setup > Interfaces > I/O module > Analog outputs
- 2 For "Config. analog output 1" or "Config. analog output 2" choose between:
  - Set by interface
  - Leakage rate linear
  - Off
- 3 Save .

### 6.2.8.3 Setting the upper scale value for 10 V of the analog output

You can set which leakage rates are represented by 10 V on the analog output. This setting only comes into effect when "leakage rate linear" is selected for the configuration of the analog output.

- 1  > Setup > Interfaces > I/O module > Analog scale

- 2 To set the upper scale value, enter a numerical value between, for example, 10 g/a and 1000 g/a using the buttons.
- 3 Save .

#### 6.2.8.4 Setting up the I/O module protocol

If necessary, set the format of the I/O module protocol.

- 1  > Setup > Interfaces > I/O module > Protocol  
⇒ Also see "Interface description BES4000".
- 2 Select between "ASCII", "LD", "Normal", and "Simple".
- 3 Save .

#### 6.2.8.5 Configuring digital outputs

- 1  > Setup > Interfaces > I/O module > PLC outputs
- 2 Select one of the 8 digital outputs and assign a function to it:
  - Setpoint 1 or 2
  - CAL internal active
  - CAL external active
  - PROOF active
  - Warning
  - Error
  - CAL or PROOF active
  - CAL prompt
  - Run-up
  - Sniffer button
  - Light barrier
  - Measure
  - Standby
  - Sniffer closed
  - Error or Warning
  - CAL internal possible
- 3 Choose between "Normal" or "Inverse".
- 4 Assign additional PLC outputs to a function if necessary.
- 5 Save .

#### Digital Outputs

Functions	State	Description
Setpoint 1 or 2	closed	Value exceeded leak rate threshold Setpoint 1 or 2
	open	Value fell below leak rate threshold Setpoint 1 or 2
CAL internal active	closed	Internal calibration is active
	open	Internal calibration is not active
CAL External active	closed	External calibration is active
	open	External calibration is not active
PROOF active	closed	PROOF function is active
	open	PROOF function is not active
Warning	closed	Warning

Functions	State	Description
	open	no warning
Error	closed	Error
	open	no error
CAL or PROOF active	closed	Calibration (internal/external) or PROOF is active
	open	Calibration (internal/external) or PROOF is not active
CAL request	closed	During external calibration: Wait for confirmation "Signal stable" from the operator In all other states: Calibration request active
	open	no request
Run-up	closed	Run-up active
	open	Run-up
Sniffer Button	closed	Sniffer button is pressed
	open	No sniffer button is pressed
Light barrier	closed	Light barrier blocked (COOL-Check)
	open	Light barrier open (COOL-Check)
Measuring	closed	Device is in state "Measure"
	open	Device is NOT in state "Measure" (Error, Run-Up, Standby, Calibration)
Standby	closed	Device is in state "Standby"
	open	Device is NOT in state "Standby" (Measure, Error, Run-Up, Calibration)
Sniffer line is connected	closed	Sniffer line is connected
	open	Sniffer line is NOT connected
Error or warning	closed	Error or warning
	open	No error or warning
CAL internal possible	closed	Internal calibration is possible (COOL-Check connected and not empty)
	open	Internal calibration is NOT possible

### 6.2.8.6 Configure digital inputs

You can set which function is carried out by a signal on the digital input.

- 1  > Setup > Interfaces > I/O module > PLC inputs
- 2 Select one of the 10 digital inputs and assign a function to it:
  - No function
  - CAL external
  - Start
  - Stop
  - Delete
  - Select trigger (To be able to use this function, switch the "Sniffer button configuration" to "Off", see "Setting up the sniffer probe [▶ 40]").
- 3 Choose between "Normal" or "Inverse".

- 4 Assign additional PLC inputs to a function if necessary.
- 5 Save .

## Digital Inputs

Fuction	Transition	Description
CAL external	inactive → active:	Start external calibration.
	active → inactive:	Apply value for background and finish calibration.
Start	inactive → active:	Switch from Standby to Measure
Stop	inactive → active:	Switch from Measure to Standby
Clear	inactive → active:	Clear warning or error message / cancel calibration.
Start/Stop	inactive → active:	Switch from Standby to Measure
	active → inactive:	Switch from Measure to Standby
Trigger selction	inactive → active:	Select Trigger 2 Sniffer button must be disabled to use this function
	active → inactive:	Select Trigger 1 Sniffer button must be disabled to use this function

Digital inputs are edge-triggered.

Transition "inactive→ active" also called "rising edge"

Transition "active→ inactive" also called "falling edge"

### 6.2.8.7 Setting the interface unit

- 1  > Setup > Interfaces > I/O module > Units
- 2 Select the unit for the leakage rate output from the following options:
  - g/a (factory setting)
  - lb/yr
  - oz/yr
  - ppm
- 3 Save .

## 6.2.9 Bus module

Further information on the BM1000 bus module can be found on the homepage at [www.inficon.com](http://www.inficon.com).

For the different bus modules from INFICON see also "Accessories and spare parts [▶ 67]".

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

- 1 Switch the instrument off.
- 2 Connect the INFICON bus module with a data cable to the M12 socket on the rear of the device, see "Design of device [▶ 12]".

- 3 Switch on the BES4000 .
- 4  > Setup > Interfaces > Device selection
- 5 Select "Bus" as the module at M12 connector.
- 6 Save .

### 6.2.9.2 Setting a bus module address

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

This setting is irrelevant for Profinet and EtherNet/IP.

- 1  > Setup > Interfaces > Bus module > Address
- 2 Use the keyboard shown for your entries.
- 3 Save .

⇒ The value set is only applied when the BES4000 is restarted. To do this, switch the power supply off and back on.

## 6.2.10 Setup scope of error messages

You can set up the scope within which error messages are shown on the display during operation of the device. This can be set up separately for the supervisor and the operator.

- 1  > Setup > Advanced setup > Error information
- 2 Under "Error information operator" or "Error information supervisor" choose between
  - No.
  - No. and text
  - No. , text and info
- 3 Save .

## 6.2.11 Access to the settings

### Role concept

- If you are logged in as a supervisor then you can change all settings available in the device, protect against changes and check test objects for leaks.
- If you are logged in as an "operator" then you can change settings as far as is authorized and check test objects for leaks. The scope of the adjustment options depends, on the one hand, on the factory settings and on the other hand whether the "supervisor" has assigned or withdrawn permissions. When individual parameters are grayed out then no changes can be made.
- For a list of the preset parameter access controls, see "Factory settings [► 19]".

The active role can be seen on the menu bar on the touchscreen:

As "operator" you see the symbol , as "supervisor" you see the symbol .

### Starting procedure in delivery condition

A stored PIN number is assessed during the starting procedure.

The PIN "0000" is preset in delivery condition. This means the device is started with a log-in as "supervisor".

### Starting procedure after assigning the PIN

The "supervisor" can protect existing settings by inputting a PIN number. After restarting the device it restarts with a log-in as "operator". This can be switched over to "supervisor" only when the correct PIN is entered.

#### 6.2.11.1 Protecting settings via PIN assign

✓ You are logged in as a "supervisor" .

1  > Access Ctrl. > Supervisor > PIN Assign

2 Enter a 4-digit number of your choice as the PIN.

⇒ So that your settings are protected, do not select "0000", see "Access to the settings [▶ 36]".

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

If you have forgotten the supervisor PIN, then please contact the INFICON service team.

Further information can be found from the help text when entering the PIN.

#### 6.2.11.2 Switch from supervisor to operator

✓ You are logged in as a "supervisor" .

▶  > Access Ctrl. > Operator

If you have stored a PIN for an operator, alternatively switch the device off and on again.

#### 6.2.11.3 Switch from operator to supervisor

1  > Access Ctrl. > Supervisor

2 Enter the PIN which is stored for logging in as "supervisor".

#### 6.2.11.4 Changing parameter access controls

✓ You are logged in as a "supervisor" .

1  > Parameter > Parameter access level

⇒ A list of all parameters is shown including the assignments to "supervisor" and "operator".

2 To change a parameter assignment in the list illustrated, press on an entry when logged in as "supervisor".

⇒ Pressing on an entry changes the shown assignment between "supervisor" and "operator".

3 To discard the change, press  or

4 Save .

⇒ With regards to the factory settings see "Factory settings [▶ 19]"

## 6.2.12 Save parameters

Regardless of access rights, you can select parameters and save them on a USB stick.

✓ You are logged in as a "supervisor"  or as an "operator" .

- 1 Connect a USB stick with the USB port on the device.
- 2  > Parameter > Save
- 3 Either select all parameters or just individual parameters.
- 4 Save .

⇒ If necessary, the saved parameters can be transferred back to the device, see "Load parameters [▶ 38]".

## 6.2.13 Load parameters

As "supervisor"  you can transfer all parameters belonging to the selected parameter file from the USB stick onto the device.

If you are logged in as an "operator"  then only those parameters which you are authorized to access are transferred from the selected parameter file to the device.

✓ You are logged in as a "supervisor"  or as an "operator" .

- 1 Connect a USB stick with the USB port on the device.
- 2  > Parameter > Load
- 3 Select a parameter file.
- 4 Save .

## 6.2.14 Switching the "Screenshot" function on or off

To allow screenshots to be saved on a USB stick, enable the "Screenshot" function. You can use screenshots when contacting INFICON service.

- 1 Insert a FAT formatted USB stick with the USB port on the device.
- 2  > Display settings > Screenshot
- 3 Under "Screenshot with probe key" choose between "On" or "Off".
- 4 Save .

For further information on saving screenshots see "Measuring [▶ 42]".

## 6.3 Settings for the measurements

### 6.3.1 Setting setpoints

By setting setpoints you can define which quantity of escaping gas you want maximum tolerance for a test object.

#### One setpoint

You only set setpoint 1. For the values, see also the following table.

The button on the sniffer probe is not required to switch from one setpoint to another setpoint.

- 1  > Setpoints > Leakage Rate Setpoint 1

**Two setpoints**

- 2 Adjust.
- or

Alternatively you can set setpoint 1 and setpoint 2 and when measuring toggle between both setpoints by pressing the button on the sniffer line.

You can only use setpoint 2 when the function for the sniffer line button is set to "Setpoint" in the settings, see "Setting up the sniffer probe [▶ 40]".

- 1  > Setpoints > Leakage Rate Setpoint 2
- 2 Adjust.

**Example of two setpoints:**

To identify leaks, measure a test object sensitivity with low setpoint without pressing the button on the sniffer line.

If the device reports a leak, press the button on the sniffer line to measure the test object with the higher setpoint 2.

**Setting ranges**

Unit	Lower setpoint	Upper setpoint
g/a	0.5	99.0
lb/yr	1 x 10 <sup>-3</sup>	1 x 10 <sup>-1</sup>
oz/yr	0.02	1.76
ppm	2	250

Table 3: Setting range for setpoints

**6.3.2 Setting up an alarm profile for setpoints**

You can set up how you are acoustically made aware of measurement results during measurements.

- ▶  > Setpoints > Setpoint alarm

Requirements	Alarm profile Pinpoint	Alarm profile Setpoint	Alarm profile Trigger
	Recommended, for precise leak localization. The sound of the acoustic signal changes its frequency within a window around the setpoint.	The pitch level is proportional to the leakage rate.	If the selected setpoint is exceeded, then a two-pitch signal is issued.
Setpoint undercut	-	No sound	No sound
Setpoint exceeded	-	Signal tone with increasing frequency	Two-tone signal

Requirements	Alarm profile Pinpoint	Alarm profile Setpoint	Alarm profile Trigger
Acoustic tracing of the measurement result	< 1/10 Setpoint: Low frequency	-	-
	>1/10 setpoint up to 10 × setpoint: Rising frequency		
	> 10 × setpoint: High frequency		

### 6.3.3 Setting up the sniffer probe

▶  > Set Up > Sniffer line

<b>Key configuration</b>	You can change between both setpoints via the button on the sniffer probe. This function can be switched either on or off: "Setpoint" or "Off". Regarding setpoints see "Setting setpoints [▶ 38]". To replace the setpoints see "Measuring [▶ 42]".
<b>Light brightness</b>	You can adjust the general brightness of the light of the sniffer probe in several steps.
<b>Light Alarm function</b>	Light when exceeding the setpoint. There are 3 options regarding the settings: Off, Brighter, Flashing.

### 6.3.4 Calibrating

#### 6.3.4.1 Time and type of calibration

The device should be calibrated daily and after every operator change.



A BES4000 must typically be in operation for at least 30 minutes. Only then are all filter and measuring characteristics achieved.

Calibration is also required after the following actions:

- Switching the sniffer line
- Switching the sniffer probe
- Request for calibration by the system

If you insert a COOL-Check calibration leak then this is the easiest method to calibrate the device.

Insert the COOL-Check into the base plate of the device, see "Change calibration leak [▶ 62]".

The leakage rate of the COOL-Check is temperature compensated and thus makes the accuracy required for calibration possible.

The most accurate calibration is achieved with the external calibration leak. The calibration leaks apply to one gas each and are temperature resistant.

The gas that leaks from the calibration leak is carried away by strong air currents.

Keep this in mind when, for example, a fan blower is standing in your surroundings. Strong air currents provide false results when calibrating.

If you have assembled an extension hose for the sniffer tip then before calibrating with the internal COOL-Check insert a centering ring to make the calibration opening on the device smaller, see "Using an extension hose for a sniffer tip [▶ 25]". The centering ring is contained in the shipment of a set with extension hoses for the sniffer tip.

Calibrate the device 30 minutes after switching it on at the earliest. After the warm-up phase it is ensured that the device calibrates optimally.

### 6.3.4.2 Calibration with an internal COOL-Check

A COOL-Check has a life of about 2 years. It is announced on the basic unit that the life of the COOL-Check is running short 3 months before this time has elapsed. For this reason never keep a supply of COOL-Checks. Store the COOL-Check in a cool, dry place. See also "Change calibration leak [▶ 62]".

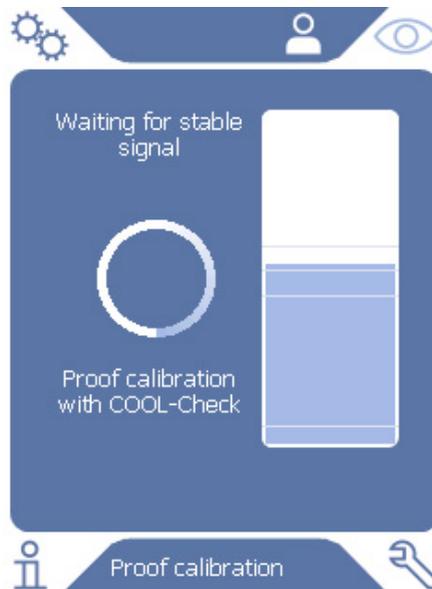


Fig. 8: Display when calibrating internally

- 1 To calibrate the device with the internal COOL-Check, switch to the measurement display .
- 2 There are 2 options:
  - ⇒ If you are prompted to calibrate then lead the sniffer tip into the calibration opening at the front of the basic unit. Calibration takes place automatically.
  - ⇒ If you are not prompted to calibrate, but wish to do so anyway then guide the sniffer tip into the calibration opening at the front of the basic unit whilst holding down the button on the sniffer probe. The calibration takes place automatically.  
If the button on the sniffer probe is not pressed then the calibration is only checked, see "Checking the calibration with an internal COOL-Check [▶ 42]".
- 3 Keep the sniffer line steady and straight during calibration.
  - ⇒ The display shows individual calibration phases and informs you whether or not calibration was successful.

### 6.3.4.3 Checking the calibration with an internal COOL-Check

The calibration can also be checked without changing calibration values. You can find out whether calibration is necessary.

- 1 Switch to measurement display.
- 2 Lead the sniffer tip into the calibration opening on the front of the basic unit without pressing the button on the sniffer probe.
- 3 Hold the sniffer line still and straight as long as the device is checking the calibration.
  - ⇒ A message appears stating whether the calibration is OK or whether the device requires recalibration.
  - ⇒ When the corresponding message appears on the measurement screen then press the button on the sniffer probe to calibrate.

## 6.4 Measuring



### **⚠ WARNING**

#### **Risk of electric shock from live parts**

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

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



### **⚠ WARNING**

#### **Risk of eye damage**

LEDs generate a bundled light that can damage your eyes.

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



### **⚠ CAUTION**

#### **Risk of electric shock from sucked liquids**

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

- ▶ Do not suck up liquids into the device.



### **⚠ WARNING**

#### **Poisoning due to damage to the device caused by unapproved solvents**

If unapproved solvents are sucked into the device, the device may be damaged.

- ▶ Test objects must be tested with approved solvents, see also "Intended use [▶ 7]".
- ▶ When using unapproved solvents, check the resistance of the materials in the gas flow of the device, see also "Technical data [▶ 18]".

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

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

- ✓ A sniffer line is connected to the basic unit.
- ✓ The device has started up and is warmed up, see "Switch ON [▶ 28]".
- ✓ The device is calibrated, see "Time and type of calibration [▶ 40]".
- ✓ You have configured the measurement settings required for your measurement, see "Settings for the measurements [▶ 38]".
- ✓ For difficult to reach places, you have used an extended and optionally flexible sniffer tip, see "Using flexible sniffer tip [▶ 25]".
- ✓ Alternatively, you have an extension hose mounted on the front of your sniffer tip, see "Using an extension hose for a sniffer tip [▶ 25]".
  - 1 Hold the sniffer tip close to the potential leak.
    - ⇒ The tip must touch the test object.
  - 2 If you want to test a weld seam or similar, you must guide the tip along the path at a speed of less than 2.5 cm/s.
  - 3 When you check a spot, hold the sniffer line to it for least 1 second.
  - 4 If you have activated the button function on the sniffer probe, see "Setting up the sniffer probe [▶ 40]", then you have the following options:
    - ⇒ If the button is not pressed on the sniffer probe: Measurement takes setpoint 1 into consideration,
    - ⇒ If the button is pressed on the sniffer probe: Measurement takes setpoint 2 into consideration.

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



If you have activated the "Screenshot" function, see "Switching the "Screenshot" function on or off [▶ 38]", save a screenshot by pressing the button on the sniffer probe.

If the button function is enabled on the sniffer probe at this time, the screenshot is also saved when switching to setpoint 2.



If the device reports large numbers of test objects as leaking in succession, this may be due to contamination of the device with solvents from test objects with gross leaks.

- ▶ A test object is considered to have a gross leak if electrolyte leaks out of it visibly or audibly or if you can smell electrolyte.

## 6.5 Measurement data

### 6.5.1 Measurement data recording

You can save measured data as files in TXT format. The device creates a new TXT file every hour.

There is approx. 16 MB of free internal memory available. This is sufficient when setting up a 500 ms recording interval for approx. 24 hours.

Alternatively, measured data can be saved on a USB stick of up to 32 GB (formatted in the FAT file system).

### Starting recording

- 1  > Recorder > Recorder settings  
⇒ Alternatively, when on the touchscreen select the button .
- 2 Select from the following settings:  
"Storage location": "USB" or "internal"  
"Record interval": "100 ms", "200 ms", "500 ms", "1 s", "2 s" or "5s"
- 3 If "USB" is selected as the storage location then connect a USB stick to the USB port on the device.
- 4 Select the "On" button under "Data Record".
- 5 Start data recording by selecting the button   
⇒ If the device is switched off or the USB stick is removed from the USB memory location without finishing the data record then the data for the current hour being recorded is lost.

### Stopping recording

- 1  > Recorder > Recorder settings  
⇒ Alternatively, when on the touchscreen select the button .
- 2 Press the "Off" button under "Data Record".
- 3 Stop data recording by selecting the button .

## 6.5.2 Evaluating measured data

A file with measurement data is structured as follows:

### Example

```
// Record file: \L0000001.txt
// Created by BES4000CU V0.11.02.18681
// BES4000CU Unique-No.: 00000000000
// BES4000 Ser.-No.: 00000000000
// BES4000MB V0.22.06(1.04.00)
// Probe V1.00
// Probe Ser.-No.: BES4000 probe
// Probe Type: ELECTR (DMC)
// IO1000 V0.05.00(0.02.02)
// IO1000 Ser.-No.: 00000000000
// BM1000 not connected
// Start time: 23.06.2014 08:58:25
Time Leakrate[g/a] Status
0.0 1.82E-02 MEASURE
0.5 1.82E-02 MEASURE
1.0 4.16E-03 MEASURE
1.5 1.29E-02 MEASURE
2.0 0.00E+00 MEASURE
2.5 1.02E-02 MEASURE
3.0 1.75E-03 MEASURE
3.5 3.43E-03 MEASURE
```

```

4.0 3.43E-03 MEASURE
4.5 0.00E+00 MEASURE
5.0 8.20E-03 MEASURE
5.5 1.71E-02 MEASURE
6.0 1.52E-02 MEASURE

```

In the example shown the data record started on 06/23/2014 at 8:58:25. From this start time onwards a measurement result was recorded every 500 milliseconds.

1.82E-02 means  $1.82 \times 10^{-2}$  as the leakage rate per year.

The following status entries are possible:

Status entry	Meaning
UNKNOWN	Unknown, as, e.g., there is no communication
RUNUP	Run-up
STANDBY	Standby
MEASURE	Measure
ERROR (xxx)	Error (error number)
WARNING (xxx)	Warning (warning number)
CAL	Calibration

### 6.5.3 Transferring measured data from the internal memory to a USB stick

You can transfer measured data from the internal memory to a connected USB stick.

- 1 Connect a USB stick with the USB port on the device.
- 2  > Recorder > Copy
- 3 Select the files you wish to copy.
- 4 Confirm your selection with .

### 6.5.4 Deleting measurement data

If the internal memory has no more available space for the data record then measured data can be deleted.

- 1  > Recorder > Delete
- 2 Select the files you wish to delete.
- 3 Confirm your selection with .

## 6.6 Standby

The device switches to idle mode when you select the  button in the measurement display of the device.

Either pressing the  button or pressing the button on the sniffer probe will reactivate the device.

If the device was in standby mode for more than 25 seconds, you can activate the device by moving the sniffer line.

## 6.7 Diagnosis

### To the list of active warnings

- ▶  > Active Warnings

### Service

The service menu is password-protected. You can configure settings in the Service menu only after completing a special training course from the INFICON service department.

### Histories

- 1  > Histories > Error And Warning History
- 2  > Histories > Calibration History

### Update

- ▶  > Update

For further information on how to proceed with an update, see "Updating the software [▶ 49]".

## 6.8 Retrieve information about the device

It is possible to call up information regarding the parameters set and the operation modes of the device.

- 1 Select the navigation button .
- 2 Make a selection by pressing one of the following buttons:
  - Basic unit
  - COOL-Check
  - I/O module
  - Parameter list
  - Sniffer line
  - Operating unit
  - Bus module

⇒ The stored device-specific information is displayed.
- 3 View the desired information. These include, for example
  - ⇒ under "Basic Unit" there is information regarding the software version, the serial number of the device, the operating hours and the interior housing temperature,
  - ⇒ under "COOL-Check" there is information regarding the leakage rate depending on temperature and on the remaining time of use available,
  - ⇒ under "Sniffer Line" there is information regarding the software version, the serial number and the gas used,
  - ⇒ under "Operating Unit" there is information regarding the operating system and the software version.
- 4 To view all information, press on the page numbers displayed below.

## 6.9 Parameter list

It is possible to display all settings for the device. For changes the necessary permissions are required, see "Access to the settings [▶ 36]".

With the aid of the parameter list several changes can be carried out in one area without navigating through various menu trees, see "Menu path [▶ 68]".

- 1  > Parameter List  
⇒ Alternatively, select " > Parameters > Parameter List".
- 2 To change individual parameters, press on an entry on the touchscreen.
- 3 Either confirm changes with  or reject them with the  button.

The following parameters are displayed:

- Analog output upper limit, see "Setting the upper scale value for 10 V of the analog output [▶ 32]"
- Display off after, see "Setting the display [▶ 31]"
- Display brightness, see "Setting the display [▶ 31]"
- Diagram maximum value (log.), see "Setting the display [▶ 31]"
- Diagram maximum value (lin.), see "Setting the display [▶ 31]"
- Display upper limit (lin.), see "Setting the display [▶ 31]"
- Display upper limit (log.), see "Setting the display [▶ 31]"
- Display unit leakage rate, see "Setting the display [▶ 31]"
- Auto scale, see "Setting the display [▶ 31]"
- Bus module address, see "Setting a bus module address [▶ 36]"
- Data record, see "Measurement data recording [▶ 43]"
- Date, see "Setting date and time [▶ 30]"
- Diagram of the leakage rate, see "Setting the display [▶ 31]"
- Factor user gas 1, see "Setting up the sniffer probe [▶ 40]"
- Factor user gas 2, see "Setting up the sniffer probe [▶ 40]"
- Factor user gas 3, see "Setting the interface unit [▶ 35]"
- Error information operator, see "Setup scope of error messages [▶ 36]"
- Error information supervisor, see "Setup scope of error messages [▶ 36]"
- Filter change request, see "Setting the filter change request [▶ 32]"
- Filter change interval, see "Setting the filter change request [▶ 32]"
- I/O module protocol, see "I/O module [▶ 32]"
- Auto standby interval, see "Setting auto standby [▶ 30]"
- Calibration request interval, see "Set time interval for calibration request [▶ 32]"
- Calibration factor, see "Calibrating [▶ 40]" (can only be changed by Service)
- Config. Analog output 1 - 2, see "Configuring analog outputs [▶ 32]"
- Configuration PLC Outputs 1 - 8, see "Configuring digital outputs [▶ 33]"
- Configuration PLC Inputs 1 - 10, see "Configure digital inputs [▶ 34]"
- Volume, see "Adjust volume [▶ 30]"

- Leakage rate setpoint 1, see "Setting setpoints [▶ 38]"
- Leakage rate setpoint 2, see "Setting setpoints [▶ 38]"
- Show measured value, see "Setting the display [▶ 31]"
- Module at M12 connector, see "I/O module [▶ 32]"
- Name user gas 1, see "Setting up the sniffer probe [▶ 40]"
- Name user gas 2, see "Setting up the sniffer probe [▶ 40]"
- Name user gas 3, see "Setting up the sniffer probe [▶ 40]"
- Phase, see "Calibrating [▶ 40]" (changeable by service)
- Calibration leak external, see "Calibrating [▶ 40]"
- Interface unit leakage rate, see "Setting the interface unit [▶ 35]"
- Sniffer light alarm configuration, see "Setting up the sniffer probe [▶ 40]"
- Sniffer light brightness, see "Setting up the sniffer probe [▶ 40]"
- Probe key configuration, see "Setting up the sniffer probe [▶ 40]"
- Setpoint audio alarm, see "Setting up an alarm profile for setpoints [▶ 39]"
- Screenshot with probe key, see "Switching the "Screenshot" function on or off [▶ 38]"
- Record interval, see "Measurement data [▶ 43]"
- Memory location, see "Measurement data [▶ 43]"
- Language, see "Setting the language [▶ 29]"
- Time, see "Setting date and time [▶ 30]"
- Show warnings, see "Warning and error messages [▶ 52]" (can only be changed by Service)
- Value axis decades, see "Setting the display [▶ 31]"
- Value axis grid, see "Setting the display [▶ 31]"
- Time axis scale, see "Setting the display [▶ 31]"

## 6.10 Resetting to factory settings

You can reset the device to the factory settings, separately for the settings of the operating unit, the basic unit or the parameter access level.



### Loss of settings and access rights

After resetting to factory settings only the manufacturer factory settings are in the memory of the device. The software of the device is not reset when restoring the factory settings.

- 1  > Parameter > Reset
- 2 Make your choice:
  - ⇒ If you want to reset operating unit settings such as display settings, press the "Reset" button next to the "Operating unit settings". See also "Factory settings [▶ 19]".

- ⇒ For example, if you want to reset measurement settings such as setpoints, press the "Reset" button next to the "Basic unit settings". See also "Factory settings [▶ 19]".
- ⇒ If you want to restore the factory settings for access, press the "Reset" button next to "Parameter access level". See also "Factory settings [▶ 19]", Table 2.
- ⇒ To reset the device to the factory settings, press all "Reset" buttons one after the other.

#### See also

- 📄 Save parameters [▶ 38]

## 6.11 Updating the software

Software updates from INFICON are installed with the aid of a USB stick. To the update function of the device:

- ▶  > Update

An update is possible,

- if one or several updates are available on the USB stick, but only one update per type at most (basic unit, operating unit, sniffer line, I/O module),
- if in the case of the "sniffer line" or the "I/O module" these parts are also connected free of disturbances and have an update function.

The corresponding buttons in the update menu such as "Basic Unit", "Operating Unit", "Sniffer Line" and "I/O Module" are active and can be activated individually.

Inactive buttons can be recognized as they are in gray.

### NOTICE

#### Data loss due to an aborted connection

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

- ▶ Switch the device off and back on after a software update has taken place.

### 6.11.1 Updating the software of the basic unit

The software is included in the file named "Flash\_BES4000\_Main\_Vxx.xx.xxx.bin".

- 1 Copy the file into the main directory of a USB flash drive.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update > Basic Unit
  - ⇒ The display shows information on the current and the new software as well as on the current boot loader.
- 4 Check the version information.
- 5 Select the "Start" button to start the update.

- 6 Do not switch off the device and do not remove the USB flash drive while the software is being updated!
- 7 Follow the instructions on the touchscreen and wait until the update is complete.
- 8 If the system displays warning 104 or 106, close it with  .

### 6.11.2 Updating the software of the operating unit

The software is included in 2 files named "BES4000CU\_IFC\_Vx.xx.xx.exe and BES4000CU\_IFC\_Vx.xx.xx.key".

- 1 Copy the files into the main directory of a USB stick.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update > Operating Unit
  - ⇒ The display shows information on the current and the new software version.
- 4 Check the version information.
- 5 Select the "Start" button to start the update.
  - ⇒ Do not switch off the device and do not remove the USB flash drive while the software is being updated!
- 6 Follow the instructions on the touchscreen and wait until the update is complete.

### 6.11.3 Updating the software of the I/O module

The software on the I/O module can be updated from the BES4000 provided that the I/O module is connected and works perfectly.

The software is included in the file named "Flash\_IO1000\_Vxx.xx.xxx.bin".

- 1 Copy the file into the main directory of a USB flash drive.
- 2 Connect the USB flash drive to the USB port on the device.
- 3  > Update > I/O Module
  - ⇒ The display shows information on the current and the new software as well as on the current boot loader.
- 4 Check the version information.
- 5 Select the "Start" button to start the update.
  - ⇒ Do not switch off the device and do not remove the USB flash drive while the software is being updated!
- 6 Follow the instructions on the touchscreen and wait until the update is complete. The following tips are shown after selecting the "Start" button on the touchscreen:
  - ⇒ Connect and switch on the IO1000.
  - ⇒ Activate boot mode (switch DIP S2.3 on and off once).
  - ⇒ When the STATUS LED flashes green, press OK.

## 6.12 Switch OFF

You can switch off the device at the mains switch at any time. The parameters set in the device remain saved.

## 7 Warning and error messages

During operation, the display shows information that helps you operate the device. Measurement values are displayed along with current device modes, operating instructions as well as warnings and error messages.

The device is equipped with extensive self-diagnostic functions. If the electronics detect a faulty state, the device will show this as far as possible on the display and will interrupt operation when necessary.

### Warnings

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

Pressing the "X" button acknowledges the warning.

### Error messages

Errors are events that the device cannot correct itself and that force interruption of its operation. The error message consists of a number and a descriptive text.

If you have eliminated the cause of the error, then start operation again by pressing the button .

The following table displays all the warnings and error messages. It states possible causes for the malfunction and instructions on troubleshooting.

No.	Message	Possible error sources	Troubleshooting
<b>1xx system error</b>			
W102	Timeout of EEPROM basic unit	Basic unit EEPROM defective.	Contact INFICON customer service.
W104	An EEPROM parameter is initializing	<ul style="list-style-type: none"> <li>A new parameter was introduced by a software update.</li> <li>If the message occurs constantly during running up, the EEPROM on the basic unit is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the warning.</li> <li>Check whether the factory settings correspond with the new parameter of your application.</li> <li>Contact INFICON customer service.</li> </ul>
W106	EEPROM parameter initializing	<ul style="list-style-type: none"> <li>A software update introduced new parameters.</li> <li>The motherboard was replaced.</li> <li>If the message occurs constantly during running up, the EEPROM on the basic unit is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the warning.</li> <li>Check whether the settings correspond with your application.</li> <li>Please contact INFICON customer service</li> </ul>
E107	Internal IIC communication error	Internal defect	Please contact INFICON customer service
W110	Clock not set	Clock jumper not set, battery empty or clock defective.	Contact INFICON customer service.

No.	Message	Possible error sources	Troubleshooting
W111	Many EEPROM write cycles within the last 6 minutes	<ul style="list-style-type: none"> <li>• Within the last 6 minutes too many write commands were sent to the device from an external controller</li> <li>• Too many settings were changed within the last 6 minutes</li> </ul>	<ul style="list-style-type: none"> <li>• Check the programming of your external control</li> <li>• Change settings only if necessary</li> </ul>
W122	No response from bus module	Connection to BUS module interrupted	Check the connection to the BUS module.
W125	I/O module no longer connected	Connection to I/O module was interrupted.	Check the connection to the I/O module.
W126	Protocol not supported by I/O module software	The I/O module software does not support the selected BES4000 protocol.	Make a software update of the I/O module to a newer version.
W127	Wrong bootloader version	The boot loader software is not compatible with the application.	Contact INFICON customer service.
E130	Sniffer line not connected	The sniffer line cannot be addressed by the basic unit.	<ul style="list-style-type: none"> <li>• Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>• If the problem persists, contact the INFICON customer service.</li> </ul>
E131	Wrong parameter in the sniffer line	The parameters stored in the sniffer line are wrong.	Contact INFICON customer service.
E132	Unsupported old sniffer line	An old sniffer line is connected which is not supported.	Use a current sniffer line.
E133	EEPROM error in sniffer line	The EEPROM of the sniffer line is defective	Contact INFICON customer service.
E134	Protocol error while communicating with the sniffer line	The interface to the sniffer line is not working correctly.	<ul style="list-style-type: none"> <li>• Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>• If the problem persists, contact the INFICON customer service.</li> </ul>
E135	Check sum error while communicating with sniffer line	<ul style="list-style-type: none"> <li>• The interface to the sniffer line does not function reliably.</li> <li>• Possible electrical sources of disturbance close by.</li> </ul>	<ul style="list-style-type: none"> <li>• Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>• Eliminate sources of disturbance</li> <li>• If the problem persists, contact the INFICON customer service.</li> </ul>

No.	Message	Possible error sources	Troubleshooting
E136	No answer from sniffer line	The interface to the sniffer line is not working correctly.	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
E137	Sniffer line reset	<ul style="list-style-type: none"> <li>The sniffer line has reset itself.</li> <li>Possible electrical sources of disturbance close by.</li> <li>The sniffer line is not connected correctly.</li> </ul>	<ul style="list-style-type: none"> <li>Eliminate sources of disturbance</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
E138	Check sum error in sniffer line EEPROM	The EEPROM of the sniffer line has incorrect data or is defective.	Contact INFICON customer service.
E139	Empty EEPROM in the sniffer line	The EEPROM of the sniffer line has no data or is defective.	Contact INFICON customer service.
W140	Acceleration of the probe was permanently too high within the last 5 minutes	<ul style="list-style-type: none"> <li>The sniffer line is not lying still.</li> <li>Sniffer line defective.</li> </ul>	<ul style="list-style-type: none"> <li>Place the sniffer line on a steadier surface.</li> <li>Contact INFICON customer service.</li> </ul>
E141	Probe / sensor mismatch	The EEPROM of the sniffer line has incorrect data or is defective.	Contact INFICON customer service.
W151	No communication with operating unit	Internal connection problems between the basic unit and the operating unit.	Contact INFICON customer service.
W153	Software of the operating unit is outdated	Software of the operating unit is outdated	Install the latest operating unit software
W163	COOL-Check is not connected	COOL-Check not connected or not properly connected.	<ul style="list-style-type: none"> <li>Connect a COOL-Check, otherwise confirm the warning and calibrate externally.</li> <li>Check the COOL-Check connection.</li> </ul>
W164	Checksum error in COOL-Check	<ul style="list-style-type: none"> <li>The COOL-Check is not connected correctly.</li> <li>The COOL-Check or the basic unit is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check the COOL-Check connection.</li> <li>Check the connection of the COOL-Check to basic unit (separate and reconnect; try another COOL-Check, if possible).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>

No.	Message	Possible error sources	Troubleshooting
E165	Timeout of EEPROM COOL-Check	<ul style="list-style-type: none"> <li>The COOL-Check is not connected correctly.</li> <li>The COOL-Check or the basic unit is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Check the COOL-Check connection</li> <li>Check the connection of the COOL-Check to basic unit (separate and reconnect; try another COOL-Check, if possible).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W166	Audio amplifier is faulty	Error in the internal audio amplifier	Contact INFICON customer service.
<b>2xx voltage error</b>			
W220	Voltage +24V out of range	<ul style="list-style-type: none"> <li>Line error on the M12 socket or the module connected there.</li> <li>Internal defect.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connections.</li> <li>Contact INFICON customer service.</li> </ul>
W230	Voltage +3.3V out of range	Internal defect.	Contact INFICON customer service.
W240	Voltage +12V out of range	<ul style="list-style-type: none"> <li>Sniffer line defective.</li> <li>Internal defect.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W241	Voltage -12V out of range	<ul style="list-style-type: none"> <li>Sniffer line defective.</li> <li>Internal defect.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W250	Voltage +5V out of range	Internal defect	Contact INFICON customer service.
W253	Wrong sniffer line voltage	Sniffer line defective.	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
<b>3xx Measurement system error</b>			

No.	Message	Possible error sources	Troubleshooting
W322	Lamp voltage out of range	<ul style="list-style-type: none"> <li>Sniffer line connection or sniffer line is defective.</li> <li>Internal defect in the basic unit.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W324	Lamp current out of range	<ul style="list-style-type: none"> <li>Sniffer line connection or infra-red source in the sniffer line is defective.</li> <li>Internal defect in the basic unit.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W363	Sensitivity too low	<ul style="list-style-type: none"> <li>Optical cell is contaminated with water vapor.</li> <li>The optical cell is dirty</li> <li>The sensor in the sniffer line is defective.</li> </ul>	<ul style="list-style-type: none"> <li>Depending on the quantity of water inside the optical cell, let the device run for between one minute to two hours to clean the optical cell.</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W364	Sensitivity too high	Sniffer line defective.	Contact INFICON customer service.
<b>5xx Flow and pressure errors</b>			
W543	Flow in the sniffer line is too low	<ul style="list-style-type: none"> <li>Filter in the sniffer tip is clogged</li> <li>Sniffer tip is clogged or defective</li> </ul>	<ul style="list-style-type: none"> <li>Change the filters, see also "Replacing the filter holder (all sniffer lines) [▶ 63]".</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W544	Valve does not toggle	Internal defect of the sniffer line.	<ul style="list-style-type: none"> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>

No.	Message	Possible error sources	Troubleshooting
W545	Flow at measuring line too low	<ul style="list-style-type: none"> <li>The filter in the sniffer tip is clogged.</li> <li>Sniffer tip is clogged or defective.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the filters</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W546	Leak at measuring line	<ul style="list-style-type: none"> <li>The filter in the sniffer tip is clogged.</li> <li>Leak or defect in the sniffer tip or the sniffer line.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the filters.</li> <li>Check the plug and screw connections.</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W547	Flow at reference line too low	<ul style="list-style-type: none"> <li>Filter in the sniffer tip is clogged.</li> <li>The sniffer tip is clogged or defective.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the filters.</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W548	Leak at reference line	<ul style="list-style-type: none"> <li>The filter in the sniffer tip is clogged.</li> <li>Leak or defect in the sniffer tip or the sniffer line.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the filters</li> <li>Check the plug and screw connections.</li> <li>Check the connection of the sniffer line with the basic unit (disconnect and reconnect; if possible try a different sniffer line).</li> <li>If the problem persists, contact the INFICON customer service.</li> </ul>
W549	Measuring and reference line are swapped	<ul style="list-style-type: none"> <li>Poor calibration.</li> <li>Internal defect on the sniffer line.</li> </ul>	<ul style="list-style-type: none"> <li>Recalibrate the device.</li> <li>Contact INFICON customer service.</li> </ul>
<b>6xx Calibration errors</b>			
W630	Calibration request	Calibration out of date or no longer applicable.	<ul style="list-style-type: none"> <li>Recalibrate the device.</li> <li>Select a suitable interval in the menu for the calibration request.</li> </ul>
W631	Light barrier overdriven	The light barrier in the calibration opening gets too much light.	Avoid direct light and sunlight to the calibration opening.

No.	Message	Possible error sources	Troubleshooting
W632	Light barrier blocked during run-up	Dust has accumulated in the calibration opening and is interrupting the light barrier.	<ul style="list-style-type: none"> <li>• Switch the instrument off.</li> <li>• Blow out the calibration opening with clean compressed air.</li> <li>• Restart the device.</li> </ul> <p>If this does not work, then calibrate externally with the COOL-Check or an external calibration leak.</p>
<b>7xx Temperature errors</b>			
E709	Mainboard temperature too low	The temperature sensor is defective	Please contact INFICON customer service
W710	Temperature main board too high	<ul style="list-style-type: none"> <li>• The ambient temperature is too high.</li> <li>• The fan is defective or blocked.</li> </ul>	<ul style="list-style-type: none"> <li>• Decrease the temperature around the device.</li> <li>• Clean the ventilation openings or replace the filter plates.</li> <li>• Contact INFICON customer service.</li> </ul>
E711	Temperature main board far too high	<ul style="list-style-type: none"> <li>• The ambient temperature is too high.</li> <li>• The fan is defective or blocked.</li> </ul>	<ul style="list-style-type: none"> <li>• Switch off the device and allow it to cool down.</li> <li>• Decrease the temperature around the device.</li> <li>• Clean the ventilation openings or replace the filter plates.</li> <li>• Contact INFICON customer service.</li> </ul>
W730	Temperature COOL-Check out of range	<ul style="list-style-type: none"> <li>• The basic unit is standing on a hot surface.</li> <li>• The temperature around the main unit is too high or too low.</li> </ul>	<ul style="list-style-type: none"> <li>• Remove the device from the hot surface.</li> <li>• Decrease or increase the temperature around the device.</li> </ul>
<b>9xx Maintenance information</b>			
W902	COOL-Check is almost empty	<ul style="list-style-type: none"> <li>• The COOL-Check is empty.</li> <li>• The basic unit is set to a wrong date.</li> </ul>	<ul style="list-style-type: none"> <li>• Change the COOL-Check.</li> <li>• Set the basic unit to the current date.</li> </ul>
W903	COOL-Check is empty	<ul style="list-style-type: none"> <li>• The COOL-Check is empty.</li> <li>• The basic unit is set to a wrong date.</li> </ul>	<ul style="list-style-type: none"> <li>• Change the COOL-Check.</li> <li>• Set the basic unit to the current date.</li> </ul>
W904	Replace the filter holder at sniffer tip	The filter of sniffer tip should be changed.	<ul style="list-style-type: none"> <li>• Replace the filters.</li> <li>• Select a suitable interval in the "Filter change request" menu.</li> </ul>

**See also**

- 📖 Replacing the filter plates [▶ 59]
- 📖 Cleaning the calibration opening [▶ 60]

## 8 Cleaning and Maintenance

Carry out maintenance work on the device in accordance with the following description.

### DANGER

#### Risk of death from electric shock

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

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

### DANGER

#### Risk of injury due to electrolyte

- ▶ Avoid contact with skin, eyes, or clothing.
- ▶ Wear appropriate protective clothing, especially gloves, gowns, and face shields.
- ▶ Observe the information on the relevant safety data sheet and follow the applicable work instructions.
- ▶ Rinse off electrolyte or acid splashes immediately with clean water.
- ▶ Consult a physician if necessary.

A Phillips-tip screwdriver is needed for some maintenance work.

## 8.1 Basic unit

### 8.1.1 Replacing the filter plates

Spare filter plates	Order no. 200005506
Required tools	Screwdriver

Two filter plates on the base of the device filter dust out of the sucked-in air. If the filters are not replaced regularly then they become clogged. Functioning filters are required to cool the device.

For this reason, check the filter plates frequently for dirt.

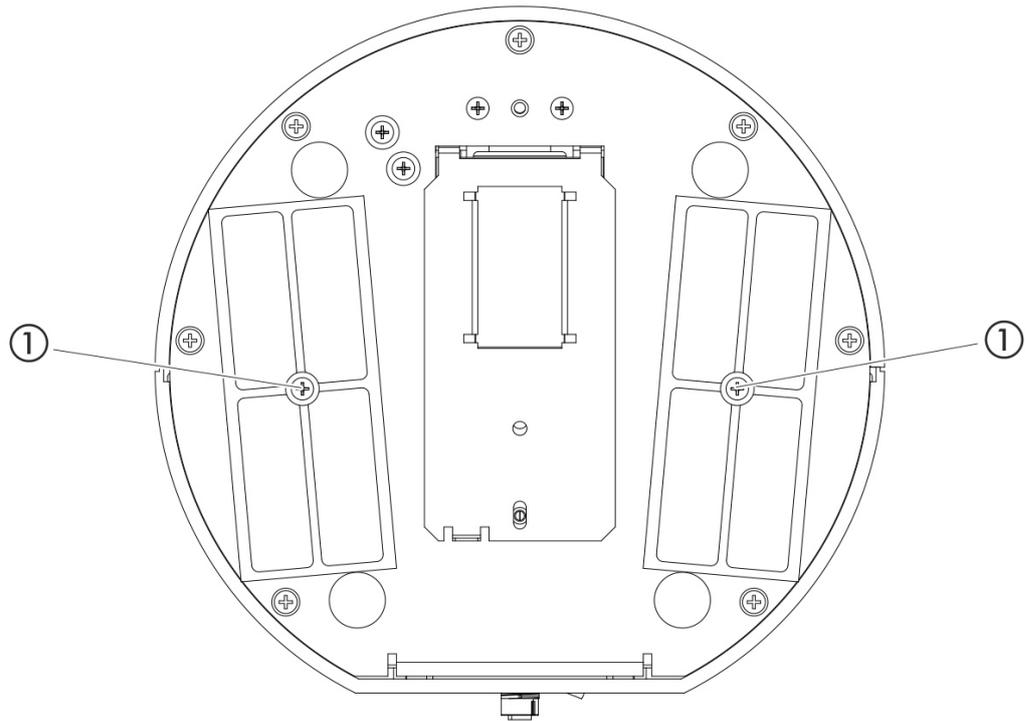


Fig. 9: View from below

**1** Screws for holding the cover for the filters

- 1 Make sure that the device is disconnected from the power supply.
- 2 Turn the device carefully to its side.
- 3 Loosen the two screws in the middle of the filter holder, see figure above (view from below).
- 4 Remove the filter plates.
- 5 Clean the filter plates depending on the degree of pollution (e.g. with clean, compressed air or a brush) or replace the filter plates.
- 6 Reinstall the filter plates.
- 7 Tighten the screws in the middle of the filter holder.

### 8.1.2 Cleaning the calibration opening

A light barrier can be found in the calibration opening on the front of the basic unit, see "Design of device [▶ 12]", (front view).

- ▶ To prevent interruption of the light barrier due to pollution, blow out the calibration frequently with clean, compressed air.

### 8.1.3 Replacing the fuses

The fuse holder of the device can be found beneath a cover alongside the mains plug at the back, .see "Basic unit", (rear view).

Replace the fuses as follows:

- 1 Make sure that the device is disconnected from the power supply.
- 2 Carefully pull the cover out of the device with the fuses attached beneath until the fuse holder can be tipped over to one side.
- 3 Remove the fuses and check them for any damage.

- 4 If necessary, replace the fuses. The two fuses used must be exactly the same, see "Technical data [▶ 18]".
- 5 Press the fuse holder along with the fuses back into the starting position until the cover locks into place.

### 8.1.4 Cleaning the device

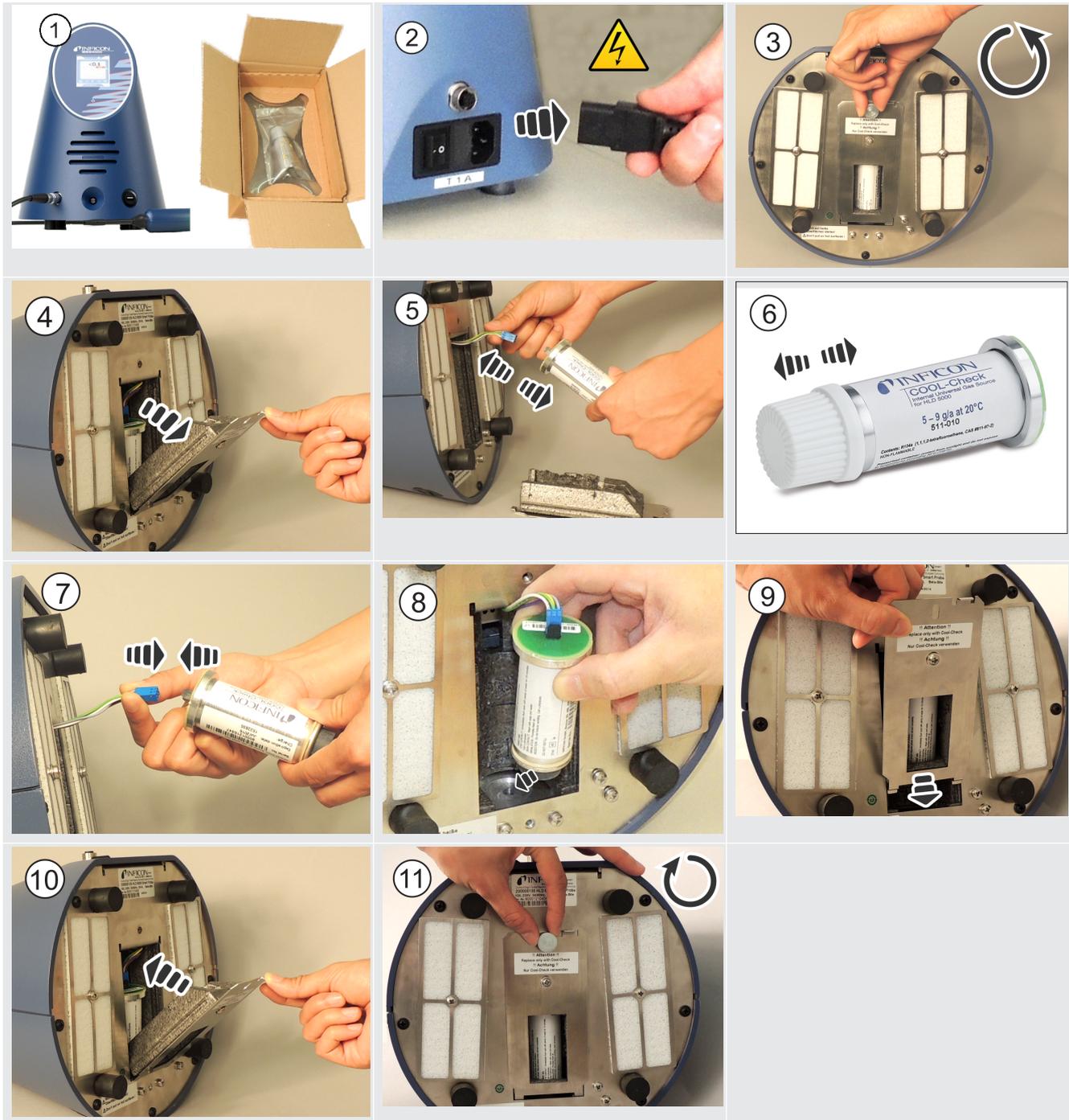
The housing of the device is composed of synthetic material.

- 1 Switch off the device and disconnect from the mains.
- 2 Only clean the appliance with a dry or slightly damp cloth.

## 8.1.5 Change calibration leak

COOL-Check	Order no. 511-010
Required tools	None

Note on the biennial maintenance cycle: This time of use is reduced after prolonged storage.





### Lifetime of COOL-Checks

A COOL-Check has a life of about 2 years. It is announced on the basic unit that the life of the COOL-Check is running short 3 months before this time has elapsed. For this reason never keep a supply of COOL-Checks. Store the COOL-Check in a cool, dry place.

Due to residues of the substance in the COOL-Check, an old COOL-Check can still be under high pressure. An expired COOL-Check must therefore be disposed of in compliance with all environmental protection regulations. You can send it to INFICON or to your supplier for disposal.

## 8.2 Sniffer line

### NOTICE

#### Material damage from compressed air

Compressed air can damage the inside of the sniffer line.

- ▶ Never try to clean the probe or the filter holder with compressed air.

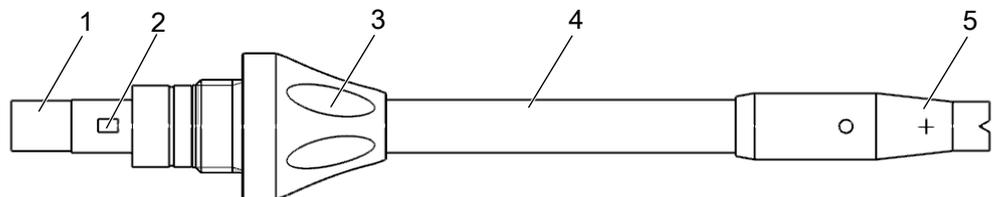


#### Incorrect measurement result due to filter block installed

If you order a new sniffer tip, you will need sealing blocks (order number 611-001). Replace the originally installed filter block with the sealing block.

The following filters are built into the sniffer line of the device:

- Filter holder with Sealing block filters in the sniffer tip,



1	Sealing block
2	Guide
3	Union nut
4	Sniffer tip
5	Filter holder

### 8.2.1 Replacing the filter holder (all sniffer lines)

Filter holder (20 units)	Order no. 511-027
Required tools	None

Replace the filter holder regularly after 40 operating hours. The fine filters in the sniffer tip are built into the filter holder, see "Sniffer line [▶ 17]", (the filters in the sniffer line).

- 1 Switch the instrument off.
- 2 Unscrew the filter holder from the sniffer tip.

- 3 Screw a new filter holder into position.



To receive an automatic request to change the filter after 40 operating hours, activate this function in the device settings (see "Setting the filter change request [▶ 32]"). When the filter holder has been changed and the request is confirmed then this function is reset. The request then reappears after 40 hours.

Regardless of the elapsed time, the device issues a warning or error message in case of pollution.

### 8.2.2 Replacing the sealing block (all sniffer lines)

Sealing block for the sniffer tip (5 units)	Order no. 611-001
Required tools	None

Replace the sealing block if it is contaminated with electrolyte.

The sealing block can be found at the base of the sniffer tip, see "Sniffer line [▶ 17]", (the filters in the sniffer line).

- 1 Switch the instrument off.
- 2 Loosen the cap nut at the lower end of the sniffer tip and separate the sniffer tip from the sniffer probe.
- 3 Pull the sealing block out of the base of the sniffer tip.
- 4 Insert a new sealing block into position.
- 5 Attach the sniffer tip back onto the sniffer probe and tighten the cap nut at the lower end of the sniffer tip.

## 8.3 Sending for repair or maintenance

You can send in your device to INFICON so it can be maintained or repaired. For further information regarding this topic see "Sending for repair or maintenance [▶ 64]".

## 8.4 Maintenance table

Maintenance cycle	Personnel	Additional information	
Two-yearly	Operating personnel	8.1.5	Change calibration leak
If soiled	Operating personnel	8.1.1	Replacing the filter plates
		8.2.2	Replacing the sealing block (all sniffer lines)
40 h	Operating personnel	8.2.1	Replacing the filter holder (all sniffer lines)

## 9 Decommissioning

### 9.1 Disposing of the device

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

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

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



Device cannot be disposed of as normal domestic waste.

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



#### WARNING

##### Danger due to harmful substances

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

- ▶ Fill in the declaration of contamination completely.

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

# Declaration of Contamination

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

**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"/>	 2) Products thus contaminated will not be accepted without written evidence of decontamination!
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 \_\_\_\_\_

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

# 10 Appendix

## 10.1 Accessories and spare parts

		Order no.
Basic unit		
	Filter plate 133x55x3mm, 10 units	200005506
Sniffer line		
	BES 4000 sniffer line	200015062
Sniffer tip		
	100 mm long, rigid, including 6 filter holders	511-021
	400 mm long, bent, including 6 filter holders	511-022
	400 mm long, flexible, including 6 filter holders	511-024
	Sealing block (5 pieces), required for sniffer tip	611-001
Extension hoses for the sniffer tip		
	400 mm, flexible (20 units), including 1 centering ring and 1 adapter	511-020
	400 mm, 45° angled (20 units), including 1 centering ring and 1 adapter	511-029
Filter for the sniffer tip		
	Filter holder for the sniffer tip (20 units)	511-027
	Extension of the sniffer line, 4.8 m	511-040
	COOL-Check calibration leak	511-010
Module		
	I/O module	560-310
	BM1000 Profibus module	560-315
	BM1000 PROFINET IO module	560-316
	BM1000 Device Net module	560-317
	BM1000 Ethernet/IP module	560-318
	Data cable LD 2 m	560-332
	Data cable LD 5 m	560-335
	Data cable LD 10 m	560-340

## 10.2 Menu path

### 10.2.1 Diagnosis

- 1  > Active Warnings
- 2  > Update
- 3  > Update > Operating Unit
- 4  > Update > Basic Unit
- 5  > Update > I/O Module
- 6  > Update > Sniffer Line
- 7  > Histories > Error And Warning History
- 8  > Histories > Calibration History

### 10.2.2 Settings

- 1  > Access Ctrl. > Operator
- 2  > Access Ctrl. > Supervisor
- 3  > Access Ctrl. > Supervisor > PIN Assign
- 4  > Setup > Language
- 5  > Setup > Request
- 6  > Setup > Auto Standby
- 7  > Setup > General > Date and Time
- 8  > Setup > Advanced setup > Error information
- 9  > Setup > Advanced setup > User gases
- 10  > Setup > Calibration leak external
- 11  > Set Up > Sniffer line
- 12  > Display Settings
- 13  > Display settings > Screenshot
- 14  > Gas
- 15  > Volume
- 16  > Parameter > Load
- 17  > Parameter > Parameter list
- 18  > Parameter > Parameter access level
- 19  > Parameter > Reset
- 20  > Parameter > Save
- 21  > Recorder > Recorder settings
- 22  > Recorder > Copy
- 23  > Recorder > Delete

- 24  > Setup > Interfaces > Bus module > Adress
- 25  > Setup > Interfaces > Device selection
- 26  > Setup > Interfaces > I/O module > Analog scale
- 27  > Setup > Interfaces > I/O module > Analog outputs
- 28  > Setup > Interfaces > I/O module > PLC outputs
- 29  > Setup > Interfaces > I/O module > PLC inputs
- 30  > Setup > Interfaces > I/O module > Units
- 31  > Setup > Interfaces > I/O module > Protocol
- 32  > Setpoints > Leakage Rate Setpoint 1
- 33  > Setpoints > Leakage Rate Setpoint 2
- 34  > Setpoints > Setpoint alarm

### 10.2.3 Information

- 1  > Bus module
- 2  > COOL-Check
- 3  > Operating unit
- 4  > Basic unit
- 5  > I/O module
- 6  > Parameter List
- 7  > Sniffer line

## 10.3 CE Declaration of Conformity



### EU Declaration of Conformity

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

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

The products meet the requirements of the following Directives:

- **Directive 2014/35/EU (Low Voltage)**
- **Directive 2014/30/EU (EMC)**
- **Directive 2011/65/EU (RoHS)**

Designation of the product:

**Electrolyte Sniffer Leak Detector**

Models:

**BES4000**

Applied harmonized standards:

- **EN ISO 12100 :2010**
- **EN IEC 61010-1:2020**
- **EN 61326-1:2013**  
**Class A according to EN 55011**
- **EN IEC 63000:2018**

Catalogue number: **610-001**

Cologne, January 7<sup>th</sup>, 2026

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

Cologne, January 7<sup>th</sup>, 2026

  
pro W. Schneider, Research and Development

**INFICON GmbH**  
Bonner Strasse 498  
D-50968 Cologne, Germany  
Tel.: +49 (0)221 56788-0  
www.inficon.com  
E-mail: leakdetection@inficon.com

## 10.4 RoHS

产品中有害物质的名称及含有的信息表

**Table of Hazardous Substance Names and Content Information in Products**

BES4000: 有害物质 BES4000: Hazardous Substances										
部件名称 Part Name	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr(VI))	多溴联苯 Poly- brominated biphenyls (PBBs)	多溴联苯 醚 Poly- brominated diphenyl ethers (PBDEs)	邻苯二甲 酸二正丁 酯 Dibutyl phthalate (DBP)	邻苯二甲 酸二异丁 酯 Diisobutyl phthalate (DIBP)	邻苯二甲 酸丁苄酯 Benzyl butyl phthalate (BBP)	邻苯二甲 酸二(2-乙 基)己酯 Bis(2- ethylhexyl) phthalate (DEHP)
组装的印刷电路板 Assembled printed circuit boards	X	O	O	O	O	O	O	O	O	O
校准泄漏 Calibration leak	X	O	O	O	O	O	O	O	O	O
<p>注 1: O: 表示该有害物质在该部件所有均质材料中的含量均不超出电器电子产品有害物质限制使用国家标准要求。 X: 表示该有害物质至少在该部件的某一均质材料中的含量超出电器电子产品有害物质限制使用国家标准要求。</p> <p>注 2: 以上未列出的部件, 表明其有害物质含量均不超出电器电子产品有害物质限制使用国家标准要求。</p> <p>Note 1: O: Indicates that said hazardous substances contained in all the homogeneous materials for this part is below the limit requirement of the national standard for the restriction of hazardous substances in electrical and electronic products.</p> <p>X: Indicates that said hazardous substances contained in at least one homogeneous material used for this part is above the limit requirement of the national standard for the restriction of hazardous substances in electrical and electronic products.</p> <p>Note 2: Parts not listed above indicate that their hazardous substances are below the limit requirement of the national standard.</p>										



Due to our continuing program of product improvements, specifications are subject to change without notice.  
The trademarks mentioned in this document are held by the companies that produce them.