

OPERATING INSTRUCTIONS

EN

Translation of the Original

MVP 015-2

Diaphragm pump

PFEIFFER  **VACUUM**




蒙天真空
MT VACUUM

Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new diaphragm pump is designed to support you with its performance, perfect operation and without impacting your individual application. The name Pfeiffer Vacuum stands for high-quality vacuum technology, a comprehensive and complete range of top-quality products and first-class service. From this extensive, practical experience we have gained a large volume of information that can contribute to efficient deployment and to your personal safety.

In the knowledge that our product must avoid consuming work output, we trust that our product can offer you a solution that supports you in the effective and trouble-free implementation of your individual application.

Please read these operating instructions before putting your product into operation for the first time. If you have any questions or suggestions, please feel free to contact info@pfeiffer-vacuum.de.

Further operating instructions from Pfeiffer Vacuum can be found in the [Download Center](#) on our website.

Disclaimer of liability

These operating instructions describe all models and variants of your product. Note that your product may not be equipped with all features described in this document. Pfeiffer Vacuum constantly adapts its products to the latest state of the art without prior notice. Please take into account that online operating instructions can deviate from the printed operating instructions supplied with your product.

Furthermore, Pfeiffer Vacuum assumes no responsibility or liability for damage resulting from the use of the product that contradicts its proper use or is explicitly defined as foreseeable misuse.

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We reserve the right to make changes to the technical data and information in this document.



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1 About this manual



IMPORTANT

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

1.1 Validity

This 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 Applicable documents

Designation	Document
Declaration of conformity	A component of these operating instructions

1.1.2 Variants

These instructions apply to diaphragm pumps of the AC series:

- MVP 015-2 as standard version

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 Stickers on the product

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

	<p>Rating plate Rating plate of the diaphragm pump</p>
	<p>Information on voltage selector switch This sticker indicates the necessity to adjust the existing mains voltage on the voltage selector switch before commissioning.</p>
	<p>Closure seal The product is sealed ex-factory. Damaging or removing a closure seal results in loss of the warranty.</p>

Tbl. 1: Stickers on the product



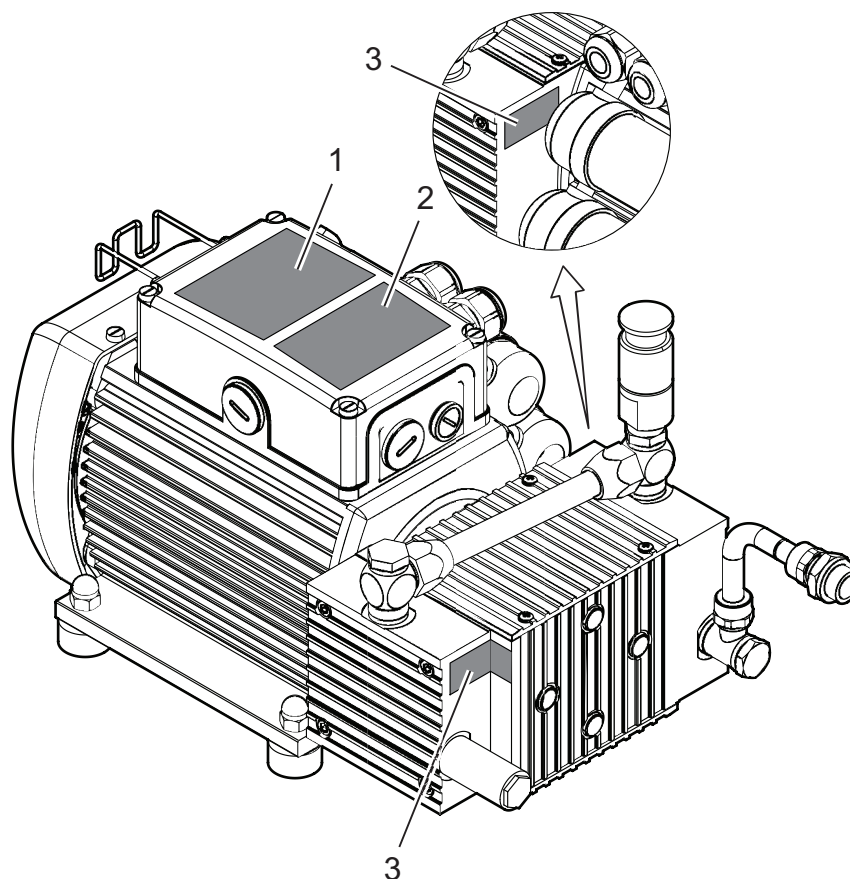


Fig. 1: Position of the stickers on the product

- | | |
|--|----------------|
| 1 Rating plate | 3 Closure seal |
| 2 Information on voltage selector switch | |

1.3.4 Abbreviations

Abbreviation	Meaning in this document
AC	Alternating current
DN	Nominal diameter (from the French: diamètre nominal)
EPDM	Ethylenepropylene diene-monomer rubber
MVP	Diaphragm vacuum pump
NN	Mean sea level
PA	Polyamide
PE	Polyethylene Earthed conductor (protective earth)
PVC	Polyvinyl chloride (PVC)
WAF	width across flats

Tbl. 2: Abbreviations used in this document

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

2.2 Safety instructions

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with Machinery Directive 2006/42/EC Annex I and EN ISO 12100 Section 5. As far as applicable, all unit life cycle phases have been considered.

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

⚠ DANGER**Danger to life from electric shock**

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

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

⚠ CAUTION**Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.

- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

Risks during operation

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

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

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

⚠ WARNING**Risk of burns on hot surfaces**

During vacuum pump operation, exposed surfaces reach high temperatures. There is a risk of burning.

- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Wear protective gloves (in accordance with EN 420).

Risks during maintenance, decommissioning and in the event of malfunctions

⚠ WARNING**Risk of burns on hot surfaces**

During vacuum pump operation, exposed surfaces reach high temperatures. There is a risk of burning.

- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Wear protective gloves (in accordance with EN 420).



⚠ 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.

Risks during disposal

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

2.3 Safety precautions

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

i

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.

i

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 for working with the vacuum pump

- ▶ Observe all applicable safety and accident prevention regulations.
- ▶ Check that all safety measures are observed at regular intervals.
- ▶ Do not expose body parts to the vacuum.
- ▶ Always ensure a secure connection to the earthed conductor (PE).
- ▶ Never disconnect plug connections during operation.
- ▶ Observe the above shutdown procedures.
- ▶ Keep lines and cables away from hot surfaces (> 70 °C).
- ▶ Never fill or operate the unit with cleaning agents or cleaning agent residues.
- ▶ Do not carry out your own conversions or modifications on the unit.
- ▶ Observe the unit protection class prior to installation or operation in other environments.
- ▶ Observe statutory and local regulations regarding solvents handling.
- ▶ Never operate an open or faulty unit.
- ▶ Before carrying out any maintenance, first allow the unit to cool and disconnect it from the vacuum equipment.



- ▶ Disconnect the vacuum pump from the mains prior to every intervention, and wait an additional five seconds until the capacitors have discharged.
- ▶ Implement suitable safety precautions where unintentional vacuum pump venting can cause hazards.
 - Power failures can cause unintentional venting.

2.4 Limits of use of the product

Installation location	Interiors, protected against the accumulation of dust and weather influences, in a non-explosive, dry environment
Installation altitude	max. 2000 m above sea level ¹⁾
Relative humidity of air	80% at T ≤ 31 °C, to max. 50% at T ≤ 40 °C
Protection degree IEC 60529	IP 20
Protection degree UL 50E	NEMA type 1
Overtoltage category	II
Degree of pollution	2
Ambient temperature	+12 °C to +40 °C

Tbl. 3: Permissible ambient conditions

2.5 Proper use

- ▶ Use the vacuum pump for vacuum generation only.
- ▶ Adhere to the installation, commissioning, operating, and maintenance instructions.
- ▶ Do not use any accessory parts other than those recommended by Pfeiffer Vacuum.

2.6 Foreseeable improper use

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

- Pumping of corrosive media
- Pumping of explosive media
- Pumping radioactive or volatile media
- Pumping of gases that contain impurities such as particles, dust, or condensate
- Pumping of fluids
- Pumping FPM-solubilizing media
- Pumping vapors from combustible liquids
- Pumping pressurized media (> atmospheric pressure)
- Pumping media that can condense or cause adhering deposits to form in the suction chamber
- Use of the vacuum pump outside the specified area of application
- Using the vacuum pump below ground
- Using the vacuum pump to generate pressure
- Using the vacuum pump in systems in which sporadic loads and vibrations or periodic forces act on the unit
- Using the vacuum pump in strong electrical, magnetic, or electromagnetic fields
- Connection to vacuum pumps or equipment which are not suitable for this purpose according to their operating instructions
- Connection to devices with exposed live parts
- Connecting to sockets without earthing contact
- Using pipes to lift the vacuum pump
- Use of accessories or spare parts that are not listed in these instructions
- Using the vacuum pump as a climbing aid
- Using the connection lines between the diaphragm heads as carrying handles
- Using the pump in ambient conditions that do not meet the specified IP protection degree limits

1) at an installation location above 1000 meters above sea level, there is a risk of insufficient cooling. If necessary, take measures according to Directive DIN EN 61010.

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

Diaphragm pumps are dry compressing positive displacement pumps. The movement of diaphragms generates a periodic change of the suction chamber volume. The gas flow causes the valves to open and close automatically. The pump unit is directly connected to the drive motor.

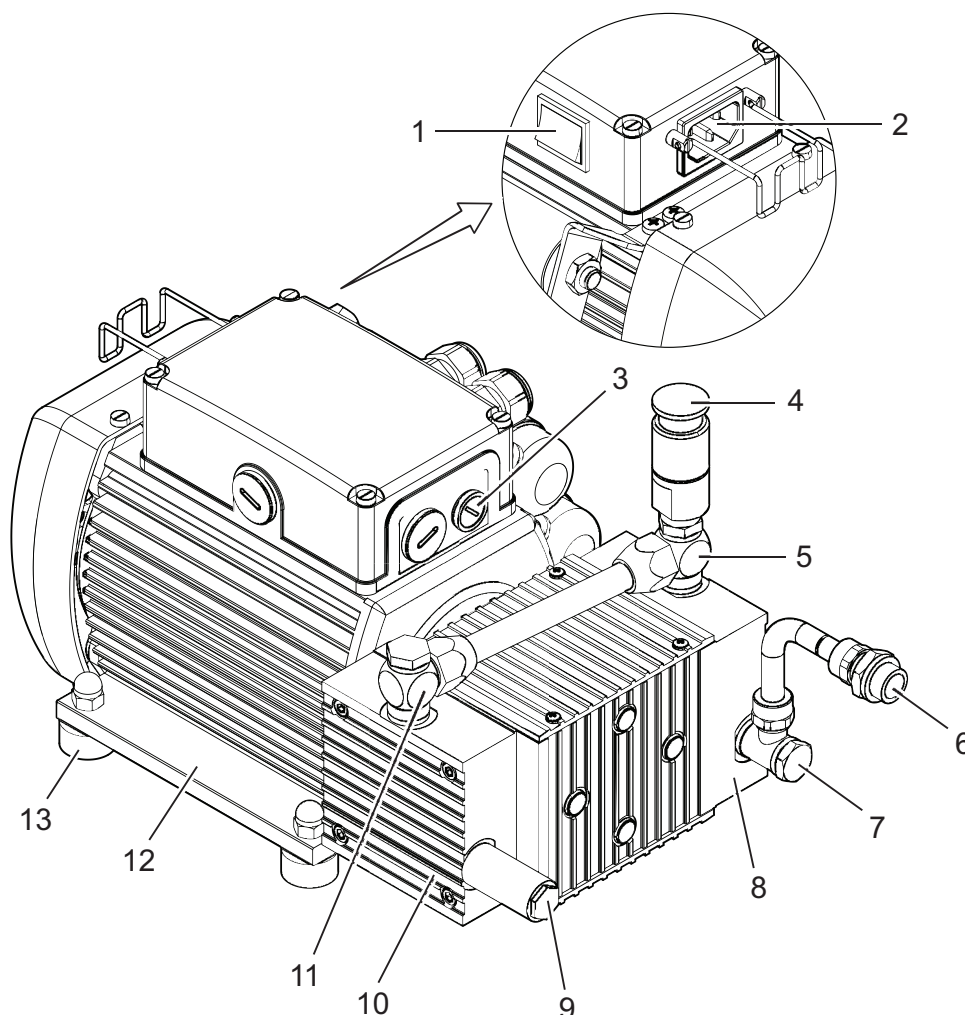


Fig. 2: Diaphragm pump design

- | | |
|---------------------------------------|------------------------------------|
| 1 Mains switch | 8 Diaphragm head 1 |
| 2 Mains connection with locking plate | 9 Exhaust connection with silencer |
| 3 Voltage selector switch | 10 Diaphragm head 2 |
| 4 Gas ballast valve | 11 Hose connection |
| 5 Banjo bolt for gas ballast valve | 12 Base plate |
| 6 Input amplification | 13 Rubber feet (4×) |
| 7 Vacuum connection | |

3.1.1 Drive

The drive motor is an alternating current motor with

- reversible voltage range on the voltage selector switch,
- thermal protection switch,
- mains switch and
- rubber connector

In event of excess temperature ($> 95\text{ °C}$), the thermic protection switch interrupts the motor current, but does not offer a permanent shut-down of the motor. Once the motor has cooled down, the vacuum pump restarts automatically.



3.1.2 Pumping system

The diaphragm pump has 2 diaphragm heads and 2 pumping stages.

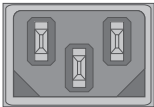
3.1.3 Cooling

The diaphragm pump is convection-cooled. The drive motor has its own fan.

3.1.4 Gas ballast

An integrated gas ballast system serves the controlled supply of ambient air or inert gas into the suction chamber. Gas ballast supports the reduction of condensate accumulating in the pumping system.

3.2 Connections

Connection	Description
	Mains power supply Housing connector C14 for the voltage supply

Tbl. 4: Connection description of the diaphragm pump

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 rating plate to hand.
- ▶ Learn about certifications through test seals on the product or at www.tuev-sued.de.

3.4 Scope of delivery

- Vacuum pump with drive
- Mains connection (reversible)
- Silencer
- G 1/8" elbow union with enclosed hose DN 6 x 1000 mm with a straight union in G 1/4" at the end
- Blind plug on the vacuum connection
- Operating instructions



4 Transportation and Storage

4.1 Transporting the vacuum pump

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.



Packing

We recommend keeping the transport packaging and original protective cover.

General information regarding safe transport

1. Observe the weight specified on the packaging.
2. Where possible, always transport or ship the product in the original packaging.
3. Always place the product on an adequately sized, level surface.

Transporting the vacuum pump without its packaging

1. Unpack the vacuum pump.
2. To protect the inside of the pump, leave the blind plugs on the vacuum connection during transport.
3. Lift the vacuum pump on both front sides.
4. Lift the vacuum pump out of the transport packaging.
5. Make sure that no forces are acting on the piping system.
6. Always place the vacuum pump on an adequately sized, level surface.

4.2 Storing the vacuum pump



Packing

We recommend storing the product in its original packaging.

Procedure

1. Seal the vacuum connection with the blind plug.
2. Store the vacuum pump only in dry, dust-free rooms, within the specified ambient conditions.
3. In rooms with humid or aggressive atmospheres: Hermetically seal the vacuum pump together with a drying agent in a plastic bag.

5 Installation

5.1 Installing the vacuum pump

Procedure


- ▶ Place the vacuum pump on a flat, horizontal surface.
- ▶ For stationary installation, screw the vacuum pump direct to the mounting surface.
- ▶ When installing the pump in a closed housing, ensure adequate air circulation.
- ▶ Keep the specifications on the motor rating plate visible and freely accessible.
- ▶ Keep the gas ballast valve visible and freely accessible.

5.2 Connecting the vacuum side


NOTICE


Property damage from contaminated gases
Pumping gases that contain contamination damages the vacuum pump.

- ▶ Use suitable filters or separators from the Pfeiffer Vacuum range of accessories, to protect the vacuum pump.

 **Installation and operation of accessories**
Pfeiffer Vacuum offers a series of special, compatible accessories for its diaphragm pumps.

- Information and ordering options for approved [accessories](#) can be found online.
- Described accessories are not included in the shipment.


 **Preventing throttling losses**
Using the shortest possible vacuum connection lines with large nominal diameter prevents pressure losses.

 **Condensate separator**
Pfeiffer Vacuum recommends the installation of a condensate separator in case vapors are formed from moisture during evacuation.

Procedure

1. Remove the blind plug from the vacuum connection.
2. Establish the shortest possible connection between vacuum pump and vacuum chamber.
3. Choose a minimum vacuum line diameter equal to the nominal diameter of the vacuum connection.
4. Depending on the pump type, use PVC or metallic hoses with flange connections from the [Pfeiffer Vacuum component shop](#).
5. Connect the vacuum pump to the vacuum system using the vacuum connection.

5.3 Connecting the exhaust side

 **WARNING**

Danger to life from poisoning where toxic process gases leak with no exhaust line
During normal operation, the vacuum pump expels exhaust gases and vapors freely into the air. In processes involving toxic media, there is a risk of injury and danger to life due to poisoning.

- ▶ Observe the relevant regulations for handling toxic substances.
- ▶ Safely purge toxic process gases via an exhaust line.



⚠ CAUTION**Danger of injury from bursting as a result of high pressure in the exhaust line**

Faulty or inadequate exhaust pipes lead to dangerous situations, e.g. increased exhaust pressure. There is a danger of bursting. Injuries caused by flying fragments, the escaping of high pressure, and damage to the unit cannot be excluded.

- ▶ Route the exhaust line without shut-off units.
- ▶ Observe the permissible pressures and pressure differentials for the product.
- ▶ Check the function of the exhaust line on a regular basis.

**Condensate separator**

Pfeiffer Vacuum recommends installing a condensate separator, with condensate drain at the lowest point of the exhaust line.

Procedure

1. Check the installed silencer for free passage.
2. Choose a minimum exhaust line diameter equal to the nominal diameter of the connection flange.
3. Depending on the pump type, use PVC or metallic hoses with flange connections from the [Pfeiffer Vacuum component shop](#).
4. Option: In case of higher gas throughputs, mount an exhaust line.
5. Route the piping downwards from the vacuum pump, to prevent condensate return.
6. Support or suspend the piping to the vacuum pump so that no piping system forces act on the vacuum pump.

5.4 Establishing mains connection

⚠ DANGER**Danger to life from electric shock**

Touching exposed and voltage-bearing elements causes an electric shock. Improper connection of the mains supply leads to the risk of touchable live housing parts. There is a risk to life.

- ▶ Before the installation, check that the connection leads are voltage-free.
- ▶ Make sure that electrical installations are only carried out by qualified electricians.
- ▶ Provide adequate grounding for the device.
- ▶ After connection work, carry out an earthed conductor check.

NOTICE**Risk of property damage from excess voltage**

Incorrect or excessive mains voltage will destroy the motor.

- ▶ Always observe the motor rating plate specifications.
- ▶ Route the mains connection in accordance with locally applicable provisions.
- ▶ Always provide a suitable mains fuse to protect the motor and supply cable in the event of a fault.

NOTICE**Property damage from the voltage range being set incorrectly**

Recommissioning after longer downtimes of the vacuum pump or after changing the oil requires the current settings to be checked.

- ▶ Before switching the vacuum pump on each time, check the currently set voltage range.
- ▶ Make changes to the voltage range only after the vacuum pump has been disconnected from the mains.



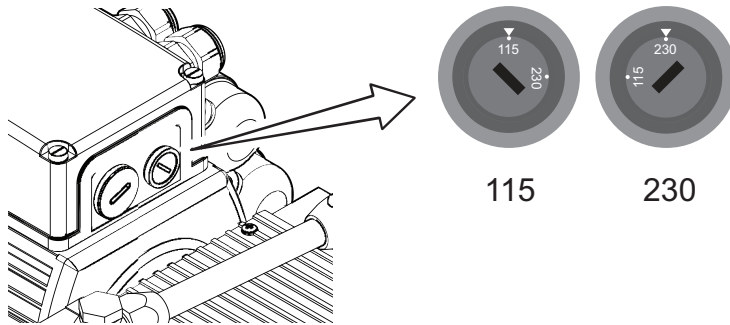


Fig. 3: Voltage selector switch on the terminal box

Switch position:	"115"	"230"
Voltage range	90 – 127 V, 50/60 Hz	187 – 259 V, 50/60 Hz

Tbl. 5: Permissible voltage range for reversible single-phase motor

Required tool

- Screwdriver

Changing the voltage range

1. The mains voltage must be determined on-site each time before the vacuum pump is installed or moved to a different location.
2. Disconnect the vacuum pump from the mains.
3. Set the required voltage range on the voltage selector switch using a suitable screwdriver.

Establish the mains supply

1. Order a corresponding mains connection cable from the Pfeiffer Vacuum accessories range.
2. Always ensure a secure connection to the earthed conductor (PE).
3. Plug the mains cable into the power supply plug of the vacuum pump.



6 Operation

6.1 Putting the vacuum pump into operation

⚠ WARNING

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

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

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

⚠ CAUTION

Danger of burns on hot surfaces

Depending on the operating and ambient conditions, the surface temperature of the vacuum pump can increase to above 70 °C.

- ▶ Provide suitable touch protection.

NOTICE

Vacuum pump damage caused by overpressure

Mixing up the connections causes overpressure overload. The vacuum pump can be started only against max. 1 bar differential pressure between inlet and outlet; otherwise the motor jams and sustains damage.

- ▶ Make sure that the distributor is installed correctly on the diaphragm heads, before connecting the vacuum pump to the vacuum equipment.
- ▶ Before commissioning, make completely sure that the pressure side pressure is below the permissible limit.

Procedure

1. Compare the frequency specifications on the rating plate with the available supply voltage.
2. Check the exhaust connection for free passage (max. permissible pressure: 1100 hPa absolute).
3. Actuate the shut-off units so that the shut-off units open before or at the same time as the vacuum pump starts up.

6.2 Switching on the vacuum pump

When pumping down dry gases, no special precautions are required.

⚠ CAUTION

Danger of burns on hot surfaces

Depending on the operating and ambient conditions, the surface temperature of the vacuum pump can increase to above 70 °C.

- ▶ Provide suitable touch protection.



Warm-up time of the vacuum pump

The warm-up time depends on the ambient temperature and takes at least 30 minutes.

Prerequisite

- Required mains connection established

Switching on the vacuum pump

1. If required, switch the vacuum pump on in each pressure range at the mains switch.
2. Allow the vacuum pump to warm up prior to process start, with the vacuum connection closed.



The vacuum pump achieves the specified throughput and final pressure values once the operating temperature has been reached.

6.3 Operating the vacuum pump with gas ballast

NOTICE

Risk of damage from condensation in vacuum pump

During operation without gas ballast, condensation may form as a result of the vapor compatibility of the vacuum pump being exceeded.

- ▶ Pump condensable vapors only when the vacuum pump is warm and the gas ballast valve open.
- ▶ Allow the vacuum pump to run on after process end for another 30 minutes with the gas ballast valve open.
 - This protects the vacuum pump against corrosion.

i **No intermediate settings possible**
An intermediate setting between open and closed is not possible.

The gas ballast valve supplies air to the working chamber of the vacuum pump periodically at the beginning of the compression phase. When pumping down vapors, this air prevents condensation within certain limits in the vacuum pump.

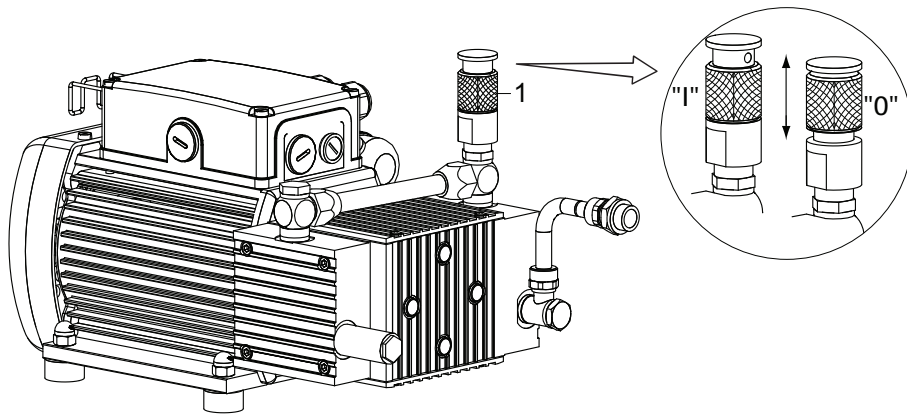


Fig. 4: Gas ballast valve

- 1 Sleeve on the gas ballast valve
- Position "1" Gas ballast valve open
- Position "0" Gas ballast valve closed

Behavior with process gases with condensable vapors

- ▶ Operate the vacuum pump with gas ballast, i.e. with the gas ballast valve open.

Open gas ballast valve

- ▶ To open the gas ballast valve, push the sleeve on the valve down into position "1".

Close gas ballast valve

- ▶ To close the gas ballast valve, push the sleeve on the valve upwards into position "0".

6.4 Switching off the vacuum pump

Procedure

1. Allow the vacuum pump to run on for 5 to 10 minutes with the vacuum connection open to allow any condensate that may be present to be removed from the vacuum pump.
2. If required, switch the vacuum pump off in each pressure range at the mains switch.



7 Maintenance

7.1 Maintenance instructions

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ CAUTION

Danger of injury from moving parts

After a power failure or a standstill as a result of overheating, the motor restarts automatically. There is a risk of injury to fingers and hands if they enter the operating range of rotating parts.

- ▶ Safely disconnect motor from the mains.
- ▶ Secure the motor against reactivation.
- ▶ Dismantle the vacuum pump for inspection, away from the system if necessary.

NOTICE

Damage caused by unsuitable cleaning agents

Unsuitable cleaning agents damage pump parts.

- ▶ Use only approved cleaning agents to clean pump parts.
- ▶ Use only a clean dry cloth to clean the diaphragms and valves.
- ▶ Do not use any alcohol or other cleaning agents to clean the diaphragms and valves.

NOTICE

Danger of property damage from improper maintenance

Unprofessional work on the vacuum pump will lead to damage for which Pfeiffer Vacuum accepts no liability.

- ▶ We recommend taking advantage of our service training offering.
- ▶ When ordering spare parts, specify the information on the nameplate.

The following section relates to the tasks for cleaning and maintaining the vacuum pump. Valves and diaphragms are wear parts.

Component	Operating hours
Diaphragms	15 000
Valves	15 000

Tbl. 6: Typical service life with normal use

Prerequisites

- Vacuum pump switched off
- Vacuum pump vented from atmospheric pressure
- Vacuum pump cooled

Required materials

- Cloth (clean, lint-free)
- Water or mild soap solution



Servicing the vacuum pump

1. Disconnect the vacuum pump from the voltage supply.
2. Secure the motor against reactivation.
3. Remove any external contamination on the vacuum pump with cloth slightly moistened with water or a mild soap solution.
4. Allow all cleaned parts to dry well.
5. For maintenance work, only dismantle the vacuum pump to the extend needed.
6. Clean the suction chamber, diaphragms, and valves with a dry cloth.
7. Examine the diaphragms and valves for cracks at the latest when the pressure values achieved decrease.

7.2 Checklist for inspection and maintenance



Notes on maintenance intervals

Depending on the process, the required maintenance intervals may be shorter than the reference values specified in the table.

- Consult with Pfeiffer Vacuum Service about shorter maintenance intervals for extreme loads or for specific processes.



Maintenance level 2

We recommend that Pfeiffer Vacuum Service carry out maintenance work at level 2. If the specified intervals are exceeded, or if maintenance work is carried out improperly, no warranty or liability claims are accepted on the part of Pfeiffer Vacuum. This also applies wherever parts other than original spare parts are used.

Action	Inspection	Maintenance level 1	Maintenance level 3	Required material
Interval	as required; at least once every six months	as required; at least every 2 years	as required; at least every 4 years	
Check silencer for contamination ²⁾	■			
Test vacuum pump optically and acoustically	■			
Read out and analyze pump data		■		
Clean the vacuum pump		■		
Change the diaphragms and valves		■		Overhaul kit
Change silencer ³⁾		■		Silencer
Perform a functional test		■		
Incoming inspection with vibration measurement			■	
Disassemble vacuum pump completely			■	
Clean vacuum pump completely			■	
Change gas ballast filter ⁴⁾			■	Filter
Replace all wear parts			■	Diaphragms, valves, sealing rings, silencers

Tbl. 7: Maintenance intervals

2) if present
 3) if present
 4) if present



7.3 Change the diaphragms and valves

NOTICE

Property damage from incorrect installation

Change in dead volume due to incorrect installation of the original spacer disks impairs the final vacuum or leads to bearing damage.

- ▶ During disassembly, keep the existing spacer disks separate per installation location.
- ▶ Reinstall the same number of original spacer disks per diaphragm head.

7.3.1 Dismantle the diaphragm head and valves

Required tools

- Open-end wrench, **WAF 14**
- Open-end wrench, **WAF 17**
- Allen key, **WAF 4**

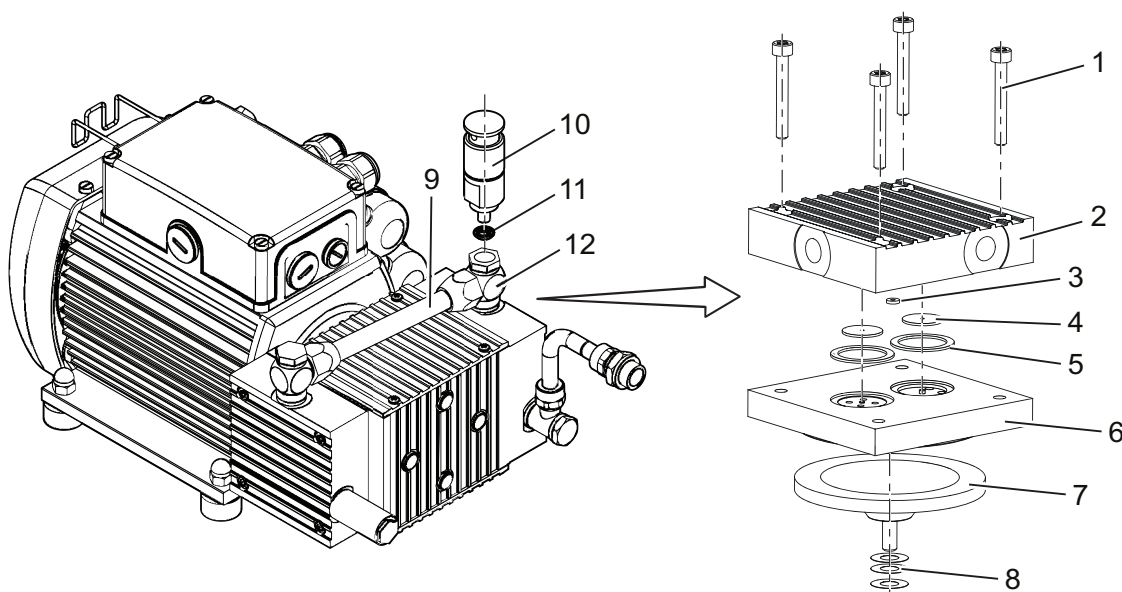


Fig. 5: Diaphragm head and valves

- | | |
|--------------------------------------|----------------------|
| 1 Interior hexagon socket screw (4×) | 7 Diaphragm |
| 2 Diaphragm head cover | 8 Spacer disks |
| 3 Seal on the suction side | 9 Hose connection |
| 4 Valve plate (2×) | 10 Gas ballast valve |
| 5 Sealing ring on the suction side | 11 O-ring |
| 6 Intermediate plate | 12 Banjo bolt (2×) |

Procedure

1. Unscrew the gas ballast valve from the banjo bolt.
 - Be careful with the O-ring.
2. Remove the banjo bolts and dismantle the hose connection.
3. Rotate the diaphragm pump so that the diaphragm head to be dismantled is facing upwards.
4. Unscrew the interior hexagon socket screws from the diaphragm head cover.
5. Remove the diaphragm head.
 - Observe the sealing rings and the seal on the suction side.
6. Remove the intermediate plate.
7. Release the valves and the sealing rings from the intermediate plate.
8. Lift the diaphragm slightly at the side.
9. Unscrew and remove the diaphragm from the connection rod by hand.
 - The diaphragm has a right-hand thread.
 - Pay attention to the spacer disks.



7.3.2 Cleaning and replacing the diaphragms and valves

Prerequisite

- Diaphragm and valves removed

Required spare parts

- Overhaul kit

Required consumables

- Clean, dry cloth
- Isopropanol

Procedure

1. Clean diaphragms and valves with a clean, dry cloth.
 - Do not use isopropanol or other cleaning agents to clean diaphragms and valves.
2. Clean valve seats, intermediate plate and head cover with isopropanol.
3. Check valve seats, intermediate plate and head cover for wear.
4. Replace all wear parts according to the inspection sets.

7.3.3 Mount the diaphragm head and valves



Spacer disks

Spacer disks are available in 3 sizes:

- 13.0 × 6.4 × 0.5 mm
- 13.0 × 6.4 × 0.1 mm
- 16.0 × 6.4 × 0.05 mm

The number and size of the spacer disks vary between the diaphragm heads.

Install the same number and size of original spacer disks per diaphragm head.

Required tools

- Open-end wrench, **WAF 14**
- Open-end wrench, **WAF 17**
- Allen key, **WAF 4**

Procedure

1. Rotate the diaphragm pump so that the diaphragm head to be mounted is facing upwards.
2. Screw the diaphragm into the connection rod by hand.
 - The diaphragm has a right-hand thread.
 - Pay attention to the spacer disks.
3. Place the valves and the sealing rings in the intermediate plate.
4. Position the intermediate plate.
5. Put on the diaphragm head cover.
 - Observe the sealing rings and the seal on the suction side.
6. Screw the interior hexagon socket screws into the diaphragm head cover.
7. Mount the hose connection using the banjo bolts.
8. Screw the gas ballast valve into the banjo bolt.
 - Be careful with the O-ring.

7.4 Cleaning the gas ballast valve

The gas ballast filter is soiled if the vacuum pump takes in ambient air containing dust during gas ballast operation.

As the soiling increases, the throughput of the gas ballast filter decreases. The risk of condensation and corrosion in the vacuum pump increases.

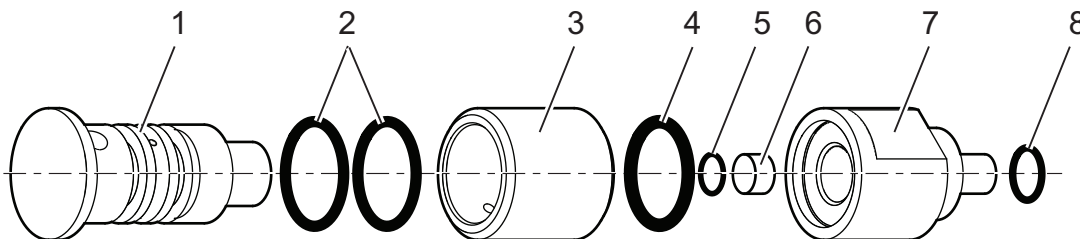
Required tool

- Bolt, max. \varnothing 3.5 mm
- Screwdriver



Required consumables

- Compressed air
- Clean, dry cloth

**Fig. 6: Gas ballast valve**

- | | |
|-----------------|----------------------|
| 1 Valve housing | 5 Circular spring |
| 2 O-ring (2x) | 6 Gas ballast filter |
| 3 Sleeve | 7 Reducing piece |
| 4 USIT ring | 8 O-ring |

Strip the gas ballast valve

1. Unscrew the gas ballast valve from the banjo bolt.
 - Be careful with the O-ring.
2. Push the bolt into the cross hole on the valve housing.
3. Screw the valve housing with the bolt out of the reducing piece.
4. Remove the sleeve from the valve housing.
5. Carefully lever the circular spring out of the reducing piece.
6. Remove the circular spring and the filter out of the reducing piece.

Cleaning the gas ballast valve

1. Clean the gas ballast filter using compressed air.
2. Check all parts for wear.
3. Replace the gas ballast valve in the event of major contamination or wear.

Install gas ballast valve

1. Insert the filter in the reducing piece.
2. Secure the circular spring in the reducing piece.
3. Push the sleeve onto the valve housing.
 - Observe the position of the bore in the sleeve.
4. Push the bolt into the cross hole on the valve housing.
5. Screw the valve housing with the bolt into the reducing piece.
6. Screw the gas ballast valve into the banjo bolt.
 - Be careful with the O-ring.

7.5 Replacing device fuses

⚠ WARNING**Danger to life from electric shock during maintenance and service work**

The vacuum pump is only completely de-energized when the mains plug has been disconnected. There is a danger to life from electric shock when making contact with live components.

- ▶ Before performing all work, switch off the mains switch.
- ▶ Disconnect mains cable from mains plug.
- ▶ Wait 2 minutes until the capacitors have discharged.
- ▶ Secure the vacuum pump against unintentional re-start.

Required tool

- Flat-tip screwdriver

Spare parts required

- 2× microfuses 5 × 20 (3,15 A T)



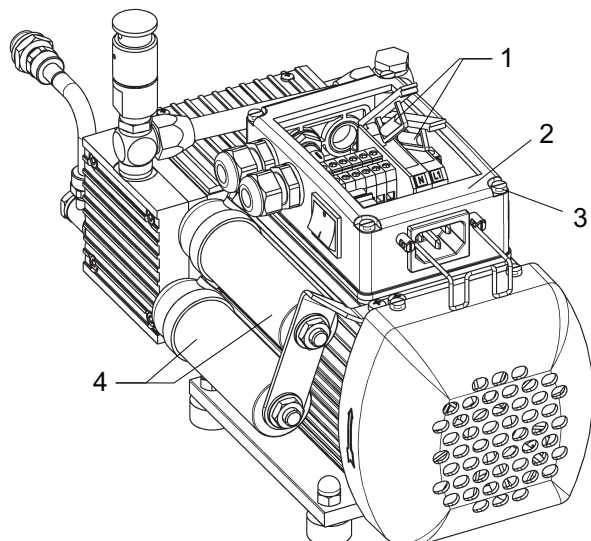


Fig. 7: Device fuses

- | | |
|-----------------------------------|-----------------------|
| 1 Device fuses in the fuse holder | 3 Cylinder screw (4×) |
| 2 Terminal box | 4 Capacitors |

Replacing defective device fuses

1. Loosen the 4 cylinder screws.
2. Remove the cover from the terminal box.
3. Open the fuse holder.
4. Replace faulty fuses.
5. Close fuse holder.
6. Place the terminal box cover on the vacuum pump.
7. Fasten the 4 cylinder screws.



8 Decommissioning

Before shutting down the vacuum pump, observe the following instructions to adequately protect the interior of the vacuum pump (suction chamber) from corrosion:

Procedure for temporary vacuum pump shutdowns

1. Allow the vacuum pump to run on for 5 to 10 minutes with the vacuum connection open to allow any condensate that may be present to be removed from the vacuum pump.
2. If media has entered the vacuum pump that may attack the pump materials or lead to deposits, clean the inside of the pump heads.

Procedure for longer vacuum pump shutdowns

1. Disconnect the vacuum pump from the vacuum system.
2. Remove the vacuum pump from the vacuum system if necessary.
3. Seal the vacuum connection with the original sealing plugs.
4. Store the vacuum pump in dry, dust-free rooms, within the specified ambient conditions.
5. Pack the vacuum pump together with a drying agent in a plastic bag, and seal the vacuum pump airtight if it is to be stored in rooms with damp or aggressive atmospheres.



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

9.2 Dispose of diaphragm pumps

Pfeiffer Vacuum diaphragm pumps contain materials that you must recycle.

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



10 Malfunctions

⚠ CAUTION

Danger of injury from moving parts

After a power failure or a standstill as a result of overheating, the motor restarts automatically. There is a risk of injury to fingers and hands if they enter the operating range of rotating parts.

- ▶ Safely disconnect motor from the mains.
- ▶ Secure the motor against reactivation.
- ▶ Dismantle the vacuum pump for inspection, away from the system if necessary.

⚠ CAUTION

Danger of burns on hot surfaces

In the event of a fault, the surface temperature of the vacuum pump can increase to above 105 °C.

- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Wear personal protective equipment if necessary.

NOTICE

Danger of property damage from improper maintenance

Unprofessional work on the vacuum pump will lead to damage for which Pfeiffer Vacuum accepts no liability.

- ▶ We recommend taking advantage of our service training offering.
- ▶ When ordering spare parts, specify the information on the nameplate.

Should malfunctions occur, you can find information about potential causes and how to fix them here:

Problem	Possible causes	Remedy
Vacuum pump will not start up	<ul style="list-style-type: none"> • No supply voltage or voltage does not correspond to the motor data 	<ul style="list-style-type: none"> • Check the supply voltage.
	<ul style="list-style-type: none"> • Pump temperature too low 	<ul style="list-style-type: none"> • Heat the vacuum pump to a temperature of > 12 °C.
	<ul style="list-style-type: none"> • Thermal protection of the motor has triggered 	<ul style="list-style-type: none"> • Identify and eliminate the cause and allow vacuum pump to cool if necessary.
	<ul style="list-style-type: none"> • Phase failure 	<ul style="list-style-type: none"> • Check the built-in device fuses. • Replace defective device fuses.
	<ul style="list-style-type: none"> • Diaphragms or valves dirty 	<ul style="list-style-type: none"> • Clean the vacuum pump.
	<ul style="list-style-type: none"> • Overpressure in the exhaust lead 	<ul style="list-style-type: none"> • If required, check and clean the exhaust line.
	<ul style="list-style-type: none"> • Fuse failure 	<ul style="list-style-type: none"> • Check the built-in device fuses. • Replace defective device fuses.
Vacuum pump switches off after a while after being started	<ul style="list-style-type: none"> • Thermal protection of the motor has triggered 	<ul style="list-style-type: none"> • Identify and eliminate the cause and allow vacuum pump to cool if necessary.
	<ul style="list-style-type: none"> • Device fuse triggered due to overload (e.g. cold start) 	<ul style="list-style-type: none"> • Heat up the vacuum pump.
	<ul style="list-style-type: none"> • Exhaust pressure too high 	<ul style="list-style-type: none"> • Check exhaust line outlet opening and exhaust side accessories.

Problem	Possible causes	Remedy
Vacuum pump does not reach the specified ultimate pressure	<ul style="list-style-type: none"> • Condensate in the vacuum pump 	<ul style="list-style-type: none"> • Operate the vacuum pump over a longer period at atmospheric pressure and, if necessary, with the gas ballast valve open.
	<ul style="list-style-type: none"> • Gas ballast valve open 	<ul style="list-style-type: none"> • Close the gas ballast valve.
	<ul style="list-style-type: none"> • Soiled valves or diaphragms 	<ul style="list-style-type: none"> • If necessary, clean or replace the valves and diaphragms.
	<ul style="list-style-type: none"> • Leak in system 	<ul style="list-style-type: none"> • Locate and eliminate the leak.
Pumping speed of vacuum pump too low	<ul style="list-style-type: none"> • The intake line is not suitably dimensioned 	<ul style="list-style-type: none"> • Make sure that connections are short and cross sections adequately dimensioned.
	<ul style="list-style-type: none"> • Exhaust pressure too high 	<ul style="list-style-type: none"> • Check exhaust line outlet opening and exhaust side accessories.
Unusual noises during operation	<ul style="list-style-type: none"> • Defective valves or diaphragms 	<ul style="list-style-type: none"> • If necessary, clean or replace the valves and diaphragms.
	<ul style="list-style-type: none"> • Suction chamber dirty 	<ul style="list-style-type: none"> • Clean suction chamber.
	<ul style="list-style-type: none"> • Silencer loose or missing 	<ul style="list-style-type: none"> • If necessary, check or replace the silencer.
	<ul style="list-style-type: none"> • Valves dirty or defective 	<ul style="list-style-type: none"> • If necessary, clean or replace the valves and diaphragms.
	<ul style="list-style-type: none"> • Motor fan defective 	<ul style="list-style-type: none"> • Replace the motor fan. • Contact Pfeiffer Vacuum Service.
	<ul style="list-style-type: none"> • Connection rod or motor bearing defective 	<ul style="list-style-type: none"> • Contact Pfeiffer Vacuum Service.

Tbl. 8: Troubleshooting on diaphragm pumps



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.

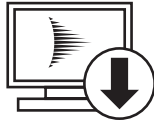
Our professional sales and service employees are available to provide you with reliable assistance, worldwide. Pfeiffer Vacuum offers an entire range of services, from [original replacement parts](#) to [service contracts](#).

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](#).



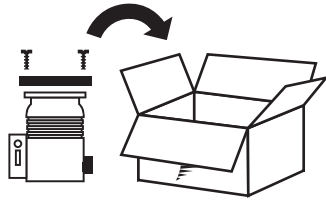
4. You will receive an acknowledgment from Pfeiffer Vacuum.

PFEIFFER VACUUM

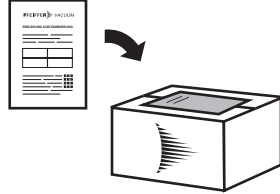
Submission of contaminated products

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.

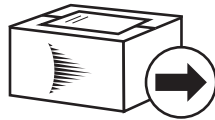




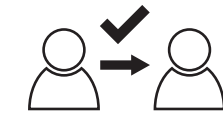
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
 - a) Neutralize the product with nitrogen or dry air.
 - b) Seal all openings with blind flanges, so that they are airtight.
 - c) Shrink-wrap the product in suitable protective foil.
 - d) Package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

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 packs

Ordering spare part packages

- ▶ Have the vacuum pump part number to hand, along with other details from the rating plate if necessary.
- ▶ Install original spare parts only.
- ▶ When ordering the inspection set, observe the respective part number of the diaphragm pump.

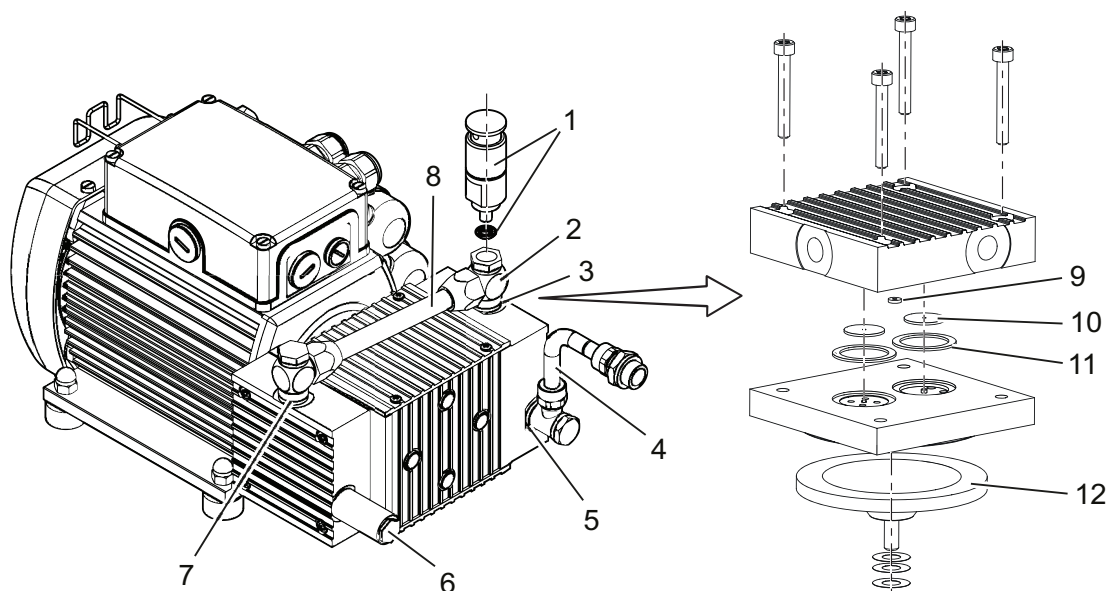


Fig. 8: Spare parts

- | | |
|------------------------------------|-------------------------------------|
| 1 Gas ballast valve, complete | 7 Seal for banjo bolt |
| 2 Banjo bolt for gas ballast valve | 8 Interhead connection |
| 3 Seal for banjo bolt | 9 Seal on the suction side |
| 4 Suction hose | 10 Valve plate (2x) |
| 5 Seal for banjo bolt | 11 Sealing ring on the suction side |
| 6 Silencer | 12 Diaphragm |

Spare parts	Order number	consisting of items	Description
Overhaul kit	PU E22 001 -T	3, 5, 7, 9, 10, 11, 12	Valve plates, sealing rings, diaphragms
Silencer	P 0920 567 E	6	-
Interhead connection	PK 050 002 -T	8	Interhead connection between the diaphragm heads
Suction hose	P 0991 939	4	Ø 6/8 mm, 1 m long, PE
Gas ballast valve, complete	PK 050 148 -U	1	-
Banjo bolt for gas ballast valve	PK 050 136	2	G 1/8", M6

Tbl. 9: Spare parts



13 Accessories

13.1 Accessory information

Relay boxes

Relay boxes are used to control backing pumps in conjunction with the electronic drive unit TC of the turbopump.

Mains Cable

Mains cables provide a secure and suitable connection.

13.2 Ordering accessories

Selection field	Part number
Relay box, shielded, for backing pumps, 1-phase 7A for TC 110/120 and TCP 350, plug M8	PM 071 282 -X
Relay box, shielded, for backing pumps, 1-phase 7 A for TC 400/1200, TM 700 and TCP 350, M12	PM 071 284 -X
Mains cable 230 V AC, CEE 7/7 to C13, 3 m	P 4564 309 ZA
Mains cable 115 V AC, NEMA 5-15 to C13, 3 m	P 4564 309 ZE
Mains cable 115/230 V without plug, IEC socket (straight), 3 m	P 4564 309 ZH
Push-in T-fitting 1/8" thread	P 4131 030 E
Screwing flange DN 16 ISO-KF / 1/8" thread incl. seal	PK 050 108 -T

Tbl. 10: Accessories MVP 015-2



14 Technical data and dimensions

14.1 General

Basis for the technical data of Pfeiffer Vacuum diaphragm pumps:

- Specifications according to PNEUROP committee PN5
- ISO 21360:2012: "Vacuum technology - Standard methods for measuring vacuum-pump performance - General description"

The following harmonized standards are fulfilled:

- IEC 61010-1
- UL 61010-1
- CSA 61010-1

	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/m²

Tbl. 11: Conversion table: Pressure units

	mbar l/s	Pa m ³ /s	sccm	Torr l/s	atm cm ³ /s
mbar l/s	1	0.1	59.2	0.75	0.987
Pa m ³ /s	10	1	592	7.5	9.87
sccm	$1.69 \cdot 10^{-2}$	$1.69 \cdot 10^{-3}$	1	$1.27 \cdot 10^{-2}$	$1.67 \cdot 10^{-2}$
Torr l/s	1.33	0.133	78.9	1	1.32
atm cm ³ /s	1.01	0.101	59.8	0.76	1

Tbl. 12: Conversion table: Units for gas throughput

14.2 Technical data

Type designation	MVP 015-2
Part number	PK T05 100
Connection flange (in)	G 1/8"
Connection flange (out)	1/8" thread with silencer
Pumping speed at 50 Hz	0.5 m ³ /h
Pumping speed at 60 Hz	0.7 m ³ /h
Final pressure with gas ballast	4.5 hPa
Final pressure without gas ballast	3.5 hPa
Intake pressure max.	1100 hPa
Exhaust pressure, max.	1100 hPa
Rotation speed at 50 Hz	1500 rpm
Rotation speed at 60 Hz	1800 rpm
Integral leakage rate	$\leq 5 \cdot 10^{-4}$ Pa m ³ /s
Sound pressure level	52 dB(A)
Ambient temperature	12 – 40 °C
Protection degree	IP20



Type designation	MVP 015-2
Input voltage 50 Hz	100 – 115 / 208 – 236 V
Input voltage 60 Hz	100 – 115 / 208 – 236 V
Switch included	Yes
Rated current consumption	1.1 A
Operating altitude, max.	2000 m
Weight	6.5 kg
Cooling method, standard	Air

Tbl. 13: Technical data, MVP 015-2

14.3 Substances in contact with the media

Pump parts	Substances in contact with the media
Diaphragm	EPDM
Valves	EPDM
Head cover	Aluminium
Hose connection	PVC
Elbow union	Aluminium
Straight compression coupling on the suction hose	CuZn, nickel-plated
Suction hose	PE
Exhaust, silencer	PA

Tbl. 14: Materials that make contact with the process media

14.4 Dimensions

Dimensions in mm

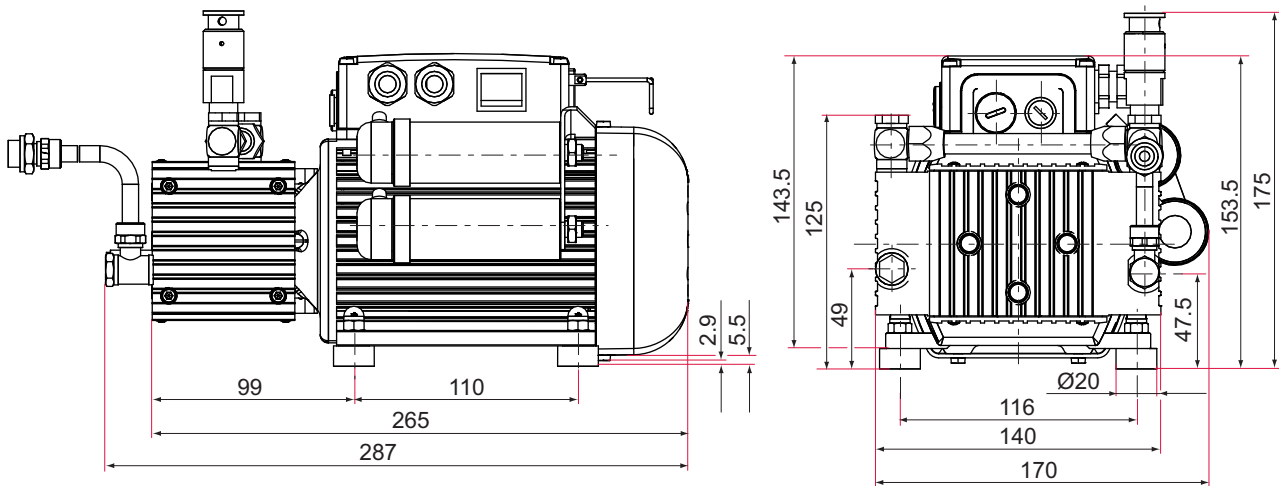


Fig. 9: Dimensions MVP 015-2



Declaration of conformity

Declaration for product(s) of the type:

Diaphragm pump

MVP 015-2

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

Machinery 2006/42/EC (Annex II, no. 1 A)

Electromagnetic compatibility 2014/30/EU

Restriction of the use of certain hazardous substances 2011/65/EU

Restriction of the use of certain hazardous substances, delegated directive 2015/863/EU

Harmonized standards and applied national standards and specifications:

DIN EN ISO 12100:2011

DIN EN 61000-6-2:2006 + Corr. 2011

DIN EN 1012-2:2011

DIN EN 61000-6-3:2007 + Corr. 2012

DIN EN 61010-1:2011

DIN EN IEC 63000:2019

DIN EN 61326-1:2013

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

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Asslar, 2019-10-22



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