OPERATING INSTRUCTIONS

EN

Translation of the Original

IKT 010 | IKT 011

Cold cathode sensor for integrated pressure measurement

PFEIFFER VACUUM

Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new sensor is designed to support you in your individual application with full performance and without malfunctions. The name Pfeiffer Vacuum represents 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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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
TC “electronic drive unit” operating instructions	(depending on the device used)
HiPace "turbopump" operating instructions	(depending on the device used)
OmniControl “Control unit” operating instructions	PT 0670
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	Connection	Version
PT R72 100	KIT 010, DN 25 ISO-KF, 1.0 m cable	Molex	Low current
PT R73 100	KIT 011, DN 25 ISO-KF, 1.0 m cable		High current
PT R72 550	KIT 010, DN 25 ISO-KF, 0.5 m cable	AccessLink	Low current
PT R73 550	KIT 011, DN 25 ISO-KF, 0.5 m cable		High current

Tbl. 2: Variants

You can find the part number on the rating plate of the product.

Pfeiffer Vacuum reserves the right to make technical changes without prior notification.

The figures in this document are not to scale.

Dimensions are in mm unless stated otherwise.

1.2 Target group

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

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

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

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

The pictographs used in the document indicate useful information.

Note

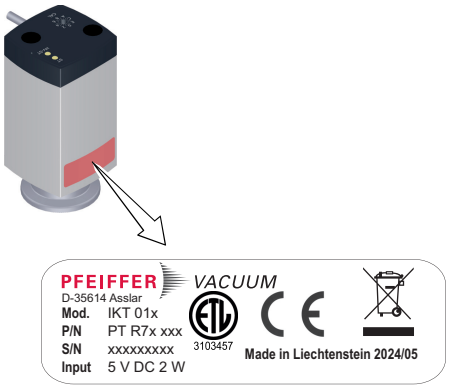
Tip

Wear laboratory gloves

Perform a visual inspection

1.3.3 Stickers on the product

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



Rating plate

The rating plate is located on the side of the sensor's electronic unit.

1.3.4 Abbreviations

Abbreviation	Explanation
ATM	Atmosphere
c	Constant for converting measuring signal and pressure
C	Correction factor for calculating the pressure of gases other than air
CAL	Calibration
EEPROM	Electrically erasable programmable read-only memory

Abbreviation	Explanation
HV	High vacuum
HV-ST	High vacuum status
LPS	Limited power source
MSL	Mean sea level
OR	Overrange
[P:000]	Electronic drive unit parameter with number
p	Pressure
PLC	Programmable logical controller
ST	Status
WAF	Width Across Flats
TC	Turbopump electronic drive unit (turbo controller)
U	Measuring signal [V] (output voltage)
UR	Underrange

Tbl. 3: Abbreviations used

1.4 Trademark proof

- HiPace® is a registered trademark of Pfeiffer Vacuum GmbH.
- Molex® is a registered trademark of Molex Incorporated, Lisle, Illinois, USA.

2 Safety

2.1 General safety information

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

⚠ DANGER

Immediately pending danger

Indicates an immediately pending danger that will result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ WARNING

Potential pending danger

Indicates a pending danger that could result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ CAUTION

Potential pending danger

Indicates a pending danger that could result in minor injuries if not observed.

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

Is used to highlight actions that are not associated with personal injury.

► Instructions to avoid damage to property

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

2.2 Safety instructions

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.

Risks during installation

⚠ DANGER

Risk to life due to electric shock

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

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

Risks during operation

⚠ 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.

⚠ 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

Risk to life due to electric shock

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

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

⚠ DANGER

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.

Duty to provide information on potential dangers

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

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

Infringement of conformity due to modifications to the product

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

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

General safety precautions when handling the product

- ► Observe all applicable safety and accident prevention regulations.
- ► Check that all safety measures are observed at regular intervals.
- ► Pass on safety instructions to all other users.
- ► Do not expose body parts to the vacuum.
- ► Always ensure a secure connection to the earthed conductor (PE).
- ► Never disconnect plug connections during operation.
- ► Observe the above shutdown procedures.
- ► Keep lines and cables away from hot surfaces (> 70 °C).

- ► Do not carry out your own conversions or modifications on the device.
- ► Observe the unit protection degree prior to installation or operation in other environments.
- ► Provide suitable touch protection, if the surface temperature exceeds 70 °C.
- ► Inform yourself about any contamination before starting work.

2.4 Limits of use of product

Parameter		Value
Relative humidity of air (for 30 days of the year)	1×10^{-8} – 1×10^{-2} hPa	≤ 70 % (non-condensing)
	1×10^{-7} – 1×10^{-2} hPa	≤ 95 % (non-condensing)
Mounting orientation		Arbitrary
Usage		Only in indoor areas
Installation altitude max.		6000 m MSL
Degree of pollution		2
Protection degree		IP40

Tbl. 4: Permissible ambient conditions

2.5 Proper use

The sensor is used for integrated pressure measurements on Pfeiffer Vacuum HiPace turbopumps throughout the permissible pressure range.

Use the product according to its intended purpose

1. Install, operate and maintain the sensor only as prescribed in these operating instructions.
2. Use the sensor only for the pressure measurement of air, inert gases and gas mixtures outside their explosion limits.
3. Connect the sensor with the corresponding connector.
4. Comply with the application limits.
5. 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 outdoors
- Use after technical changes (inside or outside on the product)
- Use with replacement or accessory parts that are not suitable or not approved

3 Product description

3.1 Function

The sensor has a cold cathode measuring system based on the principle of the inverted magnetron. The sensor outputs the measurement signal numerically.

3.2 Switch and status display

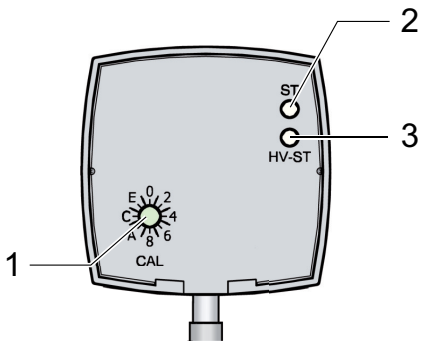


Fig. 1: Switch and LED

1 Switch for calibration value (CAL)
2 LED "ST" (supply voltage/error)
3 LED "HV-ST" (high voltage/cold cathode)

3.3 Identifying the product

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

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

3.4 Scope of delivery

The scope of delivery includes the following parts:

- Sensor with cable and power supply plug
- 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

Risk to life due to electric shock

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

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

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- ► 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

Electric flashover from helium

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

- ► Switch off the unit before carrying out a leak test.
- ► Dismantle the electronic unit before carrying out a leak test.

Prerequisites

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

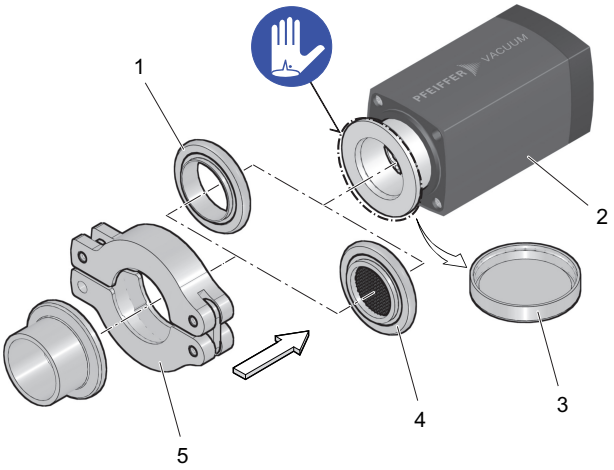

Fig. 2: Establishing vacuum connection

1 Seal with centering ring
2 Electronic unit
3 Protective cap
4 Seal with centering ring and filter
5 Tensioning piece

Recommendations

► Where possible, ensure that the sensor is not exposed to any vibrations during operation, as vibrations in general will lead to deviations in the measured values.
► Mount the sensor in a horizontal to upright mounting orientation (flange facing downwards).
  – This prevents condensate and particles from accumulating in the measurement chamber.
► Fit a seal with centering ring and filter for applications susceptible to pollution and to protect the measuring system against contamination.

Procedure

1. Remove the protective cap and store in a safe place.
2. Install the sensor on the high vacuum system, using vacuum components from the Pfeiffer Vacuum Components Shop.

5.2 Establishing electric connection

NOTICE

Property damage to the electronics or the sensor

Disconnecting the plug-and-socket connection with the voltage supply switched on may lead to the destruction of electronic components.

► Always interrupt the voltage supply before you plug in or unplug the sensor connection cable.

5.2.1 Connecting the sensor with TIC 010 to HiPace

Electronic drive unit operating instructions

Observe the information on the connection in the operating instructions for the electronic drive unit.

Assembly instructions for the TIC 010

Observe the information on assembly in the assembly instructions for the TIC 010.

The plug-in contacts of the adapter TIC 010 are numbered on its circuit board and correspond to parameters and output values in the further course. You can select the plug-in position of the sensor as desired.

Electronic drive unit	Firmware version (or higher)
TC 110	012500
TC 120	010300
TC 400	012400
TC 1200	012400
TM 700	010600

Tbl. 5: Electronic drive units and required firmware versions

Prerequisites

- Required firmware versions of the electronic drive unit are available
- All connectors are de-energized

Accessories required

- TIC 010, adapter for two sensors

Procedure

1. Connect the cable to the TIC 010 at the "PV.can" connector of the electronic drive unit.
2. Make the settings and perform the control via the interfaces of the electronic drive unit.

5.2.2 Connecting sensor with AccessLink

Vacuum pump operating instructions

Observe the information on the connection in the operating instructions for the vacuum pump.

Prerequisite

- All connectors are de-energized

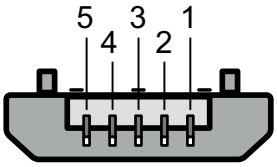

Fig. 3: AccessLink connector (micro USB, type B)

1 + 5 V (blue)
2 Sensor RxD / host TxD (white)
3 Sensor TxD / host RxD (green)
4 Not connected (red)
5 GND (black)

Procedure

1. Connect the cable to a free AccessLink of the vacuum pump.
2. Make the settings and perform the control via the interfaces of the electronic drive unit.

6 Operation

The connected sensor unit is ready for operation as soon as the supply voltage is supplied to the electronic drive unit.

LED		Meaning
"ST"	"HV-ST"	
Off	Off	No power supply
Lights up yellow	Off	Supply voltage OK, cold cathode off
Lights up yellow	Flashes green	Supply voltage OK, pressure in cold cathode range, cold cathode not ignited
Lights up green	Lights up green	Cold cathode ignited
Flashes red	Off	EEPROM error
Lights up yellow	Lights up green	Measuring range not reached or exceeded
Lights up red	Off	Unstable supply voltage

Tbl. 6: Illuminating diodes

Signal evaluation via output interfaces

The output interfaces of the electronic drive unit with the applicable Pfeiffer Vacuum protocol and the Pfeiffer Vacuum parameter set are used to operate the connected accessory devices on a Pfeiffer Vacuum vacuum pump.

See the valid operating instructions for the electronic drive unit used.

6.1 Determining effective pressure with correction factors

The measuring signal is gas type-dependent. The characteristics apply for nitrogen (N_2), oxygen (O_2), dry air and carbon monoxide (CO).

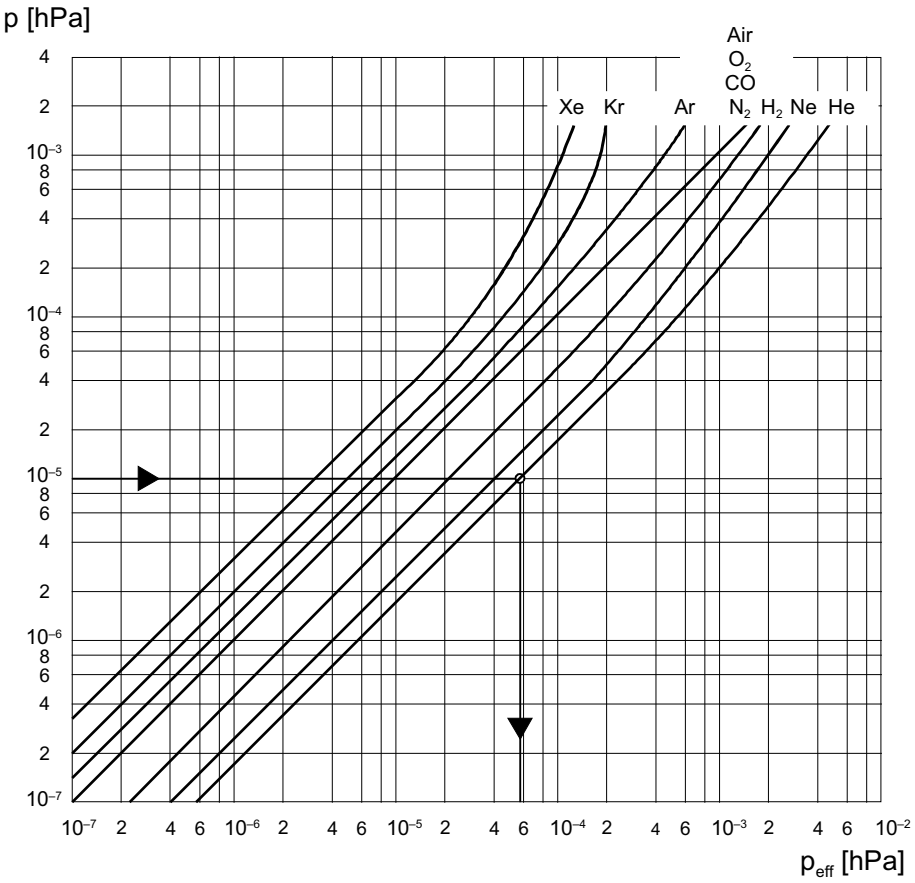

Fig. 4: Displayed pressure

In the pressure range < 10^{-5} 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)
Air, oxygen (O_2), carbon monoxide (CO), nitrogen (N_2)	1.0
Hydrogen (H_2)	2.4
Helium (He)	5.9
Neon (Ne)	4.1
Argon (Ar)	0.8
Krypton (Kr)	0.5
Xenon (Xe)	0.4
The correction factors provided are mean values.	

Tbl. 7: Correction factor for pressure range < 10^{-5} hPa

Set correction factor at electronic drive unit

► Use **[P:742]** to enter correction factor and correct displayed measured value.

Calculating pressure for gases other than air

► Calculate the effective pressure using the following formula:

$P_{eff} = C \times p$

- P_{eff} = Effective pressure
- **C** = Correction factor
- **p** = Displayed pressure (sensor calibrated for air)

6.2 Ignition delay

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

- 1×10^{-5} to 1×10^{-2} hPa < 1 second
- 1×10^{-7} to 1×10^{-5} hPa < 20 seconds
- 5×10^{-9} to 1×10^{-7} hPa < 2 minutes
- < 5×10^{-9} hPa < 20 minutes

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

6.3 Pollution

Warranty

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

Contamination of the sensor is dependent upon

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

Continuous operation in the range between 10^{-4} hPa and 10^{-2} hPa can lead to major contamination, and thus to reduced service life and shorter maintenance intervals.

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

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

Influencing the degree of contamination

It is possible to influence the level of contamination to a certain extent. Particular care should be taken in the case of vapors that deposit in the plasma (e.g. of the cold cathode measuring system).

► Implement geometric safety measures (screening sheets, bends) for particles propagated in a straight line.
► Choose a flange position in which the partial pressure of the contamination is at a minimum.
► Switch off the sensor when depositing vapors are present,

or

Seal off the sensor by means of a valve when depositing vapors are present.

7 Removal

⚠ DANGER

Risk to life due to electric shock

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

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

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ WARNING

Risk of injury resulting from overpressure in the vacuum system

Opening tensioning pieces with an overpressure **> 1000 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.

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
- Voltage supply interrupted

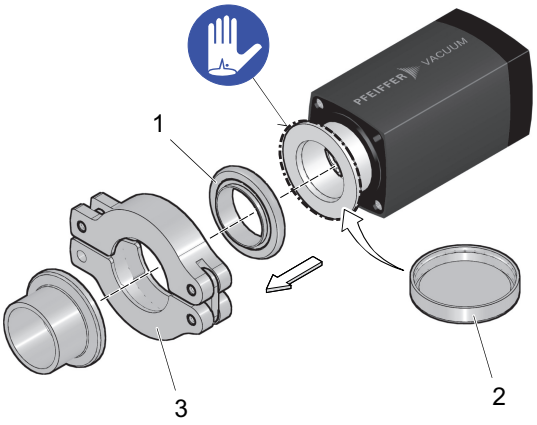

Fig. 5: Removing the sensor

1 Seal with centering ring
2 Protective cap
3 Tensioning piece

Removing the sensor

1. Disconnect the sensor cable from the turbopump's electronic drive unit.
2. Remove the sensor from the vacuum system.
3. Fit the protective cap on the connection flange.

8 Maintenance

⚠ WARNING

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- ► 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.

8.1 Sensor maintenance

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

Replacing faulty components

- ► Replace the ionization chamber and the ignition aid or the complete measurement chamber (replacement sensor) only if the unit is faulty.
- ► Replace the complete measurement chamber if heavily contaminated or faulty.

8.2 Disassembling the sensor

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.

Prerequisite

- Sensor removed from vacuum system

Required tools

- Allen key, **WAF 2**
- Pincers for circlip
- Tweezers

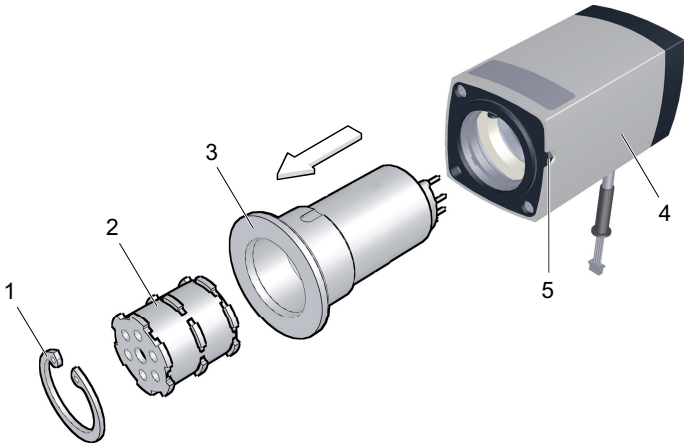


Fig. 6: Disassembling the sensor

1 Circlip
2 Ionization chamber
3 Measurement chamber
4 Electronic unit
5 Grub screw

Disassembling the sensor

1. Loosen the grub screw on the side of the electronic unit.
2. Remove the complete measurement chamber from the electronic unit.
3. Removing the circlip.
4. Remove the ionization chamber from the measurement chamber.

8.3 Replacing the ignition aid

NOTICE

Impairment from contamination and damage

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

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

Required tools

- Mounting tool for the ignition aid
- Tweezers

Spare part required

- Ignition aid

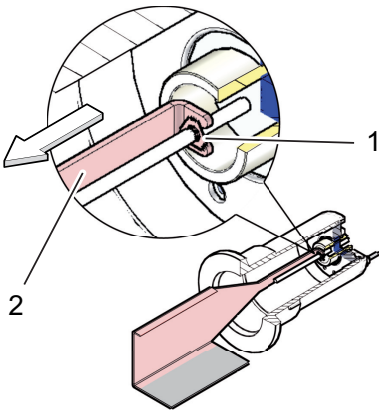


Fig. 7: Removing the ignition aid

1 Ignition aid 2 Mounting tool

Removing the ignition aid

- ► Remove the ignition aid.

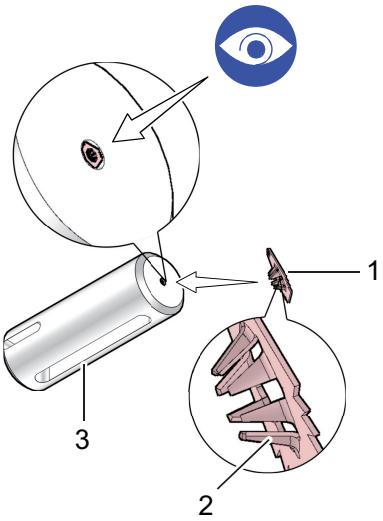


Fig. 8: Inserting the ignition aid in the mounting tool

1 Ignition aid
2 Serrated end of ignition aid
3 Mounting tool

Inserting the ignition aid in the mounting tool

1. Insert the new ignition aid in the mounting tool.
2. Ensure correct position of the ignition aid (serrated end at the bottom).

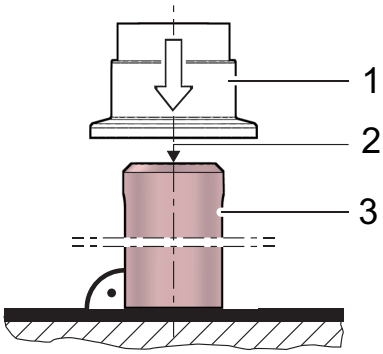


Fig. 9: Inserting the ignition aid

1 Measurement chamber (with anode)
2 Ignition aid
3 Mounting tool

Inserting the ignition aid

► Carefully push the measurement chamber with anode (either new or cleaned) into the mounting tool, centrally and parallel to the tool axis up to the stop.

8.4 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.

Prerequisite

- Sensor disassembled as required

Required tool

- Tweezers

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.

Check components for contamination

1. Check the ionization chamber for contamination.
2. Check the measurement chamber for contamination.
3. Check the ignition aid for contamination.
4. Replace the ionization chamber if only the ionization chamber is contaminated.
5. Replace the complete measurement chamber if the measurement chamber is heavily contaminated.
6. Replace the ignition aid if the ignition aid is contaminated.

Cleaning of components

1. Remove the old ignition aid.
2. Only perform work on the sealing surfaces concentrically.
3. With the polishing cloth, rub the inside walls of the measurement chamber up to the groove of the circlip until shiny.
4. Insert a new ignition aid.
5. Re-install the sensor.

8.5 Install sensor

⚠ DANGER

Risk to life due to electric shock

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

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

NOTICE

Impairment from contamination and damage

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

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

NOTICE

Electric flashover from helium

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

- ► Switch off the unit before carrying out a leak test.
- ► Dismantle the electronic unit before carrying out a leak test.

The complete measurement chamber (replacement sensor) is preassembled.

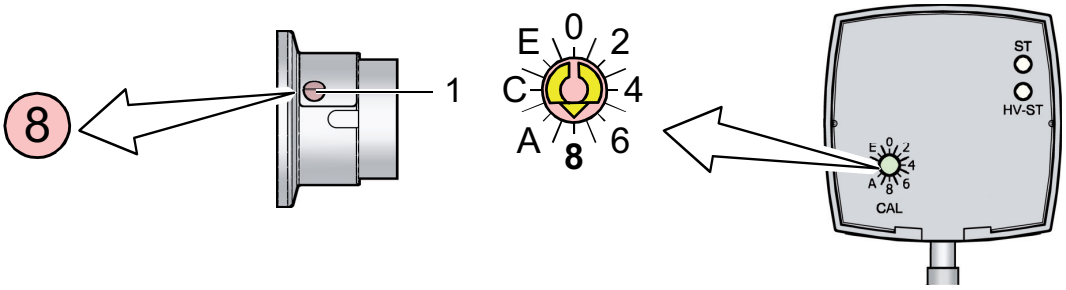


Fig. 10: Switch for CAL calibration value

1 Sticker for calibration value of replacement sensor

Setting the calibration value of the replacement sensor

- ► Set the calibration value for the replacement sensor at the switch for the calibration value (CAL) of the electronic unit.

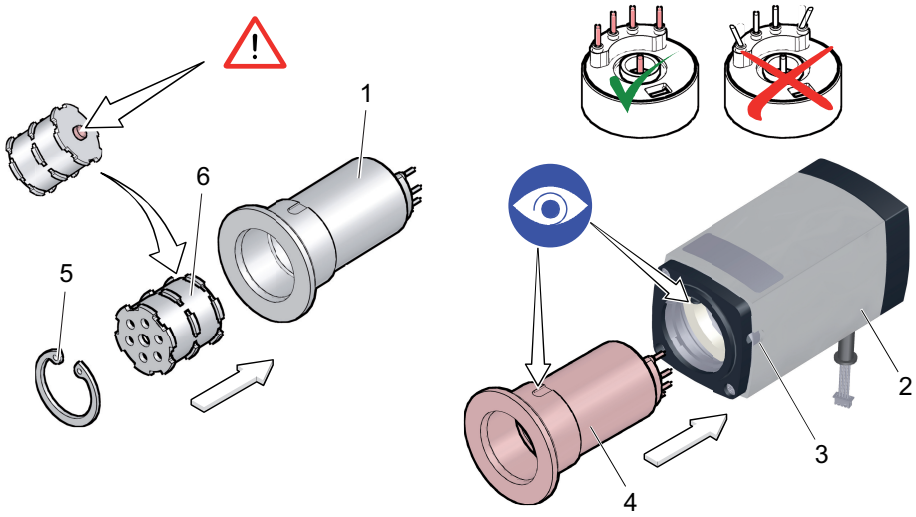


Fig. 11: Install sensor

1	Measurement chamber	4	Measurement chamber (complete)
2	Electronic unit	5	Circlip
3	Grub screw	6	Ionization chamber

Required tools

- Allen key, **WAF 2**
- Pincers for circlip
- Tweezers

Installing the sensor

1. Observe arrangement of the ionization chamber.
2. Push the ionization chamber into the measurement chamber up to the mechanical stop.
3. Fit the circlip.
4. Push the complete measurement chamber into the electronic unit up to the mechanical stop.
5. Ensure in this regard that the pins remain straight.
6. Secure the grub screw on the side of the electronic unit.
7. Perform a leak test on the measurement chamber where possible.
   – Leakage rate < 10^{-9} hPa l/s

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.

9.1 Troubleshooting

Disturbance	LED "ST"	LED "HV-ST"	Possible cause	Remedy
No communication via digital interface	Off		No supply	1. Check the sensor connection. 2. Establish the supply voltage.
Unstable measured value	Lights up green		Sensor contaminated	• Replace the ionization chamber. • Replace the complete measurement chamber.
Measured value "999999" (overrange)	Lights up yellow	Off	No high voltage in the measurement chamber	Switch on the high voltage via **[P:041]**.
			Overpressure in the measurement chamber	1. Evacuate at < 1 × 10^{-2} hPa 2. Switch off the sensor via the interface, wait 5 seconds, and then switch it back on (reset).
	Flashes red	Off	EEPROM error	Switch off the sensor via the interface, wait 5 seconds, and then switch it back on (reset).
				Replace the sensor.
Measured value "000000" (underrange)	Lights up yellow	Flashes green	Gas discharge has not ignited	Wait until the gas discharge ignites (approx. 5 minutes at a pressure of 10^{-9} hPa).
Measured value constant at approx. 5 × 10^{-4} hPa.	Lights up green		Measurement chamber heavily contaminated	Replace the complete measurement chamber.

Tbl. 8: Malfunctions

9.2 Identifying errors at measurement chamber

If you are fairly certain of the cause of a measurement chamber error, you can carry out an approximate diagnosis using an ohmmeter. Venting of the vacuum system is not necessary.

Prerequisite

- Electronic unit removed

Instrument required

- Ohmmeter

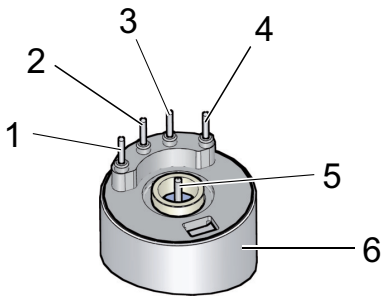


Fig. 12: Contact pins of the measurement chamber

1 – 5 Contact pin 6 Measurement chamber

Measurement between	Setpoint range	Causes of values being outside of setpoint range
5 and 6	∞	Value <<∞: contamination, short circuiting of cold cathode

Tbl. 9: Measurement

Performing a resistance test

1. Perform the measurements at the contact pins of the measurement chamber using an ohmmeter.
2. Replace the complete measurement chamber if the measured value is outside of the setpoint range.

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 sensors

Pfeiffer Vacuum sensors 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

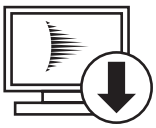
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

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 section.

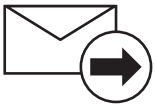
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



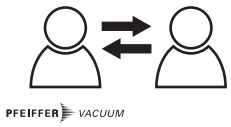
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

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.

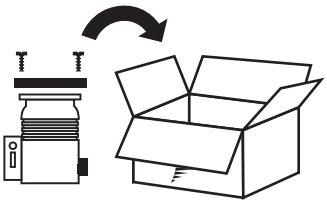


3. Send the forms by email, fax, or post to your local Service Center.

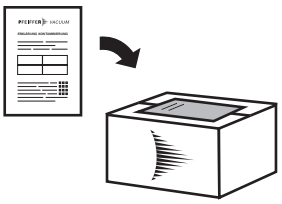


4. You will receive an acknowledgment from Pfeiffer Vacuum.

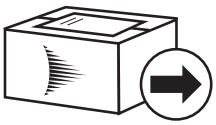
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree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



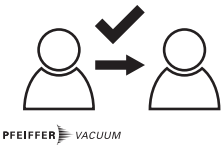
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product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

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

13 Spare parts

Ordering spare parts

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

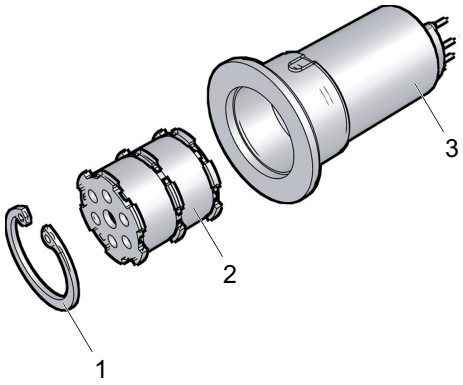


Fig. 13: Complete measurement chamber (replacement sensor)

1 Circlip
2 Ionization chamber
3 Measurement chamber

Description		Order number
Ignition aid set (10 x)		BN 845 995 -T
Mounting tool for ignition aid		PT 120 316 -T
Ionization chamber (titanium, stainless steel)	IKT 010	PT 120 313 -T
Ionization chamber (stainless steel)	IKT 011	PT 120 312 -T
Complete measurement chamber	IKT 010	PT 120 320 -T
	IKT 011	PT 120 300 -T

Tbl. 10: Spare parts

14 Accessories

View the range of accessories for hybrid-bearing HiPace turbopumps (pressure sensors) on our website.

View the range of accessories for magnetically levitated HiPace turbopumps (pressure sensors) on our website.

14.1 Accessory information

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

14.2 Ordering accessories

Description	Order number
Centering ring with sintered metal filter, 0,02 mm pore size, FKM/stainless steel, DN 25 ISO-KF	PF 117 225 -T

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 Pa = 1 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)	5×10^{-8} – 1×10^{-2} hPa
Maximum pressure (absolute)	10 000 hPa, limited to inert gases
Burst pressure (absolute)	> 13 000 hPa
Measuring principle	Cold cathode
Accuracy (N_2)	30 % of the measured value
Repeatability (N_2)	5 % of the measured value

Tbl. 13: Measured and pressure values

Parameter		Value
Response time		pressure-dependent
	p > 10^{-6} hPa	< 100 ms
	p = 10^{-6} – 10^{-8} hPa	approx. 1 s
Supply voltage		Class 2/LPS
	on sensor	+ 5 V DC (± 5%)
	Ripple	max. 0.1 V_{pp}
Ignition voltage (in the measurement chamber)		≤ 4.5 kV
Operating voltage (in the measurement chamber)		≤ 3.3 kV
Operating current (in the measurement chamber)	IKT 010	Low current
	IKT 011	High current
Power consumption		≤ 2 W
Fuse (to be connected in series)		≤ 1 AT

Parameter		Value
Connection (electrical)	PT R7x 0xx PT R7x 1xx	Molex PicoBlade, 4-pin, screened (cable with suitable plug for TIC 010)
	PT R7x 5xx	AccessLink plug (Cable with suitable plug for HiPace Neo)
Cable length (l)	PT R7x 05x PT R7x 55x	0.5 m
	PT R7x 100	1 m
	PT R7x 150	1.5 m
Grounding concept	Vacuum connection and signal ground	connected with 10 kΩ (potential difference ≤ 16 V)

Tbl. 14: Electrical data

Parameter	Value
Internal volume	approx. 19.9 cm^3
Weight	< 280 g

Tbl. 15: Internal volume and weight

Parameter		Value
Relative humidity of air (for 30 days of the year)	1×10^{-8} – 1×10^{-2} hPa	≤ 70 % (non-condensing)
	1×10^{-7} – 1×10^{-2} hPa	≤ 95 % (non-condensing)
Mounting orientation		Arbitrary
Usage		Only in indoor areas
Installation altitude max.		6000 m MSL
Degree of pollution		2
Protection degree		IP40

Tbl. 16: Ambient conditions

Parameter	Value
Operation	5 – 55 °C
Storage	-40 – +70 °C
Bake out	≤ 150 °C [1)]

Tbl. 17: Temperatures

Parameter	Value
Flange	Stainless steel (1.4435)
Measurement chamber	Stainless steel (1.4435)
Feedthrough (insulation)	Ceramic (Al_2O_3), glass
Feedthrough (ring)	Stainless steel (1.4435)
Feedthrough (anode)	Molybdenum (Mo)
Feedthrough (pin)	Nickel alloy (Ni)

1) Without electronic unit

Parameter	Value
Ionization chamber	IKT 010: Titanium, stainless steel (1.4016)
	IKT 011: Stainless steel (1.4301, 1.4016)
Ignition aid	Stainless steel (1.4310)

Tbl. 18: Substances in contact with media

15.3 Dimensions

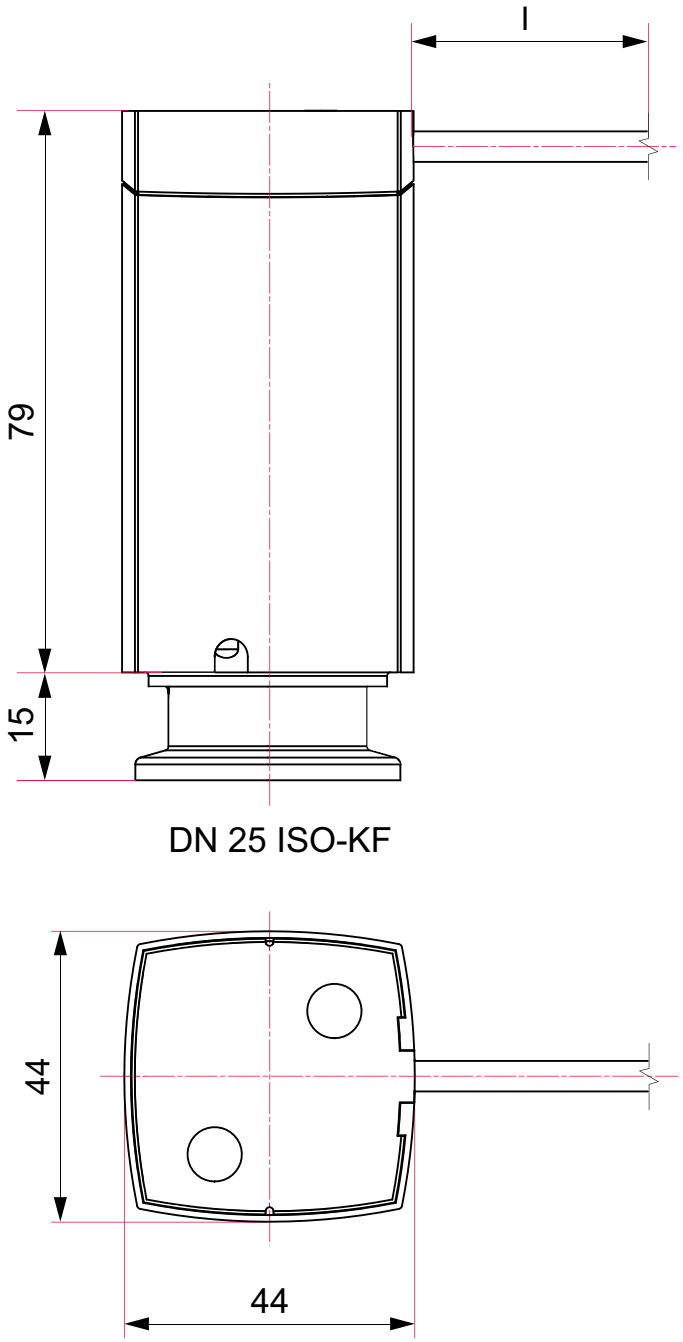


Fig. 14: Dimensions

Dimensions in mm.

l Connecting cable length

3103457

The products IKT 010 and IKT 011

- conform to the UL standard
  UL 61010-1:2012.
- are certified to the CAN/CSA standard
  CAN/CSA C22.2 No. 61010-1-12.

PFEIFFER VACUUM

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:

Cold cathode sensor

IKT 010

IKT 011

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:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2023-02-22

CE

PFEIFFER VACUUM

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:

Cold cathode sensor

IKT 010

IKT 011

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:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2023-02-22

UK CA

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