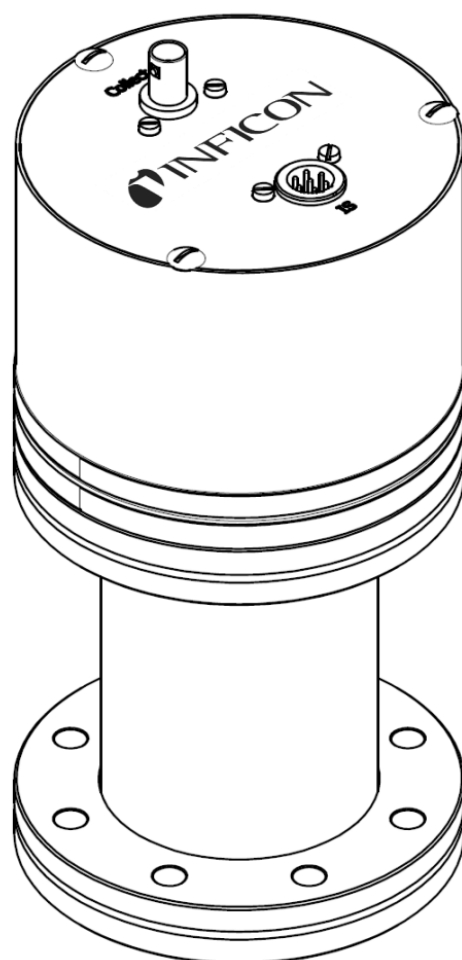


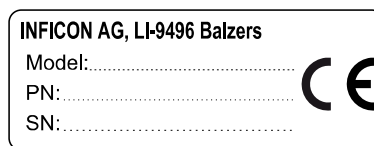
# Ion Reference Gauge

## IRG080



## Product Identification

In all communications with INFICON, please specify the information on the product nameplate.



## Validity

This document applies to products with part number  
 399-874 Ion Reference Gauge IRG080 with BNC and multipin connector  
 (DN 63 CF-R)

The part number (PN:) can be taken from the product nameplate.

We reserve the right to make technical changes without prior notice.

All dimensions in mm.

The references to diagrams, e.g. (2/3), consist of the fig. no. and the item no. in that order.

## Description

The IRG080 is a vacuum gauge developed for precise total pressure measurement in vacuum systems. This passive sensor is based on an innovative concept of ionization vacuum gauge, whereby a hot cathode emits electrons travelling on a straight path into a Faraday cup. The IRG080 is operated by the Ion Reference gauge Controller IRC081.

## Intended Use

The IRG080 gauge may only be used for the measurement of total pressures in vacuum systems and this only in connection with the Ion Reference gauge Controller IRC081.

## Unintended use

The IRG080 is designed and built exclusively for the purpose mentioned in the section "Intended Use" and may only be used in this manner. Any use for purposes that deviate from the above mentioned, in particular in connection with controller units other than IRC081, is considered unintended use.



Any unintended use is forbidden. If any damage results from this, any liability and warranty claims will expire. The operator or user solely bear the risk for this.

## Scope of Delivery

1 × IRG080 gauge  
 1 × Operating Manual

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For cross-references within this document, the symbol (→  XY) is used; for cross-references to further documents listed under 'Literature', use is made of the symbol (→  [Z]).

# 1 Safety

## 1.1 Symbols Used


Symbols for residual risks

 **DANGER**

Information on preventing any kind of physical injury.

 **WARNING**


Information on preventing extensive equipment and environmental damage.

 **Caution**

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.



## 1.2 Personnel Qualifications

 **Skilled personnel**

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

## 1.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.  
Consider possible reactions with the product materials (→ 5).
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

## 1.4 Liability and Warranty

INFICON assumes no liability and the warranty is rendered null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

## 2 Technical Data

Measurement system	Principle Electrode system configuration	hot cathode ionization according ISO/WD TS 6737
Measurement capabilities	Measurement range (N <sub>2</sub> ) with IRC081 controller  Sensitivity (N <sub>2</sub> ) (typical) Accuracy (N <sub>2</sub> ), typical Repeatability (typical)	<1×10 <sup>-8</sup> ... 1×10 <sup>-4</sup> mbar <1×10 <sup>-6</sup> ... 1×10 <sup>-2</sup> Pa  29 mbar <sup>-1</sup> ±1% of reading 1% of reading
General gauge head data	Mounting orientation  with mu-metal int. piece (399-891) Admissible temperatures Ambient, in operation Bake-out Max. flange temp. with temp. resistant gauge head cable set Max. bake-out temperature without plug and connector plate unit with mu-metal intermediate piece (399-891) Storage Relative humidity Admissible external magnetic field in the plane normal to gauge axis, without shielding Use	recommended aligned with magnetic field <sup>1)</sup> any  +20 ... +80 °C  +165 °C  +400 °C  +200 °C  +20 ... +50 °C ≤85% (non-condensing)  ≤50 μT indoors only

<sup>1)</sup> Orientation should be such that magnetic field is not perpendicular to the electron trajectory

Standard operating characteristics  
with IRC081 controller

**DANGER**

During operation, it must be ensured that the sensor voltages (anode voltage and Faraday voltages) do not become dangerous to touch according to EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019. For this purpose, the currents <1.1 mA and the charge <45 μC must be complied with in normal operation. In the event of a single fault, the limit values are 15 mA for a time of less than 30 ms and 45 μC. By use of the Ion Reference gauge Controller IRC081 the conditions for operation compliant to EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 are fulfilled. If different controller units are used, the user is responsible for a safe operation.

Collector potential	0 V
Cathode potential	+50 V
Wehnelt potential	+34 V
Anode potential	+250 V
Deflector potential	45 V
Faraday cup potential	+280 V
Emission current range	10 ... 100 μA
Cathode heater current / voltage (typ.)	1.4 ... 1.8 A / 2 V

Connections	Flange connection Gauge connections Ion collector Interface to Sensor (IS)	DN 63 CF-R  Bayonet (BNC) push-pull self-latching, 7-pin
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Materials exposed to vacuum	Feedthrough pins Feedthrough caps Feedthrough isolation Cathode Anode Wehnelt cylinder Flange	stainless steel (EN 1.4301) NiFeCo (EN 1.3981) ceramic (Al <sub>2</sub> O <sub>3</sub> ) Ta, W, Kovar, Al <sub>2</sub> O <sub>3</sub> stainless steel (EN 1.4404, EN 1.4435) stainless steel (EN 1.4404, EN 1.4435) stainless steel (EN 1.4435 ESU)
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Internal volume, weight	Internal volume Weight	~385cm <sup>3</sup> 4.3 kg
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Dimensions [mm]

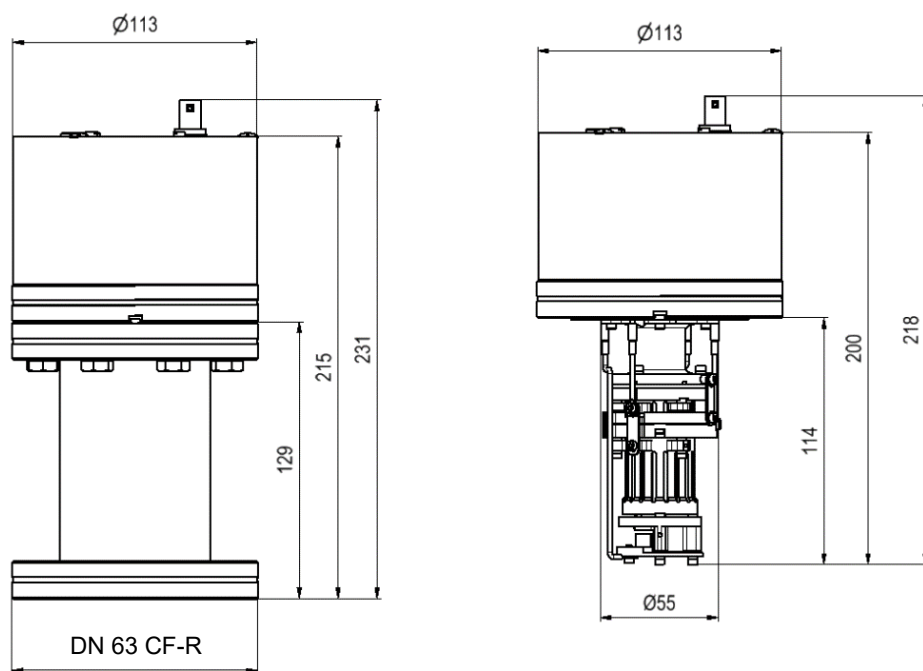


Fig. 1 Dimensions of the IRG080

## 3 Installation

### 3.1 Installation



#### Caution

As a rule, all ionization measurement systems must only be operated in connection with a properly earthed pump system. Installation and mounting may only be carried out with the operating unit switched off.

When connecting the vacuum gauges to the vacuum system it must be strictly observed that during operation the gauges are not subjected to mechanical oscillations, impact or vibrations.

The mounting position of the gauge heads has no influence on proper operation per se. However magnetic fields can influence the operation of the gauge. Electrons may be deflected by earth's magnetic field or nearby sources.

The mounting orientation should be such that magnetic field is not perpendicular to the electron trajectory. This can be obtained aligning the gauge axis to the magnetic field.



Any other mounting orientation can be adopted using the mu-metal intermediate piece 399-891 (Accessories → 17).

Exercise caution when install a venting valve in the immediate vicinity. The then suddenly occurring air flow may result in mechanical damage to the sensitive cathode.

When installing several gauge heads at one common component (T-piece or cross for example) an optical separation is required. The gauge heads may not directly "see" each other. Interactions may cause incorrect measurements.



Humidity at the insulators, caused for example by condensing water, can give rise to incorrect measurements due to leakage currents.

#### Fitting the gauge head

Fit the gauge head to the vacuum chamber and bolt the CF flange on.



Before connecting the gauge head, it is recommended to pump down the system and if possible run a vacuum test or a direct leak search.

#### Connecting the gauge head cable set


Connect the gauge head cable set (Accessories → 17) to the gauge head (Fig. 2).


- BNC plug (with metallic shell) → Collector BNC socket ("Collect.")
- Multipin connector → Multipin socket ("IS")



The touch-insulated BNC connector included in the the gauge head cable set must be connected to the IRC081 controller.

Do not use force to connect the plug. When plugging in make sure first that all pins are lined up in parallel and are straight. Otherwise the current feedthrough can suffer damage.

 **WARNING**

 Especially note the pin assignment. Provide the connection with great care. Do not subject the pin contacts to any bending forces. (Risk: damaging of the current feedthrough/leak)

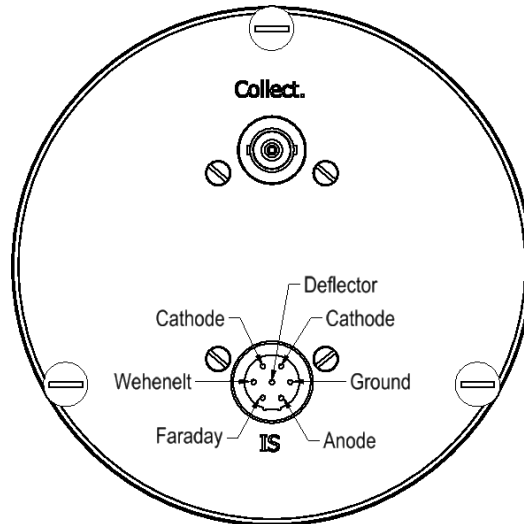


Fig. 2 View of the front connector plate with the BNC socket (Collect.) and multipin connector (IS)

### 3.2 Dismounting the gauge head connection unit



Put the gauge out of operation first before working at the gauge cable. After putting out of operation, wait for at least 15 seconds.

For bake-out above 165 °C, the gauge head connection unit shall be disconnected.



## Disassembly of the gauge head connecting unit for bake-out

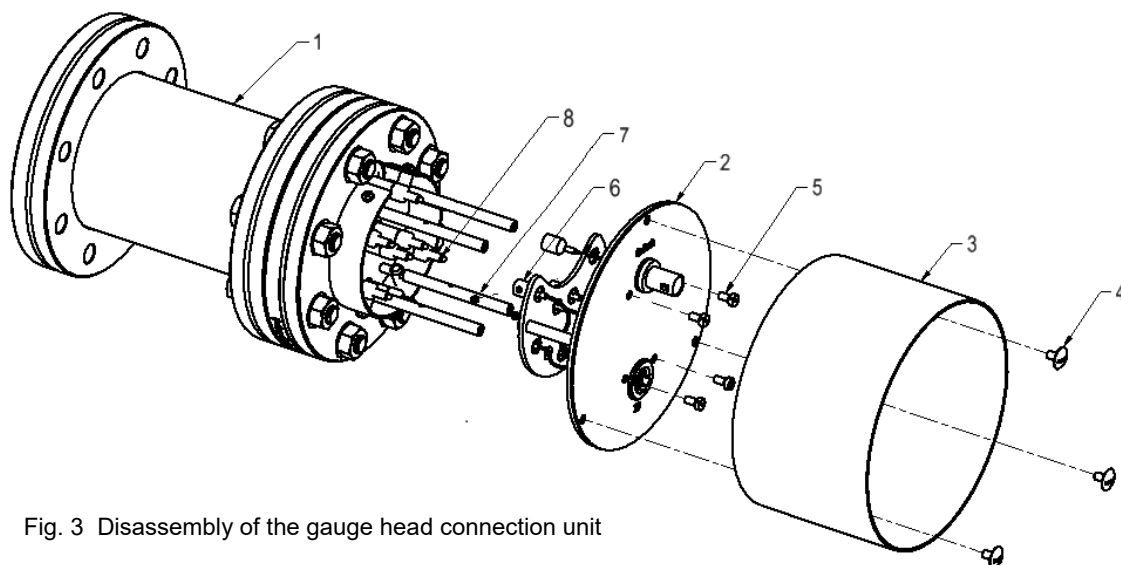


Fig. 3 Disassembly of the gauge head connection unit

- 1 Gauge head assembly
- 2 Gauge head connecting unit
- 3 Cylinder housing
- 4 Slotted truss head screws M4×6 (3×)
- 5 Slotted cylindrical head screws M3×6 (4×)
- 6 Golden connection sockets (8x)
- 7 Hex socket set screws M3×3 (8×) (also visible in the following Fig. 3)
- 8 Feedthrough pins (8×)

### Procedure

- 1** Unscrew the 3× slotted truss head screws M4×6 (3/4) using a flat head screwdriver.
- 2** Move the cylinder housing (3/3) away.
- 3** Unscrew the 4× slotted cylindrical head screws M3×6 (3/5) with flat head screwdriver.
- 4** Unscrew the 8x hex socket set screws M3×3 (3/7) with an Allen key 1.5 mm on each golden connection socket (3/6).

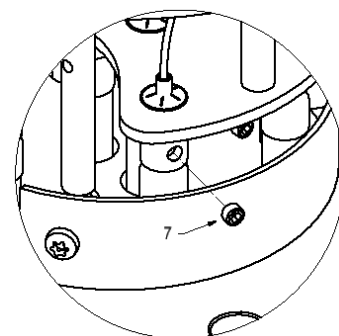


Fig. 4 Detail view of the hex socket set screws (3/7) on the connection sockets (3/6)

- 5** Separate and remove the complete gauge head connecting unit (3/2) from the gauge head assembly (3/1).



The gauge head can be baked-out up to 400 °C (200 °C with mu-metal intermediate piece 399-891).

## Assembly of the gauge head connecting unit after bake-out

- 1** Move and fit the complete gauge head connecting unit (3/2) to the gauge head assembly (3/1).
- 2** Tighten the 8x hex socket set screws M3×3 (3/7) with Allen key 1.5 mm on each golden connection socket (3/6). Recommended torque: 1 Nm.
- 3** Tighten the 4× slotted cylindrical head screws M3×6 (3/5) with flat head screwdriver. Recommended torque: 1 Nm.
- 4** Move the cylinder housing (3/3) in.
- 5** Tighten the 3× slotted truss head screws M4×6 (3/4) using a flat head screwdriver. Recommended torque: 1 Nm.

## 4 Operation



**DANGER**

During operation, it must be ensured that the sensor voltages (anode voltage and Faraday voltages) do not become dangerous to touch according to EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019.

For this purpose, the currents <1.1 mA and the charge <45 µC must be complied with in normal operation. In the event of a single fault, the limit values are 15 mA for a time of less than 30 ms and 45 µC.

By use of the Ion Reference gauge Controller IRC081 the conditions for operation compliant to EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019 are fulfilled. If different controller units are used, the user is responsible for a safe operation.

The IRG080 is a hot cathode ionization gauge with electrode system configuration according to ISO/WD TS 6737 (see Fig. 5, [12]). Electrons emitted from the cathode are accelerated and focused with the Wehnelt cylinder into the anode space. The electrons move in a tight electron beam straight towards the exit aperture of the anode cage and are deflected into a Faraday cup.

Some of the residual gas in the anode space is ionized by the electrons. The generated ions move by the electrical potential towards the ion collector where they are captured: the ion current is measured. The resulting pressure is

$$p = \frac{1}{S} \cdot \frac{I_c - I_{c_0}}{I_e} + p_0$$

where

- $p_0$  residual pressure
- $S$  gauge sensitivity
- $I_c$  ion current measured at pressure  $p$
- $I_{c_0}$  ion current measured at residual pressure  $p_0$
- $I_e$  emission current

### Calibration

Each IRG080 gauge head is individually function factory tested upon delivery.



The Ion Reference gauge Controller IRC081 includes own calibration data. Refer to the IRG081 operating manual for its delivery and storage location. (→ [1]).

### Operation



In the presence of halogen gases like fluorine, chlorine, bromine and iodine and their compounds, the inner components of the gauge head may suffer rapid wear.



Humidity at the insulators caused by condensing water for example, can give rise to incorrect measurements due to leakage currents.

### Venting

Prior to venting, the cathode must be switched off and allowed to cool down to less than 700 K.



Allow at least 1 h cool-down before venting (with N<sub>2</sub> or air) the vacuum system including the gauge head to atmosphere.



Avoid air in-rushes or fast venting to atmosphere while the cathode is still hot.

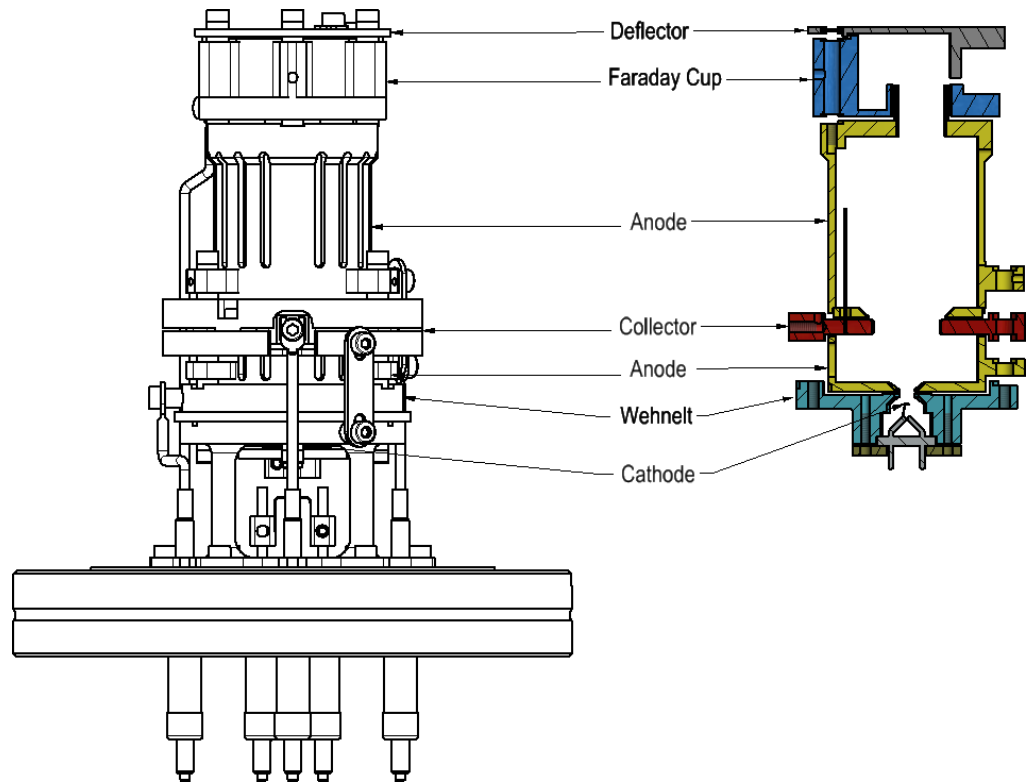


Fig. 5 Lateral view and cross section representation of the IRG080 gauge head

## 5 Maintenance



### DANGER



#### Contaminated parts

Contaminated parts can be detrimental to health and environment. Before you begin to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



### Caution



#### Vacuum component

Dirt and damages impair the function of the vacuum component. When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



### Caution



#### Dirt sensitive area

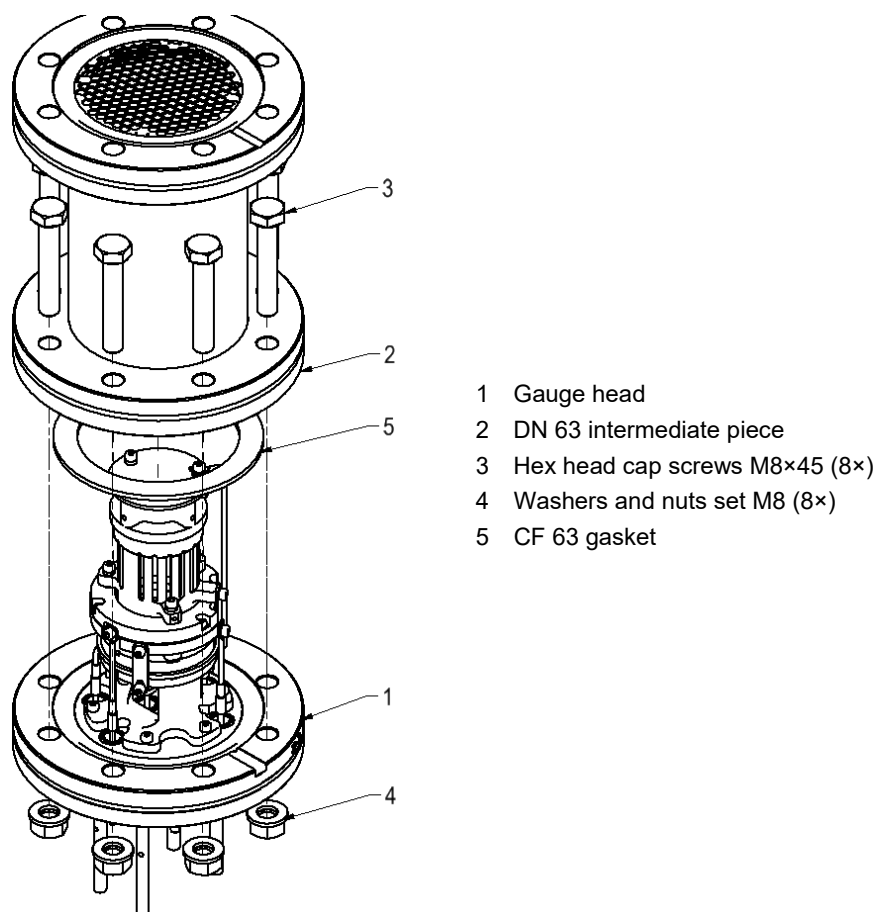
Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

## 5.1 Cathode replacement



The cathode is supplied on a plate under a cover. The cathode must only be exchanged in a room which is free of dust.



- 1 Gauge head
- 2 DN 63 intermediate piece
- 3 Hex head cap screws M8×45 (8×)
- 4 Washers and nuts set M8 (8×)
- 5 CF 63 gasket

Fig. 6 Cathode replacement, preparation, steps 5 to 7

### Preparation

- 1** Switch off the IRC081 operating unit.
- 2** Detach the gauge head cable set, comprising BNC plug and multipin connector, from the gauge head.
- 3** Remove the gauge head assembly from the vacuum system.
- 4** Disassemble the gauge head connecting unit from the gauge head assembly. For this, follow the steps described in Section 3.2, "Disassembly of the gauge head connecting unit for bake-out".
- 5** Loosen the 8× hex head cap screws M8×45 (6/3) unscrewing the 8× M8 nuts (6/4) with a flat wrench 13 mm.
- 6** Move carefully the DN 63 intermediate piece (6/2) upward to remove it.
- 7** Pull and remove the CF gasket (6/5).

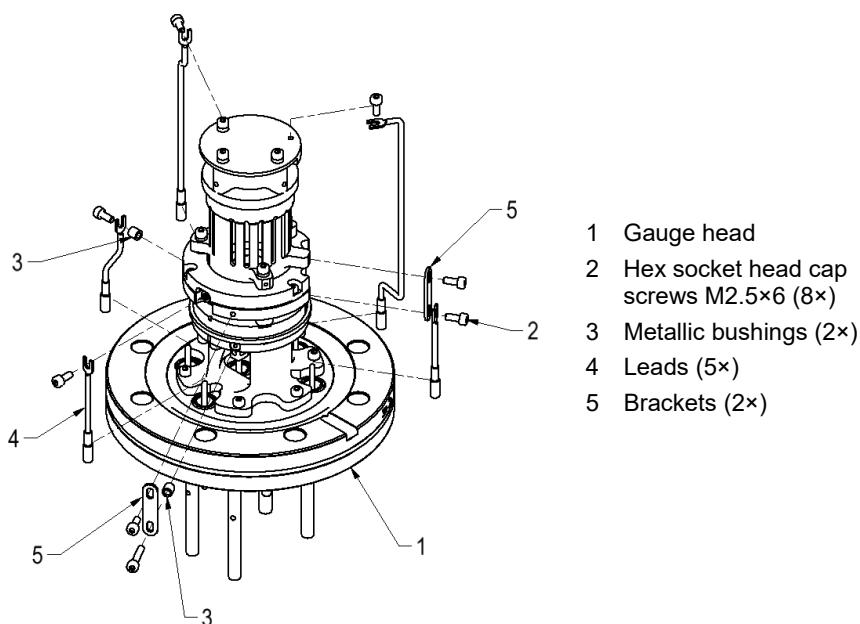


Fig. 7 Cathode replacement, steps 8 to 9

### Cathode removal

- 8** Unscrew the 8x M2.5x6 hex socket head cap screws (7/2) with an Allen key 2 mm. Remove carefully the 2x metallic bushings (7/3) and 2x brackets (7/5).
- 9** Pull upward and remove the 5x leads (7/4) from each feedthrough pin.

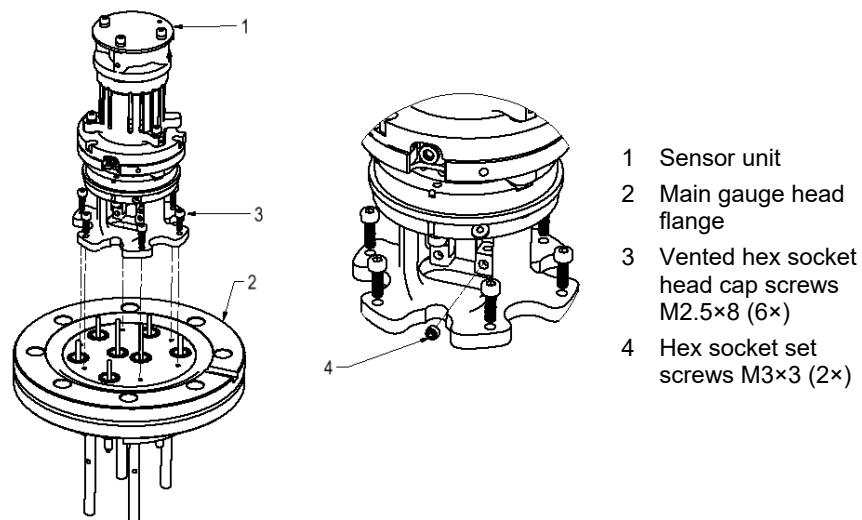
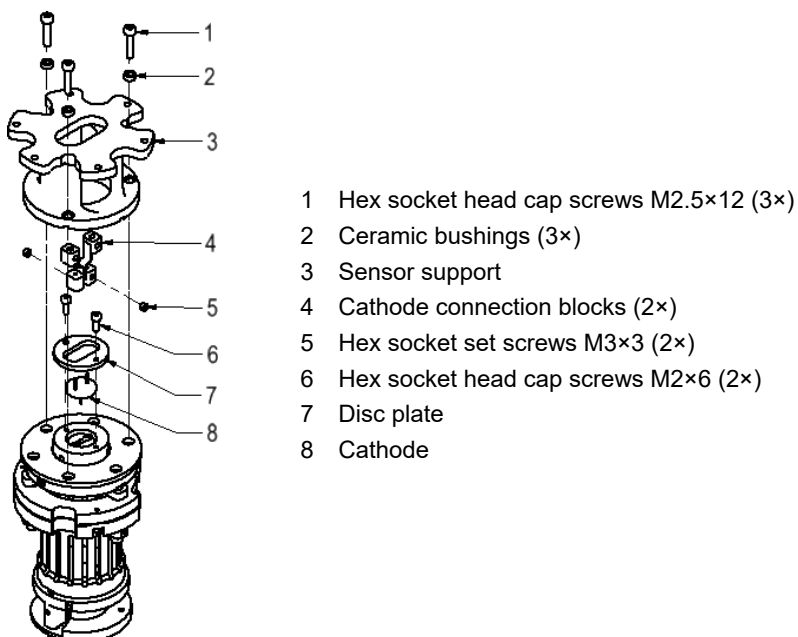


Fig. 8 Cathode replacement, steps 10 to 12

- 10** Unscrew the 2x M3x3 hex socket set screws (8/4) on the cathode connection blocks with an Allen key 1.5 mm.
- 11** Unscrew the 6x M2.5x8 vented cylindrical head socket screws (8/3) with an Allen key 2 mm.
- 12** Move away the sensor unit (8/1) from the main gauge head flange (8/2).



- 1 Hex socket head cap screws M2.5×12 (3×)
- 2 Ceramic bushings (3×)
- 3 Sensor support
- 4 Cathode connection blocks (2×)
- 5 Hex socket set screws M3×3 (2×)
- 6 Hex socket head cap screws M2×6 (2×)
- 7 Disc plate
- 8 Cathode

Fig. 9 Cathode replacement, steps 13 to 18

- 13** Unscrew the 3× M2.5×12 (9/1) hex socket cap screws with an Allen key 2 mm and remove carefully the 3× ceramic bushings (9/2).
- 14** Separate the sensor support (9/3) from the sensor unit.
- 15** Unscrew the 2× M3×3 hex socket set screws (9/5) with an Allen key 1.5 mm and carefully pull up the 2× cathode connection blocks (9/4) from the cathode legs.
- 16** Unscrew the 2× M2×6 hex socket head cap screws (9/6) with an Allen key 2 mm to free the cathode (9/8) from its retaining disc plate (9/7).
- 17** Remove the disc plate (9/7) and then the cathode (9/8).
- 18** Exchange the cathode (9/8) (Accessories → 17).

### Cathode reinstallation

To reinstall the cathode, follow the above disassembly instructions in reverse order. Recommended torque for all screws: 1 Nm.



When mating up the DN 63 intermediate pipe to the main gauge head flange, make sure to replace the used CF 63 seal with a new, unused copper gasket.



Before employing the gauge head, it is recommended to pump down the system and if possible run a vacuum test or a direct leak search.



## 6 Spare Parts, Accessories

### Spare parts

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number according to the spare parts list

	Ordering number
Replacement cathode	399-890
Mu-metal intermediate piece, DN 63 CF-F	399-891
Protection grid for intermediate piece	399-892
Transport case	399-895

### Gauge head cables, temperature resistant (up to 165 °C)

	Ordering number
5 m (16.4 ft) with contact protection	399-883
10 m (10 m) with contact protection	399-884
15 m (49.5 ft) with contact protection	399-885

## 7 Storage



### Caution



#### Vacuum component

Inappropriate storage leads to an increase of the desorption rate and/or may result in mechanical damage of the product.

Cover the vacuum ports of the product with protective lids or grease free aluminum foil. Do not exceed the admissible storage temperature range (→ 5).

## 8 Returning the Product

**WARNING**

**Forwarding contaminated products**

Products returned to INFICON for service or repair should, if possible, be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological). Otherwise, the type of contamination must be declared.

Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a completed contamination declaration (Form under [www.inficon.com](http://www.inficon.com)).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

## 9 Disposal

**DANGER**

**Contaminated parts**

Contaminated parts can be detrimental to health and environment. Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

**WARNING**

**Substances detrimental to the environment**

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment. Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Contaminated components

Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

Such components must be separated according to their materials and recycled.

## Appendix

### A: Conversion Table

Pressure units  
(vacuum technology)

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

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

### B: Further Information



[www.inficon.com](http://www.inficon.com)  
 Operating Manual  
 Ion Reference Gauge Controller IRC081  
 tinb82d1 (German)  
 tinb82e1 (English)  
 INFICON AG, LI-9496 Balzers, Liechtenstein

## EU Declaration of Conformity



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

- 2014/35/EU, OJ L 96/357, 29.3.2014  
(Low Voltage Directive; Directive relating to electrical equipment designed for use within certain voltage limits)
- 2014/30/EU, OJ L 96/79, 29.3.2014  
(EMC Directive; Directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011  
(RoHS Directive; Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

### Product

# Ion Reference Gauge

## IRG080

(operation with the Ion Reference Gauge Controller IRC081)

### 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

3 January 2023




Dr. Christian Riesch  
Head of Development

Dr. Roberto Saleme  
Product Manager

## Notes

Notes

## Notes

Original: English



TINB7AE1



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