

# OPERATING INSTRUCTIONS

EN

Translation of the Original

## IKR 270

Cold cathode gauge

**PFEIFFER**  **VACUUM**



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## Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new gauge is designed to support you in your individual application with maximum performance and without malfunctions. The name Pfeiffer Vacuum stands for high-quality vacuum technology, a comprehensive and complete range of top-quality products and first-class service. From this extensive, practical experience we have gained a large volume of information that can contribute to efficient deployment and to your personal safety.

In the knowledge that our product must avoid consuming work output, we trust that our product can offer you a solution that supports you in the effective and trouble-free implementation of your individual application.

Please read these operating instructions before putting your product into operation for the first time. If you have any questions or suggestions, please feel free to contact [info@pfeiffer-vacuum.de](mailto:info@pfeiffer-vacuum.de).

Further operating instructions from Pfeiffer Vacuum can be found in the [Download Center](#) on our website.

## Disclaimer of liability

These operating instructions describe all models and variants of your product. Note that your product may not be equipped with all features described in this document. Pfeiffer Vacuum constantly adapts its products to the latest state of the art without prior notice. Please take into account that online operating instructions can deviate from the printed operating instructions supplied with your product.

Furthermore, Pfeiffer Vacuum assumes no responsibility or liability for damage resulting from the use of the product that contradicts its proper use or is explicitly defined as foreseeable misuse.

## Copyright

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We reserve the right to make changes to the technical data and information in this document.



# Table of contents

<b>1</b>	<b>About this manual</b>	<b>5</b>
1.1	Validity	5
	1.1.1 Applicable documents	5
	1.1.2 Variants	5
1.2	Target group	5
1.3	Conventions	6
	1.3.1 Instructions in the text	6
	1.3.2 Pictographs	6
	1.3.3 Stickers on the product	6
	1.3.4 Abbreviations	6
1.4	Trademark proof	7
<b>2</b>	<b>Safety</b>	<b>8</b>
2.1	General safety information	8
2.2	Safety instructions	8
2.3	Safety precautions	10
2.4	Proper use	10
2.5	Foreseeable improper use	11
2.6	Responsibilities and warranty	11
2.7	Owner requirements	11
2.8	Personnel qualification	11
	2.8.1 Ensuring personnel qualification	12
	2.8.2 Personnel qualification for maintenance and repair	12
	2.8.3 Advanced training with Pfeiffer Vacuum	12
2.9	Operator requirements	12
<b>3</b>	<b>Product description</b>	<b>13</b>
3.1	Function	13
3.2	Status display	13
3.3	Identifying the product	13
3.4	Scope of delivery	13
<b>4</b>	<b>Transport and storage</b>	<b>15</b>
4.1	Transporting the product	15
4.2	Storing the product	15
<b>5</b>	<b>Installation</b>	<b>16</b>
5.1	Establishing the vacuum connection	16
5.2	Magnetic unit	17
5.3	Establishing the electric connection	18
<b>6</b>	<b>Operation</b>	<b>21</b>
6.1	Converting measuring signal and pressure	21
6.2	Ascertaining effective pressure with calibration factors	22
6.3	Ignition delay	24
6.4	Pollution	24
<b>7</b>	<b>Disassembly</b>	<b>25</b>
<b>8</b>	<b>Maintenance</b>	<b>27</b>
8.1	Maintaining the gauge	27
8.2	Disassembling the gauge	27
8.3	Cleaning of components	30
8.4	Assembling the gauge	31
<b>9</b>	<b>Malfunctions</b>	<b>34</b>
<b>10</b>	<b>Shipping</b>	<b>35</b>



<b>11</b>	<b>Recycling and disposal</b>	<b>36</b>
	11.1 General disposal information	36
	11.2 Dispose of gauges	36
<b>12</b>	<b>Service solutions by Pfeiffer Vacuum</b>	<b>37</b>
<b>13</b>	<b>Spare parts</b>	<b>39</b>
<b>14</b>	<b>Accessories</b>	<b>40</b>
	14.1 Accessory information	40
	14.2 Ordering accessories	40
<b>15</b>	<b>Technical data and dimensions</b>	<b>41</b>
	15.1 General	41
	15.2 Technical data	41
	15.3 Dimensions	43
	<b>ETL certification</b>	<b>44</b>
	<b>Declaration of conformity</b>	<b>45</b>



# 1 About this manual



## IMPORTANT

Read carefully before use.  
Keep the manual for future consultation.

## 1.1 Validity

This document describes the function of the products listed in the following and provides the most important information for safe use. The description is written in accordance with the valid directives. The information in this document refers to the current development status of the products. The document retains its validity assuming that the customer does not make any changes to the product.

### 1.1.1 Applicable documents

Designation	Document
Brief instructions for "Cold cathode gauge" IKR 270	BG 5115
Operating instructions "Total pressure measuring and control unit" TPG 361   TPG 362	BG 5500
Operating instructions "Total pressure measuring and control unit" TPG 366	BG 5501
Declaration of conformity	(Component of these instructions)

**Tbl. 1: Applicable documents**

The brief instructions for the gauge are included in the scope of delivery.  
You can find these documents in the [Pfeiffer Vacuum Download Center](#).

### 1.1.2 Variants

This document applies to products with the following part numbers:

Part number	Designation
PT R21 251	IKR 270 (DN 40 CF-F, short version)
PT R21 261	IKR 270 (DN 40 CF-F, long version)

**Tbl. 2: Variants**

You can find the part number on the rating plate of the product.  
Pfeiffer Vacuum reserves the right to make technical changes without prior notification.  
The figures in this document are not to scale.  
Dimensions are in mm unless stated otherwise.

## 1.2 Target group

These operating instructions are aimed at all persons performing the following activities on the product:

- Transportation
- Setup (Installation)
- Usage and operation
- Decommissioning
- Maintenance and cleaning
- Storage or disposal

The work described in this document is only permitted to be performed by persons with the appropriate technical qualifications (expert personnel) or who have received the relevant training from Pfeiffer Vacuum.

## 1.3 Conventions

### 1.3.1 Instructions in the text

Usage instructions in the document follow a general structure that is complete in itself. The required action is indicated by an individual step or multi-part action steps.

#### Individual action step

A horizontal, solid triangle indicates the only step in an action.

- ▶ This is an individual action step.

#### Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

1. Step 1
2. Step 2
3. ...

### 1.3.2 Pictographs

The pictographs used in the document indicate useful information.



Note



Tip



Wear laboratory gloves



Perform a visual inspection

### 1.3.3 Stickers on the product

This section describes all the stickers on the product along with their meaning.

	<p><b>Rating plate</b></p> <p>The rating plate is on the top of the device.</p>
	<p><b>Warning against magnetic fields</b></p> <p>The sticker displays a warning that the magnetic field of the gauge can interfere with the functioning of pacemakers, and specifies the minimum distance to the gauge which must be maintained by persons with pacemaker implants.</p>

### 1.3.4 Abbreviations

Abbreviation	Explanation
c	Constant for converting measuring signal and pressure
C	Calibration factor for calculating the pressure for gases other than air
d	Constant for converting measuring signal and pressure
MSL	Mean sea level



Abbreviation	Explanation
p	Pressure
WAF	Width across flats
U	Measuring signal [V] (output voltage)

Tbl. 3: Abbreviations used

## 1.4 Trademark proof

- Hirschmann® is a registered trademark of Hirschmann Electronics GmbH.
- Scotch-Brite® is a registered trademark of the 3M Company.

## 2 Safety

### 2.1 General safety information

The following 4 risk levels and 1 information level are taken into account in this document.

<b>⚠ DANGER</b>	
<p><b>Immediately pending danger</b> Indicates an immediately pending danger that will result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> <li>▶ Instructions to avoid the danger situation</li> </ul>	
<b>⚠ WARNING</b>	
<p><b>Potential pending danger</b> Indicates a pending danger that could result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> <li>▶ Instructions to avoid the danger situation</li> </ul>	
<b>⚠ CAUTION</b>	
<p><b>Potential pending danger</b> Indicates a pending danger that could result in minor injuries if not observed.</p> <ul style="list-style-type: none"> <li>▶ Instructions to avoid the danger situation</li> </ul>	
<b>NOTICE</b>	
<p><b>Danger of damage to property</b> Is used to highlight actions that are not associated with personal injury.</p> <ul style="list-style-type: none"> <li>▶ Instructions to avoid damage to property</li> </ul>	
<b>i</b>	Notes, tips or examples indicate important information about the product or about this document.

### 2.2 Safety instructions

<b>i</b>	<p><b>Safety instructions according to product's life stages</b> All safety instructions in this document are based on the results of a risk assessment. Pfeiffer Vacuum has taken into account all the relevant life stages of the product.</p>
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#### Risks during installation

<b>⚠ DANGER</b>
<p><b>Danger to life due to dangerous contact voltage</b> Voltages above 30 V (AC) or 60 V (DC) are considered dangerous in accordance with EN 61010. If you come into contact with dangerous contact voltage, this can result in injury through electric shocks or even death.</p> <ul style="list-style-type: none"> <li>▶ Only connect the product to devices which meet the following criteria:             <ul style="list-style-type: none"> <li>• Requirements of the earthed protective extra-low voltage (PELV)</li> <li>• Limited power source (LPS) Class 2</li> </ul> </li> <li>▶ Secure the line to the product.             <ul style="list-style-type: none"> <li>– Pfeiffer Vacuum measuring and control equipment complies with this requirement.</li> </ul> </li> </ul>





**⚠ DANGER****Risk to life due to electric shock**

An improperly earthed product is potentially fatal in the event of a fault.

- ▶ Connect the product galvanically with the earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective bonding according to EN 61010. (CF and VCR connections comply with this requirement.)
- ▶ Use electrically conductive centering rings and circlips for KF connections.

**⚠ WARNING****Danger from magnetic fields**

The product has a magnetic field that disturbs or impairs the function of electronic devices (e.g. pacemakers).

- ▶ Maintain the distances specified by the manufacturer of the pacemakers.
  - Pfeiffer Vacuum recommends a safety distance of **at least 130 mm** between the pacemaker and the product.
- ▶ Avoid the influence of strong magnetic fields by means of magnetic field shielding.

**Risks during maintenance****⚠ DANGER****Risk to life due to electric shock**

If no earth connection is established, voltage flows become hazardous to the touch and could lead to electronic components sustaining damage.

- ▶ Always tighten the electronic unit with the grub screw.
- ▶ Ensure that the grub screw of the electronic unit has been tightened correctly.

**⚠ DANGER****Electric shocks due to moisture penetrating into the device**

Moisture that has penetrated into the device results in personal injury through electric shocks.

- ▶ Only operate the device in a dry environment.
- ▶ Operate the device away from fluids and humidity sources.
- ▶ Do not switch on the device if fluid has penetrated into it, instead contact Pfeiffer Vacuum Service.
- ▶ Always disconnect the current supply before cleaning the device.

**⚠ WARNING****Health hazard through poisoning from toxic contaminated components or devices**

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

**⚠ WARNING****Health hazards due to cleaning agent**

The cleaning agent being used causes health hazards which could include, for example, poisoning, allergies, skin irritations, chemical burns or damage to the airways.

- ▶ When handling cleaning agents, observe the applicable regulations.
- ▶ Adhere to safety measures regarding handling and disposal of cleaning agents.
- ▶ Be aware of potential reactions with product materials.



**Risks when shipping**

**⚠ WARNING**

**Risk of poisoning from contaminated products**

Where products that contain harmful substances are shipped for maintenance or repair purposes, the health and safety of service personnel is at risk.

- ▶ Comply with the instructions for safe distribution.

**Risks during disposal**

**⚠ WARNING**

**Health hazard through poisoning from toxic contaminated components or devices**

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

**2.3 Safety precautions**

The product is designed according to the latest technology and recognized safety engineering rules. Nevertheless, improper use can result in danger to operator all third party life and limb, and product damage and additional property damage.



**Duty to provide information on potential dangers**

The product holder or user is obliged to make all operating personnel aware of dangers posed by this product.

Every person who is involved in the installation, operation or maintenance of the product must read, understand and adhere to the safety-related parts of this document.



**Infringement of conformity due to modifications to the product**

The Declaration of Conformity from the manufacturer is no longer valid if the operator changes the original product or installs additional equipment.

- Following the installation into a system, the operator is required to check and re-evaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

**General safety precautions when handling the product**

- ▶ Observe all applicable safety and accident prevention regulations.
- ▶ Check that all safety measures are observed at regular intervals.
- ▶ Pass on safety instructions to all other users.
- ▶ Do not expose body parts to the vacuum.
- ▶ Always ensure a secure connection to the earthed conductor (PE).
- ▶ Never disconnect plug connections during operation.
- ▶ Observe the above shutdown procedures.
- ▶ Keep lines and cables away from hot surfaces (> 70 °C).
- ▶ Do not carry out your own conversions or modifications on the device.
- ▶ Observe the unit protection degree prior to installation or operation in other environments.
- ▶ Provide suitable touch protection, if the surface temperature exceeds 70 °C.
- ▶ Inform yourself about any contamination before starting work.

**2.4 Proper use**

The gauge provides a vacuum measurement of gases within the range of  $5 \times 10^{-11}$  to  $1 \times 10^{-2}$  hPa.



**Use the product according to its intended purpose**

- ▶ Operate the gauge with a Pfeiffer Vacuum total pressure measuring and control unit or with an evaluation unit provided by the customer.
- ▶ Install, operate and maintain the gauge exclusively as prescribed in these operating instructions.
- ▶ Observe the application limits prescribed in the technical data.
- ▶ Observe the technical data.

**2.5 Foreseeable improper use**

Improper use of the product invalidates all warranty and liability claims. Any use that is counter to the purpose of the product, whether intentional or unintentional, is regarded as misuse, in particular:

- Use outside the mechanical and electrical application limits in accordance with the technical data
- Use with corrosive or explosive media, if this is not explicitly permitted
- Use outdoors
- Use after technical changes (on the inside or the outside of the product)
- Use with replacement or accessory parts that are unsuitable or are not approved

**2.6 Responsibilities and warranty**

Pfeiffer Vacuum shall assume no responsibilities and warranty if the operating company or a third party:

- disregards this document
- does not use the product for its intended purpose
- carries out any modifications to the product (conversions, changes, etc.) that are not listed in the corresponding product documentation
- operates the product with accessories that are not listed in the corresponding product documentation

The operator is responsible for the process media used.

**2.7 Owner requirements****Safety-conscious working**

1. Only operate the product in a technically flawless state.
2. Operate the product in line with its intended purpose, safety and hazard-conscious and only in compliance with these operating instructions.
3. Fulfill the following instructions and monitor the observation of the following instructions:
  - Proper use
  - Generally applicable safety instructions and accident prevention regulations
  - International, national and locally applicable standards and guidelines
  - Additional product-related guidelines and regulations
4. Only use original parts or parts approved by Pfeiffer Vacuum.
5. Keep the operating instructions available at the place of installation.
6. Ensure personnel qualification.

**2.8 Personnel qualification**

The work described in this document may only be carried out by persons who have appropriate professional qualifications and the necessary experience or who have completed the necessary training as provided by Pfeiffer Vacuum.

**Training people**

1. Train the technical personnel on the product.
2. Only let personnel to be trained work with and on the product when under the supervision of trained personnel.
3. Only allow trained technical personnel to work with the product.
4. Before starting work, make sure that the commissioned personnel have read and understood these operating instructions and all applicable documents, in particular the safety, maintenance and repair information.



## 2.8.1 Ensuring personnel qualification

### Specialist for mechanical work

Only a trained specialist may carry out mechanical work. Within the meaning of this document, specialists are people responsible for construction, mechanical installation, troubleshooting and maintenance of the product, and who have the following qualifications:

- Qualification in the mechanical field in accordance with nationally applicable regulations
- Knowledge of this documentation

### Specialist for electrotechnical work

Only a trained electrician may carry out electrical engineering work. Within the meaning of this document, electricians are people responsible for electrical installation, commissioning, troubleshooting, and maintenance of the product, and who have the following qualifications:

- Qualification in the electrical engineering field in accordance with nationally applicable regulations
- Knowledge of this documentation

In addition, these individuals must be familiar with applicable safety regulations and laws, as well as the other standards, guidelines, and laws referred to in this documentation. The above individuals must have an explicitly granted operational authorization to commission, program, configure, mark, and earth devices, systems, and circuits in accordance with safety technology standards.

### Trained individuals

Only adequately trained individuals may carry out all works in other transport, storage, operation and disposal fields. Such training must ensure that individuals are capable of carrying out the required activities and work steps safely and properly.

## 2.8.2 Personnel qualification for maintenance and repair



### Advanced training courses

Pfeiffer Vacuum offers advanced training courses to maintenance levels 2 and 3.

Adequately trained individuals are:

- **Maintenance level 1**
  - Customer (trained specialist)
- **Maintenance level 2**
  - Customer with technical education
  - Pfeiffer Vacuum service technician
- **Maintenance level 3**
  - Customer with Pfeiffer Vacuum service training
  - Pfeiffer Vacuum service technician

## 2.8.3 Advanced training with Pfeiffer Vacuum

For optimal and trouble-free use of this product, Pfeiffer Vacuum offers a comprehensive range of courses and technical trainings.

For more information, please contact [Pfeiffer Vacuum technical training](#).

## 2.9 Operator requirements

### Observing relevant documents and data

1. Read, observe and follow this operating instruction and the work instructions prepared by the operating company, in particular the safety and warning instructions.
2. Install, operate and maintain the product only in accordance with these operating instructions.
3. Carry out all work only on the basis of the complete operating instructions and applicable documents.
4. Comply with the application limits.
5. Observe the technical data.
6. Please contact the Pfeiffer Vacuum Service Center if your questions on operation or maintenance of the product are not answered by these operating instructions.
  - You can find information in the [Pfeiffer Vacuum service area](#).



## 3 Product description

### 3.1 Function

#### **⚠ WARNING**

##### **Danger from magnetic fields**

The product has a magnetic field that disturbs or impairs the function of electronic devices (e.g. pacemakers).

- ▶ Maintain the distances specified by the manufacturer of the pacemakers.
  - Pfeiffer Vacuum recommends a safety distance of **at least 130 mm** between the pacemaker and the product.
- ▶ Avoid the influence of strong magnetic fields by means of magnetic field shielding.

The gauge has a cold cathode measuring system functioning to the principle of the inverted magnetron. The measuring signal is logarithmically dependent on the pressure across the entire measuring range.

### 3.2 Status display

The LED on the top of the gauge indicates the operating status of the gauge.



Fig. 1: Light emitting diode

- 1 Green LED

LED	Operation status
lights up	Supply voltage available
Off	No supply voltage available

Tbl. 4: Operation status

### 3.3 Identifying the product

You will need all the data from the rating plate to safely identify the product when communicating with Pfeiffer Vacuum.

1. Read the data on the product rating plate.
2. Record this data.
3. Always have all rating plate specifications to hand.

### 3.4 Scope of delivery

The scope of delivery includes the following parts:

- Gauge
- Brief instructions

### **Unpacking the product and checking completeness of the shipment**

1. Unpack the product.
2. Remove the transport fasteners, transport protection etc.
3. Store the transport fasteners, transport protection etc. in a safe place.
4. Check that the shipment is complete.
5. Ensure that no parts are damaged.



## 4 Transport and storage

### 4.1 Transporting the product

#### NOTICE

##### Damage caused by incorrect transportation

Transportation in unsuitable packaging, or failure to install all transport locks, can damage the product.

- ▶ Comply with the instructions for safe transportation.



##### Packing

We recommend keeping the transport packaging and original protective cover.

##### General information regarding safe transport

- ▶ Observe the weight specified on the transport packaging.
- ▶ Where possible, always transport or ship the product in the original transport packaging.
- ▶ Always use dense and impact-proof transport packaging for the product.
- ▶ Remove the existing protective cover and transport protections only immediately prior to installation.
- ▶ Reattach transport locks and transport protections prior to each transport.

### 4.2 Storing the product

#### NOTICE

##### Damage caused by improper storage

Improper storage will lead to damage to the product.

Static charging, moisture, etc. lead to defects on the electronic components.

- ▶ Comply with the instructions for safe storage.



##### Packing

We recommend storing the product in its original packaging.

##### General information for safe storage

- ▶ Store the product in a cool, dry, dust-free place, where it is protected against impacts and mechanical vibration.
- ▶ Always use dense and impact-proof packaging for the product.
- ▶ Where possible, store the product in its original packaging.
- ▶ Store electronic components in antistatic packaging.
- ▶ Maintain the permissible storage temperature.
- ▶ Avoid extreme fluctuations of the ambient temperature.
- ▶ Avoid high air humidity.
- ▶ Seal connections with the original protective caps.
- ▶ Protect the product with the original transport protection (where available).



## 5 Installation

### 5.1 Establishing the vacuum connection

#### **⚠ DANGER**

##### **Risk to life due to electric shock**

An improperly earthed product is potentially fatal in the event of a fault.

- ▶ Connect the product galvanically with the earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective bonding according to EN 61010. (CF and VCR connections comply with this requirement.)
- ▶ Use electrically conductive centering rings and circlips for KF connections.

#### **⚠ DANGER**

##### **Risk to life due to electric shock**

If no earth connection is established, voltage flows become hazardous to the touch and could lead to electronic components sustaining damage.

- ▶ Always tighten the electronic unit with the grub screw.
- ▶ Ensure that the grub screw of the electronic unit has been tightened correctly.

#### **NOTICE**

##### **Impairment from contamination and damage**

Touching the devices or components with bare hands increases the desorption rate and leads to incorrect measurements. Dirt (e.g. dust, fingerprints, etc.) and damage impair the function.

- ▶ When working on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ▶ Only use clean tools.
- ▶ Make sure that the connection flanges are free of grease.
- ▶ Remove protective caps and protective covers from flanges and connections only when necessary.
- ▶ Carry out all work in a well lit area.

#### **NOTICE**

##### **Electric flashover from helium**

Helium can cause electric flashovers in the unit's electronics which will destroy the electronics.

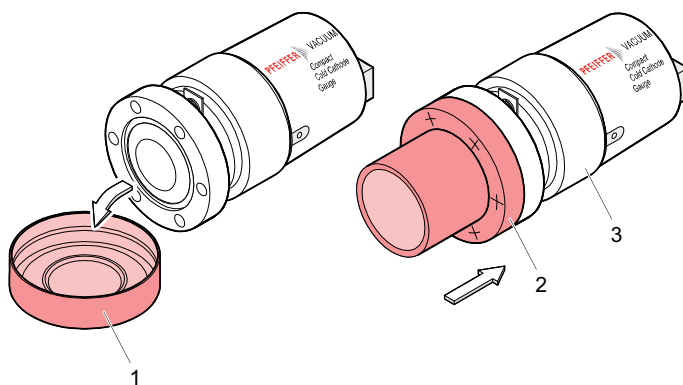
- ▶ Switch off the unit before carrying out a leak test.
- ▶ Remove the electronic unit before carrying out a leak test.

#### **Prerequisites**

- Appropriate ambient conditions
- Operating temperature within permissible range
- Adequate room available for electrical connection (e.g. permissible bending radii for cables)







**Fig. 2: Establishing the vacuum connection**

- |                        |                 |
|------------------------|-----------------|
| 1 Protective cap       | 3 Magnetic unit |
| 2 CF flange connection |                 |

### Procedure

1. Ensure where possible that the gauge is not exposed to any vibrations during operation, as vibrations in general will lead to deviations in the measured values.
2. Recommendation: Assemble the gauge in a horizontal to upright position (flange at the bottom) in order to prevent any condensate or particles entering the measuring chamber.
3. Recommendation: Remove the magnetic unit of the gauge temporarily wherever installation is only possible with the magnetic unit removed.
  - This will facilitate assembly of the CF flange connection.
4. Remove the protective cap and store in a safe place.
5. Assemble the gauge with vacuum components from the [Pfeiffer Vacuum Components Shop](#) on the vacuum system.
6. If you previously removed the magnetic unit of the gauge, assemble the magnetic unit again.

## 5.2 Magnetic unit

### NOTICE

#### Impairment from contamination and damage

Touching the devices or components with bare hands increases the desorption rate and leads to incorrect measurements. Dirt (e.g. dust, fingerprints, etc.) and damage impair the function.

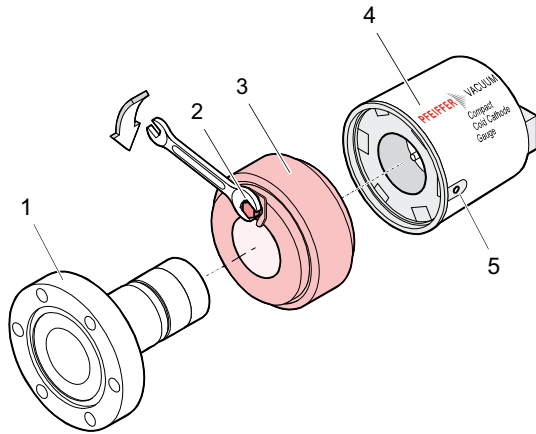
- ▶ When working on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ▶ Only use clean tools.
- ▶ Make sure that the connection flanges are free of grease.
- ▶ Remove protective caps and protective covers from flanges and connections only when necessary.
- ▶ Carry out all work in a well lit area.

Removal of the magnetic unit should facilitate fitting of the gauge.

#### Required tools

- Allen key, **WAF 1.5**
- Open-end wrench, **WAF 7**





**Fig. 3: Magnetic unit**

- |                       |                   |
|-----------------------|-------------------|
| 1 Measurement chamber | 4 Electronic unit |
| 2 Hexagon head screw  | 5 Grub screw      |
| 3 Magnetic unit       |                   |

**Removing the magnetic unit**

1. Loosen the grub screw on the side of the electronic unit.
2. Remove the electronic unit without exerting any rotary movement.
3. Loosen the hexagon head screw on the magnetic unit.
4. Remove the magnetic unit.
  - Separation of the magnetic unit and measurement chamber is made more difficult due to the effect of magnetic force and the tendency for them to tilt easily.

**Installing the magnetic unit**



**Electronic unit**

Due to the tolerances, you must fit the same electronic unit when re-assembling.

1. Fit the magnetic unit.
  - Fitting of the magnetic unit is made more difficult due to the effect of magnetic force and the tendency for it to tilt easily.
2. Fasten the hexagon head screw on the magnetic unit.
3. Carefully fit the electronic unit.
4. Push the electronic unit as far as the stop.
5. Secure the grub screw on the side of the electronic unit.

**5.3 Establishing the electric connection**

**⚠ DANGER**

**Danger to life due to dangerous contact voltage**

Voltages above 30 V (AC) or 60 V (DC) are considered dangerous in accordance with EN 61010. If you come into contact with dangerous contact voltage, this can result in injury through electric shocks or even death.

- ▶ Only connect the product to devices which meet the following criteria:
  - Requirements of the earthed protective extra-low voltage (PELV)
  - Limited power source (LPS) Class 2
- ▶ Secure the line to the product.
  - Pfeiffer Vacuum measuring and control equipment complies with this requirement.



**NOTICE****Damage sustained as a result of improper connection**

Improper connection, incorrect polarity or impermissible supply voltage will damage the gauge.

- ▶ Always connect the supply earth (Pin 5) with the earth for the supply unit.
- ▶ Always connect the shielding (Pin 6) with the earth for the supply unit.

**Required tools**

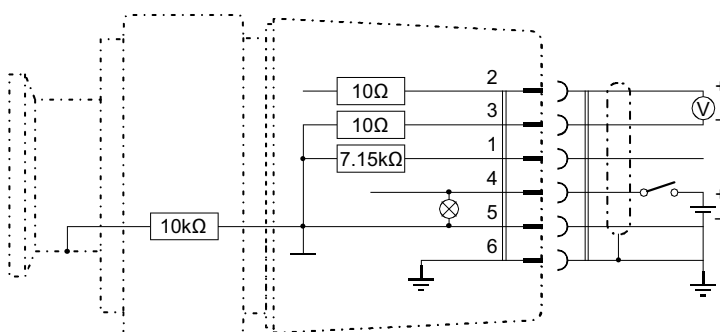
- Crosshead screwdriver
- Torque wrench ( $\leq 0.2$  Nm)

**Required materials**

- Measurement cable for a Pfeiffer vacuum total pressure measuring and control unit from the [ActiveLine accessories range](#)
- Self-fabricated measurement cable for an evaluation unit provided by the customer
- Hirschmann cable socket

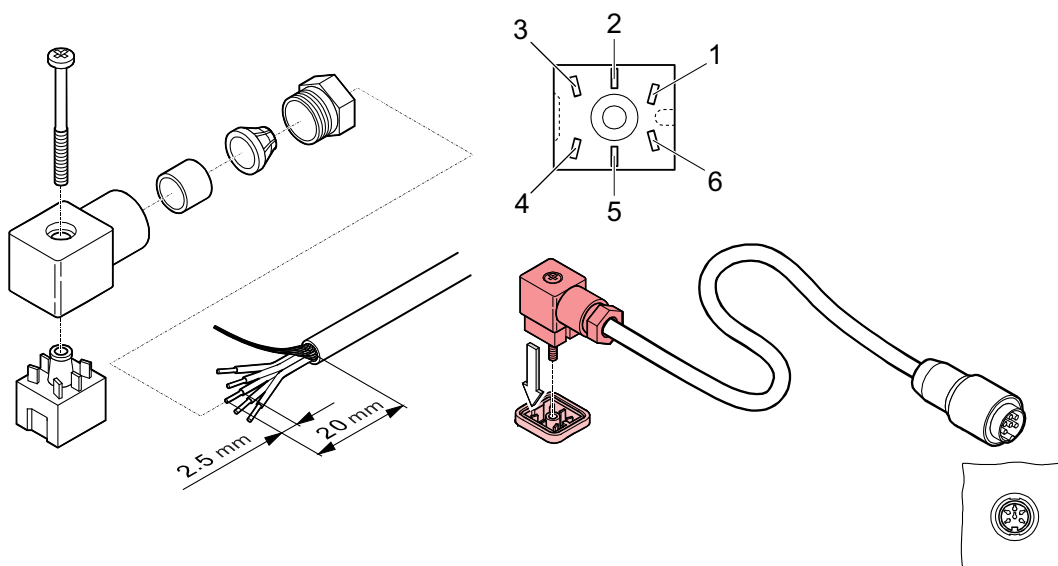
**Establishing the electric connection**

1. Connect the measurement cable to the gauge.
2. Tighten the locking screw on the Hirschmann cable socket.
  - Tightening torque:  $\leq 0.2$  Nm
3. Connect the gauge to a Pfeiffer Vacuum total pressure measuring and control unit, or to an evaluation unit provided by the customer.



**Fig. 4: Connection diagram**

- |                    |                      |
|--------------------|----------------------|
| 1 Identification   | 4 Supply             |
| 2 Measuring signal | 5 Supply earth (GND) |
| 3 Signal earth     | 6 Shielding          |



**Fig. 5: Measurement cable and Hirschmann cable socket**



### **Manufacturing a measurement cable**

You can find additional information regarding measurement cable type and conductor cross-sections in the technical data.

1. Observe the following steps to ensure optimum signal quality, whereby ground loops, differences in potential or EMC will influence the measuring signal.
2. Use a cable with braided shield.
3. Connect the supply earth directly with the protective earth for power supply pack.
4. Use a differential measuring input and separate signal earth and supply earth.
5. Ensure that the potential difference for surge protection between supply earth and housing is  $\leq 6 \text{ V}$ .
6. Assemble the Hirschmann cable socket.

### **Assembling the Hirschmann cable socket**

1. Prepare the Hirschmann cable socket as shown in the "Measurement cable and Hirschmann cable socket" diagram.
2. Solder in the connection cable as prescribed in the terminal connection diagram.
3. Assemble the Hirschmann cable socket.



## 6 Operation

Once the supply voltage has been established, the measuring signal is available at the electrical connection between pins 2 and 3.



### Controlling the IKR gauge with a Pirani gauge

For Pfeiffer Vacuum total pressure measuring and control units with at least 2 gauge connections, the IKR gauge can be controlled with a Pirani gauge, for example.

#### Recommendations

- ▶ Respect the relation between measuring signal and pressure.
- ▶ Only switch the gauge on at pressures  $< 10^{-2}$  hPa to avoid excessive contamination.

### 6.1 Converting measuring signal and pressure

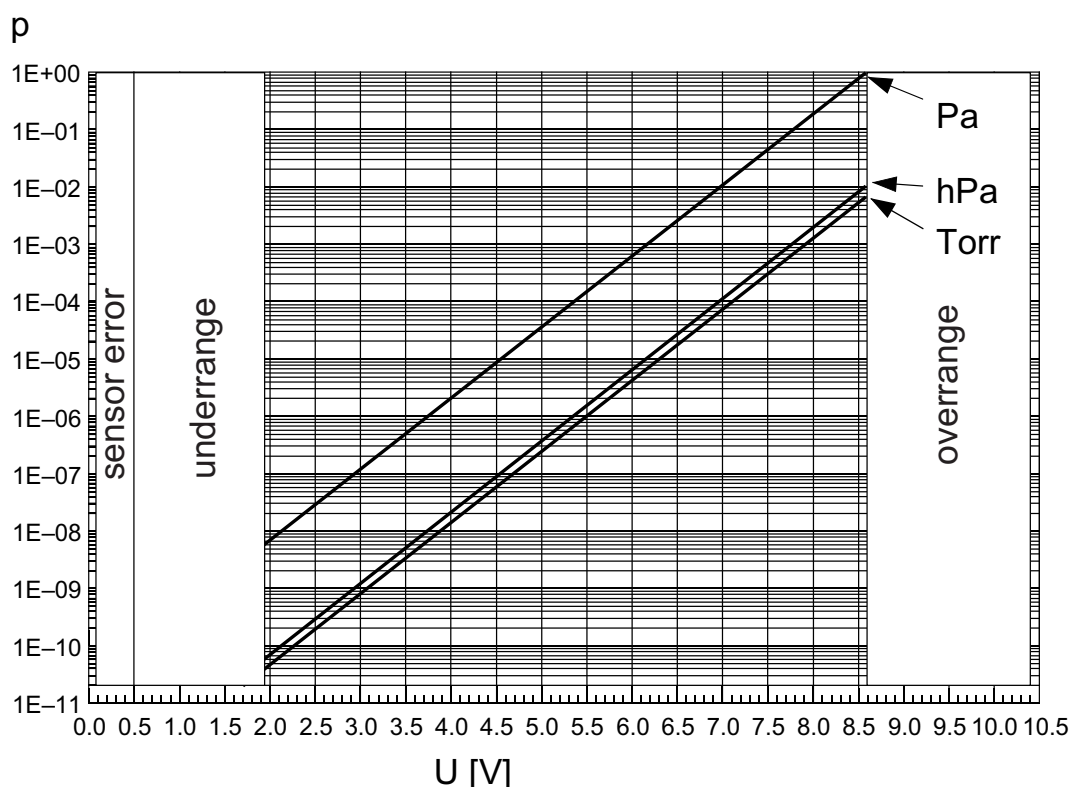


Fig. 6: Relation between measuring signal and pressure

p Pressure      U Measuring signal [V] (output voltage)

Measuring signal (U)	Pressure (p)	Constant (c) <sup>1)</sup>	Constant (d) <sup>2)</sup>
[V]	[hPa]	10.2	12.75
	[mbar]		
	[Torr]	10.3	12.875
	[micron]	7.9	9.875
	[Pa]	8.6	10.75

Tbl. 5: Constants for converting measuring signal and pressure

1) Dependent upon unit of pressure

2) Dependent upon unit of pressure



Measuring signal (U)	Pressure (p)		
	[hPa]	[Torr]	[Pa]
< 0.5	Sensor error		
0.5 – 1.96	Underrange		
1.96	$5.0 \times 10^{-11}$	$3.75 \times 10^{-11}$	$5.0 \times 10^{-9}$
2.2	$1.0 \times 10^{-10}$	$7.5 \times 10^{-11}$	$1.0 \times 10^{-8}$
3.0	$1.0 \times 10^{-9}$	$7.5 \times 10^{-10}$	$1.0 \times 10^{-7}$
3.8	$1.0 \times 10^{-8}$	$7.5 \times 10^{-9}$	$1.0 \times 10^{-6}$
4.6	$1.0 \times 10^{-7}$	$7.5 \times 10^{-8}$	$1.0 \times 10^{-5}$
5.4	$1.0 \times 10^{-6}$	$7.5 \times 10^{-7}$	$1.0 \times 10^{-4}$
6.2	$1.0 \times 10^{-5}$	$7.5 \times 10^{-6}$	$1.0 \times 10^{-3}$
7.0	$1.0 \times 10^{-4}$	$7.5 \times 10^{-5}$	$1.0 \times 10^{-2}$
7.8	$1.0 \times 10^{-3}$	$7.5 \times 10^{-4}$	0.1
8.6	$1.0 \times 10^{-2}$	$7.5 \times 10^{-3}$	1.0
8.6 – 10.5	Overrange		

**Tbl. 6: Conversion table**

**Converting measuring signal and pressure**

**Validity range**

- $1 \times 10^{-11}$  hPa < p <  $1 \times 10^{-2}$  hPa
  - $7.5 \times 10^{-12}$  Torr < p <  $7.5 \times 10^{-3}$  Torr
  - $1 \times 10^{-9}$  Pa < p < 1 Pa
- ▶ Observe the constants for converting measuring signal and pressure.
  - ▶ Convert measuring signal into pressure:  

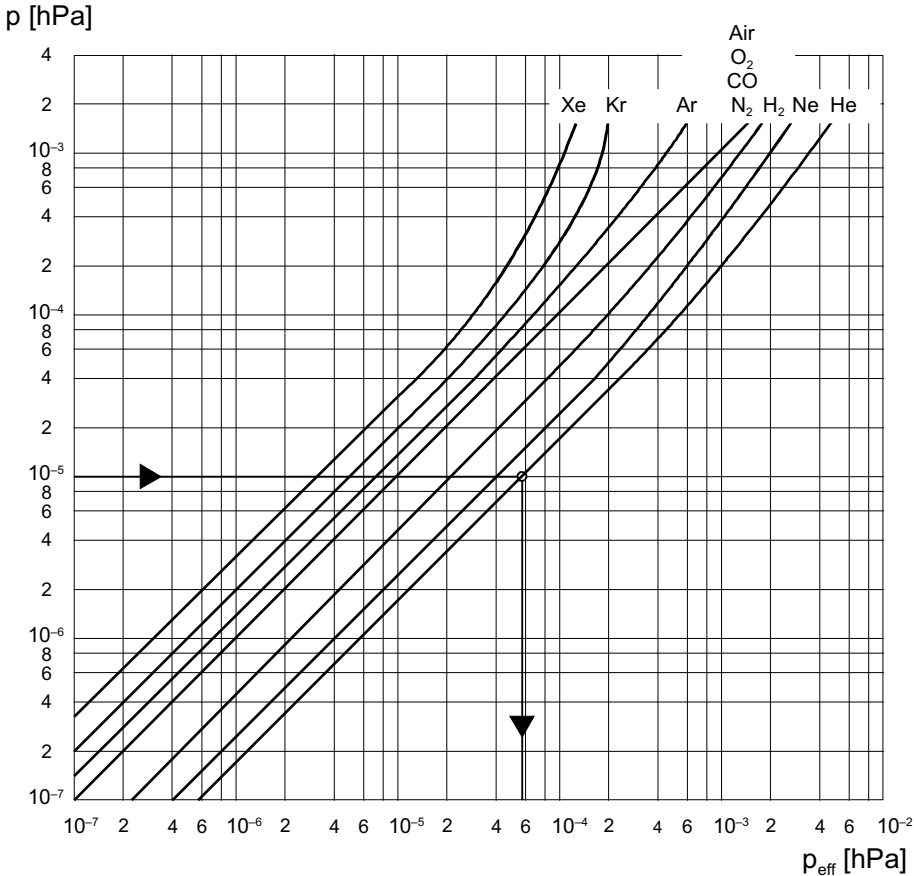
$$p = 10^{1.25 \times U - d}$$
  - ▶ Convert pressure into measuring signal:  

$$U = c + 0.8 \times \log_{10} p$$

## 6.2 Ascertaining effective pressure with calibration factors

The measuring signal is gas type dependent. The characteristics apply for nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>), dry air and carbon monoxide (CO).





**Fig. 7: Displayed pressure**

In the pressure range <math> < 10^{-5}</math> hPa, the display is linear.

i

**Gas and vapor mixtures**

Process gases are mostly mixtures of gas and vapor. Precise measuring of gas and vapor mixtures is only possible using partial pressure measurement instruments, for example a quadrupole mass spectrometer.

Gas type	Calibration factor (C)
Air, oxygen (O <sub>2</sub> ), carbon monoxide (CO), nitrogen (N <sub>2</sub> )	1.0
Hydrogen (H <sub>2</sub> )	2.4
Helium (He)	5.9
Neon (Ne)	4.1
Argon (Ar)	0.8
Krypton (Kr)	0.5
Xenon (Xe)	0.4

The calibration factors provided are mean values.

**Tbl. 7: Calibration factors for the pressure range <math> < 10^{-5}</math> hPa**

**Entering the calibration factor in a total pressure measuring and control unit**

- ▶ Enter the calibration factor to correct the displayed measured value.

**Calculating pressure for gases other than air**

► Calculate the effective pressure using the following formula:

$$P_{\text{eff}} = C \times p$$

- $P_{\text{eff}}$  = Effective pressure
- $C$  = Calibration factor
- $p$  = Displayed pressure (gauge calibrated for air)

**6.3 Ignition delay**

Cold cathode measuring systems have an ignition delay upon activation. This ignition delay is longer for lower pressures and is typically in clean, degassed units:

- $10^{-7}$  hPa approx. 6 seconds
- $10^{-8}$  hPa approx. 1 minute
- $10^{-9}$  hPa approx. 5 minutes
- $10^{-10}$  hPa approx. 20 minutes
- $5 \times 10^{-11}$  hPa approx. 30 minutes

The ignition is a static process, for which even minimal depositions can have a major influence on the inner surfaces.

**6.4 Pollution**



**Warranty**

Malfunctioning of the equipment as a direct result of contamination or wear, as well as wear parts (e.g. ignition aid) is not covered by the warranty.

Contamination of the gauge is dependent upon

- pressure in the vacuum chambers
- the type of process media
- potentially existing or newly accumulated contamination or its partial pressure (e.g. vapors, process particles etc.)
- the operating time

Continuous operation in the range between  $10^{-4}$  hPa and  $10^{-2}$  hPa can lead to major contamination, and thus to reduced service life and shorter maintenance intervals. With permanent low pressures ( $p < 1 \times 10^{-6}$  hPa), downtimes of > 1 year are achievable before cleaning is required again.

Contamination of the gauge generally leads to deviations in the measured values:

- In the **low pressure range** ( $< 1 \times 10^{-3}$  hPa), the pressure displayed is generally too low (contamination of the cold cathode system). Excessive contamination will cause instabilities (separation of layers in the measurement chamber). This can lead to short circuiting. Complete quenching of the gas discharge is also possible in the event of contamination resulting from insulating layers.

**Influencing the degree of contamination**

It is possible to influence the level of contamination to a certain extent. Particular care should be afforded for vapors which are separated in the plasma (e.g. from the cold cathode measuring system).

- Implement geometric safety measures (screening sheets, bends) for particles propagated in a straight line.
- Choose a flange position in which the partial pressure of the contamination is at a minimum.
- Switch off the gauge when there is an absence of separating vapors.

or

Seal off the gauge by means of a valve when there is an absence of separating vapors.





## 7 Disassembly

### **⚠ DANGER**

#### **Risk to life due to electric shock**

An improperly earthed product is potentially fatal in the event of a fault.

- ▶ Connect the product galvanically with the earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective bonding according to EN 61010. (CF and VCR connections comply with this requirement.)
- ▶ Use electrically conductive centering rings and circlips for KF connections.

### **⚠ WARNING**

#### **Health hazard through poisoning from toxic contaminated components or devices**

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.

### **⚠ WARNING**

#### **Risk of injury resulting from overpressure in the vacuum system**

Opening tensioning pieces with an overpressure  $> 1000 \text{ hPa}$  in the vacuum system can lead to injuries as a result of flying parts, and escaping process medium could prove harmful to health.

Elastomer seals in KF connections (e.g. O-rings) are not resistant to pressures  $> 2500 \text{ hPa}$ . This could prove harmful to health due to escaping process medium.

- ▶ Do not open any tensioning pieces when overpressure is prevalent in the vacuum system.
- ▶ Use suitable tensioning pieces for overpressure.
- ▶ Use tensioning pieces which can only be opened and closed using a tool (e.g. tightening strap-circlip).
- ▶ Use sealing rings with an outer centering ring.

### **NOTICE**

#### **Impairment from contamination and damage**

Touching the devices or components with bare hands increases the desorption rate and leads to incorrect measurements. Dirt (e.g. dust, fingerprints, etc.) and damage impair the function.

- ▶ When working on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ▶ Only use clean tools.
- ▶ Make sure that the connection flanges are free of grease.
- ▶ Remove protective caps and protective covers from flanges and connections only when necessary.
- ▶ Carry out all work in a well lit area.

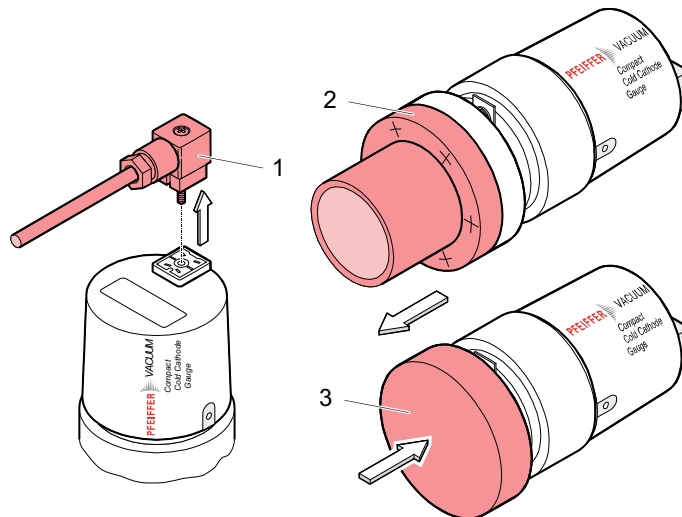
#### **Prerequisites**

- Vacuum system vented to atmospheric pressure
- Supply voltage switched off

#### **Required tool**

- Crosshead screwdriver





**Fig. 8: Disassembling the gauge**

- 1 Measurement cable
- 2 CF flange connection
- 3 Protective cap

**Disassembling the gauge**

1. Loosen the locking screw of the Hirschmann cable socket on the gauge.
2. Disconnect the measurement cable from the gauge.
3. Recommendation: Dismantle the magnetic unit of the gauge temporarily if disassembly is only possible with the magnetic unit removed.
  - This will facilitate disassembling of the CF flange connection.
4. Disassemble the gauge from the vacuum system.
5. Fit the protective cap onto the connection flange.



## 8 Maintenance



### Maintenance in the Pfeiffer Vacuum Service Center

Pfeiffer Vacuum offers a complete maintenance service for all products.

Pfeiffer Vacuum recommends: Contact your Pfeiffer Vacuum Service Center to arrange the maintenance of defective products and components.



### Cleaning in the Pfeiffer Vacuum Service Center

Pfeiffer Vacuum recommends: Contact your nearest Pfeiffer Vacuum Service Center to arrange the cleaning of heavily-soiled products and components.



### Loss of warranty claims

The following will result in the loss of the warranty:

- Damage to or removal of a closure seal
- Opening the device during the warranty period

Contact the Pfeiffer Vacuum Service Center in the event of process-related shorter maintenance intervals.



### First read through the sections completely

Read the section with the work instructions through completely first before you commence with work.

### 8.1 Maintaining the gauge

Pfeiffer Vacuum has calibrated the gauge to standard values at the factory. The gauge is maintenance-free.

#### Replacing a faulty gauge

- ▶ If the gauge is defective, you must replace the entire gauge.

### 8.2 Disassembling the gauge

#### NOTICE

#### Impairment from contamination and damage

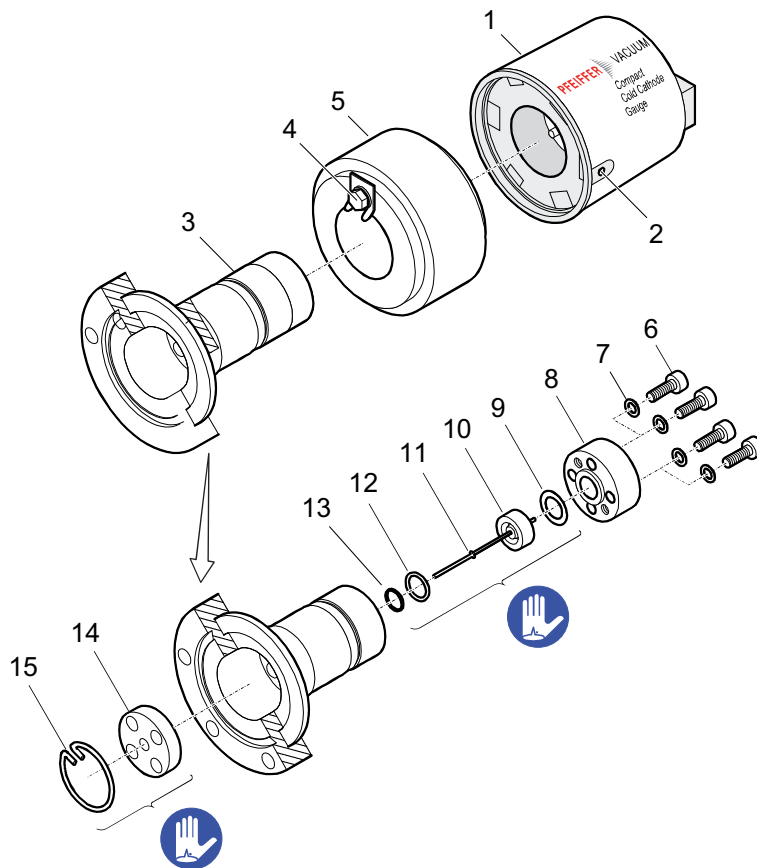
Touching the devices or components with bare hands increases the desorption rate and leads to incorrect measurements. Dirt (e.g. dust, fingerprints, etc.) and damage impair the function.

- ▶ When working on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ▶ Only use clean tools.
- ▶ Make sure that the connection flanges are free of grease.
- ▶ Remove protective caps and protective covers from flanges and connections only when necessary.
- ▶ Carry out all work in a well lit area.

#### Required tools

- Allen key, **WAF 1.5**
- Allen key, **WAF 3**
- Open-end wrench, **WAF 7**
- Pincers for circlip
- Tweezers





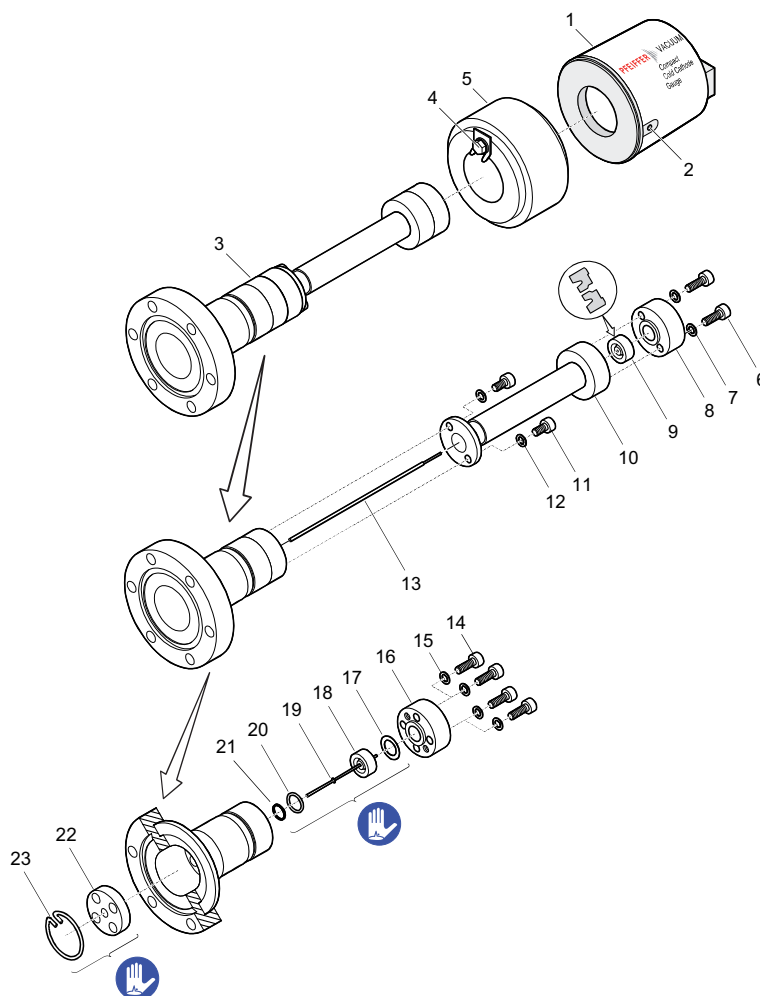
**Fig. 9: Individual parts (short version)**

- |                                      |                                 |
|--------------------------------------|---------------------------------|
| 1 Electronic unit                    | 9 Washer                        |
| 2 Grub screw                         | 10 Anode                        |
| 3 Measurement chamber                | 11 Ignition aid                 |
| 4 Hexagon head set screw             | 12 Centering ring               |
| 5 Magnetic unit                      | 13 Metal seal (anode extension) |
| 6 Interior hexagon socket screw (4×) | 14 Polarity insert              |
| 7 Lock washer (4×)                   | 15 Circlip                      |
| 8 Compression piece                  |                                 |

**Disassembling the gauge (short version)**

1. Disassemble the gauge from the vacuum system.
2. Loosen the grub screw on the side of the electronic unit.
3. Remove the electronic unit without exerting any rotary movement.
  - The hood of the electronic unit cannot be removed.
4. Loosen the hexagon head set screw on the magnetic unit.
5. Remove the magnetic unit.
  - Separation of the magnetic unit and measurement chamber is made more difficult due to the effect of magnetic force and the tendency for them to tilt easily.
6. Remove the circlip and the polarity insert from the measurement chamber.
7. Remove the interior hexagon socket screws and the lock washers from the rear of the measurement chamber.
8. Remove one after the other taking due care
  - Compression piece
  - Washer
  - Complete anode
  - Metal seal together with centering ring





**Fig. 10: Individual parts (long version)**

1	Electronic unit	13	Anode extension
2	Grub screw	14	Interior hexagon socket screw (4x)
3	Measurement chamber	15	Lock washer (4x)
4	Hexagon head set screw	16	Compression piece
5	Magnetic unit	17	Washer
6	Interior hexagon socket screw (extension) (2x)	18	Anode
7	Lock washer (extension) (2x)	19	Ignition aid
8	Compression piece (extension)	20	Centering ring
9	Insulator	21	Metal seal (anode extension)
10	Tube	22	Polarity insert
11	Interior hexagon socket screw (tube) (2x)	23	Circlip
12	Lock washer (tube) (2x)		

#### Disassembling the gauge (long version)

1. Disassemble the gauge from the vacuum system.
2. Loosen the grub screw on the side of the electronic unit.
3. Remove the electronic unit without exerting any rotary movement.
  - The hood of the electronic unit cannot be removed.
4. Loosen the hexagon head set screw on the magnetic unit.
5. Remove the magnetic unit.
  - Separation of the magnetic unit and measurement chamber is made more difficult due to the effect of magnetic force and the tendency for them to tilt easily.
6. Remove the circlip and the polarity insert from the measurement chamber.
7. Remove the interior hexagon socket screws and the lock washers on the extension.
8. Remove one after the other taking due care
  - Compression piece
  - Insulator
  - Anode extension
9. Remove the interior hexagon socket screws, the lock washers and the tube.



10. Remove the interior hexagon socket screws and the lock washers from the rear of the measurement chamber.
11. Remove one after the other taking due care
  - Compression piece
  - Washer
  - Complete anode
  - Metal seal together with centering ring

### 8.3 Cleaning of components

**⚠ DANGER**

**Electric shocks due to moisture penetrating into the device**

Moisture that has penetrated into the device results in personal injury through electric shocks.

- ▶ Only operate the device in a dry environment.
- ▶ Operate the device away from fluids and humidity sources.
- ▶ Do not switch on the device if fluid has penetrated into it, instead contact Pfeiffer Vacuum Service.
- ▶ Always disconnect the current supply before cleaning the device.

**⚠ WARNING**

**Health hazards due to cleaning agent**

The cleaning agent being used causes health hazards which could include, for example, poisoning, allergies, skin irritations, chemical burns or damage to the airways.

- ▶ When handling cleaning agents, observe the applicable regulations.
- ▶ Adhere to safety measures regarding handling and disposal of cleaning agents.
- ▶ Be aware of potential reactions with product materials.

**NOTICE**

**Damage caused by penetrating moisture**

Penetrating moisture, e.g. through condensation or dripping water, damages the device.

- ▶ Protect the device against moisture penetrating.
- ▶ Only operate the device in a clean and dry environment.
- ▶ Operate the device away from fluids and humidity sources.
- ▶ Take special precautions if there is a risk of dripping water.
- ▶ Do not switch on the device if fluid has penetrated into it, instead contact the Pfeiffer Vacuum Service Center.

**NOTICE**

**Damage caused by unsuitable cleaning agents**

Unsuitable cleaning agents damage the product.

- ▶ Do not use solvents as they attack the surface.
- ▶ Do not use any aggressive or abrasive cleaning agents.

**Required tool**

- Tweezers

**Required consumable material**

- Polishing cloth (400 grade or Scotch-Brite)
- Industrial alcohol
- Cloth (clean, soft, lint-free)

**External cleaning of the device**

1. Always use a cloth soaked in industrial alcohol for external cleaning.
2. Allow the surfaces to dry thoroughly after cleaning.



**Cleaning the measurement chamber and polarity insert**

1. Disassemble the gauge to the degree required.
2. Ensure that all work on the sealing surfaces is performed concentrically.
3. Rub the inside walls of the measurement chamber and polarity insert with the polishing cloth until shiny.
4. Rinse the measurement chamber and polarity insert with industrial alcohol.
5. Allow parts to dry well.
6. Re-assemble the gauge.

**Cleaning the anode**

1. Dismantle the gauge to the degree required.
2. Remove the old ignition aid with tweezers.
3. Rub the anode pin with a polishing cloth until shiny, taking care not to bend the anode.
  - Do not treat the ceramic with mechanical means.
4. Rinse the anode with industrial alcohol.
5. Allow the anode to dry well.
6. Replace the ignition aid.

## 8.4 Assembling the gauge

**⚠ DANGER****Risk to life due to electric shock**

If no earth connection is established, voltage flows become hazardous to the touch and could lead to electronic components sustaining damage.

- ▶ Always tighten the electronic unit with the grub screw.
- ▶ Ensure that the grub screw of the electronic unit has been tightened correctly.

**NOTICE****Impairment from contamination and damage**

Touching the devices or components with bare hands increases the desorption rate and leads to incorrect measurements. Dirt (e.g. dust, fingerprints, etc.) and damage impair the function.

- ▶ When working on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ▶ Only use clean tools.
- ▶ Make sure that the connection flanges are free of grease.
- ▶ Remove protective caps and protective covers from flanges and connections only when necessary.
- ▶ Carry out all work in a well lit area.

**NOTICE****Electric flashover from helium**

Helium can cause electric flashovers in the unit's electronics which will destroy the electronics.

- ▶ Switch off the unit before carrying out a leak test.
- ▶ Remove the electronic unit before carrying out a leak test.

**Positioning the anode**

Definitive positioning of the anode is only achieved following installation of the anode.

**Electronic unit**

Due to the tolerances, you must fit the same electronic unit when re-assembling.

**Required tools**

- Allen key, **WAF 1.5**
- Allen key, **WAF 3.0**
- Open-end wrench, **WAF 7**
- Pincers for circlip



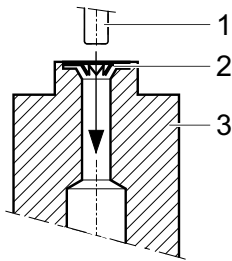
- Mounting tool for the ignition aid
- Tweezers

**Spare parts required**

- Repair kit BN 846 240 -T

**Required consumable material**

- Dry nitrogen for blowing out



**Fig. 11: Mounting tool for the ignition aid**

- |                |                 |
|----------------|-----------------|
| 1 Anode        | 3 Mounting tool |
| 2 Ignition aid |                 |

**Replacing the ignition aid**

1. Insert the new ignition aid in the mounting tool.
2. Carefully push the anode (either new or cleaned) into the ignition aid, in the center, and parallel to the tool axis.
3. Insert the anode approx. 15 mm.

**Assembling the gauge (short version)**

1. Ensure that sealing surfaces, seals and the ceramic (anode) are clean.
2. Insert the metal seal (anode bushing) with the centering ring so that it is centric in the measurement chamber.
3. Carefully insert the anode together with the ignition aid into the measurement chamber.
4. Carefully fit the compression piece and the washer onto the measurement chamber and tighten the interior hexagon socket screws and the lock washers evenly up to the stop.
5. Push the measurement chamber with anode carefully into the mounting tool, in the center and parallel to the tool axis, up to the stop.
  - By doing so, you are positioning the ignition aid.
6. Hold the measurement chamber with flange facing downward and blow out the particles in the measurement chamber with dry nitrogen.
7. Push the polarity insert into the measurement chamber up to the mechanical stop.
8. Insert the circlip correctly in the polarity insert.
9. Carry out a visual inspection to ensure that the anode pin is central to the middle borehole of the polarity insert.
  - Max. permissible eccentricity = 0.5 mm
10. Perform a leak test where possible.
  - Leakage rate <math> < 10^{-9}</math> hPa l/s
11. Fit the magnetic unit.
  - Fitting of the magnetic unit is made more difficult due to the effect of magnetic force and the tendency for it to tilt easily.
12. Fasten the hexagon head set screw on the magnetic unit.
13. Carefully fit the electronic unit.
14. Push the electronic unit as far as the stop.
15. Secure the grub screw on the side of the electronic unit.

**Assembling the gauge (long version)**

1. Ensure that sealing surfaces, seals and the ceramic (anode) are clean.
2. Insert the metal seal (anode bushing) with the centering ring so that it is centric in the measurement chamber.
3. Carefully insert the anode together with the ignition aid into the measurement chamber.
4. Carefully fit the compression piece and the washer onto the measurement chamber and tighten the interior hexagon socket screws and the lock washers evenly up to the stop.





5. Push the measurement chamber with anode carefully into the mounting tool, in the center and parallel to the tool axis, up to the stop.
  - By doing so, you are positioning the ignition aid.
6. Hold the measurement chamber with flange facing downward and blow out the particles in the measurement chamber with dry nitrogen.
7. Push the polarity insert into the measurement chamber up to the mechanical stop.
8. Insert the circlip correctly in the polarity insert.
9. Carry out a visual inspection to ensure that the anode pin is central to the middle borehole of the polarity insert.
  - Max. permissible eccentricity = 0.5 mm
10. Perform a leak test where possible.
  - Leakage rate <  $10^{-9}$  hPa l/s
11. Place the complete measurement chamber on the work surface with the flange facing downwards.
12. Fit the extension carefully on the anode pin.
13. Carefully slide on the tube.
14. Tighten the interior hexagon socket screws and lock washers evenly.
15. Ensure that the interior of the tube and the interior of the isolator are completely clean and lint-free.
16. Feed the isolator onto the extension as shown in the drawing.
17. Tighten the compression piece evenly with the interior hexagon socket screws and the lock washers.
18. Fit the magnetic unit.
  - Fitting of the magnetic unit is made more difficult due to the effect of magnetic force and the tendency for it to tilt easily.
19. Fasten the hexagon head set screw on the magnetic unit.
20. Carefully fit the electronic unit.
21. Push the electronic unit as far as the stop.
22. Secure the grub screw on the side of the electronic unit.



## 9 Malfunctions



### Warranty

Malfunctioning of the equipment as a direct result of contamination or wear, as well as wear parts (e.g. ignition aid) is not covered by the warranty.

Disturbance	Possible cause	Remedy
Continuous measuring signal < 0.5 V and green LED not lit	No supply	Switch the supply on.
Continuous measuring signal < 0.5 V and green LED lit	Supply voltage too low	Increase the supply voltage.
	Electronic unit defective	Replace the electronic unit.
Continuous measuring signal within the range 0.5 to 1.96 V (underrange)	Pressure in vacuum chamber < $5 \times 10^{-11}$ hPa	-
	Gas discharge has not ignited.	Wait until the gas discharge ignites (approx. 20 minutes with a pressure of $10^{-10}$ hPa).
Measuring signal unstable	Gauge contaminated	Clean the gauge.

Tbl. 8: Malfunctions



## 10 Shipping

### **WARNING**

#### **Risk of poisoning from contaminated products**

Where products that contain harmful substances are shipped for maintenance or repair purposes, the health and safety of service personnel is at risk.

- ▶ Comply with the instructions for safe distribution.



#### **Decontamination subject to charge**

Pfeiffer Vacuum decontaminates products not clearly declared "Free of contamination" at your expense.

#### **Instructions for safe shipping**

- ▶ Do not ship microbiological, explosive or radioactively contaminated products.
- ▶ Observe the shipping guidelines for the participating countries and transport companies.
- ▶ Highlight any potential dangers on the outside of the packaging.
- ▶ Download the explanation for contamination at [Pfeiffer Vacuum Service](#).
- ▶ Always enclose a completed declaration of contamination.



# 11 Recycling and disposal

## ⚠ WARNING

### Health hazard through poisoning from toxic contaminated components or devices

Toxic process media result in contamination of devices or parts of them. During maintenance work, there is a risk to health from contact with these poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ▶ Take suitable safety precautions and prevent health hazards or environmental pollution by toxic process media.
- ▶ Decontaminate affected parts before carrying out maintenance work.
- ▶ Wear protective equipment.



### Environmental protection

You **must** dispose of the product and its components in accordance with all applicable regulations for protecting people, the environment and nature.

- Help to reduce the wastage of natural resources.
- Prevent contamination.



### Environmental protection

The product and its components **must be disposed of in accordance with the applicable regulations relating to environmental protection and human health**, with a view to reducing natural resource wastage and preventing pollution.

## 11.1 General disposal information

Pfeiffer Vacuum products contain materials that you must recycle.

- ▶ Dispose of our products according to the following:
  - Iron
  - Aluminium
  - Copper
  - Synthetic
  - Electronic components
  - Oil and fat, solvent-free
- ▶ Observe the special precautionary measures when disposing of:
  - Fluoroelastomers (FKM)
  - Potentially contaminated components that come into contact with media

## 11.2 Dispose of gauges

Pfeiffer Vacuum gauges contain materials that you must recycle.

1. Dismantle the electronic unit.
2. Decontaminate the components that come into contact with process gases.
3. Separate the components into recyclable materials.
4. Recycle the non-contaminated components.
5. Dispose of the product or components in a safe manner according to locally applicable regulations.



## 12 Service solutions by Pfeiffer Vacuum

### We offer first-class service

High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum quality.

Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from [original replacement parts](#) to [service contracts](#).

### Make use of Pfeiffer Vacuum service

Whether preventive, on-site service carried out by our field service, fast replacement with mint condition replacement products, or repair carried out in a [Service Center](#) near you – you have various options for maintaining your equipment availability. You can find more detailed information and addresses on our homepage, in the [Pfeiffer Vacuum Service](#) section.

**You can obtain advice on the optimal solution for you, from your [Pfeiffer Vacuum representative](#).**

**For fast and smooth service process handling, we recommend the following:**



1. Download the up-to-date form templates.
  - [Explanations of service requests](#)
  - [Service requests](#)
  - [Contamination declaration](#)



- a) Remove and store all accessories (all external parts, such as valves, protective screens, etc.).
  - b) If necessary, drain operating fluid/lubricant.
  - c) If necessary, drain coolant.
2. Complete the service request and contamination declaration.



3. Send the forms by email, fax, or post to your local [Service Center](#).



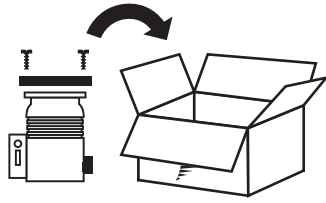
4. You will receive an acknowledgment from Pfeiffer Vacuum.

PFEIFFER VACUUM

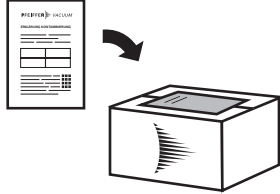
### Submission of contaminated products

No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination costs** may be incurred.

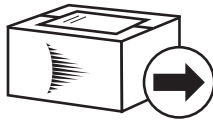




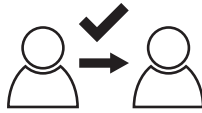
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
  - a) Neutralize the product with nitrogen or dry air.
  - b) Seal all openings with blind flanges, so that they are airtight.
  - c) Shrink-wrap the product in suitable protective foil.
  - d) Package the product in suitable, stable transport containers only.
  - e) Maintain applicable transport conditions.



6. Attach the contamination declaration to the **outside** of the packaging.



7. Now send your product to your local Service Center.



8. You will receive an acknowledgment/quotation, from Pfeiffer Vacuum.

PFEIFFER VACUUM

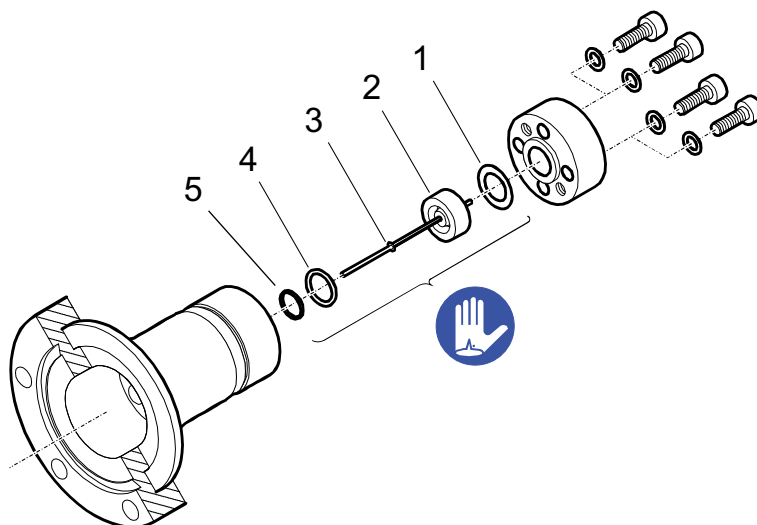
Our sales and delivery conditions and repair and maintenance conditions for vacuum devices and components apply to all service orders.



## 13 Spare parts

### Ordering spare parts

- ▶ Have the part number to hand, along with other details from the rating plate as required.
- ▶ Install original spare parts only.



**Fig. 12: Spare parts**

- |                   |                                  |
|-------------------|----------------------------------|
| 1 Washer          | 4 Centering ring                 |
| 2 Anode, complete | 5 Metal seal (HNV 100, 9×1.6 mm) |
| 3 Ignition aid    |                                  |

Description	Order number
Maintenance kit Item 1 (1×), item 3 (3×), item 4 (1×), item 5 (1×)	BN 846 241 -T
Repair kit Item 1 (1×), item 2 (1×), item 3 (3×), item 4 (1×), item 5 (1×)	BN 846 240 -T
Ignition aid kit Item 3 (10×)	BN 845 995 -T
Mounting tool for ignition aid	BG 510 600
Replacement gauge (DN 40 CF-F, short version) <sup>3)</sup>	BG G21 251 A
Replacement gauge (DN 40 CF-F, long version) <sup>4)</sup>	BG G21 261 A

**Tbl. 9: Spare parts**

<sup>3)</sup> You must return the defective gauge to Pfeiffer Vacuum.

<sup>4)</sup> You must return the defective gauge to Pfeiffer Vacuum.



## 14 Accessories



View the [range of accessories for ActiveLine](#) on our website.

### 14.1 Accessory information

**Measurement cable**

Measurement cable in different lengths, for connecting to a Pfeiffer Vacuum total pressure measuring and control unit

**Mating connector**

Cable socket for fabrication of the application-specific connecting cable

**Magnetic shielding**

For shielding of the permanent magnet in the gauge, to protect people against magnetic radiation, for example

### 14.2 Ordering accessories

Description	Order number
Measurement cable, 3 m	PT 448 250 -T
Measurement cable, 6 m	PT 448 251 -T
Measurement cable, 10 m	PT 448 252 -T
Mating connector	B4707283MA
Magnetic shielding	PT 443 155 -X





## 15 Technical data and dimensions

### 15.1 General

	mbar	bar	Pa	hPa	kPa	Torr   mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^5$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr   mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1

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

**Tbl. 10: Conversion table: Pressure units**

	mbar l/s	Pa m <sup>3</sup> /s	sccm	Torr l/s	atm cm <sup>3</sup> /s
mbar l/s	1	0.1	59.2	0.75	0.987
Pa m <sup>3</sup> /s	10	1	592	7.5	9.87
sccm	$1.69 \cdot 10^{-2}$	$1.69 \cdot 10^{-3}$	1	$1.27 \cdot 10^{-2}$	$1.67 \cdot 10^{-2}$
Torr l/s	1.33	0.133	78.9	1	1.32
atm cm <sup>3</sup> /s	1.01	0.101	59.8	0.76	1

**Tbl. 11: Conversion table: Units for gas throughput**

### 15.2 Technical data

Parameter	Value
Measuring range (air, N <sub>2</sub> )	$5 \times 10^{-11}$ up to $1 \times 10^{-2}$ hPa
Maximum pressure (absolute)	9 000 hPa, limited to inert gases and temperatures < 100 °C
Measuring principle	Cold cathode
Precision	approx. ±30 % in the range $1 \times 10^{-9}$ to $1 \times 10^{-3}$ hPa
Repeatability	approx. ±5 % in the range $1 \times 10^{-9}$ to $1 \times 10^{-3}$ hPa

**Tbl. 12: Measured and pressure values**

Parameter	Value	
Output signal (measuring signal)	Voltage range	approx. 0 V to approx. +10.5 V
	Error signal	< 0.5 V (no supply)
	Relation voltage-pressure	logarithmic, rise 0.8 V/decade
Output impedance	$2 \times 10 \Omega$	
Standard load	100 kΩ	
Load impedance (minimum load)	10 kΩ, short circuit proof	
Response time		pressure-dependent
	p > $10^{-6}$ hPa	< 10 ms
	p = $10^{-8}$ hPa	approx. 1 s
Gauge identification	Resistance 7.15 kΩ against supply earth	



Parameter		Value
Supply voltage	at gauge	14.5 to 30.0 V DC
	on the supply unit with max. cable length <sup>5)</sup>	16.0 to 30.0 V DC
	Ripple	max. 1 V <sub>pp</sub>
Operating voltage (in the measurement chamber)		≤ 3.3 kV
Operating current (in the measurement chamber)		≤ 100 μA
Power input		≤ 2 W
Fuse (to be connected in series) <sup>6)</sup>		≤ 1 AT
Connection (electrical)		Hirschmann GO 6 (6-pin, pins)
Measurement cable		5-pin, including shielding
Cable length		max. 100 m (0.25 mm <sup>2</sup> /conductor) max. 150 m (0.34 mm <sup>2</sup> /conductor) max. 500 m (1.0 mm <sup>2</sup> /conductor)
Earthing concept	(see chapter "Establishing the electric connection", page 18)	
	Vacuum connection and signal ground	Connected with 10 kΩ (max. differential voltage with regard to safety ± 50 V, with regard to accuracy ± 10 V)
	Supply earth and signal earth	Routed separately; differential measurement recommended for longer cable lengths (≥ 10 m)

**Tbl. 13: Electrical data**

Parameter	Value
Internal volume	approx. 20 cm <sup>3</sup>
Weight	950 g (short version)
	1100 g (long version)

**Tbl. 14: Internal volume and weight**

Parameter	Value
Relative humidity	max. 80 % for temperatures up to +31 °C, reducing to 50 % at +40 °C
Mounting orientation	Arbitrary
Use	Only in indoor areas
Installation altitude max.	3000 m MSL
Protection degree	IP40

**Tbl. 15: Ambient conditions**

5) The minimum voltage for the supply unit must be increased proportional to the cable length.  
6) Pfeiffer Vacuum measuring and control equipment complies with this requirement.



Parameter	Value
Operation	5 to 55 °C 250 °C (long version) <sup>7)</sup>
Storage	-40 to +65 °C
Bake out	≤ 250 °C (short version) <sup>8)</sup> ≤ 250 °C (long version) <sup>9)</sup>

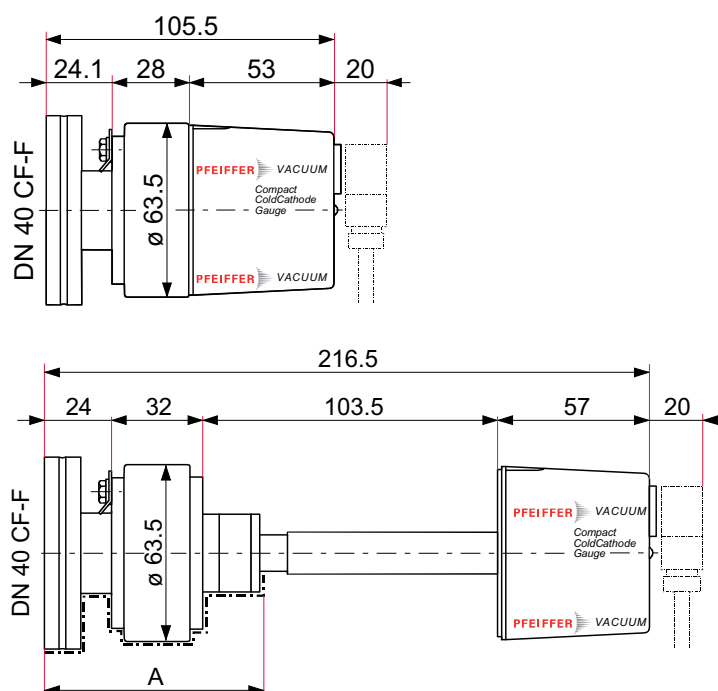
**Tbl. 16: Temperatures**

Parameter	Value
Flange	Stainless steel (1.4306)
Measurement chamber	Stainless steel (1.4306)
Insulating bushing	Ceramic (Al <sub>2</sub> O <sub>3</sub> )
Internal seals	Silver (Ag)
Anode	Molybdenum (Mo)
Ignition aid	Stainless steel (1.4310)

**Tbl. 17: Substances in contact with the media**

## 15.3 Dimensions

Dimensions in mm.


**Fig. 13: Dimensions**

A Baking out area

- 7) In the baking out area according to the dimensional drawing (without magnetic shielding)
- 8) Without electronic unit and magnetic shielding
- 9) In the baking out area according to the dimensional drawing (without magnetic shielding)





**Intertek**  
3103457

**ETL LISTED**

The product IKR 270

- conforms to the UL standard  
UL 61010-1.

- is certified to the CAN/CSA standard  
CAN/CSA C22.2 No. 61010-1.



# Declaration of conformity

Declaration for product(s) of the type:

**Cold cathode gauge**

IKR 270

We hereby declare that the listed product satisfies all relevant provisions of the following **European Directives**.

**Electromagnetic compatibility 2014/30/EU**

**Restriction of the use of certain hazardous substances 2011/65/EU**

**Restriction of the use of certain hazardous substances, delegated directive 2015/863/EU**

**Harmonized standards and applied national standards and specifications:**

DIN EN 61000-6-2:2006-03

DIN EN 61000-6-3:2011-09

DIN EN 61010-1:2011-07

DIN EN 61326-1:2013-07

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Signature:



(Daniel Sälzer)  
Managing Director

Pfeiffer Vacuum GmbH  
Berliner Straße 43  
35614 Asslar  
Germany

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Asslar, 2020-02-28



## VACUUM SOLUTIONS FROM A SINGLE SOURCE

Pfeiffer Vacuum stands for innovative and custom vacuum solutions worldwide, technological perfection, competent advice and reliable service.

## COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:

We are the only supplier of vacuum technology that provides a complete product portfolio.

## COMPETENCE IN THEORY AND PRACTICE

Benefit from our know-how and our portfolio of training opportunities!

We support you with your plant layout and provide first-class on-site service worldwide.

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perfect vacuum solution?  
Please contact us

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