



OPERATING INSTRUCTIONS

EN

Translation of the Original

PBR 360

Pirani/Bayard-Alpert gauge

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.

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.

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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
OmniControl "Control unit" operating instructions	PT 0670
TPG 366 "Total Pressure Measuring and Control Unit" operating instructions	BG 5501
Declaration of conformity	A component of these instructions

Tbl. 1: Applicable documents

You can find these documents in the [Pfeiffer Vacuum Download Center](#).

1.1.2 Variants

This document applies to products with the following article numbers:

Article number	Designation
PT R27 010	PBR 360, DN 25 ISO-KF
PT R27 011	PBR 360, DN 40 ISO-KF
PT R27 012	PBR 360, DN 40 CF-R

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.

Information that relates to only one of the products is indicated accordingly.

The figures in this document are not to scale.

Graphics without a caption reflect the product featuring a DN 25 ISO-KF vacuum connection, however, they also apply for the other vacuum connections accordingly.

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



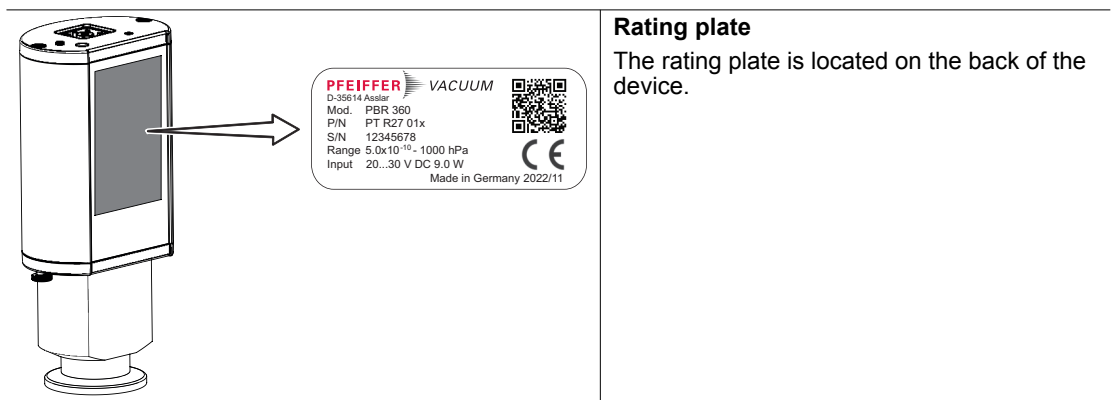
Wear laboratory gloves



Perform a visual inspection

1.3.3 Stickers on product

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



Rating plate

The rating plate is located on the back of the device.

1.3.4 Abbreviations

Abbreviation	Explanation
ATM	Atmosphere
BA	Bayard-Alpert
c	Constant for converting measuring signal and pressure
C	Correction factor for calculating the pressure of gases other than air Sensitivity of the Bayard-Alpert measurement system for nitrogen

Abbreviation	Explanation
EC	Electron collector
EMI	Emission
F	Filament
FPM	Fluoropolymer rubber
HIMS	Hot cathode ionization measurement system
HV	High vacuum
IC	Ion collector
LED	Light emitting diode
LPS	Limited power source
MSL	Mean sea level
p	Pressure
P	Pirani
PELV	Protective extra low voltage
PLC	Programmable logical controller
U	Measuring signal [V] (output voltage)

Tbl. 3: Abbreviations used

1.4 Trademark proof

- FullRange® is a trademark of Pfeiffer Vacuum GmbH.
- Hirschmann® is a registered trademark of Hirschmann Electronics GmbH.

2 Safety

2.1 General safety information

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

⚠ DANGER
<p>Immediately pending danger Indicates an immediately pending danger that will result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

⚠ WARNING
<p>Potential pending danger Indicates a pending danger that could result in death or serious injury if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

⚠ CAUTION
<p>Potential pending danger Indicates a pending danger that could result in minor injuries if not observed.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid the danger situation

NOTICE
<p>Danger of damage to property Is used to highlight actions that are not associated with personal injury.</p> <ul style="list-style-type: none"> ▶ Instructions to avoid damage to property

i	Notes, tips or examples indicate important information about the product or about this document.
----------	--

2.2 Safety instructions

i	<p>Safety instructions according to product life stages 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

⚠ DANGER
<p>Danger to life due to electric shock An improperly grounded product is potentially fatal in the event of a fault.</p> <ul style="list-style-type: none"> ▶ Connect the product galvanically with the grounded vacuum chambers. ▶ Ensure that the connection complies with the requirements of a protective connection according to EN 61010. (CF and VCR connections comply with this requirement.) ▶ Use electrically conductive centering and clamping rings for KF connections.

⚠ 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.

Risks during operation**⚠ DANGER****Danger to life from electric shock caused by moisture ingress**

Water that has entered the unit will result in personal injury through electric shocks.

- ▶ Only operate the unit in a dry environment.
- ▶ Operate the unit away from fluids and sources of moisture.
- ▶ Do not switch on the unit if fluid has entered it. Instead contact Pfeiffer Vacuum Service.
- ▶ Always disconnect the power supply before cleaning the unit.

⚠ WARNING**Risk of injury resulting from overpressure in the vacuum system**

Opening tensioning pieces with an overpressure > 1000 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 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.

Risks during maintenance**⚠ DANGER****Danger to life from electric shock caused by moisture ingress**

Water that has entered the unit will result in personal injury through electric shocks.

- ▶ Only operate the unit in a dry environment.
- ▶ Operate the unit away from fluids and sources of moisture.
- ▶ Do not switch on the unit if fluid has entered it. Instead contact Pfeiffer Vacuum Service.
- ▶ Always disconnect the power supply before cleaning the unit.

⚠ 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.

i

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.

i

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 FullRange gauge is used to measure the vacuum of gases within the range of 5×10^{-10} to 1000 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 limits of use according to 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 improper use; in particular:

- Use outside the mechanical and electrical limits of use
- Use with corrosive or explosive media, if this is not explicitly permitted
- Use for the measurement of highly flammable or combustible gases mixed with an oxidizing agent (e.g. atmospheric oxygen) within the explosion limits
- Use outdoors
- Use after technical changes (inside or outside on the product)
- Use with replacement or accessory parts that are not suitable or 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.

3 Product description

3.1 Function

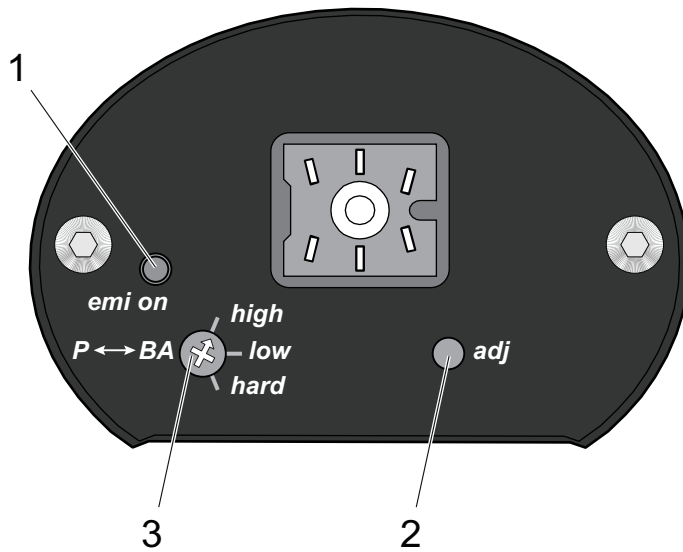


Fig. 1: Design of the transmitter

- | | |
|---|---|
| <p>1 LED "emi on" (emission / hot cathode)</p> <p>2 Button "adj" for atmospheric and zero point calibration</p> | <p>3 Switch for switchover point between Pirani and hot cathode</p> |
|---|---|

3.1.1 Measurement systems

The gauge has two measurement systems:

- Pirani measurement system (control area)
- Hot cathode ionization measurement system (HIMS) according to Bayard-Alpert (BA)

3.1.2 Gauge mode of operation

The Pirani measurement signal is always switched on. It is used to switch the HIMS on and off, thus protecting the HIMS from burning out or excessive contamination. You can choose between 3 different switch-on/off configurations. If the measured pressure is higher than the switch-on threshold p_{on} , the HIMS remains switched off and the Pirani measured value appears as an output signal. The gauge activates the HIMS controlled by the Pirani measurement system only when the value falls below the switch-on threshold p_{on} . The hot cathode is ready for operation after a few seconds start-up time. The "emi on" LED is lit continuously and the hot cathode measured value is present at the output. If the pressure increases above the switch-off threshold p_{off} , the gauge switches off the HIMS and the "emi on" LED is unlit. The Pirani measured value appears again at the output.

3.1.3 Measuring range

The gauge covers the measuring range from 5×10^{-10} to 1000 hPa.

The gauge has a continuous characteristic throughout the entire range. The measuring signal is logarithmically dependent on the pressure across the entire range. In a defined overlapping range, the gauge outputs a mixed signal of the two measurement systems. Above this range the gauge outputs the Pirani signal only, below it the hot cathode signal only. The gauge applies the optimum measuring configuration to the respective pressure range.

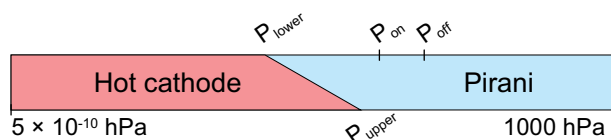


Fig. 2: Measuring configuration

The switching point P_{on} is the point at which the HIMS switches on when the pressure decreases. The switching point P_{off} is the point at which the HIMS switches off when the pressure increases. The transition area between P_{upper} and P_{lower} is the pressure area in which the gauge proportionally uses both the Pirani measurement system and the HIMS to determine the pressure. The Pirani proportion decreases as the pressure decreases. In the "hard" switch position, the switchover between Pirani and HIMS is immediate, without a transition.

3.1.4 Bayard-Alpert measurement system

The electrode system according to Bayard-Alpert is designed for a low X-ray limit. Electrons emitted by the filament (F_1 or F_2) ionize a number of molecules that is proportional to the pressure in the measuring chamber. The ion collector (IC) acquires the ion current I_+ generated in this way and feeds it to the electrometer amplifier of the gauge electronics. The ion current depends on the emission current I_e , the gas type and the gas pressure p according to the relationship:

$$I_+ = I_e \times p \times C$$

Factor C is referred to as the sensitivity of the gauge. It is determined for nitrogen (N_2) and is taken into account for the output signal that is logarithmically dependent on the pressure. The lower measurement limit is 5×10^{-10} hPa. In order for the entire range of 5×10^{-10} to 1×10^{-2} hPa to be covered in a meaningful way, the emission current and signal amplification are adapted to the pressure range. In the high-pressure range, low emission currents are used, while high emission currents are used in the low-pressure range. After the switchover, the pressure value stays at the same value for a short time, until the new condition has stabilized.

The gauge is equipped with two filaments. If the first filament fails, an automatic switchover to the second filament occurs.

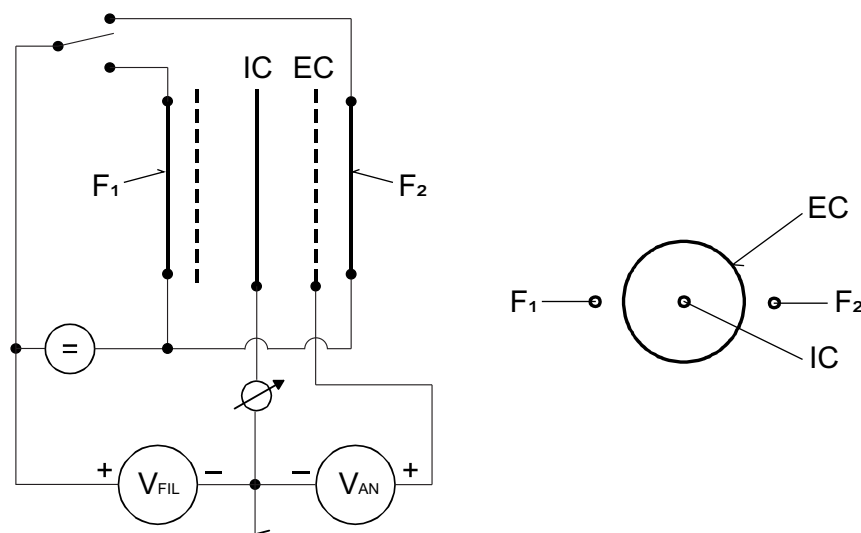


Fig. 3: Design of the Bayard-Alpert measurement system

F_1 und F_2	Filament 1 and 2 (hot cathodes)	V_{FIL}	Filament reference voltage
IC	Ion collector (collector)	V_{AN}	Anode voltage
EC	Electron collector (anode grid)		

3.1.5 Pirani measurement system

The heat conductivity of gases is pressure-dependent within certain limits. This physical phenomenon is utilized in the Pirani thermal conductivity vacuum gauge to measure the pressure. A self-calibrating bridge circuit is used as the measuring circuit. A thin tungsten wire is the actual measuring element. With a suitable control circuit, the resistance of the wire and thus its temperature are kept constant. The

electrical power that is fed to the wire is a measure for the power dissipated in the gas through heat conduction and therefore a measure for the gas pressure. As the pressure increases, convection and other effects are increasingly superimposed on the heat transmission. This means that, in the range of >100 hPa, accurate pressure measurements can no longer be performed with the Pirani measurement system.

3.2 Identifying the product

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

- ▶ To ensure clear identification of the product when communicating with Pfeiffer Vacuum, always keep all of the information on the rating plate to hand.

3.3 Scope of delivery

- Gauge
- Operating 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 transport

Transport in unsuitable packaging or failure to install all transport locks can result in damage to the product.

- ▶ Comply with the instructions for safe transport.



Packing

We recommend keeping the transport packaging and original protective cover.

Transport product safely

- ▶ 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. will lead to defects on the electronic components.

- ▶ Comply with the instructions for safe storage.



Packing

We recommend storing the product in its original packaging.

Store product safely

- ▶ 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 vacuum connection

⚠ DANGER

Danger to life due to electric shock

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

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

⚠ 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

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

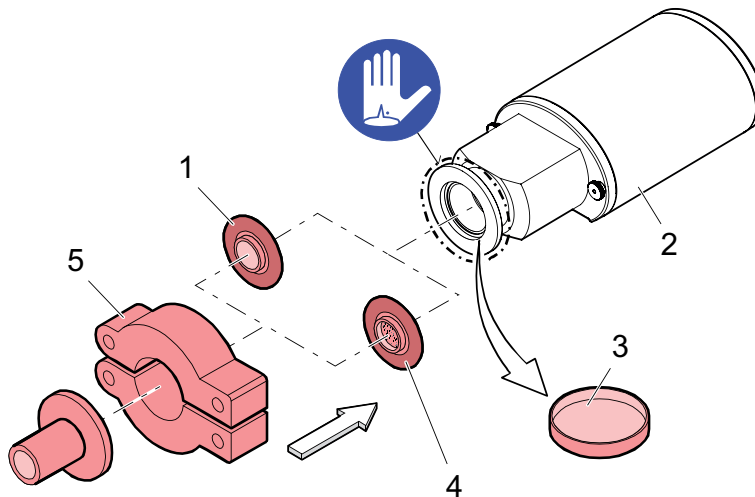


Fig. 4: Establishing vacuum connection

- | | |
|----------------------------|---------------------------------------|
| 1 Seal with centering ring | 4 Seal with centering ring and filter |
| 2 Gauge | 5 Tensioning piece |
| 3 Protective cap | |

Recommendations

1. If possible, make sure that the gauge is not exposed to any vibrations during operation, as vibrations will lead to deviations in the measured values.
2. Ensure that the button and the switch for the switch-on/off range of the gauge can be easily accessed once fitted.
3. Mount the gauge in a horizontal to upright mounting orientation (flange facing downwards).
 - This prevents condensate and particles from accumulating in the measurement chamber.
4. Use a metal seal as the vacuum flange seal; plastic seals (e.g. FPM) can already impair the measurement accuracy in the range of 10^{-6} hPa due to gas emission.
5. Remove the electronic unit of the gauge temporarily wherever installation is only possible with the electronic unit removed.
 - This will facilitate assembly of the CF flange connection.

Procedure

1. Remove the protective cap and store in a safe place.
2. Assemble the gauge with vacuum components from the [Pfeiffer Vacuum Components Shop](#) on the vacuum system.

5.2 Electronic unit

⚠ DANGER

Danger to life due to electric shock

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

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

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- ▶ 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.

Remove the electronic unit to facilitate installation and bake out the gauge.

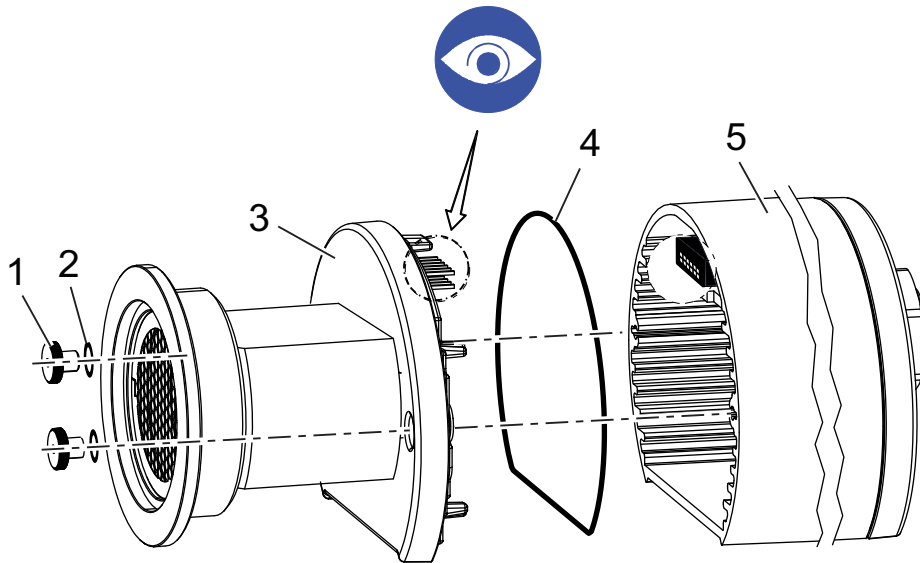


Fig. 5: Electronic unit

- | | |
|----------------------|-------------------|
| 1 Knurled nuts | 4 Seal |
| 2 Sealing washers | 5 Electronic unit |
| 3 Measurement system | |

Removing the electronic unit

1. Loosen the knurled nuts on the electronic unit.
2. Remove the electronic unit without any rotary movement of the measuring system.

Installing the electronic unit

1. Carefully fit the electronic unit onto the measurement system.
2. Note the arrangement of the pins and the groove.
3. Push the electronic unit as far as the limit stop.
4. Fasten the knurled nuts to the electronic unit.

5.3 Establishing 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 (≤ 0.2 Nm)

Required materials

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

Establishing electric connection

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

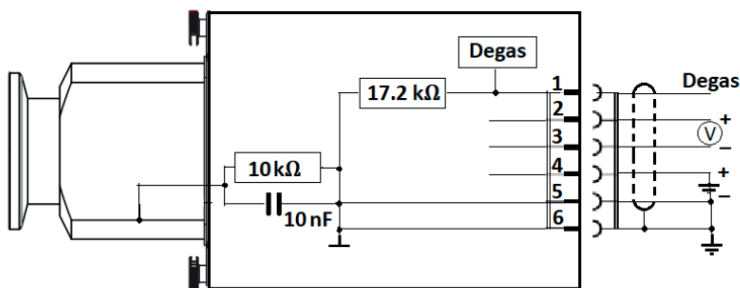


Fig. 6: Connection diagram

- | | |
|---|-----------------------|
| 1 Degas Identification ($U \leq 4.25$ V) | 4 Supply |
| 2 Measuring signal | 5 Supply ground (GND) |
| 3 Signal ground | 6 Shielding |

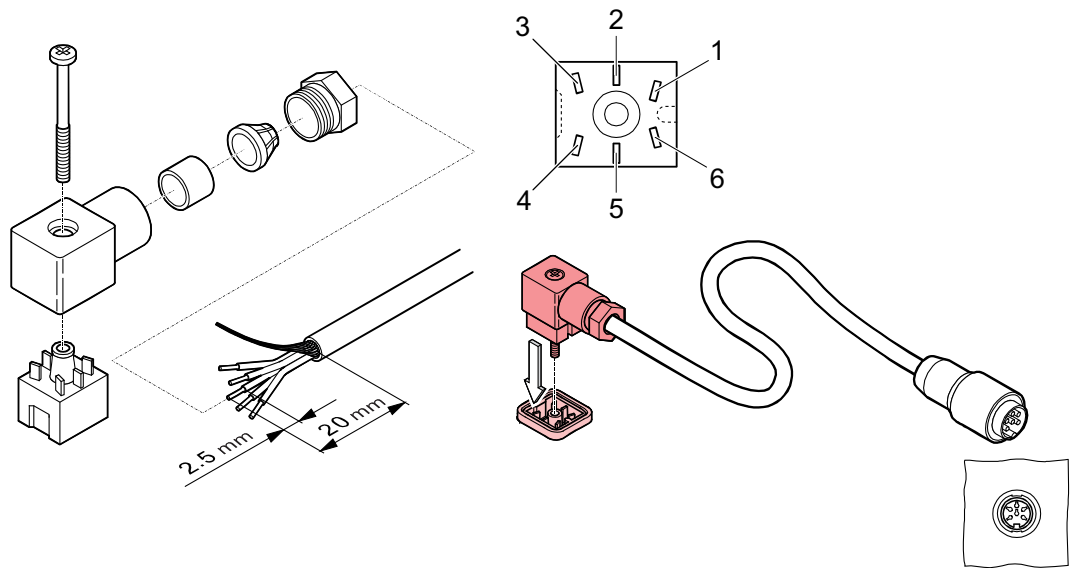


Fig. 7: Measurement cable and Hirschmann cable socket

Manufacturing measurement cable

Additional information regarding the measurement cable type and conductor cross-sections can be obtained from 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 with separate signal earth and supply earth.
5. 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 according to the connection diagram.
3. Assemble the Hirschmann cable socket.

6 Operation

After switching on the supply voltage, the gauge is ready for operation.







Recommendations

- ▶ Respect the minimum stabilization period of 10 minutes.
- ▶ Respect the relation between measuring signal and pressure.
- ▶ Leave the gauge switched on at all times, regardless of the prevalent pressure.

Accuracy of measurement

The accuracy of measurement is reduced in the range >1 hPa and $<1 \times 10^{-8}$ hPa.

6.1 Monitoring operating condition

LED "emi on"		Meaning
Off		<ul style="list-style-type: none"> • Supply voltage off • Electronics defective
Lights up green		<ul style="list-style-type: none"> • Normal operation • HIMS on
Slowly flashes green		<ul style="list-style-type: none"> • Normal operation • HIMS off
Lights up red		<ul style="list-style-type: none"> • Error • Sensor or electronics defective • Measuring error
Slowly flashes red		<ul style="list-style-type: none"> • Degassing on • Degassing function is active, measurement is possible, but with lower accuracy
Lights up orange		<ul style="list-style-type: none"> • HIMS warning • Filament 2 on, filament 1 defective

Tbl. 4: Status display

6.2 Selecting switch-on and switch-off range

The gauge offers the option of adapting the switchover range between Pirani and BA sensor as a function of the application. In this way it is possible to prevent:

- The setpoint being in the switch over range when pressure regulation takes place
- In the case of coating applications, the hot cathode (BA) being switched on and prematurely contaminated.

Ex factory, the switch for the switchover point is set to "high".

Required tools

- Screwdriver

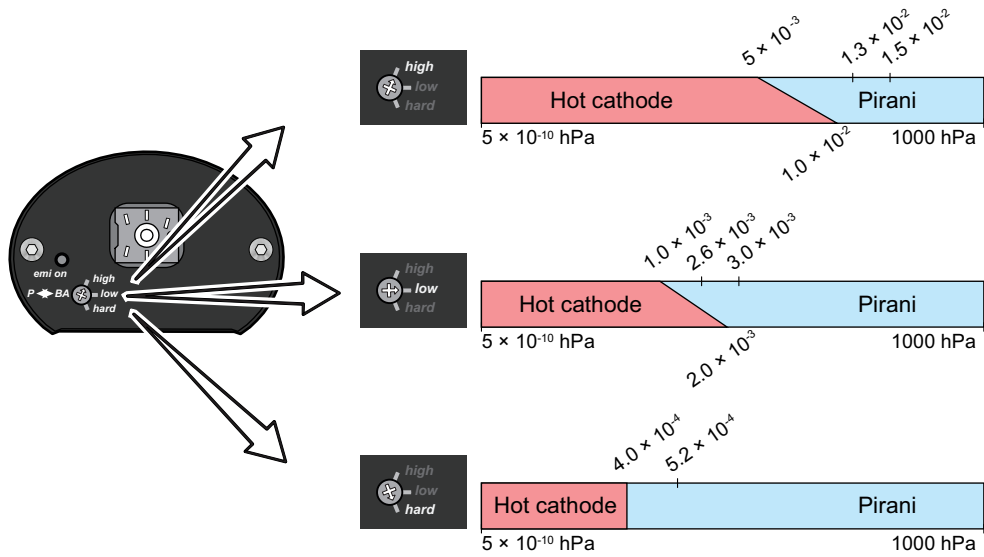


Fig. 8: Selecting switch-on and switch-off range

Procedure

1. Select the switch-on and switch-off range **before switching on the gauge**.
2. Switch over the switch-on and switch-off range using the switchover point switch.
3. Choose between the "high" (ex factory), "low" or "hard" positions.
4. Recommendation: Select "low" if possible to reduce the tendency to contaminate the HIMS.
 - The tendency to contaminate the HIMS is reduced as the pressure drops.

6.3 Converting measuring signal and pressure

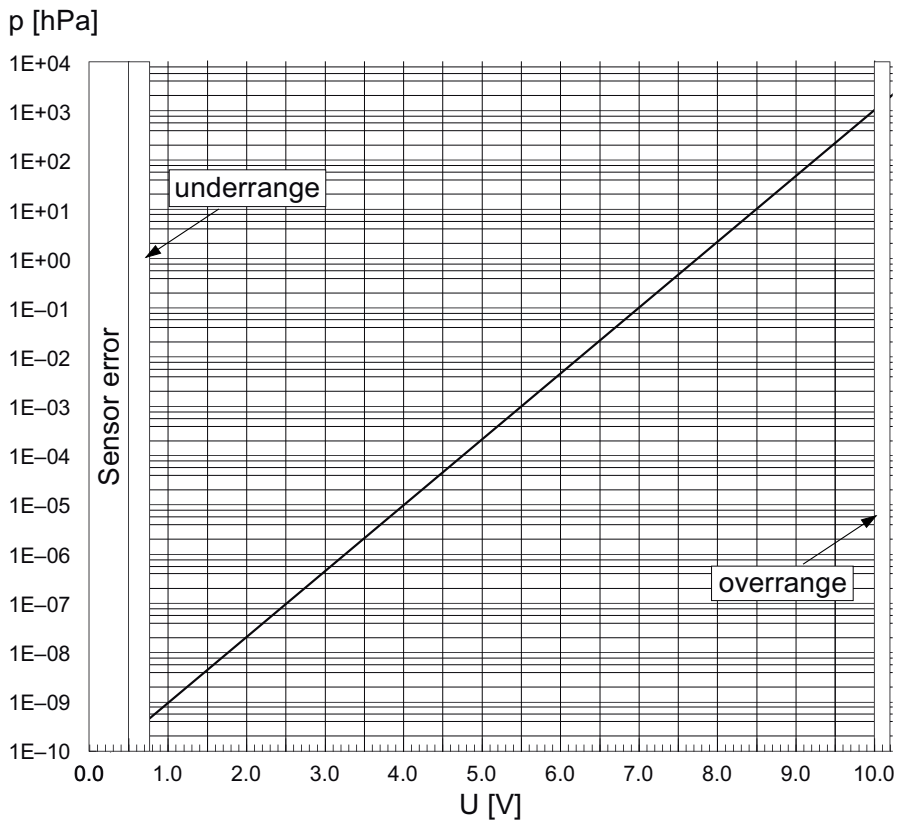


Fig. 9: Relation between measuring signal and pressure

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

Measuring signal (U)	Pressure (p)	Constant (c) ¹⁾
[V]	[hPa]	0
	[Torr]	-0.125
	[Pa]	2

Tbl. 5: Constants for converting measuring signal and pressure

Measuring signal (U)	Pressure (p)		
[V]	[hPa]	[Torr]	[Pa]
< 0.5	Sensor error		
> 0.5 to < 0.774	Underrange		
0.774	5×10^{-10}	3.75×10^{-10}	5×10^{-8}
1.00	1×10^{-9}	7.5×10^{-10}	1×10^{-7}
1.75	1×10^{-8}	7.5×10^{-9}	1×10^{-6}
2.5	1×10^{-7}	7.5×10^{-8}	1×10^{-5}
3.25	1×10^{-6}	7.5×10^{-7}	1×10^{-4}
4.00	1×10^{-5}	7.5×10^{-6}	1×10^{-3}
4.75	1×10^{-4}	7.5×10^{-5}	1×10^{-2}
5.50	1×10^{-3}	7.5×10^{-4}	1×10^{-1}
6.25	1×10^{-2}	7.5×10^{-3}	1×10^0
7.00	1×10^{-1}	7.5×10^{-2}	1×10^1
7.75	1×10^0	7.5×10^{-1}	1×10^2
8.50	1×10^1	7.5×10^0	1×10^3
9.25	1×10^2	7.5×10^1	1×10^4
10.00	1×10^3	7.5×10^2	1×10^5
> 10.0	Overrange		

Tbl. 6: Conversion table

Converting measuring signal and pressure

- ▶ Observe the constants for converting the measuring signal and pressure.
- ▶ Convert the measuring signal into pressure:

$$p = 10^{(U - 7.75) / 0.75 + c}$$

- ▶ Convert the pressure into the measuring signal:

$$U = 0.75 \times (\log p - c) + 7.75$$

6.4 Determining effective pressure with correction factors

The measuring signal is gas type-dependent. The characteristics (see page 24) apply for nitrogen (N₂), oxygen (O₂), dry air, and carbon monoxide (CO).

1) Dependent on unit of pressure

Pressure range > 10⁻⁴ hPa (Pirani operation only)

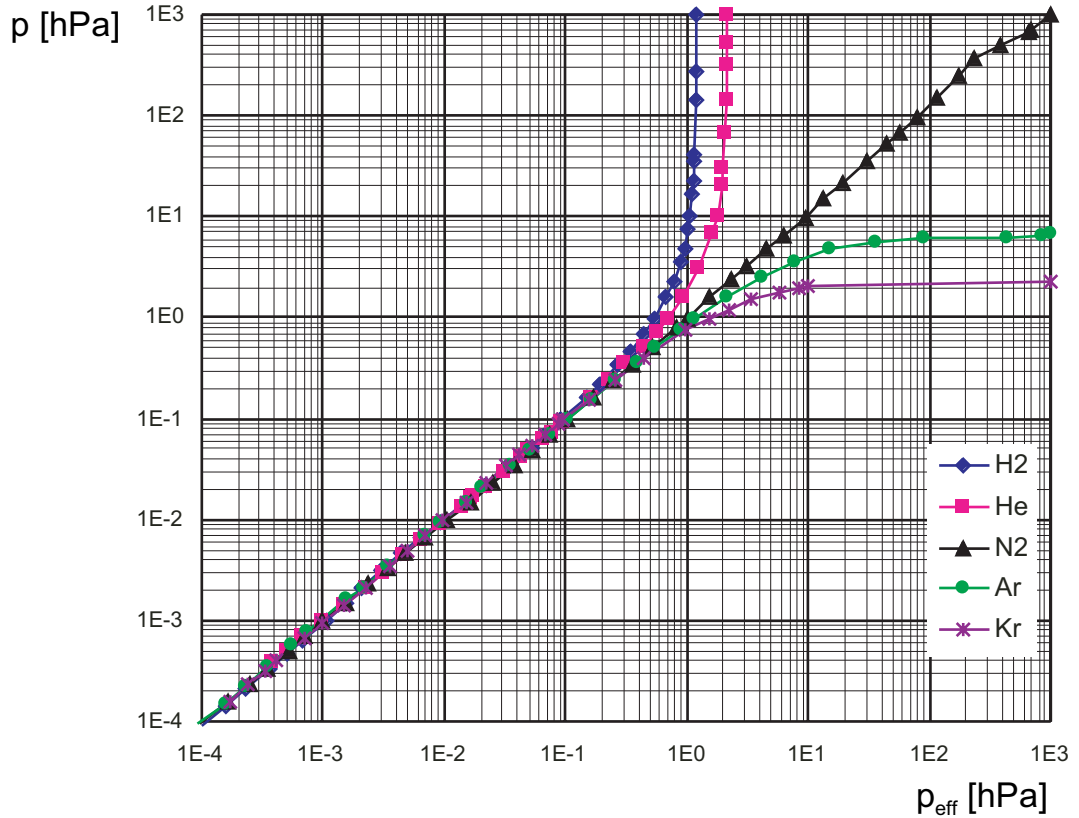


Fig. 10: Measurement curve for Pirani-only operation and when using the correction factors

Gas type	Correction factor (C)
Nitrogen (N ₂)	1.0
Air	1.0
Hydrogen (H ₂)	0.58
Helium (He)	1.02
Argon (Ar)	1.59
Carbon dioxide (CO ₂)	0.89
Tetrafluoromethane (CF ₄ , R14)	0.95

Tbl. 7: Correction factor for Pirani-only operation

Pressure range < 10⁻³ hPa (ionization range)

In the pressure range < 10⁻³ hPa, the display is linear.



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	Correction factor (C)
Helium (He)	5.93
Hydrogen (H ₂)	2.39
Argon (Ar)	0.80
Carbon dioxide (CO ₂)	0.74
Propane (C ₃ H ₈)	0.32
Neon (Ne)	3.50

Gas type	Correction factor (C)
Krypton (Kr)	0.60
Xenon (Xe)	0.41
Dichlorodifluoromethane (CCl ₂ F ₂ , R12)	0.28
Tetrafluoromethane (CF ₄ , R14)	0.57

Tbl. 8: Correction factors for HIMS

Using correction factors

Entering correction factor in total pressure measuring and control unit

- ▶ Enter the correction 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_{eff} = Effective pressure
- C = Correction factor
- p = Displayed pressure (gauge calibrated for air)

6.5 Performing degassing



Warranty

Malfunctioning of the equipment as a direct result of contamination or wear, as well as wear parts, is not covered by the warranty.

During the bake-out process, the gauge continues to provide measured values, however they may have slightly larger tolerance values than in normal use.

The contamination of the gauge depends on:

- Pressure in the vacuum chamber
- Type of process media
- Any existing or newly accumulated contamination and its partial pressure (e.g. vapors, process particles etc.)
- Measurement current
- Operating time

Deposits on the HIMS can result in an unstable measured value. The degassing process causes the electron collection grid to be heated to about 800 °C through ohmic heating, thus cleaning the measuring element.

Optional instruments required

- Total pressure measuring and control unit
- Or a run-up control (e.g. PLC)

Activating degassing function using a total pressure measuring and control unit or a system controller

1. Start the anode bake-out process at a pressure of $<2 \times 10^{-6}$ hPa.
 - The degassing function can be started from a pressure of $<1 \times 10^{-5}$ hPa. However, to protect the filament and sensor, we recommend a pressure of $<2 \times 10^{-6}$ hPa.
2. Switch the control signal from OFF (0 V) to ON (24 V) to start the bake-out process.
3. Switch the control signal from ON (24 V) to OFF (0 V) to end the bake-out process.
 - The gauge automatically ends the bake-out process after three minutes if you do not end it first.
4. Recommendation: Set the control signal back to OFF each time after three minutes of baking out by the run-up control to establish a clear operating status.
5. Switch the control signal again from OFF (0 V) to ON (24 V) to repeat the bake-out process.

6.6 Baking out gauge

NOTICE

Damage from excessive bakeout temperature

If the gauge is installed upright (flange facing down), rising heat during baking out will cause damage to the electronic unit.

- ▶ Remove the electronic unit from the measuring system before baking out at temperatures >60 °C.
- ▶ Bake out the flange only.

Prerequisite

- Electronic unit removed

Procedure

1. Bake out the gauge up to **max. 180 °C** at the flange.
2. Allow the gauge to cool down.
3. Install the electronic unit.
4. Calibrate the gauge.

7 Dismantling

DANGER

Danger to life due to electric shock

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

- ▶ Connect the product galvanically with the grounded vacuum chambers.
- ▶ Ensure that the connection complies with the requirements of a protective connection according to EN 61010. (CF and VCR connections comply with this requirement.)
- ▶ Use electrically conductive centering and clamping rings 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 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 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-clip).
- ▶ 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 tools

- Crosshead screwdriver

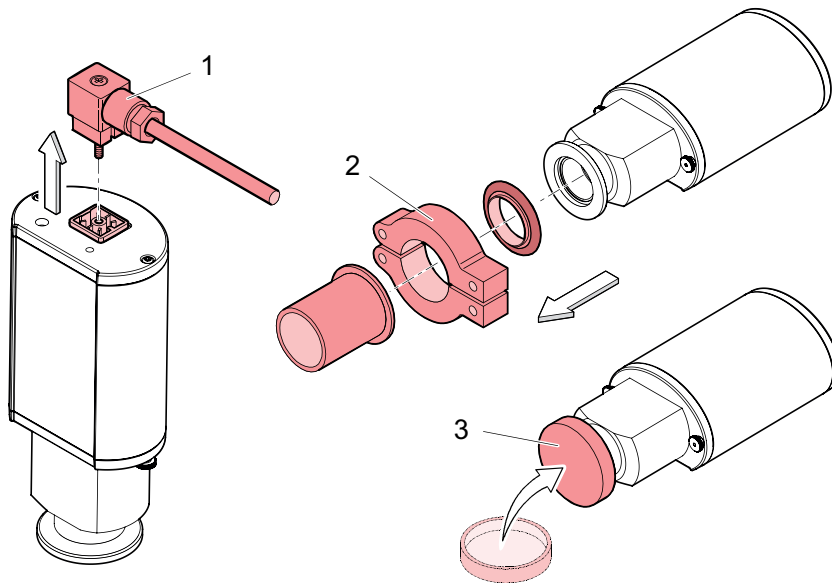


Fig. 11: Removing gauge

- | | |
|---------------------|------------------|
| 1 Measurement cable | 3 Protective cap |
| 2 Tensioning piece | |

Removing gauge

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

8 Maintenance

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.



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.



Warranty claim

Opening the device during the warranty period or damaging/removing the warranty seal will void the warranty.

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.

Other climatic conditions, long-term operation, extreme temperatures, a different mounting orientation, and aging or contamination can lead to a zero point shift in the Pirani measurement system. A zero point shift will necessitate recalibration or cleaning.

8.1 Cleaning components

DANGER

Danger to life from electric shock caused by moisture ingress

Water that has entered the unit will result in personal injury through electric shocks.

- ▶ Only operate the unit in a dry environment.
- ▶ Operate the unit away from fluids and sources of moisture.
- ▶ Do not switch on the unit if fluid has entered it. Instead contact Pfeiffer Vacuum Service.
- ▶ Always disconnect the power supply before cleaning the unit.

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 unit.

- ▶ Protect the unit against penetration of moisture.
- ▶ Only operate the unit in a clean and dry environment.
- ▶ Operate the unit away from fluids and sources of moisture.
- ▶ Take special precautions if there is a risk of dripping water.
- ▶ Do not switch on the unit 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.

You cannot clean the measurement system. If the measured values are unstable, severe contamination of the measurement system must be assumed. The contamination occurs in the form of visible contamination or discoloration of the measurement system.

Required consumables

- Industrial alcohol
- Cloth (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.

Checking components for contamination

1. Check the measurement system for contamination.
2. Replace the measurement system if the measurement system is severely contaminated.

Cleaning the electrode system

- ▶ Bake out (degas) the anode to remove any small deposits from the electrode system.

8.2 Calibrating gauge

Pfeiffer Vacuum has calibrated the gauge to default values at the factory. You can calibrate the Pirani measurement system yourself, if required. The gauge automatically detects which calibration point (ATM or HV) applies.

HV calibration will occur automatically under the following, simultaneously applicable conditions:

- The measuring value of the BA sensor is $<1 \times 10^{-5}$ hPa.
- The measuring value of the Pirani sensor remains constant for more than 1 minute and does not deviate too much from the last calibrated value.

Required tools

- Pin (<2.5 mm, 50 mm length)
(or a bent open paper clip)

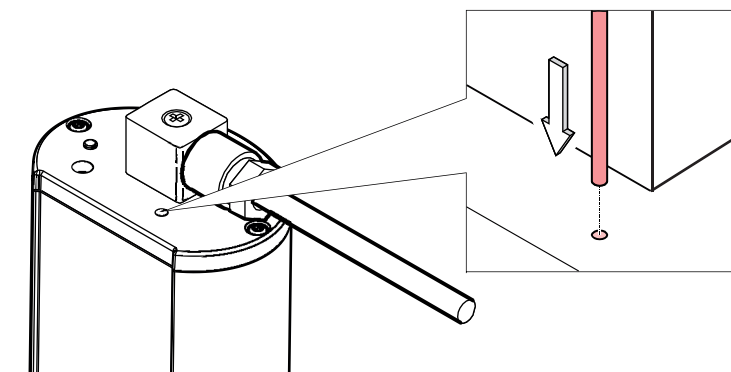




Fig. 12: Calibrating gauge

LED "emi on"		Meaning
Slowly flashes green		<ul style="list-style-type: none"> • Calibration successful (flashes green for 1 s)
Lights up red		<ul style="list-style-type: none"> • Calibration error (lights red for 3 s)

Tbl. 9: Status display

Preparing for calibration

1. Carry out a zero point calibration
 - After replacing the measurement system
 - As part of the normal maintenance activities for quality assurance.
2. Ensure the same installation and ambient conditions as those applicable for normal use.

ATM calibration

1. Allow the gauge to cool down to ambient temperature for approx. 30 minutes if you previously operated the gauge in the ionization area.
2. Put the gauge into operation.
3. Remove the sealing plug at the "adj" button.
4. Operate the gauge for at least 10 minutes at atmospheric pressure.
5. Press the "adj" button for 2 seconds using a stylus.
6. Insert the sealing plug at the "adj" button again.

Zero point calibration

1. Remove the sealing plug at the "adj" button.
2. Put the gauge into operation.
3. Run the gauge for at least 10 minutes at $\leq 5 \times 10^{-5}$ hPa.
4. Press the "adj" button for 2 seconds using a stylus.
 - The calibration takes two minutes and runs automatically.
5. Insert the sealing plug at the "adj" button again.

8.3 Replacing measurement system

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

- Measurement system severely contaminated,
- Measurement system visibly damaged or
- Gauge defective (e.g. broken filament)

Spare part required

- Replacement measurement system

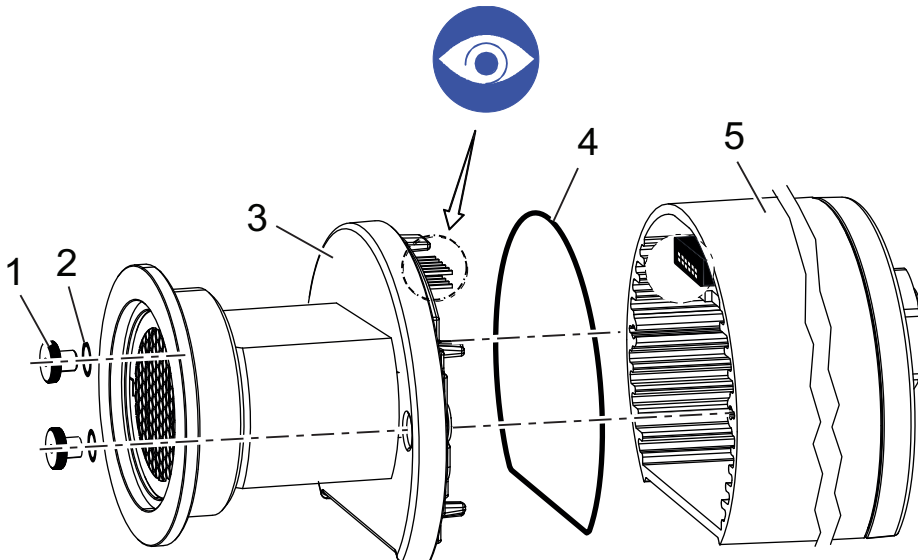


Fig. 13: Replacing measurement system

- | | |
|----------------------|-------------------|
| 1 Knurled nuts | 4 Seal |
| 2 Sealing washers | 5 Electronic unit |
| 3 Measurement system | |

Procedure

1. Remove the gauge from the vacuum system.
2. Remove the electronic unit from the defective measuring system.
3. Install the electronic unit on the new measurement system.
4. Connect the gauge to the vacuum system.
5. Establish the electric connection.
6. Calibrate the new measurement system.

9 Malfunctions



Warranty

Malfunctioning of the equipment as a direct result of contamination or wear, as well as wear parts, is not covered by the warranty.



Rectifying malfunctions (reset)

In the event of a malfunction, Pfeiffer Vacuum recommends disconnecting the supply voltage, and then reconnecting after 5 seconds.

Malfunction	Possible cause	Remedy
Continuous measuring signal approx. 0 V	No supply	<ul style="list-style-type: none"> • Check the gauge connection. • Establish the supply voltage.
	Measurement cable defective or incorrectly connected	<ul style="list-style-type: none"> • Check the measurement cable.
	Gauge in undefined state	<ul style="list-style-type: none"> • Switch the gauge off, wait 5 seconds and then switch it back on (reset).
Measuring signal approx. 0.5 V	Sensor error (measurement system defective)	<ul style="list-style-type: none"> • Replace the measurement system.
	Electronic unit not connected to measurement system correctly	<ul style="list-style-type: none"> • Check the connection.
No switching over to BA measurement at low pressures	Pirani zero point out of tolerance	<ul style="list-style-type: none"> • Carry out a zero point calibration.
Measured value in high vacuum too high	Strong sensor degassing	<ul style="list-style-type: none"> • Activate the degassing function. • Replace the measurement system.

Tbl. 10: Troubleshooting

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.

Ship product safely

- ▶ 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.

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:



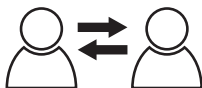
1. Download the up-to-date form templates.
 - [Explanations of service requests](#)
 - [Service requests](#)
 - [Contamination declaration](#)



- 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](#).

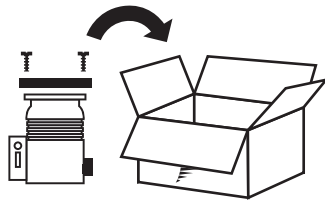


4. You will receive an acknowledgment from Pfeiffer Vacuum.

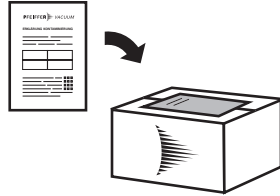
PFEIFFER VACUUM

Submission of contaminated products

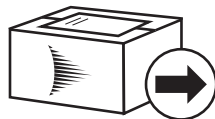
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination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



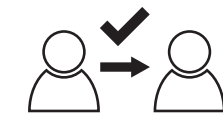
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
 - a) Neutralize the product with nitrogen or dry air.
 - b) Seal all openings with blind flanges, so that they are airtight.
 - c) Shrink-wrap the product in suitable protective foil.
 - d) Package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

Description	Order number
Measurement system, DN 25 ISO-KF	PT 120 239 -T
Measurement system, DN 40 ISO-KF	PT 120 237 -T
Measurement system, DN 40 CF-R	PT 120 241 -T

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

Contact box

Cable socket for manufacturing the application-specific connecting cable

Seals with centering ring and filter

Filter available in different pore sizes to protect the measuring system against contamination in the event of potential contaminating applications ²⁾

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 ³⁾	PT 448 252 -T
Mating connector, 6 pole	B4707283MA
Centering ring with sintered metal filter, 20 µm pore size, FKM/stainless steel, DN 25 ISO-KF	PF 117 225 -T
Centering ring with sintered metal filter, 20 µm pore size, FKM/stainless steel, DN 40 ISO-KF	PF 117 240 -T

²⁾ Using a filter can falsify the pressure signal and result in a longer response time.

³⁾ Further cable lengths are available up to 100 m.

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. 11: Conversion table: Pressure units

	mbar l/s	Pa m ³ /s	sccm	Torr l/s	atm cm ³ /s
mbar l/s	1	0.1	59.2	0.75	0.987
Pa m ³ /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 ³ /s	1.01	0.101	59.8	0.76	1

Tbl. 12: Conversion table: Units for gas throughput

15.2 Technical data

Parameter	Value	
Measuring range (air, N ₂)	$5 \times 10^{-10} - 1000$ hPa	
Transition range (hot cathode - Pirani)	High (ex factory)	$5 \times 10^{-3} - 1 \times 10^{-2}$ hPa
	Low	$1 \times 10^{-3} - 2 \times 10^{-3}$ hPa
	Hard	Direct switchover
Start-up pressure (emission)	High (ex factory)	1.3×10^{-2} hPa
	Low	2.6×10^{-3} hPa
	Hard	4.0×10^{-4} hPa
Switch-off pressure (emission)	High (ex factory)	1.5×10^{-2} hPa
	Low	3.0×10^{-3} hPa
	Hard	5.2×10^{-4} hPa
Accuracy	$1 \times 10^{-8} - 10$ hPa	±10% of the measured value
	10 – 1000 hPa	±30% of the measured value
Repeatability	$1 \times 10^{-8} - 1 \times 10^{-2}$ hPa	±5% of the measured value
	$1 \times 10^{-2} - 10$ hPa	±2% of the measured value
Maximum pressure (absolute)	≤ 400 kPa, limited to inert gases and temperatures < 50 °C	
Measuring principle	Heat conduction according to Pirani and Bayard-Alpert	
Number of filaments	2	
Filament material	Iridium, Y ₂ O ₃ -coated	
Response time	50 ms	

Tbl. 13: Measured and pressure values

Parameter		Value
Pirani	HV	Automatic calibration by the hot cathode measuring circuit in the range of $<1 \times 10^{-5}$ hPa
	ATM	Calibrate by pressing the button at atmospheric pressure
	Zero point calibration	Calibrate by pressing the button at $\leq 5 \times 10^{-5}$ hPa

Tbl. 14: Calibration

Parameter	Value
Control input signal	0 V/24 V, PLC level, high active
Duration ⁴⁾	Max. 3 minutes, then automatic shutdown

Tbl. 15: Degas

Parameter	Value	
Output signal (measuring signal)	Voltage range	0 – 10.2 V
	Measuring range	0.774 – 10 V (5×10^{-10} hPa – 1000 hPa)
	Error signals	<0.5 V = Sensor error / electronic unit not fitted correctly
	Relation voltage-pressure	0.75 V/decade, logarithmic
	Underrange	$0.5 \text{ V} < U < 0.774 \text{ V}$
	Overrange	$10 \text{ V} < U \leq 10.2 \text{ V}$
	Load impedance (minimum load)	10 k Ω , short-circuit proof
Gauge identification	Resistance (Pin 1, $U_{\text{max}} = 4.25 \text{ V}$)	17.2 k Ω against supply ground
Emission current ⁵⁾	10 μA , 100 μA , 1 mA, 2 mA	
Supply voltage at gauge	20 – 30 V DC	
Power consumption	$\leq 9 \text{ W}$	
Connection (electrical)	Hirschmann GO 6 UM (6-pin, pins)	
Measurement cable (recommended)	5-pin, including shielding	
Cable length with recommended conductor cross section	$\leq 35 \text{ m}$ (0.25 mm ² / conductor) $> 35 \text{ m} - 50 \text{ m}$ (0.34 mm ² / conductor) $> 50 \text{ m} - 100 \text{ m}$ (1.0 mm ² / conductor)	
Grounding concept	(see chapter "Establishing electric connection", page 21)	
	Vacuum connection and supply ground	Galvanically connected
	Signal ground and supply ground	Routed separately; the current consumption is so high that only differential measurement is allowed.

Tbl. 16: Electrical data

Parameter	Value	
Internal volume	DN 25 ISO-KF	$\leq 17 \text{ cm}^3$
	DN 40 ISO-KF	$\leq 25 \text{ cm}^3$
	DN 40 CF-R	$\leq 29 \text{ cm}^3$

4) During the bake-out process, the gauge continues to provide measured values, however they may have slightly larger tolerance values than in normal use.

5) Depending on the pressure range

Parameter		Value
Weight	DN 25 ISO-KF	470 g
	DN 40 ISO-KF	470 g
	DN 40 CF-R	685 g

Tbl. 17: Internal volume and weight

Parameter	Value
Relative humidity of air	At temperatures up to +30 °C max. 80% At temperatures up to +40 °C max. 50% non-condensing
Mounting orientation	Arbitrary
Usage	Only in indoor areas
Installation altitude max.	2000 m NN
Protection degree	IP40

Tbl. 18: Ambient conditions

Parameter	Value
Operation	5 – +60 °C
Bake-out temperature, max. at the flange ⁶⁾	180 °C
Storage	-40 – +65 °C

Tbl. 19: Temperatures

Materials
Stainless steel, tungsten, iridium, yttrium oxide, nickel, glass, platinum

Tbl. 20: Substances in contact with the media

6) Voltage supply switched off

15.3 Dimensions

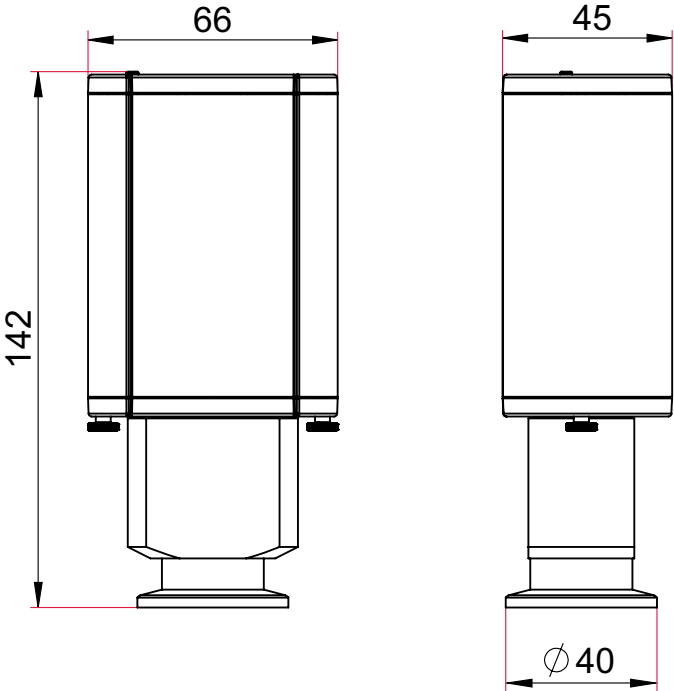


Fig. 14: Dimensions of DN 25 ISO-KF
Dimensions in mm

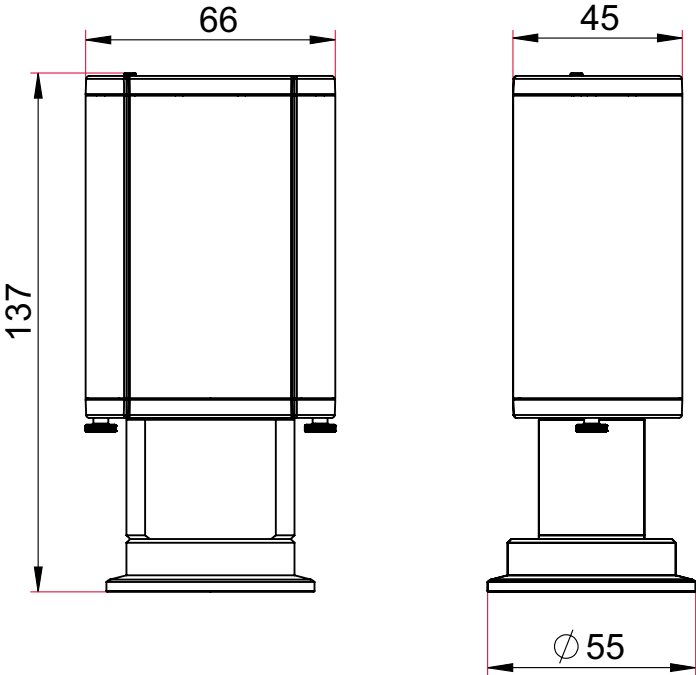


Fig. 15: Dimensions of DN 40 ISO-KF
Dimensions in mm

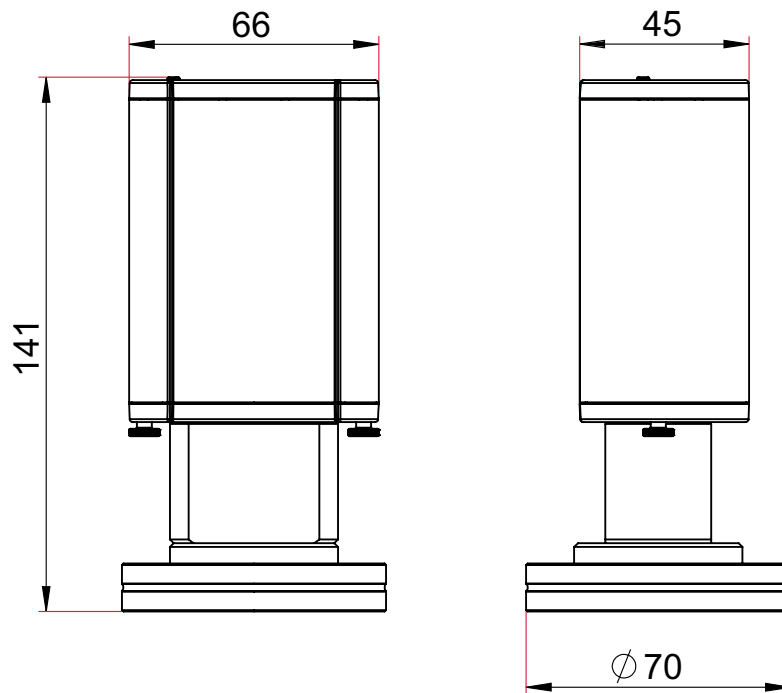


Fig. 16: Dimensions of DN 40 CF-R
Dimensions in mm

EC Declaration of Conformity

This declaration of conformity has been issued under the sole responsibility of the manufacturer.

Declaration for product(s) of the type:

Pirani/Bayard-Alpert gauge

PBR 360

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 IEC 61326-1:2022

DIN EN IEC 63000:2019

Signature:



(Daniel Sälzer)
Managing Director

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

Asslar, 2023-01-16



UK Declaration of Conformity

This declaration of conformity has been issued under the sole responsibility of the manufacturer.

Declaration for product(s) of the type:

Pirani/Bayard-Alpert gauge

PBR 360

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

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Applied standards and specifications:

EN IEC 61326-1:2021

EN IEC 63000:2018

The manufacturer's authorized representative in the United Kingdom and the authorized agent for compiling the technical documentation is Pfeiffer Vacuum Ltd, 16 Plover Close, Interchange Park, MK169PS Newport Pagnell.

Signature:



(Daniel Sälzer)
Managing Director

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

Asslar, 2023-01-16

**UK
CA**



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