OPERATING INSTRUCTIONS

EN

Translation of the Original

GSD 350 OMNISTAR/THERMOSTAR

Gas analysis system

PFEIFFER VACUUM

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Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new gas analysis system is designed to support you in your individual application with full 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
"GSD 350 OmniStar/ThermoStar" operating instructions Operation via web interface and PV MassSpec	DA 0106
"Quadrupole mass spectrometer" operating instructions QMG 250 PrismaPro	BG 6001
"Quadrupole mass spectrometer" quick start guide QMG 250 PrismaPro	BG 6003
"Diaphragm pump" operating instructions MVP 010-3 DC	PU 0071
"Turbopump" operating instructions HiPace 80	PT 0208
"Turbopump" supplementary information SplitFlow 80	PT 0635
“Electronic drive unit” operating instructions TC 110	PT 0204
"Total pressure gauge" operating instructions DigiLine Pirani/ Cold cathode gauge MPT 200 AR	PG 0025
"Analog Relay" supplementary information DigiLine Gauge	PG 0029
"Mini angle valve" operating instructions [1)] EVI 005 M	BP 5120
“Venting valve” operating instructions	PT 0228
"Sealing gas valve" operating instructions [2)]	PT 0229
Software documentation PV MassSpec	(Part of the software)
Safety data sheet [3)] Perfluorotributylamine (PFTBA)	-
"Pressure monitoring" operating instructions [4)]	-
Declaration of conformity	(Component of these instructions)

Tbl. 1: Applicable documents

You can find these documents in the Pfeiffer Vacuum Download Center.

1) only for version with calibration unit
2) only for corrosive gas version
3) only for version with calibration unit
4) only for corrosive gas version

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1.1.2 Variants

This document applies to products with the following part numbers:

Variant	Version	Analyzer with filament	Gas inlet	Mass range	Display
PT Q8 = OmniStar	**0** = Standard GSD 350 O **1** = Corrosive gas GSD 350 O C	**1** = Ir-Y_2O_3 (calibration unit) **2** = Ir-Y_2O_3 **5** = W (calibration unit) **6** = W	**161** = Stainless steel / without capillary tube	**1** = 100 u **2** = 200 u **3** = 300 u	**0** = yes **1** = no
			171 = Stainless steel / 1 m / heating 200 °C		
			172 = Stainless steel / 2 m / heating 200 °C		
			173 = Stainless steel / 1 m / heating 350 °C		
PT Q9 = ThermoStar	**0** = Standard GSD 350 T **1** = Corrosive gas GSD 350 T C	**1** = Ir-Y_2O_3 (calibration unit) **2** = Ir-Y_2O_3 **5** = W (calibration unit) **6** = W	**101** = Quartz / without capillary tube	**1** = 100 u **2** = 200 u **3** = 300 u	**0** = yes **1** = no
			111 = Quartz / 1 m / heating 200 °C		
			112 = Quartz / 2 m / heating 200 °C		
			113 = Quartz / 1 m / heating 350 °C		

Tbl. 2: Variants

Breakdown based on the example of part number PT Q80 217 110

- OmniStar version
- Standard version
- Analyzer with filament made of Ir-Y_2O_3, without calibration unit
- Gas inlet with 1 m stainless steel capillary and heating up to 200 °C
- Mass range up to 100 u
- Version with display

Feature	OmniStar	ThermoStar
Capillary	Stainless steel (OD = 1/16", ID = 0.15 mm)	Quartz (OD 0.23 mm, ID = 0.15 mm)
Gas inlet screen	Platinum/Iridium	Platinum/Iridium
Gas inlet	Controlled by 2 valves	Continuously open
Options	• Heating to 200 °C or 350 °C • Corrosive gas version with sealing gas connection • Calibration unit for calibrating the mass scale (Calibration medium for mass calibration: PFTBA)	

Tbl. 3: Features of 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

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

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

The pictographs used in the document indicate useful information.


Note

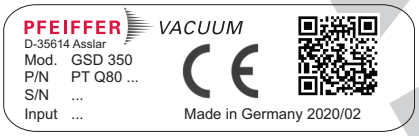

Tip


Wear laboratory gloves


Perform a visual inspection

1.3.3 Stickers on the product

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

	**Rating plate (example)** Rating plate of the unit.
	**Warning hot surface** This sticker warns of injuries caused by high temperatures in case of touching without protection during operation.

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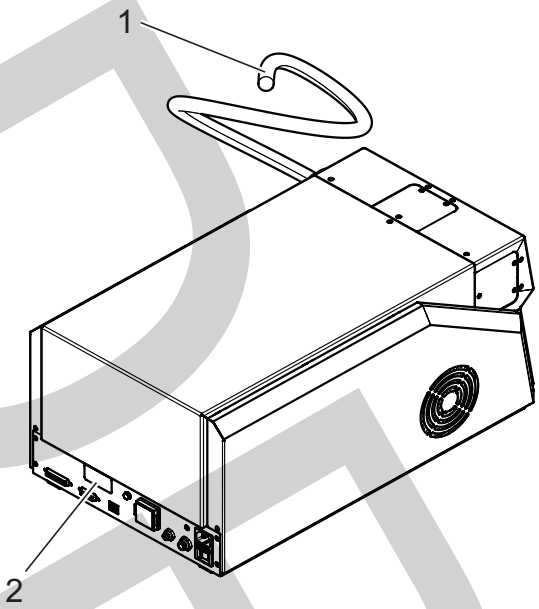

Fig. 1: Position of the stickers on the product

1 "Warning hot surface" sticker 2 Rating plate

1.3.4 Abbreviations

Abbreviation	Explanation
AD	External diameter
AI	Analog input
AO	Analog output
ATEX	Areas with a risk of explosive atmosphere (atmosphères explosibles)
C/B	Cross beam (ion source type)
DCU	Display and Control Unit
DHCP	Communication protocol for assigning the network configuration (Dynamic Host Communication Protocol)
DI	Digital input
DO	Digital output
EM	Electron multiplier
EPDM	Ethylenepropylene diene-monomer rubber, M group
FIL	Filament
FKM	Fluorinated rubber
ID	Internal diameter
IP	Intenet Protocol
IQS	Standard for plug-and-socket connections in vacuum technology
Ir-Y_2O_3	Yttrium oxide (Y_2O_3) coated iridium (Ir)
NBR	Nitrile butadiene rubber
MSL	Mean sea level
PA	Polyamide
PE	Polyethylene
PID	Proportional-integral derivative
PV	Pfeiffer Vacuum
PVC	Polyvinyl chloride (PVC)
PFTBA	Colorless liquid for mass calibration (perfluortributylamine)
PoE	Power over Ethernet

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Abbreviation	Explanation
PWM	Type of modulation (pulse width modulation) in which one technical variable, e.g. the electrical voltage, changes between 2 values.
PTFE	Polymer of fluorine and carbon (polytetrafluorethylene)
RJ-45	Standardized plug-and-socket connection for telecommunication cabling (registered jack)
sccm	Standard cubic centimeters per minute as a unit of a defined gas volume flow per unit of time under standard conditions
slpm	Standard liters per minute as a unit of a defined gas volume flow per unit of time under standard conditions
VLAN	Virtual local area network
W	Tungsten

Tbl. 4: Abbreviations used

1.4 Trademark proof

- Windows® and Internet Explorer® are trademarks of Microsoft Corporation.
- OmniStar®, ThermoStar® and PrismaPro® are trademarks of Pfeiffer Vacuum GmbH.
- Swagelok® is a registered trade name of Swagelok Company.

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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's 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 transport

⚠ WARNING

Danger of serious injury due to falling objects

Due to falling objects there is a risk of injuries to limbs through to broken bones.

► Take particular care and pay special attention when transporting products manually.
► Do not stack the products.
► Wear protective equipment, e.g. safety shoes.

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⚠ WARNING

Danger of injury due to lifting heavy loads

The product is heavy; it weighs up to 26 kg depending on the version. If one person lifts the product incorrectly without help, this will lead to injuries.

- ► Always use 2 persons to lift the product with two hands.
- ► Take all necessary safety precautions (e.g. wear work gloves).
- ► Observe local regulations.
- ► Comply with the instructions for safe transport.

Risks during installation

⚠ DANGER

Danger to life from electric shock

Inadequate or incorrect grounding of the unit leads to contact-sensitive voltage on the housing. When making contact, increased leakage currents will cause a life-threatening electric shock.

- ► Before the installation, check that the connection leads are voltage-free.
- ► Conduct the electrical connection in accordance with locally applicable regulations.
- ► Make sure that the local mains voltage and frequency match rating plate specifications.
- ► Make sure that the mains cable and extension cable meet the requirements for double isolation between input voltage and output voltage, in accordance with IEC 61010 and IEC 60950.
- ► Use only a 3-pin mains cable and extension cable with properly connected protective earthing (earthed conductor).
- ► Plug the mains plug into a socket with earthing contact only.
- ► Always connect the mains cable prior to all other cables, to ensure continuous protective earthing.

⚠ DANGER

Electric shock due to missing internal earthed conductor

The internal earthed conductor is fastened to the housing. A device without an internal earthed conductor attached can be life-threatening in the event of a malfunction.

- ► Do not rotate or loosen the internal earthed conductor.

Risks during operation

⚠ DANGER

Electric shocks due to moisture penetrating into the device

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

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

⚠ WARNING

Danger of burns on hot surfaces

During operation high temperatures (> 50 °C) occur on touchable surfaces of the heating components and the gas inlet. There is a risk of burning.

- ► Secure hot parts against inadvertent touching.
- ► Display warning signs.
- ► Make sure that the product has cooled down before performing work.
- ► Wear protective gloves (in accordance with EN 420).

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⚠ WARNING

Danger of poisoning due to toxic process media escaping from the exhaust pipe

During operation with no exhaust line, the vacuum pump allows exhaust gases and vapors to escape freely into the air. There is a risk of injury and fatality due to poisoning in processes with toxic process media.

- ► Observe the pertinent regulations for handling toxic process media.
- ► Safely purge toxic process media via an exhaust line.
- ► Use appropriate filter equipment to separate toxic process media.

⚠ CAUTION

Health risks and environmental damage due to the process gases used

Gases used (process gases) represent a health risk and damage to the environment.

- ► Check the leak tightness of the connections before introducing the process gas.
- ► Make sure that the exhaust gas system is suitable for the gases supplied.
- ► Consider potential interactions between the materials and process gases.
- ► When handling the gases used, observe the applicable guidelines.
- ► Observe the protective measures.

Risks during maintenance

⚠ DANGER

Danger to life due to electric voltage

High voltages are present inside the device. When touching parts that are live, there is a risk of death. If there is visible damage, there is a risk of death when commissioning the device.

- ► Work on the open device must only be carried out by trained specialist personnel.
- ► Before carrying out any installation and maintenance work, switch the device off and disconnect it from the current supply.
- ► Never open the device with the current supply connected.
- ► Secure the current supply against unauthorized or unintentional reactivation.
- ► Never operate an open or defective device.
- ► Secure a defective device against accidental operation.
- ► Protect the device against moisture.

⚠ WARNING

Danger of burns on hot surfaces

During operation high temperatures (> 50 °C) occur on touchable surfaces of the heating components and the gas inlet. There is a risk of burning.

- ► Secure hot parts against inadvertent touching.
- ► Display warning signs.
- ► Make sure that the product has cooled down before performing work.
- ► Wear protective gloves (in accordance with EN 420).

⚠ WARNING

Health hazards due to cleaning agent

The cleaning agents used cause health hazards.

- ► 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.

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⚠ 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.

⚠ CAUTION

Risk of injury due to splintering of the quartz capillary

Quartz capillaries splinter in case of unintended use. There is a risk of eye injuries due to splinters being projected.

- ► Do not apply force when notching the quartz capillary.
- ► Wear safety goggles.

Risks when shipping

⚠ WARNING

Risk of poisoning from contaminated products

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

- ► Comply with the instructions for safe shipping.

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.

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General safety precautions when handling the product

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

2.4 Proper use

The gas analysis system is used for manually controlled or automatic analysis for non-corrosive and non-flammable gases. The corrosive gas version of the gas analysis system is suitable for specific corrosive gas applications. The gas analysis system is not explosion proof in the sense of ATEX.

- ► Install, operate and maintain the product only in accordance with these operating instructions.
- ► Comply with the application limits.
- ► Observe the technical data.
- ► Contact Pfeiffer Vacuum for advice on corrosive or flammable gases.

2.5 Foreseeable improper use

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

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

2.6 Responsibilities and warranty

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

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

The operator is responsible for the process media used.

2.7 Owner requirements

Safety-conscious working

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

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5. Keep the operating instructions available at the place of installation.
6. Ensure personnel qualification.

2.8 Personnel qualification

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

Training people

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

2.8.1 Ensuring personnel qualification

Specialist for mechanical work

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

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

Specialist for electrotechnical work

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

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

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

Trained individuals

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

2.8.2 Personnel qualification for maintenance and repair

Advanced training courses

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

Adequately trained individuals are:

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

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2.8.3 Advanced training with Pfeiffer Vacuum

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

For more information, please contact Pfeiffer Vacuum technical training.

2.9 Operator requirements

Observing relevant documents and data

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

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3 Product description

3.1 Functional description

The GSD 350 can analyze multiple gas components simultaneously. The gas to be analyzed passes through a pressure reduction stage to the PrismaPro, which operates in a vacuum. The PrismaPro ionizes a portion of the gas to be analyzed and separates and detects the different gas components based on their different mass/charge ratio.

Two versions of the GSD 350 are available with different gas inlet systems (OmniStar and ThermoStar). The gas inlet system reduces the pressure of the gas to be analyzed from 1000 hPa to the working pressure of the PrismaPro. The gas analysis unit and the high-vacuum and gas transport system are the same in both versions.

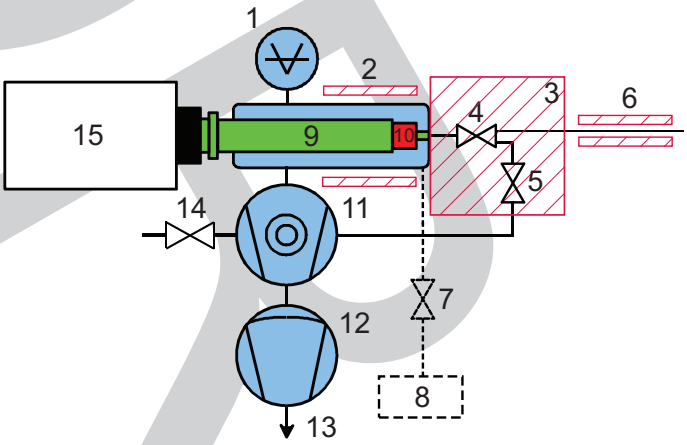

Fig. 2: Vacuum diagram of the OmniStar

1 Total pressure gauge
2 Vacuum chamber heating
3 Gas inlet heating
4 Gas inlet valve (V1) to ion source
5 Pump valve (V2)
6 Stainless steel capillary with heating
7 Shut-off valve EVI 005 M on calibration unit
8 Calibration unit (optional)
9 QMA 250 M analyzer
10 Ion source
11 Turbopump
12 Diaphragm Pump
13 Exhaust gas connection
14 Venting valve
15 Electronic unit QME 250

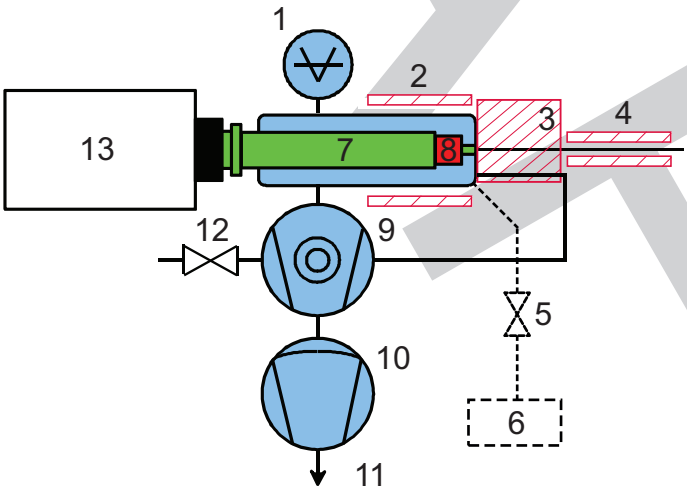

Fig. 3: Vacuum diagram of the ThermoStar

1 Total pressure gauge
2 Vacuum chamber heating
3 Gas inlet heating
4 Quartz capillary with heating
5 Shut-off valve EVI 005 M on calibration unit
6 Calibration unit (optional)
7 QMA 250 M analyzer
8 Ion source
9 Turbopump
10 Diaphragm Pump
11 Exhaust gas connection
12 Venting valve
13 Electronic unit QME 250

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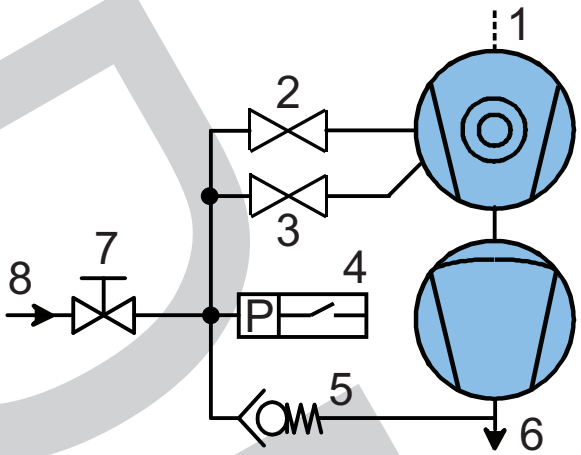

Fig. 4: Additionally sealing gas supply in corrosive gas version

1 Connection to the vacuum chambers
2 Venting valve
3 Sealing gas valve
4 Digital pressure switch with pressure gauge
5 Non-return valve
6 Exhaust gas connection
7 Manual pressure regulator
8 Sealing gas connection

3.2 Controls and indicators

The 7" touch display is located on the front side of the unit and can be removed from the housing via the 2 recesses at the side. The functions are controlled or called up by pressing the respective operator field in the display or via the assigned operator keys on both sides. The operator field and operator keys are context-sensitive and change to reflect the display. Unavailable functions are grayed.

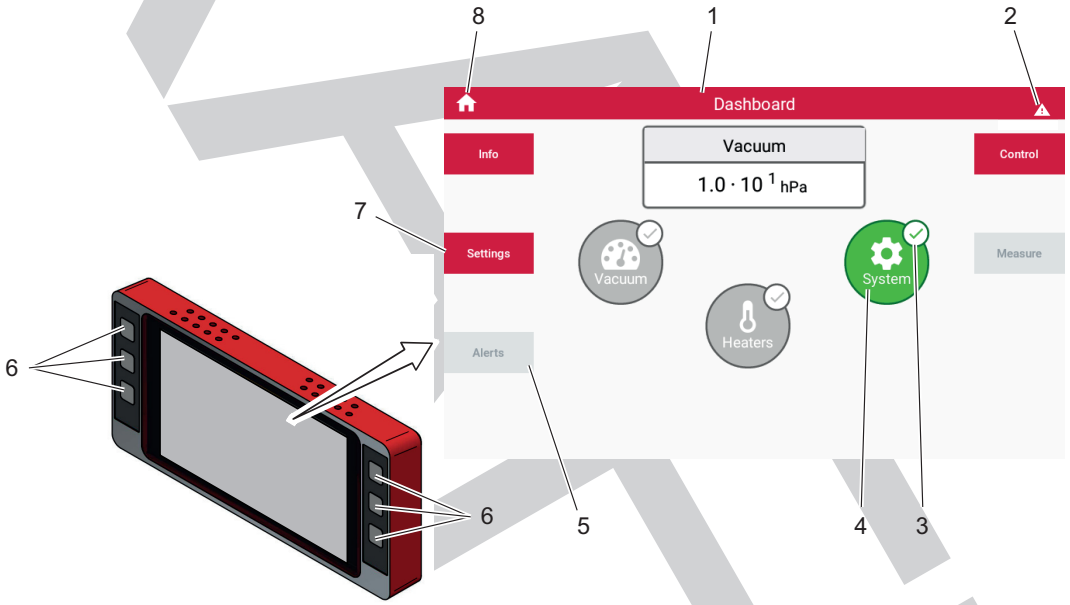

Fig. 5: Display with operator keys

1 Title bar with menu name
2 Warning triangle for warning or malfunction messages
3 Status icon
4 Components icon
5 Inactive operator field in display (grayed)
6 Controls
7 Active operator field in display
8 Link to start page

If warning or malfunction messages are pending, the warning triangle is displayed top right on screen, and the "Messages" button is activated. The warning triangle appears on all menu screens. Pressing the warning triangle displays a short malfunction description.

Symbol		Meaning
Color	light green	activated, operating status reached
	dark green	activated, operating status not yet reached
	light gray	not activated
	dark gray	switched off, switched off status not yet reached
Checkmark on status icon		stable state, final status on or off reached
Revolving arc in status icon		Function started or stopped, final status not yet reached

Tbl. 5: Symbols and colors of the status and components icons

Version without display

Various LEDs indicate the status of the individual systems for the variant without a display. Control is exclusively via the web interface.

LED	Function	Description
0	Power	The LED shows the status of the voltage supply. It is lit if the required voltage is present at the unit.
1	Vacuum + Ready	The LED flashes while the vacuum pumps are running up; it is lit once the vacuum pump is evacuated and the system is ready to measure.
2	Error	General error message
3	Heater	The LED is lit when the heating units are switched on.
4	Filament	The LED is lit when there is a flow at the filament.
5	Purge	The LED is lit if the sealing gas is connected; it flashes if sealing gas monitoring is overridden (for service work only).

Tbl. 6: Status LEDs and their meanings

3.3 Layout of the unit

3.3.1 Basic unit

The basic unit consists of a chassis and removable covers.

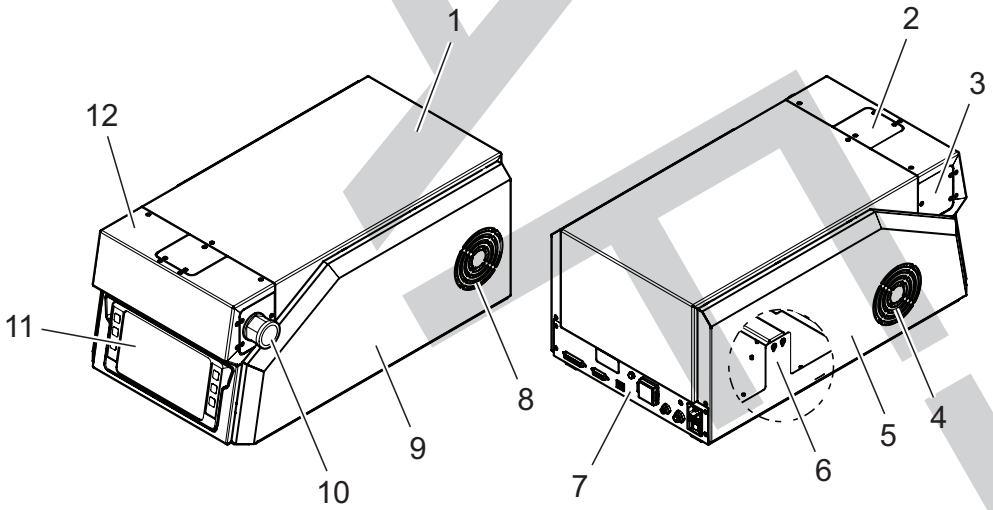

Fig. 6: Housing parts

1 Housing cover
2, 3 Optional terminal area for the heated capillary tube
4 Venting opening (outlet)
5 Side cover (left)
6 Frame, chassis
7 Terminal area
8 Venting opening (inlet)
9 Side cover (right)
10 Terminal area for heated capillary tube (as-delivered position)
11 7" touch display (alternatively: LED display without monitor)
12 Gas inlet cover

3.3.2 Terminal area

The terminal area contains all of the unit's interfaces and connections.

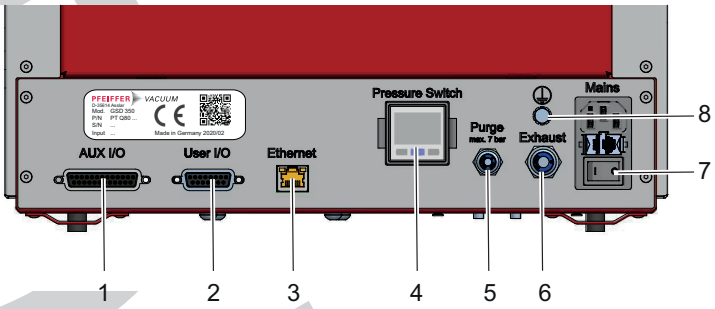

Fig. 7: Terminal area with interfaces and connections

1 "AUX IO" connection
(see chapter “"AUX IO" connection”, page 35)

2 "USER IO" connection
(see chapter “"USER IO" connection”, page 34)

3 Ethernet connection (RJ-45)
(see chapter “"Ethernet" (LAN) connection”, page 36)

4 Digital pressure switch for sealing gas [6]
(see chapter “Sealing gas system”, page 28)

5 Sealing gas connection [5]
(see chapter “Sealing gas system”, page 28)

6 Exhaust gas connection
(see chapter “High vacuum system”, page 27)

7 Mains connection with power switch
(see chapter “Mains power supply”, page 33)

8 Grounding connection (functional earth)
(see chapter “Ground terminal”, page 33)

3.3.3 Gas inlet system

General structure of the gas inlet system

The gas guide to the ion source is screwed into the gas inlet system. The gas guide holds the screen and routes the gas flow to the formation chamber of the ion source. The ceramic sleeve acts as an electrical insulator. A compression spring presses the ceramic sleeve against the formation chamber of the ion source.

5) only for corrosive gas version

6) only for corrosive gas version

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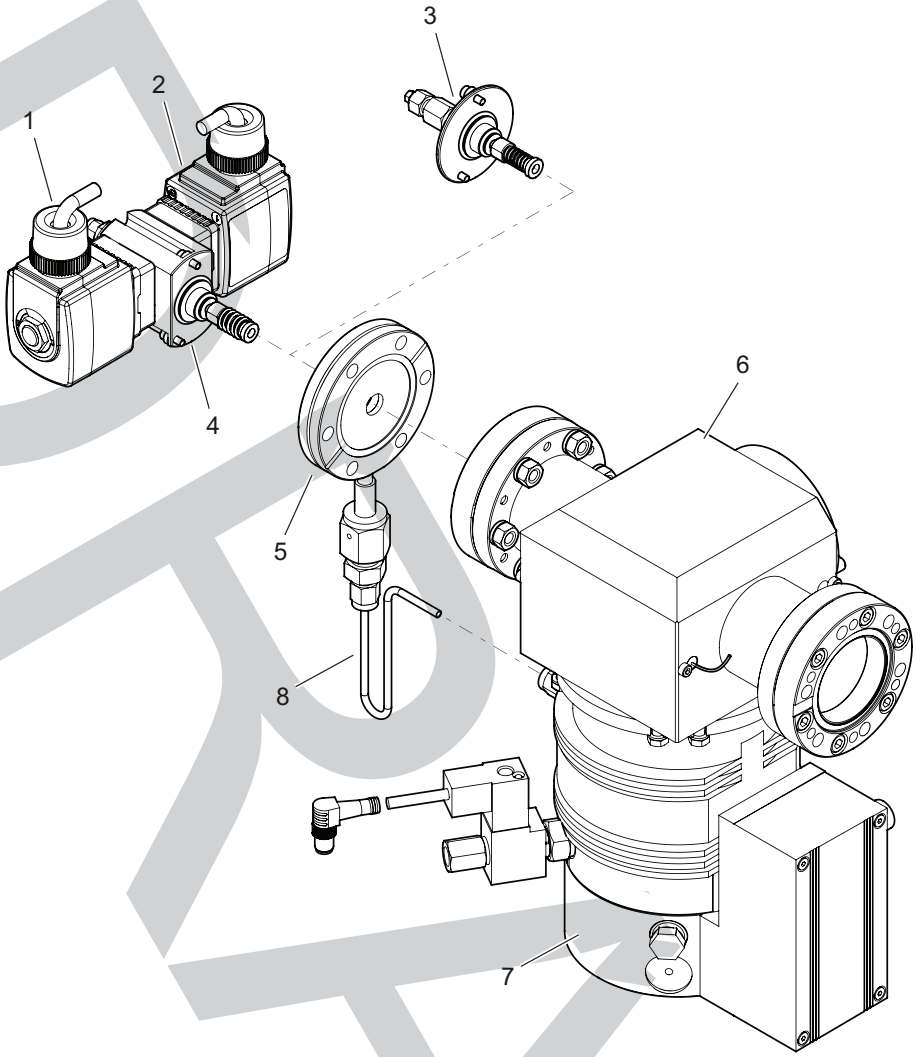

Fig. 8: Gas inlet systems

1	Gas inlet valve	5	Connection flange
2	Pump valve	6	Vacuum chamber
3	Gas inlet ThermoStar	7	Turbopump
4	Gas inlet OmniStar	8	Interstage pumping of the turbopump

Gas inlet system (OmniStar)

When the gas inlet is open, 1 to 2 sccm of the gas to be analyzed are routed through the stainless steel capillary to the valve unit. The gas reaches the screen without demixing via the integrated pressure reduction stage. The stainless steel capillary is located in a capillary tube that is heatable to 200 °C or optionally to 350 °C. The activated capillary heating also heats the valve block. Thanks to the higher temperature, condensation effects of the gases to be analyzed can be avoided. The gas inlet valve allows the sample gas flow into the vacuum chamber to be interrupted. A built-in screen allows a small portion of the gas flow to flow into the vacuum chamber. The remaining gas flow reaches the interstage pumping of the turbopump and is thus pumped out. The OmniStar gas inlet makes it possible to isolate the PrismaPro from the gas flow and thus to determine and correct for the inherent value for the gas to be analyzed. To do this, the gas analysis system shuts off the gas inlet valve and the pump valve in order to interrupt the gas flow into the vacuum chamber and into the turbopump interstage pumping. Apart from minor non-linearity of the PrismaPro as a function of the pressure in the vacuum chamber, the mass spectrometer base value can thus be determined and subtracted. The non-linearity of the PrismaPro can be detrimental in high-precision measurements. In these cases, a very pure gas (Zero Gas) must fed into the PrismaPro and the mass spectrometer base determined with it. The Zero Gas must be supplied under the same pressure conditions as the gas to be analyzed.

Gas inlet system (ThermoStar)

1 to 2 sccm of the gas to be analyzed flow through the quartz capillary and reach the screen without demixing via the integrated pressure reduction stage. The quartz steel capillary is located in a capillary

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tube that is heatable to 200 °C or optionally to 350 °C. The activated capillary heating also heats the inlet flange and screen. Thanks to the higher temperature, condensation effects of the gases to be analyzed can be avoided. The quartz capillary ends 1 to 2 mm in front of the screen. This means that part of the gas exiting the quartz capillary reaches the PrismaPro without impacting on the walls in the pressure reduction stage. This is important to identify low concentrations of reactive gases, as reactive gases thus have no contact with stainless steel, with which they would otherwise immediately form chemical compounds. This gas inlet variant does **not** make it possible to isolate the PrismaPro from the gas flow and thus determine and correct for the inherent value for the gas to be analyzed. If this is necessary, a very pure gas (Zero Gas) must fed into the PrismaPro and the mass spectrometer base determined with it. The Zero Gas must be supplied under the same pressure conditions as the gas to be analyzed.

3.3.4 Calibration unit

A calibration unit is available as an option, since suitable gas mixtures are usually not available for optimizing the PrismaPro in the high mass range (> 200 u). This calibration unit can be used to calibrate the PrismaPro in terms of the mass scale, sensitivity and resolution in the high mass range. The calibration unit contains perfluorotributylamine (PFTBA) in a glass storage vessel as calibration medium; this can be fed directly into the vacuum chamber via an orifice and an electromagnetic shut-off valve (i.e. not directly into the ion source!). The connection to the vacuum chamber is lateral via a DN 40 CF flange on the front side. The shut-off valve on the calibration unit can be opened and closed by the GSD 350 control.

Perfluorotributylamine (PFTBA) in the background signal

PFTBA has the disadvantage that it can be traced in the unit's background signal for a very long time after shutting off the calibration valve. If this interferes with the intended gas analysis, Pfeiffer Vacuum recommends baking out the vacuum chamber after calibration with PFTBA.

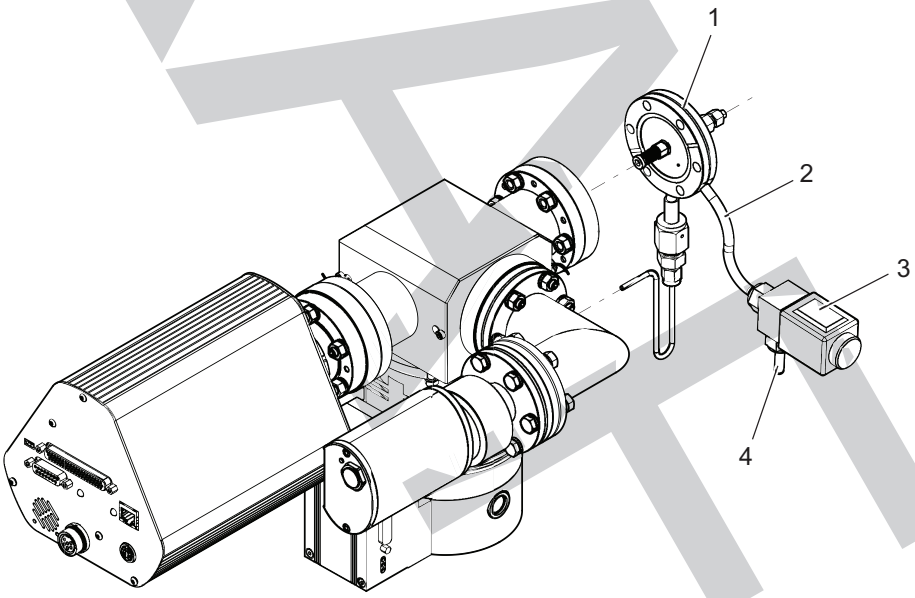

Fig. 9: Calibration unit at the gas inlet

1 Gas inlet
2 1/8" stainless steel line
3 Shut-off valve EVI 005 M
4 Glass storage vessel for PFTBA calibration medium

3.3.5 High vacuum system

The turbopump maintains the working pressure of < 5 × 10^{-5} hPa in the vacuum chamber with the gas inlet open and also receives most of the gas flowing in through the capillary via interstage pumping. The diaphragm pump receives the gas compressed to a few hPa and compresses it further to atmospheric pressure.

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3.3.6 Fore-vacuum system

The diaphragm pump creates the fore-vacuum required for operating the turbopump. The connection to the fore-vacuum connection (T 1/4") on the turbopump consists of a connection hose (DN 6 mm). Four rubber buffers damp the vibrations of the diaphragm pump on the chassis. For defined disposal of the pumped gas, the diaphragm pump has an exhaust line that can be connected to a local gas disposal line or routed out of the laboratory. The exhaust gas connection in the terminal area consists of an IQS plug-and-socket connection with 6 mm hose diameter.

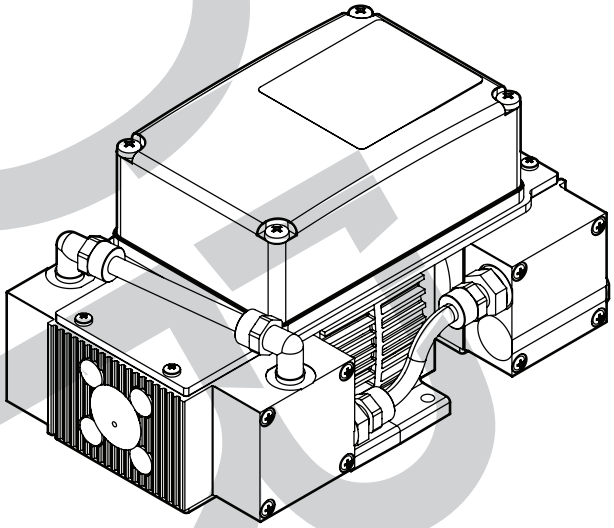

Fig. 10: Diaphragm Pump

3.3.7 Sealing gas system

In the corrosive gas version, the sealing gas protects the turbopump's bearings and ensures that the corrosive gas is fed to the diaphragm pump in a diluted form. This improves the service life of the diaphragm pump and prevents vapors condensing in the diaphragm pump. The corrosive gas version has a factory set internal pressure regulator that uses a flow meter to ensure an adequate nitrogen sealing gas flow. A small portion of the sealing gas reaches the sealing gas and venting valve on the turbopump via a flow divider. The major portion of the sealing gas, approx. 300 sccm, flows directly to the exhaust gas connection. To calculate the toxicity of the sealing gas, it can be assumed that the sealing gas dilutes the concentrations of the inlet gases by a factor > 100. If an in-house exhaust duct or scrubber is connected, overpressure must not occur at the exhaust gas connection. The sealing gas connection in the terminal area consists of an IQS plug-and-socket connection with 4 mm hose diameter and the digital pressure switch.

Purpose of the digital pressure switch:

- The digital pressure switch provides a visual indicator of the internal sealing gas pressure downstream of the pressure regulator.
- The digital pressure switch delivers a signal that triggers the shutdown procedure if the sealing gas pressure exceeds or drops below the permissible range.

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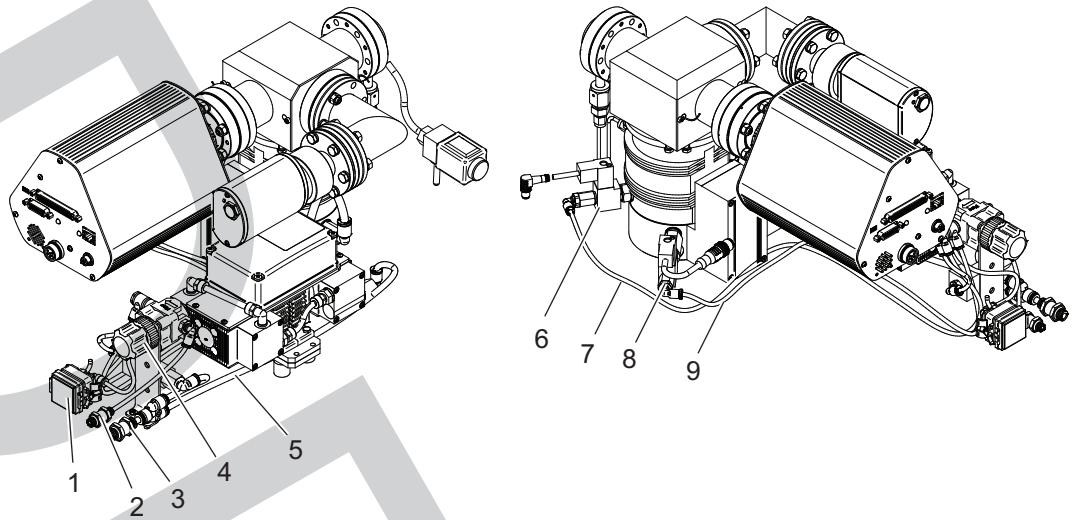

Fig. 11: Sealing gas system

1 Digital pressure switch with pressure gauge
2 Sealing gas connection
3 Exhaust gas connection
4 Manual pressure regulator
5 Hose to exhaust gas connection
6 Venting valve
7 Hose to venting valve
8 Sealing gas valve
9 Hose to sealing gas valve

3.3.8 Gas analysis unit

PrismaPro functional principle

The functional principle of the PrismaPro is described in the related operating instructions.

The PrismaPro analyzes the small part of the gas to be analyzed that penetrates into the vacuum chamber through the screen. To determine the pressure in the vacuum chamber, the gas analysis unit has a total pressure gauge on the vacuum chamber that enables continuous vacuum measurement in the pressure range from 1000 to 5 × 10^{-9} hPa. You can read the total pressure measured off the display and in the PV MassSpec software.

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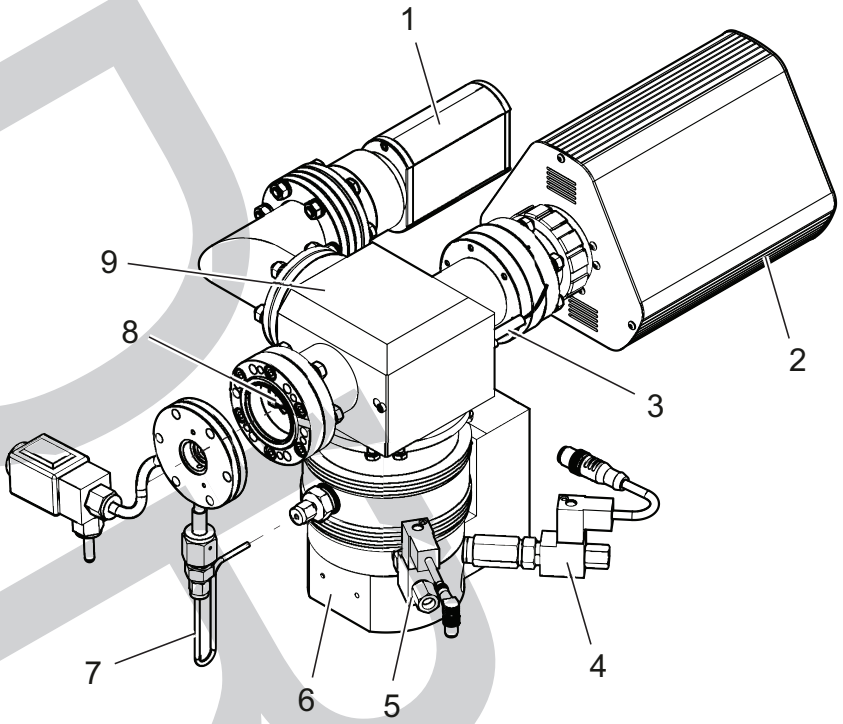

Fig. 12: Gas analysis unit components

1 Total pressure gauge
2 Electronic unit QME 250
3 Heating cartridge in the vacuum chamber
4 Sealing gas valve of corrosive gas version
5 Venting valve
6 Turbopump
7 Interstage pumping of the turbopump
8 Ion source for analyzer QMA 250 M
9 Vacuum chamber

3.3.9 Heating and insulation

The units heating units can be fully controlled via the unit's control.

Type	Temperature (max.)	Temperature (adjustable)
Capillary heating (200 °C)	200 °C	80 to 200 °C
Capillary heating (350 °C)	350 °C	80 to 350 °C
Gas inlet heating	100 °C	adjusted automatically
Vacuum chamber heating	130 °C	100 to 130 °C

Tbl. 7: Heating units on the unit

Vacuum chamber heating for baking out

Baking out the vacuum chamber considerably reduces the amount of gas condensate adhering to the surfaces of the vacuum chamber. This typically leads to a lower total pressure in the vacuum chamber, and to a lower background signal during measurements. This specifically means that the volume of water in the vacuum system can be significantly reduced. The vacuum chamber has 2 heating cartridges. The vacuum chamber and the elbow fitting to the total pressure gauge have removable insulating collars. A duration between 1 and 24 hours is selectable for baking out (the default value is 6 hours). Baking out can be disabled manually at any time via the unit's control. The temperature can be set between 100 and 130 °C (the default value is 120 °C).

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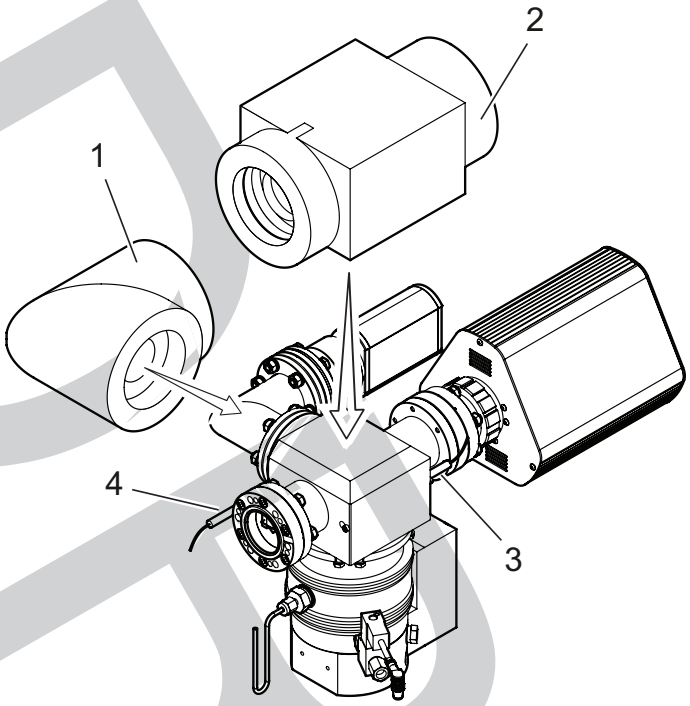

Fig. 13: Vacuum chamber heating and insulation

1 Insulation (angle)
2 Insulation of the vacuum chamber
3 + 4 Vacuum chamber heating cartridges

Gas inlet heating

The gas inlet has a heating pad and silicone foam housing insulation. The gas inlet heating is always switched on and off parallel to the capillary heating. The GSD 350 automatically adapts the temperature of the heating pad. The heating pad temperature cannot be adjusted.

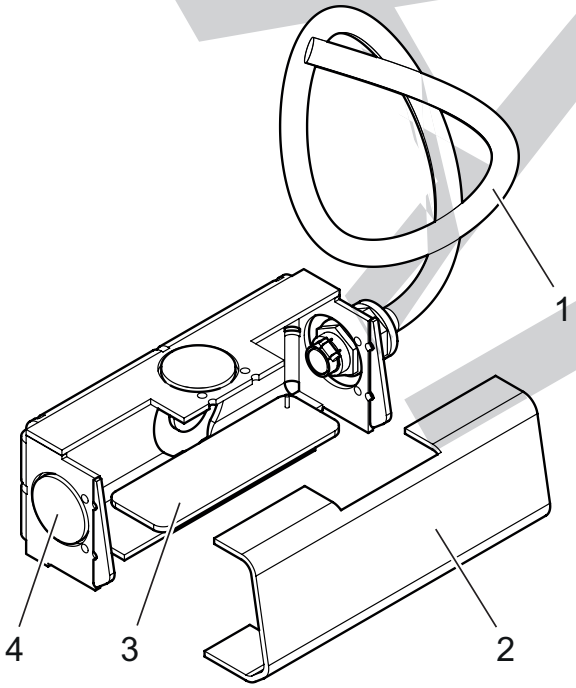

Fig. 14: Gas inlet heating

1 Capillary heating in the capillary tube
2 Silicone foam insulation in the gas inlet cover
3 Heating pad
4 Silicone foam insulation in the dummy cap

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Capillary heating
The capillary is located in a capillary tube with resistance heating and can be heated up to 200 °C or 350 °C. Depending on the temperature setting and capillary tube variant, temperatures of > 70 °C are possible on the surface of the capillary tube. The capillary heating temperature can be configured by the user between 80 °C and maximum (the default value is 120 °C).

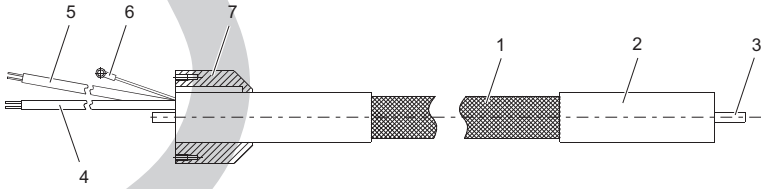

Fig. 15: Capillary heating

1 Heating coil
2 Insulation
3 Capillary guide
for 200 °C variant: PTFE hose
for 350 °C variant: Stainless steel pipe
4 Temperature sensor PT100
5+6 Electrical connection for heating
7 Fastener on unit

3.3.10 Electronic components

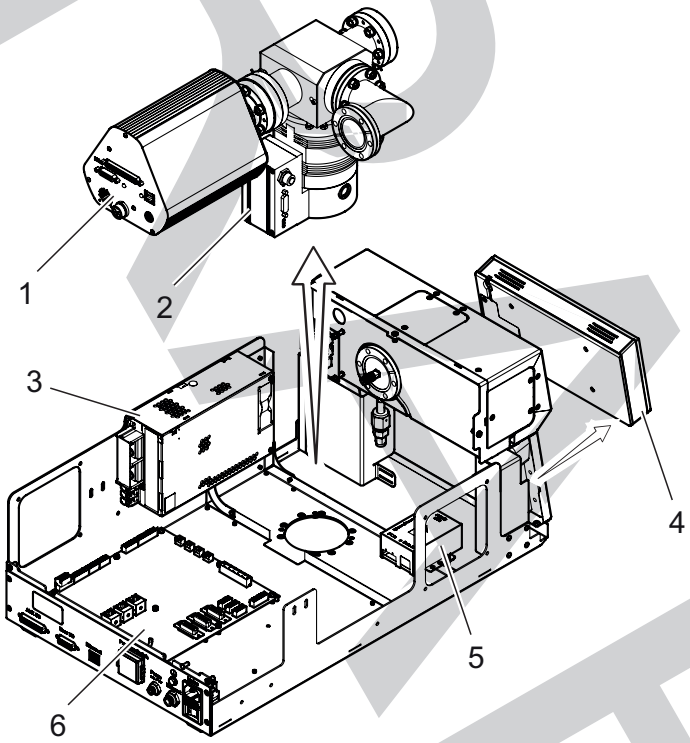

Fig. 16: Electronic components

1 electronic unit QME 250
2 Electronic drive unit TC 110
3 Power supply pack
4 Display
5 PoE injector
6 Mainboard

electronic unit QME 250
The QME 250 electronic unit is mounted on the QMA 250 M analyzer and contains the PrismaPro interfaces.

Electronic drive unit TC 110
The TC 110 electronic drive unit is a permanent component of the turbopump. The purpose of the electronic drive unit is to drive, monitor and control the entire turbopump.

Power supply pack
The wide area power supply pack supplies voltage to all GSD 350 components.

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Display
The display is used to control the GSD 350 and to call the functions.

PoE injector
The PoE injector supplies current to the display.

Mainboard
The mainboard is located on the chassis' baseplate and fulfills the following functions:

- VLAN server for communication between the PrismaPro and display
- Pump control for the turbopump and diaphragm pump
- Open and closed loop heating control
- Fan control for housing temperature
- External interfaces

3.4 Interfaces and connections

The GSD 350 has an Ethernet interface for communication, and two input/output (I/O) connections, User I/O and AUX I/O, that allow the GSD 350 to exchange information with the customer's peripherals.

3.4.1 Mains power supply

The mains connection socket with the main switch and fuse is located in the unit's terminal area. The required mains cable is included in the scope of delivery.

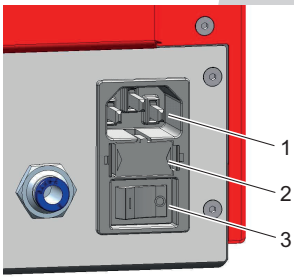

Fig. 17: Mains connection with main switch and fuse

1 Mains connection socket (IEC 320 C14)
2 Fuse
3 Master switch

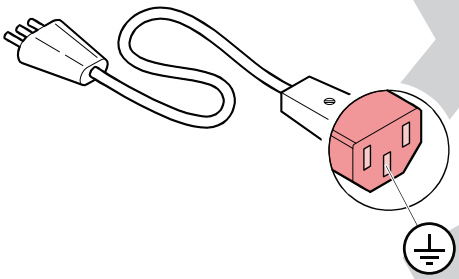

Fig. 18: Mains cable with cold-device plug C13

3.4.2 Ground terminal

⚠ DANGER

Electric shock due to missing internal earthed conductor

The internal earthed conductor is fastened to the housing. A device without an internal earthed conductor attached can be life-threatening in the event of a malfunction.

► Do not rotate or loosen the internal earthed conductor.

The unit has 2 earthed conductor connections:

- The internal earthed conductor is located below the power supply pack.
- The connection to the functional earth is located in the unit's terminal area.

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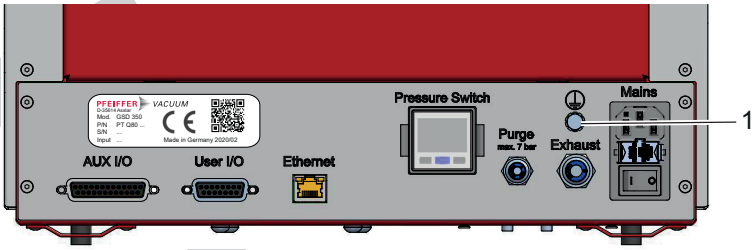

Fig. 19: Connection for functional earth

1 Connection for functional earth (M5 screw)

Connecting the connection for functional ground

► If necessary, use the M5 screw to connect the device via an earthed conductor, for example, to the reference ground of a system.

3.4.3 "USER IO" connection

NOTICE

Impairment of electrical connections caused by external disruptive influences

For reasons of electromagnetic compatibility (EMC) (external disruptive influences), you must use a screened cable.

Pfeiffer Vacuum urgently recommends wiring the analog inputs (+) and (-) with twisted pair cables.

► Connect the screening to the connection housing.
► Leave the other end open, or ground it to suppress ground loop currents.

The "USER I/O" connection provides an interface for digital and analog inputs and outputs.

Digital Input
The digital input is HIGH ACTIVE. A pull-up resistor configures input internally to HIGH. The input can be set to LOW via a contact or a transistor to ground. If used with the PV MassSpec software, the state of the digital input can be visualized or it can be used to control recipes or sequences.

- Total number of channels: 1
- "USER IO" connection: DI1

Relay output
The relay output (24 V AC/DC, 1 A) can be set via digital output DO8. The normally-open contact is on pin 3 and the reference contact on pin 4.

- Total number of channels: 1
- "USER IO" connection: DO8

Analog inputs
The analog inputs are differential inputs for the range -10 to +10 V. If used with the PV MassSpec software, analog input signals can be recorded or controlled by program sequences.

- Total number of channels: 2
- "USER IO" connection: AI1 – AI2
- Input impedance: 50 kΩ
- Sampling rate: 14 bit

Analog output
The analog outputs can output voltages in the range 0 to 10 V. If used with the PV MassSpec software, the ion currents of the individual masses can be converted to appropriate output voltages via a configurator and output.

- Total number of channels: 2
- "USER IO" connection: AO0 – AO1
- Output impedance: 100 Ω
- Sampling rate: 16 bit

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Relay for pumping system status
The "USER I/O" connection includes a relay (24 V AC/DC, 1 A), which indicates the speed status of the turbopump. When the turbopump speed reaches > 90 % (> 1350 Hz) of the nominal rotation speed, then the normally-open contact shuts. This shows that the unit is ready to measure.

- "USER IO" connection: Pin 13 (relay change-over contact, COM)
- "USER IO" connection: Pin 14 (relay normally open contact, NO)
- "USER IO" connection: Pin 15 (relay normally closed contact, NC)

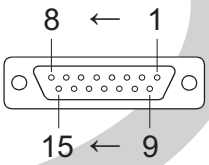

Fig. 20: "USER IO" connection

1	Ground (GND)
2	Digital input DI1
3	Relay normally open contact DO8
4	Relay change-over contact DO8
5	Analog input AI2 (-)
6	Analog input AI2 (+)
7	Analog input AI1 (-)
8	Analog input AI1 (+)
9	Analog mass (PrismaPro EXT I/O)
10	Ground (GND)
11	Analog output AO1
12	Analog output AO0
13	Relay change-over contact (pumping system)
14	Relay normally open contact (pumping system)
15	Relay normally closed contact (pumping system)

3.4.4 "AUX IO" connection

NOTICE

Impairment of electrical connections caused by external disruptive influences

For reasons of electromagnetic compatibility (EMC) (external disruptive influences), you must use a screened cable.

Pfeiffer Vacuum urgently recommends wiring the analog inputs (+) and (-) with twisted pair cables.

- ► Connect the screening to the connection housing.
- ► Leave the other end open, or ground it to suppress ground loop currents.

The "AUX I/O" connection provides and additional interface for digital and analog inputs and outputs.

Digital inputs
The digital inputs are HIGH ACTIVE. If used with the PV MassSpec software, actions activated by digital inputs can also be configured to be LOW ACTIVE if required. A pull-up resistor configures these inputs to +24 V internally. The inputs can be set to LOW via a contact or a transistor to ground. If used with the PV MassSpec software, the states of the digital inputs can be visualized or they can be used to control sequences.

- Total number of channels: 3
- "AUX IO" connection: DI13 – DI15

Digital outputs
The digital outputs are OPEN COLLECTORS and can each handle a max. load of 200 mA. If used with the PV MassSpec software, the digital outputs can be set as a function of the ion current, unit and sequence state, or also permanently. When an output is activated, the output switches from high voltage (> 20 V) to 0 V.

- Total number of channels: 6
- "AUX IO" connection: DO2 – DO7

Analog inputs
The analog inputs are differential inputs for the range -10 to +10 V. If used with the PV MassSpec software, analog input signals can be recorded or controlled by program sequences.

- Total number of channels: 3
- "AUX IO" connection: AI3 – AI5
- Input impedance: 50 kΩ
- Sampling rate: 16 bit

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Analog output

The analog outputs can output voltages in the range 0 to 10 V. If used with the PV MassSpec software, the ion currents of the individual masses can be converted to appropriate output voltages via a configurator and output.

- Total number of channels: 2
- "AUX IO" connection: AO2 – AO3
- Output impedance: 100 Ω
- Sampling rate: 16 bit

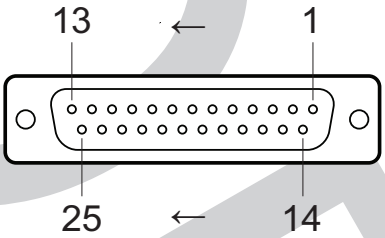

Fig. 21: "AUX IO" connection

1	Analog output AO2	14	Analog output AO3
2	Analog mass	15	Digital mass
3	Analog input AI3 (-)	16	Analog input AI3 (+)
4	Analog input AI4 (-)	17	Analog input AI4 (+)
5	Analog input AI5 (-)	18	Analog input AI5 (+)
6	Analog mass	19	Digital mass
7	Digital input DI13	20	Digital input DI14
8	Digital input DI15	21	Digital mass
9	24 V	22	Digital output DO2
10	Digital output DO3	23	Digital output DO4
11	Digital output DO5	24	Digital output DO6
12	Digital output DO7	25	unassigned
13	Digital mass		

3.4.5 "Ethernet" (LAN) connection

The "Ethernet" connection enables direct communication with the device via a computer.

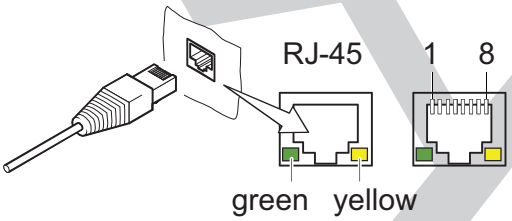

Fig. 22: "Ethernet" (LAN) connection

1	Transmission data (TD+)	6	Reception data (RD-)
2	Transmission data (TD-)	4, 5, 7, 8	Not used
3	Reception data (RD+)		

LED	Status	Meaning
Green (link)	lights up	Hardware connection exists
	dark	No hardware connection
Yellow (activity)	lit up (flickering)	Data transmission runs
	dark	no data transmission / no connection

Tbl. 8: Status of the Ethernet connection

3.5 Identifying the product

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

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

3.6 Scope of delivery

The shipment includes the following parts:

- GSD 350 OmniStar/ThermoStar
- Installation hardware and small parts
  - Allen key, WAF 2, 2.5 and 3
  - 2 open-end wrenches, WAF 10
  - Socket key, two-sided for ion source
  - Copper gasket, DN 40 CF, silver-plated
  - Only for OmniStar
    - Open-end wrench, 14 mm WAF
    - Clamp collar set for 1/16" tube (5 pieces)
  - Only for ThermoStar
    - Sealing set for capillary 250 µm (ferrule) (5 pieces)
- Transport protection for analyzer QMA 250 M
- Assembly aid for QMA 250 Analyzer
- Ethernet cable, 3 m length, red
- Mains Cable
- Operating instructions
  - GSD 350 OmniStar/ThermoStar
  - Components (see chapter “Applicable documents”, page 10)

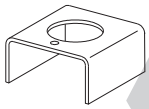

Fig. 23: Assembly aid for QMA 250 Analyzer

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.

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4 Transport and storage

⚠ WARNING

Danger of injury due to lifting heavy loads

The product is heavy; it weighs up to 26 kg depending on the version. If one person lifts the product incorrectly without help, this will lead to injuries.

- ► Always use 2 persons to lift the product with two hands.
- ► Take all necessary safety precautions (e.g. wear work gloves).
- ► Observe local regulations.
- ► Comply with the instructions for safe transport.

⚠ WARNING

Danger of serious injury due to falling objects

Due to falling objects there is a risk of injuries to limbs through to broken bones.

- ► Take particular care and pay special attention when transporting products manually.
- ► Do not stack the products.
- ► Wear protective equipment, e.g. safety shoes.

4.1 Transporting the product

NOTICE

Damage caused by incorrect transportation

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

- ► Comply with the instructions for safe transportation.

Packing

We recommend keeping the transport packaging and original protective cover.

General information regarding safe transport

1. Observe the weight of the product.
2. Where possible, always transport or ship the product in the original packaging.
3. Always use dense and impact-proof packaging for the product.
4. Always install all transport protection before transport.
5. Only remove the present protective cover immediately prior to installation.

4.2 Storing the product

NOTICE

Damage caused by improper storage

Improper storage will lead to damage to the product.

- ► Comply with the instructions for safe storage.

Packing

We recommend storing the product in its original packaging.

General information for safe storage

- ► Store the product in a cool, dry, dust-free place, where it is protected against impacts and mechanical vibration.
- ► Always use dense and impact-proof packaging for the product.
- ► Where possible, store the product in its original packaging.
- ► Store electronic components in antistatic packaging.

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- ► 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).

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5 Installation

5.1 Ensuring venting of the unit

NOTICE

Damage caused by overheating

The ambient temperature must not exceed the permissible operating temperature of the device.

- ► Make sure there is unobstructed circulation of air when installing the device.
- ► Periodically check and clean the installed air filter, if necessary.

The GSD 350 has:

- 2 venting openings with fans at the sides
- Venting openings on the top and bottom side of the removable display
- An integrated fan in the power supply pack

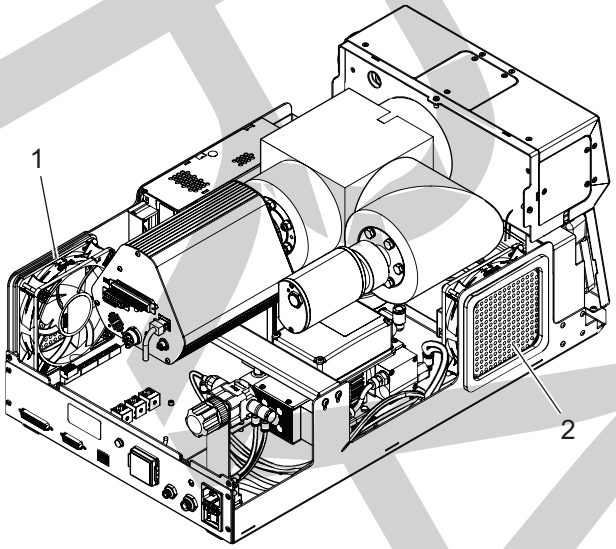

Fig. 24: Venting openings on the sides of the unit

1 Inlet with fan 2 Outlet with fan

Procedure

1. Always keep an area of > 25 mm clear around the unit.
2. If you install the unit in a cabinet:
   - Make sure that the cabinet is big enough.
   - Make sure that the cabinet ensures sufficient ventilation by the fan built into the unit.

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5.2 Establishing mains connection

⚠ DANGER

Danger to life from electric shock

Inadequate or incorrect grounding of the unit leads to contact-sensitive voltage on the housing. When making contact, increased leakage currents will cause a life-threatening electric shock.

- ► Before the installation, check that the connection leads are voltage-free.
- ► Conduct the electrical connection in accordance with locally applicable regulations.
- ► Make sure that the local mains voltage and frequency match rating plate specifications.
- ► Make sure that the mains cable and extension cable meet the requirements for double isolation between input voltage and output voltage, in accordance with IEC 61010 and IEC 60950.
- ► Use only a 3-pin mains cable and extension cable with properly connected protective earthing (earthed conductor).
- ► Plug the mains plug into a socket with earthing contact only.
- ► Always connect the mains cable prior to all other cables, to ensure continuous protective earthing.

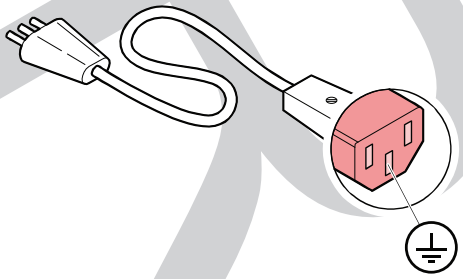

Fig. 25: Mains connection with IEC 320 C13 socket

Connecting the power supply cable

1. Connect the mains cable to the mains connection socket of the unit.
2. Connect the plug on the mains cable into a suitable socket.

5.3 Establishing the Ethernet connection

You need a corresponding Ethernet connection to operate the GSD 350 via the web interface or PV MassSpec software using a PC (host computer) or over a network.

Connecting the Ethernet cable

- ► Connect the supplied Ethernet cable to the GSD 350 and the PC.

The two LEDs in the RJ-45 socket show the interface status (see chapter “"Ethernet" (LAN) connection”, page 36).

5.4 Connecting the exhaust duct

⚠ WARNING

Danger of poisoning due to toxic process media escaping from the exhaust pipe

During operation with no exhaust line, the vacuum pump allows exhaust gases and vapors to escape freely into the air. There is a risk of injury and fatality due to poisoning in processes with toxic process media.

- ► Observe the pertinent regulations for handling toxic process media.
- ► Safely purge toxic process media via an exhaust line.
- ► Use appropriate filter equipment to separate toxic process media.

5.4.1 Trimming the exhaust gas hose

Required tool

- Hose cutter

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Required material

- PE hose (exterior Ø = 6 mm)

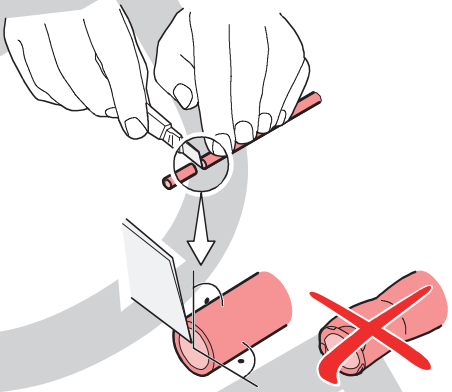

Fig. 26: Trimming the exhaust gas hose

Procedure

1. Trim the exhaust gas hose with a sharp hose cutter:
   - to the required length
   - at right angles
   - without deformation
   - without a burr
2. Make sure that there are no scratches or scores on the outside of the exhaust hose.

5.4.2 Connecting/disconnecting the exhaust gas hose

Required material

- PE exhaust hose (exterior Ø = 6 mm)
- optional: additional IQS or Schott plug-and-socket connections

IQS plug-and-socket connections have 2 pressure points

When connecting the hose, note that the IQS plug-and-socket connections have 2 pressure points through which you must push the hose: Holding claw and seal.

The hose is not correctly connected until it has passed both pressure points.

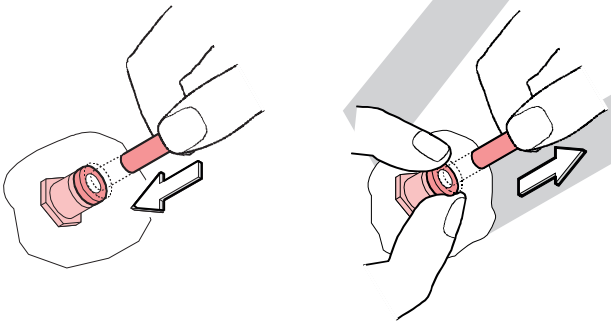

Fig. 27: Connecting and disconnecting the exhaust gas hose

Connecting exhaust gas hose

1. Connect the exhaust gas hose to the exhaust gas connection on the unit.
2. Connect an exhaust duct to the unit if you are operating the unit with corrosive or flammable substances.
3. Make sure that overpressure does not occur at the exhaust gas connection when connecting to an in-house exhaust gas line or a (gas) scrubber.
4. Observe the local regulations for handling process gases.

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Disconnecting the exhaust gas hose

1. Make sure that the exhaust duct is unpressurized.
2. Press the release ring on the exhaust gas connection part firmly down on both sides in order to open the holding claws uniformly and avoid scratches on the exhaust gas hose.
3. Pull the exhaust gas hose vertically out of the exhaust gas connection part of the unit.

5.5 Connecting the sealing gas line

5.5.1 Trimming the sealing gas hose

Required tool

- Hose cutter

Required material

- PE hose (exterior Ø = 4 mm)

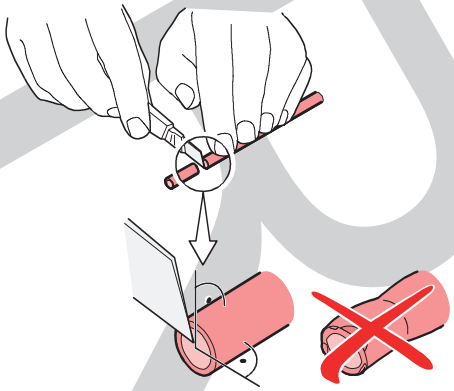

Fig. 28: Trimming the sealing gas hose

Procedure

1. Trim the sealing gas hose with a sharp hose cutter:
   - to the required length
   - at right angles
   - without deformation
   - without a burr
2. Make sure there are no scratches or grooves on the outside of the sealing gas hose.

5.5.2 Connecting/disconnecting the sealing gas line

Required material

- PE sealing gas hose (exterior Ø = 4 mm)
- optional: additional IQS or Schott plug-and-socket connections

IQS plug-and-socket connections have 2 pressure points

When connecting the hose, note that the IQS plug-and-socket connections have 2 pressure points through which you must push the hose: Holding claw and seal.

The hose is not correctly connected until it has passed both pressure points.

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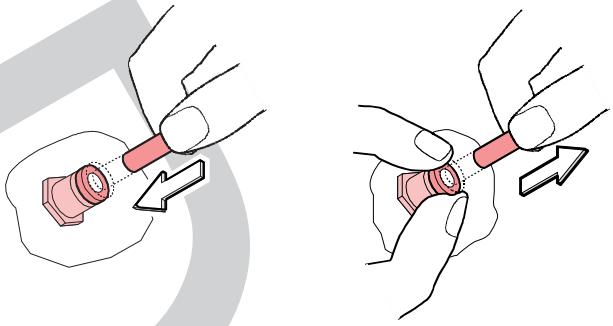

Fig. 29: Connecting/disconnecting the sealing gas line

Connecting the sealing gas hose

1. Install a suitable pressure reduction system if you expect to exceed the permissible sealing gas pressure range.
   – The unit does not have its own sealing gas shut-off valve.
2. Make sure that overpressure does not occur at the exhaust gas connection when connecting to an in-house exhaust gas line or a (gas) scrubber.
3. Connect the sealing gas hose to the sealing gas connection on the unit.
4. Observe the local regulations for handling process gases.

Disconnecting the sealing gas hose

1. Make sure that the sealing gas line is unpressurized.
2. Press the release ring on the connection part firmly down on both sides in order to open the holding claws uniformly and avoid scratches on the sealing gas hose.
3. Pull the sealing gas hose vertically out of the connection part of the unit.

5.6 Connecting the capillary

NOTICE

Damage to the sampling system

Incorrect handling of the capillary will cause damage to the unit's sampling system.

- ► Observe the bending radius.
  - 200 °C capillary hose: **≥ 50 mm**
  - 350 °C capillary hose: **≥ 200 mm**
- ► Do not additionally insulate the capillary heating.
- ► Do not additionally cover the capillary heating.
- ► Do not expose the capillary to additional heat, e.g. from a heated flange.

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.

Capillary hose adapter as accessory

A capillary hose adapter is available as an accessory for reliably connecting the capillary hose.

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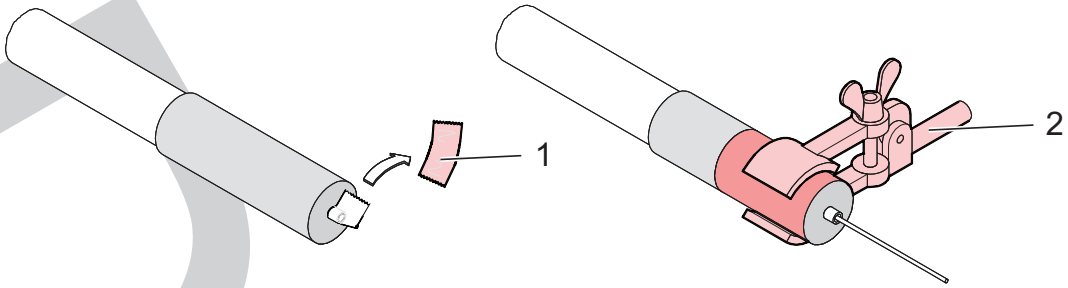

Fig. 30: Connecting the capillary

1 Adhesive tape 2 Example of how to secure a capillary hose

5.6.1 Connecting the stainless steel capillary

The OmniStar version has a stainless steel capillary.

Procedure

1. Remove the adhesive tape from the stainless steel capillary.
2. Attach the stainless steel capillary at the measurement point.
3. Use the stainless capillary tube adapter cable from the Pfeiffer Vacuum accessories range.
4. Fix the capillary tube in place.
5. Only clamp the capillary tube in the solid, inflexible area at the front.

5.6.2 Connecting the quartz capillary

The ThermoStar version has a quartz capillary.

Procedure

1. Remove the adhesive tape from the quartz capillary.
2. If needed, pull out the quartz capillary, or feed the quartz capillary in, to reach the measurement point.
   – Remove the gas inlet cover to do so (see chapter “Removing/attaching the gas inlet cover”, page 69).
3. Attach the quartz capillary at the measurement point.
4. Use the stainless capillary tube adapter cable from the Pfeiffer Vacuum accessories range.
5. Fix the capillary tube in place.
6. Only clamp the capillary tube in the solid, inflexible area at the front.

5.7 Adjusting the position of the capillary hose

⚠ WARNING

Danger of burns on hot surfaces

During operation high temperatures (> 50 °C) occur on touchable surfaces of the heating components and the gas inlet. There is a risk of burning.

- ► Secure hot parts against inadvertent touching.
- ► Display warning signs.
- ► Make sure that the product has cooled down before performing work.
- ► Wear protective gloves (in accordance with EN 420).

To optimize the orientation of the capillary tube for specific applications, the capillary tube can be placed in 3 different positions. Pfeiffer Vacuum always delivers the GSD 350 with the capillary hose on the right side (see from the front). Dummy caps are installed as seals on the two positions that are not used.

Prerequisites

- GSD 350 switched off
- Gas inlet cover removed

Required tool

- Allen key, **WAF 2**

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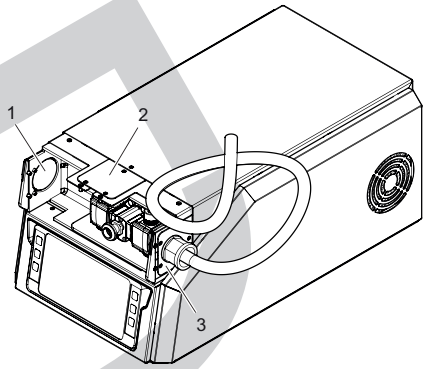

Fig. 31: Capillary hose as-delivered position

1 Dummy cap, left
2 Dummy cap, top
3 Capillary hose with dummy cap, right

Procedure

1. Unscrew the 3 countersunk screws and the dummy cap from the new capillary tube position.
2. Unscrew the 3 countersunk screws and the cover cap with the capillary tube.
3. Carefully pull out the cap with the capillary tube so that you can guide the capillary and the cable through the slot in the housing.
   – The capillary can remain mounted on the inlet.
4. Fasten the cap with the capillary hose at the new capillary hose position with the 3 countersunk screws.
5. Seal the previous capillary tube position with the dummy cap and the 3 countersunk screws.

5.8 Establishing a network connection

You need a corresponding network connection to operate the GSD 350 via the web interface or PV MassSpec software using a PC (host computer) or over a network. A network uses IP addresses as a means of identifying individual units. IP addresses are unique in a network but are not universal which means that only one device in a network can have a certain IP address, but two devices in a separate network can have the same IP address. The following sections provide information on some general network variables that can influence the GSD 350's connection. (see chapter “Setting the network parameters”, page 59)

Procedure

- ► Set the IP address of the GSD 350.
- ► Set the IP address of the PC (host computer) you are using.
- ► Set up a subnetwork.

5.8.1 IP addresses

NOTICE

IP address conflicts when connecting several devices

Pfeiffer Vacuum supplies each GSD 350 with the same default IP address. If you want to connect several GSD 350 units, their IP addresses are therefore initially not yet unique and you have to change these. Otherwise the simultaneous connection of several GSD 350 units will lead to IP address conflicts in the network.

- ► First change the IP address of the devices that you want to connect in the network.
- ► Where possible, use static IP addresses.
- ► Then connect the devices to a network.

Standard IP address for the GSD 350

- Network prefix: 192.168.1.xxx
- IP address: 192.168.1.100

The GSD 350 use IPv4 IP addresses.

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IPv4 IP addresses consist of 32 bits in dotted decimal notation. They consist of four decimal numbers that are each separated from 0 to 255 by bots, for example: 192.168.1.100. Each part represents an octet. Normally, IP addresses comprise one network prefix and one host protocol.

You can set IP addresses manually or automatically:

- **recommended:** You can set and manually adjust static (manual) IP addresses yourself.
- **not recommended:** Dynamic (automatic) IP addresses are set automatically by a host (DHCP).

An alternative to changing the GSD 350 IP address is changing the IP address of the host computer, to enable communication between the host computer and the GSD 350 .

Using IP addresses

We recommend the use of **static IP addresses** for the GSD 350.

For this purpose, you should reserve a block of addresses for the static use and ban them on the DHCP server (host). Conflicts with double IP addresses can be avoided as a result.

If you connect the GSD 350 to an existing local network, a static IP address must be available for each GSD 350 installed. Consult your network administrator for assigning the IP addresses.

Static IP addresses protect against the loss of data

As the PV MassSpec software uses the IP address to identify each GSD 350 connected, the IP address must not be changed while the GSD 350 is operational.

With DHCP, the host can generate a new IP address each time the GSD 350 goes offline and back online again. DHCP can also automatically change the IP address if there is an IP address conflict in the network. If the GSD 350's IP address is changed during data acquisition, the web interface and the PV MassSpec are not automatically reconnected with the GSD 350 as the PV MassSpec software does not recognize the newly assigned IP address. This leads to the loss of communication and the loss of data.

Static IP addresses only change if the IP address is changed manually, and help to protect the GSD 350 against the loss of communication and data.

5.8.2 Sub-networks

Standard subnet mask for GSD 350

- Subnet mask: 255.255.255.0

A Sub-network is a logical visual sub-division of an IP network. Dividing an IP network into several sub-networks is known as sub-netting. Sub-netting sets the region of the IP address that is used as network prefix for all IP addresses within a Sub-network. This is carried out via the Sub-network mask.

	Example 1	Example 2	Example 3
IP address	192.168.1.104	192.168.1.105	192.168.1.150
Subnet mask	255.255.255.0	255.255.0.0	255,255,255,192
Network prefix	192.168.1.0	192.168.0.0	192.168.1.128
Host protocol	0.0.0.104	0.0.1.105	0.0.0.22

Tbl. 9: Examples for Sub-networks

The Sub-network masks specify which octet the IP address should use as network prefix. To allow 2 network devices to communicate, these must be located in the same Sub-network. This means that they do not only have to be connected in the same internet network, but must also have the same network prefix. If 2 devices have 2 different network prefixes, this means that both devices are located in different Sub-networks.

5.8.3 Changing the IP address of the unit

Operating instructions for the web interface and PV MassSpec

Information on operating the GSD 350 via the web interface and PV MassSpec is available in the separate operating instructions as document number **DA 0106**.

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Procedure

- ► Using the display to change the unit's IP address (see chapter “Setting the network parameters”, page 59).
- ► Using the web interface to change the unit's IP address.

5.8.4 Changing the host computer IP address

Administrator rights

The following steps apply to the Windows 10 operating system. Changing the host computer IP address requires administrator rights. Contact your system administrator if necessary.

IP address 192.168.1.100

The factory-assigned IP address of the GSD 350 is 192.168.1.**100**. It cannot be used here.

Changing the IP address back to the default

To change the IP address back to the default, carry out these steps again and replace the IPv4 properties with the default values.

Procedure

1. Press the **Start** button in the taskbar.
2. Press **Settings**.
   – The Settings window opens.
3. Click on **Network & Internet**.
4. Click on **Wireless**.
5. Select **Manage known networks**.
6. Select the network for which you will be editing the settings.
7. Select **Properties**.
8. Below **IP Assignment**, select the **Edit** option.
9. Below **Edit IP settings**, select the **Manual** option
10. Enable **IPv4**.
11. Enter the **IP address**, **subnet prefix length** and the **settings for the IP address**.
    – Do not change the **Gateway**.
    – GSD 350 with default IP address: Use **192.168.1.xxx** as the IP address:, and **255.255.255.0** as the subnet prefix length.
    – "xxx" must not be 100 in the IP address.
12. Select **Save**.
    – This sets the IP address of your computer to the selected manual IP address.
13. Close all open settings windows.

5.9 Installing the PV MassSpec software

Demanding analytical measurement tasks, and applications in which measured values are to be stored, require direct operation of the PrismaPro integrated in the GSD 350 using the PV MassSpec software. The PV MassSpec software is used to parameterize the PrismaPro and create, call and start measurement recipes. All other GSD 350 unit parameters and functions are still controllable via the display or the web interface.

Operating instructions for the web interface and PV MassSpec

Information on operating the GSD 350 via the web interface and PV MassSpec is available in the separate operating instructions as document number **DA 0106**.

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6 Commissioning

NOTICE

Severe vibration will damage the turbopump

Severe vibration and vibrations during operation and after switching off will damage the turbopump.

- ► Avoid knocks and vibration during operation, for example, as caused by driving over cables and door sills.
- ► Avoid vibrations up to 5 minutes after switching off the system.

6.1 Switching on the device

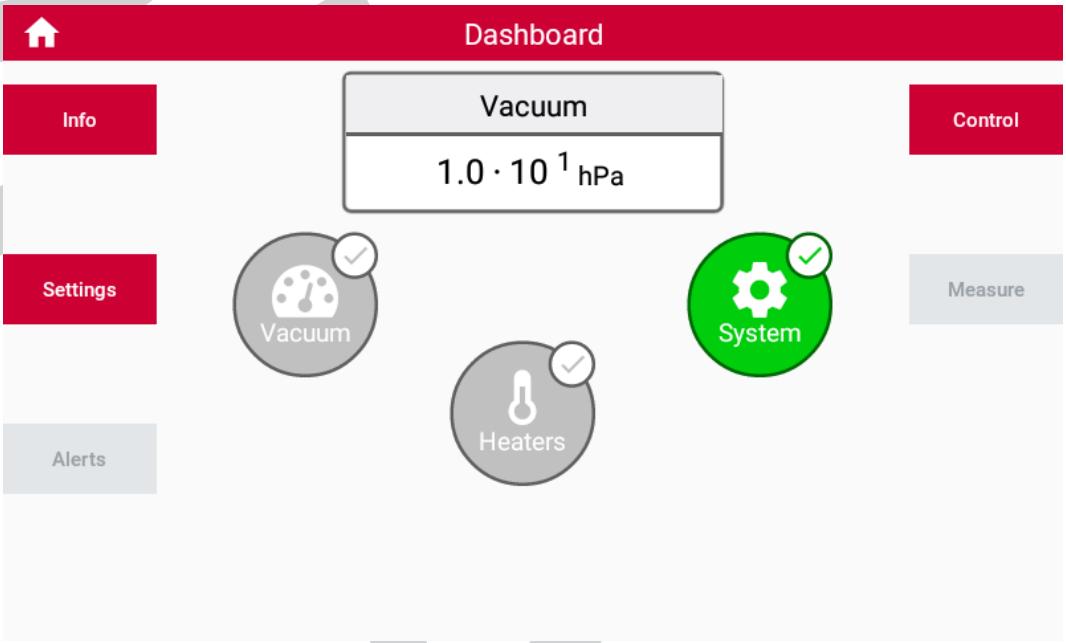

Fig. 32: "Dashboard" screen after starting the program

Procedure

1. Switch on the master switch.
   - The unit starts up. Once the electronics and the internal VLAN switch have booted, the system is ready for operation, and can be controlled using the display or the web interface.
2. Configure the language, if needed (see chapter “Setting the language”, page 58).
3. Start the pumping system.

6.2 Starting the pumping system

A pressure of < 5 × 10^{-5} hPa is required for mass spectrometer measurements.

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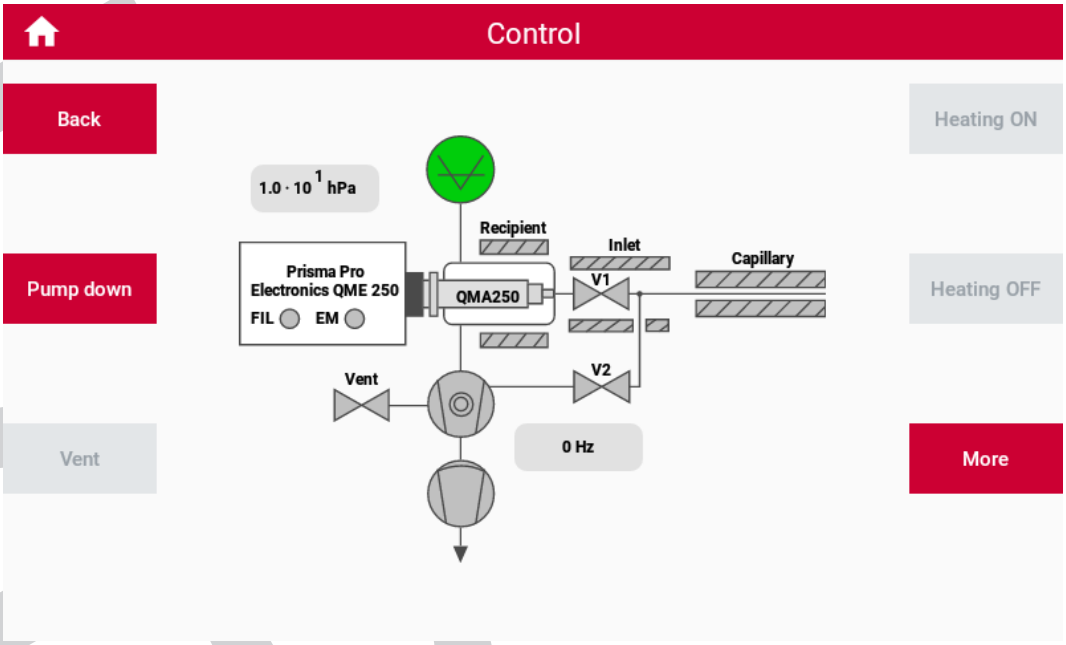

Fig. 33: "Control" screen

Pumping down the vacuum system

1. Switch to the “Control” screen.
2. Press the "Pump down" button (see chapter “Pumping down the vacuum system”, page 61).

The unit is ready for measuring.

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7 Operation via the display

Operating instructions for the web interface and PV MassSpec

Information on operating the GSD 350 via the web interface and PV MassSpec is available in the separate operating instructions as document number **DA 0106**.

The GSD 350 can be operated via the display or alternatively via the web interface. For variants without a display, the web interface is exclusively used for operation.

Conducting mass spectrometer measurements

Three different types of mass spectrometer measurements are supported.

- ► Conduct mass spectrometer measurements in one of the 3 following ways.
- ► Use the PV MassSpec software.
  - – The measured data from the measurements can only be saved if you use the PV MassSpec software.
- ► Use the display.
  - – The measured data from the measurements cannot be saved via the display.
- ► Use the web interface.
  - – The measured data from the measurements cannot be saved via the web interface.

Performing complex analytical measuring tasks

- ► Use the PV MassSpec software.

Navigating between screens and menus

The unit's functions are assigned to different screens and menus.

- ► Press the appropriate buttons on the display to navigate between screens and functions.
  - – Unavailable buttons are grayed.
- ► Press the "Next" button to go to the next page of the menu with more functions.
- ► Press the "Back" button to go back one level in the menu tree.

7.1 "Dashboard" screen

The first screen that appears after the program starts is the "Dashboard" screen. All unit functions and information can be called up directly or indirectly from here. For more information about the controls and displays, see: (see chapter “Controls and indicators”, page 23)

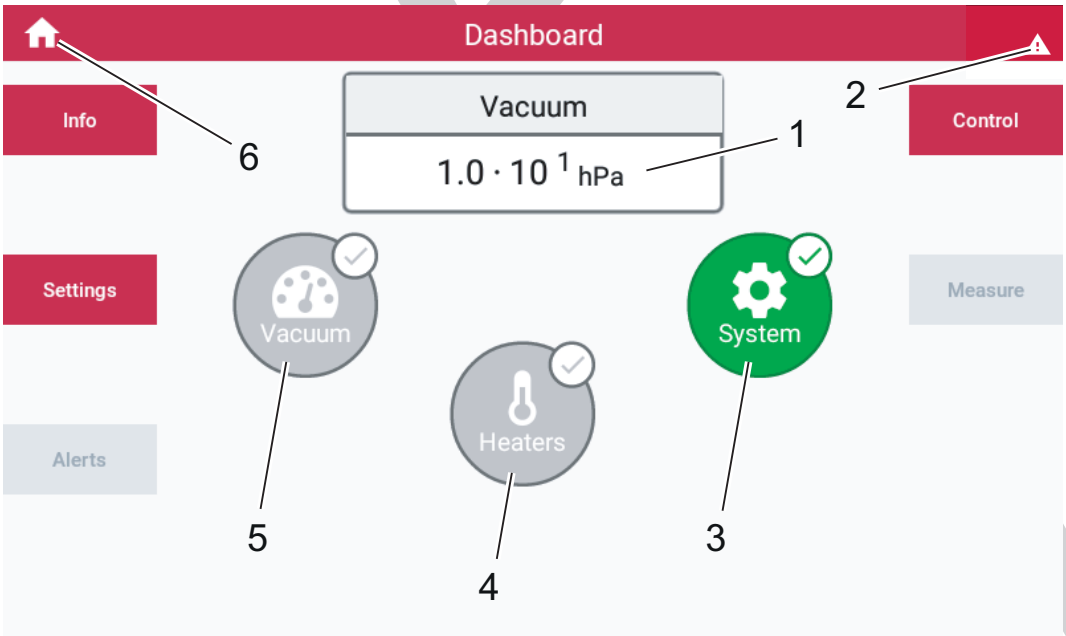

Fig. 34: "Dashboard" screen

1 Current pressure value in the vacuum chamber
2 Warning triangle
3 System status
4 Heating status
5 Vacuum system status
6 Link to start page

Menu	Subprograms, functions and information	
	1. Level	2. Level
Info (see page 53)	Vacuum pumps	Diaphragm Pump
		Turbopump
	Sensors	Mass spectrometer
		Total pressure gauge
		Sealing gas sensor
	Valves	Inlet valve (V1)
		Inlet valve (V2)
		Calibration valve
	Heating units	Capillary heating
		Gas inlet heating
		Vacuum chamber heating
	GSD	Operating hours, firmware versions, etc.
	Network	IP address
		Subnet mask
		Gateway
	Fan	Fan 1 (outlet)
		Fan 2 (inlet)
Settings (see page 53)	Recipes	Creating a new recipe
		Default recipes for air
	Heating units	Capillary heating
		Gas inlet heating
		Vacuum chamber heating
	Sensors	Mass spectrometer
		Total pressure gauge
		Sealing gas sensor
	Language	German
		English
	Autostart	Vacuum
		Heating
		Gas inlet
	Network	IP address
		Subnet mask
		Gateway
	GSD system settings	Pressure
		Temperature
		Date/time
	Factory settings	Reset to as-delivered condition
	Service [7)]	Vacuum pumps
		Sensors
		Valves
		Heating units
		GSD
		Fan
Messages (see page 60)	-	-

7) only available for service personnel after logging in

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Menu	Subprograms, functions and information	
	1. Level	2. Level
Control (see page 60)	Pump down	-
	Vent	-
	Heating on/off	-
	Gas inlet valves open/close [8)]	-
	Bake out on/off	-
	Emission on/off	-
	Electron multiplier on/off	-
	Calibration valve open/close [9)]	-
Measurement (see page 64)	Recipe selection	-

Tbl. 10: Menu structure with functions

7.2 "Info" menu

The "Info" menu shows the current status and parameter settings of the system components. Settings cannot be changed in the "Info" menu.

- Vacuum pumps
- Sensors
- Valves
- Heating units
- GSD system
- Network
- Fan

7.3 "Settings" menu

NOTICE

Property damage due to unintended changes in the Service menu

Unintended changes in the Service menu render the unit functions unusable and cause damage to the unit and its components.

The Service menu is reserved for use by the Pfeiffer Vacuum Service and only accessible after logging in.

► Contact the Pfeiffer Vacuum Service.

The "Settings" menu contains the following functions and submenus:

- **"Measurement recipes" submenu**
  Creating, editing and deleting measurement recipes
- **"Heating" submenu**
  Adjusting the heating units
- **"Sensors" submenu**
  Adjusting the sensors
- **"Language" submenu**
  Setting the language
- **"Autostart" submenu**
  Autostart functions
- **"Network" submenu**
  Network settings

8) only for OmniStar

9) only with optional calibration unit

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- **"GSD system settings" submenu**

  For configuring system settings of the unit (units, date, time and system parameters)
- **"Factory settings" submenu**

  Resetting the parameters to the factory settings
- **"Service" submenu**

  Service functions [10)]

Some setting options are generally available, others depend on the actual unit variant. There are various options for entering and/or setting individual parameters.

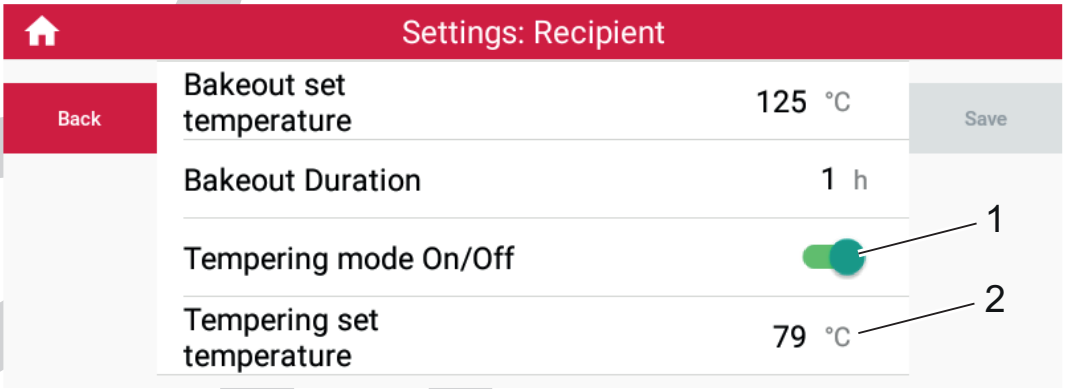

Fig. 35: Example of parameter setting

1 Switch symbol (on) 2 Editable numeric value

Using a switch to change over parameters

1. Scroll to the desired parameter.
2. Press the switch icon to toggle the switch.
3. Press the "Save" button to save the changes.

   or

   Press the "Back" button to discard the changes.
4. Complete other changes, if needed.

Entering parameter values

1. Scroll to the desired parameter.
2. Press the parameter field.
   – A numerical input field appears.
3. Enter the desired value.
   – For values outside the permissible value range, the GSD 350 automatically assumes the highest or lowest permissible value.
4. Press the "Save" button to save the changes.

   or

   Press the "Back" button to discard the changes.
5. Complete other changes, if needed.

10) Only available for service personnel after logging in

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7.3.1 Creating and editing measurement recipes

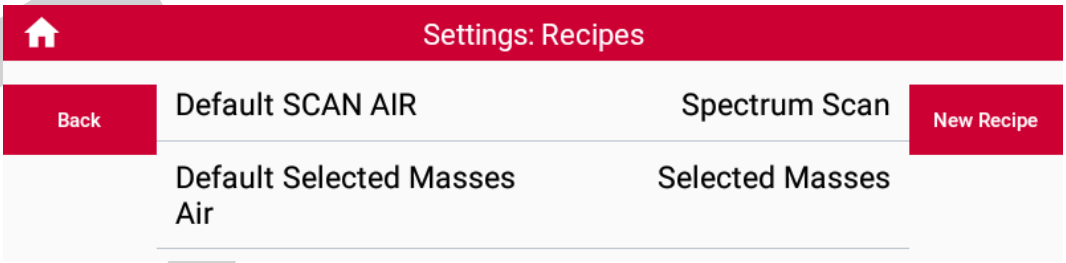

Fig. 36: "Measurement recipes" submenu

The existing measurement recipes can be selected, edited or deleted in the "Measurement recipes" submenu. Up to 8 measurement recipes can be created.

The following measurement recipes are preset:

- Measurement recipe for a scan (default SCAN AIR)
- Measurement recipe for measuring various masses over time (default Selected Masses Air)

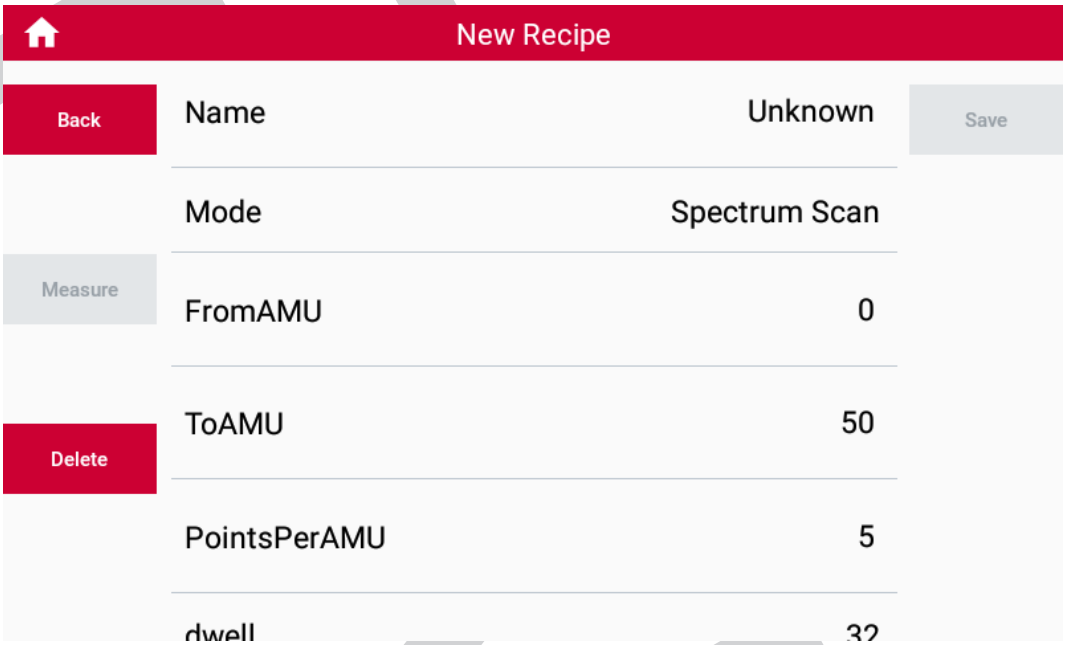

Fig. 37: Measurement recipe for "Spectrum Scan" measuring mode

Editing the measurement recipe for "Spectrum Scan" measuring mode

1. Press the "Create recipe" button .
2. Enter a name for the measurement recipe.
3. Select "Spectrum Scan" measuring mode.
4. Define the mass range by entering the start and end mass (FromAMU and ToAMU).
5. Define the number of measuring points per mass (PointsPerAMU).
6. Define the measuring time for a mass point (dwell).
7. Press "Save" to save the measurement recipe under the name you entered.

   or

   Press "Back" to discard the current input.

   or

   Press "Delete" to delete the current measurement recipe.

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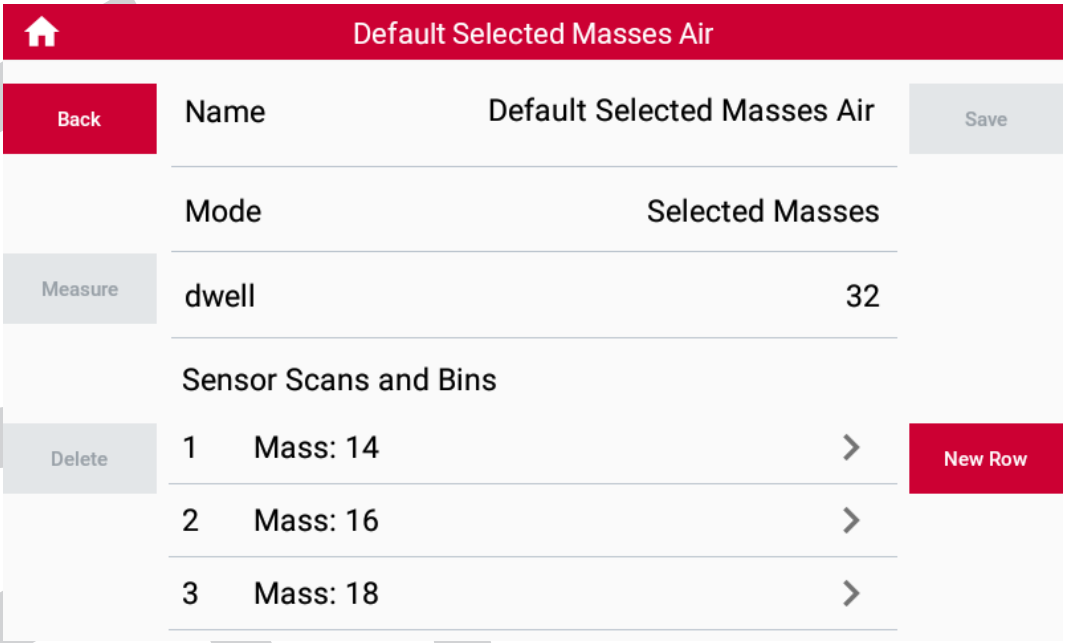

Fig. 38: Measurement recipe for " Selected Masses" measuring mode

Editing the measurement recipe for " Selected Masses" measuring mode

1. Press the "Create recipe" button .
2. Enter a name for the measurement recipe.
3. Select "Selected Masses" measuring mode.
4. Define the measuring time for a mass (dwell).
5. Define the individual mass numbers (Mass: nn) that you want the GSD 350 to record and display over time.
6. Press the "New line" button to add further mass numbers.
7. Press the "Delete" button to delete individual mass numbers.
8. Press "Save" to save the measurement recipe under the name you entered.

   or

   Press "Back" to discard the current input.

   or

   Press "Delete" to delete the current measurement recipe.

7.3.2 Adjusting the heating units

Overheating protection of heating units

All heating units are protected against overheating. The GSD 350 switches off due to this safety monitoring, possibly when setting a new, **lower** set temperature.

Recommendation: Switch the heating unit in question off first, and let it cool down until it reaches a lower temperature. After cooling down , switch the heating back on to let it adjust to the new, desired temperature value.

The current temperatures and the set heating parameters (set temperatures) are shown in the "Heating" menu.

Heating units

- Gas inlet heating
- Capillary heating
- Vacuum chamber heating

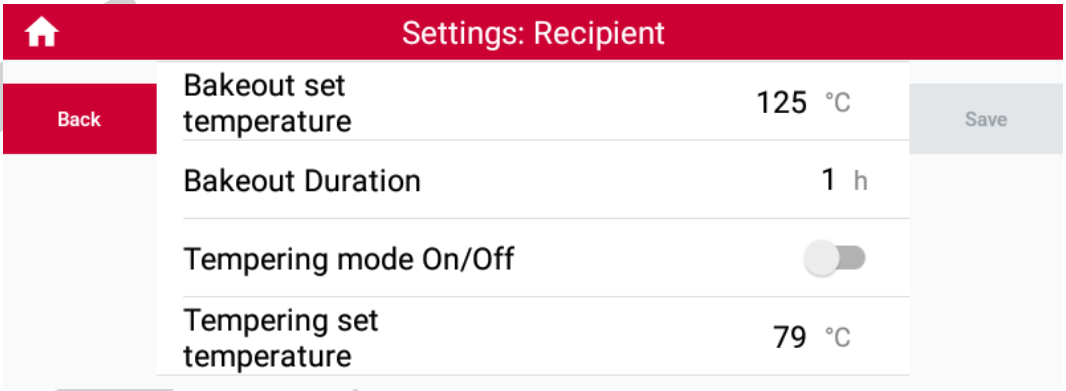

Fig. 39: Tempering mode of the vacuum chamber

In normal cases, the GSD 350 does not heat the vacuum chamber during a measurement. For certain analytical measurements, the "Tempering mode" function can be enabled in the "Vacuum chamber" submenu. If tempering mode is enabled, the GSD 350 always heats the vacuum chamber to the configured set temperature when the GSD 350 switches on the capillary heating.

Switching on tempering mode of the vacuum chamber

1. Use tempering mode for certain analytical measurements.
2. In the "Heating" submenu, press the "Vacuum chamber" button.
3. Adjust the set temperature for "Tempering set temperature".
4. Switch tempering mode on.

7.3.3 Adjusting the sensors

The current sensor parameters of the sensors appear in the "Sensors" submenu.

Sensors

- **Mass spectrometer**
  Select the filament
- **Total pressure gauge**
  Ignore sensor on/off and sensor errors
- **Sealing gas sensor (only for corrosive gas version)**
  Ignore sensor errors

Recommendations for total pressure gauges

- ► If possible, leave the total pressure gauges switched on at all times to protect filaments and vacuum pumps of the GSD 350.
- ► Switch the total pressure gauge off temporarily with the "Sensor On/Off" function if this is beneficial for specific analysis tasks.
- ► Disable the switch-off function of the GSD 350 for the total pressure gauge with the "Ignore sensor error" function so that you can continue on-going measurements if the total pressure gauge is defective.
- ► Do not use the disabling function for longer than needed.
- ► Immediately replace the total pressure gauge in case of a defect.

Recommendations for the sealing gas sensor

- ► If possible, leave the sealing gas sensor switched on at all times to protect the vacuum pumps of the GSD 350.
- ► Use the "Ignore sensor error" function to temporarily switch off sealing gas monitoring in order to reduce the consumption of sealing gas for measuring tasks where the GSD 350 is not exposed to corrosive gases or condensable gas mixtures.
- ► Do not use the disabling function for longer than needed.

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7.3.4 Setting the language

Fig. 40: "Language" submenu

The following languages are available in the "Language" submenu:

- English (standard)
- German

7.3.5 Setting autostart functions

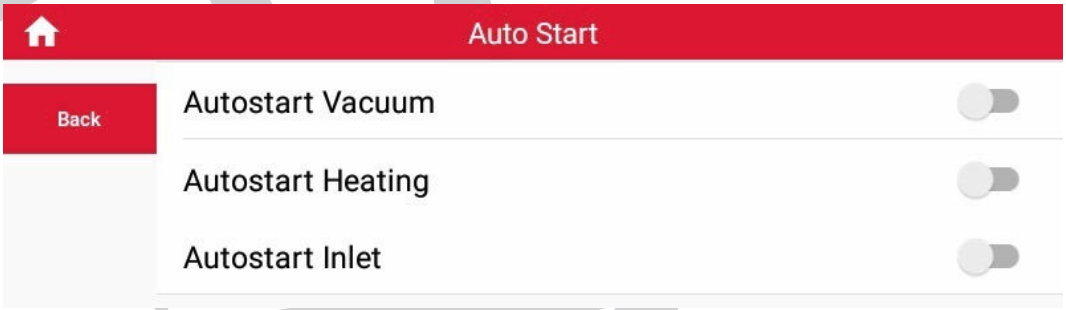

Fig. 41: "Autostart" submenu

In the "Autostart" submenu, you can define which functions of the GSD 350 start automatically after switching on.

Autostart functions

- **Vacuum**

  Starts the vacuum pumps
- **Heating**

  Heats the capillary heating to the setpoint
- **Gas inlet**

  Opens the gas inlet valve (V1) (only for OmniStar)

Required vacuum in the vacuum chamber

The "Heating" and "Gas inlet" autostart functions are only available in combination with the "Vacuum" autostart function as the required vacuum must have been built up in the vacuum chamber for these autostart functions.

7.3.6 Setting the network parameters

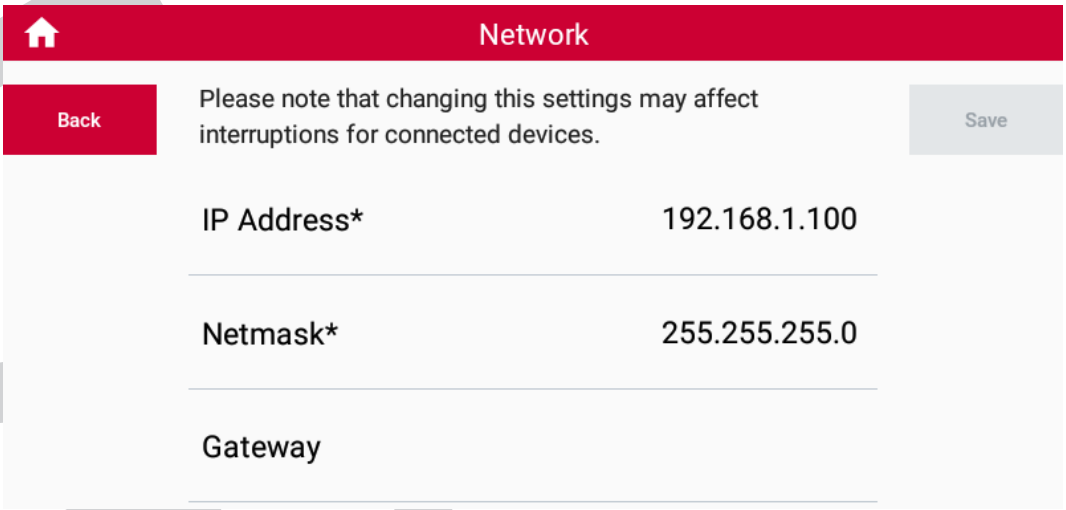

Fig. 42: "Network" submenu

You can set the network parameters for the GSD 350 in the "Network" submenu. You may need to re-start the GSD 350 after the adjustment.

Network parameters

- IP address
- Subnet mask
- Gateway

Setting up the IP address for the GSD 350

1. Enter the new static IP address.
   – Setting to DHCP is not possible.
2. Enter the new subnet mask, if needed.
3. Press the "Save" button.
4. Wait until you are prompted to switch off the GSD 350.
5. Turn off the device.
6. Switch the unit back on after > 20 seconds.

You will find the GSD 350 below the new settings.

7.3.7 Adjusting the GSD system parameters

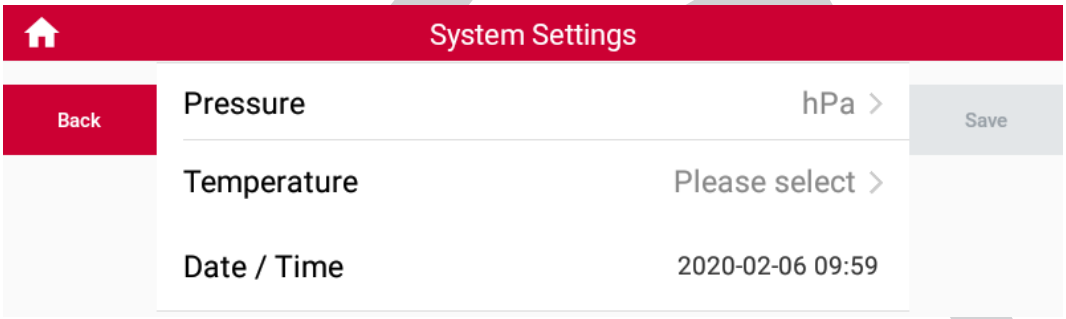

Fig. 43: "GSD system parameters" submenu

The units for the physical values pressure and temperature can be toggled in the "GSD system parameters" submenu. You can also set the date and time.

As-delivered condition

- Pressure: hPa
- Temperature: °C

Setting the time and date

1. Tap the date and time on the display.
2. Set the date.

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3. Set the time.
4. Select "Save" to confirm the settings.

7.3.8 Resetting the unit to the factory settings

Modified settings are lost

Resetting to the factory settings overwrites all modified settings, or these settings are lost. This function cannot be undone.

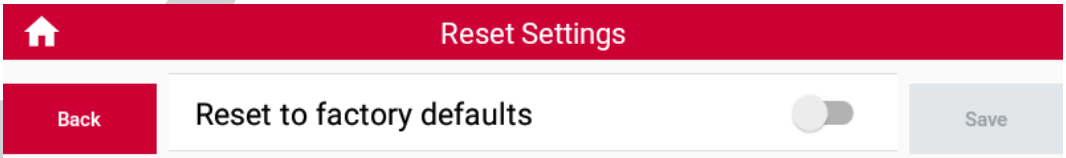

Fig. 44: "Factory settings" submenu

You can reset all of the GSD 350's parameters to the factory settings in the "Factory settings" submenu.

Procedure

1. Activate the "Reset to as-delivered condition" switch.
2. Confirm the safety prompt by pressing the "Save" button.

   or

   Press the "Back" button to keep the current parameter values.

7.3.9 Service

NOTICE

Property damage due to unintended changes in the Service menu

Unintended changes in the Service menu render the unit functions unusable and cause damage to the unit and its components.

The Service menu is reserved for use by the Pfeiffer Vacuum Service and only accessible after logging in.

► Contact the Pfeiffer Vacuum Service.

- Vacuum pumps
- Sensors
- Valves
- Heating units
- GSD
- Fan

7.4 "Messages" menu

The "Messages" menu shows current warning and malfunction messages of the unit.

Accessing warnings and malfunction messages

► Switch to the "Messages" menu or press the warning triangle.
  – The warnings and malfunction messages appear.

7.5 "Control" menu

The "Control" menu shows the vacuum diagram of the system and its important parameters.

Depending on the operating status of the unit, and the type of unit, the menu offers the following functions:

- Pump down/Vent vacuum system
- Switch capillary and inlet heating on/off
- Switch vacuum chamber heating on/off (bake out)

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- Open/shut off gas inlet (OmniStar)
- Switch emission (filament) on/off
- Switch electron multiplier on/off

Explanations of the vacuum diagram are available here: (see chapter “Functional description”, page 22)

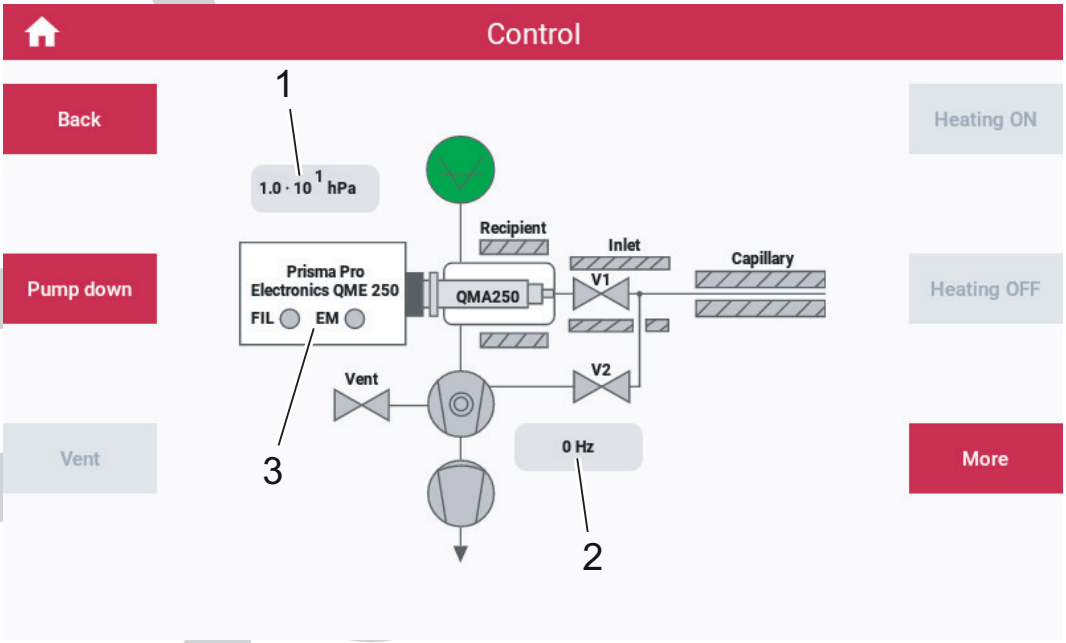

Fig. 45: "Control" menu

1 Pressure in the vacuum chamber (total pressure gauge)
2 Turbopump rotation speed
3 Status of PrismaPro filament and electron multiplier

7.5.1 Pumping down the vacuum system

Prerequisite

- Device ready for operation

Procedure

1. Switch to the “Control” menu.
2. Press the "Pump down" button.

Sequence

- The GSD 350 transitions from "Vented" state to "Pump down" state.
- The venting valve shuts.
- The diaphragm pump starts up and evacuates the vacuum system.
- After reaching the threshold value (10 hPa), the turbopump accelerates to the final rotation speed of 1500 Hz.
- After a few minutes, the vacuum system reaches a pressure of < 5×10^{-5} hPa.

7.5.2 Venting the vacuum system

Prerequisites

- On-going measurements completed (see chapter “"Measurement" menu”, page 64)
- Filament an electron multiplier switched off (see chapter “"Control" menu”, page 60).

Procedure

1. Switch to the “Control” menu.
2. Press the "Vent" button.

Sequence

- The GSD 350 transitions from "Vacuum" state to "Vented" state.
- After confirming the safety prompt, the emission and electron multiplier are switched off.

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- Once the emission is switched off, an internal timer starts. The timer allows the filament to cool down before venting the vacuum chamber. The timer time is 15 minutes; this is the duration after switching off the emission. If the emission was still switched on when starting "Venting", the timer starts at 15 minutes. The remaining timer time is shown top right on the display.
- After the timer time has expired, the turbopump runs down.
  - Below the venting rotation speed (750 Hz), the venting valve vents the turbopump and the vacuum chamber.
  - The venting valve remains open.
- The diaphragm pump stops.

7.5.3 Switching the heating units on and off

Prerequisite

- The turbopump is running at the set rotation speed

Switching the heating on

1. Switch to the “Control” menu.
2. Press the "Heating on" button.

Sequence for switching on

- The GSD 350 switches the capillary heating and the gas inlet heating on.
- A PID control regulates each heating circuit with the matching control parameters to achieve the required set temperature.

Switching the heating off

1. Switch to the “Control” menu.
2. Press the "Heating off" button.

Switch off sequence

- The GSD 350 switches the capillary heating and the gas inlet heating off.
- As of a threshold value of ≤ 40 °C, the "Heating off" state is reached.

7.5.4 Opening and closing the gas inlet (OmniStar)

Prerequisite

- The turbopump is running at the set rotation speed

Opening the gas inlet

1. Switch to the “Control” menu.
2. Press the "Open inlet valve" button.

Opening sequence

- Pump valve V2 opens and closes multiple times briefly in a defined interval in order to avoid impermissible pressure surges.
- Pump valve V2 remains open after the last interval.
- Gas inlet valve V1 opens after a delay about 7 seconds later.
- A PWM control then keeps both valves open to keep the coil flow low for thermal reasons.

Shutting the gas inlet

1. Switch to the “Control” menu.
2. Press the "Shut inlet valve" button.

Closing sequence

- Gas inlet valve V1 closes.
- Pump valve V2 closes.

7.5.5 Baking out the vacuum chamber

After the timer preset, bake out is automatically disabled, or the user can select the "Bake out off" function.

Prerequisite

- The turbopump is running at the set rotation speed

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Baking out the vacuum chamber

1. Switch to the “Control” menu.
2. Press the "Bake out on" button.

Bake out sequence

- The GSD 350 transitions from "Bake out off" state to " Bake out on" state.
  - The electron multiplier on the PrismaPro switches off.
  - Filament emission starts.
- The GSD 350 switches the vacuum chamber heating cartridges on.
  - A PID control regulates the heating circuit with the matching control parameters to achieve the required set temperature (default = 120 °C, adjustable between 100 °C and 130 °C)
  - The GSD 350 turns the heating down, if there is a risk of excess temperature in the unit.

    Information to this effect appears in the display.
- The timer starts.
  - After the timer preset (between 1 and 24 hours), bake out is automatically disabled.

Ending vacuum chamber bake out

1. Switch to the “Control” menu.
2. Press the "Bake out off" button.

Sequence on terminating

- The GSD 350 transitions from "Bake out on" state to " Bake out off" state.
- The GSD 350 switches the vacuum chamber heating cartridges off.
  - As of a threshold value of ≤ 40 °C, the "Back out off" state is reached.

7.5.6 Switching emission on and off

Malfunctions or impermissible conditions lead to emission being automatically shut off.

Prerequisites

- The turbopump is running at the set rotation speed
- The total pressure in the vacuum chamber is < 1× 10^{-4} hPa

Switching on emission

1. Switch to the “Control” menu.
2. Press the "Emission on" button.

Sequence for switching on

- The GSD 350 switches the emission of the filament on.
- The GSD 350 keeps the emission current of the switched on filament constant and monitors this continuously.

  If the pressure in the vacuum chamber is too high, the filament current is too high, or the emission fluctuations are too pronounced, emission is automatically switched off.

Switching emission off

1. Switch to the “Control” menu.
2. Press the "Emission off" button.

Switch off sequence

- The GSD 350 switches the emission of the filament off.

7.5.7 Switching the electron multiplier on and off

Malfunctions or impermissible conditions lead to the electron multiplier being automatically switched off.

If filament emission is switched off manually or automatically, the electron multiplier is also automatically switched off.

Prerequisites

- The turbopump is running at the set rotation speed
- The total pressure in the vacuum chamber is < 5× 10^{-5} hPa
- Emission on

Switching on the electron multiplier

1. Switch to the “Control” menu.
2. Press the "EM on" button.

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Sequence for switching on

- The GSD 350 switches the electron multiplier on.

Switch off the electron multiplier

1. Switch to the “Control” menu.
2. Press the "EM off" button.

Switch off sequence

- The GSD 350 switches the electron multiplier off.

7.5.8 Opening and closing the calibration valve

The calibration valve only exists on variants of the GSD 350 with a calibration unit.

Prerequisite

- The turbopump is running at the set rotation speed

Opening the calibration valve

1. Switch to the “Control” menu.
2. Press the "Open calibration valve" button.
3. Calibrate the mass scale of the PrismaPro.

Opening sequence

- The calibration valve opens in a cycle.
- The calibration medium flows into the vacuum chamber with the PrismaPro.

Shutting the calibration valve

1. Switch to the “Control” menu.
2. Press the "Shut calibration valve" button.

Closing sequence

- The calibration valve shuts off.

7.6 "Measurement" menu

Depending on the operating status of the unit, the menu offers the following functions:

- calling and starting existing measurement recipes
- In as-delivered condition: mass scan (default SCAN AIR / Spectrum Scan) or measurement of individual masses (Default Selected Masses Air / Selected Masses)

Starting the measurement

1. In the "Control" menu, switch on the filament and if applicable, also the electron multiplier.
2. In the "Measurement" menu, press the "Start" button.
3. If necessary, toggle the display between linear and logarithmic.

Stopping the measurement

1. In the "Measurement" menu, press the "Stop" button.
2. In the "Control" menu, switch off the filament and if applicable, also the electron multiplier.

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8 Decommissioning

NOTICE

Severe vibration will damage the turbopump

Severe vibration and vibrations during operation and after switching off will damage the turbopump.

- ► Avoid knocks and vibration during operation, for example, as caused by driving over cables and door sills.
- ► Avoid vibrations up to 5 minutes after switching off the system.

NOTICE

Danger of the filament being destroyed

Unplugging the power plug or turning off the main switch during operation severely stresses the filament and impacts on the filament's service life if the unit is under vacuum and emission is switched on.

- ► Always shut down the unit correctly.
- ► Switch off the unit before you disconnect the mains plug.

Protecting the filament

To protect the filament, the turbopump switches off 15 minutes after switching off the filament at the earliest. The actual venting action, venting the system, starts when the turbopump reaches a rotation speed of 750 Hz.

Recommendations for corrosive gases and condensable gas mixtures

1. Allow dry air or inert gas to flow in through the capillary.
2. Allow the GSD 350 to run for another approx. 30 minutes to flush residues of corrosive gases and condensable gases out of the system.

Switch off the device

1. Switch the emission of the PrismaPro off (see chapter “Switching emission on and off”, page 63).
2. Switch the electron multiplier of the PrismaPro off (see chapter “Switching the electron multiplier on and off”, page 63).
3. Vent the vacuum system to switch it off (see chapter “Venting the vacuum system”, page 61).
4. Wait until the GSD 350 vents the system and has switched off the vacuum pumps.
5. Switch off the main switch of the unit.
6. Disconnect the mains cable from the power supply.

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9 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.

Loss of warranty claims

The following will result in the loss of the warranty:

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

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

First read through the sections completely

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

9.1 Maintenance work and intervals

Notes on maintenance intervals

The times for the maintenance intervals depend to a great extent on the process conditions; they apply for working with clean and inert gases. The use of corrosive process gases can substantially curtail the maintenance intervals.

- Agree shorter maintenance intervals for extreme loads or for specific processes Pfeiffer Vacuum Service.

You can carry out maintenance work at **maintenance level 1** yourself.

We recommend Pfeiffer Vacuum Service for carrying out maintenance work at **maintenance level 2** and **maintenance level 3** (overhaul). If the required intervals listed below are exceeded, or if maintenance work is carried out improperly, no warranty or liability claims are accepted on the part of Pfeiffer Vacuum. This also applies if do not use original spare parts.

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Group of components, module and action	Interval	Maintenance level	Spare part/spare part set	Description
Basic unit				
Cleaning housing parts	If required	1	-	(see page 71)
Cleaning the protection screens on the fan	Monthly		-	(see page 72)
High vacuum system				
Replace copper gasket on DN 40 CF flange connection	Always when the CF flange connection is opened	2	490DFL040-S-S5	-
Replace operating fluid reservoir on turbopump	4 years		PM 143 740 -T	(see page 73) Also see turbopump operating instructions
Replace turbopump bearings		3	-	See turbopump operating instructions
Replace venting valve	in case of a defect	2	PM Z01 290 -T	(see page 73) Also see turbopump operating instructions
Fore-vacuum system				
Remove/install diaphragm pump	If required	2	-	(see page 75)
Replacing the diaphragm pump		3	PK T05 072	
Replace diaphragm pump diaphragm	after 15 000 operating hours	2	PU E22 030 -T	(see page 76) Also see diaphragm pump operating instructions
Gas analysis unit				
Install/remove QMA 250 M analyzer	If required	2	-	(see page 77) Also see PrismaPro operating instructions
Replace filament (tungsten)	If required		PT 163 331	
Replace filament (Ir-Y_2O_3)	After the first of the 2 filaments fails		PT 163 332	
Replace ion source (tungsten filaments)	If soiled		PT 163 231	
Replace ion source (Ir-Y_2O_3 filaments)			PT 163 232	
Replace sensor on total pressure gauge			PT 120 212 -T	(see page 79) Also see total pressure gauge operating instructions
Replace total pressure gauge	in case of a defect		PT R40 351 -A	(see page 79)
Gas inlet system				
Install/remove gas inlet (OmniStar)	If required	2	-	(see page 81) (see page 82)
Replace gas inlet (OmniStar)			PT 167 016 -T	
Install/remove gas inlet (ThermoStar)			-	(see page 84) (see page 85)
Replace gas inlet (ThermoStar)			PT 167 013 -T	
Replace screen (OmniStar)	If plugged		BK212576	(see page 82)
Replace screen (ThermoStar)				(see page 85)
Replace screen and internal gas guide (OmniStar)	If required		PT 167 014 -T	(see page 82)
Replace screen and internal gas guide (ThermoStar)				(see page 85)

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Group of components, module and action	Interval	Maintenance level	Spare part/spare part set	Description
Capillary				
Shorten stainless steel capillary	If plugged	2	-	(see page 86)
Replace stainless steel capillary			PT 167 060 PT 167 017 -T	(see page 87)
Trimming quartz capillary			-	(see page 88)
Replace quartz capillary			B1975082EC PT 167 015 -T	(see page 89)
Heating units				
Replacing the capillary hose	in case of a defect	3	PT 167 050 -T or PT 167 051 -T or PT 167 052 -T	(see page 91)
Electronic components				
Replace display	in case of a defect	2	PT 167 025	(see page 91)
Calibration unit (option)				
Refill calibration medium (PFTBA)	If required	2	PT 167 031	(see page 93)
Additional maintenance work for the corrosive gas version				
Replacing the sealing gas valve	in case of a defect	2	PM Z01 310 A	(see page 94)

Tbl. 11: Maintenance work and intervals

9.2 Maintaining the basic unit

⚠ DANGER

Danger to life due to electric voltage

High voltages are present inside the device. When touching parts that are live, there is a risk of death. If there is visible damage, there is a risk of death when commissioning the device.

- ► Work on the open device must only be carried out by trained specialist personnel.
- ► Before carrying out any installation and maintenance work, switch the device off and disconnect it from the current supply.
- ► Never open the device with the current supply connected.
- ► Secure the current supply against unauthorized or unintentional reactivation.
- ► Never operate an open or defective device.
- ► Secure a defective device against accidental operation.
- ► Protect the device against moisture.

⚠ WARNING

Danger of burns on hot surfaces

During operation high temperatures (> 50 °C) occur on touchable surfaces of the heating components and the gas inlet. There is a risk of burning.

- ► Secure hot parts against inadvertent touching.
- ► Display warning signs.
- ► Make sure that the product has cooled down before performing work.
- ► Wear protective gloves (in accordance with EN 420).

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9.2.1 Removing/attaching the gas inlet cover

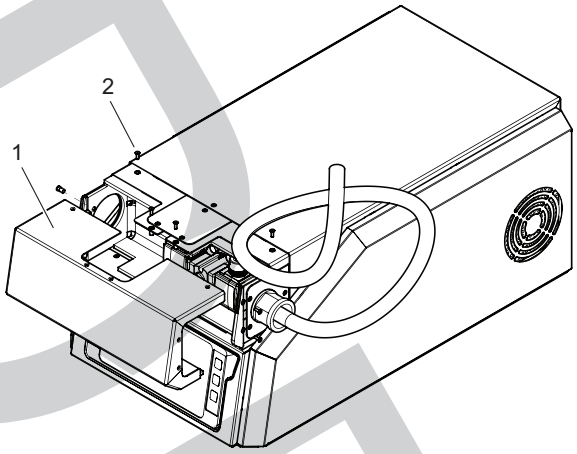

Fig. 46: Removing/attaching the gas inlet cover

1 Gas inlet cover 2 Interior hexagon socket screw (8×M3)

Prerequisites

- GSD 350 switched off
- Power cable disconnected

Required tool

- Allen key, **WAF 2**

Removing the gas inlet cover

1. Loosen the interior hexagon socket screws on the gas inlet cover from the chassis.
2. Carefully remove the gas inlet cover to the front.
   – Pay attention to the insulation.

Attaching the gas inlet cover

1. Deposit the gas inlet cover on the chassis.
   – Pay attention to the insulation.
2. Fasten the gas inlet cover to the chassis with the interior hexagon socket screws.

9.2.2 Removing/attaching the side covers

Do not remove the gas inlet cover

There is no need to remove the gas inlet cover to remove the side covers.

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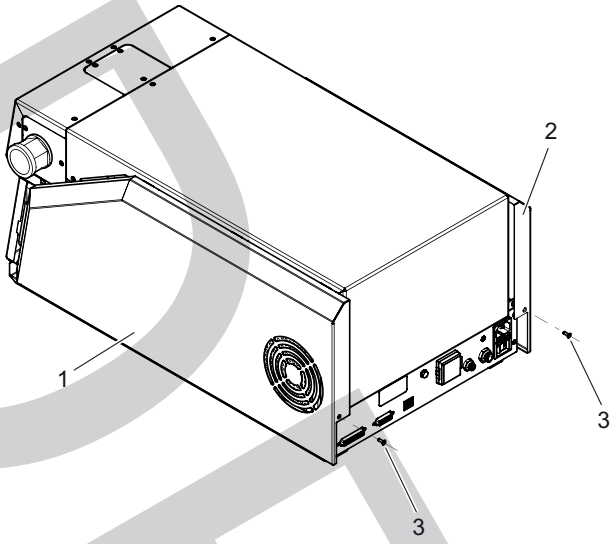

Fig. 47: Removing/attaching the side covers

1 Side cover, right
2 Side cover, left
3 Interior hexagon socket screw (2×M3)

Prerequisites

- GSD 350 switched off
- Power cable disconnected

Required tool

- Allen key, **WAF 2**

Removing the side covers

1. Loosen and remove the interior hexagon socket screws on the side cover from the chassis.
2. Carefully remove the side cover towards the rear.
   – Pay attention to the mounting straps on the side cover.
3. Loosen the plug-and-socket connection of the grounding cable on the side cover.

Attaching the side covers

1. Attach the plug-and-socket connection of the grounding cable on the side cover.
2. Carefully fit the side cover from the rear.
   – Pay attention to the mounting straps on the side cover.
3. Tighten the interior hexagon socket screws of the side cover on the chassis.

9.2.3 Removing/attaching the housing cover

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Side covers removed

Required tool

- Allen key, **WAF 2**

DRAFT

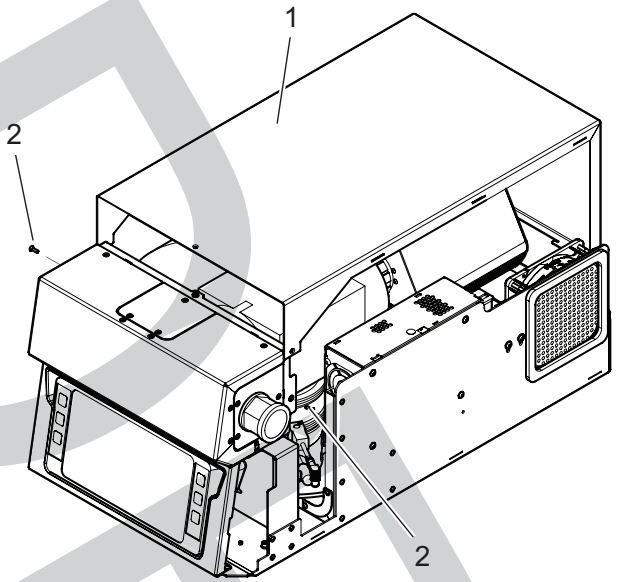

Fig. 48: Removing/attaching the housing cover

1 Housing cover 2 Interior hexagon socket screw (2×M3)

Removing the housing cover

1. Loosen the interior hexagon socket screws on the housing cover from the chassis.
2. Carefully remove the housing cover in upwards direction.
3. Loosen the plug-and-socket connection of the grounding cable on the housing cover.

Attaching the housing cover

1. Attach the plug-and-socket connection of the grounding cable on the housing cover.
2. Carefully fit the housing cover from the top.
3. Tighten the interior hexagon socket screws of the housing cover on the chassis.

9.2.4 Cleaning housing parts

⚠ DANGER

Electric shocks due to moisture penetrating into the device

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

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

⚠ WARNING

Health hazards due to cleaning agent

The cleaning agents used cause health hazards.

- ► 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.

DRAFT

NOTICE

Damage caused by penetrating moisture

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

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

NOTICE

Damage caused by unsuitable cleaning agents

Unsuitable cleaning agents damage the product.

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

Prerequisites

- GSD 350 switched off
- Power cable disconnected

Required consumables

- Usual cleaning agent (e.g. a light domestic detergent)
- Cloth (clean, soft, lint-free)
- Compressed air

Requirements for compressed air

- Oil-free
- Dry
- Free of particles > 30 µm
- < 2 bar overpressure

Cleaning housing parts

1. Use a soft, damp cloth to clean the outside of the housing.
2. Allow the surfaces to dry thoroughly after cleaning.
3. Remove dust layers inside the unit by blowing them out carefully with compressed air.

9.2.5 Cleaning the protection screens on the fans

Cleaning interval

Define the cleaning interval by visual inspections and as a function of the local dust incidence.

It is typically sufficient to occasionally vacuum the protection screen through the ventilation openings using a vacuum cleaner.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Side covers removed

Equipment required

- Vacuum cleaner

Procedure

1. Clean the protection screen as soon as a visible coating can be seen, and before the air circulation drops below the required level.
2. Use a vacuum cleaner to remove the dust from the protection screen.

DRAFT

9.3 Maintaining the high vacuum system

9.3.1 Replace operating fluid reservoir on turbopump

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill

Required tool

- Screwdriver, **4 mm**

Required special tool

- Key for housing cover (part number PV M40 813)

Required material

- Operating fluid reservoir (part number PM 143 740 -T)

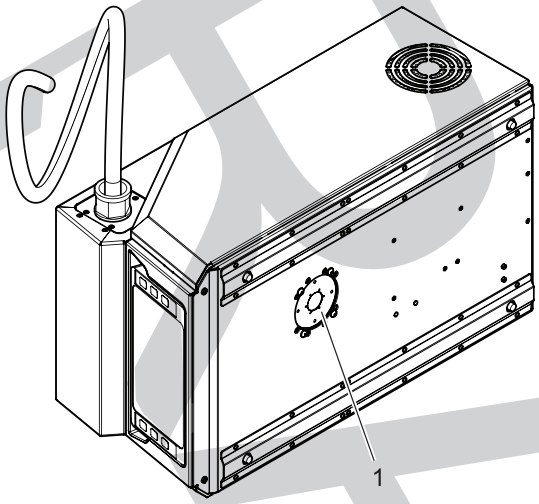

Fig. 49: Unit underside
1
Housing cover on turbopump

Procedure

1. Carefully place the GSD 350 on its side.
2. Open the turbopump housing cover using the wrench for the housing cover.
3. Replace the operating fluid reservoir and the Poroplast rods in line with the turbopump operating instructions.
4. Close the turbopump housing cover using the wrench for the housing cover.
5. Carefully erect the GSD 350 again.

9.3.2 Replace venting valve

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tools

- Open-end wrench, **WAF 17**
- Open-end wrench, **WAF 13**

Spare part required

- Venting valve (part number PM Z01 290 -T)

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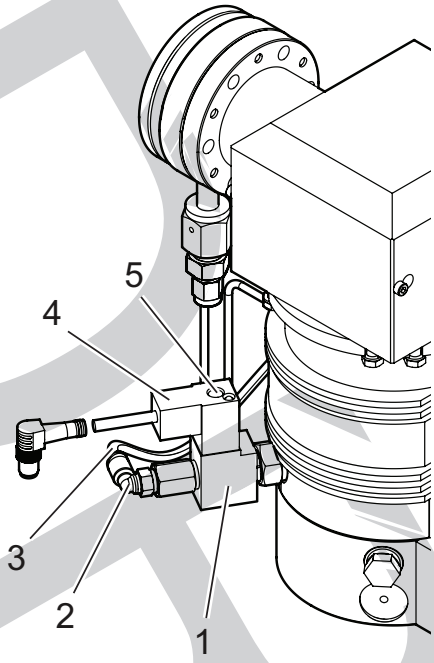

Fig. 50: Venting valve on the turbopump

1 Venting valve
2 Angled push-in fitting (corrosive gas version)
3 Sealing gas supply (corrosive gas version)
4 Power supply plug
5 Lock screw

Remove the turbopump (optional)

Due to the cramped conditions in the GSD 350 it can be useful to first remove the turbopump before starting to remove or install the valve.

1. Remove the electronics unit on the PrismaPro
   (see chapter “Maintaining the QMA 250 M analyzer”, page 77)
2. Remove the analyzer on the PrismaPro
   (see chapter “Maintaining the QMA 250 M analyzer”, page 77)
3. Remove the gas inlet flange
   (see chapter “Removing the gas inlet flange”, page 81) or (see chapter “Removing the gas inlet flange”, page 84)
4. Reinstall components after replacing the valve.

Procedure

1. Loosen the lock screw on the power supply plug.
2. Disconnect the power supply plug from the venting valve.
3. Additionally for the corrosive gas version:
   – Disconnect the sealing gas supply from the venting valve.
4. Unscrew and remove the venting valve from the turbopump.
5. Connect the new venting valve in line with the operating instructions for the turbopump.
6. Plug the power supply plug into the venting valve.
7. Fasten the lock screw on the power supply plug.
8. Additionally for the corrosive gas version:
   – Unscrew and remove the angled push-in fitting from the old venting valve.
   – Mount the angled push-in fitting on the new venting valve.
   – Connect the sealing gas supply to the venting valve.

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9.4 Maintaining the fore-vacuum system

9.4.1 Replacing the diaphragm pump

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tools

- Open-end wrench, **WAF 7**
- Allen key, **WAF 3**
- Crosshead screwdriver

Equipment required

- DCU 110, DCU 180 or DCU 310 control unit with connection cable

Spare part required

- MVP 010-3 DC diaphragm pump (part number PK T05 072)

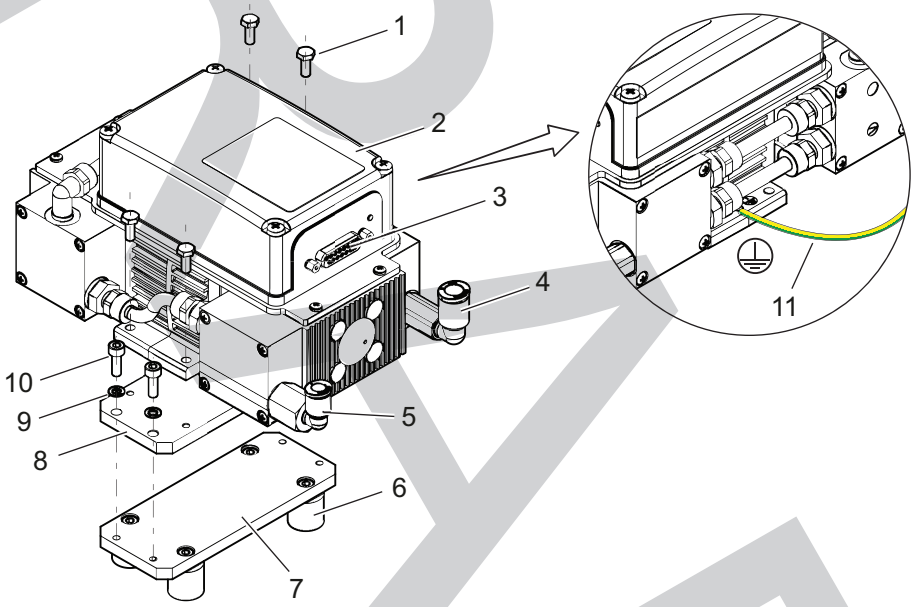

Fig. 51: Replacing the diaphragm pump

1 Hexagon head set screw (4×)
2 Diaphragm Pump
3 D-sub plug
4 Intake connection
5 Exhaust gas connection
6 Rubber buffer (4×)
7 Fixing plate
8 Diaphragm pump carrier
9 Lock washer (2×)
10 Interior hexagon socket screw (2×)
11 Ground terminal

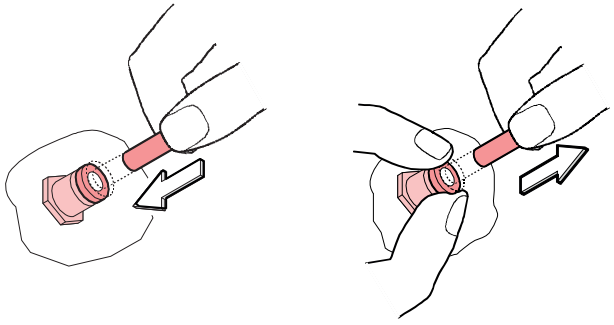

Fig. 52: Connect the exhaust gas and intake hose, and draw off

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Removing the diaphragm pump

1. Set the RS485 address of the new diaphragm pump to a value of "10" with the aid of a current DCU 110/180/310 and the appropriate connection cable.
2. Press the release ring on the exhaust gas connection of the diaphragm pump firmly down on both sides in order to open the holding claws uniformly and avoid scratches on the exhaust gas hose.
3. Pull the exhaust gas hose vertically out of the diaphragm pump.
4. Press the release ring on the intake connection of the diaphragm pump firmly down on both sides in order to open the holding claws uniformly and avoid scratches on the intake hose.
5. Pull the intake hose vertically out of the diaphragm pump.
6. Loosen the lock screws on the diaphragm pump's D-Sub plug.
7. Disconnect the D-Sub plug from the diaphragm pump.
8. Loosen the grounding connection on the diaphragm pump.
9. Loosen the interior hexagon socket screws and the circlips.
10. Remove the diaphragm pump and diaphragm pump carrier from the fastening plate by turning slightly.
11. Loosen the hexagon head set screws.
12. Remove the diaphragm pump carrier from the diaphragm pump.

Installing the diaphragm pump

1. Use the interior hexagon socket screws to fasten the diaphragm pump to the diaphragm pump carrier.
2. Use the interior hexagon socket screws and circlips to fasten the diaphragm pump and diaphragm pump carrier to the fastening plate.
3. Plug the D-Sub plug into the diaphragm pump.
4. Fasten the lock screws on the D-Sub plug.
5. Fasten the grounding connection on the diaphragm pump.
6. Insert the exhaust gas hose into the exhaust gas connection on the diaphragm pump.
   – Observe the correction position of the exhaust gas side.
7. Insert the intake hose into the vacuum connection on the diaphragm pump.
   – Observe the correction position of the intake side.

9.4.2 Replace diaphragm pump diaphragms

The typical service life of diaphragms and valves is 15 000 operating hours at nominal speed under clean operating conditions and with the GSD 350 analyzing inert gases only.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed
- Diaphragm pump removed from GSD 350

Required material

- Inspection set (part number PU E22 030 -T)

Procedure

1. Replace the diaphragms and valves after 15 000 operating hours at the latest.
2. Replace the diaphragms and valves in line with the diaphragm pump operating instructions.

DRAFT

9.5 Maintaining the gas analysis unit

9.5.1 Maintaining the QMA 250 M analyzer

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.

- ► During assembly and maintenance work on high or ultra high vacuum systems, always wear clean, lint-free and powder-free laboratory gloves.
- ► Only use clean tools.
- ► During assembly, ensure for connecting flanges free of grease.
- ► Only remove protective caps and protective covers from flanges and connections when necessary.
- ► Only remove the analyzer transport protection when necessary.
- ► Carry out all work in a well lit area.

PrismaPro operating instructions

Information on disassembly and assembly of the electronic unit (QME) and analyzer (QMA) is available in the PrismaPro operating instructions.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tool

- 2 open-end wrenches, **WAF 10**

Required aid

- Assembly aid for QMA 250 Analyzer

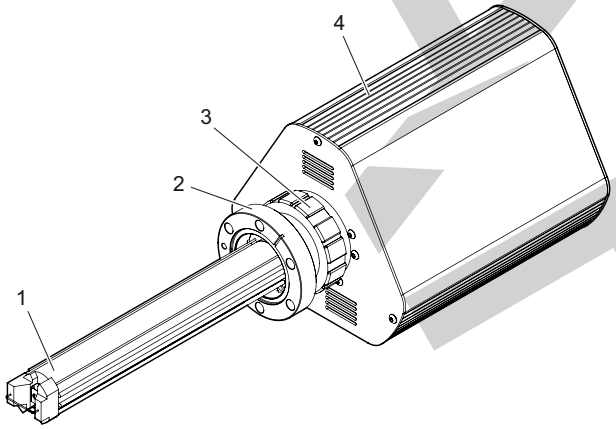

Fig. 53: PrismaPro Quadrupole mass spectrometer

1 QMA 250 M analyzer
2 Flange
3 Clamp collar
4 Electronic unit QME 250

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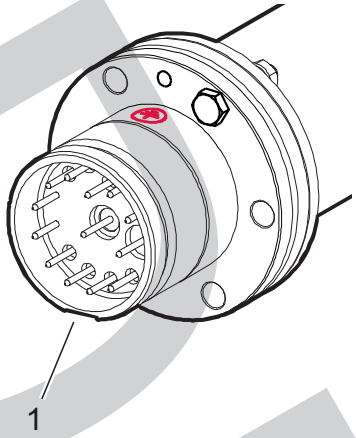

Fig. 54: Groove on analyzer

1 Groove on analyzer

Determining the sensitivity of the PrismaPro

If you notice a loss of measuring sensitivity, the cause may be decreasing gain of the built-in electron multiplier (EM) or contamination of the ion source. In such a case, Pfeiffer Vacuum recommends determining the sensitivity of the PrismaPro with the electron multiplier switched off, i.e. only with the Faraday detector.

1. Determine the sensitivity of the PrismaPro with the Faraday detector.
2. Allow air to flow into the system via the capillary inlet.
3. Add the ion currents (peak maximums) of the 8 to 10 largest peaks.
4. Compute the total ion current against the total pressure.
   – This gives you a good approximation of the sensitivity in A/hPa. The value should be > 4×10^{-5} A/hPa.
5. Counteract the wear of the electron multiplier by setting the amplifier voltage higher.

Value	Result	Remedy
< 4×10^{-5} A/hPa	Contamination of the ion source	Replace the ion source.
	Filament at end of life	Replace the filament.
> 4×10^{-5} A/hPa	Wear of electron multiplier	Increase the amplifier voltage.

Tbl. 12: Determined sensitivity of the PrismaPro

Replacing the filaments

If one of the two filaments fails, it is possible to temporarily continue measuring with the second filament, but Pfeiffer Vacuum recommends replacing both filaments as soon as possible.

► Replace both filaments if one of them fails.
► Also check the condition of the ion source.
   – If the ion source is heavily polluted, Pfeiffer Vacuum recommends replacing the entire ion source.

Maintaining the analyzer

1. Disconnect all connection cables on the front panel of the QME 250 electronics unit.
2. Disconnect the black clamp collar on the electronics unit and pull the electronics unit off the analyzer.
3. Disconnect the flange connection between the analyzer and the vacuum chamber.
4. Carefully pull the analyzer out of the vacuum chamber.
5. Insert the analyzer with the flange pointing down into the assembly aid.
6. Perform the required maintenance work on the analyzer as per the PrismaPro operating instructions:
   - Replacing the filament unit, or
   - Replacing the ion source
7. Position the analyzer with a new silver-plated copper gasket in the vacuum chamber.
   – Pay attention to the correct position of the groove in the analyzer ("9 o'clock position") on the feedthrough flange.

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8. Position the electronics unit on the analyzer.
   – The groove in the analyzer must engage in the lug on the electronics unit.
9. Tighten the black clamp collar on the electronics unit.
10. Connect all connection cables on the front panel of the QME 250 electronics unit.

9.5.2 Maintaining the total pressure gauge

The GSD 350's MPT 200 AR total pressure gauge is a combined measurement tube consisting of a Pirani sensor and a cold cathode sensor. Depending on the use of the GSD 350, often when using gas mixtures with a high argon content, it can happen that the total pressure gauge becomes polluted and the cold cathode sensor no longer ignites. In this case, the unit often only displays pressures > 1 × 10^{-4} hPa although the pumping system is working normally and there are no leakages. In such a case, it is also impossible to switch on the PrismaPro's filament. This problem can be resolved by replacing the gauge or the gauge sensor element.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tool

- 2 open-end wrenches, **WAF 10**

Spare parts required

- Copper gasket (DN 40 CF, silver-plated) (part number 490DFL040-S-G-S5)
- For replacing the sensor element:
  – Sensor (part number PT 120 212 -T)
- For replacing the total pressure gauge:
  – Total pressure gauge (order number: PT R40 351)

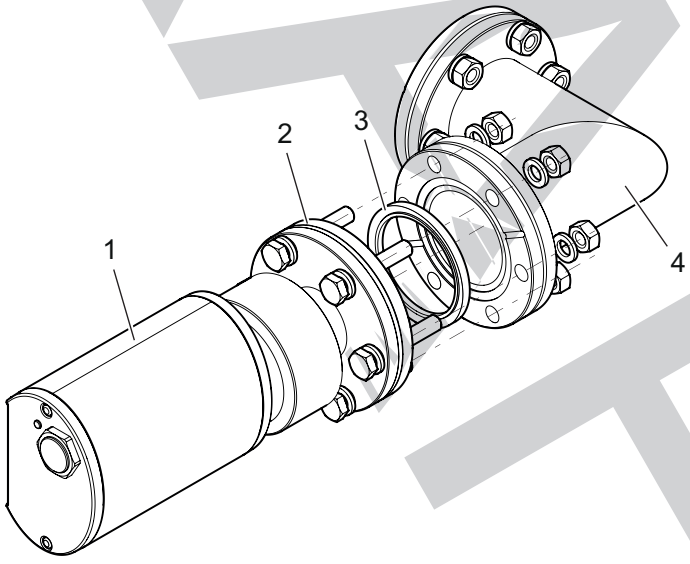

Fig. 55: Total pressure gauge on the gas analysis unit

1 Total pressure gauge
2 Flange connection
3 Copper seal
4 Elbow fitting with insulating pad (not shown)

Procedure

1. Remove the insulating mat around the elbow fitting and gauge flange.
2. Loosen the connection cables on the gauge.
3. Open the flange connection between the gauge and the elbow fitting and remove the gauge.
4. Replace the sensor element on the gauge as per the gauge operating instructions, or use a new gauge.
5. If you use a new gauge: Set the address on the address selection switch of the gauge to a value of "1".

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6. Flange the gauge onto the elbow fitting using a new silver-plated copper gasket.
7. Fit the insulating mat around the elbow fitting and the gauge flange.
8. Connect the connection cables to the gauge.

9.6 Maintaining the gas inlet system of the OmniStar

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.

If the gas inlet valve is opened and the pressure in the GSD 350 does not increase at all or increases only slightly (pressure remains < 1 × 10^{-6} hPa), it can be assumed that either the stainless steel capillary or the screen of the gas inlet is partly or completely blocked. The probability of a blocked stainless steel capillary is greater than the probability of a blocked screen.

Pfeiffer Vacuum recommends first shortening or replacing the stainless steel capillary (see chapter “Servicing the capillary”, page 86), and only replacing the screen if the work on the stainless steel capillary does not achieve the desired results.

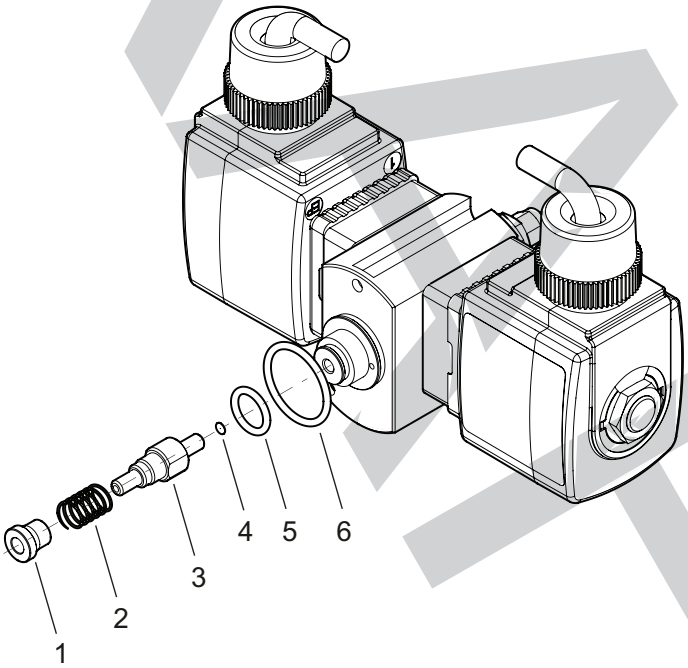

Fig. 56: Parts of the internal gas guide on OmniStar

1	Ceramic sleeve	4	Screen
2	Compression spring	5	O-ring, inside
3	Gas guide	6	O-ring, outside

DRAFT

9.6.1 Removing the gas inlet flange

NOTICE

Destruction of the turbopump due to incomplete internal gas guide

If the ceramic sleeve, the pressure spring or one of the two O-rings of the inner gas guide are missing, putting the GSD 350 into operation will destroy the turbopump.

- ► Make sure the inner gas guide is complete.
- ► Make sure that the compression spring and the ceramic sleeve are located on the gas guide part.
- ► Remove missing parts from the vacuum chamber before starting up the GSD 350 again.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet cover removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5/16"**
- Open-end wrench, **WAF 9/16"**

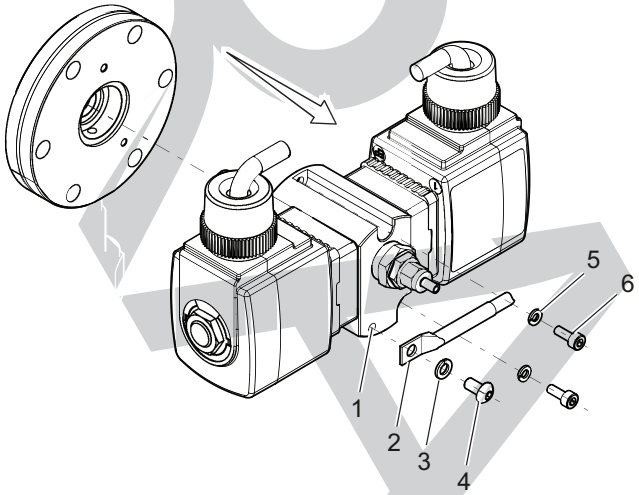

Fig. 57: Disassemble the valve block

1	Valve block	4	Fixing screw
2	Temperature sensor	5	Lock washer (2×)
3	Lock washer	6	Interior hexagon socket screw (2×)

Procedure

1. Remove the insulating collar from the gas inlet housing.
2. Loosen the connection cables on the valves.
3. Pull the stainless steel capillary in the gas inlet housing slightly out of the capillary hose.
   - If this is not possible: Open the capillary fitting an the valve block with the open end wrenches and pull the stainless steel capillary out there.
4. Loosen the fastening screw on the temperature sensor.
5. Loosen both interior hexagon socket screws on the valve block.
6. Carefully pull the valve block off towards the front.
7. Make sure the inner gas guide is complete.
8. Complete the further required work:
   - Replacing the screen (see chapter “Replacing the screen”, page 82)
   - Replacing the interior gas guide and screen (see chapter “Replacing the interior gas guide and screen”, page 82)
   - Replacing the complete gas inlet

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9.6.2 Replacing the screen

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet removed

Spare part required

- Screen, 50 µm (part number BK212576)

Procedure

1. Unscrew and remove the gas guide from the valve block.
2. Turn the gas inlet so that the screen drops out.
3. If the screen is stuck, carefully tap the gas inlet against a soft substrate until the screen drops out.
4. Place the new screen on the gas guide.
5. **Hand tighten** the gas guide in the valve block.
   – Do **not** use an open end wrench.

9.6.3 Replacing the interior gas guide and screen

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet removed

Spare parts required

- Spare part set (part number PT 167 014 -T)

Procedure

1. Unscrew and remove the gas guide from the valve block.
2. Turn the gas inlet so that the screen drops out.
3. If the screen is stuck, carefully tap the gas inlet against a soft substrate until the screen drops out.
4. Replace the inner and outer o-rings on the valve block.
5. Replace the gas guide, compression spring and ceramic sleeve.
6. Place the new screen on the gas guide.
7. **Hand tighten** the gas guide in the valve block.
   – Do **not** use an open end wrench.

9.6.4 Installing the gas inlet flange

NOTICE

Destruction of the turbopump due to incomplete internal gas guide

If the ceramic sleeve, the pressure spring or one of the two O-rings of the inner gas guide are missing, putting the GSD 350 into operation will destroy the turbopump.

► Make sure the inner gas guide is complete.
► Make sure that the compression spring and the ceramic sleeve are located on the gas guide part.
► Remove missing parts from the vacuum chamber before starting up the GSD 350 again.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet cover removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5/16"**
- Open-end wrench, **WAF 9/16"**

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Procedure

1. Check the seat of the compression spring and ceramic sleeve.
2. Carefully insert the valve block into the counter flange on the vacuum chamber.
3. Tighten the two interior hexagon socket screws on the valve block.
4. Push the stainless steel capillary back into the capillary tube.
   – If you removed the stainless steel capillary previously, mount the stainless steel capillary on the valve block (see chapter “Replace the stainless steel capillary”, page 87).
5. Fasten the temperature sensor on the valve block with the fixing screw.
6. Connect the connection cables to the valves.
   – Make sure that you have the correct assignments.
7. Mount the insulating collar on the gas inlet housing.

9.7 Maintaining the gas inlet system of the ThermoStar

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.

If the pressure in the GSD 350 is permanently < 1 × 10^{-6} hPa although atmospheric pressure is present at the inlet of the quartz capillary, it can be assumed that either the quartz capillary or the screen of the gas inlet is partly or completely blocked. The probability of a blocked quartz capillary is greater than the probability of a blocked screen.

Pfeiffer Vacuum recommends first shortening or replacing the quartz capillary (see chapter “Servicing the capillary”, page 86), and only replacing the screen if the work on the quartz capillary does not achieve the desired results.

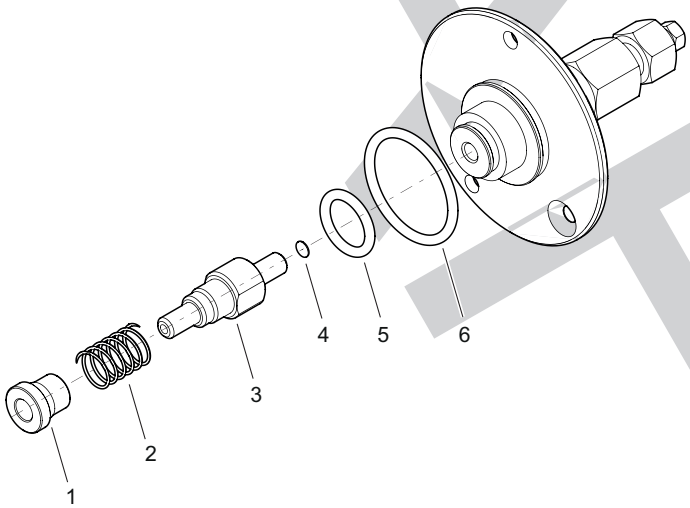

Fig. 58: Part of the internal gas guide

1	Ceramic sleeve	4	Screen
2	Compression spring	5	O-ring, inside
3	Gas guide	6	O-ring, outside

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9.7.1 Removing the gas inlet flange

NOTICE

Destruction of the turbopump due to incomplete internal gas guide

If the ceramic sleeve, the pressure spring or one of the two O-rings of the inner gas guide are missing, putting the GSD 350 into operation will destroy the turbopump.

- ► Make sure the inner gas guide is complete.
- ► Make sure that the compression spring and the ceramic sleeve are located on the gas guide part.
- ► Remove missing parts from the vacuum chamber before starting up the GSD 350 again.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet cover removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5.5**
- Open-end wrench, **WAF 1/4"**
- Open-end wrench, **WAF 3/8"**

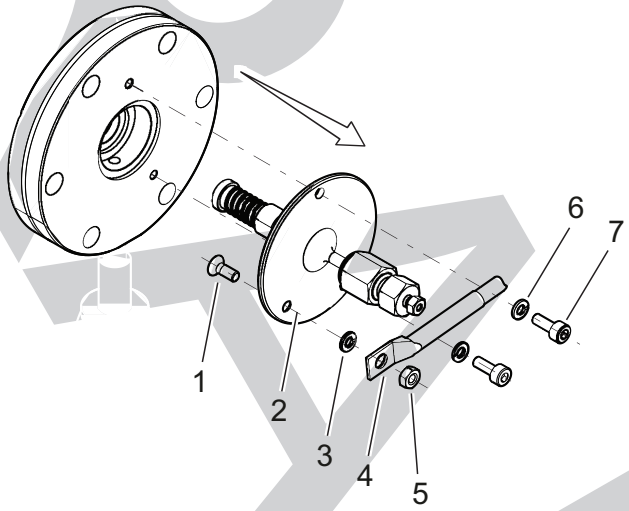

Fig. 59: Removing the gas inlet flange

1 Countersink screw
2 Gas inlet flange
3 Lock washer
4 Temperature sensor
5 Fastening nut
6 Lock washer (2×)
7 Interior hexagon socket screw (2×)

Procedure

1. Remove the insulating collar from the gas inlet housing.
2. Pull the quartz capillary in the gas inlet housing slightly out of the capillary hose.
   – If this is not possible: Open the capillary fitting on the gas inlet flange and pull the quartz capillary out there.
3. Loosen both interior hexagon socket screws on the gas inlet flange.
4. Loosen the fastening nut on the temperature sensor.
5. Carefully pull the gas inlet flange off towards the front.

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6. Make sure the inner gas guide is complete.
7. Complete the further required work:
   – Replacing the screen (see chapter “Replacing the screen”, page 85)
   – Replacing the interior gas guide and screen (see chapter “Replacing the interior gas guide and screen”, page 85)
   – Replacing the complete gas inlet

9.7.2 Replacing the screen

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet removed

Spare part required

- Screen, 50 µm (part number BK212576)

Procedure

1. Unscrew and remove the gas guide from the gas inlet flange.
2. Turn the gas inlet so that the screen drops out.
3. If the screen is stuck, carefully tap the gas inlet against a soft substrate until the screen drops out.
4. Place the new screen on the gas guide.
5. **Hand tighten** the gas guide in the gas inlet flange.
   – Do **not** use an open end wrench.

9.7.3 Replacing the interior gas guide and screen

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Gas inlet removed

Spare parts required

- Spare part set (part number PT 167 014 -T)

Procedure

1. Unscrew and remove the gas guide from the gas inlet flange.
2. Turn the gas inlet so that the screen drops out.
3. If the screen is stuck, carefully tap the gas inlet against a soft substrate until the screen drops out.
4. Replace the inner and outer o-rings on the gas inlet flange.
5. Replace the gas guide, compression spring and ceramic sleeve.
6. Place the new screen on the gas guide.
7. **Hand tighten** the gas guide in the gas inlet flange.
   – Do **not** use an open end wrench.

9.7.4 Installing the gas inlet flange

NOTICE

Destruction of the turbopump due to incomplete internal gas guide

If the ceramic sleeve, the pressure spring or one of the two O-rings of the inner gas guide are missing, putting the GSD 350 into operation will destroy the turbopump.

► Make sure the inner gas guide is complete.
► Make sure that the compression spring and the ceramic sleeve are located on the gas guide part.
► Remove missing parts from the vacuum chamber before starting up the GSD 350 again.

Prerequisites

- GSD 350 switched off
- Power cable disconnected

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- Turbopump at standstill
- Gas inlet cover removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5.5**
- Open-end wrench, **WAF 1/4"**
- Open-end wrench, **WAF 3/8"**

Procedure

1. Check the seat of the compression spring and ceramic sleeve.
2. Fasten the temperature sensor on the gas inlet flange with the fixing screw.
3. Carefully insert the gas inlet flange into the counter flange on the vacuum chamber.
4. Tighten the two interior hexagon socket screws on the gas inlet flange.
5. Push the quartz capillary back into the capillary tube.
   – If you removed the quartz capillary previously, mount the quartz capillary on the gas inlet flange (see chapter “Replace the quartz capillary”, page 89).
6. Mount the insulating collar on the gas inlet housing.

9.8 Servicing the capillary

If the expected total pressure is not achieved in the GSD 350, that is, the pressure remains at < 1 × 10^{-6} hPa) with the gas inlet open (OmniStar), then it must be assumed that either the capillary or the screen on the gas inlet is partly or completely blocked. The probability of a blocked capillary is greater than the probability of a blocked screen.

Pfeiffer Vacuum recommends first shortening or replacing the capillary, and only replacing the screen if the work on the capillary does not achieve the desired results.

9.8.1 Shorten the stainless steel capillary

If the stainless steel capillary is blocked, then the blockage frequently occurs in the front atmosphere side area of the stainless steel capillary. Shortening the stainless steel capillary can help to clear the blockage.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Stainless steel capillary disconnected from measurement point
- Length of stainless steel capillary still sufficient after shortening

Required tools

- Tube or capillary cutter (1/16") knife file

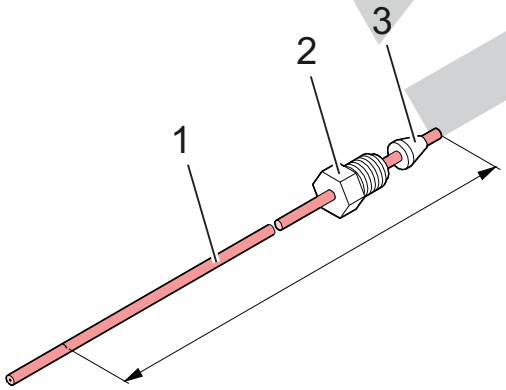

Fig. 60: Length of stainless steel capillary with clamping collar fitting

1 Stainless steel capillary
2 Clamping collar fitting
3 Capillary seal (ferrule)

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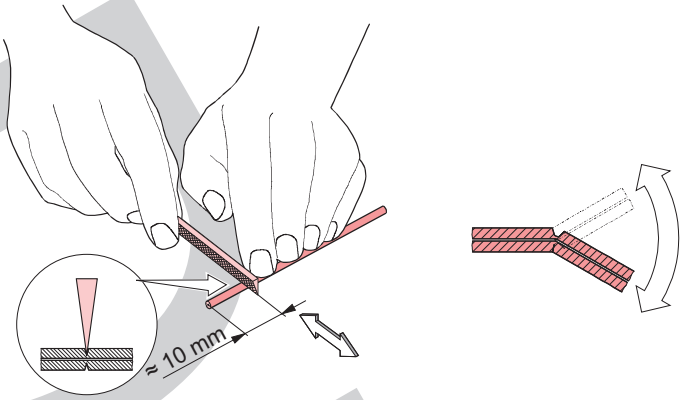

Fig. 61: Notch and snap off the stainless steel capillary

Trimming the stainless capillary with the pipe or capillary cutters

1. Pull the stainless capillary far enough out of the capillary hose.
2. Cut off the stainless capillary with the pipe or capillary cutters.

Trimming the stainless steel capillary with a file

1. Pull the stainless capillary far enough out of the capillary hose.
2. Notch the stainless steel capillary carefully at two opposing positions.
   – Notches = **max. depth 0.5 mm**
3. Carefully bend the stainless steel capillary until it brakes at the notches.

Commissioning the unit

1. Start the pumping system.
2. Wait for the turbopump to run-up (approx. 10 minutes).

Checking the pressure in the vacuum chamber

1. Check the pressure in the vacuum chamber.
   – The displayed pressure must be ≥ 1 × 10^{-6} hPa with the gas inlet valve open.
2. If the displayed pressure is < 1 × 10^{-6} hPa, this can be due to the following:
   – Stainless steel capillary plugged over the entire length (see chapter “Replace the stainless steel capillary”, page 87)
   – Screen blocked (see chapter “Replacing the screen”, page 82) or (see chapter “Replacing the interior gas guide and screen”, page 82)

9.8.2 Replace the stainless steel capillary

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Stainless steel capillary disconnected from measurement point
- Gas inlet cover removed

Required tools

- Open-end wrench, **WAF 9/16"**
- Open-end wrench, **WAF 5/16"**
- Tube or capillary cutter (1/16") knife file

Spare parts required

- Stainless steel capillary (part number PT 167 060 -T)
- Capillary seals (part number PT 167 017 -T)

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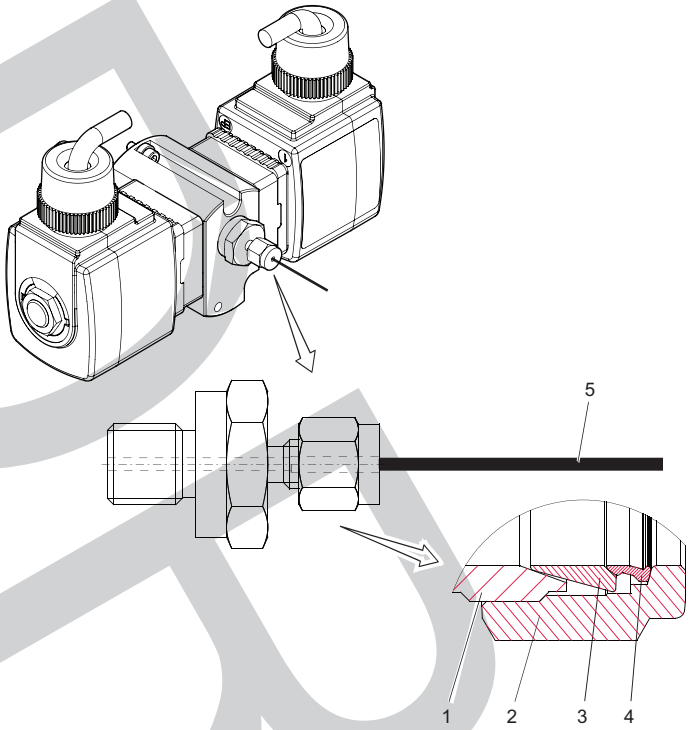

Fig. 62: Clamp collar fitting for the stainless steel capillary

1 Adapter
2 Nut
3 Front clamp collar
4 Rear clamp collar
5 Stainless steel capillary

Procedure

1. Trim the length of the stainless steel capillary (see chapter “Shorten the stainless steel capillary”, page 86).
   – **Capillary length = length of capillary tube + 15 cm + required length at the measuring point**
2. Remove the insulating collar from the gas inlet housing.
3. Open the cooling clamping collar fitting.
4. Remove the old stainless steel capillary.
5. Push the clamping collar fitting and a new capillary seal onto the new, trimmed stainless steel capillary.
6. Push the stainless steel capillary with the capillary seal and the clamping collar fitting into the fitting on the valve block.
7. Lightly screw in the clamping collar fitting so that the stainless steel capillaries can still be displaced.
8. Push the stainless steel capillary in up to the stop.
9. Pull the stainless steel capillary back by 1 or 2 mm.
10. Tighten the clamping collar fitting with the open end wrenches.
11. Carefully push the free end of the stainless steel capillary into the capillary tube.

9.8.3 Trimming the quartz capillary

⚠ CAUTION

Risk of injury due to splintering of the quartz capillary

Quartz capillaries splinter in case of unintended use. There is a risk of eye injuries due to splinters being projected.

- ► Do not apply force when notching the quartz capillary.
- ► Wear safety goggles.

If the quartz capillary is blocked, then the blockage frequently occurs in the front atmosphere side area of the quartz capillary. Shortening the quartz capillary can help to clear the blockage.

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Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Quartz capillary disconnected from measurement point
- Length of quartz capillary still sufficient after shortening

Required tools

- Capillary cutting tool

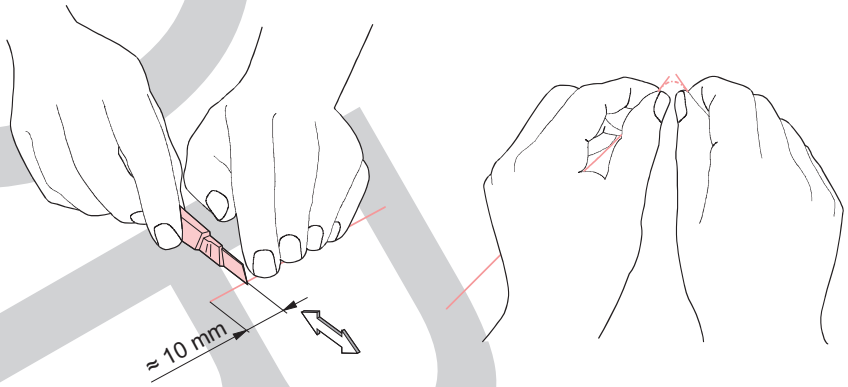

Fig. 63: Notching and snapping off the quartz capillary

Trimming the quartz capillary

1. Pull the quartz capillary far enough out of the capillary hose.
2. Carefully notch the quartz capillary without applying pressure.
3. Carefully snap off the quartz capillary at the point notched previously.

Commissioning the unit

1. Start the pumping system.
2. Wait for the turbopump to run-up (approx. 10 minutes).

Checking the pressure in the vacuum chamber

1. Check the pressure in the vacuum chamber.
   - The displayed pressure must be ≥ 1×10^{-6} hPa.
2. If the displayed pressure is < 1×10^{-6} hPa, this can be due to the following:
   - Quartz capillary plugged over entire length (see chapter “Replace the quartz capillary”, page 89)
   - Screen blocked (see chapter “Replacing the screen”, page 85) or (see chapter “Replacing the interior gas guide and screen”, page 85)

9.8.4 Replace the quartz capillary

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Quartz capillary disconnected from measurement point
- Gas inlet cover removed

Required tools

- Open-end wrench, **WAF 1/4"**
- Open-end wrench, **WAF 3/8"**
- Capillary cutting tool

Spare parts required

- Quartz capillary (part number B1975082EC)
- Capillary seals (part number PT 167 015 -T)

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Do not loosen the rear fitting

You must not open the rear fitting on the gas inlet flange. To replace the capillary, only open the front fitting.

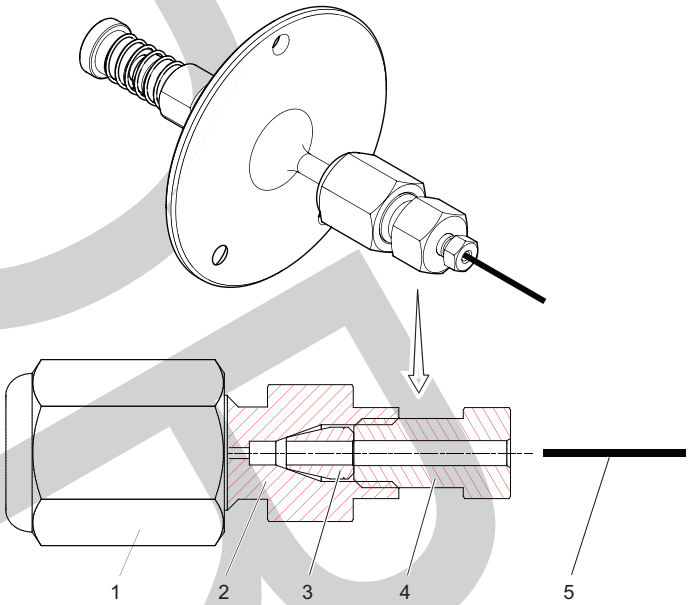

Fig. 64: Front fitting of the quartz capillary

1 Rear fitting
2 Front fitting
3 Seal (ferrule)
4 Pressure screw
5 Quartz capillary

Procedure

1. Trim the length of the quartz capillary (see chapter “Trimming the quartz capillary”, page 88).
   – **Capillary length = length of capillary tube + 30 cm + required length at the measuring point**
2. Remove the insulating collar from the gas inlet housing.
3. Loosen the front fitting.
4. Remove the old quartz capillary.
5. Push the front fitting and a new capillary seal onto the new, trimmed quartz capillary.
   – Distance between end of capillary and ferrule = approx. 25 mm
6. Push the quartz capillary with the capillary seal and the front fitting into the rear fitting on the gas inlet flange.
7. Lightly screw in the front fitting so that the quartz capillaries can still be displaced.
8. Push the quartz capillary in up to the stop.
9. Pull the quartz capillary back by 1 or 2 mm.
10. Tighten the front fitting with the open end wrenches.
11. Carefully push the free end of the quartz capillary into the capillary tube.

9.9 Maintaining the heating units

WARNING

Danger of burns on hot surfaces

During operation high temperatures (> 50 °C) occur on touchable surfaces of the heating components and the gas inlet. There is a risk of burning.

- ► Secure hot parts against inadvertent touching.
- ► Display warning signs.
- ► Make sure that the product has cooled down before performing work.
- ► Wear protective gloves (in accordance with EN 420).

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9.9.1 Replacing the capillary hose

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.9.2 Maintaining the gas inlet heating

If the GSD 350 shows a defect of the gas inlet heating, then the heating and/or the temperature sensor must be replaced.

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.9.3 Servicing the vacuum chamber heating

If the temperature of the vacuum chamber does not reach the set temperature when baking out, even after a longer waiting period, or if the GSD 350 indicates a defect in the vacuum chamber heating, the heating and/or the corresponding temperature sensor must be replaced.

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.10 Maintaining the electronic components

All of the electronic components in the GSD 350 are maintenance-free. Defective electronic components must be replaced.

9.10.1 Replacing the display

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill

Required tool

- Crosshead screwdriver

Spare part required

- 7" touch display (part number PT 167 025)

Display voltage supply

The PoE injector in the GSD 350 supplies voltage to the display via the connection cable. Do not connect any other Ethernet components to this connection cable.

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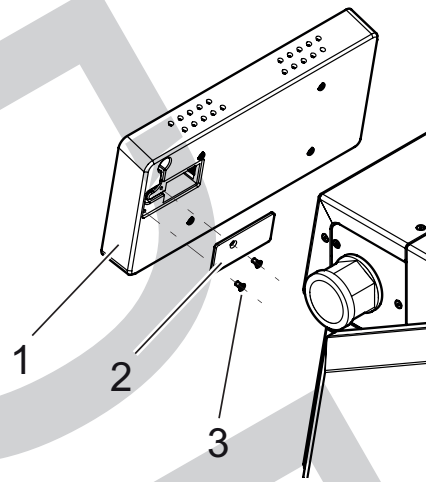

Fig. 65: Replacing the display

1 Display
2 Cable fastener
3 Countersunk screw (2×)

Procedure

1. Carefully remove the display from the GSD 350.
2. On the rear side of the display, loosen the countersunk screws of the cable fasteners.
3. Disconnect the connection cable from the display.
4. Plug the connection cable into the new display.
5. On the rear side of the display, fasten the countersunk screws of the cable fasteners.
6. Place the display in the GSD 350.

During the run-up, the GSD 350 automatically synchronizes the display with the configuration of the GSD 350.

9.10.2 Replacing the PoE injector

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.10.3 Replacing the mainboard

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.10.4 Replacing the power supply pack

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.10.5 Replacing the QME 250 electronic unit

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.10.6 Replacing the TC 110 electronic drive unit on the turbopump

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

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9.11 Maintaining the calibration unit

9.11.1 Refilling with calibration medium

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 17**

Required consumables

- Calibration medium (PFTBA) (part number PT 167 031)

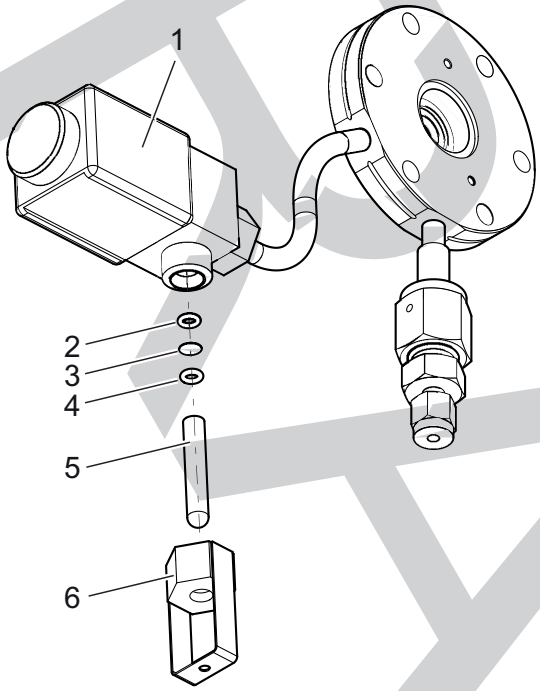

Fig. 66: Calibration unit

1	Shut-off valve EVI 005 M	4	Seal
2	Seal	5	Glass storage vessel
3	Screen	6	Compression coupling

Procedure

1. Unscrew the fitting over the glass storage vessel by hand.
2. Pull the glass storage vessel off the shut-off valve in downward direction.
   – Pay attention to the washer and the screen.
3. Fill the glass storage vessel with calibration medium.
4. Mount the glass storage vessel on the shut-off valve.
   – Pay attention to the washer and the screen.
5. Tighten the fitting over the glass storage vessel by hand.

9.11.2 Replacing the calibration valve

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

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9.12 Additional maintenance work for the corrosive gas version

9.12.1 Replacing the sealing gas valve

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed

Required tools

- Allen key, **WAF 2.5**
- Allen key, **WAF 3**
- Open-end wrench, **WAF 15**
- Open-end wrench, **WAF 17**

Spare part required

- Sealing gas valve (part number PM Z01 310 A)

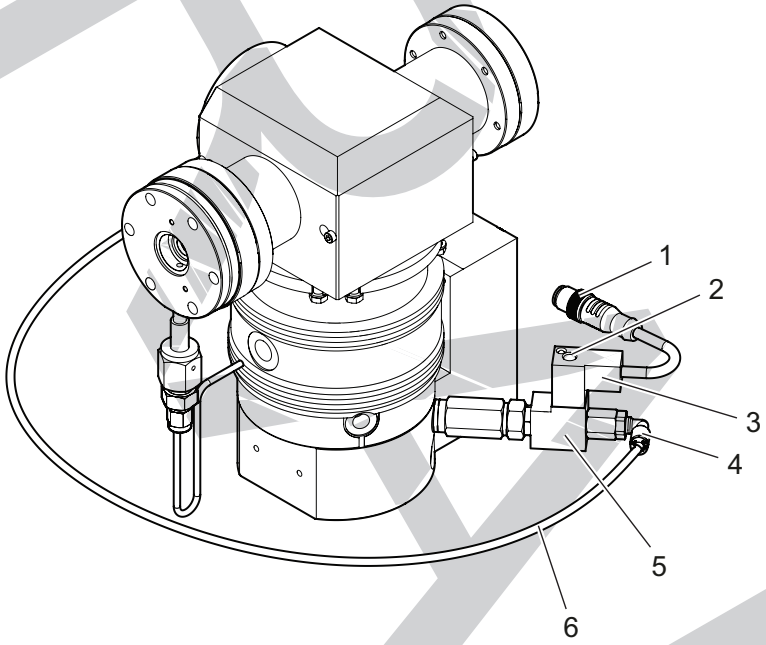

Fig. 67: Sealing gas valve on the turbopump

1	Electrical connection	4	Angled push-in fitting
2	Lock screw	5	Sealing gas valve
3	Power supply plug	6	Sealing gas feed

Remove the turbopump (optional)

Due to the cramped conditions in the GSD 350 it can be useful to first remove the turbopump before starting to remove or install the valve.

1. Remove the electronics unit on the PrismaPro
   (see chapter “Maintaining the QMA 250 M analyzer”, page 77)
2. Remove the analyzer on the PrismaPro
   (see chapter “Maintaining the QMA 250 M analyzer”, page 77)
3. Remove the gas inlet flange
   (see chapter “Removing the gas inlet flange”, page 81) or (see chapter “Removing the gas inlet flange”, page 84)
4. Reinstall components after replacing the valve.

Replacing the sealing gas valve

1. Loosen the lock screw on the power supply plug.
2. Disconnect the power supply plug from the sealing gas valve.
3. Disconnect the sealing gas supply from the sealing gas valve.
4. Unscrew and remove the sealing gas valve from the turbopump.
5. Unscrew and remove the angled push-in fitting from the old sealing gas valve.
6. Mount the angled push-in fitting on the new sealing gas valve.
7. Connect the new sealing gas valve in line with the operating instructions for the turbopump.
8. Plug the power supply plug into the sealing gas valve.
9. Fasten the lock screw on the power supply plug.
10. Connect the sealing gas supply to the sealing gas valve.

9.12.2 Replacing the manual pressure regulator

Pressure regulator preset

Pfeiffer Vacuum has factory preset the pressure regulator. Do not change the preset.

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

9.12.3 Replacing the digital pressure regulator

Pressure regulator preset

Pfeiffer Vacuum has factory preset the pressure regulator. Do not change the preset.

Procedure

Pfeiffer Vacuum Service handles the replacement.

► Contact the Pfeiffer Vacuum Service.

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10 Troubleshooting

Notes on malfunction handling in the Help menus

Further information on malfunction handling and malfunction handling when operating the unit via the web interface or when using the PV MassSpec software can be found in the corresponding Help menus.

Problem	Possible cause	Remedy
The display remains dark after switching on.	No supply voltage at the unit	Check the mains connection and mains cable.
	Mains fuses (2×10 AT) defective	Replace the mains fuses.
	Display cable loose	Check the plug-and-socket connection on the display.
After switching on, the "Dashboard" start screen does not appear.	Run-up time not completed	Wait for the run-up time of < 60 seconds to complete.
	The unit was switched off and back on again too quickly.	1. Turn off the device. 2. Wait for 15 seconds. 3. Switch the unit back on again.
After the "Pump down" control command, the diaphragm pump fails to start up (icon remains light gray).	Cable connection loose	Check the plug-and-socket connections on the diaphragm pump and the mainboard.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
	Sealing gas pressure too low (for corrosive gas version)	Check the sealing gas supply.
After the "Pump down" control command, the diaphragm pump fails to reach the nominal rotation speed (icon remains dark green).	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
After the "Pump down" control command, the turbopump fails to start up (icon remains light gray).	Switch-on vacuum of 10 hPa not yet reached	Wait for the pump down action for the fore-vacuum to complete (target < 60 s).
	Moisture content in the vacuum system too high	Bake out the vacuum chamber.
	Condensate in the diaphragm pump	1. Dismantle and clean the diaphragm pump. 2. Wipe the diaphragm pump parts dry.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
	Cable connection loose	Check the plug-and-socket connections of the electronic drive unit and the mainboard.
	Turbopump defective	Replace the turbopump.
After the "Pump down" control command, the turbopump fails to reach the nominal rotation speed (icon remains dark green).	Run-up time of turbopump not completed	Wait for the run-up time of < 8 minutes to complete.
	Inlet pressure too high (only for ThermoStar)	Reduce the pressure. on the inlet side of the capillary to < 1200 hPa.
	Leakage	Check the capillary seal in the gas inlet area.
	Fore-vacuum pressure too high	Check the vacuum connection diaphragm pump/turbopump for leakages.

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Problem	Possible cause	Remedy
Diaphragm pump switches off.	Overtemperature	1. Check the fans. 2. Service the diaphragm pump.
	Cable connection loose	Check the plug-and-socket connections on the diaphragm pump and the mainboard.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
Turbopump switches off.	Overtemperature	1. Check the fans. 2. Service the turbopump.
	Inlet pressure too high	Reduce the pressure. on the inlet side of the capillary to < 1200 hPa.
	Leakage	Check the capillary seal in the gas inlet area.
	Fore-vacuum pressure too high	Check the vacuum connection diaphragm pump/turbopump for leakages.
	Condensate in the diaphragm pump	1. Dismantle and clean the diaphragm pump. 2. Wipe the diaphragm pump parts dry.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
Both vacuum pumps switch off and the system is automatically shut down.	Overtemperature	1. Check the fans. 2. Clean the protection screens on the fans. 3. Keep to the permissible ambient temperature.
	Sealing gas pressure too low (for corrosive gas version)	Check the sealing gas supply.
The pressure in the vacuum chamber with the gas inlet valve shut off is > 1 × 10^{-7} hPa (only for OmniStar).	System has not been running for long	Continue pumping down.
	Moisture content in the vacuum system too high	Bake out the vacuum chamber.
	Inlet valve not tight	Replace the valve block.
	Fore-vacuum pressure too high	Check the vacuum connection diaphragm pump/turbopump for leakages.
	Condensate in the diaphragm pump	1. Dismantle and clean the diaphragm pump. 2. Wipe the diaphragm pump parts dry.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.

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Problem	Possible cause	Remedy
Pressure in vacuum chamber is too high (> 3 × 10^{-5} hPa) (for ThermoStar and/or OmniStar with open gas inlet valve).	Inlet pressure too high	Reduce the pressure. on the inlet side of the capillary to < 1200 hPa.
	Leakage	Check the capillary seal in the gas inlet area.
	Moisture content in the vacuum system too high	Bake out the vacuum chamber.
	Fore-vacuum pressure too high	Check the vacuum connection diaphragm pump/turbopump for leakages.
	Condensate in the diaphragm pump	1. Dismantle and clean the diaphragm pump. 2. Wipe the diaphragm pump parts dry.
	Diaphragm pump defective	Service the diaphragm pump or replace the diaphragm pump.
	Pump valve polluted (only for OmniStar)	Replace the valve block.
	Pump valve defective (only for OmniStar)	Replace the valve block.
Pressure in vacuum chamber is too high (> 1 × 10^{-3} hPa).	Total pressure gauge polluted	Clean the total pressure gauge.
	Total pressure gauge defective	Replace the total pressure gauge.
Pressure in vacuum chamber is too low (< 1 × 10^{-6} hPa) (for ThermoStar and/or OmniStar with open gas inlet valve).	Inlet pressure too low	Increase the pressure on the inlet side of the capillary.
	Capillary blocked	Trim the capillary or replace the capillary.
	Screen blocked	Replace the screen.
Gas inlet valve fails to open (only for OmniStar)	Delay time for valve opening not yet completed	Wait for the delay time of < 7 seconds to complete.
	Gas inlet valve is not controlled.	Check the plug-and-socket connections on the gas inlet valve and the mainboard.
	Gas inlet valve polluted	Replace the valve block.
	Gas inlet valve defective	Replace the valve block.
No mass peaks visible in range > 200 u on calibrating the mass scale (for version with calibration unit)	Sensitivity of PrismaPro too low	See PrismaPro operating instructions.
	Stock of calibration medium too low	Top up the calibration medium.
	Shut-off valve on calibration unit is not controlled.	Check the plug-and-socket connections on the shut-off valve and the mainboard.
	Shut-off valve on calibration unit polluted	Replace shut-off valve on calibration unit.
	Shut-off valve on calibration unit defective	Replace shut-off valve on calibration unit.
Error during measurement	PrismaPro malfunction	See PrismaPro operating instructions.
Insufficient measurement sensitivity	PrismaPro settings incorrect	See PrismaPro operating instructions.
Poor peak form	PrismaPro settings incorrect	See PrismaPro operating instructions.

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Problem	Possible cause	Remedy
High noise level	PrismaPro settings incorrect	See PrismaPro operating instructions.
After the "Vent" control command, the vacuum pumps continue running and the system is not vented.	Delay time for venting not yet completed	Wait for the delay time of < 15 minutes to complete. (The time is shown top right in the display.)
After the "Vent" control command, the venting valve fails to open.	Delay time for venting not yet completed	Wait for the delay time of < 15 minutes to complete. (The time is shown top right in the display.)
	Venting valve is not controlled.	Check the plug-and-socket connections on the venting valve and the mainboard.
	Venting valve polluted	Replace the venting valve.
	Venting valve defective	Replace the venting valve.

Tbl. 13: Troubleshooting

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11 Shipping

⚠ WARNING

Risk of poisoning from contaminated products

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

- ► Comply with the instructions for safe shipping.

Decontamination subject to charge

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

Instructions for safe shipping

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

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12 Recycling and disposal

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

Environmental protection

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

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

Environmental protection

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

12.1 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

12.2 Dispose of a gas analysis system

Pfeiffer Vacuum gas analysis systems contain materials that you must recycle.

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

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13 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.

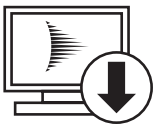
Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from original replacement parts to service contracts.

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.

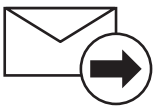
For fast and smooth service process handling, we recommend the following:



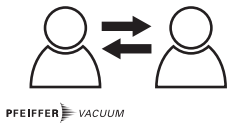
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

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.

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.

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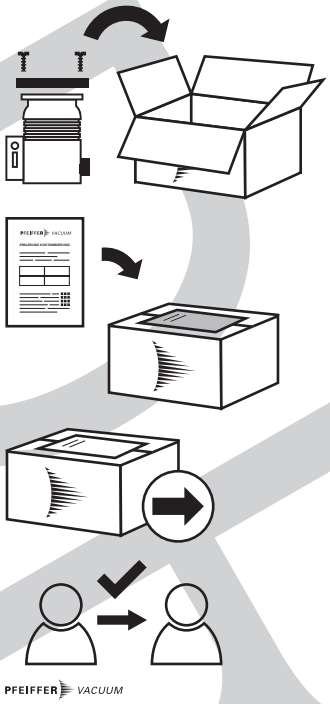

5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product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

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14 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.

Designation	Order number	Description/scope of delivery
Gas inlet (OmniStar)	PT 167 016 -T	Flange insert with valves, screen 50 µm, 2 o-rings and gas guide, without stainless steel capillary
Gas inlet (ThermoStar)	PT 167 013 -T	Flange insert, screen 50 µm, 2 o-rings and gas guide, without quartz capillary
Spare part set for gas inlet (OmniStar)	PT 167 014 -T	2 o-rings, screen 50 µm, gas guide pipe, compression spring
Spare part set for gas inlet (ThermoStar)		
Screen for gas inlet (ThermoStar)	BK212576	50 µm
Screen for gas inlet (ThermoStar)		
Capillary (stainless steel)	PT 167 060	1/16", 0.12 mm × 5 m
Capillary (quartz)	B1975082EC	0.23", 0.14 mm × 5 m
Capillary seals (stainless steel capillary)	PT 167 017 -T	Capillary seals (ferrules) (pack of 10)
Capillary seals (quartz capillary)	PT 167 015 -T	
Capillary hose	PT 167 050 -T	200 °C, 1 m, without capillary
	PT 167 051 -T	200 °C, 2 m, without capillary
	PT 167 052 -T	350 °C, 1 m, without capillary
Overhaul set for diaphragm pump	PU E22 030 -T	Diaphragms and valves of the diaphragm pump • 4 diaphragms EPDM/PTFE • 8 valve plates EPDM • 8 sealing rings EPDM
Diaphragm pump	PK T05 072	Diaphragm pump MVP 010-3 DC
Sensor of total pressure gauge	PT 120 212 -T	MPT sensor, DN 40 CF
Total pressure gauge	PT R40 351 -A	Replacement measurement tube MPT 200 AR
Filament unit for analyzer QMA 250 M	PT 163 331	Tungsten filament unit with 2 filaments
	PT 163 332	Ir-Y_2O_3 filament unit with 2 filaments
Ion source for analyzer QMA 250 M	PT 163 231	Complete ion source with 2 tungsten filaments
	PT 163 232	Complete ion source 2 Ir-Y_2O_3 filaments
Operating fluid reservoir	PM 143 740 -T	For turbopump
Venting valve	PM Z01 290 -T	
Sealing gas valve	PM Z01 310 A	
Copper seal	490DFL040-S-G-S5	DN 40 CF, silver-plated (pack of 5)
7" touch display	PT 167 025	Display module, without cable
Calibration medium (PFTBA)	PT 167 031	Bottled, 5 ml

Tbl. 14: Spare parts

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15 Special tool

Designation	Order number	Use
Wrench for housing cover	PV M40 813	(see chapter “Replace operating fluid reservoir on turbopump”, page 73)

Tbl. 15: Special tool

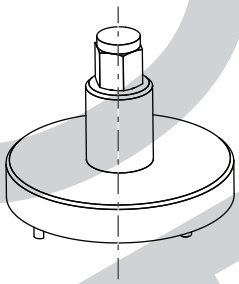

Fig. 68: Wrench PV M40 813 for housing cover of turbopump

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16 Accessories

View the range of accessories for ThermoStar and OmniStar on our website.

16.1 Accessory information

Capillary hose adapter
The capillary hose adapter is used to reliably connect the capillary hose.

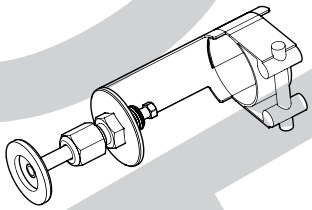

Fig. 69: Capillary hose adapter

16.2 Ordering accessories

Description	Order number
Capillary hose adapter	PT 167 045 -T

Tbl. 16: Accessories

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17 Technical data and dimensions

17.1 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. 17: 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. 18: Conversion table: Units for gas throughput

17.2 Technical data

Classification advanced	OmniStar® GSD 350 O1, 1-100 u	OmniStar® GSD 350 O2, 1-200 u	OmniStar® GSD 350 O3, 1-300 u	OmniStar® GSD 350 O1C, 1-100 u	OmniStar® GSD 350 O2C, 1-200 u	OmniStar® GSD 350 O3C, 1-300 u
Corrosive gas version	No	No	No	Yes	Yes	Yes
Mass range	1 – 100 u	1 – 200 u	1 – 300 u	1 – 100 u	1 – 200 u	1 – 300 u
Detection limit min.: C-SEM (ppm)	< 100 ppb	< 100 ppb	< 100 ppb	< 100 ppb	< 100 ppb	< 100 ppb
Contribution to neighboring mass: 40 to 41	< 10 ppb	< 20 ppm	< 50 ppm	< 10 ppb	< 20 ppm	< 50 ppm
Grain size limit (separable)	1 µm	1 µm	1 µm	1 µm	1 µm	1 µm
Inlet pressure max.	1200 hPa	1200 hPa	1200 hPa	1200 hPa	1200 hPa	1200 hPa
Exhaust pressure, max.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
System control	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface
Number of filaments	2	2	2	2	2	2
Filament	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3
Gas flow rate	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)

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Classification advanced	OmniStar® GSD 350 O1, 1-100 u	OmniStar® GSD 350 O2, 1-200 u	OmniStar® GSD 350 O3, 1-300 u	OmniStar® GSD 350 O1C, 1-100 u	OmniStar® GSD 350 O2C, 1-200 u	OmniStar® GSD 350 O3C, 1-300 u
Gas connection	Capillary, AD 1/16"	Capillary, AD 1/16"	Capillary, AD 1/16"	Capillary, AD 1/16"	Capillary, AD 1/16"	Capillary, AD 1/16"
Capillary, material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel
N_2 sealing gas flow	–	–	–	0.81 – 1.21 slpm (0 °C)	0.8 – 1.2 slpm (0 °C)	0.8 – 1.2 slpm (0 °C)
N_2 Flushing gas connection	–	–	–	ISQ plug-in connection: 4 mm	ISQ plug-in connection: 4 mm	ISQ plug-in connection: 4 mm
N2 gas connection type	–	–	–	ISQ plug-in connection	ISQ plug-in connection	ISQ plug-in connection
Gas inlet	With inlet valve, controlled via control unit or web interface	With inlet valve, controlled via control unit or web interface	With inlet valve, controlled via control unit or web interface	With inlet valve, controlled via control unit or web interface	With inlet valve, controlled via control unit or web interface	With inlet valve, controlled via control unit or web interface
Gas connection: Length	2 m	2 m	2 m	2 m	2 m	2 m
Input voltage(s)	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz
Recommended electric fuse protection on-site	10 A	10 A	10 A	10 A	10 A	10 A
Power consumption	830 W	830 W	830 W	830 W	830 W	830 W
Output: Analog	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit
Output: Digital	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA
Input: Analog	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit
Input: Digital	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V
Interface: Type	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
Ambient temperature	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C
Temperature: Storage	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C
Operating temperature: Capillary, up to	200 °C	200 °C	200 °C	200 °C	200 °C	200 °C
Relay: Number	2 Pieces	2 Pieces	2 Pieces	2 Pieces	2 Pieces	2 Pieces
Relay: Switching Voltage DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Relay: Switching current	1 A	1 A	1 A	1 A	1 A	1 A

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Classification advanced	OmniStar® GSD 350 O1, 1-100 u	OmniStar® GSD 350 O2, 1-200 u	OmniStar® GSD 350 O3, 1-300 u	OmniStar® GSD 350 O1C, 1-100 u	OmniStar® GSD 350 O2C, 1-200 u	OmniStar® GSD 350 O3C, 1-300 u
Materials in contact with media	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR
Operating site	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof
Relative humidity of air	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C
Overvoltage category	Category II	Category II	Category II	Category II	Category II	Category II
Operating altitude, max.	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m
Protection category	IP30	IP30	IP30	IP30	IP30	IP30
Weight	25 kg	25 kg	25 kg	25 kg	25 kg	25 kg

Tbl. 19: Technical data OmniStar

Classification advanced	ThermoStar® GSD 350 T1, 1–100 u	ThermoStar® GSD 350 T2, 1–200 u	ThermoStar® GSD 350 T3, 1–300 u	ThermoStar® GSD 350 T1C, 1–100 u	ThermoStar® GSD 350 T2C, 1–200 u	ThermoStar® GSD 350 T3C, 1–300 u
Corrosive gas version	No	No	No	Yes	Yes	Yes
Mass range	1 – 100 u	1 – 200 u	1 – 300 u	1 – 100 u	1 – 200 u	1 – 300 u
Detection limit min.: C-SEM (ppm)	< 100 ppb	< 100 ppm	< 100 ppb	< 100 ppb	< 100 ppm	< 100 ppb
Contribution to neighboring mass: 40 to 41	< 10 ppb	< 20 ppm	< 50 ppm	< 10 ppb	< 20 ppm	< 50 ppm
Grain size limit (separable)	1 µm	1 µm	1 µm	1 µm	1 µm	1 µm
Inlet pressure max.	1200 hPa	1200 hPa	1200 hPa	1200 hPa	1200 hPa	1200 hPa
Exhaust pressure, max.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
System control	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface	Color 7” touch display or via web interface
Number of filaments	2	2	2	2	2	2
Filament	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Iridium coated with Y_2O_3	Tungsten
Gas flow rate	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)	1 – 2 sccm (0 °C)
Gas connection	Capillary, AD 0,23 mm	Capillary, AD 0,23 mm	Capillary, AD 0,23 mm	Capillary, AD 0,23 mm	Capillary, AD 0,23 mm	Capillary, AD 0,23 mm
Capillary, material	Quartz	Quartz	Quartz	Quartz	Quartz	Quartz

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Classification advanced	ThermoStar® GSD 350 T1, 1–100 u	ThermoStar® GSD 350 T2, 1–200 u	ThermoStar® GSD 350 T3, 1–300 u	ThermoStar® GSD 350 T1C, 1–100 u	ThermoStar® GSD 350 T2C, 1–200 u	ThermoStar® GSD 350 T3C, 1–300 u
N_2 sealing gas flow	–	–	–	0.8 – 1.2 slpm (0 °C)	0.8 – 1.2 slpm (0 °C)	0.8 – 1.2 slpm (0 °C)
N_2 Flushing gas connection	–	–	–	ISQ plug-in connection: 4 mm	ISQ plug-in connection: 4 mm	ISQ plug-in connection: 4 mm
N2 gas connection type	–	–	–	ISQ plug-in connection	ISQ plug-in connection	ISQ plug-in connection
Gas inlet	Continuously open	Continuously open	Continuously open	Continuously open	Continuously open	Continuously open
Gas connection: Length	2 m	2 m	2 m	2 m	2 m	2 m
Input voltage(s)	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz	100 – 240 V AC, 50/60 Hz
Recommended electric fuse protection on-site	10 A	10 A	10 A	10 A	10 A	10 A
Power consumption	830 W	830 W	830 W	830 W	830 W	830 W
Output: Analog	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit	4 x, 0 – 10 V, Imax = 10 mA, 16 bit
Output: Digital	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA	6 x open collector, nominal + 24 V, Imax = 200 mA
Input: Analog	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit	5 x, -10 – +10 V, 14 bit | 16 bit
Input: Digital	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V	4 x nominal + 24 V
Interface: Type	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet	Ethernet
Ambient temperature	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C	10 – 40 °C
Temperature: Storage	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C	5 – 45 °C
Operating temperature: Capillary, up to	200 °C	200 °C	200 °C	200 °C	200 °C	200 °C
Relay: Number	2 Pieces	2 Pieces	2 Pieces	2 Pieces	2 Pieces	2 Pieces
Relay: Switching Voltage DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Relay: Switching current	1 A	1 A	1 A	1 A	1 A	1 A
Materials in contact with media	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR	Stainless steel, aluminum, ceramic, copper, silver, gold, molybdenum, nickel, platinum/iridium, glass, FPM, PTFE, NBR
Operating site	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof	Indoor, weatherproof

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Classification advanced	ThermoStar® GSD 350 T1, 1–100 u	ThermoStar® GSD 350 T2, 1–200 u	ThermoStar® GSD 350 T3, 1–300 u	ThermoStar® GSD 350 T1C, 1–100 u	ThermoStar® GSD 350 T2C, 1–200 u	ThermoStar® GSD 350 T3C, 1–300 u
Relative humidity of air	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C
Overvoltage category	Category II	Category II	Category II	Category II	Category II	Category II
Operating altitude, max.	2000 m	2000 m	2000 m	2000 m	2000 m	2000 m
Protection category	IP30	IP30	IP30	IP30	IP30	IP30
Weight	25 kg	25 kg	25 kg	25 kg	25 kg	25 kg

Tbl. 20: Technical data ThermoStar

17.3 Dimensions

Dimensions in mm.

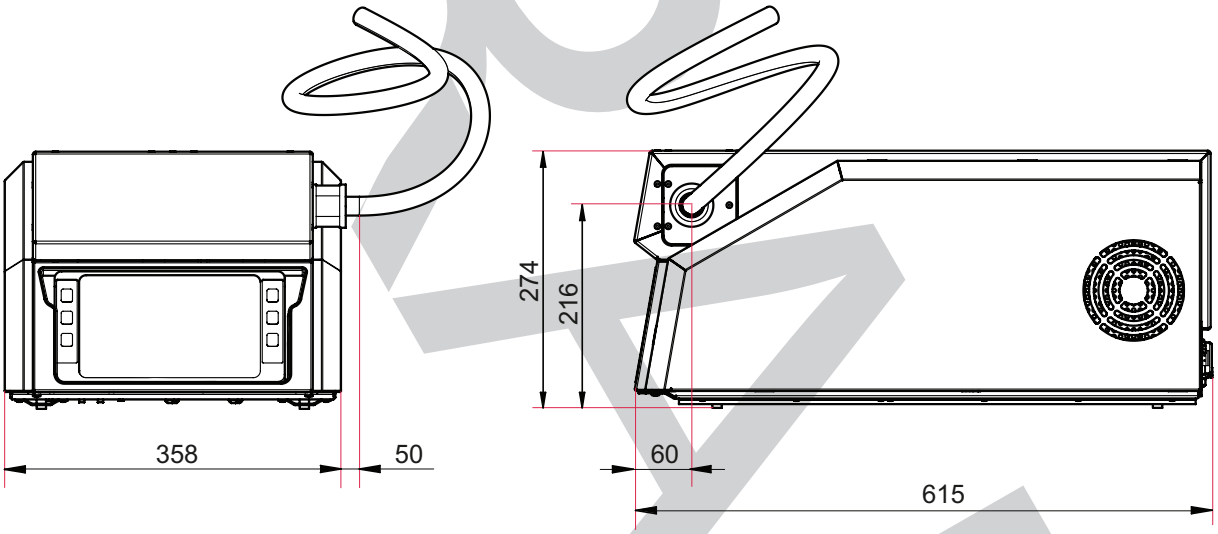

Fig. 70: Dimensions

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The product GSD 350 OmniStar/ThermoStar

- conforms to the UL standards

UL 61010-1:2012 R4.16
Safety requirements for electrical equipment for measurement, control and laboratory use
Part 1: General requirements

UL 61010-2-010:2014
Safety requirements for electrical equipment for measurement, control and laboratory use
Part 2-010: Particular requirements for laboratory equipment for the heating of materials

- is certified to the CAN/CSA standards

CAN/CSA No. 61010-1:2012 + GI1 + GI2 (R2017)
Safety requirements for electrical equipment for measurement, control and laboratory use
Part 1: General requirements

CAN/CSA No. 61010-2-010:2014
Safety requirements for electrical equipment for measurement, control and laboratory use
Part 2-010: Particular requirements for laboratory equipment for the heating of materials

- conforms to the following rules and regulations

FCC, Title 47 CFR, Part 15, Subpart B
Telecommunication - Radio Frequency Devices - Unintentional Radiators

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Declaration of conformity

Declaration for product(s) of the type:

Gas analysis system
GSD 350 OmniStar
GSD 350 ThermoStar

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

Machinery 2006/42/EC (Annex II, no. 1 A)
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:
EC 61010-1:2010 + corr. :2011
IEC 61010-2-010:2014
EN ISO 12100:2010
EN 61326-1:2013
EN 55011:2016 + A1:2017
EN IEC 61000-3-2:2019
EN 61000-3-3:2013

The authorized representative for the compilation of technical documents is Mr. Tobias Stoll, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Asslar, Germany.

Signature:

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(Daniel Sälzer)
Managing Director

Asslar, 2020-02-10

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PFEIFFER VACUUM

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

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