OPERATING INSTRUCTIONS

EN

Original

PNEUMATIC GATE VALVE

Valve

PFEIFFER VACUUM

Dear customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new Pfeiffer Vacuum valves should 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. With this expertise, we have acquired a multitude of skills contributing to an efficient and secure implementation of our product.

Knowing that our product must not interfere with your actual work, we are convinced that our product offers you the solution that supports you in the effective and trouble-free execution 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

1 About this manual

IMPORTANT
Read carefully before use.
Keep the manual for future consultation.

1.1 Validity

This operating instructions is a customer document of Pfeiffer Vacuum. The operating instructions describe the functions of the named product and provide the most important information for the safe use of the device. The description is written in accordance with the valid directives. The information in this operating instructions refers to the product's current development status. The document shall remain valid provided that the customer does not make any changes to the product.

1.1.1 Products concerned

This document applies to products with the following part numbers:

Part number	Description
GVP-Sxxxxxxx	Models for high vacuum applications
GVMP-Sxxxxxx	Models for ultra high vacuum applications

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

Pictographs used in the document indicate useful information.

Note

Tip

1.3.3 Abbreviations

Abbreviation	Meaning in this document
CDA	Clean dry air
CF	Flange: Metal-sealed connector in accordance with ISO 3669
Delta P	Delta pressure
DN	Nominal diameter as size description
FKM	Fluoropolymer rubber
GV	Manual gate valve, HV
GVM	Manual gate valve, UHV
HV	High vacuum
IPA	Isopropyl alcohol
ISO	Flange: Connection in accordance with ISO 1609 and ISO 2861
OFHC	Oxygen free copper
UHV	Ultra-high vacuum

Tbl. 1: Abbreviations used in this document

1.4 Trademark proof

- Apiezon® is a registered trademark of M&I Materials Ltd.
- Allen® is a registered trademark of Apex Brands, Inc
- Loctite® is a registered trademark of Henkel IP & Holding GmbH, Germany.

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

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.

Risks during installation

⚠ WARNING

Risk of injury due to incorrect installation

Dangerous situations may arise from unsafe or incorrect handling

► Do not put hands or any other body part or objects in the valve.

Risks during maintenance, decommissioning 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.

2.3 Safety precautions

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.
- ► Never put hands or any other object in the valve.

2.4 Limits of use of the product

Parameter	Limit value
Installation orientation	Product may be installed in any orientation, with flow in either direction. Common installation direction is gate seal side facing away from the vacuum pump
Allowable ambient humidity	0 - 95 % non-condensing
Process temperature range	-18 °C - 200 °C Process temperatures above 150 °C may require use of seal materials other than FKM
Heating capabilities	Body can be heated up to 150 °C Actuator can be heated up to 60 °C
Maximum internal pressure	1000 hPa
Maximum delta P before opening	1000 hPa in open direction. 1000 hPa in closing direction.
Reliability	100,000 cycles in a clean environment
Leak rate	High Vacuum: 1 x 10^{-9} hPa l/s Ultra-High Vacuum: 1 x 10^{-10} hPa l/s
Overpressure limits	Valves are designed to run at maximum 5500 hPa. Do not operate valves above 5500 hPa.

Tbl. 2: Limits of use for pneumatic gate valves

2.5 Proper use

- ► Use the valve to isolate vacuum.
- ► Use the valve only in closed indoor areas.
- ► Use the valve only for the evacuation of dry and inert 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 in accordance with the technical data
- Use with corrosive or explosive media, if this is not explicitly permitted
- Use outdoors
- Use with bare hands or with powder gloves
- Use after unauthorized technical changes (on the inside or the outside of the product)
- Use with replacement or accessory parts that are unsuitable or are not approved

2.7 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 Function

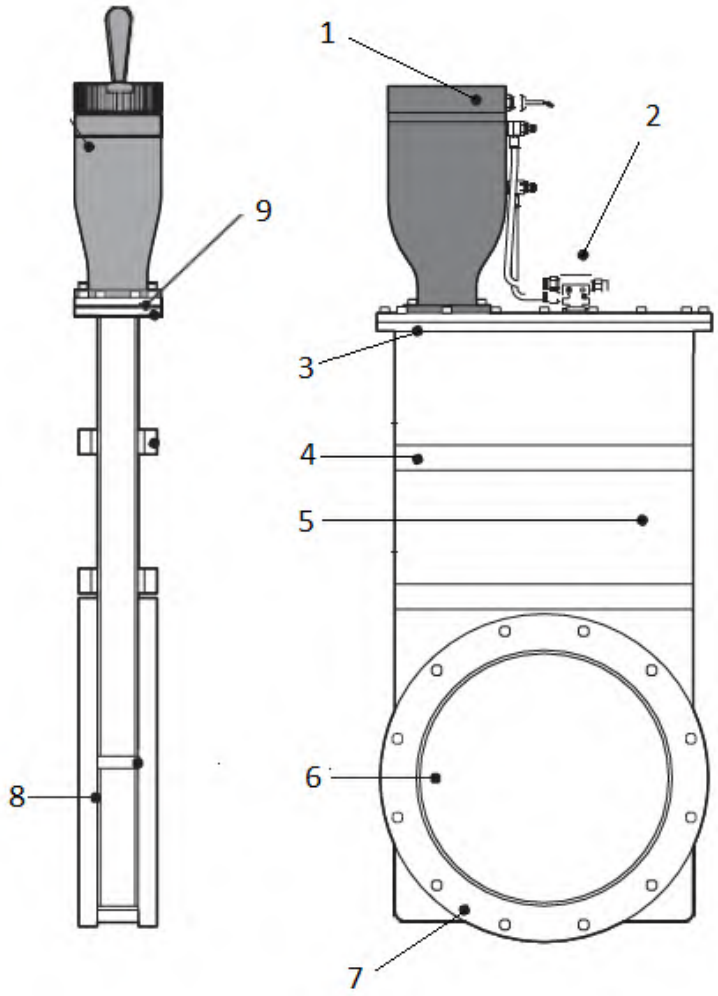


Fig. 1: Pneumatic gate valve overview

1 Pneumatic actuator: air cylinder with piston
2 Actuator solenoid
3 Bonnet flange
4 Structural supports
5 Valve body
6 Gate (seal) side with O-ring
7 Port flange: standard CF or KF/ISO
8 Carriage side
9 Bonnet seal: elastomer or metal

3.2 Scope of delivery

- Valve
- Quick-start guide

3.3 Identifying the product

► To ensure clear identification of the product when communicating with Pfeiffer Vacuum, always keep all of the information on the model number and serial number on hand.

3.3.1 Product types

The product designation of Pfeiffer Vacuum gate valves from the GVP (high vacuum) and GVMP (ultra-high vacuum) series is composed of the family name, the size and, if required, an additional feature description.

Family	Size/model
GVP	DN 16 to 320
GVMP	DN 16 to 320

Tbl. 3: Product designation of Pfeiffer Vacuum pneumatic gate valves

3.3.2 Product features

Feature	Description	Valve version
Valve body material	304 stainless steel	GVP and GVMP
Welded bellows shaft seal	AM-350	GVP and GVMP
Bonnet / gate seals	FKM elastomer	GVP
	OFHC copper / FKM elastomer	GVMP

Tbl. 4: Pneumatic gate valve features

4 Transportation and Storage

4.1 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.

We recommend

Pfeiffer Vacuum recommends keeping the transport packaging and original protective cover.

Instructions for safe transport

- ► Transport the valve only within the permissible temperature limits.
- ► Where possible, always transport or ship the valve in its original packaging.
- ► Always carry the valve with both hands or use adequate equipment to transport the valve.
- ► Remove the protective cover only immediately prior to installation.
- ► Transport the valve in the closed position.

4.2 Storage

We recommend

Pfeiffer Vacuum recommends storing the products in their original transport packaging.

Storing the valve

1. Seal all flange openings with the original protective caps.
2. Seal all other connections (e.g. venting connection) with the corresponding original parts.
3. Store the valve only indoors within the permissible temperature limits.

5 Installation

5.1 Preparatory work

⚠ WARNING

Risk of injury due to incorrect installation

Dangerous situations may arise from unsafe or incorrect handling

► Do not put hands or any other body part or objects in the valve.

General notes for the installation of vacuum components

► Choose an installation location that permits access to the product and to supply lines at all times.
► Observe the ambient conditions given for the limits of use.
► Provide the highest possible level of cleanliness during assembly.
► Ensure that flange components during installation are grease-free, dust-free and dry.

Required tools and materials

- Lint-free, dry wipe
- Powder-free latex gloves
- Vacuum grease

Pre-installation

1. Observe the instructions for transport to the installation location.
2. Determine that the valve and adjacent plumbing in the vacuum system will be adequately supported when installed.
3. Make sure the mating flanges are in line, flat, parallel, and the correct distance aparty to minimize straining of the valve body.
4. Remove the flange cover and wipe the flange and gaskets with a lint-free, dry wipe.
5. If installing an o-ring seal flange, apply a light film of vacuum grease to the o-ring and install in the flange groove.

5.2 Bench test

A capacitance manometer is not necessary for test purposes. If possible, test the unit when it is under vacuum.

Prerequisites

- Before installing the valve into a system, run a bench test to verify the gate functions are operational.

Bench test procedure

1. Connect air lines by pressing on the air fitting ring and inserting the air line.
2. Release the air fitting ring to grip and secure the air line.
   – Smaller valves have the solenoid remotely mounted.
   – The fitting closest to the bonnet will open the valve, and the other fitting will close the valve.
   – In all cases, air is exhausted through the solenoid.
3. Confirm that the valve actuates properly by carefully checking the operation of the valve using the minimum air pressure required to achieve full closure.
4. First, make sure the gate is actuated into the open position.
5. Next, slowly close the valve using the minimum amount of air required until you visually see the gate O-ring make contact.
6. Increase pressure by 2.5 kg increments, as necessary to achieve a seal.

5.3 Mounting orientation

It is preferable to install the valve with vacuum on the backside of the gate so the valve body remains under vacuum at all times and the pump down of the valve body is eliminated.

- For sizes 16 mm – 160 mm, valve can be mounted in any orientation
- For sizes 200 mm – 320 mm and greater, contact Pfeiffer Vacuum Service for suggested valve orientation.
- Valves are adjusted for horizontal actuation.
- Valves that are mounted with vertical actuation may require more torque on the actuator knob to compensate for the weight of the gate-carriage assembly.

5.4 Mounting instructions

- ► Make sure no foreign particles enter the valve.
- ► For continued trouble-free operation, it is recommended that an air filter/lubricator be used in the air line system.
- ► Refer to the solenoid nameplate for the correct voltage when connecting to the electrical service.
- ► Connect the compressed air supply to the valve using PTFE tape on the threads to ensure leak-proof joints.
- ► Carefully check the opeartion of the valve using 1400 hPa air pressure.
- ► Position indicator switches are preset. Wires are marked for OPEN/CLOSE indicators.
- ► When installing the valve, it is imperative that proper length bolts be used.
  - – Bolts longer than the thickness of both mating flanges will damage the body panels and destroy the seal surface area for the gate O-ring.
  - – For best results, always use bolts that are at least 1/4-inch (6.4 mm) shorter than the thickness of both mating flanges.
- ► Lightly grease the flange bolts with high temperature, non-galling type grease such as Loctite® Heavy Duty Anti-Seize or equivalent.
- ► Carefully tighten the bolts around the flange using the proper torque sequence until flanges are metal to metal and bolts are at proper torque.

5.4.1 Torque values

Valve size (mm)	Torque (Nm)
16	10.9 - 13.6
40	20.4 - 24.5
50 and larger	34 - 40.8

Tbl. 5: Torque values for copper gaskets for CF-F flanges

Valve size (mm)	Torque (Nm)
16	6.8 - 10.9
40	10.9 - 13.6
50 and larger	20.4 - 27.2

Tbl. 6: Torque values for FKM O-rings for ISO and other flanges

5.4.2 Proper torque sequence

Prerequisites

- 180° bolt sequence.
- Always follow the proper bolt sequence for each of the following steps of tightening.

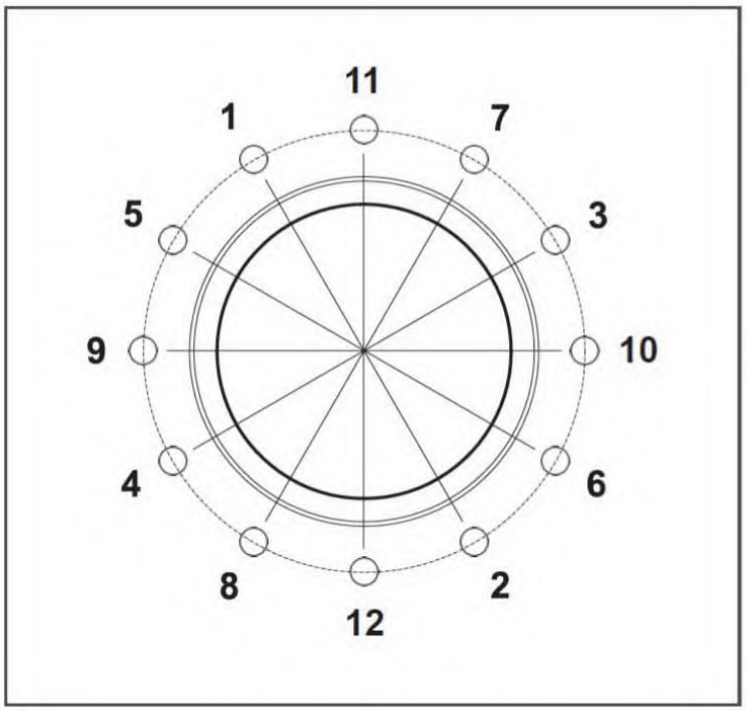


Fig. 2: Torque sequence example

Number of bolt holes will vary depending on flange type and size.

Proper tightening

1. Finger tighten bolts first.
2. Tighten supply with wrench to 1/2 the required torque.
3. Tighten to recommended torque range.

6 Operation

- For continued trouble-free operation, keep the valve clean and free of contaminants.
- Use powder-free latex gloves to avoid contaminating the valve with finger oils.
- Work in a clean environment to avoid other contamination.

7 Maintenance

7.1 General maintenance information

⚠ 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.

General notes

- For continued trouble-free operation, keep the valve clean and free of contaminants.
- Use powder-free latex gloves to avoid contaminating the valve with finger oils.
- Work in a clean environment to avoid other contamination.
- Use the crank handle to manually open or close the gate valve.

Required spare parts

1. To order replacement parts or repair kits, contact Pfeiffer Vacuum service.
2. Please provide the model number and serial number when ordering replacement parts.

Serviceable parts

- ► Contact Pfeiffer Vacuum service for repair of non-user-serviceable parts

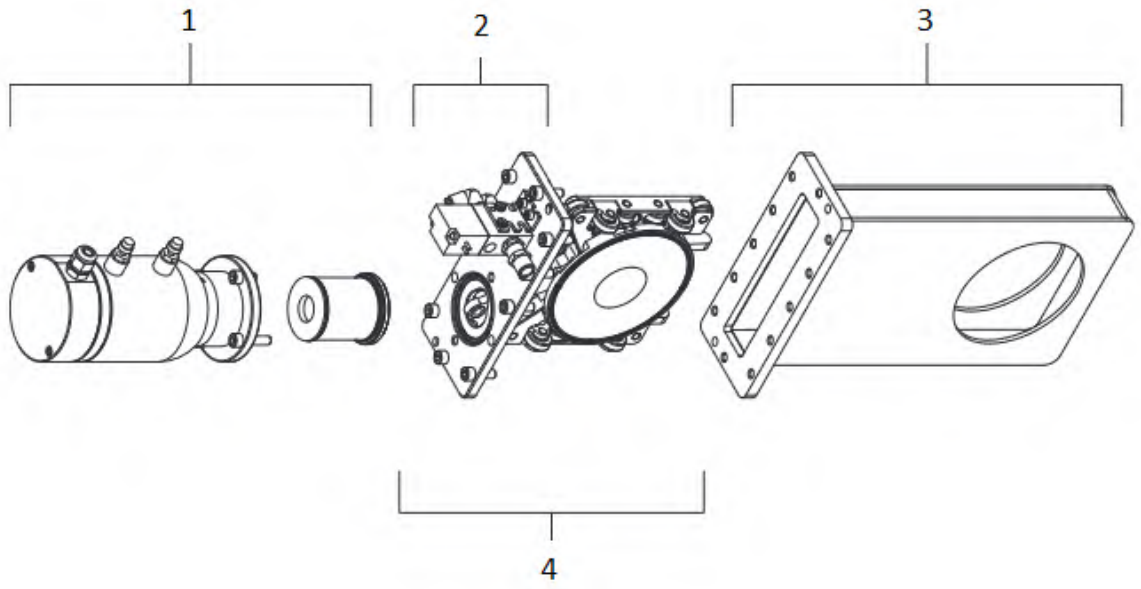


Fig. 3: Pneumatic gate valve | serviceability

1	Gate actuator	3	Valve body
2	Solenoid	4	Gate/Strongback

Gate actuator	Solenoid	Valve body	Gate/strongback
• Drive shaft O-ring • Piston O-ring • Piston wear rings • Bellows • Bellows O-ring	No user serviceable parts	No user serviceable parts	• Gate O-ring • Bonnet O-ring or gasket • Pins • Bearings • Washers • Retaining rings • Set screws • Gate spring

Tbl. 7: Pneumatic gate valve | serviceable parts

7.2 Removing bonnet actuator carriage assembly

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

All servicing of O-rings, bellows, pins, and bearings requires removal of the bonnet actuator carriage assembly from the valve body.

Required tools and materials

- Allen wrench set: sizes 0.028" - 3/8"
- 1/2" box wrench
- 1/4" 12pt. wrench
- 5/16" 12pt. wrench
- Powder-free latex gloves
- Appropriate replacement O-rings or metal gasket

Prerequisites

- Vacuum system vented to atmospheric pressure
- Electrical supply disconnected
- Valve actuated to GATE OPEN position

Procedure

1. Remove the bolts that hold the bonnet actuator carriage assembly to the body.
2. Pull out the bonnet actuator carriage assembly, taking care not to move the adjustement of the linkage.
3. Support the carriage with a block to minimize stress on linkage

7.3 Maintaining gate and bonnet seals

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

For standard and metal seal bonnets

Required tools and materials

- Allen wrench set: sizes 0.028" - 3/8"
- 1/2" box wrench
- O-ring pick, plastic
- Powder-free latex gloves
- Grease for O-rings: Apiezon L
- Isopropyl alcohol
- Appropriate replacement O-rings or metal gasket

Prerequisites

- Bonnet actuator carriage assembly removed

Remove bonnet O-ring

1. Remove bonnet O-ring or metal gasket with a plastic pick to avoid scratching the O-ring groove.
2. Remove gate O-ring with the plastic pick to avoid scratching the O-ring groove.
3. Discard the O-rings or metal gaskets.
4. Clean the O-ring groove with IPA and dry out with nitrogen or CDA.
5. Apply a light coat of Apiezon-L grease to the new gate O-ring.

Insert new bonnet O-ring

1. Install new O-ring on the gate.
   - Set new O-ring on gate
   - Press O-ring in at 6 and 12 o'clock
   - Press at 3 and 9 o'clock
   - Continue pressing O-ring into groove at 180° apart intervals
   - Smooth out the O-ring all the way around the groove
2. Apply a light coat of Apiezon-L grease to the new bonnet assembly FKM O-ring. Install the copper gasket dry.
3. Install new O-ring or gasket on the bonnet assembly.
4. Replace bonnet actuator carriage assembly into the body.
5. Install bolts and tighten.
   - For metal seal/copper gasket type, tighten each bolt 1/8th turn at a time until bonnet plate and body are metal to metal.

7.4 Replace bellows, piston, & shaft seals

Use for gate valves with elastomer seal only. If your valve is a metal sealed gate valve (UHV), please send back to Pfeiffer Vacuum for servicing.

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

Required tools and materials

- Special spanner wrench / custom piston removal tool
- Allen wrench set: size 0.028" - 3/8"
- Calipers
- O-ring pick, plastic
- Retaining ring pick
- Needle-nose pliers
- Small standard screwdriver
- Powder-free latex gloves
- Actuator O-rings
- Grease for bellows O-ring: Apiezon L
- Vacuum grease
- IPA
- Heat gun
- Loctite

Prerequisites

- Valve in GATE OPEN position
- Bonnet actuator carriage assembly removed
- Actuator cover (2 screws) removed
- Actuator top (6 screws; For DN 250 and DN 300, 4 screws) removed

Disassemble bellows and shaft

1. Measure the distance between the top of the piston and the top of the drive nut shaft: DIM "A"
2. Remove the jam nut from the drive shaft
   - Heat gun may be needed to melt the Loctite on the thread.

3. Using a spanner wrench, mate the knobs on the wrench with the indentations on the piston
4. Turn the piston counterclockwise to unscrew and remove the piston from the actuator housing.
5. Remove O-ring from the top of the drive shaft. This will allow the actuator housing to slide off the drive shaft.
6. Remove remaining screws holding the actuator housing to the bonnet plate (2 screws).
7. Remove the actuator housing.
8. Remove retaining ring from drive shaft, using a pick
   – If a replacement is not available, use care to preserve the retaining ring. Otherwise pull out using the needle nose pliers and discard.
9. Remove bellows by pulling and twisting slightly and discard.
10. Remove O-ring in the bellows drive shaft area and discard.
11. Clean drive shaft groove and bellows area with IPA.

Assemble bellows and shaft

1. Apply a thin coat of grease on the bellows area drive shaft O-ring.
2. Install O-ring for bellows area drive shaft.
3. Apply a thin coat of grease to the O-ring for the bellows base flange.
4. Install O-ring for the bellows base flange.
5. Replace bellows assembly on the drive shaft, pushing and twisting slightly to go over the O-ring.
6. Install retaining ring on the drive shaft, using a screw driver and a pick. Make sure it clicks into the groove next to the top of the bellows.
7. Apply a thin coat of vacuum grease to the drive shaft.
8. Install actuator housing on the bonnet plate (2 screws).
9. Apply a thin coat of vacuum grease to the O-ring for the top of the drive shaft.
10. Install O-ring on the top of the drive shaft.
11. Apply a thin coating of vacuum grease to the piston area, if necessary.
12. Install piston on the drive shaft.
    – Using a spanner wrench, turn clockwise until "DIM A" is achieved.
    – It is helpful to visually locate the start of the threads for both the drive shaft and the piston. Line them up so a first turn produces correct threading. Be careful to not cross-thread.
13. Install jam nut using Loctite and tighten.

Assemble valve

1. Install actuator top with position indicator reed switches and tighten screws.
2. Install actuator cover and tighten screws (2 screws).
3. Replace bonnet actuator carriage assembly into the body.
4. Install bolts and tighten.
   – For metal seal bonnet, copper gasket, type, tighten side to side 27-34 Nm.
5. Install air line and test operation of the valve and actuator.

7.5 Replace actuator O-ring

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

Required tools and materials

- Spanner wrench
- Allen wrench set: size 0.028" - 3/8"
- O-ring pick, plastic
- Needle-nose pliers
- Small standard screwdriver
- Powder-free latex gloves
- Actuator O-ring replacements
- Grease for bellows O-ring: Apiezon L
- Vacuum grease
- IPA
- Heat gun
- Loctite

Prerequisites

- Valve in GATE OPEN position
- Bonnet actuator carriage assembly removed
- Actuator cover (2 screws) removed
- Actuator top (6 screws; for DN 250 and DN 300, 4 screws) removed

Disassmble actuator

1. Measure and record the piston to drive shaft dimension "DIM A".
2. Remove the jam nut from the drive shaft.
   – Heat gun may be needed to melt the Loctite on the thread.
3. Using a spanner wrench, mate the knobs on the wrench with the indentations on the piston.
4. Turn the piston counterclockwise to unscrew and remove piston from actuator housing.
5. Remove O-ring from top of the drive shaft. This will allow the actuator housing to slide off the drive shaft.
6. Remove remaining screws holding the actuator housing to the bonnet plate (2 screws)
7. Remove the actuator housing.
8. Remove O-ring in actuator housing using a pick and using care to not scratch the groove surface.

Assemble actuator

1. Apply a thin coat of vacuum grease to the new O-ring.
2. Install O-ring.
3. Inspect the drive shaft and clean and lubricate as neceassary.
4. Install actuator housing on the bonnet plate and tighten screws (2 screws).
5. Apply a thin coat of vacuum grease on the O-ring for the top of the drive shaft.
6. Install O-ring.
7. Inspect actuator housing and clean using IPA and lubricate as necessary.
8. Apply a thin coat of vacuum grease on the O-ring for the piston.
9. Install O-ring on the piston.
10. Install piston on drive shaft, using a splanner wrench and turn clockwise until "DIM A" is acheived.
11. Install jam nut using Loctite and tighten.
12. Apply a thin coat of vacuum grease to the O-ring for the actuator top.
13. Install O-ring on the actuator top.
14. Install actuator top with position indicator reed switches and tighten screws (6 screws; For DN 250 and DN 300, 4 screws).
15. Install actuator cover and tighten screws (2 screws).
16. Replace bonnet actuator carriage assembly into the body.
17. Install bolts and tighten.
    – For metal seal bonnet, copper gasket valves, tighten side to side 27-33 Nm.
18. Install air line and test operation of valves and actuator.

7.6 Seal plate assembly, pins, and bearings

DN100 and up sizes only

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

Required tools and materials

- Allen wrench set: size 0.028" - 3/8"
- Arbor press
- Punch
- Hammer
- Wrenches, box or open
- Retaining ring pliers
- Calipers
- Vacuum grease: Castrol Braycote 296
- IPA

- Powder-free latex gloves
- Replacement pins, bearings, washers, and retaining rings; optional gate spring

Prerequisites

- Vacuum system on both sides of the valve vented to atmosphere
- Valve in GATE OPEN position
- Air to actuator removed

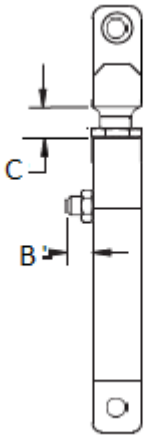


Fig. 4: Lowerlink assembly adjustment

Disassemble gate from strongback

1. Remove bolts that hold the bonnet actuator assembly to the body.
2. Pull out the bonnet actuator carriage assembly.
3. Using a punch and hammer, remove the pin that holds the upper linkage to the lower linkage-upperlinkage of the Strongback.
4. Inspect the pin assembly and place the punch on the end with the retaining ring.
   – If the pin does not move, turn the assembly over and try from the other side.
5. Discard all pins, washers, and retaining rings and replace with all new parts.
   – There should be three washers and a retaining ring recovered along with the pin.
   – Caution: Be careful not to bend the upper linkage; the use of a block for support is recommended.
6. Separate the bonnet upper linkage assembly from the carriage assembly.
7. Measure the distance between the strongback lower linkate and the upper linkage-lower linkage, dimension C. This will be helpful later during reassembly and valve adjustment. Record this dimension.
8. For DN 160 and DN 200 valves, measure the overcenter adjustment, dimension B, and record it.
9. Move carriage assembly to a suitable work place for disassembly and the replacement of pins, bearings and retaining rings.
10. Remove gate spring by removing one set screw.
    – Now the gate can be raised slightly from the strongback
11. Remove four screws that mount the gate to the strongback. They are accessible under the gate, two each end, top and bottom
12. Separate the gate from the strongback. Lift off the gate from the strongback as if opening a book with the bottom of the assembly as the spine of the book.
13. Remove set screws, links, washers, pins, and carriage bars and discard all used parts, except carriage bars.
    – Re-using worn or used parts will lead to operational failure and damage to the valve.
14. Using a punch and hammer, remove pins from wheels.
    – Before punching, inspect the pin assembly and place the punch on the end with the retaining ring.
    – If the pin does not move, try from the other side.
15. Using an arbor press, remove the bearings from the links and wheels and discard expendable parts.
16. Clean all reusable parts such as the gate, strongback, links, carriage bars, and gate spring with IPA.

Assemble gate to strongback

1. Press the new bearings in using an arbor press.
   – For FKM bonnet sealing valves, ensure that the bearings are properly lubricated with the appropriate vacuum grease (Castrol Braycote 296 or equivalent).
   – For copper sealed bonnet valves, run bearings dry.
2. Verify that all bearings spin freely.
3. Install the washers, pins, and retaining rings into strockback using the recommended technique.
   – Slide long side of pin through hole first (the side without the groove)
   – Install retaining ring close to the end of the pin, not in the groove
   – Add one washer
   – Add the wheel, then one more washer
   – Push pin in until the retaining ring snaps into its groove
4. Verify that all wheels spin freely.
5. Set strongback aside for later assembly.
6. Install links, washers, and pins into gate slots. Use a small amount of Braycote 296 on washers to make them stick to the links during assembly.
7. Adjust pins to correspond to strongpack pin pockets. Align the pins so they will be in the center of each slot when the gate lies on the strongback.
8. Install gate to strongback and verify that all pins fit into strongback pockets.
9. Install four new set screws under the gate which were removed earlier. Watch to see that the gate does not rise up when the set screws are tightened.
10. Verify that the gate is flush with the strongback in the down position and moves freely up and down.
11. Install gate spring. This may require pressure to compress the spring.
12. Install and tighten set screw.
13. Re-attach upper linkage to strongback lower linkage-upper linkage
    – Slide long side of pin through hole first (the side without the groove)
    – Install retaining ring close to the end of the pin, not in the groove
    – Add one washer
    – Add the upper link, then the other two washers
    – Push pin in until the retaining ring snaps into its groove
14. Verify that the link moves freely.
15. Verify dimensions B and C that were recorded earlier and adjust as necessary.
    – The bonnet actuator carriage assembly can now be reinstalled into the valve body.
16. Replace the complete assembly into the valve body.
17. Tighten the bolts.
18. Test the valve operation to ensure proper functionality.
19. If necessary, refer to the valve adjust procedure to fine tune the valve.

7.7 Valve adjustment

Compression and over-center

- Always wear powder-free latex gloves when servicing the valve
- Be careful not to scratch o-ring groove
- Avoid twisting, stretching, or deforming the o-ring
- Avoid damaging the materials
- Heat gun may be required to melt any Loctite on jam nut threads

Required tools and materials

- Allen wrench set: size 0.028" - 3/8"
- Wrench set, box or open
- Calipers
- Air regulator
- Heat gun
- Powder-free latex gloves

Prerequisites

- Either remove valve from system or vent system to atmosphere
- Open gate valve

- Remove air to actuator
- Remove actuator cover
- Remove actuator top

Adjust the valve

1. Loosen the jam nut on drive shaft.
   – This may require the use of the heat gun to melt the Loctite on the thread.
2. Check dimension A on the valve adjustment chart for the specific valve size.
3. Adjust and tighten jam nut. Do not use Loctite at this point as adjustment may be needed later.
4. Install actuator top, using only 2-4 screws.
5. Remove bolts holding the bonnet actuator assembly to valve body. For quick-clamp bonnet, undo the clamp.
6. Pull out actuator bonnet carriage assembly from valve body.
7. Check dimension C on the valve adjustment chart for the specific valve size.
8. To adjust, loosen jam nut, then turn lower linkage-upper linkage counterclockwise to increase dimension for more compression; or turn clockwise to decrease the dimension for less compression.
   – More compression means more air pressure to lock the valve; less compression means less air pressure to lock the valve
9. After adjusting, tighten jam nut.
10. Reassemble bonnet carriage assembly on the valve body.
11. Using an in-line air regulator, check the air pressure required to lock valve. Refer to valve adjustment vhart for recommended locking air pressure per gate valve size.
12. Adjust dimension C until the correct locking air pressure is achieved.
13. Check dimension B on valve adjustment chart for specific valve size, depending on overcenter or no overcenter requirement.
   – Proper overcenter means that the gate does not drop when air pressure is removed from the actuator.
14. If necessary, loosen nut and adjust dimension B by turning screw counterclockwise to increase dimension for less overcenter or turn clockwise to decrease the dimension for more overcenter.
   – Less overcenter means less traval for the linkage; more overcenter means more travel.
15. Check for overcenter adjustment: If gate drops after removal of air pressure for valves that require overcenter, recheck and readjust dimension B.
16. Tighten nut
17. Install all bolts and tighten.
18. Test valve operation.

Valve size	Dimension A Piston adjust*	Dimension B Overcenter adjust	Dimension B No overcenter adjust	Dimension C Compression adjust	Recommended locking air pressure
DN 40	2.794 mm **	N/A	N/A	5.145 mm	1380 - 2070 hPa
DN 50	3.048 mm **	N/A	N/A	8.820 mm	2400 - 3500 hPa
DN 63	3.063 mm **	N/A	N/A	4.655 mm	2400 - 3800 hPa
DN 80	3.063 mm **	N/A	N/A	9.555 mm	4130 - 4480 hPa
DN 100	N/A	7.061 mm	8.820 mm	10.290 mm	1380 - 2400 hPa
DN 160	N/A	2.159 mm	3.920 mm	8.575m	2400 - 3100 hPa
DN 200	N/A	9.271 mm	11.393 mm	6.370 mm	3800 - 4830 hPa
DN 250	N/A	-	19.600 mm	17.640 mm	1720 - 2400 hPa
DN 260	N/A	15.558 mm	26.289 mm	13.970 mm	2070 - 2760 hPa
DN 300	N/A	15.680 mm	26.289 mm	13.970 mm	2070 - 2760 hPa
DN 350	N/A	-	-	-	3100 - 3800 hPa
DN 400	N/A	13.230 mm	18.620 mm	13.230 mm	
DN 450	N/A	-	-	-	4130 - 5520 hPa
DN 500	N/A	-	-	-	-

* = Starting adjustment

** = Piston adjustment controls overcenter adjustment

Tbl. 8: Valve adjustment chart

8 Decommissioning

Dismounting the valve

1. Vent system to atmosphere
2. Close the valve
3. Carefully loosen the bolts around the flange
4. Dismount the valve from the system

9 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.

9.1 General disposal information

Pfeiffer Vacuum products contain materials that you must recycle.

- ► Dispose of our products according to the following:
  - – Iron
  - – Aluminium
  - – Copper
  - – Synthetic
  - – Electronic components
  - – Oil and fat, solvent-free
- ► Observe the special precautionary measures when disposing of:
  - – Fluoroelastomers (FKM)
  - – Potentially contaminated components that come into contact with media

10 Malfunctions

Problem	Possible causes	Remedy
Leak at gate	Dirty or damaged gate seal	• Replace the gate seal • Contact Pfeiffer Vacuum Service
Leak at body	Dirty or damaged bonnet gasket	• Check for a leak using a leak detector on the actuator • Replace the bonnet seal • Contact Pfeiffer Vacuum Service
Valve does not open / close	Air pressure issue	Check compressed air connection
	Operating pressure issue	Check and adjust operating pressure
	Electrical connection faultry	Connect the voltage, if applicable
Gate open/ close is stuck	• Wheels and bearings in the gate/ carriage assembly have seized • Flanges have been over-tightened and are compressing the body causing the gate to seize • Bolts used in the flanges are are too long and have dented the inside of the body	• Replace the wheels and bearings in the gate/carriage assembly • Contact Pfeiffer Vacuum Service

Tbl. 9: Troubleshooting the valve

11 Service solutions by Pfeiffer Vacuum

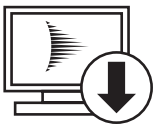
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum quality.

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

Make use of Pfeiffer Vacuum service
Whether preventive, on-site service carried out by our field service, fast replacement with mint condition replacement products, or repair carried out in a Service Center near you – you have various options for maintaining your equipment availability. You can find more detailed information and addresses on our homepage, in the Pfeiffer Vacuum Service section.

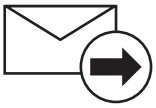
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



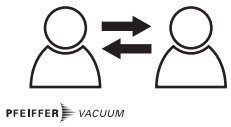
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

a) Remove and store all accessories (all external parts, such as valves, protective screens, etc.).
b) If necessary, drain operating fluid/lubricant.
c) If necessary, drain coolant.

2. Complete the service request and contamination declaration.

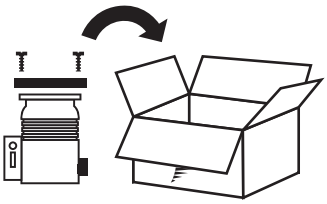


3. Send the forms by email, fax, or post to your local Service Center.

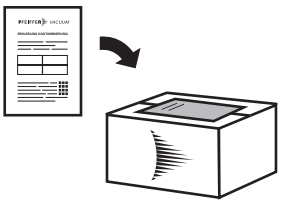


4. You will receive an acknowledgment from Pfeiffer Vacuum.

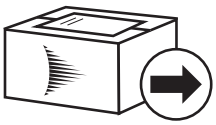
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree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



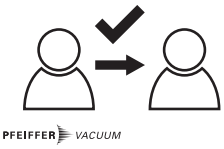
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product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

12 Spare parts - Gate valve

For size not shown on the below tables, please contact Pfeiffer Vacuum for more information on the recommended spare parts.

Size	Elastomer or metal sealed gate valve	Part number
DN 40 - DN 80	Elastomer (GV or GVP)	KBB15S - 96
DN 100 - DN 200	Elastomer (GV or GVP)	KBB4-85
DN 250 - DN 320	Elastomer (GV or GVP)	KBB10-12S-96
DN 40	Metal seal (GVM or GVMP)	KBB15M-96
DN 63	Metal seal (GVM or GVMP)	KBB25M -96
DN 100	Metal seal (GVM or GVMP)	KBB40M -96
DN 160	Metal seal (GVM or GVMP)	KBB60M-96
DN 200	Metal seal (GVM or GVMP)	KB80M-96

Tbl. 10: Overview of the bellow kits available for the gate valves

Size	Elastomer or metal sealed gate valve	Part number
DN 40	Elastomer (GV or GVP)	KSB15S
DN 63	Elastomer (GV or GVP)	KSB25S
DN 100	Elastomer (GV or GVP)	KSB40S
DN 160	Elastomer (GV or GVP)	KSB60S
DN 200	Elastomer (GV or GVP)	KSB80S
DN 250	Elastomer (GV or GVP)	KSB100S
DN 320	Elastomer (GV or GVP)	KSB120S
DN 40	Metal seal (GVM or GVMP)	KSB-15SM
DN 63	Metal seal (GVM or GVMP)	KSB-25M
DN 100	Metal seal (GVM or GVMP)	KSB-40M
DN 160	Metal seal (GVM or GVMP)	KSB-60M
DN 200	Metal seal (GVM or GVMP)	KSB-80M
DN 250	Metal seal (GVM or GVMP)	KSB-100M
DN 320	Metal seal (GVM or GVMP)	KSB-120SM

Tbl. 11: Overview of the seal kits available for the gate valves

13 Technical data and dimensions

13.1 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. 12: 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. 13: Conversion table: Units for gas throughput

13.2 Technical data and product dimensions

- Please refer to the Pfeiffer Vacuum website for specific valve size and configuration data sheets and dimensions.
- If your valve is not listed on the Pfeiffer Vacuum website, please contact Pfeiffer Vacuum Service for more information.

VACUUM SOLUTIONS FROM A SINGLE SOURCE

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

COMPLETE RANGE OF PRODUCTS

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

COMPETENCE IN THEORY AND PRACTICE

**Benefit from our know-how and our portfolio of training opportunities!
We support you with your plant layout and provide first-class on-site service worldwide.**

ed. A - Date 2203 - P/N:NV4022OEN

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

Pfeiffer Vacuum GmbH
Headquarters • Germany
T +49 6441 802-0
info@pfeiffer-vacuum.de

www.pfeiffer-vacuum.com

PFEIFFER VACUUM