



OPERATING INSTRUCTIONS

EN

Translation of the Original

CCR 351 | 352 | 353

Capacitive gauge

PFEIFFER  **VACUUM**

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.

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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
Declaration of conformity	A component of these instructions

Tbl. 1: Applicable documents

You can find this document in the [Pfeiffer Vacuum Download Center](#).

1.1.2 Variants

This document applies to products with the following article numbers:

Article number	Type	Connection	Measuring range min/max.
PT R27 559	CCR 351	4 VCO external thread	1×10^{-1} Torr/1000 Torr (FS)
PT R27 569	CCR 352		1×10^{-2} Torr/100 Torr (FS)
PT R27 579	CCR 353		1×10^{-3} Torr/10 Torr (FS)

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 product

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

	<p>Rating plate The rating plate is located on the side of the unit.</p>
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1.3.4 Abbreviations

Abbreviation	Explanation
AC	Alternating current (AC)
ATM	Atmosphere
c	Constant for converting measuring signal and pressure
DC	Direct current
EMC	Electromagnetic compatibility
FKM	Fluorinated rubber
FS	Measuring range max. (full scale)
GND	Ground
HV	High vacuum
LPS	Limited power source

Abbreviation	Explanation
MSL	Mean sea level
p	Pressure
PE	Protective earth (earthed conductor)
PELV	Protective extra low voltage
U	Measuring signal [V] (output voltage)
VCO	Trademark of the Swagelok Company

Tbl. 3: Abbreviations used

1.4 Trademark proof

- VCO® is a trademark of the Swagelok Company.

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	<p>Notes, tips or examples indicate important information about the product or about this document.</p>
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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 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.</p> <ul style="list-style-type: none"> ▶ Only connect the product to devices which meet the following criteria: <ul style="list-style-type: none"> • Requirements of the earthed protective extra-low voltage (PELV) • Limited power source (LPS) Class 2 ▶ Secure the line to the product. <ul style="list-style-type: none"> – Pfeiffer Vacuum measuring and control equipment complies with this requirement.

⚠ 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 earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective connection according to EN 61010.
 - VCO connections comply with this requirement.

⚠ WARNING**Risk of poisoning from toxic process gases escaping**

High mechanical, chemical, or thermal stress causes leaks in the sensor. In processes involving toxic process media, there is a risk of injury and danger to life from poisoning by escaping gas in the event of overpressure in the vacuum system.

- ▶ Prevent high mechanical, chemical, or thermal stress from occurring.
- ▶ Prevent overpressure from occurring in the vacuum system.
- ▶ Take appropriate measures to prevent hazards or damage caused by the release of process media, such as gas supply interruption, extraction, or leak testing.

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 Limits of use of product

Parameter	Value
Relative humidity of air	At temperatures up to +31°C max. 80% At temperatures up to +40°C max. 50%
Mounting orientation	Arbitrary
Usage	Only in indoor areas
Installation altitude max.	4000 m MSL

Parameter	Value
Degree of pollution	2
Protection degree	IP40

Tbl. 4: Permissible ambient conditions

2.5 Proper use

The gauge is used for vacuum measurement of gases within its defined measuring range.

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.

2.6 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

2.7 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.

2.8 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.

2.9 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.

2.9.1 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.

2.9.2 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

2.9.3 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](#).

2.10 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 limits of use.
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 in these operating instructions.
 - You can find information in the [Pfeiffer Vacuum service area](#).

3 Product description

3.1 Function

The gauge has a capacitive measuring element with a ceramic diaphragm. The pressure deflects the ceramic diaphragm. The gauge detects the deflection of the diaphragm as a change in the capacitance. The electronics convert the capacitance change to an output signal (DC). The output signal is linear with the pressure to be measured. The output pressure value is independent of the gas type to be measured.

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

The scope of delivery includes the following parts:

- Gauge (in clean room packaging)
- Stylus (Ø 1.1 mm)
- Calibration certificate
- 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 earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective connection according to EN 61010.
 - VCO connections comply with this requirement.

⚠ WARNING

Risk of poisoning from toxic process gases escaping

High mechanical, chemical, or thermal stress causes leaks in the sensor. In processes involving toxic process media, there is a risk of injury and danger to life from poisoning by escaping gas in the event of overpressure in the vacuum system.

- ▶ Prevent high mechanical, chemical, or thermal stress from occurring.
- ▶ Prevent overpressure from occurring in the vacuum system.
- ▶ Take appropriate measures to prevent hazards or damage caused by the release of process media, such as gas supply interruption, extraction, or leak testing.

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

Damage caused by vibrations

Vibrations and strikes destroy the ceramic sensor, which is sensitive to shocks.

- ▶ Treat the gauge carefully.
- ▶ Avoid vibrations and strikes.
- ▶ Do not drop the gauge.

Prerequisites

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

Recommendations

- ▶ 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.
- ▶ Mount the gauge in a horizontal to upright mounting orientation (flange facing downwards).
 - This prevents condensate and particles from accumulating in the measurement chamber.
- ▶ Ensure that the button of the gauge can be easily accessed with the stylus once fitted.

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 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.

Required tool

- Torque wrench (≤ 0.4 Nm)

Required materials

- Self-fabricated measurement cable for an evaluation unit provided by the customer

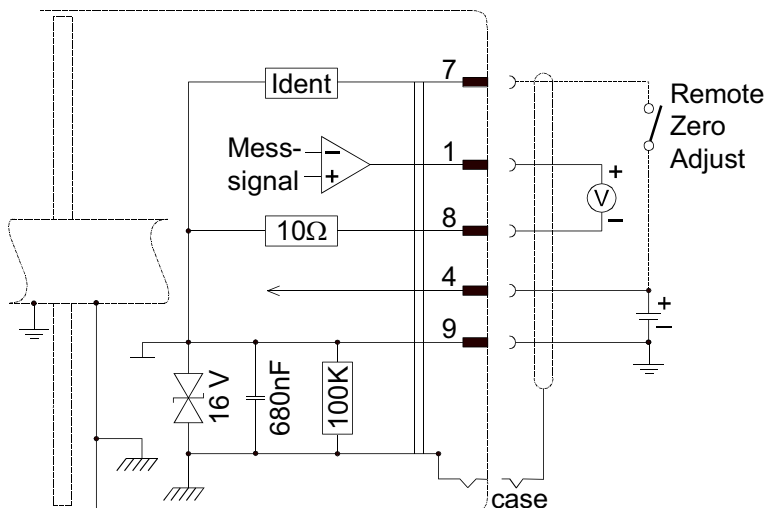


Fig. 1: Connection diagram

1	Measuring signal	7	Identification or remote zero adjust
2, 3	not connected	8	Signal ground
4	Supply	9	Supply ground (GND)
5, 6	not connected	case	Plug housing

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 and metallic connector housing.
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. Ensure that the potential difference for surge protection between the supply earth and the housing is ≤ 16 V.
6. Install the D-sub cable socket.

Establishing electric connection

1. Connect the measurement cable to the gauge.
2. Tighten the locking screw on the D-sub cable socket.
 - Tightening torque: $\leq 0.4 \text{ Nm}$
3. Connect the gauge to a Pfeiffer Vacuum total pressure measuring and control unit or an evaluation unit provided by the customer.

6 Operation

After switching on the supply voltage, the gauge is ready for operation. The measuring signal is independent of the gas type.

Recommendations

- ▶ On initial operation, perform zero point calibration.
- ▶ Allow a start-up time of at least 1 minute for general pressure measurements within the specifications.

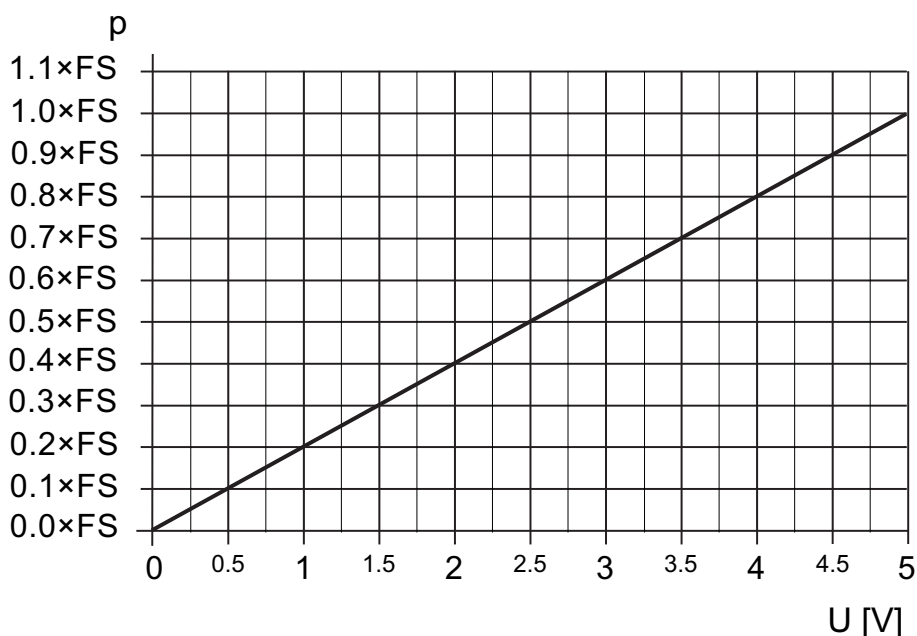


Fig. 2: Relation between measuring signal and pressure

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

Measuring signal (U)	Pressure (p)	Constant (c) ¹⁾
[V]	[Torr]	1.00
	[hPa]	1013.25/760 = 1.3332
	[mbar]	
	[Pa]	101325/760 = 133.3224

Tbl. 5: Constants for converting measuring signal and pressure

Converting measuring signal and pressure

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

$$p = (U/5 \text{ V}) \times c \text{ (FS)}$$

- ▶ Convert the pressure into the measuring signal:

$$U = (p \times 5 \text{ V})/c \text{ (FS)}$$

Example: Gauge with 10 Torr FS and 3 V measuring signal

$$p = (3 \text{ V}/5 \text{ V}) \times 10 \text{ Torr} = 0.6 \times 10 \text{ Torr} = \mathbf{6 \text{ Torr}}$$

1) Source: NPL (National Physical Laboratory) Guide to the Measurement of Pressure and Vacuum, ISBN 0904457x/1998

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 earthed vacuum chamber.
- ▶ Ensure that the connection complies with the requirements of a protective connection according to EN 61010.
 - VCO connections comply with this requirement.

⚠ 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.

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

Damage caused by vibrations

Vibrations and strikes destroy the ceramic sensor, which is sensitive to shocks.

- ▶ Treat the gauge carefully.
- ▶ Avoid vibrations and strikes.
- ▶ Do not drop the gauge.

Prerequisites

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

Removing gauge

1. Disconnect the measurement cable from the gauge.
2. Remove the gauge from the vacuum system.
3. Fit the protective cap on the connector.

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.



Warranty

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



First read through the sections completely

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

The gauge is maintenance-free in clean operating conditions. Long-term operation or contamination can lead to a zero point shift. A zero point shift necessitates recalibration.

8.1 Cleaning of 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.

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.

8.2 Calibrating gauge

Pfeiffer Vacuum calibrated the gauge ex factory in vertical upright position.

FS	Recommended final pressure
1000 Torr	< 5×10^{-2} torr < 7×10^{-2} hPa
100 Torr	< 5×10^{-3} torr < 7×10^{-3} hPa
10 Torr	< 5×10^{-4} torr < 7×10^{-4} hPa

Tbl. 6: Recommended final pressure for zero point calibration

i **Operation with a measurement instrument**

If you operate the gauge with a measurement instrument, zero adjustment must be carried out at the measurement instrument for the entire measuring system:
Calibrate the gauge first and then the measurement instrument.

i **Zero point calibration in case of excessive final pressure**

Zero point calibration at an excessive final pressure (> 25% of FS) means that you will not reach zero.

Required tools

- Stylus (max. \varnothing 1.1 mm)

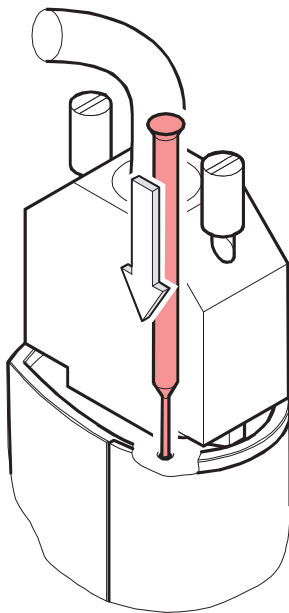


Fig. 3: Zero point calibration with button

Preparing for calibration

1. Ensure the same installation and ambient conditions as those applicable for normal use.
2. Check the filter for contamination as required.
3. Replace the filter if the filter is contaminated or damaged.
4. Put the gauge into operation.

Zero point calibration

1. If possible, commission the gauge in the subsequent mounting orientation.
2. Evacuate the gauge to the recommended final pressure.
3. Operate the gauge until the measured value is stable.
4. Using a stylus, briefly press the button.

Alternatively: Briefly apply the supply voltage to pin 7.

- Zero point calibration is performed automatically (duration \leq 8 seconds).

Following zero point calibration, the gauge automatically returns to measuring mode.

9 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.

10 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.

10.1 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

10.2 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.

11 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.

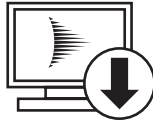
Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from original replacement parts to service contracts.

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.

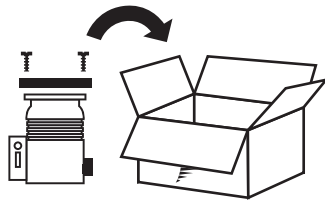


4. You will receive an acknowledgment from Pfeiffer Vacuum.

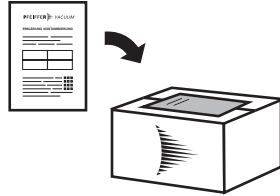
PFEIFFER VACUUM

Submission of contaminated products

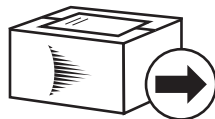
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination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



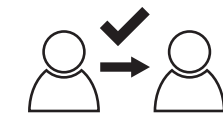
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
 - a) Neutralize the product with nitrogen or dry air.
 - b) Seal all openings with blind flanges, so that they are airtight.
 - c) Shrink-wrap the product in suitable protective foil.
 - d) Package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

12 Technical data and dimensions

12.1 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. 7: 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. 8: Conversion table: Units for gas throughput

12.2 Technical data

Parameter	Value	
Measuring range	CCR 351	1×10^{-1} Torr/1000 Torr (FS)
	CCR 352	1×10^{-2} Torr/100 Torr (FS)
	CCR 353	1×10^{-3} Torr/10 Torr (FS)
Maximum pressure (absolute)	≥ 500 Torr/mbar (FS)	400 kPa
	50 – 200 Torr/mbar (FS)	300 kPa
	10 – 30 Torr/mbar (FS)	200 kPa
Burst pressure (absolute)	600 kPa	
Gas type dependence	None	
Accuracy ²⁾	$\leq 0.5\%$ of the measured value	
Temperature influence on zero point	0.02% FS/ °C	
Temperature influence on range	0.02% of measured value/ °C	
Resolution	0.05% FS	
Gauge calibration	Button for zero point calibration Digital input for zero point calibration with an external switching contact (remote zero adjust)	

Tbl. 9: Measured and pressure values

2) Non-linearity, hysteresis, repeatable accuracy within calibrated range at 25 °C ambient temperature without influence of temperature after 2 hours of operation.

Parameter		Value
Output signal analog (measuring signal)	Voltage range	-0.2 – +5.12 V
	Measuring range	0 – +5 V
	Relation voltage-pressure	Linear
Output impedance		10 Ω (short-circuit proof)
Load impedance		>10 kΩ
Identification	Resistance R_{Ident}	Resistance 13.2 kΩ against supply earth
Response time		100 ms
Supply voltage	At gauge	+12 – +32 V DC ³⁾
	Ripple	≤50 mV _{pp}
Current consumption		<20 mA
Power consumption		≤0.3 W
External switching contact		30 V DC/<5 mA DC
	Pulse, impulse	>1 s – <5 s
Fuse (to be connected in series) ⁴⁾		1.25 AT (slow), automatic reset (Polyfuse)
Connection (electrical)		D-sub (9-pin, pins)
Measurement cable		9-pin, including shielding
Cable length ⁵⁾		≤100 m (0.14 mm ² / conductor)
Grounding concept	Vacuum connection and signal earth	Connected via 100 MΩ (voltage difference < 16 V)
	Supply earth and signal earth	routed separately for differential measurement (10 Ω)

Tbl. 10: Electrical data

Parameter	Value
Internal volume	≤6.1 cm ³
Weight	159 g

Tbl. 11: Internal volume and weight

Parameter	Value
Relative humidity of air	At temperatures up to +31°C max. 80% At temperatures up to +40°C max. 50%
Mounting orientation	Arbitrary
Usage	Only in indoor areas
Installation altitude max.	4000 m MSL
Degree of pollution	2
Protection degree	IP40

Tbl. 12: Ambient conditions

Parameter	Value
Operation	0 – +70 °C
Compensated temperature range	+10 – +50 °C

3) The gauge is protected against polarity reversal of the supply voltage.

4) Pfeiffer Vacuum measuring and control units comply with this requirement.

5) Larger conductor cross sections are required for longer cables.

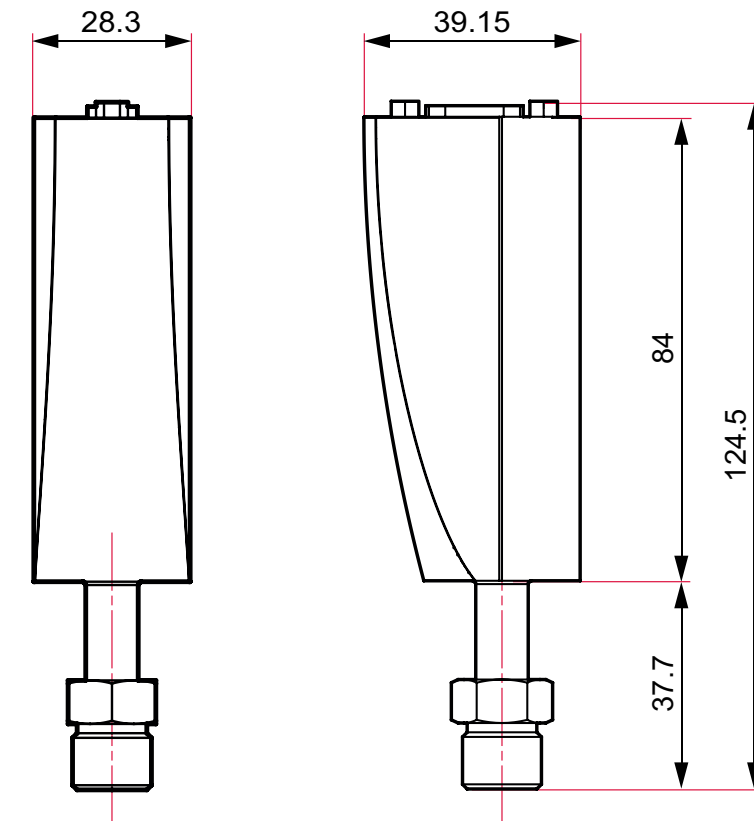
Parameter	Value
Bake out (not operational)	≤ 110 °C at flange
Storage	-20 – +85 °C

Tbl. 13: Temperatures

Parameter	Value
Flange, tube	Stainless steel AISI 316L
Sensor, feedthrough	Aluminum oxide ceramic ($\text{Al}_2\text{O}_3 \geq 99.5\%$)

Tbl. 14: Substances in contact with media

12.3 Dimensions



4 VCO
External Thread

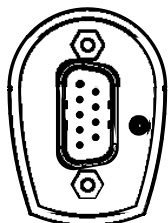


Fig. 4: Dimensions
Dimensions in mm

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:

Capacitive gauge

CCR 351

CCR 352

CCR 353

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 61000-6-2:2019

DIN EN IEC 61000-6-3:2022

DIN EN 61010-1:2020

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, 2023-04-17



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:

Capacitive gauge

CCR 351

CCR 352

CCR 353

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 61000-6-2:2019

EN IEC 61000-6-3:2021

EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019

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, 2023-04-17

**UK
CA**



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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Are you looking for a
perfect vacuum solution?
Please contact us

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