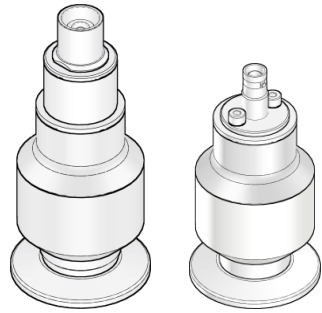


Cold Cathode Gauge

IKR084, IKR085, IKR086



Operating Manual
Incl. EU Declaration of Conformity
IG9048BEN/A (2021-04)

Product Identification

In all communications with INFICON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

INFICON AG, LI-9496 Balzers

Model:
PN:
SN:

Validity

This document applies to products with part number

IOG18770	(IKR084, DN 40 ISO-KF)
IOG18771	(IKR084, DN 40 CF-F)
IOG18772	(IKR085, DN 40 ISO-KF)
IOG18773	(IKR085, DN 40 CF-F)
IOG18776	(IKR086, DN 40 ISO-KF)
IOG18777	(IKR086, DN 40 CF-F)

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

If not indicated otherwise in the legends, the illustrations in this document correspond to the IKR085 with vacuum connection DN 40 ISO-KF. They apply to the other products by analogy.

Intended Use

The above Cold Cathode Gauges have been designed for vacuum measurement in the specified display range (→ "Technical Data").

They are used in conjunction with an INFICON TPG300 / TPG500 measurement and control unit.

The IKR084 is connected via a cable with SHV to SHV-Coaxial connectors (→ ITER Catalogue: Cold Cathode Cables under www.inficon.com).

The IKR085 is connected via a cable with Triax to SHV-Coaxial connectors (→ ITER Catalogue: Cold Cathode Cables under www.inficon.com).

The IKR086 is connected via a cable with Triax to Triax connectors (→ ITER Catalogue: Cold Cathode Cables under www.inficon.com).

Functional Principle

The gauge functions with a cold cathode ionization measurement circuit (according to the inverted magnetron principle).

Safety

Symbols Used

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.

Note

Personnel Qualification

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.

General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
- Consider possible reactions between the materials (→ Technical Data) and the process media.
- Consider possible reactions (e.g. explosion) of the process media due to the heat generated by the product.
- 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.

Responsibility and Warranty

INFICON assumes no liability and the warranty becomes 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.

The end-user assumes the responsibility in conjunction with the process media used.

Gauge failures due to contamination are not covered by the warranty.

Technical Data

Admissible temperatures	
Storage	-40 °C ... +80 °C
Operation	
With standard cable	+5 °C ... +80 °C
With high temp. cable	+5 °C ... +230 °C
Bakeout	
With high temp. cable	+230 °C
Mechanical integrity	+250 °C
Relative humidity	max. 80% at temperatures up to +31 °C, decreasing to 50% at +40 °C
Mounting orientation	
Use	any indoors only unlimited altitude

Display range (air, N ₂)	
IKR084/085/086 With CP300C9 board	5×10 ⁻⁹ ... 1×10 ⁻² mbar
IKR086 With CP300T11/T11L board	5×10 ⁻¹⁰ ... 1×10 ⁻² mbar
Measurement range (air, N ₂)	1×10 ⁻⁸ ... 5×10 ⁻³ mbar
Accuracy (at 25 °C)	≈±30% of reading
Gas type dependence	→ Appendix

Protection category	IP 40
Admissible pressure (absolute)	9 bar, for inert gases <55 °C
Radiation resistance	1×10 ⁷ Gy

External magnetic field	
In axial direction ¹⁾	Measurement deviation
≤140 mT	<10% at 25 °C
≤120 mT	<10% at 230 °C
≤340 mT	<200% at 25 °C
≤340 mT	<200% at 230 °C
In radial direction ¹⁾	Measurement deviation
≤160 mT	<10% at 25 °C
≤160 mT	<10% at 230 °C
≤195 mT	<200% at 25 °C
≤185 mT	<200% at 230 °C

Operating voltage (in measuring chamber)	≤3.3 kV
Operating current (in measuring chamber)	≤600 µA (CP300C9 board)

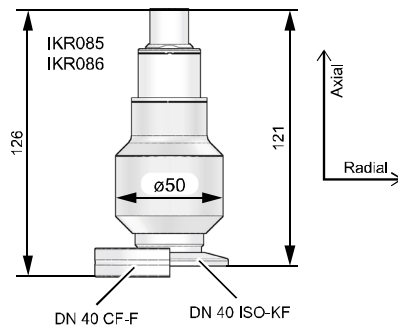
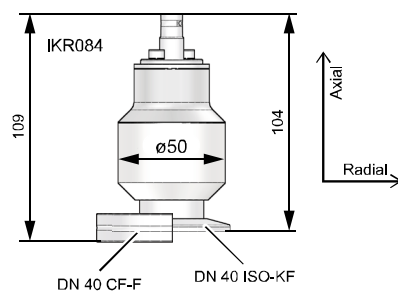
Gauge connector	
IKR084	SHV coaxial, male
IKR085, IKR086	triaxial, female
Sensor cable and cable length	→ Operating Manual IG9972BEN

Grounding concept	
Vacuum connection (flange; casing)	conductive to protection earth

Materials	
On the vacuum side	
Vacuum connection	stainless steel (1.4306)
Measuring chamber	stainless steel (1.4306)
Feedthrough isolation	ceramic (Al ₂ O ₃)
Internal seal	Ag
Anode	Mo
Ignition aid	stainless steel (1.4330)
Ionization chamber	stainless steel (1.4301, 1.4016)
Magnet	NdFeB

Internal volume	
DN 40 ISO-KF	≈23.9 cm ³
DN 40 CF-F	≈26.1 cm ³

Dimensions [mm]



Weight	≤0.9 kg
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¹⁾ Performance values validated with +3 dB applied magnetic field as per ITER procedure ITER_98JL4W.

Installation

Vacuum Connection

Caution
 External magnetic fields and temperatures High-intensity external magnetic fields (>480 mT) and high temperatures (>230 °C) in close proximity of the gauge can lead to demagnetization of the permanent magnets of the gauge.
Protect the gauge from the influence of high-intensity external magnetic fields and high temperatures by arranging the gauge appropriately or by installing magnetic shields and temperature shields.

DANGER
 Overpressure in the vacuum system >1 bar Injury caused by released parts and harm caused by escaping process gases can result if clamps are opened while the vacuum system is pressurized.
Do not open any clamps while the vacuum system is pressurized. Use the type clamps which are suited to overpressure.

DANGER
 Overpressure in the vacuum system >2.5 bar KF connections with elastomer seals (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.
Use O-rings provided with an outer centering ring.

DANGER
 Protective ground Incorrectly grounded products can be extremely hazardous in the event of a fault.
The gauge must be electrically connected to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:
• CF connections fulfill this requirement
• For gauges with a KF flange, use a conductive metallic clamping ring

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.

Mount the gauge so that no vibrations occur. Vibrations at the gauge cause a deviation of the measured values.

The gauge may be mounted in any orientation.

External magnetic fields >300 mT: We recommend mounting the gauge aligned with the magnetic field in axial direction.

To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position.

Remove the protective lid and connect the product to the vacuum system.

Keep the protective lid.

Electrical Connection

Make sure the vacuum connection is properly made.

- The TPG300 / TPG500 control unit must be turned off before any work is performed on the gauge or sensor cable.
- Wait at least 15 seconds after turning off, before connecting cable.
- Customer-specific cables or lengths have to comply with EN 61010-1 standard (Q ≤45 µC). Cable length ≤100 m.

Connect the sensor cable to the gauge and to the INFICON measurement unit (→ Operating Manual IG9972BEN of measurement boards used).

Operation

The gauge is ready for operation as soon as it has been connected.

Gas type Dependence

The measuring signal depends on the type of gas being measured. The value displayed is accurate for dry air, N₂, O₂ and CO. It can be mathematically converted for other gases. This can be done by entering the corresponding calibration factor on the INFICON measurement unit (→ Appendix).

Ignition Delay

When cold cathode measurement systems are activated, an ignition delay occurs. The delay time increases at low pressures and for clean, degassed gauges it is typically:

1×10 ⁻⁷ mbar	≈ 0.1 minute
1×10 ⁻⁸ mbar	≈ 1 minute
1×10 ⁻⁹ mbar	≈ 5 minutes

The ignition is a statistical process. Already a small amount of depositions on the inner surfaces can have a strong influence on it.

Contamination

Gauge failures due to contamination are not covered by the warranty.

Cold cathode gauges are subject to contamination. The degree of contamination and subsequently the accuracy of the measured value depend on:

- the pressure in the vacuum chamber
- contaminants inside the vacuum chamber (vapors, process particles, etc.)
- the measurement current.

To avoid extensive contamination switch the gauge on only at pressures of <10⁻² mbar.

If the gauge is frequently operated at pressures between 3×10⁻⁵ mbar and 1×10⁻² mbar, use measurement boards which limit the current to a maximum of 100 µA (→ Operating Manual IG9970BEN of INFICON measurement boards for TPG300 / TPG500).

Contamination generally has the effect that the pressure indication is too low. If the contamination is severe, instability occurs. Contamination layers can peel off in the measuring chamber and cause short circuits.

Depending on the operating conditions, cleaning may therefore be necessary after a few days or after a few years.

Deinstallation

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.

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.

Procedure

- Turn off the TPG300 / TPG500 control unit.
 Wait at least 15 seconds after turning off, before disconnecting cable.
- Vent the vacuum system and disconnect the sensor cable from the gauge.
- Remove gauge from the vacuum system and install the protective lid.

Maintenance

Sensor failures due to contamination and wear and tear, as well as expendable parts (e.g. ionization chamber, ignition aid), are not covered by the warranty.

INFICON assumes no liability and the warranty becomes null and void if any repair work is carried out by the end-user or third parties.

Cleaning the Gauge / Cleaning or Replacing Ionization chamber and Ignition aid

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.

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.

Precondition

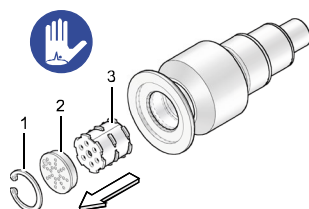
- Gauge removed from vacuum system

Tools required

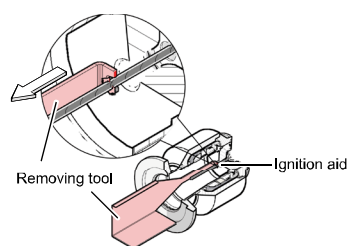
- Pliers for circlip
- Mounting / removing tool for ignition aid
- Cleaning alcohol
- Scotch-Brite

Procedure

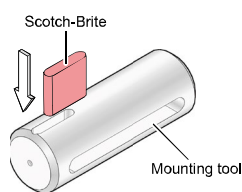
- 1 Remove the circlip (1), the pole insert (2) and the ionization chamber from the measuring chamber.



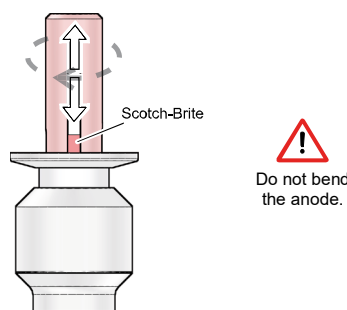
- 2 Due to contamination remove the ignition aid with the removing tool.



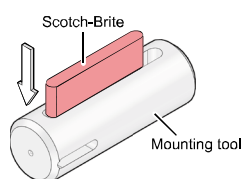
- 3 Insert a Scotch-Brite into the mounting tool ...



... and carefully rub the anode to a bright finish.



- 4 Insert a Scotch-Brite into the mounting tool ...



... and carefully rub the upper part of the inside walls of the measuring chamber to a bright finish.

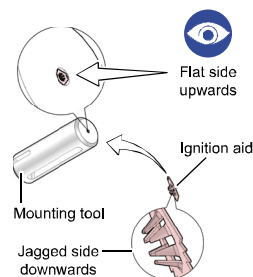


- 5 We recommend to carefully rub the inside walls of the measuring chamber up to the groove for the retaining ring and the pole insert to a bright finish using e.g. a polishing cloth.

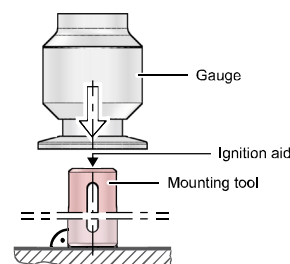
- The sealing surfaces must only be worked concentrically.
- Do not bend the anode.

- 6 Rinse the measuring chamber and the pole insert with alcohol and allow them to dry.

- 7 Insert a new ignition aid into the mounting tool with the flat side upwards ...

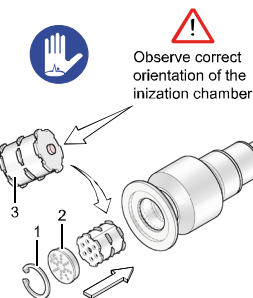


... and carefully slide it onto the anode until the stop position is reached.



- 8 Remove particles in the measuring chamber by blowing with dry nitrogen (while the flange of the measuring chamber is pointing downward).

- 9 Slide a new ionization chamber (3) and the cleaned pole insert (2) into the measuring chamber until the mechanical stop is reached and mount the retaining ring (1).



Replacing the Anode

Precondition

- Gauge deinstalled
- Pole insert, ionization chamber and ignition aid removed

Tools required

- Allen wrench AF 3

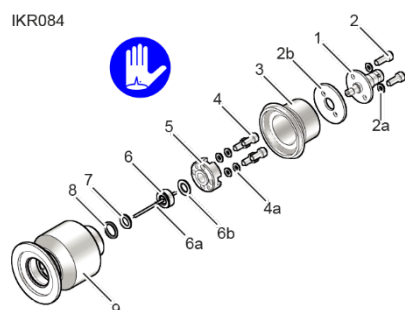


Figure 2

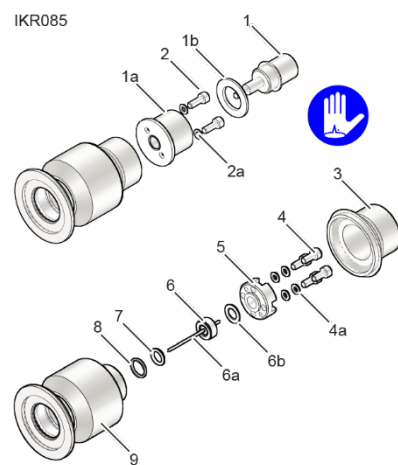


Figure 3

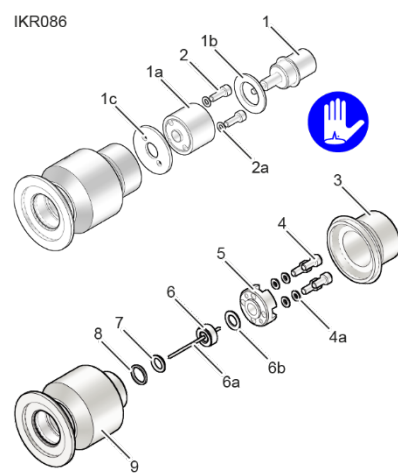


Figure 4

- 1 **IKR084:** Carefully unscrew two hex socket screws (2) and remove the receptacle (1) and the washer (2b).
IKR085: Carefully unscrew the receptacle (1) and remove the washer (1b). Unscrew two hex socket screws (2) and remove the adapter (1a).
IKR086: Carefully unscrew the receptacle (1) and remove the washer (1b). Unscrew two hex socket screws (2) and remove the adapter (1a) and the washer (1c).

- 2 Remove the shielding (3) and unscrew the 4 hex socket screws (4) on the back of the measuring chamber (9).

- 3 Carefully remove the following items in this order: pressure piece (5), washer (6b), complete anode (6), metal seal (7) and centering ring (8).

Assembling the Gauge

- 1 Insert new metal seal (7) with the centering ring (8) centered into the measuring chamber (9). Sealing surface, seal and ceramic part must be clean.

- 2 Carefully insert the anode (6) into the measuring chamber.

- 3 Place the pressure piece (5) incl. washer (6b) on the measuring chamber (9) and tighten the 4 screws (4) incl. lock washers (4a) uniformly until the stop position is reached.

- 4 Remove particles in the measuring chamber (9) by blowing with dry nitrogen (while the flange of the measuring chamber is pointing downward).

- 5 Position the ignition aid (6a) with the mounting tool.

- 6 Slide a new ionization chamber and the cleaned pole insert into the measuring chamber until the mechanical stop is reached and mount the retaining ring.

- 7 If possible perform a leak test (leak rate $<10^{-9}$ mbar l/s).

- 8 **IKR084:** Place the washer (2b) and the SHV connector (1) onto the chamber (9), tighten both hex socket screws (2) including the locking washers (2a).

IKR085: Place the adapter (1a) onto the chamber (9), tighten both hex socket screws (2) including the locking washers (2a).

IKR086: Place the washer (1c) and the adapter (1a) onto the chamber (9), tighten both hex socket screws (2) including the locking washers (2a).

- 9 **IKR085 / 086:** Place the washer (1b) and screw in the triaxial connector (1) carefully.

Troubleshooting

Problem	Possible cause	Correction
The measurement values indicated are too low	Gauge contaminated	Clean the gauge

Spare Parts / Accessories

When ordering spare parts, always indicate:

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

→ Figure 1	Position	Ordering No.
Ionization chamber	(3)	I0G351555

→ Figure 2, Figure 3, Figure 4	Position	Ordering No.
Repair kit		I0G846240
Anode complete	(6)	
Washer	(6b)	
Metal seal, HNV100 9×1.6	(7)	
Centering ring	(8)	
Ignition aid	(6a)	
Ignition aid (set of 10 pieces)	(6a)	I0G351995

	Ordering No.
Mounting / removing tool for ignition aid	I0G351550

Returning the Product

WARNING

Forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or microbiological hazard) can be detrimental to health and environment.

Products returned to INFICON should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination (form under 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.

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

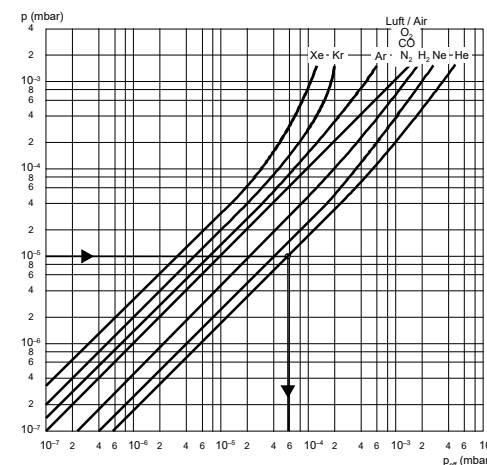
After disassembling the product, separate its components according to the following criteria:

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

Appendix

Gas Type Dependence

Indicated pressure (gauge calibrated for air)



In the range below 10^{-5} mbar the pressure indication is linear. For gases other than air the pressure can be determined by means of a simple conversion formula:

$$p_{\text{eff}} = C \times \text{displayed pressure}$$

where	Gas type	C
	Air (N ₂ , O ₂ , CO)	1.0
	Xe	0.4
	Kr	0.5
	Ar	0.8
	H ₂	2.4
	Ne	4.1
	He	5.9

These conversion factors are average values.

A mixture of gases and vapors is often involved. In this case accurate determination is only possible with a partial pressure measuring instrument, e.g. an INFICON quadrupole mass spectrometer.

EU Declaration of Conformity

CE We, INFICON, hereby declare that the equipment mentioned below comply with the provisions of the following directive:

- 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)

Products

Cold Cathode Gauge
IKR084, IKR085, IKR086

Manufacturer / Signatures

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