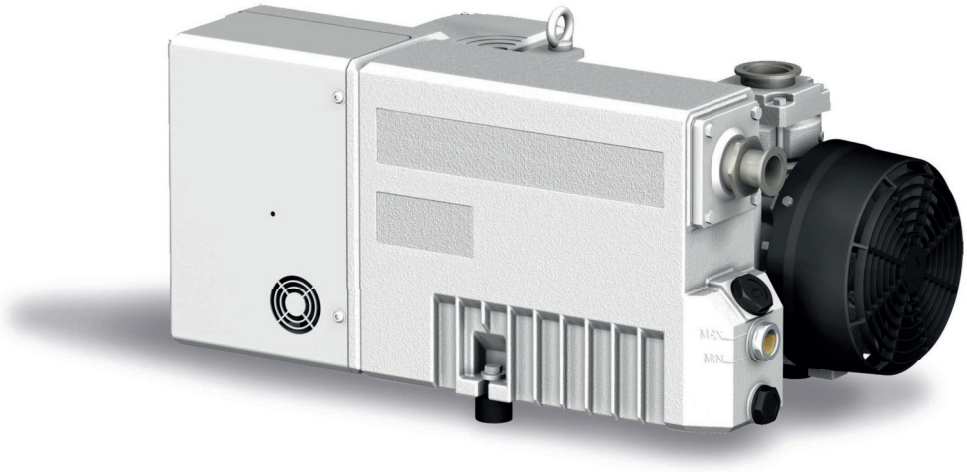


OPERATING INSTRUCTIONS

EN

Translation of the Original

HENA 50 | 70

Rotary vane pump

PFEIFFER VACUUM

Dear Customer,

Thank you for choosing a Pfeiffer Vacuum product. Your new rotary vane pump is designed to support you by its performance, its perfect operation and without interfering your individual application. The name Pfeiffer Vacuum stands for high-quality vacuum technology, a comprehensive and complete range of top-quality products and first-class service. With this expertise, we have acquired a multitude of skills contributing to an efficient and secure implementation of our product.

Knowing that our product must not interfere with your actual work, we are convinced that our product offers you the solution that supports you in the effective and trouble-free execution of your individual application.

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

Further operating instructions from Pfeiffer Vacuum can be found in the Download Center on our website.

Disclaimer of liability

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

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

Copyright

Table of contents

List of tables

List of figures

1 About this manual

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

1.1 Validity

This operating instructions is a customer document of Pfeiffer Vacuum. The operating instructions describe the functions of the named product and provide the most important information for the safe use of the device. The description is written in accordance with the valid directives. The information in this operating instructions refers to the product's current development status. The document shall remain valid provided that the customer does not make any changes to the product.

1.1.1 Applicable documents

Document	Number
Declaration of conformity	A component of these instructions

You can find this document in the Pfeiffer Vacuum Download Center.

1.1.2 Variants

These instructions apply to HenaLine vacuum pumps.

Pump type	Pump version
Hena 50	Rotary vane pump
Hena 70	

1.2 Target group

These operating instructions are aimed at all persons performing the following activities on the product:

- Transportation
- Setup (Installation)
- Usage and operation
- Decommissioning
- Maintenance and cleaning
- Storage or disposal

The work described in this document is only permitted to be performed by persons with the appropriate technical qualifications (expert personnel) or who have received the relevant training from Pfeiffer Vacuum.

1.3 Conventions

1.3.1 Instructions in the text

Usage instructions in the document follow a general structure that is complete in itself. The required action is indicated by an individual step or multi-part action steps.

Individual action step

A horizontal, solid triangle indicates the only step in an action.

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

1. Step 1
2. Step 2
3. ...

1.3.2 Pictographs

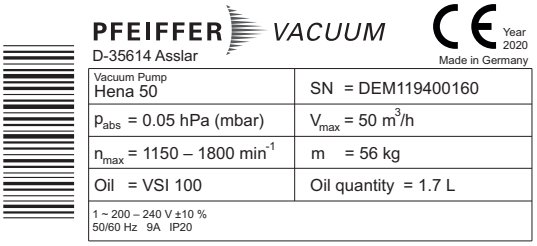
Pictographs used in the document indicate useful information.

Note

Tip

1.3.3 Stickers on the product

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

	**Rating plate** (example) Rating plate of the rotary vane vacuum pump **Motor rating plate (not shown)**
	**Warning hot surface** This sticker warns of injuries caused by high temperatures in case of touching without protection during operation.
	**Electrical voltage warning** The sticker warns of the risk of electric shock when working with the housing open.
	**No stepping on surface** This sticker prohibits the use of the vacuum pump as a climbing aid.
	**Operating instructions note** This sticker indicates that these operating instructions must be read before performing any tasks and before plugging in the mains plug.
	**Arrow indicating direction of rotation** The direction of rotation arrow indicates the direction of rotation of the motor.

Tbl. 1: Stickers on the product

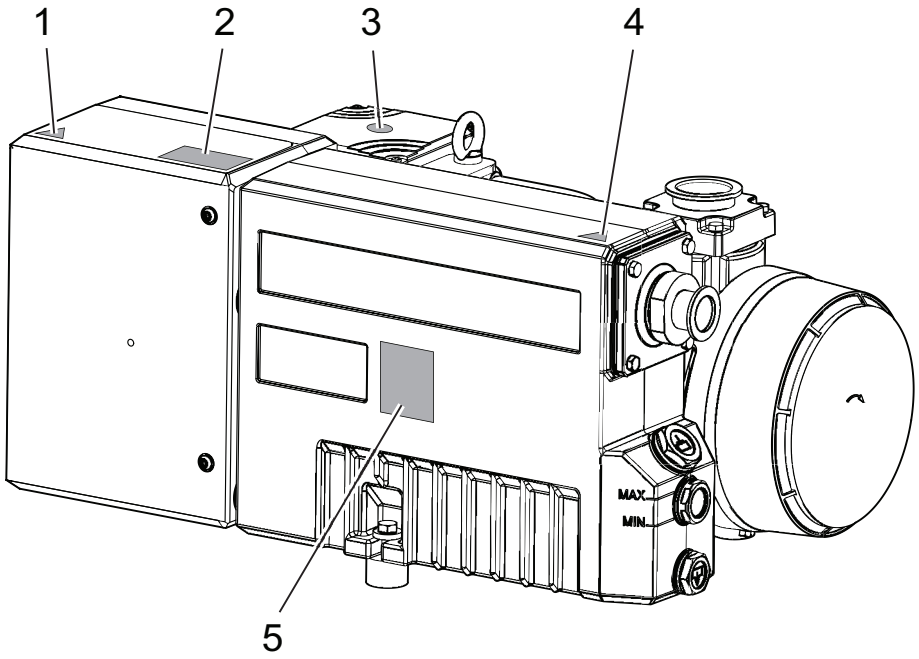


Fig. 1: Position of the stickers on the product

1 Warning sign for live voltage
2 Operating instructions note
3 Prohibition sign - No stepping on surface
4 Hot surface warning sign
5 Rating plate of the rotary vane vacuum pump

1.3.4 Abbreviations

Abbreviation	Meaning in this document
OI	Operating instructions
CB	Certified body according to IEC (international electrotechnical commission)
DI	Digital Input
DO	Digital Output
N/A	not connected
N.N.	Mean sea level
NRTL	Nationally Recognized Test Laboratory
PE	Earthed conductor (protective earth)
RCCB	Residual Current Operated Circuit Breaker
WAF	width across flats
MM	Maintenance manual

Tbl. 2: Abbreviations used in this document

2 Safety

2.1 General safety information

The following 4 risk levels and 1 information level are taken into account in this document.

⚠ DANGER

Immediately pending danger

Indicates an immediately pending danger that will result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ WARNING

Potential pending danger

Indicates a pending danger that could result in death or serious injury if not observed.

► Instructions to avoid the danger situation

⚠ CAUTION

Potential pending danger

Indicates a pending danger that could result in minor injuries if not observed.

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

Is used to highlight actions that are not associated with personal injury.

► Instructions to avoid damage to property

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

2.2 Safety instructions

All safety instructions in this document are based on the results of the risk assessment carried out in accordance with Machinery Directive 2006/42/EC Annex I and EN ISO 12100 Section 5. Where applicable, all life cycle phases of the product were taken into account.

Risks during transport

⚠ WARNING

Risk of serious injury from swinging, toppling or falling objects

During transport, there is a risk of crushing and impact on swinging, toppling or falling objects. There is a risk of injuries to limbs, up to and including bone fractures and head injuries.

- ► Secure the danger zone if necessary.
- ► Pay attention to the center of gravity of the load during transport.
- ► Ensure even movements and moderate speeds.
- ► Observe safe handling of the transport devices.
- ► Avoid sloping attachment aids.
- ► Never stack products.
- ► Wear protective equipment, e.g. safety shoes.

Risks during installation

⚠ DANGER

Danger to life from electric shock

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

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

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

⚠ WARNING

Risk of danger to life through missing mains disconnection device

The vacuum pump and electronic drive unit are **not** equipped with a mains disconnection device (mains switch).

- ► Unplug the mains cable in order to disconnect the mains supply.
- ► Install a residual circuit breaker (RCCB).

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

⚠ CAUTION

Risk of injury from trapping of body parts due to unexpected automatic startup

With open control input, the motor can start unexpectedly following extrinsic contact, if the mains voltage is already applied.

A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Note the prescribed switch-on procedure for safe startup.

⚠ CAUTION

Danger of injury from moving parts

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

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

Risks during operation

⚠ WARNING

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

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

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

⚠ WARNING

Risk of burns from ejected hot oil mist

During operation, hot pressurized oil mist escapes from the operating fluid separator.

- ► Only operate the vacuum pump with the filler screw securely fitted.
- ► Open the locking screws on the separator only while the vacuum pump is switched off.

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

⚠ CAUTION

Risk of injury from entrapment of body parts

After a power failure or a standstill as a result of overheating, the motor restarts automatically. A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Maintain sufficient distance to the vacuum flange during all work.
- ► Safely disconnect motor from the mains.
- ► Secure the motor against re-start.

⚠ CAUTION

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

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

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

⚠ CAUTION

Danger of burns on hot surfaces

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

► Provide suitable touch protection.

Risks during maintenance, decommissioning and malfunctions

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ WARNING

Danger to life from electric shock in the event of a fault

In the event of a fault, devices connected to the mains may be live. There is a danger to life from electric shock when making contact with live components.

► Always keep the mains connection freely accessible so you can disconnect it at any time.

⚠ WARNING

Health hazard and risk of environmental damage from toxic contaminated operating fluid

Toxic process media can cause operating fluid contamination. When changing the operating fluid, there is a health hazard due to contact with poisonous substances. Illegal disposal of toxic substances causes environmental damage.

► Wear suitable personal protective equipment when handling these media.
► Dispose of the operating fluid according to locally applicable regulations.

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

► Observe the application instructions and precautions.
► Do not allow tobacco products to come into contact with the operating fluid.

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

⚠ CAUTION

Risk of injury from entrapment of body parts

After a power failure or a standstill as a result of overheating, the motor restarts automatically. A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Maintain sufficient distance to the vacuum flange during all work.
- ► Safely disconnect motor from the mains.
- ► Secure the motor against re-start.

⚠ CAUTION

Scalding from hot operating fluid

Danger of burns when draining operating fluid if it comes into contact with the skin.

- ► Wear protective equipment.
- ► Use a suitable collection receptacle.

⚠ CAUTION

Danger of burns on hot surfaces

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

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

⚠ CAUTION

Danger of injury from moving parts

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

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

Risks during disposal

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

2.3 Safety precautions

Duty to provide information on potential dangers

The product holder or user is obliged to make all operating personnel aware of dangers posed by this product.

Every person who is involved in the installation, operation or maintenance of the product must read, understand and adhere to the safety-related parts of this document.

Infringement of conformity due to modifications to the product

The Declaration of Conformity from the manufacturer is no longer valid if the operator changes the original product or installs additional equipment.

- Following the installation into a system, the operator is required to check and re-evaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

General safety precautions when handling the product

- ► Observe all applicable safety and accident prevention regulations.
- ► Check that all safety measures are observed at regular intervals.
- ► Do not expose body parts to the vacuum.
- ► Always ensure a secure connection to the earthed conductor (PE).
- ► Never disconnect plug connections during operation.
- ► Observe the above shutdown procedures.
- ► Keep lines and cables away from hot surfaces (> 70 °C).
- ► Never fill or operate the unit with cleaning agents or cleaning agent residues.
- ► Do not carry out your own conversions or modifications on the unit.
- ► Observe the unit protection class prior to installation or operation in other environments.
- ► Provide suitable touch protection, if the surface temperature exceeds 70 °C.

2.4 Limits of use of the product

Parameter	Hena 50	Hena 70
Installation location	• Indoors, protected from dust deposits • Outdoors, protected from direct weather influences	
Installation altitude	max. 2000 m above sea level	
Orientation	horizontal	
permissible angle of inclination	±1 °	
Pumped medium intake temperature, max.	+40 °C	
Ambient temperature	+12 °C to +40 °C	
Ambient temperature without NRTL plate and CB certificate	+12 °C to +50 °C	
Relative air humidity	max. 80 %	
Permissible operating pressure range during continuous operation	< 20 hPa unlimited	
Exhaust pressure	Atmospheric pressure	

Tbl. 3: Limits of use of the product

2.5 Proper use

- ► Use the vacuum pump for vacuum generation only.
- ► When pumping media with an oxygen concentration level of ≥ 21 %, only use perfluorinated, synthetic oils (YLC 250 B, A113) as operating fluid.
- ► Adhere to the installation, commissioning, operating, and maintenance instructions.
- ► Do not use any accessory parts other than those recommended by Pfeiffer Vacuum.

2.6 Foreseeable improper use

Improper use of the product invalidates all warranty and liability claims. Improper use is any, even unintended, use, which is contrary to the product purpose; and in particular:

- Pumping of corrosive media
- Pumping radioactive media
- Pumping of condensable vapors
- Pumping of gases that introduce an ignition source to the suction chamber
- Pumping of gases that contain impurities such as particles, dust, or condensate
- Pumping explosive media
- Pumping of media with a propensity to sublimation
- Pumping of fluids
- Use of the vacuum pump in potentially explosive atmospheres
- Use of the vacuum pump outside the specified area of application
- Use for pressure generation
- Use in strong electrical, magnetic, or electromagnetic fields
- Connection to vacuum pumps or equipment which are not suitable for this purpose according to their operating instructions
- Connection to devices with exposed live parts
- Use of accessories or spare parts not listed in these operating instructions
- Using the vacuum pump as a climbing aid
- Use of operating fluids other than those specified by Pfeiffer Vacuum
- Use of D1 or mineral oil as operating fluid with an oxygen concentration level of > 21 %

  Mineral oils are combustible and ignite in high temperatures and when they come into contact with pure oxygen. This oils oxidize heavily and thus lose their lubricating capacity.

2.7 Personnel qualification

The work described in this document may only be carried out by persons who have appropriate professional qualifications and the necessary experience or who have completed the necessary training as provided by Pfeiffer Vacuum.

Training people

1. Train the technical personnel on the product.
2. Only let personnel to be trained work with and on the product when under the supervision of trained personnel.
3. Only allow trained technical personnel to work with the product.
4. Before starting work, make sure that the commissioned personnel have read and understood these operating instructions and all applicable documents, in particular the safety, maintenance and repair information.

2.7.1 Ensuring personnel qualification

Specialist for mechanical work

Only a trained specialist may carry out mechanical work. Within the meaning of this document, specialists are people responsible for construction, mechanical installation, troubleshooting and maintenance of the product, and who have the following qualifications:

- Qualification in the mechanical field in accordance with nationally applicable regulations
- Knowledge of this documentation

Specialist for electrotechnical work

Only a trained electrician may carry out electrical engineering work. Within the meaning of this document, electricians are people responsible for electrical installation, commissioning, troubleshooting, and maintenance of the product, and who have the following qualifications:

- Qualification in the electrical engineering field in accordance with nationally applicable regulations
- Knowledge of this documentation

In addition, these individuals must be familiar with applicable safety regulations and laws, as well as the other standards, guidelines, and laws referred to in this documentation. The above individuals must have an explicitly granted operational authorization to commission, program, configure, mark, and earth devices, systems, and circuits in accordance with safety technology standards.

Trained individuals
Only adequately trained individuals may carry out all works in other transport, storage, operation and disposal fields. Such training must ensure that individuals are capable of carrying out the required activities and work steps safely and properly.

2.7.2 Personnel qualification for maintenance and repair

Advanced training courses
Pfeiffer Vacuum offers advanced training courses to maintenance levels 2 and 3.

Adequately trained individuals are:

- **Maintenance level 1**
  - Customer (trained specialist)
- **Maintenance level 2**
  - Customer with technical education
  - Pfeiffer Vacuum service technician
- **Maintenance level 3**
  - Customer with Pfeiffer Vacuum service training
  - Pfeiffer Vacuum service technician

2.7.3 Advanced training with Pfeiffer Vacuum

For optimal and trouble-free use of this product, Pfeiffer Vacuum offers a comprehensive range of courses and technical trainings.

For more information, please contact Pfeiffer Vacuum technical training.

3 Product description

3.1 Function

The rotary vane pumps of the HenaLine are single-stage, oil-sealed rotary positive displacement pumps with air cooling and circulatory lubrication. A non-return valve in the vacuum connection closes the intake line automatically when the rotary vane pump is switched off and prevents an operating fluid return flow. The integrated oil mist filter cleans the conveyed gas and prevents the operating fluid mist from being emitted at the exhaust.

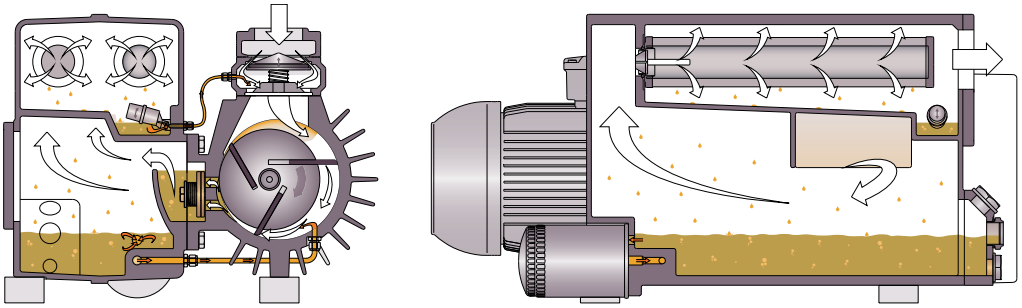


Fig. 2: Operating principle

The pumping system is made up of the housing, the eccentrically mounted rotor, and the centrifugally sliding vanes, which divide the suction chamber into multiple chambers. The volume of each chamber changes periodically as the rotor rotates. This causes the gas to be continuously drawn in at the vacuum connection and compressed in the suction chamber by the rotation of the rotor until the exhaust valve opens against the atmospheric pressure and the gas leaves the suction chamber.

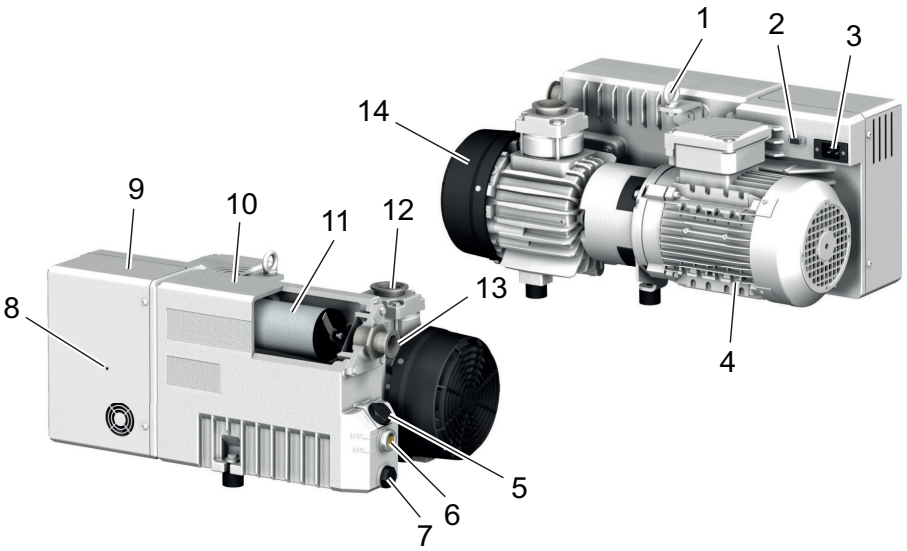


Fig. 3: Structure of the rotary vane pump

1	Crane lug	8	LED A1 for pump status during operation LED A2 for communication status (behind the cover)
2	Control input	9	Electronic drive unit
3	Mains supply plug	10	Operating fluid separator
4	Motor	11	Exhaust filter
5	Filler screw	12	Vacuum connection with DN 40 KF
6	Sight glass	13	Exhaust connection with DN 25 KF
7	Drain screw	14	Vacuum pump axial fan

3.1.1 Operating fluid

The pump oil, also known as operating fluid, fulfills various tasks in a rotary vane pump:

- lubrication of all moving parts
- filling part of the dead volume under the exhaust valve

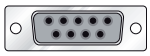
- sealing the gap between the intake and exhaust channel, and between the vanes and the working chamber
- ensuring an optimal temperature balance through heat transfer

3.1.2 Cooling

The rotary vane pump is cooled by thermal radiation from its surface, the air flow of the two fans and the pumped gas.

3.2 Connections

The supplied D-Sub mating plug has bridged pins 8 and 9. This enables the vacuum pump to be started and stopped directly by switching the voltage supply on and off. When the D-Sub mating plug is used, the vacuum pump always runs at maximum rotation speed.

Connection	Description
	**remote** D-sub socket with 9 pins for connection and configuration of a remote control.

Tbl. 4: Connection description of the electronic drive unit

3.3 Identifying the product

- ► To ensure clear identification of the product when communicating with Pfeiffer Vacuum, always keep all of the information on the rating plate to hand.
- ► Observe the motor-specific data on the motor rating plate attached separately.

3.4 Product features

Pump type	Characteristics
Hena 50	• Nominal pumping speed max. 50 m^3/h • Vacuum and exhaust connection with small flange • Electronic drive unit
Hena 70	• Nominal pumping speed max. 70 m^3/h • Vacuum and exhaust connection with small flange • Electronic drive unit

Tbl. 5: Features of the rotary vane pumps

3.5 Scope of delivery

- Rotary vane vacuum pump with motor
- Operating fluid
- Locking caps for vacuum and exhaust connection
- D-Sub mating plug
- Operating instructions

4 Transportation and Storage

4.1 Transporting the vacuum pump

⚠ WARNING

Risk of serious injury from swinging, toppling or falling objects

During transport, there is a risk of crushing and impact on swinging, toppling or falling objects. There is a risk of injuries to limbs, up to and including bone fractures and head injuries.

- ► Secure the danger zone if necessary.
- ► Pay attention to the center of gravity of the load during transport.
- ► Ensure even movements and moderate speeds.
- ► Observe safe handling of the transport devices.
- ► Avoid sloping attachment aids.
- ► Never stack products.
- ► Wear protective equipment, e.g. safety shoes.

NOTICE

Equipment damage from operating fluid leaking into the pumping system.

If the vacuum pump is tipped, the operating fluid will overflow into the pumping system, resulting in the vane breaking when the vacuum pump is switched on.

- ► Always transport the vacuum pump horizontally or without operating fluid filling.
- ► Fill in the operating fluid only at the final installation location.

Preparations for transport

Pfeiffer Vacuum recommends keeping the transport packaging and original protective cover.

General information regarding safe transport

1. Observe the weight specified on packaging.
2. Use personal protective equipment, e.g. safety shoes.
3. Use transport equipment (e.g. fork lift truck or lift truck).
4. Where possible, always transport or ship the product in the original packaging.
5. Be mindful of transport damage.
6. Always place the product on an adequately sized, level surface.

Transporting the vacuum pump with its packaging

1. Observe safe handling of manually operated transport devices.
2. Note the center of gravity of the load.
3. Use a fork lift truck or pallet truck to transport the vacuum pump on a pallet in its packaging.
4. Ensure harmonious movements and moderate speeds.
5. To protect the inside of the pump, leave both protective covers on the connections during transport.

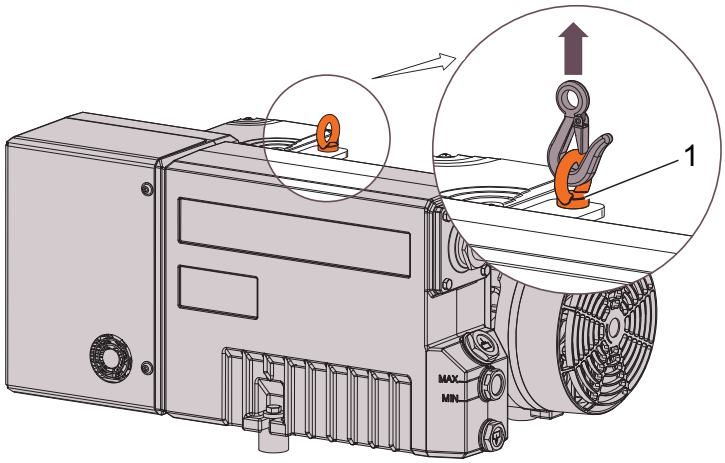


Fig. 4: Transporting the vacuum pump

1 Crane lug

Transporting the vacuum pump without its packaging

1. Unpack the vacuum pump.
2. To protect the inside of the pump, leave the protective caps on the connections during transport.
3. For lifting, use the crane lug provided for this purpose, located on the top of the pump.
4. Lift the vacuum pump out of the transport packaging.
5. Always place the vacuum pump on an adequately sized, level surface.

4.2 Storing the vacuum pump

Storage

Pfeiffer Vacuum recommends storing the products in their original transport packaging.

Procedure

1. Seal the vacuum and exhaust connection.
2. Store the vacuum pump only in dry, dust-free rooms, within the specified ambient conditions.
3. In rooms with humid or aggressive atmospheres: Hermetically seal the vacuum pump together with a drying agent in a plastic bag.
4. Change the operating fluid if the storage period is longer than 2 years.

5 Installation

5.1 Installing the vacuum pump

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

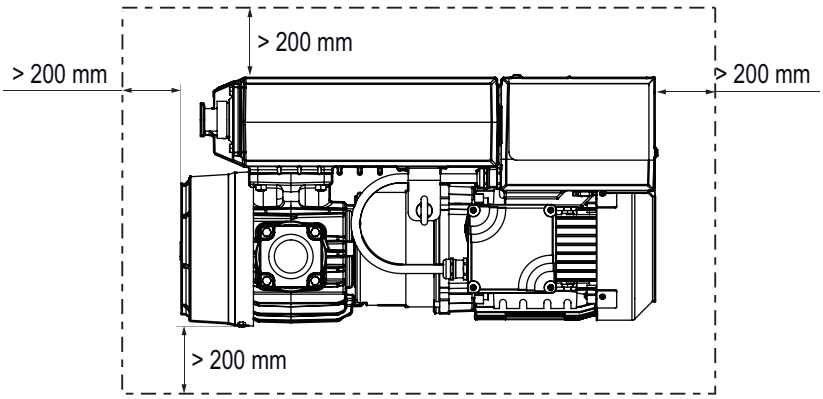


Fig. 5: Minimum distances to the lateral limitations (top view)

Procedure

1. Place the vacuum pump on a flat, horizontal surface.
2. Observe the permissible angle of inclination of ±1°.
3. The vacuum pump can be secured with stationary installation on the base as required.
4. When installing the pump in a closed housing, ensure adequate air circulation.
5. Keep the sight glass visible and freely accessible.
6. Keep the voltage and frequency specifications on the motor rating plate visible and freely accessible.
7. Ensure that the connections remain freely accessible at all times.

5.2 Connecting the vacuum side

NOTICE

Property damage from contaminated gases

Pumping down gases that contain impurities (condensate, particles) damages the vacuum pump.

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

Installation and operation of accessories

Pfeiffer Vacuum offers a series of special, compatible accessories for its rotary vane pumps.

- You can find information and ordering options for approved accessories online.
- Described accessories are not included in the shipment.

Procedure

1. Remove the protective cap from the vacuum connection.
2. Establish the shortest possible pipeline between vacuum pump and vacuum chamber.
3. Choose a minimum diameter equal to the nominal diameter of the vacuum connection.
4. Depending on the pump type, use PVC or metallic hoses with flange connections from the Pfeiffer Vacuum component shop.
5. Support or suspend the piping to the vacuum pump so that no piping system forces act on the vacuum pump.
6. Use a separator or filter from the Pfeiffer Vacuum line of accessories if necessary.
7. Connect the vacuum pump to the vacuum system using the vacuum connection.

5.3 Connecting the exhaust side

⚠ CAUTION

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

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

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

Installation and operation of accessories

Pfeiffer Vacuum offers a series of special, compatible accessories for its rotary vane pumps.

- You can find information and ordering options for approved accessories online.
- Described accessories are not included in the shipment.

Condensate separator

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

Procedure

1. Remove the protective cap from the exhaust connection.
2. Choose a minimum diameter for the exhaust line at least equal to the nominal diameter of the exhaust connection.
3. Depending on the pump type, use PVC or metallic hoses with flange connections from the Pfeiffer Vacuum component shop.
4. Route the piping downwards from the vacuum pump, to prevent condensate return.
5. Support or suspend the piping to the vacuum pump so that no piping system forces act on the vacuum pump.
6. Use a separator or filter from the Pfeiffer Vacuum line of accessories if necessary.

5.4 Filling the operating fluid

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

NOTICE

Risk of damage due to the use of non-approved operating fluid

Product-specific performance data are not achieved. All liability and warranty claims against Pfeiffer Vacuum are also excluded.

► Only use approved operating fluids.
► Only use other application-specific operating fluids after consultation with Pfeiffer Vacuum.

Operating fluid type

Fundamentally, when filling, refilling, or changing operating fluid, you must always use the operating fluid type specified on the rating plate.

Approved operating fluid

- VSI 100 (standard operating fluid)
- A 113 (operating fluid for processes with increased oxygen content)

Required consumable material

- Operating fluid

Required aids

- Funnel (optional)

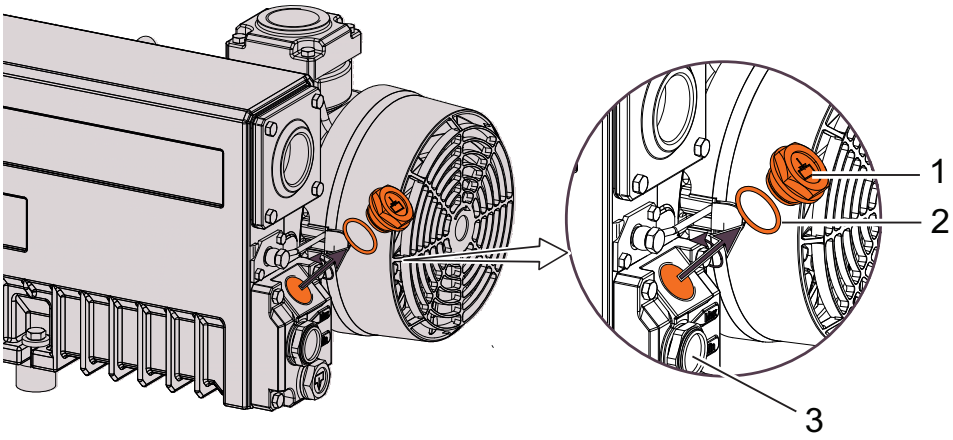


Fig. 6: Filling the operating fluid

1 Filler screw
2 O-ring
3 Sight glass

Filling the operating fluid

1. Unscrew the filler screw.
2. Fill the operating fluid according to the sight glass:
3. Screw in the filler screw again.
   – Be careful with the O-ring.
4. Seal the vacuum connection.
5. Start the vacuum pump.
6. Operate the vacuum pump for approx. 5 minutes.
7. Switch off the vacuum pump.
8. Wait approx. 1 minute until the operating fluid has accumulated in the operating fluid separator.
9. Check the fill level.
   – The correct fill level is between the Min/Max markings or within the ring mark on the sight glass.
10. If necessary, fill more operating fluid in case the fill level is incorrect.

5.5 Establishing mains connection

⚠ DANGER

Danger to life from electric shock

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

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

⚠ WARNING

Danger to life from electric shock in the event of a fault

In the event of a fault, devices connected to the mains may be live. There is a danger to life from electric shock when making contact with live components.

- ► Always keep the mains connection freely accessible so you can disconnect it at any time.

⚠ CAUTION

Risk of injury from trapping of body parts due to unexpected automatic startup

With open control input, the motor can start unexpectedly following extrinsic contact, if the mains voltage is already applied.

A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Note the prescribed switch-on procedure for safe startup.

⚠ CAUTION

Risk of injury from trapping of body parts due to unexpected automatic startup

When connecting the power cable, the motor can start unexpectedly if the control cable is already connected to an activated on-site contact.

A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Note the prescribed switch-on procedure for safe startup.

NOTICE

Risk of property damage from excess voltage

Incorrect or excessive mains voltage will destroy the motor.

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

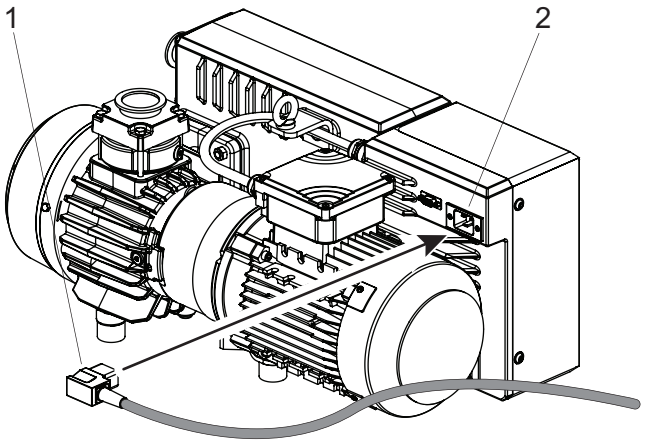


Fig. 7: Mains connection

1 Mains cable with C19 bushing from the range of accessories
2 Mains supply plug

Establish the mains supply

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

On-site protection

The vacuum pump has an internal fuse 10 A TT.

► Recommendation: Always provide a 16 amp fuse as protection for the motor in the event of a malfunction.

5.6 Installing a residual current circuit breaker

In the event of an insulation fault, installation of a residual current circuit breaker ensures protection against personal injury.

RCCB	
Residual current waveform	Type B ● AC/DC sensitive ● Safe functioning with overlapping of different residual current waveforms ● regardless of — phase angle — polarity — occurring suddenly or increasing gradually

Tbl. 6: Technical requirements for a residual current circuit breaker

Procedure

1. Observe the technical requirements for a residual current circuit breaker.
2. Observe the prescribed inspection periods for electrical protective devices.

6 “Modbus” protocol

NOTICE

Property damage on the electronics

Separating all plug-and-socket connections within the bus system with voltage supply switched on may lead to the destruction of electronic components.

- ► Always disconnect the voltage supply before removing the connecting plug.
- ► After switching off the power supply pack, wait until the residual load has dispersed completely before disconnecting the plug-and-socket connection.

The 9-pin D-Sub connection with the "Modbus" designation provides the option to start/stop the vacuum pump, select the four pre-set rotation speeds and request the status values of the vacuum pump, e.g. current, voltage and operating hours.

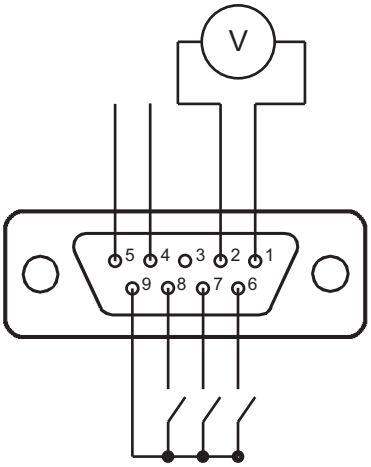


Fig. 8: D-Sub socket on electronic drive unit, 9-pin

Pin	Function	Description, factory setting
1	DO	Digital Output
2	Ground (GND)	Ground connection
3	-	N/A
4	RS-485	Status request (D+)
5	RS-485	Status request (D-)
6	DI4	Preset rotation speed DI2/DI4: 0/0: Rotation speed 1 = 1800 rpm 1/0: Rotation speed 2 = 1600 rpm 0/1: Rotation speed 3 = 1350 rpm 1/1: Rotation speed 4 = 1150 rpm Logic 0 = input voltage 0 – 4 V DC Logic 1 = input voltage 8 – 30 V DC
7	DI2	
8	DI1	open: Stop; closed: Start
9	+24 VDC output	Voltage supply

Tbl. 7: Plug arrangement of the D-Sub socket, 9-pin

7 Operation

7.1 Putting the vacuum pump into operation

⚠ WARNING

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

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

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

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

⚠ CAUTION

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

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

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

Before switching on

1. Check the operating fluid in the sight glass.
2. Compare the voltage and frequency specifications on the motor rating plate with the available mains voltage and frequency.
3. Protect the vacuum pump from sucking in contamination using suitable measures.
4. Check the operating fluid at regular intervals.
5. Check the exhaust connection for free passage (max. permissible pressure: atmospheric pressure).

7.2 Switching on the vacuum pump

⚠ WARNING

Risk of burns from ejected hot oil mist

During operation, hot pressurized oil mist escapes from the operating fluid separator.

- ► Only operate the vacuum pump with the filler screw securely fitted.
- ► Open the locking screws on the separator only while the vacuum pump is switched off.

⚠ CAUTION

Risk of injury from entrapment of body parts

After a power failure or a standstill as a result of overheating, the motor restarts automatically. A risk exists of minor injury to fingers and hands (e.g., hematoma), from direct contact with the vacuum flange.

- ► Maintain sufficient distance to the vacuum flange during all work.
- ► Safely disconnect motor from the mains.
- ► Secure the motor against re-start.

⚠ CAUTION

Danger of burns on hot surfaces

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

- ► Provide suitable touch protection.

NOTICE

Risk of damage to the drive from increased motor current consumption

At an intake pressure of approximately 300 hPa and under unfavorable operating conditions (such as for example exhaust side counterpressure), the power input exceeds the rated current.

- ► Limit the maximum power input of 1.5 times the rated current to max. 2 minutes (in accordance with EN 60034-1).

Cycle operation

Cycle operation with maximum 10 cycles per hour is possible.

Longer operating phases and short downtimes permit a functionally safe operating condition of the vacuum pump.

Operating Conditions

- The optimal operating condition of the vacuum pump is continuous operation.
- Observe the application limits prescribed by (see chapter “Limits of use of the product”, page 15).
- When pumping down dry gases, no special precautions are required.

Switching on the vacuum pump

When using the supplied D-Sub mating plug, only operation at max. rotation speed is possible.

1. If required, switch the vacuum pump on in each pressure range.
2. Seal the vacuum connection.
3. Connect the control input.
4. Allow the vacuum pump to warm up prior to process start, with the vacuum connection closed, for approx. 30 minutes.

Inspect operating fluid level

1. Regularly check the operating fluid level while the vacuum pump is running and at operating temperature.
2. Make sure that the fill level is within the markings of the sight glass.
3. Check the operating fluid fill level daily during continuous operation, and every time the vacuum pump is switched on.

7.3 Operating modes

Automatic start

After bridging the contacts at pins 8 and 9 on the connecting plug or when using a connection cable with respective bridges and applying the supply voltage, the vacuum pump starts up immediately.

Pfeiffer Vacuum therefore recommends switching on the voltage supply immediately before operation.

Possible operating mode of the electronic drive unit

- Operation without control unit

Operation without control unit

1. Connect the corresponding connection cable to the control input with bridges from the Pfeiffer Vacuum accessories or the supplied D-Sub mating plug.
2. Provide the current supply.

7.4 Operating mode display via LED

The LEDs indicate the basic operating and communication states.

LED A1 is visible from the outside during operation.

LED A2 is inside and only visible once the cover plate has been removed, i.e. for troubleshooting. LED A2 is only active when the “Modbus” protocol is used.

LED	LED status	Display	Meaning
A1	Off	———	Vacuum pump switched off
	On, constant, green		Vacuum pump switched on No errors
	On, constant, red		Vacuum pump switched on Error
A2	Off	———	No communication
	Flashes green		Communication is established (ready for operation)

Tbl. 8: Behavior and meaning of the LEDs

7.5 Refilling operating fluid

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

Prerequisite

- Vacuum pump switched off

Required tool

- Ring spanner **WAF 32**

Required consumable

- Operating fluid

Required aids

- Funnel (optional)

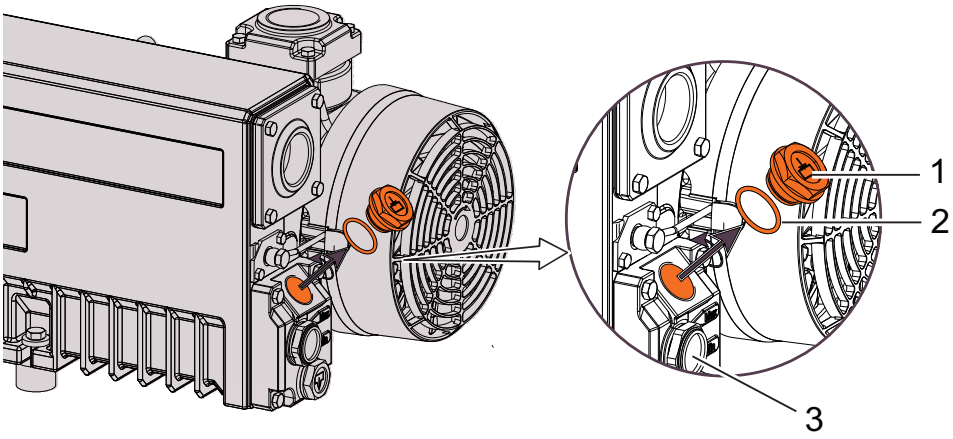


Fig. 9: Refilling operating fluid

1 Filler screw
2 O-ring
3 Sight glass

Procedure

1. Unscrew the filler screw.
2. With the vacuum pump at operating temperature, refill with operating fluid up to the top marking before the minimum fill level is reached.
3. Screw in the filler screw again.
   – Be careful with the O-ring.

7.6 Switching off the vacuum pump

⚠ WARNING

Risk of danger to life through missing mains disconnection device

The vacuum pump and electronic drive unit are **not** equipped with a mains disconnection device (mains switch).

- ► Unplug the mains cable in order to disconnect the mains supply.
- ► Install a residual circuit breaker (RCCB).

NOTICE

Contamination from operating fluid backflow

After the vacuum pump is switched off, there is a risk that the connected vacuum system can become contaminated by backflow. The safety valve on the vacuum pump is not suitable for longer-term sealing.

- ► Install an additional shut-off valve in the intake line.
- ► Shut off the intake line immediately after switching off the vacuum pump.

NOTICE

Contamination of the vacuum chamber from operating fluid backflow

After the vacuum pump is switched off, there is a risk that the connected vacuum system can become contaminated by backflow.

- ► Vent the vacuum chamber, regardless of its size, within 30 seconds.
- ► Shut off the intake line with an additional shut-off valve, after the vacuum pump is switched off during longer venting operations.

Rotary vane vacuum pumps of the HenaLine have an integrated non-return valve on the suction side. The non-return valve closes automatically when the vacuum pump is switched off, preventing the return flow of gas and processing materials into the intake line.

Procedure

1. If required, switch the vacuum pump off in each pressure range.
2. Isolate the control input or disconnect the electronic drive unit safely from the mains.
3. Install an additional shut-off valve in the intake line to ensure that the vacuum is maintained in the vacuum chamber.
4. Remove the mains cable and disconnect the vacuum pump from the power supply.

8 Maintenance

8.1 Maintenance instructions

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ WARNING

Tilting danger! Serious injury due to tilting of the product

There is a danger of the vacuum pump not attached tipping over due to changes in the center of gravity or incorrect loading. Serious injuries due to trapping or crushing of limbs, e.g. feet, are the result.

- ► Do not use the vacuum pump as a climbing aid.
- ► Do not exert any force on the product.
- ► Ensure that the product has a safe centre of gravity, when mounting components.
- ► Wear protective equipment , e.g. protective shoes

⚠ CAUTION

Danger of injury from moving parts

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

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

NOTICE

Danger of property damage from improper maintenance

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

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

The following section describes the tasks for cleaning and maintaining the vacuum pump. More advanced works are described in the service instructions.

Prerequisites

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

Preparing maintenance

- ► Safely disconnect the drive motor from the mains.
- ► Secure the motor against switching back on.
- ► For maintenance work, only dismantle the vacuum pump to the extend needed.
- ► Dispose of used operating fluid according to applicable regulations in each case.
- ► When using synthetic operating fluid, please observe the associated application instructions.
- ► Only clean the pump parts using industrial alcohol, isopropanol or similar media.

8.2 Checklist for inspection and maintenance

Notes on maintenance intervals

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

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

You can carry out maintenance work at **maintenance level 1** yourself.

We recommend Pfeiffer Vacuum Service for carrying out maintenance work at **maintenance level 2** and **maintenance level 3** (revision). If the required intervals listed below are exceeded, or if maintenance work is carried out improperly, no warranty or liability claims are accepted on the part of Pfeiffer Vacuum. This also applies if original spare parts are not used.

Action described in document	**Inspection** OI	**Cleaning** OI	**Maintenance level 1** OI	**Maintenance level 2** MM	**Maintenance level 3** MM	**Required material**
Interval	**Weekly**	**≤ every six months**	**≤ 1 year**	**≤ 16000 hours**	**≤ 5 years**	
Inspection						
Visual and acoustic pump check • Check operating fluid fill level • Check operating fluid color (contamination) • Check saturation of the exhaust filters • Check vacuum pump for leaks	■					
Check accessories (in accordance with respective operating instructions)	■					
Cleaning						
• Clean the outside of the pump housing • Clean the fan cap on the motor and pump • Clean the electronic components and cooler filter		■				
Maintenance level 1 – operating fluid replacement						
• Changing the operating fluid • Change the exhaust filter			■			Operating fluid Maintenance kit
Maintenance level 2 – RSSR change						
• Replace the radial shaft seal ring [1)]				■		RSSR set
Maintenance level 3 – overhaul						

1) In event of noticeably high loss of operating fluid from operating fluid escaping between the pump housing and motor or fan, the radial shaft seal rings have to be replaced.

Action described in document	Inspection OI	Cleaning OI	Maintenance level 1 OI	Maintenance level 2 MM	Maintenance level 3 MM	Required material
Interval	**Weekly**	**≤ every six months**	**≤ 1 year**	**≤ 16000 hours**	**≤ 5 years**	
Dismantle and clean vacuum pump, replace seals and all wear parts: • Storage • Replace the radial shaft seal ring 2) • Clean or replace the exhaust valves • Check the coupling and replace the sleeve					■	Overhaul kit (without vane) Operating fluid
• Vane					■ as required	Set of vanes

Tbl. 9: Maintenance intervals

8.3 Changing the operating fluid

⚠ WARNING

Health hazard and risk of environmental damage from toxic contaminated operating fluid

Toxic process media can cause operating fluid contamination. When changing the operating fluid, there is a health hazard due to contact with poisonous substances. Illegal disposal of toxic substances causes environmental damage.

- ► Wear suitable personal protective equipment when handling these media.
- ► Dispose of the operating fluid according to locally applicable regulations.

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

⚠ CAUTION

Scalding from hot operating fluid

Danger of burns when draining operating fluid if it comes into contact with the skin.

- ► Wear protective equipment.
- ► Use a suitable collection receptacle.

2) In event of noticeably high loss of operating fluid from operating fluid escaping between the pump housing and motor or fan, the radial shaft seal rings have to be replaced.

NOTICE

Risk of damage due to the use of non-approved operating fluid

Product-specific performance data are not achieved. All liability and warranty claims against Pfeiffer Vacuum are also excluded.

- ► Only use approved operating fluids.
- ► Only use other application-specific operating fluids after consultation with Pfeiffer Vacuum.

Pfeiffer Vacuum recommends determining the precise service life of the operating fluid in the first operating year.

The service life may deviate from the reference value specified depending on thermic and chemical loads, and the accumulation of suspended particles and condensate in the operating fluid.

Operating fluid type

Fundamentally, when filling, refilling, or changing operating fluid, you must always use the operating fluid type specified on the rating plate.

Safety data sheets

You can obtain the safety data sheets for operating fluids from Pfeiffer Vacuum on request, or from the Pfeiffer Vacuum Download Center.

The usable life of operating fluid is dependent on the area of application of the rotary vane vacuum pumps.

Instructions for when operating fluid should be changed

- The vacuum pump does not reach the specified ultimate pressure.
- Operating fluid is perceptibly polluted, milky, or cloudy when viewed through the sight glass.

Prerequisites

- Vacuum pump switched off
- Vacuum pump vented to atmospheric pressure
- Vacuum pump has cooled so that it can be touched
- Operating fluid still warm

Required consumable

- Operating fluid

Required tools

- Ring spanner **WAF 32**
- Ring spanner **WAF 27**

Required aids

- Collection receptacle (> 2 l)
- Funnel (optional)

8.3.1 Draining the operating fluid

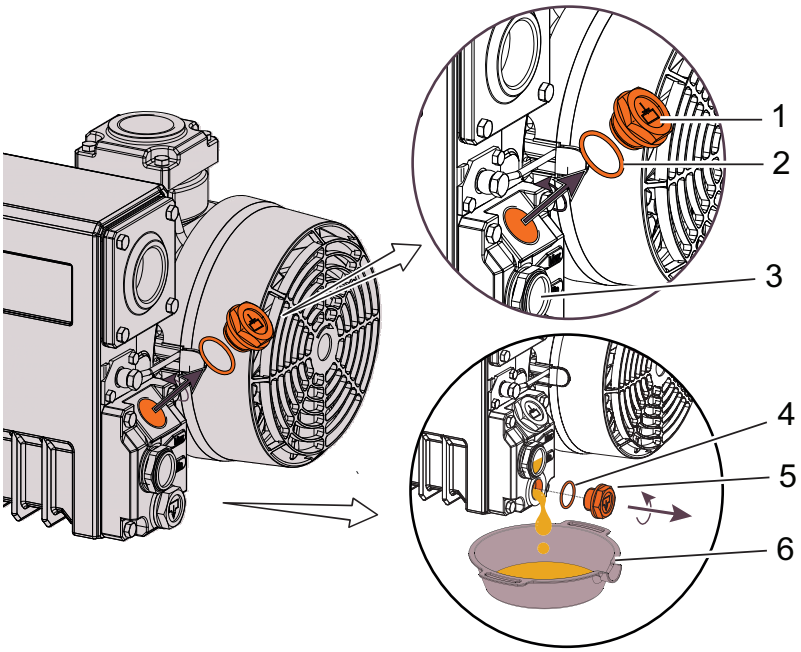


Fig. 10: Draining the operating fluid

1	Filler screw	4	O-ring
2	O-ring	5	Drain screw
3	Sight glass	6	Collection receptacle

Draining the operating fluid

1. Unscrew the filler screw.
   – Be careful with the O-ring.
2. Place a collection receptacle below the drain hole.
3. Unscrew the drain screw.
   – Be careful with the O-ring.
4. Allow operating fluid to drain into collection receptacle.

8.3.2 Filling the operating fluid

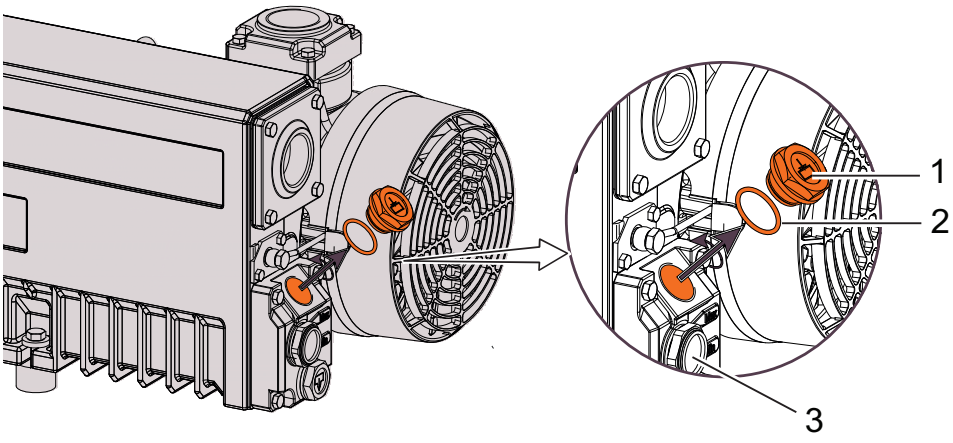


Fig. 11: Filling the operating fluid

1	Filler screw	3	Sight glass
2	O-ring		

Filling fresh operating fluid

1. Screw in the drain screw.
   – Be careful with the O-ring.
2. Fill new operating fluid.
3. Check level.
4. Screw in the filler screw.
   – Be careful with the O-ring.

8.3.3 Rinsing and cleaning the rotary vane vacuum pump

Cleaning by changing the operating fluid

Pfeiffer Vacuum recommends, in cases of heavy contamination with process residues, cleaning the inside of the vacuum pump with several operating fluid changes.

Prerequisites

- Fresh operating fluid filled

Required aids

- Collection receptacle (> 2 l)

Change operating fluid for cleaning

1. Operate the vacuum pump until it is warm.
2. Perform an operating fluid change.
3. Check the pollution level and repeat the changing of the operating fluid if necessary.
4. In case of highly contaminated operating fluid, replace the exhaust filter.

8.4 Change exhaust filters in the operating fluid separator

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

⚠ WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic operating fluid generates toxic vapors. Danger of poisoning if inhaled.

- ► Observe the application instructions and precautions.
- ► Do not allow tobacco products to come into contact with the operating fluid.

Change the exhaust filter annually

Pfeiffer Vacuum recommends replacing the exhaust filter in the operating fluid separator annually, depending on the work process and the contamination incurred during the process.

Indications for saturation of the exhaust filter:

- higher current consumption of the motor
- increased emission of operating fluid mist at the gas outlet
- increased pressure in the operating fluid separator (pressure gauge indicator in the red area).

Continuous monitoring of the filter resistance

- ► To continually monitor the filter resistance, use a manometer from Pfeiffer Vacuum Accessories instead of the filler screw .

8.4.1 Dismantling the exhaust filters

Prerequisites

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

Required tools

- Hexagonal wrench **SW 10**

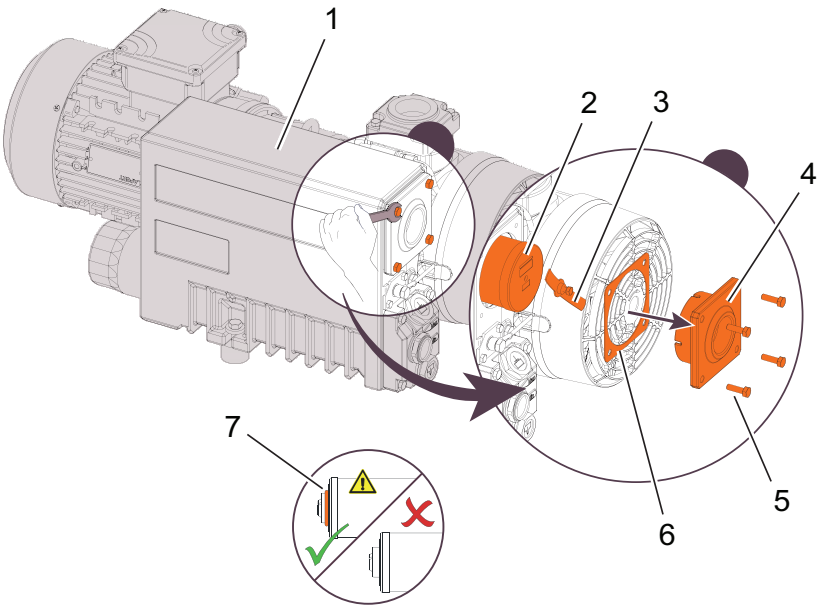


Fig. 12: Dismantling the exhaust filters

1 Operating fluid separator
2 Exhaust filter
3 Filter spring
4 Separator cover plate
5 Hexagon head set screw (4×)
6 Flat seal
7 O-ring on exhaust filter

Procedure

1. Remove the exhaust line.
2. Remove the separator cover plate.
   – Pay attention to the flat seal.
3. Loosen the filter spring on the exhaust filter.
4. Pull the exhaust filter completely out of the operating fluid separator.
5. Disassemble the filter spring.
6. Replace the exhaust filter.

8.4.2 Mounting the exhaust filters

Prerequisites

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

Required consumables

- Maintenance kit – Maintenance level 2

Required tools

- Hexagonal wrench **SW 10**
- Calibrated torque wrench (tightening factor ≤ 2.5)

Procedure

1. Place a new O-ring on the front side of the exhaust filter.
2. Install the exhaust filter
   – Be careful with the O-ring.
   – An arrow on the filter indicates the installation orientation.
   – The arrow must point upwards (↑).
3. Insert the filter spring in the housing.
4. Turn the screw until the filter spring is level.
5. Fit the separator cover plate with new flat seal.
6. Tighten the screws on the separator cover plate evenly.
   – Tightening torque: **6 Nm**
7. Assemble the exhaust line.

9 Decommissioning

9.1 Shutting down for longer periods

Before shutting down the vacuum pump, observe the following instructions to adequately protect the interior of the vacuum pump (pumping system) against corrosion:

1. Switch off the vacuum pump.
2. Vent the vacuum pump.
3. Allow the vacuum pump to cool down.
4. Remove the vacuum pump from the vacuum system if necessary.
5. Change the operating fluid.
6. Start the vacuum pump and bring it to operating temperature in order to wet the inside of the vacuum pump with fresh operating fluid.
7. Seal the connections with the original protective covers.
8. Store the vacuum pump in dry, dust-free rooms, within the specified ambient conditions.
9. Pack the vacuum pump together with a drying agent in a plastic bag, and seal the vacuum pump airtight if it is to be stored in rooms with damp or aggressive atmospheres.
10. For longer storage periods (> 2 years), Pfeiffer Vacuum recommends changing the operating fluid again prior to recommissioning.

9.2 Recommissioning

NOTICE

Risk of damage to vacuum pump as a result of operating fluid aging

The operating fluid usability is limited (max. 2 years). Prior to recommissioning, following a shutdown of **2 years or more**, carry out the following work.

- ► Change the operating fluid.
- ► Change the radial shaft seal rings and other elastomer parts if required.
- ► Observe the maintenance instructions – consult Pfeiffer Vacuum if necessary.

10 Recycling and disposal

⚠ WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

Environmental protection

You **must** dispose of the product and its components in accordance with all applicable regulations for protecting people, the environment and nature.

- Help to reduce the wastage of natural resources.
- Prevent contamination.

Environmental protection

The product and its components **must be disposed of in accordance with the applicable regulations relating to environmental protection and human health**, with a view to reducing natural resource wastage and preventing pollution.

10.1 General disposal information

Pfeiffer Vacuum products contain materials that you must recycle.

- ► Dispose of our products according to the following:
  - Iron
  - Aluminium
  - Copper
  - Synthetic
  - Electronic components
  - Oil and fat, solvent-free
- ► Observe the special precautionary measures when disposing of:
  - Fluoroelastomers (FKM)
  - Potentially contaminated components that come into contact with media

10.2 Dispose of rotary vane pump

Pfeiffer Vacuum rotary vane pumps contain materials that you must recycle.

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

11 Malfunctions

⚠ CAUTION

Danger of injury from moving parts

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

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

⚠ CAUTION

Danger of burns on hot surfaces

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

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

NOTICE

Danger of property damage from improper maintenance

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

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

The vacuum pump indicates errors in two ways:

- LED A1 lights up red
- No ready for operation signal is given at the control input with existing connection

The electronic drive unit makes 6 attempts at 20-second intervals to automatically reset the error.

Reset error

1. Determine the potential cause of the error.
2. Eliminate the error.
3. Interrupt the current supply for at least 30 seconds.
   – This resets the error.

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

Problem	Possible causes	Remedy
Vacuum pump will not start up	• No mains voltage or voltage does not correspond to the drive data	• Check the mains voltage and mains fuse
	• No start signal	• Check the control input.
	• Internal fuse is faulty	• Check the fuse in the drive (10 A TT) and replace if necessary.
	• Pump temperature too low	• Heat the vacuum pump to > 12 °C.
	• Drive coupling is defective	• Replace the coupling parts.
	• Pumping system contaminated	• Clean the vacuum pump. • Contact Pfeiffer Vacuum Service.
	• Pumping system damaged	• Clean and maintain the vacuum pump. • Contact Pfeiffer Vacuum Service.
	• Motor or drive defective	• Contact Pfeiffer Vacuum Service.

Problem	Possible causes	Remedy
Vacuum pump switches off after a while after being started	• Thermal protection of the drive has triggered	• Determine and eliminate the cause of overheating. • Allow the vacuum pump to cool down as required.
	• Exhaust pressure too high	• Ensure that the exhaust line is depressurized.
Vacuum pump does not reach the specified ultimate pressure	• Measurement result distorted	• Check the measurement instrument. • Check the ultimate pressure without system connected.
	• Vacuum pump or connected accessory contaminated	• Clean the vacuum pump. • Check the components for contamination.
	• Operating fluid contaminated	• Change the operating fluid.
	• Operating fluid level too low	• Top up the operating fluid.
	• Leak in system	• Locate and eliminate the leak.
	• Vacuum pump is damaged	• Contact Pfeiffer Vacuum Service.
Pumping speed of vacuum pump too low	• Poor dimensioning of vacuum line	• Make sure that connections are short and cross sections adequately dimensioned.
	• Rotation speed of pump is too low	• Check the signals at the control input.
	• Exhaust pressure too high	• Ensure that the exhaust line is depressurized.
Loss of operating fluid	• Operating fluid separator leaking	• Check for leaks. • Replace the seal as required.
	• Radial shaft seal rings (RSSR) leaking	• Check the RSSR. • Contact Pfeiffer Vacuum Service.
	• Operational loss of operating fluid	• Check the exhaust filter and replace if necessary.
Unusual noises during operation	• Drive coupling is worn	• Replace the coupling parts.
	• Pumping system contaminated or damaged	• Clean and maintain the vacuum pump. • Contact Pfeiffer Vacuum Service.
	• Motor bearing is defective	• Change the motor. • Contact Pfeiffer Vacuum Service.

Tbl. 10: Troubleshooting for rotary vane pumps

12 Service solutions by Pfeiffer Vacuum

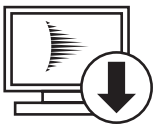
We offer first-class service
High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum quality.

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

Make use of Pfeiffer Vacuum service
Whether preventive, on-site service carried out by our field service, fast replacement with mint condition replacement products, or repair carried out in a Service Center near you – you have various options for maintaining your equipment availability. You can find more detailed information and addresses on our homepage, in the Pfeiffer Vacuum Service section.

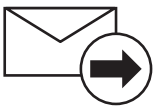
You can obtain advice on the optimal solution for you, from your Pfeiffer Vacuum representative.
For fast and smooth service process handling, we recommend the following:



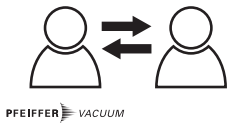
1. Download the up-to-date form templates.
   - Explanations of service requests
   - Service requests
   - Contamination declaration

a) Remove and store all accessories (all external parts, such as valves, protective screens, etc.).
b) If necessary, drain operating fluid/lubricant.
c) If necessary, drain coolant.

2. Complete the service request and contamination declaration.

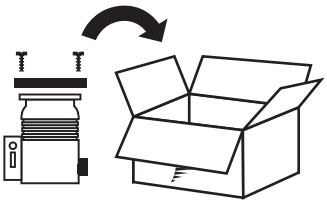


3. Send the forms by email, fax, or post to your local Service Center.

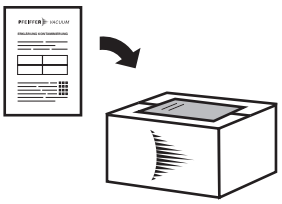


4. You will receive an acknowledgment from Pfeiffer Vacuum.

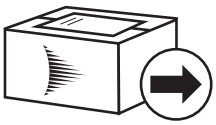
Submission of contaminated products
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination costs** may be incurred.



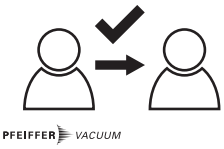
5. Prepare the product for transport in accordance with the provisions in the contamination declaration.
a) Neutralize the product with nitrogen or dry air.
b) Seal all openings with blind flanges, so that they are airtight.
c) Shrink-wrap the product in suitable protective foil.
d) Package the product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



6. Attach the contamination declaration to the **outside** of the packaging.



7. Now send your product to your local Service Center.



8. You will receive an acknowledgment/quotation, from Pfeiffer Vacuum.

Our sales and delivery conditions and repair and maintenance conditions for vacuum devices and components apply to all service orders.

13 Accessories

View the range of accessories for rotary vane pumps on our website.

13.1 Accessory information

Condensate separator
Protects the vacuum pump against fluids from the intake line and from the condensate return from the exhaust line

Dust separators
Protects the vacuum pump from particles out of the process

Activated carbon filter
Protects the vacuum pump and the operating fluid against gaseous contaminants with assembly on the intake side and lowers the concentration of damaging exhaust products with assembly on the exhaust side

13.2 Ordering accessories

Description	Part number
SAS 40, DN 40 ISO-KF	PK Z60 510
KAS 40, Condensate Separator	PK Z10 008
FAK 040, Activated Carbon Filter	PK Z30 008
Manometer for Monitoring the Operating Fluid Separator, G 3/4"	PK 100 126
Mains cable with safety plug at C19 socket (straight)	PK 050 305
Mains cable with NEMA 6-15 plug to receptacle C19	PK 050 306
Mains cable without plug to socket C19	PK 050 307
Mains cable with BS 1363 plug (UK) to socket C19	PK 050 308

Tbl. 11: Accessories

Description	Part number
VSI 100, based on PAO (Poly-alpha-olefin), 1 l	P 0995 876
A113, Perfluoropolyether Oil, 0.5 L	064657
A113, Perfluoropolyether Oil, 2.5 L	064659

Tbl. 12: Operating fluid

14 Technical data and dimensions

14.1 General

Basis for the technical data of Pfeiffer Vacuum rotary vane pumps:

- Specifications according to PNEUROP committee PN5
- ISO 21360-1: 2016: “Vacuum technology - Standard methods for measuring vacuum-pump performance - Part 1: General description”
- Leak test to ascertain the integral leakage rate according to EN 1779: 1999 technique A1; with 20 % helium concentration, 10 s measurement duration
- Sound pressure level according to ISO 3744, class 2

	mbar	bar	Pa	hPa	kPa	Torr | mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^{5}$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr | mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1
1 Pa = 1 N/m²						

Tbl. 13: Conversion table: Pressure units

	mbar l/s	Pa m³/s	sccm	Torr l/s	atm cm³/s
mbar l/s	1	0.1	59.2	0.75	0.987
Pa m³/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 cm³/s	1.01	0.101	59.8	0.76	1

Tbl. 14: Conversion table: Units for gas throughput

14.2 Technical data

Classification	Hena 50	Hena 50	Hena 70	Hena 70
Part number	PK D04 081 174	PK D04 081 175	PK D04 091 174	PK D04 091 175
Connection flange (in)	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF	DN 40 ISO-KF
Connection flange (out)	DN 25 ISO-KF	DN 25 ISO-KF	DN 25 ISO-KF	DN 25 ISO-KF
Final pressure without gas ballast	≤ $2 \cdot 10^{-1}$ hPa	≤ $5 \cdot 10^{-2}$ hPa	≤ $2 \cdot 10^{-1}$ hPa	≤ $5 \cdot 10^{-2}$ hPa
Continuous inlet pressure, max.	20 hPa	20 hPa	20 hPa	20 hPa
Leak rate safety valve	≤ $8 \cdot 10^{-3}$ Pa m³/s	≤ $8 \cdot 10^{-3}$ Pa m³/s	≤ $8 \cdot 10^{-3}$ Pa m³/s	≤ $8 \cdot 10^{-3}$ Pa m³/s
Exhaust pressure, max.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
Exhaust pressure, min.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
Gas ballast	No	No	No	No
Rotation speed min.	1150 rpm	1150 rpm	1150 rpm	1150 rpm

Classification	Hena 50	Hena 50	Hena 70	Hena 70
Rotation speed max.	1800 rpm	1800 rpm	1800 rpm	1800 rpm
Emission sound pressure level without gas ballast at 60 Hz	≤ 60 dB(A)	≤ 60 dB(A)	≤ 60 dB(A)	≤ 60 dB(A)
Cooling method, standard	Air	Air	Air	Air
Continuous gas temperature, max.	40 °C	40 °C	40 °C	40 °C
Operating fluid	A113	VSI 100	A113	VSI 100
Operating fluid amount	1.7 l	1.7 l	1.7 l	1.7 l
Ambient temperature	12 – 40 °C	12 – 40 °C	12 – 40 °C	12 – 40 °C
Shipping and storage temperature	-25 – 55 °C	-25 – 55 °C	-25 – 55 °C	-25 – 55 °C
Motor version	1-ph motor	1-ph motor	1-ph motor	1-ph motor
Input voltage(s)	200 – 240 V AC (±10 %), 50/60 Hz	200 – 240 V AC (±10 %), 50/60 Hz	200 – 240 V AC (±10 %), 50/60 Hz	200 – 240 V AC (±10 %), 50/60 Hz
Mains cable	No, C20-plug inside the terminal box	No, C20-plug inside the terminal box	No, C20-plug inside the terminal box	No, C20-plug inside the terminal box
Rated power at max. rotational speed	1.2 kW	1.2 kW	1.2 kW	1.2 kW
Protection degree	IP20	IP20	IP20	IP20
Weight	56 kg	56 kg	56 kg	56 kg

Tbl. 15: Technical data Hena 50 | Hena 70

14.3 Dimensions

Dimensions in mm

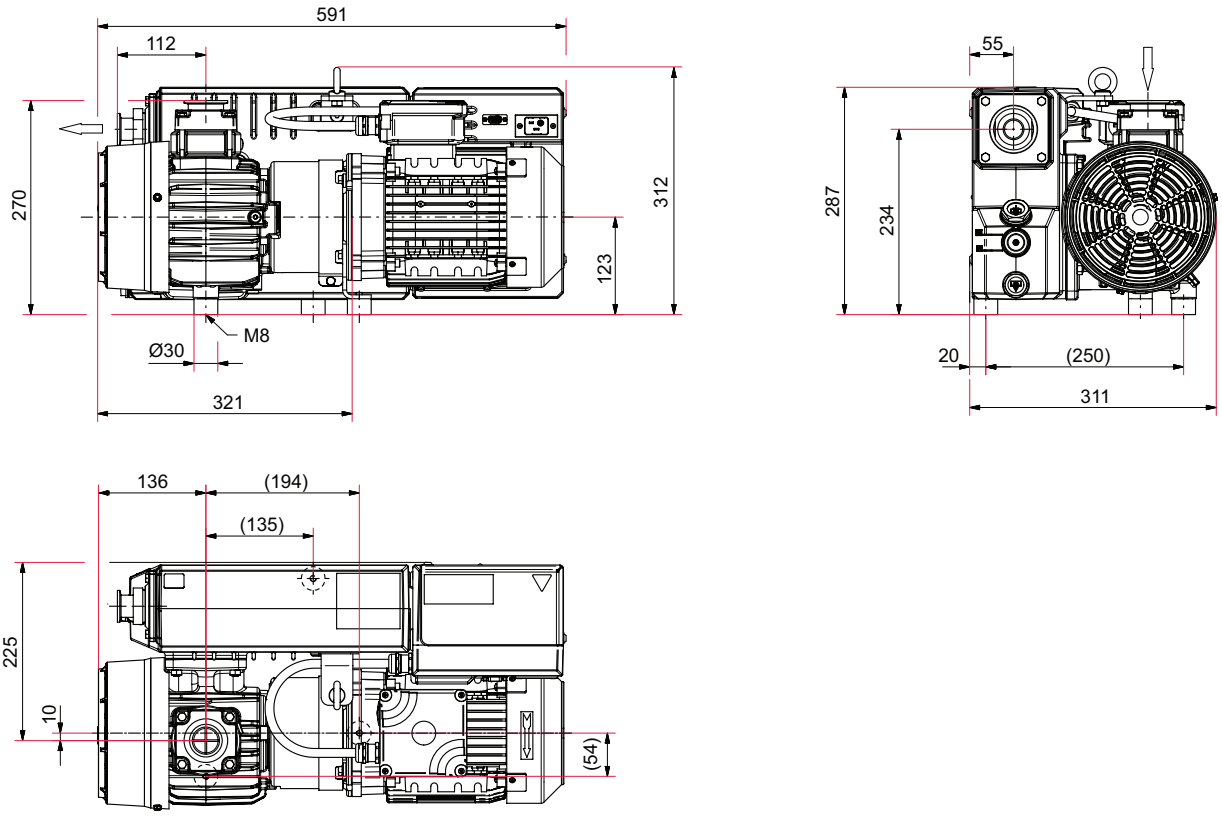


Fig. 13: Dimensions Hena 50

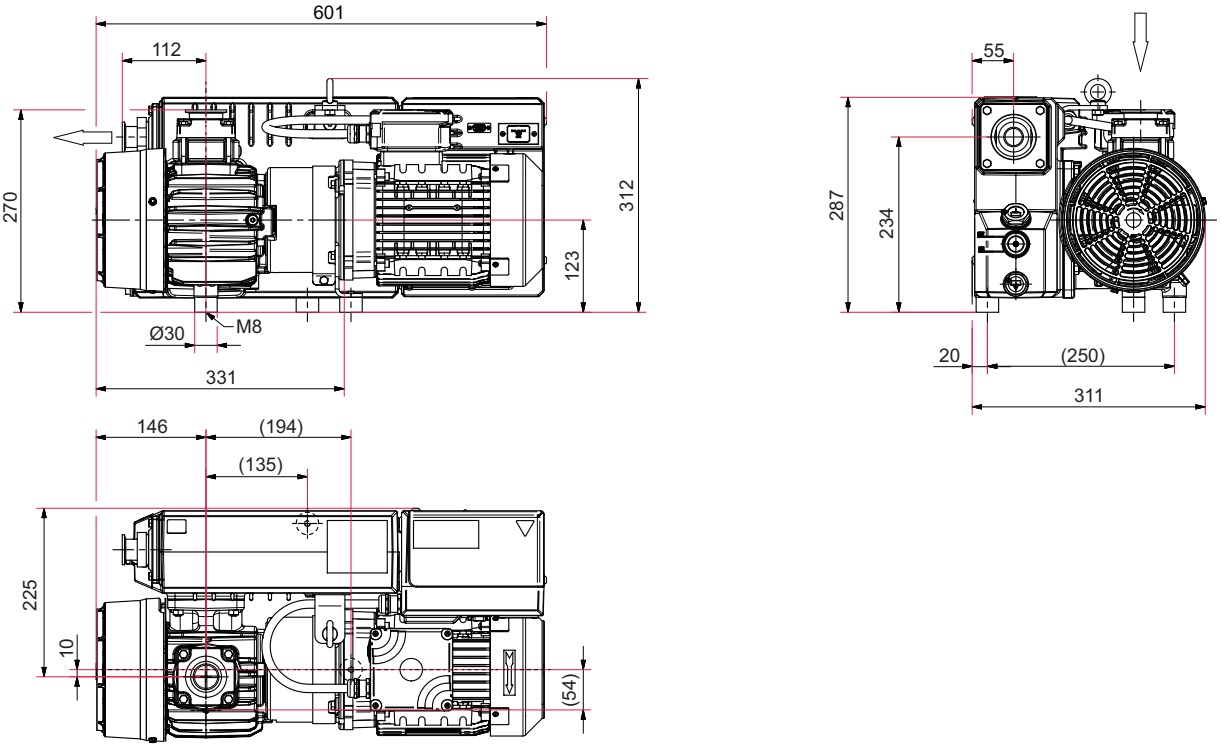


Fig. 14: Dimensions Hena 70

Declaration of conformity

Declaration for product(s) of the type:

Rotary vane pump
Hena 50
Hena 70

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

Machinery 2006/42/EC (Annex II, no. 1 A)
Electromagnetic compatibility 2014/30/EU
Restriction of the use of certain hazardous substances 2011/65/EU
Restriction of the use of certain hazardous substances, delegated directive 2015/863/EU

Harmonized standards and applied national standards and specifications:

DIN EN ISO 12100: 2011-03	DIN EN 60204-1: 2019-06
DIN EN ISO 13857: 2008-06	DIN EN 61000-6-2: 2006-03
DIN EN 1012-1: 2011-02 DIN EN 1012-2 : 2011-12	DIN EN 61000-6-4: 2011-09
DIN EN ISO 2151 : 2009-01	DIN EN 13849-1: 2016-06

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

Signature:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2019-12-13

CE

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

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