A PASSION FOR PERFECTION

PFEIFFER VACUUM

MVP 003-2

Diaphragm Pumps

Operating Instructions

EN

Translation of the original instructions

PU 0061 BEN/B (1406)

Table of contents

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 refers 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.com.

Applicable documents

MVP 003-2	Operating instructions
Declaration of Conformity	Part of this document
Operating instructions for accessories (order-specifically)	see section "accessories"*

*also available via www.pfeiffer-vacuum.com

1.2 Conventions

Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions 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

Imminent danger

Indicates an imminent hazardous situation that will result in death or serious injury.

WARNING

Possibly imminent danger

Indicates an imminent hazardous situation that can result in death or serious injury.

CAUTION

Possibly imminent danger

Indicates an imminent hazardous situation that can result in minor or moderate injury.

NOTICE

Command or note

Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

Pictographs

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 the product or this document

Instructions in the text

➔ Work instruction: here you have to do something.

Symbols used

The following symbols are used consistently throughout in all illustrations:

- Ⓥ Vacuum connection
- Ⓐ Exhaust

2 Safety

2.1 Safety precautions

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.

Installation and operation of accessories

Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.

➔ For information on order numbers of components, see "Accessories".

➔ Use original accessory parts only.

- 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.
- 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

NOTICE

EC 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 Nicht-bestimmungsgemäße Verwendung

Improper use will cause all claims for liability and warranties to be forfeited. Improper use is defined as usage for purposes deviating from those mentioned above, especially:

- pumping of corrosive gases
- pumping of explosive media
- operation 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 exposed voltage-carrying parts

3 Transport and storage

3.1 Transport

➔ Lift pump by hand at both face sides.
  – Do not use the hose connection on the top side of the pump to carry 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.

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

Scope of delivery

- Pump with drive unit
- Silencer
- Operating instructions

4.2 Function

The diaphragm vacuum pump of the series MVP 003-2 is a two stage, dry compressor vacuum pump. 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.

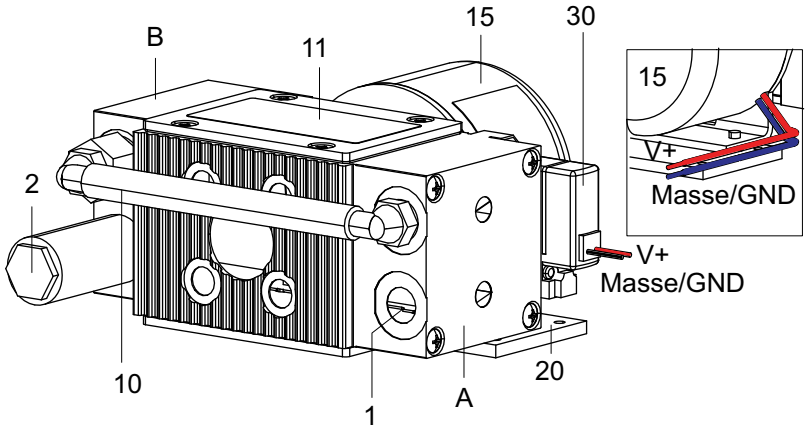


Fig. 1: MVP 003-2

A	Diaphragm head 1	10	Hose connection	20	Fixing plate
B	Diaphragm head 2	11	Cover	30	Solenoid valve with purge orifice
1	Vacuum connection, G 1/8"	15	Drive motor		
2	Exhaust with silencer, G 1/8"				

4.3 Range of application

The pump is suitable for pumping air and gases at a temperature of + 5 to 40°C.

5 Installation

5.1 Setting up the pump

Observe the following requirements when setting up the pump:

➔ Install the pump on an even, horizontal surface and mount on the associated fixing plate.
  – Use rubber feet to reduce vibration and noise emissions.

➔ 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.

Installation conditions

The pump MVP 003-2 must be installed and operated under the following ambient conditions:

Installation location	protected from water and dust (internal spaces)
Schutzart	IP 30
Installation altitude	max. 1000 m above sea level
Ambient temperature	+5-+40 °C
Relative air humidity	80 % at T ≤ 31 °C, up to max. 50% at T ≤ 40 °C
Degree of contamination	2
Overvoltage category	II

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 vacuum chamber 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.

➔ Do not operate the pump with excess pressure at the inlet; observe the maximum allowable pressures and pressure differences.

➔ Assemble silencer at the diaphragm head 2;
  – alternatively connect exhaust line.

➔ 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.

➔ 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

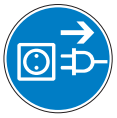
Emission of toxic substances from the exhaust!

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 and remove these substances.

5.4 Voltage supply



NOTICE

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.

NOTICE

Incorrect polarity!

Risk of destroying the equipment when connecting the power supply.

➔ Note the color markings on the wires when connecting the pump cable.

➔ Connect +24V DC power supply (in accordance with type plate) to the corresponding cable leads.

6 Operation

6.1 Before switching on

➔ Compare the voltage information on the rating plate with the supply voltage.

➔ Check that the exhaust connection allows free flow (max. permissible pressure 1.3 hPa 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 pump only at atmospheric pressure.

6.2 Switching on the pump

The pump attains the stated values for throughput rates and ultimate 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.

6.3 Pumping condensable vapours

Steam or moisture from pumped media can condense in the vacuum pump and hence impair the suction performance.

WARNING

Reactive, explosive or otherwise dangerous mixtures!

Uncontrolled gas inlet at the flushing gas inlet 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 flushing gas supply.

NOTICE

Damage to the pump!

Danger of condensation during operation without sufficient supply of flushing gas.

➔ Only pump vapors when the pump is warm and the flushing gas nozzle is open.

➔ When the process has been completed, allow the pump to continue running for about 30 minutes at atmospheric pressure with the flushing gas ballast open.

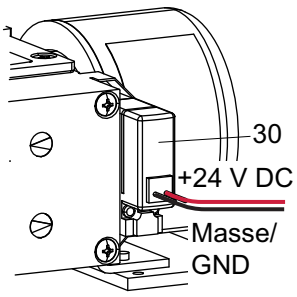
Purge orifice (option)

WARNING

Danger of process gas discharge!

For intake pressures > 500 hPa process gas can discharge at the purge orifice.

➔ Use a suction line, if applicable.



The rate of expulsion of condensate can be increased by admitting a purge media (air) and the pump will attain the specified final pressure within a shorter time.

In addition, the opening of the solenoid valve causes a safe starting of the pump under vacuum.

➔ For this open solenoid valve 30 (normally closed) to admit purge gas.

– Don't keep the solenoid valve permanently open!

6.4 Switching off

The pump can be switched off in any pressure range.

7 Maintenance

7.1 Precautions

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 **8000** operating hours.

➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool, if necessary.

➔ Disconnect the drive motor from the mains and secure it so that it cannot be switched on.

➔ Only dismantle the pump as far as necessary in order to repair defects.

➔ Clean the components of elastomeric materials (such as valves and diaphragms) with compressed air or distilled water only.

– Metal components of the diaphragm head may, however, be cleaned with alcohol.

➔ Exchange wear parts according to maintenance kit

➔ Reassemble pump in reverse order.

NOTICE

Service work should be carried out by a qualified person only!

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.com.

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

Checklist for inspection, maintenance and overhaul

Certain maintenance 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, below listed, intervals are exceeded or maintenance 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 may be shorter than the guide values specified in the table. Please consult Pfeiffer Vacuum, if necessary.

7.2 Cleaning and replacing diaphragms and valves

NOTICE

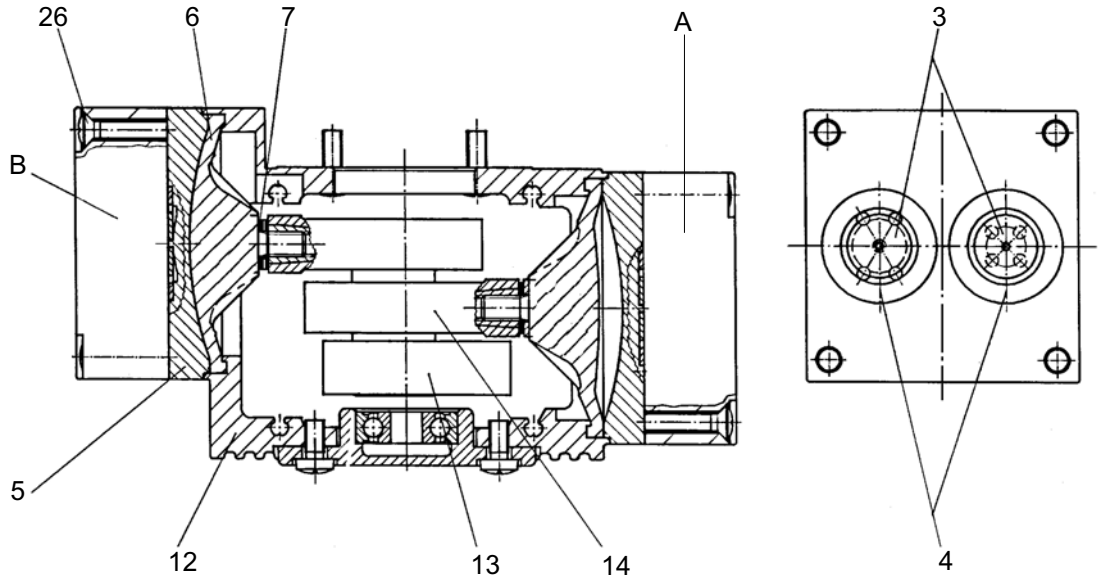
Damage to the pump and bad ultimate pressure!

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

➔ Check for spacer disk 7.

➔ Make sure that the original number is reassembled at the individual membrane head.

Dismantling



A/B	Head cover	6	Diaphragm	14	Connection rod
3	Valves	7	Spacer disk	26	Countersunk screw
4	Sealing ring	12	Housing		
5	Intermediate plate	13	Counterweight		

➔ Close shut-off valve in the intake line and separate the pump from the process.

➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool, if necessary.

➔ Disconnect the drive motor from the mains and secure it so that it cannot be switched on.

➔ Remove intake and exhaust line from the pump.

➔ Disconnect the hose connection 10 between the pump stages.

➔ Place pump on the side with the diaphragm head face upwards.

In principle, valves, diaphragms and sealing rings should be changed at the same time. If possible, carry out all jobs for each diaphragm head separately to preclude mixing up the parts:

➔ mark each diaphragm head, head cover A/B, intermediate plate 5 and pump housing with a continuous felt-tip pen mark to preclude mixing up the parts during assembly at a later date.

➔ Unscrew countersunk screws 26.

➔ Remove head cover A/B together with the intermediate plate 5 from the pump housing.

➔ Separate head cover A/B and intermediate plate 5, pay attention to valves 3 and sealing rings 4.

➔ Remove valves 3 and sealing rings 4 from the intermediate plate.

➔ Clean valve seats, intermediate plate and head cover and check for wear, change parts if necessary.

Assembling

➔ **Assembling** is carried out in reverse order.

➔ Clean all parts and inspect for wear.

➔ Insert new valves into the valve seats in the intermediate plate 5;
  – secure proper positioning with slight horizontal movement.

➔ Insert new sealing rings 4 into the intermediate plate 5.

Changing the diaphragm

➔ Remove cover 11 from the pump housing.

➔ Move connection rod 14 into top dead center by rotating the counterweight 13.

➔ Raise diaphragm 6 slightly at the edge and unscrew by hand from the connection rod (righthand thread); pay attention to spacer disks 7.
  – Ensure that the spacer disks do not fall off the diaphragm threaded bolt into the housing.

➔ Remove spacer disk(s) 7 from the diaphragm threaded bolt and keep them together with the associated parts.

➔ Clean all parts and inspect for wear.

Assembling

➔ **Assembling** is carried out in reverse order.

➔ Move diaphragm 6 into top dead center by rotating the counterweight 13.

➔ Place spacer disk(s) 7 onto the diaphragm threaded bolt.

➔ Screw the diaphragm threaded bolt fingertight into the connection rod.
  – Make sure that the membrane is not bent.

➔ Place intermediate plate 5 (with valves and sealing rings) and head cover onto the housing in accordance with the marking.
  – Check the centering by slight lateral movement.

➔ Tighten countersunk screws 26 only slightly.

➔ Check free movement of the pump by rotating the counterweight 13.

➔ Now tighten countersunk screws 26 crosswise fingertight.

➔ Fit cover 11 on pump housing.

8 Decommissioning

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 gas ballast valve, if existing.

➔ Close the inlet and outlet opening (e.g. with transport caps).

➔ Store the pump in a dry place.

8.2 Disposal

Products or parts thereof (mechanical and electrical components, operating fluids, etc.) may cause environmental burden.

➔ Safely dispose of the materials according to the locally applicable regulations.

9 Malfunctions

Please note the following instructions should the pump malfunction:

9.1 Rectifying malfunctions

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
	Diaphragms or valves dirty	Clean pump*(see p. 12, chap. 7)*
	Overpressure in the exhaust line	Check exhaust line
	Vacuum in the intake line (< atmospheric pressure)	Vent pump
Pump switches off after a while after being started	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
Pump not achieving the final pressure	Condensate in the pump	Operate pump for a longer period of time at atmospheric pressure
	Valves or diaphragms dirty or defective	Clean or change valves and diaphragms *(see p. 12, chap. 7)*
	Leak in the system	Check leaks
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 *(see p. 12, chap. 7)*
	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 *(see p. 12, chap. 7)*
	Connection rod or motor bearing defective	Contact Pfeiffer Vacuum Service

NOTICE

Service work should be carried out by a qualified person only!

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.com.

➔ 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.com (Service)**.

Maintenance and repairs in the Pfeiffer Vacuum ServiceCenter

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

➔ Download the forms "Service Request" and "Declaration on Contamination".[1)]
➔ Fill in the "Service Request" form and send it by fax or e-mail to your service address.
➔ Include the confirmation on the service request from Pfeiffer Vacuum with your 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.

Sending of contaminated pumps or devices

No units will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. “Hazardous substances” are substances and compounds in accordance with the hazardous goods directive (current version). If pumps are contaminated or the declaration on contamination is missing, Pfeiffer Vacuum performs decontamination at the shipper's expense.

➔ Neutralise the pump by flushing it with nitrogen or dry air.
➔ Close all openings airtight.
➔ Seal the pump or unit in suitable protective film.
➔ Return the pump/unit only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

Service orders

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

1) Forms under www.pfeiffer-vacuum.com

11 Spare parts

Spare parts package/spare parts	No.	Quantity (quantity/ pump)	comprising the following parts
Maintenance kit	PU E22 018 -T	4	Valves (3)
		4	Sealing ring (4)
		2	Diaphragm (6)
Silencer	P 0920 567 E	1	8

12 Accessories

Benennung	MVP 003-2
Screw-in flange DN 16 ISO-KF / G 1/8" incl. seal	PK 050 108 -T
Hose connection DN 6x400 mm with straight fitting G 1/8" and G 1/4" including seal	P 0920 739 E
Angled screw coupling, G 1/8"	P 0920 773
Screw-in-flange, DN 16 KF/ G 1/4"	PM 006 994

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

13 Technical data and dimensions

13.1 Technical data

Parameter	MVP 003-2
Flange (in)	Female thread G 1/8"
Flange (out)	Silencer G 1/8"
Pumping speed, max.	0.25 m^3/h
Ultimate pressure without gas ballast	≤ 7 hPa
Exhaust pressure, min.	1000 abs. hPa
Exhaust pressure, max.	1300 abs. hPa
Rotation speed max.	3500 min^{-1}
Emission sound pressure level without gas ballast	≤ 65 dB (A)
Ambient temperature	+5-+40 °C
Relative humidity of air	80, non- condensing %
Power	max. 12 W
Mains requirement: voltage	24 V DC
Mains requirement: voltage (range)	22.8 - 25.2 (± 5 %) V DC
Switch	No
Rated current absorption	0.5 A
Altitude of site, max	≤ 1000 m
Integral leak rate	≤ $6 \cdot 10^{-3}$ Pa m^3/s
Weight	0.74 kg

13.2 Substances in contact with the media

MVP 003-2	Substances in contact with the media
Diaphragm	PTFE-coated
Valves	EPDM
Head cover	Aluminum alloy
Intermediate plate	Aluminum alloy

13.3 Dimensions

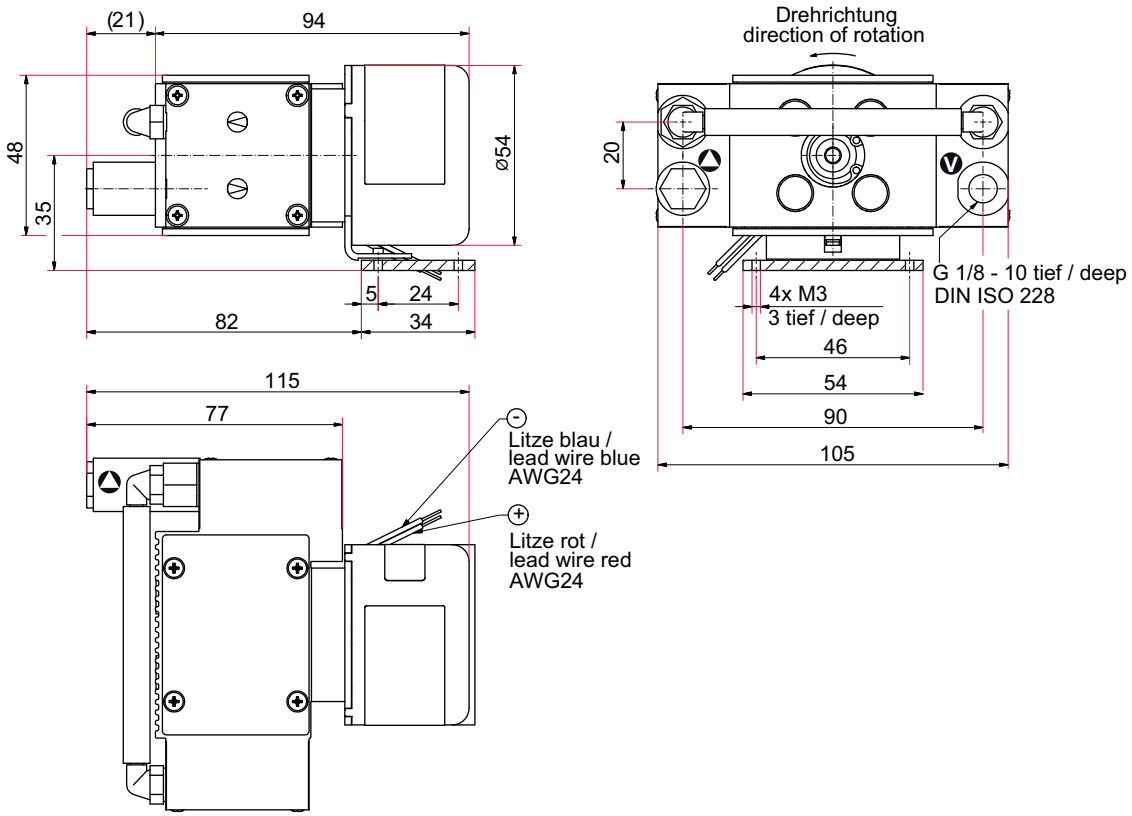


Fig. 2: MVP 003-2, PK T05 080 A

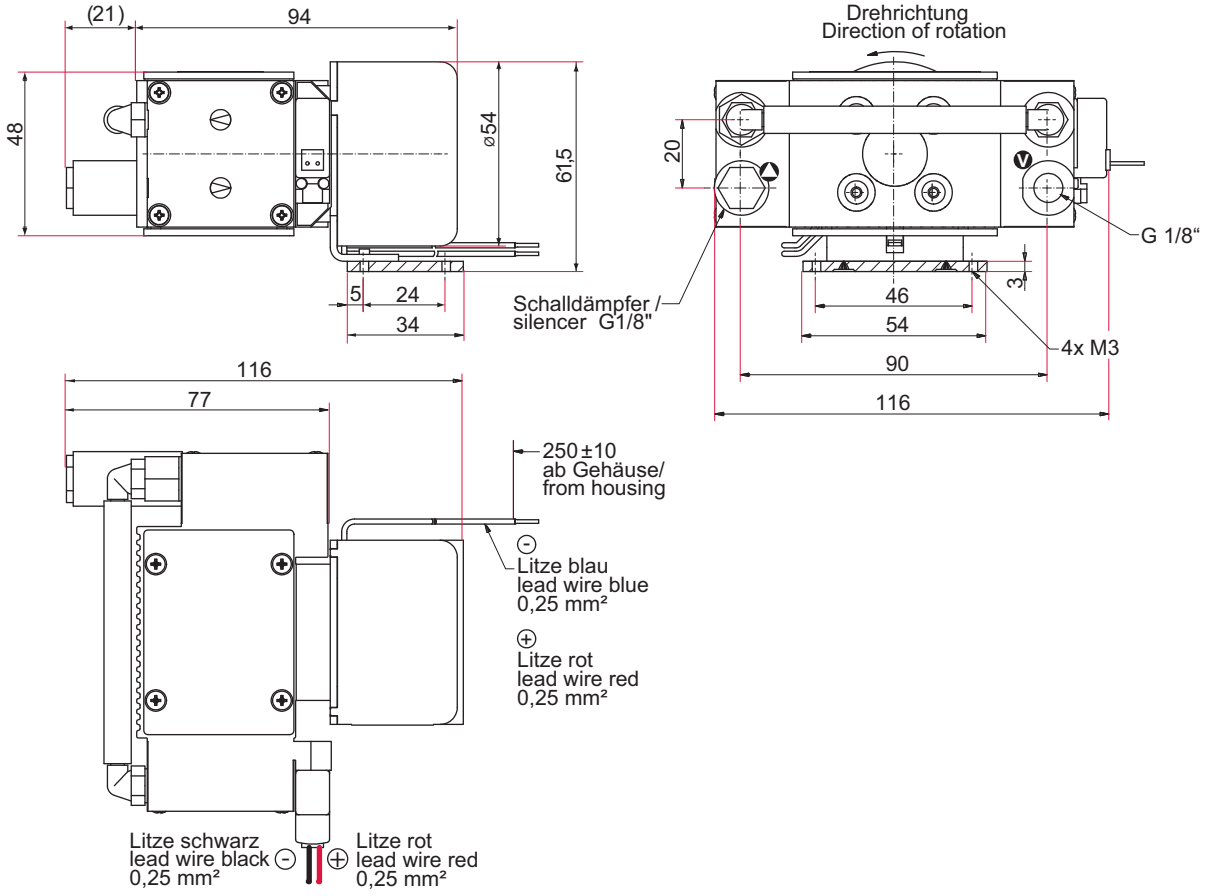


Fig. 3: MVP 003-2, PK T05 081 B

Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions according to the following **EC directives**:

- **Machinery 2006/42/EC (Annex II, no. 1 A)**
- **Electromagnetic Compatibility 2004/108/EC**
- **Restriction of Hazardous Substances 2011/65/EU**

The agent responsible for compiling the technical documentation is Mr. Sebastian Oberbeck, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Aßlar.

MVP 003-2

Harmonised standards and national standards and specifications which have been applied:

DIN EN ISO 12100 : 2011-03	DIN EN 61000-6-2 : 2006
DIN EN 1012-2 : 1996	DIN EN 55014-1 : 2007-06

Signatures:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(M.Bender) Managing Director	(Dr. M. Wiemer) Managing Director	CE/2014

PFEIFFER VACUUM

A PASSION FOR PERFECTION

PFEIFFER VACUUM

Vacuum solutions from a single source

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

Complete range of products

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

Competence in theory and practice

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

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

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