



OPERATING INSTRUCTIONS

EN

Translation of the Original

SMARTVANE 55 | 70

Rotary vane pump

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.

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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 are applicable for SmartVane line vacuum pumps:

- SmartVane 55
- SmartVane 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



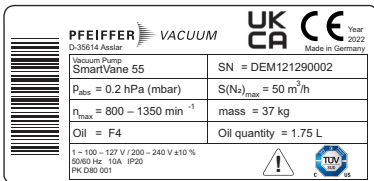
Tip



Qr code is linked to further online information.
We recommend viewing on a tablet computer.
Pay attention to the amount of data that is generated.

1.3.3 Stickers on the product

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

	Rating plate (example) Rating plate of the rotary vane vacuum pump
	Warning hot surface This sticker warns of injuries caused by high temperatures as a result of contact 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 this operating instructions must be read before performing any tasks.

Tbl. 1: Stickers on the product

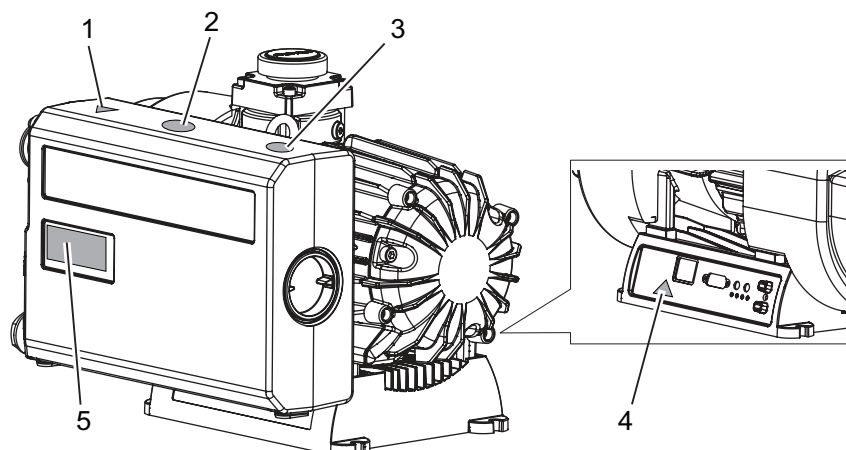


Fig. 1: Position of the stickers on the product

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

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
f	Rotation speed value of a vacuum pump (frequency, in rpm or Hz)
FCC	Federal Communications Commission (USA)
N/A	not connected
N.N.	Mean sea level
NRTL	Nationally Recognized Test Laboratory
[P:xxx]	Parameters are printed in bold as three-digit numbers in square brackets. Example: [P:xxx] Software version
PC	Personal computer
PE	Protective earth (earthed conductor)
PFC	Power factor correction circuitry in power supply pack
RCD	Residual Current Device
RS-485	Standard for a physical interface for asynchronous serial data transmission (recommended standard)
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, DIN EN ISO 12100 Chapter 5 and DIN EN 1012-2. 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 fatal injury due to electric shock on account of incorrect installation**

The device's power supply uses life-threatening voltages. Unsafe or improper installation can lead to life-threatening situations from electric shocks obtained from working with or on the unit.

- ▶ Ensure safe integration into an emergency off safety circuit.
- ▶ Do not carry out your own conversions or modifications on the unit.

⚠ 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**Risk of fatal injury due to electric shock caused by water damage**

The device meets protection degree IP 20 according to EN 60529: 2014 and is not protected against water ingress. Vacuum pumps operated on the floor lead to leakage current in penetrating and surrounding water. There is a danger to life from electric shock when making contact with live water.

- ▶ In case of water damage, disconnect the complete power supply from the area affected.
- ▶ Provide an on-site electrical fuse protection (e.g. RCD) in hazardous areas.
- ▶ When selecting the installation location, observe potential damage from water.

⚠ 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. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

- ▶ Install suitable touch protection if the vacuum pump is accessible to untrained persons.
- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Contact Pfeiffer Vacuum for suitable touch protection in system solutions.

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.

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**Danger of injury if hair or loose clothing is pulled in**

There is a danger of injury from getting pulled in at rotating parts of the fan.

- ▶ Do not wear loose-fitting jewelry, or hide it under clothing.
- ▶ Wear close-fitting clothing.
- ▶ Use a hair net if necessary.

⚠ 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. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

- ▶ Install suitable touch protection if the vacuum pump is accessible to untrained persons.
- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Contact Pfeiffer Vacuum for suitable touch protection in system solutions.

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

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

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	SmartVane 55 SmartVane 70
Installation location	Indoors, protected from dust deposits
Installation altitude	max. 4000 m above sea level
Orientation	horizontal
permissible angle of inclination	± 1 °
Gas inlet temperature, continuous, max.	+40 °C
Ambient temperature range	+15 °C to +45 °C
Relative humidity of air	max. 80%
Permissible operating pressure range during continuous operation	<15 hPa unlimited

Parameter	SmartVane 55 SmartVane 70
Exhaust pressure	Atmospheric pressure
Permissible protection degree	IP20 Housing type: Nema Type 1 (according to UL 50E)
Degree of pollution	2
Restriction of voltage range	SmartVane 70: Avoid the voltage range of 100 to 127 V +/-10 %, because due to the max. permissible input current of 10 A and the temperature limits, the full rotation speed is not achieved.

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 (F4) as operating fluid.
- ▶ Use the vacuum pump only for pumping clean air or other, non-combustible and non-toxic gases.
- ▶ 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. Any use that is counter to the purpose of the product, whether intentional or unintentional, is regarded as improper use; 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 contamination such as particles, dust, or condensate
- Pumping explosive media
- Pumping of media with a propensity to sublimation
- Pumping of fluids
- Using the vacuum pump in potentially explosive atmospheres
- Using the vacuum pump outside the specified area of application
- Using the vacuum pump to generate pressure
- Using the vacuum pump with a vacuum flange that is open to the atmosphere
- Using in systems in which sporadic loads and vibrations or periodic forces act on the device
- Using the vacuum pump in strong electrical, magnetic, or electromagnetic fields
- Connecting to vacuum pumps and units that are not designed for this purpose according to their operating instructions
- Connecting to units with exposed live parts
- Use of H1 or mineral oil as operating fluid with an oxygen concentration level of > 21 %. Mineral oils are combustible and ignite at high temperatures and when they come into contact with pure oxygen. These oils oxidize heavily and thus lose their lubricating capacity.
- 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

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.

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 electrical engineering 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 expressly 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

Adequately trained individuals are:

- **Maintenance level 1**
 - Customer with technical education
 - Pfeiffer Vacuum service technician
- **Maintenance level 3**
 - Pfeiffer Vacuum service technician

3 Product description

3.1 Function

The rotary vane pumps on the SmartVane line 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.

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.



Scan the QR code or [click here](#) to see how single-stage Pfeiffer Vacuum rotary vane pumps work.

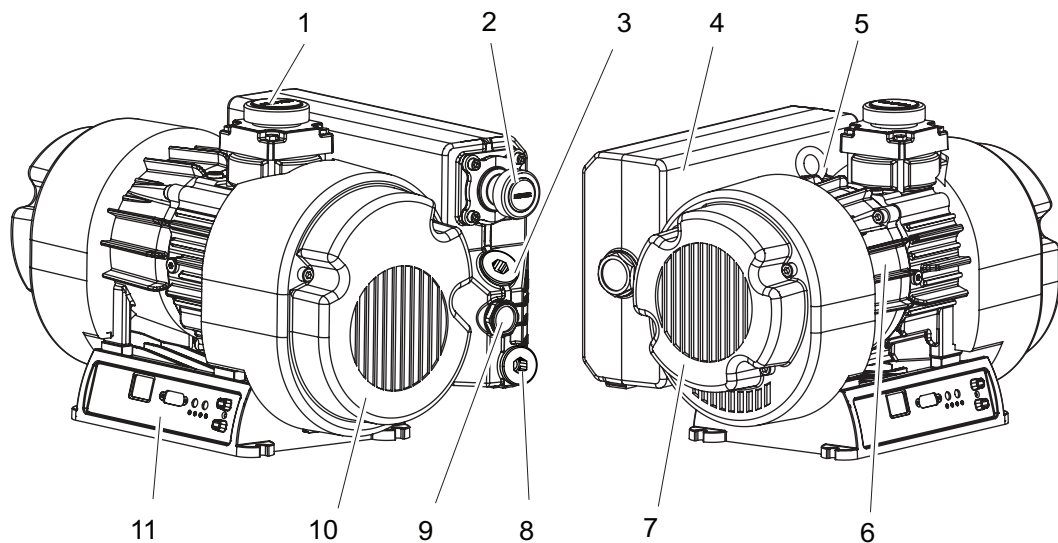


Fig. 2: Structure of the rotary vane pump

- | | |
|---|--|
| 1 Protective cap for DN 40 vacuum connection | 7 Axial fan (only for SmartVane 70) |
| 2 Protective cap for DN 25 exhaust connection, (internal thread G 1/2") | 8 Drain screw |
| 3 Filler screw | 9 Sight glass |
| 4 Operating fluid separator | 10 Axial fan |
| 5 Lifting eye | 11 Electronic drive unit with interfaces |
| 6 Motor | |

3.1.1 Drive

The vacuum pump is equipped with a highly efficient synchronous motor with sensor-free control, in accordance with the patented INFORM procedure according to Prof. Schrödl.

The integrated electronic drive unit permits the control and monitoring of pumping functions via the "remote" interface using a display and control panel.

3.1.2 Operating fluid

The operating fluid fulfills various tasks in a rotary vane pump:

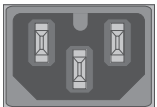
- lubrication of all moving parts
- filling part of the dead volume under the exhaust valve
- sealing the gap between the inlet and outlet channels.
- sealing the gap between the vanes and working chamber.
- ensuring an optimal temperature balance through heat transfer

3.1.3 Cooling

- Air cooling

The electronic drive unit regulates the speed of the axial fan depending on the cooling requirement.

3.2 Connections

Connection	Description
	mains input Housing connector for the voltage supply
	remote D-sub socket with 15 pins for configuration and connection of a remote control.
	Stand-by button Pressing this button activates or deactivates the stand-by mode of the vacuum pump. Corresponds with parameter [P:002] .
	On/Off button Switches the vacuum pump and all components connected on or off, depending on their configuration. Corresponds with parameter [P:010] .
	Accessory connection 2 connecting sockets for the operation of suitable Pfeiffer Vacuum accessory devices

Tbl. 4: Interfaces 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.
- Learn about certifications through test seals on the product or at www.certipedia.com with company ID no. 000024550.

3.4 Product features

Pump type	Characteristics
SmartVane 55	• Nominal pumping speed max. 50 m³/h • Vacuum and exhaust connection with small flange • Electronic drive unit
SmartVane 70	• Nominal pumping speed max. 70 m³/h • Vacuum and exhaust connection with small flange • 2 axial fans • Electronic drive unit

Tbl. 5: Features of the rotary vane pumps

3.5 Scope of delivery

- Rotary vane pump with electronic drive unit
- Operating fluid
- Locking caps or blank flange plugs for vacuum and exhaust connection, depending on the lubricant version
- Operating instructions

4 Transportation and Storage

4.1 Transporting 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.

Safe transport of the product

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

Transporting vacuum pump with packaging

1. Observe safe handling of manually operated transport devices.
2. Note the center of gravity of the load.
3. Transport the packaged vacuum pump on the pallet.
4. Ensure harmonious movements and moderate speeds.

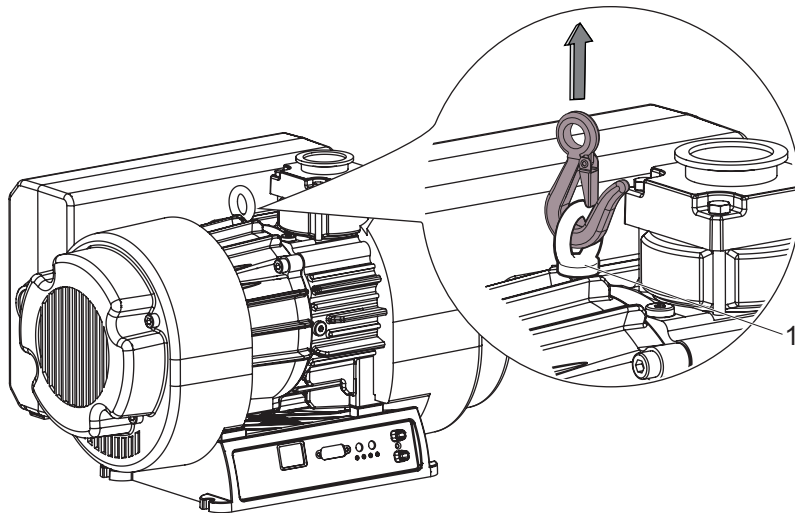


Fig. 3: Transporting vacuum pump

1 Crane lug

Transporting vacuum pump without packaging

1. Unpack the vacuum pump.
2. Leave the protective caps on the connectors during transport.
3. For lifting, use the crane lug 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 vacuum pump

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.
- Replace all elastomer parts.
- Observe the maintenance instructions – consult Pfeiffer Vacuum if necessary.



Storage

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

Procedure

1. Seal the vacuum and exhaust flanges with the original protective covers.
2. Store the vacuum pump only in dry, dust-free rooms, within the specified ambient conditions.
3. In rooms with humid or aggressive atmospheres: Wrap the vacuum pump in corrosion-inhibiting film.

5 Installation

5.1 Setting up 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

⚠ 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. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

- ▶ Install suitable touch protection if the vacuum pump is accessible to untrained persons.
- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Contact Pfeiffer Vacuum for suitable touch protection in system solutions.

NOTICE

Property damage from external vibrations

Vibrations, impacts or strong oscillations originating externally can damage the bearings of the vacuum pump.

- ▶ Do not store the vacuum pump in the vicinity of machines, traffic routes, or similar.

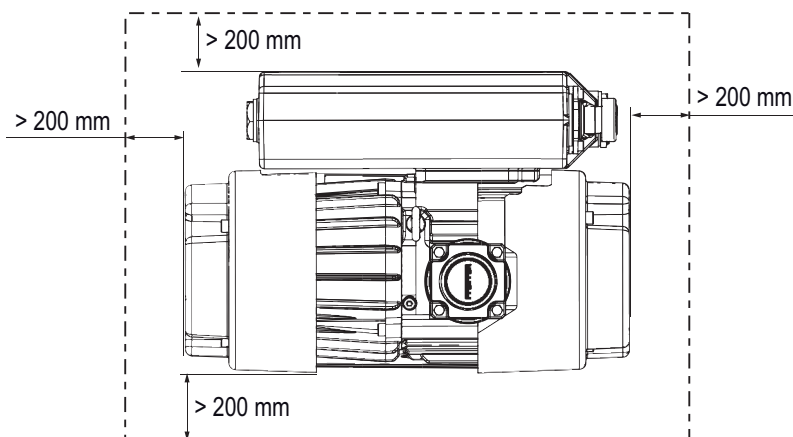


Fig. 4: Minimum distances to the lateral limitations (top view)

Procedure

- When selecting the installation location, observe the requirement for touch protection to prevent burns.
 - Closed housing: no touch protection required
 - Access for trained individuals only: no touch protection required
 - Unrestricted access for untrained individuals: Touch protection required
 - Pfeiffer Vacuum supports you in implementing the touch protection.
1. Place the vacuum pump on a flat, horizontal surface.
 2. Observe the permissible angle of inclination.
 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 gases that contain contamination 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 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.

Required tools when using the threaded connector

- Calibrated torque wrench (tightening factor ≤ 2.5)

Procedure



Information on using the threaded connector

- Max. permissible torque when using the threaded connector: **12 Nm**

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 up 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.



Observing operating fluid type

When filling, refilling, or changing operating fluid, always use the operating fluid type specified on the rating plate. Filling or provision of operating fluid is dependent on the delivery specification.

- Check the filling prior to commissioning and check the fill level during operation.

Approved operating fluid

- H1 (standard operating fluid)
- F4

Required consumables

- Operating fluid

Required tools

- Allen key, WAF 12 mm
- Calibrated torque wrench (tightening factor ≤ 2.5)

Required aids

- Funnel (optional)

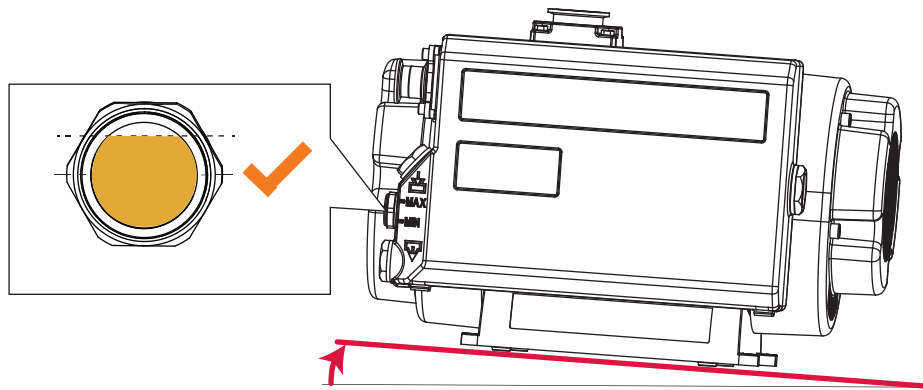


Fig. 5: Checking filling

Detecting filling

If the rotary vane pump has been filled at the factory, the fill level might exceed the visible area of the sight glass.

- ▶ Raise the pump approx. 10° on the sight glass side to detect an operating fluid filling.
 - If a fill level is visible when the pump is tilted, the rotary vane pump has been filled.
 - If the pump has not been filled at the factory, fill it with operating fluid.
- ▶ Check the fill level during operation.
 - Optimal fill level: Middle of the inspection glass

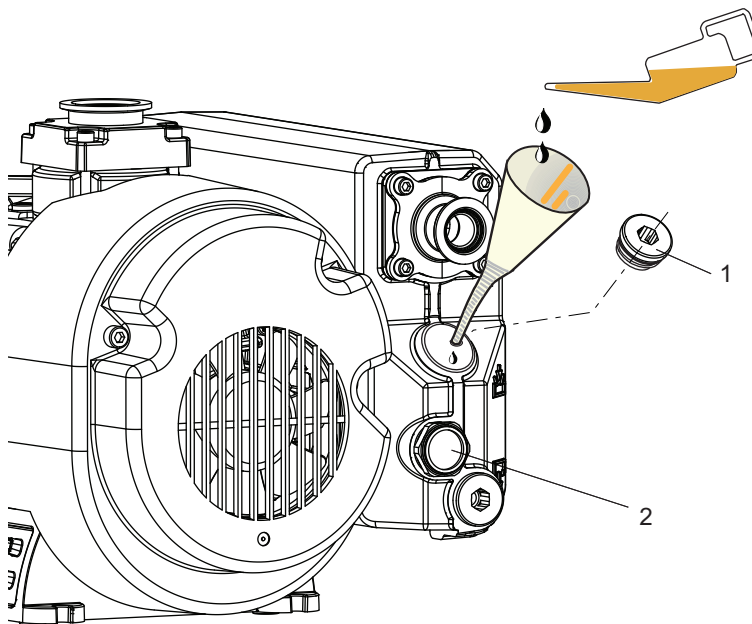


Fig. 6: Filling up operating fluid

- 1 Filling screw with seal
- 2 Sight glass

Filling up operating fluid

1. Unscrew the filler screw.
2. Fill with operating fluid according to the details on the rating plate.
3. Screw in the filler screw again.
 - Pay attention to the seal.
 - Tightening torque: **37 Nm**

5.5 Connecting to mains power supply

DANGER

Danger to life from electric shock

Inadequate or incorrect grounding of the unit leads to contact-sensitive voltage on the housing. When making contact, increased leakage currents will cause a life-threatening electric shock.

- ▶ Before the installation, check that the connection leads are voltage-free.
- ▶ Conduct the electrical connection in accordance with locally applicable regulations.
- ▶ Make sure that the local mains voltage and frequency match rating plate specifications.
- ▶ Make sure that the mains cable and extension cable meet the requirements for double isolation between input voltage and output voltage, in accordance with IEC 61010 and IEC 60950.
- ▶ Use only a 3-pin mains cable and extension cable with properly connected protective earthing (earthed conductor).
- ▶ Plug the mains plug into a socket with earthing contact only.
- ▶ Always connect the mains cable prior to all other cables, to ensure continuous protective earthing.

WARNING

Risk of fatal injury due to electric shock on account of incorrect installation

The device's power supply uses life-threatening voltages. Unsafe or improper installation can lead to life-threatening situations from electric shocks obtained from working with or on the unit.

- ▶ Ensure safe integration into an emergency off safety circuit.
- ▶ Do not carry out your own conversions or modifications on the unit.

WARNING

Risk of fatal injury due to electric shock caused by water damage

The device meets protection degree IP 20 according to EN 60529: 2014 and is not protected against water ingress. Vacuum pumps operated on the floor lead to leakage current in penetrating and surrounding water. There is a danger to life from electric shock when making contact with live water.

- ▶ In case of water damage, disconnect the complete power supply from the area affected.
- ▶ Provide an on-site electrical fuse protection (e.g. RCD) in hazardous areas.
- ▶ When selecting the installation location, observe potential damage from water.

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.

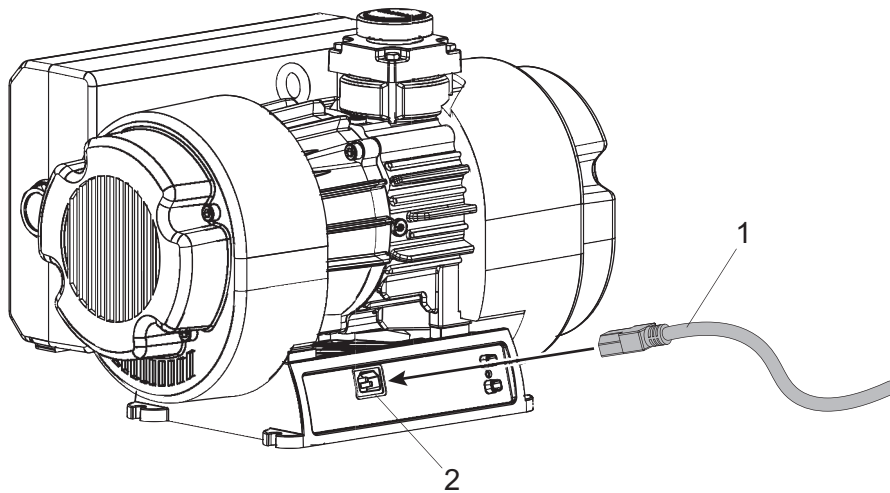


Fig. 7: Connecting to mains power supply

1 Power supply cable, country-specific

2 Mains connection ACin



Mains supply

The electronic drive unit starts together with the connection of the voltage supply.

Establishing mains supply

1. Use a corresponding power supply cable from the Pfeiffer Vacuum [accessories range](#).
2. Always ensure a secure connection to the earthed conductor (PE).
3. Make sure that the mains connection is easily accessible so that you can interrupt the connection at any time.
4. Install overload protection for the vacuum pump according to DIN EN 60204-1 or DIN EN 61010-1.
5. Plug the mains cable into the connecting plug of the electronic drive unit.

6 Interfaces

6.1 Interface overview

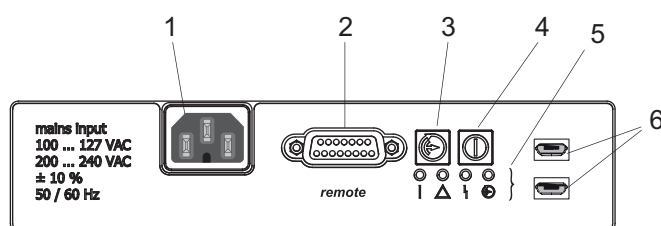


Fig. 8: Interfaces of the electronic drive unit

- | | |
|------------------------------|------------------------------------|
| 1 Mains connection ACIn, C16 | 4 On/Off button |
| 2 "remote" connection | 5 LED operating mode display |
| 3 Stand-by button | 6 Accessory connectors "C" and "D" |

6.2 "Remote" interface

The 15-pin sub-D connection with the "remote" designation offers the possibility to operate the electronic drive unit via remote control. The following specifications are the factory settings for the electronic drive unit. They can be configured with the Pfeiffer Vacuum parameter set.

► Utilize the screened plug and cable.

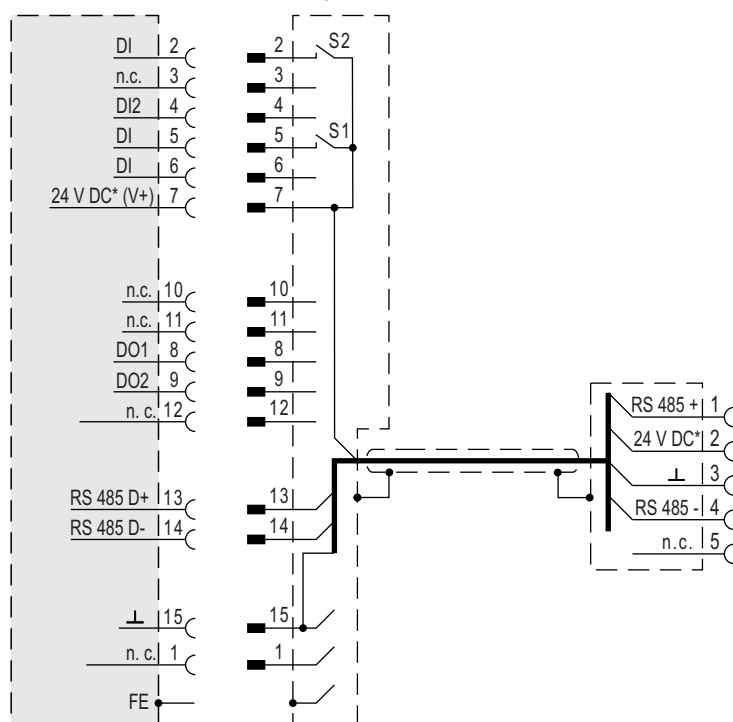


Fig. 9: Connection diagram of 15-pin "remote" connection



Pin	Assignment	Description, factory setting
1	unassigned	
2	DI remote priority	Operation via "remote" interface
3	unassigned	
4	DI2	open: off; V+: on
5	DI Pumping station	open: off; V+: on and malfunction acknowledgment
6	DI stand-by	open: Standby off, V+: Standby on
7	+24 V DC* output (V+)	Reference voltage for all digital inputs (5 W max.)
8	DO1	GND: no, V+: yes ($I_{\max} = 50 \text{ mA}/24 \text{ V}$), function can be selected via parameters
9	DO2	GND: no, V+: yes ($I_{\max} = 50 \text{ mA}/24 \text{ V}$), function can be selected via parameters
10	unassigned	
11	unassigned	
12	unassigned	
13	RS-485	D+
14	RS-485	D-
15	Ground (GND)	Reference earth for all digital inputs and outputs

Tbl. 6: Connection assignment of 15-pin "remote" connection

6.2.1 Inputs

The digital inputs at the "remote" connection are used to switch various electronic drive unit functions. Inputs are assigned with functions ex-factory. You can configure them via the RS-485 interface and the Pfeiffer Vacuum parameter set.

DI remote priority/pin 2

V+: The "remote" connection has control priority over all other control sources.

open: Remote priority inactive

DI/Pin 4

V+: On

open: Off

DI pumping station/pin 5

V+: Pumping station on and malfunction acknowledgment.
Reset pending error messages after eliminating the cause.

open: Pumping station off

DI standby/pin 6

V+: Standby on

open: Operation at nominal rotation speed or selected rotation speed in rotation speed setting mode

6.2.2 Outputs

The digital outputs at the "remote" connection have a maximum load limit of 24 V/50 mA per output. You can configure all listed outputs with the Pfeiffer Vacuum parameter set via the RS-485 interface (description relates to factory settings).

DO1/Pin 8

Active high yes

GND no

DO2/Pin 9	
Active high	yes
GND	no

6.2.3 RS-485

Connecting RS-485 via D-Sub

- Connect a Pfeiffer Vacuum control unit or an external PC via pin 13 and pin 14 at the D-Sub connection of the electronic drive unit.

6.2.4 Connecting control unit

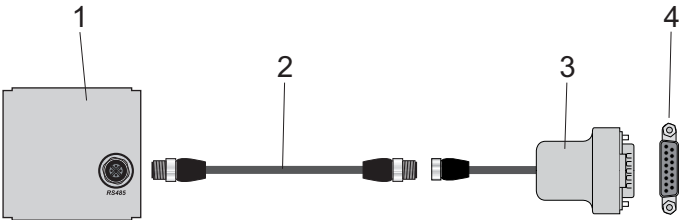


Fig. 10: Connecting a control unit via the "remote" connection

- | | |
|------------------------------|-------------------------|
| 1 Control unit | 3 RS-485 to M12 adapter |
| 2 M12 to M12 interface cable | 4 "remote" connection |

Procedure

- Use cables from the scope of delivery of the control unit, or from the accessories program.
- Install the interface cables between the "remote" connection and the "RS-485" connection of the control unit.
 - Tightening torque: **0.4 Nm**
- Always connect the RS-485 interface to one external control unit only.

6.3 Using RS-485 interface

⚠ DANGER

Danger to life from electric shock

When establishing the voltages that exceed the specified safety extra-low voltage (according to IEC 60449 and VDE 0100), the insulating measures will be destroyed. There is a danger to life from electric shock at the communication interfaces.

- Connect only suitable devices to the bus system.

The interface designated "RS-485" is intended for connecting a Pfeiffer Vacuum control unit or a external PC. The connections are galvanically safe and are isolated from the maximum supply voltage for the electronic drive unit.

Designation	Value
Serial interface	RS-485
Baud rate	9600 Baud
Data word length	8 bit
Parity	none (no parity)
Start bits	1
Stop bits	1

Tbl. 7: Features of the RS-485 interface

Connecting Pfeiffer Vacuum control units or a PC

- ▶ Use the connection cable from the scope of delivery of the control unit or from the Pfeiffer Vacuum accessories.
- ▶ Connect a control unit to the RS-485 interface.
- ▶ Connect a PC via the USB/RS-485 converter.

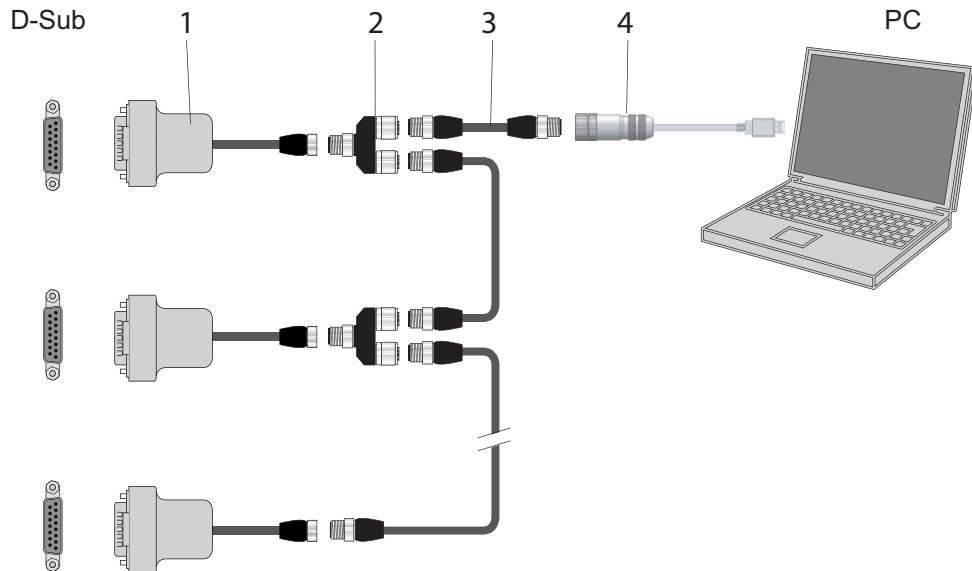


Fig. 11: Cross-link via connection RS-485 using connection cables and accessories

- | | |
|--------------------------|------------------------------|
| 1 RS-485 to M12 adapter | 3 M12 to M12 interface cable |
| 2 Y-connector for RS-485 | 4 USB RS-485 converter |

Networking as RS-485 bus

The group address for the electronic drive unit is **902**.

1. Install the devices according to the specification for RS-485 interfaces.
2. Make sure that all devices connected to the bus have different RS-485 device addresses [**P:797**].
3. Connect all devices with RS-485 D+ and RS-485 D- to the bus.

6.4 Connecting accessories

NOTICE

Property damage to third-party electronic devices

The accessory connections on the vacuum pump do not meet any USB standard. The connection assignment does not comply with any standard. Depending on their configuration, the 24 V DC supply voltage may damage or destroy third-party electronic devices, e.g. tablet computer.

- ▶ Do not connect any third-party electronic devices to the accessory connections.
- ▶ Only use the connecting sockets for pump-specific accessories.

USB sockets "C" and "D" are each used to connect an accessory. The software of the electronic drive unit automatically detects accessories connected to interfaces.

6.5 Pfeiffer Vacuum protocol for RS-485 interface

6.5.1 Telegram frame

The telegram frame of the Pfeiffer Vacuum protocol contains only ASCII code characters [32; 127], the exception being the end character of the telegram C_R . Basically, a host (e.g. a PC) sends a telegram, which a device (e.g. electronic drive unit or gauge) responds to.

a2	a1	a0	*	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C_R
----	----	----	---	---	----	----	----	----	----	----	-----	----	----	----	----	-------

a2 – a0	Unit address for device ○ - Individual address of the unit ["001";"255"] - Group address "9xx" for all identical units (no response) - Global address "000" for all units on the bus (no response)
*	Action according to telegram description
n2 – n0	Pfeiffer Vacuum parameter numbers
l1 – l0	Data length dn to d0
dn – d0	Data in the respective data type (see chapter "Data types", page 34).
c2 – c0	Checksum (sum of ASCII values of cells a2 to d0) modulo 256
C _R	carriage return (ASCII 13)

6.5.2 Telegram description

Data query  --> ○ ?

a2	a1	a0	0	0	n2	n1	n0	0	2	=	?	c2	c1	c0	C _R
----	----	----	---	---	----	----	----	---	---	---	---	----	----	----	----------------

Control command  --> ○ !

a2	a1	a0	1	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C _R
----	----	----	---	---	----	----	----	----	----	----	-----	----	----	----	----	----------------

Data response / Control command understood ○ --> 

a2	a1	a0	1	0	n2	n1	n0	l1	l0	dn	...	d0	c2	c1	c0	C _R
----	----	----	---	---	----	----	----	----	----	----	-----	----	----	----	----	----------------

Error message ○ --> 

a2	a1	a0	1	0	n2	n1	n0	0	6	N	O	_	D	E	F	c2	c1	c0	C _R
										_	R	A	N	G	E				
										_	L	O	G	I	C				

NO_DEF Parameter number n2–n0 no longer exists
_RANGE Data dn–d0 outside the permissible range
_LOGIC Logical access error

6.5.3 Telegram example 1

Data query

Current rotation speed (parameter [P:309], device address: "123")

 --> ○ ?	1	2	3	0	0	3	0	9	0	2	=	?	1	1	2	C _R
ASCII	49	50	51	48	48	51	48	57	48	50	61	63	49	49	50	13

Data response: 633 Hz

Current rotation speed (parameter [P:309], device address: "123")

○ --> 	1	2	3	1	0	3	0	9	0	6	0	0	0	6	3	3	0	3	7	c _R
ASCII	49	50	51	49	48	51	48	57	48	54	48	48	48	54	51	51	48	51	55	13

6.5.4 Telegram example 2

Control command

Switch on the pumping station (parameter [P:010], device address: "042")

 --> ○ !	0	4	2	1	0	0	1	0	0	6	1	1	1	1	1	1	0	2	0	C _R
ASCII	48	52	50	49	48	48	49	48	48	54	49	49	49	49	49	49	48	50	48	13

Control command understood

Switch on the pumping station (parameter [P:010], device address: "042")

○ --> 	0	4	2	1	0	0	1	0	0	6	1	1	1	1	1	1	0	2	0	C _R
ASCII	48	52	50	49	48	48	49	48	48	54	49	49	49	49	49	49	48	50	48	13

6.5.5 Data types

No.	Data type	Description	Length l1 – l0	Example
0	boolean_old	Logical value (false/true)	06	000000 is equivalent to false 111111 is equivalent to true
1	u_integer	Positive whole number	06	000000 to 999999
2	u_real	Positive fixed point number	06	001571 corresponds with 15.71
4	string	Any character string with 6 characters. ASCII codes between 32 and 127	06	TC_110, TM_700
6	boolean_new	Logical value (false/true)	01	0 is equivalent to false 1 is equivalent to true
7	u_short_int	Positive whole number	03	000 to 999
10	u_expo_new	Positive exponential number. The last of both digits are the exponent with a deduction of 20.	06	100023 is equivalent to $1,0 \cdot 10^3$ 100000 is equivalent to $1,0 \cdot 10^{-20}$
11	string16	Any character string with 16 characters. ASCII codes between 32 and 127	16	BrezelBier&Wurst
12	string8	Any character string with 8 characters. ASCII codes between 32 and 127	08	Example

7 Parameter set

7.1 General

Important settings and function-related characteristics are factory-programmed into the electronic drive unit as parameters. Each parameter has a three-digit number and a description. The parameter can be accessed via Pfeiffer Vacuum control units or externally via RS-485 using Pfeiffer Vacuum protocol.

The vacuum pump starts in standard mode with factory default pre-set parameters.



Non-volatile data storage

When switching off or in the event of unintentional voltage drop, the **parameters** and the operating hours stay saved in the electronics.

#	Three digit number of the parameter
Indicator	Display of parameter description
Description	Brief description of the parameters
Functions	Function description of the parameters
Data type	Type of formatting of the parameter for the use with the Pfeiffer Vacuum protocol
Access type	R (read): Read access; W (write): Write access
Unit	Physical unit of the described variable
min. / max.	Permissible limit values for the entry of a value
default	Factory default pre-setting (partially pump-specific)
	The parameter can be saved persistently in the electronic drive unit

Tbl. 8: Explanation and meaning of the parameters

7.2 Control commands

#	Indicator	Designations	Functions	Data type	Access type	Unit	min.	max.	default	
002	Stand-by	Stand-by	0 = off 1 = on	0	RW		0	1	0	✓
006	Auto stdby	automatic standby	not supported	0	RW		0	1	0	✓
009	ErrorAckn	Malfunction acknowledgement	1 = Malfunction acknowledgement	0	W		1	1		
010	PumpgStatn	Pumping station	0 = off 1 = on and malfunction acknowledgement	0	RW		0	1	0	✓
011	Auto boost	automatic boost operation (Not supported)	0 = off 1 = on	0	RW		0	1	0	✓
019	Cfg DO2	Output DO2 configuration	0 = Switch-point reached 1 = No error 2 = Error 5 = Set rotation speed reached 6 = Pump on 9 = Always "0" 10 = Always "1" 11 = Remote priority active	7	RW		0	21	5	✓

#	Indicator	Designations	Functions	Data type	Access type	Unit	min.	max.	de-fault	
024	Cfg DO1	Output DO1 configuration	0 = Switch-point reached 1 = No error 2 = Error 5 = Set rotation speed reached 6 = Pump on 9 = Always "0" 10 = Always "1" 11 = Remote priority active	7	RW		0	21	2	
026	SpdSet-Mode	Rotation speed setting mode	0 = off 1 = on	7	RW		0	1	0	
034	Auto start	automatic start after power failure	0 = off 1 = on	0	RW		0	1	1	
052	BalGasValv	Gas ballast valve control (Not supported)	0 = off 1 = on	0	RW		0	1	0	
060	CtrlVialnt	Operate via interface	1 = remote 2 = RS-485 255 = Unlock interface selection	7	RW		1	255	1	
061	IntSelLckd	Interface selection locked	0 = off 1 = on	0	RW		0	1	0	
063	Cfg DI2	Configuration input DI2	0 - 4 = Deactivated 5 = Rotation speed setting mode On	7	RW		0	5	0	
095	FactorySet	Factory settings	1 = Reset to factory configuration	0	RW		0	1	0	

Tbl. 9: Control commands

7.3 Status requests

#	Display	Designations	Functions	Data type	Access type	Unit	min.	max.	de-fault	
300	RemotePrio	Remote priority	0 = no 1 = yes	0	R		0	1		
303	Error code	Error code		4	R					
304	OvTempElec	Excess temperature drive electronics	0 = no 1 = yes	0	R		0	1		
308	SetRotSpd	Set rotation speed (Hz)		1	R	Hz	0	999999		
309	ActualSpd	Actual rotation speed (Hz)		1	R	Hz	0	999999		
310	DrvCurrent	Drive current		2	R	A	0	9999.99		
311	OpHrsPump	Pump operating hours		1	R	h	0	999999		
312	Fw version	Drive electronics software version		4	R					
313	DrvVoltage	Drive voltage		2	R	V	0	9999.99		
314	OpHrsElec	Drive electronics operating hours		1	R	h	0	999999		
315	Nominal Spd	Nominal rotation speed (Hz)		1	R	Hz	0	999999		
316	DrvPower	Drive power		1	R	W	0	999999		
324	TempPwrStg	Final stage temperature		1	R	°C	0	999999		

#	Display	Designations	Functions	Data type	Access type	Unit	min.	max.	de-fault	
326	TempElec	Electronics temperature		1	R	°C	0	999999		
346	TempMotor	Motor temperature		1	R	°C	0	999999		
349	ElecName	Electronic drive unit designation		4	R					
360	ErrHist1	Error code history, item 1		4	R					✓
361	ErrHist2	Error code history, item 2		4	R					✓
362	ErrHist3	Error code history, item 3		4	R					✓
397	SetRotSpd	Set rotation speed (rpm)		1	R	rpm	0	999999		
398	ActualSpd	Actual rotation speed (rpm)		1	R	rpm	0	999999		
399	NominalSpd	Nominal rotation speed (rpm)		1	R	rpm	0	999999		

Tbl. 10: Status requests

7.4 Reference value inputs

#	Indicator	Designations	Functions	Data type	Access type	Unit	min.	max.	de-fault	
707	SpdSVal	Set value in rotation speed setting mode SmartVane 55		2	RW	%	60	100	100	✓
		Set value in rotation speed setting mode SmartVane 70		2	RW	%	45	100	100	✓
717	StdbysVal	Set value for rotation speed in stand-by SmartVane 55		2	RW	%	60	100	80	✓
		Set value for rotation speed in stand-by SmartVane 70		2	RW	%	45	100	60	✓
721	SlgVlvTime	Opening interval of gas ballast valve		2	RW	min	0	60	5	✓
730	Press. Set	Switch-on threshold with auto standby / target pressure with pressure regulation		10	RW	hPa	0.01	30.0	10.0	✓
732	Press. Rel	Switch-off threshold with auto standby		10	RW	hPa	1.0	100.0	20.0	✓
739	PrsSn1Name	Name sensor 1		4	R					
740	Pressure 1	Pressure value 1		10	RW	hPa	$1 \cdot 10^{-5}$	1200.0		✓
742	PrsCorrPi 1	Correction factor 1		2	RW		0.1	8.0	-	✓
797	RS485Adr	RS-485 Interface address		1	RW		1	255	2	✓

Tbl. 11: Reference value inputs

8 Operation

8.1 Commissioning vacuum pump

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 if hair or loose clothing is pulled in

There is a danger of injury from getting pulled in at rotating parts of the fan.

- ▶ Do not wear loose-fitting jewelry, or hide it under clothing.
- ▶ Wear close-fitting clothing.
- ▶ Use a hair net if necessary.

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

- Compare the voltage and frequency specifications on the rating plate with the available mains voltage and frequency.
- Protect the vacuum pump from sucking in contamination using suitable measures.
- Check the operating fluid level.
- Check the exhaust connection for free passage (max. permissible pressure: atmospheric pressure).

8.2 Switching on 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. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

- ▶ Install suitable touch protection if the vacuum pump is accessible to untrained persons.
- ▶ Allow the vacuum pump to cool down before carrying out any work.
- ▶ Contact Pfeiffer Vacuum for suitable touch protection in system solutions.

NOTICE

Malfunction of the oil return flow line from an intake pressure that is permanently too high

In the long term, operation with an intake pressure that is permanently too high leads to insufficient operating fluid supply. This results in damage to the rotary vane pump.

- ▶ After longer evacuation phases with high intake pressure, switch to operating stages with intake pressure < 15 hPa.

The "Pumping station" parameter **[P:010]** comprises operation of the vacuum pump with control of all connected interfaces and configurations.

Switch on via electronic drive unit

1. Switch the vacuum pump on by pressing the  button once.
 - After successfully completing the self-test (approx. 5 seconds), the electronic drive unit resets pending and corrected error messages.

Alternative: Switch on via Pfeiffer Vacuum parameters

- ▶ Set parameter **[P:010]** to value of "1".

Alternative: Switch on via "remote" interface

- ▶ Bridge pins 7, 2 and 5.

8.3 Checking operating fluid level

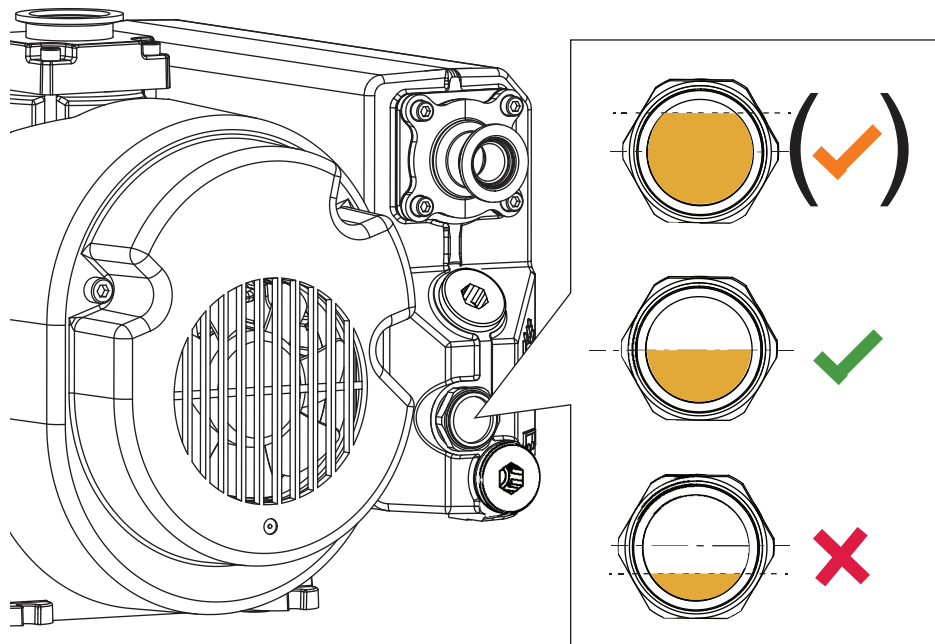


Fig. 12: Checking operating fluid level at sight glass

Checking operating fluid level

- ▶ Check the fill level during operation, with the vacuum connection closed.
- ▶ During continuous operation, check the fill level daily.
- ▶ Top up operating fluid as required.

8.4 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.

Required tools

- Allen key, **WAF 12 mm**

Required consumables

- Operating fluid

Required aids

- Funnel (optional)

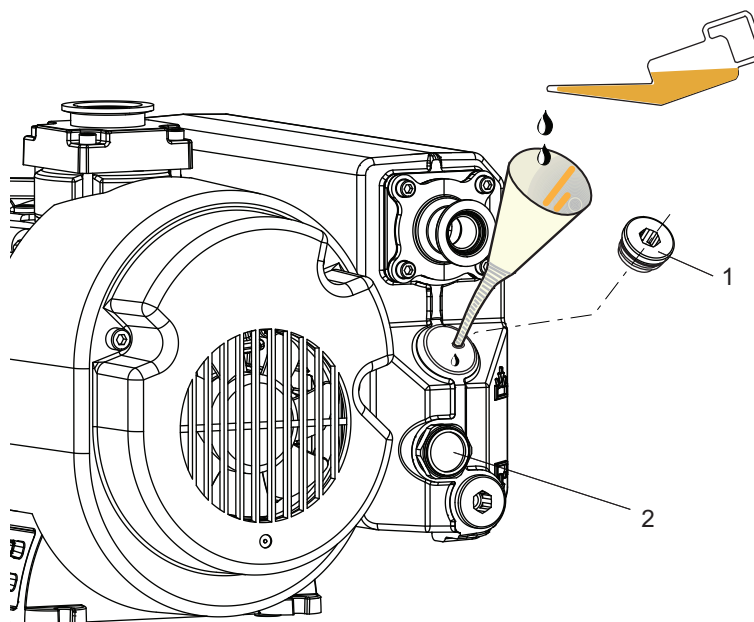


Fig. 13: Filling up operating fluid

- 1 Filling screw with seal 2 Sight glass

Refilling operating fluid

1. Switch off the vacuum pump.
2. Unscrew the filler screw.
3. Top up with the missing amount of operating fluid.
 - Optimal fill level: Middle of the inspection glass
 - The level difference of 5 mm in the sight glass corresponds to approx. 150 ml.
4. Screw in the filler screw.
 - Pay attention to the seal.
 - Tightening torque: **37 Nm**
5. Switch the vacuum pump on.
6. Check level.

8.5 Configuring the connections with the Pfeiffer Vacuum parameter set

The electronic drive unit is pre-configured with the factory default basic functions and is ready for operation. For individual requirements, you can configure most connections for the electronic drive unit with the parameter set.

8.5.1 Configuring the digital outputs

Option	Description
0 = Rotation speed switchpoint reached	active, once the switch-point is reached
1 = No error	active, with trouble-free operation
2 = Error	active, if the error message is active
5 = Set rotation speed reached	active, once the set rotation speed switch-point is reached
6 = Pump on	active, if pumping station on, motor on and no error
9 = Always "0"	GND for the control of an external device
10 = Always "1"	+24 V DC for the control of an external device
11 = Remote priority active	active, if the remote priority is active

Tbl. 12: Configure parameters [P:019] and [P:024]

8.5.2 Configuring the digital input

Option	Description
0 - 4 = Deactivated	Connection not operational
5 = Rotation speed setting mode	Control corresponds to parameter [P:026]

Tbl. 13: Configure parameter [P:063]

8.5.3 Selecting the interfaces

The parameter [P:060] indicates the current selected interface with operating priority. The electronic drive unit only accepts control commands via the interface with operating priority. If the actual setting is not locked by the parameter [P061] = 1, if another interface issues a control command, operating priority is automatically transferred to the other interface.

Option	Description
1 = remote	Operation via connection "remote"
2 = RS-485	Operation via connection "RS-485"
255 = Unlock interface selection	-

Tbl. 14: Parameter [P:060]

8.6 Selecting operating mode

After applying the operating voltage, the electronic drive unit carries out a self-test to check the supply voltage.

The following operating modes are possible:

- Operating without control unit
- Operation via an external control unit
- Operation via RS-485 and peripheral device or PC
- Operation with automatic start

Operating vacuum pump without controller

1. Establish the current supply.
2. Operate the vacuum pump with the on/off and standby buttons.

Operating vacuum pump with external controller

1. Connect a remote control via the "remote" 15-pin D-Sub socket.
2. Control the vacuum pump by means of the "PLC level".

Operating vacuum pump with peripheral device

1. Observe the operating instructions of the peripheral device.
2. Connect the respective peripheral device to the "remote" 15-pin D-Sub socket.
3. Make the desired settings via the RS-485 using the peripheral device.

Operating vacuum pump with auto start function

- ▶ Parameter [P:010] = 1: Hold the  button pressed for longer than 5 s.
 - This switches off the auto start function: [P:034] = 0. The vacuum pump itself remains activated. In the event of a return to the mains following a power failure, the vacuum pump remains deactivated.
- ▶ Parameter [P:010] = 0: Hold the  button pressed for longer than 5 s.
 - This switches on the auto start function: [P:034] = 1. The vacuum pump itself remains deactivated. In the event of a return to the mains, the vacuum pump restores the operating status which was established prior to the power failure.

To confirm the command, the yellow LED flashes for 1 second after releasing the button.

8.7 Selecting speed mode

The vacuum pump has different speed modes.

- General speed modes
 - Normal operation
 - Standby mode
 - Rotation speed setting mode

8.7.1 Normal operation

The vacuum pump starts and operates at nominal rotation speed.

Setting the related parameters

1. Set the parameter **[P:002]** to "0".
2. Set the parameter **[P:026]** to "0".
3. Check the set rotation speed (parameter **[P:308]** or **[P:397]**).

8.7.2 Standby mode

Pfeiffer Vacuum recommends standby mode for during process and production stops. When standby mode is active, the electronic drive unit reduces the rotation speed of the vacuum pump. Stand-by mode has priority over normal operation and rotation speed setting mode.

Factory setting:

- SmartVane 55: 80% of rated speed
- SmartVane 70: 60% of rated speed

Switching on standby mode

- ▶ Press the  button.

Alternative: Operating stand-by using parameters

- ▶ Set parameter **[P:002]** to value of "1".

Alternative: Operating stand-by via "remote" interface

- ▶ Bridge pins 7 and 6 for DI standby.

Set the stand-by rotation speed

- SmartVane 55: 60 % – 100 % (800 – 1350 rpm)
 - SmartVane 70: 45 % – 100 % (800 – 1800 rpm)
1. Set the parameter **[P:717]** to the required value in %.
 2. Set the parameter **[P:002]** to "1".
 3. Check the set rotation speed (parameter **[P:308]** or **[P:397]**).

8.7.3 Speed actuator operation

Rotation speed setting mode reduces the speed and hence the throughput of the vacuum pump. The pumping speed changes proportionally to the rotation speed. Standby has priority over rotation speed setting mode. The specification in rotation speed setting mode **[P:707]** sets the set rotation speed. The rotation speed switch point varies with the set rotation speed.



Permissible rotation speed range

Settings in the rotation speed mode or stand-by mode are subject to the permissible rotation speed range of the respective vacuum pump (technical data). The electronic drive unit adjusts the set rotation speed automatically to the next valid value.

Set the rotation speed setting mode

1. Set the parameter **[P:707]** to the required value in %.
2. Set the parameter **[P:026]** to "1".
3. Check the set rotation speed (parameter **[P:308]** or **[P:397]**).

8.8 Operating mode display via LED

LEDs on the electronic drive unit show the basic operating states of the vacuum pump. A differentiated error and warning display is only possible for operation with the Pfeiffer Vacuum display and control unit or a PC.

LED	Symbol	LED status	Display	Meaning
Green 		Off	—	without current
		On, flashing		"Pumping station OFF", rotation speed ≤ 60 rpm
		On, blinking		"Pumping station OFF", rotation speed > 60 rpm
		On, inverse flashing		"Pumping station ON", set rotation speed not reached
		On, constant		"Pumping station ON", set rotation speed reached
		On, inverse flashes twice		Selected speed temporarily overwritten by an autospeed mode
Yellow 		Off	—	no warning
		On, short-time blinking		Note ¹⁾
		On, constant		Warning
		On, flickering 1 sec		Confirmation, command acceptance
Red 		Off	—	No error
		On, constant		Error

Tbl. 15: Behavior and meaning of the LEDS of the electronic drive unit

LED	Symbol	LED status	Display	Meaning
Green 		Off	—	Standby OFF
		On, constant		Standby ON
		On, inverse flashes twice		Auto standby active

Tbl. 16: Behavior and meaning of the LED standby

8.9 Switching off vacuum pump



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.

The "Pumping station" parameter **[P:010]** comprises operation of the vacuum pump with control of all connected interfaces and configurations.

Switching off via electronic drive unit

1. Switch the running vacuum pump off by pressing the  button once.
2. Switch the voltage supply off.

Alternative: Switch off via Pfeiffer Vacuum parameters

- Set parameter **[P:010]** to value of "0".

Alternative: Switch off via "remote" interface

- Interrupt the jumper between pins 7 and 5.

1) Regularly check the performance data of the vacuum pump.

9 Maintenance

9.1 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 extent 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.

9.2 Checklist for inspection and maintenance



Maintenance frequency and service lives

Maintenance frequency and service lives are process-dependent. Chemical and thermic loads or contamination reduce the recommended reference values.

- Determine the specific service lives during the first operating interval.
- Consult with Pfeiffer Vacuum Service if you wish to reduce the maintenance frequency.

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

We recommend that Pfeiffer Vacuum Service carry out maintenance work in **Maintenance Level 3** (overhaul). 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 3 MM	Required material
Interval	Weekly	≤ every six months	≤ 2 years	≤ 4 years	
Inspection					
Visual and acoustic pump check • Check the operating fluid filling level • Check color (contamination)	■				
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 axial fan		■			
Maintenance level 1 – Operating fluid change					
• Changing operating fluid • Change the exhaust filter			■		Operating fluid Maintenance kit (see spare parts)
Maintenance level 3 – overhaul					
Dismantle and clean vacuum pump, replace seals and all wear parts: • Replace the bearings (if necessary) • Clean the exhaust valves • Replace the vanes • Replace the seals				■	Overhaul kit (including seals and vanes) Operating fluid

Tbl. 17: Maintenance intervals

9.3 Changing 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.

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.



Maintenance frequency and service lives

Maintenance frequency and service lives are process-dependent. Chemical and thermic loads or contamination reduce the recommended reference values.

- Determine the specific service lives during the first operating interval.
- Consult with Pfeiffer Vacuum Service if you wish to reduce the maintenance frequency.



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.

Switch-off procedure

1. Close the intake port valve, if necessary.
2. Vent the vacuum pump to atmospheric pressure to prevent operating fluid from flowing back.

Required consumables

- Operating fluid

Required tools

- Allen key, **WAF 12**

Required aids

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

9.3.1 Draining operating fluid

Prerequisites

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

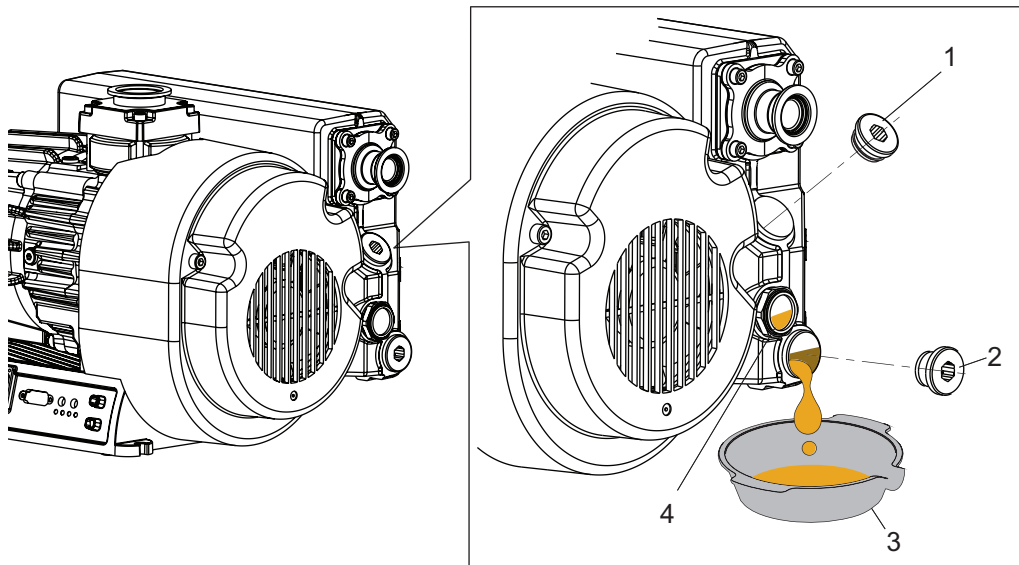


Fig. 14: Draining operating fluid

- | | |
|---------------------------|-------------------------|
| 1 Filling screw with seal | 3 Collection receptacle |
| 2 Drain screw with seal | 4 Sight glass |

Draining operating fluid

1. Unscrew the filler screw.
2. Place a collection receptacle below the drain hole.
3. Unscrew the drain screw.
4. Allow operating fluid to drain into collection receptacle.
5. Screw the drain screw back in.
 - Pay attention to the seal.
 - Tightening torque: **37 Nm**

9.3.2 Filling up operating fluid

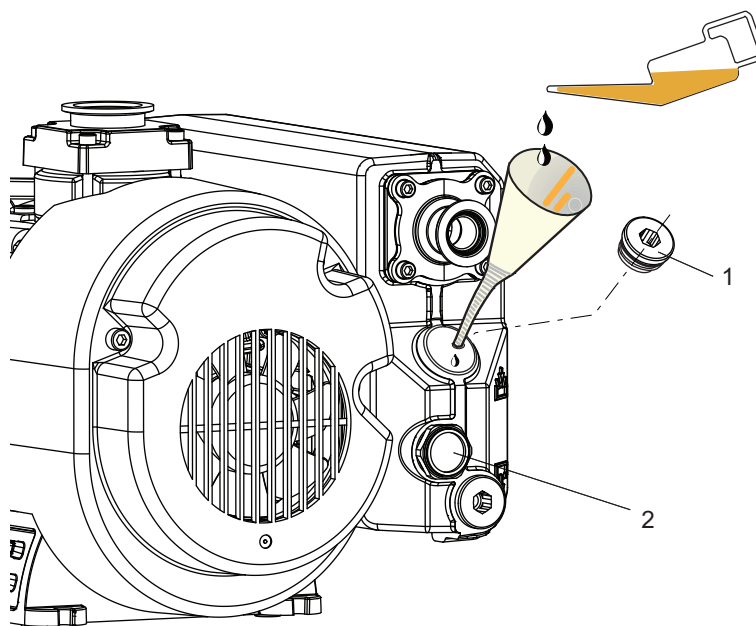


Fig. 15: Filling up operating fluid

- 1 Filling screw with seal 2 Sight glass

Filling up fresh operating fluid

1. Fill with operating fluid as specified on the rating plate.
2. Screw in the filler screw again.
 - Pay attention to the seal.
 - Tightening torque: **37 Nm**
3. Seal the vacuum connection.
4. Check the fill level during operation.
 - Optimal fill level: Middle of the inspection glass

9.3.3 Rinsing and cleaning 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. Also change the exhaust filter at each operating fluid change.

9.4 Maintaining 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.

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.

9.4.1 Dismantling exhaust filters

Prerequisites

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

Required tools

- Allen key, **WAF 5**

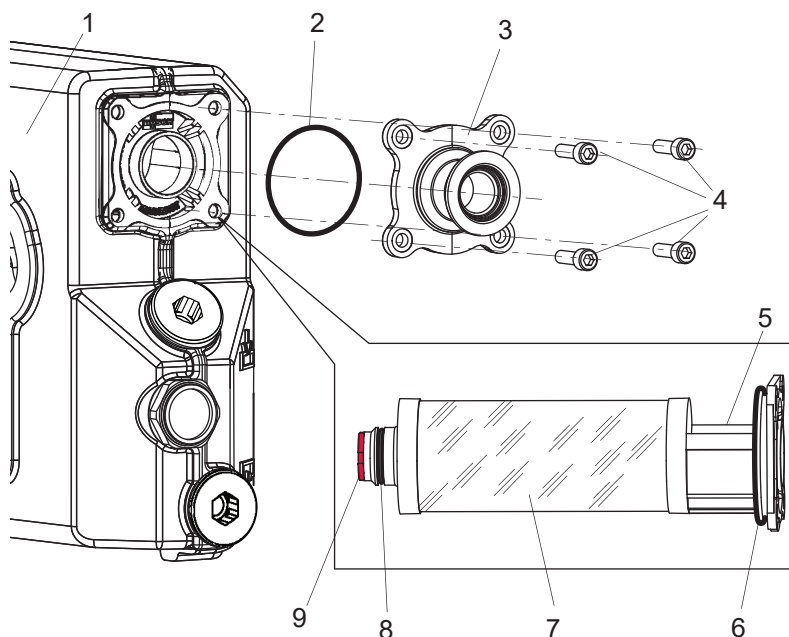


Fig. 16: Dismantling exhaust filters

- | | |
|-----------------------------|------------------|
| 1 Operating fluid separator | 6 O-ring |
| 2 O-ring | 7 Exhaust filter |
| 3 Exhaust cover | 8 O-ring |
| 4 Screws | 9 Orifice (red) |
| 5 Cut-out | |

Procedure

1. Remove the exhaust line.
2. Remove exhaust cover.
 - Be careful with the o-ring.
3. Pull the exhaust filter completely out of the operating fluid separator.
4. Dispose of the exhaust filter according to the applicable regulations.

9.4.2 Mounting exhaust filters

Prerequisites

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

Required consumables

- Maintenance kit – Maintenance level 1

Required tools

- Allen key, **WAF 5**
- Calibrated torque wrench (tightening factor ≤ 2.5)

Procedure

1. Check whether the orifice has been installed at the new exhaust filter.
2. Install the exhaust filter.
 - Pay attention to cut-out on sleeve surface.
 - Cut-out must point upwards (↑).
3. Mount exhaust cover with a new o-ring.
4. Tighten screws on exhaust cover uniformly.
 - Tightening torque: **4 Nm**.
5. Assemble the exhaust line.

10 Decommissioning

10.1 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.

10.2 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.
- ▶ Replace all elastomer parts.
- ▶ Observe the maintenance instructions – consult Pfeiffer Vacuum if necessary.

11 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.

11.1 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

11.2 Disposing of rotary vane pump

Pfeiffer Vacuum rotary vane pump systems contain materials which must be recycled.

1. Fully drain the operating fluid.
2. Decontaminate the components that come into contact with process gases.
3. Separate the components into recyclable materials.
4. Recycle the non-contaminated components.
5. Dispose of the product or components safely according to locally applicable regulations.

12 Malfunctions

12.1 General

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

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.

Vacuum pump and electronic drive unit malfunctions always result in a warning or error message. In both cases, you will receive an error code that you can read out via the interfaces of the electronic drive unit. Generally, the LED on the electronic drive unit displays the operating messages.

Problem	Possible causes	Remedy
The vacuum pump will not start up; none of the built-in LEDs on the electronic drive unit light up	• Current supply interrupted	• Check the current supply lines.
	• Incorrect operating voltage	• Supply the correct operating voltage.
	• Electronic drive unit defective	• Contact Pfeiffer Vacuum Service .
	• Pump temperature too low	• Heat the vacuum pump to >15 °C.
	• 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 final pressure	Measurement result distorted	- Check the measurement instrument. - Check the final 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	Check the exhaust line for clear passage.
Loss of operating fluid	Operating fluid separator leaking	- Check for leaks. - Replace the seal as required.
	Operational loss of operating fluid	Check the exhaust filter and replace if necessary.
Unusual noises during operation	Pumping system contaminated or damaged	- Clean and maintain the vacuum pump. - Contact Pfeiffer Vacuum Service.
	Pump bearing defective	Contact Pfeiffer Vacuum Service.
Red LED on the electronic drive unit illuminates	Group error	- Switch the current supply off and back on. - Press . - Set the parameter [P: 010] to "0" and subsequently acknowledge with "1" via the RS-485 interface. - Set the parameter [P: 009] to "1" via the RS-485 interface. - Connect V+ on Pin 13 to "remote". - Carry out a differentiated malfunction analysis with a control unit. - Contact Pfeiffer Vacuum Service.

Tbl. 18: Troubleshooting for rotary vane pumps

12.2 Error codes

Errors (** Error E — **) always cause the vacuum pump and connected peripheral devices to be switched off.

Warnings (* Warning F — *) are only displayed and do not cause components to be switched off.

Handling malfunction messages

1. Read out error codes via Pfeiffer Vacuum control units or a PC.
2. Remove the cause of the malfunction.
3. Reset the malfunction message with parameter **[P:009]**.
 - Use preconfigured interfaces or screen tiles on Pfeiffer Vacuum control units.

Error code	Problem	Possible causes	Remedy
Err001	Excess rotation speed	–	• Contact Pfeiffer Vacuum Service • Only acknowledge for rotation speed $f = 0$
Err002	Excess voltage	• Mains voltage incorrect	• Check the mains input voltage • Only acknowledge for rotation speed $f = 0$ • Contact Pfeiffer Vacuum Service
Err006	Overload	• Gas throughput too high • Overtemperature • The rotation speed drops • Restricted power	• Reduce the gas throughput
Err021	Pump not recognized		• Contact Pfeiffer Vacuum Service
Err037	Overcurrent, motor final stage		• Contact Pfeiffer Vacuum Service
Err041			
Err044	Excess temperature, electronics	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for a correct fit and damage. • Improve the cooling • Check the operating conditions
Err045	Excess temperature, motor	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for correct fit and damage. • Improve the cooling • Check the operating conditions
Err093	Motor temperature evaluation faulty	–	• Contact Pfeiffer Vacuum Service
Err094	Electronics temperature evaluation faulty	–	• Contact Pfeiffer Vacuum Service
Err098	Internal communication error	–	• Contact Pfeiffer Vacuum Service
Err114	Final stage temperature evaluation faulty	–	• Contact Pfeiffer Vacuum Service
Err118	Excess temperature, final stage	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for a correct fit and damage. • Check the operating conditions • Improve the cooling
Err175	PFC excess current	–	• Contact Pfeiffer Vacuum Service
Err176	Flash Program Error	–	• Contact Pfeiffer Vacuum Service
Err825	Internal communication error	–	• Contact Pfeiffer Vacuum Service
Err913	Direction of rotation	• Direction of rotation false	• Contact Pfeiffer Vacuum Service

Tbl. 19: Error messages of the electronic drive unit

Error code	Problem	Possible causes	Remedy
Wrn007	Undervoltage or power failure	• Mains failure	• Check the mains input voltage
Wrn037	Auto standby inactive	• Control set to remote	• Deactivate the remote priority
Wrn040	Note	Maintenance level 1 recommended	• Regularly check the performance data of the vacuum pump • If necessary, perform maintenance • To reset the message, press  and  for 5 s at the same time
Wrn042	Maintenance required	Have maintenance performed	• Contact Pfeiffer Vacuum Service
Wrn044	Electronics high temperature	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for correct fit and damage. • Check the operating conditions • Improve the cooling
Wrn045	Motor high temperature	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for correct fit and damage. • Check the operating conditions • Improve the cooling
Wrn118	High power electronics temperature	• Cooling inadequate	• Check to make sure the fan is working. • Check the fan connecting cable for correct fit and damage. • Improve the cooling • Check the operating conditions

Tbl. 20: Warning messages of the electronic drive unit

13 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](#).

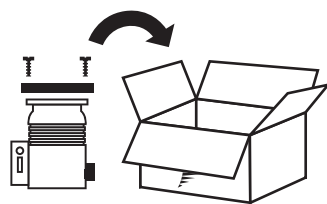


4. You will receive an acknowledgment from Pfeiffer Vacuum.

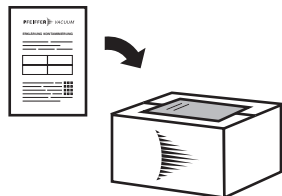
PFEIFFER VACUUM

Submission of contaminated products

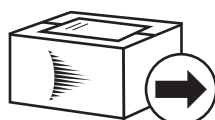
No microbiological, explosive, or radiologically contaminated products will be accepted. Where products are contaminated, or the contamination declaration is missing, Pfeiffer Vacuum will contact you before starting service work. Depending on the product and degree of pollution, **additional decontamination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

PFEIFFER VACUUM

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

14 Accessories



View the [range of accessories for rotary vane pumps](#) on our website.

14.1 Accessory information

Control units

Control units are used to check and adjust operating parameters.

Cable and adapter

Mains, interface, connection, and extension cables provide a secure and suitable connection. Different lengths on request

Dust separator

Protects the pump against particles from the processes

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

14.2 Ordering accessories

Description	Order number
FAK 040, activated carbon filter	PK Z30 008
SAS 40, dust separator	PK Z60 510
Mains cable 230 V AC, CEE 7/7 to C15, 3 m	PK 050 343
Mains cable 115 V AC, NEMA 5-15 to C15, 3 m	PK 050 344
Y-connector M12 for RS-485	P 4723 010
Adapter RS-485 M12	PE 100 150 -X
OmniControl 001 Mobile, control units	PE D20 000 0
OmniControl 001, rack unit without integrated power supply pack	PE D40 000 0
RJ 45 interface cable on M12	PM 051 726 -T
USB RS-485 converter	PM 061 207 -T
Interface cable, M12 m straight / M12 m straight, 3 m	PM 061 283 -T

Tbl. 21: Accessories

Description	Order number
H1, 1 l	PK 001 210 -T
F4, Perfluoropolyether, 0.25 l	PK 005 885 -T
F4, Perfluoropolyether, 0.5 l	PK 005 886 -T
F4, Perfluoropolyether, 1 l	PK 005 887 -T

Tbl. 22: Operating fluid

15 Technical data and dimensions

15.1 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

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

Tbl. 23: 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. 24: Conversion table: Units for gas throughput

15.2 Technical data

Type designation	SmartVane 55	SmartVane 55	SmartVane 70	SmartVane 70
Part number	PK D80 000	PK D80 001	PK D81 000	PK D81 001
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
Nominal pumping speed	31 – 50 m³/h	31 – 50 m³/h	31 – 70 m³/h	31 – 70 m³/h
Final pressure without gas ballast	$\leq 2 \cdot 10^{-1}$ hPa	$\leq 2 \cdot 10^{-1}$ hPa	$\leq 2 \cdot 10^{-1}$ hPa	$\leq 2 \cdot 10^{-1}$ hPa
Continuous inlet pressure, max.	15 hPa	15 hPa	15 hPa	15 hPa
Exhaust pressure, min.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
Exhaust pressure, max.	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure	Atmospheric pressure
Leak rate non-return valve	$\leq 1 \cdot 10^{-2}$ Pa m³/s	$\leq 1 \cdot 10^{-2}$ Pa m³/s	$\leq 1 \cdot 10^{-2}$ Pa m³/s	$\leq 1 \cdot 10^{-2}$ Pa m³/s

Type designation	SmartVane 55	SmartVane 55	SmartVane 70	SmartVane 70
Emission sound pressure level (EN ISO 2151) with connected exhaust line	≤ 60 dB(A)	≤ 60 dB(A)	≤ 60 dB(A)	≤ 60 dB(A)
Gas ballast	No	No	No	No
Cooling method	Air, Forced convection	Air, Forced convection	Air, Forced convection	Air, Forced convection
Mains cable	No, C16-plug inside the terminal box	No, C16-plug inside the terminal box	No, C16-plug inside the terminal box	No, C16-plug inside the terminal box
Switch	Yes, with control input	Yes, with control input	Yes, with control input	Yes, with control input
Motor protection	Internal	Internal	Internal	Internal
Protection degree	IP20	IP20	IP20	IP20
Input voltage(s)	100 – 127 / 200 – 240 V AC (±10 %), 50/60 Hz	100 – 127 / 200 – 240 V AC (±10 %), 50/60 Hz	100 – 127 / 200 – 240 V AC (±10 %), 50/60 Hz	100 – 127 / 200 – 240 V AC (±10 %), 50/60 Hz
Rotation speed	800 – 1 350 rpm	800 – 1 350 rpm	800 – 1 800 rpm	800 – 1 800 rpm
Rated power at max. rotation speed	0.75 kW	0.75 kW	1 kW	1 kW
I/O interfaces	RS-485	RS-485	RS-485	RS-485
Operating fluid	H1	F4	H1	F4
Operating fluid amount	1.75 l	1.75 l	1.75 l	1.75 l
Continuous gas input temperature, max.	40 °C	40 °C	40 °C	40 °C
Ambient temperature	15 – 45 °C	15 – 45 °C	15 – 45 °C	15 – 45 °C
Shipping and storage temperature	-25 – 55 °C	-25 – 55 °C	-25 – 55 °C	-25 – 55 °C
Operating altitude, max.	4000 m	4000 m	4000 m	4000 m
Weight	36 kg	36 kg	37 kg	37 kg

Tbl. 25: Technical data of SmartVane 55 | SmartVane 70

15.3 Dimensions

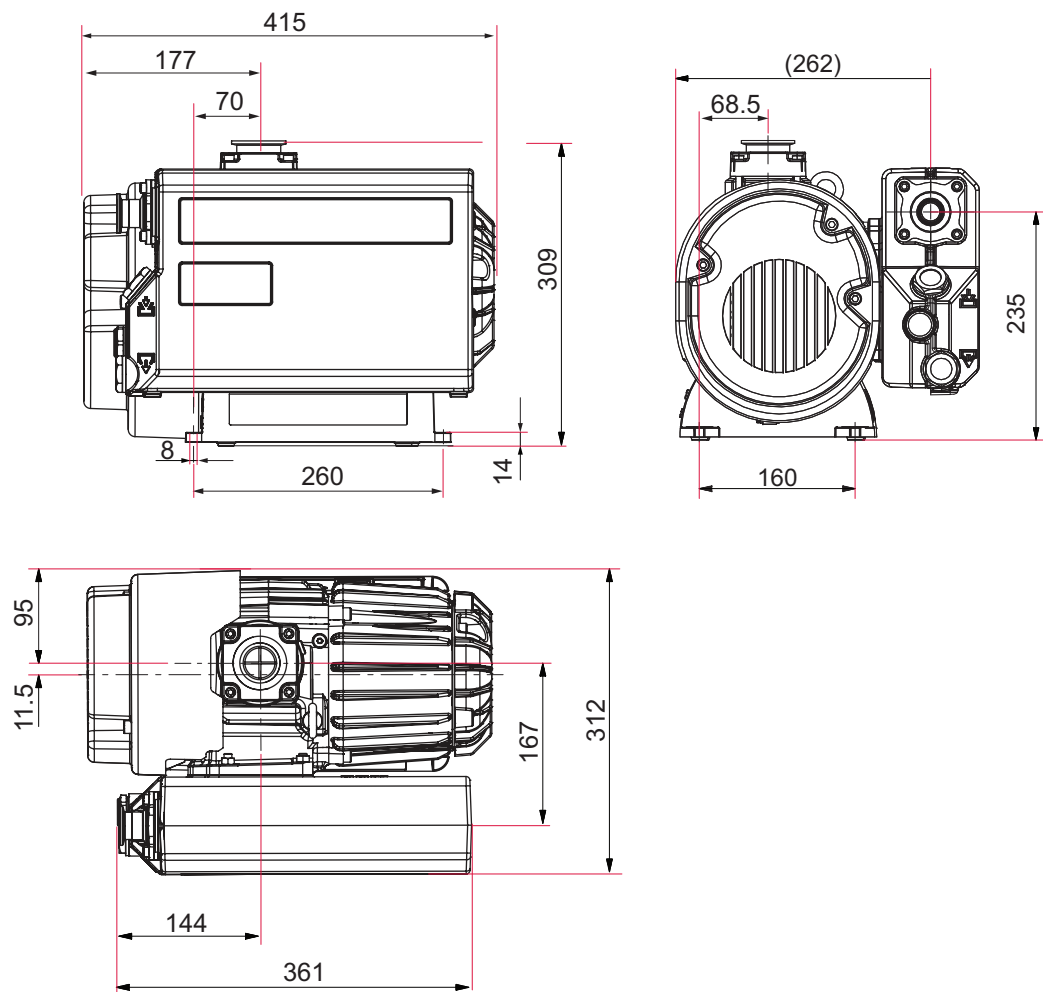


Fig. 17: Dimensions of SmartVane 55

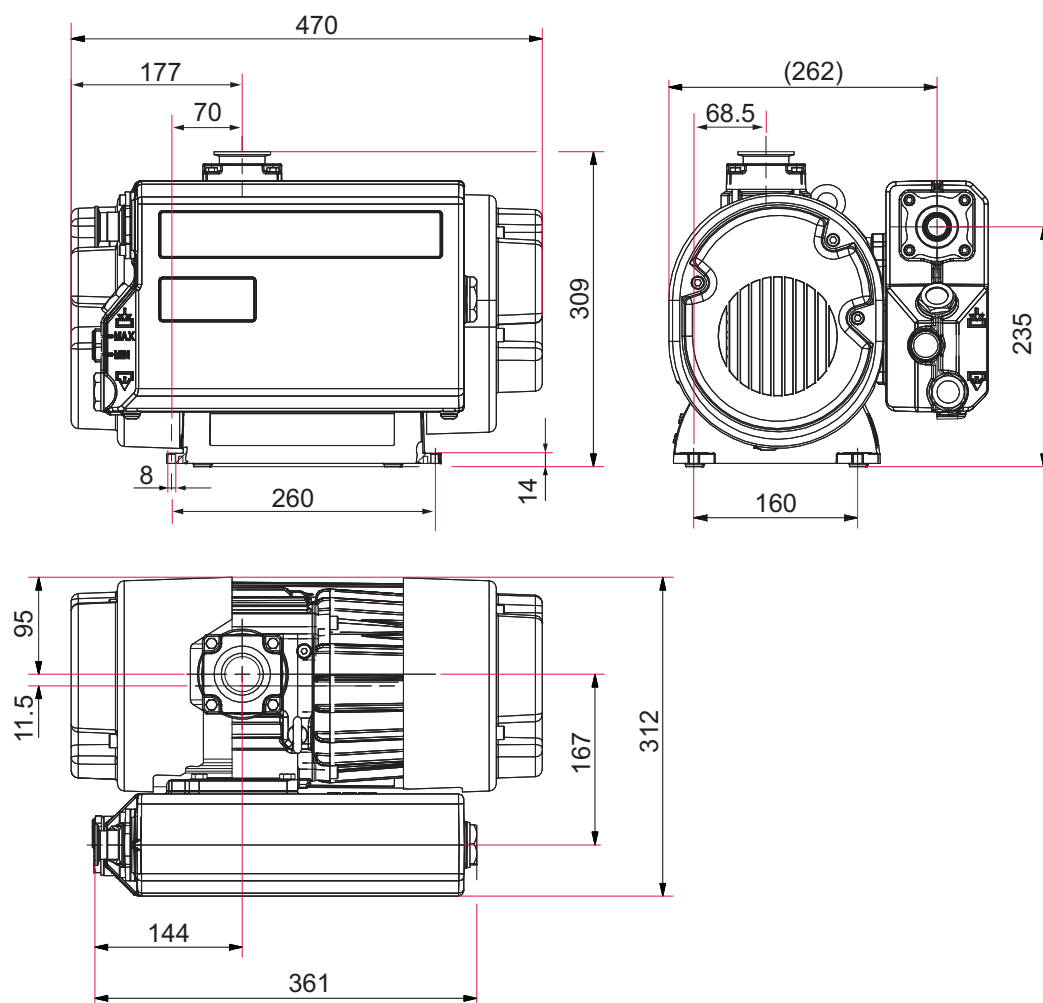


Fig. 18: Dimensions of SmartVane 70
Dimensions in mm

EC Declaration of Conformity

Declaration for product(s) of the type:

Rotary vane pump

SmartVane 55

SmartVane 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

EN 61000-3-2: 2019

EN ISO 13857: 2019

DIN EN 13849-1: 2016

DIN EN 1012-2: 2011

DIN EN 61326-1: 2013

DIN EN ISO 2151: 2009

DIN ISO 21360-1: 2016

DIN EN 61010-1: 2020

ISO 21360-2: 2012

DIN EN IEC 61000-6-2: 2019

DIN EN IEC 61000-6-4: 2020

The authorized representative for the compilation of technical documents is
Dr. Adrian Wirth, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Asslar, Germany.

Signature:



Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2021-08-05



UK Declaration of Conformity

This declaration of conformity has been issued under the sole responsibility of the manufacturer.

Declaration for product(s) of the type:

Rotary vane pump

SmartVane 55

SmartVane 70

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

Supply of Machinery (Safety) Regulations 2008

Electrical Equipment (Safety) Regulations 2016

Electromagnetic Compatibility Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Harmonized standards and applied national standards and specifications

ISO 12100: 2010

EN ISO 13849-1: 2016

ISO 13857: 2019

EN 61326-1: 2013

EN 1012-1: 2010

ISO 21360-1: 2020

EN 1012-2+A1: 1996

EN ISO 2151: 2008

ISO 21360-1: 2020

IEC 61010-1: 2010

IEC 61000-3-2: 2018

EN IEC 61000-6-2: 2019

EN IEC 61000-6-4: 2019

The manufacturer's authorized representative in the United Kingdom and the authorized agent for compiling the technical documentation is Pfeiffer Vacuum Ltd, 16 Plover Close, Interchange Park, MK169PS Newport Pagnell.

Signature:



(Daniel Sälzer)
Managing Director

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

Asslar, 2022-08-24

**UK
CA**



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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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perfect vacuum solution?
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