OPERATING INSTRUCTIONS

EN

Translation of the Original

GSD 350 OMNISTAR | THERMOSTAR

Gas analysis system

PFEIFFER VACUUM

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.

Copyright

Table of contents

List of tables

List of figures

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
Operating instructions for “venting valve”	PT 0228
"Sealing gas valve" operating instructions [2)]	PT 0229
Software documentation PV MassSpec	(part of the software)
Safety data sheet [3)] Perfluorotributylamine (PFTBA)	-
"Digital pressure switch" operating instructions [4)]	OM_ZSE_ISE30A_OML0003 (SMC)
Declaration of conformity	(part 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

1.1.2 Variants

This document applies to products with the following article 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	**151** = Quartz / 1 m / heating 200 °C	**1** = 100 u **2** = 200 u **3** = 300 u	**0** = yes **1** = no
			152 = Quartz / 2 m / heating 200 °C		
			153 = Quartz / 1 m / heating 350 °C		
			161 = Stainless steel / without capillary tube		
			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 = Thermo-Star	**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

Example of breakdown for article number PT Q80 217 110

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

Feature	OmniStar	ThermoStar
Capillary	Stainless steel (OD = 1/16", ID = 0.12 mm) or Quartz (OD 0.23", ID = 0.14 mm)	
Gas inlet screen	Platinum	
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

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

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

The pictographs used in the document indicate useful information.


Note

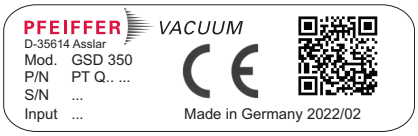

Tip


Wear laboratory gloves


Perform a visual inspection

1.3.3 Stickers on the product

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

	**Rating plate (example)** Rating plate of unit.
	**Warranty seal** The product is sealed ex factory. Damaging or removing a warranty seal results in loss of the warranty.

	**Warning hot surface** This sticker warns of injuries caused by high temperatures as a result of contact without protection during operation.
	**VSM sticker** This sticker contains links to Dreebit virtual service management.

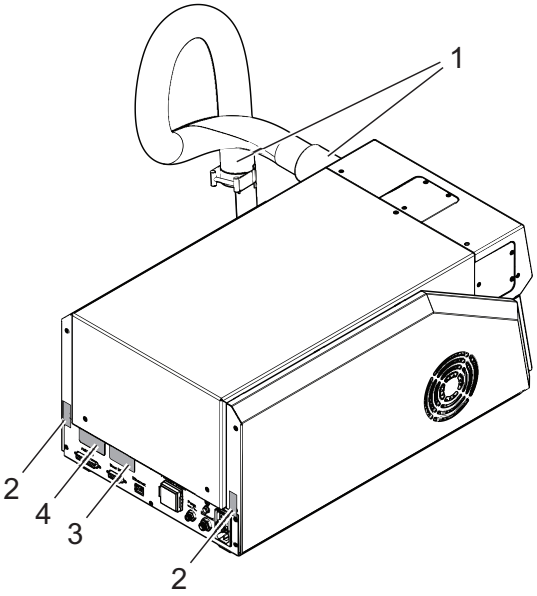


Fig. 1: Position of the stickers on the product

1 "Warning hot surface" sticker [5)]
2 Warranty seal
3 VSM sticker
4 Rating plate

1.3.4 Orientation left/right

The orientation left and right is from the display operator's view.

1.3.5 Abbreviations

Abbreviation	Explanation
OD	Outer 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

5) Only for capillary heating up to 350°C

Abbreviation	Explanation
FIL	Filament
FKM	Fluorinated rubber
ID	Inner diameter
IP	Internet protocol
IQS	Standard for plug-and-socket connections in vacuum technology
Ir-Y_2O_3	Yttrium oxide (Y_2O_3) coated iridium (Ir)
MVP	Diaphragm vacuum pump
NBR	Nitrile butadiene rubber
MSL	Mean sea level
PA	Polyamide
PE	Polyethylene
PFTBA	Colorless liquid for mass calibration (perfluortributylamine)
PID	Proportional-integral derivative
PoE	Power over Ethernet
PT100	Platinum measuring resistor with shunt resistance of 100 Ohm
PTFE	Polymer of fluorine and carbon (polytetrafluorethylene)
PUN hose	Externally calibrated polyurethane hose
PV	Pfeiffer Vacuum
PVC	Polyvinyl chloride
PWM	Type of modulation (pulse width modulation) in which one technical variable, e.g. the electrical voltage, changes between 2 values.
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
VSM	Cloud-based software for managing vacuum components and systems, and for planning service processes (virtual service management)
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.

2 Safety

2.1 General safety information

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

⚠ DANGER

Immediately pending danger

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

► Instructions to avoid the danger situation

⚠ WARNING

Potential pending danger

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

► Instructions to avoid the danger situation

⚠ CAUTION

Potential pending danger

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

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

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

► Instructions to avoid damage to property

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

2.2 Safety instructions

Safety instructions according to product life stages

All safety instructions in this document are based on the results of a risk assessment. Pfeiffer Vacuum has taken into account all the relevant life stages of the product.

Risks during 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.

⚠ 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 unit without an internal earthed conductor attached can be life-threatening in the event of a malfunction.

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

Risks during operation

⚠ DANGER

Electric shock due to moisture entering the unit

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

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

⚠ WARNING

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

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

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

⚠ 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 health and safety of service personnel is at risk.

- ► Comply with the instructions for safe distribution.

Risks during disposal

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

2.3 Safety precautions

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

Duty to provide information on potential dangers

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

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

Infringement of conformity due to modifications to the product

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

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

General safety precautions when handling the product

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

2.4 Limits of use of the product

Installation location	weatherproof (internal space)
Installation altitude	max. 2000 m
Rel. air humidity	max. 80%, at T <31°C, up to max. 50% at T <40°C
Protection class	I
Excess voltage category	II
Permissible protection degree	IP30
Pollution degree	2
Ambient temperature	10 °C to 40 °C

Tbl. 5: Permissible ambient conditions

2.5 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.

- ► 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.

2.6 Foreseeable misuse

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
- Operation with corrosive, inflammable or explosive media, if this is not explicitly permitted
- Operation in potentially explosive areas [6)]
- Operation in environments where explosive gas mixes can occur.
- Operation outdoors
- Use after technical changes (inside or outside on the product)
- Use of accessories or spare parts that are not listed in these instructions

6) The gas analysis system is not explosion proof in the sense of ATEX.

2.7 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.

2.7.1 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.

2.7.2 Personnel qualification for maintenance and repair

Advanced training courses

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

Adequately trained individuals are:

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

2.7.3 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.

3 Product description

3.1 Functional description

The GSD 350 can analyze multiple gas components simultaneously. The gas to be analyzed passes through a capillary to the mass spectrometer, which operates in a vacuum. The mass spectrometer ionizes a portion of the gas and both separates and detects the different gas components based on their different mass/charge ratio. The different gas inlet systems from OmniStar and ThermoStar reduce the pressure of the gas to be analyzed from 1000 hPa to the operating pressure of the mass spectrometer. The gas analysis unit and the high-vacuum and gas transport system are the same in both OmniStar and ThermoStar versions.

3.1.1 OmniStar

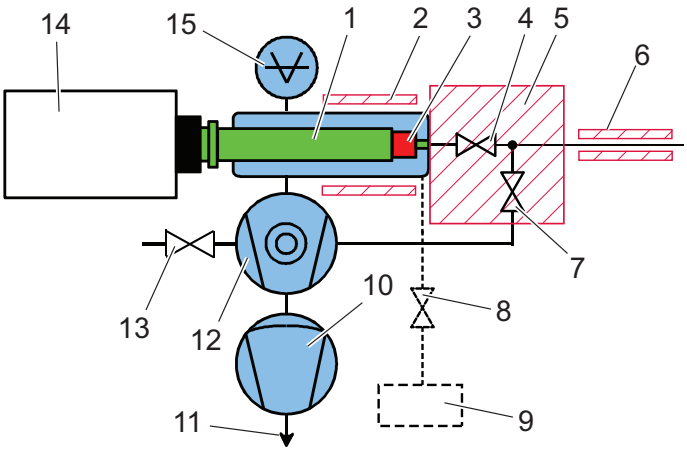


Fig. 2: Vacuum diagram of the OmniStar

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

3.1.2 ThermoStar

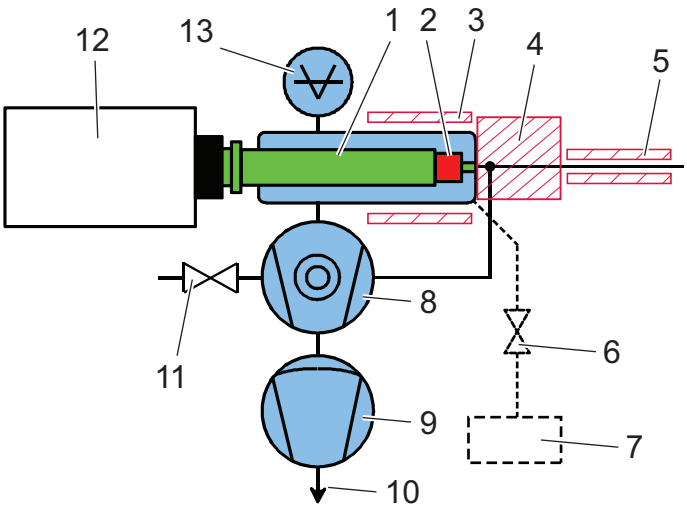


Fig. 3: Vacuum diagram of ThermoStar

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

3.1.3 Corrosive gas version

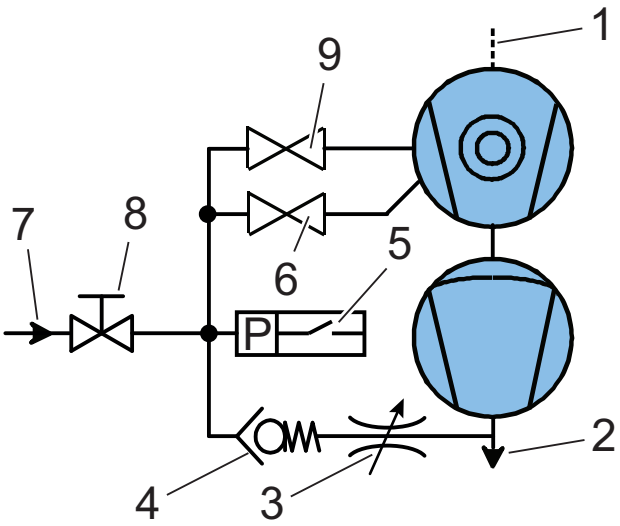


Fig. 4: Additionally sealing gas supply in corrosive gas version

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

3.2 Controls and indicators

3.2.1 Version with display

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 operator field and operator keys are context-sensitive and change to

reflect the display. Unavailable functions are grayed. On the “Messages” screen, inactive message levels are also shown as gray buttons.

Warning messages or fault messages

In the event of a warning or malfunction message, a warning triangle appears at the top right of the display. The warning triangle appears on all menu screens. Pressing the warning triangle or the “Messages” button displays the message overview.

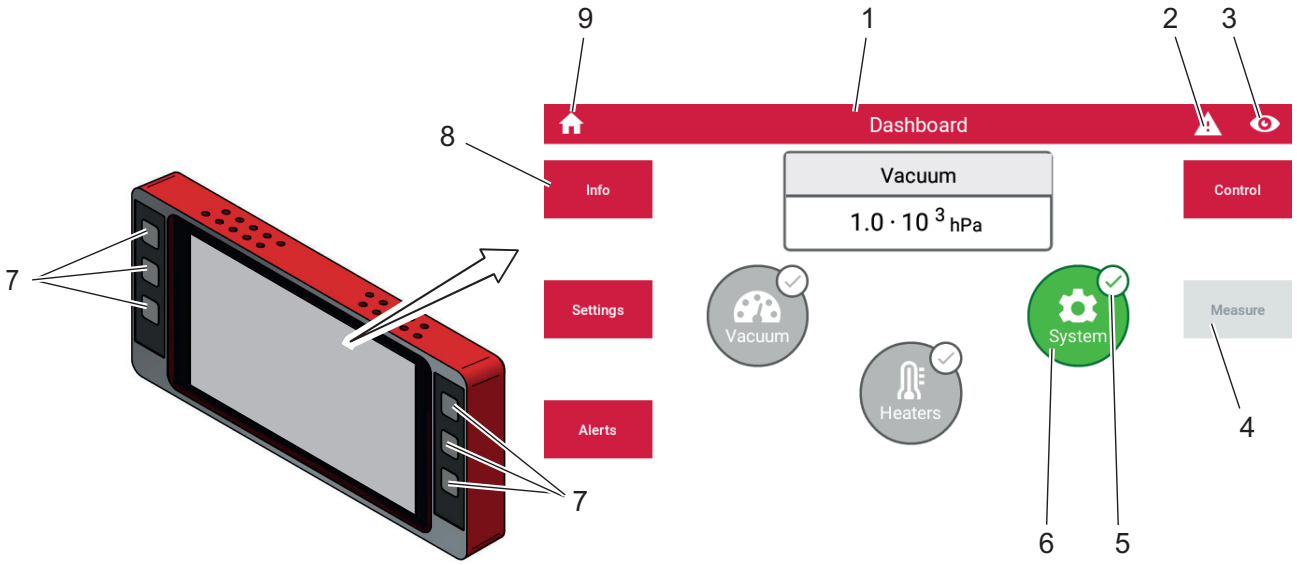


Fig. 5: Display with operator keys

1 Title bar with menu name
2 Warning triangle in the event of a warning or malfunction message
3 User settings
4 Inactive operator field in display (grayed)
5 Status icon
6 Components icon
7 Controls
8 Active operator field in display
9 Link to dashboard

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. 6: Symbols and colors of the status and components icons

3.2.2 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	Heating	The LED is lit when the heating units are switched on.

LED	Function	Description
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. 7: 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.

For ventilation, the GSD 350 features:

- 2 ventilation openings with fans at the sides
- Ventilation openings on the top and bottom side of the removable display

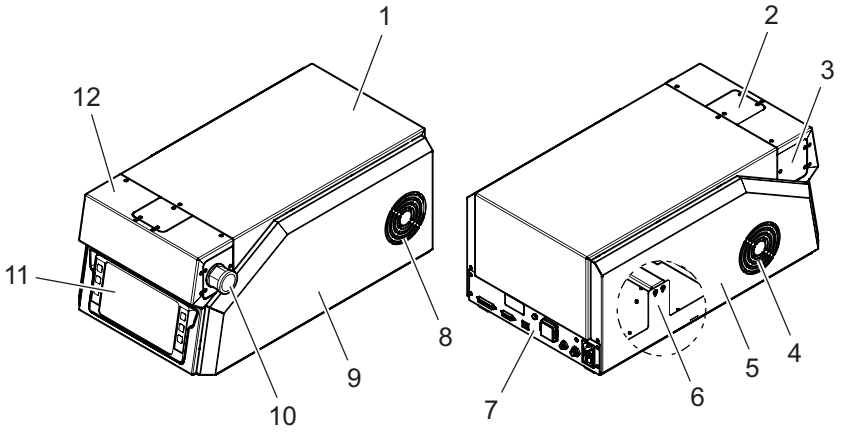


Fig. 6: Housing parts

1 Housing cover
2, 3 Optional connection panel for the heated capillary tube
4 Ventilation opening (inlet)
5 Side cover (left)
6 Frame, chassis
7 Terminal area
8 Ventilation opening (outlet)
9 Side cover (right)
10 Connection panel 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 connection panel contains all of the unit's interfaces and connections.

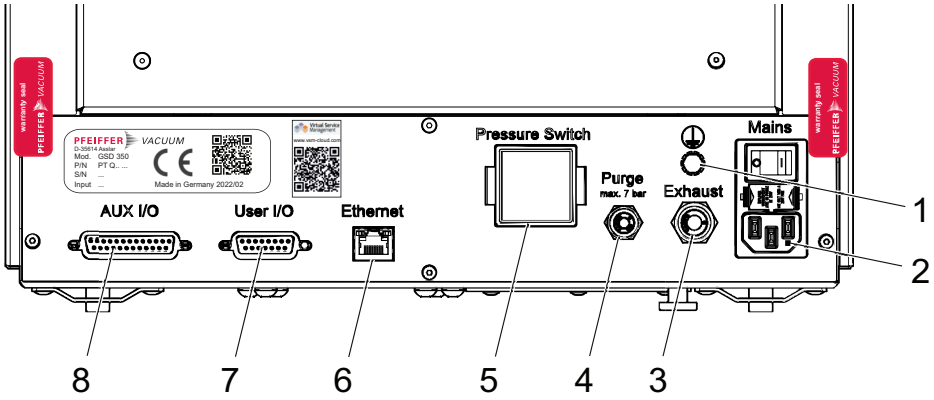


Fig. 7: Connection panel with interfaces and connections

1 Grounding connection (functional earth)
2 Mains connection with power switch
3 Exhaust gas connection
4 Sealing gas connection [8)]
5 Digital pressure switch for sealing gas [7)]
6 Ethernet connection (RJ-45)
7 "USER IO" connection
8 "AUX IO" connection

3.3.3 Gas inlet system

The gas guide to the ion source is screwed into the gas inlet systems of the OmniStar and ThermoStar. The gas guide holds the orifice and routes the reduced gas flow directly into 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.

Gas inlet system (OmniStar)
When the gas inlet is open, 1 to 2 sccm of the gas to be analyzed streams through the stainless steel capillary to the valve unit. Through the pressure reduction stage, consisting of the capillary and an orifice in front of the gas guide, the gas to be analyzed reaches the mass spectrometer without demixing. The stainless steel capillary is located in a capillary tube that is heatable to 200 °C or optionally to 350 °C. When the capillary heating is switched on, the inlet heating is also activated and the gas inlet is automatically heated. The effects of condensation in the gases to be analyzed can be avoided by the increased temperature. The valves allow the sample gas flow to be interrupted. The built-in orifice 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. When the gas inlet and split-flow valves are closed, no gas flows into the vacuum chamber. This makes it possible to determine the vacuum chamber background value with the mass spectrometer and subtract it from later measurements if necessary. The non-linearity of the mass spectrometer can be detrimental in high-precision measurements. By letting in a very clean gas (zero gas), the mass spectrometer background value can be accurately determined, even at operating pressure (approx. 1×10^{-5} hPa). 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 flows through the pressure reduction stage, consisting of the capillary and an orifice in the gas guide, to the mass spectrometer without demixing. The quartz capillary is located in a capillary tube that is heatable to 200 °C or optionally to 350 °C. When the capillary heating is switched on, the inlet heating is also activated and the gas inlet is therefore heated. The effects of condensation in the gases to be analyzed can be avoided by the increased temperature. The quartz capillary ends 1 to 2 mm in front of the orifice. This means that part of the gas exiting the quartz capillary reaches the mass spectrometer without impacting on the walls in the pressure reduction stage. This is important to identify low concentrations of reactive gases, as reactive gases will not have any contact with stainless steel. The gas flow cannot be separated from the vacuum chamber with the mass spectrometer when using this gas inlet variant. This means that the background value of the vacuum chamber and mass spectrometer cannot be determined and adjusted. If this is necessary, letting in a very clean gas (zero gas) allows the mass spectrometer background value to be accurately determined,

7) only for corrosive gas version
8) only for corrosive gas version

even at operating pressure (approx. 1 × 10^{-5} hPa). The Zero Gas must be supplied under the same pressure conditions as the gas to be analyzed.

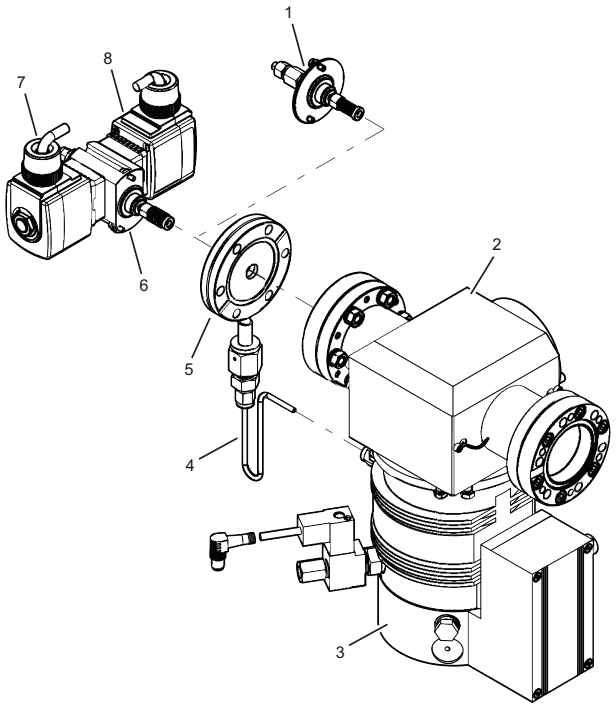


Fig. 8: Gas inlet systems

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

3.3.4 Calibration unit

The optional calibration unit allows the mass scale and resolution of the mass spectrometer to be calibrated in the high mass range (> 200 u). A glass storage vessel with perfluortributylamine (PFTBA) serves as a calibration medium and is inserted into the vacuum chamber via an orifice and shut-off valve. 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.

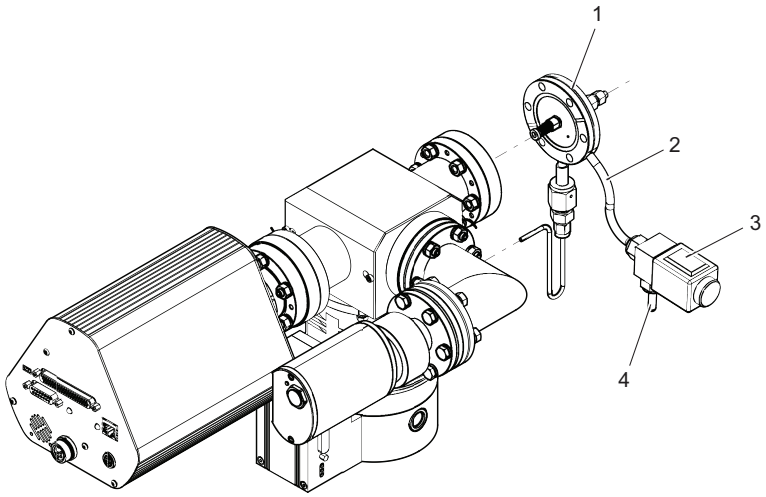


Fig. 9: Calibration unit at the gas inlet

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 side system

The turbopump functions according to the SplitFlow principle and maintains an operating pressure of $< 5 \times 10^{-5}$ hPa in the vacuum chamber with the gas inlet open. The turbopump assumes the majority of the gas flowing in through the capillary by way of interstage pumping.

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 (G 1/4") on the turbopump consists of a connection hose. For defined disposal of the pumped gas, the diaphragm pump has an exhaust line that can you can connect to a local gas disposal line or route out of the laboratory.

Diaphragm pump noise development

The diaphragm pump's rotation speed automatically adapts to the different operating statuses of the GSD 350. This can result in different noise developments.

Changing pump frequency with active emission

You can change the frequency of the diaphragm pump for sensitive measurements with the mass spectrometer and active emission. This allows you to minimize the influence on the measurement signal. A detailed description can be found in document DA0106 "Operation via web interface and PV MassSpec".

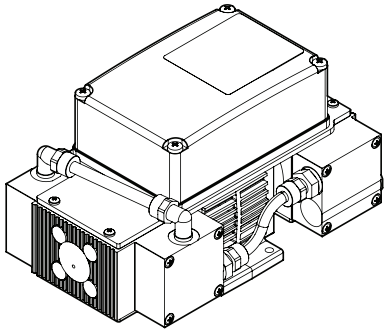


Fig. 10: Diaphragm pump

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 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. If an exhaust duct or scrubber is connected, overpressure must not occur at the exhaust gas connection.

Purpose of the digital pressure switch:

- to provide a visual indicator of the internal sealing gas pressure (2 to 16 kPa overpressure) downstream of the pressure regulator
- to deliver a signal that triggers the shutdown procedure if the sealing gas pressure exceeds or drops below the permissible range

Concentrations of the admitted gases

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.

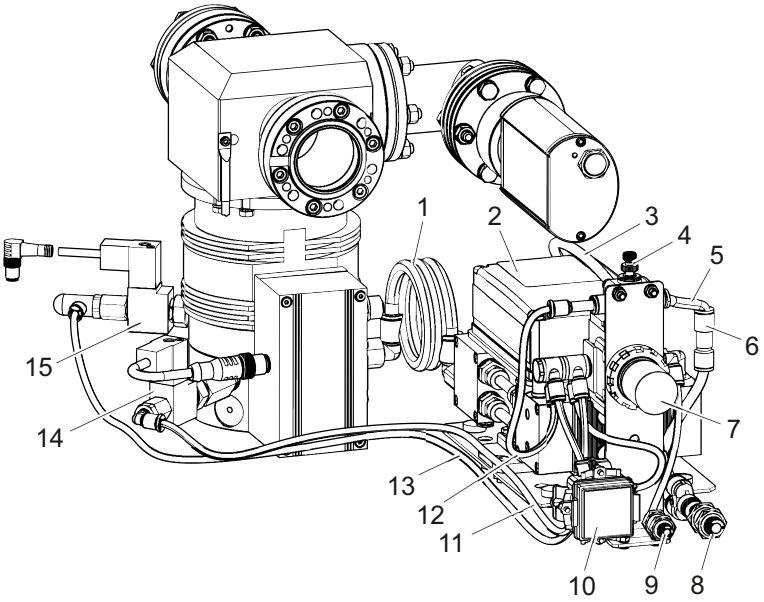


Fig. 11: Sealing gas system

1 Hose between diaphragm pump and turbopump
2 Diaphragm pump
3 Diaphragm pump exhaust gas hose
4 Throttle non-return valve
5 Hose to exhaust gas connection
6 Non-return valve
7 Manual pressure regulator
8 Exhaust gas connection
9 Sealing gas connection
10 Digital pressure switch with pressure gauge
11 Hose to sealing gas valve
12 Sealing gas hose
13 Hose to venting valve
14 Sealing gas valve
15 Venting valve

3.3.8 Gas analysis unit

Mass spectrometer functional principle

The functional principle of the PrismaPro mass spectrometer is described in the matching operating instructions.

The mass spectrometer analyzes the small part of the gas to be analyzed that penetrates into the vacuum chamber through the orifice. When the emission is switched on, the gas analysis unit can determine the pressure in the vacuum chamber itself and display it in the PV MassSpec software. The gas analysis unit also has a total pressure gauge on the vacuum chamber, which enables vacuum measure-

ment in the pressure range from 1000 to 5 × 10^{-9} hPa independently of the mass spectrometer. The total pressure measured can be read off the display, the web UI, and in the PV MassSpec software.

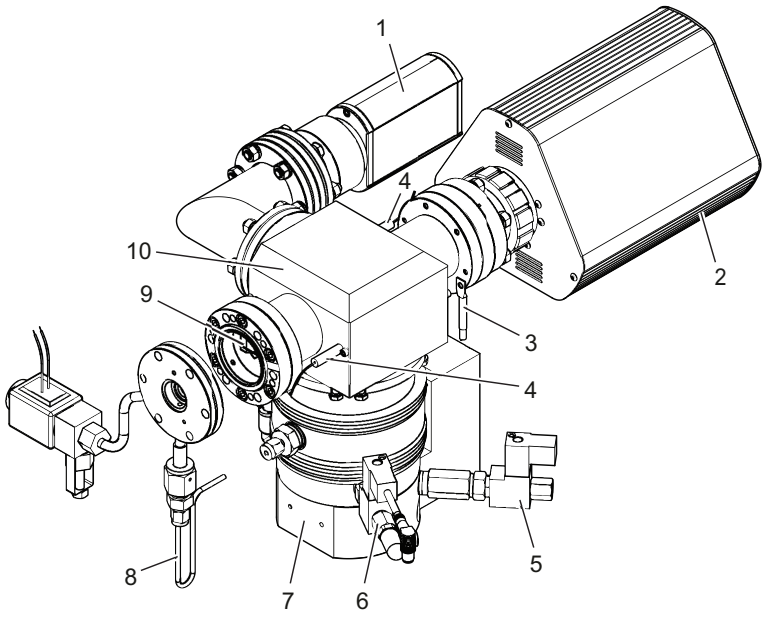


Fig. 12: Gas analysis unit components

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

3.3.9 Heating and insulation

⚠ 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).

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

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	40 to 130 °C

Tbl. 8: Heating units on the unit

Vacuum chamber heating (baking out)

Baking out reduces the condensed gases which adhere to the surface of the vacuum chamber. This leads to a lower total pressure in the vacuum chamber, and to a lower background signal during measurements. As a result, the amount of water is reduced in the vacuum system.

Characteristics of vacuum chamber heating

- The vacuum chamber has 2 heating cartridges.
- You can remove the insulation of the vacuum chamber and elbow fitting.

- You can select a duration of 1 to 24 hours for baking out. The standard value for baking out is 4 hours.
- You can terminate the baking out process at any time via the control on the unit.
- You can select a temperature between 100 and 130 °C. The standard value for the temperature is 120 °C.

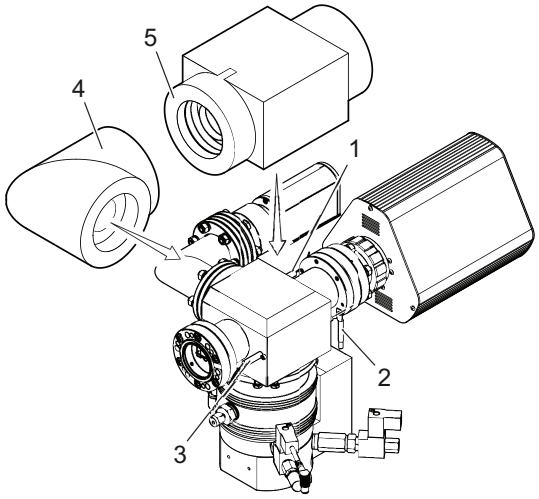


Fig. 13: Vacuum chamber heating and insulation

1,3	Vacuum chamber heating cartridges	4	Insulation (angle)
2	Temperature sensor	5	Insulation of the vacuum chamber

Gas inlet heating

Characteristics of the gas inlet heating

- The OmniStar and ThermoStar gas inlets have a heat conductor plate with a heating pad and an insulating collar.
- The Omnistar version also has a heating cartridge in the valve block.
- The gas inlet heating is always switched on and off parallel to the capillary heating.
- The GSD 350 automatically adjusts the temperature of the gas inlet. You cannot adjust the gas inlet heating temperature.

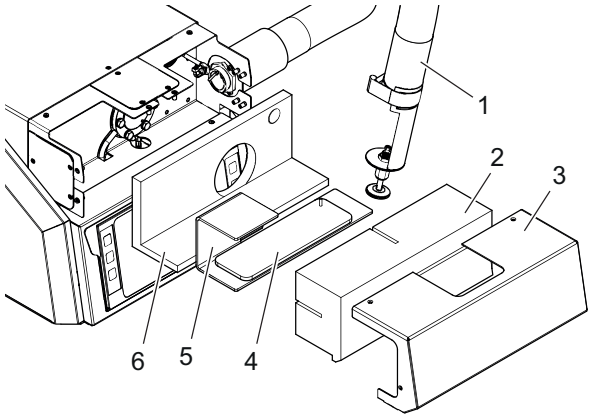


Fig. 14: Gas inlet heating

1	Capillary heating in the capillary tube	4	Heating pad (stuck to heat conductor plate)
2	Gas inlet cover insulating collar	5	Heat conductor plate
3	Gas inlet cover	6	Rear wall insulating collar

Capillary heating

The capillary is located in a flexible capillary tube with resistor heating. You can heat the capillary to 200 °C or 350 °C. The standard value for the temperature of the capillary heating is 120°C. Depending on the temperature setting and capillary tube variant, temperatures of > 70°C are possible on the surface of the capillary tube.

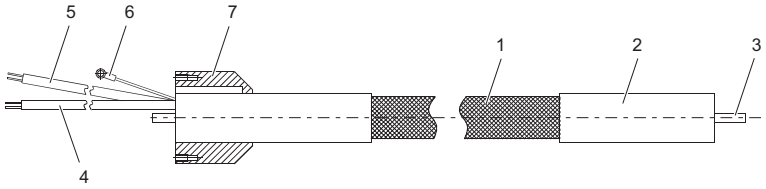


Fig. 15: Capillary heating

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

Electronic unit QME 250
The QME 250 electronic unit is mounted on the QMA 250 M analyzer and contains the mass spectrometer interfaces. The QME 250 provides all the voltages required for operation of the QMA 250 analyzer and prepares the measured ion currents for further processing.

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.

Diaphragm pump electronic drive unit
The electronic drive unit is a permanent component of the diaphragm pump. The purpose of the electronic drive unit is to monitor and control the entire diaphragm pump.

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

Display
Control the GSD 350 and call up functions via the display.

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 mass spectrometer and display
- Pump control for the turbopump and diaphragm pump
- Control of the gas inlet valves of the OmniStar
- Control of the calibration gas valve for GSD 350 with calibration unit
- Open and closed loop heating control
- Fan control for housing temperature
- External interfaces

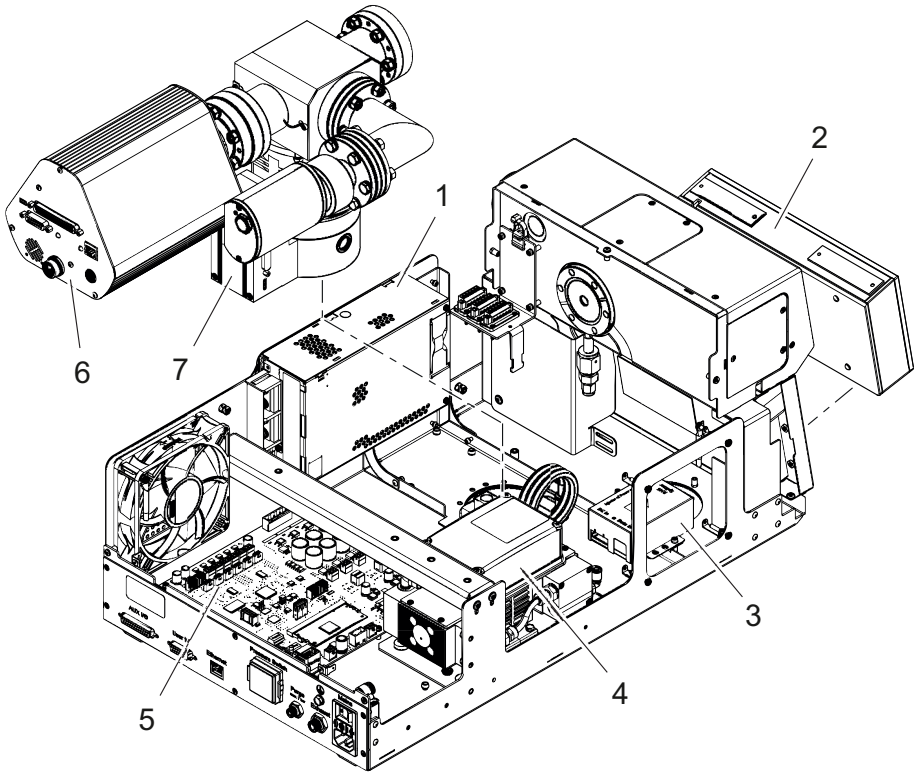


Fig. 16: Electronic components

1 Power supply pack
2 Display
3 PoE injector
4 Diaphragm pump electronic drive unit
5 Supervisor board
6 Electronic unit QME 250
7 Electronic drive unit TC 110

3.4 Identifying the product

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

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

3.5 Scope of delivery

The scope of delivery includes the following parts:

- GSD 350 OmniStar/ThermoStar
- installation hardware and small parts
  - Allen key, WAF 2, WAF 2.5, and WAF 3
  - Metric open-end wrenches, WAF 8, WAF 10 (2x), and WAF 14
  - Imperial open-end wrenches, WAF 5/16", WAF 3/8", and WAF 9/16"
  - Two-sided socket key for the ion source
  - Special tool for the orifice of the gas inlet system
  - Assembly aid for analyzer QMA 250
  - 2 O-rings made of FKM, 9.25 × 1.78 mm and 18.77 × 1.78 mm
  - 2 slow fuses, 10 A
  - for OmniStar with stainless steel capillary only
    - Hexagon socket wrench, TX20
    - Clamp collar set for 1/16" tube (5 pieces)
  - for ThermoStar or GSD 350 with quartz capillary only
    - Sealing set for capillary 250 µm (ferrule) (5 pieces)
  - Only for versions with calibration unit
    - Mounting aid for calibration gas support
- Transport protection for analyzer QMA 250 M

- Ethernet cable, 3 m length, red
- Mains cable
- Operating instructions
  - GSD 350 OmniStar/ThermoStar
  - Components (see chapter “Applicable documents”, page 10)

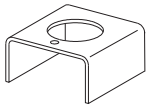


Fig. 17: Assembly aid for analyzer QMA 250

Fig. 18: Special tool for the orifice of the gas inlet system

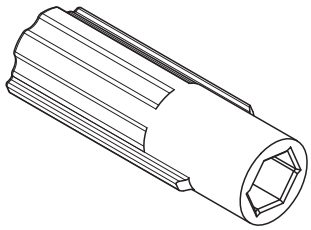


Fig. 19: Mounting aid for calibration gas support

Unpacking the product and checking completeness of the shipment

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

4 Transport and storage

⚠ 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 product

NOTICE

Damage caused by incorrect transport

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

- ► Comply with the instructions for safe transport.

Packing

We recommend keeping the transport packaging and original protective cover.

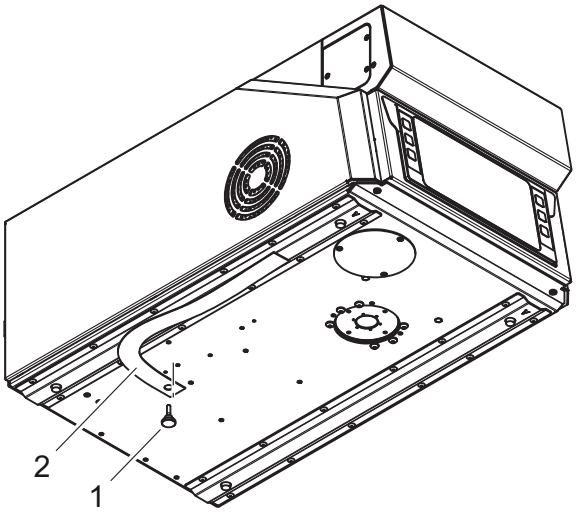


Fig. 20: Transport protection for the diaphragm pump

1 Transport protection for the diaphragm pump 2 Lug

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.

Installing transport protection for the diaphragm pump

1. Slightly raise the left side of the GSD 350.
2. Fully screw in the transport protection.

4.2 Storing 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.

Store product safely

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

5 Installation

5.1 Ensuring ventilation

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.

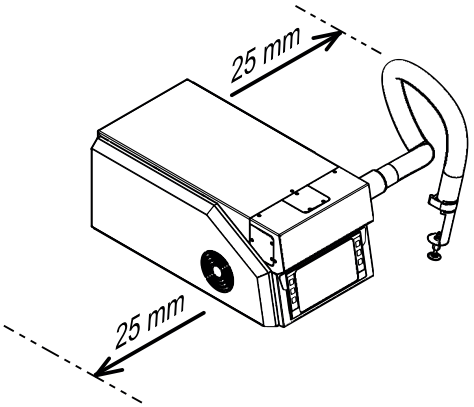


Fig. 21: Minimum lateral distances of the unit

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.

5.2 Removing transport protection for the diaphragm pump

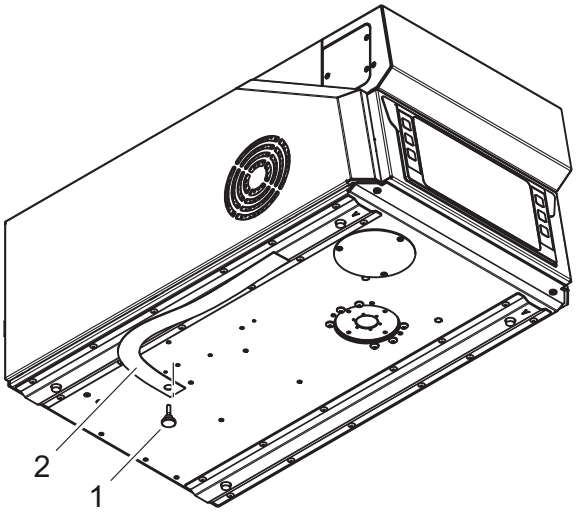


Fig. 22: Transport protection for the diaphragm pump

1 Transport protection for the diaphragm pump 2 Lug

Procedure

The transport protection is located on the underside of the GSD 350. Pfeiffer Vacuum has marked the transport protection with a lug ex factory.

1. Set up the GSD 350 unit at the place of use.
2. Slightly raise the left side of the GSD 350 and reach under the unit.
3. Fully unscrew the transport protection.
4. Keep the transport protection in a safe place.

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 48).

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

Required material

- PE hose (exterior Ø = 6 mm)

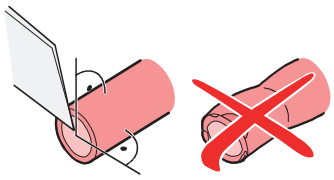


Fig. 23: Trimming the exhaust gas hose

Procedure

1. You must take the utmost care when cutting the exhaust gas hose.
   – The exhaust gas hose should not be deformed or have any scratches or gouges.
2. Cut the exhaust gas hose cleanly without any burring:
   - to the required length
   - at right angles

5.4.2 Connecting exhaust gas hose

Prerequisite

- Exhaust duct unpressurised

Required material

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

IQS plug-and-socket connections

IQS plug-and-socket connections have 2 pressure points: Holding claw and seal.

The hose is properly connected when both pressure points are passed.

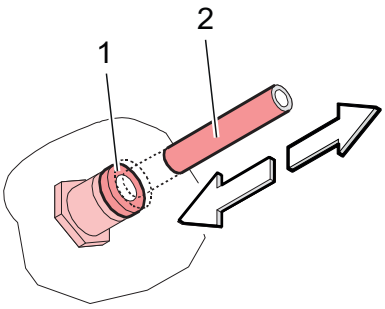


Fig. 24: Connecting exhaust gas hose

1 Release ring 2 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 substances.
3. Observe the local regulations for handling process gases.

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)

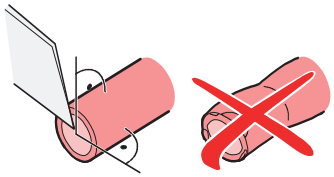


Fig. 25: Trimming the sealing gas hose

Procedure

1. You must take the utmost care when cutting the sealing gas hose.
   – The sealing gas hose should not be deformed or have any scratches or gouges.
2. Cut the sealing gas hose cleanly without any burring:
   - to the required length
   - at right angles

5.5.2 Connecting the sealing gas line

Prerequisite

- Sealing gas line and exhaust duct unpressurised

Required material

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

IQS plug-and-socket connections

IQS plug-and-socket connections have 2 pressure points: Holding claw and seal.

The hose is properly connected when both pressure points are passed.

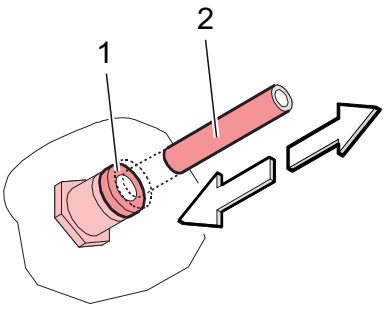


Fig. 26: Connecting the sealing gas line

1 Release ring 2 Hose

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. Connect the sealing gas hose to the sealing gas connection on the unit.
3. Observe the local regulations for handling process gases.

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.

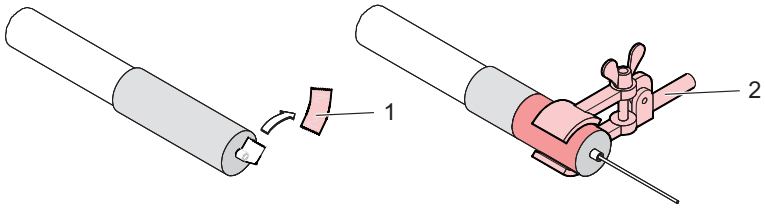


Fig. 27: Connecting the capillary

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

5.6.1 Connecting the OmniStar 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 ThermoStar 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 gas inlet cover”, page 72).
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 Adapting 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 delivers the GSD 350 with the capillary hose on the right-hand side. Dummy caps are installed as seals on the two positions that are not used.

Prerequisites

- GSD 350 switched off
- Gas inlet cover removed

Required tools

- Allen key, **WAF 2**

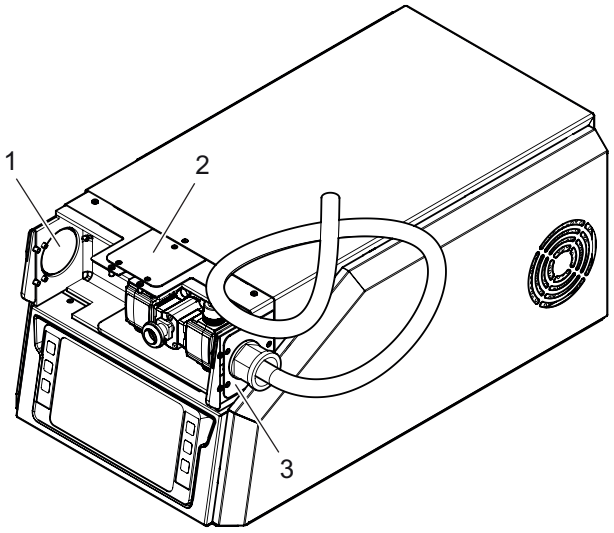


Fig. 28: Position of the capillary hose upon delivery

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

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

- **IP addresses**

  A network uses IP addresses as a means of identifying individual units. IP addresses are unique within a network, but are not universal. This means that only one unit in a network can have a certain IP address, but 2 units in separate networks can have the same IP address.

The following sections provide information on some general network variables that can influence connection of the GSD 350 (see chapter “Setting network parameters”, page 61).

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 units

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 initially not unique. Simultaneous connection of multiple GSD 350 units with identical standard IP address leads to IP address conflicts in the network.

► Change the IP address of the units that you want to connect in the network.
► Where possible, use static IP addresses.
► Then connect the units to a network.

Using IP addresses

Pfeiffer Vacuum recommends that **static IP addresses** are used for the GSD 350.

Reserve a block of IP addresses for static use and ensure that these reserved IP addresses are prohibited on the DHCP server (host). This will prevent any conflicts with double IP addresses.

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

Static IP addresses protect against the loss of data

The PV MassSpec software and the web interface use the IP address of the GSD 350 in order to identify each connected GSD 350. The IP address of the GSD 350 must not be changed during operation

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 accidentally during data acquisition, the web interface and the PV MassSpec are not automatically reconnected with the GSD 350, as the PV MassSpec 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 when the IP address is changed manually, and help to protect the GSD 350 against loss of communication and data.

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

Setting IP addresses

- ► **Recommendation**: Use static IP addresses.
  - – You can set and change static IP addresses manually.
- ► Do **not** use dynamic IP addresses.
  - – A host (DHCP) sets these IP addresses automatically.
- ► An alternative to changing the IP address is to change the IP address of the host computer, thus enabling communication between the host computer and the unit.

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 a network prefix for all IP addresses within a sub-network. This is carried out via the subnet 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 subnet masks define which octets of the IP address are used as a network prefix. In order that 2 network units are allowed to communicate, the network units 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.

5.8.3 Changing IP address for the GSD 350

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**.

IP addresses in the range 192.168.2.xxx

IP addresses in the range 192.168.2.xxx are reserved for internal services. These IP addresses cannot be used.

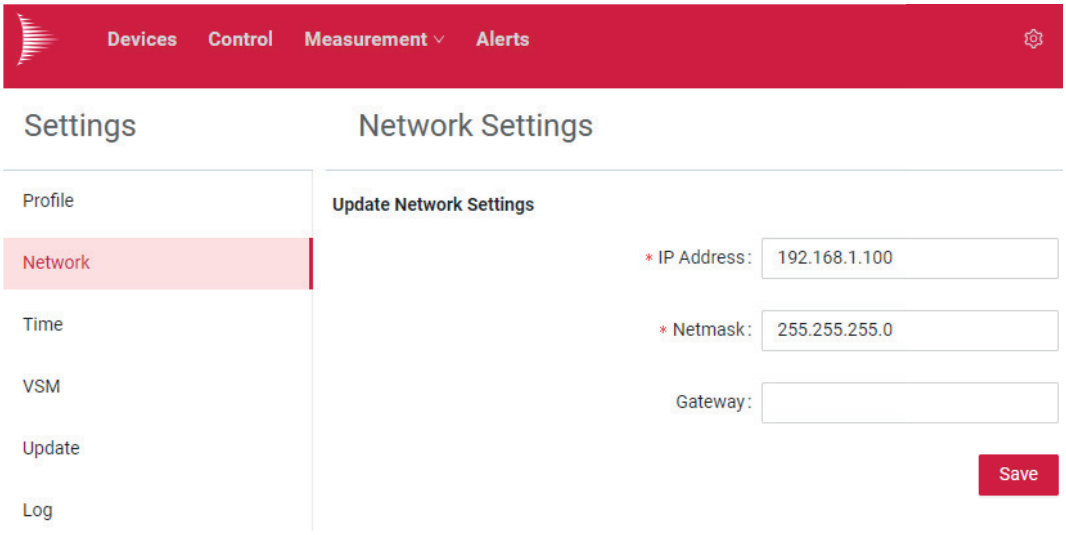


Fig. 29: Changing IP address of the GSD 350 via the web interface

Procedure

- ► Using the display to change the unit's IP address (see chapter “Setting network parameters”, page 61).
- ► 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.

Ex factory IP address 192.168.1.100

The unit is assigned the IP address 192.168.1.100 at the factory. You cannot use it here.

Changing the IP address back to the default

Perform these steps from the beginning again and replace the IPv4 properties again with the standard values in order to change the IP address back to standard.

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 Connecting the functional earth

⚠ 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 unit without an internal earthed conductor attached can be life-threatening in the event of a malfunction.

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

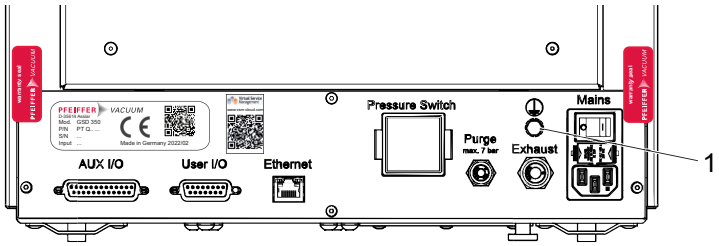


Fig. 30: Connection for functional earth

1 Connection for functional earth (M5 screw)

Procedure

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

5.10 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.

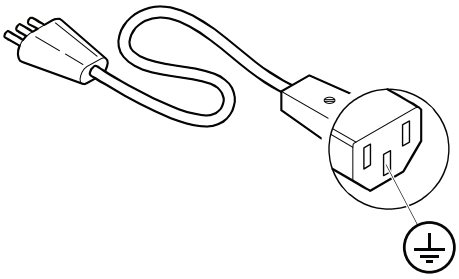


Fig. 31: Mains connection with IEC 320 C13 socket

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.

5.11 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 to create, call and start measurement recipes. All other GSD 350 unit parameters and functions can still be controlled 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**.

6 Interfaces and connections

The GSD 350 has an Ethernet interface for communication, as well as 2 input/output (I/O) connections, User I/O and AUX I/O, which allow the GSD 350 to exchange information with the customer's peripheral devices.

6.1 Mains connection

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

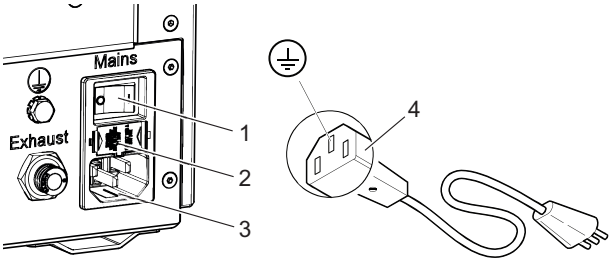


Fig. 32: Mains connection with main switch and fuse

1	Main switch	3	Mains connection socket (IEC 320 C14)
2	Fuse	4	Mains cable with cold-device plug C13

6.2 Ground terminal

⚠ DANGER

Electric shock due to missing internal earthed conductor

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

► Do not rotate or release 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 connection panel.

6.3 "User I/O" connection

NOTICE

Impairment of electrical connections caused by external disruptive influences

External disruptive influences due to electromagnetic emissions cause malfunctions in the unit and lead to property damage.

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

► A screened cable should be used due to the electromagnetic compatibility (EMC).
► Avoid external disruptive influences.
► 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. You can set the input to low via a contact or a transistor to ground. If used with the PV MassSpec software, you can view the states of this input or use them for recipe or sequential control.

- Total number of channels: 1
- "USER I/O" connection: DI1

Relay output
You can set the relay output (24 V AC/DC, 1 A) 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 I/O" connection: DO8

Analog inputs
The analog inputs are differential inputs for the range -10 to +10 V. The PV MassSpec software records analog input signals or controls program sequences.

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

Analog output
The analog outputs allow the outputting of voltages within the range of 0 to 10 V.

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

Relay for system status
The “USER I/O” connection includes a relay that indicates the status of the GSD 350. When the system is in the measurement ready state (vacuum ready), the normally open contact closes. This shows that the unit is ready to measure.

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

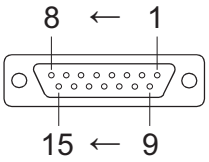


Fig. 33: "USER I/O" connection

1	Ground (GND)
2	Digital input DI1
3	Relay change-over contact DO8
4	Relay normally open contact DO8
5	Analog input AI2 (-)
6	Analog input AI2 (+)
7	Analog input AI1 (-)
8	Analog input AI1 (+)
9	Analog ground (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)

6.4 "AUX IO" connection

NOTICE

Impairment of electrical connections caused by external disruptive influences

External disruptive influences due to electromagnetic emissions cause malfunctions in the unit and lead to property damage.

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

- ► A screened cable should be used due to the electromagnetic compatibility (EMC).
- ► Avoid external disruptive influences.
- ► 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 highly active. The PV MassSpec software allows you to set the actions activated by digital inputs to low active. A pull-up resistor configures these inputs internally to +24 V. 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 viewed or they can be used for sequential control.

- 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, you can set the digital outputs permanently or relative to currents, unit state and sequence state. When you activate the output, 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, you can record analog input signals simultaneously or control program sequences.

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

Analog output
The analog outputs allow the outputting of voltages within the range of 0 to 10 V. If used with the PV MassSpec software, the ion currents of the individual masses can be converted to corresponding output voltages using a configurator, and then be output.

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

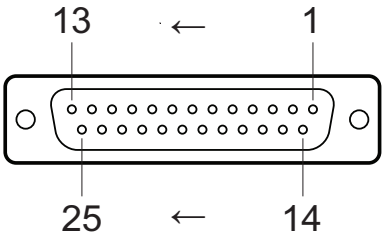


Fig. 34: "AUX IO" connection

1	Analog output AO2	14	Analog output AO3
2	Analog ground	15	Digital ground
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 ground	19	Digital ground
7	Digital input DI13	20	Digital input DI14
8	Digital input DI15	21	Digital ground
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 ground		

6.5 "Ethernet" (LAN) connection

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

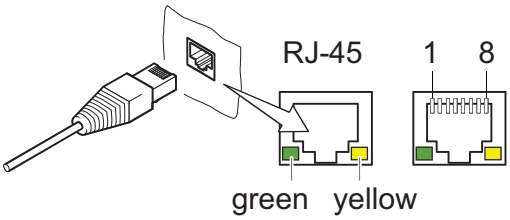


Fig. 35: "Ethernet" (LAN) connection

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. 10: Status of the Ethernet connection

7 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.

7.1 Switching on unit

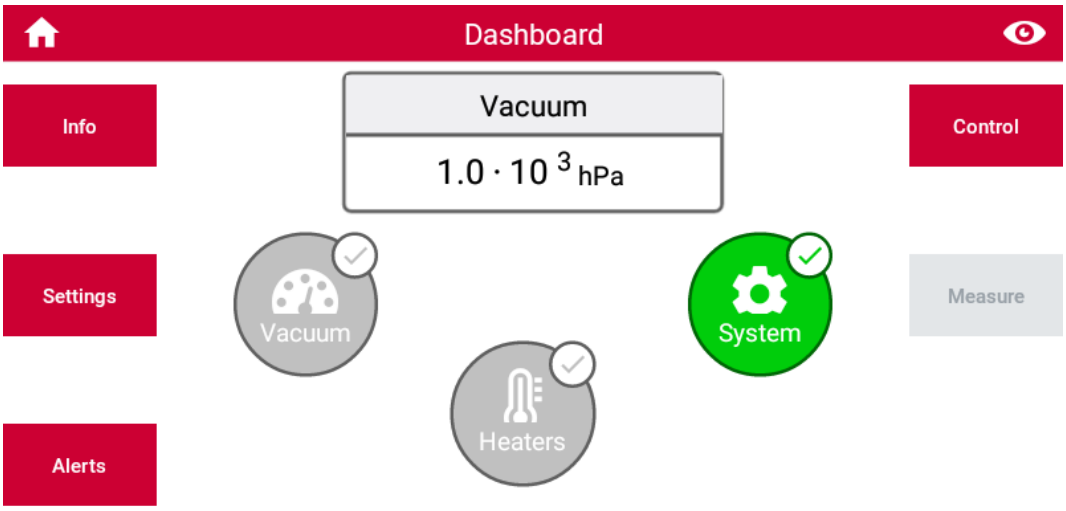


Fig. 36: "Dashboard" screen after starting the program

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 “Changing user settings”, page 60).
3. Start the pumping system.
4. Before measuring, note the stabilization time of the total pressure gauge of 5 to 10 minutes.

7.2 Starting pumping system

Requirements for measurement readiness (vacuum ready)

- Pressure < 5 × 10^{-5} hPa
- Turbopump rotation speed > 1200 Hz
- Turbopump current consumption < 2 A

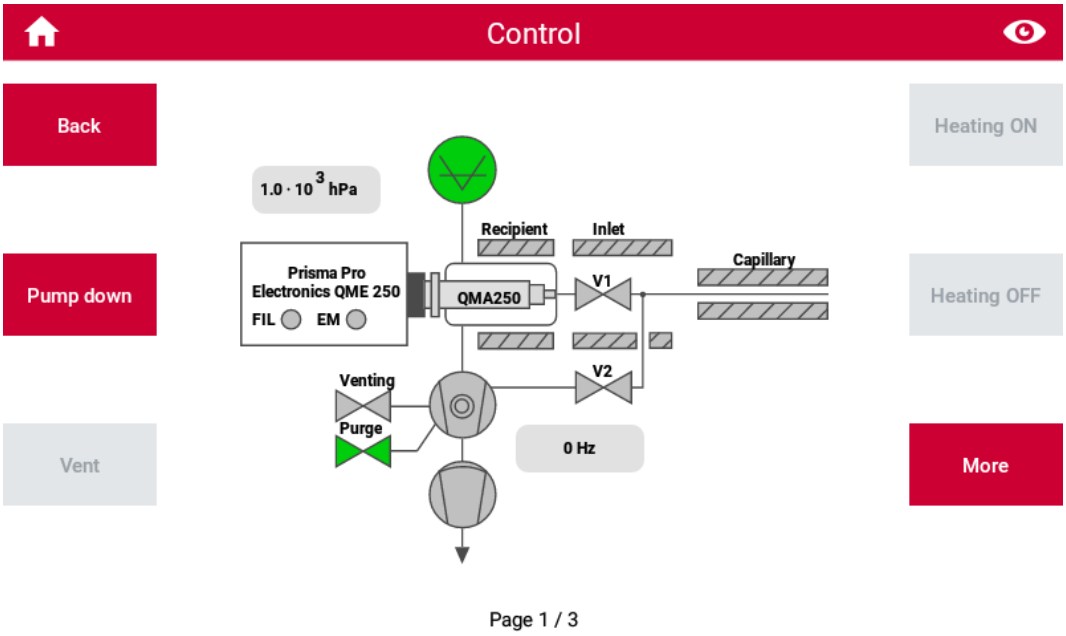


Fig. 37: "Control" screen

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 64).

The unit is ready for measuring.

8 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 used exclusively 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 are using the PV MassSpec software.
- ► Use the display.
  - – You cannot save the measured data of measurements via the display.
- ► Use the web interface.
  - – You cannot save the measured data of measurements 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 keys and inactive settings in the Messages menu are grayed out.
- ► 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.

8.1 "Dashboard" screen

The first screen that appears after the program starts is the "Dashboard". All unit functions and information can be called up from here directly or indirectly. For more information about the controls and displays, see: (see chapter “Controls and indicators”, page 22)

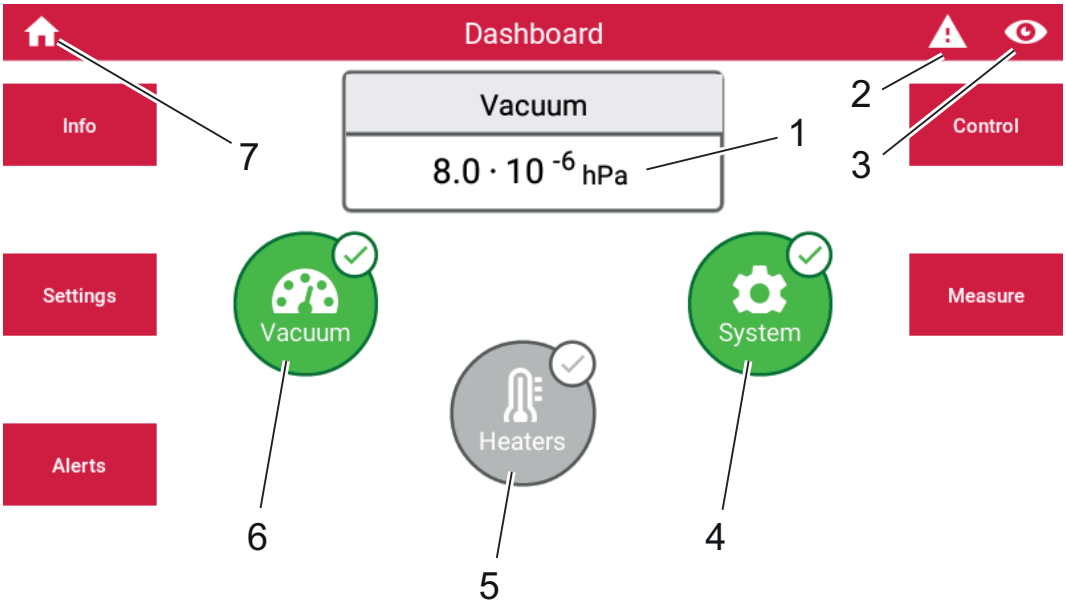


Fig. 38: "Dashboard" screen

1 Current pressure value in the vacuum chamber
2 Warning triangle in the event of a warning or malfunction message
3 User settings
4 System status
5 Heating status
6 Vacuum system status
7 Link to dashboard

8.2 Menu structure with functions

Menu	Subprograms, functions and information	
	1st Level	2nd Level
Info (see page 54)	Vacuum pumps	Diaphragm pump
		Turbopump
	Sensors	Gauges
		Sealing gas sensor
	Valves	Metering valve (V1)
		Split-flow valve (V2)
		Calibration valve
	Heating units	Capillary
		Gas inlet
		Vacuum chamber
	DMD	Operating hours, firmware versions, etc.
	Network	DHCP
		IP address
		Gateway
		Subnet mask
	Fan	Pump inlet fan
		Pump outlet fan

Menu	Subprograms, functions and information	
	1st Level	2nd Level
Settings (see page 55)	Recipes	Creating a new recipe
		Default recipes for air
	Heating units	Capillary
		Gas inlet
		Vacuum chamber
	Sensors	Gauges
		Sealing gas sensor
	User settings	User name
		Roller
		Language
		Pressure unit
		Temperature unit
		Date
	Autostart	Vacuum
		Heating
		Gas inlet
	Network	DHCP
		IP address
		Gateway
		Subnet mask
	Factory settings	Reset to as-delivered condition
	Service [9]	Vacuum pumps
		Sensors
		Valves
		Heating units
		DMD
		Fan
Messages (see page 62)	Active messages: history and confirmation	Content, history, filter for errors, warnings, info (inactive filters grayed out)
Control (see page 63)	Pump down (to)	-
	Vent	-
	Heating on/off	-
	Metering valve open/closed [10]	-
	Bake out on/off	-
	Emission on/off	-
	Electron multiplier on/off	-
	Calibration valve open/close [11]	-
Measurement (see page 67)	Recipe selection	-

Tbl. 11: Menu structure with functions

8.3 "Info" menu

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

9) Only available for service personnel after logging in

10) Only for OmniStar

11) only with optional calibration unit

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

8.4 "Settings" menu

NOTICE

Property damage due to unintended changes in the Service menu

Improper changes in the Service menu impair unit functions and cause damage to the unit and its components.

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

► Contact Pfeiffer Vacuum Service.

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

- **"Recipes" submenu**
  - Creating, editing and deleting measurement recipes
- **"Heating" submenu**
  - Specify the setpoint temperatures for heating and set the heating mode for vacuum chamber heating
- **"Sensors" submenu**
  - Adjusting sensors
- **“User settings” submenu**
  - Changing user settings
- **"Autostart" submenu**
  - Setting autostart functions
- **"Network" submenu**
  - Making the network settings
- **"Factory settings" submenu**
  - Resetting the parameters to the factory settings
- **"Service" submenu**
  - Service functions [12)]

12) Only available for service personnel after logging in

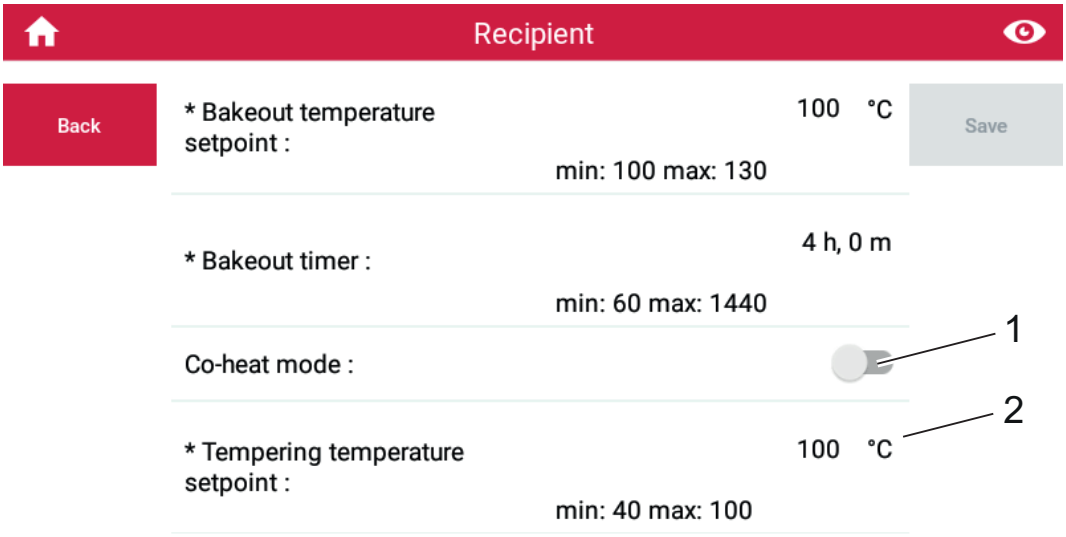


Fig. 39: Example of parameter setting

1 Switch symbol (off) 2 Editable numeric value

Using a switch to change over parameters

1. Scroll to the desired parameter.
2. Press the switch symbol 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 entry 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.

8.4.1 Creating and editing measurement recipes

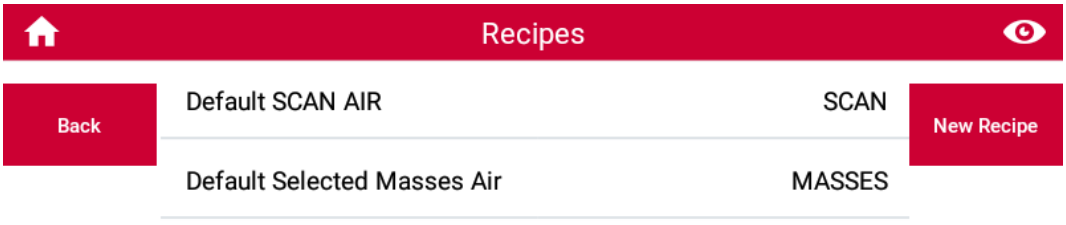


Fig. 40: "Recipes" submenu

You can select, change or delete existing measurement recipes in the "Recipes" submenu.

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)

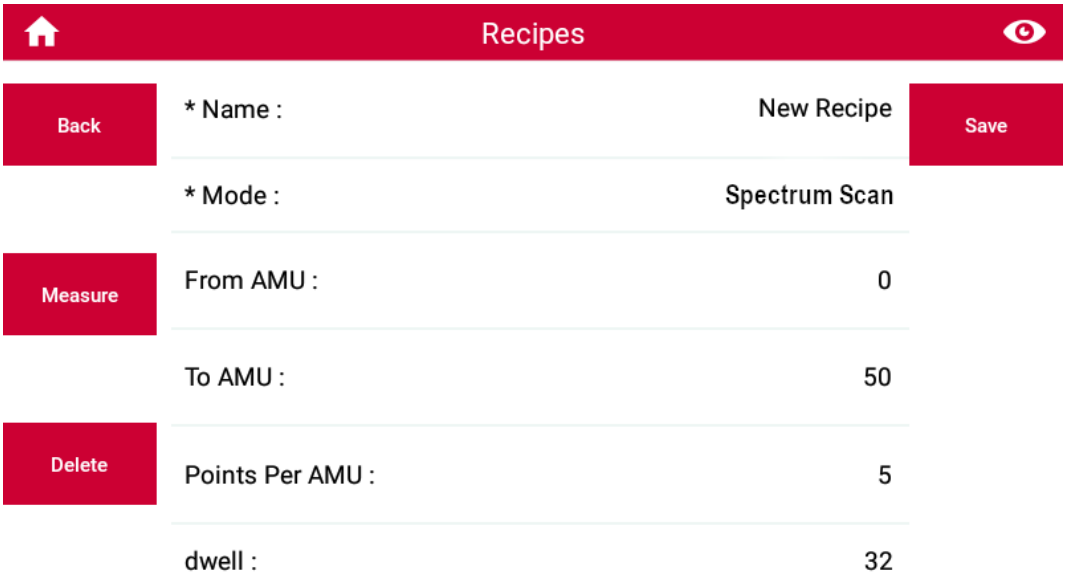


Fig. 41: Measurement recipe for "Spectrum Scan" measuring mode

Editing the measurement recipe for "Spectrum Scan" measuring mode

1. Press the "New 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.

Fig. 42: Measurement recipe for " Selected Masses" measuring mode

Fig. 43: Measurement recipe for “Selected Masses - Special” measuring mode

Editing measurement recipe for " Selected Masses" measuring mode

1. Press the "New recipe" button.
2. Enter a name for the measurement recipe.
3. Select "Selected Masses" measuring mode.
4. Select the display for a mass or a special (e.g., pressure value).
5. Define the measuring time for a mass (dwell).
6. Define the individual mass numbers (Mass: nn) that you want the GSD 350 to record and display over time.
7. Press the "New line" button to add further mass numbers.
8. Press the "Delete" button to delete individual mass numbers.
9. 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.

8.4.2 Adjusting the heating units

Overheating protection of heating units

All heating units are protected against overheating. In the event of a deviation from the expected set temperature, the GSD 350 outputs a warning. Under certain circumstances, this may also occur at cool ambient temperatures. The warning goes out as soon as the heating temperature is back within the expected range. If the GSD 350 measures an impermissible temperature, the heating switches off. It can be switched back on again once the cause has been eliminated.

The set heating parameters (set temperatures) are shown in the "Heating" submenu.

Heating units

- Gas inlet heating
- Capillary heating
- Vacuum chamber heating

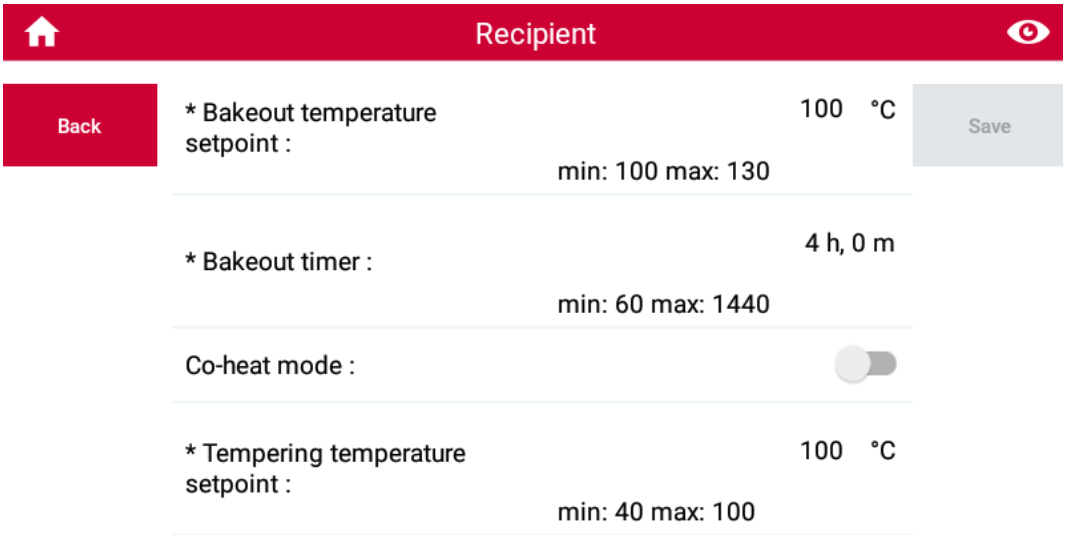


Fig. 44: Tempering mode of the vacuum chamber

In normal cases, the GSD 350 does not heat the vacuum chamber during a measurement. For certain analytical measurements, you can activate the "Tempering mode" function 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.

8.4.3 Adjusting sensors

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

Sensors

- **Gauges**

  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 switched off or 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.

8.4.4 Changing user settings

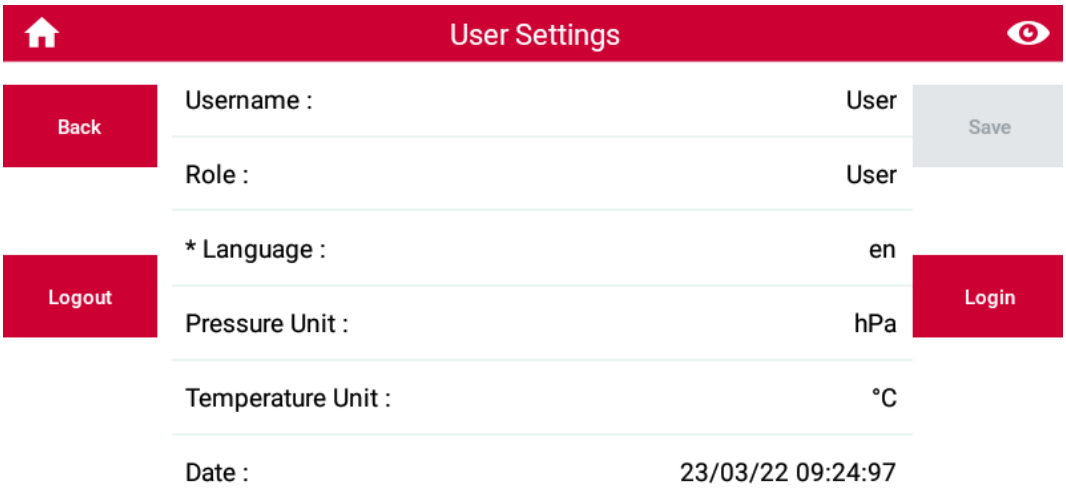


Fig. 45: "User settings" submenu

You can toggle the units for the pressure and temperature physical variables in the menu navigation in the "User settings" submenu. You can also set the language, date, and time.

As-delivered condition

- Pressure: hPa
- Temperature: °C

Available languages

- English (standard)
- German

Setting the time and date

1. Tap the date and time on the display.
2. Set the date.
3. Set the time.
4. Select "Save" to confirm the settings.

8.4.5 Setting autostart functions

Fig. 46: "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 pump
- **Heating**

  Heats the capillary heating to the setpoint
- **Inlet**

  Open inlet valve (for OmniStar only)

Required vacuum in the vacuum chamber

The "Heating" and "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.

8.4.6 Setting network parameters

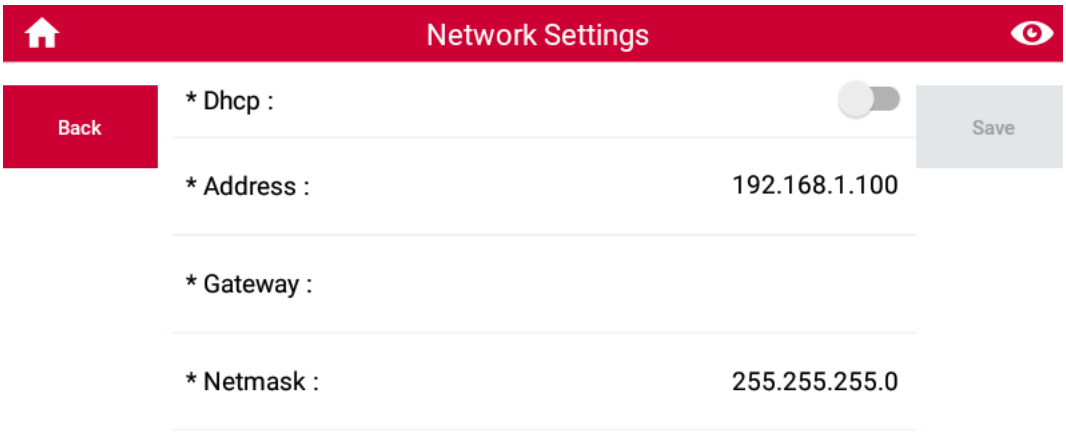


Fig. 47: "Network" submenu

You can set the network parameters for the GSD 350 in the "Network" submenu. The GSD 350 must be restarted in order to activate the new network parameter. For operation with a measuring computer, the GSD 350 requires a static IP address.

Network parameters

- DHCP
- IP address
- Gateway
- Subnet mask

Do not switch off in evacuated state

Do not switch off the GSD 350 in the evacuated state.

Setting up the IP address for the GSD 350

1. Enter the new static IP address.
   – The IP address 192.168.2.xxx is reserved for internal services and cannot be selected.
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 unit.
6. Switch the unit back on after > 20 seconds.

You will find the GSD 350 below the new settings.

8.4.7 Resetting the unit to the factory settings

Modified settings are lost

This function allows you to reset all parameters set/changed by the user to the default values (factory settings). All modified settings are lost on resetting to the factory settings. You cannot undo this function. The assigned IP address and the measurement recipes are retained.

Fig. 48: "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.

8.4.8 "Service" submenu

NOTICE

Property damage due to unintended changes in the Service menu

Improper changes in the Service menu impair unit functions and cause damage to the unit and its components.

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

► Contact Pfeiffer Vacuum Service.

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

8.5 "Messages" menu

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

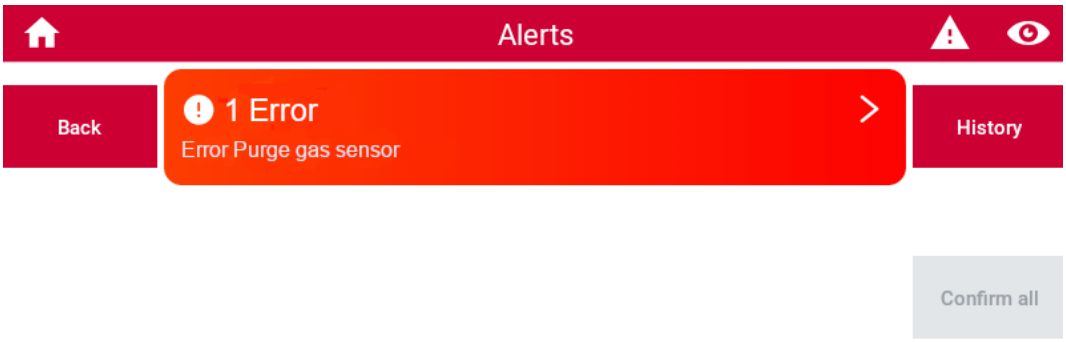


Fig. 49: Example of a malfunction message

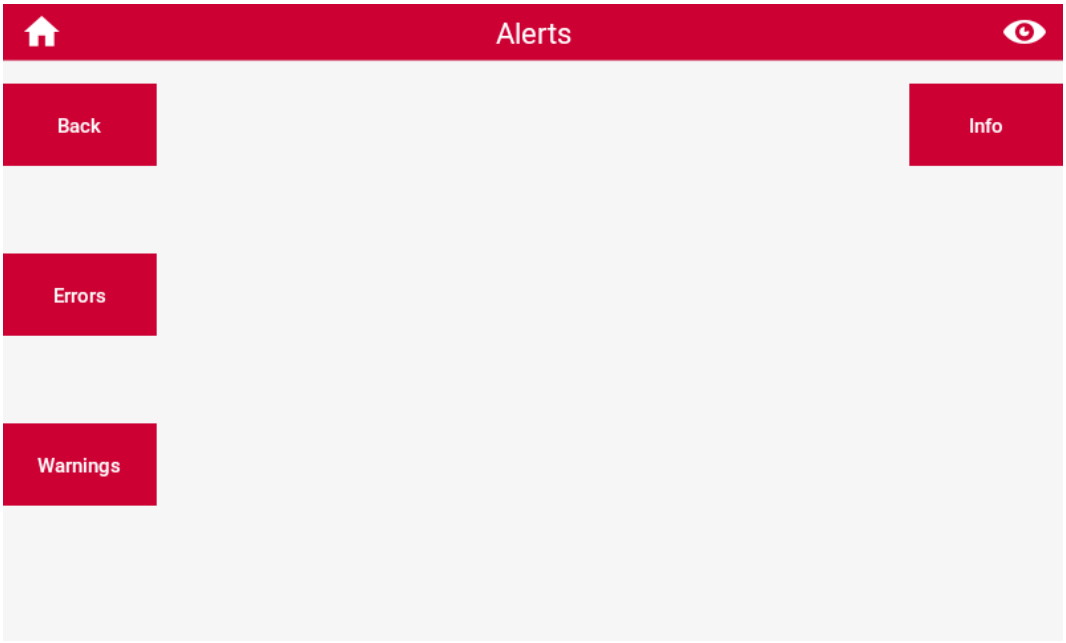


Fig. 50: Example of older messages

Accessing warnings and malfunction messages

- ► Switch to the "Messages" menu or press the warning triangle.
  - – The warnings and malfunction messages appear.
- ► Press the “History” button to access older messages.
- ► Apply filters by pressing the “History” button.

8.6 "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)
- 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 21)

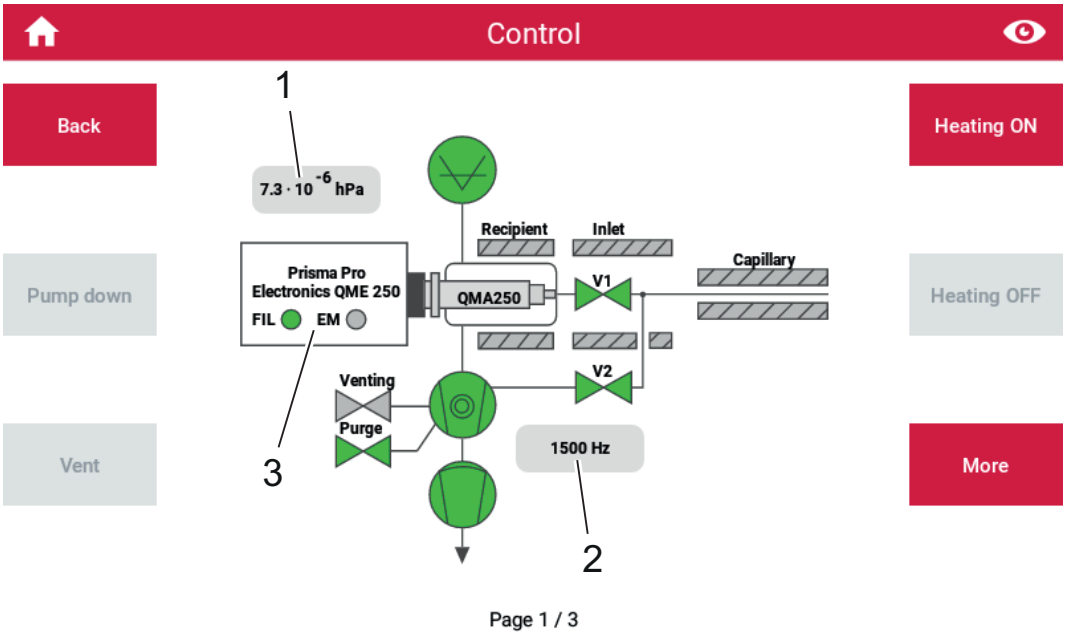


Fig. 51: "Control" menu

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

8.6.1 Pumping down the vacuum system

Prerequisite

- GSD 350 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.
- The GSD 350 is now ready to measure (vacuum ready)

8.6.2 Venting vacuum system

Prerequisites

- Ongoing measurements completed (see chapter “"Measurement" menu”, page 67)
- Filament an electron multiplier switched off (see chapter “"Control" menu”, page 63).

Procedure

1. Switch to the “Control” menu.
2. Switch off the secondary electron multiplier and the emission.
3. Press the "Vent" button.

Sequence

- The GSD 350 transitions from "Vacuum" state to "Vented" state.
- An internal timer runs if the emission was still switched on up to 15 minutes before venting. 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

before starting “Venting,” the timer starts at 15 minutes. The remaining timer time is shown top right on the display.

- After the timer time has elapsed, the diaphragm pump stops and the turbopump shuts down.
  - Below the venting rotation speed (750 Hz), the venting valve vents the turbopump and the vacuum chamber.
  - The venting valve and the sealing gas valve (for corrosive gas version) remain open.

8.6.3 Switching heating units on and off

Passive heating of vacuum chamber

After switching on, the gas inlet heating also passively heats the vacuum chamber until a compensation temperature has been reached, since the gas inlet and vacuum chamber are connected to each other.

Prerequisite

- GSD 350 ready to measure (vacuum ready)

Switching 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 (± 5°C).

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.

8.6.4 Opening and closing gas inlet (OmniStar)

Prerequisite

- GSD 350 ready to measure (vacuum ready)

Opening gas inlet

1. Recommendation: Switch off the filament for the moment in which the valve is opened.
2. Switch to the “Control” menu.
3. Press the "Open inlet valve" button.

Opening sequence

- The diaphragm pump increases its rotation speed.
- Split-flow valve V2 opens and closes multiple times briefly in a defined interval in order to avoid impermissible pressure surges.
- Split-flow valve V2 remains open after the last interval.
- Metering valve V1 opens after a delay about 4 seconds later.
- A PWM control then keeps both valves open to keep the coil flow low for thermal reasons.
- The diaphragm pump again reduces its rotation speed to 30 Hz.

Shutting the gas inlet

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

Closing sequence

- Metering valve V1 closes.
- Split-flow valve V2 closes.

8.6.5 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

- GSD 350 ready to measure (vacuum ready)

Baking out the vacuum chamber

1. Recommendation: During bakeout, switch off the electron multiplier and switch on the filament emission.
2. Recommendation: Close the inlet valves prior to bakeout (OmniStar).
3. Switch to the “Control” menu.
4. Press the "Bake out on" button.

Bake out sequence

- The GSD 350 transitions from "Bake out off" state to " Bake out on" state.
- 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 switches the heating off if there is a risk of excess temperature in the unit.

    Information to this effect appears in the display.
- The timer starts (standard value: 4 h).
  - 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 “Cooled” state is reached.

8.6.6 Switching emission on and off

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

Prerequisite

- GSD 350 ready to measure (vacuum ready)

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.

8.6.7 Switching 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

- GSD 350 ready to measure (vacuum ready)
- Emission on

Switching on the electron multiplier

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

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.

8.6.8 Opening and closing calibration valve

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

Prerequisite

- GSD 350 ready to measure (vacuum ready)

Opening calibration valve

1. Recommendation: To avoid exposing the filament to unnecessary pressure surge, only open the calibration valve if the emission is switched off.
2. Wait until the pressure in the vacuum chamber has dropped below 1×10^{-5} hPa before switching on the filament.
3. Switch to the “Control” menu.
4. Press the "Open calibration valve" button.
5. Calibrate the mass scale of the mass spectrometer.

Opening sequence

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

Shutting the calibration valve

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

Closing sequence

- The calibration valve shuts off.

8.7 "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)

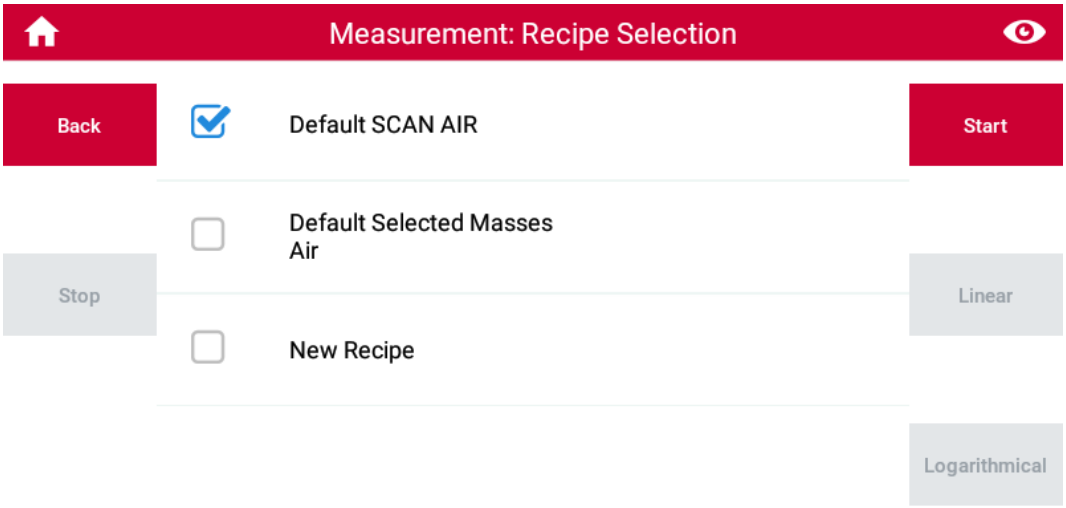


Fig. 52: Recipe selection

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.

9 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

Property damage as a result of interrupting the supply voltage during operation

Unplugging the mains plug or turning off the main switch during operation severely stresses the filament and shortens the filament's service life if the unit is under vacuum and emission is switched on. There is a risk of total ruination of the filament.

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

Protecting 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.

Switching off unit

1. Switch the EM of the mass spectrometer off (see chapter “Switching electron multiplier on and off”, page 66).
2. Switch the emission of the mass spectrometer off (see chapter “Switching emission on and off”, page 66).
3. Vent the vacuum system to switch it off (see chapter “Venting vacuum system”, page 64).
4. Wait until the GSD 350 vents the system and has switched off the vacuum pumps.
5. Stop the sealing gas supply (corrosive gas version).
6. Switch off the main switch of the unit.
7. Disconnect the mains cable from the power supply.

Disconnecting the exhaust gas hose

1. 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.
2. Pull the exhaust gas hose vertically out of the exhaust gas connection part of the unit.

Disconnecting 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.

10 Maintenance

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

Maintenance in the Pfeiffer Vacuum Service Center

Pfeiffer Vacuum offers a complete maintenance service for all products.

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

Cleaning in the Pfeiffer Vacuum Service Center

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

Warranty claim

Opening the device during the warranty period or damaging/removing the warranty seal will void the warranty. The warranty seals are attached to the unit in such a way that you can open the following parts of the GSD 350 without removing a warranty seal:

- Gas inlet
- Turbopump operating fluid reservoir
- Service opening for the calibration medium (PFTBA)

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.

10.1 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 with the 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.

Group of components, module and action	Interval	Maintenance level	Spare part/spare part set
Basic unit			
Replace the housing screws	in case of loss	1	Housing screws
Clean the housing parts	If required	1	-
Replace the gas inlet cover	If required	1	Gas inlet cover
Replace the side cover	If required	1	Side cover
Replace the housing cover	If required	1	Housing cover
Replace the terminal area for capillary hose	If required	1	Terminal area
Clean the protection screen on the fan	If soiled	1	-
High vacuum side system			
Replace the copper gasket on the DN 40 CF flange connection	Always when the CF flange connection is opened	1	Copper seal
Replace the operating fluid reservoir on the turbopump	4 years	1	Operating fluid reservoir
Replace the turbopump bearings	4 years	2	-
Fore-vacuum system			
Replacing diaphragm pump	If required	1	Diaphragm pump
Replacing diaphragm pump diaphragm	after 15,000 operating hours	1	Overhaul kit
Gas analysis unit			
Install/remove analyzer QMA 250 M	If required	1	-
Replace filament (tungsten)	If required	1	Filament unit
Replace filament (Ir-Y_2O_3)	After the first of the 2 filaments fails	1	Filament unit
Replace ion source (tungsten filaments)	If soiled	1	Ion source
Replace ion source (Ir-Y_2O_3 filaments)	If soiled	1	Ion source
Replace sensor on total pressure gauge	If soiled	1	Sensor
Replace the total pressure gauge	in case of a defect	1	Total pressure gauge
Gas inlet system			
Install/remove gas inlet (OmniStar)	If required	2	-
Replace gas inlet (OmniStar)	If required	2	Gas inlet
Install/remove gas inlet (ThermoStar)	If required	2	-
Replace gas inlet (ThermoStar)	If required	2	Gas inlet
Replace orifice (OmniStar)	If plugged	2	Screen
Replace orifice (ThermoStar)	If plugged	2	
Replace orifice and internal gas guide (OmniStar)	If required	2	Spare parts set
Replace orifice and internal gas guide (ThermoStar)	If required	2	
Capillary			
Shortening stainless steel capillaries	If plugged	1	-
Replacing stainless steel capillary	If plugged	1	Capillary Capillary seals
Trimming quartz capillaries	If plugged	1	-
Replacing quartz capillary	If plugged	1	Capillary Capillary seals
Electronic components			
Replacing display	in case of a defect	1	7" touch display

Group of components, module and action	Interval	Maintenance level	Spare part/spare part set
Calibration unit (option)			
Refill the calibration medium (PFTBA)	If required	2	Calibration medium (PFTBA)

Tbl. 12: Maintenance work and intervals

10.2 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).

10.2.1 Removing/attaching gas inlet cover

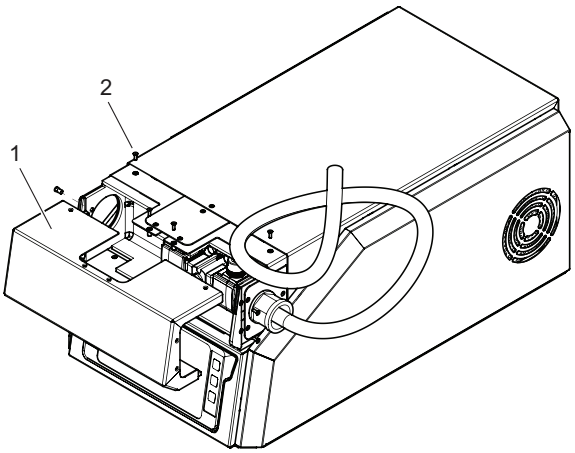


Fig. 53: Removing/attaching gas inlet cover

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

Prerequisites

- GSD 350 switched off
- Power cable disconnected

Required tools

- Allen key, **WAF 2**

Removing 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.
3. Loosen the insulating hood's Velcro fasteners.
4. Remove the insulating hood from the gas inlet.

Attaching gas inlet cover

1. Place the insulating hood on the gas inlet.
2. Fasten the insulating hood's Velcro fasteners.
3. Deposit the gas inlet cover on the chassis.
4. Fasten the gas inlet cover to the chassis with the interior hexagon socket screws.

10.2.2 Removing/attaching side covers

Do not remove the gas inlet cover

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

Warranty claim

Opening the device during the warranty period or damaging/removing the warranty seal will void the warranty. The warranty seals are attached to the unit in such a way that you can open the following parts of the GSD 350 without removing a warranty seal:

- Gas inlet
- Turbopump operating fluid reservoir
- Service opening for the calibration medium (PFTBA)

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

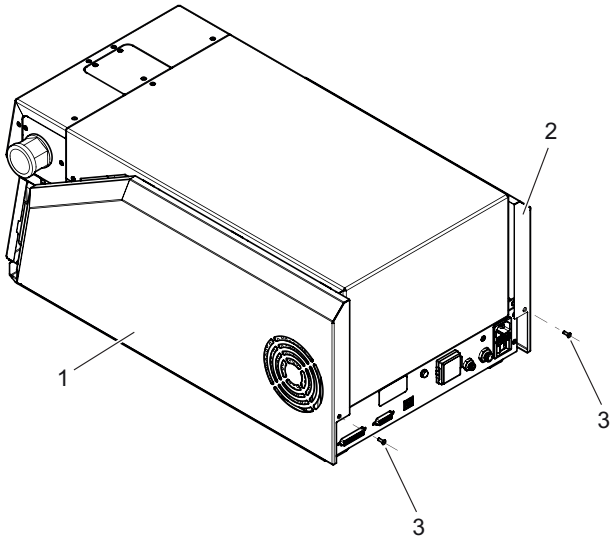


Fig. 54: Removing/attaching side covers

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

Prerequisites

- GSD 350 switched off
- Power cable disconnected

Required tools

- 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.

10.2.3 Removing/attaching housing cover

Warranty claim

Opening the device during the warranty period or damaging/removing the warranty seal will void the warranty. The warranty seals are attached to the unit in such a way that you can open the following parts of the GSD 350 without removing a warranty seal:

- Gas inlet
- Turbopump operating fluid reservoir
- Service opening for the calibration medium (PFTBA)

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

Prerequisites

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

Required tools

- Allen key, **WAF 2**

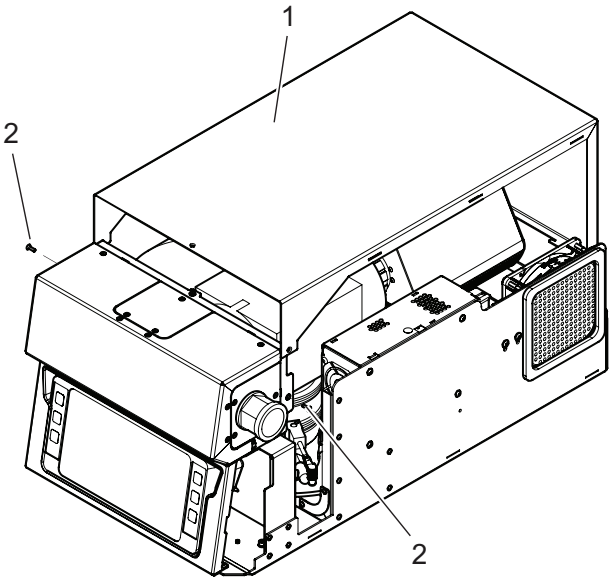


Fig. 55: Removing/attaching housing cover

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.

10.2.4 Cleaning housing parts

⚠ DANGER

Electric shock due to moisture entering the unit

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

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

⚠ WARNING

Health hazards due to cleaning agent

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

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

NOTICE

Damage caused by penetrating moisture

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

- Cleaning agent (e.g. 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.

10.2.5 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 see, and before the air circulation drops below the required level.
2. Hold the fan firmly to prevent the induction of current to the fan.
3. Use a vacuum cleaner to remove the dust from the protection screen.

10.3 Maintaining the high vacuum system

10.3.1 Replacing operating fluid reservoir on turbopump

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

► Observe the application instructions and precautions.
► Do not allow tobacco products to come into contact with the operating fluid.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Side covers installed

Required tools

- Screwdriver, **4 mm**

Required special tools

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

Required material

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

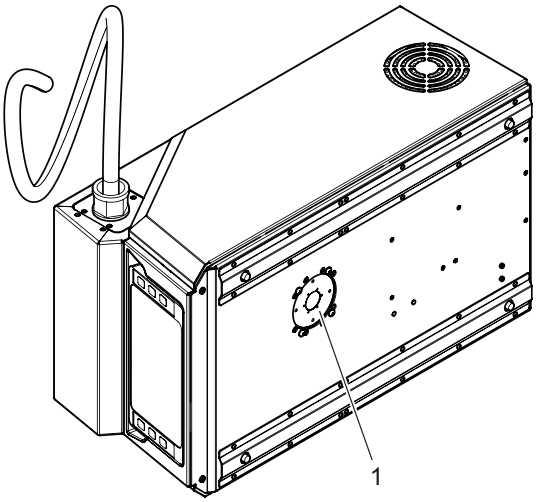


Fig. 56: Unit underside
1
Housing cover on turbopump

Procedure

1. Install the diaphragm pump's transport protection. (see chapter "Transport and storage", page 34)
2. Carefully place the GSD 350 on its side.
3. Open the turbopump housing cover using the wrench for the housing cover.
4. Replace the operating fluid reservoir and the Poroplast rods in line with the turbopump operating instructions.
5. Close the turbopump housing cover using the wrench for the housing cover.
6. Carefully erect the GSD 350 again.
7. Remove the diaphragm pump's transport protection. (see chapter "Removing transport protection for the diaphragm pump", page 36)

10.3.2 Replacing the venting valve

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.4 Maintaining the fore-vacuum system

10.4.1 Replacing 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

Instrument required

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

Spare part required

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

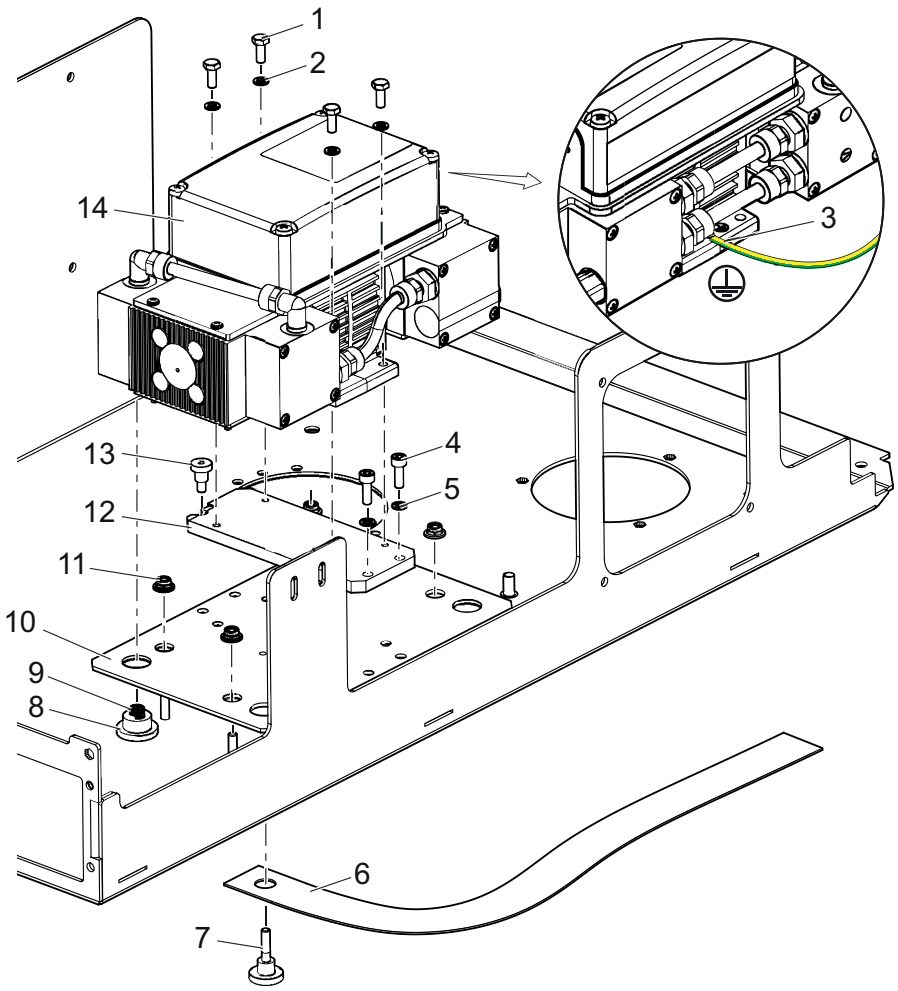


Fig. 57: Replacing diaphragm pump

1	Hexagon head screw M4×10 (4×)	8	Spring damper (4×)
2	Lock washer (4×)	9	Compression spring (4×)
3	Ground terminal	10	Fixing plate
4	Allan head screw M4×12 (2×)	11	Nut (4×)
5	Lock washer (2×)	12	Diaphragm pump carrier
6	Transport protection lug	13	Shoulder screw
7	Transport protection	14	Diaphragm pump

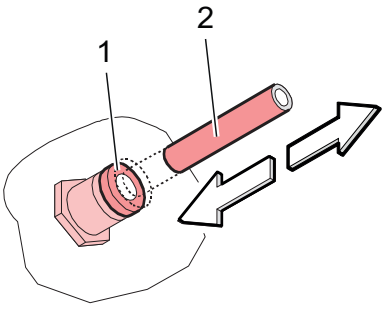


Fig. 58: Connect the exhaust gas and intake hose, and draw off

1	Release ring	2	Hose

Removing diaphragm pump

1. Fasten the transport protection on the diaphragm pump.
2. Detach the exhaust gas hose from the diaphragm pump.
3. Detach the intake hose from the diaphragm pump.
4. Loosen the lock screws on the diaphragm pump's D-Sub plug.

5. Disconnect the D-Sub plug from the diaphragm pump.
6. Loosen the grounding connection on the diaphragm pump.
7. Unscrew the hexagon socket screws with lock washers from the diaphragm pump carrier.
8. Remove the diaphragm pump and diaphragm pump carrier from the fastening plate by turning slightly.
9. Loosen the hexagon socket screws and lock washers on the diaphragm pump.
10. Remove the diaphragm pump carrier from the diaphragm pump.
11. Unscrew the shoulder screw from the fastening plate.
12. Loosen the nuts and remove the fastening plate.
13. Detach the compression springs and spring dampers from the housing of the GSD 350.

Setting RS-485 address of new diaphragm pump

► 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.

Installing diaphragm pump

1. Fasten the compression springs and the spring dampers to the housing of the GSD 350.
2. Fix the fastening plate in position with the nuts.
3. Screw the shoulder screw into the fastening plate.
4. Use the hexagon head screws and lock washers to fasten the diaphragm pump carrier to the diaphragm pump.
5. Position the diaphragm pump with the diaphragm pump carrier on the fastening plate.
6. Screw the hexagon socket screws with lock washers into the diaphragm pump carrier.
7. Fasten the grounding connection on the diaphragm pump.
8. Plug in the D-Sub connector.
9. Fasten the D-Sub connector's lock screws to the diaphragm pump.
10. Insert the intake hose into the diaphragm pump.
    – Observe the correction position of the intake side.
11. Insert the exhaust gas hose into the diaphragm pump.
    – Observe the correction position of the exhaust gas side.
12. If necessary, remove the transport protection from the diaphragm pump.

10.4.2 Replacing diaphragm pump diaphragm

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
- Vacuum system at a standstill and vented to atmospheric pressure
- Side covers removed
- Housing cover removed
- Diaphragm pump removed from GSD 350

Required material

- Inspection set (order 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.

10.5 Maintaining the gas analysis unit

10.5.1 Maintaining 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.
- ► Make sure that the connection flanges are free of grease.
- ► Remove protective caps and protective covers from flanges and connections only when necessary.
- ► Remove the analyzer's transport protection only when necessary.
- ► Carry out all work in a well lit area.

Mass spectrometer operating instructions

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

Centering ion source

An ion source that is not centered will affect the measurement performance of the mass spectrometer and result in faster aging of the filaments.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Turbopump at standstill
- Side covers removed
- Housing cover removed
- Gas inlet removed (for reinstallation of QMA)

Required tools

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

Required aids

- Assembly aid for analyzer QMA 250
- Centering gauge for QMA (available as special tool)

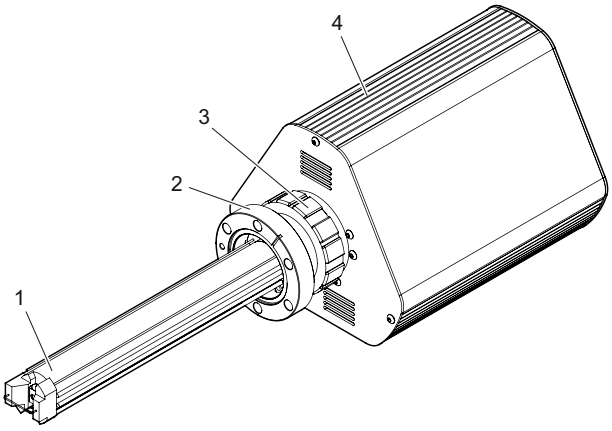


Fig. 59: PrismaPro Quadrupole mass spectrometer

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

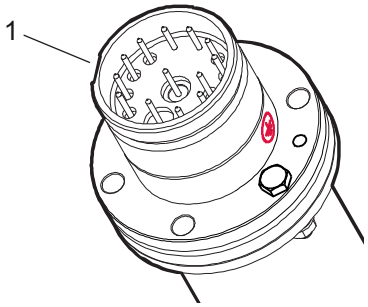


Fig. 60: Groove on analyzer

1 Groove on analyzer

Determining sensitivity of the mass spectrometer

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 mass spectrometer with the electron multiplier switched off, i.e., only with the Faraday detector.

1. Determine the sensitivity of the mass spectrometer 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 (see table).
   – This gives you a good approximation of the sensitivity in A/hPa. The value should be > 4×10^{-5} A/hPa.
5. Compensate for the wear of the electron multiplier by setting the amplifier voltage higher.

Value	Cause of sensitivity loss	Remedy
< 5×10^{-6} A/hPa	Contamination of the ion source	Replace the ion source.
	Filament at end of life	Replace the filament.
> 5×10^{-6} A/hPa	Wear of electron multiplier	Increase the amplifier voltage.

Tbl. 13: Determined sensitivity of the mass spectrometer

Replacing the filaments

If one of the two filaments fails, measuring may continue temporarily with the second filament.

► **Recommendation:** Replace both filaments as soon as possible if one of the filaments fails.
► Also check the condition of the ion source.
   – If the ion source is heavily polluted, Pfeiffer Vacuum recommends replacing the entire ion source.

Maintain 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 mass spectrometer operating instructions:
   - Replace the filament unit, or
   - Replace the ion source
7. Locate the analyzer with a new silver-plated copper gasket in the vacuum.
   – Pay attention to the correct position of the groove in the analyzer ("9 o'clock position") on the feedthrough flange.
8. Tighten the analyzer so that the ion source remains centrally positioned in the flange.
9. Locate the electronics unit on the analyzer.
   – The groove in the analyzer must engage in the lug on the electronics unit.

10. Tighten the black clamp collar on the electronics unit.
11. Connect all connection cables on the front panel of the QME 250 electronics unit.

10.5.2 Maintaining total pressure gauge

Ignition duration of the cold cathode at low pressures

If you switch off the gauge in “Ignore sensor errors” mode, a certain time may elapse before the GSD 350 displays valid pressure values when it is switched on again.

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Side covers removed
- Housing cover removed

Required tools

- 2 open-end wrenches, **WAF 10** (non-magnetic)

Spare parts required

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

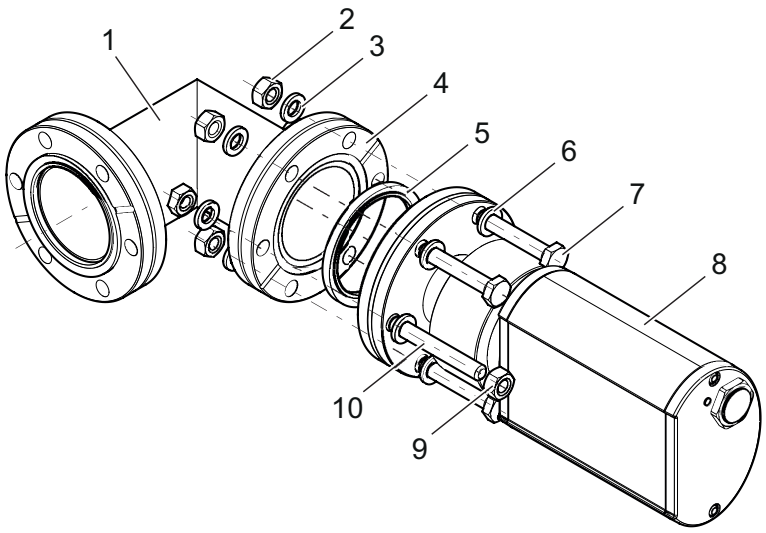


Fig. 61: Total pressure gauge on the gas analysis unit

1	Elbow fitting with insulating pad (not shown)	6	Washers
2	Hexagon nuts	7	Hexagon head screws
3	Washers	8	Total pressure gauge
4	CF flange	9	Hexagon nut
5	Copper seal	10	Grub screw

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

10.6 Maintaining gas inlet system of 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.

Trimming or replacing stainless steel capillary

Trim the stainless steel capillary or first replace the stainless steel capillary. Only replace the orifice if the work on the stainless steel capillary has not achieved the desired results.

If the pressure in the GSD 350 does not increase at all or only increases marginally after opening the metering valve (pressure remains at < 1 × 10^{-6} hPa), then the capillary or orifice of the gas inlet is probably partially or fully blocked. The probability of a blocked capillary is greater than the probability of a blocked orifice.

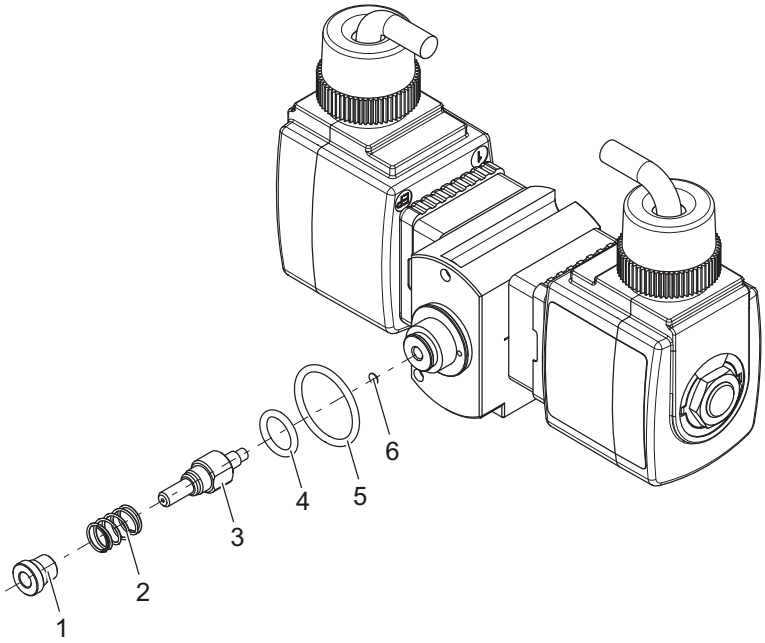


Fig. 62: Part of internal gas guide on OmniStar

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

10.6.1 Removing 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
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet cover removed
- Insulating collar removed

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5/16"**
- Open-end wrench, **WAF 9/16"**
- Open-end wrench, **WAF 14**

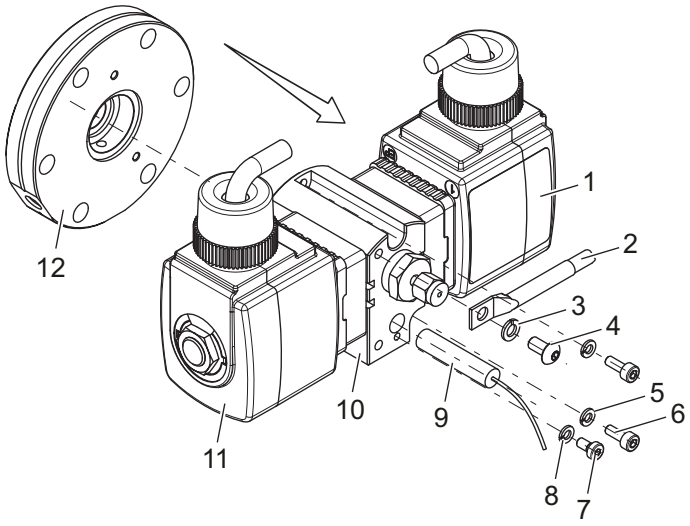


Fig. 63: Disassemble the valve block

1	Metering valve	8	Lock washer
2	Temperature sensor	9	Heating cartridge
3	Lock washer	10	Capillary fitting
4	Rounded head screw	11	Valve block
5	Lock washer (2×)	12	Split-flow valve
6	Interior hexagon socket screw (2×)	13	Connection flange
7	Interior hexagon socket screw		

Procedure

1. Loosen the nuts on the spools of both valves.
2. Pull the heat conductor plate out from under the valve block and place it on top of the GSD 350.
3. Remove the spools from the valve bodies on both valves.
4. Open the capillary fitting on the valve block with the aid of the open-end wrench and pull the stainless steel capillary out.
5. Loosen the temperature sensor's lock washer and rounded head screw.
6. Remove the temperature sensor.
7. Loosen the heating cartridge's lock washer and hexagon socket screw.
8. Pull the heating cartridge out of the valve block.
9. Loosen the lock washers and hexagon socket screws on the valve block.
10. Carefully pull the valve block forward off the connection flange.
11. Make sure the inner gas guide is complete.

Complete the following required work

► Complete the further required work:
  – Replace the orifice
  – Replace the interior gas guide and orifice
  – Replace the complete gas inlet

10.6.2 Replacing orifice

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet removed

Required tools

- Special tool for the orifice of the gas inlet system
- Open-ended wrench for gas guide, **WAF 8**

Spare part required

- Orifice, 50 µm (order number BK212576)

Procedure

1. Unscrew and remove the gas guide from the valve block.
2. Turn the gas inlet so that orifice can drop out.
3. Drill the orifice manually using the special tool and pull the orifice out from the valve block if the orifice remains stuck.
4. If the orifice cannot be loosed with the special tool, gently tap the gas inlet on a soft surface to make it fall out.
5. Locate the new orifice on the gas guide in the correct orientation so that the matt side is visible when you look into the hole.
6. Using a wrench, **hand tighten** the gas guide in the valve block.

10.6.3 Replacing interior gas guide and orifice

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet removed

Required tools

- Special tool for the orifice of the gas inlet system
- Open-ended wrench for gas guide, **WAF 8**

Required aids

- Clean paper

Spare parts required

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

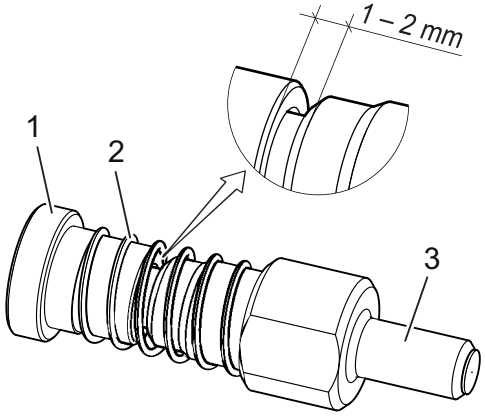


Fig. 64: Gas guide approx. 1–2 mm behind the end of the ceramic sleeve

1 Ceramic sleeve
2 Compression spring
3 Gas guide

Procedure

1. Unscrew and remove the gas guide from the valve block.
2. Turn the gas inlet so that the orifice drops out.
3. Drill the orifice manually using the special tool and pull the orifice out from the valve block if the orifice remains stuck.
4. If the orifice cannot be loosed with the special tool, gently tap the gas inlet on a soft surface to make it fall out.
5. Replace the gas guide, compression spring and ceramic sleeve.
6. Push the spring onto the ceramic sleeve.
7. Push the spring and the ceramic sleeve onto the gas guide.
8. Make sure that the gas guide is located approx. 1–2 mm behind the end of the ceramic sleeve.
9. Push the ceramic sleeve onto a piece of clean paper and make sure that the gas guide spring deflects and friction is low.
10. Locate the new orifice on the gas guide in the correct orientation so that the matt side is visible when you look into the hole.
11. Using a wrench, **hand tighten** the gas guide in the valve block.

10.6.4 Installing 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
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet cover removed
- Insulating collar removed
- Gas inlet removed
- Stainless steel capillaries possibly installed on valve block

Required tools

- Allen key, **WAF 2.5**
- Open-end wrench, **WAF 5/16"**
- Open-end wrench, **WAF 9/16"**
- Open-end wrench, **WAF 14** for valves

Procedure

1. Check the seat of the compression spring and ceramic sleeve.
2. Carefully center and insert the valve block into the connection flange on the vacuum chamber.
   – The last centimeter of the gas guide is directly in the mass spectrometer.
3. Fasten the lock washers and hexagon socket screws to the valve block.
4. Push the heating cartridge into the valve block.
5. Fasten the heating cartridge's lock washer and hexagon socket screw.
6. Fasten the temperature sensor with the lock washer and rounded head screw.
7. Push the stainless steel capillary back into the capillary tube.
8. Place the spools on the valve bodies of both valves.
9. Bolt on the spools at a 90° angle.
10. Make sure that you have the correct assignments.
11. Push the heat conductor plate under the valve block in the gas inlet.
12. Mount the insulating collar on the gas inlet housing.

10.7 Maintaining gas inlet system of 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.

First shorten or replace the quartz capillary

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

If the pressure in the GSD 350 is permanently < 1 × 10^{-6} hPa despite atmospheric pressure at the gas inlet, then the capillary or orifice on the gas inlet is probably partially or fully blocked. The probability of a blocked capillary is greater than the probability of a blocked orifice.

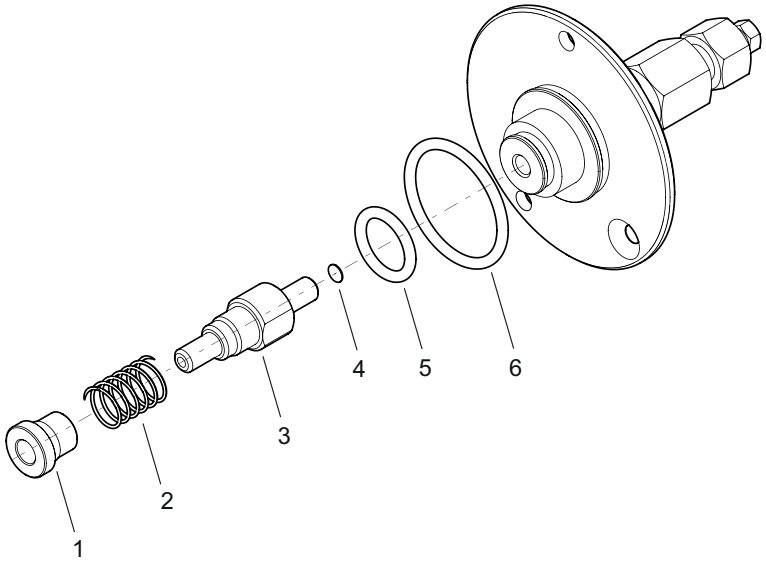


Fig. 65: Parts of the internal gas guide on the ThermoStar

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

10.7.1 Removing 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
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet cover removed
- Insulating collar 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"**

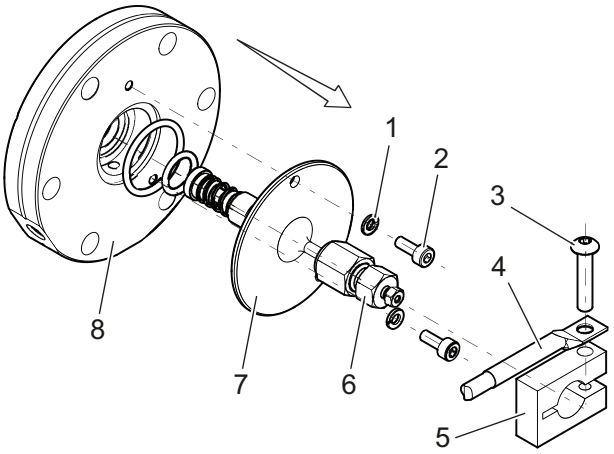


Fig. 66: Removing gas inlet flange

1 Lock washer (2×)
2 Interior hexagon socket screw (2×)
3 Rounded head screw
4 Temperature sensor
5 Terminal
6 Capillary fitting
7 Gas inlet flange
8 Connection flange

Procedure

1. Remove the insulating collar from the gas inlet housing.
2. Pull the heat conductor plate out and place it on top of the GSD 350.
3. Open the capillary fitting on the gas inlet flange and pull the quartz capillary out there.
4. Loosen the temperature sensor's rounded head screw and clamp.
5. Remove the temperature sensor.
6. Fasten the two hexagon socket screws and lock washers on the gas inlet flange.
7. Carefully pull the gas inlet flange forward off the connection flange.
8. Make sure the inner gas guide is complete.

Complete the following required work

► Complete the further required work:
  – Replace the orifice
  – Replace the interior gas guide and orifice
  – Replace the complete gas inlet

10.7.2 Replacing orifice

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet removed

Required tools

- Special tool for the orifice of the gas inlet system
- Open-ended wrench for gas guide, **WAF 8**
- Mandrel for orifice, diameter 1.5 mm, 40 mm length

Spare part required

- Orifice, 50 µm (order number BK212576)

Procedure

1. Unscrew and remove the gas guide from the gas inlet flange.
2. Turn the gas inlet so that orifice can drop out.
3. Push out the orifice from the capillary side with a thin mandrel.
4. Check the orifice for reusability.
5. Drill the orifice manually using the special tool and pull the orifice out from the valve block if the orifice remains stuck.
6. If the orifice cannot be loosed with the special tool, gently tap the gas inlet on a soft surface to make it fall out.
7. Locate the new orifice on the gas guide in the correct orientation so that the matt side is visible when you look into the hole.
8. Using an open-ended wrench, **hand tighten** the gas guide in the gas inlet flange.

10.7.3 Replacing interior gas guide and orifice

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet removed

Required tools

- Special tool for the orifice of the gas inlet system
- Open-ended wrench for gas guide, **WAF 8**

Required aids

- Clean paper

Spare parts required

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

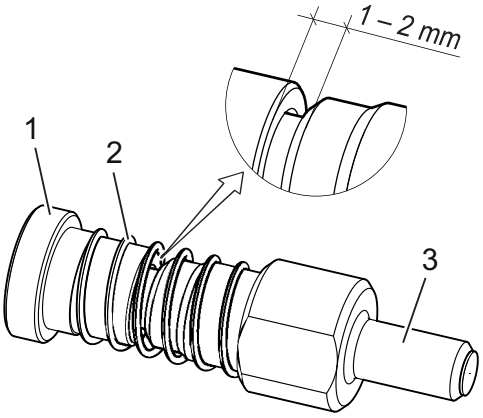


Fig. 67: Gas guide approx. 1–2 mm behind the end of the ceramic sleeve

1 Ceramic sleeve
2 Compression spring
3 Gas guide

Procedure

1. Unscrew and remove the gas guide from the gas inlet flange.
2. Turn the gas inlet so that the orifice drops out.
3. Drill the orifice manually using the special tool and pull the orifice out from the valve block if the orifice remains stuck.
4. If the orifice cannot be loosed with the special tool, gently tap the gas inlet on a soft surface to make it fall out.
5. Replace the gas guide, compression spring and ceramic sleeve.
6. Push the spring onto the ceramic sleeve.
7. Push the spring and the ceramic sleeve onto the gas guide.

8. Make sure that the gas guide is located approx. 1–2 mm behind the end of the ceramic sleeve.
9. Push the ceramic sleeve onto a piece of clean paper and make sure that the gas guide spring deflects and friction is low.
10. Locate the new orifice on the gas guide in the correct orientation so that the matt side is visible when you look into the hole.
11. Using an open-ended wrench, **hand tighten** the gas guide in the gas inlet flange.

10.7.4 Installing 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
- Vacuum system at a standstill and vented to atmospheric pressure
- Gas inlet cover removed
- Insulating collar removed
- Gas inlet removed
- Quartz capillary possibly assembled on the gas inlet flange

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. Carefully insert the gas inlet flange into the connection flange on the vacuum chamber.
3. Tighten the two hexagon socket screws and lock washers on the gas inlet flange.
4. Push the quartz capillary back into the capillary tube.
5. Push the clamp onto the middle fitting of the gas inlet.
6. Fasten the temperature sensor to the clamp with the rounded head screw.
7. Push in the heat conductor plate.
8. Mount the insulating collar on the gas inlet housing.

10.8 Servicing capillary

Only use original capillaries from the accessories

The capillary is part of the pressure reduction stage and necessary to achieve the operating pressure for the mass spectrometer. Only use original capillaries from the Pfeiffer Vacuum accessories. Contact Pfeiffer Vacuum Service is you have any questions.

Shortening or replacing capillary

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

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

10.8.1 Shortening stainless steel capillaries

Required length of stainless steel capillaries

Capillary length = length of capillary tube + 15 cm + required length at the measuring point

The capillary is part of the pressure reduction system. A capillary significantly longer than 2 m may result in lower pressures in the vacuum chamber.

A potential blockage of the stainless steel capillaries frequently occurs in the front atmosphere side area of the stainless steel capillaries. Trim the stainless steel capillaries to resolve the blockage.

Prerequisites

- 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

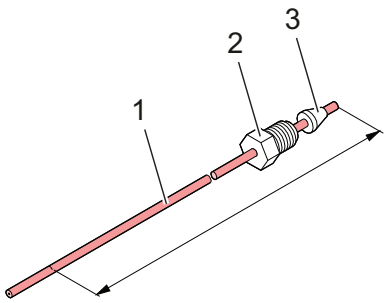


Fig. 68: Length of stainless steel capillary with clamping collar fitting

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

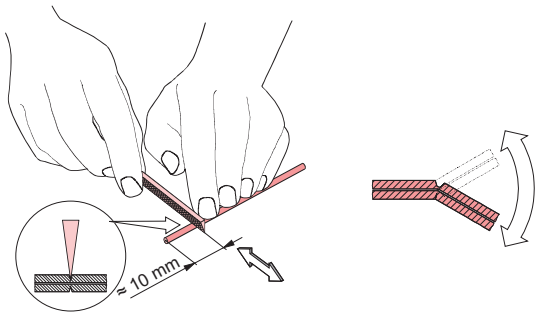


Fig. 69: Notch and snap off the stainless steel capillary

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 unit

1. Start the pumping system.
2. Wait for the turbopump to run-up time to elapse (approx. 5 minutes).

Checking pressure in the vacuum chamber

1. Check the pressure in the vacuum chamber.
   – The displayed pressure must be ≥ 1 × 10^{-6} hPa with the metering valve open.
2. If the displayed pressure is < 1 × 10^{-6} hPa, this can be due to the following:
   – Stainless steel capillary plugged over entire length (see chapter “Replacing stainless steel capillary”, page 92)
   – Screen blocked (see chapter “Replacing orifice”, page 85) or (see chapter “Replacing interior gas guide and orifice”, page 85)
   – Stainless steel capillary too long
   – Capillary diameter too small

10.8.2 Replacing stainless steel capillary

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Stainless steel capillary disconnected from measurement point
- Gas inlet cover removed
- Insulating collar 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 (order number PT 167 060 -T)
- Capillary seals (order number PT 167 017 -T)

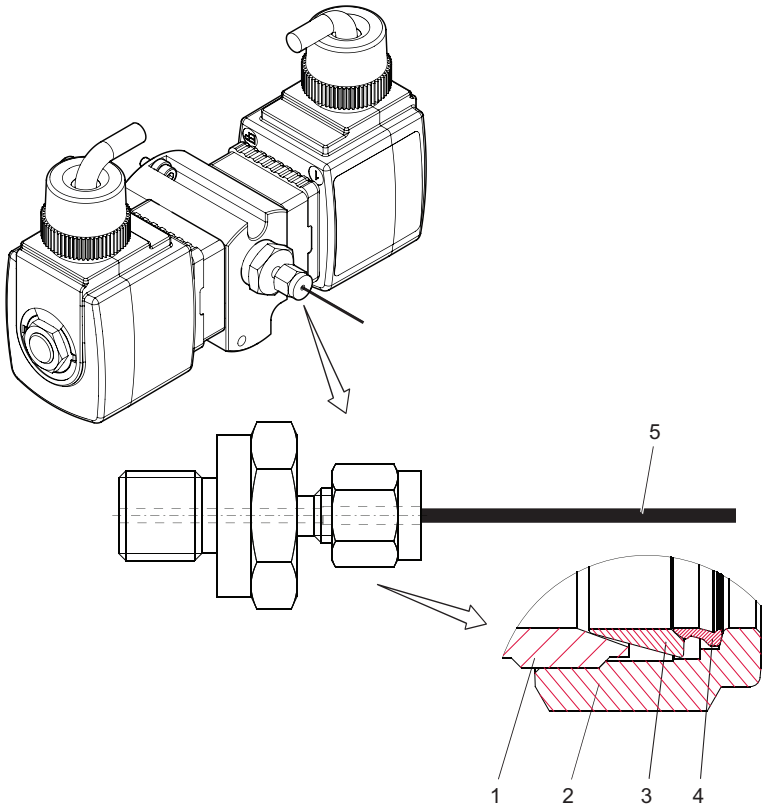


Fig. 70: Clamp collar fitting for stainless steel capillary

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

10.8.3 Trimming quartz capillaries

⚠ 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.

Required length of quartz capillaries

Capillary length = length of capillary tube + 30 cm + required length at the measuring point

A potential blockage of the quartz capillaries frequently occurs in the front atmosphere side area of the quartz capillaries. Trim the quartz capillaries to resolve the blockage.

Prerequisites

- Quartz capillary disconnected from measurement point
- Length of quartz capillary still sufficient after shortening

Required tools

- Capillary cutting tool

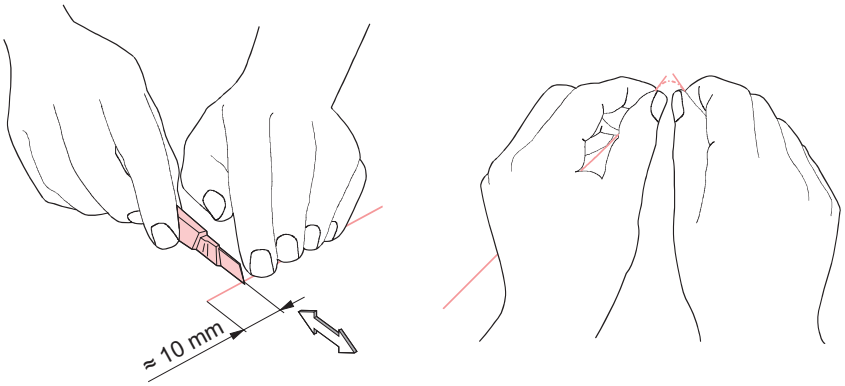


Fig. 71: Notching and snapping off the quartz capillary

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 unit

1. Start the pumping system.
2. Wait for the turbopump to run-up time to elapse (approx. 5 minutes).

Checking 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 “Replacing quartz capillary”, page 94)
   – Screen blocked (see chapter “Replacing orifice”, page 88) or (see chapter “Replacing interior gas guide and orifice”, page 89)

10.8.4 Replacing quartz capillary

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure
- Quartz capillary disconnected from measurement point
- Gas inlet cover removed
- Insulating collar removed

Required tools

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

Spare parts required

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

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.

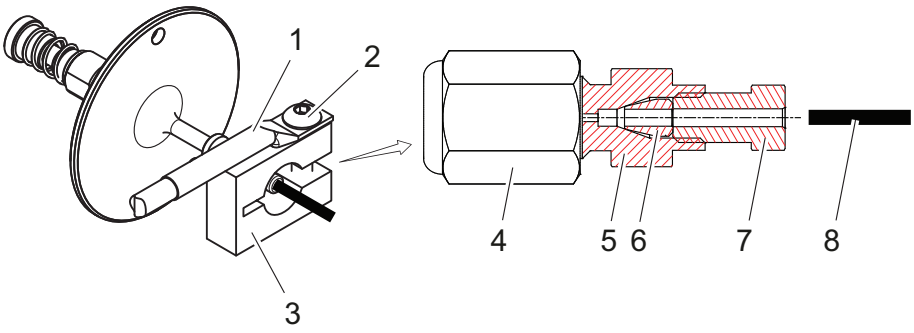


Fig. 72: Front fitting of quartz capillary

1	Temperature sensor	5	Pressure screw
2	Rounded head screw	6	Seal (ferrule)
3	Terminal	7	Pressure screw
4	Rear fitting	8	Quartz capillary

Procedure

1. Trim the length of the quartz capillaries.
   – **Capillary length = length of capillary tube + 30 cm + required length at the measuring point**
2. Loosen the rounded head screw.
3. Remove the temperature sensor and the clamp.
4. Loosen the pressure screw.
5. Remove the old quartz capillary.

6. Push the pressure screw and a new capillary seal onto the new, trimmed quartz capillary.
   – Distance between end of capillary and ferrule = approx. 25 mm
7. Push the quartz capillary with the capillary seal and the pressure screw into the rear fitting on the gas inlet flange.
8. Push the quartz capillary in up to the stop.
9. Pull the quartz capillary back by 1 or 2 mm.
10. Tighten the pressure screw with the open-end wrenches.
11. Carefully push the free end of the quartz capillary into the capillary tube.
12. Fasten the temperature sensor and the clamp with the rounded head screw.

10.9 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).

10.9.1 Replacing the capillary hose

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.9.2 Maintaining the gas inlet heating

If the GSD 350 has a defect on the gas inlet heating, you must replace the heating and/or the temperature sensor.

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.9.3 Servicing the vacuum chamber heating

If the temperature of the vacuum chamber does not reach the set temperature when baking out, even after a substantial 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.

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.10 Maintaining electronic components

All of the electronic components in the GSD 350 are maintenance-free. You must replace any defective electronic components.

10.10.1 Replacing display

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure

Required tools

- Crosshead screwdriver

Spare part required

- 7" touch display (order 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.

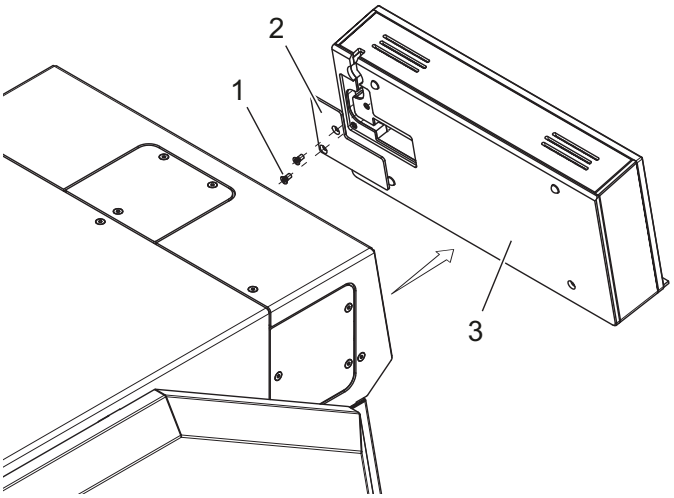


Fig. 73: Replacing display

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

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.

10.10.2 Replacing the PoE injector

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.10.3 Replacing the mainboard

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.10.4 Replacing the power supply pack

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.10.5 Replacing the QME 250 electronic unit

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.10.6 Replacing the TC 110 electronic drive unit on the turbopump

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.11 Maintaining the calibration unit

10.11.1 Refilling calibration medium

Prerequisites

- GSD 350 switched off
- Power cable disconnected
- Vacuum system at a standstill and vented to atmospheric pressure

Required tools

- Allen key, **WAF 2.5**
- Mounting aid for calibration gas support

Required consumables

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

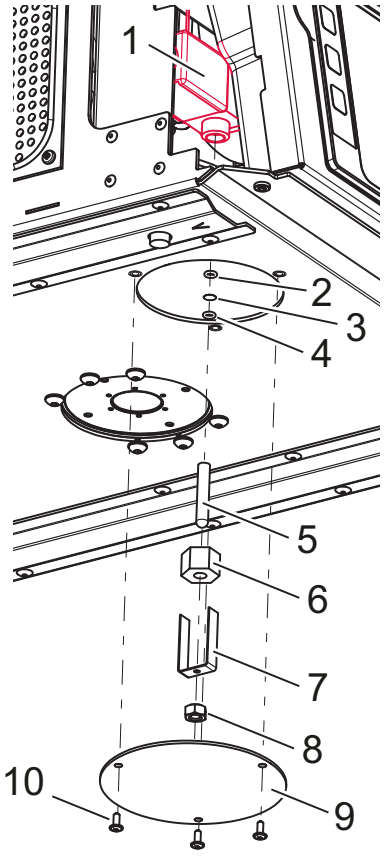


Fig. 74: Calibration unit

1	Shut-off valve EVI 005 M	6	Compression coupling
2	Seal	7	Bracket
3	Screen	8	Hexagon nut
4	Seal	9	Lid
5	Storage vessel	10	Countersunk screw (3×)

Additional person for assistance

For this step, you must pull the GSD 350 about 17 cm over the edge of the table in order to be able to open the cover on the housing base of the GSD 350. Pfeiffer Vacuum recommends that another person assist to prevent the GSD 350 from slipping during this step.

Procedure

1. Pull the GSD 350 forward so that it protrudes about 17 cm above the edge of the table.
2. Loosen the cover's countersunk screws from the housing base.
3. Remove the cover.
4. Loosen the fitting above the storage vessel with the mounting aid.
5. Pull the storage vessel downwards off the shut-off valve.
   – Pay attention to the seals and the orifice.
6. Fill the storage vessel with calibration medium.
7. Install the storage vessel on the shut-off valve with the mounting aid.
   – Pay attention to the seals and the orifice.
8. Fasten the fitting hand tight.
9. Fasten the cover on the housing base with the countersunk screw.

10.11.2 Replacing the calibration valve

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.12 Additional maintenance work for the corrosive gas version

10.12.1 Replacing sealing gas valve

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

10.12.2 Replacing manual pressure regulator

Pfeiffer Vacuum Service handles the replacement and adjustment.

► Contact Pfeiffer Vacuum Service.

10.12.3 Replacing digital pressure switch

Pressure switch presetting
Do not change the presetting. Pfeiffer Vacuum has factory-preset the pressure switch.

Pfeiffer Vacuum Service handles the replacement.

► Contact Pfeiffer Vacuum Service.

11 Troubleshooting

Notes on malfunction handling in the Help menus

Further information on troubleshooting and malfunction messages 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 and on the PoE in the GSD 350.
	Power supply cable between PoE and supervisor board loose	Check the plug-and-socket connection of the power supply cable between PoE and supervisor board.
After switching on, the "Dashboard" start screen does not appear.	Run-up time not completed	Wait for the run-up time of approx. 60 seconds to complete.
	The unit was switched off and back on again too quickly	1. Turn off the unit. 2. Wait for 15 seconds. 3. Switch the unit back on again.
	Ethernet cable between PoE and supervisor board loose	Check the plug-and-socket connection of the Ethernet cable between PoE and supervisor board.
After the "Pump down" control command, the diaphragm pumps fail to start up (icon remains light gray).	Cable connection loose	Check the plug-and-socket connections on the diaphragm pump and the supervisor board.
	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 pumps fail 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 fail 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).
	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 supervisor board.
	Turbopump defective	Replace the turbopump.

Problem	Possible cause	Remedy
After the "Pump down" control command, the turbopump fail 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.
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 supervisor board.
	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 metering 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.

Problem	Possible cause	Remedy
Pressure in vacuum chamber is too high (> 3 × 10^{-5} hPa) (for ThermoStar and/or OmniStar with open metering 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.
	Split-flow valve contaminated (only for OmniStar)	Replace the valve block.
	Split-flow valve faulty (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 metering valve).	Inlet pressure too low	Increase the pressure on the inlet side of the capillary.
	Capillary blocked	Trim the capillary or replace the capillary.
	Orifice blocked	Replace the orifice.
Metering valve fails to open (only for OmniStar)	Delay time for valve opening not yet completed	Wait for the delay time of < 15 seconds to complete.
	Metering valve is not controlled.	Check the plug-and-socket connections on the metering valve and the supervisor board.
	Metering valve contaminated	Replace the valve block.
	Metering valve faulty	Replace the valve block.
No mass peaks visible in range > 200 u on calibrating the mass scale (for version with calibration unit)	Sensitivity of mass spectrometer too low	Read the mass spectrometer operating instructions for details.
	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 supervisor board.
	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	Mass spectrometer error	Read the mass spectrometer operating instructions for details.
Insufficient measurement sensitivity	Mass spectrometer settings incorrect	Read the mass spectrometer operating instructions for details.

Problem	Possible cause	Remedy
Poor peak form	Mass spectrometer settings incorrect	Read the mass spectrometer operating instructions for details.
High noise level	Mass spectrometer settings incorrect	Read the mass spectrometer operating instructions for details.
After the "Vent" control commands, 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.	Turbopump rotation speed still > 750 Hz	Wait until the turbopump's rotation speed is < 750 Hz.
	Venting valve is not controlled.	Check the plug-and-socket connections on the venting valve and the supervisor board.
	Venting valve polluted	Replace the venting valve.
	Venting valve defective	Replace the venting valve.

Tbl. 14: Troubleshooting

12 Shipping

⚠ WARNING

Risk of poisoning from contaminated products

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

► Comply with the instructions for safe distribution.

Decontamination subject to charge

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

Ship product safely

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

13 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.

13.1 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

13.2 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.

14 Service solutions by Pfeiffer Vacuum

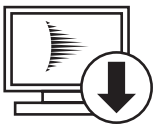
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

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.

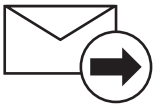
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



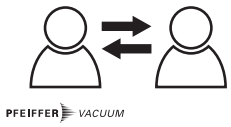
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

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.

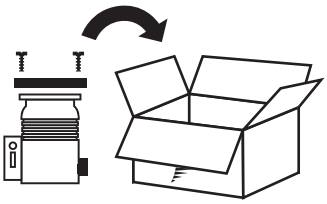


3. Send the forms by email, fax, or post to your local Service Center.

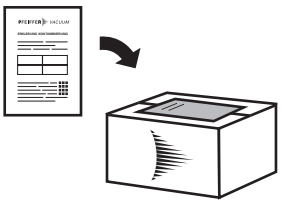


4. You will receive an acknowledgment from Pfeiffer Vacuum.

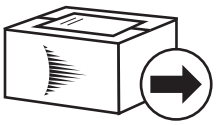
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree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



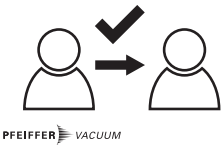
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product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

15 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
Structure and housing parts		
Housing cover	PT 167 000	-
Gas inlet cover	PT 167 005	-
Side cover, OmniStar	PT 167 003	left
	PT 167 004	right
Side cover, ThermoStar	PT 167 001	left
	PT 167 002	right
Terminal area for capillary hose	PT 167 007	Cover with bore
	PT 167 006	Cover without bore
Housing screws	PT 167 065 -T	Set (10 pcs)
Flange connections		
Copper seal	490DFL040-S-G-S5	DN 40 CF (set with 10 pcs)
Gas inlet and capillaries		
Gas inlet	PT 167 016 -T	OmniStar Flange insert with valves, orifice 50 µm, 2 O-rings, and internal gas guide, without stainless steel capillary
	PT 167 013 -T	ThermoStar Flange insert, orifice 50 µm, 2 O-rings, and internal gas guide, without quartz capillary
Spare parts set	PT 167 014 -T	OmniStar and ThermoStar 2 O-rings, orifice 50 µm, gas guide, compression spring
Screen	BK212576	OmniStar and ThermoStar 50 µm
Capillary	PT 167 060	Stainless steel, 1/16", 0.12 mm × 5 m
	B1975082EC	Quartz, 0.23", 0.14 mm × 5 m
Capillary seals	PT 167 017 -T	Capillary seals (ferrules) for stainless steel capillaries (set of 10 pcs)
	PT 167 015 -T	Capillary seals (ferrules) for quartz capillaries (set of 10 pcs)
Calibration unit		
Calibration medium (PFTBA)	PT 167 031	Bottled, 5 ml
Diaphragm pump		
Diaphragm pump	PK T05 072	Diaphragm pump MVP 010-3 DC
Overhaul kit	PU E22 030 -T	Diaphragms and valves
Total pressure gauge		
Total pressure gauge	PT R40 351 -A	Replacement gauge MPT 200 AR
Sensor	PT 120 212 -T	MPT sensor, DN 40 CF
PrismaPro analyzer QMA 250 M with special ion source		

Designation	Order number	Description/scope of delivery
Analyzer	PT M25 451	1 – 100 u, with cross beam ion source, tungsten filament unit and EM
	PT M25 452	1 – 100 u, with cross beam ion source, Ir-Y_2O_3 filament unit and EM
	PT M25 453	1 – 200 u, with cross beam ion source, tungsten filament unit and EM
	PT M25 454	1 – 200 u, with cross beam ion source, Ir-Y_2O_3 filament unit and EM
	PT M25 455	1 – 300 u, with cross beam ion source, tungsten filament unit and EM
	PT M25 456	1 – 300 u, with cross beam ion source, Ir-Y_2O_3 filament unit and EM
Ion source	PT 163 291	Ion source with 2 tungsten filaments
	PT 163 292	Ion source with 2 Ir-Y_2O_3 filaments
Filament unit	PT 163 331	Tungsten filament unit with 2 filaments
	PT 163 332	Ir-Y_2O_3 filament unit with 2 filaments
Transport protection	PT 160 010	-
Turbopump		
Operating fluid reservoir	PM 143 740 -T	Operating fluid reservoir with capillary rods
Sealing gas system		
Sealing gas valve	PM Z01 310 A	-
Exhaust gas connection	PT 167 011	Exhaust gas connection, 6 mm, for assembly in housing wall
Display		
7" touch display	PT 167 025	Display module, without cables

Tbl. 15: Spare parts and components, maintenance level 1

The hoses on the GSD 350 consist of externally calibrated PUN hose.

System	Color	Diameter	Required length	Connection
Vacuum	Blue	8 × 5 mm	170 mm, coiled	Diaphragm pump and turbopump
Exhaust gas	Black	6 × 4 mm	120 mm	Pressure regulator and exhaust gas dilution
			500 mm	Diaphragm pump exhaust air (standard)
			45 mm	Intermediate piece (Y piece) and exhaust connector
	Transparent		400 mm	Diaphragm pump exhaust air (corrosive gas version)
Sealing gas/ purge	Transparent	4 × 2.5 mm	140 mm	Sealing gas connection and pressure regulator
			120 mm	Pressure regulator and non-return valve
			570 mm	Sealing gas connection and turbopump
			740 mm	Venting connection and turbopump

Tbl. 16: Hose colors and dimensions

Description	Number per GSD 350	Order number (Tempel)
Angled plug connector, long, 1/8" thread, 8 mm	1	IQSLL 188 G
Angled plug connector, 1/8" thread 4 mm	4	IQSL 184 GL
Angled plug connector, long, 1/4" thread, 8 mm	1	IQSLL 148 G
Angled plug connector, long, 1/8" thread, 6 mm	2	IQSLL 186 G
Multiple distributor plug, 4x, R 1/8", 4 mm	1	IQSLV4 184
Schott plug connector, 4 mm	1	IQSS 40
Schott plug connector, 6 mm	1	IQSS 60
Y plug connector, 6 mm-6 mm	1	IQSY 60
Y angled plug connector, I/O 1/8" thread 6 mm	1	IQSYTF 186 G
Non-return valve, 6 mm	1	AK2000-F01
Silencer, 1/8" thread	1	U 18
Pressure regulator ARX21-F01	1	OT-SMC005811
Contact: Tempel Hydraulik & Reinigungstechnik Schwarze Kiefern 12 09633 Halsbrücke OT Tuttendorf Homepage and Online Shop		

Tbl. 17: Components for hose connections

16 Special tool

Designation	Order number	Usage
Wrench for turbopump housing cover	PV M40 813	(see chapter “Replacing operating fluid reservoir on turbopump”, page 76)
Centering gauge for QMA	PT 167 082	(see chapter “Maintaining QMA 250 M analyzer”, page 80)
Mounting aid for calibration gas support	PT 167 081	(see chapter “Refilling calibration medium”, page 97)

Tbl. 18: Special tool

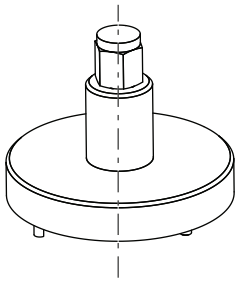


Fig. 75: Wrench for turbopump housing cover

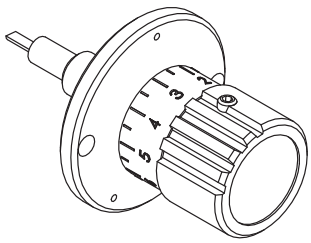


Fig. 76: Centering gauge for QMA

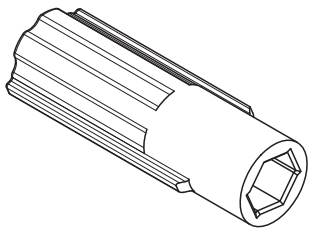


Fig. 77: Mounting aid for calibration gas support

17 Accessories

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

17.1 Accessory information

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

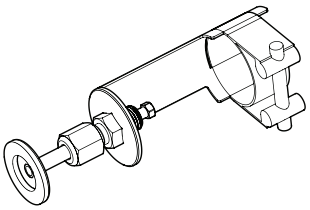


Fig. 78: Capillary hose adapter

17.2 Ordering accessories

Description	Order number
Capillary hose adapter	PT 167 070 -T

Tbl. 19: Accessories

18 Technical data and dimensions

18.1 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. 20: 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. 21: Conversion table: Units for gas throughput

18.2 Technical data

Configuration (mass range)	1 to 100 u	1 to 200 u	1 to 300 u
Quadrupole mass spectrometer			
Type	PrismaPro QMG 250 M1	PrismaPro QMG 250 M2	PrismaPro QMG 250 M3
Detector	C-SEM		
Ion source	Crossbeam (C/B)		
Number of filaments	2		
Sensor performance according to mass range[13)]			
Minimum detection limits (C-SEM)	< 100 ppb	< 1 ppm	< 10 ppm
Amount for neighboring mass (40/41)	< 10 ppm	< 20 ppm	< 50 ppm
Dwell			
Adjustable from 1 ms/u to 16 s/u			
Gas inlet / process gas			
Type	OmniStar: with inlet valve ThermoStar: permanently open		
Sample gas pressure, max.	1 200 hPa		
Gas flow rate	1 to 2 sccm		
Contaminants	Particle size ≤ 1 µm		
Valve control (OmniStar)	Via color 7” display or web interface		
Capillary			
Material	OmniStar: Stainless steel or quartz ThermoStar: Quartz		
Length	1 m (2 m also available)		

13) The mass range specifications are only applicable for non-interfering gases/species.

Configuration (mass range)	1 to 100 u	1 to 200 u	1 to 300 u
Diameter	OmniStar: OD = 1/16", ID = 0.12 mm ThermoStar: OD 0.23 mm, ID = 0.14 mm		
Operating temperature of capillary	200 °C (350 °C also available)		
Exhaust gas			
Permissible pressure	≤ atmospheric pressure		
Connection	IQS plug-and-socket connection, 6 mm PE hose (exterior Ø = 6 mm)		
Sealing gas (corrosive gas version)			
Sealing gas	Inert gas, nitrogen or argon recommended		
Pressure	5,000 to 7,000 hPa		
Gas flow rate	approx. 300 sccm		
Impurities	≤ 100 ppm oxygen		
Connection	IQS plug-and-socket connection, 4 mm PE hose (exterior Ø = 4 mm)		
Calibration unit (option)			
Calibration medium for mass calibration	PFTBA		
Ambient conditions			
Shipping and storage temperature	-20 to 55 °C		
Operating temperature	10 to 40 °C		
Relative humidity of air	max. 80% up to 31 °C, linearly decreasing to 50% at 40 °C		
Installation location	Indoor, weatherproof		
Installation altitude	≤ 2,000 m above sea level		
Protection class	I		
Overvoltage category	II		
Protection degree	IP30		
Degree of pollution	2		
Materials on vacuum side			
Capillary	Stainless steel, quartz glass (depending on version)		
Gas inlet	Stainless steel, FKM, PTFE (quartz capillary only)		
Screen	Platinum/Iridium		
Vacuum chamber	Aluminum/stainless steel, PTFE, copper, silver		
Analyzer	Stainless steel, copper, silver, gold, quartz glass, ceramic		
Filament	Ir-Y_2O_3 or W		
Turbopump	Aluminum, stainless steel, epoxy resin, lubricant		
Diaphragm pump	EPDM, aluminum, PVC, brass, polyamide		
Total pressure gauge	Tungsten, stainless steel, nickel, molybdenum, glass		
Mains connection			
Voltage	100 to 240 V AC		
Frequency	50 to 60 Hz		
Power consumption	830 W		
Mains fuse	2× 10 A (slow)		
User interfaces			
Operation	Via color 7” touch display or web interface		
Software	PV MassSpec		
Data exchange	TCP/IP Ethernet		
Pump characteristics			
Operational readiness	After 10 minutes		
Switch-off time	15 minutes		
User control			
Analog inputs	5× ±10 V, resolution 14 and 16 bit		

Configuration (mass range)	1 to 100 u	1 to 200 u	1 to 300 u
Digital inputs	4× nominal +24 V		
Analog outputs	4× 0 to 10 V, I_{max} = 10 mA, resolution 16 bit		
Digital outputs	6× open collector, nominal +24 V, I_{max} = 200 mA		
Number of relays	2		
Switching voltage of relays	24 V AC/DC		
Switching current of relays	1 A		
Relay for pumping system status	"USER I/O" connection: Pins 13, 14 and 15		
Connector assembly	USER I/O: 15-pin D-Sub AUX I/O: 25-pin D-Sub		
Noise level			
< 50 dB in normal operation			
Weight			
23 kg to 26 kg (depending on respective version)			

Tbl. 22: Technical data

18.3 Dimensions

Dimensions in mm.

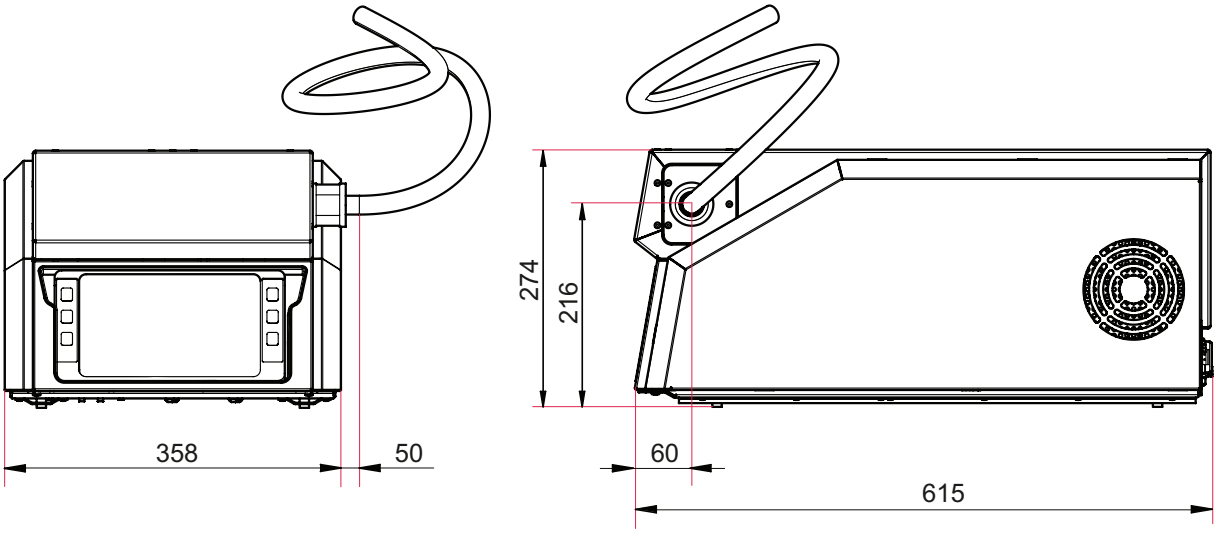


Fig. 79: Dimensions

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

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**.

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:
IEC 61010-1:2010+A1
IEC 61010-2-010:2019
EN ISO 12100:2010
EN 61326-1:2013
EN 55011:2009 + A1:2011
EN 61000-3-2:2014
EN 61000-3-3:2013
IEC 60529:1989 + A1:1999 + A2:2013

Signature:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2022-03-09

CE

PFEIFFER VACUUM

VACUUM SOLUTIONS FROM A SINGLE SOURCE

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

COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:
We are the only supplier of vacuum technology that provides a complete product portfolio.

COMPETENCE IN THEORY AND PRACTICE

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