

OPERATING INSTRUCTIONS

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Catalog no

550-300A

550-310A

550-330A



From software version V1.78

Modul1000

Modular leak detector

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Content

1	User guidelines	1-1
1.1	Application of this manual	1-1
1.2	Warning and danger symbols	1-1
1.3	Representation conventions	1-2
1.4	Explanation of terms	1-2
2	Important safety instructions	2-1
2.1	Intended use	2-1
2.2	Operator requirements	2-1
2.3	Restrictions of use	2-2
2.4	Hazards under normal use	2-2
3	Description of equipment	3-1
3.1	The housing	3-1
3.2	Interfaces	3-3
3.3	Operating options	3-3
3.3.1	Desktop operation	3-3
3.3.2	Installation in switch cabinet	3-4
3.3.3	Remote control RC1000	3-5
3.4	Scope of delivery	3-6
3.5	Accessories	3-6
3.5.1	Sniffer line SL200	3-6
3.5.2	Test chamber TC1000	3-6
3.5.3	Set of male connectors for Interfaces	3-7
4	Installation	4-1
4.1	Mechanical installation	4-1
4.2	Electrical installation	4-3
4.2.1	Power supply	4-3
4.2.2	Electrical interfaces	4-3
4.2.3	Vacuum equipment connections	4-8
5	Operation modes	5-1
5.1	Vacuum	5-1
5.2	Partial flow mode	5-2
5.3	Auto Leak Test	5-3
5.3.1	Auto leak test settings	5-3
5.4	Commander Operation	5-4
5.4.1	Construction of a leak detection system	5-5
5.4.2	Test procedure	5-6
5.5	Sniffer mode	5-8

6	Operation	6-1
6.1	Switching ON or OFF	6-1
6.2	Status LED	6-2
6.3	Controller	6-3
6.4	Control commands	6-4
6.5	Display	6-7
6.6	Calibration	6-9
6.6.1	Calibration in vacuum mode	6-10
6.6.2	Calibrating in sniffer mode	6-11
6.6.3	Calibration in Auto Leak Test	6-11
6.6.4	Calibrate in commander mode	6-12
6.7	Machine factor	6-13
6.8	Menu structure	6-14
6.9	Description of the menu items	6-16
6.9.1	Main menu → back	6-16
6.9.2	Main menu → display	6-16
6.9.3	Main menu → operating mode	6-17
6.9.4	Main menu → Trigger & Alarms	6-17
6.9.5	Main menu → Calibration (CAL) Vacuum operating mode	6-19
6.9.6	Main menu → Settings	6-21
6.9.6.1	Main menu → Settings → Vacuum settings	6-21
6.9.6.2	Main menu → Settings → Zero & Background	6-24
6.9.6.3	Main menu → Settings → Mass	6-24
6.9.6.4	Main menu → Settings → Interfaces	6-24
6.9.6.5	Main menu → Settings → Miscellaneous	6-27
6.9.6.6	Main menu → Settings → Loading / Saving parameters	6-28
6.9.6.7	Main menu → Settings → Monitoring	6-29
6.9.7	Main menu → Info	6-31
6.9.8	Main menu → User authorization	6-32
7	Maintenance work	7-1
7.1	Maintenance and service at INFICON	7-1
7.2	General notes on maintenance	7-1
7.3	Maintenance plan	7-3
7.4	Maintenance intervals	7-3
7.5	Description of the maintenance operations	7-6
7.5.1	Opening the device	7-6
7.6	Replace oil wick cartridge	7-7
7.7	Changing the fuses	7-10
7.7.1	Summary of the electrical fuses	7-10
7.7.2	Replace mains fuse	7-11
7.7.3	Replacing Interface Board Fuses	7-12
7.8	Parameter storage (I•STICK) replacement	7-13
7.9	Flood filter replacement	7-14
8	Transport and disposal	8-1
8.1	Returning the device for maintenance, repair or disposal	8-1

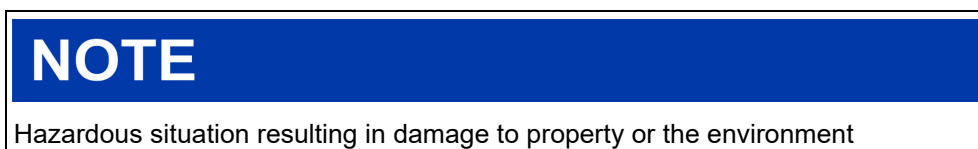
9	Technical data	9-1
9.1	Device data	9-1
9.1.1	Power supply	9-1
9.1.2	Weight / dimensions	9-1
9.1.3	Characteristics	9-1
9.1.4	Ambient conditions	9-2
9.2	Control via the PLC inputs and outputs	9-3
9.2.1	PLC inputs	9-3
9.2.2	PLC outputs	9-5
9.3	The digital valve outputs	9-8
9.4	Analog output	9-9
9.4.1	Configuration of the analog output	9-9
9.5	Connection assignment	9-12
9.5.1	PLC IN / AUDIO	9-12
9.5.2	PLC OUT	9-14
9.5.3	Pressure Gage	9-15
9.5.4	Valves	9-18
9.5.5	Recorder	9-20
9.6	Installation drawing of the control unit for rack installation	9-21
9.7	Commander Operation	9-22
10	Warnings and malfunction messages	10-1
11	Ordering Information	11-1
12	Appendix	12-1
12.1	Declaration of Conformity	12-1
12.2	Declaration of Incorporation	12-2
	<hr/> Index	1-1

1 User guidelines

1.1 Application of this manual

- Please read this manual before using the Modul1000.
- Save the manual so that you have it at hand at all times.
- If the device is passed on to a third party, this manual must be attached.

1.2 Warning and danger symbols



1.3 Representation conventions

Notice Refers to very important information.

1 Refers to an operation that has to be performed.

⇒ Refers to a result of a completed operation.

→ Refers to a button to be pressed.

- A list is displayed.

1.4 Explanation of terms

Automatic tuning / Mass setting

This function adjusts the mass spectrometer so that a maximum sensitivity is achieved. The control computer changes the voltage that accelerates the ions within the selected mass range so that a maximum ion current is detected by the ion detector. During each calibration, the mass is adjusted automatically.

Automatic Measurement range selection

The amplification range of the preamplifier is automatically selected. The automatic measuring range selection of the Modul1000 overlaps the entire leak rate range as a function of the selected operating mode: Vacuum mode or sniffing mode. Not only the leak rate signal but also the pressure in the DUT (inlet pressure PE) and the fore-line pressure (PV) are used for control purposes.

Automatic zeroing

Measurement and automatic adaptation to the helium background in vacuum operating mode. This function determines the internal device zero, which is then deducted from the currently measured leak rate signal. This function is activated during the calibration process or when the start button is pressed, if the Modul1000 has previously run for at least 20 seconds in "Standby" or "Ventilation" operating mode. If the previously suppressed helium background continues to fall, the zero point is automatically adjusted.

Internal helium background

The existing helium partial pressure in the measurement system. The size of the internal helium background is measured in Standby operating mode and subtracted from the measured signal. (See above: Automatic zeroing)

Minimum detectable leak rate

The minimum detectable leak rate that the Modul1000 can safely detect (5×10^{-12} mbar l/s).

MEASURE

MEASURE is the measurement range with an inlet pressure of less than 0.4 mbar. The minimum detectable leak rate is $< 5 \times 10^{-12}$ mbar l/s.

Menu

The menu allows the operator of the Modul1000 to program it according to his wishes. The menu has a structure that branches out in a tree-like manner.

Standby

The Modul1000 is ready for operation.

Turbo molecular pump

The turbo molecular pump (hereinafter abbreviated as TMP) is a vacuum pump which generates the necessary high vacuum for the mass spectrometer. The turbo molecular pump has drive electronics, also known as TMP converter.

Foreline pressure

Pressure of the backing pressure between the turbo molecular pump and the backing pump.

Factory delivery condition

State of the settings of the Modul1000 as supplied by the factory.

2 Important safety instructions

2.1 Intended use

The Modul1000 is designed for vacuum leak testing. With the sniffer version of the Modul1000 (Catalog no. 550-310), leaks can also be found on the DUT.

The Modul1000 may only be used for leak testing with the gases helium and hydrogen. It may only be used in dry rooms and on a dry surface.

Only use accessories from INFICON.

The intended use also includes:

- compliance with the technical data and environmental conditions,
- the use of standard and original accessories,
- observance of this document and compliance with the instructions and regulations contained therein.

2.2 Operator requirements

The Modul1000 may only be installed and operated by trained personnel.


- Familiarize yourself with the function of the device. You may only install and operate the device after reading and understanding the manual.
- Check with the local, state or national authorities for special requirements and regulations.
- If you have any further questions regarding safety, operation and / or maintenance, please contact our nearest representative.

2.3 Restrictions of use


DANGER

Lethal hazard due to explosion

- Use the Modul1000 only outside explosively hazardous areas.


DANGER

Danger from hazardous gases


The device is not suitable for corrosive, toxic, corrosive and explosive substances.

- Use the device only to detect harmless materials.

2.4 Hazards under normal use

Before you install the Modul1000, read all safety instructions carefully and make sure you understand them correctly.


Hazard


DANGER

Lethal hazard due to explosion

If explosive gases are used as tracer gases, the gas container could explode.

- Avoid flames and sparks, keep ignition sources away, and smoke only far from the device.


DANGER

Life threatening hazard from electric shock

- Only operate the Modul1000 indoors and on dry ground.
- Connect the Modul1000 to a 3-pin power cable and ground it using a PE connector.
- Keep the sniffer tip away from live parts.
- Unplug the power cord before opening the Modul1000.



DANGER

Danger to life from electric shock

The insulating properties of plastics used, for example in power supply units, can deteriorate at very low humidity. If parts become live in the event of a fault, an electric shock may occur.

- Avoid storage and operation of the device in excessively low humidity. Minimum humidity during transport and storage: 10%, minimum humidity during operation: 30%.



DANGER

Hazard of injury and contamination by toxic gases

Use the Modul1000 to detect only harmless substances.

The device is unsuitable for toxic, corrosive, microbiological, explosive, radioactive or other harmful substances.

- Please contact the manufacturer if such an application is planned.



DANGER

Lethal hazard due to implosion

Connected test objects and connections must be able to withstand the negative pressure during vacuum operation. Otherwise, further protective measures must be taken (e.g. splinter protection).

- Only connect containers and components suitable for vacuum to the inlet flange of the Modul1000.



DANGER

Danger of hydrogen explosion

Hydrogen is a flammable and explosive gas.

- Only use test gases with a hydrogen concentration that cannot explode in combination with oxygen. For the permissible composition of gas mixtures available for purchase, please refer to the safety data sheets of the respective manufacturers.



WARNING

Danger for wearers of implants such as pacemakers

There is a strong permanent magnet in the device. The magnetic fields can interfere with the function of the implant when the device cover is removed.

- As a wearer of such devices, maintain a distance of at least 10 cm between the leak detector and the implant.
- Furthermore, observe the safety instructions of the implant manufacturer.



WARNING

Risk of injury from rotating parts

- Allow the Modul1000 to rest for at least 20 minutes before transporting.



WARNING

Fire hazard due to overload, short circuit and overheating

- Observe the permissible ambient conditions.
- Ensure sufficient ventilation, especially at the ventilation openings: Free space at the front, rear and sides at least 10 cm.
- Keep heat sources away from the device.
- Use the specified fuses.
- Ensure regular maintenance of the fan filter.
- Make sure that the power switch or power plug is always easily accessible.
- Disconnect the device from the mains immediately if smoke is emitted from the device.



WARNING

Risk of injury due to the device falling

- Carry the Modul1000 with two persons.



WARNING

Injury to back due to heavy weight

- Carry the Modul1000 with two persons.



WARNING

Health damage caused by exhaust gases and vapors

- Connect an exhaust hose before operating in closed rooms.
- Do not pump out hazardous gases.



WARNING

Danger due to suction effect at the inlet flange

When operating the device in the "Vacuum" operating mode, a vacuum is created at the inlet flange. The suction effect on hands or limbs can cause injuries or trigger uncontrolled movements due to startling.

- Pay attention to this danger especially when using a remote control!
- Make sure that no objects get into the inlet.
- Protect long hair when the inlet flange is open.
- Connect the inlet flange to a test assembly or close it with a blank flange.



WARNING

Supposed risk

- If it is to be assumed that safe operation is no longer possible, put the device out of operation and secure it against unintentional start-up.
- Please contact the INFICON service.

Notice This can be the case:

- if the device shows visible signs of damage,
- if a fluid has penetrated the device,
- if the device is no longer functions,
- after extended storage under unfavorable conditions,
- after being subjected to significant strain from transport.



CAUTION

Injuries and property damage due to high voltages

The electronics of the Modul1000 can be damaged by high voltage.

- Assign digital inputs with a maximum voltage of 30V.



CAUTION

Injuries and property damage due to high electrical load

The electronics of the Modul1000 can be damaged by an excessive electrical load.

- Load relay outputs with max. 60V DC or 25V AC / 1A with ohmic load.
- Load semiconductor outputs with max. 30V / 1A.



CAUTION

Injuries and property damage without safe mains disconnection

The electronics of the Modul1000 can be destroyed if devices are connected to the Modul1000, the electronics of which do not have a safe separation from the mains.

- Only connect devices to the Modul1000 whose connections are also safely disconnected from the mains.



CAUTION

Injuries and material damage due to liquid penetration

The Modul1000 can be destroyed if liquid is penetrated.

- If liquid has penetrated the Modul1000, do not turn on the Modul1000 and contact the INFICON service.

Note

NOTE

Turbomolecular pump can be damaged

- Make sure that no foreign objects enter the inlet of the leak detector.
- Do not move the leak detector jerkily during operation.
- Do not move it until 2 minutes after it has been turned off and the inlet has been vented. Otherwise, do not move it for 6 minutes.

NOTE

Material damage due to aggressive substances

The Modul1000 will be destroyed by aggressive substances.

- Avoid contact with bases, acids, solvents and extreme temperatures.

NOTE

Material damage by testing inappropriate materials

The Modul1000 can become unusable by inappropriate materials.

The filter at the inlet of the Modul1000 should prevent the penetration of dirt into the vacuum system.

- Only use helium or hydrogen with the device.

NOTE

Material damage due to incorrect mains voltage

The electronics of the Modul1000 can be damaged by incorrect mains voltage.

- Before switching on, check that the operating voltage of the device matches the local mains voltage.

NOTE

Material damage due to overheating

The Modul1000 can be damaged by overheating, for example, by closing the openings.

- Keep the openings for air inlet and air outlet free.
- Observe service messages and replace contaminated air filters.

NOTE

Material damage due to incorrect storage

The Modul1000 can be destroyed if stored for months or years under unfavorable conditions (wet, too cold, too high above sea level). (See technical data!)

- If the Modul1000 has been stored in these circumstances, leave it switched off.
- Contact the INFICON service.

NOTE

Material damage due to improper transport

The Modul1000 can be damaged by improper transport.

- Only transport the Modul1000 in its original packaging.

NOTE

Calibration leak can be destroyed by excessive pressure

- To avoid too high pressure and a risk of explosion for the calibration leak used, observe the permissible ambient conditions for the storage and use of calibration leaks. See also Module1000, chapter [9.1.4 Ambient conditions](#).

3 Description of equipment

The Modul1000 is a helium leak detector which has been designed to be installed in leak test work stations or integrated machines.

The analysis system with turbo molecular pump and a complete control unit are integrated in a compact housing. Depending on the set operating mode, the Modul1000 can execute overriding control functions in a leak test system.

Multiple signal and status outputs allow the universal integration in existing or new system versions.

The operating parameters set by the user are stored in a separate memory module (I•STICK) which can be withdrawn easily.

All device configurations and the necessary maintenance works can be performed without opening the device.

To generate the fore-vacuum required for the operation of the turbo-molecular pump, as well as for evacuation of the connected DUT, a backing pump with a pumping speed of $>2 \text{ m}^3/\text{h}$ has to be connected. It must be able to generate a final pressure of $<1 \times 10^{-2} \text{ mbar}$.

3.1 The housing



Fig. 3-1 Left side view and front view



Fig. 3-2 Right side view and back view

Item	Description	Item	Description
1	Inlet flange DN25 KF	8	Vent connection FESTO coupling Hose 8 mm
2	Loudspeaker / Air inlet	9	Mains socket with main switch and Mains fuses
3	Openings for unlocking the the cover	10	Connection DN25 KF for Backing pump or sniffer line
4	Recess handles	11	Electrical interfaces
5	Status LED		
6	Air filter		
7	Connection DN25 KF for Backing pump		



Fig. 3-3 Cut-out in the bottom side of Modul1000

Item	Description
1	Connection for the backing pump (screwed flange)

3.2 Interfaces

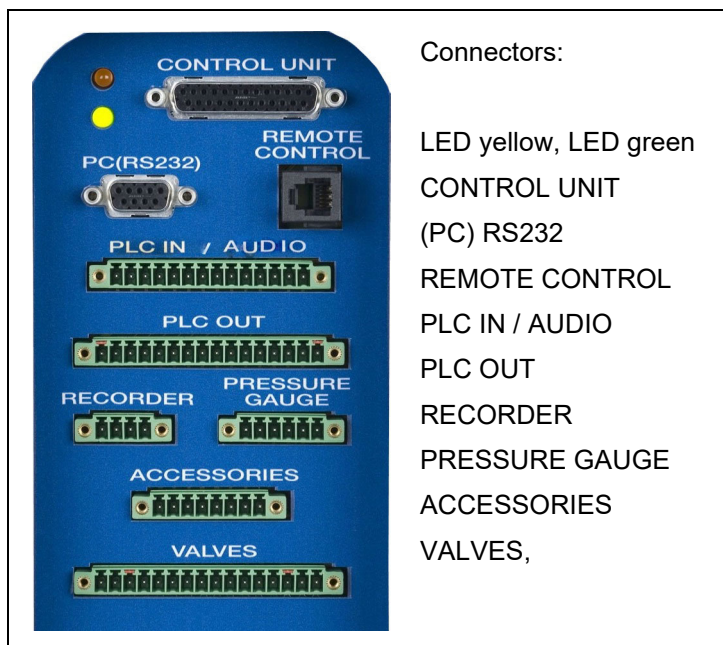


Fig. 3-4

The two 16-pin plug connectors PLC OUT and VALVES are keyed so they cannot be interchanged. For the PLC OUT, coding tongues are inserted on the pins 1 and 16, for the VALVES connector, the tongues are on the pins 3 and 14.

For maximum cable lengths see chaptersiehe [4.2.2 Electrical interfaces](#).

3.3 Operating options

The Modul1000 can be operated via the control unit for desktop operation or the operating unit for the installation in a switch cabinet.

The Modul1000 provides an extensive software menu which serves for operation and configuration (refer to chapter [9.2 Control via the PLC inputs and outputs](#)). This control unit offers access to the menu structure.

The control unit can optionally be connected to the Modul1000 via 0.7 m or 5 m long connecting cables.

The control unit is for configuring and controlling the Modul1000 individually and parameters as well as measured values can be read out.

3.3.1 Desktop operation

The control unit can be placed on even desktops and does not slip.

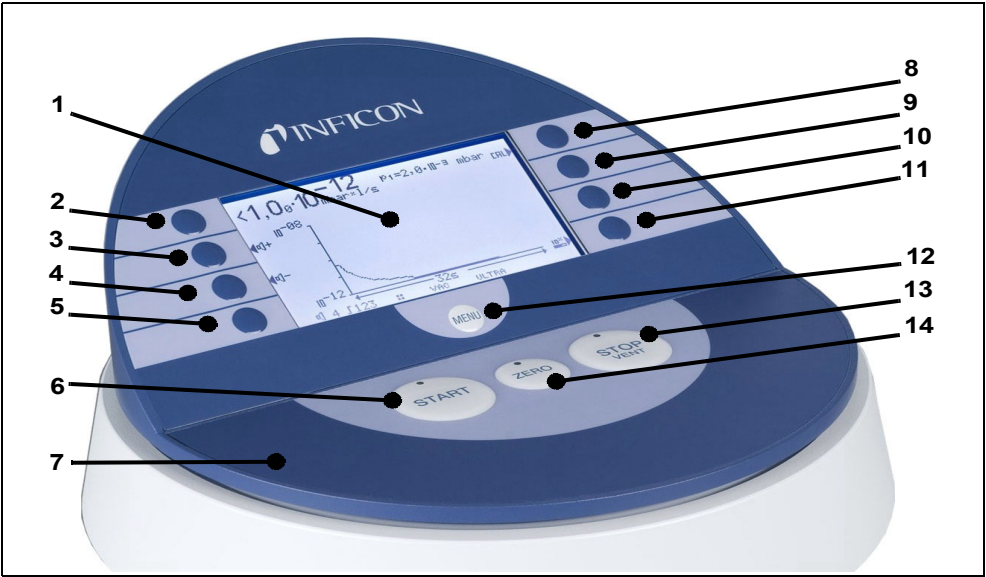


Fig. 3-5 Control Unit for Desktop Operation

Item	Description	Item	Description
1	LCD display	8	Button no. 5
2	Button no. 1	9	Button no. 6
3	Button no. 2	10	Button no. 7
4	Button no. 3	11	Button no. 8
5	Button no. 4	12	Menu button
6	START button with LED	12	STOP / Vent button with LED
7	Control unit	14	ZERO button with LED

3.3.2 Installation in switch cabinet

The operating unit (control unit as mounted version) is intended to be integrated in the front of a 19" rack system.



Fig. 3-6 Operating unit for the installation in a switch cabinet

3.3.3 Remote control RC1000

The wireless remote control RC1000 allows the operation of the device from a distance of up to 100 m. The remote control allows the functions START, STOP / VENT (STOP / ventilate), and ZERO (background) to be used, it shows the measured leak rate as a bar graph on the display as a figure or as a diagram (see the technical manual of the RC1000).

The measurement values can be stored in the internal memory of the RC1000 for a period of up to 24 hours. Then the data can easily be transferred to a USB stick.

An internal trigger can be set to provide a warning if the limit leak rates are exceeded. The warning occurs visually on the display and audibly via the built-in loudspeaker or the connected headset.

The remote control RC1000 is in a robust housing, which allows working ergonomically. Magnets on the lower side allows installation in horizontal or vertical metal surfaces. The remote control RC1000 can control the leak detector via a cable with a length of up to 28 meters.



Fig. 3-7 RC1000 wireless remote control

3.4 Scope of delivery

- Leak detector for helium and hydrogen, Modul1000
- Mains connection cable (country-specific)
- Set of spare fuses
- Folder with documents
- Tools for opening the cover: 8 mm Allen-key
- Metering orifice DN25, 2 mm

3.5 Accessories

Accessories	Cat. No. / Ref. No.
Sniffer line SL200	140 05
Test chamber TC1000	551-005
Set of male connectors for Interfaces	551-110
Control unit (desktop version)	551-100
Control unit (mounting version 19 inches)	551-101
Connecting cable for control unit, 1 m	551-103
Connecting cable for control unit, 5 m	551-102
Remote control RC1000	
- RC1000WL wireless	551-015
- RC1000C cable version	551-010
- Extension cable, 8 m, for RC1000C	140 22

3.5.1 Sniffer line SL200

The Modul1000, in the version as vacuum or sniffer leak detector needs the sniffer line SL200 to be able to work in sniffer mode.

3.5.2 Test chamber TC1000

The vacuum chamber TC1000 serves for integrated testing of helium-filled parts. The test procedure can be configured individually in the software menu of Modul1000 and runs automatically after the chamber has been closed.

3.5.3 Set of male connectors for Interfaces

The connector kit includes the following plugs:

PLC IN / AUDIO,

PLC OUT,

RECORDER,

PRESSURE GAUGE,

VALVES,

ACCESSORIES

4 Installation



WARNING

Injury to back due to heavy weight

- Carry the Modul1000 with two persons.

4.1 Mechanical installation

- The Modul1000 is suitable for mounting underneath and above table workstations.
- The leak detector may only be operated on a horizontal surface.



WARNING

Risk of injury due to the device falling down

- Place the device on a level and non-slippery surface.



CAUTION

Risk of stumbling over lines

- When laying lines or connecting a sniffer line, make sure that trip hazards are avoided.

NOTE

Material damage from overheated device

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

- Please note the technical specifications. The maximum permissible ambient temperature must not be exceeded during the operation of the Modul1000!
- Ensure there is adequate ventilation especially at the air inlet and air outlet openings.
- Keep heat sources away from the device.

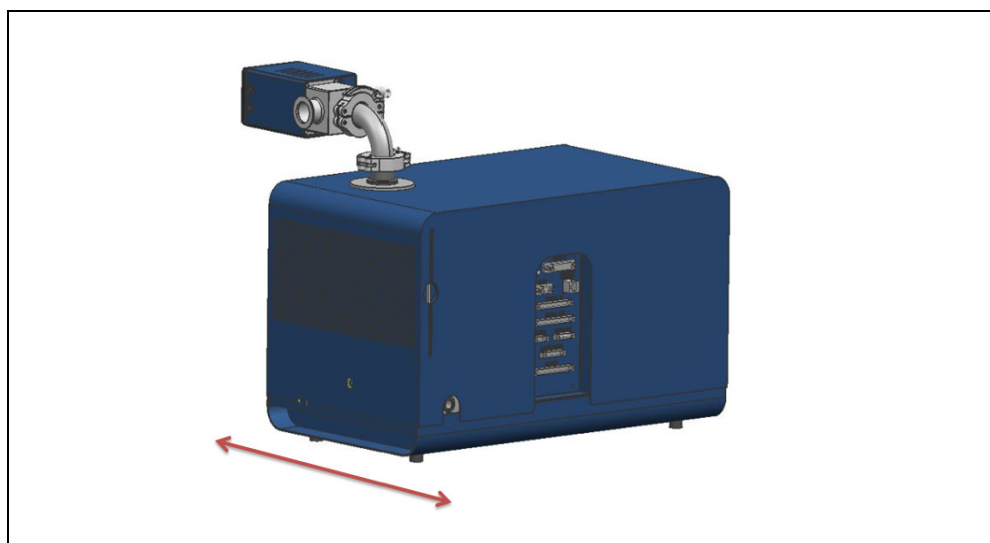
NOTE

Material damage due to strong vibrations

Depending on the applications connected, the device may be exposed to strong vibrations or shocks that may damage the device.

- If shock or vibrations are to be expected, use flexible connections for the connection of the device and if possible avoid direct connections.
- In such cases, use flexible connections for the connection of test chambers, angle valves or similar accessories.

The following figure illustrates the impact and vibration direction when using angle valves, test chambers or similar accessories:



NOTE

Material damage due to contamination of the vacuum area

If objects or particles enter the vacuum area of the device, the device may be damaged.

- Be careful that objects or particles do not get into the device each time you unplug the connectors.
- Ensure the presence and functionality of built-in filters.

4.2 Electrical installation

4.2.1 Power supply

The socket for the connection of the mains voltage is located on the rear panel (see [Fig. 3-2/ 9](#)).

Place the device where you can always reach the mains plug.



WARNING

Danger from electric shock

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

- Only use the included 3-wire power cable.
- Only move the device when the power cord is not plugged in.
- Check the power cord for damage before each use.

4.2.2 Electrical interfaces

All the electrical interfaces of the Modul1000 are clearly arranged in a connection panel (See [Fig. 3-2](#)).

NOTE

Measurement results can be falsified

To avoid undesired influence on measurement results, observe the maximum cable lengths.

- CONTROL UNIT: 5 m shielded (INFICON accessories)
- RS232: 3 m
- REMOTE CONTROL: 30 m
- PLC IN / OUT: 30 m
- RECORDER: 30 m
- PRESSURE GAUGE: 30 m
- ACCESSORIES: 3 m
- VALVES: 30 m

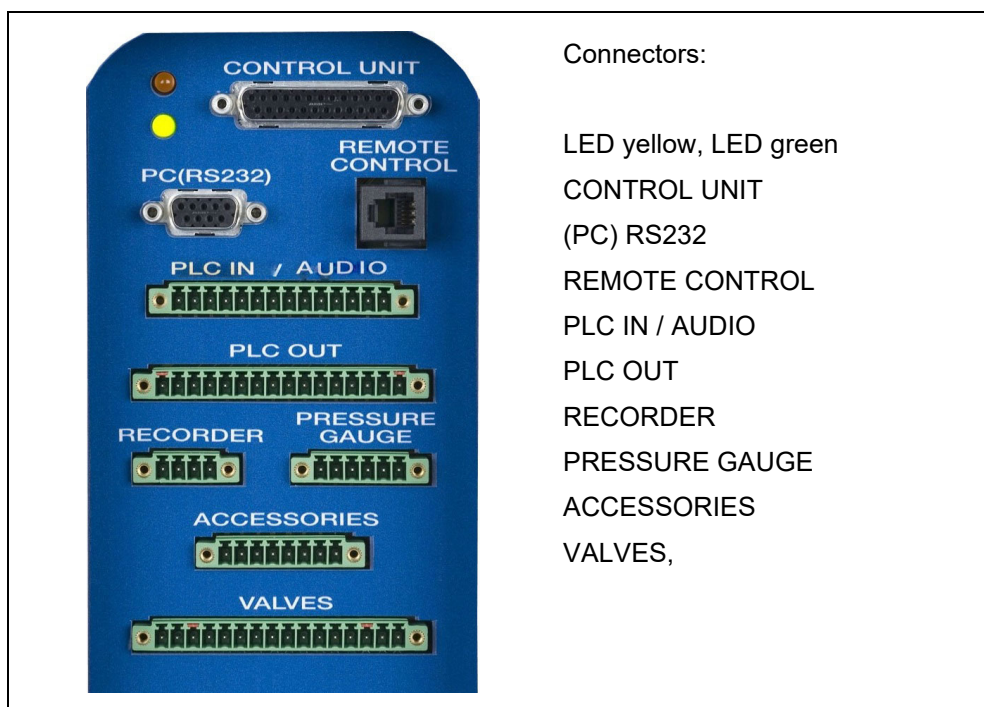


Fig. 4-1 Electrical interfaces

Valves

Via the VALVES connection, external valves can be controlled.

PLC inputs and outputs

The connector plug set should be used to connect the control inputs and outputs (PLC IN / PLC OUT). The connectors are not included in the scope of supply.

Control unit

The "operating unit table version" or "operating unit rack version" is connected to the CONTROL UNIT connection via the corresponding connection cable.

Remote control

The cable-connected RC1000 remote control is connected to the REMOTE CONTROL connector.

Use a ferrite on the cable (eg Würth 742 711 31). Lay the cable twice through the ferrite and place it as close as possible to the 14-pin connector.

Sniffer line SL200 or Test chamber TC1000 (ACCESSORIES)

The sniffer line SL200 or the test chamber TC1000 can be connected to the connection ACCESSORIES.

Use a ferrite on the cable (eg Würth 742 711 31). Lay the cable twice through the

ferrite and place it as close as possible to the 14-pin connector.


External Pressure measurement points

If the Modul1000 is used in commander mode, an additional pressure measuring point must be connected to the PRESSURE GAUGE connection. Connect the pressure measurement point to the eight-pin Phoenix connector "PRESSURE GAUGE" as follows.

Contact	Assignment
1	24V fused with F3 on the interface board (0.8A, maximum output current at this contact together with contact 1 at the PLC IN connector)
2	GND
3	Input 1
4	GND to input 1
5	Input 2 (not supported by the current software)
6	GND to input 2

Notice The pressure transmitters to be connected can be supplied via the contacts 1 and 2 from the Modul1000.
If the power supply is supplied from external power supplies, it must be noted that the contacts 4 and 6 must have a maximum potential of $\pm 4V$ compared to contact 2. Otherwise there is a risk of damage.

Notice The sensor is adjusted correctly by the zero point and full scale of the output curve.



DANGER

Danger to life due to electric shock!

- Before opening the housing, disconnect the leak detector from the mains!

The Modul1000 can process measured values in the form of current and voltage. In the delivery state, input 1 is configured for current measurement 4 - 20 mA, input 2 is for voltage measurement 0 - 10 V.

In order to change the configuration of the input of the pressure measuring point, the corresponding jumper must be inserted on the interface board inside the Modul1000. Open the device to do this.

The jumpers are located on the interface board and are accessible after opening the hood.

By switching the jumper to plug-in contact XP5, the setting of the input 1 can be changed. For a current signal, pin 1 and 2 is connected by XP5, for a voltage signal pin 2 and 3.

By changing the jumper to plug-in contact XP4, the setting of input 2, which is not supported in the current software, will change.

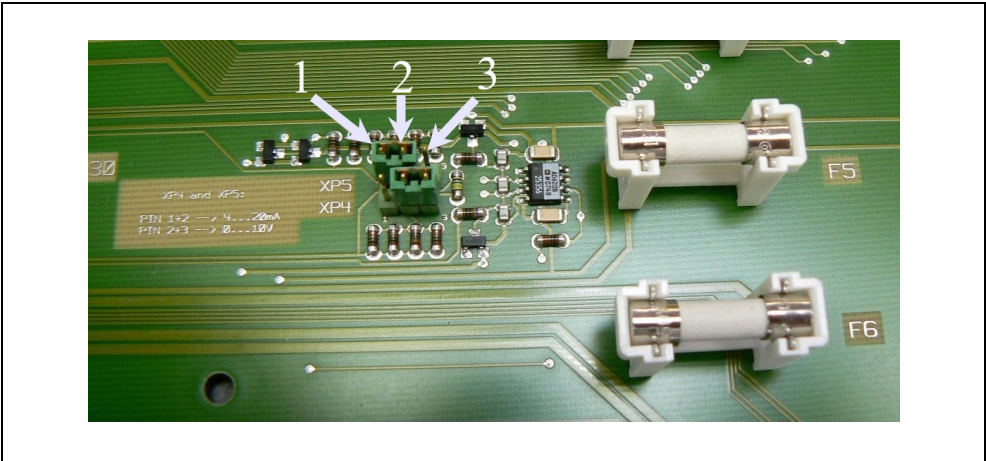


Fig. 4-2 Jumper XP5 and XP4

Item	Description	Item	Description
1	Pin 1	3	Pin 3
2	Pin 2		

Analog Recorder output

Both of the recorder outputs can be used to record the leak rate, the inlet pressure, and the foreline pressure.
The output voltage is updated every 50 ms.

Contact	Assignment
1	Analog output 1
2	GND
3	GND
4	Analog output 2

RS232 interface

A PC can be connected directly to the Modul1000 via the RS232 interface.
The Modul1000 is then controlled by means of corresponding command sets as described in the interface description.

Contact	Assignment
1	24 V can be connected via jumper XT2, max. current consumption 0.3 A (pin 2 and 3 connected). In the delivery state, 24 V is not connected (pin 1 and 2 connected).
2	TxD
3	RxD
4	GND 24V can be connected via jumper XT1 (pin 2 and 3 connected). In the delivery state, GND 24 V is not connected (pin 1 and 2 connected).
5	GND RS232
6	Not connected
7	Not connected
8	Not connected
9	Not connected

With the plug-in bridge field XT1 or XT2, earth or 24V can be connected to the RS232 interface by switching the respective plug-in bridge (pin 2 and 3). Delivery state: XT1 or XT2, pin 1 and 2 bridged \cong "Factory settings (Standard) RS232".



DANGER

Danger to life due to electric shock!

- Before opening the housing, disconnect the leak detector from the mains!

The jumpers are located on the interface board and are accessible after opening the hood.

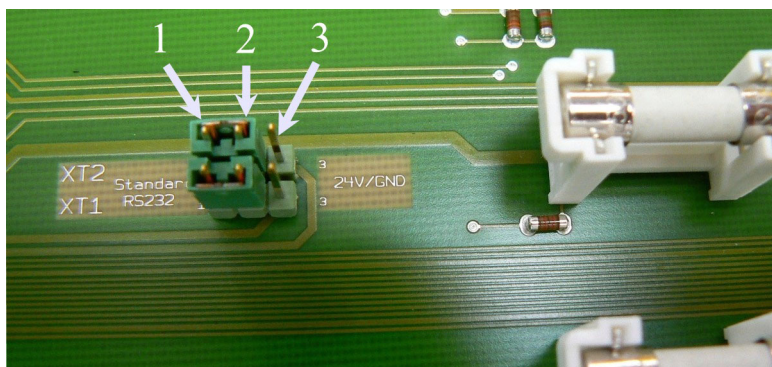


Fig. 4-3 Jumper XT2 and XT1

Item	Description
1	Pin 1
2	Pin 2
3	Pin 3

4.2.3 Vacuum equipment connections

Backing pump

The backing pump connection is located on the left front of the device or on the bottom. As an alternative, the pump connection can also be made on the right side in the vacuum version of the Modul1000.

- 1** Unscrew the connection flange with the open-end wrench AF13 to remodel it and remove the seal.
- 2** Unscrew the plug of the connector that you are going to use
- .
- 3** Screw the plug with the seal into the opening of the remote connection flange.
- 4** Screw the connection flange with the seal.

Notice With the sniffer version of the Modul1000, only the pump connection on the left side and on the bottom can be used.

The backing pump used must meet the following specification:

- The connecting hose should not be less than a minimum diameter of 15 mm.
- The backing pump should have a pumping speed of $> 2 \text{ m}^3 / \text{h}$ and
- an achievable final pressure of $< 1 \times 10^{-2} \text{ mbar}$.

If the backing pump has a magnet-controlled gas ballast valve or flushing gas valve, this can be controlled via the valve output V22 of the Modul1000.

DUT/Test system

The connection to the DUT or the test system is via the DN25 KF inlet flange on the top of the Modul1000.

In order to be able to measure with the leak detector even at pressures higher than 0.4 mbar, the orifice supplied can be installed in front of the inlet of the leak detector. If the orifice is mounted in the suction line of the leak detector, the maximum inlet pressure is 3 mbar.

Since the pumping speed is greatly reduced when using an orifice, the evacuation with a partial flow pump makes sense.

In order to obtain short signal response times of the Modul1000, the orifice should be mounted as close as possible to the DUT / test system.

The Modul1000b has the orifice already installed and can also measure up to 3 mbar.

Notice The maximum permissible load perpendicular to the flange is 400 N.

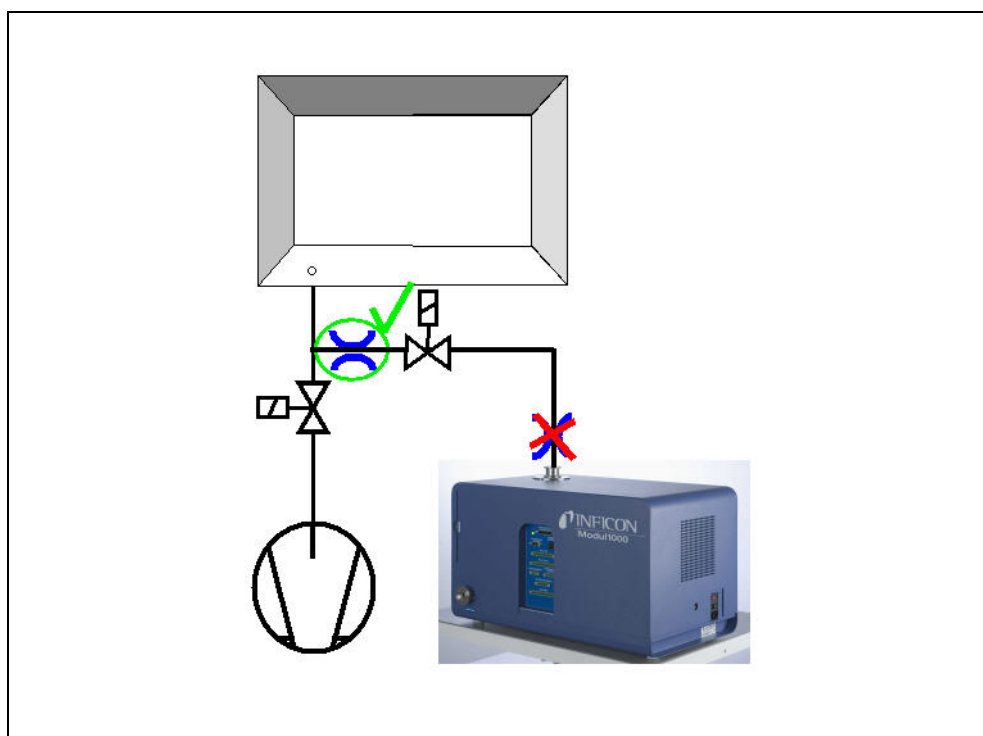


Fig. 4-4 Installing the orifice

Ventilation

Normally, the DUTs or connected vacuum chambers are vented with ambient air after the test has been completed. If necessary, the DUTs can be vented with a different gas (e.g. fresh air, dry air, nitrogen, etc.) to atmospheric pressure. In these cases, the gas supply must be connected to the flood connection (8 mm hose connection) on the left side of the device. The gas pressure at the flood connection must not exceed 1100 mbar (absolute).

An external venting valve can be connected to valve outlet V21.

Sniffer line

The connection for the sniffer line is only available with the sniffer version of the Modul1000 (catalog number 550-310). This connection can be connected to the optional SL200 sniffer line. The electrical connection of the SL200 is made via the ACCESSORIES connection socket.

5 Operation modes

The following vacuum operating modes are available:

- Vacuum,
- Commander,
- Auto Leak Test.

In these operating modes, a partial flow pump can additionally be used.

In the sniffing version of the Modul1000 there is also the operating mode:

- Sniff.

5.1 Vacuum

In normal vacuum mode, the Modul1000 is operated as a "stand-alone" leak detection device.

The DUT or the vacuum chamber is evacuated only via the inlet flange of the leak detector. The pumping speed at the inlet of the leak detector is dependent on the backing pump used and the internal conductance of the device.

From a pressure of less than 0.4 mbar, the device changes to measuring mode and outputs the currently measured leak rate.

The pumping speed at the inlet when measuring is only determined by the device internal turbo molecular pump and is 2.5 l/s.

5.2 Partial flow mode

In order to increase the effective pumping speed at the vacuum chamber or the DUT, an external partial flow valve can be connected to the valve outlet V20. The increased pumping speed accelerates evacuation processes and the signal response time of the Modul1000.

Depending on the setting, the partial flow pump can only be connected via an external partial flow valve only during evacuation or during evacuation and measurement. If the partial flow pump is also switched on during the measurement, the pumping speed of the partial flow pump for helium must be taken into account by setting the machine factor accordingly (see Chapter 6.9). External calibration is also recommended (see Chapter 6.6).

An additional external ventilation valve V21 can be connected for fast ventilation.

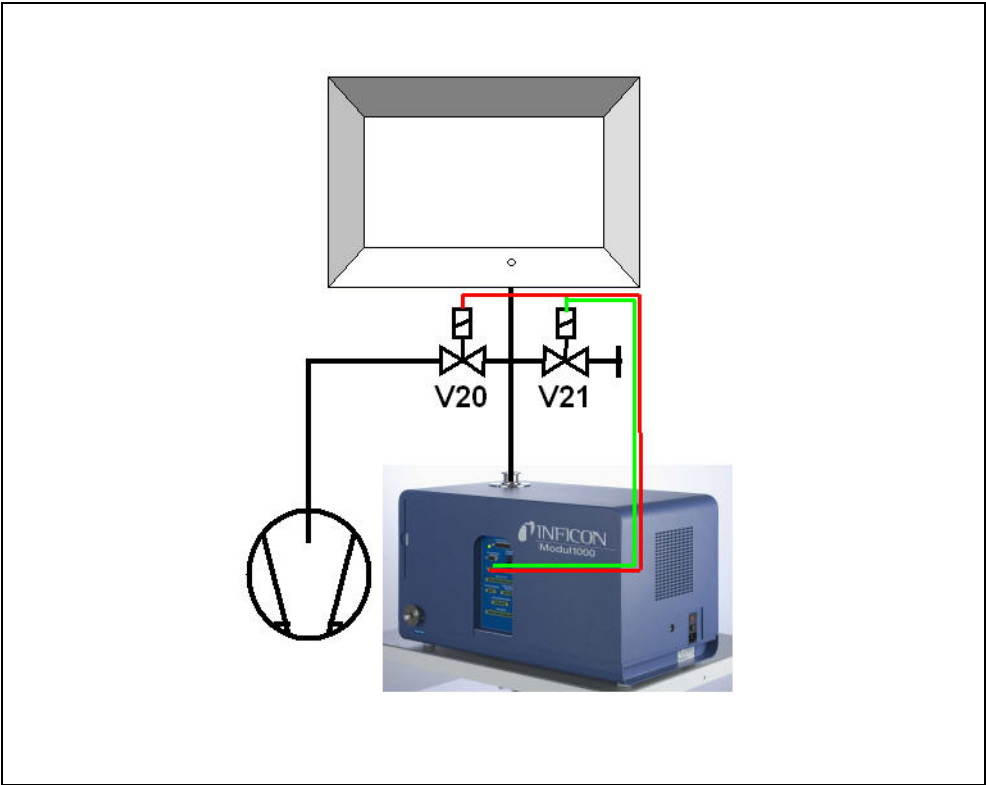


Fig. 5-1 Partial flow mode

Item	Description	Item	Description
V20	Partial flow valve	V21	Venting valve

5.3 Auto Leak Test

In Auto Leak Test operating mode, components filled with helium can be tested integrally in a vacuum chamber. The Modul1000 takes over the entire control of the test sequence.

The test sequence is divided into the following steps:

Evacuating the vacuum chamber,

Measuring the leak rate and

subsequently ventilating the vacuum chamber.

At the end of the test, if the leak rate exceeds the set trigger value during the measurement period, the device outputs "PASS" via the control unit. If the trigger is exceeded, the device outputs the message "FAIL".

The test can alternatively also be carried out in partial flow mode.

After activation of START, the entire test sequence runs automatically. When the optional test chamber TC1000 is used, the test sequence starts automatically when the chamber lid is closed.

5.3.1 Auto leak test settings

The Auto Leak Test operating mode can be selected via the control unit or the RS232 interface.

The test sequence can be individually adapted to your leak detection application. The corresponding settings can be made via the control unit or the RS232 interface (see interface description).

Measuring time

The measuring time starts as soon as the Modul1000 changes from the evacuation phase to the measuring mode. A minimum and a maximum measuring time can be entered.

If the trigger level 1 is not reached after the minimum measuring time has elapsed, the measurement is terminated with "PASS".

If the trigger level 1 is exceeded after the maximum measuring time has elapsed, the measurement is terminated with "FAIL".

Otherwise the measuring result is displayed after the measurement time has elapsed.

Trigger level

If the set trigger level 1 is exceeded at the end of the measuring time, the Modul1000 outputs the message "FAIL" and thus signals a leaking DUT.

Parts number

A part counter can be activated in the software menu, which assigns a number to the individual measurement cycles. The last 12 measurement results can be displayed with the date and test result on the "Test Log" menu page.

Serial error message

The software menu can be used to set a serial error message after a certain number of consecutive measurements with the result "FAIL". The number of consecutive measurements necessary for Modul1000 to issue a serial error message can be set between 2 - 9. It can also be deactivated.

In order to ensure that such an accumulation of successive "FAIL" measurements is not caused by helium background in the test equipment, a reference measurement is recommended.

Reference measurement

For a test system contaminated with helium, it is possible to perform a reference measurement. In the software menu, you can set whether a reference measurement is allowed. If it is approved, it can be called up in the measurement screen.

During a reference measurement, the Modul1000 determines the internal helium background of the test equipment and deducts this from the measuring results during the following measurement cycles.

To reduce the level of the of the test equipment background, the vacuum system of the installation is evacuated and ventilated three times during a reference measurement before the actual background measurement.

5.4 Commander Operation

If the Modul1000 is integrated into a leak detection system, it can take over the control of the entire integral chamber test procedure in Commander Operation. All necessary valves for the helium filling of the DUT, as well as the necessary pressure measuring point, can be connected directly to the Modul1000. The test run supports a device for helium recovery, too.

The test can alternatively be carried out in partial flow mode to accelerate the leak detection process.

5.4.1 Construction of a leak detection system

The construction of a leak detection system with the Modul1000 commander function corresponds essentially to that of a conventional integral leak test system.

The vacuum chamber is evacuated by the Modul1000, alternatively also in the partial flow mode (Fig. 5-1 Partial flow mode). The DUT located in the vacuum chamber is connected to the helium filling device through the chamber walls and is charged with helium in the evacuated state of the vacuum chamber.

As a result of the pressure difference between the helium pressure in the DUT and the vacuum in the vacuum chamber, for a leaky DUT, helium flows from the leakage into the vacuum chamber and further into the leak detector where it is quantitatively detected as a leakage gas stream.

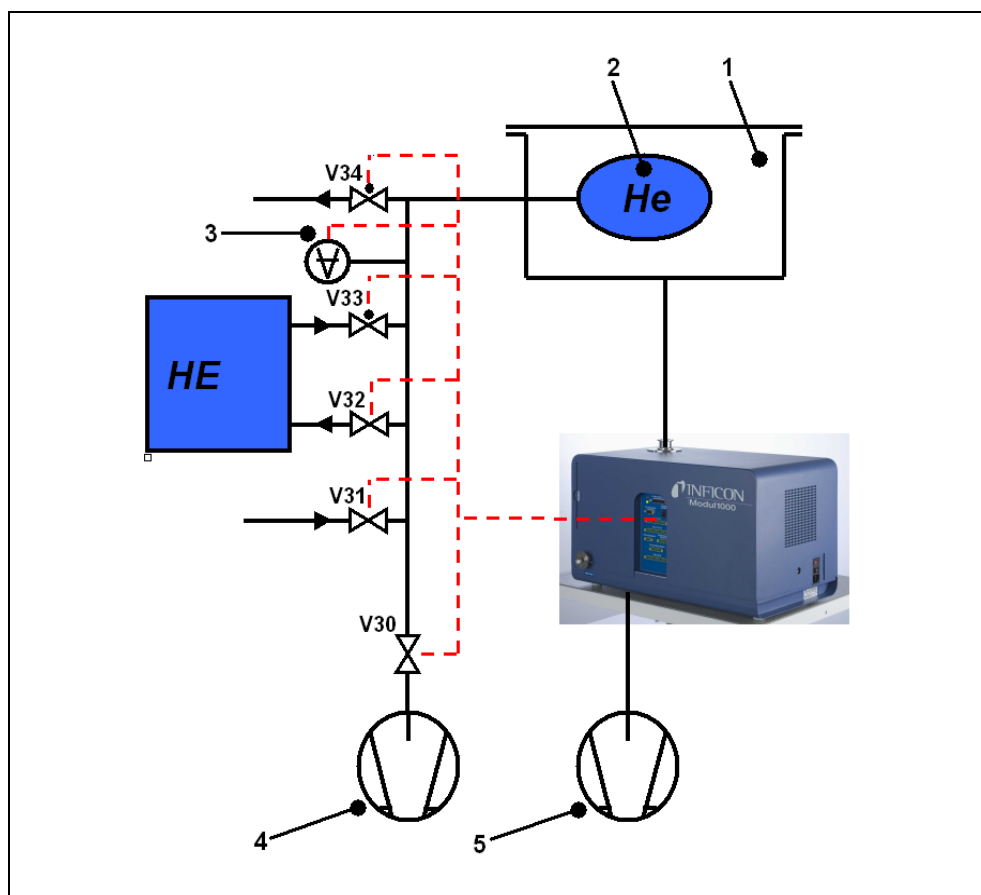


Fig. 5-2 Leak detection system

Item	Description	Item	Description
V30	Evacuate valve (DUT)	1	Vacuum chamber
V31	Flood valve (DUT)	2	Device Under Test (DUT)
V32	Valve for helium recovery	3	Pressure measuring point
V33	Filling valve (DUT)	4	Vacuum pump (DUT)
V34	Emergency valve (open without power)	5	Backing pump (Modul1000)

Helium filling device

The helium filling device consists of the vacuum pump, the valves V30 - V34, a pressure measuring point and the helium supply.

Valves V30, V31, V32, V33, V34

The test sequence of the Commander Software includes the control of all necessary valves belonging to the helium filling of the DUT. The control of the valves takes place via the connection "VALVES".

Notice We recommend using pressure-operated valves.

Pressure measuring point

The helium supply of the DUT and a heavy plate test contained in the test sequence are pressure-controlled and therefore require a pressure measuring point which covers a measuring range of < 50 mbar up to the maximum filling pressure of the DUT. The characteristic curve and the measuring range of the measuring point used must be set at the Modul1000. The pressure measuring point is connected via the "PRESSURE GAUGE" connection on the right side of the device.

Vacuum pump

The DUT is evacuated via the vacuum pump before filling with helium in order to largely remove the air contained in the component. A pump with a final pressure < 50 mbar is recommended.

5.4.2 Test procedure

- 1** The DUT is located in the vacuum chamber connected to the Modul1000 inlet. The DUT is connected to the helium filling device by a suitable coupling.
- 2** After initiating the START signal, the Modul1000 starts evacuating the vacuum chamber. If a partial flow pump is connected to the Modul1000, the partial flow valve V20 (Fig. 5-1) is controlled and the test sequence is supported according to the partial flow setting by the partial flow pump.
- 3** Prior to the actual helium test, a heavy plate test is carried out in order to establish coarse leakages at the DUT or the leak detection system. When the chamber pressure of 100 mbar is reached, a check is made as to whether the DUT pressure has fallen and has fallen below the preset pressure $p_{A_Grobleckstest}$ (gross leak test). If this is the case, the measuring cycle is terminated with the error message 91.
- 4** If the system passes the gross leak test, the valve V30 opens and the DUT is evacuated. If the DUT pressure falls below the prescribed pressure ($p_{B_Abpumpdruck}$) within the prescribed time ($t_{A_Abpumpzeit}$), the valve V30 closes. Otherwise, the measuring cycle is terminated with error message 92.
- 5** If the chamber pressure falls within the preset time ($t_{F_Meterbereitschaft}$) to the switching pressure, the device changes to measuring mode. This switching pressure is in the menu:
 "Main menu --> Settings --> Monitoring --> Pressure limits for vacuum ranges"
 settable between 0.2 mbar and 0.4 mbar.
 Depending on the "background suppression" setting, an automatic background subtraction may be performed:

- When set to "OFF": Zero is not performed
- When set to "ON": A zero is performed after the time $t_{B_Zeroverzögerung}$ (zero delay)
- When set to "Stable": A zero is performed within the time $t_{B_Zeroverzögerung}$ (zero delay) if the leak rate signal is stable enough to detect a leak in the magnitude of the set trigger level 1. If this condition is not fulfilled within the time $t_{B_Zeroverzögerung}$ (zero delay), the measuring cycle is terminated with error message 98.

If the chamber pressure is not low enough for switching to the measuring mode within the preset time $t_{F_Messbereitschaft}$, the sequence is terminated with the error message 94.

- 6 After evacuating the DUT, the valve V33 is opened and the filling process of the component begins with helium. If the pressure in the DUT reaches the set filling pressure $p_{C_Fülldruck}$ within the set time $t_{C_Füllzeit}$, the valve V33 is closed again and the filling process is completed. If the filling pressure is not reached in time, the measuring cycle is terminated with error message 93.
- 7 The actual leak testing is now started. After the set time $t_{G_Messzeit}$ has elapsed, the measured leak rate is output. If, during the leak test, the test piece pressure falls below the pressure $p_{E_Druckabfallschwelle}$ due to a leak in the system, the measuring cycle is terminated with the error message 99.
- 8 After the measuring time has elapsed, the valve V32 is opened. The helium is returned from the DUT to the helium filling device until the pressure in the DUT has reached the release pressure $p_{D_Entspanndruck}$. V32 is then closed again.
If this is not done within the predetermined time $t_{D_Entspannzeit}$, the measuring cycle is terminated with the error message 95.
- 9 In order to remove the remaining helium from the DUT, the valve V30 is opened and the DUT is evacuated via the pump 4 to the pressure $p_{B_Abpumpdruck}$.
This must be done within the specified time $t_{A_Abpumpzeit}$, otherwise the measuring cycle is terminated with the error message 96.
- 10 Valve V30 is closed. The DUT is vented to atmospheric pressure via valve V31.
If the predefined DUT pressure $p_{A_Groblecktest}$ is not reached within the time $t_{E_Belüftungszeit}$, the measuring cycle is terminated with the error message 97.
- 11 Subsequently, the vacuum chamber is ventilated to atmospheric pressure by the Modul1000 (and the external Flood Valve V21 (Fig. 5-1) if connected).

5.5 Sniffer mode

The Modul1000 in the sniffer version can be used as a vacuum as well as a sniffer device.

To be able to use it as a sniffer leak detector, the optional sniffer line SL200 must be connected to the "Sniff" connector on the right side of the Modul1000. In the measuring mode, the module then sucks a constant gas stream through the sniffer line. Helium contained in this gas stream is output as a leak rate.

In the sniffer mode, the detection limit is limited to $< 1 \times 10^{-7}$ mbar l/s by the high atmospheric helium background.

The gas flow through the sniffer line is approx. 25 sccm.

The electrical connection is made via the "ACCESSORIES" connector.

The setting "Operating mode" must be set to "Sniff".

In the "SNIFF" mode, the red LED on the sniffer probe signals a bad DUT and the green LED indicates a good DUT.

For sniffer lines with active buttons on the sniffer probe, the external background suppression can be switched-on. Pressing the button for 3 seconds will switch off the external background suppression.

6 Operation

6.1 Switching ON or OFF

Switch ON

Install the device as described in the Chapter Installation. Connect the mains cable and switch on the device. The power switch and the power cord are located on the rear panel.

The run-up starts automatically after pressing the mains switch.

During the run-up (≤ 3 min.), the following appears on the display of the control unit:

- Rotational speed of turbo molecular pump
- Foreline pressure
- State of emission
- Active cathode
- A bar graph showing the run-up progress

After the run-up is complete, the device is in the "standby" state.

Switch OFF

NOTE

Material damage caused by penetrating oil

Switching off the external backing pump can cause oil to seep into the running leak detector and cause damage to it.

- Switch off the leak detector first!
- Only then switch off the backing pump.

NOTE

Turbomolecular pump can be damaged

- Make sure that no foreign objects enter the inlet of the leak detector.
- Do not move the leak detector jerkily during operation.
- Do not move it until 2 minutes after it has been turned off and the inlet has been vented. Otherwise, do not move it for 6 minutes.

6.2 Status LED

The LED indicates the operating condition of the device:

Operating status	Green LED	Yellow LED
Run up	Flashes alternately	Flashes alternately
Standby / Vent	on	off
Evacuate	on	Flashes slowly
Measuring	on	on
Calibration	Flashes synchronously	Flashes synchronously
Errors / Warnings / Maintenance messages	off	Flashes quickly

6.3 Controller

The Modul1000 can be controlled via the control unit, via a remote control, via the PLC inputs or via the RS232 interface. The menu item "Control location" is used to select from these options.

(See: Main menu → Settings → Interfaces → Control location)

Control unit

Using the optional control unit, all device functions can be programmed, controlled and read out.

The functions and the structure of the control units for table operation (see Kap. 3.3.1) and the device operation for installation in a control cabinet (see Kap. 3.3.2) are identical.

Remote control

The basic functions Start, Stop, Vent and Zero can be carried out using the optional remote control (see Kap. 3.3.3). Also, the volume can be changed.

If the "LOCK" display is active, the control of the Modul1000 has been disabled via the remote control within the menu point "Control location".

RS232 interface

A PC can be connected directly to the Modul1000 via the RS232 interface.

The control commands are then sent to the device via corresponding interface commands as described in the interface description.

PLC inputs and outputs

The most important control commands can also be sent to the module1000 via a PLC. The functions of the inputs and outputs are configurable.

6.4 Control commands

The following control commands can be sent to the Modul1000 via the corresponding buttons on the optional control unit / remote control, via the PLC control inputs or via the RS232 interface.

START

When the control unit is connected, the LED in the START button flashes during the evacuation process.

It lights up continuously during the measurement.

If the control unit START activates in the active measuring mode, the maximum leak rate display (holding function) is activated. The largest leak rate measured since the start is displayed.

Pressing the START button again initializes this hold function.

The LED in the button signals the sequence:

LED flashes:	Evacuate
LED on:	Measuring mode

When START is activated, Modul1000 starts evacuating the connected DUT.

If the pressure at the inlet of the leak detector reaches a pressure of <0.4 mbar, the Modul1000 automatically changes to the measuring mode.

This pressure threshold is in the menu

"Settings → Monitoring → Pressure limit for vacuum range"

Configurable.

STOP / VENT

The STOP command terminates the measurement and the leak detection device changes to the "Standby" state.

Pressing the STOP button briefly interrupts the measurements.

If the button is pressed longer, the inlet is ventilated according to the conditions defined in the "Delay of ventilation" menu.

LED on: Inlet flooded.

ZERO

Pressing the ZERO button activates the background suppression. To cancel the background suppression, simply press the ZERO button again for 3 seconds.

The function of the ZERO button is indicated by the LED:

LED on: ZERO enabled

Notice The ZERO function should first be activated when the leak rate signal is stable. In the setting I•Zero, the ZERO function can only be used if the falling background signal is stable.

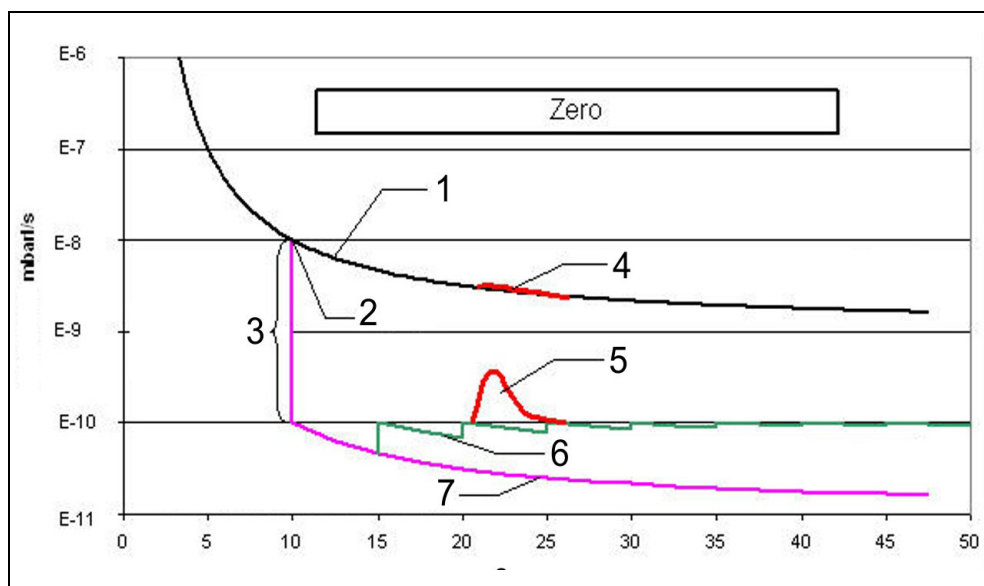


Fig. 6-3 Zero function (background suppression)

MENU

Press the MENU button to display the selection menu on the display.

Displaybuttons

The function of the eight buttons on the left or right of the display depends on the currently selected menu level. The respective functions are then described in the display.

Numerical input

If a menu page has been opened in which numeric entries can be made, proceed as follows:

- If no numerical value is to be changed, button no. 1 should be pressed to cancel.
- The number whose value can be changed is displayed inverted. The position to be changed can be selected using (button no. 8) and (button no. 4).
- To change the digit at the selected point, press the button with the corresponding digit pair.

A sub-menu opens, in which the desired digit value can be selected.

After selection, the sub-menu closes automatically and the next input point of the whole number is displayed inverted and can be changed.

After the last digit has been reached, all corrections must be confirmed by pressing the "OK" button.

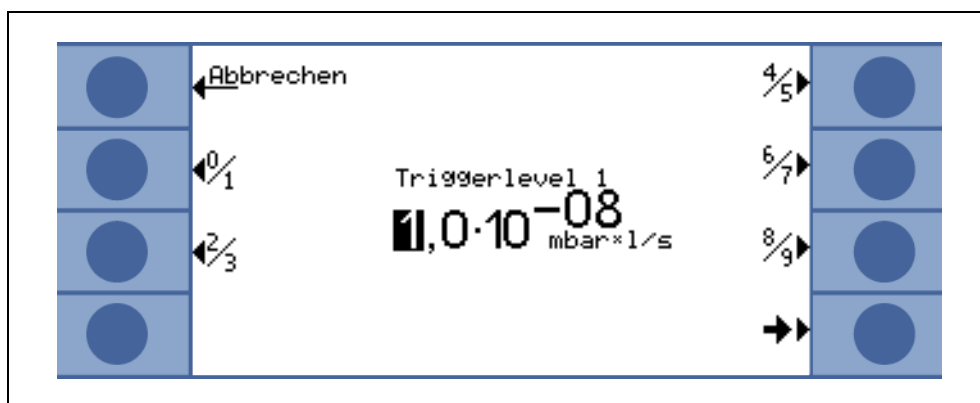


Fig. 6-4 Example of a numerical input of trigger level 1

To change the trigger threshold from 1.0×10^{-9} mbar l/s to 3×10^{-9} mbar l/s, press button 2/3 (button no. 3). A sub-menu opens in which the desired value 3 (button 4) can be selected.

6.5 Display



The display shows measured values, operating modes, device parameters and their values as well as the functions of the eight buttons on the left and right of the display.

Run up

After switching on, the Modul1000 outputs various status information via the display.

Status line

The status line at the bottom of the display outputs the following device information after the Modul1000 has run-up.

Display symbols	Meaning	Explanation
	Volume	See chapter Volume for the acoustic signal
S1, 2, 3	Trigger 1, 2, 3	If the trigger thresholds are exceeded, these symbols are displayed inverted.
• •	Covered mass	The number of points shows the mass number (4 points = helium, 2 points = hydrogen).
	Warning triangle	See Chapter 4.4.2
VAC	Operating mode	VAC, SNIFF, COMMAND or AUTO LEAK TEST indicate the selected operating mode
ZERO	ZERO	Indicates whether the background suppression function is active.
COR	Corrected leak rate	Indicates whether the leak rate is corrected with the machine factor.
Auto Leak Test	Auto Leak Test	Indicates whether the model was selected.
I•ZERO	I•ZERO	Indicates that the function I•ZERO is active.
STABLE	Stable	Indicates that the background signal is stable.

Standby

After run-up is completed the Modul1000 automatically changes to standby and is ready to measure.

Evacuate

After pressing the START button the Modul1000 evacuates the inlet. The evacuation time depends on the volume connected to the Modul1000 and the backing pump or the partial flow pump.



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As soon as the pressure at the inlet of the Modul1000 falls below the set pressure limit, the device changes to measuring mode.

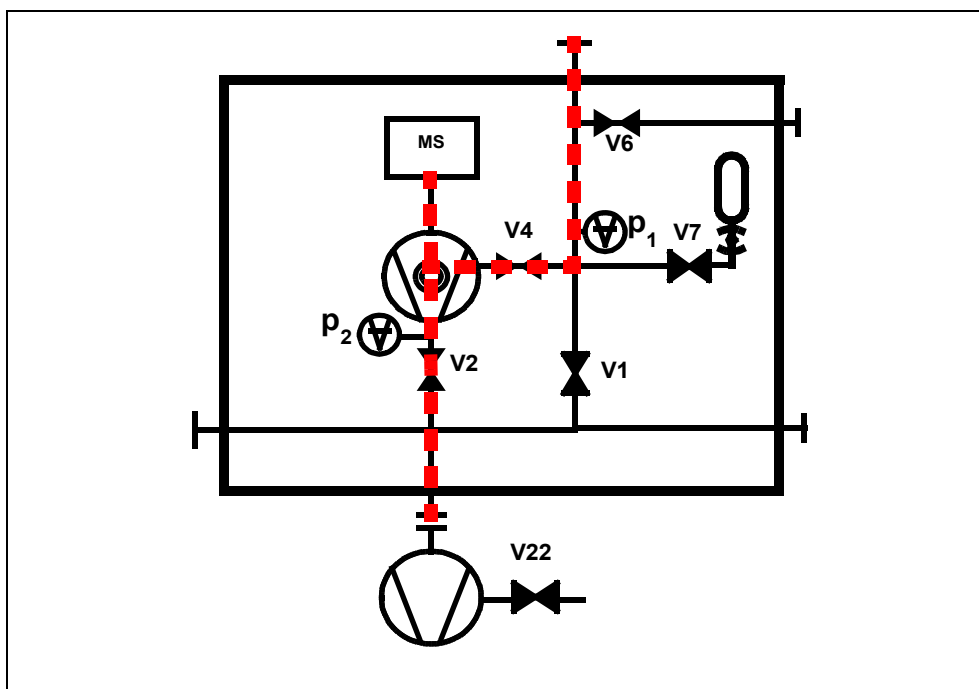


Fig. 6-6 Measuring

Measurement view

In the measuring mode two different displays can be selected for the measured value display.

- Numeric display with large numbers and as bar display

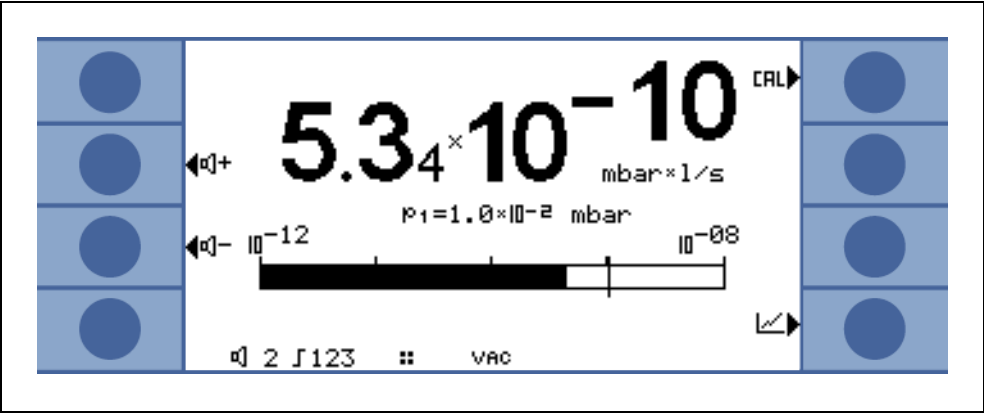


Fig. 6-7

- Graphical display as a function of the measuring time

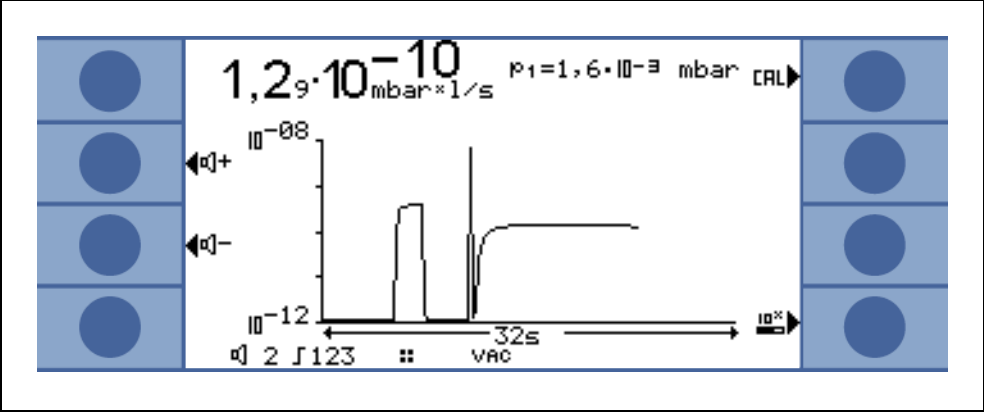


Fig. 6-8

Switching between the numeric display and the graphical display is done with button 8. It bears alternately the symbol numeric representation or graphic representation.

6.6 Calibration

Switching off the pre-amplifier test

The device tests the installed preamplifier during calibration. You can switch off of the amplifier test. This increases the speed of the calibration, but reliability drops off.	
– 0 OFF – 1 ON	
Control unit	Switch-on > Monitoring > Preamplifier test ON/OFF
Binary protocol	Commands 154 / 155
ASCII protocol	Command *CONFig:AMPTest (ON,OFF)

6.6.1 Calibration in vacuum mode

The Modul1000 can be calibrated in different ways. For each calibration the mass spectrometer is adjusted to maximum sensitivity (Auto tune).
A distinction is made between internal and external calibration, depending on the test leak used.

The calibration can be started in any of the following ways, regardless of the control location:

	Set control location
Internal manual	LOKAL, RS232 ASCII
Internal automatic	LOKAL, RS232 ASCII, RS232 BINARY, SPS
external manual	LOKAL, RS232 ASCII, RS232 BINARY, SPS
external automatic	LOKAL, RS232 ASCII

For the internal calibration, the internal test leak installed in the Modul1000 is used.
A separate test leak is needed for external calibration. External calibrations have the advantage that they can be carried out under the boundary conditions (pressure, measuring time) which are similar or equal to the subsequent measurements.

If a device operation is connected to the Modul1000, the LEDs in the START, STOP / VENT and ZERO buttons are illuminated during calibration.

Notice Before calibration, the leak detector should be warm for at least 20 minutes.

Internal calibration

When using a partial flow pump in the measuring mode, the correct machine factor must be set before the 1st calibration.

The internal calibration is also not carried out in partial flow mode when setting "partial flow in measuring mode". The correction is made via the adjusted machine factor.

Automatic internal calibration

After the calibration has been started, the entire calibration process is carried out automatically.

The signal settling time of the test leak (CAL settling time), which is adjustable in the menu, is used, which must first be adjusted to the volume at the inlet. The CAL settling time increases according to the volume connected to the inlet.

Manual internal calibration

After starting the calibration, the Modul1000 opens the internal test leak and pumps out the inlet. Depending on the connected volume, the signal settling time of the test leak increases.

Therefore, the operator must confirm that the test leak signal has reached a steady level.

External calibration

The external calibration offers the advantage that it takes account of the application-specific measurement conditions. Instead of the test object or at a suitable location of the leak detection system, a suitable calibration leak can be connected to the inlet of the Modul1000.

Calibration leaks with electromagnetic valve can be connected to the VALVES port on the back of the device. The valve is then automatically controlled by the Modul1000.

Before calibration, the corresponding value of the calibration leak, which is used to calibrate the Modul1000, must be stored in the settings of the Modul1000. This can be done via the optional control unit or via the RS232 interface.

With the setting "partial flow in measuring mode" the external calibration is carried out in partial flow mode.

Automatic external calibration

An automatic external calibration requires a calibrated leak with an electromagnetic valve.

The electrical connection is made via the "VALVES" connector.

After starting the automatic external calibration, the Modul1000 automatically runs through the entire calibration process.

The signal settling time of the test leak (CAL settling time), which is adjustable in the menu, is used, which must first be adjusted to the volume at the inlet.

The CAL settling time increases according to the volume connected to the inlet.

Manual external calibration

For manual external calibration, the test leak valve must be manually opened and closed.

The steady test leak signal must also be confirmed manually.

When using the control unit or the device control, the user is guided through the calibration routine through the display.

6.6.2 Calibrating in sniffer mode

Applies only to devices with catalog numbers 550-310 and 550-330.

Calibration in the sniffing mode is analogous to external manual calibration in vacuum mode.

With the optional sniffing cable connected to the Modul1000, both a sniffer line and the helium background must be measured.

The steady test leak signal and the steady background value must be confirmed manually.

6.6.3 Calibration in Auto Leak Test

4 types of calibration are selectable:

- internal automatic
- internal manual

- external automatic
- external manual

For external calibration, a separate test leak is required, which is attached to the chamber.

For partial flow mode, an external calibration should always be carried out.

Calibration procedure:

- 1** Manually open test leak or it opens automatically,
- 2** evacuate,
- 3** Confirm stable signal with manual calibration,
- 4** auto tune (adjust to maximum sensitivity),
- 5** vent,
- 6** evacuate, after the measurement time has elapsed, use the signal with the test leak open,
- 7** vent,
- 8** close the test leak, evacuate, apply the background signal after expiration of the measurement time,
- 9** vent

6.6.4 Calibrate in commander mode

The test gas supply is not activated during calibration.

4 types of calibration are selectable:

- internal automatic
- internal manual
- external automatic
- external manual

For external calibration, a separate test leak is required, which is attached to the chamber.

The course of the calibration is as in the vacuum mode.

6.7 Machine factor

The machine factor takes into account the fact that the Modul1000 is used in parallel with a pumping system (partial flow method).

Since, in such an installation configuration, only a part of the leakage gas flows through the leak detector, the Modul1000 outputs smaller measured values on the basis of an internal calibration by the partial flow ratio.

To prevent this, the machine factor can be stored in the software menu of the Modul1000. The measured leak rates are then multiplied by an internal calibration multiplied by the machine factor.

The machine factor can be estimated taking into account the helium pumping speed of the Modul1000 and the external pump.

The measurement of the leak rate is more accurate using an external test leak with the DUT - once with the external pump switched and once without. The ratio of the two results gives the machine factor.

The machine factor can also be used to correct the leak rate display with respect to the air equivalence.

The machine factor for this correction is: 3.7×10^{-1} .

If this setting is used, the status on the display is indicated by COR.

6.8 Menu structure

Main menu Modul1000	Display	Linear / logarithmic scaling				
		Auto / manual display range				
		Time axis				
		Contrast				
		Background in standby				
		Lower display limit				
	Operating mode					
	Trigger & Alarms	Trigger level 1				
		Trigger level 2				
		Trigger level 3				
		Volume				
		Units				
		Alarm delay				
		Audio Alarm Type				
	Calibration	Internal automatic				
		Internal manual				
		External automatic				
		External manual				
	Settings	Vacuum settings	Purge & gas ballast			
			Delayed venting			
			Partial flow			
			Auto leak test settings	measuring time		
				Trigger level 1		
				Serial error message		
				Parts number		
				Reference measurement		
			Commander functions	Commander timing		
				Commander pressure thresholds		
				Background suppression		
				Trigger 1 level		
			Machine factor			
			Internal test leak leak rate			
		Zero & Background	Background suppression			
			Zero			
		Mass				
		Interfaces	Control location			
			RS232			
External manometer			Characteristics			
			Zero point			
			Full deflection			
Define PLC output						
Define PLC inputs						
Recorder			Recorder output			
		Recorder output scaling				
Miscellaneous		Gas ballast output				
		Date / Time				
	Language					
	Leak rate filter					
	Parts number					
	CAL settling time					
	Maintenance intervals	Maintenance interval, TMP reset				
		Maintenance message for TMP				
		Maintenance interval fan filter				
		Maintenance message fan filter				
Maintenance message overall device on/off						

Main menu Modul1000	Settings	Loading / saving parameters	Save under "PARA SET 1"
			Save under "PARA SET 2"
			Save under "PARA SET 3"
			Load default value
			Load "PARA SET 1"
			Load "PARA SET 2"
			Load "PARA SET 3"
		monitoring	Calibration request
			Paging function
			Contamination protection
			Pressure limit for vacuum range
			Pressure limit for sniffing mode
			Maximum evacuation time
			Preamplifier
	Info	Display settings	
		Display internal data	
		Vacuum schematic	
		Interfaces	
		Logged data	Error list display
			Maintenance list
			Display calibration history
			Test logs
			Delete test logs
		Calibration factors	
		Service	
	Use authorization	Access to CAL function	
		Change device PIN	
		Change PIN menu	

6.9 Description of the menu items

The menu items to which the respective description refers are printed in bold letters.

Press the MENU button to display the selection menu on the display. The software menu opens at the menu level at which it was previously exited.

Press the MENU button again to exit the software menu.

When pressing the MENU button for approx. 2 seconds, the display changes to the top menu level, the main menu.

6.9.1 Main menu → **back**

Goes back to the previous page, does not change the settings.

6.9.2 Main menu → **display**

→ **Linear / logarithmic scaling**

This setting can be used to change the scaling of the bar display and the Y axis (see Chapter "Measured value display")

It can be selected between linear and logarithmic representation. Only in the logarithmic representation can the number of displayed decades be changed by pressing the "↑" and "↓" buttons.

→ **Auto / manual display range**

The upper limit of the bar graph as well as the graphical display can be set manually or automatically.

- **Manual:**
If you select manually, you can set any upper display limit between 10^{+3} mbar l/s and 10^{-8} mbar l/s for the bar display or for the Y axis for graphical leak rate display.
The lower display limit is determined by the scale setting (see Chapter Linear logarithmic scale).
- **Automatic:**
In the "automatic" setting, the bar display and the Y axis are automatically tracked when the display area is above or below the display of graphical leak rate display.

→ **Time axis**

The length of the time axis in the trend mode can be changed in several steps from 16 to 960 s.

→ **Contrast**

You can change the contrast of the display. Changes to the contrast are immediately visible. Under normal conditions a contrast setting of approx. 50 is recommended.

If the display was set so bright or dark that menu items cannot be read anymore, the contrast can be set to the factory default as follows:

- 1** Switch off the Modul1000 and switch it on again
- 2** During the run-up phase, press buttons 3 and 7 simultaneously until you can read the display again.

This setting is only applied permanently when the setting in the contrast menu is confirmed. If no confirmation is given, the module1000 will revert to the old control settings when it is switched on again.

→ **Background in standby**

In standby mode, the device-internal helium background can be displayed.

→ **Lower display limit**

This setting limits the display of the leak rate in the measurement mode. It is effective only for the vacuum mode. The lower display limit affects the graphical leak rate output as well as the numerical leak rate output. The Modul1000 does not show any leak rates lower than the lower display limit.

The lower display limit is freely selectable between 1×10^{-5} and 1×10^{-11} mbar l/s.

6.9.3 Main menu → operating mode

Changing the operating modes is only possible in standby mode.

The following operating modes can be selected:

- **Commander** (see Kap. 5.4)
- **Sniffing** (see Kap. 5.5)
- **Auto leak test** (see Kap. 5.3)
- **Vacuum** (see Kap. 5.1)

6.9.4 Main menu → Trigger & Alarms

→ **Trigger Level 1 (2 or 3)**

Up to three leak rate trigger thresholds can be set under these menu items. If the measured leak rate exceeds the set trigger thresholds, the Modul1000 behaves as follows:

Display: The symbols for trigger 1, 2 or 3 are displayed inverted at the bottom of the display.

Relay output: The trigger relay of the PLC outputs switches.

Alarm / loudspeaker: If trigger threshold 1 is exceeded, an alarm signal is triggered through the loudspeaker of Modul1000.

→ **Volume**



WARNING

The hearing can be damaged by the alarm signal.

The alarm level of the Modul1000 can exceed 85dB (A).

- Only use the alarm signals for a short time or use ear protection.

In the menu item "Volume", the volume of the acoustic signals can be adjusted by pressing the "↑" and "↓" buttons to the left and right of the value of the volume. In addition, the volume can also be changed in the measuring mode on the measuring surface with the buttons marked with a loudspeaker.

If a minimum volume is set in the "Volume" menu item, a lower volume than the minimum volume cannot be set in the measurement area or in the "Loudspeakers" menu item.

Beep sound: The beep sound of the Modul1000 can be switched on or off by means of the "Beep on" or "Beep off" button. If the beep sound is switched on, the module1000 signals certain status changes by a short signal sound.

→ **Units**

The units in which the Modul1000 expresses measurement results can be changed.

It is possible to choose between the pressure units mbar, Pa, atm and Torr as well as the leak rate measurement units mbar l/s, Pa m³/s, Torr l/s, atm cc/m and atm cc/s.

In the Sniff mode, the units of measure ppm, g/a, oz/yr can be selected.

→ **Alarm delay**

In order to avoid triggering of the trigger alarm by high background, for example, during an evacuation process, an alarm delay time can be set. After the Modul1000 has switched from evacuation to measuring mode, the alarm delay time starts. Trigger 1 does not trigger until the set alarm delay time has elapsed or the leak rate measured value was briefly lower than the set trigger value 1.

The alarm delay time can be variably set between zero and ten minutes. If the time is extended beyond 10 minutes, the alarm delay time automatically jumps to infinity.

→ **Audio Alarm Type**

Three different alarm types can be selected.

- **Pinpoint:**
The tone of the acoustic signal changes its frequency only within a leak rate window which comprises a range from a decade below the value of trigger threshold 1 to a decade above the value for trigger threshold 1. Below this window the sound is constantly low and above the window it is constantly high.
For example: The trigger threshold 1 is 4×10^{-7} mbar l/s. Thus the window ranges from 4×10^{-8} mbar l/s up to 4×10^{-6} mbar l/s.

- **Leakage Rate Proportional:**
The frequency of the audible signal is proportional to the bar graph display. The frequency range is 300 Hz to 3300 Hz.
- **Setpoint:**
The pitch is proportional to the leak rate. However, a tone will sound only if the leak rate has exceeded trigger 1.
- **Trigger alarm:**
If the trigger level1 is exceeded, a signal tone is output.

6.9.5 Main menu → Calibration (CAL) Vacuum operating mode

→ *Internal automatic*

If the internal automatic calibration method is selected, the Modul1000 performs the entire calibration process independently.

In automatic calibration methods, the Modul1000 automatically runs through the following sequences:

- Internal test leak is opened automatically, evacuation of the inlet
- Measuring the test leak
- Auto tune (adjustment to maximum sensitivity of the mass spectrometer)
- Internal test leak is automatically closed, measuring the helium background
- Display of the newly determined calibration

→ *Internal manual*

If a manual calibration method is selected, various inputs must be made during the calibration procedure.

- 1** Only for the external manual calibration method, if the displayed leak rate does not match the value of the test leak used, the test leak value must be entered. The internal manual calibration already starts by selecting the calibration method.

By pressing the "Change leak rate" button, the value of the test leak used can be entered (see also Chapter Changing values).

After setting the test leak value, the calibration process must be started by pressing the "Start" button.

- 2** After the calibration process is started, the Modul1000 evacuates the inlet area.
- 3** As soon as the maximum inlet pressure of the Modul1000 is reached, the Modul1000 displays an initially fluctuating measuring signal in the form of a bar display. After a time dependent on the volume associated with the inlet, this indicator stabilizes.

As soon as the bar display has assumed a stable value, this must be confirmed by pressing the "OK" button.

- 4** In a next step, the Modul1000 compares the mass spectrometer to maximum sensitivity.
- 5** For external manual calibration, the Modul1000 prompts you to close the external test leak.

Once the external test leak has been closed, confirm by pressing the OK button.

No action is required for manual internal calibration.

- 6** No inputs are required during the actual calibration phase.
- 7** In a last step, the Modul1000 saves the newly determined calibration factor.

If the newly determined calibration factor deviates by a factor of two from the calibration factor previously determined in the calibration, the acceptance of the new values must be confirmed.

Pressing "Yes" takes over the newly determined calibration factor.

Pressing "No" does not take over the newly determined calibration factor. The Modul1000 also uses the calibration factor found in the previous calibration.

→ **External automatic**

This requires the connection of an external test leak with an electromagnetic valve.

After selecting this calibration method, the entire calibration is carried out automatically. At the end of the calibration process (after approx. 25 s), a beep sounds. Then the leak detector is ready for further use.

You can set the time before opening / closing the test leak until a stable measuring signal is obtained.

→ **External manual**

- 1** Make sure the test leak is connected and open.
- 2** Read the leak rate at the test leak and compare it with the leak rate displayed. If there are any deviations, press the Edit Leak Rate button and correct the value. If the leak rates match, press *START*.
- 3** The bar display shows a signal, which may fluctuate only slightly. If this is the case, press *OK*.
- 4** Close the external test leak and confirm with *OK*.
- 5** The bar display shows a signal that cannot be reduced any further. Small fluctuations are acceptable. If this is the case, press *OK* (button no. 8).

⇒ The Modul1000 displays the old and the recalculated calibration factor.

6.9.6 Main menu → Settings

6.9.6.1 Main menu → Settings → Vacuum settings

→ **Purge & Gas Ballast**

The following functions can be selected in the "Purge & Gas Ballast" menu.

- Manual purge
- Automatic purge
- Manual gas ballast

→ **Delaying the ventilation**

By briefly pressing the "Stop / Vent" button, the Modul1000 is reset from the measuring mode to the standby mode. If the "Stop / Vent" button is pressed longer, the inlet of the device is additionally vented.

The length of time the Stop / Vent button must be pressed so that the inlet of the Modul1000 is vented depends on the time set in the "Delay ventilation" menu.

There may be a time duration corresponding to the button inscription, "no ventilation", or "immediate". If "no ventilation" is selected, the inlet cannot be ventilated by means of the stop button. If "immediate" is selected, the module1000 immediately switches to standby mode by pressing the "Stop / Vent" button.

→ **Partial flow**

The partial flow mode can be set and configured in the partial flow menu. It is possible to connect the partial flow pump separately only for the measuring operation and for the evacuation phase.

Main menu → Settings → Vacuum settings → **Auto Leak Test Settings**

→ **Measuring time**

In this software menu the measurement time can be determined in the Auto Leak test. A measurement time between 1 second and 30 minutes can be set.

→ **Trigger Level 1**

In the software menu trigger level 1, the rejection leak rate for the Auto Leak Test can be set.

→ **Serial error message**

The serial fault message function can be activated in the "Serial error message" menu and the number of consecutive "FAIL" measurements leading to the serial fault message can be determined.

→ **Parts number**

The part counter can be activated in the software menu part numbers and a start value can be determined, from which counting is performed after each test cycle.

→ **Reference measurement**

A reference measurement can be started in this software menu item.

Main menu → Settings → Vacuum settings → Commander Functions →

In the "Commander Functions" menu item, all parameters of the Commander function can be configured.

→ **Commander timing**

Here, the times for the individual sequences can be set.
The setting range is from 0.1 to 999.9 seconds

t_A pump-down time

Maximum time to reach the set DUT pressure "p_B pump down pressure"
Factory setting: 30 seconds

t_B zero delay

Time delay until ZERO is executed (if zero "enabled") or time within which I•ZERO is executed (if I•ZERO is activated).
Factory setting: 10 seconds

t_C full time

Maximum time to reach the filling pressure "p_C filling pressure" in the DUT
Factory setting: 30 seconds

t_D relaxing time

Maximum time to reach the release pressure "p_D Relaxing pressure"
Factory setting: 30 seconds

t_E flooding time

Maximum time to reach the flood pressure p_A gross leak test
Factory setting: 10 seconds

t_F measuring readiness

Maximum time to reach the measuring mode
Factory setting: 10 seconds

t_G measuring time

Time after which the leak rate signal has settled.
Factory setting: 10 seconds

→ **Commander pressure thresholds**

p_A gross leak test

Pressure to which the DUT is allowed to sink

Factory setting: 900 mbar

p_B pump down pressure

Pressure to which the DUT is pumped

Factory setting: 40 mbar

p_C filling pressure

Pressure to which the DUT is filled with helium

Factory setting: 2000 mbar

p_D relaxing pressure

Pressure to which the helium is discharged from the DUT

Factory setting: 1100 mbar

p_E pressure drop threshold

Pressure which the DUT must not fall below during the leak rate measurement

Factory setting: 1800 mbar

Main menu → Settings → Vacuum settings → Machine Factor

After internal calibration, the machine factor takes into account the ratio between the effective pumping speed of the Modul1000 and that of the system pump state in the measuring mode.

The machine factor takes into account the fact that a parallel external pumping system is used.

On the basis of an internal calibration, all measured leak rates would be too small in such a case.

The measured leak rates are multiplied by the machine factor and displayed as a result. This factor is used only in the vacuum mode (not in the sniffing mode).

The machine factor can be estimated, taking into account both the helium pumping speed of the Modul1000 and the external pump.

The measurement of the leak rate is more accurate using an external test leak with the DUT - once with the external pump switched and once without. The difference between the results determines the machine factor.

The machine factor can also be used to correct the leak rate display with respect to the air equivalence. The machine factor for this correction is 3.7×10^{-1} .

If the machine factor is not equal to 1, this status is indicated on the display by "COR".

Main menu → Settings → Vacuum settings → Internal test leak leak rate

The value of the internal test leak can be entered here.

6.9.6.2 Main menu → Settings → Zero & Background

→ **Background suppression**

Inlet area: In addition to the internal background, the background of the inlet area is also subtracted from the measuring signal by pressing the START button. The value has to be determined by means of the function "Background determination inlet area" in the "Zero & background" menu.

Only internally: The internal background is measured by pressing the START button and subtracted from the measuring signal.

→ **Inlet area background determination**

For this function, the device must be in the following state:

- Vacuum mode
- Condition ventilated (at least 1 minute)
- Inlet blank flange
- At least 20 minutes from power on.

→ **Zero**

The I•Zero function enables the ZERO button to be released only if the leak rate is stable. In this setting, the slope of the falling background signal is measured. The leak rate signal must be sufficiently stable to find a leak about the size of the set trigger 1. This is indicated by the message STABIL in the status bar. The I•Zero function is locked as long as the leak rate signal is not stable enough. (Slope of the falling background signal is $> 0.5 \times$ set trigger value1.) The set trigger value 1 is displayed in the display when the I•ZERO function is activated.

6.9.6.3 Main menu → Settings → Mass

In the "Mass" software menu, the tracer gas used for the leak detection can be changed. Choices are

- H₂ (Hydrogen)
- He (Helium)
- ³He (Helium isotope with mass 3)

6.9.6.4 Main menu → Settings → Interfaces

The electrical interfaces of the Modul1000 can be configured in the software menu "Interfaces".

Main menu → Settings → Interfaces → **Control Location**

→ **PLC**

The Modul1000 is controlled by the digital input. The START, STOP and ZERO buttons on the device are disabled.

→ **RS232**

The Modul1000 is controlled via the RS232 interface from an external computer. In this operating mode the module cannot be operated via the keyboard.

→ **All**

Control interfaces PLC, RS232 and local.

→ **Local and PLC**

The Modul1000 is controlled by the START, STOP and ZERO buttons on the device as well as via the digital inputs.

→ **Local and RS232**

The module is controlled by the START, STOP and ZERO buttons on the device as well as via the RS232 interface.

→ **Local**

The Modul1000 is controlled by the START, STOP and ZERO buttons.

Main menu → Settings → Interfaces → **RS232**

→ **Local**

The leak detector continuously sends the status and the leak rate without request.

→ **Binary**

Allows the reading of device parameters, e.g. during maintenance.

→ **UL2xxLeak Ware**

When a PC is connected to the controller, it is possible to read measured values via the software package Leak Ware.

(For the operation of the Leak Ware, see the corresponding instructions for use).

Notice The calibration function of the Leak Ware is not suitable for operation with the Modul1000. Please execute the "STORE DATA" function in the "Single Part Measurement" operating mode so that the measured value recording starts.

→ **ASCII**

Allows operation of the Modul1000 via an RS232 terminal. For details, refer to the interface description.

Main menu → Settings → Interfaces → **External Manometer**

In Commander mode, the Modul1000 must be connected to an external pressure measuring point. In the software menu "External manometer" the characteristics and the zero point as well as full stroke of the pressure gage used must be entered.

→ **Characteristics:** The characteristics can be entered: Current linear, voltage linear, current logarithmic, voltage logarithmic.

- **Zero point:** The zero point (pressure value) of the connected sensor can be assigned with the corresponding current or voltage value.
- **Full deflection:** The full deflection (pressure value) of the connected sensor can be assigned with the corresponding current or voltage value.

*Main menu → Settings → Interfaces → **Define PLC outputs***

In this sub-menu, the pin assignment of the PLC output connector (PLC-OUT) can be changed.

To define the PLC outputs, proceed as follows:

- 1** Use the left-hand arrow buttons to select the connection pin to be configured for the PLC-OUT connector
- 2** Use the right arrow buttons to assign one of the listed functions to the selected connection pin.
- 3** After the PLC outputs have been defined as required, the settings must be saved by pressing the "OK" button.

*Main menu → Settings → Interfaces → **Define PLC inputs***

In this sub-menu, the pin assignment of the PLC input connector (PLC-IN) can be changed.

To define the PLC inputs, proceed as follows:

- 1** Use the left-hand arrow buttons to select the connection pin to be configured for the PLC-IN connector
- 2** Use the right arrow buttons to assign one of the listed functions to the selected connection pin.
- 3** After the PLC inputs have been defined as required, the settings must be saved by pressing the "OK" button.

The PLC inputs and the PLC outputs can be inverted in the menu and via the serial interface. The inversion is also stored in the parameter sets.

*Main menu → Settings → Interfaces → **Recorder***

In this sub-menu, the signals to be recorded by a recorder can be assigned to the two writer outputs (analog outputs).

→ **Recorder output**

See Kap. 9.4 analog output (recorder output).

→ **Recorder output scaling**

In this sub-menu you can adjust the scaling of the recorder outputs. This setting is only effective when selecting the signals LR lin or LR log.

The upper display limit of the analog output can be set by pressing the arrow buttons to the left and right of the "Upper limit" value.

By pressing the arrow buttons to the left and right of the "scale" value, the scale can be adjusted in increments of 0.5, 1, 2, 2.5, 5, 10 volts/decade, the total range being 10 V. (Only for "LRlog")

Example for signal LRlog:

- 1** Upper limit set to 10^{-5} (= 10 V)
- 2** Scale set to 5 V/decade
 \Rightarrow Lower limit value is thus at 10^{-3} (= 0 V)

*Main menu → Settings → Interfaces → **Gas ballast Output** →*

- inverted:
Output level HIGH with closed gas ballast / purge valve
- normal:
Output level HIGH with open gas ballast / purge valve

6.9.6.5 Main menu → Settings → Miscellaneous

→ **Date / Time**

Set the time and date if necessary.

→ **Language**

The languages can be German, English, Italian, French, Polish, Katakana, Chinese or Spanish.

The default language is English.

If an incorrect language has been set incorrectly, the Modul1000 can be switched to "English" by pressing buttons 2 and 6 simultaneously.

The setting is not saved automatically, but must be made via this menu item.

→ **Leak rate filter**

The leak rate filter type can be selected here. The factory setting is I•CAL.

The abbreviation I•CAL stands for Intelligent Calculation Algorithm for leak rates. This ensures that the signals are averaged at optimal time intervals and this is based on each leak rate range. I•CAL also determines interference spikes, which bear no relevance to the leak rate signals and delivers unusually short reaction times even with low leak rate signals.

The algorithm used provides excellent sensitivity and response time; the use of this setting is strongly recommended.

The filter type Fixed uses a fixed mean time of 0.2 seconds.

→ **Parts number**

In this menu you can set the function of automatic counting of parts to be tested.

→ **CAL settling time**

This menu can be used to set the time for an internal or external automatic calibration from the opening of the test leak valve to the detection of the stable signal. The time is dependent on the volume that is at the inlet during calibration.

→ **Maintenance intervals**

- **Maintenance interval device reset** Resets the maintenance interval of the overall device (see Chapter 7 Maintenance work)
- **Maintenance interval, TMP reset** Resets the maintenance interval of the turbo molecular pump (see chapter 7 Maintenance work)
- **Maintenance message For TMP** Via the menu item "Maintenance message for TMP", the maintenance message, which appears automatically after the maintenance interval has elapsed, can be deactivated.
- **Maintenance interval fan filter** In the "Maintenance interval fan filter" menu, the maintenance interval can be set in 500-hour increments. The highest value is 4000 hours. If there is a high dust content of the air at the site, a short interval period should be selected.
- **Maintenance message fan filter** In the menu "Fan filter maintenance message", the maintenance message, which appears automatically after the maintenance interval has elapsed, can be deactivated.
- **Maintenance message for the overall device ON/OFF** The maintenance messages can be switched on or off for the overall device.

Notice Maintenance messages should be deactivated only if there is a separate maintenance schedule and the maintenance, authorizations, intervals etc. described in chapter 7 were taken into consideration.

NOTE

Material damage due to overheating

If the maintenance message is ignored and a dirty air filter is not replaced, the Modul1000 may overheat.

6.9.6.6 Main menu → Settings → Loading / Saving parameters

- **Save under "PARA SET 1"**
- **Save under "PARA SET 2"**
- **Save under "PARA SET 3"**

By pressing the buttons "Save PARA SET 1" to "Save PARA SET 3" the current menu settings of the Modul1000 can be saved.

On the menu page that appears, a new name can be given to the stored parameter set by pressing the "Change name" button.

- **Load "PARA SET 1"**
- **Load "PARA SET 2"**
- **Load "PARA SET 3"**

The previously stored parameter sets can be loaded and activated with the buttons "Load PARA SET 1" to "Load PARA SET 3".

→ **Load default value**

By pressing the "Load default values" button, one of the four factory parameter sets can be loaded:

	Default Parameter set 1	Default Parameter set 2	Default Parameter set 3	Default Parameter set 4
PLC IN Pin 3	START	START_STOP	START	START/STOP
PLC IN Pin 4	STOP	GAS BALLAST	STOP	CAL
PLC IN Pin 5	ZERO	ZERO	ZERO	ZERO ON
PLC IN Pin 6	CAL	CAL	INV GAS BALLAST ON	
PLC IN Pin 7	CAL INTERN	CLEAR	GAS BALLAST OFF	
PLC IN Pin 8	CAL EXTERN	NOT USED	NOT USED	
PLC IN Pin 9	CLEAR	NOT USED	NOT USED	
PLC IN Pin 10	GAS BALLAST	NOT USED	NOT USED	
PLC OUT Pin 3	TRIGGER 1	ERROR	MEASURE	EMISSION ON
PLC OUT Pin 4	TRIGGER 2	WARNING	ERROR	INV TRIGGER1
PLC OUT Pin 5	TRIGGER 3	EMISSION ON	MEASURE	INV TRIGGER2
PLC OUT Pin 6	ZERO ACTIVE	CAL ACTIVE	EMISSION ON	INV ERROR
PLC OUT Pin 7	EMISSION ON	GAS BALLAST	GAS BALLAST	
PLC OUT Pin 8	ERROR	CAL REQUEST	TRIGGER 1	
PLC OUT Pin 9	CAL ACTIVE	MEASURE	TRIGGER 2	
PLC OUT Pin 10	CAL REQUEST	ZERO ACTIVE	TRIGGER 3	
PLC OUT Pin 11	OPEN	TRIGGER 1	OPEN	
PLC OUT Pin 12	OPEN	TRIGGER 2	OPEN	
PLC OUT Pin 13	OPEN	TRIGGER 3	OPEN	
PLC OUT Pin 14	OPEN	REC STROBE	OPEN	

RECORDER Pin 2	LR MANTISSA	LR MANTISSA	LR MANTISSA	
RECORDER Pin 3	LR EXPONENT	LR EXPONENT	LR EXPONENT	

LR unit	mbar l/s	Pa m3/s	Pa m3/s	Pa m3/s
Pressure unit	mbar	Pa	Pa	Pa
Control location	LOCAL	LOCAL, PLC	LOCAL, PLC	LOCAL, PLC

Factory setting: Parameter set 1

6.9.6.7 Main menu → Settings → Monitoring

→ **Calibration request**

Here you can set whether or not the operator should be reminded of the need for calibration. The factory setting is "OFF".

When the calibration request is activated, a corresponding message will be displayed 30 minutes after power-up, or if the temperature in Modul1000 has changed by more than 5 °C since the last calibration.

→ **Paging function**

If the Modul1000 is connected to a wireless remote control RC1000WL, an acoustic signal can be activated, which is heard on the remote control in order to locate and identify it.

→ **Contamination protection**

When this mode is switched on, the Modul1000 will close all valves as soon as the measured leak rate exceeds the limit for the contamination protection. This will prevent an excess amount of helium from entering the mass spectrometer. Consequently, the leak detector is prevented from becoming contaminated by helium.

→ **Pressure limit for vacuum range**

In this menu, the switchover point set at the factory can be set from evacuation to the ULTRA measuring mode. This can be necessary if the Modul1000 is pumped down with gases other than air. The pressure signal of the gas type inlet pressure gage (Pirani) can then deliver the corresponding switching values of the sequence flow. This can be compensated by changing the switching point.

Factory setting: 0.4 mbar (Modul1000) or 3 mbar (Modul1000b)

→ **Pressure limit for sniffing mode**

This function is activated automatically in sniffing mode. The pressure limits define a maximum and a minimum inlet pressure. If the pressure is not within this range, error messages / warnings are output:

Foreline pressure > Maximum pressure: Error message E63 (Caliper defective)

Foreline pressure > Minimum pressure: Warning W62 (Gas flow through the caliper is too low).

→ **Maximum evacuation time**

This menu item is used to determine when a gross leak message is to be made. The gross leak monitoring works on two levels and the threshold can be adjusted when required (factory settings 30 min.).

This menu point is especially useful with series tests that always have the same test conditions.

After pressing the Start button the DUT is evacuated.

If the corresponding pressure conditions are not reached or not undershot ($p_1 < 100$ mbar or $p_1 < \text{pressure limit for vacuum range}$) during the times to be set here, the evacuation process is interrupted and a warning message is displayed. (W75 or W76)

The times to be selected depend, on the one hand, on the desired reaction time for the gross leak test, and on the other hand, on the available DUT volume and on the effective pumping speed.

If the duration is infinite, the oil level of a rotary vane pump used should be checked more frequently.

→ **Preamplifier**

Preamplifier test during calibration:

The device tests the installed preamplifier during calibration. If the test is switched off, the calibration will be faster, but the reliability will be reduced.

Preamplifier test during measurement:

In the measuring mode, the device checks whether the built-in preamplifier switches very frequently between the amplifier ranges (error message 20). This would indicate a defective preamplifier. If false alarms are generated, you can disable this test.

6.9.7 Main menu → Info

→ **Display settings**

In this picture you can see most important measurement settings.

→ **Display internal data**

This menu item goes over several pages and displays all internal data.

→ **Vacuum schematic**

The vacuum diagram of the Modul1000 is displayed. This diagram shows, among other things, which valves are currently open or closed. For partial flow mode and the use of the Commander functions, the corresponding vacuum diagrams are displayed on additional menu pages.

→ **Interfaces**

This menu item provides an overview of the interfaces (configuration and status).

→ **Logged data**

The history of errors, maintenance and tests can be displayed here.
(See below)

→ **Calibration factors**

The calibration factors for the various masses or operating modes and the machine factor are displayed.

→ **Service**

This menu item is only accessible to INFICON's authorized service personnel.

Main menu → Info → Loggeddata

→ **Error list display**

The last 12 device errors are listed.

→ **Maintenance list**

The times of the last 12 maintenance sessions are displayed.

→ **Display calibration history**

The data from the last 12 calibration procedures are displayed.

→ **Test logs**

The test logs are stored if part number is activated.

→ **Delete test logs**

The stored test logs can be deleted.

6.9.8 Main menu → User authorization

→ **Access to CAL function**

Here you can block access to the calibration function and open it.

→ **Change device PIN**

Access to the Modul1000 can be restricted by entering or changing the device PIN. If the device PIN is different from 0000, the module1000 asks for this PIN immediately after switching on. The Modul1000 cannot be used without entering the device PIN.

→ **Changing the menu PIN**

Here you can set and change a 4-digit PIN to block access to the menu via the control unit.

7 Maintenance work

The Modul1000 is a specially designed and constructed instrument for industrial use. The components and assemblies used meet the highest quality standards and are largely maintenance-free.

However, to maintain the warranty claims for the Modul1000, it is necessary to comply with the maintenance intervals listed below.

A maintenance contract for the Modul1000 with INFICON or a service partner authorized by INFICON is recommended.

7.1 Maintenance and service at INFICON

If you submit a device to INFICON for maintenance or repair, indicate whether the device is free from hazardous substances or has been contaminated. If it is contaminated, indicate the nature of the hazard. For this purpose, use a form "contamination declaration" prepared by us, which we will send to you on request. A copy of the form can be found at the end of this technical manual. Copies of the form are also permissible.

Attach the form directly to the device or attach it to the device in the package!

Notice The Declaration of Conformity is essential to ensure compliance with statutory requirements and the protection of our employees. INFICON must return devices without a "Contamination Declaration" to the sender.

7.2 General notes on maintenance

Maintenance work for the Standards is divided into 3 service levels:

- Service level I Customer
- Service level II Customer with technical training
- Service level III Authorized INFICON service technician

Maintenance work on the Service Level II and III may only be carried out by persons authorized and trained by INFICON GmbH Cologne.

Please observe the safety instructions for all maintenance work on the Standards!

If you have your own maintenance schedule and are authorized to carry out maintenance work, then you can switch off the maintenance messages. See Kap. 6.9.6.5

Notice Compliance with the following maintenance schedule is mandatory for cases where warranty claims are asserted for Modul1000. In the event, that the appropriate maintenance work was not carried out, the claim for warranty for these assemblies expires.



DANGER

Life threatening hazard from electric shock

- Disconnect the leak detector from the mains for all maintenance work!

NOTE

Material damage from pollution

- For work on the vacuum system, pay attention to a clean environment and use a clean tool.

The Modul1000 has 3 independently running maintenance counters. In detail:

- 1** Maintenance counter for air filter.
The default setting is 1500 operating hours. The maintenance counter can be varied or switched off. It can thus be adapted to the operating conditions of the device.
- 2** Maintenance counter 5000 operating hours.
Serves the inspection and cleaning of valve drives and valve block.
- 3** Maintenance counter 2 years
Serves the maintenance of the turbo molecular pump.

The reaching of one of the above maintenance intervals is displayed as a warning on the control unit of the Modul1000 each time the device is switched on. The message is generated until the maintenance interval has been acknowledged. The maintenance counter 2 is only released for acknowledgment of service levels II and III in the service menu.

Notice Compliance with the following maintenance schedule is mandatory for cases where warranty claims are asserted for Modul1000. In the event, that the appropriate maintenance work was not carried out, the claim for warranty for these assemblies expires.

Backing pump

The backing pump is not part of the device delivery. Therefore, the maintenance intervals and instructions prescribed by the manufacturer of the backing pump apply to the maintenance of the backing pump.

Damage to the Modul1000, which is clearly due to faulty behavior of the backing pump, cannot be asserted on warranty.

7.3 Maintenance plan

Assembly	Maintenance work Standards	Operating hours / years				Service level	Replacement part no.
		1500	5000	15000			
		1/4	1	2	4		
Vacuum system							
Valve block	Clean valve, replace valve seals		X ₁			III	200000594
	Dismantle and clean the valve block			X ₁		III	200002002
	Replace the flood gas line filter		1	X ₁		I, II,III	200000683
	Adjust Pirani			X		III	
	Recalibrate the internal test leak		X ₂				
Turbo molecular pump	Change the oil wick cartridge			2		II & III	200003801
	Change the bearing and the oil wick cartridge				X ₂	III	
Electrical							
Fan assembly	Replace the chassis hood filter elements	1	X ₁			I	200001552
	Clean the fan chassis & turbo pump	1	X ₁			I	

Maintenance schedule legend

- I Service level I Customer
- II Service level II Customer with INFICON training
- III Service level III Authorized INFICON service technician
- X Carry out maintenance as per operating hours or duration
- X₁ Carry out maintenance work as per operating hours
- X₂ Carry out maintenance work as per duration
- 1 Depending on environment and use
- 2 Depends on environmental influences, operating conditions, contamination, and application process (optional)

7.4 Maintenance intervals

The maintenance plan for the Modul1000 can be subdivided into three maintenance groups for an easy overview.

- 1500 Hour maintenance
- 5000 Hour maintenance
- 2 Year maintenance

1500 Hour maintenance

The 1500-hour maintenance can be performed by an operator or by a customer-own maintenance staff. The maintenance intervals can be adapted to the ambient conditions of the device and are variable.
If desired, the maintenance interval can be switched off.

To carry out the 1500 hours of maintenance, the filter cartridges in the chassis hood must be checked and replaced if they are contaminated. The replacement of the filter elements can be carried out while the device is running without opening the device hood.

For the exchange see the following Fig. 7-1.

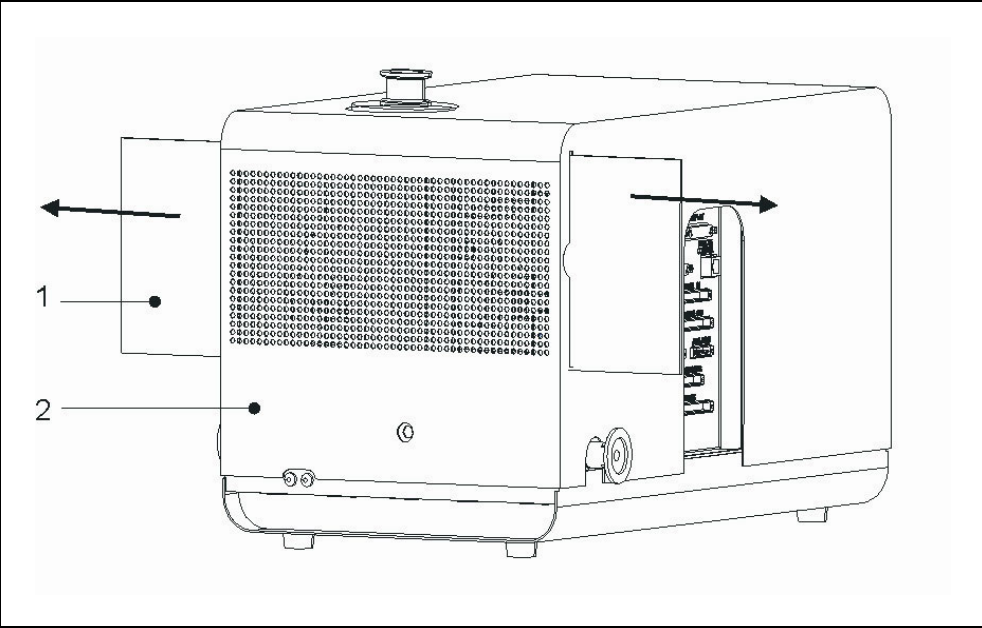


Fig. 7-1 Removing the filters from the chassis housing

Item	Description	Item	Description
1	Filter cartridge	2	Chassis Modul1000

Work to be performed	Material required	Order no.
Check / replace air filter	• Replacement filter for fan	200001552

5000 Hour maintenance

The 5000 hour maintenance should be carried out by an INFICON service technician or a person authorized by INFICON.

The valve drives must be inspected, cleaned and the valve seals or valve caps renewed every 5000 operating hours. The flood filter is to be checked depending on the application after 5000, but at the latest after 15000 hours of operation it is to be replaced.

After 15,000 operating hours, the valve block must be completely cleaned. The valve block must be disassembled for this.

Notice The internal helium standard leak has a certificate with a validity period of one year after delivery of the leak detector. It is recommended to have the certificate renewed annually by INFICON GmbH. The internal helium standard leak is checked in all functions and a new certificate is issued for another year.

Work to be performed	Material required	Order no.
Clean valve actuators, replace valve seals and valve caps (5000 hours)	• Valve seal kit	200000594
Check / replace flood filter (5000 / 15,000 hours)	• Replacement filter for flood gas line	200000683
Clean valve block completely (15,000 hours)	• Sealing kit detection system compl.	200002002
Recalibrate the internal test leak (recommended annually)		
Test and readjust Pirani sensors (15,000 hrs.)		

2 year maintenance: Oil wick cartridge (optional)

The optional 2-year maintenance of the turbo molecular pump oil wick cartridge should be carried out by a INFICON service technician or a person authorized by INFICON. Customers who have received a corresponding training from an authorized person can carry out this maintenance within their own responsibility.

The oil wick cartridge of the turbomolecular pump can be replaced after 2 years, depending on the operating conditions and contamination of the oil. Please follow the instructions in Chapter 7.6 for the exchange of the oil wick cartridge.

Work to be performed	Material required	Order no.
Replace oil wick cartridge	• Oil wick cartridge	200000577

7.5 Description of the maintenance operations


Modifications to Modul1000 which go beyond the normal scope of the maintenance measures may only be carried out by trained personnel.

The removal of the device hood is not required for maintenance purposes as described in this Chapter. Replacing a fuse however, requires opening the device. In order to avoid any possible danger with this, the procedure is described below.

7.5.1 Opening the device


Required tools

Allen wrench 8 mm

**DANGER**

Life threatening hazard from electric shock

- Disconnect the leak detector from the mains before removing the device cover!

**WARNING**

Danger for wearers of implants such as pacemakers

There is a strong permanent magnet in the device. The magnetic fields can interfere with the function of the implant when the device cover is removed.

- As a wearer of such devices, maintain a distance of at least 10 cm between the leak detector and the implant.
- Furthermore, observe the safety instructions of the implant manufacturer.

To open the Modul1000, proceed as follows.

- 1** Turn off the mains switch and remove the mains cable.
- 2** Remove the quick release ring from the test port.
- 3** Use the Allen wrench AF 8 mm to open the (ROTO-LOCK) fasteners on either side of the unit cover. See [Fig. 7-2](#) for more information.

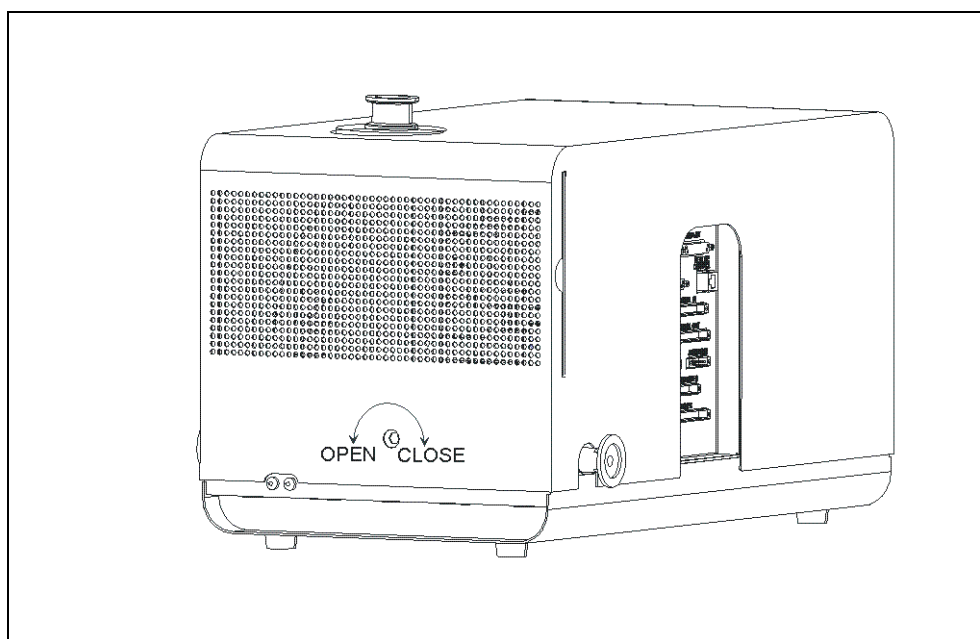


Fig. 7-2 Opening the device cover

- 1** Turn the Roto-Lock locks to the "OPEN" position.
- 2** Carefully lift off the device hood.
- 3** Proceed in reverse order when refitting the device cover. When refitting the device cover, make sure that no electrical connections are pinched between the hood and the chassis.
- 4** To close the device cover, turn the Roto-Lock locks towards the "CLOSE" position.

7.6 Replace oil wick cartridge

The turbo molecular pump is filled with an operating fluid for the lubrication of the ball bearings. The oil wick cartridge of the turbomolecular pump can be replaced after 2 years, depending on the operating conditions and contamination of the oil.

Required tools

Special tool pin wrench

Required material

Oil wick cartridge P/N: 200 000 577



WARNING

Only in the flooded state can the sealing cover be opened from the oil wick cartridge.

- Before starting any maintenance work, make sure that the mass spectrometer and the turbo pump are completely flooded.

- 1 To flood the turbo molecular pump, switch on the fore-vacuum connection for Standards disconnection and switch on the device for approx. 10 to 25 s. After approx. 10 s valve V2 opens and mass spectrometer and turbo molecular pump are flooded. Wait at least another 10 s until the high vacuum system has been completely flooded.
- 2 Turn off the mains switch again and disconnect the device from the mains supply.
- 3 Turn the device on a lengthwise side so that you have access to the revision shaft on the bottom of the device.

Notice Be careful not to damage the fore-vacuum connections.

- 4 To replace the turbo molecular pump oil wick cartridge, the cap must be unscrewed on the bottom of the turbo molecular pump. See [Fig. 7-3/3](#) for more information.

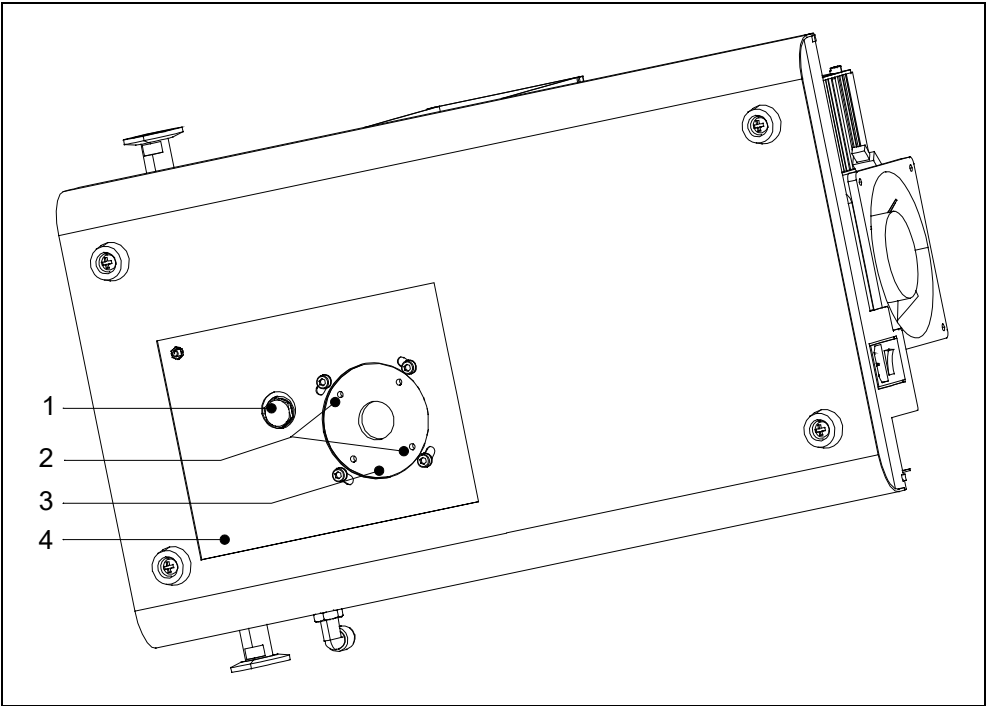


Fig. 7-3 sealing cover oil wick cartridge

Item	Description	Item	Description
1	Fore-vacuum connection	3	Sealing cover oil wick cartridge
2	Engagement special tool	4	Revision shaft

- 5 Unscrew the cap on the underside of the turbo molecular pump using a special tool (pin wrench).
- 6 After the sealing cover has been removed, the oil wick cartridge is accessible. Use a screwdriver to pry out the oil wick cartridge and dispose of it according to local regulations.
- 7 Inserting a new oil wick cartridge.
See [Fig. 7-4](#) for more information.



CAUTION

Do not press the oil wick cartridge in completely. The oil wick cartridge is correctly positioned over the sealing cover after screwing it into place. See also the operating instructions for Pfeiffer PT 0208 BN / I.

- 8 Replace O-ring ([Fig. 7-4/2](#)) with a new O-ring. Make sure that the new O-ring is inserted in the correct position. An incorrectly mounted O-ring will result in gross leaks, which lead to a malfunction of the device.
- 9 Finish by refitting and tightening the cover.

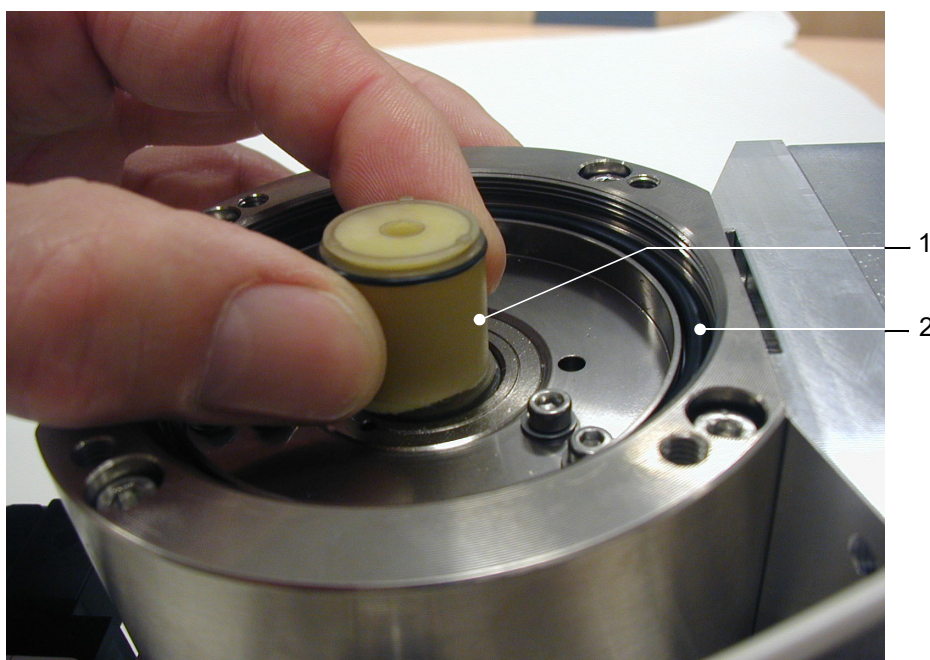


Fig. 7-4 Replace oil wick cartridge

Item	Description	Item	Description
1	Oil wick cartridge	2	O-ring

7.7 Changing the fuses



CAUTION

The replacement of fuses on printed circuit boards is not possible without their removal. The removal without ESD protective measures is grossly negligent and can lead to damage to the device!

7.7.1 Summary of the electrical fuses

Designation	Technical data	Fuse protection for
Mains switch	2 x T 6.3 A	Power supply fuse (2-phase OFF)

Wiring level:

Designation	Technical data	Fuse protection for
F10	T 6.3 A	Turbo molecular pump converter
F11	T 0.8 A	Fans

Power supply ZWS240PAF-24/TA:

Designation	Technical data	Fuse protection for
F1	F 6.3 A	Fuse protection - power supply unit

I/O printed circuit card:

Designation	Technical data	Fuse protection for
F1; F2	T 0.8 A	not used
F3	T 0.315 A	not used

Summary of the electrical fuses

MSV printed circuit card:


Designation	Technical data	Fuse protection for
F1	T 2 A	24 V main fuse for MSV board
F2	T 3.15 A	Anode heater (not used)
F3	T 1 A	±15 V; +5 V DC/DC converter
F4	M 0.032 A	Anode-cathode voltage (85 V)

Interface boards:

Designation	Technical data	
F1	T 1 A	24 V CONTROL UNIT
F2	T 0.8 A	24 V REMOTE CONTROL; PC RS232
F3	T 0.8 A	24 V PRESSURE GAGE; PLC IN
F4	T 1.6 A	24 V PLC OUT; VALVES; ACCESSORIES
F5	T 1.0 A	VALVES V30 - V33 feed (max. 30 V)
F6	T 1.0 A	VALVES V34 - V37 feed (max. 30 V)

Notice Replacing the fuse can only be carried out by a qualified electrician, as removal of the device hood is usually necessary.

7.7.2 Replace mains fuse



DANGER

Danger to life due to electric shock!

- Before replacing the fuse, unplug the power cord of the Modul1000.
- Only install fuses with the specified values in the Modul1000.

Required tools

- Slotted screwdriver size 1

Required material

- Melting fuse 2 x T 6.3 A

The main fuses of the Modul1000 are housed in the mains plug of the unit.

- To replace the main fuses, use a screwdriver to open the cover flap guarding the fuse link. Insert the screwdriver into the corresponding groove and open the cover flap. See [Fig. 7-5](#) for more information.
- Make sure there are two functional fuses in the fuse holder.

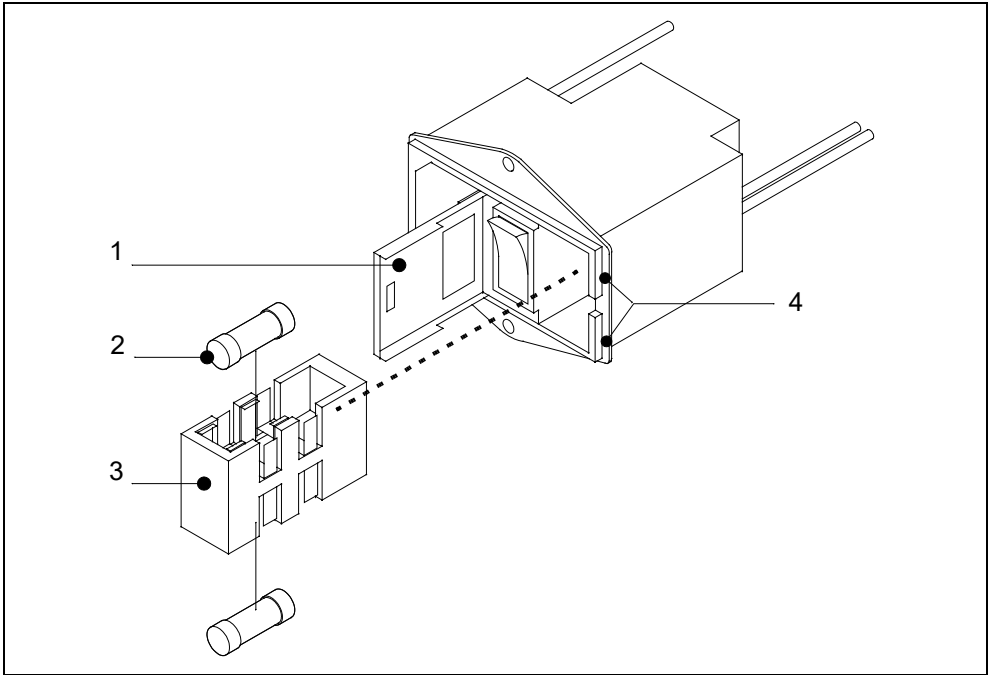


Fig. 7-5 Changing the fuses

Item	Description	Item	Description
1	Cover flap	3	Fuse link
2	Melting fuse T 6.3 A	4	Groove opening

7.7.3 Replacing Interface Board Fuses

The interface board (SSK) contains the fuses for the inputs and outputs on the board. A summary of the fuses and their use can be found under [Summary of the electrical fuses](#).

Required tools

- Allen key AF 8

Required material

- Complete fuse set Order no.: 200 000 641

Access to the fuses is only possible when the device cover has been removed from the Modul1000. Proceed as described in [7.5.1 Opening the device](#) for this purpose.

Notice Please observe the relevant safety instructions in this chapter.

- After removing the device hood, the fuse is accessible on the interface board. See [Fig. 7-6](#) for more information.

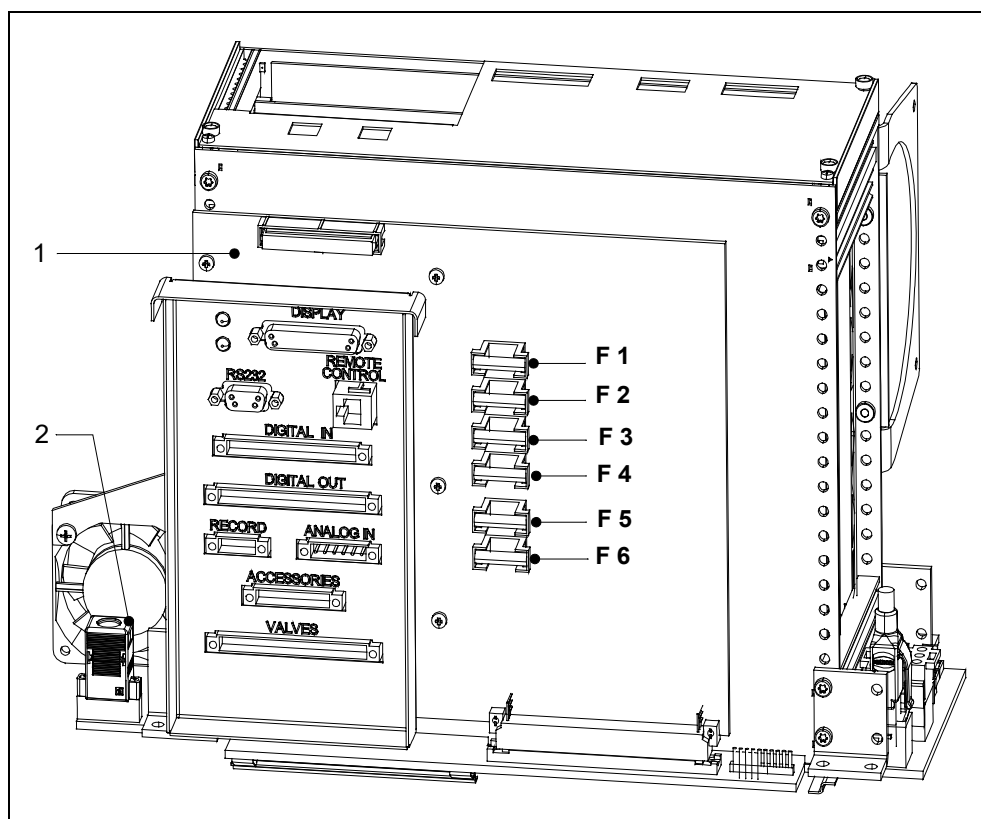


Fig. 7-6 Interface board fuses (SSK)

Item	Description	Item	Description
1	Interface board SSK	2	I•STICK

7.8 Parameter storage (I•STICK) replacement

The application parameters of the customer are stored on the I•STICK. If a backup device has to be installed, the user parameters can simply be transferred to the backup device by replacing the I•STICK.

Required tools

- Allen key AF 8
- Screwdriver size 1

Required material

- I•STICK

Access to the I•STICK is only possible when the device cover has been removed from the Modul1000. Proceed as described in [7.5.1 Opening the device](#) for this purpose.

Notice Please observe the relevant safety instructions in this chapter.

- To replace the I•STICK, loosen the two screws with which the I•STICK is screwed on the socket. See [Fig. 7-7](#) below for more information.

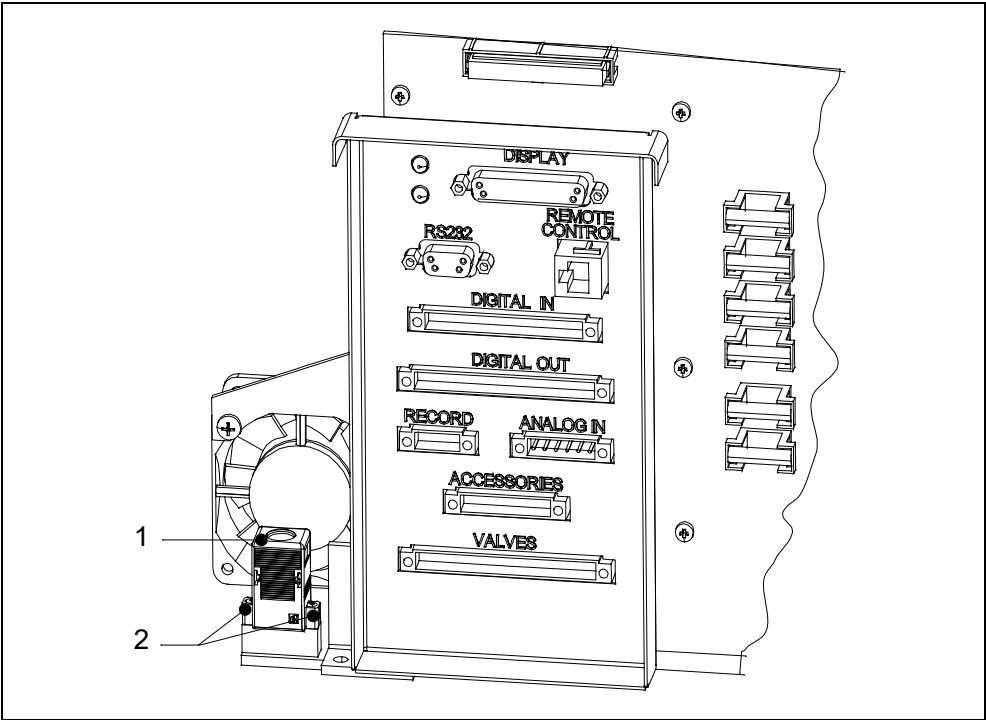


Fig. 7-7 I•STICK replacement

Item	Description	Item	Description
1	I•STICK	2	Mounting screws

After the screws have been loosened, remove the I•STICK from the socket and replace it with the I STICK of the defective unit.
The installation is carried out in the reverse order.

7.9 Flood filter replacement

The flood filter is checked or exchanged within the scope of the 5000 hours of maintenance. When used in extreme operating conditions, shorter maintenance times is more realistic.

Required tools

- Allen key AF 8

Required material

- Replacement filter (2 pieces) Order no.: 200 000 683

Access to the flood filter is only possible when the device hood has been removed from the Modul1000. Proceed as described in [7.5.1 Opening the device](#) for this purpose.

Notice Please observe the relevant safety instructions in this chapter.

- To remove the flood filter, disconnect the hose connections from the quick couplings. By pressing the outer ring on the quick couplings, the hose can be pulled off. Refer to Fig. 7-8 for the installation position.

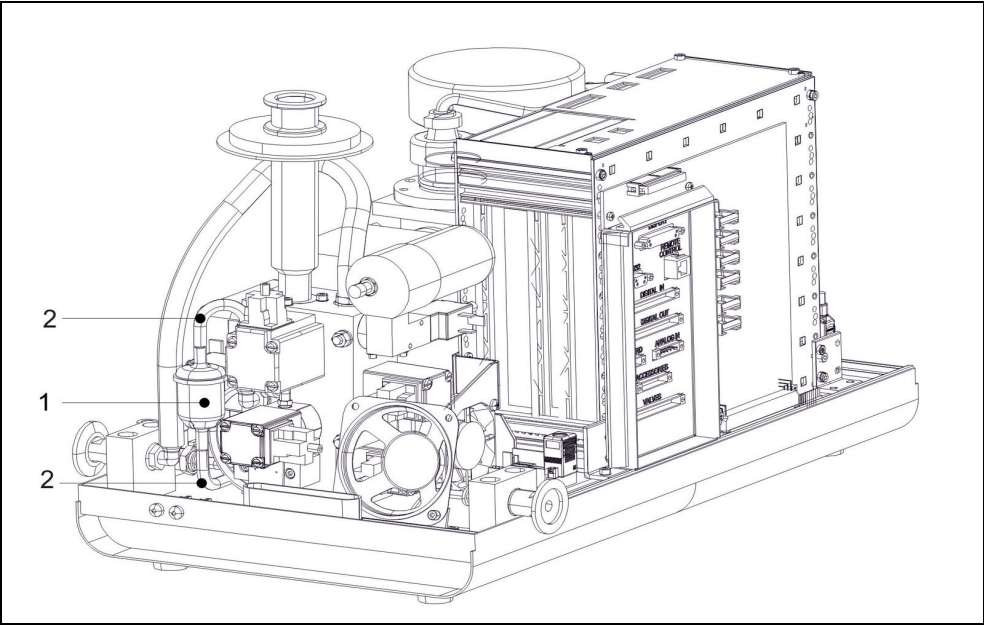


Fig. 7-8 Modul1000 replacement flood filter

Item	Description	Item	Description
1	Flood filter	2	Hose guide

Notice Let only trained personnel work with and on the device. The trained personnel must have received training on the device. Make sure that authorized personell have read and understood this manual and all other applicable documents before starting work.

8 Transport and disposal

NOTE

Danger of damage

The Modul1000 can be damaged by improper transport.

- Only transport the Modul1000 in its original packaging.

8.1 Returning the device for maintenance, repair or disposal



WARNING

Danger due to harmful substances

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


- Fill in the declaration of contamination completely.

- 1 Contact the manufacturer and send in a completed declaration of contamination before return shipment.

You will then receive a return number and the shipping address.

- 2 Use the original packaging when returning.
- 3 Before shipping the instrument, attach a copy of the completed contamination declaration to the outside of the package.

For contamination declaration see below.



Declaration of Contamination

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

1 Description of product

Type _____

Article Number _____

Serial Number _____

2 Reason for return

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

4 Process related contamination of product

toxic	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>		
caustic	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>		
biological hazard	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)		
explosive	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)		
radioactive	no <input type="checkbox"/>	yes <input type="checkbox"/> 2)		
other harmful substances	no <input type="checkbox"/> 1)	yes <input type="checkbox"/>		

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!

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

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

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www.inficon.com leakdetection.service@inficon.com

zisa01e1-a

Fig. 8-1 Sample for a contamination declaration form

If you dispose of the Modul1000, please observe the legal regulations for the disposal of electronic devices.

9 Technical data

9.1 Device data

9.1.1 Power supply

Mains voltage and frequency	100V - 240V $\pm 10\%$, 50/60 Hz
Power consumption	< 400 VA
Protection type basic unit	EN 60529 IP20 U 50E Typ 1
Protection type control unit	EN 60529 IP40 U 50E Typ 1

9.1.2 Weight / dimensions

Dimensions (L × W × H)	535 × 350 × 339 mm
Weight	30 kg
Switching capacity level dB (A)	< 70
Sound pressure level in dB (A)	< 56
Noise level dB (A) 0.5 m distance	< 56
Audio alarm in dB (A)	90
Contamination value (as per IEC 60664-1)	2
Over-voltage class (as per IEC 60664-1)	II
Main cable	3 m

9.1.3 Characteristics

Max. inlet pressure (Modul1000)	0.4 mbar
Max. inlet pressure (Modul1000b)	3.0 mbar
Minimum detectable helium leak rate	
In vacuum mode (ULTRA)	< 5×10^{-12} mbar l/s
Lower detection limit in sniffing mode	< 5×10^{-8} mbar l/s
Maximum allowable gas flow in the sniffer line	25 sccm
Maximum displayable helium leak rate	0.1 mbar l/s
Measurement range	12 decades
Max. pumping speed (helium) at the inlet	
ULTRA mode	2.5 l/s
Time constant of the leak rate signal (63% of the final value)	< 1 s
Detectable masses	2, 3 and 4
Run-up time (after switching on)	≤ 3 min
Mass spectrometer	180° magn. Sector field
Ion source (2 cathodes)	Iridium/Yttrium oxide
Inlet flange	DN25 KF
Valves	electromagnetic

9.1.4 **Ambient conditions**

For use in rooms	
Permissible ambient temperature (during operation)	+10° C to +40° C 50° F to 104° F
Permissible storage temperature	0° C to +60° C 32° F to 140° F
Maximum relative humidity	80% at 31° C / 88° F, falling linearly to 50% at 40° C / 104° F
Minimum humidity during transport and storage	10%
Minimum humidity during operation	30%
Max. allowable height AMSL (during operation)	2000 m

Operating Instructions


(2508)

jimb80em1-14

9.2 Control via the PLC inputs and outputs

If the Modul1000 is to be controlled via the PLC inputs and outputs, the control location "PLC", "All" or "Local and PLC" (see chapter, or SB) must be selected.

9.2.1 PLC inputs



CAUTION

The electronics of the Modul1000 can be destroyed if the input voltage is too high. The input voltage must not exceed 30 V DC.

The 14-pin Phoenix connector is located on the back of the device and is labeled PLC IN / AUDIO. The pin assignment of the connection socket can be freely configured (see also interface description)

Contact	Assignment	
1	24V fused with F3 on the interface board (0.8 A, maximum current output at this contact together with contact 1 at the connection PRESSURE GAUGE)	
2	GND	
3	freely configurable PLC input	e.g. START (factory setting)
4	freely configurable PLC input	e.g. STOP (factory setting)
5	freely configurable PLC input	e.g. ZERO (factory setting)
6	freely configurable PLC input	e.g. CAL (factory setting)
7	freely configurable PLC input	e.g. CAL INTERNAL (factory setting)
8	freely configurable PLC input	e.g. CAL EXTERNAL (factory setting)
9	freely configurable PLC input	e.g. CLEAR (factory setting)
10	freely configurable PLC input	e.g. GAS BALLAST (factory setting)
11	PLC GND (as per ref. potential)	
12	free	
13	AUDIO_OUT	5V level, PWM output
14	GND 24V	

Use a ferrite on the cable (eg Würth 742 711 31). Lay the cable twice through the ferrite and place it as close as possible to the 14-pin connector.

The contacts are numbered from left to right.

Fault or warning messages may occur when the connection cable is disconnected or unplugged during operation.

Description of how the digital inputs work:

A signal between 0V to 7V is recognized as LOW, a signal > 13V is recognized as HIGH. The maximum signal level is 30 V DC. All functions can also be selected in inverted form.

Notice The signals at these inputs are only accepted if the control location is at *PLC* or *Local and PLC*.

ZERO

Flank-controlled input

Change from LOW to HIGH: Switch ZERO on.

Change from HIGH to LOW: Switch ZERO off.

START / STOP

Flank-controlled input

Change from LOW to HIGH: Perform START.

Change to LOW: Perform STOP.

START

Flank-controlled input

Change from LOW to HIGH: Perform START

STOP

Flank-controlled input

Change from LOW to HIGH: Perform STOP.

If this this input is HIGH for longer that the "Delayed Ventilation" ventilate additionally.

VENT

Flank-controlled input

Change from LOW to HIGH: Flood

GAS BALLAST

Flank-controlled input

Change from LOW to HIGH: Gas Ballast / Switch-on flushing.

Change from HIGH to LOW: Gas Ballast / Switch off flushing.

CLEAR

Flank-controlled input

Change from LOW to HIGH: Confirm the error message or abort a calibration.

CAL

Flank-controlled input

Change from LOW to HIGH:

If the device is in standby mode: Start internal automatic calibration. If the device is in measurement mode: Start external manual calibration (prerequisite: external test leak must be open and leak rate signal stable)

Change from HIGH to LOW:

For external calibration: Confirmation that the external test leak is closed and the leak rate signal is stable.

CAL INT

Flank-controlled input

Change from LOW to HIGH: Start internal automatic calibration.

CAL EXT

Flank-controlled input

Change from LOW to HIGH: Start external manual calibration.

CYCLE (Flank-controlled START / STOP input)

State-controlled input

Change from LOW to HIGH: In the standby state START is executed and the STOP state is executed.

GAS BALLAST ON

Flank-controlled input

Change from LOW to HIGH: The gas ballast valve is opened.

GAS BALLAST OFF

Flank-controlled input

Change from LOW to HIGH: The gas ballast valve is closed.

ZERO ON

Flank-controlled input

Change from LOW to HIGH: Switch ZERO on

ZERO is turned off when the device changes to Standby.

SNIFF

State-controlled input

Change from LOW to HIGH in the Standby state:
Switch to SNIFF operating mode.

Change from HIGH to LOW in the Standby state:
Switch to the set operating mode.

9.2.2 PLC outputs

The 16-pin Phoenix connector is located on the back of the device and is labeled PLC OUT. The pin assignment of the connection socket can be freely configured.

Notice Relay outputs (contact 3-12): Max. load 60V DC / 25V AC / 1A ohmic load, for up to 500,000 switching operations.

Semiconductor relay outputs (contact 13, 14): max. load 30V 1A for frequent switching operations.

For frequent switching operations (more than 500,000 in the planned operating time), only the semiconductor relay outputs should be used.

Contact	Assignment	
1	24V fused with F4 on the interface card (1.6A, maximum current output at this contact together with contact 1 at contact VALVES)	
2	GND	
3	NO contact to contact 15	e.g. TRIGGER1 (factory setting)
4	NO contact to contact 15	e.g. TRIGGER2 (factory setting)
5	NO contact to contact 15	e.g. TRIGGER3 (factory setting)
6	NO contact to contact 15	e.g. ZERO ACTIVE (factory setting)
7	NO contact to contact 15	e.g. EMISSION ON (factory setting)
8	NO contact to contact 15	e.g. ERROR (factory setting)
9	NO contact to contact 15	e.g. CAL ACTIVE (factory setting)
10	NO contact to contact 15	e.g. CAL REQUEST (factory setting)
11	NO contact to contact 15	e.g. OPEN (factory setting)
12	NO contact to contact 15	e.g. OPEN (factory setting)
13	NO contact to contact 15	e.g. OPEN (factory setting)
14	NO contact to contact 15	e.g. OPEN (factory setting)
15	"COM_DIGOUT" common reference potential for all outputs	
16	not assigned	

Use a ferrite on the cable (eg Würth 742 712 21). Lay the cable twice through the ferrite and place it as close as possible to the 14-pin connector.

All functions can also be selected in inverted form. When the device is switched off, all relay outputs are open.

OPEN:

Relay contact is open without control

CLOSE:

Relay contact is closed without control

TRIGGER 1, 2, 3

Closed when trigger level has been exceeded and the device is in measuring mode.

ZERO ACTIVE

Closed when ZERO function is activated.

READY

Closed when the device is ready for measurement (emission on, no fault).

STANDBY

Closed when the device is in the STANDBY state.

MEASURE

Closed when the device is in the measuring mode.

VENTED

Closed when the inlet is vented.

ERROR

Closed if no fault is present.

Open if a fault is present.

WARNING

Closed when there is no warning.

Open when there is a warning.

CAL ACTIVE

Closed when a calibration routine is completed.

CAL REQUEST

External manual calibration active:

Open if external test leak is to be closed.

External manual calibration not active:

Open if a calibration request is pending.

REC STROBE

Open, if recorder output assumes invalid values when changing the decade. Used only if recorder output is set to "leak rate".

GAS BALLAST

Closed when gas ballast function is used

EMISSION ON

Closed when emission is switched on.

CYCLE ACTIVE

Closed when the device is in the state of evacuating, measuring mode or calibration.

PUMP DOWN

Closed when the device is in the evacuation state.

SNIFF

Closed when the device is in the SNIFF state.

This output serves as a feedback signal for the PLC input "SNIFF".

TEST PASS

Closed when the result of the Auto Leak test measurement is "PASS".

TEST FAIL

Closed when the result of the Auto Leak test measurement is "FAIL".

9.3 The digital valve outputs

The 16-pin Phoenix connector on the back of the device is labeled "VALVES".

Use a ferrite on the cable (eg Würth 742 712 21). Lay the cable twice through the ferrite and place it as close as possible to the 14-pin connector.

External valves are controlled via this plug-in connection.

They can be divided into 2 groups:

- 1** A 24 V valve can be connected to the contacts 13, 14 and 15, respectively; maximum current consumption per output 1A. The common reference point is contact 16 (GND).
- 2** 8 valves can be connected to the contacts 5 to 12. For greater flexibility, these switched outputs are potential-free: the user can thus connect an external DC power supply. This must have a safe separation from the mains and must not exceed 30 V.

The 24V supply of the Modul1000 can be used to supply the valves. The valve switch switches to the 24V supply applied to contact 3. Each valve switch may be loaded with a maximum of 0.2A.

The following valves can be controlled by the Modul1000.

Contact	Assignment
1	24V fused with F4 (T 1.6 A) on the interface card. The maximum current output at this contact, together with the current drawn from contact 1 at the PLC OUT and ACCESSORIES outputs, must be less than 1.6 A.
2	GND
3	External supply (24V / 30V max.)
4	Empty connection - can serve as a support point for the external wiring.
5	Output 1 (V30 Commander Operation to evacuate the DUT)
6	Output 2 (V31 Commander Operation to flood the DUT)
7	Output 3 (V32 Commander Operation empty DUT valve)
8	Output 4 (V33 Commander Operation fill DUT valve)
9	Output 5 (V34 Commander Operation emergency valve)
10	Output 6 (V35)
11	Output 7 (V36)
12	Output 8 (V37 external test leak valve 24V / < 0.2A)
13	Output 9 (V20 partial flow valve, 24V / <1A) *)
14	Output 10 (V21 flood valve, 24V / <1A) *)
15	Output 11 (V22 gas ballast, 24V / <1A) *)
16	GND

*) When connecting control inputs (e.g. valves with integrated electronics) instead of electromechanical valves, a resistance of 10K ohms \pm 5% (0.5W) must be connected in parallel.

9.4 Analog output

The 4-pin Phoenix pin strip is located on the back of the device and is labeled "RECORDER".

The recorder outputs can be used to record the leak rate, the inlet pressure, and the foreline pressure. The values of the recorder output are updated every 50 ms. Both recorder outputs can be set individually for the output of leak rates and pressures. The measured values are output via an analog signal in the range from 0 V - 10 V at a maximum of 1 mA. The resolution is limited to 10 mV. The measuring voltages are applied to contacts 1 and 4, the reference potential (GND) is applied to the contacts 2 and 3. The contacts are numbered from left to right.

Use a ferrite on the cable (eg Würth 742 711 11). Lay the cable twice through the ferrite and place it as close as possible to the 14-pin connector.

Accuracy of the recorder outputs:

± 50mV offset and additionally

± 1% of the measurement value (current output voltage) as a linearity error (at 25°C)

Hinweis The recorder outputs are electrically isolated from the other connections. If hum noise should occur, it is advisable to operate the Modul1000 and the recorder at the same mains phase. If this is not possible, ensure that the earth connections of both devices are at the same potential.

Pin	Assignment
1	Analog 1
2	GND (reference potential)
3	GND (reference potential)
4	Analog 2

9.4.1 Configuration of the analog output

A series of different measured value representations (assignments) are made available for the analog output. The various settings can be selected via the optional control unit.

OFF

The recorder output is switched off (0 V).

p1 (input pressure) / p2 (foreline pressure)

The output voltage of the pressure measuring points for the inlet pressure p1 or the foreline pressure p2 is output.

The output voltages are scaled logarithmically.

The signals p1 and p2 behave as the characteristic curve of the TPR265.

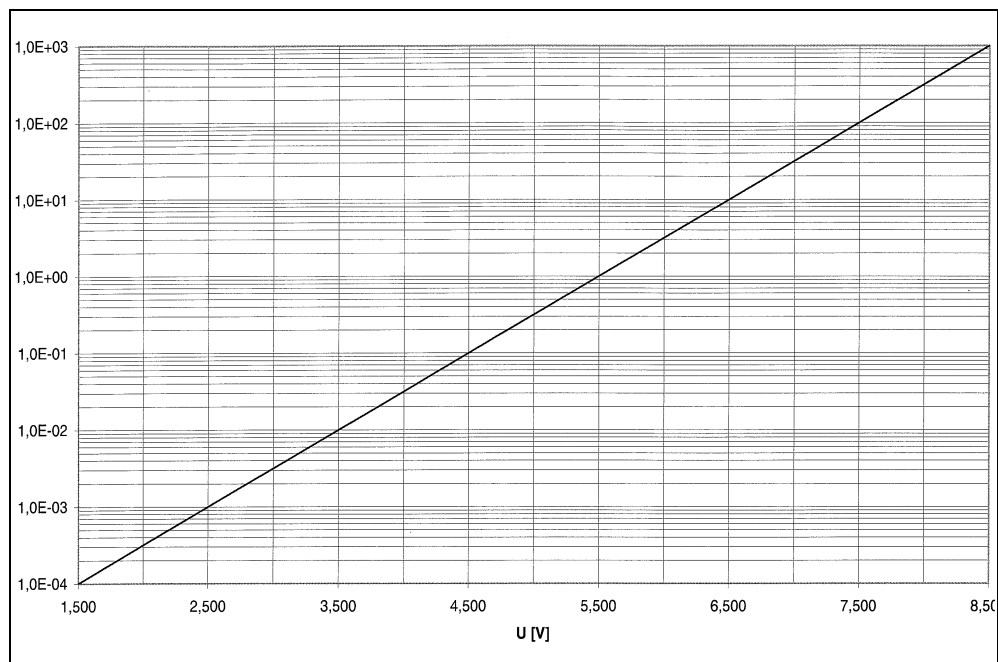


Fig. 9-1 TPR characteristic (P1, P2, recorder output)

p1 (input pressure) / p2 (foreline pressure) UL200

The inlet pressure p1 or the foreline pressure p2 is output. This assignment corresponds to the logarithmic recorder output of the UL200 leak detector.

Pressure logarithmic:

$U = 1 \text{ to } 10 \text{ V}$; 0.5 V / decade starting with

$1 \text{ V} = 1 \cdot 10^{-3} \text{ mbar} / 1 \cdot 10^{-3} \text{ Pa}$

LR lin

The output of the leak rate is linearly scaled. The output voltage is 0 - 10V. The upper limit (corresponds to 10V) and the scaling (in volts / decades) is set via the optional control unit under "Scaling recorder output".

LR log

The output of the leak rate is logarithmically scaled. The output voltage is 1 - 10 V in adjustable steps from 0.5 V to 10 V per decade. The scale (in volts / decades) is set via the optional control unit under "Scaling recorder output".

Example of signal LR log:

Upper limit set to 10^{-5} mbar l/s (= 10 V)

Scale set to 5 V//decade

Lower limit value is thus at 10^{-3} mbar l/s (= 0 V)

LR mantisse

The leak rate mantissa is output linearly from 1 - 10 V.

LR exponent

The leak rate exponent is output as a step function:

U= 1 - 10 V in steps of 0.5 V per decade beginning with 1 V = 1×10^{-12} .

LR log. H.

$$LR = 10(V-E) \cdot 10^{-(11-E)}$$

LR = leak rate

V = output voltage

E = output voltage values rounded down (1V, 2V, 3V, 4V, ...)

Voltages between 1V to 1.1V, 2V to 2.1V, 3V to 3.1V etc. are not issued.

9.5 Connection assignment

9.5.1 PLC IN / AUDIO

All inputs are optically isolated with opto-couplers.

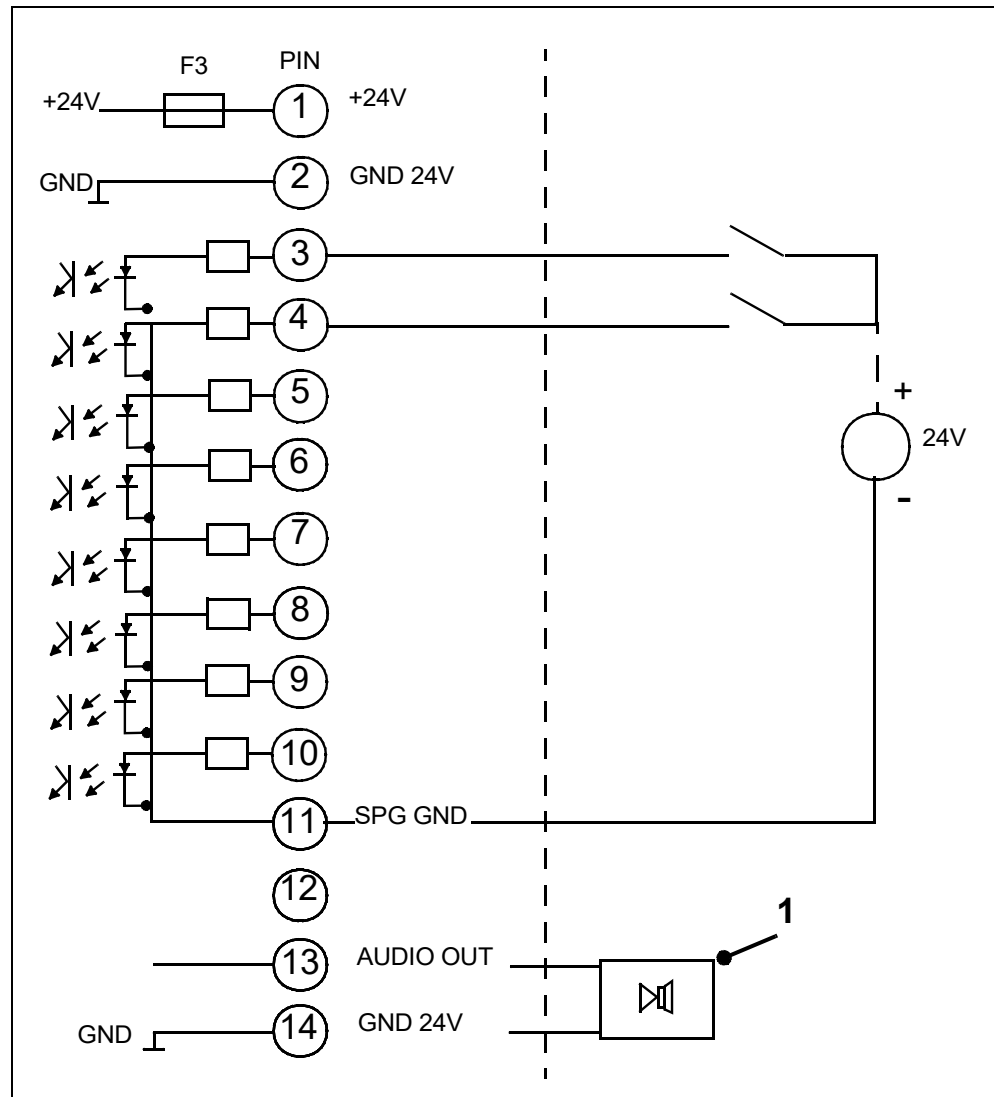


Fig. 9-2 External wiring, e.g. PLC with external voltage supply

Item	Description
1	External, active speaker

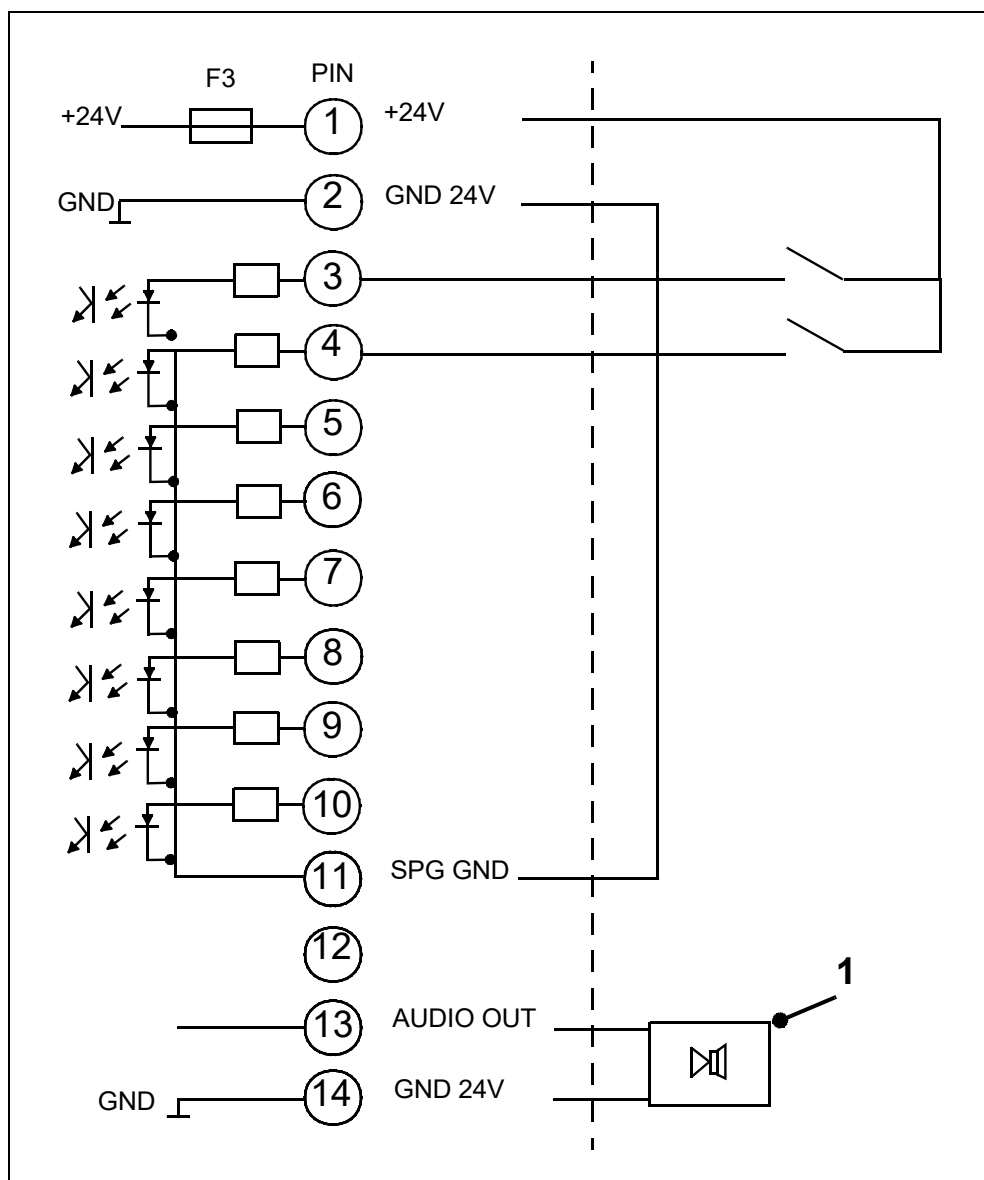


Fig. 9-3 External wiring, e.g. PLC with internal voltage supply

9.5.2 PLC OUT

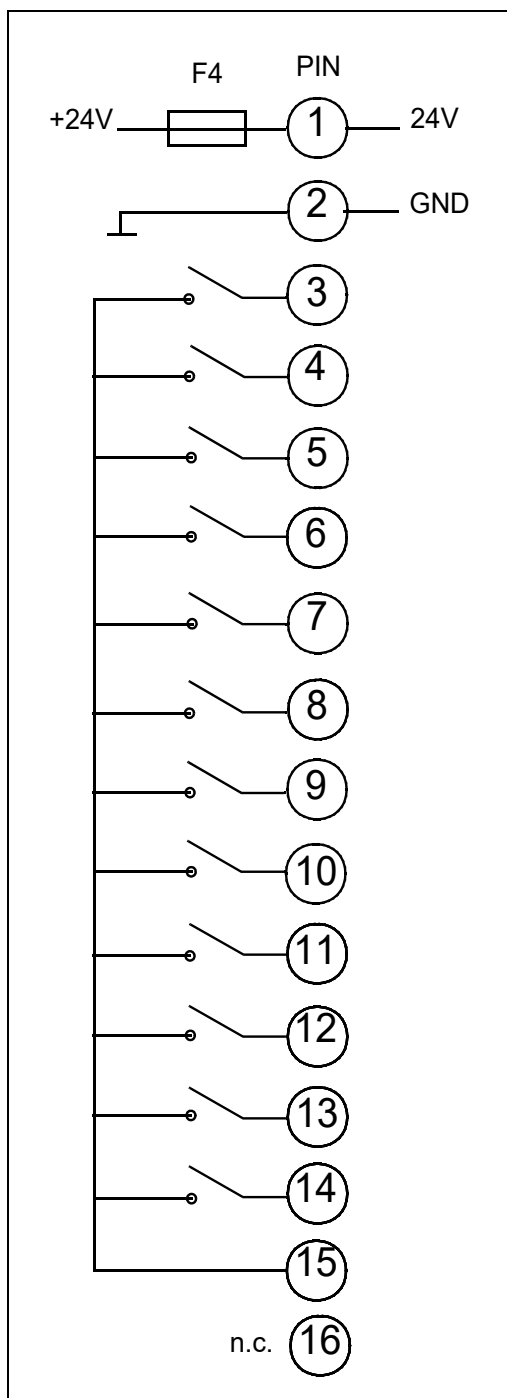


Fig. 9-4 PLC Out

PIN 3 - 12: Relay contacts, max. 60V DC / 25V AC / 1A

PIN 13, 14: Semiconductor relay, max. 30V DC / 1A

9.5.3 Pressure Gage

Connection of sensors with 4 - 20mA signal

Notice Plug in jumpers on interface cards accordingly.

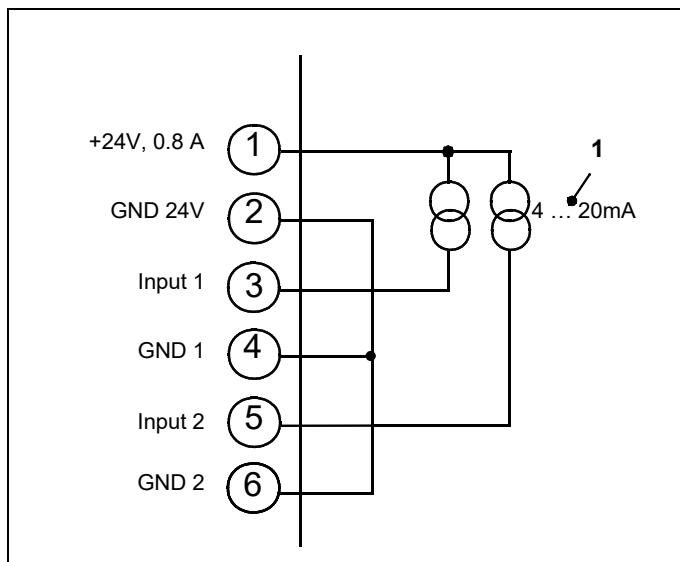


Fig. 9-5 Internal supply +24 V

Item	Description
1	Pressure sensors

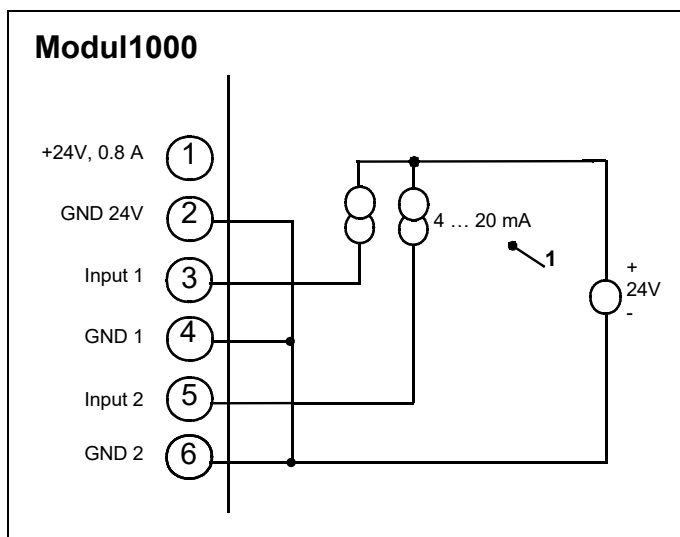


Fig. 9-6 External supply + 24 V with common GND

Item	Description
1	Pressure sensors

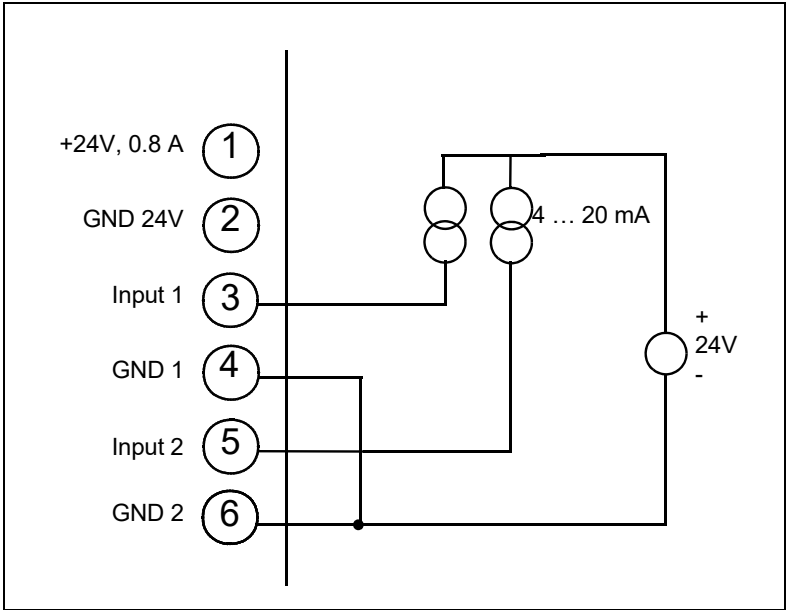


Fig. 9-7 External sensor supply 24 V with separate grounding

The voltage difference between pin 2 and pins 4 and 5 is ± 4 V.

Connection of sensor with 0 - 10V

Notice Plug in jumpers on interface card accordingly.

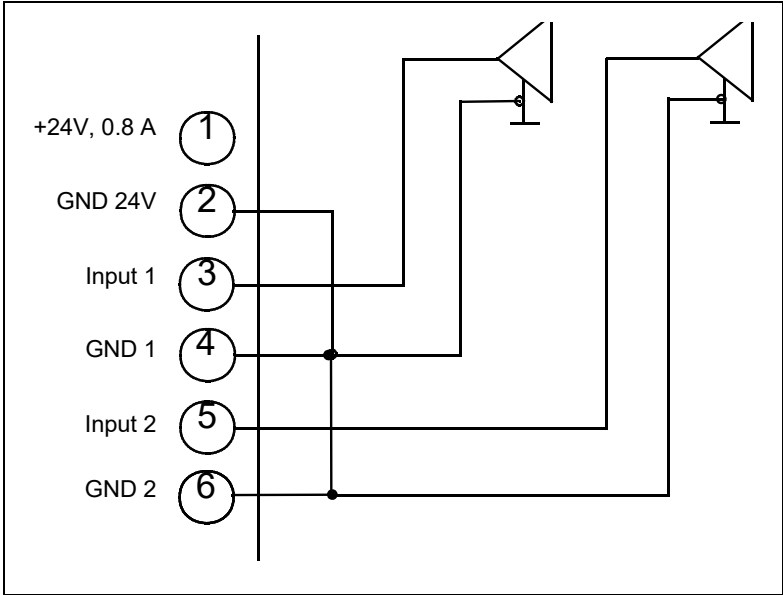


Fig. 9-8 Connection with common ground

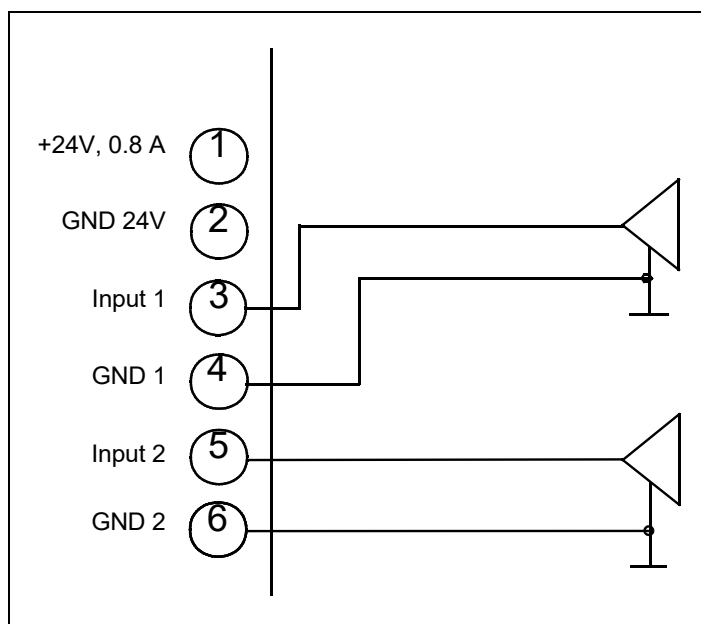


Fig. 9-9 Connection with separate grounding

The voltage difference between PIN 2 and PIN 4/6 must not exceed $\pm 4V$.

9.5.4 Valves

Internal supply

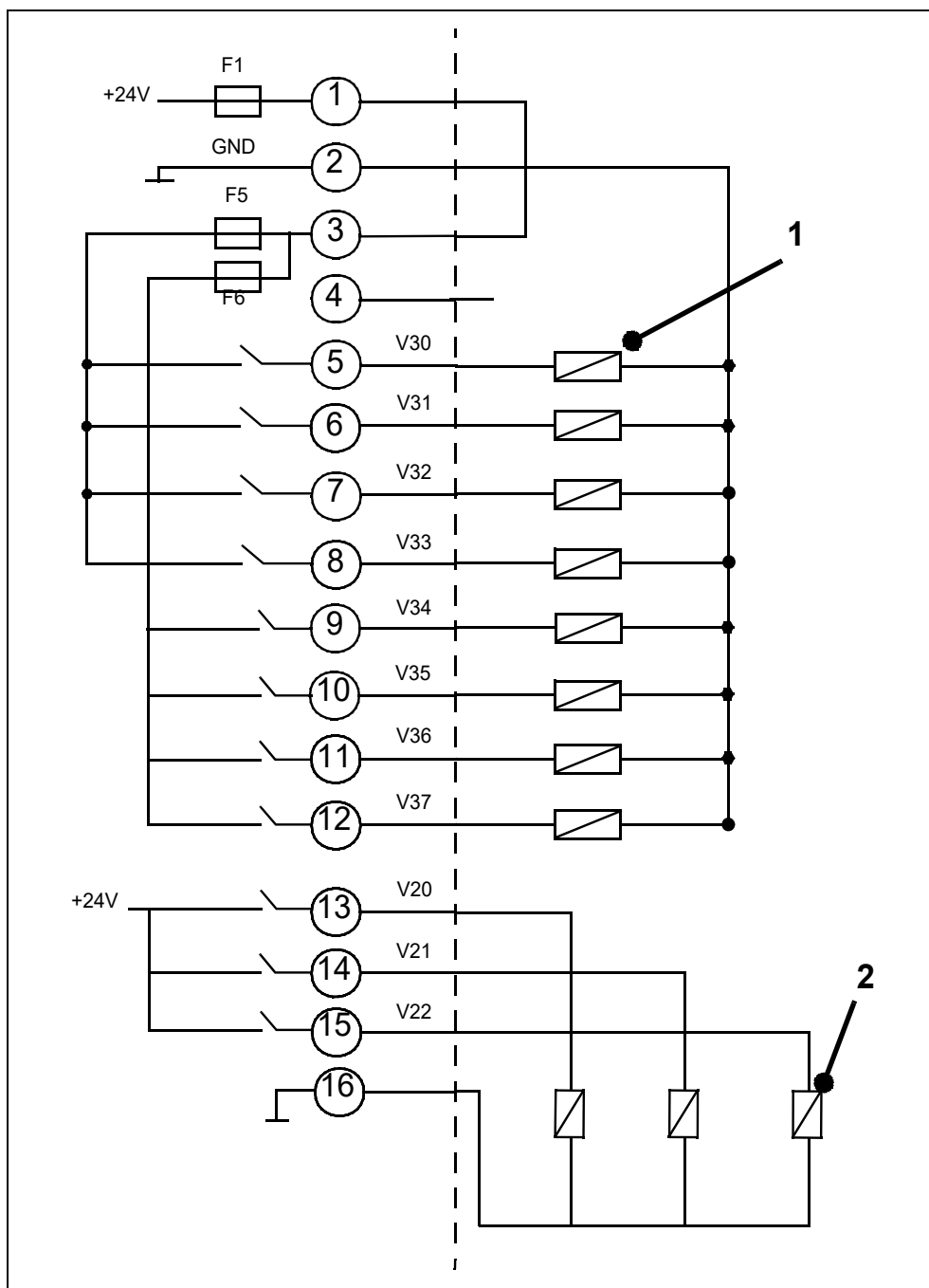


Fig. 9-10 Connection example

Item	Description
1	Valve I max < 0.2 A, maximum 8 pieces
2	Valve I max < 1A

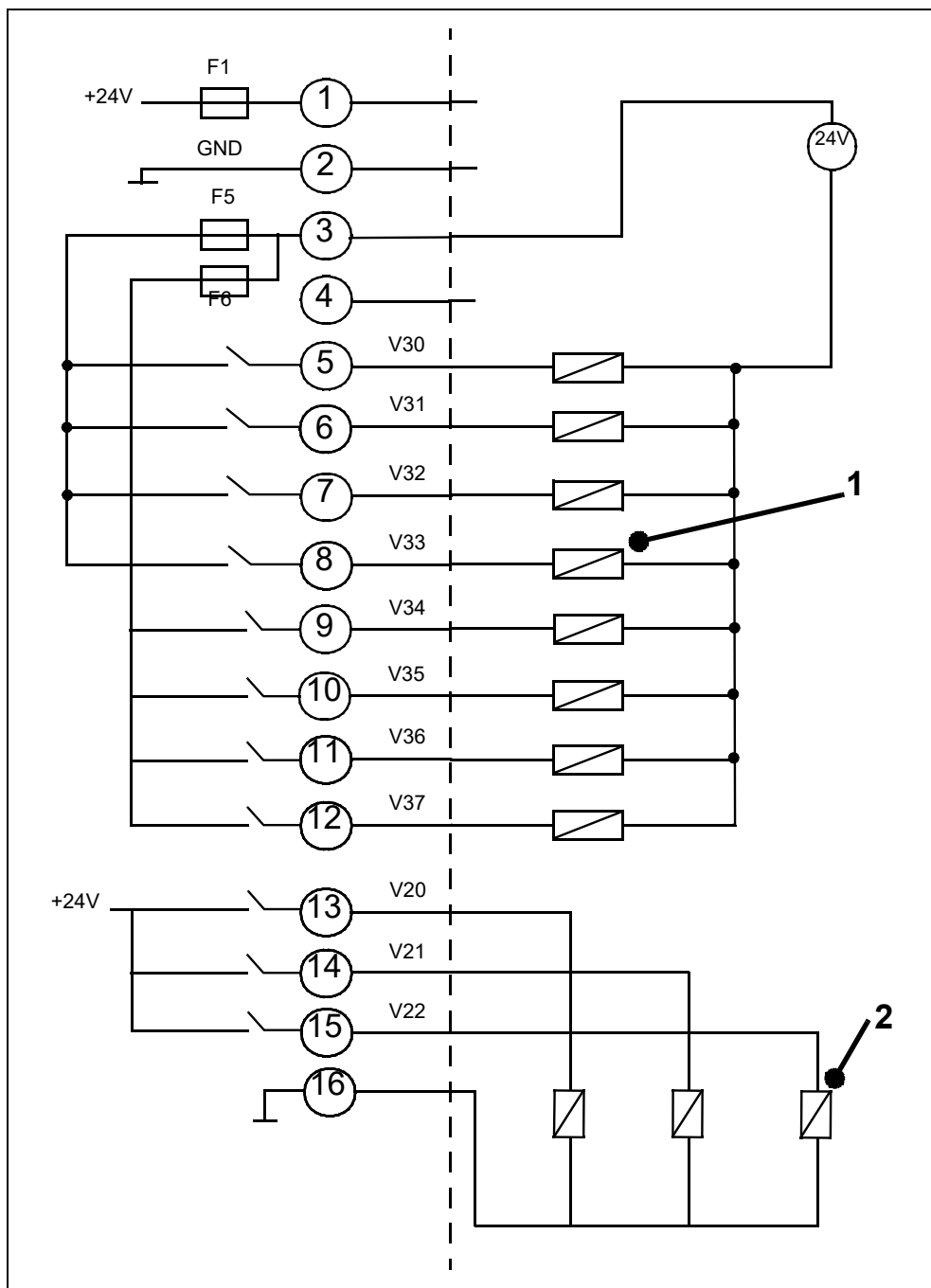


Fig. 9-11 Connection example

Item	Description
1	Valve I max < 0.2 A, maximum 8 pieces
2	Valve I max < 1A

9.5.5 Recorder

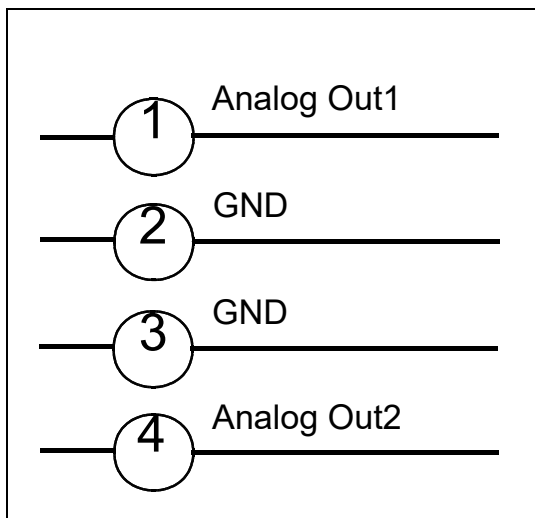


Fig. 9-12

Load resistance > 10k Ω

Accuracy of the analog output:

Final value: 10V: 1.2% from final value

Offset $\pm 1\%$ from final value.

9.6 Installation drawing of the control unit for rack installation

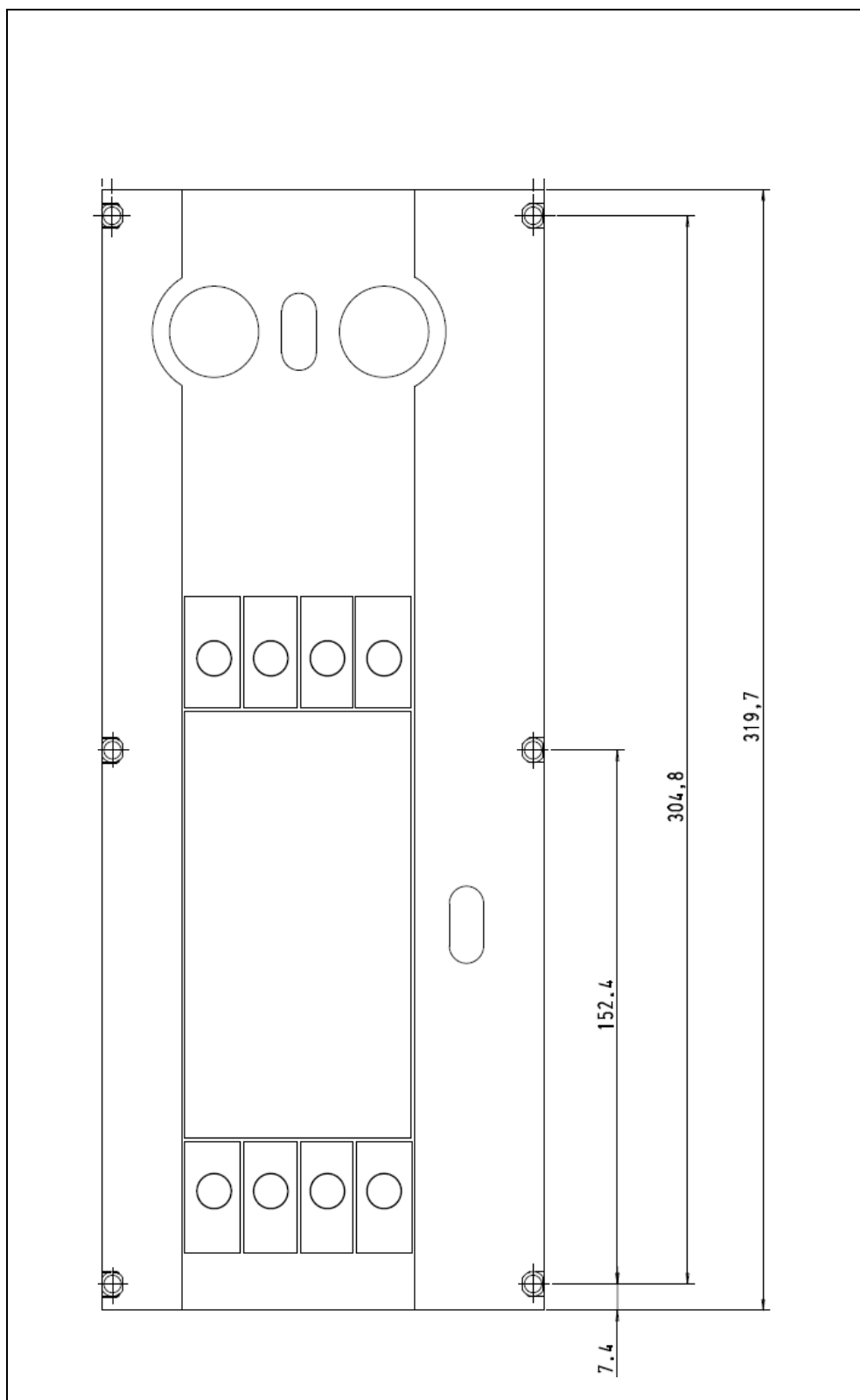


Fig. 9-13 Cutout of the control panel for the installation of the control unit

9.7 Commander Operation

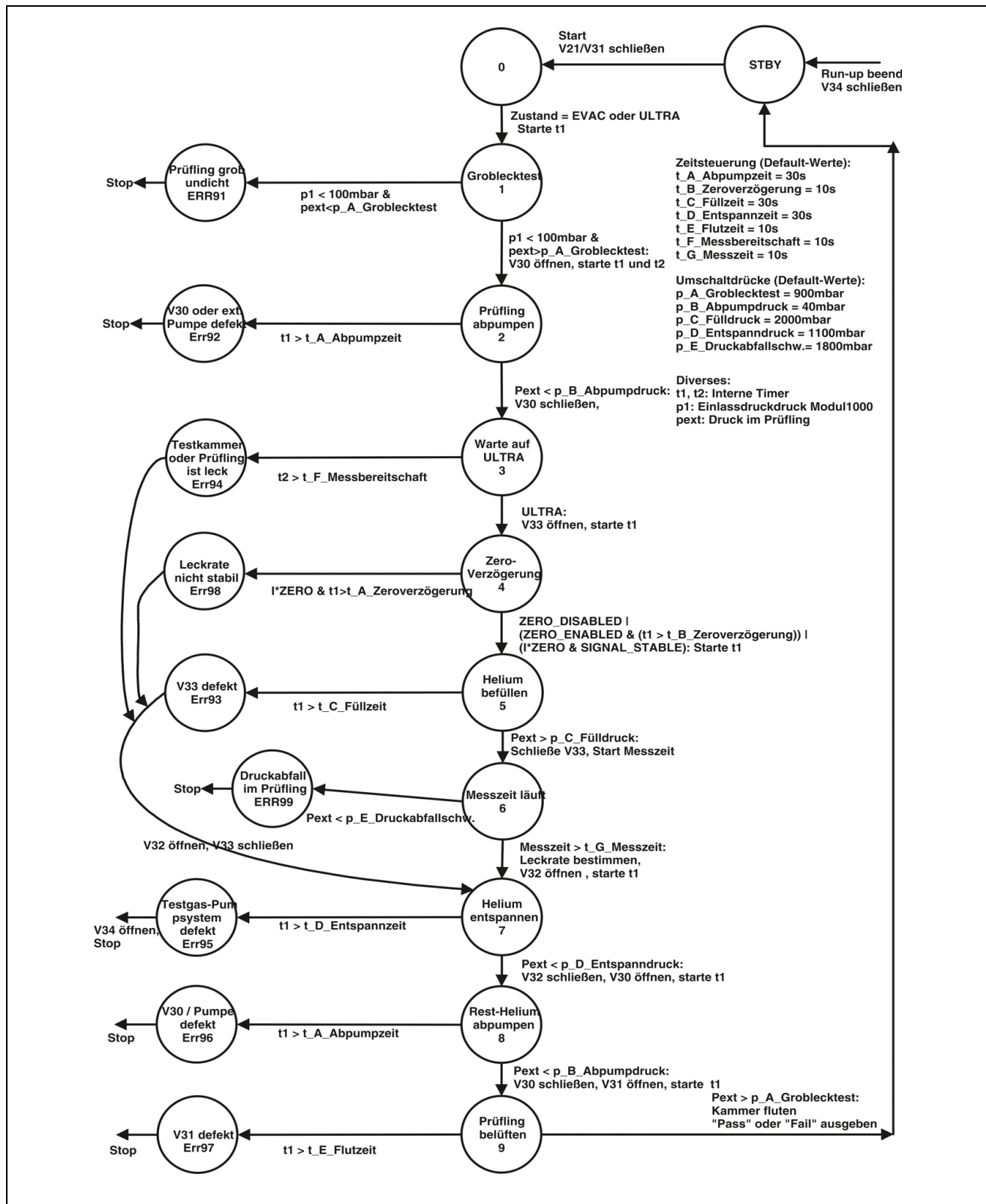


Fig. 9-14 Flowchart

10 Warnings and malfunction messages

No.	Displayed message	Description and possible remedy of cause
E03	Suppressor test incorrect!	MSV board defective. The pre-amplifier is defective. The suppressor cable is faulty.
E04	TMP temperature monitoring incorrect (E025)	Short circuit in the temperature sensor.
E05	TMP temperature sensor incorrect (E026)	Temperature sensor broken.
E06	TMP frequency too high	Overspeed TMP Replace TMP incl. TMP converter. Inform INFICON Service.
E07	TMP power supply defective	Power supply output voltage of the TMP converter too low. Check the output voltage of the Modul1000 24 V power supply Replace TMP with the converter.
E08	TMP run-up time error	The speed of the TMP after the run-up time of 15 min. is below the rotational speed of < 1200 Hz Foreline pressure too high. Leak in the vacuum system Turbo pump bearing damage
E09	TMP connection, converter to TMP faulty	Internal connection, converter to TMP faulty Replace TMP incl. TMP converter.
E10	TMP controller in the TMP converter faulty	Error in the controller of the TMP converter Reset the controller with the pump is still (0 Hz) by switching the leak detector power ON then OFF again. Replacement of the TMP along with the converter
E11	TMP, incorrect pump characteristic resistance	Controller has detected an incorrect pump characteristic resistance Replacement of the TMP along with the converter Inform INFICON Service
E12	TMP motor control defective	Error in the motor final stage or the motor controller Replacement of the TMP along with the converter Inform INFICON Service
W13	TMP unknown TMP error	Error message from the TMP converter for which there is no error code in the leak detector software. The error code of the TMP converter is displayed.
W15	Leak rate too high! It has been switched to standby mode to avoid helium contamination!	The monitor function "Contamination protection" is activated and a leak rate above the set limit value has been detected. Gross leak. Switch-off limit value too low. Alarm delay set too short.
W16	Service interval of the leak detector has expired!	The service interval for leak detector has expired! Perform and acknowledge the service for the leak detector.

No.	Displayed message	Description and possible remedy of cause
W17	Service interval of the leak detector has expired!	The service interval for the turbo pump has expired! Time since the last Service > 2 years Replace and acknowledge the oil wick cartridge of the turbo pump.
W18	Service interval for the fan filter has expire!	The service interval for the fan filter chassis has expired! Replace and acknowledge service for the fan filter.
E20	Alternate preamplifier range	Preamplifier defective Strange leak rate progress
W21	EEPROM write timeout	The write command from the MC 68 to the EEPROM was not acknowledged. E-EPROM defective. Error on wiring board MC 68 defective.
W22	EEPROM parameter queue overflow	Software problem. Please contact the INFICON Service!
E23	External supply (24 V) too high	Voltage monitoring input AD24 A/B > 11.5 V External supply to one of the 24 V outputs of the connector interface card.
E24	External supply (24 V) too low	Voltage monitoring input AD24 A/B < 2.5 V. Check the fuses F1 to F4 on the interface card. At least 2 fuses failed.
E25	Reduced valve voltage too low (<7 V)	Valve voltage reduction on I/O board <7 V) I/O board is defective. Control board MC 68 is defective.
E26	Monitoring voltage F3, F4	Voltage monitoring for fuses F3, F4 AD 24 A <5.6 V. Fuse F3 interface card (SSK) defective.
E27	Monitoring voltage F3, F4	Voltage monitoring for fuses F3, F4 AD 24 A <7.8 V. Fuse F4 interface card (SSK) defective.
W28	Real-time clock has been reset! Please enter date and time.	Real-time clock was reset. Rechargeable battery on MC68 is discharged or defective. MC68 was replaced.
E29	24 V power supply for the fan is defective.	The power supply for the fan is < 20 V. Fuse F11 on the wiring level is defective. Fan connection polarity reverse.
W31	The offset voltage of the pre-amplifier is too high. (>5 mV)	Offset voltage preamplifier without emission > 5 mV. The pre-amplifier is defective. Defective supply voltage pre-amplifier. Faulty MC 68 control board.
W32	Pre-amplifier temperature is too high. (>60°C)	The ambient temperature is too high. Heat accumulation due to unfavorable placement. The air filter is soiled. Temperature sensor in the pre-amplifier defective. Faulty MC 68 control board.

No.	Displayed message	Description and possible remedy of cause
W33	Pre-amplifier temperature is too low. ($<2^{\circ}\text{C}$)	The ambient temperature is too low. The temperature sensor in the pre-amplifier is defective. Faulty MC 68 control board.
E34	24 V voltage at MSV board is too low!	Signal MVPZN is active on the MSV printed circuit board. 24 V voltage on the MSV board is too low, $U < 18.3\text{ V}$. Fuse F1 on the MSV board has blown. Reference voltage UREF on the MSV printed circuit board XT7/1 is too high, $U > 5\text{ V}$. DC/DC inverter on MSV board defective 24 V power supply voltage from the main power supply has too great a load or is faulty.
E35	Anode-cathode voltage is too high!	Anode-cathode voltage is greater than $U > 130\text{ V}$. MSV is defective.
E36	Anode-cathode voltage is too low!	Anode-cathode voltage is less than $U < 30\text{ V}$. Fuse F4 on the MSV board is defective. MSV is defective.
E37	Suppressor voltage reference value too high.	Signal MFSZH is active on the MSV printed circuit board. The nominal value for the suppressor signal is too high. Suppressor voltage is shorted (cable or ion collector). MSV is defective.
E38	Suppressor potential too high.	Suppressor potential is greater than 363V. MSV is defective
E39	Suppressor potential too low.	Suppressor potential is less than $U < 297\text{ V}$. Short circuit in the suppressor line. MSV is defective. High ohmic short circuit in the ion collector.
E40	The anode potential has exceeded its nominal value by over 10%.	The actual value of the anode voltage exceeds the nominal value by 10%. You can view the nominal value in the service menu (under "Info"). MSV is defective. MC 68 defective
E41	The anode potential has dropped below its nominal value by over 10%.	The actual value of the anode voltage has dropped below the nominal value by more than 10%. You can view the nominal value in the service menu (under "Info"). Brief increase in pressure in the mass spectrometer. MSV is defective. MC 68 defective

No.	Displayed message	Description and possible remedy of cause
E42	Set point of the anode potential is too large.	Signal MFAZH is active on the MSV printed circuit board. Nominal value of the anode potential is too high. Brief increase in pressure in the mass spectrometer. Valve impurities cause a high mass spectrometer pressure in the short term. The anode voltage is short-circuited. The nominal value for the anode voltage is too high. The anode voltage is limited to 1,200 V.
E43	Cathode current is too high.	Signal MPKZH is active on the MSV printed circuit board. Cathode current is too high, $I > 3.6$ A. MSV board defective.
E44	Cathode current is too low!	Signal MPKZN is active on the MSV printed circuit board. Cathode current is too low, $I < 0.2$ A. MSV board defective Defective ion source connector or cable.
W45	Emission for cathode 1 cannot be switched on.	Signal MSIBE is not active on the MSV printed circuit board. The emission of cathode 1 cannot be switched on. Modul1000 switches to cathode 2. Order new ion source. Cathode 1 is defective Defective ion source connector or cable. MSV board defective.
W46	Emission for cathode 2 cannot be switched on!	Signal MSIBE is not active on the MSV printed circuit board. The emission of cathode 2 cannot be switched on. Modul1000 switches to cathode 1. Order new ion source. Cathode 2 is defective Defective ion source connector or cable. MSV board defective.
E47	Emission for both cathodes cannot be switched on!	Signal MSIBE is not active on the MSV printed circuit board. Switching on emission is not possible on either of the cathodes. After replacing the ion source, you need to be able to switch on both cathodes manually in the service menu. Both cathodes defective. Replace ion source. Defective ion source connector. MSV board defective
W49	Several DUTs in a row are faulty! Perform reference measurement.	The leak detector detected several faulty DUTs in a row. Check of the setting at which amount the error is issued. Background signal has considerably increased. Perform reference measurement again.
E50	No communication with turbo pump.	No communication with the TMP converter. Fuse F10 is defective on the wiring level. Connector RS 485 not connected at the cross-wiring level or drive electronics of the turbo molecular pump. TMP converter defective, replace turbo molecular pump. MC 68 defective

No.	Displayed message	Description and possible remedy of cause
E52	TMP frequency is too low!	<p>The speed of the turbo molecular pump is low after 5 min run-up time.</p> <p>Foreline pressure of the turbo molecular pump is too high.</p> <p>Turbo molecular pump is defective.</p> <p>TMP converter is defective.</p>
W53	Temperature at electronic unit is too high! (55°C)	<p>The ambient temperature is too high.</p> <p>Unfavorable placement of the leak detector. (Heat build-up)</p> <p>Fan failed.</p> <p>Air filter too heavily contaminated.</p> <p>Temperature sensor defective.</p>
E54	Temperature at electronic unit is too high! (60°C)	<p>The ambient temperature is too high.</p> <p>Unfavorable placement of the leak detector. (Heat build-up)</p> <p>Fan failed.</p> <p>Air filter too heavily contaminated.</p> <p>Temperature sensor defective.</p>
W55	Temperature at the electronic unit is too low (<2°C).	<p>The temperature sensor housed on the wiring board indicates that $T < 2^{\circ}\text{C}$. Observe the longer run-up time the external backing pump!</p> <p>Ambient temperature too low</p> <p>Temperature sensor is defective.</p>
E56	Inlet pressure p1 too low!	<p>Output voltage Pirani p1 $V < 0.27\text{ V}$.</p> <p>Pirani sensor P1 defective.</p> <p>Pirano electronics on the I/O board defective.</p> <p>Cable connection defective.</p>
E58	Foreline pressure p2 too low!	<p>Output voltage Pirani p2 $V < 0.27\text{ V}$;</p> <p>Pirani sensor P1 defective.</p> <p>Pirano electronics on the I/O board defective.</p> <p>Cable connection defective.</p>
E60	p2 > 10 mbar after 5 minutes since switch-on.	<p>p2 > 10 mbar after $t > 5$ minutes since switch-on of the leak detector.</p> <p>Final pressure of the backing pump is too high.</p> <p>Leakage of the high vacuum system or fore-vacuum connection.</p> <p>Backing pump defective.</p> <p>Valve V2 does not open, since the speed of 6Hz for the turbo molecular pump is not exceeded.</p> <p>Pressure measurement incorrect</p>
E61	Emission fail.	<p>Emission should be switched-on. MSV assembly signals an error. MENB, emission current outside the acceptable range.</p> <p>Both cathodes defective. Replace ion source.</p> <p>Ion source connector not connected.</p> <p>MSV board defective</p>

No.	Displayed message	Description and possible remedy of cause
W62	Flow through capillary is too low! Leaks can under certain conditions not be detected.	The inlet pressure of the sniffer line is monitored in sniffing mode. If the inlet pressure drops below a minimum value, the flow rate through the capillary is too low. You can use the menu to adjust the minimum value within certain limits. The factory setting is 0.5 mbar. Filter in filter tip blocked Sinter filter in filter tip soiled. Capillary blocked by dirt. Lower pressure limit too high.
E63	Capillary broken	The flow of the sniffer line is monitored in sniffing mode. If the pressure exceeds the set maximum value, the gas flow rate through the capillary is too high. You can use the menu to adjust the maximum pressure within certain limits. The factory setting is 2.0 mbar. Capillary broken or torn Upper pressure limit is too low.
W64	Preamplifier signal is too large.	Preamplifier signal has exceeded 10 V for 10 s in the most insensitive measurement range. Massive contamination of the high vacuum system with helium. Preamplifier defective Gross contamination in the mass spectrometer.
E68	TMP frequency too small.	TMP frequency of setpoint speed dropped in sniffing mode. Sniffer not connected. Sniffer line leaking. Frequency converter defective. Replace turbo molecular pump.
W69	Signal difference between test leak and air too small.	Signal difference between test leak and air $< 2 \times 10^{-14}$ A. Malfunction during calibration Test leak too small. Test leak is empty.
W70	Supply voltage +/-15 V too low.	DC/DC converter on the MSV board provide too low output voltage. Fuse F3 on MSV board defective DC/DC converter on the MSV defective. Jumpers for DC/DC converter on MSV board wrongly set.
W71	Supply voltage +/-15 V too high.	DC/DC converter on the MSV board provide too high output voltage. DC/DC converter on the MSV defective.
E73	Emission off (p_2 too high)	The emission is switched off when the pressure $p_2 > 22$ mbar. If the pressure drops again after the inlet valves are closed, the leak detector returns to standby mode. Inrush of air in measuring mode Contaminated valve
W75	Maximum "Evacuation time" up to 100 mbar exceeded.	Within the set evacuation time, the pressure threshold of 100 mbar has not been reached. DUT has a gross leak. Evacuation time is adapted incorrectly to the sample volume.

No.	Displayed message	Description and possible remedy of cause
W76	Maximum "evacuation time" until measuring mode was exceeded.	<p>Within the set evacuation time, the pressure threshold of 0.4 mbar has not been reached.</p> <p>DUT has a gross leak.</p> <p>Evacuation time is adapted incorrectly to the sample volume.</p>
W77	Maximum signal is outside the mass matching range!	<p>Unable to find the signal maximum within the mass adjustment range. The signal maximum has shifted to the limit values for the mass adjustment.</p> <p>Incorrect basic setting of the anode voltage. Use the service menu to perform a manual mass adjustment and calculate the anode voltage again.</p> <p>Leak rate signal was unstable during the mass adjustment. Re-calibrate.</p> <p>Incorrect or defective test leak. Check internal test leak and repeat the calibration with an external test leak.</p>
W78	Signal difference between opened and closed test leak too small.	<p>The pre-amplifier voltage difference between the open and the closed test leak is $\leq 2 \times 10E-14$ A.</p> <p>Internal test leak defective</p> <p>The external test leak valve is defective or not closed.</p>
W79	Calibrated leak signal too small	<p>The preamplifier voltage generated by the test leak is $\leq 2 \times 10E-14$ A.</p> <p>The test leak used for the calibration is too small.</p> <p>The external test leak valve is not open or defective.</p> <p>Internal test leak defective.</p>
W80	Please recalibrate the device!	<p>The automatic calibration request is activated and one of the following conditions is fulfilled:</p> <p>30 minutes have expired since switching on the leak detector.</p> <p>The pre-amplifier temperature has changed by more than 5°C since the last calibration.</p> <p>The mass setting or operating mode has been changed.</p> <p>A measurement time change in test chamber operation was performed.</p>
W81	Calibration factor too low	<p>The calculated calibration factor is outside the permissible range (< 0.1). The old factor is retained.</p> <p>The internal test leak is defective.</p> <p>The leak rate value entered for the internal test leak is much too small.</p> <p>The conditions necessary for calibration have not been satisfied.</p>
W82	Calibration factor too high!	<p>The calculated calibration factor is outside the permissible range (> 10). The old factor is retained.</p> <p>The internal test leak is defective or empty.</p> <p>The test leak value entered for the internal test leak is too great.</p> <p>Mass spectrometer soiled and non-sensitive.</p> <p>The conditions necessary for calibration have not been satisfied.</p>
W83	All EEPROM parameters lost! Please check your settings!	<p>EEPROM on wiring board is empty and was initialized with default values. All customer parameters must be re-entered or determined.</p> <p>If the warning is re-activated after reconnection, the EEPROM on the wiring level can not be written. EEPROM on wiring level defective.</p>

No.	Displayed message	Description and possible remedy of cause
W84	EEPROM parameter initialized after software update	Missing or changed parameter in the EEPROM and new software version number determined. A software update has been performed and one or more new parameters determined. The message can be acknowledged in this case. The parameter(s) is (are) automatically added.
W85	EEPROM parameters lost! Please check settings!	Defective or missing parameters in the EEPROM. The software version number has not changed. If the warning is re-activated after reconnection, the EEPROM on the wiring level can not be written or is defective. EEPROM on wiring level defective! The write access has been interrupted. Check the settings and acknowledge the error message.
W86	All I•STICK parameters are lost! Please check your settings.	I•STICK on wiring level is empty and has been initialized with default values. All customer parameters must be re-entered or determined. I•STICK not connected. I•STICK does not contain any values. I•STICK is defective!
W87	Parameter in the I•STICK initialized! Please check settings	Missing or changed parameter in the I•STICK and new software version number determined. A software update has been performed and one or more new parameters determined. The message can be acknowledged in this case. The parameter(s) is (are) automatically added.
W88	Parameters lost in the I-Stick! Please check settings	Defective or missing parameters in the I•STICK. The software version number has not changed. If the warning is re-activated after reconnection, the I•STICK on the wiring level cannot be written or is defective. I•STICK on wiring level defective! The write access has been interrupted. Check the settings and acknowledge the error message.
E89	Monitoring voltage F1, F2	Voltage monitoring for fuses F1, F2 AD 24 B < 5.6 V. Fuse F1 interface card (SSK) defective.
E90	Monitoring voltage F1, F2	Voltage monitoring for fuses F1, F2 AD 24 B < 7.8 V. Fuse F2 interface card (SSK) defective.
W91	P_ext smaller than p_A	Pressure in the DUT falls below the value of p_A, although only the test chamber was pumped DUT grossly leaking. Adaption DUT leaking. Incorrect setting for p_A.
W92	DUT evacuation takes too long	Time t1 > as the set evacuation time t_A. Valve V30 does not open. Backing pump defective. DUT leaking. Incorrect time setting for t_A. Incorrect setting for the evacuation pressure p_B.
W93	Filling the DUT with the tracer gas takes too long.	Time t1> as the predetermined DUT filling time t_C. Valve tracer gas inlet V33 does not open. Time for tracer gas inlet t_C too small. Trace gas p_C selected too high.

No.	Displayed message	Description and possible remedy of cause
W94	Time until "Ultra" is too long	<p>Time $t_2 >$ as the time t_F for reaching the measuring mode "Ultra".</p> <p>Test chamber is leaking.</p> <p>DUT is leaking</p> <p>Incorrect setting for the time t_F (time until measuring mode "Ultra").</p>
W95	Tracer gas release takes too long	<p>Time $t_1 >$ as the tracer gas release time t_D.</p> <p>Tracer gas pump system defective.</p> <p>Valve V32 does not open.</p> <p>Time t_D is too short to reach the release pressure p_D.</p> <p>Relaxing pressure p_D incorrectly selected. Release pressure $p_D >$ set final pressure after the expiry of the release time t_D.</p>
W96	Residual gas evacuation too slow	<p>Time $t_1 >$ as the set evacuation time t_A.</p> <p>Valve V30 does not open.</p> <p>Backing pump defective.</p> <p>Incorrect time setting for t_A. $t_A <$ the evacuation time of the residual gas.</p> <p>Incorrect setting for the evacuation pressure p_B. Evacuation pressure not reached within the preset evacuation time ($p_B <$ residual pressure tracer gas).</p>
W97	DUT flooding takes too long	<p>Time $t_1 >$ as a predetermined flooding time t_E.</p> <p>Flood valve V31 defective.</p> <p>Incorrect setting of the flooding time to reach the pressure p_A. (p_A = Gross leak test pressure). $t_E <$ ventilation time</p> <p>Incorrect setting of the pressure p_A, which must be reached within a given flooding time. $p_A >$ atmospheric pressure.</p>
W98	Leak rate during zero delay time is not stable enough	<p>When Ultra is reached, the readiness for the function I•ZERO "activated" is enabled if a stable leak rate signal has been set during the zero delay time depending on the selected trigger.</p> <p>Incorrect setting of the zero delay time t_B.</p> <p>Trigger 1 selected too small.</p> <p>The background in the test chamber is too high.</p>
W99	Pressure in the DUT has fallen below p_E .	<p>Fill pressure of the DUT has fallen below the pressure decay trigger p_E during the measuring time.</p> <p>Incorrect setting for the pressure decay trigger P_E.</p> <p>Gross leak on the DUT.</p>

11 Ordering Information

Description	Cat. no.
Control unit table drive	551-100
Control unit rack mounting	551-101
Connection line for the control unit, 0.7 m	551-103
Connection line for the control unit, 5 m	551-102
Sniffer line SL200	140 05
Remote control:	
– Remote control RC1000WL, wireless	551-015
– Remote control RC1000C, wired	551-010
– Radio transmitter (For operating a further leak detector)	551-020
Test chamber TC1000	551-005
Connector set	551-110

12 Appendix

12.1 Declaration of Conformity



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

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

Designation of the product:

Modular Leak Detector

Models: **Modul1000**

Catalogue numbers:

**550-300A
550-310A
550-330A**

The products meet the requirements of the following Directives:

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

Applied harmonized standards:

- **EN 61326-1:2013**
Class A according to EN 55011
- **EN IEC 63000:2018**

Cologne, August 18th, 2023

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

Cologne, August 18th, 2023


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12.2 Declaration of Incorporation



EC DECLARATION OF INCORPORATION

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

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

Designation of the product:

Modular Leak Detector

Models:

Modul1000

Catalogue numbers:

**550-300A
550-310A
550-330A**

The products meet the requirements of the following Directives:

- **Directive 2006/42/EC (Machinery)**

Applied harmonized standards:

- **EN ISO 12100:2010**
- **EN ISO 61010-1:2010+A1:2019**

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of this Directive (2006/42/EC), where appropriate.

The manufacturer will electronically transmit, in response to a reasoned request by the national authorities, relevant information on the partly completed machinery.

The relevant technical documentation is compiled in accordance with part B of Annex VII.


Authorised person to compile the relevant technical files:

Heinz Rauch, INFICON GmbH, Bonner Strasse 498, D-50968 Cologne

The following essential health and safety requirements according to Annex II of Directive 2006/42/EC were fulfilled:

1.1.2, 1.1.3, 1.1.5, 1.2.1, 1.2.6, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.5.1, 1.5.2, 1.5.4, 1.5.5, 1.5.6, 1.5.8, 1.5.9, 1.5.10, 1.5.11, 1.5.13, 1.6.1, 1.6.3, 1.7.1, 1.7.2, 1.7.3, 1.7.4

Cologne, August 18th, 2023

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

Cologne, August 18th, 2023


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Index

Backing pump see pump

A

Accessories	3-6, 4-4
Air filter	7-4
Alarm delay	6-18
Alarms	6-17
Analog output	9-9
ASCII	6-25
Auto Leak Test	5-3, 6-17, 6-21
Automatic external calibration	6-20

B

Background	6-4, 6-24
Backing	
• pump	7-2
Backing pump	3-1, 4-8
Buttons	
• Display	6-5

C

Calibrate factor	6-32
Calibration	
• external	
– manual	6-11
Calibration request	6-29
Change device	
• PIN	6-32
Changing the menu PIN	
•	6-32
Clear	9-4
Commander	
• test procedure	5-6
Commander functions	6-22
Commander Operation	5-4
Connection assignment	9-12
Connector kit	3-7
Contamination protection	6-30
Contrast	6-17

Control	
• PLC	
– Inputs and Outputs	4-4
Control location	6-24
Control Unit	4-4
Control unit	6-3
• Graphical	4-4
Control units	3-3
Cycle	9-5

D

Date	6-27
Define PLC inputs	
•	6-26–6-27
Define PLC outputs	
•	6-26
Delete test logs	
•	6-32
Device Under Test (DUT)	4-8
Dimensions	9-1
Display	6-16
• internal	
– data	6-31
Display settings	
•	6-31

E

Error list	
• display	6-32
Evacuate	6-7
Evacuation time	6-31
External	
• calibration	6-11
External manometer	
•	6-25
External manual calibration	
•	6-20
External valve	
• supply	
–	9-19

F

Fan filter	6-28
------------	------

Flood filter	
• replacement	7-14
Foreline pressure	1-3
Fore-vacuum	
• Refer to fore-vacuum pump	
Fuses	7-10

G

Gas Ballast	9-7
Gas ballast	6-21, 9-4

H

Helium background	
• internal	1-2
Helium filling device	5-6
Helium leak rate	9-1

I

Info	6-31
Informations de commande	12-1
Inlet area background determination	6-24
Interface	
• RS232	4-6, 6-3
Internal	
• calibration	6-10
Internal valve	
• supply	
–	9-18

L

Language	6-27
Leak rate	
• minimum detectable	1-3
Leak rate filter	6-27
Leak Test	
• See Auto Leak Test	
Leak Ware	6-25
Loading / saving parameters	
•	6-28
Logged	
• data	6-32

M

Machine factor	6-23
Main menu	6-16

Mains fuse	
• replacement	
– material	7-11
– tool	7-11

Maintenance	
• after 1500 hours	7-4
• after 2 years	7-5
• after 5000 hours	7-4
• TMH071	7-7

Maintenance intervals	6-28
-----------------------	------

Mass	6-24
------	------

Mass setting	
• automatic tuning	1-2

Measure	9-6
---------	-----

Measurement range selection	
• automatic	1-2

Measuring	6-8
-----------	-----

Measuring time	5-3
----------------	-----

MENU	6-5
------	-----

Menu	1-3
------	-----

monitoring	6-29
------------	------

O

Oil wick cartridge	7-5
--------------------	-----

Opening	
• Device	
– Tool	7-6

Operating mode	6-17
----------------	------

Ordering Information	11-1
----------------------	------

P

Partial flow	6-10
--------------	------

Partial flow mode	5-2
-------------------	-----

Parts number	5-3, 6-27
--------------	-----------

PIN	6-32
-----	------

Pinpoint	6-18
----------	------

PLC	
• in	9-12
• out	9-14

Pressure Gage	9-15
---------------	------

Pressure Gauge	4-5
----------------	-----

Pressure limit	
• vacuum range	6-30

Pressure measurement point	
• external	4-5

Pumping speed	5-1, 6-23, 9-1
Purge	6-21

R

Rack	
• installation	
– drawing	9-21
Recorder	9-9, 9-20
Recorder output	9-7
• analog	4-6
• scaling	6-26
Recorder outputs	9-9
Reference measurement	5-4
Remote control	4-4, 6-3
Replace I•STICK	
•	7-13
Replacing interface board	
•	7-12
RS232 protocol	6-25–6-27
Run up	6-1, 6-7
Run-up time	9-1

S

Save	
• parameter	6-28
Scope of delivery	3-6
Serial error message	
• Auto Leak Test	5-4
Service list	6-32
Setpoint	6-19
Settings	6-24
• Miscellaneous	6-27
Settling time	
• CAL	6-27
Sniffer line	4-4, 4-9
Speaker	6-17
Stand-by	6-7

START	6-4
Status line	6-7
STOP	6-4

T

Technical data	9-1
Test logs	6-32
Test system	4-8
Time	6-27
Time axis	6-16
Trigger	6-7
Turbo molecular	
• Refer to turbo molecular pump	
Turbo molecular pump	3-1

U

Units	6-18
Use authorization	6-32

V

Vacuum mode	5-1
Vacuum schematic	6-31
Vacuum settings	6-21
VENT	6-4
Ventilation	4-9, 6-21
Volume	6-18

W

Weight	9-1
--------	-----

Z

Zero	6-4
Zeroing	
• automatic	1-2

