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

<table>
<thead>
<tr>
<th>MVP 035-2, MVP 055-3/3C</th>
<th>Operating instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety information for vacuum pumps “Safety Guide”</td>
<td>PT 0300 BN*</td>
</tr>
<tr>
<td>Declaration of Conformity</td>
<td>Part of this document</td>
</tr>
<tr>
<td>Operating instructions for accessories (order-specifically)</td>
<td>see section “accessories”**</td>
</tr>
</tbody>
</table>

*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:

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate danger</td>
</tr>
<tr>
<td>Death or very severe injuries occur.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
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</thead>
<tbody>
<tr>
<td>Possible danger</td>
</tr>
<tr>
<td>Death or injuries may occur.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
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</thead>
<tbody>
<tr>
<td>Possible danger</td>
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<tr>
<td>Medium to slight injuries may occur.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE</th>
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<tbody>
<tr>
<td>Command or note</td>
</tr>
<tr>
<td>Command to perform an action or information about properties, the disregarding of which may result in damage to the product.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Pump designs</th>
</tr>
</thead>
</table>
| 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  
• DN 16 ISO-KF  
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  
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
Fig. 4: MVP 055-3C

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
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.
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

**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.

**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.

**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.

**Switch position: 115° & 230°**

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

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.
**Installation**

### 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:

![Connection diagram](image)

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

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

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

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.

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.
Operation

**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.

<table>
<thead>
<tr>
<th>NOTE</th>
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<tbody>
<tr>
<td>Do not exceed maximum inlet pressure of 1.1 bar (absolute) at the flushing gas connection!</td>
</tr>
<tr>
<td>This can result in damage to the diaphragms.</td>
</tr>
<tr>
<td>➔ Provide a pressure reducer.</td>
</tr>
</tbody>
</table>

**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.
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.
- 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.

#### 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.

#### 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
D Tolerance ring
G1 Housing cover inlet side
G2 Housing cover outlet side
K1 Head cover inlet side
K2 Head cover outlet side

2.1 Silencer
2.3 Sealing ring
3 Diaphragm spring washer
4 Con-rod
6 Housing panel
9 Diaphragm support washer
10 Diaphragm pair
11 Inlet and outlet valve seal
16 Countersunk screw
17 Countersunk screw
26 Cheesehead screw
40 Gas ballast valve

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.
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.
- 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.

#### 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.
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.
Changing the Diaphragms

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

![Fig. 12: Diaphragm attachments](image)

**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.

**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).

**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.
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.

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

Clean 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.

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.
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

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:

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hot surface!</strong></td>
</tr>
<tr>
<td>Danger of burns if hot parts are touched. The surface temperature of the pump may rise above 105 °C in case of malfunction.</td>
</tr>
<tr>
<td>➔ Carry out work on the pump only after it has cooled to a safe temperature.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Motor overload!</strong></td>
</tr>
<tr>
<td>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.</td>
</tr>
<tr>
<td>➔ Implement an additional network safety device.</td>
</tr>
</tbody>
</table>
## 9.1 Troubleshooting

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

### 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

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

12 Accessories

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

Further detailed accessories are contained in the Pfeiffer Vacuum printed Catalogue or the Online Catalogue.
# 13 Technical Data

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>MVP 035-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum connection</td>
<td>G 1/4&quot; elbow union + enclosed hose DN 8 x 1000 mm with a elbow union in G 1/4&quot; at the end</td>
</tr>
<tr>
<td>Exhaust connection</td>
<td>G 1/4&quot; + silencer</td>
</tr>
<tr>
<td>Volume flow rate at 50 Hz</td>
<td>2.1 m³/h</td>
</tr>
<tr>
<td>Volume flow rate at 60 Hz</td>
<td>2.4 m³/h</td>
</tr>
<tr>
<td>Final pressure: total without gas ballast</td>
<td>≤ 4 mbar</td>
</tr>
<tr>
<td>Final pressure: total with gas ballast</td>
<td>≤ 5 mbar</td>
</tr>
<tr>
<td>Intake pressure, max.</td>
<td>1100 mbar</td>
</tr>
<tr>
<td>Exhaust pressure, max.</td>
<td>1100 mbar</td>
</tr>
<tr>
<td>Leak rate</td>
<td>1·10⁻¹ mbar l/s</td>
</tr>
<tr>
<td>Emission sound pressure level without gas ballast</td>
<td>49 dB(A)</td>
</tr>
<tr>
<td>Max. installation altitude (above mean sea level)</td>
<td>2000 m</td>
</tr>
<tr>
<td>Ambient and gas temperature, max.</td>
<td>12 - 40 ºC</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP 54</td>
</tr>
<tr>
<td>Overload protection, motor</td>
<td>+ 160°C</td>
</tr>
<tr>
<td>Mains requirement (switchable)</td>
<td>100-120 / 200-240 V, 50/60 Hz</td>
</tr>
<tr>
<td>Power switch</td>
<td>yes</td>
</tr>
<tr>
<td>Nominal rotation speed at 50 Hz</td>
<td>1500 1/min</td>
</tr>
<tr>
<td>Nominal rotation speed at 60 Hz</td>
<td>1800 1/min</td>
</tr>
<tr>
<td>Motor rating</td>
<td>180 W</td>
</tr>
<tr>
<td>Current, max. at 100 ... 120V/60Hz</td>
<td>3.8 A</td>
</tr>
<tr>
<td>Current, max. at 200 ... 240V/60Hz</td>
<td>1.8 A</td>
</tr>
<tr>
<td>Weight</td>
<td>10.4 kg</td>
</tr>
</tbody>
</table>
### Technical Data

<table>
<thead>
<tr>
<th></th>
<th>MVP 055-3</th>
<th>MVP 055-3 C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum connection</td>
<td>G 1/4” elbow union + enclosed hose DN 8x 1000 mm with a elbow union in G 1/4” at the end</td>
<td>DN 16 ISO-KF / 1/8” NPT</td>
</tr>
<tr>
<td>Exhaust connection</td>
<td>G 1/4” + silencer</td>
<td>Hose wave DN 10 mm / 1/8” NPT</td>
</tr>
<tr>
<td>Volume flow rate at 50 Hz</td>
<td>3.3 m³/h</td>
<td>3.0 m³/h</td>
</tr>
<tr>
<td>Volume flow rate at 60 Hz</td>
<td>3.8 m³/h</td>
<td>3.5 m³/h</td>
</tr>
<tr>
<td>Final pressure: total without gas ballast</td>
<td>≤ 2 mbar</td>
<td>≤ 2 mbar</td>
</tr>
<tr>
<td>Final pressure: total with gas ballast</td>
<td>-</td>
<td>≤ 4 mbar</td>
</tr>
<tr>
<td>Intake pressure, max.</td>
<td>1100 mbar</td>
<td>1100 mbar</td>
</tr>
<tr>
<td>Exhaust pressure, max.</td>
<td>1100 mbar</td>
<td>1100 mbar</td>
</tr>
<tr>
<td>Leak rate</td>
<td>1·10⁻¹ mbar l/s</td>
<td>1 mbar l/s</td>
</tr>
<tr>
<td>Emission sound pressure level without gas ballast</td>
<td>52 dB (A)</td>
<td>52 dB (A)</td>
</tr>
<tr>
<td>Max. installation altitude (above mean sea level)</td>
<td>2000 m</td>
<td>2000 m</td>
</tr>
<tr>
<td>Ambient and gas temperature, max.</td>
<td>12 - 40 ºC</td>
<td>12 - 40 ºC</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP 20</td>
<td>IP 20</td>
</tr>
<tr>
<td>Overload protection, motor</td>
<td>+ 160°C</td>
<td>+ 160°C</td>
</tr>
<tr>
<td>Mains requirement (switchable)</td>
<td>100-120 / 200-240 V, 50/60 Hz</td>
<td>100-120 / 200-240 V, 50/60 Hz</td>
</tr>
<tr>
<td>Power switch</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Nominal rotation speed at 50 Hz</td>
<td>1500 1/min</td>
<td>1500 1/min</td>
</tr>
<tr>
<td>Nominal rotation speed at 60 Hz</td>
<td>1800 1/min</td>
<td>1800 1/min</td>
</tr>
<tr>
<td>Motor rating</td>
<td>200 W</td>
<td>200 W</td>
</tr>
<tr>
<td>Current, max. at 100 ... 120V/60Hz</td>
<td>4.5 A</td>
<td>4.5 A</td>
</tr>
<tr>
<td>Current, max. at 200 ... 240V/60Hz</td>
<td>2.1 A</td>
<td>2.1 A</td>
</tr>
<tr>
<td>Weight</td>
<td>15.8 kg</td>
<td>16.2 kg</td>
</tr>
</tbody>
</table>
# Technical Data

## 13.1 Substances in contact with the media

### Standard version

**MVP 035-2 and MVP 055-3**

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

### Corrosive gas version

**MVP 055 -3C**

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

(M.Bender)  (Dr. M. Wiemer)
Managing Director  Managing Director

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

CE/2007
Vacuum is nothing, but everything to us!

- Turbopumps
- Rotary vane pumps
- Roots pumps
- Dry compressing pumps
- Leak detectors
- Valves
- Components and feedthroughs
- Vacuum measurement
- Gas analysis
- System engineering
- Service