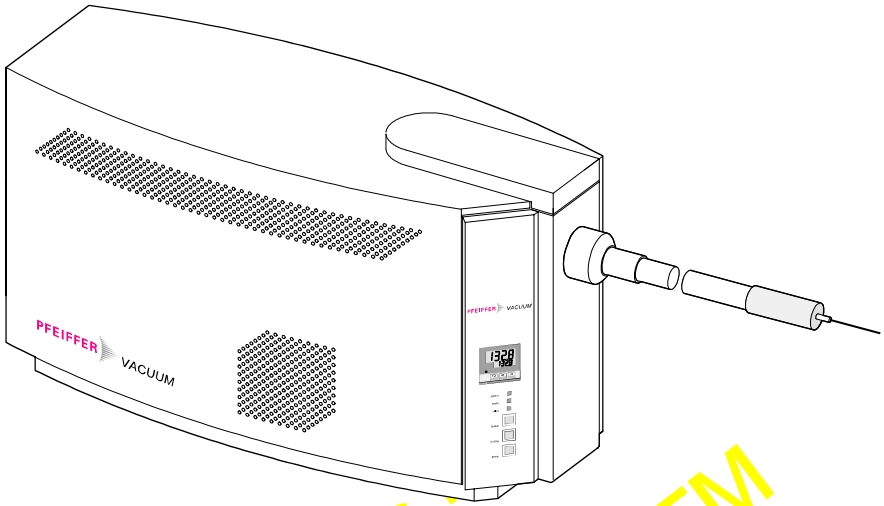
Operating Instructions
Incl. Declaration of Conformity

PFEIFFER VACUUM

OmniStar™
ThermoStar™

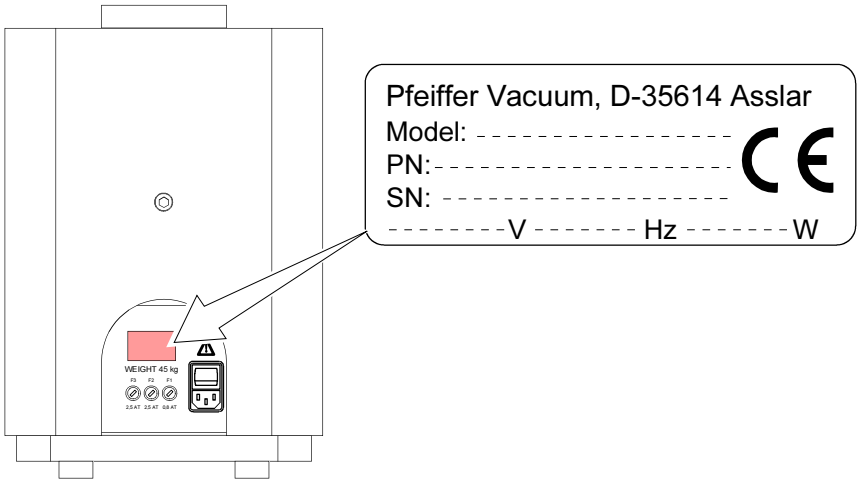
Gas Analysis System

GSD 301 O
GSD 301 T



Product Identification

In all communications with Pfeiffer Vacuum, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below



Validity

This document applies to products with part numbers corresponding to the following key:

P T M 6 1 1 1 1

6 ⇒ 230 VAC, 50…60 Hz
7 ⇒ 115 VAC, 50…60 Hz

1 ⇒ ThermoStar™ standard gas inlet
2 ⇒ ThermoStar™ gas inlet with calibration device
3 ⇒ OmniStar™ standard gas inlet
4* ⇒ OmniStar™ pressure controlled inlet, 3 decades
5* ⇒ OmniStar™ pressure controlled inlet, 5 decades
6* ⇒ ThermoStar™ inlet for respiratory gas
7* ⇒ OmniStar™ / ThermoStar™ membrane inlet
8* ⇒ Omnistar™ low pressure gas inlet

1 ⇒ mass range 100
2 ⇒ mass range 200
3 ⇒ mass range 300

1 ⇒ standard Prisma, tungsten filament
2 ⇒ standard Prisma, yttriated iridium filament
3 ⇒ fast Prisma, tungsten filament
4 ⇒ fast Prisma, yttriated iridium filament

1 ⇒ capillary heater 1 m
2 ⇒ capillary heater 2 m
3 ⇒ without capillary heater
4* ⇒ capillary heater 1 m, exchangeable hinged lid
5* ⇒ capillary heater 2 m, exchangeable hinged lid
6* ⇒ without capillary heater, exchangeable hinged lid

The part number (PN) can be taken from the product nameplate.

We reserve the right to make technical changes without prior notice.

* For systems marked with an asterisk, additional documents are available (→ "Literature", 🗎 57).

Intended Use

The GSD 301 is designed for manually controlled as well as automatic analysis of non-corrosive and non-explosive gases, subject to the material compatibility, TLVs as well as the Ex-limits[1)].

1) In case of questions please contact your local Pfeiffer Vacuum representative.

Contents

For cross-references within this document, the symbol (→ 🗎 XY) is used.

1 Safety

1.1 Symbols Used

Symbols for residual risks

DANGER

Information on preventing any kind of physical injury.

WARNING

Information on preventing extensive equipment and environmental damage.

Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.

Further symbols


The result is O.K.


The result is not as expected.


The lamp/display is lit.


The lamp/display flashes.


The lamp/display is dark.


Wear protective glasses.


Waiting time, reaction time, duration of test


… please contact your local Pfeiffer Vacuum representative.

1.2 Personnel Qualifications

Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

1.3 General Safety Instructions

a) State of the art

The GSD 301 is built according to the most advanced engineering principles and is safe to operate.

b) Extension of the scope of application

Any use of this equipment for purposes other than originally intended (measurement of corrosive or explosive gases or measurement of liquids) requires the prior written approval by the Pfeiffer Vacuum parent company.

Any use of the GSD 301 not corresponding to the (extended) scope of application is considered to be non-conforming and the manufacturer declines all liability resulting from such use.

c) Access by unauthorized persons

The end-user shall ensure that only trained persons work on the GSD 301.

d) Inappropriate working procedures

The equipment must not be operated in any way that impairs the safety of the users and the GSD 301.

e) Obligation to report changes of the system

The user shall immediately notify the end-user of any changes that have occurred and may impair the safety of the GSD 301.

f) Obligation to perform maintenance

The end-user shall keep the GSD 301 in proper working condition at all times.

g) Shut-down and disconnection from the power

The GSD 301 must be switched off and disconnected from the power source before any maintenance work is performed. In particular the shut-down procedures in these Operating Instructions must be strictly followed.

h) Removal of protective devices

Protective devices may only be removed after the GSD 301 has been completely shut down and disconnected from the power source.

i) Inspection after maintenance or repair work

After maintenance or repair work, make sure that all protective devices have been installed and that they function correctly. Only when this is the case, the GSD 301 may again be put into service.

k) Industry-specific accident prevention regulations

In all cases, the industry-specific and local accident prevention regulations are applicable to the GSD 301.

l) Disposal of the operating media

The operating media must be treated and disposed of in accordance with local regulations.

m) Instructions

Based on these Operating Instructions, the owner shall prepare a set of instructions that describe the activities and specifications required for safe operation.

These instructions shall be posted at a suitable place at the workplace and shall be observed by all persons working with the equipment.

1.4 Gases

a) Adhere to the applicable regulations and take the necessary precautions for the process media used.

   Consider possible reactions between the materials (→ 10) and the process media.

b) If toxic or combustible gases are measured with the GSD 301, the exhaust gases shall be treated and disposed of in conformity with the applicable regulations.

1.5 Liability and Warranty

Pfeiffer Vacuum assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the corresponding product documentation.

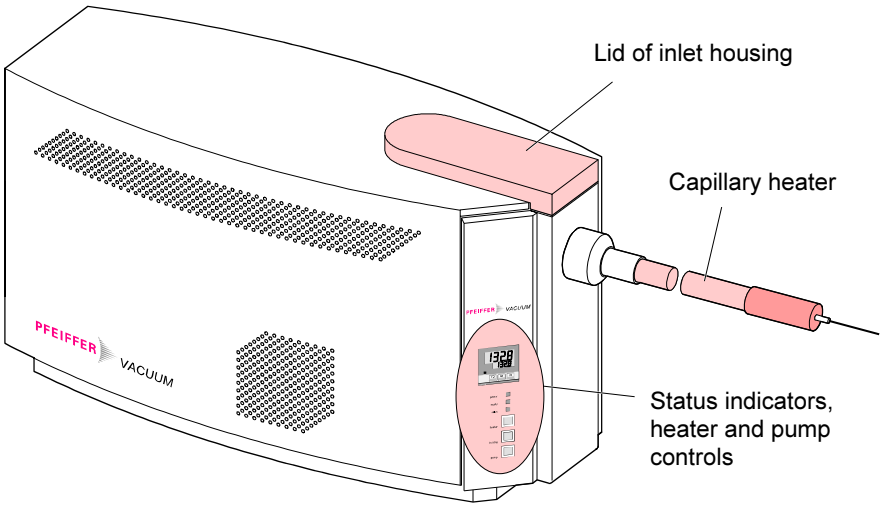
The end-user assumes the responsibility in conjunction with the process media used.

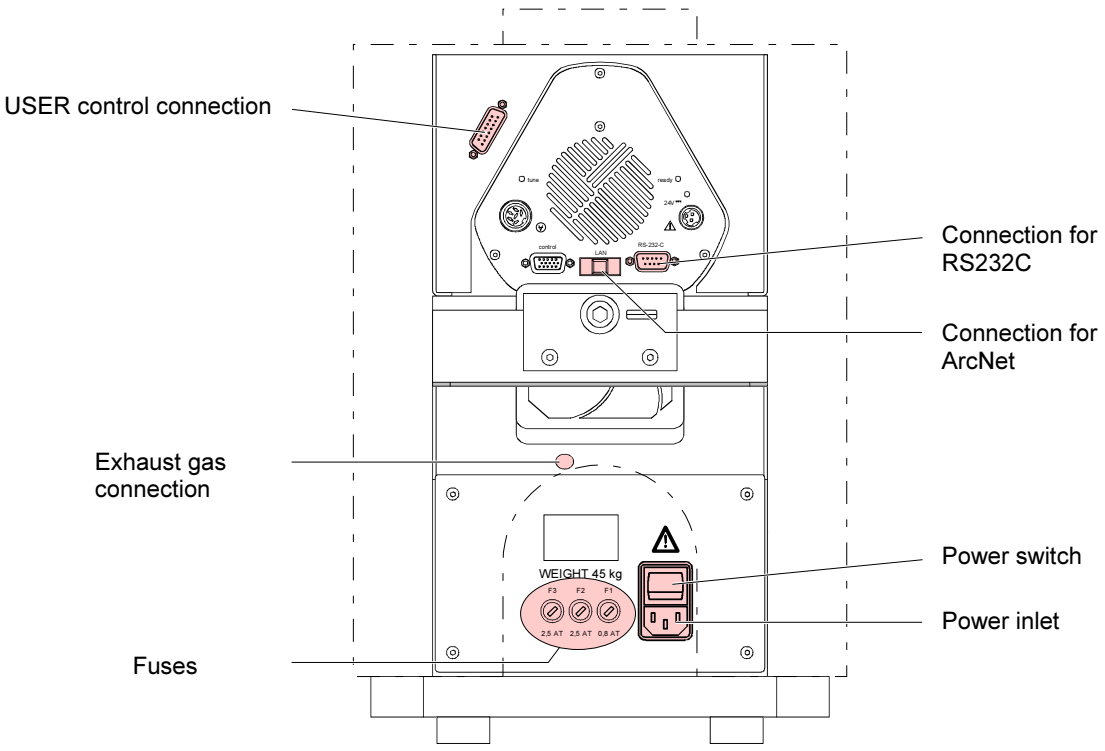
1.6 Training

Training

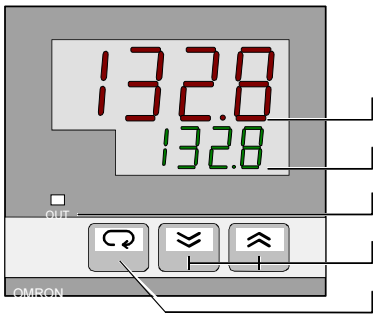
Pfeiffer Vacuum offers application, operating and maintenance courses for the best use of this product. Please contact your local Pfeiffer Vacuum representative.

2 Design


Lid of inlet housing
Capillary heater
Status indicators, heater and pump controls
PFEIFFER VACUUM


USER control connection
Connection for RS232C
Connection for ArcNet
Exhaust gas connection
Power switch
Power inlet
Fuses
WEIGHT 45 kg
F3 F2 F1
2.5 AT 2.5 AT 0.8 AT

Status indicators, heater and pump controls



Actual temperature capillary heater

Nominal temperature capillary heater

Status indicator

Keys for entering the setpoint

No Function

power

Green: Mains power and status o.k.
Red: Safety off activated

ready

Green flashing: Turbo pump accelerating
Green: Turbo pump has reached the rotation speed setpoint (90% of the nominal speed)

valve

Green: OmniStar™ Gas inlet valve open
ThermoStar™ Valve of calibration unit open

heater

Yellow: Capillary and inlet heater on

baking

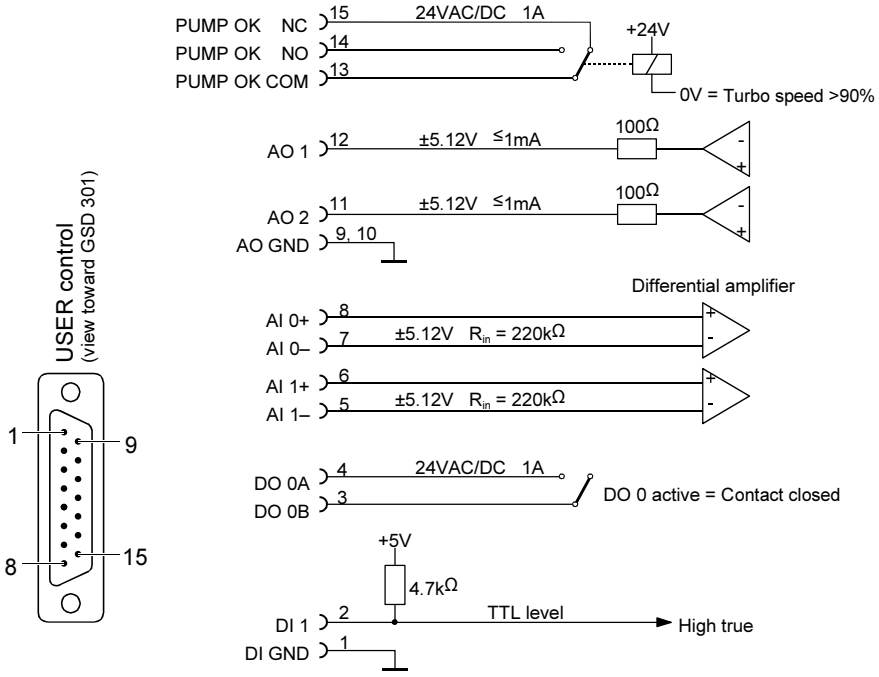
Yellow: Vacuum chamber is being heated
Yellow flashing: Internal overheating

pump

Yellow: Pumping system on

3 Technical Data

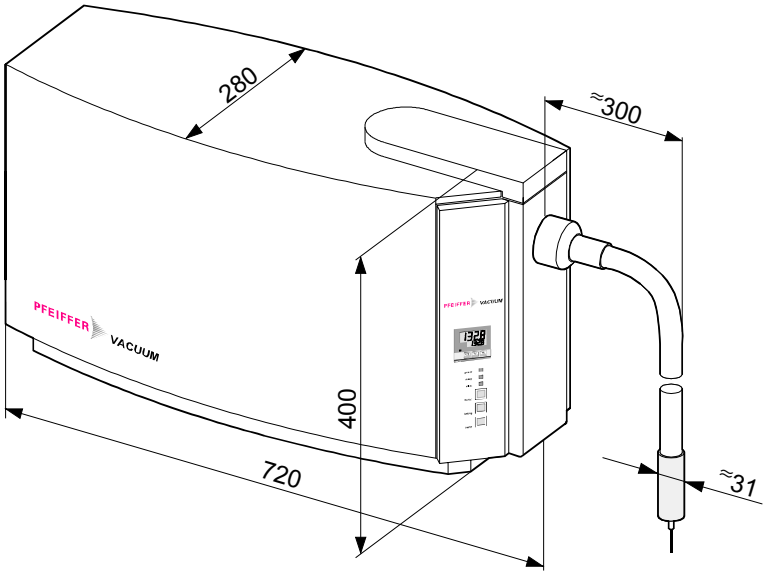
Admissible temperatures		
Storage	5 … 45 °C	
Operation	12 … 35 °C	
Relative humidity	max. 80% at temperatures up to +31 °C decreasing to 50% at +40 °C	
Application	indoors only height up to 2000 m	
Gas flow rate	1 … 2 sccm	
Materials on the vacuum side		
Capillary		
OmniStar™	stainless steel	
ThermoStar™	quartz	
Gas inlet	stainless steel, FPM	
Orifice	platinum	
Vacuum chamber	stainless steel	
Analyzer	stainless steel, copper, silver, gold, quartz glass, ceramics	
Turbo pump	aluminum, stainless steel, epoxy, lubricant	
Tubing	PTFE, stainless steel, FPM	
Diaphragm pump	aluminum, anodized aluminum, FPM, PTFE-coated NBR, PA	
Ready for operation after	10 minutes	
Time interval between switching off and restarting	>10 s	
Slowing-down time of the pumping system after power off	5 minutes	
Display		
Temperature	nominal and actual value	
Status	power, ready, valve	
Power connection	(→ nameplate)	
Voltage	90 … 127 VAC	187 … 253 VAC
Frequency	50 … 60 Hz	50 … 60 Hz
Power consumption	620 W	590 W
Fuses		
F1	0.8 AT, 250 V, ø5×20 mm	
F2, F3	2.5 AT, 250 V, ø5×20 mm	
Type of protection	IP 21 (protection against foreign objects > ø12 mm and protection against water with harmful effect where vertical drops occur)	
Noise level	<50 dB in full operation	
Safety, immunity, interference suppression	→ Declaration of Conformity 🗎 58	
Interfaces	1× RS232C 1× ArcNet LAN 1× USER control	



For range ±10.24 V at analog inputs:
Connect a resistor 110 kΩ, 1% for each line.

Other connections	→ 🕮 Prisma™ BG 805 201 BE

Dimensions [mm]



Weight	45 kg
Box	1120×620×640 mm (l×w×h)

Technical data of the components → 🕮 of the corresponding components

4 Installation

4.1 Carrying and Transporting the Unit

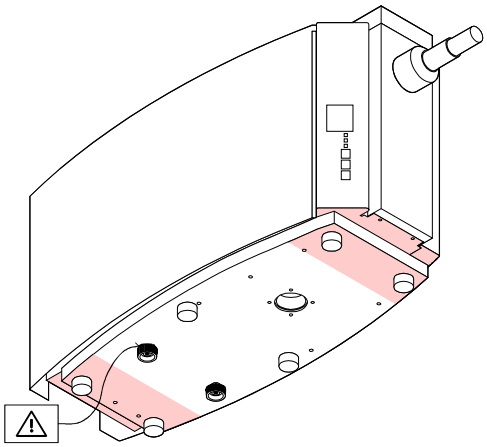
STOP DANGER

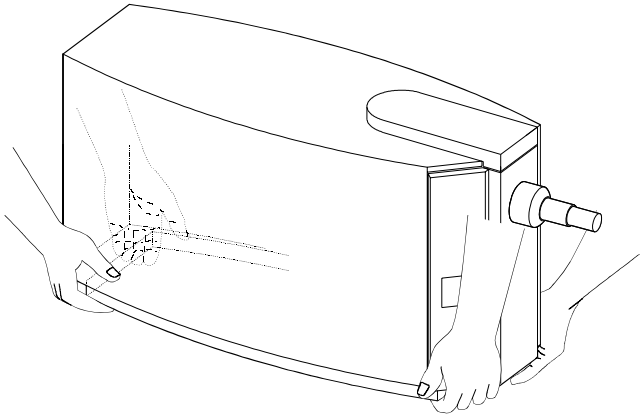
>25 kg

Caution: heavy product

Physical injury can result if the product is lifted and carried by only one person.

Adhere to the local regulations and take the necessary precautions when lifting and transporting the product.





4.2 Checking the Shock and Overturning Indicators

STOP DANGER

Caution: damaged product

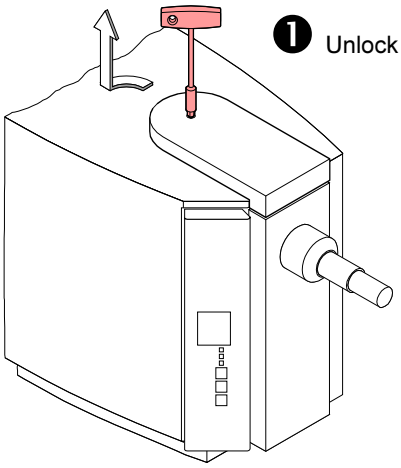
Putting a damaged product into operation can be extremely hazardous.

In case of visible damage make sure the product is not put into operation.

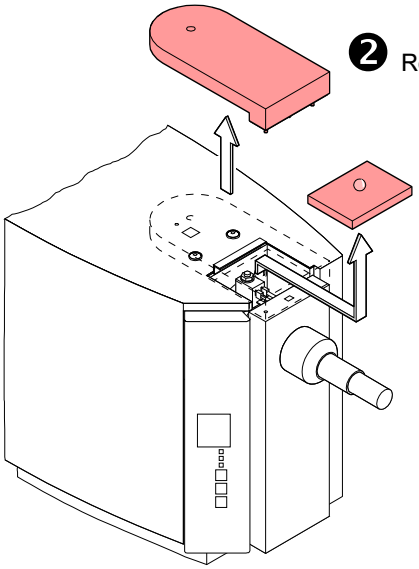
Required tools / material

- Supplied Allen wrench

Procedure

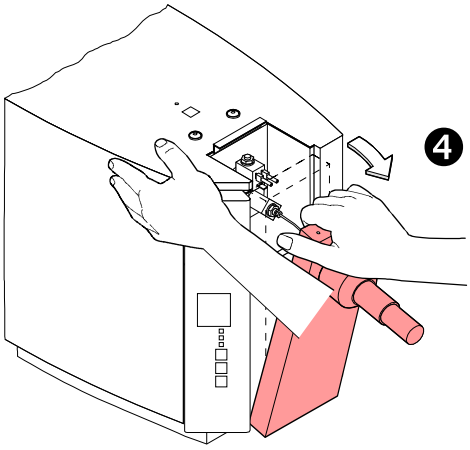


❶ Unlock the lid.



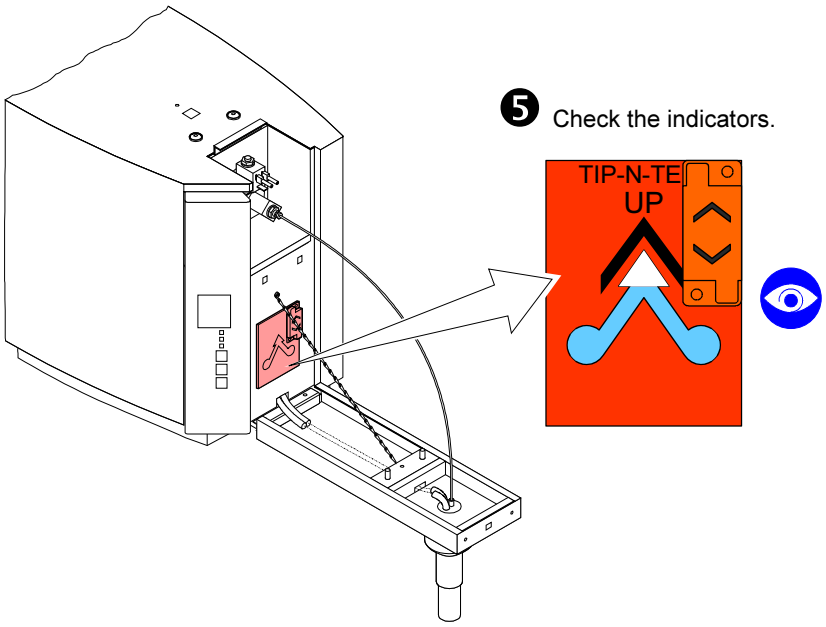
❷ Remove the lid.

❸ Remove the insulation cover.



❹ Open the hinged lid.

⚠ Do not tear the capillary.



❺ Check the indicators.

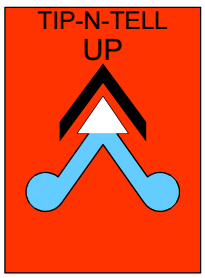
Shock indicator

Both arrows have a red color.

One or both arrows have a blue color ⇒ the unit may possibly be damaged.

Examine the unit for visible external damage and notify the forwarding company, if this is the case.

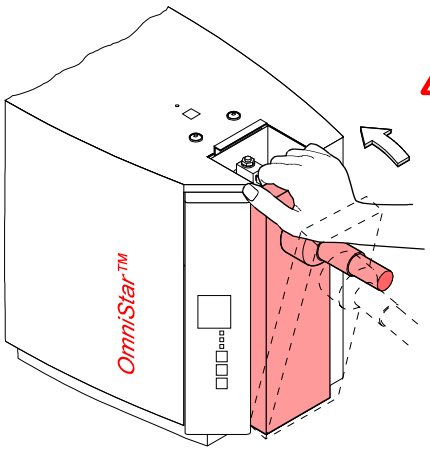
Overturning indicator



There is no blue sand in the tip of the arrow.

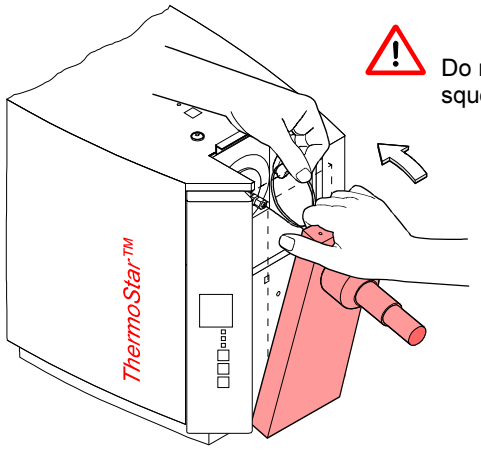
There is blue sand in the tip of the arrow ⇒ the unit may possibly be damaged.

Examine the unit for visible external damage and notify the forwarding company, if this is the case.

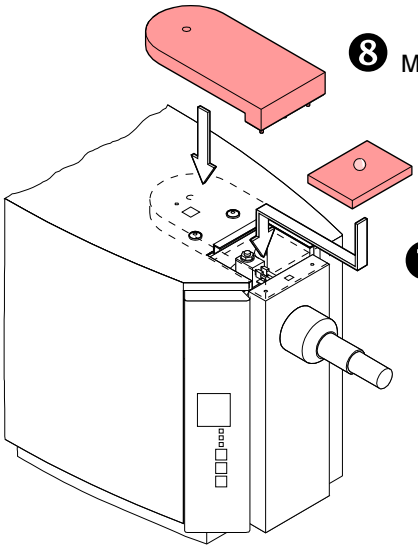


Do not buckle the capillary.

❻ Carefully close the hinged lid and let it catch.

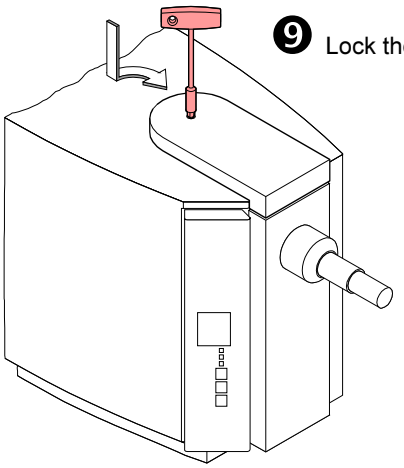


Do neither buckle nor squeeze the capillary.



8 Mount the lid.

7 Mount the insulation cover.



9 Lock the lid.

4.3 Putting the Unit Into Place

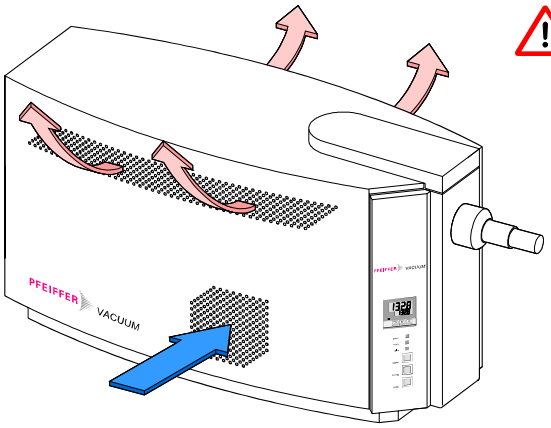
Space requirements

Width	≥300 mm
Depth	≥700 mm

Media

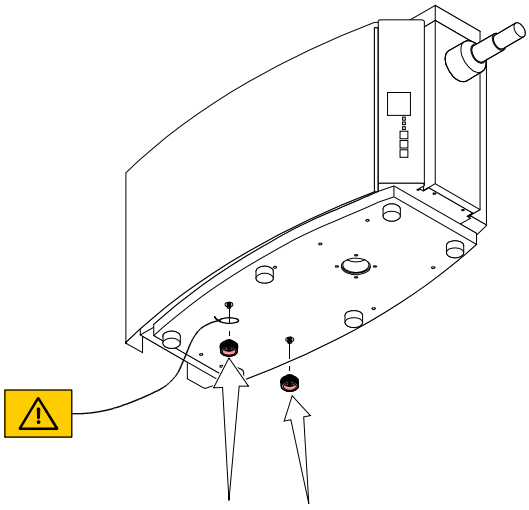
Mains power	(→ nameplate)	
Voltage	90 … 127 VAC	187 … 253 VAC
Frequency	50 … 60 Hz	50 … 60 Hz
Power	620 W	590 W
Exhaust line		
(for toxic and combustible gases)	→ 17	

Circulation of the cooling air



Do not cover the cooling air in- and outlets. Otherwise, the unit may get damaged.

Removing the transport fixing parts



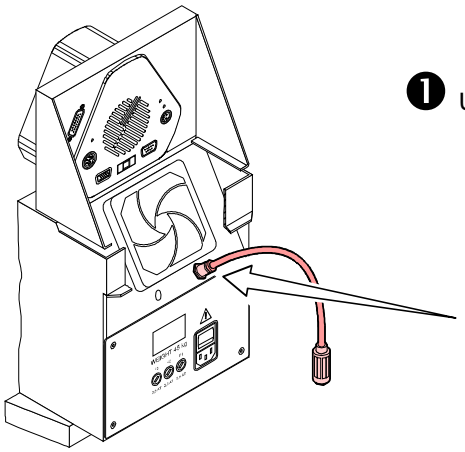
Remove both knurled nuts (transport fixing parts) on the bottom of the GSD 301 before starting operation.

Store the knurled nuts and remount them if the GSD 301 is to be transported again.

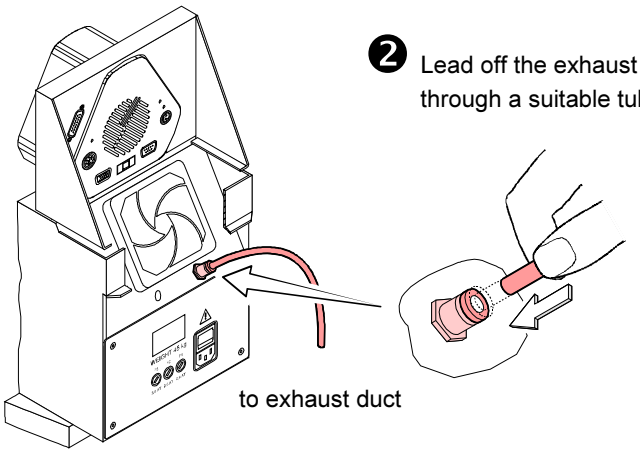
4.4 Connecting the Exhaust Gas Line

Skilled personnel

If you measure toxic or combustible gases with the GSD 301, the exhaust gases must be treated and disposed of in accordance with the applicable regulations.



❶ Unfasten the short exhaust gas line.

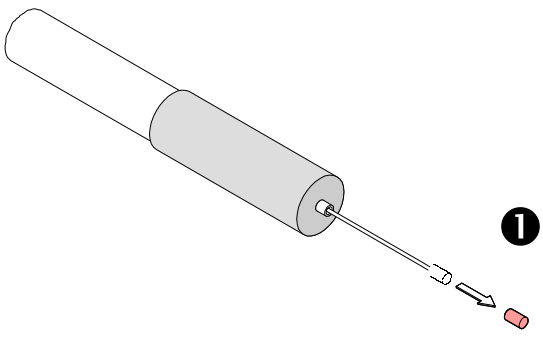


❷ Lead off the exhaust gases through a suitable tube (ø6/4).

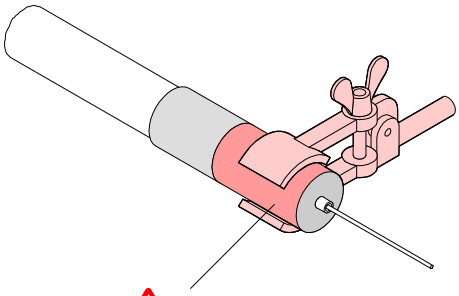
4.5 Connecting the Capillary

- Minimum bending radius 150 mm.
- Do not additionally insulate or cover the capillary heater.
- Do not expose the capillary to any additional heat (for example, heated flange).

OmniStar™



❶ Remove the tap.

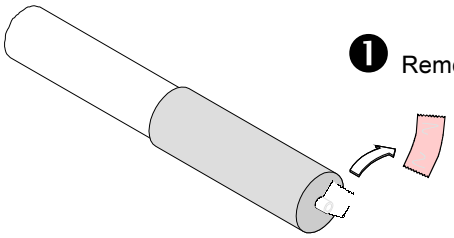


❷ Connect the capillary to the measurement point.

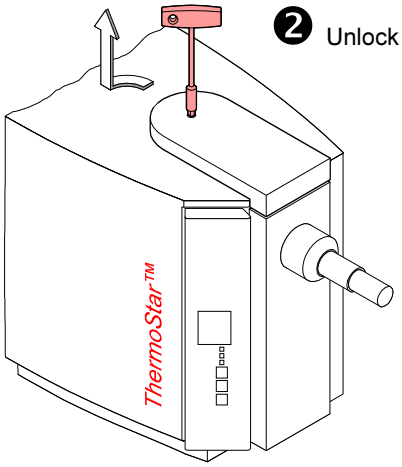
Firmly connect the front tip of the capillary heater tube to the measurement equipment. Clamp only the part of the tube which contains a metal bush.

For reliable connection of the capillary heater, an adapter is available as accessory (→ 🗎 55).

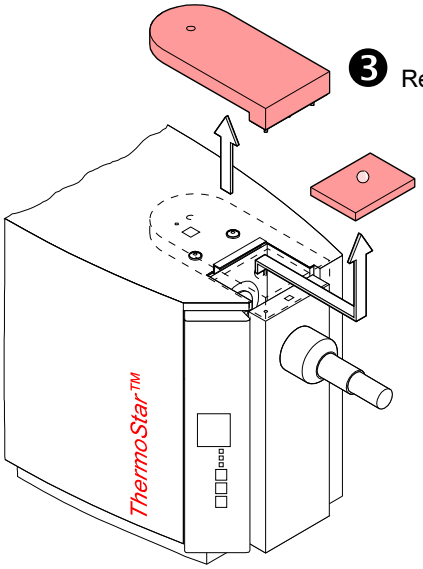
ThermoStar™



❶ Remove the adhesive tape.

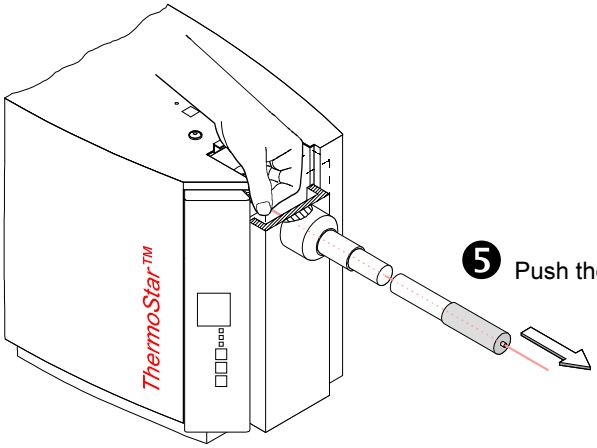


❷ Unlock the lid.

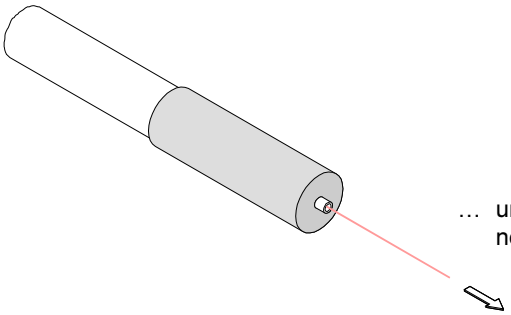


❸ Remove the lid.

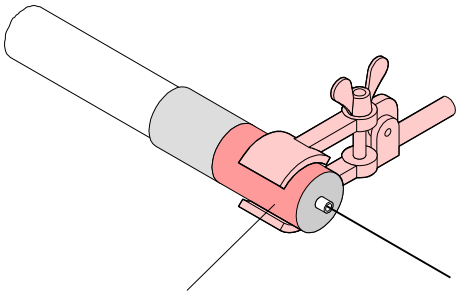
❹ Remove the insulation cover.



❺ Push the capillary forward …



… until it is long enough for connection to the measurement point.



❻ Connect the capillary to the measurement point.

Do not expose the quartz capillary to mechanical stress. Firmly connect the front tip of the capillary heater tube to the measurement equipment. Clamp only the part of the tube which contains a metal bush.

❼ Mount the insulation cover.

❽ Mount the lid.

❾ Lock the lid.

4.600 Connecting the Interface

The GSD 301 features three connectors for communication with customer supplied peripheral devices:

- RS232C interface(→ section 4.6.1)
- ArcNet LAN interface(→ section 4.6.2)
- USER control connection (→ section 4.6.3)

The RS232C interface cannot be used simultaneously with the ArcNet LAN interface.

4.6.10 Connecting the RS232C Interface

Remove the equipment cover to gain access to the interface connector (→ section 4.6.4).

Install the cable (9 poles, sockets on both sides) supplied with the software. If necessary insert the extension cable or the 9/25 pole adapter.

4.6.20 Connecting the ArcNet Interface (LAN)

Installing the interface board into the PC: → 🕮 of the interface.

Remove the equipment cover to gain access to the interface connector (→ section 4.6.4).

4.6.3 Connecting the Interface (USER control)

The USER control connector connects the inputs from and outputs to the Prisma™ (control connector) with the interface print.

Pin assignment → 🗎 10

Remove the equipment cover to gain access to the interface connector (→ section 4.6.4).

4.6.4 Removing the Equipment Cover

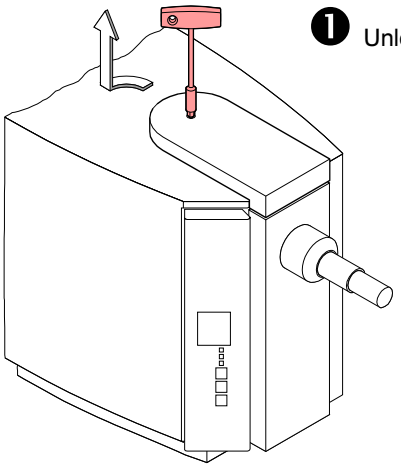
Preconditions

- System switched off
- System disconnected from the power source

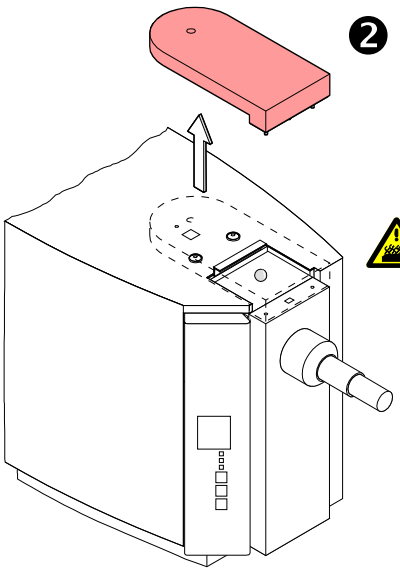
Required tools / materials

- Supplied Allen wrench

Procedure



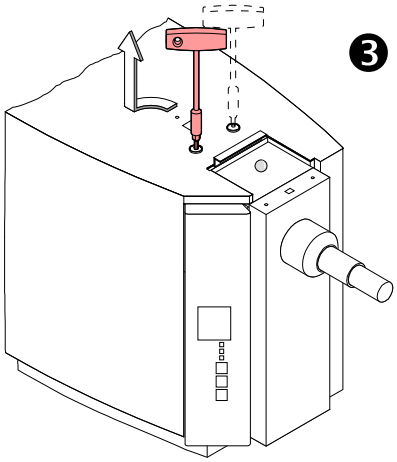
❶ Unlock the lid.



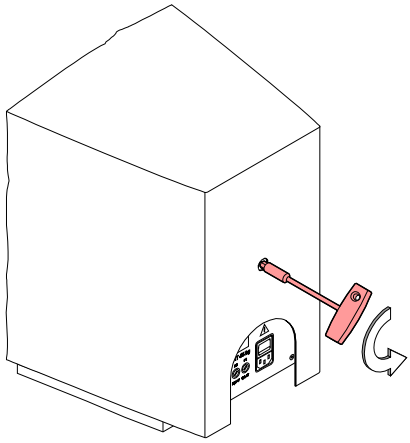
❷ Remove the lid.

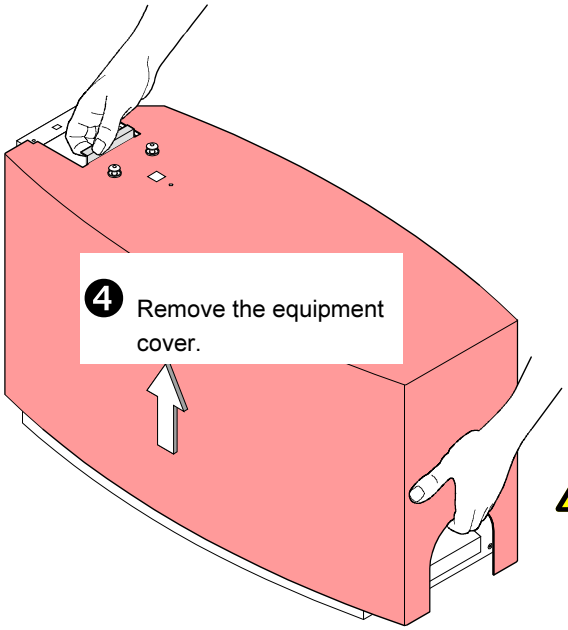
Hot surface.

Allow the unit to cool off before continuing to work.



❸ Unlock the equipment cover.





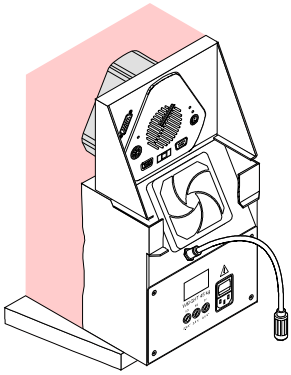
❹ Remove the equipment cover.

Little space:
Watch your fingers.

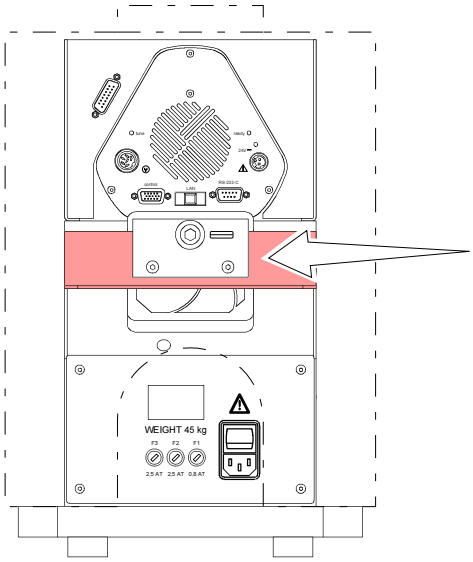
✓ You now have access to the interface connections.

Skilled personnel

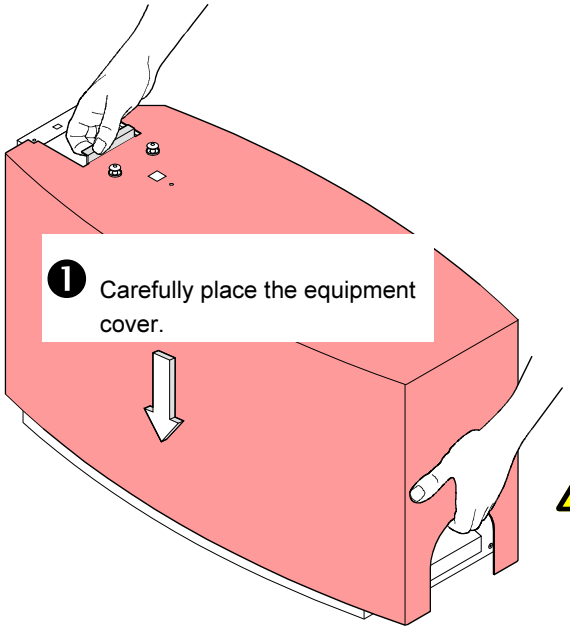
Interventions inside the equipment:
only by maintenance or service specialists.



4.6.5 Mounting the Equipment Cover

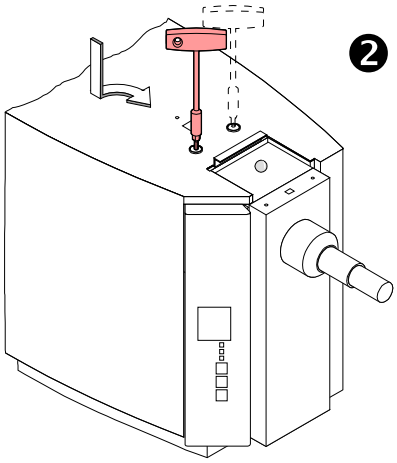


Lead cables behind this panel.

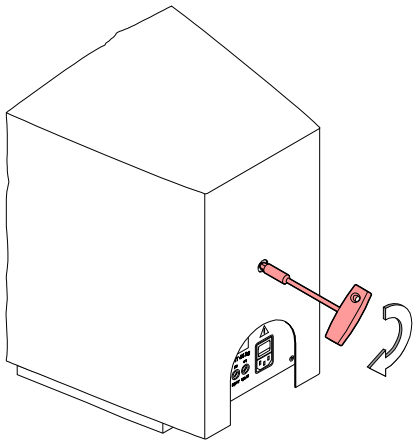


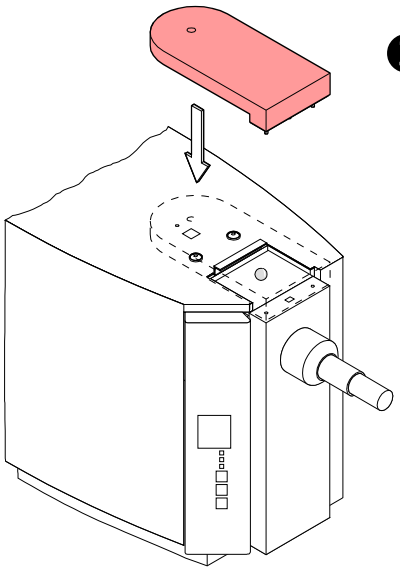
❶ Carefully place the equipment cover.

Little space:
Watch your fingers.



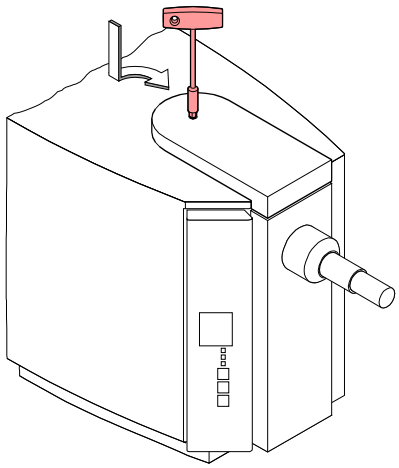
❷ Lock the equipment cover.





❸ Place the lid …

… and lock it.



4.7 Power Connection

❶ Turn off the power switch. 

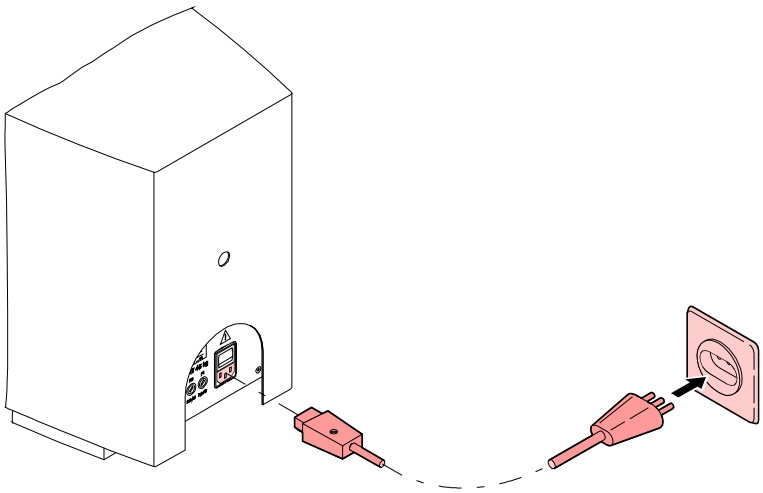
❷ Connect the system.

Caution

Caution: line voltage

Incorrect voltages can destroy the product.

The local line voltage ratings must correspond to the nominal voltage of the product (→ product nameplate). If they do not correspond, please contact your local Pfeiffer Vacuum service center.



DANGER

Caution: line voltage

Incorrectly grounded products can be extremely hazardous in the event of a fault.

Use only a 3-conductor power cable with protective ground. The power connector may only be plugged into a socket with a protective ground. The protection must not be nullified by an extension cable without protective ground.

5 Initial Start Up

5.1 Switching On

WARNING

Caution: jerks and jolts

Jerks and jolts during operation and after switching off can damage the turbo pump.

Avoid shocks and vibrations (e.g. moving over cables, door sills) during operation and up to 5 minutes after switching the GSD 301 off.

Precondition

- Installation completed (→ 12 ff)

Procedure

Turn the mains switch on. 

 <**power**> lit green.

⇩

Start the pumping system with the <**pump**> key.

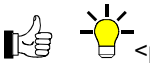
 <**ready**> flashing green.

- The vent valve is closed.
- The diaphragm pump is switched on.
- After 30 seconds: the turbo pump is switched on.

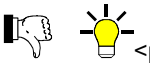
⇩

 Wait until the turbo pump has reached the rotation speed setpoint (90% of the nominal speed).

⇩

 <**power**> lit green.

The system is ready for operation.

 <**power**> lit red.

The turbo pump has not reached the rotation speed setpoint (90% of the nominal speed) within 10 minutes and is therefore turned off.

- The diaphragm and turbo pump are switched off.
- The gas inlet valve (and valve of calibration unit) are closed.
- The system is vented.

 <**ready**> dark.

⇩

Turn off the pumping system with the <**pump**> key.

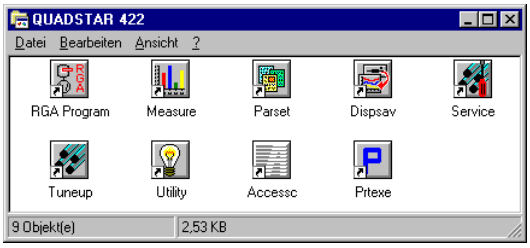
If  <**power**> is again lit red, there is a fault in the pumping system or a leak.

5.2 Pfeiffer Vacuum Quadstar™ 422 Setup

The Pfeiffer Quadstar™ 422 needs certain GSD 301 specific adaptations which are to be performed or checked after the installation. Therefore, carefully follow the instructions given below before performing any measurements.

Precondition

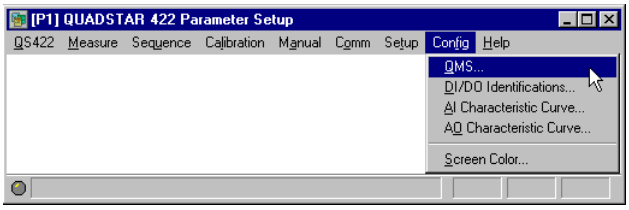
- Pfeiffer Vacuum Quadstar™ 422 installed (→ corresponding 🕮)



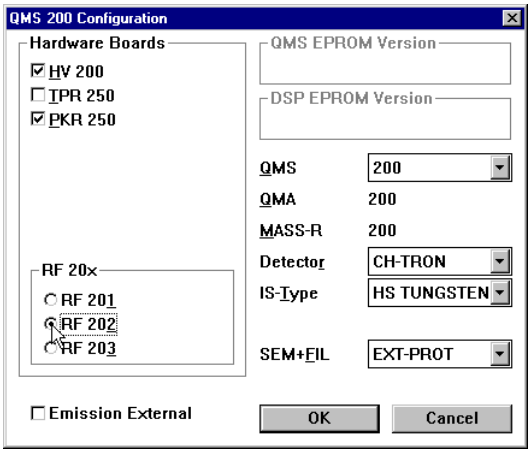
Procedure

❶ Define the QMS configuration:

- Start the Parset program.
- Choose <Config><QMS...> in the menu bar.



- Accept the following configuration:



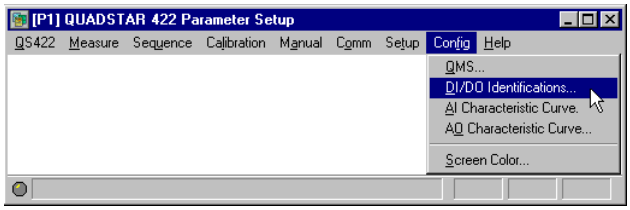
Make sure that the RF 20x is set up in accordance with the mass range of the GSD 301.

- Close the window with OK.

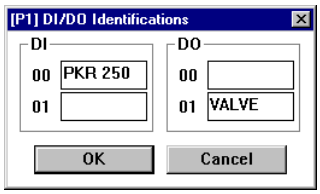
❷ Define the identifications for the digital inputs/outputs.

- Start the Parset program.

- Choose <Config><DI/DO Identifications...> in the menu bar.



- Define the following identifications for DI00 and DO01:



- Close the window with OK .
- Quit the "Parameter Setup" program.

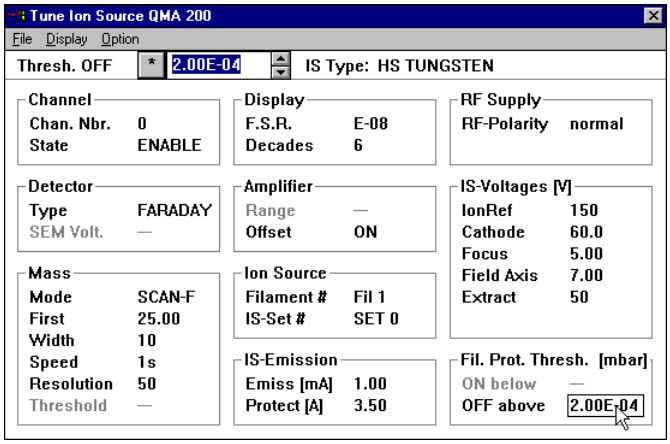
❸ Define the switching threshold for SEM/Fil protection.

The monitoring of the admissible maximum pressure for Filament and SEM is performed as a standard feature by the PKR 250 gauge. The maximum admissible pressure is defined in the TuneUp program. If the gauge needs to be switched off for special measurement functions, the maximum pressure is monitored via the turbo pump speed (fixed threshold at 90%) rather than via the total pressure.

- Start the Tuneup program.

- Choose <Tune><Ion Source> in the menu bar.
  The <Tune Ion Source QMA 200> window is displayed.

- Choose <OFF above> parameter …



… and enter the value 

.

- Close the <Tune Ion Source QMA 200> window.
  Save the changes with <YES>.
- Quit the "Tuneup" program.

5.3 Optimizing the Ion Source Parameters (OmniStar™)

Om

Optimize the ion source parameters in regular intervals, in particular during the first time operation and after all service work on the ion source.

The optimization procedure differs, depending on the existing configuration, measurement task, and available test gas.

- Optimization with test gas air → section 5.3.1
- Optimization with test gas argon → section 5.3.2

5.3.1 … With Test Gas Air

O

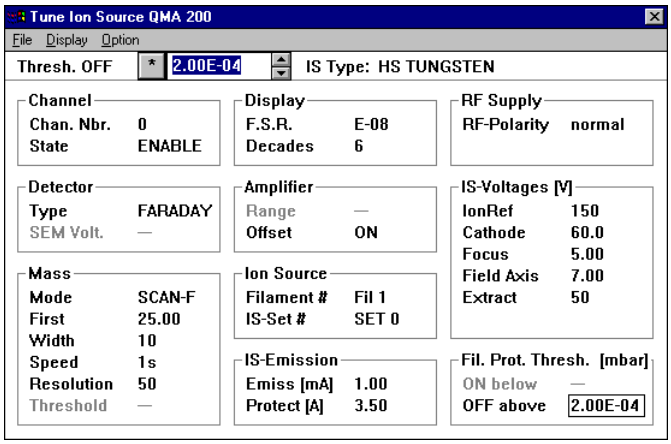
OmniStar™ OmniStar™ OmniStar™ OmniStar™ OmniStar™ OmniStar™

Optimize with air if no special test gas is available.

❶ Start the  Tuneup program.

- Open the inlet valve:
  - Choose <Manual><DI/DO...> in the menu bar.
  - Double click **Valve** to activate it.
  - Close window with <OK>.
- Choose <Tune><Ion Source> in the menu bar.

❷ Adjust all parameters as shown in the picture below:



❸ Choose <Display><Measure Data> for displaying the peak groups of nitrogen and oxygen.

❹ Optimize:

- Test at which **RF-Polarity** the better peak shapes are obtained and choose the corresponding polarity.
- Set **Field Axis** in such a way that a useful resolution and peak shape are obtained.
- Alternately optimize **Extract** and **Focus** to maximum peak height.

❺ Quit:

- Close the <Tune Ion Source QMA 200> window.
- Save the changes with <YES>.
- Close the "Tuneup" program.

5.3.2 … With Test Gas Argon

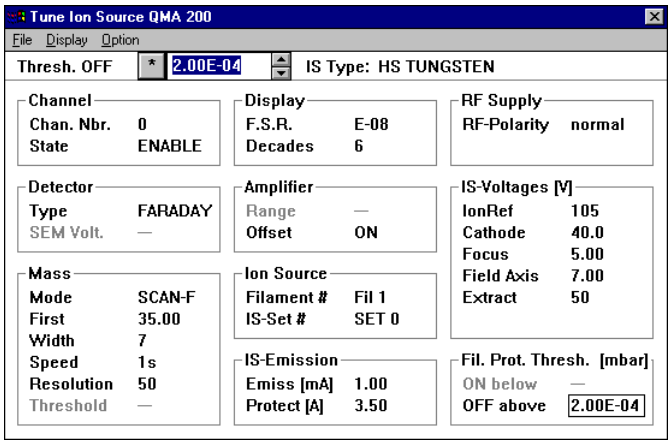
Optimize with the test gas argon if argon is subsequently to be analyzed. Setting of "Cathode" to 40 V prevents formation of Ar^{++} ions and allows detection of low H_2O concentrations on mass 18.

Make sure that argon is connected to the GSD 301 and that the feeder lines are thoroughly purged.

❶ Start the Tuneup program.

- Open the inlet valve:
  - Choose <Manual><DI/DO...> in the menu bar.
  - Double click **Valve** to activate it.
  - Close window with <OK>.
- Choose <Tune><Ion Source> in the menu bar.

❷ Adjust all parameters as shown in the picture below:



❸ Choose <Display><Measure Data> for displaying the peak group of argon.

❹ Optimize:

- Test at which **RF-Polarity** the better peak shapes are obtained and choose the corresponding polarity.
- Set **Field Axis** in such a way that a useful resolution and peak shape are obtained.
- Alternately optimize **Extract** and **Focus** to maximum peak height.

❺ Quit:

- Close the <Tune Ion Source QMA 200> window.
- Save the changes with <YES>.
- Close the "Tuneup" program.

5.4 Optimizing the Ion Source Parameters (ThermoStar™)

Optimize the ion source parameters in regular intervals, in particular during the first time operation and after all service work on the ion source.

The optimization procedure differs, depending on the existing configuration and available test gas.

- Optimization with test gas air → section 5.4.1
- Optimization with calibration unit (PFTBA) → section 5.4.2
- Optimization with test gas argon → section 5.4.3

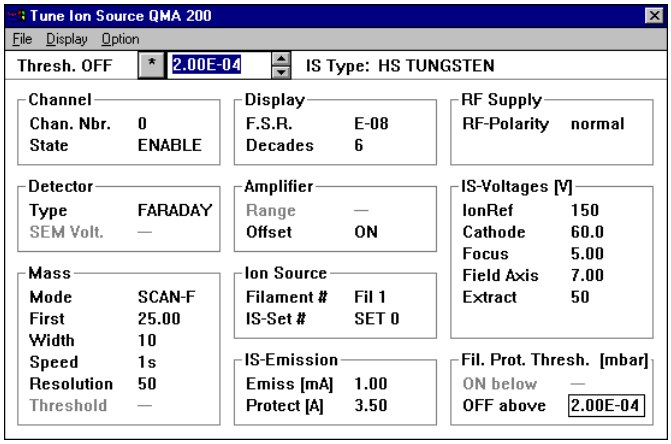
5.4.1 … With Test Gas Air

Optimize with air if no special test gas is available.

❶ Start the  Tuneup program.

❷ Choose <Tune><Ion Source> in the menu bar.

❸ Adjust all parameters as shown in the picture below:



❹ Choose <Display><Measure Data > for displaying the peak groups of nitrogen and oxygen.

❺ Optimize:

- Test at which **RF-Polarity** the better peak shapes are obtained and choose the corresponding polarity.
- Set **Field Axis** in such a way that a useful resolution and peak shape are obtained.
- Alternately optimize **Extract** and **Focus** to maximum peak height.

❻ Quit:

- Close the <Tune Ion Source QMA 200> window.
- Save the changes with <YES>.
- Close the "Tuneup" program.

5.4.2 … With Calibration Unit (PFTBA)

The calibration substance PerFluorTriButylAmin yields mass peaks up to 614 amu. It is ideal for optimizing ion source settings in the high mass range.

❶ Start the  Tuneup program.

❷ Turn off SEM/Emission:

- Choose <Setup><SEM/Emission Control> in the menu bar.
- Turn off SEM and Filament.
- Close the window with <OK>.

❸ Open the valve of the calibration unit:

- Choose <Manual><DI/DO...> in the menu bar.
- Double click **Valve** to activate it.
- Close the window with <OK>.

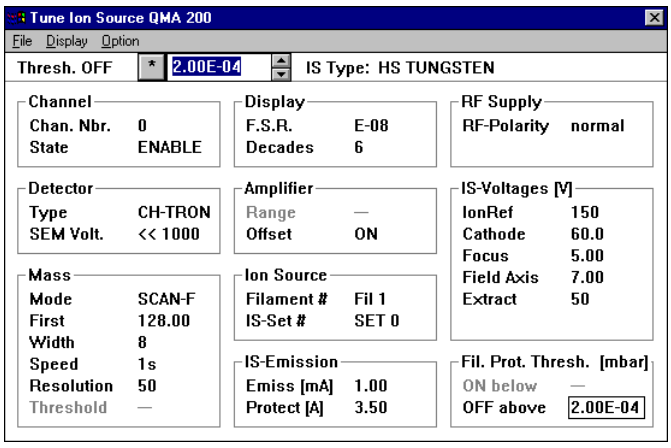
Wait 10s (compensation of the pressure rise caused by opening the valve of the calibration unit).

❹ Turn on SEM/Emission:

- Choose <Setup><SEM/Emission Control> in the menu bar.
- Turn on SEM and Filament.
- Close the window with <OK>.

❺ Choose <Tune><Ion Source> in the menu bar.

❻ Adjust all parameters as shown in the picture below:



❼ Choose <Display><Measure Data> for displaying the peak group around mass 129 amu.

❽ Optimize:

- Test at which **RF-Polarity** the better peak shapes are obtained and choose the corresponding polarity.
- Set **Field Axis** in such a way that a useful resolution and peak shape are obtained.
- Alternately optimize **Extract** and **Focus** to maximum peak height.

❾ Quit:

- Close the <Tune Ion Source QMA 200> window.
- Save the changes with <YES>.
- Close the "Tuneup" program.

❿ Close the valve of the calibration unit:

- Choose <Manual><DI/DO...> in the menu bar.
- Double click **Valve** to deactivate it.
- Close the window with <OK>.

5.4.3 … With Test Gas Argon

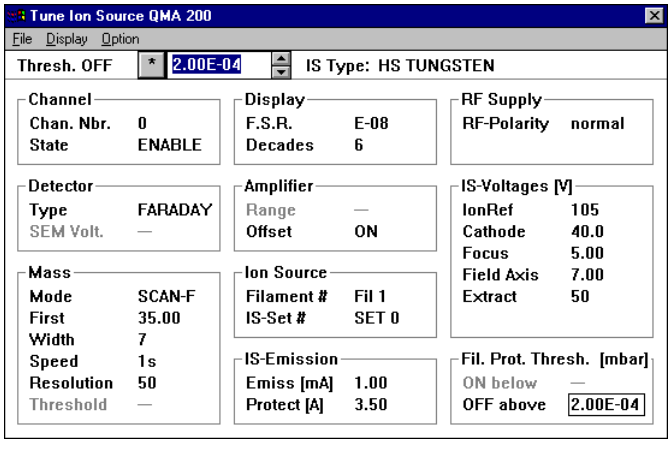
Optimize with the test gas argon if argon is subsequently to be analyzed. Setting of "Cathode" to 40 V prevents formation of Ar^{++} ions and allows detection of low H_2O concentrations on mass 18.

⚠ Make sure that argon is connected to the GSD 301 and that the feeder lines are thoroughly purged.

❶ Start the  Tuneup program.

❷ Choose <Tune><Ion Source> in the menu bar.

❸ Adjust all parameters as shown in the picture below:



❹ Choose <Display><Measure Data> to display the peak group of argon.

❺ Optimize:

- Test at which **RF-Polarity** the better peak shapes are obtained and choose the corresponding polarity.
- Set **Field Axis** in such a way that a useful resolution and peak shape are obtained.
- Alternately optimize **Extract** and **Focus** to maximum peak height.

❻ Quit:

- Close the <Tune Ion Source QMA 200> window.
- Save the changes with <YES>.
- Close the "Tuneup" program.

6 Operation

6.1 Switching On

WARNING

Caution: jerks and jolts

Jerks and jolts during operation and after switching off can damage the turbo pump.

Avoid shocks and vibrations (e.g. moving over cables, door sills) during operation and up to 5 minutes after switching the GSD 301 off.

Preconditions

- Initial start up procedure completed (→ 26 ff)
- Pfeiffer Vacuum Quadstar™ 422 ready for operation

Procedure

❶ Turn on the mains switch. 

❷ Start the pumping system with the <**pump**> key.

Wait until the turbo pump has reached the rotation speed setpoint (90% of the nominal speed).

❸ Establish communication with Pfeiffer Vacuum Quadstar™ 422. <**valve**>

OmniStar™: The valves are controlled by the software.
ThermoStar™: Valve (option) is opened only for calibration.

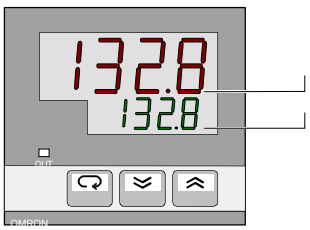
❹ Adjust the gas inlet and capillary or vacuum chamber heaters (→ section 6.2).

6.2 Operating the Heaters

Capillary heater

❶ Turn on the capillary heater with the <**heater**> key.

<**heater**>



The temperatures are displayed:
Actual temperature
Nominal temperature

❷ Enter the temperature setpoint with the and keys (value range 0 ... 200° C).

<**OUT**> Actual temperature < nominal temperature (heater operates with full power)

<**OUT**> Actual temperature ≈ nominal temperature (temperature is stabilized)

Inlet housing heater

The gas inlet heater is electrically connected in parallel with the capillary heater. The temperature of the gas inlet cannot be controlled directly, it approximately follows the temperature of the capillary heater.

Vacuum chamber heater

The vacuum chamber is heated for conditioning the analysis chamber.

During an analysis, the vacuum chamber heater must be switched off. In particular the secondary electron multiplier must not be in operation while the vacuum chamber heater is on.

Turn on the vacuum chamber heater with the <**baking**> key.

<**baking**> Vacuum chamber is being heated

<**baking**> Internal overheating

6.3 Interaction with Software

→ section 5.2.

6.4 Switching Off

❶ Turn off the emission.

❷ Quit Pfeiffer Vacuum Quadstar™.

Wait for 10 minutes (cooling time for filament and ion source).

❸ Turn off the pumping system with the <**pump**> key.

- The turbo pump is switched off.

<**ready**> during slowing-down time of turbo pump (4 minutes)

- The diaphragm pump is switched off.
- The vent valve is opened.

Wait for 1 minute.

❹ Turn off the mains switch. 

6.5 Preparation for Transport

Preconditions

- System switched off (→ 36)
- Turbo pump has to run out to standstill (5 minutes)

Procedure

- Place the transport fixing parts (→ 16).
- Carefully pack the unit (use the original packing material).

7 Maintenance and Care

Pfeiffer Vacuum offers maintenance courses for this product. Through examples and more detailed documentation these courses enable the user to keep the equipment in proper working condition.

For additional information, please contact your local Pfeiffer Vacuum service center.

Cleaning the unit

DANGER

Caution: line voltage
Touching live parts is hazardous.
Disconnect the product from the mains.

A slightly damp cloth normally suffices for cleaning the outside of the unit. Do not use any aggressive or scouring cleaning agents.

Make sure that no liquid can penetrate the product. Allow the product to dry thoroughly before putting it into operation again.

8 Troubleshooting

In case of toubles other than described below, please contact your local Pfeiffer Vacuum service center.

If the gas flow of the system is restricted or completely blocked, check for the following causes:

- Capillary clogged (⇒ Shortening the capillary → 🗎 38, 39 or Replacing the capillary → 🗎 41, 45)
- Orifice clogged (⇒ Replacing the orifice → 🗎 50, 53)

DANGER

Caution: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

8.1 Shortening the Capillary (OmniStar™)

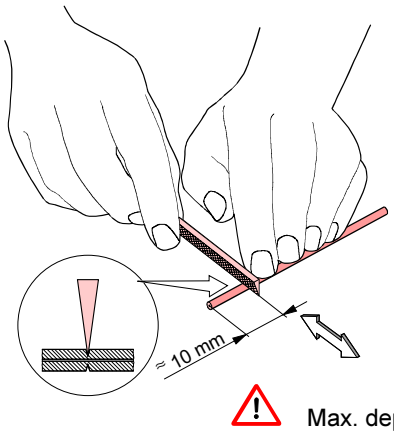
Preconditions

- System switched off
- Capillary detached from measurement point
- Length of capillary still adequate after shortening

Required tools

- Tube cutter, capillary cutting tool (recommended → 🗎 55) or knife file

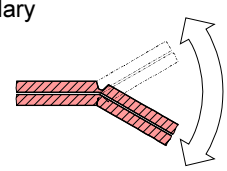
Procedure



❶ Make two opposing small indentations.

Max. depth of indentations 0.5 mm

❷ Bend the capillary until it breaks.



⚠ Do not finish the point of break (capillary gets clogged).

❸ Turn on the system.

Wait for 10 minutes (turbo pump acceleration time).

❹ Check the pressure in the analysis chamber as follows:

- Start the Service program.
- Choose <Measure><Total pressure> in the menu bar.
  ⇒ The total pressure of the analysis chamber is displayed.

  Displayed pressure ≥1×10^{-6} mbar

  Displayed pressure <1×10^{-6} mbar

  Possible causes:
  - Capillary clogged at the end
    ⇒ Shorten the capillary by additional 10 mm.
  - Orifice clogged
    ⇒ Replace the orifice (→ 🗎 50).
  - Capillary clogged across the entire length
    ⇒ Replace the capillary (→ 🗎 41).

❺ Connect the capillary to the measurement point.

8.2 Shortening the Capillary (ThermoStar™)

Preconditions

The

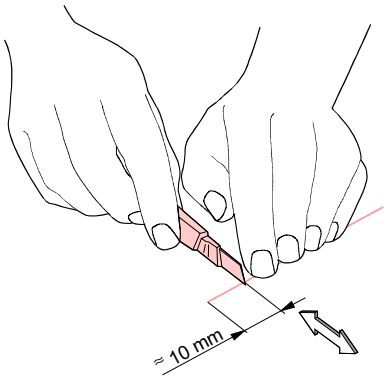
- System switched off
- Capillary detached from measurement point
- Length of capillary still adequate after shortening

Required tools

T

- Capillary cutting tool (recommended → 🗎 55) or cutting blade

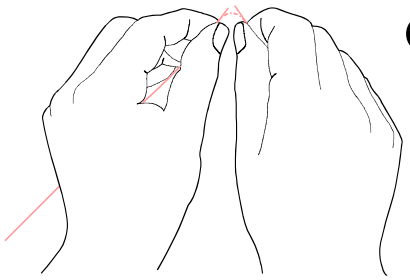
Procedure



❶ Carefully notch the capillary.

Quartz capillaries may splinter.

Do not exert pressure.



❷ Break the capillary at the point notched previously.

❸ Turn on the system.

Wait for 10 minutes (turbo pump acceleration time).

❹ Check the pressure in the analysis chamber as follows:

- Start the Service program.
- Choose <Measure><Total pressure> in the menu bar.

  ⇒ The total pressure of the analysis chamber is displayed.

  Displayed pressure ≥1×10^{-6} mbar

  Displayed pressure <1×10^{-6} mbar

  Possible causes:
  - Capillary clogged at the end
    ⇒ Shorten the capillary by additional 10 mm.
  - Orifice clogged
    ⇒ Replace orifice (→ 🖹 53).
  - Capillary clogged across the entire length
    ⇒ Replace capillary (→ 🖹 45).

❺ Connect the capillary to the measurement point.

8.3 Replacing the Capillary (OmniStar™)

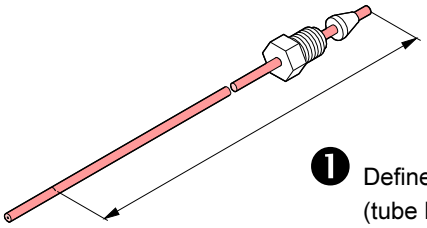
Precondition

- System switched off

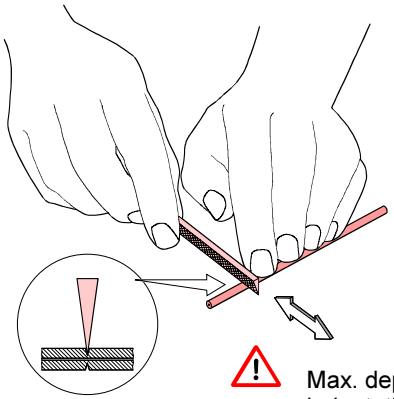
Required tools / materials

- Tube cutter (recommended → 🗎 55) or knife file
- Wrench ¼" (6.5 mm)
- Supplied Allen wrench
- Stainless steel capillary, ferrule, possibly nut (→ 🗎 56)

Preparing the new capillary



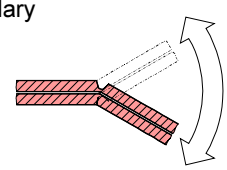
❶ Define tube length (tube length + 10 cm + length required for measurement point).



❷ Make two opposing small indentations.

⚠ Max. depth of indentations 0.5 mm

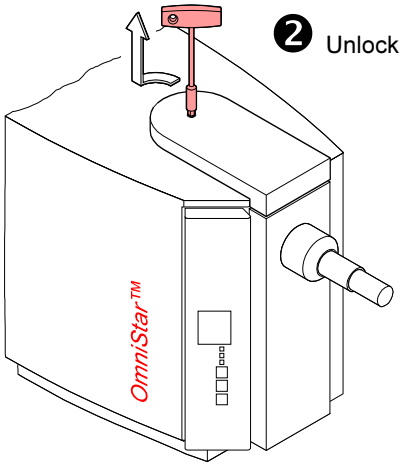
❸ Bend the capillary until it breaks.



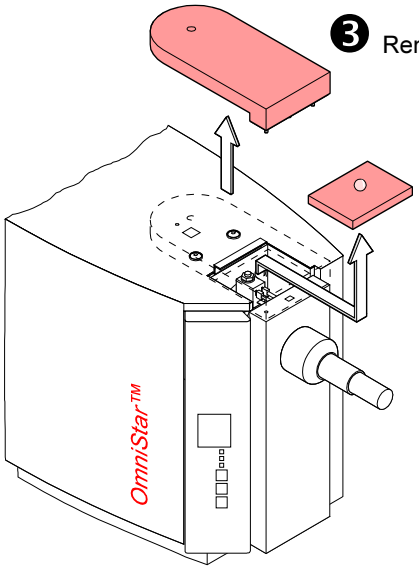
⚠ Do not finish the point of break (capillary gets clogged).

Removing old capillary

❶ Detach the capillary at the measuring point.



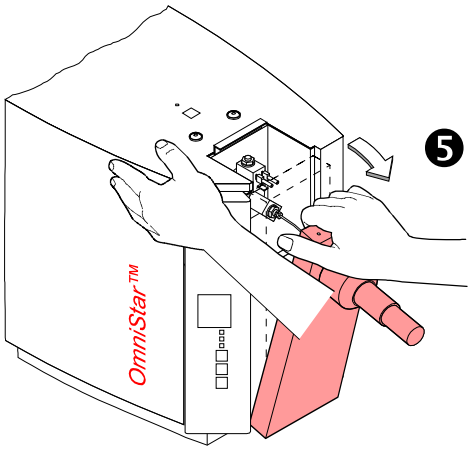
❷ Unlock the lid.



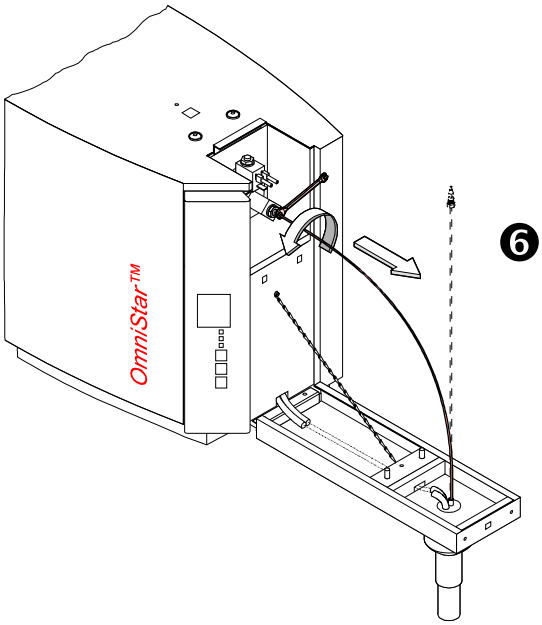
❸ Remove the lid.

Hot surface.
First allow the gas inlet to cool off.

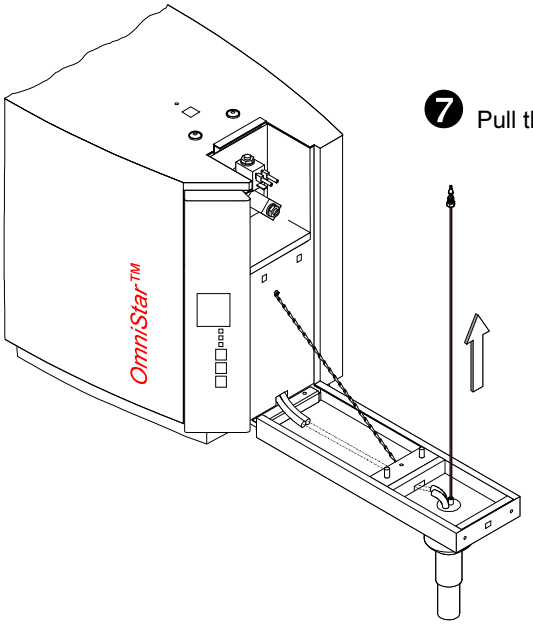
❹ Remove the insulation cover.



❺ Open the hinged lid.



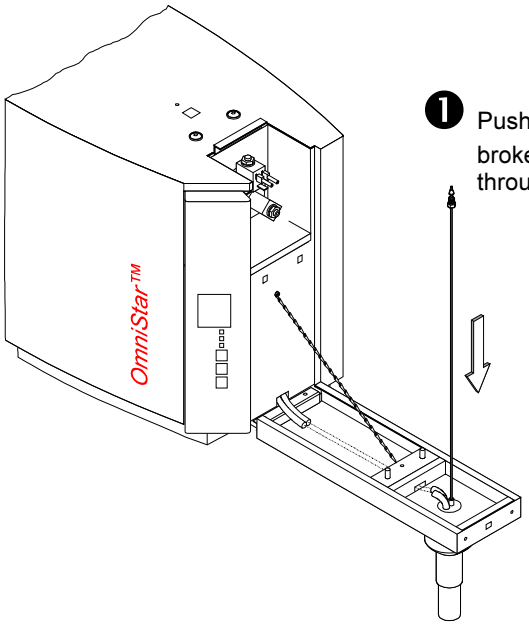
6 Loosen the capillary at the gas inlet and pull it back.



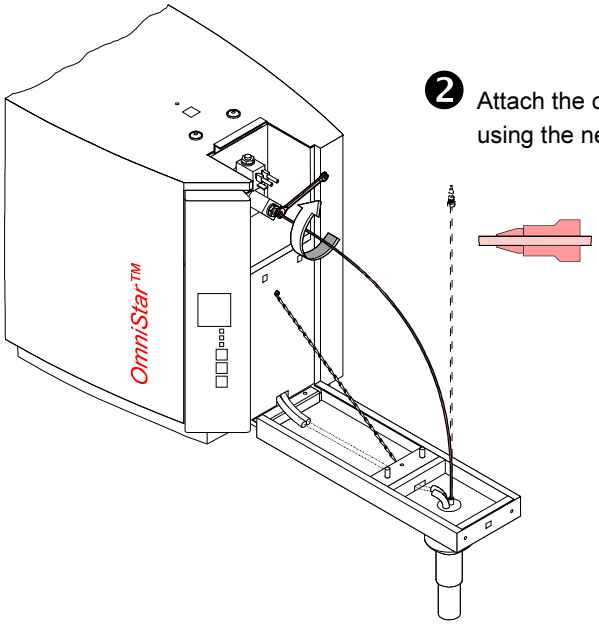
7 Pull the capillary out of the tube.

8 Remove the nut (reuse it if in good shape).

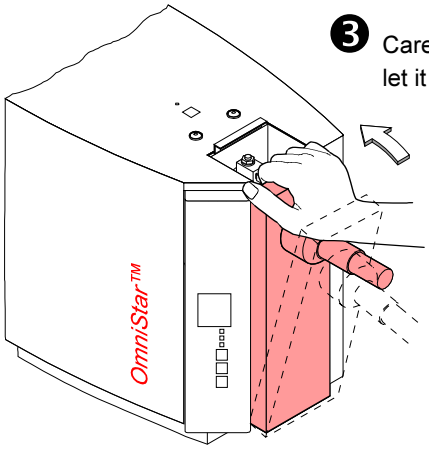
Installing the new capillary



❶ Push the capillary, which has been broken down to the correct length, through the tube.



❷ Attach the capillary to the gas inlet using the new ferrule.



❸ Carefully close the hinged lid and let it catch.

⚠ Do not buckle the capillary.

❹ Mount the insulation cover.

❺ Mount the lid.

❻ Lock the lid.

❼ Connect the capillary to the measurement point.

8.4 Replacing the Capillary (ThermoStar™)

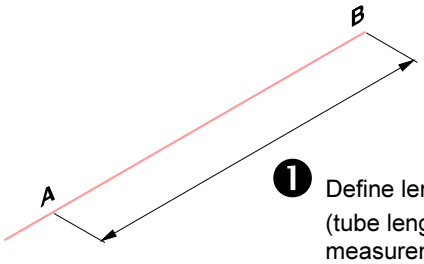
Preconditions

- System switched off
- Capillary detached from the measurement point

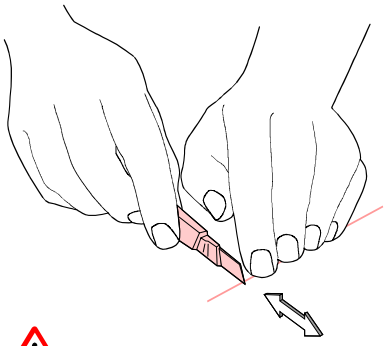
Required tools / materials

- Capillary cutting tool (recommended → 🗎 55) or cutting blade
- Wrench ¼" (6.5 mm)
- Supplied Allen wrench
- Quartz capillary, ferrule, possibly coupling (→ 🗎 56)

Preparing the new capillary



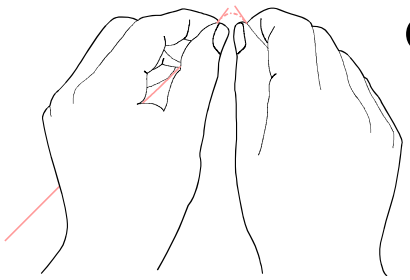
❶ Define length
(tube length + 30 cm + length required for measurement point, e.g. thermobalance)



❷ Carefully notch the capillary at end A.

Quartz capillary may splinter.

Do not exert pressure.

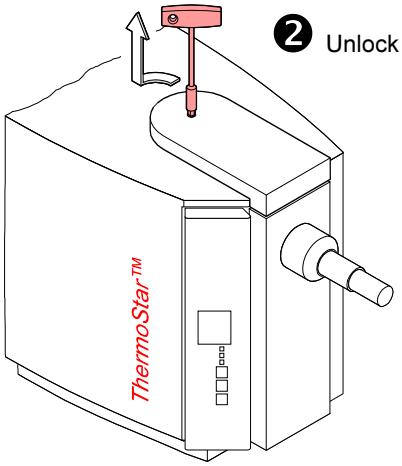


❸ Break the capillary at the point notched previously.

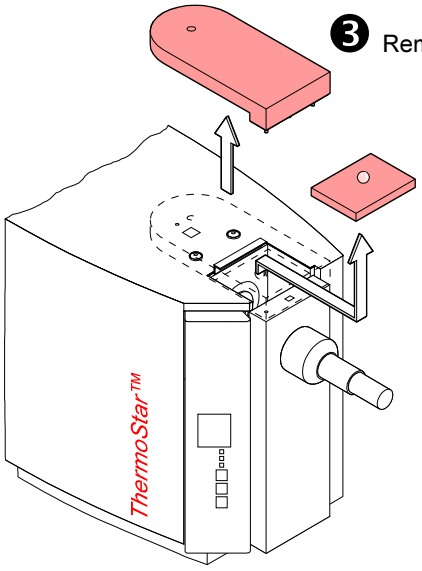
Remember the position of end A, which is clean now.

Removing the old capillary

❶ Detach the capillary at the measurement point.



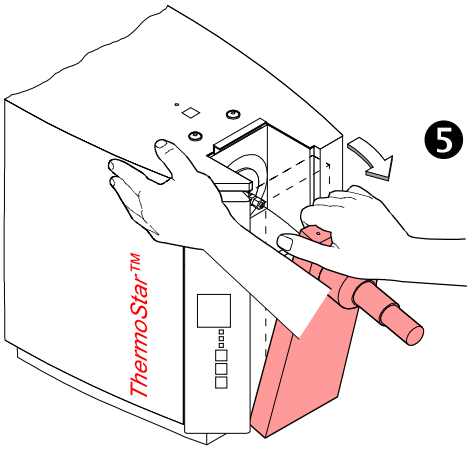
❷ Unlock the lid.



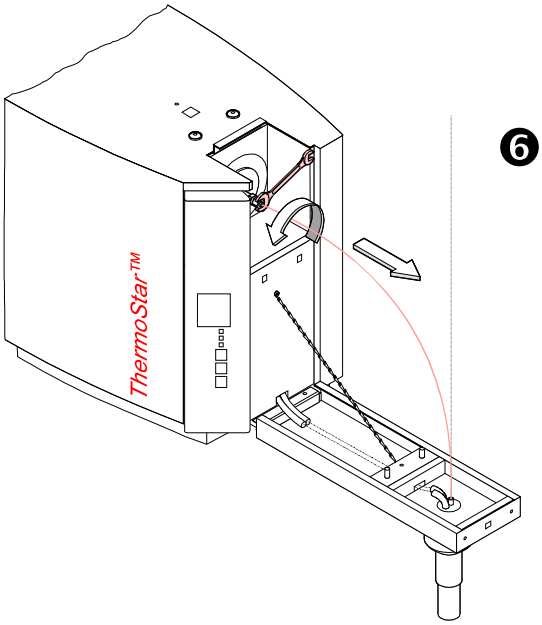
❸ Remove the lid.

Hot surface.
First allow the gas inlet to cool off.

❹ Remove the insulation cover.

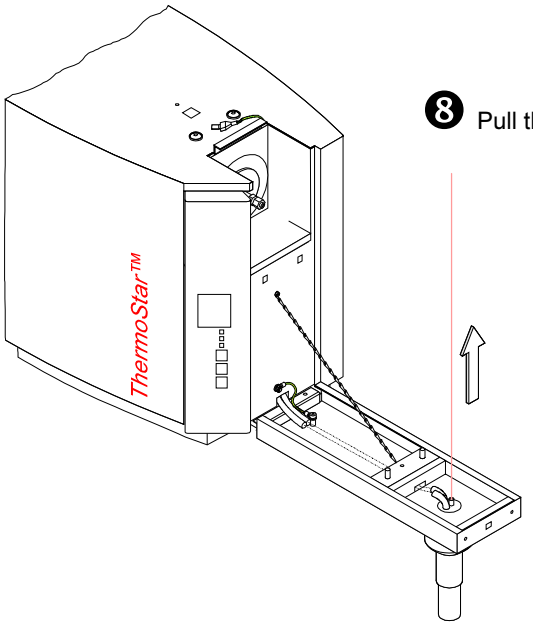


❺ Open the hinged lid.



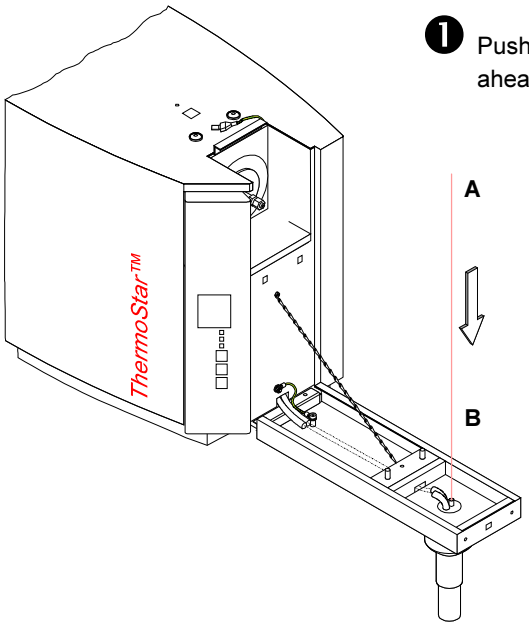
❻ Loosen the capillary at the gas inlet and pull it

❼ Remove coupling and ferrule.



❽ Pull the capillary out of the tube.

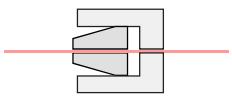
Installing the new capillary

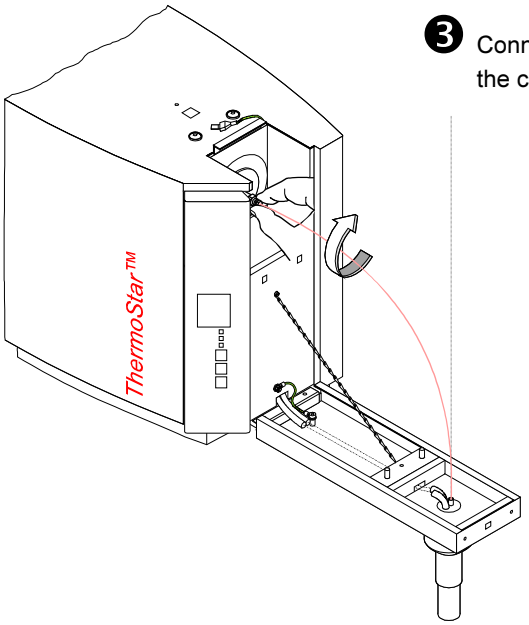


❶ Push the capillary, with end B ahead, into the tube.

Quartz may splinter.

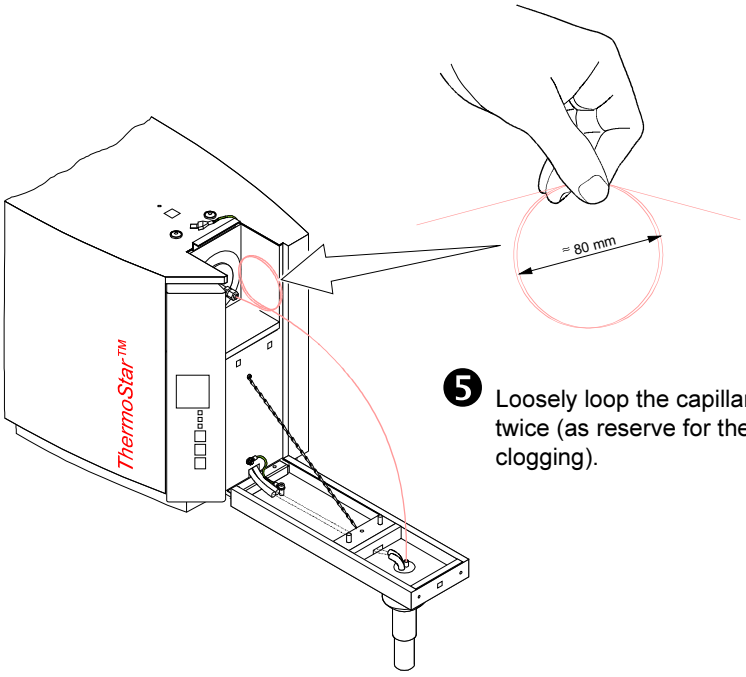
❷ Slide the coupling and the new ferrule on the capillary.



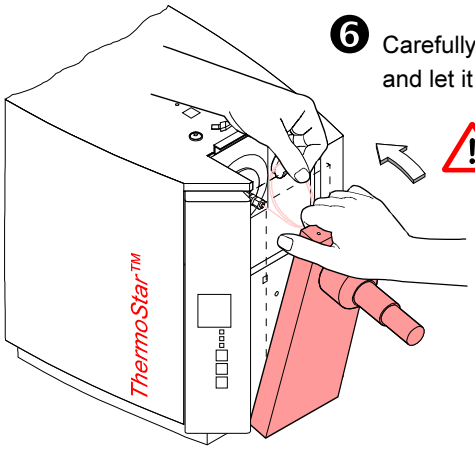


❸ Connect the capillary and tighten the coupling by hand.

❹ Push the capillary into the gas inlet until the mechanical stop is reached, pull it back ≈ 2 mm.
Tighten until the capillary can not be moved any more, tighten ½ turn more.



❺ Loosely loop the capillary once or twice (as reserve for the event of clogging).



❻ Carefully close the hinged lid and let it catch.

Do neither buckle nor squeeze the capillary.

❼ Mount the insulation cover.

❽ Mount the lid.

❾ Lock the lid.

❿ Shorten the capillary at end B (→ 🗎 39).

⓫ Connect the capillary to the measurement point.

8.5 Replacing the Orifice (OmniStar™)

Caution

Caution: dirt sensitive area

Touching the product or parts thereof with one's bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

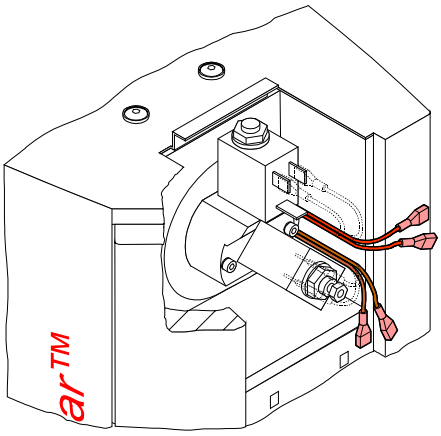
Preconditions

- System switched off
- Capillary removed (→ 🗎 41)

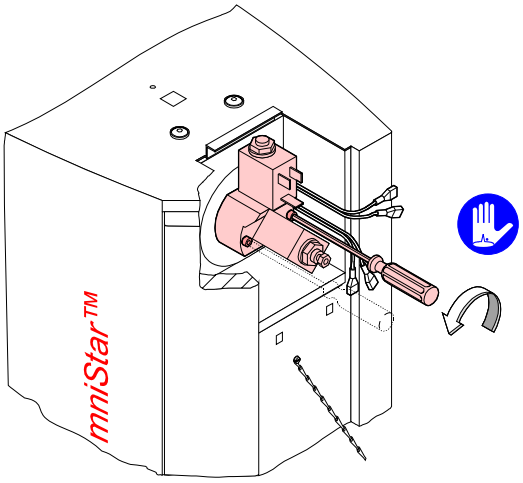
Required tools / material

- Allen wrench 2.5 mm
- Screwdriver No. 1
- Orifice (→ 🗎 56)

Procedure

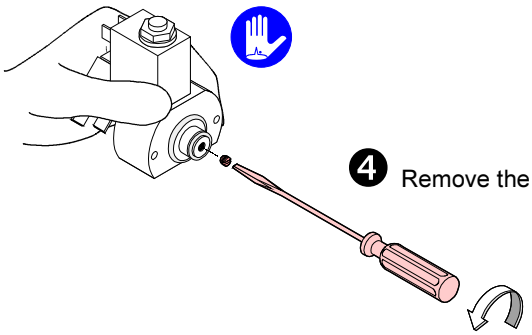


❶ Disconnect the cables from valves V1 and V2.

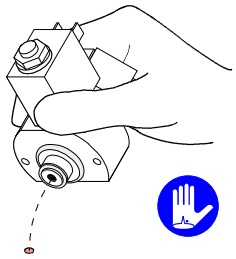


❷ Loosen the two hexagon socket screws.

❸ Remove the gas inlet.

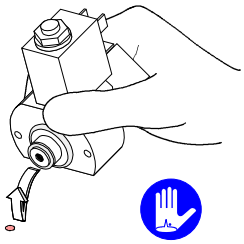


❹ Remove the screw of the orifice.



❺ Tilt the gas inlet in order for the orifice to drop out.

If the orifice is stuck, carefully knock the gas inlet against a soft surface until the orifice drops out.

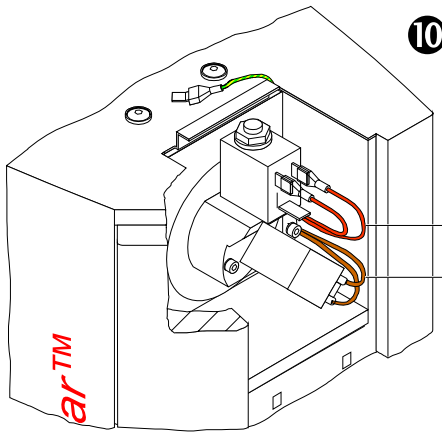


❻ Insert the new orifice.

❼ Screw in the orifice screw and firmly tighten it.

❽ Insert the gas inlet.

❾ Tighten the two hexagon socket screws.



❿ Connect the cables to valves V1 and V2.

Do not mix up the cables.

⓫ Connect the capillary (→ 🗎 44).

8.6 Replacing the Orifice (ThermoStar™)

Caution

Caution: dirt sensitive area

Touching the product or parts thereof with one's bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

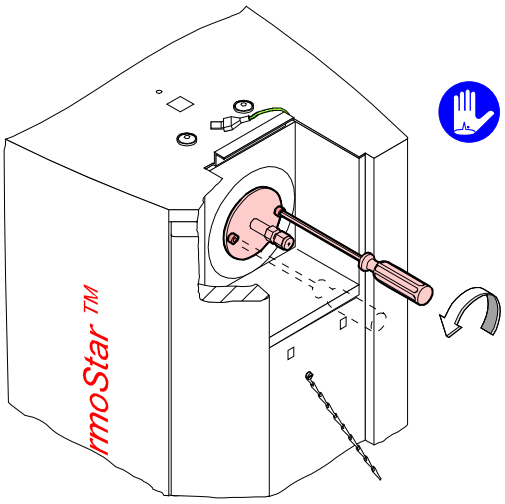
Preconditions

- System switched off
- Capillary removed (→ 🗎 45)

Required tools / material

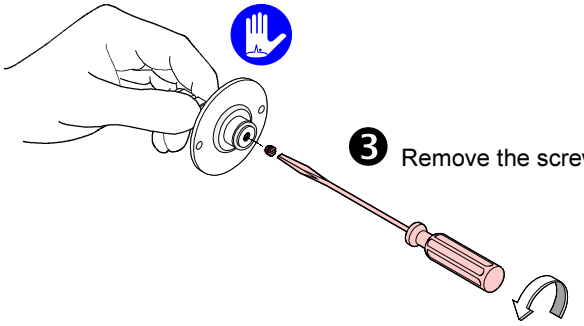
- Allen wrench 2.5 mm
- Screwdriver No. 1
- Orifice (→ 🗎 56)

Procedure



❶ Loosen the two hexagon socket screws.

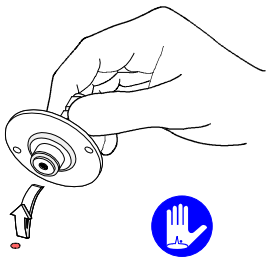
❷ Remove the gas inlet.



❸ Remove the screw of the orifice.

4. Tilt the gas inlet in order for the orifice to drop out.

If the orifice is stuck, carefully knock the gas inlet against a soft surface until the orifice drops out.



5. Insert the new orifice.

6. Fasten the orifice screw and firmly tighten it.

7. Insert the gas inlet.

8. Tighten the two hexagon socket screws.

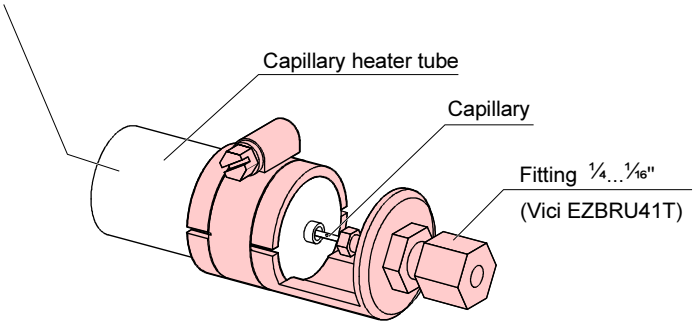
9. Connect the capillary (→ 🗎 48).

8.7 Replacing the Fuses

If a fuse has blown, there is usually a fault inside the system, too. Call your in-house service department or contact your local Pfeiffer Vacuum service center.

9 Accessories

Description	Ordering number	Available from
1/16" tube cutter TT-6	082780	SGE International Pty Ltd, Scientific Glass Engineering 7 Argent Place, Ringwood Vic 3134, Australia or any of their national distributors
Capillary cutting tool CTT (or compatible products of other manufacturers)	0625010	
Capillary heater adapter	BG 442 778 -T	Pfeiffer Vacuum



10 Spare Parts

When ordering spare parts, always indicate:

- all information on the product nameplate
- description and ordering number

Parts for both systems

Description	Ordering number
Filament[1]	
Tungsten (standard)	BN 846 281 -T
Iridium yttriated	BN 846 395 -T

[1] Replacing the filament → 🕮 Operating Instructions Prisma™

OmniStar™

Omni

OmniStar™

Description			Ordering number
Gas inlet consumables set, consisting of:			BN 846 295 -T
Stainless steel capillary	ø1⁄16" / 0.12 mm	5 m	
Ferrule	ø1⁄16"	4	
O-ring	ø12.42 mm×1.78 mm	2	
O-ring	ø18.77 mm×1.78 mm	1	
O-ring	ø9.25 mm×1.78 mm	1	
Orifice	ø0.02 mm	1	
Press screw		1	
Plunger FPM		2	
Nut	ø1⁄16"	1	

ThermoStar™

ThermoStar™

Description			Ordering number
Gas inlet consumables set, consisting of:			BN 846 294 -T
Quartz capillary	ø0.23 mm / 0.15 mm	5 m	
Ferrule	ø1⁄16" / 0.3 mm	10	
Coupling		1	
O-ring FPM	ø18.77 mm×1.78 mm	1	
O-ring FPM	ø9.25 mm×1.78 mm	1	
Orifice	ø0.02 mm	1	
Press screw		1	

11 Returning the Product

WARNING

Caution: forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or biological hazard) can be detrimental to health and environment.

Products returned to Pfeiffer Vacuum should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination (→ 🗎 58).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer.

Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

12 Disposal

DANGER

Caution: contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

WARNING

Caution: substances detrimental to the environment

Electric components can be detrimental to the environment and are subject to specific disposal regulations.

Dispose of such substances in accordance with the relevant local regulations.

WARNING

Caution: substances detrimental to the environment

Products, operating fluids etc. can be detrimental to the environment and might be subject to specific disposal regulations.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

Contaminated components

Contaminated components (radioactive, toxic, caustic, or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.

Other components

Such components must be separated according to their materials and recycled.

Literature

Please contact your local Pfeiffer Vacuum representative.

Declaration of Contamination

The service, repair, and/or disposal of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay.
This declaration may only be completed (in block letters) and signed by authorized and qualified staff.

1 Description of product

Type _____
Part number _____
Serial number _____

2 Reason for return

_____
_____
_____

3 Operating fluid(s) used (Must be drained before shipping.)

_____
_____

4 Process related contamination of product:

toxic	no ❑ 1)	yes ❑
caustic	no ❑ 1)	yes ❑
biological hazard	no ❑	yes ❑ 2)
explosive	no ❑	yes ❑ 2)
radioactive	no ❑	yes ❑ 2)
other harmful substances	no ❑ 1)	yes ❑

The product is free of any substances which are damaging to health yes ❑

1) or not containing any amount of hazardous residues that exceed the permissible exposure limits

2) Products thus contaminated will not be accepted without written evidence of decontamination!

5 Harmful substances, gases and/or by-products

Please list all substances, gases, and by-products which the product may have come into contact with:

Trade/product name	Chemical name (or symbol)	Precautions associated with substance	Action if human contact

6 Legally binding declaration:

I/we hereby declare that the information on this form is complete and accurate and that I/we will assume any further costs that may arise. The contaminated product will be dispatched in accordance with the applicable regulations.

Organization/company _____
Address _____ Post code, place _____
Phone _____ Fax _____
Email _____
Name _____

Date and legally binding signature _____

Company stamp

This form can be downloaded from our website.

Copies:
Original for addressee - 1 copy for accompanying documents - 1 copy for file of sender

Declaration of Conformity

CE

We, Pfeiffer Vacuum, hereby declare that the equipment mentioned below complies with the provisions of the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EEC and the Directive relating to electromagnetic compatibility 89/336/EEC.

Product

OmniStar™
ThermoStar™

Gas Analysis System

GSD 301 O
GSD 301 T

Part numbers

PT M61 111	PT M71 111
PT M61 112	PT M71 112
PT M61 113	PT M71 113
PT M61 212	
PT M61 213	
PT M61 312	PT M71 312
PT M61 313	
	PT M72 112
	PT M72 113
PT M63 111	PT M73 111
PT M63 112	PT M73 112
PT M63 113	PT M73 113

Standards

Harmonized and international/national standards and specifications:

- EN 292-1/-2 (Safety of machinery)
- EN 61010 / A2 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 50081-1 (Electromagnetic compatibility: generic emission standard)
- EN 50082-2 (Electromagnetic compatibility: generic immunity standard)

Signature

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