



OPERATING INSTRUCTIONS

EN

Translation of the original instructions

MVP 015-4 Diaphragm Pumps

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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 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 015-4	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

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

- www.tuvdotcom.com
- TUVdotCOM-ID 0000021320

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
<p>Imminent danger Indicates an imminent hazardous situation that will result in death or serious injury.</p>
WARNING
<p>Possibly imminent danger Indicates an imminent hazardous situation that can result in death or serious injury.</p>
CAUTION
<p>Possibly imminent danger Indicates an imminent hazardous situation that can result in minor or moderate injury.</p>
NOTICE
<p>Command or note Command to perform an action or information about properties, the disregarding of which may result in damage to the product.</p>

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:

- ⓪ Vacuum connection
- Ⓛ Exhaust
- Ⓜ Gas ballast valve
- Ⓢ Power connection

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.

- 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 sufficient.
- 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 Improper use

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 (exception: pumps in C version)
- 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

Closure seal

The product is sealed at the factory. Damaging or removal of a closure seal leads to the loss of liability and warranty entitlements.

→ Do not open the product within its warranty period!

→ For process-related shorter maintenance intervals please contact the Pfeiffer Vacuum Service.

3 Transport and storage

3.1 Transport

- Lift pump by hand at both face sides.
 - Do not use the hose connection 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
- Mains cable
- Silencer
- Locking cap for vacuum flange
- Operating instructions

Variants

Parameter	MVP 015-4	MVP 015-4
Pumping speed at 50 Hz	0.50 m ³ /h	
Pumping speed at 60 Hz		0.60 m ³ /h
Rotation speed at 50 Hz	1500 min ⁻¹	
Rotation speed at 60 Hz		1800 min ⁻¹
Mains requirement: voltage 50 Hz	230 V	
Mains requirement: voltage 60 Hz		120 V

4.2 Function

The diaphragm vacuum pump of the series MVP 015-4 is a four 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 015-4

A	Diaphragm head 1	D	Diaphragm head 4	9	Capacitor
B	Diaphragm head 2	1	Vacuum connection	10	Hose connection
C	Diaphragm head 3	2	Exhaust with silencer	13	Mains connection

5 Installation

5.1 Setting up the pump

Observe the following requirements when setting up the pump:

- Always place the pump on a firm, even surface.
 - Where stationary installation is involved, anchor the pump on site.
- Consider the load-bearing capacity of the installation site.
- When installing the pump in a closed housing, ensure there is sufficient air circulation.
 - Technical information given on the motor rating plate must be visible.

Installation

conditions

The pump MVP 015-4 must be installed and operated under the following ambient conditions:

Installation location	weather protected (indoors)
Protection category	IP 20
Installation altitude	Max. 2000 m above m.s.l., 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).
Ambient temperature	12-40 °C
Relative humidity	80 % at $T \leq 31$ °C, up to max. 50% at $T \leq 40$ °C
Degree of pollution	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 4;
 - 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 Connecting to the mains power 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.

**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.

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

→ Always ensure a safe connection to the protective earthing conductor (PE, protection class III).

Motor protection

A self-locking thermal winding protector switches off the pump motor in the event of overheating (> 95°C).

- Allow the pump to cool off several minutes.
 - Pump runs-up automatically after cooling off.

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 1100 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, make sure that no impermissibly high pressure arises on the pressure side.
- Start pumps at a maximum pressure differential of 1000 hPa between inlet and outlet.

6.2 Switching on the pump

The pump can be switched on in any pressure range between atmospheric and ultimate pressure.

The pump attains the stated values for throughput rates and ultimate pressure levels only once the operating temperature is reached.

- Connect the mains cable to the mains.
- 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.

Intermittent operation with TC via relay box (accessory)

To prolong the life of diaphragm pumps, intermittent operations can be selected with lesser gas throughputs of < 0.18 hPa l/s. This means that, dependent on the TMP power take-up, the backing pump will be switched on and off. TMP power take-up is dependent on the fore-vacuum pressure and gas throughput.

- By comparing the power take-up with an upper and a lower limit value, the relative switch-on duration with lesser gas throughputs can be reduced to approx. 1 to 60%.
- To avoid too frequent switching on, the buffer volume in the fore-vacuum line should amount to ≥ 0.5 liter from approx. 0.018 hPa l/s.

6.3 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 **15000** operating hours.

- Turn off the vacuum pump, vent to atmospheric pressure and allow to cool.
- 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 to carry out maintenance.
- Only clean valves and diaphragms with a dry cloth; do not use alcohol or any other detergents.
- 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 after 15000 h	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 D.

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

Dismantling

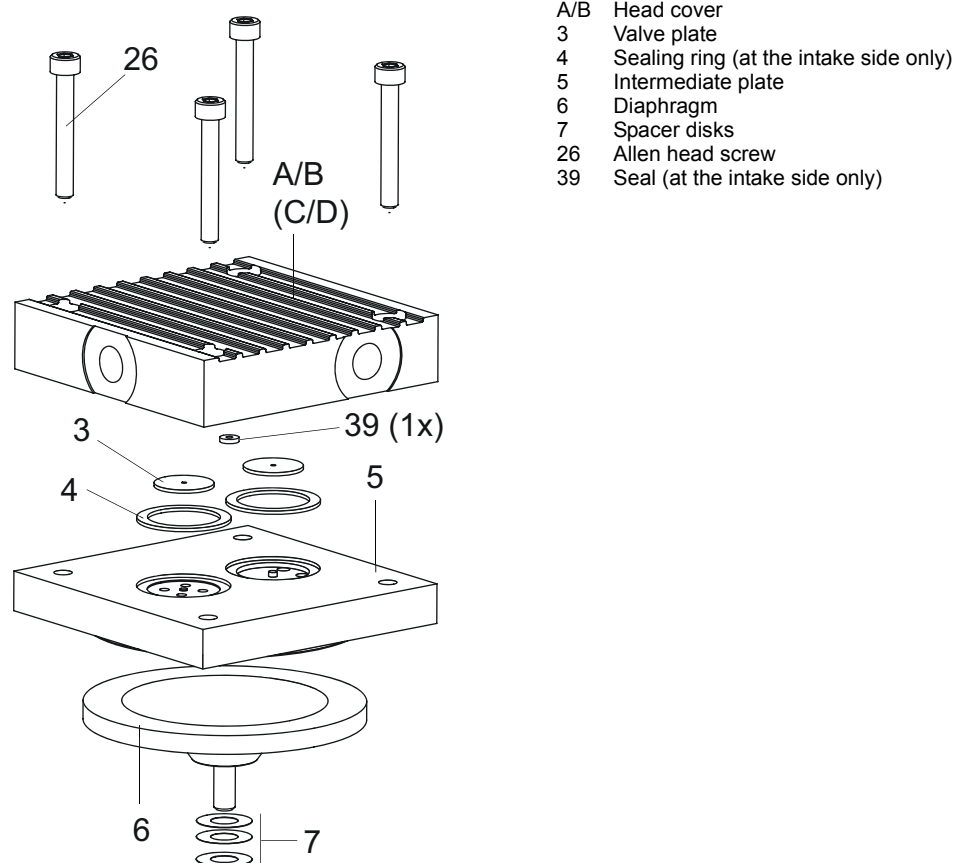


Fig. 2: Replacing diaphragm and valves

- Unscrew the hose connection between the pump stages by loosening the hollow screw with a wrench (size 14).
- Place pump on the side with the diaphragm head face upwards.
- Unscrew Allen head screws 26 (4 pieces) from the head cover A1/B1, and remove head cover; be careful with the sealing rings 4 and 39.
- Remove intermediate plate 5.
- Remove valves 3 and sealing rings 4 from the intermediate plate.
- Lift the diaphragm 6 slightly on the edge and manually unscrew from the connecting rod (right-hand thread); be careful with spacer disk D.

Assembling

- **Assembling** is carried out in reverse order.
- Only clean valves and diaphragms with a dry cloth; do not use alcohol or any other detergents.
- Clean valve seats, intermediate plate and head cover using alcohol and check for wear.
- Check bypass bore in the intermediate plate 5 of the intake side.
- Exchange wear parts according to maintenance kit

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.

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.

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
	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 (see p. 11, chap. 7)
Pump switches off after a while after being started	Overpressure in the exhaust lead	Check exhaust lead
	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
Pump not achieving the ultimate pressure	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
	Condensate in the pump	Operate pump for a longer period of time at atmospheric pressure; if necessary, open the gas ballast valve
	Valves or diaphragms dirty or defective	Clean or change valves and diaphragms (see p. 11, chap. 7)
Pumping speed of pump too low	Leak in the system	Fix leak
	Intake line not well-dimensioned	Keep connections as short as possible and see that cross-sections are sufficiently dimensioned
Unusual noises during operation	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
	Diaphragms or valves defective	Clean or change valves and diaphragms (see p. 11, 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. 11, 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.

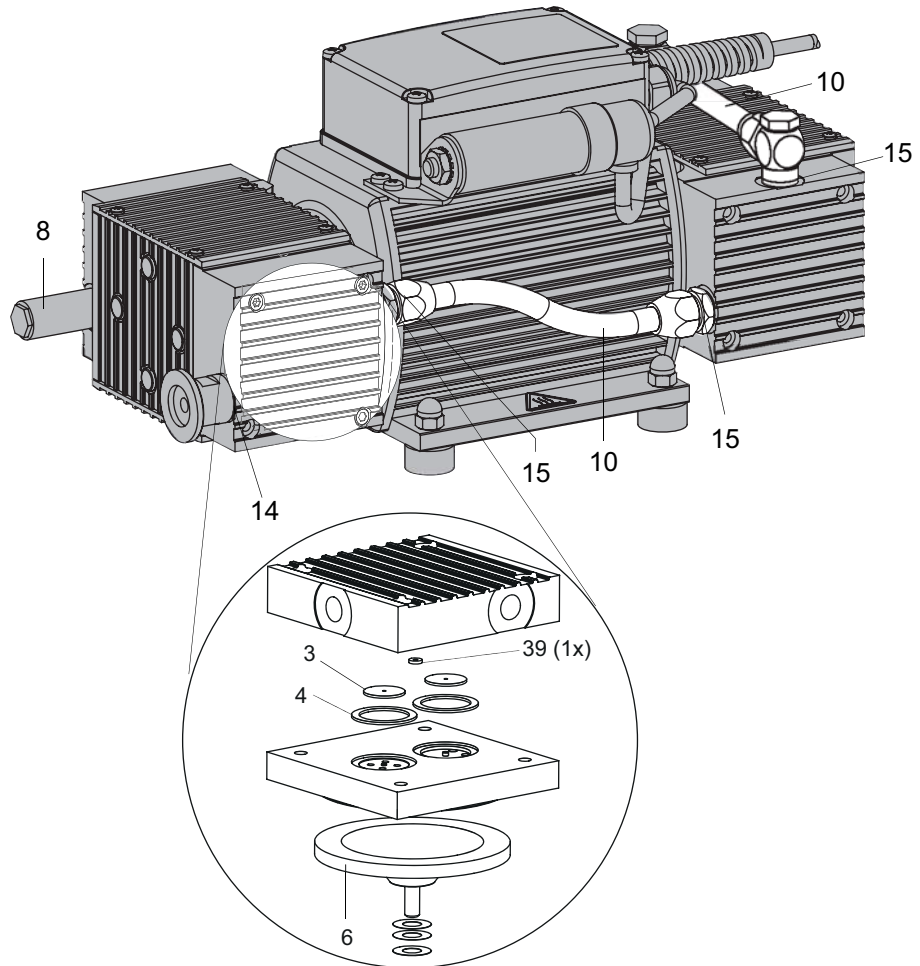
Service orders

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 part package/ Spare parts	No.	consisting of the parts
Set of wearing parts	PU E22 009 -T	3, 4, 6, 14, 15, 39
Silencer	P 0920 567 E	8
Connecting hoses, complete	PK 050 272 -T	10



12 Accessories

Designation	MVP 015-4
Relay box, shielded, for backing pumps, 1-phase 7A for TC 110/120 and TCP 350, plug M8	PM 071 282 -X
Relay box, shielded, for backing pumps, 1-phase 7 A for TC 400/1200, TM 700 and TCP 350, M12	PM 071 284 -X
Screw-in-flange, DN 16 KF/ G 1/4"	PM 006 994
Hose connection DN 6x400 mm with straight fitting G 1/8" and G 1/4" including seal	P 0920 739 E

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

13 Technical data and dimensions

13.1 General

The following harmonised standards are fulfilled:

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

Conversion table: pressure units

	mbar	bar	Pa	hPa	kPa	Torr mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^5$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1

1 Pa = 1 N/m²

Conversion table: gas throughput units

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

13.2 Technical data

Parameter	MVP 015-4
Flange (in)	DN 16 ISO-KF / G 1/8"
Flange (out)	G 1/8" + silencer
Pumping speed at 50 Hz	0.50 m ³ /h
Pumping speed at 60 Hz	0.60 m ³ /h
Ultimate pressure without gas ballast	≤ 0.50 hPa
Intake pressure max.	1100 hPa
Exhaust pressure, max.	1100 hPa
Rotation speed at 50 Hz	1500 min ⁻¹
Rotation speed at 60 Hz	1800 min ⁻¹
Leak rate	< $5 \cdot 10^{-4}$ Pa m ³ /s
Emission sound pressure level without gas ballast	≤ 52 dB (A)
Ambient temperature	12-40 °C
Protection category	IP 54
Mains requirement: voltage 50 Hz	230 V
Mains requirement: voltage 60 Hz	120 V
Switch	No
Current consumption	0.3 A
Altitude of site, max	2000 m
Weight	7.5 kg
Cooling method, standard	Air

13.3 Substances in contact with the media

MVP 015-4	Substances in contact with the media
Diaphragm	EPDM
Valve seals	EPDM
Head cover	Aluminium
Hose connection	PVC
Elbow union	Aluminium
Straight union at intake hose	CuZn nickel-plated
Intake hose	Polyethylene
Exhaust, silencer	Polyamide

13.4 Dimensions

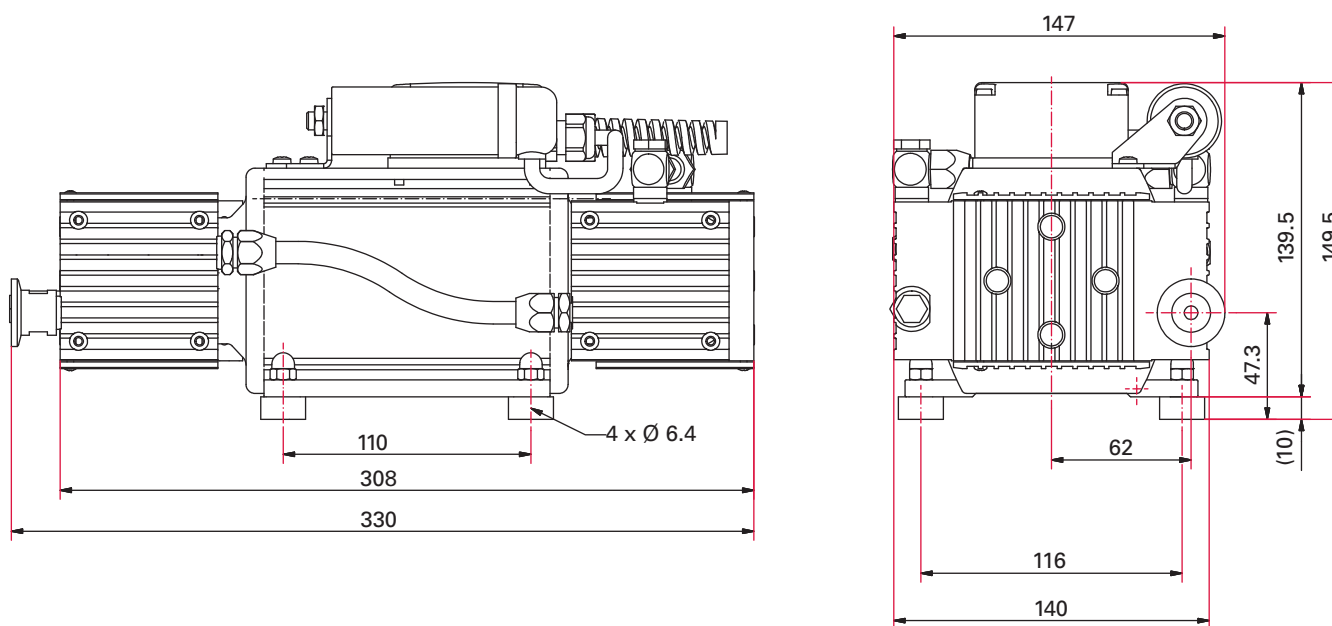


Fig. 3: MVP 015-4



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 2014/30/EU**
- **Restriction of the use of certain 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 015-4

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

DIN EN ISO 12100 : 2010	DIN EN 61326-1 : 2013-07	DIN EN 61000-3-2 : 2013
DIN EN 1012-2 : 2011-12	DIN EN 55011 : 2009 + A1: 2010	DIN EN 61000-3-3 : 2013
DIN EN 61010-1 : 2010		

Signature:

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35614 Asslar
Germany

(Dr. Ulrich von Hülsen)
Managing Director

2016-03-07

VACUUM SOLUTIONS FROM A SINGLE SOURCE

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

COMPLETE RANGE OF PRODUCTS

From a single component to complex systems:

We are the only supplier of vacuum technology that provides a complete product portfolio.

COMPETENCE IN THEORY AND PRACTICE

Benefit from our know-how and our portfolio of training opportunities!

We support you with your plant layout and provide first-class on-site service worldwide.

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

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