

Diaphragm Pumps



MVP 035-2
MVP 055-3
MVP 055-3C

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1 About this manual

1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable EU guidelines. All information provided in this operating manual refer to the current state of the product's development. The documentation remains valid as long as the customer does not make any changes to the product.

Up-to-date operating instructions can also be downloaded from www.pfeiffer-vacuum.net.

Applicable documents

MVP 035-2, MVP 055-3/3C	Operating instructions
Safety information for vacuum pumps "Safety Guide"	PT 0300 BN*
Declaration of Conformity	Part of this document
Operating instructions for accessories (order-specifically)	see section "accessories"*

*also available via www.pfeiffer-vacuum.net

For information about other certifications, if applicable, please see the signet on the pump or:

- www.tuvdotcom.com
- TUVdotCOM-ID 0000021320

1.2 Conventions

Safety instructions

The safety instructions in Pfeiffer Vacuum operating manuals are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, Semi-S1, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

DANGER	
Immediate danger	Death or very severe injuries occur.
WARNING	
Possible danger	Death or injuries may occur.
CAUTION	
Possible danger	Medium to slight injuries may occur.
NOTE	
Command or note	Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

Pictograph definitions



Prohibition of an action or activity in connection with a source of danger, the disregarding of which may result in serious accidents.



Warning of a displayed source of danger in connection with operation of the unit or equipment.



Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents.



Important information about a product, handling or applicable part of the documentation to which special attention should be paid.

Instructions in the text

→ Work instruction: here you have to do something.

Abbreviations used

C version: Corrosive gas version

Symbols used

The following symbols are used consistently throughout in all illustrations:

- ① Vacuum connection
- ⌚ Exhaust
- Ⓜ Gas ballast valve
- ⚡ Power connection

2 Safety

2.1 Safety precautions



NOTE

Duty to inform

Each person involved in the installation, operation or maintenance of the vacuum pump must read and observe the safety-related parts of these operating instructions.

→ The operator is obligated to make operating personnel aware of dangers originating from the vacuum pump, the pumped medium and the entire system.

- Before pumping dangerous, corrosive or environmentally hazardous media, take suitable precautions:
 - Test the compatibility with substances in contact with the media.
 - Prevent the release of process gases and their reaction products and by-products or dispose of them according to the relevant regulations.
 - Safety measures (e.g. wearing protective clothing and safety goggles) to prevent inhalation and skin contact.
- Before pumping gases which could form ignitable mixtures, take suitable precautions:

- By implementing the required safety measures, prevent potentially explosive mixtures from occurring in the housing and from being ignited in the event of a diaphragm crack by mechanically produced sparks, hot surfaces or static electricity.
- If necessary, use inert gas for gas ballast supply or ventilation.
- Connect the vacuum pump to a shockproof socket only.
 - Use only undamaged network cables which comply with the regulations.
 - Make sure that the grounding is neither faulty nor insufficient.
- Do not expose any body parts to the vacuum.
- Observe the safety and accident prevention regulations.
- Check regularly that all safety precautions are being complied with.
- Do not carry out any unauthorised modifications or conversions to the pumps.
- Depending on the operating and ambient conditions, the surface temperature of the pumps may rise above 70 °C. Use suitable finger guards if necessary.
- When returning the pumps to us please note the instructions in the Service section.

2.2 Proper use



NOTE

CE conformity

The manufacturer's declaration of conformity becomes invalid if the operator modifies the original product or installs additional components.

→ Following installation into a plant and before commissioning, the operator must check the entire system for compliance with the valid EU directives and reassess it accordingly.

- The vacuum pump may only be used to generate a vacuum.
- Installation, operating and maintenance regulations must be complied with.
- Other accessories than those described in this manual must not be used without the agreement of Pfeiffer Vacuum.
- When pumping gases which could form explosive or ignitable mixtures, take suitable precautions:
 - If necessary, connect inert gas for ventilation or gas ballast supply.

2.3 Improper use

The following are classed as improper use:

Use for purposes which deviate from those described above, in particular:

- Pumping of corrosive gases (exception: pumps in C version).
- Pumping of explosive media.
- Operation of the pump in potentially explosive areas.
- Pumping of gases containing impurities such as particles, dusts and condensate; note the vapour compatibility levels of the pump.
- Pumping of substances that tend to sublime.
- Use of the vacuum pump to generate pressure.
- Pumping of liquids.
- Connection to pumps or units which are not suitable for this purpose according to their operating instructions.
- Connection to units which have touchable and voltage carrying parts.

Improper use of the equipment automatically invalidates all warranty and liability claims.

3 Transport and storage

3.1 Transport

Transport instructions

- ➔ Remove the locking cap from the vacuum flange immediately before connecting!
- ➔ Use only the handles provided for that purpose to lift the pump.
 - Do not use the interhead connections on the top side of the pump to carry the pump.

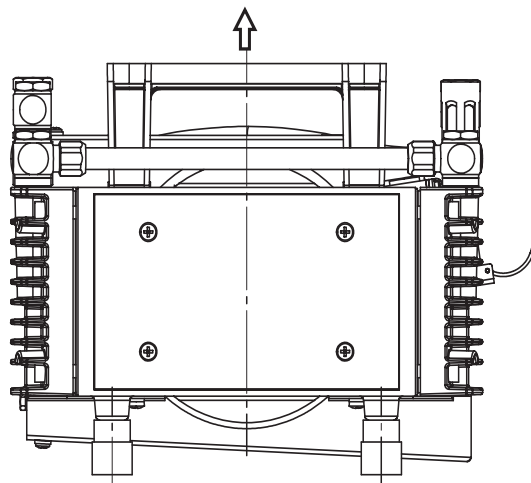


Fig. 1: Lifting and transporting the pump

3.2 Storage

- ➔ Check that all the openings on the pump are securely closed.
- ➔ Store the pump in a cool, dry place; preferably at room temperatures (approx. 20°C).
 - For a longer period of storage, seal the pump in a PE bag with drying agents enclosed.

4 Product description

4.1 Product identification

To correctly identify the product when communicating with Pfeiffer Vacuum, always have the information from the rating plate available and use it:

- Pump model and model number
- Serial number
- Date of manufacture

Please find the voltage range and motor-related data on the separately attached motor rating plate if necessary.

Scope of delivery

- Pump with mains power supply (switchable) via rubber socket
- Locking caps for vacuum and exhaust flange
- Operating manual

Differences between the pump types

Pump type	Pump designs
MVP 035-2	Standard version: • G 1/4" elbow union + enclosed hose DN 8 x 1000 mm with a elbow union in G 1/4" at the end
MVP 055-3	Standard version: • G 1/4" elbow union + enclosed hose DN 8 x 1000 mm with a elbow union in G 1/4" at the end G 1/4" elbow union + enclosed hose DN 8x 1000 mm with a elbow union in G 1/4" at the end • DN 16 ISO-KF
MVP 055-3C	C version: • DN 16 ISO-KF / 1/8" NPT

4.2 Design and function

The diaphragm vacuum pumps of the series MVP 055-3/3C are three stage and those of the MVP 035-2 series are two stage, dry compressor vacuum pumps. That means that the supplied medium is not brought into contact with lubrication. The pumps are positive displacement pumps with a periodic change of size of the suction chamber produced by the movement of the diaphragm. The gas flow causes the valves to open and close automatically. The pump units are directly connected to the drive motor.

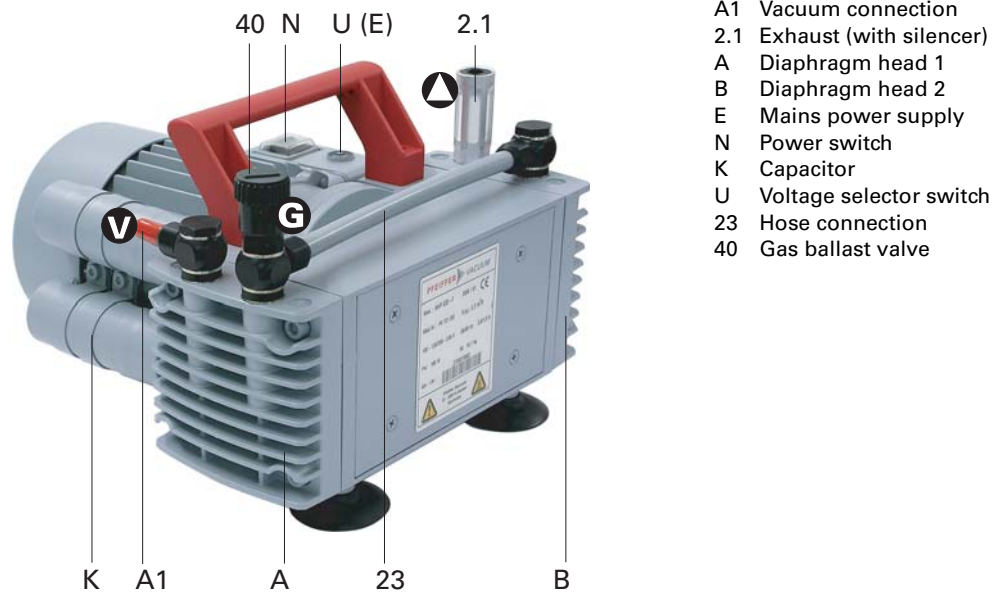


Fig. 2: MVP 035-2

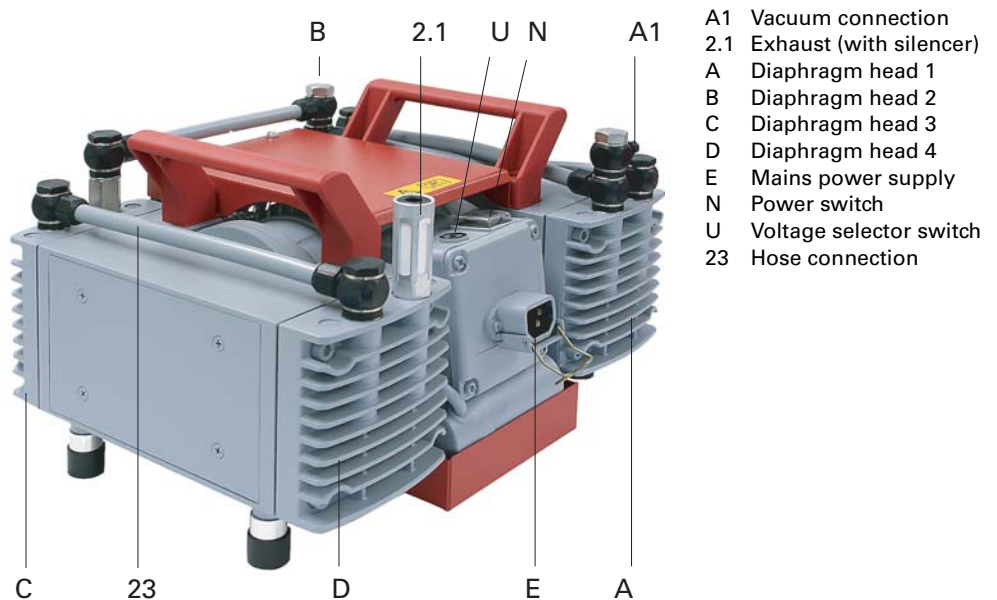
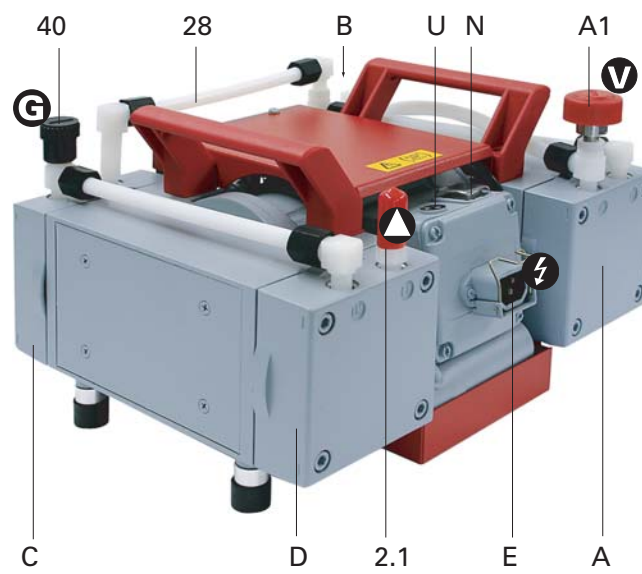


Fig. 3: MVP 055-3



- A1 Vacuum connection
- 2.1 Exhaust
- A Diaphragm head 1
- B Diaphragm head 2
- C Diaphragm head 3
- D Diaphragm head 4
- E Mains power supply
- N Power switch
- U Voltage selector switch
- 28 Hose connection
- 40 Gas ballast valve

Fig. 4: MVP 055-3C

5 Installation

5.1 Setting up the pump

Installation location

Observe the following requirements when setting up the pump:

- Note the load-bearing capacity of the mounting surface.
 - Maximum installation altitude 2000 m (above mean sea level)
 - Permissible ambient temperature: +12 ... +40°C
 - Maximum relative humidity 85%
- Always place the pump on a firm, even surface.
- Where stationary installation is involved, anchor the pump on site.
- When installing the pump in a closed housing, ensure there is sufficient air circulation.
- Voltage and frequency information given on the motor rating plate must be visible.
 - If vacuum pump is installed above 1000 m above mean sea level check compatibility with applicable safety requirements, e.g. DIN EN 61010 (motor may overheat due to insufficient cooling).
- Check the hose connections between the individual pumping stages.
- The intake connections of the pumps are marked "IN" and the outlets "Ex" at the diaphragm heads.

5.2 Connecting the vacuum side

- Remove locking cap on intake connection and connect vacuum pump to the apparatus.
- The connection between the pump and the recipient should be kept as short as possible.
- Depending on the pump type, use metallic hoses or PVC hoses with flange connections.
 - Separators, filters etc. may be installed upstream to protect the pump (see accessories). However, please observe the loss of pumping capacity due to the conductivity of the accessories.

5.3 Connecting the exhaust side



CAUTION

High pressure in the exhaust line!

Danger of damage to the seals and danger of the pump bursting.

- Install the line without shut-off valves on the exhaust side.
- Pumpe nicht mit Überdruck am Einlass betreiben; max. zulässige Drücke und Druckdifferenzen beachten.

- Choose the cross-section of the exhaust line to be at least the size of the nominal connection diameter of the vacuum pump's exhaust connection.
- Piping to the pump must be suspended or supported.
- Forces from the piping system must not be allowed to act on vacuum pumps.
- Lay piping from the pump, sloping downward so that no condensate can flow back into the pump; otherwise fit a condensate separator.
- If an air trap is created in the system then a device for draining condensation water must be provided at the lowest point.

**WARNING****Emission of toxic substances from the exhaust!**

Danger of poisoning from emitted gases or vapours, which can be detrimental to health and/or can pollute the environment, depending on the particular application.

- Comply with the applicable regulations when working with toxic substances.
- Only officially approved filter systems may be used to separate out these substances.

5.4 Connecting to the mains power supply

The pump is driven by single-phase extended voltage range motors with reversible voltage ranges:

- 230 V range: 200 ... 240 V, 50/60 Hz
- 115 V range: 100 ... 120 V, 50/60 Hz

**CAUTION****Excess voltage!**

Danger of destroying the motor.

- Power connections must comply with local regulations. Voltage and frequency information given on the motor rating plate must correspond to the mains voltage and frequency values.
- To protect the motor and supply cable in case of malfunction, mains fuse protection must be implemented.

Single-phase extended range motor

- The mains voltage must be determined on-site each time before the pump is installed or moved to a different location.

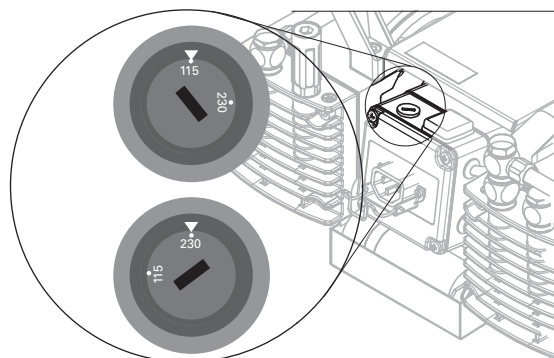
**NOTE****Overvoltage!**

An incorrect voltage range setting can damage the motor.

- Disconnect the pump from the power supply.
- Only change the voltage range when the pump is disconnected from the power mains.

Changing the voltage range

- Disconnect the pump from the power supply.
- Set the desired voltage range on the voltage selector switch using a suitable screwdriver.



Switch position:

"115"

"230"

Voltage ranges:	100 ... 120 V, 50/60 Hz	200 ... 240 V, 50/60 Hz
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Motor protection

A self-locking thermal winding protector switches off the pump motor in the event of overheating.

➔ Allow the pump to cool off several minutes and do not switch it back on until it has cooled off.

Intermittent operation with TC 600 via relay box (accessory)

Connection of diaphragm pumps in the pumping station according wiring diagram in operating instructions PT 0030 BN of the Backing Pump Relay Boxes:

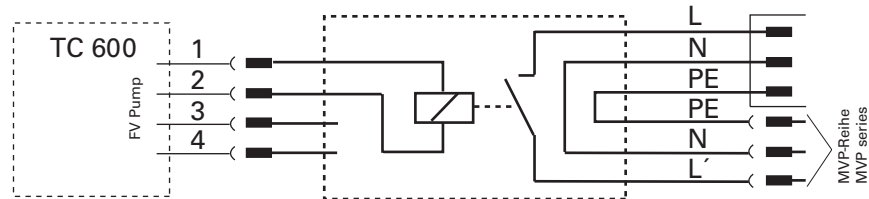


Fig. 5: Connection with relay box (PM 041 937 GT) to TC 600

5.5 Retrofitting the gas ballast valve

As an option, the MVP 055-3 can be retrofitted with a gas ballast valve.

Installation

The gas ballast valve may only be installed on membrane head 3.

- ➔ Hollow screw 15 at the outlet (Ex) to membrane head 3 using a SW 17 open-end wrench.
- ➔ Remove hollow screw 15 and assemble gas ballast valve, seals and spacer (SW 17).

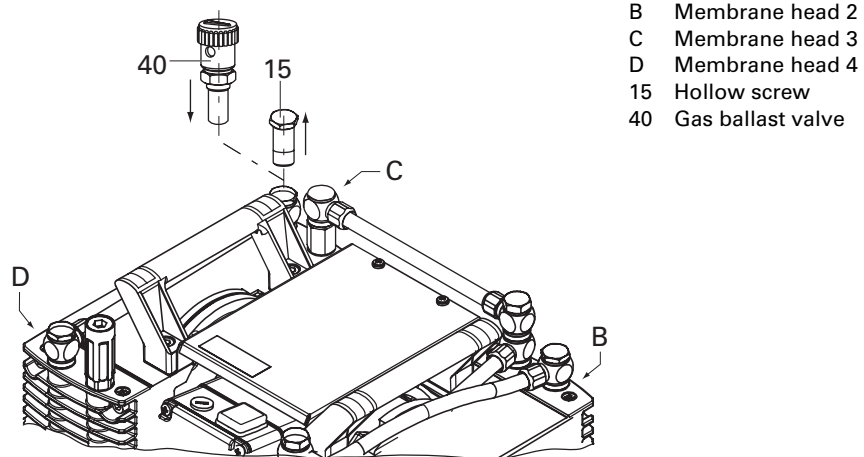


Fig. 6: Fitting the gas ballast valve

6 Operation

6.1 Before switching on the pump

- Compare the voltage information on the rating plate with the mains voltage.
- Check that the exhaust connection allows free flow (max. permissible pressure 1.1 bar absolute).
 - Activate the shut-off valves in such a way that they open before or at the same time as the pump is started.
- Protect the pump sufficiently from taking in contaminants by means of suitable precautions (e.g. dust filters).



CAUTION

Dangerous overpressure overload!

Mixing up the connections leads to a dangerous overpressure overload in the pump, and the motor could be damaged.

- Before commissioning, it is imperative that you ensure that the pressure does rise above the maximum permissible pressure on the pressure side.
- Start pumps at a maximum pressure differential of 1 bar between inlet and outlet.

6.2 Switching on the pump

The pump can be switched on in any pressure range.

No special precautions are necessary when pumping dry gases. In order to attain the lowest possible final pressures, the gas ballast valve should be closed.

The pump attains the stated values for throughput rates and final pressure levels only once the operating temperature is reached (after approximately 15 minutes).

- Switch on the pump with the vacuum flange closed and allow to warm up for 15 minutes.



CAUTION

Hot surface!

Danger of burns if hot parts are touched. Depending on the operating and ambient conditions, the surface temperature of the pump may rise above 70 °C.

- In this case, use suitable finger guards.

6.3 Pumping condensable vapors

Should the process gases contain condensable gases present at high percentages, the vacuum pump must be operated with a gas ballast (i.e. with an open gas ballast valve).



WARNING

Reactive, explosive or otherwise dangerous mixtures!

Uncontrolled gas inlet at the gas ballast valve can result in dangerous mixtures.

- By implementing the required safety measures, the user must prevent potentially explosive mixtures from occurring in the inside of the pump and from being ignited in the event of a diaphragm crack by mechanically produced sparks, hot surfaces or static electricity.
- If necessary, use inert gas for ventilation and gas ballast supply.

**NOTE****Bad final vacuum and damage to the pump!**

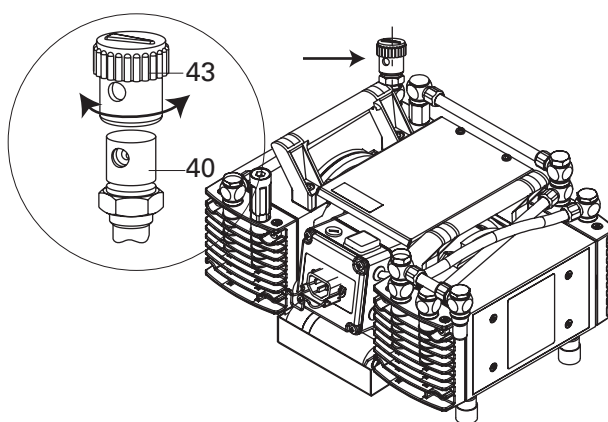
Danger of condensation and a reduced final vacuum during operation without a gas ballast or in case of insufficient supply of flushing gas.

- Only pump vapors when the pump is warm and the gas ballast valve is open.
- When the process has been completed, allow the pump to continue running for about 30 minutes at atmospheric pressure with the gas ballast open.

Gas ballast valve

Letting in gas ballast improves the discharge of condensate, and the pump achieves the specified final vacuum more quickly. The gas ballast valve can be replaced with a flushing gas connection if necessary.

The gas ballast valve is closed when turning to the right to position 0 and open when turning to the left to position 1. Intermediate settings are not possible.



- 40 Gas ballast valve
- 43 Cap

Fig. 7: Operation with gas ballast valve

- Open gas ballast valve; to do so, turn cap 43 on the gas ballast valve 40 so that the two holes line up.

**NOTE**

The pump achieves the specified values for throughput and final pressure after the operating temperature has been achieved and with the gas ballast valve closed.

Installing the flushing gas connection

The MVP 055-3C can be equipped with a flushing gas connection as an option.

Assembly

- Disconnect connection line from gas ballast valve.
- Dismantle gas ballast valve and replace with flushing gas connection piece.
- Restore connection line and connect inert gas line.
 - As a rule, let in dry air or pure nitrogen.



NOTE

Do not exceed maximum inlet pressure of 1.1 bar (absolute) at the flushing gas connection!

This can result in damage to the diaphragms.

- Provide a pressure reducer.

6.4 Switching off the pump

The pump can be switched off in any pressure range.

7 Maintenance

7.1 Precautions



WARNING

Danger of injury from moving parts!

After power failure or motor shutdown due to overheating, the motor may restart automatically.

- Secure the motor so that it cannot be switched on while any work is being performed on the pump.
- If necessary, dismantle the pump from the installation for inspection.



WARNING

Pump parts may be contaminated from pumped media!

Danger of poisoning due to contact with harmful substances.

- Decontaminate the pump before carrying out any maintenance work.
- In the event of contamination, take suitable safety precautions to prevent your health from being harmed by any dangerous substances.

The valves and the diaphragms are wear parts. If the rated ultimate vacuum is no longer achieved, the pump interior, the diaphragms and the valves must be cleaned and the diaphragms and valves must be checked for cracks or other damage.

Depending on individual cases it may be efficient to check and clean the pump heads on a regular basis. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours.

- Allow the pump to cool to a safe temperature.
- Only dismantle the pump as far as necessary in order to repair defects.
- Use only alcohol or similar agents for cleaning pump parts.
- Restore the original hose connections between the individual pumping stages.
 - The intake connections of the pumps are marked "IN" and the outlets "Ex" at the diaphragm heads.



NOTE

Service work should only be carried out by qualified personal!

Pfeiffer Vacuum is not liable for any damage to the pump resulting from work carried out improperly.

- Take advantage of our service training programs; additional information at www.pfeiffer-vacuum.net.
- Please state all the information on the pump rating plate when ordering spare parts.

Check list for inspections and maintenance

Certain repair and overhaul work should only be performed by Pfeiffer Vacuum Service (PV). Pfeiffer Vacuum will be released from all warranty and liability claims if the required intervals for inspection, maintenance, or overhaul are exceeded or inspection, maintenance, repair or overhaul procedures are not performed properly. This also applies if replacement parts other than Pfeiffer Vacuum OEM replacement parts are used.

Activity	daily	as required; at least once every six months	as required; at least annually	as required; at least every 2 years
Check silencer for contamination		X		
Clean, change valves and diaphragms			X	
Change silencer				X

Depending on the process, the required intervals for inspection and maintenance can exceed the typical values specified in the table. Please consult Pfeiffer Vacuum if necessary.

7.2 Cleaning and replacing diaphragm and valves at MVP 035-2

Cleaning and replacing the valves

- Allow the pump to cool down before beginning dismantling.
- Detach the pump from the mains and the pumping system and ensure the motor cannot get switched on.
- Unscrew the hose connection between the pump stages by loosening the hollow screw with a wrench (size 17).
- Remove the cheesehead screws 26 (four per membrane head).
- Remove housing cover G1 with head cover K1 taking care to prevent head cover falling out of housing cover.



NOTE

Damage to the pump

The two membrane heads have differing head covers K1/K2 and housing covers G1/G2. Head cover K1 has, on the intake side, and the housing cover G2 has, on the outlet side, an additional groove in the valve seating.

- When servicing take care not to interchange these two parts.

- Check diaphragm pair 10 for damage and replace if necessary.
- Remove head cover K1 from housing cover G1 to check valve seals 11.
- Taking care with the position of valve seals 11, remove and check for damage, and replacing if necessary.



NOTE

Damage to the valve seals

Valve seals can be destroyed by gluing to after wrong installation.

- Pay attention to the fitting position of the inlet and outlet valve seals. The valve flap of the valves may not cover the groove in the head and housing cover K/G.

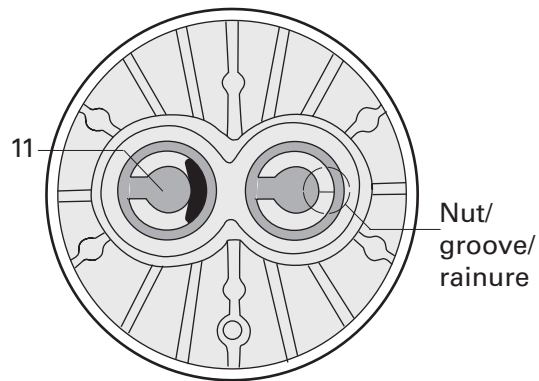


Fig. 8: Position of valve seals in the head cover

- Clean all parts.
- Re-assemble pump in reverse order.
- Check the other membrane head in the same way.

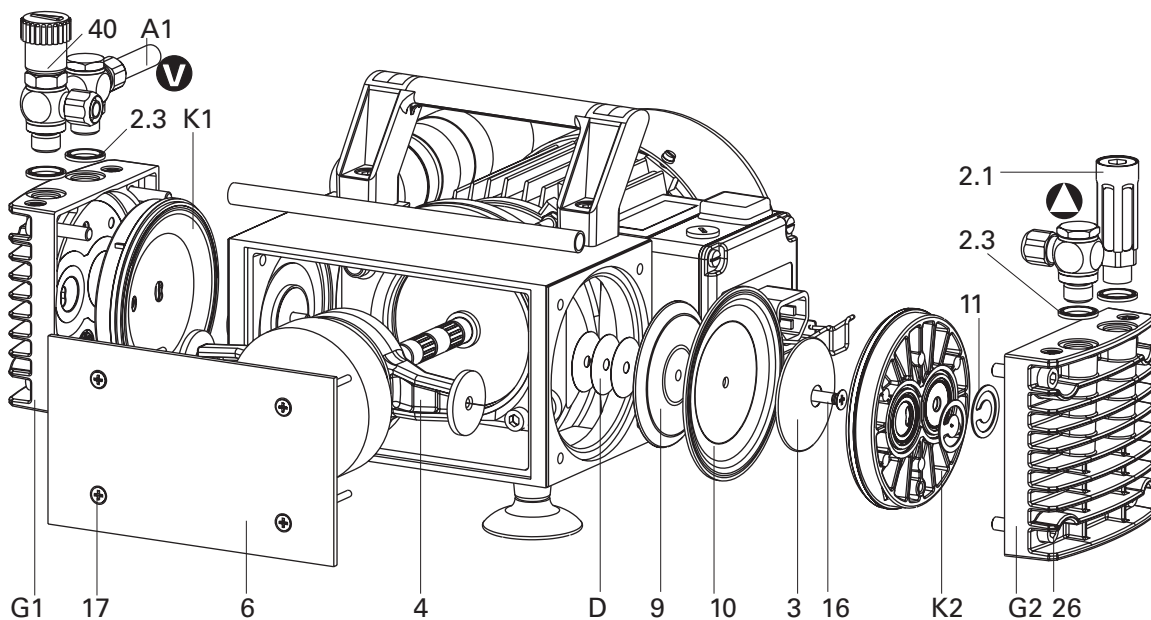


Fig. 9: MVP 035-2

A1 Vacuum inlet with hose connection	2.1 Silencer	11 Inlet and outlet valve seal
D Tolerance ring	2.3 Sealing ring	16 Countersunk screw
G1 Housing cover inlet side	3 Diaphragm spring washer	17 Countersunk screw
G2 Housing cover outlet side	4 Con-rod	26 Cheesehead screw
K1 Head cover inlet side	6 Housing panel	40 Gas ballast valve
K2 Head cover outlet side	9 Diaphragm support washer	
	10 Diaphragm pair	

Changing the Diaphragm

- Dismantle membrane heads as described before.
- Unscrew housing panel 6.
- Remove screw 16; this screw has been stuck to make secure against loosening.

**NOTE****Damage to the pump and reduced final vacuum!**

A changed dead centre (TDC) leads in the most unfavorable case to a bearing damage.

- Check for washers D under diaphragm support washer.
- Make sure that the original number is reassembled at the individual membrane head.

Assembling

- Dismantle diaphragm spring washer 3, diaphragm pair 10 and diaphragm support washer 9.
 - If it is difficult to separate the old diaphragm from support washer 9, apply e.g. alcohol or petroleum ether.
- When existing, re-fit spacers D under the diaphragm support washer 9. Fix in place with a little grease to prevent them falling down.
- Put two single diaphragms with their rough side together so that the labelled side of the two diaphragms are readable.
- Arrange diaphragm support washer 9, diaphragm pair 10 and diaphragm spring washer 3 onto screw 16.
- Place some threadlocker (low strength) under the head of screw 16 and screw in con-rod 4.
- Refit head cover, valve seals and housing cover in reverse order, taking care with the position of valve seals 11.

7.3 Cleaning and replacing diaphragm and valves at MVP 055-3

Cleaning and replacing the valves

- Allow the pump to cool down before beginning dismantling.
- Detach the pump from the mains and the pumping system and ensure the motor cannot get switched on.
- Unscrew the hose connection between the pump stages by loosening the hollow screw with a wrench (size 17).
- Remove the cheesehead screws 26 (four per membrane head).
- Remove housing cover G1 ... G4 with head cover K1 ... K4 taking care to prevent head cover falling out of housing cover.
- Check diaphragm pair 10 for damage and replace if necessary.
- Remove head cover K from housing cover G to check valve seals 11.
- Taking care with the position of valve seals 11, remove and check for damage, and replacing if necessary.

**NOTE****Damage to the valve seals!**

Valve seals can be destroyed by gluing to after wrong installation. The inlet valve seal (11a) of membrane head 4 and the outlet valve seal (11b) of membrane head 3 differ from all other valve seals.

- Do not exchange when assembling the membrane heads.

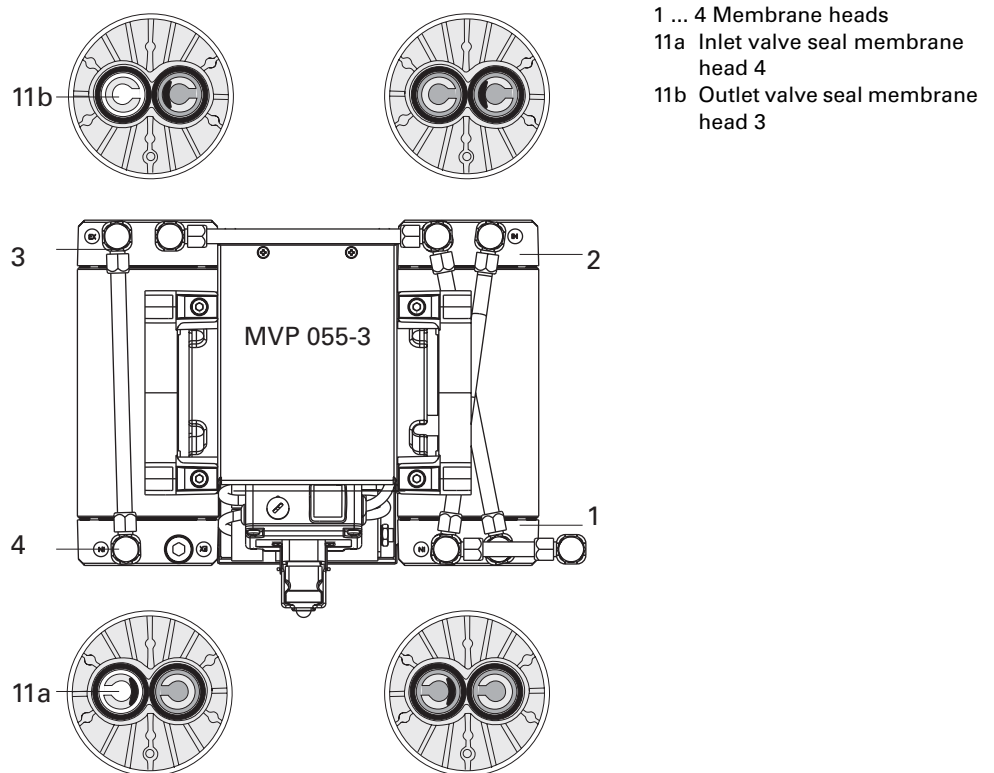


Fig. 10: Required fitting positions of the valve seals 11

- ➔ Replace both o-rings 12 of the valve seat.
- ➔ Clean all parts.
- ➔ Re-assemble pump in reverse order.
- ➔ Check the other membrane head in the same way.

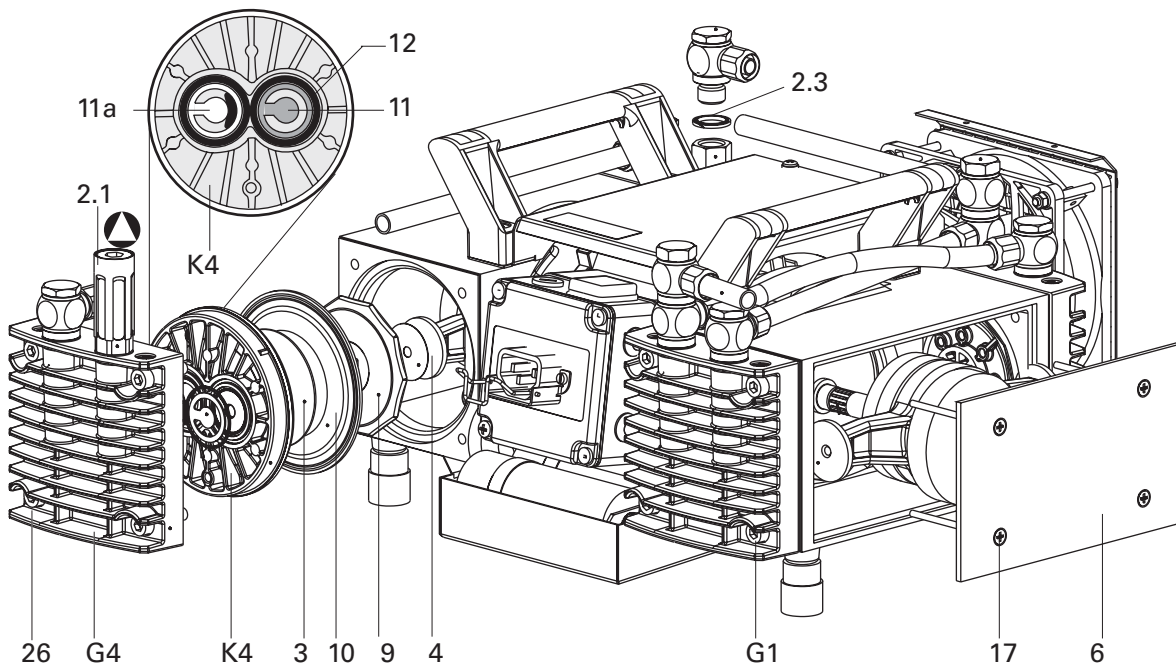


Fig. 11: MVP 055-3

G1	Housing cover membrane head 1	6	Housing panel	11b	Outlet valve seal membrane head 3
G4	Housing cover membrane head 4	9	Diaphragm support washer	12	O-ring
K4	Head cover membrane head 4	10	Diaphragm pair	16	Countersunk screw (not shown in fig.)
2.1	Silencer	11	Inlet and outlet valve seal (standard)	17	Countersunk screw
2.3	Seal ring	11a	Inlet valve seal membrane head 4	26	Cheesehead screw
3	Diaphragm spring washer				
4	Con-rod				

Changing the Diaphragms

Depending on the pump type two diaphragm attachments are possible for replacing of diaphragms:

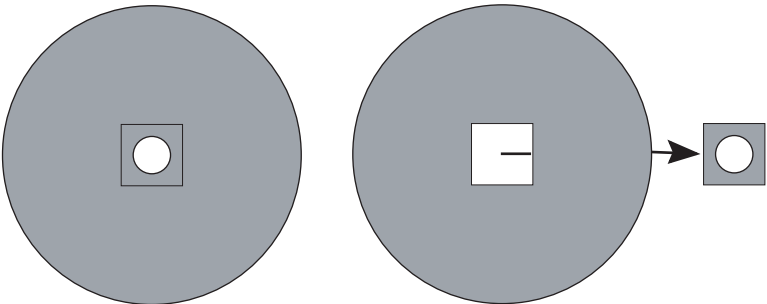


Fig. 12: Diaphragm attachments

design with round hole for countersunk screw

design with square hole for attachment by means of form fit (remove the punched part in the centre!)

Diaphragm attachment by means of form fit

- Use face wrench with universal joint (size 40/4) and turn the diaphragm support disc 9 from the connecting rod side to remove the diaphragm pair.
- If the old diaphragm pair 10 is difficult to separate from the support disc 9, immerse assembly in alcohol or petroleum ether.

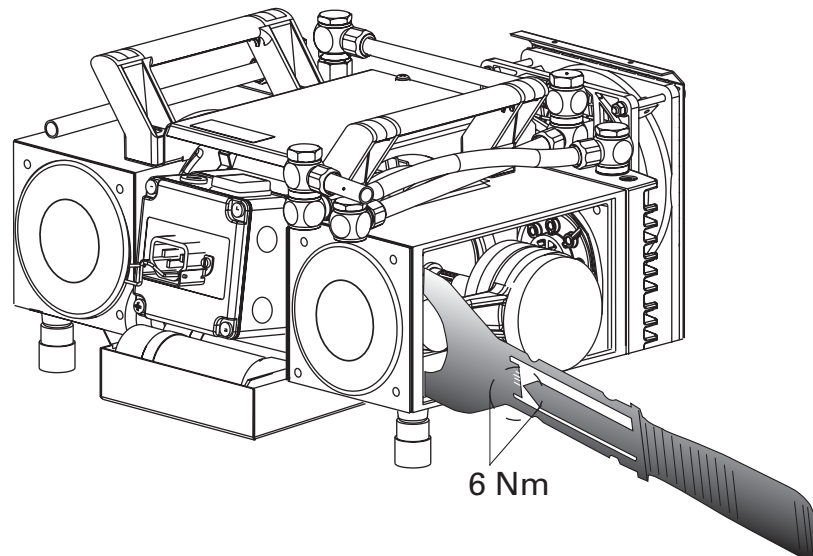


NOTE

Damage to the pump and reduced final vacuum!
A changed dead centre (TDC) leads in the most unfavorable case to a bearing damage.
→ Check for washers D under diaphragm support washer.
→ Make sure that the original number is reassembled at the individual membrane head.

Assembling

- Remove the punched part in the centre of the diaphragm (only for diaphragm spring washer with square head socket).
- When existing, re-fit spacers D under the diaphragm support washer 9. Fix in place with a little grease to prevent them falling down.
- Put two single diaphragms with their rough side together so that the labelled side of the two diaphragms are readable.
- Position new diaphragm pair 10 between diaphragm spring washer 3 with square head screw and diaphragm support washer 9; make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- Use face wrench to assemble diaphragm spring washer, diaphragm pair 10 and diaphragm support washer 9 (and eventually spacers D) to the con rod 4.
- Adhere the optimum torque of 6 Nm for the diaphragm support washer; the pointer in the handle of the face wrench with universal joint shows to the longer marking line.
- Reassemble housing upper parts and housing plate in reverse order.
- Performance check of the pump (after reassembling the connection hoses).



Diaphragm attachment with countersunk head screw

- Dismantle membrane heads as described before.
- Unscrew housing panel 6.
- Remove screw 16; this screw has been stuck by threadlocker to make secure against loosening.



NOTE

Damage to the pump and reduced final vacuum!

A changed dead centre (TDC) leads in the most unfavorable case to a bearing damage.

- Check for washers D under diaphragm support washer.
- Make sure that the original number is reassembled at the individual membrane head.

- Dismantle diaphragm spring washer 3, diaphragm pair 10 and diaphragm support washer 9.
 - If it is difficult to separate the old diaphragm from support washer 9, apply e.g. alcohol or petroleum ether.

Assembling

- When existing, re-fit spacers D under the diaphragm support washer 9. Fix in place with a little grease to prevent them falling down.
- Put two single diaphragms with their rough side together so that the labelled side of the two diaphragms are readable.
- Arrange diaphragm support washer 9, diaphragm pair 10 and diaphragm spring washer 3 onto screw 16.
- Place some threadlocker (low strength) under the head of screw 16 and screw in con-rod 4.

7.4 Cleaning and replacing diaphragm and valves at MVP 055-3C

Cleaning and replacing the valves

- Allow the pump to cool down before beginning dismantling.
- Detach the pump from the mains and from the pumping system and ensure the motor cannot get switched on.
- Unscrew the hose connection between the pump stages by loosening the hollow screw with a wrench (size 17).
- Remove the cheesehead screws 26 (four per membrane head).
- Remove housing cover G1 ... G4 with head cover K1 ... K4 taking care to prevent head cover falling out of housing cover.

- Check diaphragm 10 (individual part) for damage and replace if necessary.
- Remove head cover K from housing cover G to check valve seals 11.
- Taking care with the position of valve seals 11, remove and check for damage, and replacing if necessary.
- Clean all parts.
- Re-assemble pump in reverse order.
- Check the other membrane head in the same way.

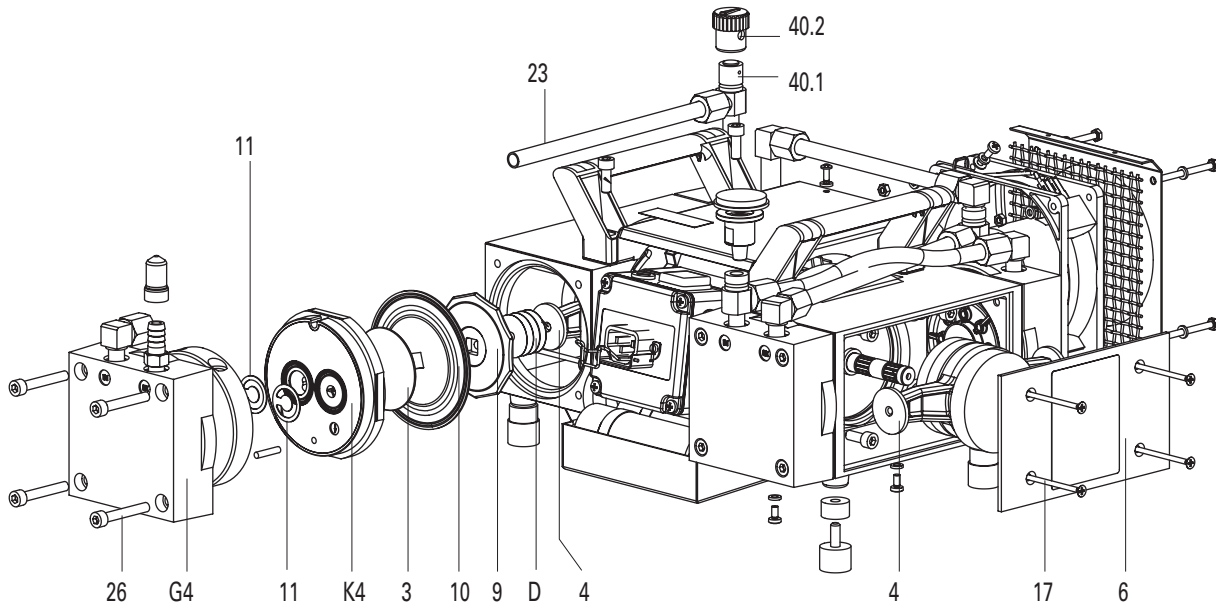


Fig. 13: MVP 055-3C

D	Spacers	9	Diaphragm support washer	17	Countersunk screw
G4	Housing cover membrane head	10	Diaphragm (individual part)	23	Connecting hose
4		11	Inlet and outlet valve seal II	26	Cheesehead screw
K4	Head cover membrane head 4	16	Countersunk screw	40.1	Gas ballast elbow union
3	Diaphragm spring washer			40.2	Rubber cap for 40.1
4	Con-rod				
6	Housing panel				

Changing the Diaphragm on MVP 055-3C

- Dismantle membrane heads as described before.
- Unscrew both housing panels 6.
- Use face wrench with universal joint (size 40/4) and turn the diaphragm support washer 9 from the con-rod side to remove the diaphragm 10.
- Remove diaphragm spring washer 3, diaphragm 10 and diaphragm support washer 9.
- If the old diaphragm 10 is difficult to separate from the support washer 9, immerse assembly in alcohol or petroleum ether.



NOTE

Damage to the pump and reduced final vacuum!

A changed dead centre (TDC) leads in the most unfavorable case to a bearing damage.

- Check for washers D under diaphragm support washer.
- Make sure that the original number is reassembled at the individual membrane head.

- Fit new diaphragm 10 between diaphragm spring washer 3 and diaphragm support washer 9.
- Refit diaphragm 10 with spring washer and support washer in reverse order.

- ➔ Place some threadlocker (low strength) at the thread of diaphragm spring washer 3 and screw in con-rod 4 with face wrench.
- ➔ Fit both housing covers 6.
- ➔ To fit the PTFE connecting hose 23, tighten the metal lock nut by hand and then by a half a turn with an open-end wrench (size 17).

8 Shutdown

8.1 Shutting down for longer periods

Before shutting down the pump, observe the following procedure and adequately protect the pump system against corrosion:

Shortly after condensate has formed:

- Let the vacuum pump continue to run for several minutes with the intake port open.
- Should media get into the pump which could corrode the pump materials or form deposits, clean and check the diaphragm heads.

In the long term:

- Carry out the measures described for brief shutdowns.
- Disconnect the pump from the equipment.
- Close the manual gas ballast valve.
- Close the inlet and outlet opening (e.g. with transport caps).
- Store the pump in a dry place.

9 Malfunctions

Please note the following instructions should the pump malfunction:



CAUTION

Hot surface!

Danger of burns if hot parts are touched. The surface temperature of the pump may rise above 105 °C in case of malfunction.

- Carry out work on the pump only after it has cooled to a safe temperature.



NOTE

Motor overload!

Depending on the malfunction (e.g. blocking during cold start), the motor may not be sufficiently protected by the built-in thermal protection switch from damage through overheating.

- Implement an additional network safety device.

9.1 Troubleshooting

Problem	Possible causes	Remedy
Pump will not start up	No mains voltage or voltage does not correspond to the motor data	Check mains voltage and mains fuse protection; check motor switch
	Pump temperature too low	Warm up pump to > 12°C
	Thermal protection switch of the motor has responded	Detect and fix cause of overheating; allow pump to cool off if necessary.
	Phase failure	Check fuse
	Diaphragms or valves dirty	Clean pump (<i>see p. 17, chap. 7</i>)
	Overpressure in the exhaust lead	Check exhaust lead
Pump switches off after a while after being started	Thermal protection switch of the motor has responded	Detect and fix cause of overheating; allow pump to cool off if necessary.
	Mains fuse protection triggered due to overload (e.g. cold start)	Warm up pump
	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
Pump not achieving the end pressure	Condensate in the pump	Operate pump for a longer period of time at atmospheric pressure; if necessary, open the gas ballast valve
	Gas ballast valve open	Close gas ballast valve
	Valves or diaphragms dirty or defective	Clean or change valves and diaphragms (<i>see p. 17, chap. 7</i>)
	Leak in the system	Fix leak
Pumping speed of pump too low	Intake line not well-dimensioned	Keep connections as short as possible and see that cross-sections are sufficiently dimensioned
	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
Unusual noises during operation	Diaphragms or valves defective	Clean or change valves and diaphragms (<i>see p. 17, chap. 7</i>)
	Suction chamber dirty	Clean suction chamber
	Silencer loose or missing	Check silencer; replace if necessary
	Valves dirty or defective	Clean or change valves and diaphragms (<i>see p. 17, chap. 7</i>)
	Motor fan defective	Replace motor fan
	Connection rod or motor bearing defective	Contact Pfeiffer Vacuum Service



NOTE

Service work should only be carried out by qualified personal!

Pfeiffer Vacuum is not liable for any damage to the pump resulting from work carried out improperly.

→ Take advantage of our service training programs; additional information at www.pfeiffer-vacuum.net.

→ Please state all the information on the pump rating plate when ordering spare parts.

10 Service

Pfeiffer Vacuum offers first-class service!

- Maintenance/repairs on the spot by Pfeiffer Vacuum field service
- Maintenance/repairs in the nearby service center or service point
- Fast replacement with exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

Detailed information and addresses at: **www.pfeiffer-vacuum.net (Service)**.

Maintenance and repairs in the Pfeiffer Vacuum ServiceCenter

The following steps are necessary to ensure a fast, smooth servicing process:

- RMA¹⁾ form and contamination declaration.
- Fill in the RMA form and send it by fax or e-mail to your service address.
- Enclose the RMA confirmation of receipt from Pfeiffer Vacuum in the shipment.
- Fill in the contamination declaration and enclose it in the shipment (required!).
- Dismantle all accessories.
- Send the pump in its original packaging if at all possible.

Returning contaminated vacuum pumps

Units which are microbiologically, explosively or radioactively contaminated will not be accepted by Pfeiffer Vacuum as a matter of principle. Hazardous substances are substances and compounds in accordance with the hazardous goods directive (current version). Should pumps be contaminated or the contamination declaration be missing, Pfeiffer Vacuum will decontaminate the pumps at your cost.

Returning contaminated pumps or units

- Neutralise the pump by flushing it with nitrogen or dry air.
- Close off all openings so that they are air-tight.
- Seal the pump or unit in suitable protective film.
- Only return the pump/unit in a suitable and sturdy transport container.

All service orders are carried out exclusively according to our repair conditions for vacuum units and components.

¹⁾ RMA: Download the return material authorisation

11 Spare parts

Spare part package/ Spare parts	Pump type	No.	Pieces	consisting of the parts
Set of wearing parts	MVP 035-2	PU E22 005 -T	1	10, 11
	MVP 055-3	PU E22 006 -T	1	10, 11, 11a, 11b
	MVP 055-3C	PU E22 007 -T	1	10, 11
Silencer	MVP 035-2	P 0920 412 E	1	2.1
	MVP 055-3		1	
Usit-Dichtring	MVP 035-2	P 3529 143 -C	1 (of 13)	2.3
	MVP 055-3		1 (of 30)	
Hose connection, complete	MVP 035-2	P 0920 542 E		
	MVP 055-3	P 0920 410 E		
	MVP 055-3C	P 0920 429 E		
Hose, Polyethylene 10 x8 mm	MVP 035-2	P 0988 088	1 m	
	MVP 055-3			
Hose, PTFE	MVP 055-3C	P 0988 734	1 m	
Gas ballast valve	MVP 035-2	P 0920 634 E	1	40
Gas ballast elbow union	MVP 055-3C	P 0996 097	1	40.1
Rubber cap for gas ballast elbow union	MVP 055-3C	P 0996 098	1	40.2
Elbow union 1/8 NPT	MVP 055-3C	P 0920 558 E	1	

12 Accessories

Description	Size / Length	Order no.
Mains cable for individual wiring Anschluss an TC 600 and for connecting to TC 600 via relay box	3 m	PK 050 111
Mains cable 230 V, with schuko plug, EURO Counter plug CEE 22	2 m	PK 050 109
Mains cable 115 V, UL EURO Counter plug CEE 22	2 m	PK 050 110
Relaisbox for TC 600 connection		PM 041 937 GT
Face wrench with torque pointer 6 Nm	40/4	P 0998 187
Small flange connection with seal ring for MVP 035-2 (for intake or outlet side)	DN 16 ISO-KF	PK 050 114 -T
Small flange connection with seal ring for MVP 055-3 (for intake side)	DN 16 ISO-KF	PK 050 115 -T
Small flange connection with seal ring for MVP 055-3 (for outlet side)	DN 16 ISO-KF	PK 050 114 -T
Gas ballast valve für MVP 055-3		P 0920 634 E
Hose nipple + seal ring for outlet side for MVP 055-3	DN 10 / G 1/4"	PK 050 174
Small flange connection with seal ring for MVP 055-3C (for intake or outlet side)	DN 16 ISO-KF	P 0920 746 E
Flushing gas connector for MVP 055-3C	ø 11 mm	PK 050 123
Hose nipple for outlet side for MVP 055-3C	DN 10 / 1/8 NPT	PK 050 175

Further detailed accessories are contained in the Pfeiffer Vacuum printed Catalogue or the Online Catalogue.

13 Technical Data

Technical Data	MVP 035-2
Vacuum connection	G 1/4" elbow union + enclosed hose DN 8 x 1000 mm with a elbow union in G 1/4" at the end
Exhaust connection	G 1/4" + silencer
Volume flow rate at 50 Hz	2.1 m ³ /h
Volume flow rate at 60 Hz	2.4 m ³ /h
Final pressure: total without gas ballast	≤ 4 mbar
Final pressure: total with gas ballast	≤ 5 mbar
Intake pressure, max.	1100 mbar
Exhaust pressure, max.	1100 mbar
Leak rate	1·10 ⁻¹ mbar l/s
Emission sound pressure level without gas ballast	49 dB(A)
Max. installation altitude (above mean sea level)	2000 m
Ambient and gas temperature, max.	12 - 40 °C
Protection class	IP 54
Overload protection, motor	+ 160°C
Mains requirement (switchable)	100-120 / 200-240 V, 50/60 Hz
Power switch	yes
Nominal rotation speed at 50 Hz	1500 1/min
Nominal rotation speed at 60 Hz	1800 1/min
Motor rating	180 W
Current, max. at 100 ... 120V/60Hz	3.8 A
Current, max. at 200 ... 240V/60Hz	1.8 A
Weight	10.4 kg

Technical Data	MVP 055-3	MVP 055-3 C
Vacuum connection	G 1/4" elbow union + enclosed hose DN 8x 1000 mm with a elbow union in G 1/4" at the end	DN 16 ISO-KF / 1/8" NPT
Exhaust connection	G 1/4" + silencer	Hose wave DN 10 mm / 1/8" NPT
Volume flow rate at 50 Hz	3.3 m ³ /h	3.0 m ³ /h
Volume flow rate at 60 Hz	3.8 m ³ /h	3.5 m ³ /h
Final pressure: total without gas ballast	≤ 2 mbar	≤ 2 mbar
Final pressure: total with gas ballast	-	≤ 4 mbar
Intake pressure, max.	1100 mbar	1100 mbar
Exhaust pressure, max.	1100 mbar	1100 mbar
Leak rate	1·10 ⁻¹ mbar l/s	1 mbar l/s
Emission sound pressure level without gas ballast	52 dB (A)	52 dB (A)
Max. installation altitude (above mean sea level)	2000 m	2000 m
Ambient and gas temperature, max.	12 - 40 °C	12 - 40 °C
Protection class	IP 20	IP 20
Overload protection, motor	+ 160°C	+ 160°C
Mains requirement (switchable)	100-120 / 200-240 V, 50/60 Hz	100-120 / 200-240 V, 50/60 Hz
Power switch	yes	yes
Nominal rotation speed at 50 Hz	1500 1/min	1500 1/min
Nominal rotation speed at 60 Hz	1800 1/min	1800 1/min
Motor rating	200 W	200 W
Current, max. at 100 ... 120V/60Hz	4.5 A	4.5 A
Current, max. at 200 ... 240V/60Hz	2.1 A	2.1 A
Weight	15.8 kg	16.2 kg

13.1 Substances in contact with the media

Standard version MVP 035-2 and MVP 055-3

Pump components	Substances in contact with the media
Diaphragm pair	FPM
Diaphragm spring washer	Aluminium alloy (Al Si 12)
Head cover	Aluminium alloy (Al Si 12)
Valve seals	FPM
Housing cover	Aluminium alloy (Al Si 12)
Fittings	Aluminium alloy, anodised (Al Cu Mg Pb)
Connecting hose	Polyethylene
Seals	Steel/Elastomer (FPM)
Countersunk screw (diaphragm spring washer)	Stainless steel
Silencer	Aluminium/PE
Intake flange (option)	Stainless steel

Corrosive gas version MVP 055 -3C

Pump components	Substances in contact with the media
Diaphragm	PTFE coated, reinforced Elastomer
Diaphragm spring washer	Fluoroplastics (ETFE) coated Aluminium
Head cover	Reinforced ETFE
Valve seals	Perfluoroelastomer (e. g. Kalrez)
Housing cover, inner part	Reinforced PTFE
Fittings	Fluoroplastics (ETFE)
Connecting hose	PTFE
Hose nipple	Fluoroplastics (ETFE)
Intake flange	Stainless steel

13.2 Dimension diagram

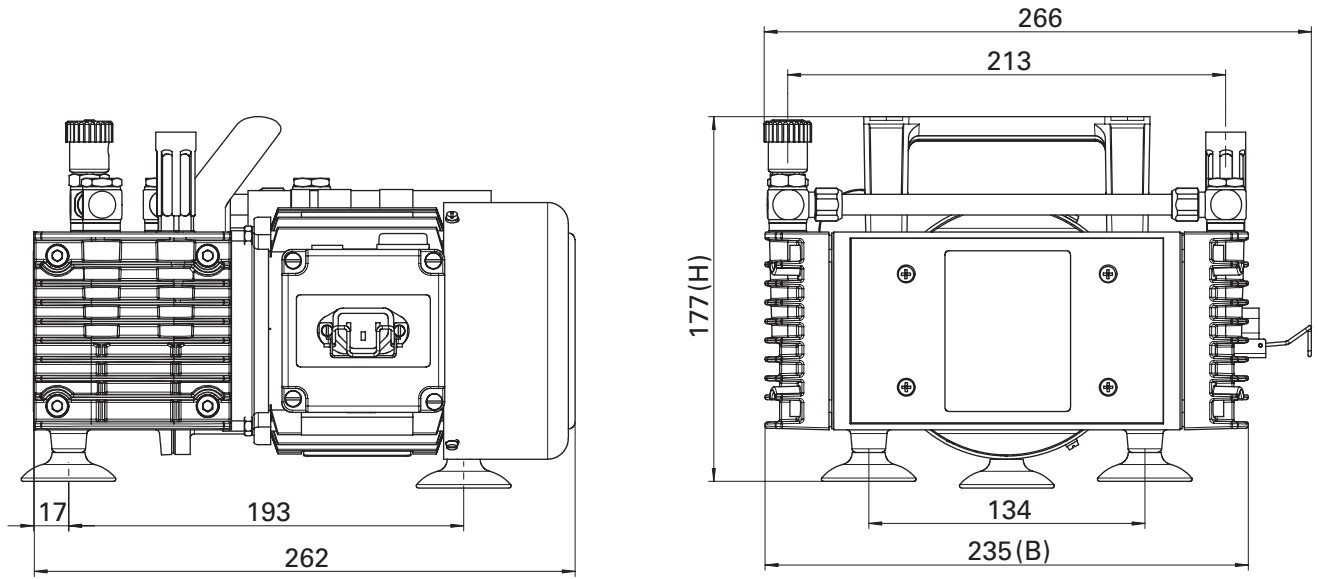


Fig. 14: Dimensions MVP 035-2

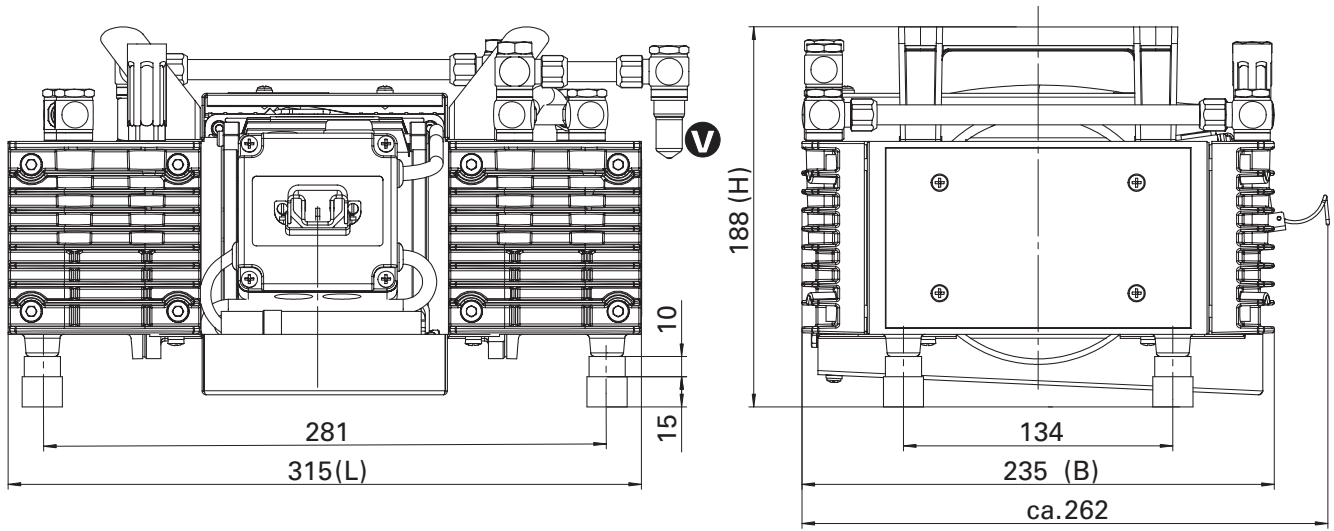


Fig. 15: Dimensions MVP 055-3

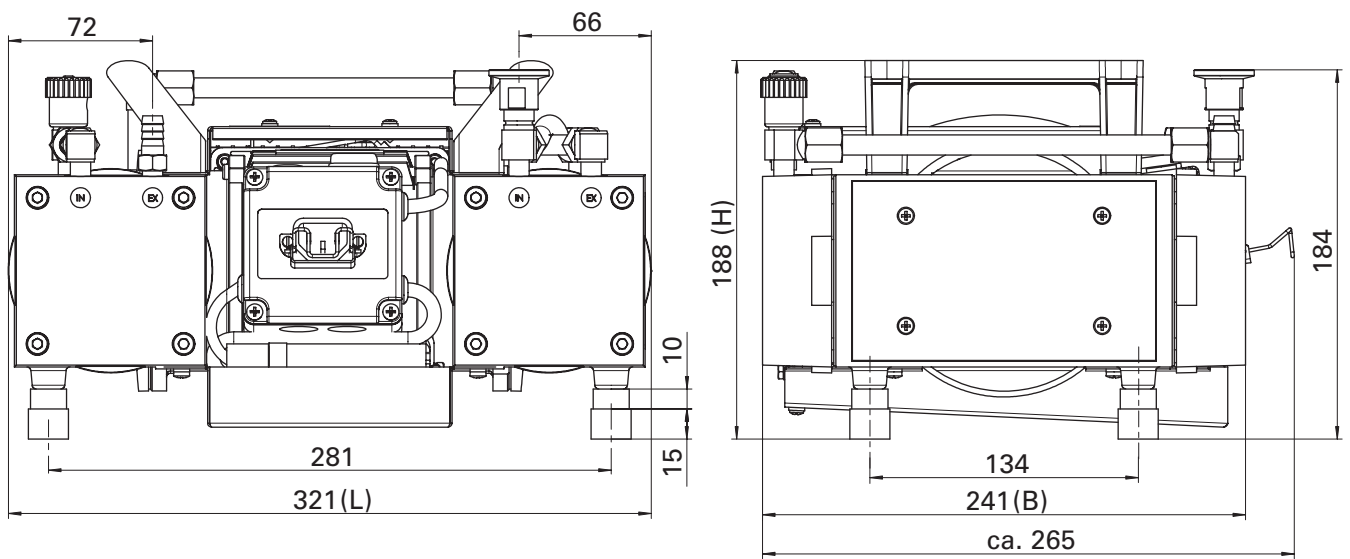


Fig. 16: Dimensions MVP 055-3C



Declaration of conformity

pursuant to the following EU directives:

- **Machinery 98/37/EEC (Annex II A)**
- **Low Voltage 2006/95/EEC**
- **Electromagnetic Compatibility 89/336/EEC**

We hereby certify, that the product specified below is in accordance with the provision of EU Machinery Directive **98/37/EEC**, EU Electromagnetic Compatibility Directive **89/336/EEC** and the EU Low Voltage Directive **2006/95/EEC**.

MVP 035-2, MVP 055-3/3C

Guidelines, harmonised standards, national standards in languages and specifications which have been applied:

DIN EN ISO 12100-2

DIN EN 61010-1

DIN EN 1012-2

DIN EN 61326

Signatures:

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CE/2007

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Turbopumps



Rotary vane pumps



Roots pumps



Dry compressing pumps



Leak detectors



Valves



Components and feedthroughs



Vacuum measurement



Gas analysis



System engineering



Service



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