Ion Reference Gauge Controller

IRC081

CE

Table of Contents

The (→ 🗎 XY) symbol is used for references in the text. The (→ 🕮 [Z]) symbol is used for references to other documents listed in the list of references.

1 Introduction

1.1 Validity

This document is valid for products with the part number

399-880

You can find the part number (PN) on the nameplate.

This instruction manual is based on the 0.6 ff hardware version and version 2.0.7 ff of the PC software for control and read-out.

Older hardware and software versions do not have the full functionality described in this instruction manual.

If the device does not work as described, check whether your device is equipped with this firmware version. The hardware version is indicated on the nameplate. You can find the software version in the software's info window (→ software information, 🗎 36).

The nameplate is on the side of the device. The specifications of the nameplate are required when communicating with INFICON.

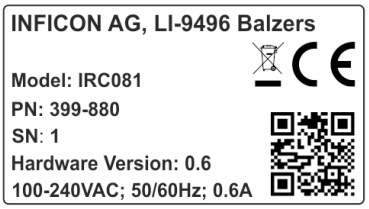


Figure 1 – Example of a nameplate

1.2 Intended use and function

The Ion Reference Gauge Controller IRC081 and its User Interface are an operating and display interface to the standardized Ion Reference Gauge IRG080. IRC081 delivers, in combination with IRG080, precise and reference total pressure measurement in the range of 10^{-8} … 10^{-4} mbar (10^{-6} … 10^{-2} Pa). To this end, various parameters for operating the Ion Reference Gauge IRG080 can be set and read.

The coupled "IRC081 User Interface" PC software takes on essential control functions and graphically depicts the parameter values and pressure value. Full functionality is only provided by operating both components together.

The IRC081 is only intended to be connected to an Ion Reference Gauge IRG080.

The Ion Reference Gauge Controller IRC081 and its user interface are referred to below as "IRC081" for short.

The Ion Reference Gauge IRG080 will be referred to as "IRG080".

1.3 Unintended use and function

The IRC081 is designed and built exclusively for the purpose mentioned in the section Intended use, 🗎 4 and may only be used in this manner.

Any use for purposes that deviate from the above mentioned, in particular for the connection of not allowed or unsuitable gauges and components and/or the application of voltages outside the allowed range is considered unintended use.

Use of the IRC081 for control tasks, in particular in safety-critical applications, is expressly excluded.

1.4 Supplied equipment

Designation	Quantity
Ion Reference gauge Controller IRC081	1
Shockproof measuring line, CAT III, 1 m, red	1
Shockproof measuring line, CAT III, 1 m, black	1
USB cable, USB A/USB B, 2 m, USB 2.0	1
USB stick with software and instructions	1
D-sub, female, 9-pin for vacuum interlock	1

1.5 Safety

Personnel qualifications

The work described in this document may only be carried out by persons who have suitable technical training and have the necessary experience or have been trained accordingly by the operator.

Depiction of residual hazards

In this instruction manual, safety instructions for residual hazards are depicted as follows:

Danger

Indicates an imminently dangerous situation that, if not avoided, will result in death or serious injuries.

Warning

Indicates a possibly dangerous situation that, if not avoided, could result in death or serious injuries.

Caution

Indicates a possibly dangerous situation that, if not avoided, could result in moderate or light injuries or property damage.

Indicates to particularly important but non-safety-relevant information.

Fundamental safety regulations

Comply with the relevant safety regulations when carrying out any work. Furthermore, observe all safety instructions given in this document and pass these instructions on to all other users.

In particular, pay attention to the following safety instructions:

Danger

Supply voltage

Contact with live components in the device is dangerous to life if objects are inserted or liquids penetrate inside.

Do not insert any objects into openings in the device. Protect the device against moisture.

Caution

Improper use

Improper use can damage the IRC081.

Only use the IRC081 according to the manufacturer's specifications (→ Intended use, 🗎 4).

Caution

Incorrect connection and operation data

Incorrect connection and operation data can damage the IRC081.

Adhere to all stipulated connection and operation data.

1.6 Responsibility and warranty

INFICON denies all responsibility and warranty if the operator or third parties

- disregard this document,
- use the product in an unintended manner,
- make any adjustments to the product (conversions, modifications, etc.),
- operate the product with accessories that are not listed in the associated product documentation.

2 Specifications

Mechanical data

Weight	2.2 kg
Use	Tabletop
Dimensions [mm]	

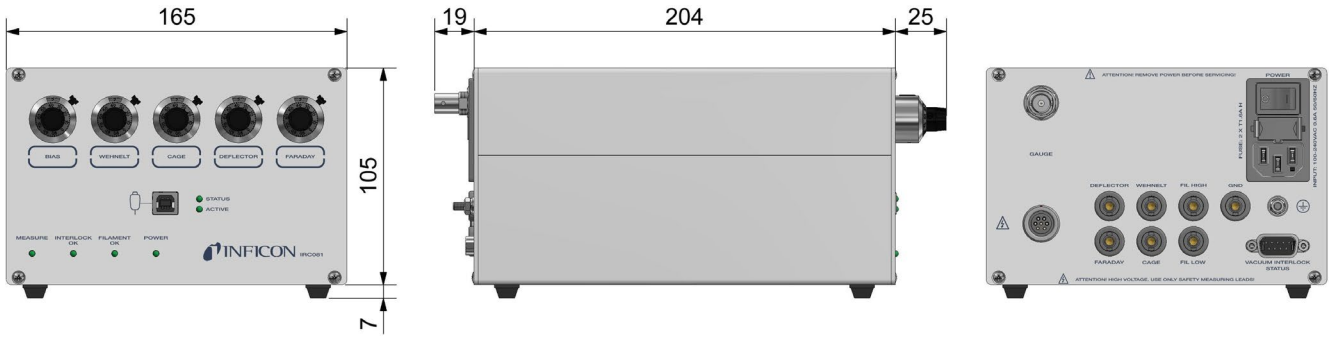


Figure 2 – Dimensions of the IRC081

Environment

Temperature	
Storage	-20 – +60 °C
Operation	+5 – +40 °C
Relative humidity	max. 80% (up to 30 °C)
	decreasing to max. 50% (from 40 °C)
Use	indoors, max. altitude of 3000 m above MSL
Degree of contamination	II
Ingress protection	IP40

Operation

Manual	via 5 helipot knobs
Computer	via USB-B 2.0 with PC software "IRC081 User Interface"

Connection to power supply

Voltage	100-240 V (ac)
Frequency	50/60 Hz
Power consumption	max. 20 VA
Excess voltage category	II
Protection category	1
Connector	IEC 320 C14 connector plug
Fuse	2 x T1.6A H

Measurement channel

Connector	
to gauge control interface	1 x LEMO EGG.2B.307.CLL
to gauge ion collector	1 x BNC
Usable gauges	IRG080

Measuring sockets

Connection type	CAT III, 4 mm
Quantity	7 (2x filament, Wehnelt, cage (anode), deflector, Faraday, GND)

Vacuum interlock/status	Connector	D-sub, 9-pin (male)
	External vacuum interlock: 1 x relay contact from external vacuum gauge	
	Sensor status: 1 x potential-free make contact	

Voltage sources

			Accuracy
Cathode bias voltage	20-60 V (dc)		0.1%
Wehnelt voltage	20-60 V (dc)	max. 1 mA	0.1%
Anode voltage	200-400 V (dc)	max. 1 mA	0.1%
Deflector voltage	20-60 V (dc)	max. 1 mA	0.1%
Faraday voltage	200-400 V (dc)	max. 1 mA	0.1%

Current sources

Emission current	Two emission current ranges (100 µA, 1 mA, accuracy : 0.1%)
Heater current	Controlled by the emission current (in increments of 0.1 A) Limit: 1-2 A (PC software) The heater current guided control is possible when the selected emission current is higher than the set maximum heater current.

Measurement output

Measurement ranges	7
End values	50 pA/500 pA/5 nA/50 nA/500 nA/5 µA/50 µA
Converter resolution	>16 bit
Min. measurement current	<0.1 pA
Accuracy	<0.1%, in the 50 pA range <0.5%

3 Installation

3.1 Unpacking

1. Inspect the transport packaging for external damage.
2. Unpack the IRC081 and put the packaging aside.

   Keep the packaging material. The IRC081 may only be stored and transported in its original packaging.

3. Check the IRC081 for completeness.
4. Visually check the IRC081 for damage.

Warning

In case of visible damage, putting the product into operation can be life-threatening. Do not put the damaged product into operation and secure it against unintended operation.

3.2 Mechanical installation

The IRC081 is intended for use as a tabletop device. Always pay attention to the following safety instruction.

Caution

Excessive ambient temperature.

Exceeding the maximum allowable ambient temperature can damage the device.

Make sure that the maximum allowable ambient temperature is not exceeded. Do not expose the device to direct sunlight.

3.3 Connection

3.3.1 Rear panel of the IRC081

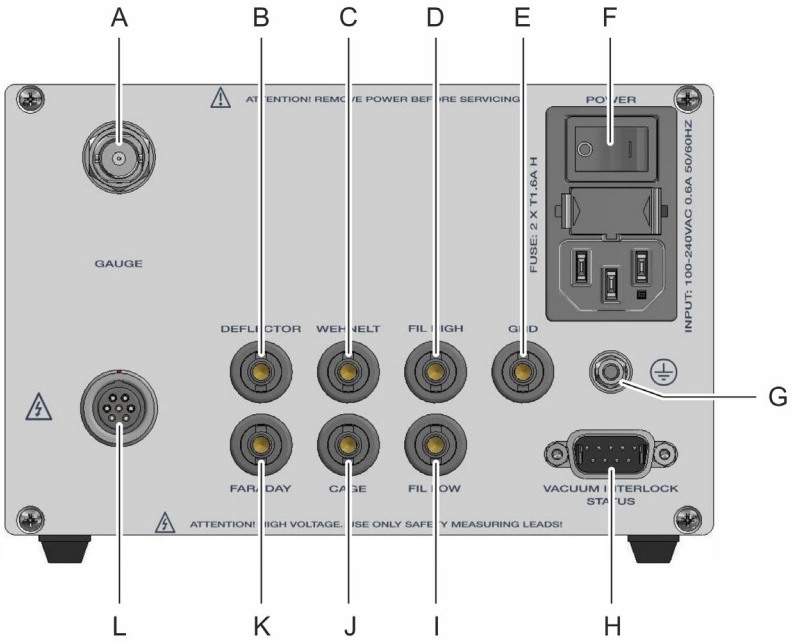


Figure 3 – Rear view of the IRC081

A	GAUGE connection (ion collector current input)
B	DEFLECTOR measuring socket (deflector voltage)
C	WEHNELT measuring socket (Wehnelt voltage)
D	FIL HIGH measuring socket (bias voltage – upper value)
E	GND measuring socket
F	Power supply with power switch and device fuses
G	Attachment and grounding screw for internal protective conductor
H	VACUUM INTERLOCK/STATUS connection
I	FIL LOW measuring socket (bias voltage – lower value)
J	CAGE connection (anode voltage)
K	FARADAY connection (Faraday voltage)
L	GAUGE connection (Interface to Sensor)

Warning

Internal protective conductor and grounding.

The internal protective conductor is attached to the inside of the housing by means of a screw. A device with an unattached protective conductor can be life-threatening in the event of a fault.

Do not turn or loosen the screw and the corresponding nut on the housing (to which the internal protective conductor is fastened).

The screw outside of the housing serves as an earthing connection with which the unit is connected to the protective earthing of the vacuum chamber. To do this, only the outer nut must be loosened.

The assignment of the individual connections is described in the sections below.

3.3.2 Power supply

The power supply (→ Figure 3 – Rear view of the IRC081, pos. F, 🗎 10) is intended for a power cable that ends in a connector plug on the device side.

The power cable must meet the following specifications:

- Three-core cable with protective grounding
- Conductor cross section 3 × 0.75 mm^2 or greater
- Cable length: max. 2.5 m

Danger

Supply voltage.

Improperly grounded devices are life-threatening in the event of a fault.

Only use three-core power cables or extension cords with protective grounding.
Only plug the power supply plug into a socket with a protective contact.

❶ Plug the connector plug of the power cable into the power connector of the device.

❷ Plug the power supply plug of the power cable into the socket.

3.3.3 Grounding

Protective conductor

The grounding screw (→ Figure 3 – Rear view of the IRC081, pos. G, 🗎 10) can be used to connect the IRC081 to the local protective grounding network.

❶ If necessary: Connect the local protective grounding network to the grounding screw via a protective conductor.

❷ Only loosen the outer nut on the earthing screw.

The metal flange of the IRG080 gauge is connected to the protective conductor via the measuring line through the IRC081.

3.3.4 GAUGE

The **GAUGE** connection is used to connect the IRG080.

Control signals

Control signals and supply voltages are supplied through a 7-pin socket, type LEMO EGG.2B.307.CLL (→ Figure 3 – Rear view of the IRC081, pos. L, 🗎 10 and Figure 4 – 7-pin GAUGE connection socket, 🗎 12).

Contact assignment:

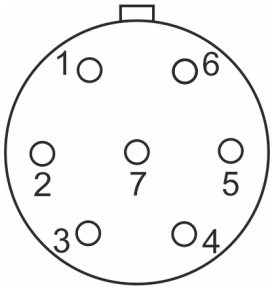


Figure 4 – 7-pin GAUGE connection socket

1	Faraday	5	Safety interlock
2	Wehnelt	6	Cage (anode)
3	Fil High	7	Deflector
4	Fil Low		

☞ A safety interlock in the measuring line prevents accidental switch-on of the emission when the connector is pulled out. Nevertheless, only perform work on the IRG080 or the measuring line when the device is switched off. Wait about another 15 seconds after switching off the device before starting to work.

☞ For operation, both the safety interlock and the vacuum interlock circuits must be closed (→ Figure 5 – VACUUM INTERLOCK/STATUS connector plug, 🗎 14).

Measurement signal

The measurement signal, i.e., the ion current, is transmitted via a coaxial cable (→ Figure 3 – Rear view of the IRC081, pos. A, 🗎 10).

Contact assignment:

Inner conductor: ion current

Outer conductor: shielding

3.3.5 FARADAY

The **FARADAY** connection is used to measure the set Faraday voltage. A single-pin CAT III, 4 mm measuring socket is available for the measurement (→ Figure 3 – Rear view of the IRC081, pos. K, 🗎 10).

Warning

Dangerous contact voltage.

Voltages above 60 V (dc) are dangerous to contact.

Use the included shockproof measuring lines and a suitable meter for voltage measurement.

❶ Measure the Faraday voltage between the **FARADAY** measuring socket and the **GND** measuring socket with the included shockproof measuring lines and a suitable meter.

3.3.6 DEFLECTOR

The **DEFLECTOR** connection is used to measure the set deflector voltage. A single-pin CAT III, 4 mm measuring socket is available for the measurement (→ Figure 3 – Rear view of the IRC081, pos. B, 🗎 10).

❶ Measure the deflector voltage between the **DEFLECTOR** measuring socket and the **GND** measuring socket with the included shockproof measuring line and a suitable meter.

3.3.7 CAGE

The **CAGE** connection is used to measure the set cage (anode) voltage. A single-pin CAT III, 4 mm measuring socket is available for the measurement (→ Figure 3 – Rear view of the IRC081, pos. J, 🗎 10).

Warning

Dangerous contact voltage.

Voltages above 60 V (dc) are dangerous to contact.

Use the included shockproof measuring lines and a suitable meter for voltage measurement.

❶ Measure the Faraday voltage between the **CAGE** measuring socket and the **GND** measuring socket with the included shockproof measuring line and a suitable meter.

3.3.8 WEHNELT

The **WEHNELT** connection is used to measure the set Wehnelt voltage. A single-pin CAT III, 4 mm measuring socket is available for the measurement (→ Figure 3 – Rear view of the IRC081, pos. C, 🗎 10).

❶ Measure the Wehnelt voltage between the **WEHNELT** measuring socket and the **GND** measuring socket with the included shockproof measuring line and a suitable meter.

3.3.9 FIL HIGH/FIL LOW

The **FIL HIGH** and **FIL LOW** connections are used to measure the set cathode bias voltage. A single-pin CAT III, 4 mm measuring socket is available for the measurement (→ Figure 3 – Rear view of the IRC081, pos. D and I, 🗎 10).

❶ Measure the voltage between the **FIL HIGH** / **FIL LOW** measuring sockets and the **GND** measuring socket with the included shockproof measuring line and a suitable meter.

❷ Form the arithmetic mean from the two measured voltage values to determine the correct cathode bias voltage.

3.3.10 GND

The **GND** connection is used as a ground connection for the voltage measurements. A single-pin CAT III, 4 mm measuring socket is available (→ Figure 3 – Rear view of the IRC081, pos. E, 🗎 10).

3.3.11 VACUUM INTERLOCK/STATUS

The **VACUUM INTERLOCK/STATUS** (→ Figure 3 – Rear view of the IRC081, pos. H, 🗎 10 and Figure 5 – VACUUM INTERLOCK/STATUS connector plug, 🗎 14) is used as a safety interlock to protect the cathode of the sensor. During measurement operation, a relay contact connects PIN 1 to PIN 2 (max. 30 V (ac), 0.5 A).

Contact assignment:

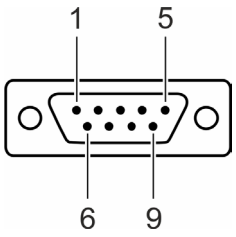


Figure 5 – VACUUM INTERLOCK/STATUS connector plug

1	Sensor status	6	n.c. (not connected)
2	Sensor status	7	n.c. (not connected)
3	n.c. (not connected)	8	n.c. (not connected)
4	Vacuum interlock	9	n.c. (not connected)
5	Vacuum interlock		

❶ Connect the peripheral components to the **VACUUM INTERLOCK/STATUS** connection using a shielded connecting cable.

❷ Use the switching point output of another vacuum gauge for the vacuum interlock connection. A pressure value of 1×10^{-4} mbar is recommended for the switching point.

3.4 Software

Using the IRC081 requires communication with a PC or laptop.

Both the function control and the measured value processing take place via the **IRC081 User Interface** PC software in a LabVIEW environment on the computer. A RedLab measurement module is built into the IRC081 for data processing and data exchange with the computer.

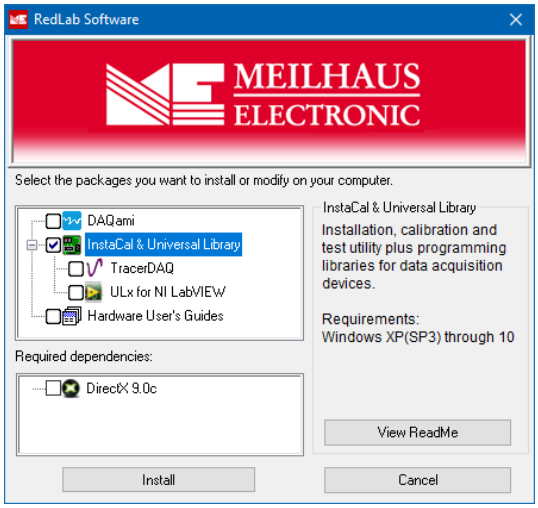
❶ First, install on a PC or laptop the software necessary for operation for the RedLab module and the **IRC081 User Interface**.

3.4.1 RedLab measurement module

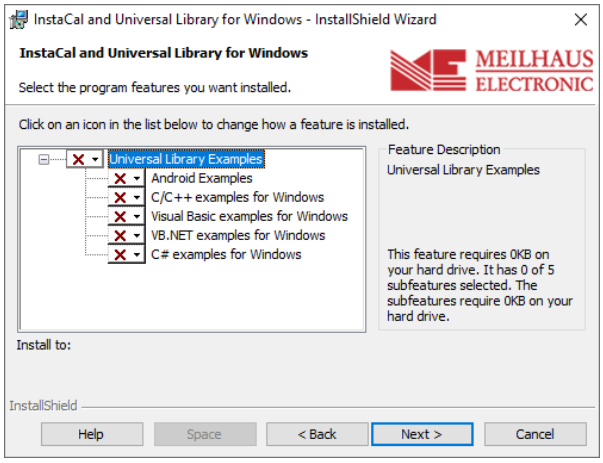
The RedLab software package is included free-of-charge in the scope of delivery of the RedLab modules and is available via the supplied USB stick. Alternatively, the software is offered for download on the website of the manufacturer Meilhaus Electronic: www.meilhaus.de

❶ Connect the IRC081 to the PC via USB. The IRC081 does not need to be switched on for this.

❷ Once the USB device is recognized, run the **install.exe** file from the **RedLab_CD_v4_3** folder to install the **InstaCal & Universal Library** software component. This software component is required to allow data logging with the RedLab **USB-2408-2AO** module integrated in the IRC081.

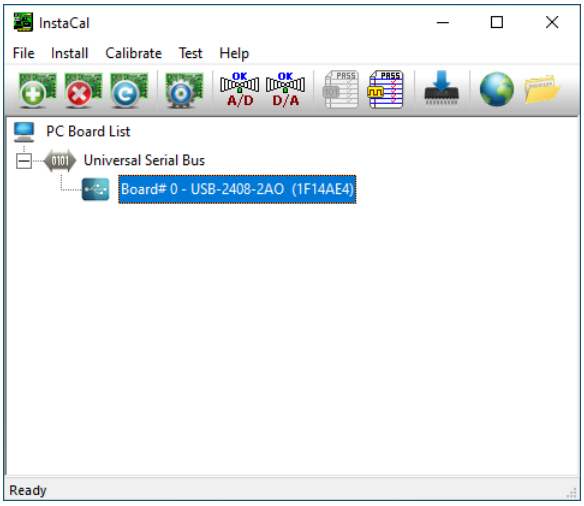


The Universal Library Examples are not required.



❸ After restarting the PC, run the **InstaCal** program. You can find the program in the Windows start menu under **Programs\RedLab**.

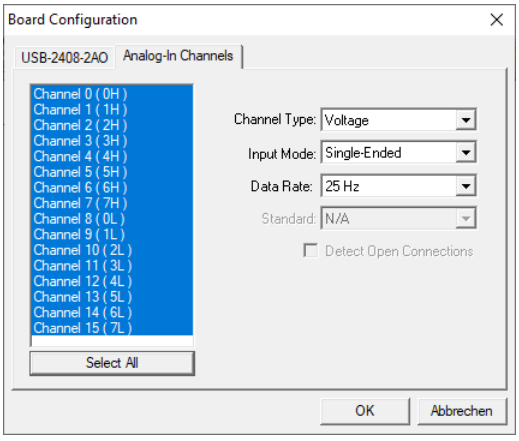
- The measurement module **USB-2408-2AO** is recognized automatically and subsequently appears in the device list.



Make sure the board number is zero (Board# 0 – USB-2408-2AO).

❹ Right-click on this entry and select **Configure…**. All channels in the **Analog-In Channels** tab are of the **Voltage** type and configured as **Single-ended** and with a sampling rate of **25 Hz**.

- These settings are pre-configured and permanently stored in the device so that no further adjustments are necessary upon delivery.



In case of problems with the commissioning of the RedLab module, please consult the operating manual in:

\RedLab_CD_v4_3\Userguides\de\ RedLab 2408-2AO_de.pdf

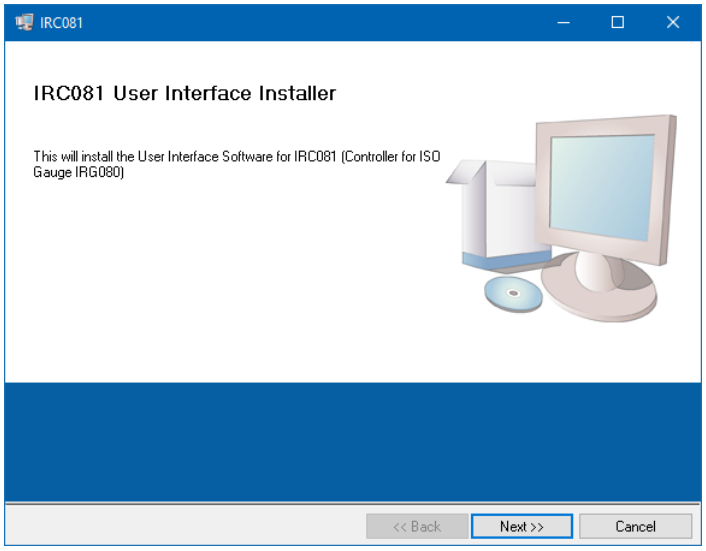
\RedLab_CD_v4_3\Userguides\en\ RedLab 2408-2AO_en.pdf

3.4.2 IRC081 User Interface and LabVIEW runtime environment

The **IRC081 User Interface** runs in a LabVIEW environment on the PC. All files needed for installation are located on the supplied USB stick.

❶ Run the **setup.exe** file in the **IRC081 Installer** folder and follow the instructions.

- The installation routine transfers the necessary program files to the **IRC081** folder in the programs folder of your Windows system and installs the LabVIEW runtime environment (version 2011, 32-bit) by National Instruments.



You can find the shortcuts to the **IRC081 User Interface** on your desktop and in the Windows start menu under **Programs\INFICON**.

The configuration file **IRC081 UI Configuration.ini** is located in the **C:\ProgramData\IRC081** directory after the program is started for the first time.
The **ProgramData** directory is a hidden folder by default. When using Windows Explorer, if necessary, select in the folder options to show hidden files, folders and drives.

3.4.3 Storage location of the controller's calibration data

During installation of the **IRC081 User Interface** software, the **IRC081 Calibration.ini** file is created in the **C:\ProgramData\IRC081** directory.

❶ Upon delivery, this file already contains the calibration data of your controller. If the controller is later recalibrated, replace this file with the one containing the new calibration data.

4 Operation

4.1 User interfaces

4.1.1 Front panel of the IRC081

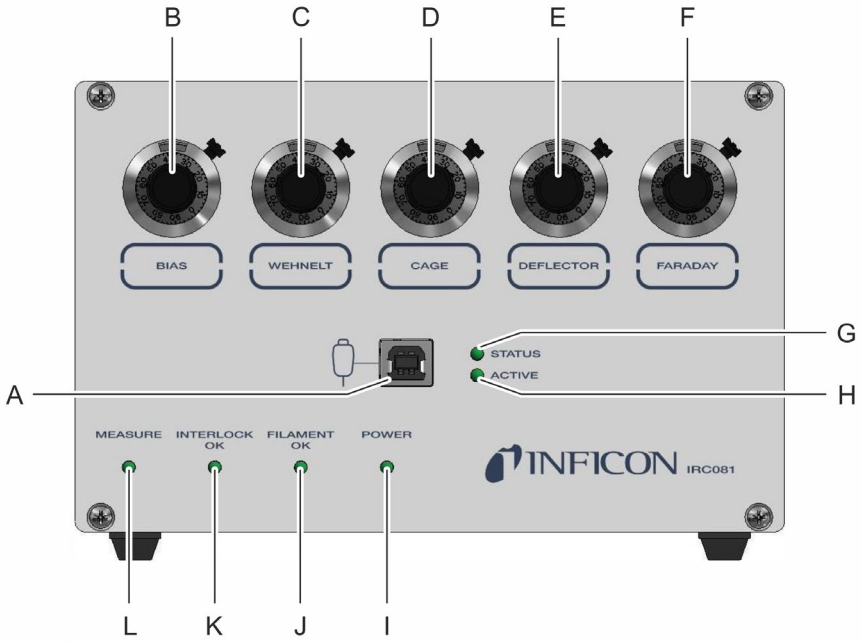


Figure 6 – Front view of the IRC081

A	USB port for connection to the PC
B	BIAS knob for setting the cathode bias voltage
C	WEHNELT knob for setting the Wehnelt voltage
D	CAGE knob for setting the cage (anode) voltage
E	DEFLECTOR knob for setting the deflector voltage
F	FARADAY knob for setting the Faraday voltage
G	STATUS LED display for USB connection
H	ACTIVE LED display for USB connection
I	POWER LED display
J	FILAMENT OK LED display
K	INTERLOCK OK LED display
L	MEASURE LED display

4.1.2 Main window of the IRC081 User Interface

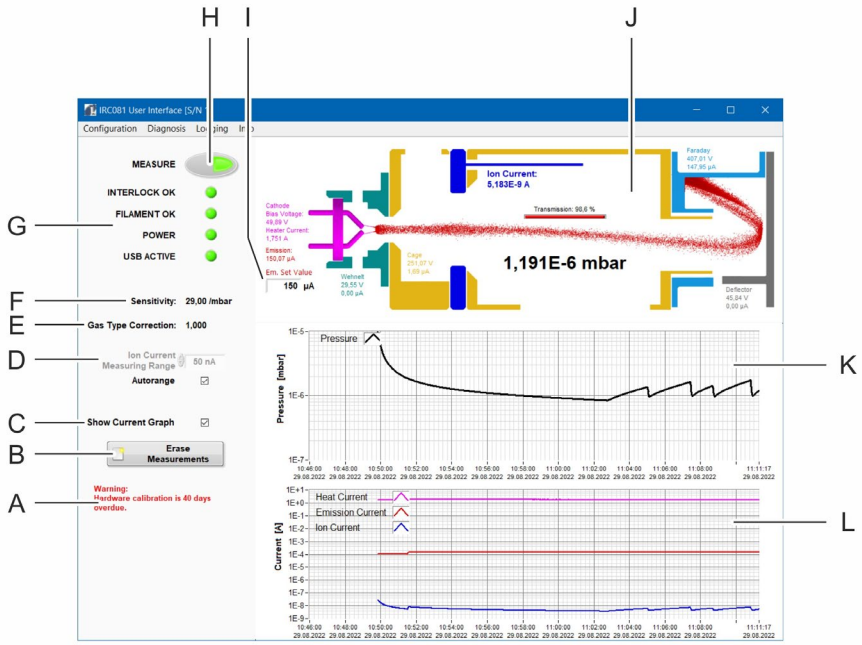


Figure 7 – Main window of the **IRC081 User Interface**

A Message area for warnings and instructions

B Button for erasing the values in the graphs

C Checkbox for selecting the display of the current (running) values on the graph

D Input window for manual set-up of the measurement range for the ion current

Autorange: checkbox for selection of the automatic adjustment of the measurement range

E Value for gas type correction

F Value for the sensitivity of the IRG080 gauge

G **INTERLOCK OK**, **FILAMENT OK**, **POWER**, **USB ACTIVE** status displays

H Switch with the **MEASURE** status display for starting or ending the measurement

I Emission current target value input window

J Cross section representation of the IRG080 gauge with

- display of the current pressure value
- display of the set voltage values
- display of the measured current values
- display of the transmission rate
- representation of the electron beam path (pressure measurement by ionization)

K Graph display of the current pressure values

L Graph display of the current values

4.2 Display

Measurement and operating data are displayed via the **IRC081 User Interface**. (→ Figure 7 – Main window of the **IRC081 User Interface**, 🗎 19)

Important messages

Important messages and warnings are displayed as full text in the lower left area of the **IRC081 User Interface** (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. A, 🗎 19).

Status

Status displays on the front panel of the IRC081 (→ Figure 6 – Front view of the IRC081, pos. G-L, 🗎 18) and in the **IRC081 User Interface** (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. L, 🗎 19) provide information about current standby and operating states. The status displays light up or flash green as long as the respective status is active.

Display IRC081 front panel	**Display IRC081 User Interface**	**Meaning**
STATUS		USB connection has been established between the IRC081 and the PC.
ACTIVE	**USB ACTIVE**	**IRC081 User Interface** has started. Data exchange between the IRC081 and the **IRC081 User Interface** is active. Operational readiness has been established.
POWER	**POWER**	IRC081 is switched on.
FILAMENT OK	**FILAMENT OK**	Filament is OK. If the filament breaks, the status display turns off. The measurement cannot be started.
INTERLOCK OK	**INTERLOCK OK**	The safety interlock is not triggered. Safety interlock and vacuum interlock are closed.
MEASURE	**MEASURE**	Measurement is active.

Cross section of the IRG080

A cross section of the IRG080 is depicted in the upper right area of the main window of the **IRC081 User Interface** (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. J, 🗎 19).

In this area, the measured pressure, the set voltage values and the measured current values are displayed.

For improved allocation, the individual display areas or components of the IRG080 are displayed in color during active measurement (→ Figure 8 – Display areas in the cross section representation of the IRG080, 🗎 21).

The current pressure value is displayed as a three-digit floating-point number in power-of-ten notation by default. The pressure unit is displayed to the right: mbar, Pa or Torr (→ Figure 8 – Display areas in the cross section representation of the IRG080, pos. F, 🗎 21).

Click on the displayed pressure reading with the right or left mouse button to change the display unit.

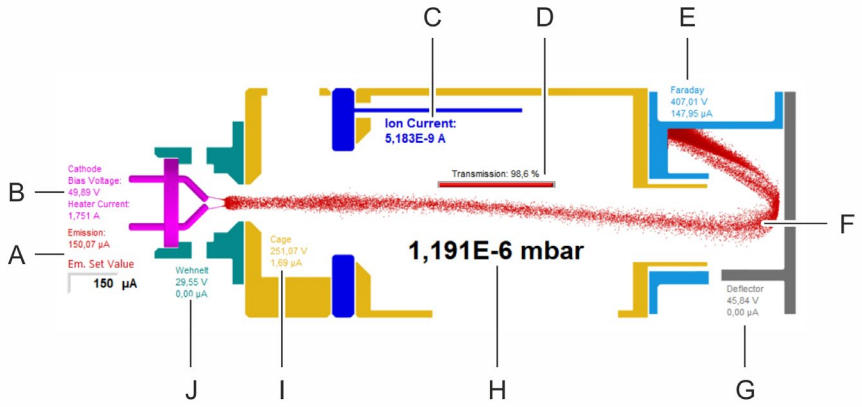


Figure 8 – Display areas in the cross section representation of the IRG080

A Emission area (shown in red) with
- display of the measured emission current
- text box for entering the target value for the emission current (Em. Set Value) with input range of 1-1000 µA

B Cathode area (shown in magenta) with
- display of the set bias voltage (Bias Voltage)
- display of the measured heater current (Heater Current)

C Ion collector area (shown in blue) with
- display of the measured ion current

D Display of the transmission rate (= Faraday current / measured emission current) as a measure for the accuracy of the adjustment

E Faraday area (shown in light blue) with
- display of the set Faraday voltage
- display of the measured Faraday current

F Electron beam path for measurable pressure (shown in red)

G Deflector area (shown in gray) with
- display of the set deflector voltage
- display of the measured deflector current

H Display area for the current pressure value. When the measurement is switched off, the Pressure N/A message appears here.

I Cage (anode) area (shown in golden yellow) with
- display of the set cage (anode) voltage
- display of the measured cage (anode) current

J Wehnelt area (shown in turquoise green) with
- display of the set Wehnelt voltage
- display of the measured Wehnelt current

Diagrams

The measured values for the pressure and various currents are shown as a function of time in two diagrams below the sectional view of the IRG080 (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. K and L, 🗎 19).

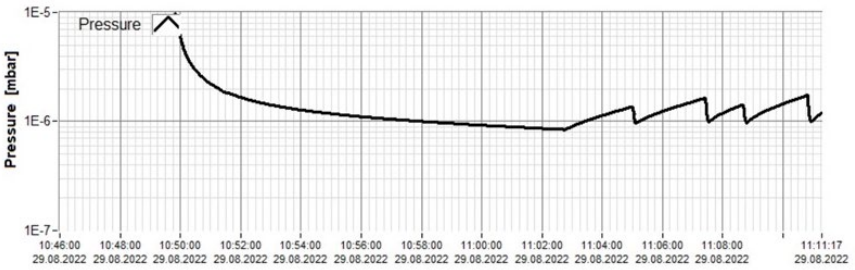


Figure 9 – Diagram for displaying the measured values for pressure

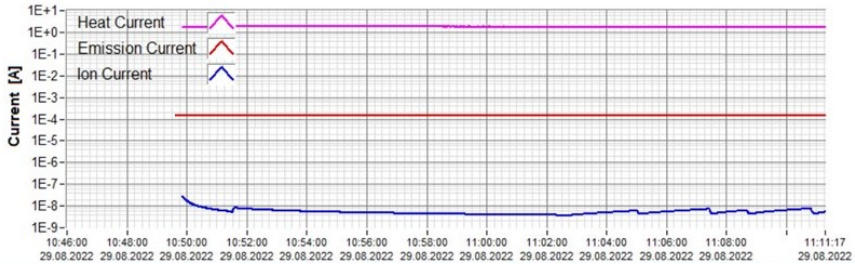


Figure 10 – Diagram for displaying the measured values for various currents

The diagram axes and graphs can be configured in a customer-specific manner.

Click on the diagram area with the right mouse button to select or deselect autoscaling. When autoscaling is deselected, it is possible to input values when clicking on the scale end values.

Click on the input box next to the entry in the legend with the left mouse button to make visual changes, such as color, line type or line thickness changes, to the selected graph.
By default, the colours of the curves correspond to those in the cross section representation of the IRG080 (→ Figure 8 – Display areas in the cross section representation of the IRG080, 🗎 21).

4.3 Controls

Measuring and operating data is displayed exclusively via the IRC081.

4.3.1 IRC081

Settings for the various voltage values can be made via the knobs on the front panel of the IRC081 (→ Figure 6 – Front view of the IRC081, pos. B-F, 🗎 18).

BIAS
WEHNELT
CAGE
DEFLECTOR
FARADAY

The BIAS, WEHNELT, CAGE, DEFLECTOR and FARADAY knobs (→ Figure 11 – Knobs on the front panel of the IRC081, 🗎 23) are used to set the values for bias voltage (BIAS), Wehnelt voltage (WEHNELT), cage voltage (CAGE), deflector voltage (DEFLECTOR) and Faraday voltage (FARADAY).

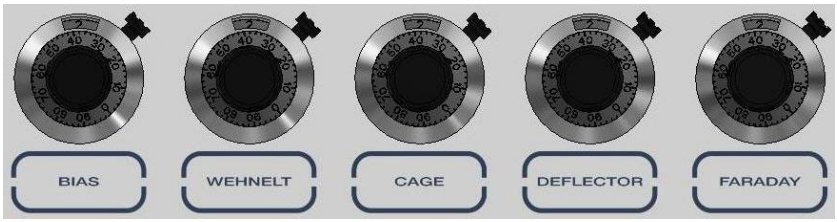


Figure 11 – Knobs on the front panel of the IRC081

The standard parameters are already preset in the delivery state. The heliport knobs are locked, i.e., the small lever on the right side is at the stop clockwise.

To change the voltage values, proceed as follows:

❶ Switch on the IRC081 and establish a connection with the **IRC081 User Interface**. Start the measurement.

- The set voltage values are displayed in the sectional view of the IRG080 in the **IRC081 User Interface**.
- The voltages can be measured via the measuring sockets and the GND socket on the back of the IRC081.

❷ Unlock the corresponding knob by turning the small lever on the right side counterclockwise until the stop.

- The voltage values can be set via the rotary knob.

❸ Set the desired voltage value via the rotary knob.

- The set voltage value is displayed in the sectional view of the IRG080 in the **IRC081 User Interface**.
- The set voltage can be measured via the corresponding measuring socket and the GND socket on the back of the IRC081.

❹ Lock the corresponding helipot by turning the small lever on the right side clockwise until the stop.

- The rotary knob can no longer be adjusted.

4.3.2 IRC081 User Interface

Settings for the measurement itself and for the display are made via controls and input elements in the **IRC081 User Interface** (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. B, C, D, H and I, 🗎 19).

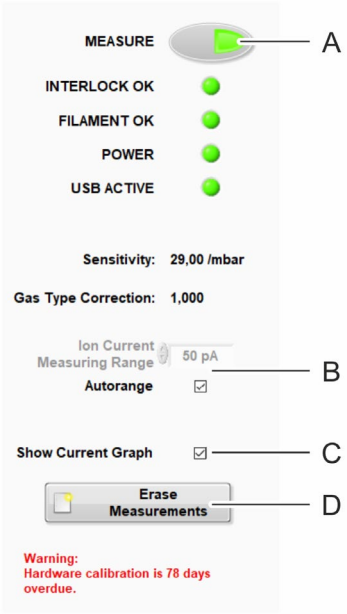


Figure 12 – Controls and input elements in the **IRC081 User Interface**

A **MEASURE** button
B **Ion Current Measuring Range** checkbox and text box
C **Show Current Graph** checkbox
D **Erase Measurements** button

MEASURE

The **MEASURE** button (→ Figure 12 – Controls and input elements in the **IRC081 User Interface**, pos. A, 🗎 24) is used to start and end the measurement.

❶ Click on the button **MEASURE** in the deactivated state to start the measurement.

- The measurement is activated.
- The button is shown with a green background.
- The sectional view becomes colored and all current and voltage values are displayed.

❷ Click on the button **MEASURE** in the activated state to end the measurement.

- The measurement is deactivated.
- The button is shown with a gray background.
- The sectional view turns gray. No measured values are displayed.

Ion Current Measuring Range

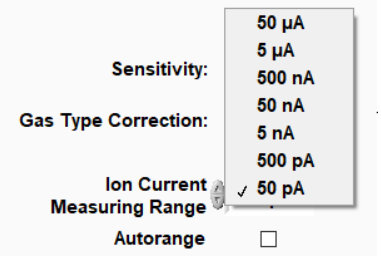
The **Autorange** checkbox (→ Figure 12 – Controls and input elements in the **IRC081 User Interface**, pos. B, 🗎 24) is used to select or deselect automatic selection of the ion current measuring range.

❶ Click on the checkbox **Autorange** if the checkmark is not shown.

- Automatic selection of the ion current measuring range is activated.
- The checkmark is shown in the checkbox.
- A manual selection is not possible. The area for selection located above this is shown in gray.

❷ Click on the checkbox **Autorange** if the checkmark is shown.

- Automatic selection of the ion current measuring range is deactivated.
- The checkmark is not shown in the checkbox.
- Manual selection is possible. Click on the text field to carry out the selection.



- Select one of the values and confirm your input with the **Enter** key.

Show Current Graph

The **Current Graph** checkbox (→ Figure 12 – Controls and input elements in the **IRC081 User Interface**, pos. C, 🗎 24) is used to select or deselect the display of the diagram for the current values.

❶ Click on the checkbox **Current Graph** if the checkmark is not shown.

- The diagram for the current values is displayed.
- The checkmark is shown in the checkbox.

❷ Click on the checkbox **Current Graph** if the checkmark is shown.

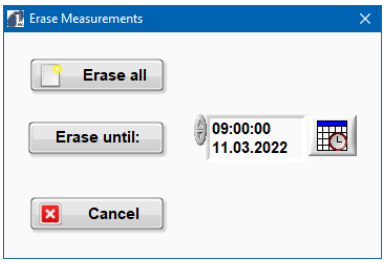
- The diagram for the current values is hidden.
- The checkmark is not shown in the checkbox.

Erase Measurements

Using the **Erase Measurements** button (→ Figure 12 – Controls and input elements in the **IRC081 User Interface**, pos. D, 🗎 24) in the **IRC081 User Interface**, the accumulated measured values and the measured values displayed can be erased in the diagrams.

❶ Click on the button in the **IRC081 User Interface**.

- The **Erase Measurements** menu window opens.



❷ Click **Erase all** to erase all accumulated values.

- All values are erased. The accumulated measurement values and the measurement values shown in the diagram are removed.

❸ Click **Erase until** to erase values up to a defined point in time. To this end, choose the desired time in the selection box to the right.

You can also define the time until which you would like to erase values in advance by clicking on the corresponding time in the progression chart. This value is automatically transferred to the selection box.

- Only the measurement values that have accumulated up to the chosen time and the measurement values shown in the diagram are removed.

Em. Set Value

The **Em. Set Value** text box (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. I, 🗎 19) is located within the sectional view of the IRG080 and is used to input target values for the emission current.

❶ Click on the text box **Em. Set Value**.

❷ Enter a value between **1** and **1000 µA** and confirm the input with the **Enter** key.

- The emission current is adjusted to the entered value.

4.4 Switching on and off

4.4.1 Switching on

❶ Switch on the power switch on the IRC081 (→ Figure 3 – Rear view of the IRC081, pos. F, 🗎 10).

- The **POWER** status LED on the front panel of the IRC081 is green.
- If the IRG080 is properly connected with an intact filament, the **FILAMENT OK** status LED lights up green.
- When an interlock is connected, the **INTERLOCK OK** status LED lights up green.
- After the USB connection with the PC is established and the **IRC081 User Interface** has started up, the device is ready for measurement.

☞ For operation, both the safety interlock and the vacuum interlock must be closed.

☞ You can also switch the IRC081 on and off via a central power distributor.

4.4.2 Switching off

❶ Switch off the power switch on the IRC081 (→ Figure 3 – Rear view of the IRC081, pos. F, 🗎 10).

- The **POWER** status LED on the front panel of the IRC081 goes out.
- The **FILAMENT OK** status LED on the front panel of the IRC081 goes out.
- The **INTERLOCK OK** status LED on the front panel of the IRC081 goes out.

☞ Measurement is no longer possible, even if the **IRC081 User Interface** program is still open.

4.4.3 Wait time

☞ Wait at least 10 seconds before you switch on the IRC081 again.

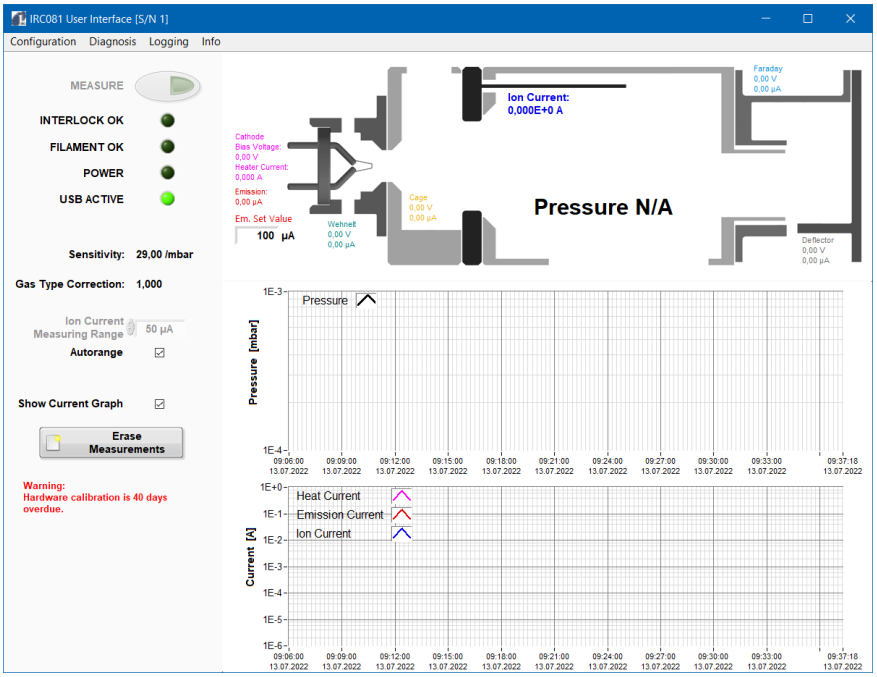
4.5 Measurement operation

4.5.1 Program start

❶ Make sure the connection between the PC and the USB port on the IRC081 has been established.

❷ Start up the **IRC081 User Interface** program on the PC.

- The program window opens.
- The sectional view of the IRG080 is shown in gray as long as measurement is not active.
- The **STATUS** and **ACTIVE** LED displays for the USB port on the front panel of the IRC081 light up or flash green.



4.5.2 Configuration and preparation

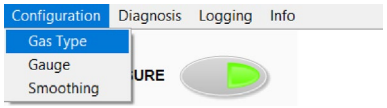
All program settings are stored in the **IRC081 UI Configuration.ini** file in the **C:\ProgramData\IRC081** directory and loaded when the program starts up.

Various configuration windows can be opened in the menu under **Configuration**.

Gas Type

The **Gas Type** parameter makes it possible to define a correction factor for the pressure calculation that depends on the gas type.

❶ Choose the **Gas Type** menu item in the Configuration menu in the menu bar.

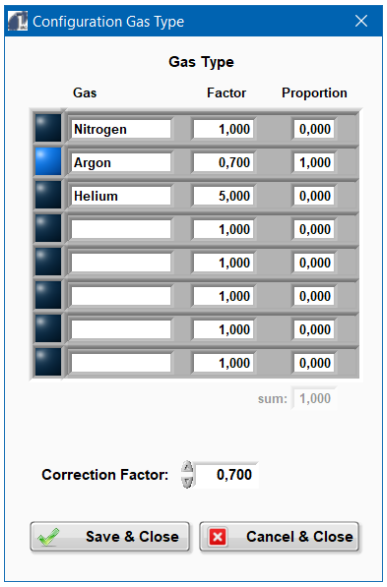


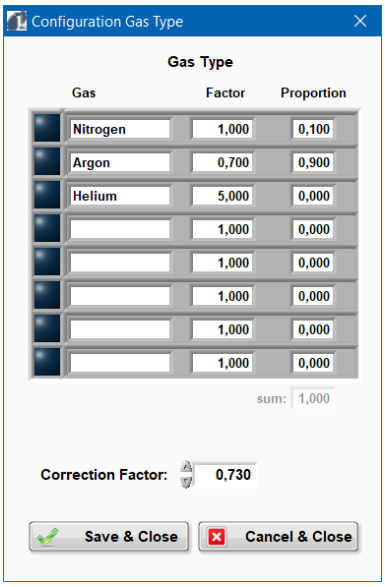
- The **Gas Type Configuration** menu window opens.

❷ In the **Gas Type Configuration** menu window, enter the value for a correction factor in the **Correction Factor** entry field.

Alternatively:

Enter various gas types with their respective sensitivities and the proportional share in the window.





If a measurement is for a pure gas from the entered list, it can be selected by clicking on the blue LED to the left. The proportion values are automatically set to 1 or 0.

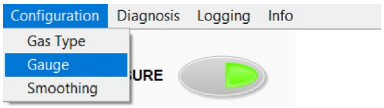
❸ Confirm the entries with ✓ **Save & Close**.

- The values are adopted and applied.
- The set value is displayed in the main window of the **IRC081 User Interface**.

Gauge

The sensor sensitivity (in 1/mbar) and the maximum filament heater current for protecting the IRG080 are entered via the **Gauge** parameter.

❶ Choose the **Gauge** menu item in the **Configuration** menu in the menu bar.

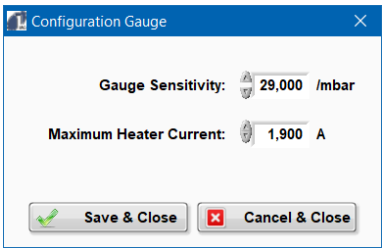


- The **Gauge Configuration** menu window opens.

❷ In the **Gauge Configuration** menu window, enter the value for the sensor sensitivity in the **Gauge Sensitivity** entry field.

The value for the sensor sensitivity is included with the IRG080.

❸ In the **Gauge Configuration** menu window, enter the value for the maximum heater current in the **Maximum Heater Current** entry field.



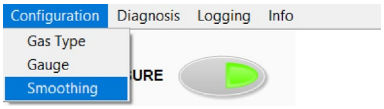
❹ Confirm the entries with ✓ **Save & Close**.

- The values are adopted and applied.
- The set values are displayed in the main window of the **IRC081 User Interface**.

Smoothing

The **Smoothing** parameter makes it possible to average the measured values across a certain number of measured values.

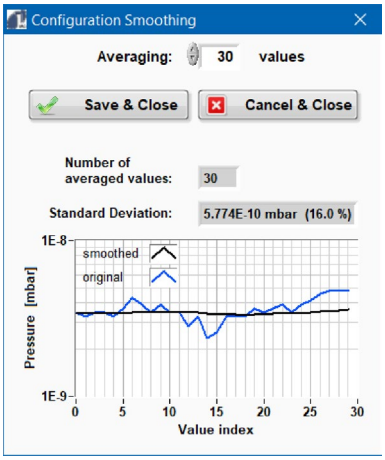
❶ Choose the **Smoothing** menu item in the **Configuration** menu in the menu bar.



- The **Smoothing Configuration** menu window opens.

❷ In the **Smoothing Configuration** menu window, enter the value for the number of measured values to be averaged in the **Averaging** entry field.

- The applied number of averaged values is displayed in the **Number of averaged values** field, the standard deviation (deviation of the measured values from the average) in the **Standard Deviation** field. In the graph below these fields you can follow how the chosen averaging affects the pressure output measured value.



❸ Confirm the entries with ✓ **Save & Close**.

- The values are adopted and applied.

Emission current

The target value for the emission current can be adjusted in a range of **1** – **1000 µA**.

Use the **Em. Set Value** text box (→ Figure 7 – Main window of the **IRC081 User Interface**, pos. I, 🗎 19) in the sectional view of the IRG080 in the main window of the **IRC081 User Interface** for input (→ 4.3.2 IRC081 User Interface, Em. Set.Value, 🗎 24 ff.) et seq.).

The target value is adopted immediately by leaving the entry field or by confirming an entry value using **Enter**. The actual emission current can be read off from this.

If the actual emission current does not reach the target value during measurement operation, the heater current may be at the specified upper limit or the voltages set on the IRC081 (bias, Wehnelt, cage, Faraday, deflector) are unsuitable.

Ion current measuring range

The ion current measuring range is chosen by default (**Autorange** activated). By deactivating the **Autorange** function, the measuring range can be predefined, for example to obtain a continuous measurement signal in the pressure range near a measurement range switchover.

Use the **Autorange** checkbox (→ Figure 12 – Controls and input elements in the **IRC081 User Interface**, pos. B, 🗎 24) to select or deselect automatic selection of the ion current measuring range (→ 4.3.2 IRC081 User Interface, Ion Current Measuring Range, 🗎 24 et seq.).

4.5.3 Measurement

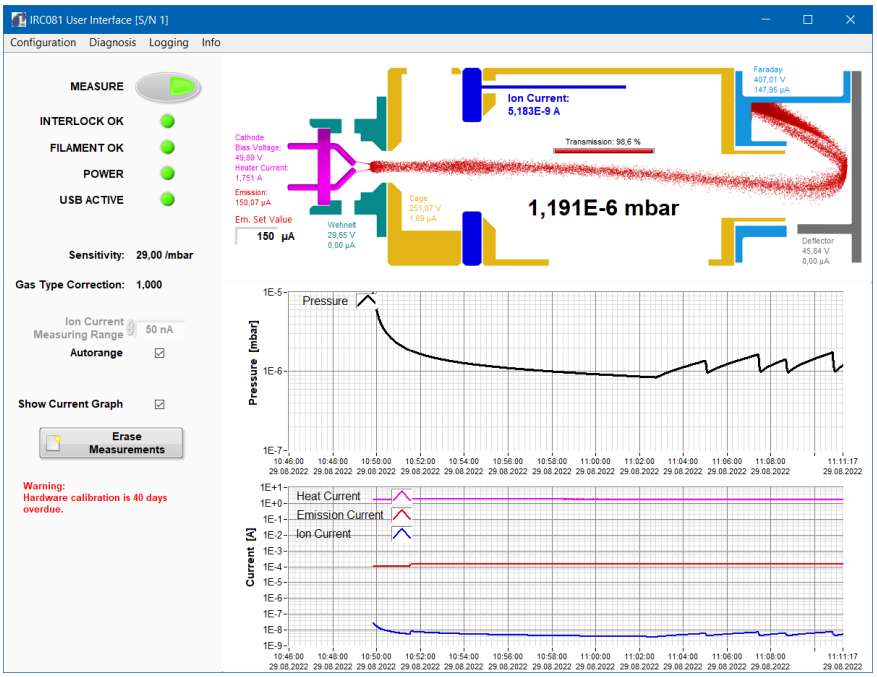
❶ Switch on the IRC081 using the power switch of the grid input combination on the back of the device.

- The **POWER** status LED on the front panel of the IRC081 is green.

❷ Press the **MEASURE** button in the main window of the **IRC081 User Interface**.

- The measurement is started.

- The sectional view of the IRG080 is shown in color, as is a symbolic electron beam.
- The four status LEDs in the main window of the **IRC081 User Interface** light up green, the **MEASURE**, **INTERLOCK** and **FILAMENT OK** status LEDs on the front panel of the IRC081 also light up green.



If at least one LED does not light up, check the requirements in this order:

Status	Reason for Error
INTERLOCK OK	The power-on release is given via the bridge at the *Interlock/Status* port of the IRC081.
FILAMENT OK	The IRG080 is connected, the filament is functional.
POWER	The IRC081 is supplied with voltage and switched on.
USB ACTIVE	The IRC081 is connected via USB and the RedLab driver software was correctly installed and set up.

❸ Press the **MEASURE** button in the main window of the **IRC081 User Interface** in the switched-on state.

- The measurement is ended.

Note

Automatic safety shutdown.

The measurement is terminated automatically if the measured pressure exceeds a value of 1×10^{-2} mbar.

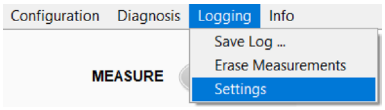
4.5.4 Data storage

All settings for data storage are defined in the **Logging** menu.

Settings

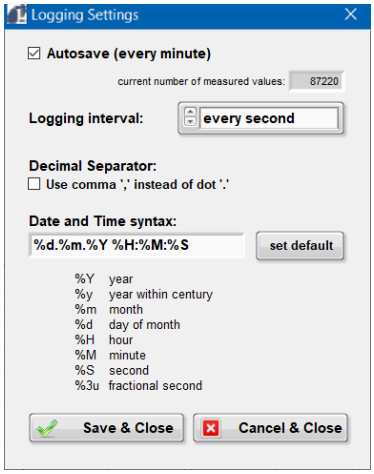
The **Settings** menu item can be used to make settings for the log files to be saved.

❶ Choose the **Settings** menu item in the **Logging** menu in the menu bar.



- The **Logging Settings** menu window opens.

❷ Make the desired settings in the **Logging Settings** menu window.



Autosave is activated in the basic settings. Every minute, a data package with the accumulated values is saved. By default, the values are recorded in the C:\ProgramData\IRC081 directory.

If you deactivate Autosave, please use the **Save log …** function to securely store the data.

With **Autosave** deactivated, the accumulated values are lost when the program is closed.

By adjusting the **Date and Time Syntax**, you can specify the formatting of the first **Date and Time** column of the log files to be stored as desired.

Under **Logging interval**, you can adjust the frequency at which measurement values are recorded. You can choose to save the value in the log file every 1 (default setting), 2, 5, 10, 30 or 60 seconds.

The columns in the file are tab delimited and can easily be processed further in a spreadsheet program at a later time using the copy & paste or import functions.

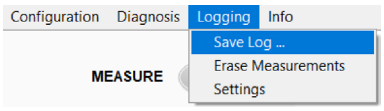
❸ Confirm the entries with ✓ **Save & Close**.

- The values are adopted and applied.

Save log …

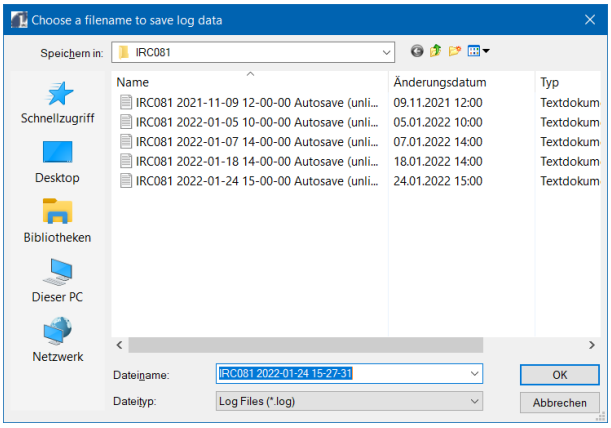
A log file is created on your PC via the **Save Log …** menu item.

❶ Choose the **Save Log** menu item in the **Logging** menu in the menu bar.



- The **Choose a filename to save log data** menu window opens.

❷ Use the automatically generated file name or enter your own file name and confirm with **OK**.

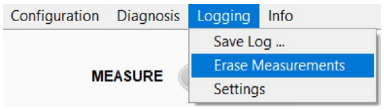


- The data package is stored.

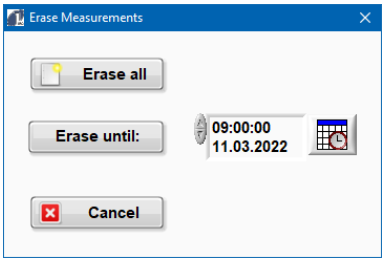
Erase Measurements

The accumulated data is erased via the **Erase Measurements** menu item. The same function is stored as for the **Erase Measurements** button (→ 4.3.2 IRC081 User Interface, Erase Measurements, 🗎 24 et seq.).

❶ Choose the **Save Log** menu item in the **Logging** menu in the menu bar.



- The **Erase Measurements** menu window opens.



❷ Click **Erase all** to erase all accumulated values.

- All values are erased. The accumulated measurement values and the measurement values shown in the diagram are removed.

❸ Click **Erase until** to erase values up to a defined point in time. To this end, choose the desired time in the selection box to the right.

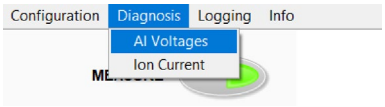
You can also define the time until which you would like to erase values in advance by clicking on the corresponding time in the progression chart. This value is automatically transferred to the selection box.

- Only the measurement values that have accumulated up to the chosen time and the measurement values shown in the diagram are removed.

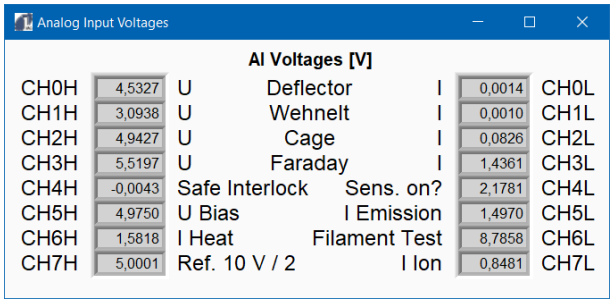
4.5.5 Diagnosis

For diagnosis purposes, a window can be displayed that shows the unprocessed voltage values of the 16 analog input channels of the measurement module.

❶ Choose the **AI Voltages** menu item in the **Diagnosis** menu in the menu bar.



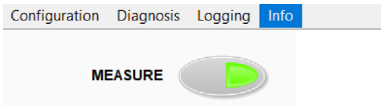
- The unprocessed voltage values of the 16 analog input channels of the measurement module are displayed.



4.5.6 Software information

Notes on the software version are displayed in the Info window.

❶ Choose the **Info** menu in the menu bar.



- The **Info** window with information on the software is displayed.

5 Maintenance, service and operating parameter check

5.1 Maintenance

The IRC081 does not require any special maintenance work.

5.1.1 Cleaning

For external cleaning, a slightly damp cloth is usually sufficient. Do not use aggressive or abrasive cleaning agents.

Danger

Supply voltage.

The IRC081 contains live components. Direct or indirect contact with these components leads to fatal injuries.

Do not insert any objects into the openings in the device. Protect the device against moisture. Do not open the device.

5.1.2 Periodic inspections

- Visual inspection of the device for damaged or deformed housing and plug connector and damaged lead insulation.
- Inspection of protection equipment.
- Electrical visual inspection in accordance with national/international standards or internal specifications.
- Inspection of the PE conductor connection with the housing.

5.2 Troubleshooting

5.2.1 Fault display

Warnings or fault messages are issued via the user interface.

5.2.2 Help in case of faults

If the fault persists even after the gauge is replaced or repaired, please contact your nearest INFICON AG service center.

If faults cannot be remedied, you must decommission the IRC081 and protect it against accidental commissioning.

5.2.3 Fuse replacement

To replace defective device fuses, only use the fuse type T1.6A H as indicated on the back of the device.

The two device fuses are located in the fuse holder on the network filter (→ Figure 3 – Rear view of the IRC081, pos. F, 🗎 10). The fuse can be removed using a small screwdriver.

5.2.4 Repair

Defective products must be sent to the nearest INFICON AG service center for repair. INFICON AG denies all responsibility and warranty if the operator or third parties perform maintenance work on the IRC081.

5.3 Checking operating parameters

To guarantee measurement accuracy, it is important to check periodically the sensor operating parameters .

5.3.1 Voltages

The operating voltages of the IRG080 sensor can be accessed on the back with CAT III measuring sockets (→ Figure 3 – Rear view of the IRC081, pos. B-E and I-K, 🗎 10).

Warning

Dangerous contact voltage.

Voltages above 60 V (dc) or 25 V (ac) are dangerous to contact and can cause serious injuries.

Use the included shockproof measuring lines and a suitable meter for voltage measurement.

1. Commission the IRC081 with the IRG080 and start the measurement.
2. To measure and check the operating voltages, connect the corresponding measuring sockets to a calibrated voltmeter.

   To this end, use the included shockproof measuring lines.

   Make sure that the used voltmeter allows voltages up to 400 V (dc).
3. Compare the displays on your voltmeter to the display values in the sectional view of the IRG080 in the main window of the **IRC081 User Interface** (bias – shown in magenta, Wehnelt – shown in turquoise green, cage (anode) – shown in golden yellow, deflector – shown in gray, Faraday – shown in light blue).

   If you find deviations of more than 0.1%, the device should be recalibrated. Please contact your nearest INFICON AG service center.

Note

Measurement error.

Please note that the current displays also show the current through the voltmeter.

When measuring the bias voltage, the emission current typically increases by 50 V/10 MΩ = 5 µA.

5.3.2 Ion collector current

1. Switch off the IRG080 by ending the measurement and unplug the BNC connector of the measuring line from the IRC081.
   - The interlock is now triggered.
2. Connect a calibrated power source to the BNC socket on the back of the IRC081 and activate the Ion Current field under the Diagnosis menu item in the **IRC081 User Interface**.
3. Supply currents of up to a maximum of 40 µA and compare the display value of the collector current (Ion Current – shown in blue) to the supplied current in the cross section representation of the IRG080 in the main window of the **IRC081 User Interface**.

   The measurement range of the IRC081 is also displayed.

   If the deviation between the supplied current and the display is greater than 0.1% of the range final value, the device should be recalibrated. Please contact your nearest INFICON AG service center. In the 50 pA range, the error limit is 0.5% of the final value.

5.3.3 Emission current

❶ Switch off the IRG080 by ending the measurement. Connect the BNC connector of the measuring line to the IRC081 again and switch the IRG080 back on by starting the measurement.

❷ In the cross section representation of the IRG080 in the main window of the **IRC081 User Interface**, read the display values for the current at Faraday Cup (Faraday – shown in light blue) and cage (anode) (Cage – shown in golden yellow) and form the sum from this.

If the sum deviates from the measured emission current by more than 0.1%, the device should be recalibrated. Please contact your nearest INFICON AG service center.

The measured value for the emission current (Emission – shown in red) is also displayed in the schematic representation of the IRG080 in the display window of the user interface.

6 Storage, disposal

6.1 Packaging

Please keep the original packaging. You will require this packaging if you want to store the IRC081 or send it to an INFICON service center.

6.2 Storage

The IRC081 may only be stored in a dry space. The following ambient conditions must be observed:

Ambient temperature:	-20 to +60 °C
Humidity:	As low as possible. Preferably use an air-tight plastic bag with a desiccant.

6.3 Disposal

The industry-specific and local disposal and environmental regulations for systems and electronic components apply to disposal.

7 Accessories

Gauges

Item	Ordering Number
Ion Reference Gauge IRG080, USB 2.0 incl. 2 x measuring lines CAT III (1 m, red/black), USB Type-A/B cable, USB stick with software and instructions, D-sub 9-pin port	399-874

Heat resistant gauge head cable set to IRG080

Item	Ordering Number
5 m, with contact protection	399-883
10 m, with contact protection	399-884
15 m, with contact protection	399-885

Shockproof measuring line

Item	Ordering Number
Shockproof measuring line, CAT III, 1 m, black	399-887
Shockproof measuring line, CAT III, 1 m, red	399-888

Transport

Item	Ordering Number
Transport case	399-895

Appendix

A: Standard parameters

IRC081

Parameter	Value
Bias voltage (BIAS)	50 V
Wehnelt voltage (WEHNELT)	34 V
Cage (anode) voltage (CAGE)	250 V
Deflector voltage (DEFLECTOR)	45 V
Faraday voltage (FARADAY)	280 V

User interface

Parameter	Value
Emission current (emission)	30 µA

The voltage and current values preset as standard parameters correspond to the specifications in the instruction manual of the Ion Reference Gauge IRG080 (→ 🕮 [1]).

These values can be changed depending on the user requirements. However, as a result, the operating behavior of the Ion Reference Gauge IRG080, in particular its sensitivity and beam parameters, is affected.

In case of unfavorable settings, the space charge of the electrons can lead to a sharp increase in the filament current. To prevent filament damage , the heater current is limited to 2.0 A by the **IRC081 User Interface**.

Normally, more than 95% of electrons reach the Faraday cup and a small portion falls on the cage. Wehnelt and deflector should remain de-energized.

B: Program library

Dynamic program library

In the **C:\Programs (x86)\IRC081 directory**, there is a dynamic program library called **IRC081_data_exchange.dll** that allows other Windows software to access various measured values while running the **IRC081 User Interface**.

Overview of implemented functions

Function name	Parameter [data type]	Return value [data type; value when measurement inactive]
Getpressure	---	Pressure in mbar [double; NaN]
Measuring	---	0 or 1 for measurement inactive or active [integer 32 bit; 0]
Getvalues	Selector [Unsigned Integer 8 bit]	Pressure or current value [double]
	0 or >5	Pressure in mbar [;NaN]
	1	Pressure in Pa [;NaN]
	2	Pressure in Torr [;NaN]
	3	Heater current in A [;0]
	4	Emission current in A [;0]
	5	Ion current in A [;0]

C: Conversion table

Pressure units
(vacuum technology)

	mbar	Bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	1×10^{-3}	100	1	0.1	0.75
Bar	1×10^{3}	1	1×10^{5}	1×10^{3}	100	750
Pa	0.01	1×10^{-5}	1	0.01	1×10^{-3}	7.5×10^{-3}
hPa	1	1×10^{-3}	100	1	0.1	0.75
kPa	10	0.01	1×10^{3}	10	1	7.5
Torr mm Hg	1.332	1.332×10^{-3}	133.32	1.3332	0.1332	1

1 Pa = 1 N/m^2

D: Further Information

📖 [1] www.inficon.com
Operation Manual
Ion Reference Gauge IRG080
tinb74e1
INFICON AG, LI–9496 Balzers, Liechtenstein

EU Declaration of Conformity

CE

We, INFICON, hereby declare that the equipment mentioned below complies with the provisions of the following directives:

- 2014/35/EU, OJ L 96/357, 29.03.2014
  (Low Voltage Directive; directive on electrical equipment designed for use within certain voltage limits)
- 2014/30/EU, OJ L 96/79, 29.03.2014
  (EMC Directive; directive on electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 01.07.2011
  (Restriction of Hazardous Substances Directive; directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

Ion Reference Gauge Controller

IRC081

(operation with the Ion Reference Gauge IRG080)

Standards

Harmonized and international/national standards and specifications:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
  (Safety requirements for electrical equipment for measurement, control, and laboratory use)
- EN 61326-1:2013; Group 1, Class B
  (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

INFICON AG, Alte Landstraße 6, LI-9496 Balzers

3 January 2023

Dr. Christian Riesch
Head of Development

3 January 2023

Dr. Roberto Salemme
Product Manager

Original: German tinb82d1 (2023-01)
TINB82E1

INFICON
LI–9496 Balzers
Liechtenstein
Tel +423 / 388 3111
Fax +423 / 388 3700
reachus@inficon.com

www.inficon.com