Translation of the original operating instructions

T-Guard

Leak detector

jina85e1-g, 1409

Order no.:
540-001, 540-002

From software version:
2.11

INFICON

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1 About this manual

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

1.1 Target group

These operating instructions are intended for the owner and for technically qualified personnel with experience in leak detection technology and integration of leak detection devices in leak detection systems. In addition, the installation and use of the unit require knowledge of electronic interfaces.

1.2 Other applicable documents

- Interface description, document no. jins85e1-e

1.3 Presentation of information

1.3.1 Warnings

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2 Safety

2.1 Intended use

The T-Guard is a helium leak detector. With it, you can examine test objects for leaks and quantify the leaks.

A vacuum chamber is not required to use the T-Guard.

Since measurements are usually carried out in normal air, the smallest verifiable leak rate is 1×10^{-6} mbar l/s. This depends on the volume of the measurement chamber and the measurement time. For practical reasons, the leak rate is usually between 1×10^{-4} and 1×10^{-2} mbar l/s.

- ► You must install, operate and service the device only in compliance with these operating instructions.
- ► Adhere to the restrictions of use, see "4.4 Technical data," page 16.

Misuse

- ► Do not suck up liquids with the device.
- ► Never operate the device without the external filter.

2.2 Owner requirements

Safety-conscious operation

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

Personnel qualifications

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

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2.3 User requirements

- ► Read, observe and follow the information in these operating instructions and the working instructions created by the owner, especially the safety instructions and warnings.
- ► Carry out any work on the basis of the complete operating instructions only.
- ► If you have any questions regarding operation or maintenance that are not answered in these instructions, please contact the INFICON customer service.

2.4 Dangers

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

Dangers due to electric power

The unit is operated with electric voltages of 24 V. Internally, the device functions with a voltage of 3000 V. Touching parts where electric voltage is applied can result in fatal injuries.

- ► 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.
- ► Before starting the leak test, disconnect electrically operated test objects from the power supply. Make sure that the electric power supply cannot be reconnected without authorization.

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

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

Dangers due to liquids and chemical substances

Liquids and chemical substances can damage the device.

- ► Adhere to the restrictions of use, see “4.4 Technical data,” page 16.
- ► Do not suck up liquids with the device.
- ► Never try to find toxic, caustic, microbiological, explosive, radioactive or other harmful substances with the device.
- ► Operate the device only in dry conditions.
- ► Only use the device outside explosion-prone areas.
- ► No smoking. Do not subject the device to open fire and avoid the formation of sparks.

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3 Shipment, transport, storage

Shipment

Table 1: Shipment

Item	Quantity
T-Guard, part no. 540-001 or T-Guard with PROFIBUS, part no. 540-002	1
Power supply cable	1
Cable bushing for the power supply cable	1
Line with filter, length 0.5 m	2
Operating instructions	1
Interface description	1

► Check the shipment for completeness after receipt of the product.

Accessory list: see "13.1 Accessories," page 67

Transport

NOTICE

Damage from transport

Transport in unsuitable packaging material can damage the device.

► Keep the original packaging.

► Only transport the device in the original packaging.

Storage

Always store the device in compliance with the technical data, see "4.4 Technical data," page 16.

4 Description

4.1 Function and setup of the T-Guard

The T-Guard can verify and quantify helium using a Wise Technology™ Sensor.

A fore pump, which is an available accessory, provides constant pressure and flow at the Wise Technology™ Sensor.

During a measurement, outside air is sucked in through the reference inlet. This allows the natural helium content of the air at the measurement location to be measured. This measurement value influences the calculation of the test result.

Wise Technology™ Sensor

The Wise Technology™ Sensor consists of a glass housing, which is locked with a quartz membrane. The quartz membrane is permeable only for helium.

The pressure in the interior of the glass housing is measured by a highly sensitive measurement system. The pressure is proportional to the concentration of helium in the air sucked from the measurement chamber.

4.2 Main unit

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

Fig. 1: Front view

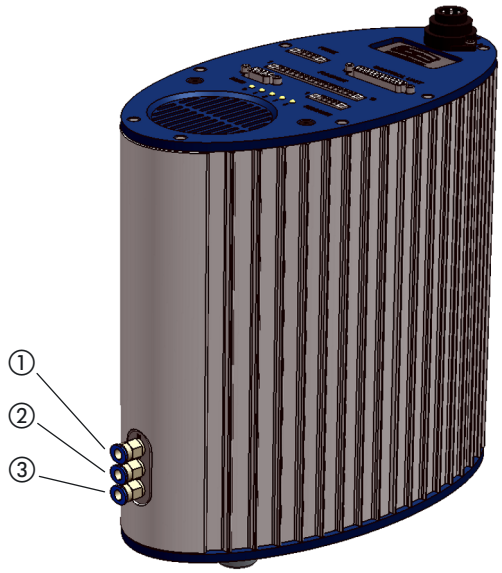

Fig. 2: Rear view

① *"IN" connection, measurement inlet*
② *"REF" connection, reference inlet*
③ *"OUT" connection, pump connection*

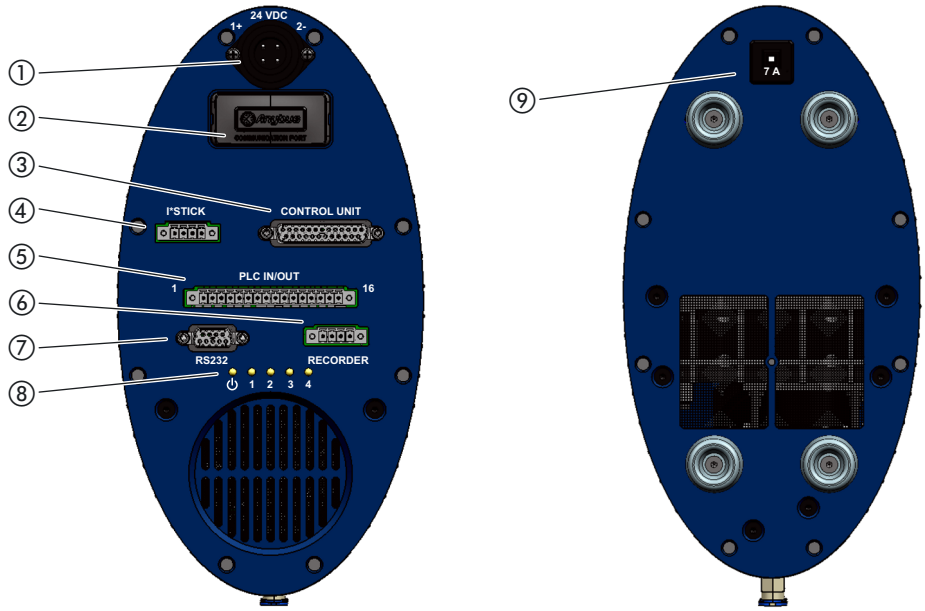

Fig. 3: View from above, view from below

① *Power supply unit connection*
② *PROFIBUS connection*
③ *Control unit connection (CONTROL UNIT)*
④ *I•Stick connection*
⑤ *PLC interface (PLC IN/OUT)*
⑥ *Analogue recorder output (RECORDER)*
⑦ *RS-232 connection*
⑧ *Status LEDs*
⑨ *Fuse*

① *Power supply unit connection*
The positive pole is marked with "1+" and the negative pole with "2+". The other 2 pins have no function. For more information, see see "4.4 Technical data," page 16 and "5.4 Connecting to the power supply system," page 24.

② *PROFIBUS connection*
The T-Guard version 540-002 can be controlled using a PROFIBUS.

③ *Control unit connection (CONTROL UNIT)*
The control unit, which is an available accessory, is connected here, see "4.3.1 Control unit," page 14.

④ *I•Stick connection*
The I•Stick, which is an available accessory, is connected here, see "4.3.6 I•Stick," page 16.

⑤ *PLC interface (PLC IN/OUT)*
The interface enables communication with a PLC. Some functions of the T-Guard can be controlled from the outside and measurement results and device states of the T-Guard can be transmitted to the outside.

The T-Guard has 6 configurable digital PLC inputs and 8 configurable digital PLC outputs, see "5.5 Connecting the PLC inputs to the electrical system," page 25 and "5.6 Connecting the PLC outputs to the electrical system," page 27.

⑥ *Analogue recorder output (RECORDER)*
The T-Guard has 2 separate configurable analogue recorder outputs, see "7.3 Configuring analogue outputs," page 53.

⑦ *RS-232 connection*
A RS-232-capable device can be connected here to control the T-Guard, see "7.2 Controlling using RS-232," page 52.

⑧ *Status LEDs*
The 5 status LEDs provide information on the T-Guard's various operating modes.

LED ⏻:	Lights up when the device is switched on.
LEDs 1–4:	Displays the status of the configurable digital outputs 1-4.
LED 2:	LED 2 is red and lights up – unless configured otherwise – in the event of an error or a warning.

⑨ *Fuse*
The fuse trips in the event of faulty polarization or when the current exceeds 7 A. After the error has been resolved, the fuse can be switched back on again by pressing the button.

Measurement and reference line

Along with the device, you receive 2 identical lines with a length of 0.5 m with a filter. One line is used to connect the measurement chamber to the device, the other sucks in reference air, see "5.2 Operating modes and measurement setup," page 20.

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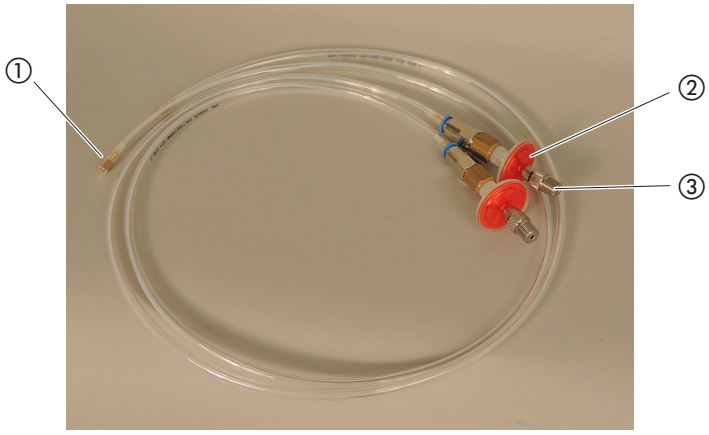

Fig. 4: Measurement and reference line with filter

① *T-Guard connection*
② *Filter*
③ *Threaded connector 1/8" M-NPT*

4.3 Accessories (not included in the shipment)

A complete list of the accessories with their order numbers can be found in the appendix, page 67.

4.3.1 Control unit

You can operate the device using an external control unit. There are two versions of the control unit – one for table-top operation and another for rack installation.

Fig. 5: Control unit for table-top operation

Fig. 6: Control unit for rack installation

4.3.2 Control unit connection cable

Use this cable to connect the control unit to the T-Guard™.

4.3.3 Connector mated set

The connector mated set contains Phoenix connectors, with which you can modify the following cables:

- PLC
- Analogue recorder

4.3.4 Fore pump

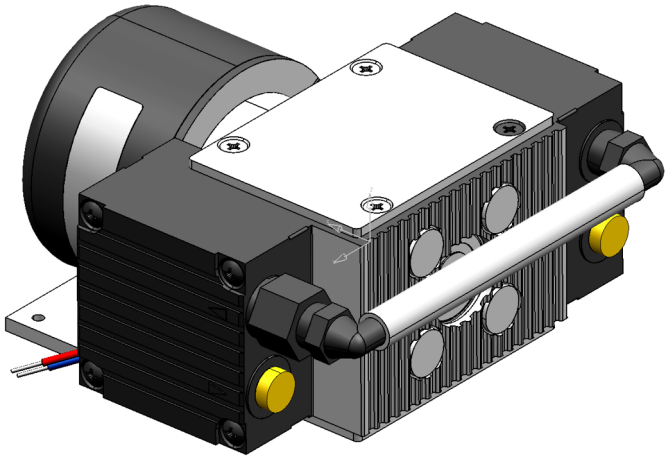

Fig. 7: Fore pump (example)

The fore pump sucks the air from the measurement chamber and guides it to the T-Guard. The fore pump is double-stage, brushless and operates at a supply voltage of 24 V DC.

4.3.5 Measurement and reference line, long

Lines with lengths of 0.5 m, 1.0 m and 2.0 m are available as accessories.

4.3.6 I•Stick

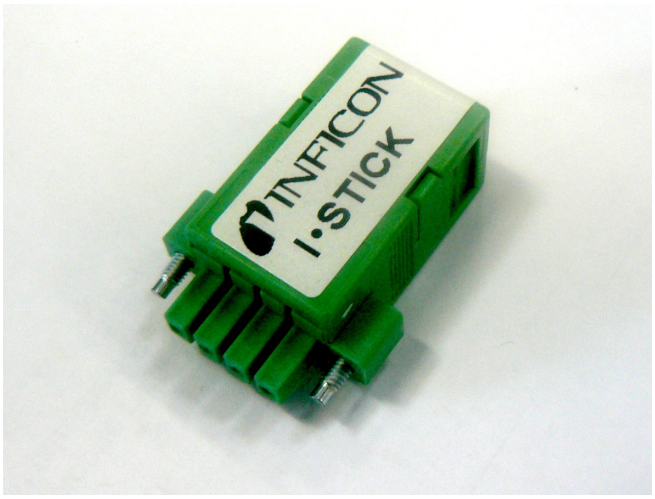

Fig. 8: I•Stick

On the I•Stick, you can save parameters and quickly switch between the different T-Guard devices, see "8 Saving parameters," page 55

4.3.7 Filter set

The filter set consists of 2 filters for the lines. The filters must be replaced regularly, see "11.1 Replacing the inlet filter," page 63.

4.4 Technical data

Table 2: Technical data

Mechanical data	
Dimensions (W × H × D)	130 mm × 272 mm × 258 mm
Weight	4.5 kg
Line connections	6 mm quick connectors
Screw thread IN / REF line	1/8″ M-NPT
Noise level	< 56 dB (A)
Ambient conditions	
Permissible ambient temperature (during operation)	10 °C to 50 °C (not condensing)
Permissible storage temperature	0 °C to 60 °C
Max. relative humidity up to 31 °C	80 %
Max. relative humidity from 31 °C to 40 °C	decreasing linearly from 80 % to 50 %
Max. relative humidity above 40 °C	50 %
Pollution degree	II (According to IEC 61010/ Part 1: "Usually, only non-conducting contamination may occur. However, temporary conductivity caused by condensation is permissible at times.")
Max. altitude above sea level	2000 m

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Table 2: Technical data (Cont.)

Electrical data	
Supply voltage	24 V DC ± 10 % / ≤ 6 A
Power consumption, typical	70 Watt
Protection class	IP 40
Overvoltage category (as per IEC 60664-1)	II
Fuse	7 A, inert
Physical Data	
Max. inlet pressure	2000 mbar
Minimum detectable leak rate, helium	1×10^{-6} mbar l/s
Maximum leak rate that can be displayed	15 mbar l/s
Measurement range	5 decades
Time constant of the leak rate signal (63 % of the final value)	< 1 s
Gas flow FINE	180 sccm
Gas flow GROSS	90 sccm
Helium sensor	Wise Technology
Max. carrier gas flow	1000000 sccm
Time until ready for operation	– 3 . . . 30 min, depending on the length of the rest time – up to several hours in the event of long storage

Table 3: Factory settings

Setting	**Value**
Control unit	
Display contrast	30
Display limit	2
Language	English
Trigger level 1	2×10^{-5} mbar l/s
Trigger level 2	1×10^{-5} mbar l/s, deactivated
Test leak rate	1×10^{-5} mbar l/s
Calibration leak rate (calibration leak)	1×10^{-5} mbar l/s
He concentration	100 %
Standby time	10 min.
Carrier gas flow	1000 sccm
Length of the line	50 cm
Measurement time	Automatic
Waiting time purge	4 s
Purge time	4 s
Volumes, accumulation	1 l
Pressure unit	mbar
Interfaces	
Control location	All
Analogue output 1..2	LR exponent
Analogue output 3..4	LR Log., 2 V/decade

Table 3: Factory settings

Setting	**Value**
Contamination limit	Low
Pressure limits (monitoring)	
Lower limit	180 mbar
Upper limit	350 mbar
Cal factor	1
Menu PIN	0000

5 Installation

5.1 Setup

WARNING

Danger due to moisture and electricity

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

► Only operate the T-Guard in a dry environment.

► Operate the T-Guard away from sources of liquid and moisture.

CAUTION

Danger due to falling heavy loads

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

► Only place the device on a sufficiently sturdy surface.

NOTICE

Material damage from an overheated device

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

► Please note the technical data, see page 16.

► Ensure sufficient ventilation. There must be 20 cm of free space on the upper side of the device above the ventilation opening.

► The ventilation opening on the underside of the device must remain unobstructed.

► Keep heat sources away from the device.

► Do not expose the device to direct sunlight.

Do not subject the device to any vibrations. Vibrations could lead to incorrect measurement results.

The device can be installed in any orientation. The rubber feet can be unscrewed and the holes can be used to secure the device.

At the time of delivery, the device is filled with helium-free nitrogen. This prevents the sensor from recording helium readings. The line connections are equipped with plugs. Only remove the plugs immediately before connecting the lines.

The delivered lines are 0.5 m in length. Lines with a maximum length of 2.0 m can be purchased as accessories. Longer lines may not be used. The device must therefore be installed suitably close to the measurement chamber.

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5.2 Operating modes and measurement setup

The T-Guard can carry out measurements in two different operating modes:

- Accumulation measurement
- Carrier gas measurement

For accumulation measurement, the leak rate of the test object is formed from the difference between two helium measurements. The pressurized and helium-filled test object is placed in the measurement chamber, or it is subjected to pressure in the measurement chamber. The first measurement then takes place. If the test object is leaking, the helium concentration in the measurement chamber will increase, and the subsequent second measurement registers a higher concentration.

For the carrier gas measurement, the test object is also either placed, filled and ready, in the chamber, or is subjected to pressure only after being placed in the chamber. In any case, the measurement chamber is not airtight. Instead, a clearly defined amount of outside air is blown into the measurement chamber. The airflow comes into contact with the test object and carries any emerging helium from the test object to the T-Guard. The device measures the helium content in the gas flow for a defined period of time and determines the leak rate from the measurement result.

The carrier gas measurement allows for larger leaks to be quickly identified. The carrier gas measurement is, however, sensitive to variations in the helium background. Since the helium background often varies in a production environment, accumulation measurement is generally more reliable.

The device measures the helium background and displays the level with a message:

<10 ppm	Background OK
10 … 18 ppm	Background moderate
>18 ppm	Background bad

5.2.1 Accumulation measurement setup

Select the most helium-free environment possible for the measurement setup. For reliable measurements with the T-Guard, the helium content in the air must be less than 10 ppm. By nature, air contains 5 ppm (0.0005%) helium.

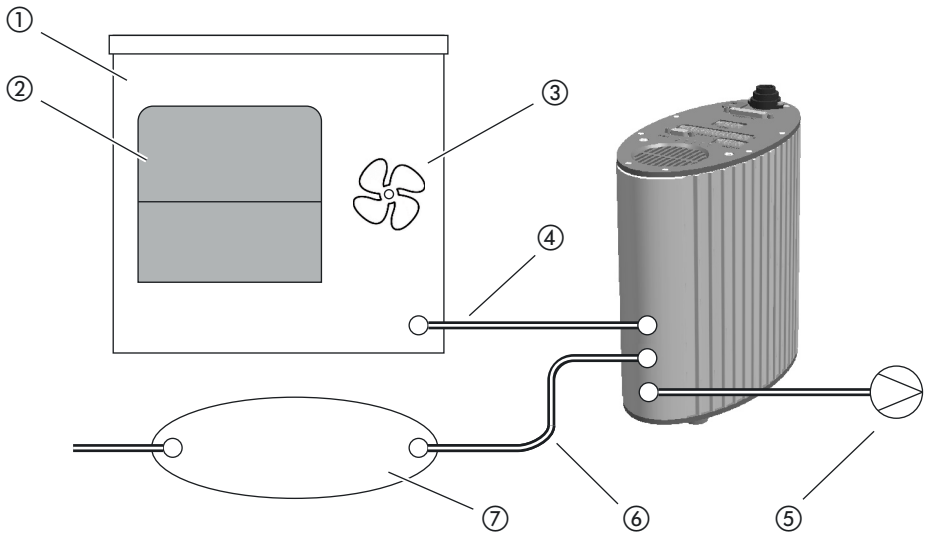


Fig. 9: Measurement setup for accumulation measurements

① *Measurement chamber*
② *Test object*
③ *Fan*
④ *Measuring line*
⑤ *Fore pump*
⑥ *Reference line*
⑦ *Buffer volumes*

① *Measurement chamber*
The measurement chamber must be leak-proof. The net volume, i.e. the measurement chamber volume minus the volume of the test object, must be between 0.01 and 10,000 liters. The measurement chamber should not be bigger than necessary, but the test object may not touch the walls.

② *Test object*
The test object should not be placed on the areas that may be leaking.

③ *Fan*
The measurement chamber must have a fan that blows air at the test object. The helium escaping from the leak is distributed equally in the measurement chamber by the fan. It is therefore irrelevant from the point of view of the measurement result whether the leak is close to the measuring line.

The flow of gas from the fan should be equal to at least the volume of the measurement chamber per second. For measurement times under 15 seconds, the flow of gas from the fan should be equal to at least twice the volume of the measurement chamber per second. The measurement time is displayed on the device: “Main menu > Settings > Measurement settings > Set times > measurement time”

④ *Measuring line*
The measuring line and reference line must be the same length.

⑤ *Fore pump*
All vacuum pumps can be used with a gas flow of more than 200 sccm at a basic pressure of under 50 mbar. INFICON offers a suitable pump as an accessory, see “4.3.4 Fore pump,” page 15.

The fore pump is connected to the “OUT” connection of the T-Guard with a 6 mm hose.

The fore pump exhaust air opening should be as far as possible from the test chamber and the buffer volumes.

NOTICE

Material damage due to oil loss

Pumps with an oil seal can leak oil and thereby damage the T-Guard.

► Set up pumps with oil seals underneath the T-Guard or place the lines so that no oil can flow to the T-Guard.

⑥ *Reference line*
To protect the sensor, helium may not enter the reference line. Therefore, only outside air or fresh air may be sucked into the reference line.

⑦ *Buffer volume*
For the best possible reproducible results, the helium background must be stable. Therefore, do not deliver the outside air directly to the reference inlet - use a buffer volume instead. The buffer volume must be at least 4 liters.

5.2.2 Carrier gas measurement setup

Select the most helium-free environment possible for the measurement setup. For reliable measurements with the T-Guard, the helium content in the air must be less than 10 ppm. By nature, air contains 5 ppm (0.0005%) helium.

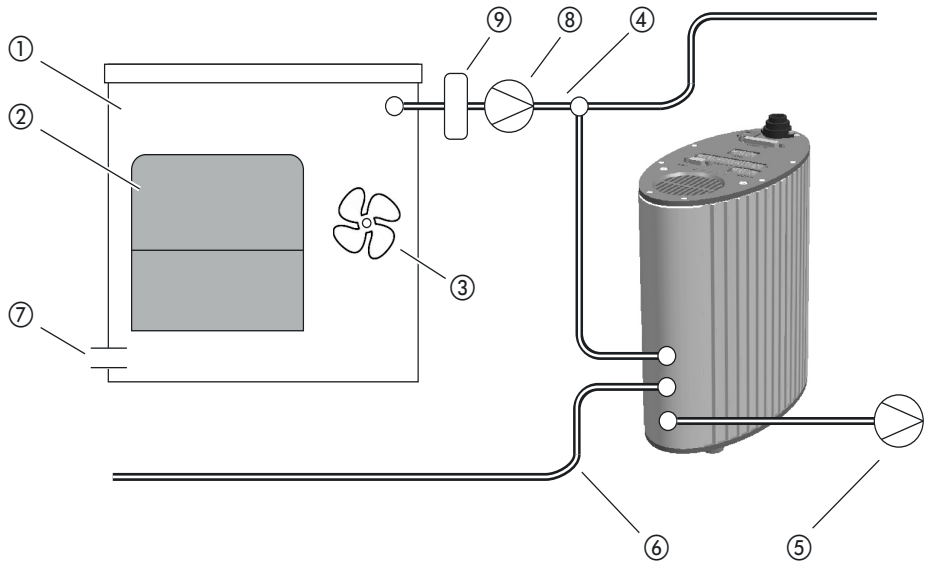


Fig. 10: Measurement setup for carrier gas measurements

① *Measurement chamber*
② *Test object*
③ *Fan*
④ *Measuring line*
⑤ *Fore pump*
⑥ *Reference line*
⑦ *Outside air inlet*
⑧ *Carrier gas pump*
⑨ *Mass flow controller (optional)*

① *Measurement chamber*
The net volume, i.e. the measurement chamber volume minus the volume of the test object, must be between 0.01 and 10,000 liters. The measurement chamber should not be bigger than necessary, but the test object may not touch the walls. Apart from the outside air inlet, the measurement chamber must be leak-proof.

② *Test object*
The test object should not be placed on the areas that may be leaking.

③ *Fan*
The measurement chamber must have at least one fan that blows air at the test object. If the test object has a leak, the helium that emerges is distributed equally around the test chamber. It is therefore irrelevant from the point of view of the measurement result whether the leak is close to the measuring line.

The flow of gas from the fan should be equal to at least the volume of the measurement chamber per second.

④ *Measuring line*
The measuring line and reference line must be the same length.

⑤ *Fore pump*
All vacuum pumps with a gas flow of more than 200 sccm at a basic pressure of under 50 mbar can be used as a fore pump. INFICON offers a suitable pump as an accessory, see "4.3.4 Fore pump," page 15.

The fore pump is connected to the “OUT” connection of the T-Guard with a 6 mm hose.

The fore pump exhaust air opening should be as far as possible from the buffer volumes.

NOTICE

Material damage due to oil loss

Pumps with an oil seal can leak oil and thereby damage the T-Guard.

► Set up pumps with oil seals underneath the T-Guard or place the lines so that no oil can flow to the T-Guard.

⑥ *Reference line*
For the best possible reproducible results, supply outside air to the reference inlets. The same air must be sucked in by the reference line as in the measurement chamber.

Use one of the two supplied lines and connect it to the “REF” inlet of the T-Guard.

⑦ *Outside air inlet*
The inlet for the outside air must be opposite the exhaust air connection. Do not make the outside air inlet too big. Helium may not escape from the measurement chamber at this point.

⑧ *Carrier gas pump*
The carrier gas pump ensures carrier gas flow through the measurement chamber. The following limits apply:

Table 4: Expected leak rate and carrier gas flow

Expected leak rate	Carrier gas flow
1×10^{-5} mbar l/s	<3000 sccm
1×10^{-4} mbar l/s	<30000 sccm
1×10^{-3} mbar l/s	<300000 sccm

⑨ *Mass flow controller*
The mass flow controller controls the actual current mass flow. This allows for the determination of a more accurate leak rate than an estimation of the mass flow.

5.3 Connecting an external control unit

NOTICE

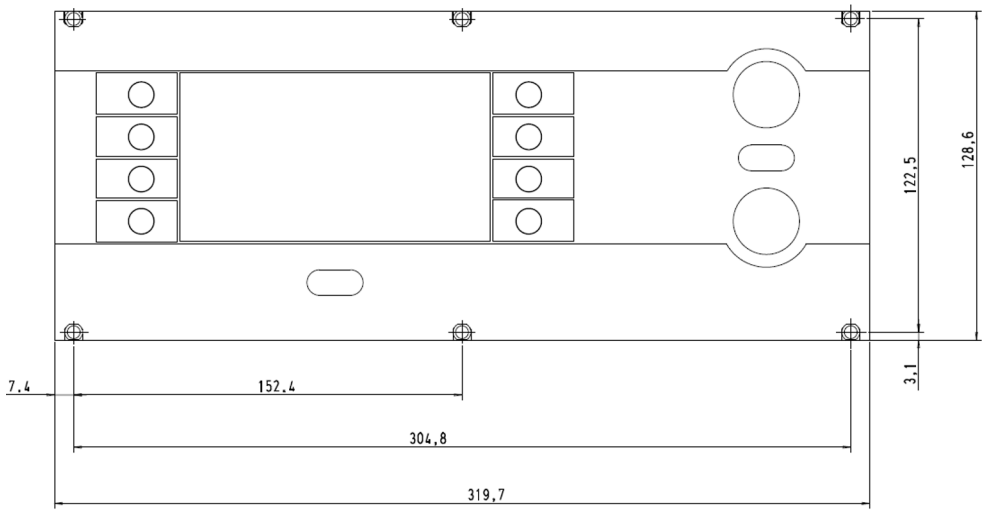
Material damage due to connection error.

If you insert or remove the plug during operation, the T-Guard could be damaged.

► Only insert or remove the cable when the T-Guard is disconnected from the power supply.

The diagram below displays the dimensions of the control unit for rack installation.

The front of the control unit for rack installation corresponds to protection class IP40.



1 Place the table device on a stable base or mount the control unit in a rack.

2 Connect the external control unit to the "CONTROL UNIT" connection on the T-Guard using the corresponding cable.

3 Secure the plug on the socket by tightening the screws.

5.4 Connecting to the power supply system

DANGER

Life-threatening hazard from electric shock

Touching parts where electric voltage is applied can result in fatal injuries.

► Disconnect all cables and devices from the power supply prior to any installation work. Make sure that the electric power supply cannot be reconnected without authorization.

Requirements for the power supply unit

NOTICE

Material damage if power supply unit has the wrong specifications or is connected improperly

A power supply unit that has the wrong specifications or is connected improperly can destroy the unit.

► Use a suitable power supply unit, see below.

► If the short circuit current of the power supply unit is greater than 10 A, connect a fuse between the power supply unit and the T-Guard.

► Use power supply cables with a sufficient cross-section, see below.

The following power supply unit types are suitable:

- Output voltage with electrically safe separation
- Output voltage: 24 V DC ± 10 %

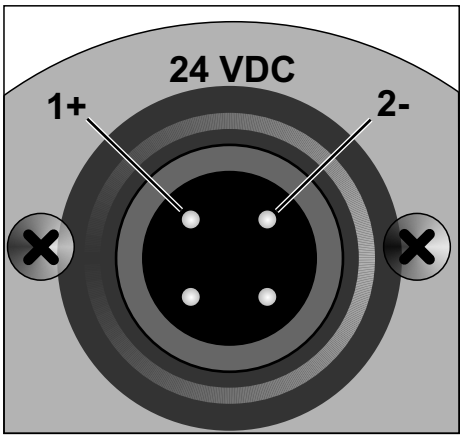
- Current rating: min. 6 A. In general, the T-Guard consumes 70 W.

Table 5: Diameter of the power cable

Cable length	Minimum diameter/cable type
8.5m	0.75 mm^2
10 m	1 mm^2 / AWG 18
15 m	AWG 16
17.5 m	1.5 mm^2
25 m	AWG 14

The diagram shows the pin assignment of the connector plug.

Connect the power cable to the device as described below.



1 Modify a cable to the required size with the supplied cable bushing.

2 Slide the bushing onto the connector plug and secure the connection with the cap nut.

3 Connect the cable to the power supply.

5.5 Connecting the PLC inputs to the electrical system

WARNING

Danger due to components subjected to electrical overload

Material damage or personal injury can result from current that is too high at the inputs and outputs.

► The voltage at the I/O port with regard to the protective conductor cable or the ground potential must be less than 60 V DC or 25 V AC.

Technical data for the PLC inputs

- Input voltage 24 V DC nom., 28 V DC max.
  - Low level: 0 … 7 V
  - High level: 13 … 28 V

Changing from low to high:
The programmed input function is activated (edge-controlled).

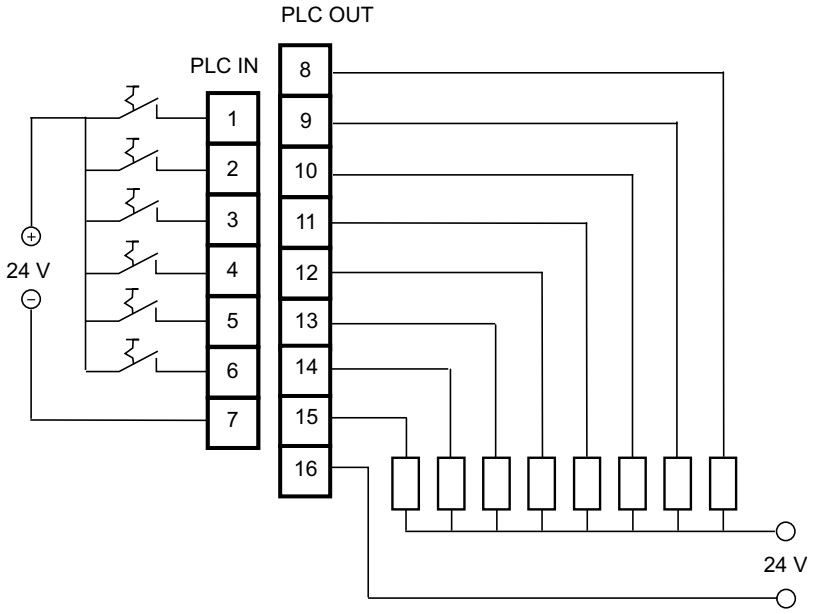


Fig. 11: Electrical connection for the PLC inputs and outputs

Table 6: Allocation of functions for the PLC inputs (factory setting)

Pin	Function
1	START
2	STOP
3	CAL
4	PROOF
5	CLEAR
6	STANDBY
7	COMMON (NEGATIVE)

Pin 7 is the common negative pole for all inputs and is connected to the negative pole of the voltage source. The allocation of functions for pins 1 to 6 can be changed, see "7.1.1 Allocation of functions for PLC input," page 47.

5.6 Connecting the PLC outputs to the electrical system

WARNING

Danger due to components subjected to electrical overload

Material damage or personal injury can result from current that is too high at the inputs and outputs.

► The voltage at the I/O port with regard to the protective conductor cable or the ground potential must be less than 60 V DC or 25 V AC.

Technical data for the PLC outputs

Table 7: Technical data for the PLC outputs

Nominal output voltage	±24 V DC
Maximum output voltage	28 V DC
Maximum sum of the currents for the output pins 8 … 11	0.75 A
Maximum sum of the currents for the output pins 12 … 15	0.75 A

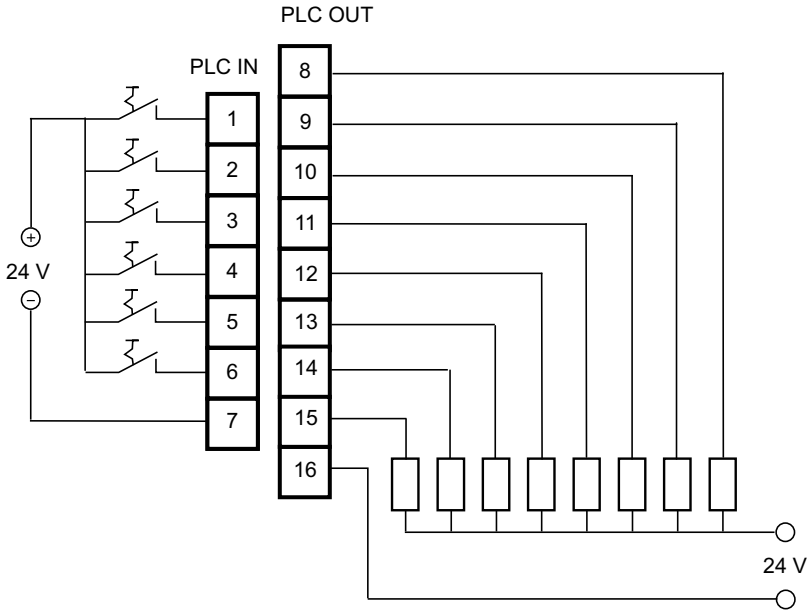


Fig. 12: Electrical connection for the PLC inputs and outputs

Table 8: Allocation of functions for the PLC outputs (factory setting)

Pin	Function	Pin	Function
8	TRIGGER 1	13	REC. STROBE
9	ERROR/WARNING	14	WARNING
10	READY	15	CAL ACTIVE
11	MEASURE	16	COMMON
12	STANDBY		

Pin 16 is the common pole for all outputs. The pin can be used either as a positive or negative pole.

The allocation of functions for pins 8 to 15 can be changed, see "7.1.2 Allocation of functions for PLC output," page 48.

5.7 Connecting the analogue outputs to the electrical system

Technical data for the analogue outputs

Table 9: Technical data for the analogue outputs

Analogue output 1	Pin1	0 … 10 V
	Pin 2	Mass
Analogue output 2	Pin 3	Mass
	Pin 4	0 … 10 V
Load resistance	≥10 kOhm per output	

Fig. 13: Pin numbering for the analogue outputs

The allocation of functions can be changed, see "Allocation of functions," page 53.

5.8 Connecting to a PC

A PC can be connected using an RS-232 interface with a commercially available 9-pole sub-D connector. Please refer to the interface description (doc. no. jins85e1-e) for further information on data exchange.

5.9 Connecting measurement, reference and vacuum lines

Use the filters supplied. They protect the lines from blockages and the sensor from dust.

Measurement and reference lines cannot be shortened. If the length of the line or its inner diameter is changed, the measurement speed and the measurement results are affected. Only use the supplied lines, or those available as accessories.

► Slide the lines into the connections until they engage.

To release the lines again, press the release ring and pull the line.

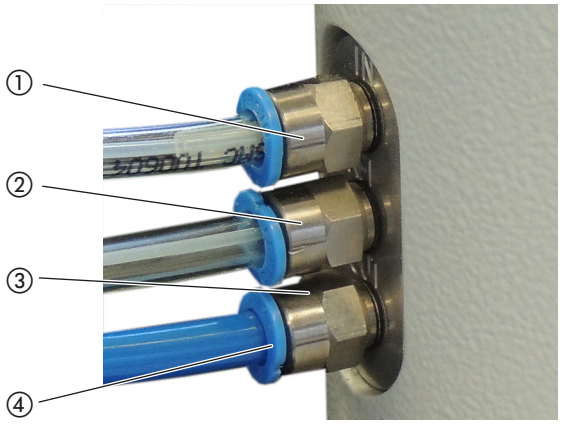


Fig. 14: Vacuum line connection

① *"IN" connection for the measuring line*
② *"REF" (reference) connection for the reference line*
③ *"OUT" connection for the vacuum line (pump connection)*
④ *Release ring*

6 Operation

6.1 Switching on

The T-Guard does not have an on/off switch. It starts up when the power supply is established.

6.2 Warm-up phase

The longer the storage time of the T-Guard, the longer it will take for the T-Guard to reach full capacity after start-up. For storage periods of weeks to months, this warm-up phase can take a few hours, and no less than 30 minutes.

If the warm-up phase has not yet completed after 30 minutes, the device is released with a warning message. INFICON recommends continued operation of the T-Guard with a running fore pump even if not in use.

The measurement view appears when the device is ready for operation.

6.3 Display and keys on the control unit

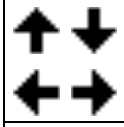
All settings are made with the keys to the left and the right of the display. The function allocations of the keys change depending on the current operating step. The function allocation is shown directly next to the key, which allows for fast and error-free operation after a short learning period.

Using the "Start" and "Stop" keys, you can start and stop the measurements. Using the "Menu" key, you can move a level higher in the user interface. If you press the "Menu" key for 2 seconds, the main menu is called up.

The LEDs embedded in the control unit keys and the "ZERO" key do not have a function.

6.3.1 Recurring function symbols

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

	– Calls up the main menu. – Calls up a window again that was previously closed with  .
	Calls up information: Software version, operating hours, serial number, date and time, warning and malfunction messages.
	Back to last menu level.
	Navigates in a selection list.
	Pressing this key assigns the allocation "0" to the key and "1" to an adjacent key. The same setting option exists for the numbers "2/3", "4/5", "6/7", and "8/9".
	Closes the window and calls up the measurement view. Back to the window with 
OK	Confirms an entry or selection.

6.3.2 Elements of the measurement view

The measured leak rates are shown numerically.

The diagram below shows the other elements of the measurement view.

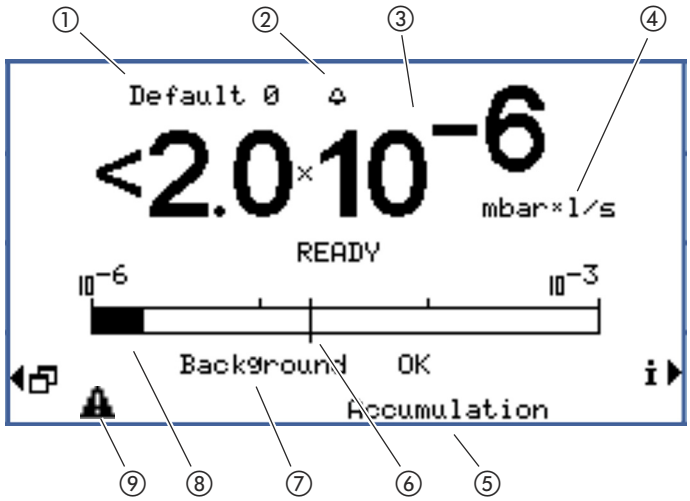


Fig. 15: Elements of the measurement view

① *Selected set of parameters*
② *Flashing bell: Trigger value 1 exceeded*
③ *Leak rate*
④ *Leak rate unit*
⑤ *Operating mode*
⑥ *Trigger value*
⑦ *Information on helium background*
⑧ *Bar graph, logarithmic*
⑨ *Warning triangle*

① *Selected set of parameters*
The selected set of parameters is displayed in the upper row of the measurement view. If the set of parameters is subsequently changed, this is illustrated by means of a small star before the name of the parameter set.

⑦ *Information on helium background*
The device measures the size of the helium background. The measurement result is displayed with the “background OK”, “background moderate” and “background bad” messages.

⑨ *Warning triangle*
The warning triangle is displayed when there is a message. To call up the message, select i.

6.4 Basic settings

Before making the first measurement, set up the device using the following menu.

- Settings > Miscellaneous
- Display
- Settings > Interfaces
- User authorization

You can access the menus using the main menu.

First, set the language.

6.4.1 Setting the language and date

Language

You can select one of the following languages:

- English
- German
- French
- Italian
- Portuguese
- Spanish
- Japanese

► Select “Settings > Miscellaneous > Language”

To temporarily set the language to English, press keys 2 and 6 during the warm-up phase. Call up the language setting after the warm-up phase and set the desired language.

Fig. 16: Key numbering sequence

Date & time

► Select “Settings > Miscellaneous > Time & date”.

First page: Internal date in the DD.MM.YYYY format

Second page: Time in the HH:MM format.

6.4.2 Selecting a pressure unit

Continuous measurement only: To be able to interpret the measurement result, you need the pressure that is displayed with it.

You can choose between the following pressure units:

- atm
- Torr
- Psi
- Pa
- mbar

► Select “Settings > Measurement settings > Pressure unit”.

6.4.3 Setting the display

You can set the contrast, the background color and the display limits.

Contrast

You can adjust the display contrast to the light conditions.

► Select “Display > Contrast”.

If the display is not legible after switching on because it is too dark or too bright, you can change the setting as follows:

1 After switching on, press the 3 key to make the display darker, or 7 to make it brighter.

2 Call up the contrast setting after the warm-up phase and set the desired contrast.

Inverting the display

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

Display limit

With the function "Display limit", you can hide measurement results that are below the expected leak rate.

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

► Select "Display > Display limit".

6.4.4 Calibration

The device must be calibrated before the first measurement.

Calibration is only possible after the device has completed the warm-up phase. Before this point, the relevant menu item is not displayed.

In the following operation, you only need to calibrate again if the measurement setup or the measurement conditions are changed:

- Accumulation measurement
  - Change to the accumulation volume
  - Change to the measurement time for manual measurement time entry
  - Change to the trigger value
- Carrier gas measurement
  - Change to the carrier gas flow
  - Change to the measurement time for manual measurement time entry

NOTICE

Incorrect calibration because of unsuitable calibration leak

An unsuitable calibration leak leads to an incorrect calibration and therefore to incorrect measurement results.

► An accurate calibration is achieved with client-specific calibration leaks by INFICON.

► Ideally, produce a master test object with a built-in calibration leak.

► The calibration leak rate must be greater than half of trigger level 1. Possible leak rates are 5×10^{-6} to 15 mbar l/s.

The measurement time during the calibration is set automatically. You can change the measurement time if necessary; a shorter measurement time, however, leads to lower reproducibility ("Measurement settings > Set times > measurement time").

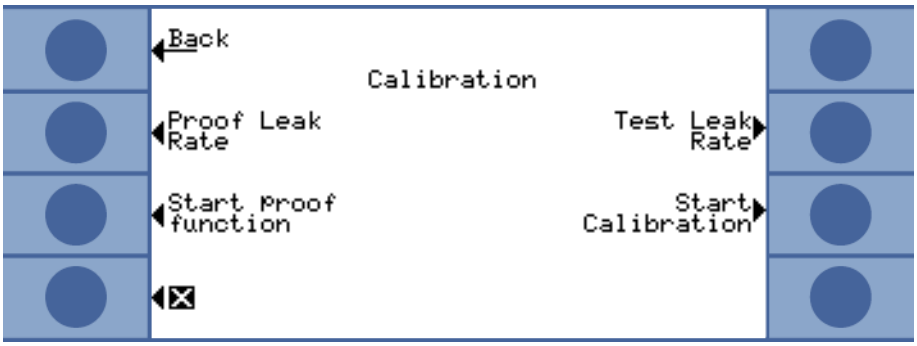


Fig. 17: Access to the calibration settings

6.4.4.1 Accumulation measurement

For the calibration of an accumulation measurement, you must enter the accumulation volume, i.e. the volume of the measurement chamber minus the volume of the calibration leak. If you do not know the accumulation volume, you can carry out a volume test - see below.

Volume test

The device must be ready to measure (READY).

1. Place the calibration leak in the measurement chamber and close the measurement chamber.
2. Select "Settings > Measurement settings > Accumulation volume/Volume test".
3. A window opens in which you can set the calibration leak rate.
4. Confirm with "OK".

The device measures and the calculated volume is displayed. You can accept the value by pressing "OK".

Calibration sequence

1. In the main menu, select "Settings > Measurement settings > Accumulation volume" and enter the net volume of the measurement chamber (volume of the measurement chamber minus the volume of the calibration leak).
2. In the main menu, select "Trigger > Trigger level 1" and enter the trigger level for the upcoming measurement run, see "Trigger level 1 and 2," page 41.
3. In the main menu, select "Calibration > Test leak rate" and enter the leak rate of the calibration leak.
4. Place the calibration leak in the measurement chamber and close the measurement chamber.
5. Select "Start calibration".

The device measures and the new calibration value is displayed. You can accept the new calibration factor by pressing "OK", or cancel it by selecting "Cancel".

Ideally, the calibration factor is 1. If the calibration factor is less than 0.5 or greater than 2, you can accept it but a warning message appears, stating that it is possible to improve your measurement setup.

6.4.4.2 Carrier gas measurement

The carrier gas flow can be determined using the carrier gas pump technical data, or by installing a mass flow controller. Alternatively, you can carry out a flow test - see below.

Flow test

The device must be ready to measure (READY).

1. Place the calibration leak in the measurement chamber and close the measurement chamber.
2. Wait 30 seconds.
3. In the main menu, select "Settings > Measurement settings > Carrier gas flow > Test flow".
4. A window opens in which you can set the calibration leak rate.
5. Confirm with "OK".

The device measures and the new calculated flow is displayed. You can accept the value by pressing "OK".

Calibration sequence

1. Select "Settings > Measurement settings > Carrier gas flow" and enter the carrier gas flow.
2. In the main menu, select "Trigger > Trigger level 1" and enter the trigger level for the upcoming measurement run, see "Trigger level 1 and 2," page 41.
3. In the main menu, select "Calibration > Test leak rate" and enter the leak rate of the calibration leak.
4. Place the calibration leak in the measurement chamber and close the measurement chamber.
5. Wait for a defined amount of time, which is calculated as follows:

$$\frac{3 \times \text{net chamber volume (in ccm)}}{\text{carrier gas flow (in ccm/s)}}$$

6. In the main menu, select "Calibration > Start calibration".

The device measures and the new calibration value is displayed. You can accept the new calibration factor by pressing "OK", or cancel it by selecting "Cancel".

Ideally, the calibration factor is 1. If the calibration factor is less than 0.5 or greater than 2, you can accept it but a warning message appears, stating that it is possible to improve your measurement setup.

6.4.4.3 Checking the calibration

When checking the calibration, only the calibration factor is checked and is not written again.

The leak rate of the test leak used for the test may differ from the leak rate of the calibration leak. Therefore, they must be entered separately. The leak rate must be greater than half of trigger level 1.

Possible leak rates are 5×10^{-6} to 15 mbar l/s.

► In the main menu, select "Calibration > leak rate ext. Test leak".

The test procedure is the same as for a calibration, see above. After the test, the device displays whether the calibration was OK or whether it needs to be calibrated again.

► To start the test, select "Calibration > Start test function" in the main menu.

6.4.5 Selecting the control location

Select from where the device should be controlled.

Table 10: Control locations

Control location	Function
Local (control unit)	The device can only be controlled using the control unit.
RS232	The device can only be controlled using the RS-232 interface.
PLC	The device can only be controlled using the PLC inputs.
Local and RS232	The device can be controlled using the control unit and the RS-232 interface.
Local and PLC	The device can be controlled using the control unit and the PLC inputs.
All	The device can be controlled using the control unit, the RS-232 interface and the PLC inputs.

Furthermore, the following applies:

- RS-232 may always read values.
- The PLC outputs are always active.
- Device settings can be changed using the control unit, regardless of the selections in the interface. If you want to prevent this, use the user authorization to do so, see "6.4.6 Setting up user authorization," page 37.

► Select "Main menu > Settings > Interfaces > Control location".

Please refer to Chapter "7 Controlling the T-Guard using interfaces," page 47 and the interface description (jins85e1-e) for detailed information on interfaces.

6.4.6 Setting up user authorization

Access to calibration

You can prevent access to calibration:

► Select "Main menu > Access control > Access to CAL function".

Protecting settings

You can protect access to the settings with a PIN.

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

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

Fig. 18: Defining the menu PIN

6.5 Operating modes

You can carry out measurements in 3 operating modes:

- Accumulation measurement
- Carrier gas measurement
- Continuous measurement (accumulation or carrier gas)

6.5.1 Accumulation measurement

If a leaking test object that has been filled with helium under pressure is placed in a closed measurement chamber, the helium concentration in this measurement chamber increases over time. This is called accumulation (of helium). The difference between the helium concentrations at 2 time points provides the leak rate.

The air in the measurement chamber must be circulated so that the concentration of the helium in the entire measurement chamber is set equally.

The following diagram shows the typical helium concentration over time in a closed measurement chamber with a leaking test object. Because of the helium content in the environment, the helium value is never zero. The helium concentration shows linear growth over time. The device measures the helium concentration in the measurement chamber 4 times (except for turbo measurement).

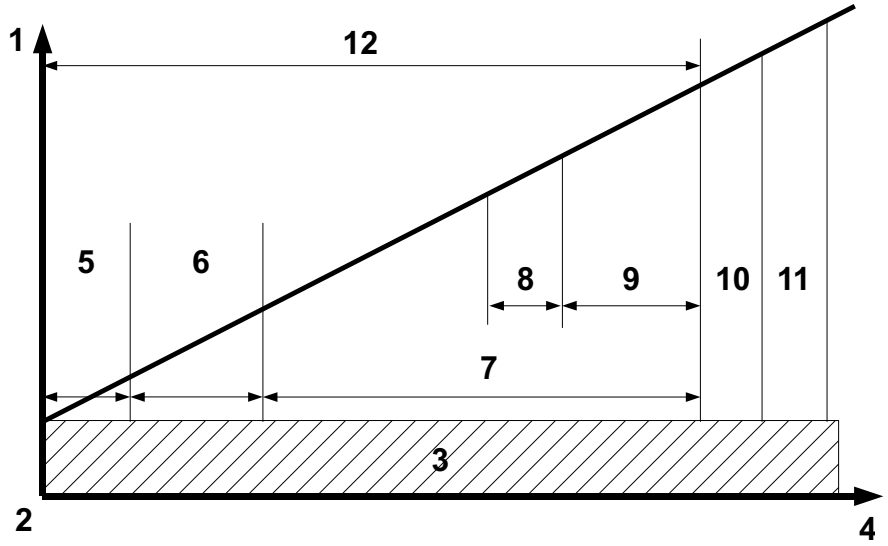


Fig. 19: Accumulation measurement procedure

① *Helium concentration*
② *Start*
③ *Helium in environment*
④ *Time*
⑤ *First GROSS measurement*
⑥ *First FINE measurement*
⑦ *Accumulation time*
⑧ *Second GROSS measurement*
⑨ *Second FINE measurement*
⑩ *Waiting time before purge*
⑪ *Purge time*
⑫ *Measurement time*

GROSS measurement and FINE measurement

During the measurement, the switch between GROSS and FINE measurement takes place automatically. For the GROSS measurement, the sensitivity is limited to protect the sensor from helium contamination. The sensor measures with the highest sensitivity for the FINE measurement.

Measurement cycle

The accumulation measurement begins with a GROSS measurement. If, at the beginning of the measurement, the helium concentration in the measurement chamber is already higher than the environment by approx. 1000 ppm, the test object has a large leak. In such a case, the device stops the measurement. The display shows a leak rate that is a hundred times higher than trigger value 1, or, if used, trigger value 2.

If the test object passes the GROSS measurement, the device switches to FINE measurement.

The device stops if the helium concentration increases too quickly during the FINE measurement. The display shows a leak rate that is 5 times higher than trigger value 1, or, if used, trigger value 2.

After the first FINE measurement, a short measurement break follows, in which the test object can be subjected to higher pressure. Then the second GROSS measurement takes place. The second GROSS measurement is necessary because a large leak could have occurred as a result of the additional pressure.

If the test object passes the second GROSS measurement, the device switches to FINE measurement again. From the difference between the 2 FINE measurement results, the device calculates the leak rate.

Turbo measurement

If a trigger value greater than 1×10^{-3} mbar l/s per liter of the net volume is set, the device automatically carries out a turbo measurement. The turbo measurement only takes 6 seconds, consisting of 3 seconds settling time and 3 seconds measurement time. The device is ready to measure again after 2 further seconds.

6.5.2 Carrier gas measurement

The following diagram shows the typical helium concentration over time in a measurement chamber with a leaking test object.

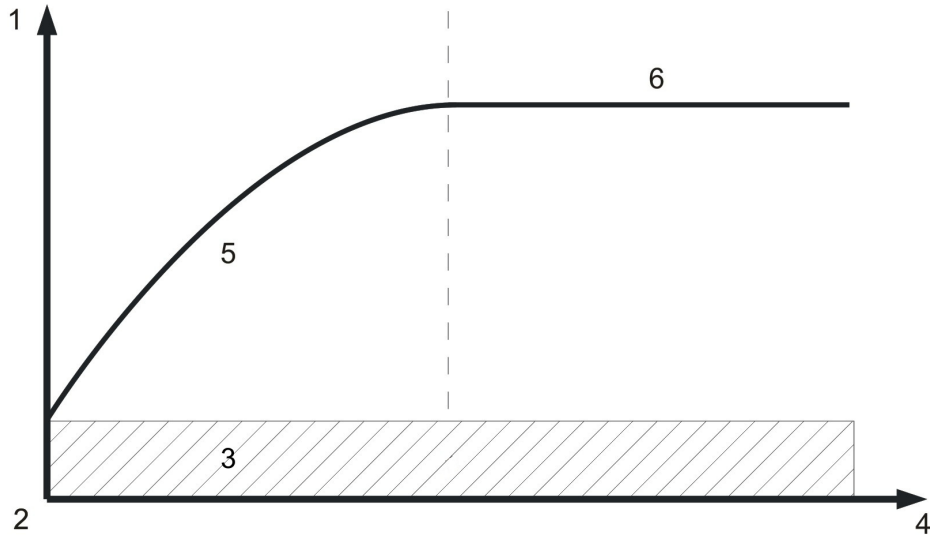


Fig. 20: Carrier gas measurement procedure

① *Helium concentration*
② *Start*
③ *Helium in environment*
④ *Time*
⑤ *Increasing signal*
⑥ *Stable signal, final value*

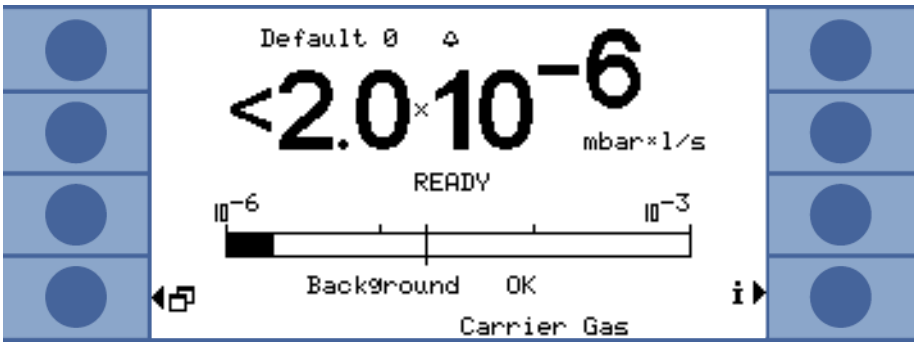


Fig. 21: Leak rate display of a carrier gas measurement with information on the helium background of the sensor and the surroundings

The time required to achieve a constant signal in carrier gas mode (final value) depends on the gas flow and the volume in the measurement chamber. The larger the measurement chamber and the smaller the gas flow through it, the longer it takes for the signal to reach its final value.

The time required to see 63 % of the signal is the volume of the measurement chamber divided by the gas flow.

For example: For a volume of 2 liters and a gas flow of 20 l/s, 63 % of the signal can be seen after 0.1 s. Three times this time reveals 95 % of the signal (0.3 s in this example). Five times this time reveals 99 % of the signal (0.5 s in this example). With a larger gas flow, the measurement is quicker but the sensitivity is lower. The smallest representable leak rate increases with increases to the gas flow.

Dynamic measurement

To save time, you can calibrate and measure with a shorter time than is necessary for the leak rate final value. In this case, however, the temporal progression of every measurement must be identical to the progression of the calibration. This method is called dynamic measurement.

GROSS measurement and FINE measurement

The measurement cycle begins with a GROSS measurement. The FINE measurement follows it automatically. For the GROSS measurement, the sensitivity is limited to protect the sensor from helium contamination. The sensor measures with the highest sensitivity for the FINE measurement.

6.5.3 Continuous measurement

For the continuous measurement, expert knowledge from the helium leak test department is required.

During the continuous measurement, the device provides continuous measurement results, but as sensor current in amperes rather than as a leak rate. It is therefore not possible to set a trigger value. The sensor current changes by approx. 1.5×10^{-7} amperes per mbar of helium at the sensor. It is your task to interpret the current signal.

Whether a GROSS or a FINE measurement takes place is also set manually: In the measurement window, select “Select gross” or “Select fine”.

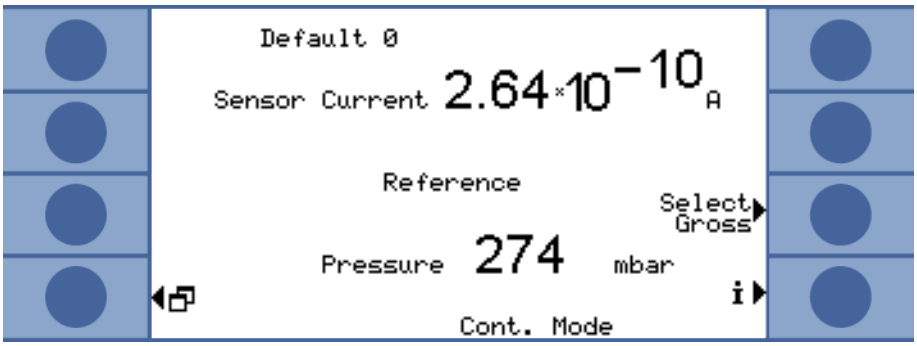


Fig. 22: Display of the reference values during a continuous measurement

The measurement begins when you select "Start". Selecting "Stop" switches from the measurement line to the reference line.

If you interrupt the measurement, you should always switch to the reference line using "Stop" or select standby, see "6.9 Standby," page 45. This preserves the sensor.

6.6 Settings for the measurement

When you have decided on an operating mode, set the parameters for the measurement.

Trigger level 1 and 2

Accumulation measurement: If a trigger value greater than 1×10^{-3} mbar l/s per liter of the net volume is set, the device automatically carries out a turbo measurement, see "Turbo measurement," page 39.

Carrier gas measurement: The set value determines the measurement time and decides whether a FINE measurement takes place after the GROSS measurement, see "GROSS measurement and FINE measurement," page 38. The limit is 6.7×10^{-7} mbar l/s per sccm of the carrier gas flow.

The limit is automatically increased by the device if you are working with diluted helium and have made the corresponding change to the device settings, see "He concentration," page 41.

A second trigger level can be helpful for the assessment of the measurement values. You can activate the trigger level under "Trigger lever 2" and set a value. If you set a very high value here, the display range is also expanded upwards.

► In the main menu, select "Trigger > Trigger level 1" or "… Trigger level 2".

Setting range:

Trigger level 1: 1.0×10^{-6} to 15 mbar l/s.
Trigger level 2: 2.5×10^{-5} to 15 mbar l/s.

He concentration

To measure with a helium concentration of 100%, you must evacuate the test object before adding the helium. In all other cases, work is carried out with diluted helium and the concentration must be set.

The device modifies the measurement time based on the concentration.

► In the main menu, select "Settings > Measurement settings > He concentration".

Under certain conditions, the measurement time changes and the displayed cycle time therefore does not change:

Accumulation measurement: If a turbo measurement is triggered as a result of the low He concentration or if the measurement time has already reached the maximum length.

Carrier gas measurement: If the measurement is carried out as a GROSS measurement or if the measurement time has already reached the maximum length.

Length of the line

The measurement line length is important for the measurement time, and you must set the line length. The setting causes the automatic addition of a lead time before the measurement.

► In the main menu, select “Settings > Measurement settings > Line length”.

Contamination limit

Where possible, set the contamination limit low to protect the sensor from helium contamination. The measurement stops when the contamination limit has been reached.

Table 11: Contamination limit data

Contamination limit	Measurement time	Measurement result
low	30 s	40 ppm
normal	30 s	75 ppm
high	30 s	200 ppm

► In the main menu, select “Settings > Monitoring > Contamination limit”.

Pressure limits

If the value of the lower pressure limit is exceeded, this indicates a blocked filter. If the value of the upper pressure limit is exceeded, this indicates a leaking measurement line or a malfunctioning fore pump.

The device issues a warning if a limit is exceeded.

Table 12: Setting range for the pressure limits

Limit	Pressure
Lower pressure limit	10 … 350 mbar
Upper pressure limit	250 … 800 mbar
Required gap between lower and upper limit	> 100 mbar

► In the main menu, select “Settings > Monitoring > Pressure limits”.

Waiting and purge time

You can set a time in which you can open the measurement chamber and remove the test object. The measurement chamber must be completely purged with fresh air. If the waiting time has expired or the measurement chamber has been purged, the device automatically sucks air in and uses it to purge the measurement line and the sensor.

► Select “Settings > Measurement settings > Set times > Wait time purge”.

Setting range: 1 … 300 sec.

The duration of the purge time can also be set:

► Select “Settings > Measurement settings > Set times > Purge time (+ on/off)”.

Setting range: 1 … 50 sec.

The larger the leak, the greater the purge time should be. During the purge time, the device checks the helium concentration and issues a warning message if there is still too much helium in the chamber. INFICON recommends a purge time of > 4 sec.

Automatic purging can also be switched off. Then you have to manually begin the purge after each measurement.

► Select “Settings > Measurement settings > Set times > Purge time (+ on/off)”.

To purge manually, you must activate the required key beforehand:

► Select “Settings > Key functions”.

The corresponding interface command can be found in the interface description (jins85e1-e).

Be aware that you cannot manually purge during a turbo measurement, because the brevity of the measurement is paramount.

Measurement time

You can overwrite the measurement time automatically selected by the device. A longer measurement time provides a more accurate result, a shorter measurement time provides a less accurate result.

The measurement time should not be shorter than half of the time automatically set by the device.

► In the main menu, select “Settings > Measurement settings > Set times > measurement time”.

A further menu command resets to the automatically set measurement time:

► In the main menu, select “Settings > Measurement settings > Set times > Set times automatically”.

Volume (accumulation measurement only)

Enter the net volume of the measurement chamber (volume of the measurement chamber minus the volume of the test object).

► In the main menu, select “Settings > Measurement settings > Accumulation volume”.

The setting range is 0.01 … 10,000 liters.

To determine the volume, you can carry out the device volume test, see “Volume test,” page 35.

Carrier gas flow (carrier gas measurement only)

Enter the carrier gas flow.

► In the main menu, select “Settings > Measurement settings > Carrier gas flow”.

The setting range is 60 sccm … 1,000,000 sccm.

To determine the carrier gas flow, you can carry out the device flow test, see “Flow test,” page 36.

Measuring in a nitrogen environment

For the highest measurement sensitivity, the measurement must be carried out in a helium-free environment. This is possible when measuring in a nitrogen-filled chamber.

So that the T-Guard does not interpret the complete absence of helium as a malfunction, you need to switch off the corresponding monitoring (minimum current test):

► In the main menu, select “Settings > Monitoring > Without He (N2)”.

Translation of the original operating instructions T-Guard, jina85e1-g, 1409

6.7 Starting the measurement

Waiting time before the start (only for carrier gas measurement)

After closing the measurement chamber, wait for a defined amount of time, which is calculated as follows:

$$\frac{3 \times \text{net chamber volume (in ccm)}}{\text{carrier gas flow (in ccm/s)}}$$

Start

The measurement is started with the interface or with the selection of "Start". During the measurement, bars display the measurement progress. When the measurement is finished, the display shows the leak rate or a malfunction message. The measurement can be interrupted at any time by selecting "Stop". The leak rate displayed at that point is a provisional value.

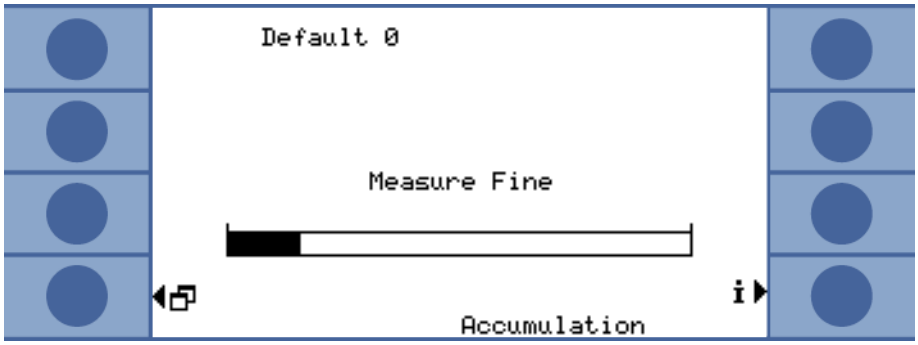


Fig. 23: FINE measurement, progress bars

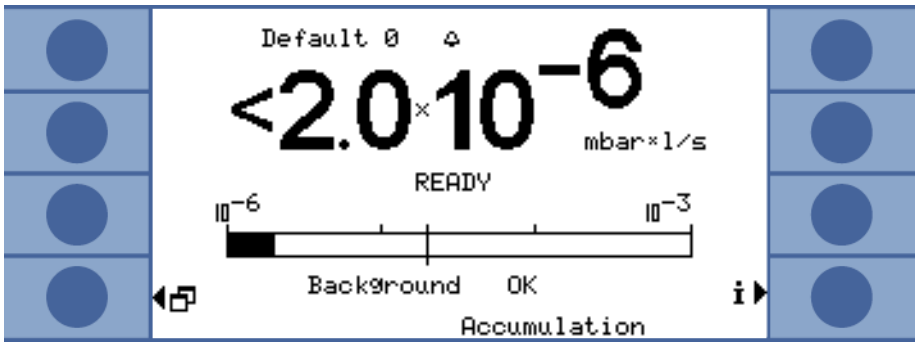


Fig. 24: Leak rate display of an accumulation measurement with information on the helium background of the sensor and the surroundings.

6.8 Helium contamination

The sensor is well protected from helium contamination. Every measurement cycle begins with a GROSS measurement. The sensitivity of the sensor is limited during the GROSS measurement. The subsequent FINE measurement is stopped immediately when the following measurement value is reached:

- > 5 × trigger value 1, if trigger value 2 is not active
- > 5 × trigger value 2, if trigger value 2 is active

In addition, you can set limits for the helium contamination. The device stops the measurement when they are reached, see "Contamination limit," page 42.

If the sensor is then contaminated again, direct helium-free nitrogen or outside air to the reference inlet. This cleans the sensor. The cleaning time depends on the helium content of the supplied air and the degree of contamination.

Continuous measurement

No trigger value can be set for the continuous measurement. You must therefore stop the measurement yourself as soon as you see that the sensor current is too high. The device switches automatically to the reference line as a last resort when the sensor current is greater than 1×10^{-8} A

6.9 Standby

In standby, air is sucked through the reference line and the sensor is purged. This preserves the sensor. Always select standby if no measurement is currently taking place during a continuous measurement session but you do not want to switch the device off.

► Select "Operating mode > Standby" in the main menu.

During an accumulation and a carrier gas measurement, the device automatically goes into standby when not in use. The time taken to enter standby can be set.

► In the main menu, select "Settings > Measurement settings > Standby delay".

6.10 Switching off

To switch the device off, disconnect it from the power supply.

NOTICE

Material damage due to helium contamination

Helium remaining in the sensor shortens the service life of the sensor and increases the warm-up phase.

► Do not switch off the device if the sensor is contaminated with helium. Wait until the device is ready to measure again (measurement view is displayed).

6.11 Calling up information on the T-Guard and on the measurement

All important information for operation can be displayed on the info menu.

► Select "Info" in the main menu.

Displaying/changing settings

You can find all the current measurement settings under "View/change settings". You can select a setting using the right arrow key and switch to the corresponding setting window by selecting "Change".

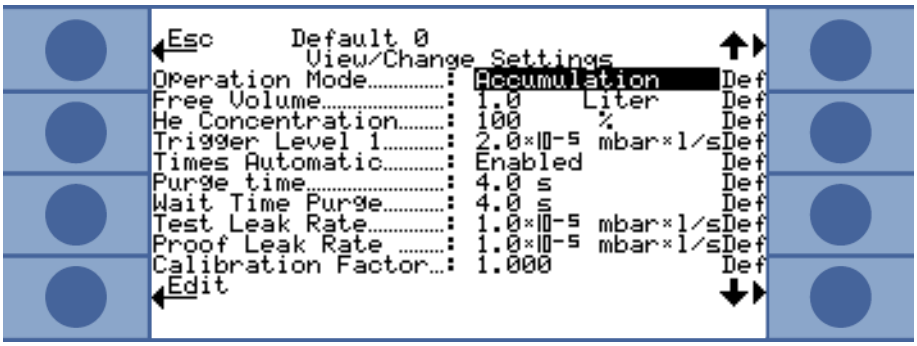


Fig. 25: Settings overview

Leave the window by selecting “Cancel”. Changed settings are saved.

Internal data You can display all of the device’s internal data by selecting “Internal data”. You can switch between the 8 windows using the lower right and left keys .

Vacuum schematic The image called up displays the device’s vacuum schematic and its valve arrangement. In addition, sensor pressure, sensor current and an estimated helium concentration in ppm are displayed.

Interfaces You can display all information on the interfaces by selecting “Interfaces”. You can select a setting using the right arrow key and switch to the corresponding setting window by selecting “Change”.

History & maintenance Under “History & Maintenance” you can display the last 12 measurement results, warning and malfunction messages, and calibrations.

Cal factor You can display all information on the calibration factor by selecting “Cal factor”.

Service The service menu is password-protected. Settings may only be made by the INFICON customer service.

7 Controlling the T-Guard using interfaces

7.1 Controlling using PLC

The basic functions of the device can be controlled by a PLC, and the measurement values can be read. Most PLC functions are activated when the input signal increases. A high signal when the device is starting up is not sufficient.

Electrical data of the inputs and outputs: see "5.5 Connecting the PLC inputs to the electrical system," page 25 and see "5.6 Connecting the PLC outputs to the electrical system," page 27.

7.1.1 Allocation of functions for PLC input

Using a graphic, you can change the allocation of functions for the input and then test it.

► In the main menu, *select "Settings > Interfaces > Select PLC input"*.

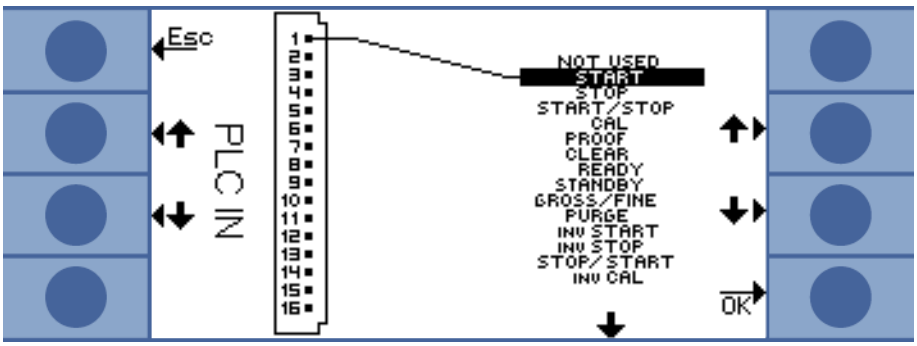


Fig. 26: User-defined allocation of functions, PLC inputs

Change an allocation as follows:

1. Select a pin with the up and down keys on the left side.
2. Select the desired function with the up and down keys on the right side.
3. Confirm with "OK". An overview with all selected functions is displayed.
4. Check the allocations and press "OK" again to confirm.

The current state of all inputs and outputs is displayed. The relays can be switched for testing:

1. Select "Test PLC output".
2. Using the arrow keys, navigate to the output you want to test.
3. Select "Switch relay".

Table 13: Input functions and their meaning

Function	Meaning
START	Starts a measurement cycle. If the device was in standby, the start is delayed by a few seconds.
STOP	Stops a measurement cycle. You will not receive a valid leak rate.
START/STOP	Start and stops a measurement cycle when a switch to/from HIGH to/from LOW is made.
CAL	Starts a calibration. A successful calibration changes the calibration factor.
PROOF	Starts the calibration check with the test leak rate.

Table 13: Input functions and their meaning (Cont.)

Function	Meaning
CLEAR	Deletes errors and warnings. The device restarts after an error.
READY	Wakes the device from standby mode.
STANDBY	Switches the device to standby.
GROSS/FINE	Switches between GROSS and FINE measurement. Only available for continuous measurement.
PURGE	Purges the measurement lines if the input signal is high. The signal from the helium sensor is ignored. Only available when "Automatic purge" is switched off.
INV START	Electrically inverted start command
INV STOP	Electrically inverted stop command
STOP/START	Stops and starts a measurement cycle when a switch to/from HIGH to/from LOW is made.
INV CAL	Electrically inverted CAL command
INV PROOF	Electrically inverted TEST command
INV CLEAR	Electrically inverted delete command
INV READY	Electrically inverted ready command
INV STANDBY	Electrically inverted standby command
FINE/GROSS	Switches between FINE and GROSS measurements. Only available for continuous measurement.
INV PURGE	Electrically inverted purge command

7.1.2 Allocation of functions for PLC output

Using a graphic, you can change the allocation of functions for the output and then test it.

► In the main menu, select "Settings > Interfaces > Define PLC outputs".

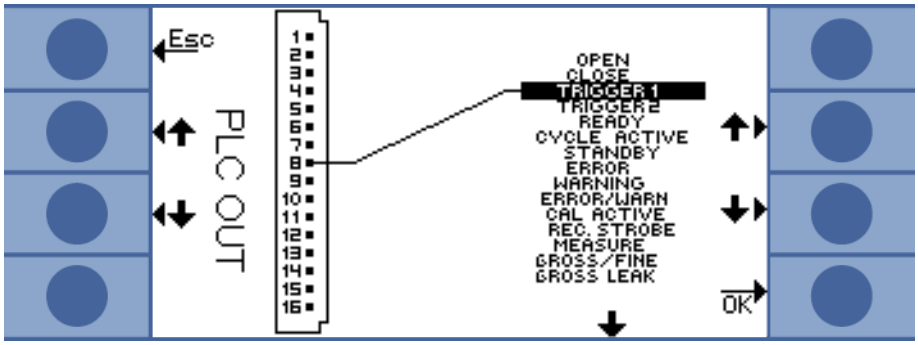


Fig. 27: User-defined allocation of functions, PLC outputs

Change an allocation as follows:

1 Select a pin with the up and down keys on the left side.

2 Select the desired function with the up and down keys on the right side.

3 Confirm with "OK". An overview with all selected functions is displayed.

4 Check the allocation and press "OK" again to confirm.

The current state of all inputs and outputs is displayed. The relays can be switched for testing:

1 Select "Test PLC output".

2 Using the arrow keys, navigate to the output you want to test.

3 Select "Switch relay".

PLC outputs 8 to 11 are connected to LEDs 1 to 4.

The measured leak rate is measured at the analogue output, see "7.3 Configuring analogue outputs," page 53.

Table 14: PLC output functions and their meanings

Function	Meaning
OPEN	Low resistance, for test purposes
CLOSE	High resistance, for test purposes
TRIGGER 1	Low resistance means that trigger value 1 has been exceeded.
TRIGGER 2	Low resistance means that trigger value 2 has been exceeded.
READY	Low resistance means that the device is ready for the next measurement. For a continuous measurement, the T-Guard measures the reference line.
CYCLE ACTIVE	Low resistance means that the device is currently carrying out a measurement cycle.For a carrier gas measurement, automatic purging and the reference measurement are included. For a continuous measurement, there is no measurement cycle; the output is therefore always high resistance.
STANDBY	Low resistance means that the device is in standby.
ERROR	Low resistance means that an error has occurred.
WARNING	Low resistance means that there is a warning.
ERROR / WARN	Low resistance means that an error has occurred or that there is a warning.
CAL ACTIVE	Low resistance means that calibration is in process.
REC. STROBE	Low resistance means that the recorder output is invalid for 300 ms because the analogue outputs are currently being updated.
MEASURE	Low resistance means that the device is currently measuring. The leak rate of the last measurement is measured if both this output and the REC STROBE output are high resistance.
GROSS/FINE	Low resistance means that the device is currently carrying out a GROSS measurement.
GROSS LEAK	Low resistance means that the highest trigger value has been exceeded by at least a factor of 5.
CONTAMINATED	Low resistance means that the sensor has been contaminated with too much helium. The sensor must be decontaminated immediately, see "6.8 Helium contamination," page 44.
BACKGROUND	Low resistance means that the sensor current displays a low-helium state. This is a requirement for a sensitive measurement.
INV TRIGGER 1	High resistance means that trigger value 1 has been exceeded.
INV TRIGGER 2	High resistance means that trigger value 2 has been exceeded.
INV READY	High resistance means that the device is ready for the next measurement. In continuous measurement mode, the T-Guard measures the reference line.
INV CYCLE ACTIVE	High resistance means that the device is currently carrying out a measurement cycle . For a carrier gas measurement, this includes automatic purging and the reference measurement. For a continuous measurement, there is no measurement cycle; the output is therefore always high resistance.
INV STANDBY	High resistance means that the device is in standby.
INV ERROR	High resistance means that an error has occurred.
INV WARNING	High resistance means that there is a warning.
INV ERROR / WARN	High resistance means that an error has occurred or that there is a warning.
INV CAL ACTIVE	High resistance means that calibration is in process.
INV REC. STROBE	High resistance means that the recorder output is invalid for 300 ms because the analogue outputs are currently being updated.
INV MEASURE	High resistance means that the device is currently measuring. The leak rate of the last measurement is measured if both this output and the REC STROBE output are high resistance.
FINE/GROSS	High resistance means that the device is currently carrying out a GROSS measurement.

Table 14: PLC output functions and their meanings (Cont.)

Function	Meaning
INV GROSS LEAK	High resistance means that the highest trigger value has been exceeded by at least a factor of 5.
INV CONTAMIN.	High resistance means that the sensor has been contaminated with too much helium.
INV BACKGROUND	High resistance means that the sensor current displays a low-helium state. This is a requirement for a sensitive measurement.

7.1.3 Controlling an accumulation measurement using PLC

► Start the measurement when READY is low resistance.

The MEASURE output is low resistance during the measurement.

After the measurement, the MEASURE output becomes high resistance. If only the REC STROBE output is high resistance again, you can read out the analogue outputs. This is the case after approx. 300 ms.

If automatic purging is activated, READY becomes low resistance after purging. Only then can the next measurement be started.

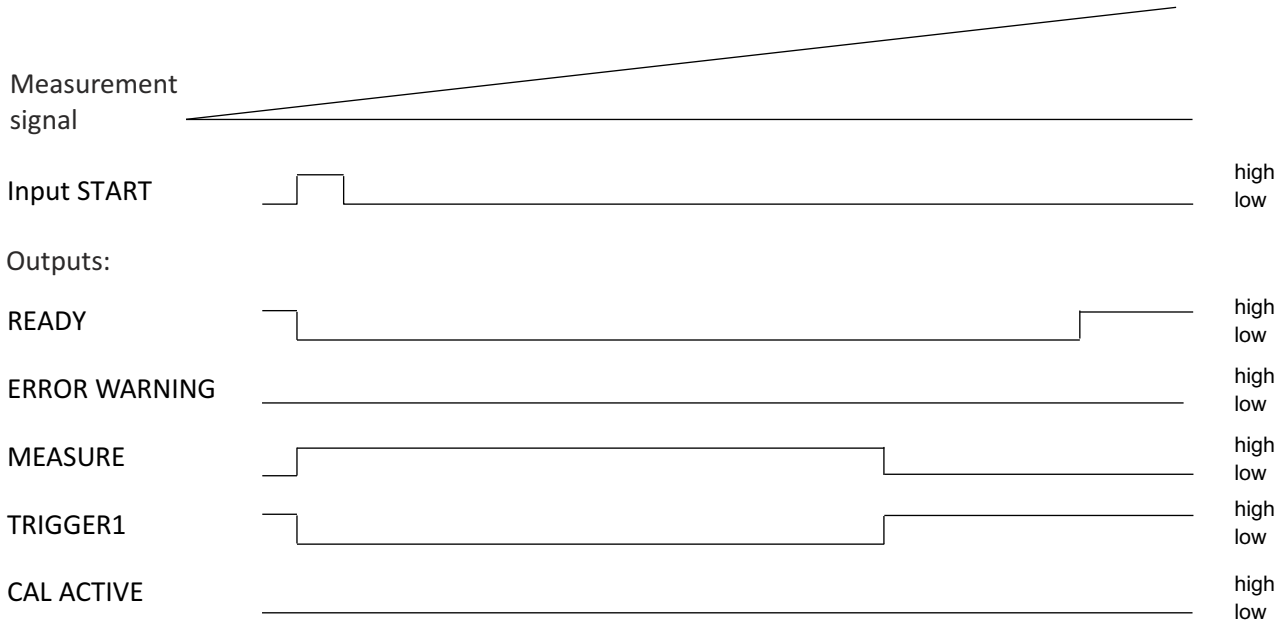


Fig. 28: Example of a PLC- controlled accumulation measurement

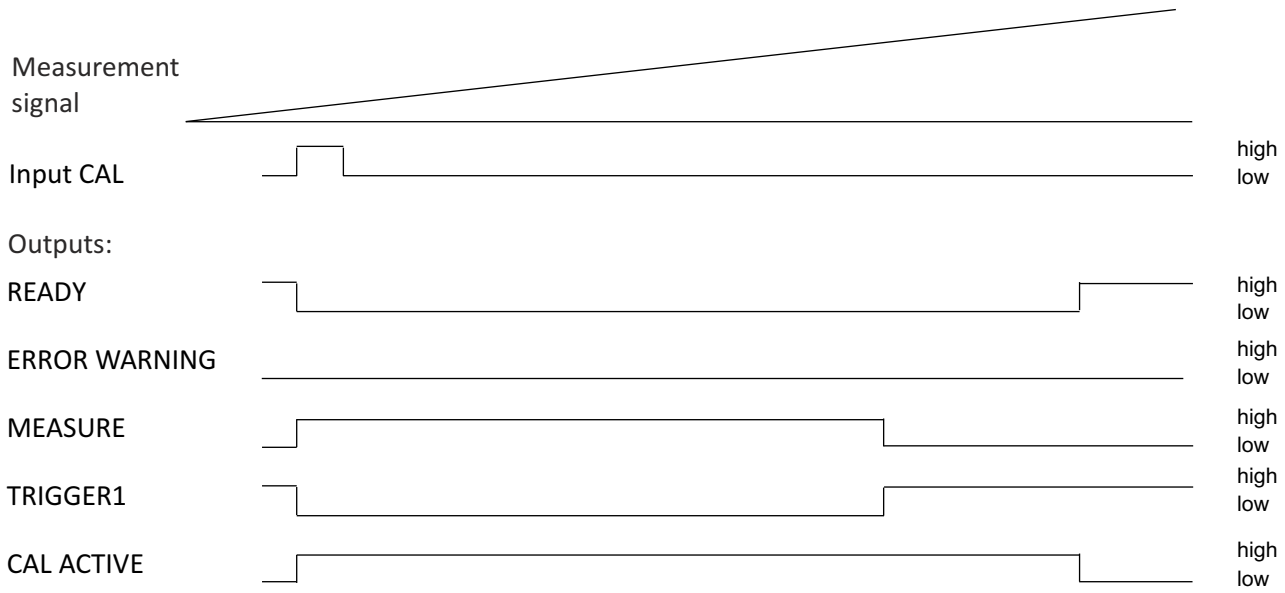


Fig. 29: Example of a PLC- controlled accumulation calibration

7.1.4 Controlling a carrier gas measurement using PLC

► Start the measurement when READY is low resistance.

The MEASURE output is low resistance during the measurement.

After the measurement, the MEASURE output becomes high resistance. If only the REC STROBE output is high resistance again, you can read out the analogue outputs. This is the case after approx. 300 ms.

The READY output becomes low resistance after the reference measurement. This lasts as long as the FINE measurement. The next measurement can only be started after it.

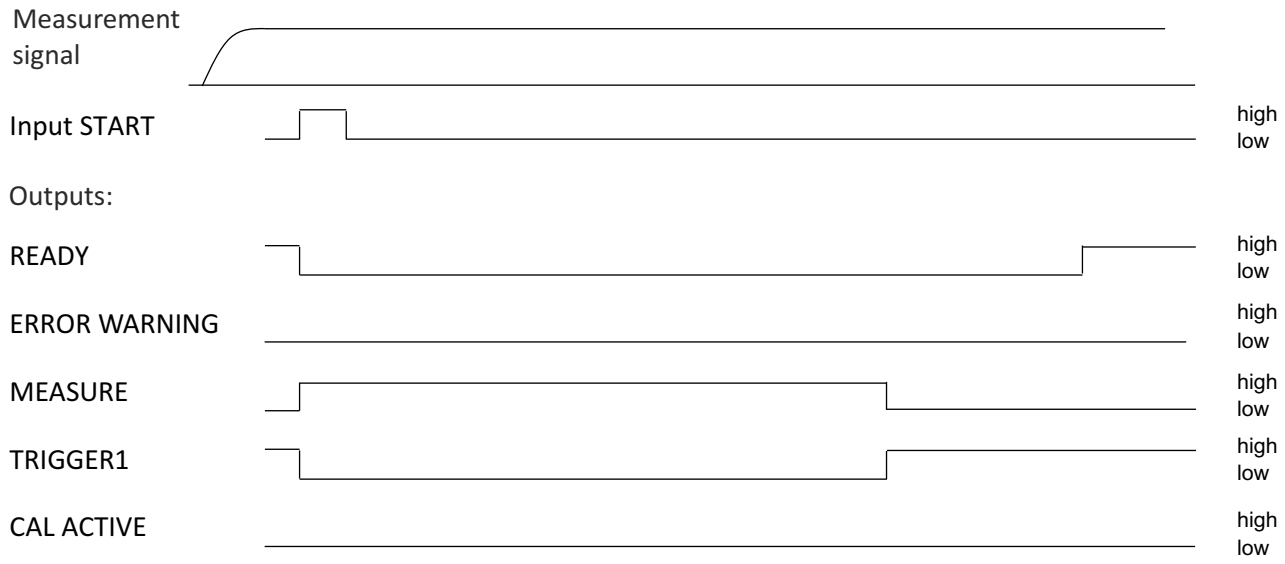


Fig. 30: Example of a PLC- controlled carrier gas measurement

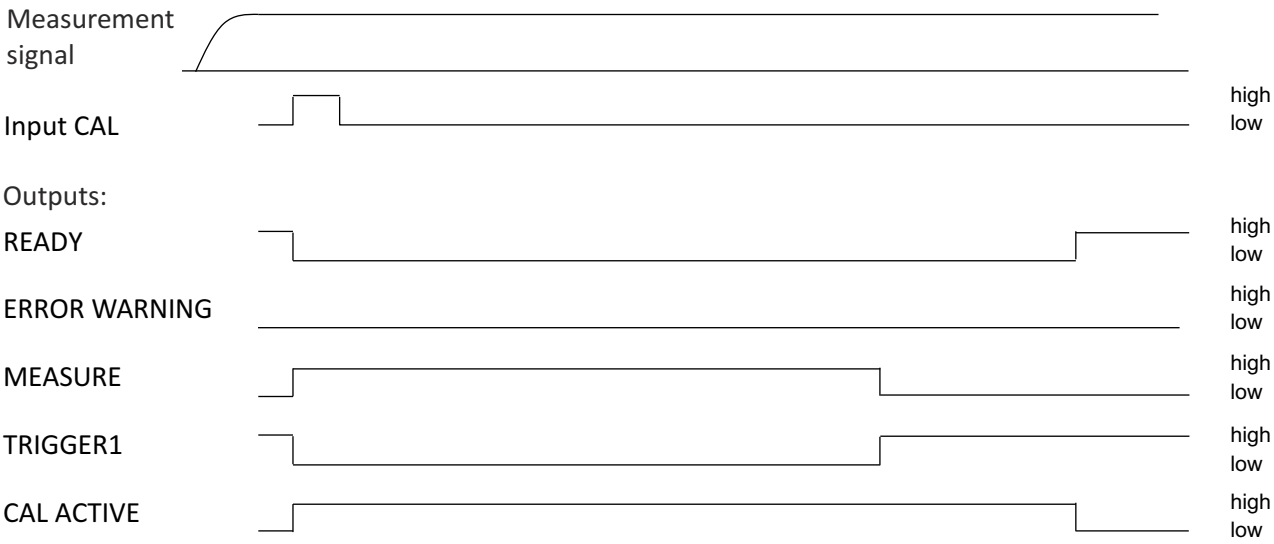


Fig. 31: Example of a PLC- controlled carrier gas calibration

7.2 Controlling using RS-232

Almost all of the device's functions can be controlled with a PC using the RS-232 interface. RTS and CTS are supported. Set the protocol used on the device.

- ASCII
- Binary

The ASCII protocol can be used to communicate with the device using typical commands from a terminal program, e.g. Microsoft Hyperterm, as well as to provide answer texts that are understandable for humans. This protocol is pre-set in delivery condition.

The binary protocol can be used to communicate with the device using software that was written by a programmer. This communication method is very fast. It is the fastest way to, for example, read out the leak rate.

► In the main menu, select "Settings > Interfaces > RS232 protocol".

In addition, you can set the device to send the following data via RS-232 after every measurement:

- Date
- Time
- Parameter set name
- Operating mode
- Leak rate
- Trigger 1
- Trigger 2 (if activated)

► Select "Interfaces > RS232 protocol > Print automatically".

Further details can be found in the interface description (jins85e1-e).

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7.3 Configuring analogue outputs

The T-Guard has 2 separate configurable analogue recorder outputs (electrical data: see "5.7 Connecting the analogue outputs to the electrical system," page 28). The outputs have 16-bit resolution and deliver a result after every measurement. In the continuous measurement setting, the renewal rate is 2 Hz. For a higher renewal rate, use the RS-232 interface.

Allocation of functions

Using a graphic, you can change the allocation of functions for the outputs.

In the main menu, select "Settings > Interfaces > Analogue output".

To change an allocation:

1. Select the pins with the up and down keys on the left side.
2. Select the desired function with the up and down keys on the right side.
3. Confirm with "OK".

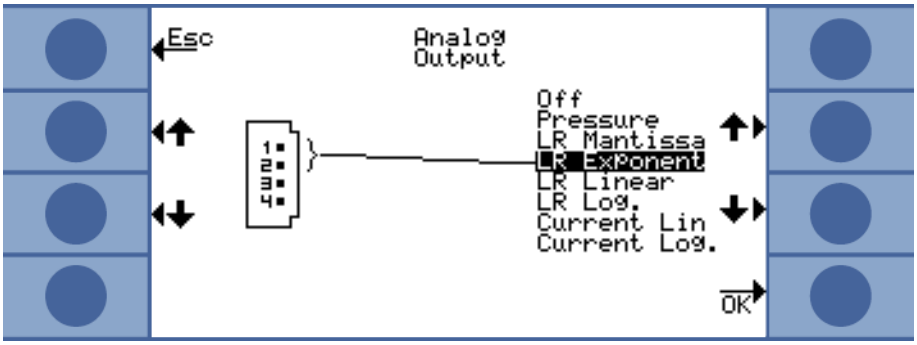

Fig. 32: Allocation of functions for the analogue outputs

Table 15: Analogue outputs and their meanings

Function	Meaning
Pressure	0 … 10 V corresponds to 0 … 1000 mbar in linear display
LR mantissa	Useful only if the other analogue output is assigned "Leak rate exponent". The mantissa corresponds to the output voltage in volts.
LR exponent	Useful only if the other analogue output is assigned "Leak rate mantissa". The exponent is calculated from the voltage as follows: Exponent = (voltage [V] × 2) – 14. For example: A voltage of 4.5 V results in an exponent of (4.5 × 2) – 14 = –5. A voltage for the mantissa of 3 V is 3. The leak rate is then: 3×10^{-5} mbar l/s.
LR linear	The output voltage is linear and proportional to the measured leak rate. The increase is set with the "Analogue scale" setting (see below).
LR log.	The output voltage displays the leak rate logarithmically. The corresponding values are set with the "Analogue scale" setting (see below).
Current lin	The output voltage displays the current linearly. The upper limit value is set with the "Analogue scale" setting (see below).
Current log.	The output voltage displays the current logarithmically. The corresponding values are set with the "Analogue scale" setting (see below).

Scale

The scale of the analogue output can be set.

► In the main menu, select “Settings > Interfaces > Analogue output scaling”.

Set the final value and the increase (volt/decade) for outputs 1..2 and 3..4 separately.

The upper limit applies for the “LR linear”, “LR log.”, “Current lin” and “Current log.” settings.

The increase (volt/decade) applies for the “LR log.”, and “Current log.” settings.

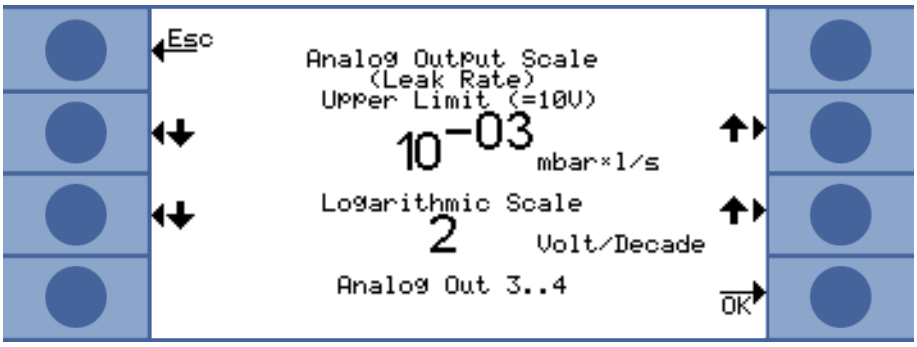

Fig. 33: Configuration of the analogue output scale

- In the “LR log” setting, the leak rate is calculated by:

$$\text{leak rate} = \text{final value} \times 10^{(U-10)/(\text{volt/decade})}$$

For example: A voltage of 3.7 V provides a leak rate of 7.08×10^{-5} mbar l/s for a final value of 10^{-1} mbar l/s and 2 V per decade.

For “Current log.”, the same applies for current instead of leak rate.

- In the “LR linear” setting, the leak rate is calculated by:

$$\text{leak rate} = \frac{\text{current} \times \text{final value}}{10}$$

For example: 10 V correspond to the final value, e.g. 10^{-3} mbar l/s, 3.7 V then correspond to e. g. 3.7×10^{-4} mbar l/s.

For “Current lin.”, the same applies for current instead of leak rate.

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8 Saving parameters

You can save and call up 4 measurement settings as parameter set in the device. If you use the I•Stick, this number increases to 25.

The I•Stick is removable storage developed for the T-Guard. You can also use it to easily transfer data to another device.

A parameter set contains all parameters, except for the settings for language and the RS-232 protocol. The designation of a set of parameters can be modified. The designation of the current set of parameters is in the upper row of the measurement window. If the set of parameters is subsequently changed, this is illustrated by means of a star in front of the designation.

In the "Copy parameters" window, all available storage space is listed to the left and right. On the left, the parameter set "Default" also appears, which contains the factory settings.

The currently set parameter set is always the second one in the left column. Therefore, "Current data" appears above the left column when you select this storage space.

On the left, you select the parameter set you want to save and on the right the destination.

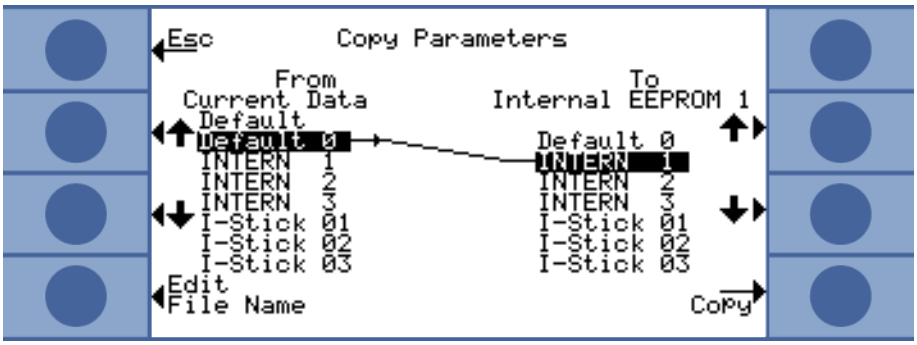

Fig. 34: Copying parameters

Inserting the I•Stick

On start-up, the device checks whether an I•Stick is inserted.

► With the device switched off, insert the I•Stick into the I•Stick slot.

The I•Stick is initialized on first use. Switch the device off and back on again in order to use the I•Stick.

Removing the I•Stick

NOTICE

Loss of data from interruption to connection

If the I•Stick is removed during operation, errors will occur during the next reading or writing operation.

► Only remove the I•Stick when the device is switched off.

Saving a new set of parameters

1. In the main menu, select "Settings > Copy parameters".
2. Select the "Default 0" entry on the left.
3. On the right, select the storage location.
4. Select "Copy" to save under the same name, or "Change name" to save the parameters set under a different name.

Before copying, the changed data is displayed for confirmation.

If the parameter set was successfully changed, the “Settings displayed” window is displayed again. Otherwise a malfunction message is displayed.

Calling up a saved parameter set

1. In the main menu, select “Settings > Copy parameters”.
2. On the left, select the parameter set that you want to call up.
3. On the right, select the first entry.
   If you only want to transfer the parameter set but not use it yet, select the second, third or fourth entry.
4. Select “Copy” to save under the same name, or “Change name” to save the parameters set under a different name.

Before copying, the changed data is displayed for confirmation.

If the parameter set was successfully changed, the "Settings" window is displayed again. Otherwise a malfunction message is displayed.

9 F.A.Q. – Frequently Asked Questions

- Why are the measurements not reproducible?
  - Measurements are less reproducible when the T-Guard reports “Background moderate” or “Background bad”. Remedy: Reduce the background by checking the helium supply for leaks. If possible, locate the helium supply far away from the T-Guard. Evacuate the test object after the measurement to dispose of the helium. Deliver outside air to the measurement room. The carrier gas mode only functions when there is a stable 5 ppm of helium in the air.
  - Measurements are less reproducible when the measurement chamber is leaking. Since the chamber does not exhibit any difference in pressure to the surroundings, the seal only needs to fulfill basic requirements and does not require the complex design required for vacuum technology. A calibration factor of 0.7 to 1.3 indicates that the chamber volume was entered correctly during the accumulation measurement. If the calibration factor deviates by more than 1, either the chamber volume, the He concentration, the trigger level or the leak rate of the calibration leak was entered incorrectly.
  - Measurements are less reproducible when the trigger level is much greater than the measured leak rate. The trigger level should be the same as the leak rate to be measured.
  - Measurements are less reproducible when the measurement time is reduced too much. This has the same effect as a trigger level that is too big.
  - Measurements are less reproducible when the chamber fan is too weak. The fan should circulate the chamber volume twice per second.
  - Measurements are less reproducible when the device is carrying out a gross measurement (carrier gas flow measurement). From a trigger level of 6.7×10^{-7} mbar l/s per sccm of the carrier gas flow, the device only carries out a gross measurement. The message “gross only” appears in the display when the trigger value is changed. Remedy: Avoid a gross-only measurement by using diluted helium and the appropriate setting or by using a larger measurement chamber.
  - Measurements are less reproducible if you do not use INFICON measurement hoses. Hoses with an inner diameter greater than 1 mm may not be used, since the air in the hose cannot be replaced quickly enough.
  - Measurements are less reproducible when the vacuum lines are not completely inserted into the couplings. Press the vacuum lines deeply enough into the coupling.
- Why is the measured leak rate always smaller if I don’t purge the measurement chamber between measurements?
  - Check the measurement chamber for leaks. Helium can get lost. Over time, this results in smaller leak rates. Remedy: Seal the measurement chamber. Use rubber seals for the chamber lid.
- Why can the device not be calibrated?
  - Enter the correct chamber volume and set the trigger level and the calibration leak rate to the leak rate used. If diluted helium is being used, enter this into the device.
  - Check all answers to the first question: “Why are the measurements not reproducible?”

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- Why do I get a warning after confirming the new calibration factor?
  - Your measurement setup can and should be improved. Remedy: Check the chamber volume, the calibration leak rate, the trigger level, the He concentration, the measurement time and the fan, and check the measurement chamber for leaks.
- Why does the measured leak rate become bigger over time?
  - The longer the T-Guard was stored, the longer it will take for the T-Guard to reach full capacity after start-up. With storage periods of weeks to months, this run-in phase can take a few hours, however no less than 30 minutes.
  - You are using a calibration leak that takes time to stabilize. Remedy: Use an INFICON leak.
  - In your test object, the mixing of helium and air takes too long. Remedy: Evacuate your test object to the greatest extent possible before filling it with helium.
  - The fans in the chamber are dimensioned too weakly.
- Why does the follow-up measurement deliver a leak rate that is too small after a gross leak?
  - In particular after a measured gross leak, you should flush the measurement line with low-helium air for at least 4 s and then wait 1 s before the next measurement. This removes the remaining helium from the measurement system, which otherwise could affect the follow-up measurement.

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10 Warning and malfunction messages

During operation, the control console shows information that helps you operate the T-Guard. Measurements are displayed along with current device modes, operating instructions as well as warnings and malfunction messages.

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

Malfunction messages

Errors are events that the T-Guard cannot correct itself and that force an interruption to operation. The malfunction message consists of a number and a descriptive text.

After you have eliminated the cause of the error, start operation again with the Restart key.

Warning messages

Warning messages warn of device conditions that can impair the accuracy of measurements. Operation of the device is not interrupted.

A warning triangle is displayed in the measurement view when there is a warning. To call up the message, select **i**. Use the OK key to acknowledge the warning.

The following table displays all the warnings and malfunction messages. It lists possible causes for the malfunction and instructions on how to eliminate them.

Table 16: Warning and malfunction messages

No.	Message	Possible cause	Troubleshooting
E1	24 V at the MC50 is too low	Fuse F1 on the DC/DC circuit board is blown	Contact the INFICON customer service.
		Power supply unit too weak	Use a regulated power supply unit.
E2	24 V of the sensor heating unit is too low	Fuse F2 on the DC/DC circuit board is blown	Contact the INFICON customer service.
		Power supply unit too weak	Use a regulated power supply unit.
E3	24 V II is too low	Fuse F3 on the DC/DC circuit board is blown	Contact the INFICON customer service.
		Power supply unit too weak	Use a regulated power supply unit.
W4	24 V at OPTION output is too low	Fuse F4 on the DC/DC circuit board is blown	Contact the INFICON customer service.
		Power supply unit too weak	Use a regulated power supply unit.
E7	-15 V at the MC50 is too low	DC/DC circuit board is defective	Contact the INFICON customer service.
E8	15 V at the MC50 is too low	DC/DC circuit board is defective	Contact the INFICON customer service.
E9	High voltage is faulty	Problem in the sensor electronics	Contact the INFICON customer service.
W11	WISE current not stable	The T-Guard was not used for several days; the sensor current should stabilize after a long run time.	Leave the T-Guard running for 2 hours.
		The helium background is higher than 20 ppm.	Lower the helium background in the room.
E12	Wise sensor not ignited	The Wise Technology sensor current is too low 10 min after switching on ($<5 \times 10^{-11}$ A).	Restart the T-Guard. If the problem still exists, contact the INFICON customer service.
E13	Error with heating regulation	The heating control for the Wise Technology sensor is defective.	Restart the T-Guard. If the problem still exists, contact the INFICON customer service.
E14	Discharge expired	– Problem with sensitivity at the Wise Technology sensor – No helium in the surroundings (e.g. inlet openings purged with nitrogen)	Restart the device but with the inlet openings connected to outside air. If the problem still exists, contact the INFICON customer service.
E20	Temperature at the electronics unit too high (>60°)	Ambient temperature too high	Cool the surroundings, place the T-Guard in a cooler room.
		Fan failed	Check the fan (check the flow rate through the inlet in the housing)

Table 16: Warning and malfunction messages (Cont.)

No.	Message	Possible cause	Troubleshooting
W27	Incorrect measurement settings	The trigger setting is smaller than 5 x the minimum display	Correct the trigger value(s)
W28	Real-time clock was reset! Please enter date and time!	CPU card was replaced	Please enter date and time
		CPU card battery is faulty	Contact the INFICON customer service.
E 38	Pump is faulty	Sensor pressure is higher than 800 mbar Fore pump defective, not switched on or pump hose is broken	Check the fore pump and the lines to the device.
W41	Pressure difference is too great	Pressure difference between the measurement inlet and air inlet should be ±10 % of the pressure difference between READY and FINE	Check the inlet filter.
W43	Pressure too low	Pressure below lower limit Reference line is blocked	Check the lower pressure limit Check the reference line
W44	Pressure too high	Pressure above upper limit Bad fore pump Pump hose is broken	Check the upper pressure limit Check the fore pump and the pump hose
W45	He concentration too high	At the time of the purge procedure, there is too much helium before or in the measurement line. The T-Guard interrupts the purge procedure prematurely to protect the sensor. The measurement chamber was not sufficiently purged before the measurement.	Purge the measurement chamber with outside air or nitrogen and initiate another sensor purge procedure using the PLC input or the RS232 command. Purge the measurement chamber more intensively before the measurement.
W50	No I·Stick available	I·Stick was not connected at start-up I·Stick is defective	Switch the T-Guard off and back on again, this time with the I·Stick inserted
W52	I·Stick parameter lost! Please check the settings!	I·Stick removed during operation I·Stick is defective	Check your settings Switch the T-Guard off and back on again, this time with the I·Stick inserted
W59	Overflow of EEPROM parameter queue!	May occur if a software update to an older version is carried out	Restart the T-Guard. If the problem still exists, contact the INFICON customer service.
W60	All EEPROM parameters lost! Please check your settings!	New EEPROM was installed, EEPROM on the system board is not programmed.	All settings in the software menu are reset to factory settings. Modify your settings again.
		If the message occurs constantly during start-up, the EEPROM on the system board is defective.	Contact the INFICON customer service.
W61	EEPROM parameters initialized!	Software update carried out and new parameters introduced Warning, newly introduced parameters listed below.	Confirmation required
		If the message occurs constantly during start-up, the EEPROM on the system board is defective.	Contact the INFICON customer service.
W62	EEPROM parameters lost!	A parameter was changed and reset to factory setting during the software update. The parameters affected are listed in the warning below.	Check the setting of the modified parameter in the corresponding software menu and set the desired parameter.
		If the message occurs constantly during start-up, the EEPROM on the system board is defective.	Contact the INFICON customer service.
W64	There are warnings pending!	Acknowledged but not yet valid warnings are repeated every two hours or at every new start-up.	Please check the warnings twice!
W65	Communication error with fieldbus module		Switch the T-Guard off and back on again. If the problem still exists, contact the INFICON customer service.

Table 16: Warning and malfunction messages (Cont.)

No.	Message	Possible cause	Troubleshooting
W72	No communication with analogue card		Switch the T-Guard off and back on again. If the problem still exists, contact the INFICON customer service.
W81	Calibration factor too low!	If the calibration factor was set to less than 0.2, the calibration was not successful. If a calibration factor between 0.2 and 0.5 was confirmed, a warning still occurs after confirming this successful calibration.	
		The calibration leak rate is larger than entered.	Check the correct setting for the calibration leak value!
W82	Calibration factor too high!	If the calibration factor was set to more than 5, the calibration was not successful. If a calibration factor between 2 and 5 was confirmed, a warning still occurs after confirming this successful calibration.	Please check the chamber volume settings and/or gas flow
		The calibration leak rate is smaller than entered.	Check the correct setting for the calibration leak value!
		Chamber volume and/or gas flow are greater than entered.	Please check the chamber volume settings and/or gas flow
W84	Calibration leak signal too small	Calibration leak defective	Check your calibration leak
		Trigger value(s) too high	Check the trigger
		Volume/flow setting too low	Check the accumulation volume/the carrier gas flow
		Measurement chamber leaking	Check the measurement chamber for leaks
W89	Overstep of the limit value!	The T-Guard is contaminated with helium.	Do not switch the T-Guard off. Leave the T-Guard running while supplying fresh air to the measurement and reference lines until the warning goes out. If the warning occurs frequently, increase the contamination limit!
			Check the helium background, see information in the vacuum diagram.
		Calibration leak value too high during calibration	Use a smaller calibration leak for the calibration!

11 Maintenance work

11.1 Replacing the inlet filter

There is a filter in both the measurement and reference lines.

Check the filter for dirt every 6 months and replace it if necessary.

Replace filter at the latest after 2 years.

Always replace both filters.

1 Unscrew the old filters from the lines (Luer-Lock connection).

2 Screw the new filters into the lines.

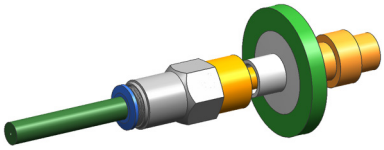


Fig. 35: Filter in the line

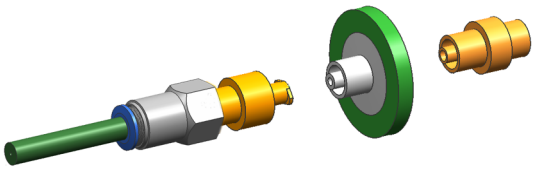


Fig. 36: Unscrewed filter

12 Decommissioning the device

12.1 Disposing of the T-Guard

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

The device is made of recyclable materials. You should use this option to avoid waste and to protect the environment.

► Please comply with the environmental and safety regulations of your country when disposing of the device.

12.2 Returning the T-Guard

WARNING

Danger due to harmful substances

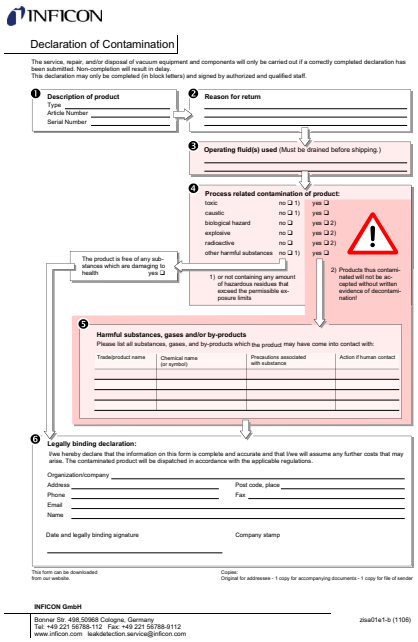
Contaminated devices can threaten the health of INFICON staff.

► Fill out the Declaration of Contamination completely.

► Attach the Declaration of Contamination to the exterior of the packaging.

The Declaration of Contamination is a legal requirement and serves to protect our employees. Devices submitted without a completed Declaration of Conformity will be returned to the sender by INFICON.

You can find a printed form in the folder with the T-Guard documents.



INFICON

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 ❑ 1)	yes ❑
caustic	no ❑ 1)	yes ❑
biological hazard	no ❑	yes ❑ 2)
explosive	no ❑	yes ❑ 2)
radioactive	no ❑	yes ❑ 2)
other harmful substances	no ❑ 1)	yes ❑

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

2) Products thus contaminated will not be accepted without written evidence of decontamination!

5 Harmful substances, gases and/or by-products
Please list all substances, gases, and by-products which the product may have come into contact with:

Trade/product name	Chemical name (or symbol)	Precautions associated with substance	Action if human contact

6 Legally binding declaration:
I/we hereby declare that the information on this form is complete and accurate and that I/we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations.

Organization/company
Address
Post code, place
Phone
Fax
Email
Name

Date and legally binding signature

Company stamp

This form can be downloaded from our website.

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

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

zisa01e1-b (1106)

Fig. 37: Declaration of Contamination

13 Appendix

13.1 Accessories

Table 17: Accessories and order numbers

Accessory part	Order no.
Control unit for table-top operation	551-100
Operator panel for 19″ rack	551-101
Connecting cable for control unit, 5 m	551-102
Connecting cable for control unit, 1 m	551-103
Connector mated set	551-110
I•Stick	200 001 997
Filter set	200 001 680
E/A testbox for testing the PLC in/outputs	200 002 490
Power supply connection	200 002 496
Measurement chamber connection	200 002 615
Lines 2 × 0.5 m 2 × 1.0 m 2 × 2.0 m	 540-011 540-012 540-013
Fore pump, 24 V, two-stage, brushless	200 002 929
Test leaks	On request

13.2 Menu tree

Main menu T-Guard™ Leak Detection Sensor				
	Back			
	Display	Contrast	Invert display	
		Display limit		
	Operating mode	Accumulation		
		Carrier gas		
		Continuous mode		
		Standby		
	Trigger	Trigger level 1		
		Trigger level 2	Enabled	
	Calibration	leak rate ext. Test leak		
		Start test function		
		Test leak rate		
		Start calibration		
	Settings	Miscellaneous	Language	
			Time & date	
		Interfaces	Control location	PLC
				RS232
				All
				Local and PLC
				Local and RS232
				Local
			RS232 protocol	ASCII
				Binary
				Print automatically
				Baud rate
			Select PLC input	Condition of all PLC lines
			Define PLC outputs	Condition of all PLC lines
			Analogue output	Condition of all outlets
			Analogue output scaling	Analogue output 1 .. 2
				Analogue output 3 .. 4
		Measurement settings	He concentration	
			Standby delay	
			Carrier gas flow	Test flow
			Length of the line	
			Set times	Set times automatically
				measurement time
				Wait time purge
				Purge time (+ on/off)
			Accumulation volume	Volume test
			Pressure unit	
		Copy parameters	Change name	
			Copy	
		Monitoring	Without He (N2)	On/off
			Contamination limit	High
				Normal
				Low
			Pressure limits	
		2	Purge on/off key	
	Info	View/Change settings	View/change basic settings	
		Internal data	Display of 8 info pages	
		Vacuum diagram		
		Interfaces	Display of all interface settings.	
		History & Maintenance	Measurement list	
			Display error list	
			Calibration list	
		Cal factor	Set to 1	
		Service		
	Access control	Access to CAL function	On/Off	
		Change Menu PIN		

13.3 Declaration of Conformity

INFICON

CE

EC Declaration of Conformity

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

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

The products meet the requirements of the following directives:

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

Applied harmonized standards:

- **EN 61010 - 1 : 2001**
- **EN 61000-6-4 : 2002 Part EN 55011 Class A**

During influence of strong electromagnetic interferences a temporary disturbance of the T-Guard could occure.

Designation of the product: **Leak Detection Sensor**

Model: **T-Guard**

Catalog No. **540-001**
540-002

Cologne, May 07, 2014

Dr. Döbler, Manager

Cologne, May 07, 2014

Finke, Research and Development

t-guard.07.05.2014.engl.doc

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Translation of the original operating instructions T-Guard, jina85e1-g, 1409

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Visit our website for contact information and other sales offices worldwide. **www.inficon.com**

Dokument: jina85e1-g 1409