

Translation of the Original Operating Instructions

CU1000

Operating Unit

Catalog No.
560-320

From software version
3.16 (LDS3000) / 3.14 (CU1000)

jina54en1-09-(2404)



INFICON GmbH
Bonner Strasse 498
50968 Cologne, Germany

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1 About these instructions

1.1 Target groups

This instruction manual is intended for operators and technically qualified personnel with experience in leak detection technology and the integration of leak detectors in leak detection systems. In addition, the installation and use of the device require knowledge of electronic interfaces.

1.2 Other associated documents

Mass spectrometer module operating instructions	jiqa54
Operating instructions bus module	jiqb10
Operating instructions I/O module	jiqc10
Protocol Descriptions	jira54

1.3 Warnings



⚠ DANGER

Imminent hazard resulting in death or serious injuries



⚠ WARNING

Hazardous situation resulting in potential death or serious injuries



⚠ CAUTION

Hazardous situation resulting in minor injuries



NOTICE

Hazardous situation resulting in damage to property or the environment

2 Safety

2.1 Intended use

The device is intended for querying and configuring the data of the mass spectrometer module LDS3000.

- ▶ Only install, operate and maintain the device indoors in accordance with these instructions.
- ▶ Maintain the application limits (refer to Chapter 4.3).

2.2 Duties of the Operator

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

2.3 Owner requirements

Safety conscious operation

Operate and install the device only in technically perfect working order and as specified, in a safety-conscious and hazard-conscious manner and in compliance with these instructions.

- ▶ Fulfill and ensure compliance with the following regulations:

- Intended use

Universally valid safety and accident prevention regulations

- International, national and local standards and guidelines

- Additional device-related provisions and regulations

- ▶ Use only original parts or parts approved by the manufacturer.
- ▶ Keep this manual available at the operating site.

Personnel qualifications

- ▶ All work must be performed only by technically qualified specialists who have been trained on the device.

▶ Allow personnel in training to work on the device only under the supervision of technically qualified specialists.

▶ Make sure that the authorized personnel have read and understood these instructions and all other applicable documents (refer to "Other associated documents"), especially the information on safety, maintenance and repairs, before starting work.

- ▶ Define responsibilities, authorizations and supervision of personnel.

2.4 Dangers

- Only use the device away from areas with a risk of explosions.

3 Shipment, Transport, Storage

Scope of delivery

Item	Quantity
Control unit	1
Touch PIN	1
Digital operating instructions, to download as PDF from www.inficon.com	1

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

Transport

NOTICE

Damage due to unsuitable packaging material

Transport in unsuitable packaging material can damage the device.

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

Storage

- ▶ Always store the device in compliance with the technical data, see "Technical Data".

4 Description

4.1 Device setup

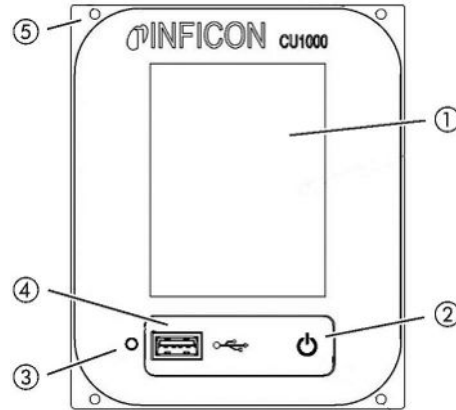


Fig. 1: Front view

1	Touchscreen	4	USB port
2	Status LED	5	Mounting holes
3	Rest button		

Status LED

Status LED illuminated	Control unit operates normally
Status LED flashing	Display is set to power saving mode

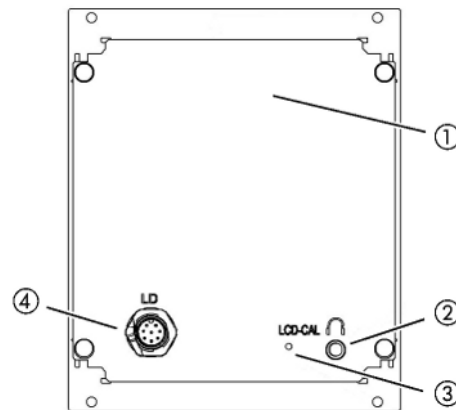


Fig. 2: Rear view

1	Rating plate with control unit	3	Calibration button for calibrating the touch screen (LCD-CAL), can be operated with touch PIN
2	Connection for headphones	4	Connection for the cable to the leak detector (LD)

4.2 Function

You can use the control unit to configure the mass spectrometer module LDS3000. It also lets you output the data stored in the MSB box.

4.3 Technical data

Mechanical data

	560-320
Dimensions (lxwxh)	106,2 mm x 128,4 mm x 49,2 mm

Electrical data

	560-320
Memory capacity for measured data	16 MB

Ambient conditions

	560-320
Max. altitude above sea level	2000 m
Max. relative humidity above 40 °C	50%
Max. relative humidity from 31 °C to 40 °C	80% to 50% (linear abfallend)
Max. relative humidity to 40 °C	80%
Permissible ambient temperature (during operation)	10°C - 45°C
Storage temperature	-20°C - 60°C
Pollution degree	2

5 Installation

5.1 Connecting the control unit

Establish connection of "LD" of the control unit and "Control Unit" of the MSB box with the data cable.

The data cable on the control unit can also be connected or removed during operation.

- ▶ If needed, connect headphones or speakers to the headphones symbol.

⚠ DANGER

Hearing damage from loud volume setting

Loud volume setting can damage hearing.

- ▶ Do not set volume of headphones too loud.

5.2 Installing the control unit

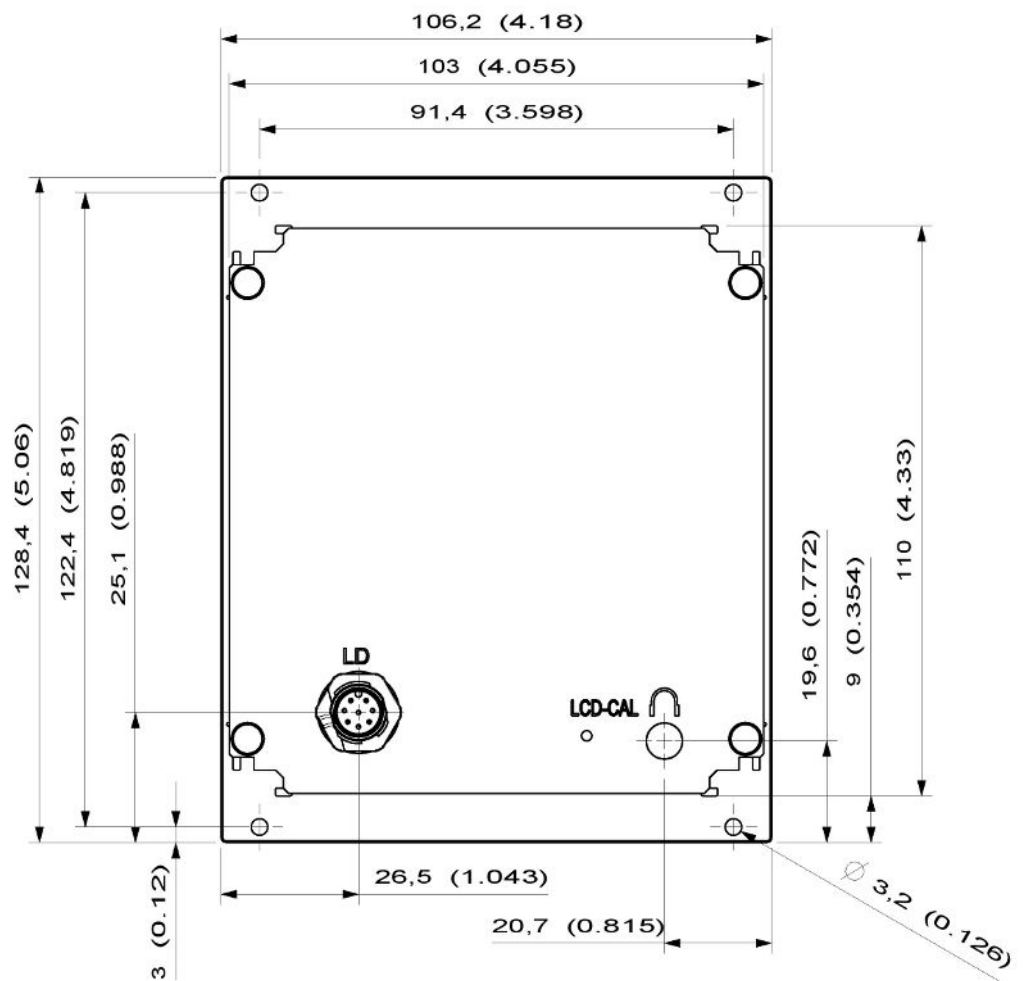


Fig. 3: Dimensions of the control unit in mm (inches in brackets)

- ✓ Recess for control unit is incorporated in the test system.
 - 1** Push the control unit into the recess and screw it tight.
 - 2** Pull protection film from touch screen.

6 Operation CU1000

NOTICE

Damage to touch screen from incorrect operation.

The touch screen can be damaged with a hard or pointed item.

- ▶ Operate touch screen with fingers only.
-

6.1 Touchscreen elements

6.1.1 Measurement display elements

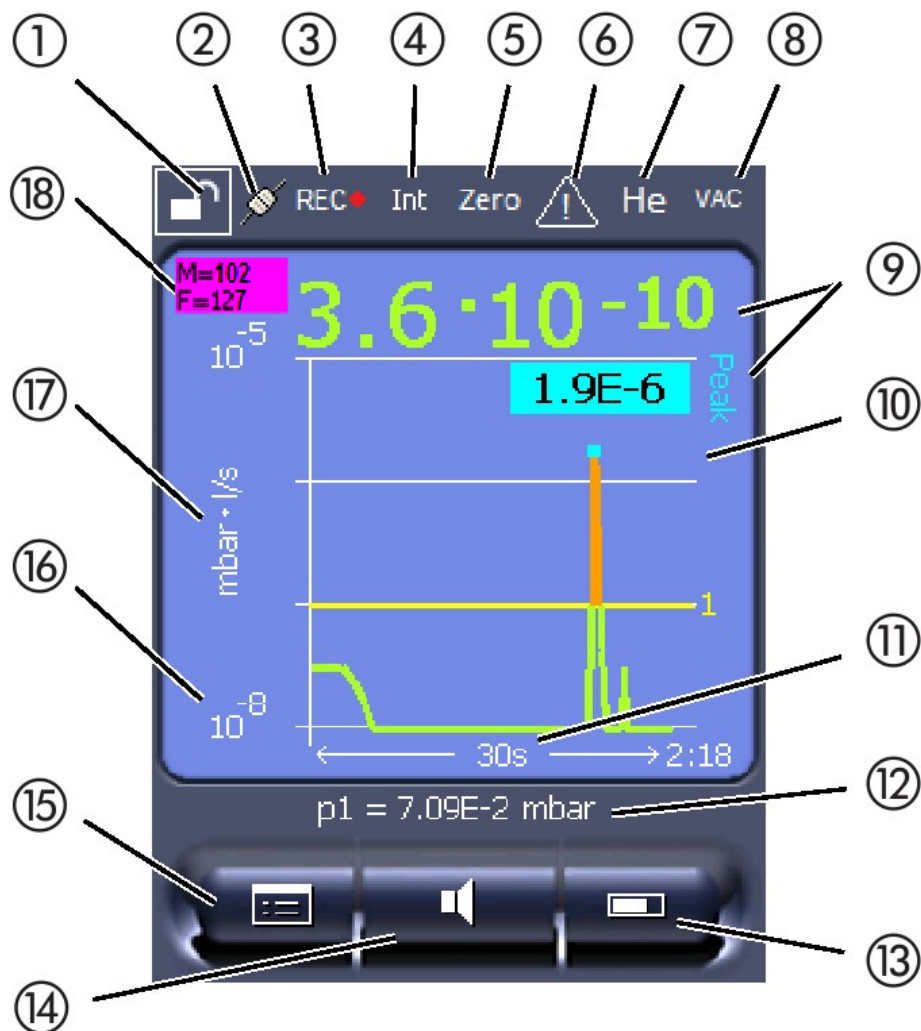


Fig. 4: Measurement display

1	Keyboard lock	2	Communication status	3	Data recording
4	Operator	5	ZERO	6	Message
7	Tracer gas	8	Operation mode	9	Leak rate with peak hold function
10	Graphic representation of the leak rate and the peak hold function	11	Time axis	12	Foreline pressure
13	Button "Favorite 2"	14	Button "Favorite 1"	15	Menu
16	Value axis	17	Measurement unit	18	Display equivalence leak rate

1 - Keyboard lock

The control unit is locked or unlocked by pressing and holding the icon for the keyboard lock.

2 - Icon for the communication status

- Icon connected: The device communicates with the mass spectrometer module.
- Icon disconnected: The device does not communicate with the mass spectrometer module.

Establish communication:

- 1 Reset control unit.
- 2 Checking the status of the mass spectrometer module.
- 3 Check cable connection.

3 - Icon for the data recording

The measurement is recorded.

4 - Ser

The registered operator is shown abbreviated.

Display	Meaning
Ope	Operator
Sup	Supervisor
Int	Integrator
Ser	SERVICE

For more information, see "Operator types and authorizations [▶ 21]".

5 - Zero

Background suppression is active.

6 - Caution icon

Active warnings are stored in the unit.

The active warnings can be displayed via the menu "Info > History > Active warnings".

7 - Tracer gas

Set tracer gas and tracer gas concentration percentage.

Display	Meaning
He	Helium (⁴ He)
H2	Hydrogen
M3	E.g. H-D, ³ He or H ₃

8 - Operation mode

Configured operation mode

Display	Operation mode
VAC	Vacuum
SNIF	Sniffing
LOW FLOW	XL sniffer adapter in LOW FLOW
HIGH FLOW	XL sniffer adapter in HIGH FLOW
Standby	XL sniffer adapter in HIGH FLOW on standby

9 - Leak rate

Current measurement for the leak rate.

10 - Graph

Graphic display of the leak rate $Q(t)$.

11 - Time axis

Time axis of the leak rate $Q(t)$.

12 - Primary vacuum pressure (not with operation mode XL Sniffer Adapter)

Backing pressure p_1 .

13 - Button "Favorite 2"

You can assign preferred parameters to this button, see "Touch screen settings [▶ 17]". In the figure in "Measurement display elements [▶ 14]", the "Favorite 2" button is assigned to the "Measurement view" function as an example.

14 - Button "Favorite 1"

You can assign preferred parameters to this button, see "Touch screen settings [▶ 17]". In the figure in "Measurement display elements [▶ 14]", the "Favorite 1" button is assigned the "Volume" function as an example.

15 - Icon for the menu

All functions and parameters of the control unit can be accessed using the "Menu" key .

A full display of the menu of the menu is included as a file on the USB flash drive supplied with the LDS3000.

16 - Value axis

Value axis of the leak rate Q(t).

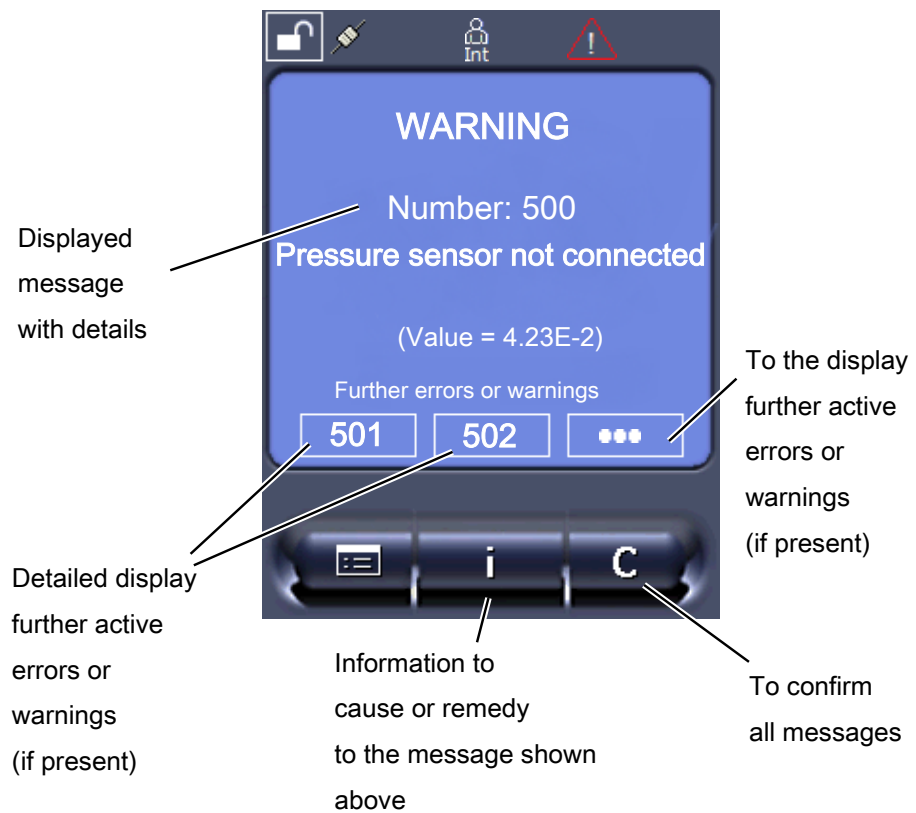
17 - Device of measurement

Device of measurement of the value axis.

18 - Display equivalence leak rate

Correction factor for the test gas used.

6.2 Elements of the error and warning display



You will find an overview of possible errors and warnings in the operating instructions of the LDS3000 (mass spectrometer module), chapter "Warning and error messages".

6.3 Settings and functions

Settings and functions of the control unit are explained in the following. You will find the settings and functions of the mass spectrometer module LDS3000 you can set using the control unit in the operating instructions of the mass spectrometer module.

6.3.1 Touch screen settings

The touch screen grays out the parameters if

- the user is not authorized to change the values, see also “Operator types and authorizations [► 21]“.
- an older version of the software run by mass spectrometer module LDS3000 does not support this parameter.

Scaling of the Q(t)axis

Linear or logarithmic	
Lin.	
Log.	
Control unit	Display > Q(t) axis > Linear or logarithmic

Number of decades with logarithmic view	
1	
2	
3	
4	
Control unit	Display > Q(t) axis > Decades

Autoscale	
Disabled: You can change the display by pressing on the intersection of the coordinate axes and then swiping your finger along the desired axis and releasing it, or if you press on the end of the desired coordinate axis and swipe along in the direction of the intersection of the axes and release.	
On: The display is automatically adjusted depending on the leak rate.	
Control unit	Display > Q(t) axis > Auto scale

Scaling of the time axis

Scaling of the time axis	
15 s	240 s
30 s	480 s
60 s	960 s
120 s	
Control unit	Display > Time axis > Time axis scale

Display units

Device of pressure	
mbar	atm
Pa	Torr
Control unit	Display > Units (display) > Pressure unit

Measured value display

Type of graphic display

	Diagram
	Bar graph
	Control unit Display > Measurement view > Measurement view mode
	Numeric representation of the measurements
	Off
	On
	Control unit Display > Measurement view > Show value
Display brightness	Display brightness
	20 ... 100 %
	Control unit Display > Brightness > Display brightness
Trigger display on the touch screen	Selection of the trigger (leak rate threshold) displayed on the touch screen.
	1
	2
	3
	4
	Control unit Settings > Trigger > Trigger sel.
Assigning favorite buttons	The favorite buttons offer direct access to individual functions. They can be assigned with access control "Supervisor" or higher by the user.
	Favorite 1: Middle button (see the figure in "Measurement display elements [▶ 14]").
	Favorite 2: Right button
	Favorite 3: Button on the bottom right of the main menu.
	Volume Flow switching
	Display settings Check CAL
	Start/Stop At AQ additionally: AQ Wizard
	Measurement view Gas equivalent
	(at AQ instead of : AQ, at instead of :) - - - (= without function)
	CAL
	Control unit Settings > Favorites > Favorite 1 (2, 3)
Displaying warnings on the touchscreen	The display of warnings on the touchscreen can be allowed or suppressed.
	Off
	On

	Control unit	Settings > Set up > Control unit > Messages > Show warnings
Show calibration note	<p>Suppress or allow the calibration note with the following content:</p> <ul style="list-style-type: none"> • Leak rate of the applied calibration leak • No calibration should take place during the first 20 mins <p>OFF (suppressed) ON (allowed)</p>	
	Control unit	Settings > Set up > Control unit > Messages > Show calibration notes
Show calibration request	<p>The display of the calibration request can be permitted or suppressed. To activate or deactivate the calibration request as such, see "Activating the calibration request".</p> <p>OFF (suppressed) ON (allowed)</p>	
	Control unit	Settings > Set up > Control unit > Messages > Show calibration request
Setting the audio alarm	<p>Output of an acoustic signal depending on the leak rate</p> <p>--- No sound</p> <p>Proportional: The frequency of the audible signal is proportional to the bar graph display or diagram height. The frequency range is 300Hz to 3300Hz.</p> <p>Setpoint: The pitch is proportional to the leak rate. The signal sounds if the leak rate exceeds the selected trigger value.</p> <p>Pinpoint: The sound of the acoustic signal changes its frequency within a specific range of leak rates. Range: A decade below the selected trigger threshold up to one decade above. The sound keeps at a constant low and a constant high frequency below and above this range, respectively.</p> <p>Trigger: If the selected trigger threshold is exceeded, a two-pitch signal sounds.</p>	
	Control unit	Settings > Set up > Control unit > Audio > Audio alarm mode
	<p>Behavior with warnings or error messages: If the touch screen shows a warning or an error, then a two-pitch signal sounds simultaneously.</p>	
Automatic switch off of the touch screen	<p>The touch screen can be switched off automatically after a specific time without any operation to save energy.</p>	

30 s	10 min
1 min	30 min
2 min	1 h
5 min	∞ (=never)
Control unit	
Settings > Set up > Control unit > Energy > Display off after	

6.3.2 Operator types and authorizations

There are four different operator types that are distinguished by different authorizations. The integrator is registered ex works.

Additional operators can be registered. The following table shows options for individual operator types to register new operator types.

Operator registration

Viewer	Operator	Supervisor	Integrator
-	Operator	Supervisor	Integrator
	Viewer	Operator	Supervisor
		Viewer	Operator
			Viewer

For the types "Integrator", "Supervisor" and "Operator", a four-digit PIN must be assigned during registration (0000 ... 9999). "0000" is assigned to all operators ex works.

If an operator keeps the pin "0000", this operator will always be registered is during the start up of the system (without PIN query).

A key-operated switch can be used in addition to a PIN if an I/O module is connected. The key-operated switch is connected to the I/O module via three digital inputs (see operating instructions of the LDS3000).

The following table shows the authorizations of individual operator types.

Function	Viewer	Operator	Supervisor	Integrator
Changing parameters	-	x	x	x
Changing the display of error information	-	x	x	x
Calling up factory settings	-	-	-	x
Entering maintenance history	-	-	-	x

The menu "Service" is accessible only to INFICON service staff.

Load parameters	The saved/backed-up parameters of control unit CU1000 and of the mass spectrometer module can be loaded from a USB stick.	
	Control unit	Function > Data > Parameters > Load
Save parameters	The parameters of control unit CU1000 and of the mass spectrometer module can be saved to a USB flash drive.	
	Control unit	Function > Data > Parameters > Save
Display error information	The type of error information can be set differently for each operator type. The Integrator always receives the complete information. Number: Message number text: Brief description Info: Expanded message information	
	<ul style="list-style-type: none"> • Only numbers • Number and text • Number, text and info 	
	Control unit	Function > Data > Parameter > Error info Viewer (Operator, Supervisor)
Parameter list display and change	Parameters can be displayed as an alphabetical list with names and current value s. Each list entry is a button which, when pressed, will open the parameter's set-up dialog box.	
	Control unit	List > Parameters list or : Functions > Data > Parameters > List
Display list of parameter change authorizations	Parameters can be displayed as an alphabetical list with names and current change authorizations. Each list entry is a button which, when pressed, will change access control. Changes are possible in accordance with the hierarchy of the operator.	
	Control unit	Functions > Data > Parameters > Parameter Access

6.3.2.1 Logging out the operator

The operator activates access level "Viewer" to log out. "Access Ctrl > Viewer"

6.3.3 Reset settings

Mass spectrometer module	The settings of the mass spectrometer module can be reset to factory settings.	
	Control unit	Functions > Data > Parameters > Reset > MSB settings
Access controls	The authorization for changing parameters can be reset to factory setting.	
	Control unit	Functions > Data > Parameters > Reset > Param. Access control

Control unit	The control unit settings can be reset to factory settings.	
	Control unit	Functions > Data > Parameters > Reset > Control unit settings

6.3.4 Recording data

The data is saved as a TXT file. Each TXT file contains the following information:

- Date created
- Software version
- Serial number
- Start time
- Time stamp (measurement indicates offset in seconds in relation to start time)
- File name
- Time stamp (offset in seconds in relation to start time)
- Leak rate (expressed in selected unit)
- Pressure p1 (expressed in selected unit)
- Device status

Switching on/off	Switching data recording on/off	
	<ul style="list-style-type: none"> • Off • On 	
	Control unit	Functions > Data > Recorder > Settings > Data recording

Record interval	Time interval between data recordings	
	<ul style="list-style-type: none"> • 100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s 	
	Control unit	Functions > Data > Recorder > Settings > Record interval

Memory location	The data stored in the control unit can be saved to a USB stick. The memory in the control unit is limited to the recording of a 24-hour measurement. Each time after one hour has elapsed, the file is closed and recording continues in the next file.	
	<ul style="list-style-type: none"> • USB flash drive • Control unit 	
	Control unit	Functions > Data > Recorder > Settings > Storage location

Copy data	Copy data from the internal memory of the control unit to a connected USB stick.	
	Control unit	Functions > Data > Recorder > Copy > Copy files

Delete data	Delete data in the internal memory of the control unit
--------------------	--

Control unit

Functions > Data > Recorder > Delete >
Delete files

6.3.5 Calling up information

Different information and states of the system can be called up with the info menu.

- | | |
|-----------------------------------|--|
| Measurement values | <ul style="list-style-type: none"> • Preamplifier • Environment • TMP |
| Temperature | <ul style="list-style-type: none"> • Electronic • TMP |
| Energy and operating hours | <ul style="list-style-type: none"> • Energy values: Information on consumption values • Operation hours: Display for operating hours • Supply voltages: Information on internal supply voltages • Power supply: Information on the supply voltages of the components |
| History | <ul style="list-style-type: none"> • Error, error history / warning history • Calibration, calibration history • TMP error, TMP history • Warnings, active warnings • Maintenance, maintenance history |
| Control unit | <ul style="list-style-type: none"> • Version control unit: Information on the software version • Memory: Information on available memory • Settings: Control unit settings. • Serial port wired: Information on the communication connection • Data exchange: Information on the data exchange between mass spectrometer module and the control unit |
| Mass spectrometer module | <ul style="list-style-type: none"> • MSB (1): Information on the software version • MSB (2): Information on operating parameters • TMP controller (1): Information on the turbo molecular pump • TMP controller (2): Information on the turbo molecular pump, continued • Ion source: Information on the ion source used • Preamplifier: Information on the preamplifier • Preamplifier test: Information on the preamplifier test. |
| Interfaces | <ul style="list-style-type: none"> • I/O module (1): Information on the software version, inputs and outputs • I/O module (2): Visualized information to the digital inputs |

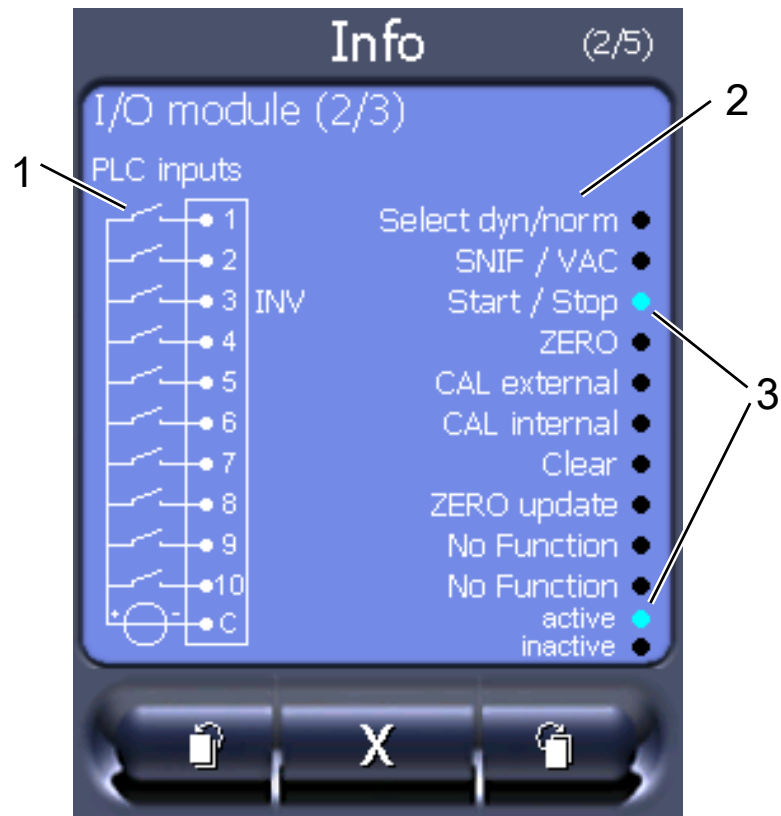


Fig. 5: I/O module (2): Visualized information to the digital inputs

1	Input signal condition	2	Configured function (INV = Function is inverted)
3	Status of the function (active or inactive)		

- I/O module (3): Visualized information to the digital outputs

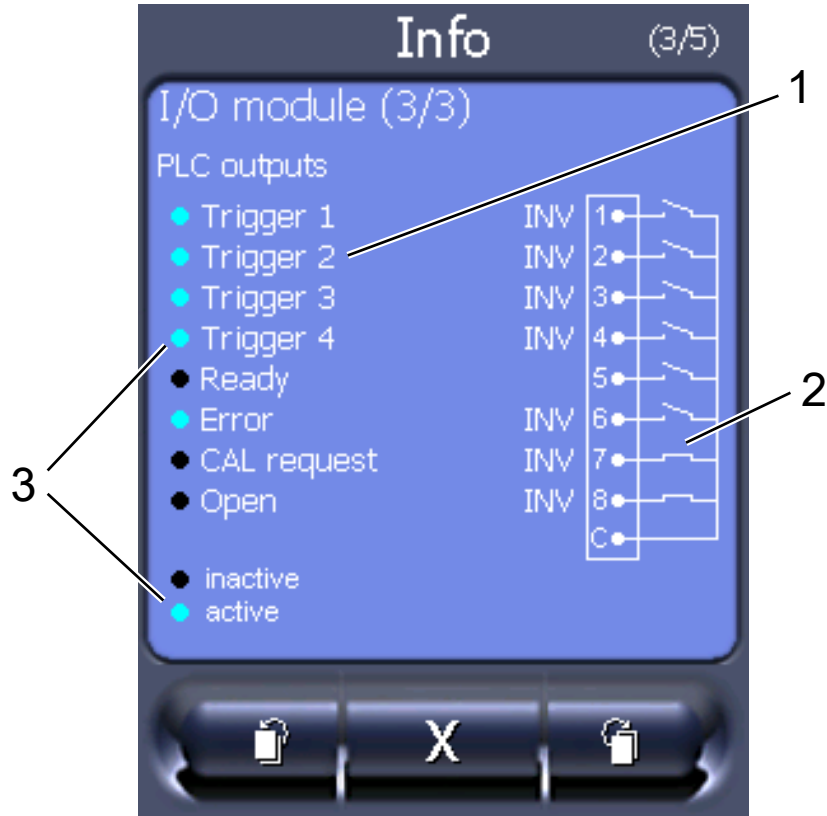


Fig. 6: Visualized information to the digital outputs

1	Configured function (INV = Function is inverted)	2	Output signal condition
3	Status of the function (active or inactive)		

- Bus module (1): Information on the bus module
- Bus module (2): Information on the bus module, continued

6.3.6 Display equivalence leak rate for other gas



Scope

The explanations on the equivalence rate only refer to sniffing operation.

If you measure with the test gases helium or hydrogen, but want to display another gas with its leak rate, use a correction factor for the test gas used.



Fig. 7: Measurement screen with displayed equivalence leak rate and configured favorites key

1	Display of gas name and equivalence factor
2	Favorites button for fast configuration of "gas equivalent selection" after set up, see "Touch screen settings [▶ 17]", "Assigning favorite buttons".

You have a choice of two methods:

- To conveniently set the correction factor, use the "Gas equivalent selection [▶ 27]". There, the correction factor can be selected from a self-defined list, see "Configure gas list [▶ 28]", or switched back to the tracer gas.
- Alternatively, it is possible to calculate and configure the correction factor. For information on calculation, see "Calculate equivalence factor [▶ 29]". For information on configuring the device, see "Set equivalence factor and molar mass [▶ 30]".

6.3.6.1 Gas equivalent selection

- 1 Control unit: Settings > Set up > Operation modes > Equivalence leak rate > Gas equi."
- 2 In the window "Gas equivalent selection", you can respond to different situations:
 - ⇒ If the desired gas equivalent is already stored (numbers 1 to 4), select the desired gas equivalent number and confirm with "OK". The gas name and the equivalence factor of this gas equivalent are then displayed at the top left in the measuring window. You can perform measurement.

- ⇒ If the desired gas equivalent is not stored, it must be configured, see "Configure gas list [▶ 28]".
- ⇒ If you do not find a suitable entry in the 4 gas equivalents and also do not want to change these, you can calculate the correction factor as an alternative. In the window "Gas equivalent selection" select the entry "User-defined" and configure the correction factor, see "Set equivalence factor and molar mass [▶ 30]".
- ⇒ If you want to switch from the display of the gas equivalent in the measuring window back to the measurement value of the measuring gas, select "Switch off" and confirm with "OK".



The options "Switch off" and "Gas equivalent no. 1...4" overwrite parameters, see "Set equivalence factor and molar mass [▶ 30]".

If you select the option "User-defined", parameters then have to be configured, see "Set equivalence factor and molar mass [▶ 30]".

6.3.6.2 Configure gas list

You can predefine up to 4 equivalence gases and assign names to them. The equivalence gases can then be selected in the gas equivalent selection, see "Gas equivalent selection [▶ 27]".

- 1** Control unit: Settings > Set up > Operation modes > Equivalence leak rate > Configure gas list
- 2** Select one of the numbers 1 to 4.
 - ⇒ A set of parameters is displayed for each stored gas. If there is an unused entry, "No Entry" is displayed.
- 3** Press the button "Edit".
 - ⇒ If you want to detect one of the gases from the stored gas library, press the desired entry. See also "Gas library [▶ 36]".
 - ⇒ If the desired gas is not stored, scroll to the end of the gas library and select "User-defined gas". Then, assign a name of your choice in the window "Equivalence gas name" and confirm your choice. Then enter the molar mass and viscosity factor of the equivalence gas. For all gases that are not available in the gas library, please feel free to contact INFICON.
- 4** Make your customer-specific entries in the following windows, which are brought up by the assistant, first "Absolute pressure equivalence gas".
 - ⇒ Corresponds to the absolute pressure of the equivalence gas in the test object in bar.
- 5** Window "Measuring mass".
 - ⇒ This is the mass of the tracer gas (helium, mass 3 or hydrogen)
- 6** Window "Percentage of measuring gas".

⇒ This is the gas proportion of the tracer gas in percent, e.g. for forming gas (95/5) it would be 5%.

7 Window "Absolute pressure measuring gas".

⇒ Corresponds to the absolute pressure of the tracer gas in the test object in bar.

Example

An air conditioning system is to be checked for leaks. The system is first filled with 2 bar (absolute) pure helium and checked for leaks. Later the plant will be filled with R134a. The operating pressure is 15 bar (absolute).

This results in the following values for the above-specified parameters:

Absolute pressure equivalence gas = 15.0

Measuring mass = 4

Percentage of measuring gas = 100.0

Absolute pressure measuring gas = 2.0

6.3.6.3 Calculate equivalence factor

The equivalence factor is not calculated by the software of the device. Calculate the equivalence factor using the following formula:

$$\text{Equivalence factor} = \frac{\eta_{test}}{\eta_{equi}} * \frac{(p_{equi})^2 - 1}{(p_{test})^2 - 1}$$

η_{Test}	Dynamic viscosity of test gas (helium or H ₂)
η_{equi}	Dynamic viscosity of the equivalent gas
p_{test}	Absolute pressure of the test gas in the test object in bar
p_{equi}	Absolute pressure of the equivalent gas in the test object in bar

Example

An air conditioning system is to be checked for leaks.

The system is first filled with 2 bar (absolute) helium and checked for leaks. Later the plant will be filled with R134a. The operating pressure is 15 bar (absolute).

The dynamic viscosity of helium is 19.62 µPa*s.

The dynamic viscosity of R134a is 11.49 µPa*s.

In order to obtain an R134a equivalent leak rate display during the helium leak detection, the following equivalence factor must be entered:

$$\text{Equivalence factor} = \frac{\eta_{test}}{\eta_{equi}} * \frac{(p_{equi})^2 - 1}{(p_{test})^2 - 1} = \frac{19,62}{11,49} * \frac{15^2 - 1}{2^2 - 1} \approx 127$$

6.3.6.4 Set equivalence factor and molar mass

- ✓ The equivalence factor is known. See also "Calculate equivalence factor [▶ 29]".
- ✓ The test gas used is specified (hydrogen or helium, mass 2, 3 or 4).
- ✓ The molar mass of the equivalence gas you want to display is known.

1 Control unit: Settings > Set up > Operation modes > Equivalence rate

2 "Gas factor" button

⇒ (LD protocol: Command 469)

3 Select "Mass 2", "Mass 3" or "Mass 4" according to your test gas.

⇒ If the test gas is set to helium, the window "Equivalent Gas Factor He" opens.

4 Set the equivalence gas factor. In the example (see "Calculate equivalence factor [▶ 29]") for 127:



Equivalence gas factor He
0127.0

5 Control unit: Settings > Set up > Operation modes > Equivalence rate

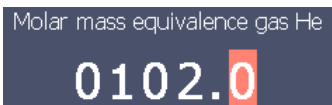
6 "Molar mass" button

⇒ (LD protocol: Command "470")

7 Select "Mass 2", "Mass 3" or "Mass 4" to match your test gas as described above.

⇒ If the test gas is set to helium, the window "Molar mass equivalent gas He" opens.

8 Set your molar mass. In the example for 102:



Molar mass equivalence gas He
0102.0

- ⇒ If the equivalence factor is not equal to 1 or the molar mass is not set to factory settings, the equivalence factor is displayed both on the calibration result and on the measurement screen.



Fig. 8: Top left: Display of Molar Mass (102) and Equivalence Factor (127)

6.3.7 Updating the software

Software updates from INFICON are installed with the aid of a USB flash drive. The update function of the device can be found under "Functions > Data > Update".

An update is possible,

- if one or several updates are available on the USB flash drive, but only one update per type at most (control unit, MSB box, I/O module),
- if these parts are also connected free of disturbances and have an update function.

The corresponding buttons in the update menu such as "Control Unit", "MSB Box", and "I/O Module" are active and can be activated individually.

NOTICE

Aborted connection

Loss of data due to disconnection

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

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

6.3.7.1 Updating the software of the control unit

The software is contained in two files with the same file name, but with different file name extensions (".exe" and ".key").

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

6.3.7.2 Checking and updating the software version of the MSB box

The current software is available from the Inficon support.

The functions of the XL Sniffer adapter set are taken into consideration in system software version 2.11 or higher.

- 1** Copy the file with the file name extension ".bin" into the root directory of a USB stick.
- 2** Connect the USB flash drive to the USB port on the device.
- 3** Select: "Functions > Data > Update > MSB".
 - ⇒ The display shows information on the current and the new software version as well as on the boot loader.
- 4** Check the version information.
 - ⇒ Select the "Start" button to start the update.
 - ⇒ Do not switch off the device and do not remove the USB flash drive while the software is being updated! Do not switch off the device and do not remove the USB flash drive while the software is being updated!
- 5** Follow the instructions on the touchscreen and wait until the update is complete.
- 6** If the system displays warning 104 or 106, confirm with "C".

6.3.7.3 Updating the software of the I/O module

The software of the I/O module can be updated from the control unit if the mass spectrometer module has at least the software version "MS module 1.02".

- 1** Copy the file with the file name extension ".bin" into the root directory of a USB stick.

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

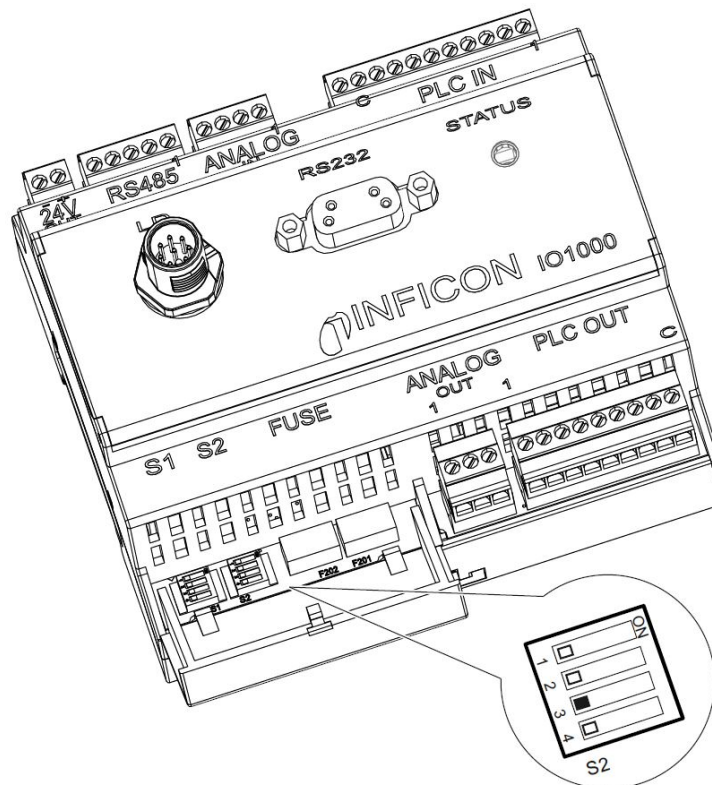


Fig. 9: DIP switch on the I/O module

7 Decommissioning the measuring instrument

7.1 Disposing of the device

The device can either be disposed of by the operator or be sent to the manufacturer. The device consists of materials that can be recycled. This option should be exercised to prevent waste and also to protect the environment.

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

7.2 Returning the device for maintenance, repair or disposal

WARNING

Danger due to harmful substances

Contaminated devices could endanger health. The contamination declaration serves to protect all persons who come into contact with the device.

► Fill in the declaration of contamination completely.

-
- 1** Please do not hesitate to contact us and send a completed declaration of contamination before sending anything to us.
 - ⇒ You will then receive a return number and the shipping address.
 - 2** Use the original packaging when returning.
 - 3** Before sending the device, attach a copy of the completed 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"/>	

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

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

5 Harmful substances, gases and/or by-products

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

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

6 Legally binding declaration:

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

Organization/company _____

Address _____ Post code, place _____

Phone _____ Fax _____

Email _____

Name _____

Date and legally binding signature _____
Company stamp _____

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

8 Gas library

The operating software of the device contains a list of approx. 100 gases which could be relevant in the refrigeration industry.

The list is stored in the nonvolatile flash memory of the operating unit and can be updated. The user can access this list while pre-defining the equivalence gases, see "Configure gas list [▶ 28]". The user can then select from the pre-defined gases during gas equivalent selection, see "Gas equivalent selection [▶ 27]".

The library of the device has the following factory-defined content:

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R11	CFCl ₃	137.4	0.515	1.15
R12	CF ₂ Cl ₂	120.9	0.591	1.319
R12B1	CF ₂ ClBr Halon 1211	165.4	0.523	1.167
R13	CF ₃ Cl	104.5	0.857	1.913
R13B1	CF ₃ Br Halon 1301	149	0.852	1.902
R14	CF ₄	80	0.857	1.913
R21	CHFCl ₂	102.9	0.535	1.194
R22	CHF ₂ Cl	86.5	0.632	1.411
R23	CHF ₃	70	0.704	1.571
R32	CH ₂ F ₂	52	0.632	1.411
R41	CH ₃ F	34	0.551	1.23
R50	CH ₄ Methane	16	0.556	1.241
R113	C ₂ F ₃ Cl ₃	187.4	0.484	1.08
R114	C ₂ F ₄ Cl ₂	170.9	0.545	1.217
R115	C ₂ F ₅ Cl	154.5	0.627	1.4
R116	C ₂ F ₆	138	0.709	1.583
R123	C ₂ HF ₃ Cl ₂	152.9	0.54	1.205
R124	C ₂ HF ₄ Cl	136.5	0.581	1.297
R125	C ₂ HF ₅	120	0.653	1.458
R134a	C ₂ H ₂ F ₄	102	0.591	1.319
R141b	C ₂ H ₃ FCl ₂	117	0.464	1.036
R142b	C ₂ H ₃ F ₂ Cl	100.5	0.494	1.103
R143a	C ₂ H ₃ F ₃	84	0.561	1.252
R152a	C ₂ H ₄ F ₂	66.1	0.515	1.15

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R170	C ₂ H ₆ Ethane	30.1	0.479	1.069
R218	C ₃ F ₈	188	0.627	1.4
R227ea	C ₃ H ₇ F	170	0.627	1.4
R236fa	C ₃ H ₂ F ₆	152	0.55	1.228
R245fa	C ₃ H ₃ F ₅	134	0.52	1.161
R290	C ₃ H ₈ Propane	44.1	0.433	0.967
R356	C ₄ H ₅ F ₅	166.1	0.561	1.252
R400	Mixture of 50% R12 50% R114	141.6	0.571	1.275
R401A	Mixture of 53% R22 13% R152a 34% R124	94.4	0.607	1.355
R401B	Mixture of 61% R22 11% R152a 28% R124	92.8	0.612	1.366
R401C	Mixture of 33% R22 15% R152a 52% R124	101	0.602	1.344
R402A	Mixture of 38% R22 60% R125 2% R290	101.6	0.647	1.444
R402B	Mixture of 60% R22 38% R125 2% R290	94.7	0.642	1.433
R403A	Mixture of 75% R22 20% R218 5% R290	92	0.642	1.433
R403B	Mixture of 56% R22 39% R218 5% R290	103.3	0.647	1.444

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R404A	Mixture of 44% R125 52% R143a 4% R134a	97.6	0.607	1.355
R405A	Mixture of 45% R22 7% R152a 5.5% 142b 42.5% RC318	111.9	0.622	1.388
R406A	Mixture of 55% R22 4% R600a 41% R142b	89.9	0.566	1.263
R407A	Mixture of 20% R32 40% R125 40% R134a	90.1	0.637	1.422
R407B	Mixture of 10% R32 70% R125 20% R134a	102.9	0.647	1.444
R407C	Mixture of 10% R32 70% R125 20% R134a	86.2	0.627	1.4
R407D	Mixture of 23% R32 25% R125 52% R134a	91	0.612	1.366
R407E	Mixture of 25% R32 15% R125 60% R134a	83.8	0.622	1.388
R407F	Mixture of 40% R134a 30% R125 30% R32	82.1	0.67	1.496
R408A	Mixture of 7% R125 46% R143a 47% R22	87	0.602	1.344

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R409A	Mixture of 60% R22 25% R124 15% R142b	97.4	0.607	1.355
R409B	Mixture of 65% R22 25% R124 10% R142b	96.7	0.612	1.366
R410A	Mixture of 50% R32 50% R125	72.6	0.673	1.502
R410B	Mixture of 45% R32 55% R125	75.6	0.673	1.502
R411A	Mixture of 1.5% R1270 87.5% R22 11% R152a	82.4	0.617	1.377
R411B	Mixture of 3% R1270 94% R22 3% R152a	83.1	0.62	1.388
R411C	Mixture of 3% R1270 95.5% R22 1.5% R152a	83.4	0.627	1.4
R412A	Mixture of 70% R22 5% R218 25% R142b	92.2	0.602	1.344
R413A	Mixture of 9% R218 88% R134a 3% R600	104	0.581	1.297
R414A	Mixture of 51% R22 28.5% R124 4% R600a 16.5% R142	96.9	0.586	1.308

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R415A	Mixture of 82% R22 18% R152a	81.7	0.622	1.388
R416A	Mixture of 59% R134a 39.5% R124 1.5% R600	111.9	0.576	1.286
R417A	Mixture of 50% R134a 46% R125 4% R600a	106.7	0.61	1.362
R422D	Mixture of 65.1% R125 31.5% R134a 3.4% R600a	112.2	0.622	1.388
R438A	Mixture of 45% R125 44.2% R134a 8.5% R32 1.7% R600 0.6% R601a	104.9	0.617	1.377
R441A	Mixture of 54.8% R290 36.1% R600 6% R600a 3.1% R170	49.6	0.398	0.888
R442A	Mixture of 31% R32 31% R125 30% R134a 5% R227ea 3% R152a	81.8	0.629	1.404
R448A	Mixture of 26% R32 26% R125 21% R134a 20% R1234yf 7% R1234ze	99.3	0.625	1.395

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R449A	Mixture of 25.7% R134 25.3% R1234yf 24.7% R125 24.3% R32	87.2	0.622	1.388
R450A	Mixture of 58% R1234ze 42% R134a	109	0.592	1.321
R452A	Mixture of 59% R125 30% R1234yf 11% R32	103.5	0.612	1.366
R452B	Mixture of 67% R32 26% R1234yf 7% R125	72.9	0.639	1.426
R454C	Mixture of 22% R32 78% R1234yf	90.8	0.62	1.384
R500	Mixture of 74% R12 26% R152a	99.3	0.581	1.297
R501	Mixture of 75% R22 25% R12	93.1	0.627	1.4
R502	Mixture of 49% R22 51% R115	111.6	0.647	1.444
R503	Mixture of 40% R23 60% R13	87.3	0.709	1.583
R504	Mixture of 48% R32 52% R115	79.3	0.678	1.513
R505	Mixture of 78% R12 22% R31	103.5	0.612	1.366
R506	Mixture of 55% R31 45% R114	93.7	0.561	1.252

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
R507	Mixture of 50% R125 50% R143a	98.9	0.612	1.366
R508A	Mixture of 39% R23 61% R116	100.1	0.729	1.627
R508B	Mixture of 46% R23 54% R116	95.4	0.729	1.627
R513A	Mixture of 44% R134a 56% R1234yf	108.7	0.582	1.299
R600	C ₄ H ₁₀ Butane	58.1	0.377	0.842
R600a	C ₄ H ₁₀ Iso-Butane	58.1	0.377	0.842
R601	C ₅ H ₁₂ Pentane	72.2	0.341	0.761
R601a	C ₅ H ₁₂ Iso-Pentane	72.2	0.336	0.75
R601b	C ₅ H ₁₂ Neopentane	72.2	0.337	0.752
R601c	C ₅ H ₁₂ Cyclopentane	70.1	0.337	0.752
R1233zd	C ₃ H ₂ ClF ₃	130.5	0.558	1.246
R1234yf	C ₃ H ₂ F ₄	114	0.624	1.393
R1234ze	C ₃ H ₂ F ₄	114	0.619	1.382
R1243zf	C ₃ H ₃ F ₃	96	0.6	1.339
Ar	Argon	40	1.127	2.516
CO ₂	R744	44	0.744	1.661
H ₂	Hydrogen	2	0.448	1
H ₂ O	R718	18	0.459	1.025
He	Helium	4	1	2.232
HT135	Galden HT135	610	1	2.232
Kr	Krypton	84	1.275	2.846
N ₂	Nitrogen	28	0.892	1.991
Ne	Neon	20.2	1.586	3.54
NH ₃	R717	17	0.505	1.127

Gas designation (max. 8 digits)	Other designations	Molecular mass (amu)	Helium viscosity factor	Hydrogen/mass 3 viscosity factor
O ₂	Oxygen	32	1.03	2.299
SF ₆		146.1	0.765	1.708
Xe	Xenon	131.3	1.153	2.574
ZT130	Galden ZT130	497	1	2.232

Table 1: Gas library V3.24

9 CE Declaration of Conformity



EU Declaration of Conformity

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

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

Designation of the product:

Operating unit

Models: **CU1000**

Catalogue numbers:

560-320

Cologne, August 24th, 2023

Matthias Fritz, President LDT

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 B according to EN 55011
- **EN IEC 63000:2018**

Cologne, August 24th, 2023

pro
W. Schneider, Research and Development

INFICON GmbH
Bonner Strasse 498
D-50968 Cologne
Tel.: +49 (0)221 56788-0
Fax: +49 (0)221 56788-90
www.inficon.com
E-mail: leakdetection@inficon.com



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