Operating Instructions

Cold Cathode Gauge
FPM sealed
IKR 050

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).

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.

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

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.

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.

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, N2) 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 Type SHV 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 stainless steel (1.4104)
DN 25 ISO-KF stainless steel (1.4306)
DN 40 ISO-K stainless steel (1.4306)
DN 40 CF-F stainless steel (1.4306)
Feedthrough isolation ceramic (Al2O3)
Internal seal FPM
Anode Mo
Ignition aid stainless steel (1.4310)

Internal volume = 20 cm³

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.

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**

**Gas type dependence**
The measuring signal depends on the type of gas being measured. The value displayed is accurate for dry air, N₂, O₂, CO and CO₂. 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:
- 1×10⁻⁵ mbar = 0.1 minute
- 1×10⁻⁶ mbar = 1 minute
- 1×10⁻⁷ mbar = 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 <10⁻⁵ mbar.

If the gauge is frequently operated at pressures between 3×10⁻⁵ mbar and 1×10⁻⁷ mbar, use measurement boards which limit the current to a maximum of 100 µA (→ 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.

**Maintenance**

**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.
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: protective piece (9), complete anode (10), inner ring (11) and FPM seal (12).

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

**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**
- 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.

**Maintenance**

**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.

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).
Cleaning the Gauge

Procedure

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.

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.
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.
7) Position the ignition aid (10a): slide the mounting tool over the inner ring (11) centered into the measuring chamber (7). Sealing surface, seal and ceramic part must be clean (∆→ figure 1).
8) Press the anode pin until the mechanical stop is reached.
9) Place the pressure piece (9) 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).

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 (∆→ 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 (∆→ figure 1).
7) Place the circlip (5) snugly fitting on the pole insert.
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).
10a) Insert the new ignition aid (10a) into the mounting tool.
10b) 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.

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 biological 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.

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.

Disposal

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.

Appendix

Gas Type Dependence

Indicated pressure
(Gauge calibrated for air)

\[ p_{\text{eff}} = C \times \text{displayed pressure} \]

where
- **Gas type**
- **C**
  - Air (N₂, O₂, CO): 1.0
  - Ne: 4.1
  - He: 5.9
  - Kr: 0.8
  - Ar: 0.5
  - Ne: 4.1
  - Xe: 2.4

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

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

Note
These conversion factors are average values.
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  ❑
   - caustic  no  ❑
   - biological hazard  no  ❑
   - explosive  no  ❑
   - radioactive  no  ❑
   - other harmful substances  no  ❑
   - 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 |
     |--------------------|---------------------------|--------------------------------------|-------------------------|
     |                    |                           |                                      |                         |
     |                    |                           |                                      |                         |

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

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

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

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

This form can be downloaded from our website.

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