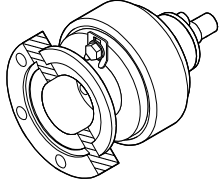


Operating Instructions

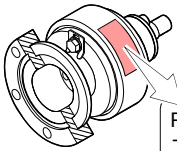
Cold Cathode Gauge
FPM sealed
IKR 050



BG 805 031 BE (0307)

Product Identification

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



Pfeiffer Vacuum, D-35614 Asslar
Typ: -----
No: -----
F-No: -----

Validity

This document applies to products with part number

- PTR18500 (DN 25 ISO-KF)
- PTR18501 (DN 40 ISO-KF)
- PTR18502 (DN 40 CF-F)

The part number can be taken from the product nameplate.

Intended Use

The above Cold Cathode Gauges have been designed for vacuum measurement in the pressure range of 2×10^{-9} ... 5×10^{-3} mbar.

They are used together with a Pfeiffer Vacuum measurement and control unit of the type TPG 300.


Functional Principle


Over the whole measurement range, the measuring signal is output as logarithm of the pressure.


The IKR 050 functions with a cold cathode ionization measurement circuit (according to the inverted magnetron principle).


Safety

Symbols Used


 **Specialists**
The work described in this document may only be carried out by persons with suitable technical training and the necessary experience.

 **DANGER**
Information on preventing any kind of personal injury or extensive equipment damage.

 **WARNING**
Information on damage prevention.

 **Note**
Information on cost-effective use of the product.

Safety Information

 **DANGER**

- a) Adhere to the applicable regulations and take the necessary precautions for the gases used.
Consider possible reactions with the product materials (→ Technical data).
- b) Adhere to the relevant regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- c) Products returned to Pfeiffer Vacuum for service or repair should if at all possible be free of harmful substances (e.g. radioactive, toxic, caustic or microbiological hazard). Otherwise the type of contamination has to be declared.
Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Communicate the safety information to all other users.

Responsibility and Warranty

Pfeiffer Vacuum 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.

Technical Data

Admissible temperatures	
Storage	-40 °C ... +150 °C (without cable)
Operation	+5 °C ... +80 °C (with normal cable) +5 °C ... +150 °C (with high temperature cable)
Relative humidity	max. 80% at temperatures up to +31 °C, decreasing to 50% at +40 °C
Use	indoors only altitude up to 2000 m

Measurement range (air, N ₂)	2×10^{-9} ... 5×10^{-3} mbar
Gas type dependence	→ Appendix

Protection type	IP 40
Overpressure	≤9 bar, for inert gases and temperatures <55 °C only

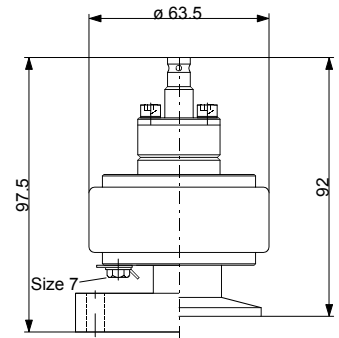
Operating voltage (in measuring chamber)	≤3.3 kV
Operating current (in measuring chamber)	≤700 μA

Electrical connection	
Connector	SHV
Type	coaxial cable

Cable length between gauge and measurement unit	max. 100 m (40 m if the lower limit of the measurement range is used → Operating instructions of Pfeiffer Vacuum measurement unit)
---	---

Materials on the vacuum side	
Vacuum connection	stainless steel (1.4306)
Measuring chamber	
DN 25 ISO-KF	stainless steel (1.4104)
DN 40 ISO-K	stainless steel (1.4306)
DN 40 CF-F	stainless steel (1.4306)
Feedthrough isolation	ceramic (Al ₂ O ₃)
Internal seal	FPM
Anode	Mo
Ignition aid	stainless steel (1.4310)
Internal volume	≈ 20 cm ³

Dimensions [mm]



Weight	600 g (DN 25 ISO-KF)
	600 g (DN 40 ISO-KF)
	850 g (DN 40 CF-F)

Installation

Vacuum Connection



Note

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



DANGER

When using KF vacuum connections with elastomer sealing rings (e.g. O-rings), the sealing ring must be equipped with an outer centering ring at overpressures >2.5 bar.

At overpressures >1 bar a clamp only to be opened and closed by means of a tool (e.g. hose clip clamping ring) has to be used.

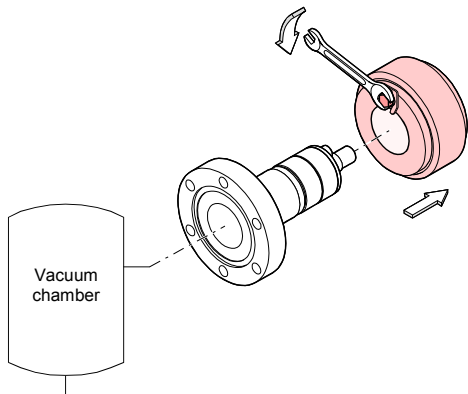
If the IKR 050 Cold Cathode Gauge may come into contact with charged particles (plasma, ion beam etc.), make sure its vacuum connections is galvanically connected to the vacuum chamber and do always use conductive metallic centering rings and clamps.

When CF vacuum connections are made, it can be advantageous to temporarily remove the magnet unit (→ next section).

The gauge can be mounted in any orientation. However, it should be mounted so that no particles can get into the measuring chamber (→ Technical data for space requirements).

Removing the Magnet Unit

(CF vacuum connection only)



Note

For reasons of tolerance, the same magnet unit has to be used again when reassembling the gauge.

Tools required

- Allen wrench 1.5 mm
- Open-end wrench 7.0 mm

Procedure

(→ figure 1, next page)

- 1) Unfasten the hex head screw (3) on the magnet unit (4) and remove the magnet unit.



Note

The magnetic force and the tendency to tilt make it more difficult to separate the magnet unit and the measuring chamber (7).

- 2) Make the vacuum connection between the gauge and the vacuum system.
- 3) Mount the magnet unit and lock it with the hex head screw (3).

Electrical Connection

- Install the gauge to the grounded vacuum chamber.
- Connect the gauge to the Pfeiffer Vacuum measurement unit (→ operating instructions 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 Pfeiffer Vacuum measurement unit (→ Appendix).

Ignition delay

An ignition delay occurs when the cold cathode gauges are turned on. The delay time increases at low pressures, and is typically:

- 1×10^{-7} mbar \approx 0.1 minute
- 1×10^{-8} mbar \approx 1 minute
- 1×10^{-9} mbar \approx 5 minutes

Contamination

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
- the operating time



Note

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 μ A (→ Operating instructions of Pfeiffer Vacuum measurement boards for TPG 300).

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.

Disassembly



DANGER

Before starting work, find out whether the vacuum components are contaminated.

Adhere to the relevant regulations and take the necessary precautions when handling contaminated products.



Note

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.

Procedure

- 1) Turn the gauge off.
- 2) Detach the connection cable.
- 3) Remove the gauge from the vacuum chamber.



Note

Cover the flange with the protective lid supplied for this purpose.

Maintenance



DANGER

Before starting work, find out whether the vacuum components are contaminated.

Adhere to the relevant regulations and take the necessary precautions when handling contaminated products.

Cleaning the Gauge / Changing Parts

Tools required

- Allen wrench 3.0 mm
- Open-end wrench 7.0 mm
- Pliers for circlip
- Polishing cloth (grain 400) or Scotch-Brite
- Tweezers
- Mounting tool for ignition aid
- Cleaning alcohol

Disassembling the Gauge

(→ figure 1, next page)

Precondition

- Gauge removed from vacuum system

Procedure

- 1) Unfasten the hex head screw (3) on the magnet unit (4) and remove the magnet unit.



Note

- The magnetic force and the tendency to tilt make it more difficult to separate the magnet unit and the measuring chamber (7).
- For reasons of tolerance, the same magnet unit has to be used again when reassembling the gauge.

- 2) Remove the circlip (5) and the pole insert (6) from the measuring chamber (7).
- 3) Loosen the 2 hex socket screws (1a) and remove the coaxial connector (2a).
- 4) Remove the 4 (or 2) hex socket screws (8) incl. the lock washers (8a) on the back of the measuring chamber (7).
- 5) Carefully remove the following items in this order: pressure piece (9), complete anode (10), inner ring (11) and FPM seal (12).

The parts can now be cleaned or replaced individually (→ next section).



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Cleaning the Gauge

Procedure



DANGER

Adhere to the relevant regulations and take the necessary precautions when handling and disposing of cleaning agents.

Cleaning the measuring chamber and the pole insert:

- 1) Clean the inside walls of the measuring chamber and the pole insert to a bright finish. Use a polishing cloth.



WARNING

Sealing surfaces must only be worked concentrically.

- 2) Rinse the measuring chamber and the pole insert with alcohol.
- 3) Dry both.

Cleaning or replacing the anode (10):

- 1) Remove the old ignition aid (10a), for example with tweezers.
- 2) Rub the anode pin to a bright finish by means of a polishing cloth.



WARNING

Do not bend the anode.
Do not carry out mechanical work on the ceramic part.

- 3) Rinse the anode with cleaning alcohol.
- 4) Dry the anode.
- 5) Insert the new ignition aid (10a) into the mounting tool.
- 6) Carefully press the anode (cleaned or new) centered and parallel to the tool axis into the ignition aid and insert it to a depth of ≈ 15 mm. The final position is established only after the anode is installed.

Assembling the Gauge

Procedure

- 1) Insert the FPM seal (12) with the inner ring (11) centered into the measuring chamber (7). Sealing surface, seal and ceramic part must be clean (\rightarrow figure 1).
- 2) Carefully insert the anode (10) incl. ignition aid (10a) into the measuring chamber.
- 3) Place the pressure piece (9) on the measuring chamber (7) and tighten the screws (8) incl. lock washers (8a) uniformly until the stop position is reached.
- 4) Position the ignition aid (10a): slide the mounting tool over the anode pin until the mechanical stop is reached.
- 5) Remove particles in the measuring chamber (7) by blowing with dry nitrogen (while the flange of the measuring chamber is pointing downward).
- 6) Slide the pole insert (6) into the measuring chamber up to the mechanical stop (\rightarrow figure 1).
- 7) Place the circlip (5) snugly fitting on the pole insert.

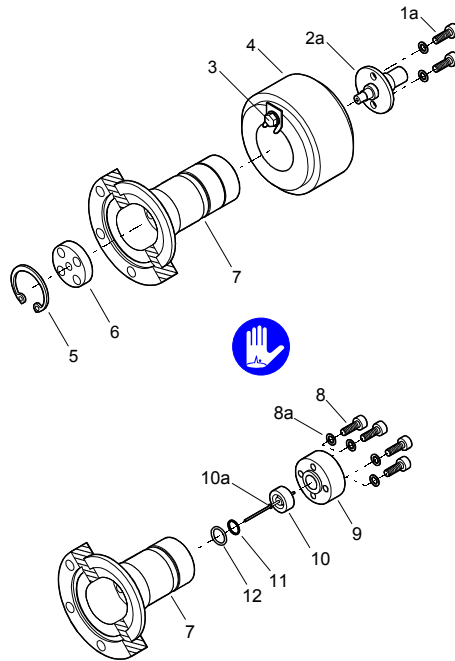


Note

Visually check that the anode pin is centered over the hole of the pole insert (tolerated eccentricity ≤ 0.5 mm).

- 8) If possible perform a leak test (leak rate $< 10^{-9}$ mbar l/s).
- 9) Place the coaxial connector (2a) on the measuring chamber (7) and tighten both hex socket screws (1a).
- 10) Mount the magnet unit (4) and lock it with the screw (3).

Figure 1:



Troubleshooting

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

Returning the Product

WARNING



Caution: forwarding contaminated products

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

Products returned to Pfeiffer Vacuum 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.

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.

Spare Parts

When ordering spare parts, always indicate:

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

	Position \rightarrow figure 1	Ordering number
Maintenance kit		PT846239-T
Inner ring	(11)	
O-ring FPM, 3.69 \times 1.78	(12) ¹⁾	
O-ring FPM, 10.82 \times 1.78	(12)	
Ignition aid	(10a)	
Repair kit		PT846252-T
O-ring FPM, 10.82 \times 1.78	(12)	
Anode complete	(10)	
Inner ring	(11)	
Ignition aid	(10a)	

¹⁾ O-ring not used.

Disposal



DANGER



Caution: 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



Caution: 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

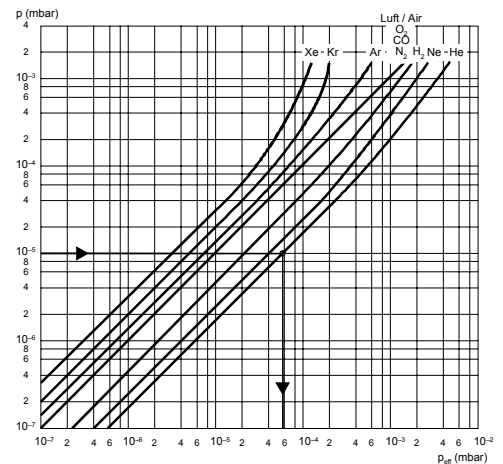
After disassembling the product, separate its components according to the following criteria:

- 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

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.



Note

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. a Pfeiffer Vacuum quadrupole mass spectrometer.

Declaration of Contamination

The service, repair, and/or disposal of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.

This declaration may only be completed (in block letters) and signed by authorized and qualified staff.

1 Description of product
 Type _____
 Part number _____
 Serial number _____

2 Reason for return

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

4 Used in copper process
 no yes **Seal product in plastic bag and mark it with a corresponding label.**

5 Process related contamination of product:

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

2) Products thus contaminated will not be accepted without written evidence of decontamination.

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

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

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

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

7 Legally binding declaration:
 We hereby declare that the information on this form is complete and accurate and that we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations.

Organization/company _____
 Address _____ Post code, place _____
 Phone _____ Fax _____
 Email _____
 Name _____

Date and legally binding signature _____ Company stamp _____

This form can be downloaded from our website.

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

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