



Operating Instructions

Vacuum Pump EVE-WR 25-65

Note

The Operating instructions were originally written in German. Store in a safe place for future reference. Subject to technical changes without notice. No responsibility is taken for printing or other types of errors.

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Contact

J. Schmalz GmbH
Johannes-Schmalz-Str. 1
72293 Glatten, Germany
T: +49 (0) 7443 2403-0
schmalz@schmalz.de
www.schmalz.com

Contact information for Schmalz companies and trade partners worldwide can be found at:
www.schmalz.com/salesnetwork

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1 Important Information

1.1 Note on Using this Document

J. Schmalz GmbH is generally referred to as Schmalz in this document.

The document contains important notes and information about the different operating phases of the product:

- Transport, storage, start of operations and decommissioning
- Safe operation, required maintenance, rectification of any faults

The document describes the product at the time of delivery by Schmalz and is aimed at:

- Installers who are trained in handling the product and can operate and install it
- Technically trained service personnel performing the maintenance work
- Technically trained persons who work on electrical equipment

1.2 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
 2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
 3. Pass on the technical documentation to subsequent users.
- ⇒ Failure to follow the instructions in these Operating instructions may result in life-threatening injuries!
- ⇒ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:

www.schmalz.com/services

1.3 Type Plate

The type plate is permanently attached to the product and must always be clearly legible. It contains product identification data and important technical information.

- ▶ For spare parts orders, warranty claims or other inquiries, have the information on the type plate to hand.

1.4 Symbols



This symbol indicates useful and important information.

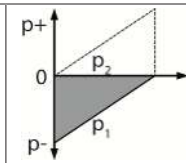
- ✓ This symbol represents a prerequisite that must be met before an action is performed.
- ▶ This symbol represents an action to be performed.
- ⇒ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

1. First action to be performed.
2. Second action to be performed.

1.5 Glossary

Term	Explanation
System	Operator's facility in which the product is installed
Circulating vacuum pump	Ready-to-connect liquid ring vacuum pump installed in a separator and, if necessary, further accessories for generating the vacuum. The product consists of a compressor part and drive.
Drive	Asynchronous motor and, if necessary, drive controller
Liquid ring	Sealing principle
Pump section	Mechanical part of the product without the drive
Pump interior	Media-conveying part of the product
Impeller	Rotating component for generating pressure inside the compressor
Gas inlet	Gas entry point
Gas outlet	Gas exit point
Substructure	Mounting plate, base frame or foundation on which the product is installed
Elastic/rigid	If the lowest natural frequency of the system, consisting of the vacuum pump and substructure, is at least 25% higher than the rotational frequency of the product per measuring direction, the substructure is considered to be rigid. All other substructures are considered elastic.
Installation environment	Space in which the product is installed and operated (may differ from the intake environment)
Intake/discharge environment	Space from which the medium to be conveyed is sucked in or into which the medium to be conveyed is discharged (may differ from the assembly environment)
Rated operating fluid flow	Quantity of the required operating fluid at which the characteristic curve is reached under reference conditions
Flow rate	Air or gas volume delivered per unit of time
Vacuum operation	Operation with <ul style="list-style-type: none"> • Pressure at gas inlet $p_1 < p_{\text{atm}}$ • Pressure at gas outlet $p_2 = p_{\text{atm}}$
Mobile operation	Non-fixed/non-stationary operation
Counter-clockwise rotation (default)	The direction of rotation is counter-clockwise when looking at the pump cover
Cavitation	Creation and sudden collapse (implosion) of vapor bubbles in the rotating operating fluid. The implosion produces noise and extreme pressures on very small areas. These forces can destroy the pump due to surface erosion over an extended period of time.
Cavitation zone	Pressure range in which cavitation occurs if no cavitation protection measures are in place



2 Fundamental Safety Instructions

2.1 Intended Use

The vacuum pump is built in accordance with the latest standards of technology and is delivered in a safe operating condition.

The vacuum pump is used to generate a vacuum.

It is suitable for conveying the following media:

- air and air-gas mixtures that are not explosive, combustible, aggressive or toxic, with a relative humidity of up to 100% without condensation
- Dust $\leq 10 \mu\text{m}$ (at least filter class G1 according to EN779) without moisture and solids

The vacuum pumps are designed for operation with the following operating fluids:

- Water with a pH value between 6 and 9 that is free from solids (e.g. sand)
- Antifreeze ethylene glycol up to max. 30%

Conveying other media increases the thermal and/or mechanical load on the machine and therefore requires prior consultation with J. Schmalz.

The vacuum pump is optimized for continuous operation and can be used in buildings, outdoors as well as in dusty or damp environments. The degree of protection is indicated on the type plate.

The product is intended for industrial use.

Intended use includes observing the technical data and the installation and operating instructions in this manual.

2.2 Non-Intended Use

In particular, the following are considered non-intended use:

- Operation in a potentially explosive atmosphere (ATEX).
- Connection to a potentially explosive atmosphere (ATEX).
- Conveying explosive, flammable, aggressive, unstable, oxidative or toxic media.
- Reversing operation with a sudden/abrupt change of direction of rotation. This produces high drive and alternating loads. The machine can be destroyed.
- Use in non-commercial systems without adaptation to the additional requirements.
- Use in areas with ultrasonic, ionizing and non-ionizing radiation.

2.3 Personnel qualification




Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

1. Electrical work and installations may only be carried out by qualified electrical specialists.
2. Assembly and adjustment work may only be carried out by qualified personnel.

These operating instructions are intended for fitters who are trained in handling the product and who can operate and install it.

2.4 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. The signal word indicates the level of danger.

Signal word	Meaning
 DANGER	Indicates a high-risk hazard that will result in death or serious injury if not avoided.
 WARNING	Indicates a medium-risk hazard that could result in death or serious injury if not avoided.
 CAUTION	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
NOTE	Indicates a danger that leads to property damage.

2.5 Residual Risks



DANGER

Working at a standstill and in de-energized state

Working on running or energized vacuum pumps/compressors can lead to serious injuries due to drawing in and cutting off or crushing of body parts as well as to death by electric shock.

- ▶ Work on the vacuum pump must be performed only when it is at a standstill and in de-energized state.



WARNING

Underpressure/overpressure and escaping media

Pressures and escaping media can cause serious injuries.

- ▶ Depressurize the system before commencing work on the vacuum pump.
- ▶ Check that all components are depressurized.
- ▶ Verify that no media can escape.



WARNING

Screw connections

Screws can damage the thread in the case of repeated screwing. As a result, screwed parts can detach and cause serious injuries.

- ▶ Replace damaged screws.
- ▶ Manually screw the screws into the existing thread.
- ▶ Then use a screwdriver for tightening.



CAUTION

Touching hot surfaces

Touching hot surfaces may cause injury from burns.

- ▶ Wear work gloves.
- ▶ Do not touch components during operation.
- ▶ Allow the components to cool down before commencing work on the product.



WARNING

Risk of crushing and cutting!

Crushing and cutting of body parts due to falling parts or sharp edges on the open vacuum pump.

- ▶ Wear safety glasses, protective gloves and safety shoes during all assembly and dismantling work, troubleshooting and maintenance activities.
 - ▶ In addition, wear head protection during transport work and when working overhead.
-



WARNING

Risk of injury!

Severe injuries due to suction and drawing in of body parts and hair (vacuum) or due to ejected particles (pressure).

- ▶ Wear eye protection and tight-fitting clothing during all operational work.
 - ▶ Cover long hair with a hair net.
 - ▶ Remove jewelry and rings.
-



WARNING

Hearing damage!

Hearing damage due to presence in noise zone under unfavorable operating conditions or due to noise caused by the escaping pumping medium at the gas outlet or the piping.

- ▶ Wear hearing protection when working in the noise zone.
-

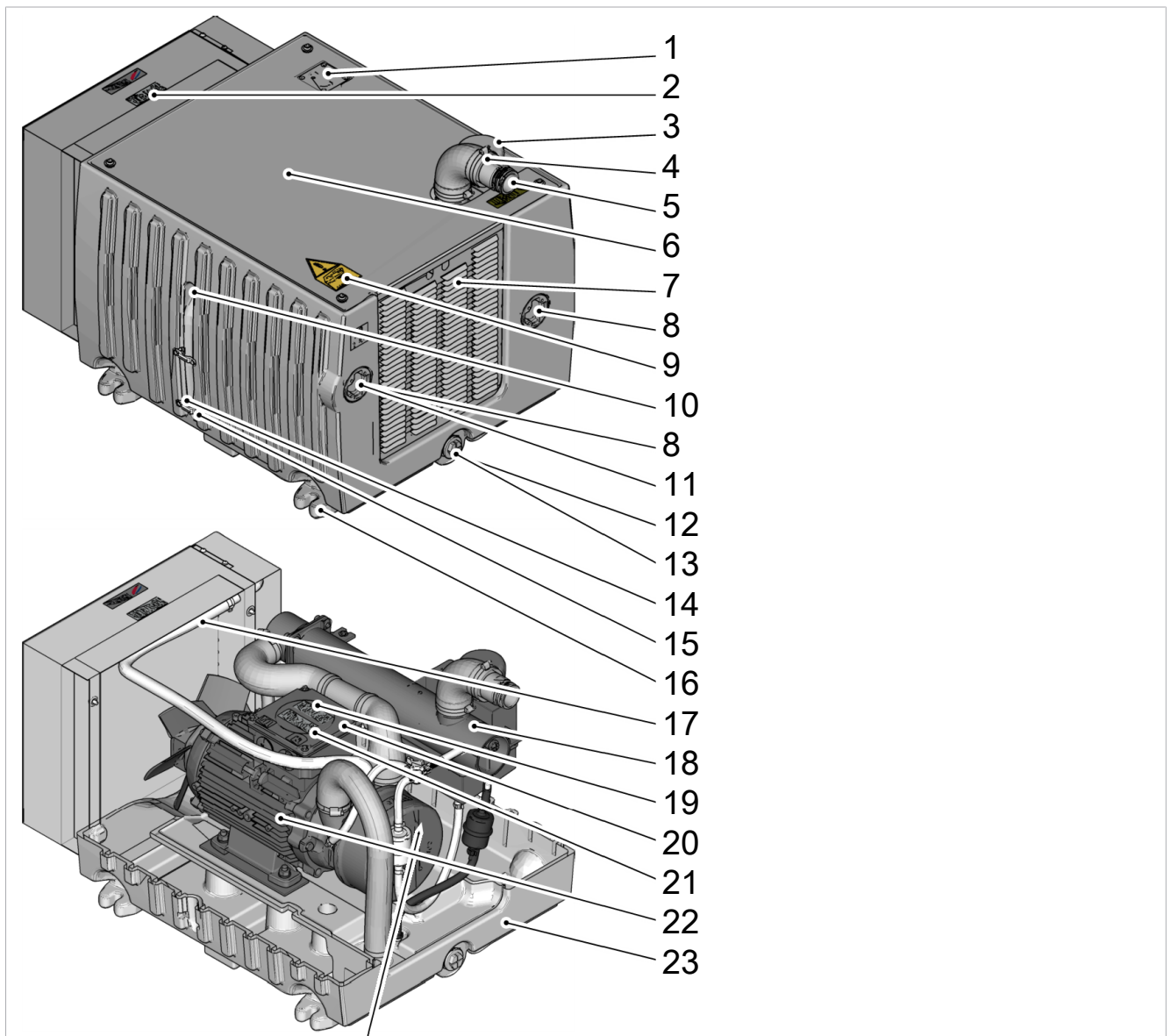
2.6 Changes to the Vacuum Generator

Schmalz assumes no liability for consequences of modifications over which it has no control:

1. The vacuum generator must be operated only in its original condition as delivered.
2. Use only original spare parts from Schmalz.
3. The vacuum generator may be operated only in perfect condition.

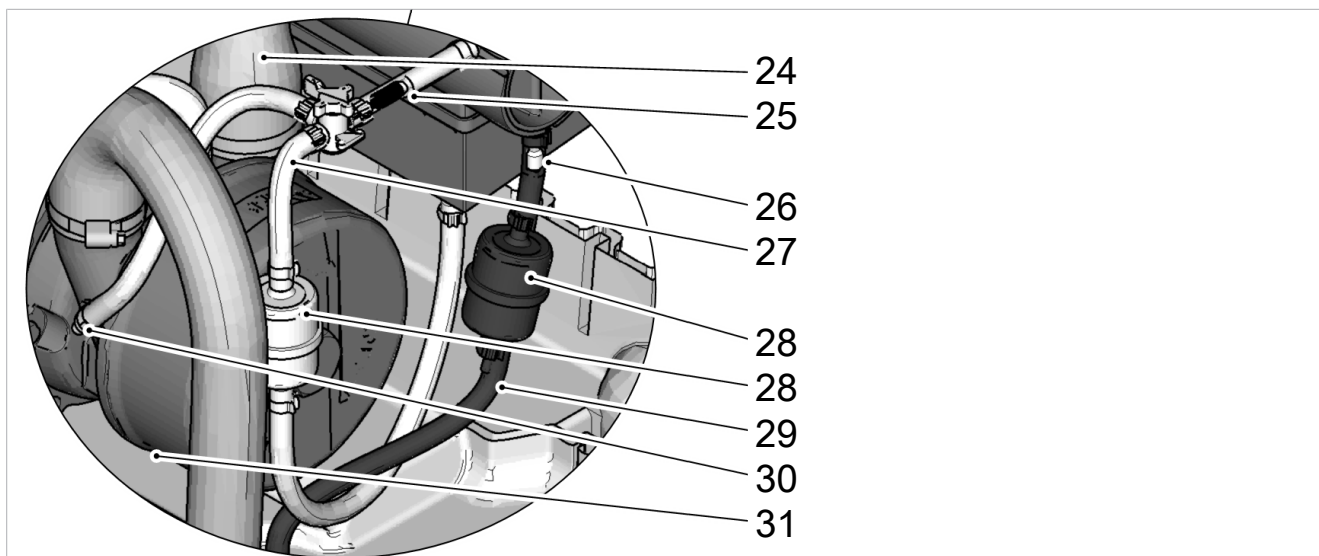
3 Product Description

3.1 Vacuum Pump Components



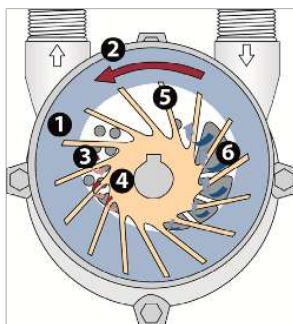
- | | |
|----|---------------------------|
| 1 | Level indicator |
| 2 | Type plate |
| 3 | Gas outlet, not connected |
| 4 | Fitting |
| 5 | Gas inlet |
| 6 | Cover plate |
| 7 | Protective grid |
| 8 | Bung plug |
| 9 | Frost protection sticker |
| 10 | Cable bushing |
| 11 | Operating fluid outlet |
| 12 | Sealing screw |

- | | |
|----|----------------------|
| 13 | Separator drain |
| 14 | Strain relief clamp |
| 15 | Screw |
| 16 | Foot |
| 17 | Operating fluid line |
| 18 | Condensation cooler |
| 19 | Pump type plate |
| 20 | Connection box |
| 21 | Motor type plate |
| 22 | Pump |
| 23 | Separator |



24	Gas outlet	28	Filter
25	Condensate line restrictor	29	Injection water line
26	Injection water line restrictor	30	Connection for cavitation protection
27	Condensate line with 3-way valve	31	Pump drain

3.2 Functional Principle



The product is a compact, ready-to-connect circulating vacuum pump. It consists of a liquid ring vacuum pump which is installed in a liquid separator. The product is air-cooled, 100% oil-free and requires no additional water. The pumping medium is compressed in a contact-free manner and makes the product virtually maintenance-free.

Because of the exhaust air cooling, the exhaust air is no more than room temperature or is generally cooler and is cleaned, antistatic and dust-free.


In liquid ring vacuum pumps/compressors, the impeller (4) rotates eccentrically and without contact in the pump housing (2). A rotating liquid ring (1) creates a seal between and at the front of the impeller blades. This liquid ring is produced by the rotation of the impeller and rests against the inside of the pump housing.

Due to the eccentric arrangement of the impeller, the spaces between the impeller blades (5) change during rotation. The pumping medium is sucked in, compressed and ejected via a full revolution. The pumping medium flows via the inlet slot (6) into the blade cells and is ejected again via the pressure slot (3).

To stabilize the liquid ring and dissipate the heat, liquid is continuously sucked or pressed into the pump chamber and ejected with the pumping gas.

4 Technical Data

4.1 General Parameters

Parameter	EVE-WR 25	EVE-WR 45	EVE-WR 65
Installation height	1000 m above sea level		
Speeds	See type plate		
Pumping media temperature	+5° C to 60° C		
Operating fluid temperature with frost protection	-20° C to +40° C		
Operating fluid temperature without frost protection At ambient temperatures < +10° C, there is a risk of icing. Enrich the operating fluid with antifreeze based on ethylene glycol (e.g. Clariant Antifrogen) according to the sticker on the cover plate.	+10° C to +40° C		
Temperature range	+5° C to +40° C		
Intake pressure p in vacuum mode At intake pressures >350 mbar, the water vapor content of the emerging gases may be above that of the sucked-in gases. This water loss can be compensated automatically with a feed regulator.	50 to 800 mbar		
Maximum relative humidity, non-condensing	60%		
Vibration velocity 	Max. $v_{\text{eff}} = 4.5 \text{ mm/s}$		
Accelerations The roller bearings can be destroyed by excessive alternating loads.	Max. $0.3 \times g$		
Mass without operating fluid	40 kg	55 kg	72 kg
Mass with operating fluid	64 kg	100 kg	117 kg
Noise emission at 50 Hz	65 dB(A)	68 dB(A)	73 dB(A)
Noise emission at 60 Hz	69 dB(A)	73 dB(A)	78 dB(A)

For exact electrical and pneumatic data, refer to the type plate and/or data sheet.

4.2 Fill Quantities

Parameter	EVE-WR 25	EVE-WR 45	EVE-WR 65
Max. fill quantity of operating fluid for initial filling – separator	22.5 l	43.5 l	43.5 l
Max. fill quantity of operating fluid for initial filling – pump	1.5 l	1.5 l	1.5 l
Decalcifier fill quantity Use pure citric acid in granular form as a decalcifier. The fill quantity is based on the average filling of the separator with tap water.	2.0 kg	4.0 kg	4.0 kg
Corrosion inhibitor fill quantity Use only ethylene-glycol-based agents as corrosion inhibitors (e.g. Clariant Antifrogen). The fill quantity is based on the complete interior of the installed pump.	0.6 l	1.0 l	1.0 l

5 Transportation and Storage

5.1 Checking the Delivery

The scope of delivery can be found in the order confirmation. The weights and dimensions are listed in the delivery notes.

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

5.2 Transporting the Vacuum Pump

- ✓ Wear protective work shoes and gloves.
- 1. Secure the load according to national regulations before every transport operation.
- 2. Ensure that the hoists and slings used have the necessary specifications.
- 3. Ensure that any personnel involved in transporting with lifting devices or industrial trucks are authorized and qualified to do so.



⚠ WARNING

Suspended load.

Risk of injury!

- ▶ Do not walk, stand or work under suspended loads.



⚠ CAUTION

Risk of crushing and cutting.

Crushing and cutting of body parts due to tipping or falling loads during transport!

- ▶ Always transport the product horizontally.
- ▶ The load-bearing capacity of the lifting straps and load suspension devices must correspond to the mass.
- ▶ Protect against tipping or falling.
- ▶ Do not stand under suspended loads.
- ▶ Place the product on a load-bearing, horizontal surface.



NOTE

Mechanical damage

The vacuum pump can be damaged during transport.

- ▶ The vacuum pump is designed to be transported with a crane or forklift. Do not subject the vacuum pump to shocks and impacts during transport.

Transport by Crane

1. Check the vacuum pump for transport damage.
2. Disconnect attached accessories (e.g. gas jet, suction filter) from the vacuum pump before transport.
3. Use lifting straps with sufficient length (spread angle less than 90°).
4. Guide the lifting straps under the molded recesses on the separator (23).
5. Ensure that the lifting straps cannot slip off!
6. Lift and transport the vacuum pump.
7. Set down the vacuum pump and, if necessary, secure it against slipping and falling.
8. Remove the lifting straps.



If the vacuum pump is mounted on a base plate, proceed as follows:

1. Remove the packaging except for the transport protection of the connection openings.
2. Undo the fastening screws on the foot (16).

5.3 Storage



NOTE

Mechanical damage and corrosion!

Failure to comply with the storage conditions can lead to mechanical damage and corrosion and shorten the life of the grease.

- ▶ Observe the storage and standstill conditions.
- ▶ The maintenance intervals of the roller bearings are reduced as the storage time increases.

1. Seal all openings with adhesive tape or reuse the supplied caps.
2. Rotate the rotor once a year to avoid permanent marks due to standstill.

Storage conditions	Permitted values
Ambient pressure	Atmospheric
Environmental composition	Dry, dust-free atmosphere (relative humidity < 60%)
Temperature range	+5° C to +40° C
Static loads	None
Shock loads	None
Vibration velocity V_{eff}	< 1.5 mm/s

5.4 Measures After Extended Storage

Replacing the roller bearings and radial shaft sealing ring

If the storage period until installation exceeds 4 years under the specified storage conditions:

1. Replace the roller bearings.
2. Clean and re-grease the intermediate cavities of the roller bearings when open.
3. Replace and grease the radial shaft sealing ring.

In the case of deviating storage conditions, a reduction of the roller bearing life is to be expected.

Measuring the insulation resistance of the motor

- ▶ Measure the insulation resistance of the motor at 500 V DC voltage between the conductors of the main circuit and the protective conductor system.
 - ⇒ Value $\geq 1 \text{ M}\Omega$: no action required.
 - ⇒ Value $< 1 \text{ M}\Omega$: dry the winding.

Removing the corrosion inhibitor

Vacuum pumps that have been filled with corrosion protection for storage must be emptied and cleaned.

1. Drain the corrosion inhibitor as described and dispose of it according to the manufacturer's instructions ([> See ch. 11 Taking the Product Out of Operation and Disposal, p. 36](#)).
2. Rinse the vacuum pump ([> See ch. 9.3 Rinsing the Vacuum Pump, p. 34](#)).

6 Installation

6.1 Installation Instructions



CAUTION

Improper installation or maintenance

Personal injury or damage to property

- ▶ Prior to installation and before maintenance work, the vacuum generator must be disconnected from the power supply and secured against unauthorized restart!

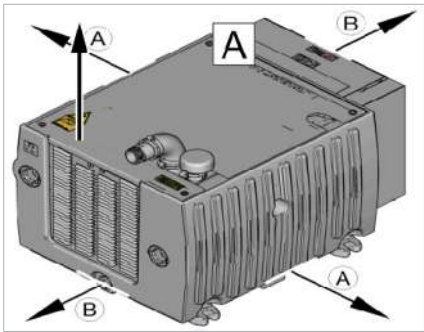


NOTE

Using the Vacuum pump outside the permissible installation conditions.

Danger of premature failure of the machine and loss of efficiency.

- ▶ The installation conditions must comply with all specifications.



Maintain the following clearances for heat dissipation:

A [mm]	B [mm]
10	40

For safe installation, the following instructions must be observed:

- ✓ No exhaust air from other machines in the intake area of the motor fan.
 - ✓ External vibrations and impact loads or accelerations are not permitted.
 - ✓ External mechanical loads on the vacuum pump and its attachments are not permitted (e.g. pipework without support, climbing onto the vacuum pump and its attachments).
1. Always position the vacuum pump on a level installation surface or base frame. The dimensions and load capacity must be suitable for the vacuum pump.
 2. Provide protection against weather effects when installing outdoors.
 3. Ensure adequate ventilation when installing in enclosed rooms. In the case of pumping media other than air, the leakage of the vacuum pump must be taken into account (e.g. forced ventilation, gas monitoring).

6.2 Reducing Vibrations and Noise

Vibrations and noise emissions can be reduced with the following measures.

- Position the vacuum pump on a stable foundation or on a solid support surface.
- Never install the vacuum pump on sound-conducting or sound-radiating mounting surfaces.
- Equip mounting surfaces with sound-absorbing intermediate layers.

6.3 Horizontal Mounting on the Foot

- ✓ Always install the vacuum pump with the feet facing down (no installation on walls or ceilings).
 - ✓ If the product is installed above ground level, it must be bolted to the support surface.
1. Mark the fastening points through the holes in the foot (16) or using the dimension sheet.
 2. Remove the vacuum pump and drill holes for the fasteners.
 3. Position the vacuum pump with the foot in mounting position.
 4. Secure the foot by applying fasteners to all mounting holes.
Screw M12 steel (8.8 to ISO 898-1): 18 to 22 Nm and washer according to ISO 7093-1.

6.4 Connecting Pipelines and Hoses



NOTE

Pressure loss due to reduced cross-sections of pipes and hoses

- ▶ The cross-sections of the pipes and hoses must be as long as possible and greater than or equal to the connections of the vacuum pump.



NOTE

A non-return valve prevents the reverse flow of the pumping media from the vacuum pump when operation is interrupted.

In the following cases, a non-return valve must be fitted to the gas inlet (5):

- ▶ Two or more vacuum pumps are operated in parallel. Each vacuum pump must have its own non-return valve at the gas inlet.
- ▶ If, when the vacuum pump is switched off, a vacuum can occur in the connected suction line for more than 1 minute.

The pumping medium is sucked in via the gas inlet (5) and ejected via the gas outlet (24). The vacuum pump can be connected via hoses or pipes.

Gas Inlet Connection Dimensions

Type	Pipe thread [EN 10226]	Hose connection [mm]
EVE-WR-25	R ¾	32
EVE-WR-45 EVE-WR-65	R 1¼	50

1. Remove the transport protection from the connection openings.
2. In the case of contamination of the pumping medium, install the filter (accessory) in the suction line.

3. The gas outlet (24) is not connected. The protective cap must not be removed.
4. For hose connection, release the hose clamp on the fitting (4) and rotate the fitting by 180°. Tighten the hose clamp.
Hose clamp: 2.7 to 3.3 Nm.
5. Connect the pipe or hose of the system-side suction line to the gas inlet (5).

6.5 Electrical Connection

6.5.1 General Installation Instructions



⚠ DANGER

Deadly electric shock on the housing due to insufficient air gaps!

Air gaps between bare, live parts and to ground must be at least 5.5 mm (for a rated voltage of $U_N \leq 690$ V).

- ▶ Avoid protruding wire ends.
- ▶ Electrical connections must be permanently safe.



⚠ DANGER

Deadly electric shock due to contact voltage on the housing!

- ▶ Protection against contact voltage according to IEC 60204-1 must be implemented. Use the grounding connection in the connection box (protective equipotential bonding). When working with a drive controller, observe the operating instructions of the drive controller manufacturer.
- ▶ Where applicable, connect functional equipotential bonding to the outer ground connection.
- ▶ Keep the connection box free of foreign objects, dirt and moisture.
- ▶ Seal the connection box lid and the cable entry openings to prevent water and dust ingress.



NOTE

Destruction of the drive!

Incorrect operation or incorrect control can destroy the drive.

- ▶ The product is equipped with an asynchronous motor.
- ▶ Operation on a network with a non-grounded neutral point is not permitted.

The electrical installation must meet the requirements of IEC 60204-1, IEC 60204-11 and IEC 61010-1 as applicable.

In addition, the electrical installation must be carried out in accordance with the applicable national, local and system-specific regulations as well as the regulations of the utility company.

The conditions at the place of use must match the specifications on the rating plate.

The following conditions are permissible for mains operation:

- $\pm 5\%$ voltage deviation without power reduction (range A, EN 60034-1) according to pump type plate (19)
- $\pm 10\%$ voltage deviation with power reduction (range B, EN 60034-1) according to pump type plate (19)

- $\pm 2\%$ frequency deviation
- Deviations are indicated on the pump type plate

The electrical installation must meet the following conditions:

- Ambient and operating conditions must be configured accordingly (current rating).
- The product must be correctly installed and protected.
- The product must be kept away from hot surfaces.
- The product must be sufficiently electrically isolated.
- The electrical installation must be configured and constructed such that the following issues do not lead to hazards:
 - Short-circuit
 - Mechanical impact
 - Interruptions or fluctuations of the power supply
 - Electromagnetic fields
 - Ground faults

The electrical equipment and control must not render the protective devices of the drive system and of the motor protection ineffective (e.g. PTC thermistor, bimetal switch, FC current limit).

In the event of a deviation or failure of the power supply to the control, continued operation or start-up of the product must be prevented.

Protective devices and switches must satisfy the applicable fault safety requirements.

Overcurrent Protection

The power supply of the motor must be equipped with overcurrent protection (e.g. motor-protection switch) in accordance with IEC 60204-1, 7.2.

Set the overcurrent protection to the maximum current.

Supply Disconnecting Device

A supply disconnecting device must meet the following requirements:

- Stipulated according to IEC 60204-1, 5.3 and 5.5.
- Clearly and visibly marked.

6.5.2 Controls

Controls and instruments must meet the following requirements with regard to their design and arrangement:

- They are easily visible and accessible and can be operated without excessive effort.
- The operator understands the functions.
- Operating errors are avoided.

A control system must comply with ISO 12100, 4.11; IEC 60204-1, 9.4 and ISO 13849-1.

In the event of a failure of the power supply to the control, a "system with oriented failure mode" according to ISO 12100, 6.2.12.3 must be used.

Start and stop devices must be clearly marked in accordance with ISO 13850 and IEC 60417

EMERGENCY STOP Function

An EMERGENCY STOP function must be provided if a hazardous situation requiring manual rectification can arise (see ISO 12100, 6.3.5.2) ▪

- The EMERGENCY STOP function must comply with EN 418 and EN 50099.
- A manual EMERGENCY STOP function must comply with ISO 13849-1, 5 (in particular 5.2.1).
- The stop category and color of the EMERGENCY STOP function must comply with ISO 13850.
- If a risk assessment determines that the normal switch can fulfill the EMERGENCY STOP function, this switch must be marked accordingly.

Following an EMERGENCY STOP, start-up must only be possible by means of an intentional, manually triggered operation.

Manual Reset

A manual reset following a stop command must comply with ISO 13849-1, 5.5.2 and IEC 60204-1, 9.2.5.3 and 9.2.5.4.

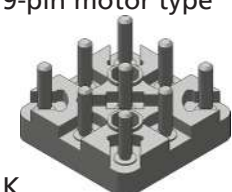
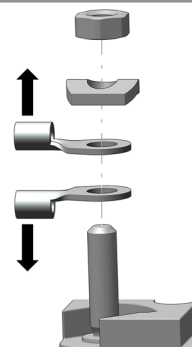
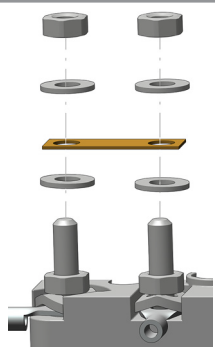
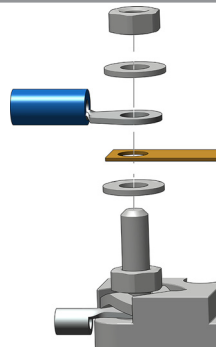
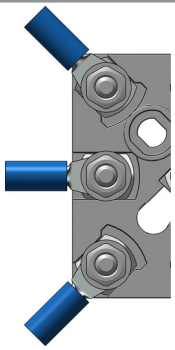
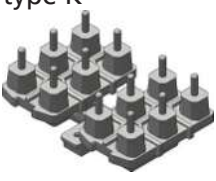
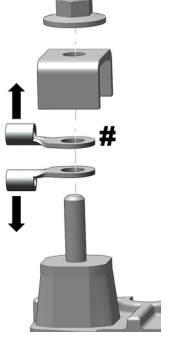
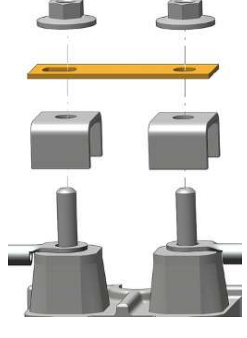
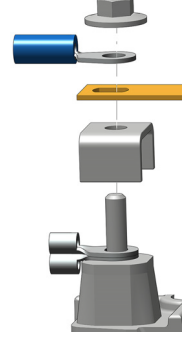
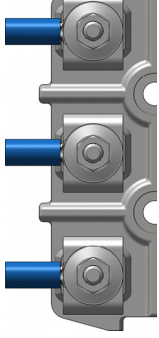
Start and Restart


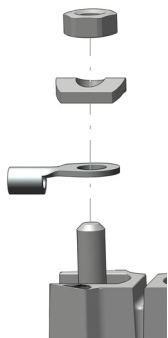
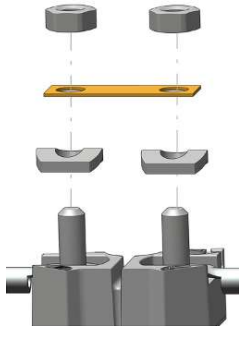
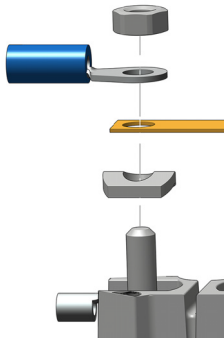
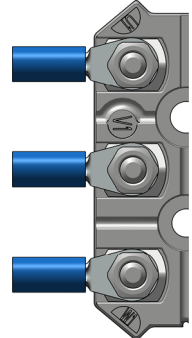

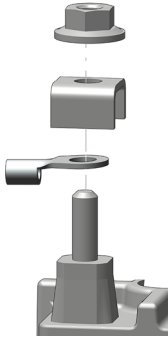
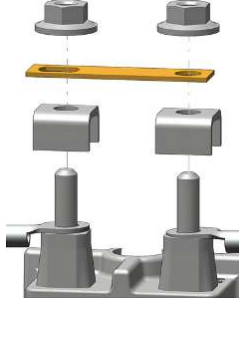
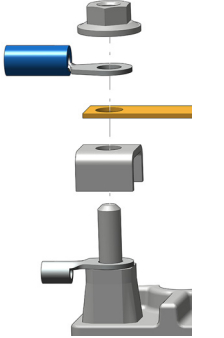
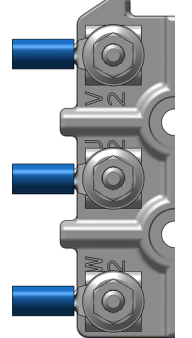
The requirements for a start and restart must comply with ISO 13849-1, 5.2.3.

If the vacuum pump is equipped with an automatic or remote-controlled start control, it must be marked with the danger symbol for automatic start-up.

Automatic or remote start-up during maintenance or servicing must be prevented.

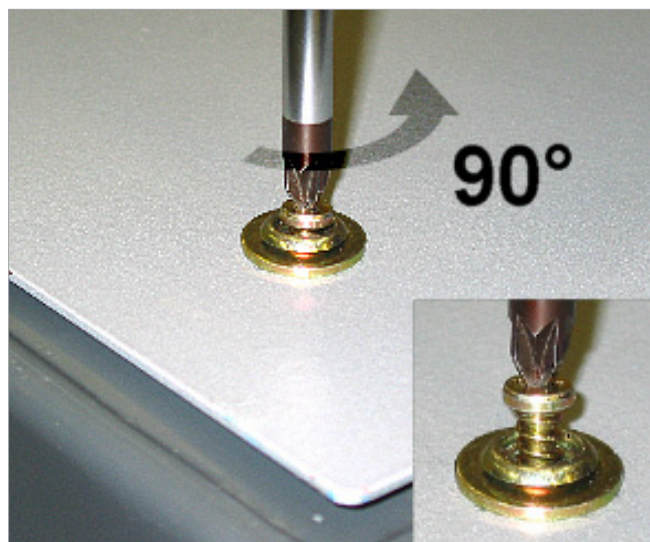
6.5.3 Connecting the Motor to the Mains

Terminal board version	Internal motor connection		Customer connection / mains connection / connectors	
	Motor connection cables	Connecting bars	Mains connection	Cable routing*
9-pin motor type  K				
2x6-pin motor type K 	 #Flexible bridge			

Terminal board version	Internal motor connection		Customer connection / mains connection / connectors	
	Motor connection cables	Connecting bars	Mains connection	Cable routing*
6-pin motor type  Q				
4-pin motor type  Q				

* Route cable lugs parallel to the terminal board pockets/domes!

1. Rotate the locking pin 90° counter-clockwise.



2. Remove the cover plate (6).
3. Open the connection box lid.
4. Open the required access points for cable glands.

5. Screw in or insert the cable glands and secure them with the lock nut. Screw in reducers where necessary.

The cable glands and reducers must not affect the IP degree of protection.

6. Insert the **flexible** cables to be connected into the connection box (20) via the cable entry (10) and cable glands.
7. Equip the cables to be connected with cable lugs.
8. Connect the protective conductor to the prepared position with the ground symbol.
M4: 4.0 to 5.0 Nm
M5: 7.5 to 9.5 Nm
9. Connect the mains power cable and connecting bars according to the circuit diagram in the connection box.
M4: 0.8 to 1.2 Nm
M5: 1.8 to 2.5 Nm
10. If applicable, connect the PTC thermistor, bimetal switch and standstill heating according to the circuit diagram in the connection box. Use a PTC thermistor evaluation unit for evaluating the PTC thermistor.
11. Remove unused parts (e.g. bridges, nuts) from the connection box.

12. Tighten the cable glands according to the manufacturer's specifications.



13. Seal open access points for cable glands with suitable seals.
14. Close the connection box lid.
M4: 4.0 to 5.0 Nm
M5: 7.5 to 9.5 Nm

15. Tighten the strain relief clamp (14).
0.72 to 0.88 Nm
16. Fit the cover plate (6).
17. Rotate the locking pin 90° clockwise.

6.6 Initial Filling with Operating Fluid

Filling the Pump (22)

When the product is filled for the first time, the pump must also be filled with operating fluid in addition to the separator.

- ▶ Fill the pump with operating fluid via the gas inlet (5).



Filling the Separator (23)

1. Fill the separator with operating fluid via the operating fluid outlet (11).



2. Check the fill level via the fill level indicator (1).
Do not fill the separator over indicator position 1.

6.7 Checking the Direction of Rotation



NOTE

Electric motor running in the wrong direction

Damage to the motor

- ▶ Reverse the rotational direction by reversing the polarity in the supply line.

1. Briefly switch on the vacuum pump and switch it off again.
2. Check whether cooling air escapes from the protective grid.
 - ⇒ Cooling air escapes: direction of rotation correct, no action.
 - ⇒ No cooling air escapes: incorrect direction of rotation, change direction of rotation by swapping over two phases of the electrical connection line.



Damage or destruction of the motor resulting from operation with the incorrect rotational direction is not covered by the warranty.

7 Operation

7.1 Safety Instructions



⚠ CAUTION

Touching hot surfaces

Touching hot surfaces may cause injury from burns.

- ▶ Wear work gloves.
- ▶ Do not touch components during operation.
- ▶ Allow the components to cool down before commencing work on the product.



⚠ CAUTION

Noise pollution caused by machine during operation

Danger of hearing damage

- ▶ If you spend longer periods of time in the immediate vicinity of the machine when it is not soundproofed: Wear ear protectors.

7.2 Checks before Starting Work



NOTE

Overpressure!

Overpressure during a leak test can damage the vacuum pump.

- ▶ When checking the system for leaks, separate the vacuum pump.

- ▶ Check before starting or restarting the vacuum pump:
 - ⇒ The vacuum pump has been flushed where necessary.
 - ⇒ The vacuum pump is correctly installed and aligned.
 - ⇒ Rotating components move freely.
 - ⇒ The interior of the pump is filled with operating fluid.
 - ⇒ The separator is filled with operating fluid.
 - ⇒ Pipes and hoses are connected correctly.
 - ⇒ Attachments, screw unions and electrical connections are fastened with the specified tightening torques.
 - ⇒ Operating conditions correspond to the specified rating plate data.
 - ⇒ Limit speeds are monitored and maintained by the control.
 - ⇒ Contact protection measures have been implemented.
 - ⇒ Cooling air supply is not impaired.

7.3 Sensor Function Test

- ▶ Check the correct connection of the sensors (e.g. PTC thermistor).

7.4 Measuring Vibrations



We recommend that vibration measurements be performed at the intended operating speeds.

1. Carry out vibration measurements.
2. If the permissible vibration velocity is exceeded, implement measures to reduce vibrations and noise.

7.5 Activation



NOTE

Destruction of the mechanical seal within seconds due to dry-running!

- ▶ Ensure that the interior of the pump is filled with operating fluid.
- ▶ Ensure that the separator is filled with operating fluid.

1. If present, open shut-off valves in the suction line and feed regulator.
2. Turn on the power supply and open the operating fluid supply.
⇒ The vacuum pump begins to draw in the pumping medium.
3. If the vacuum pump does not generate a vacuum during initial start-up, briefly throttle or close the suction side and open it again.

7.6 Use in the Work Process

Continuous operation at maximum vacuum or minimum intake pressure (against the closed suction valve) is possible. This is when the power consumption of the vacuum pump is at its lowest.

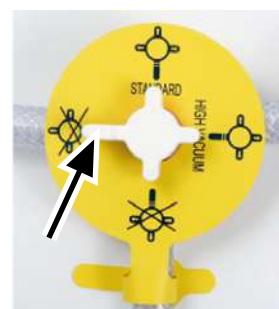
Operation with minimum intake pressure is recommended when running in idle (lowest power requirement).

3-Way Valve

STANDARD



HIGH VACUUM



During operation with low intake pressures ≤ 200 mbar, the suction capacity of the vacuum pump can be increased by switching the 3-way valve (27) to the HIGH VACUUM position. At intake pressures ≥ 200 mbar, the valve position HIGH VACUUM can lead to splash water formation at the gas outlet (24).

7.7 Loss of Operating Fluid

At low humidity and high intake pressure > 350 mbar abs., the water vapor content of the emerging gases is slightly higher than that of the sucked-in gases. This results in a small loss of operating fluid.

1. Check the operating fluid level in the separator via the level indicator (1) and top up if necessary.
2. At indicator position 0, switch off the vacuum pump and fill the separator (23).
 - ⇒ At indicator position 0, the suction rate decreases and prolonged operation without a supply of operating fluid will cause the vacuum to collapse and, eventually, the vacuum pump to run dry.

Feed Regulator

In the event of a loss of operating fluid, a feed regulator can be connected to enable automatic compensation of the fluid level.

7.8 Increase in Operating Fluid

At high humidity and low intake pressure, the water vapor content of the emerging gases is slightly lower than that of the sucked-in gases. This causes the operating fluid to increase.

The operating fluid level also increases if water is conveyed via the gas inlet (5).

- ▶ Regularly check the operating fluid in the separator via the level indicator (1) and drain excess operating fluid (11) if necessary.



Overfilling cannot be checked with the fill level indicator!

Drain Regulator

In the event of an increase in operating fluid, a drain regulator must be connected to enable automatic compensation of the fluid level.

7.9 Deactivation

- ✓ Before deactivation, ensure that no operating fluid can be pressed or sucked into the system.
1. Turn off the power supply and close the operating fluid supply.



WARNING

Risk of injury due to rotating impeller

- ▶ Wait for complete standstill.

⇒ The vacuum pump interrupts the suction of the pumping medium. The impeller slows down and the vacuum is gradually reduced.

2. If present, close shut-off valves in the suction line and feed regulator.

7.10 Emergency Shutdown

1. The vacuum pump can be switched off in an emergency without any special measures.
2. Determine the cause.
3. Eliminate the risk.
4. Put the vacuum pump back into operation.

8 Troubleshooting

8.1 Safety Instructions for Troubleshooting



⚠ DANGER

Electrocution by live components or wires

Serious injury or death!

- ▶ Electrical installation work may only be carried out by qualified personnel.
- ▶ Make sure that the electrical components are not live before installation, maintenance and troubleshooting.
- ▶ Switch off the mains switch and secure against unauthorized restart.



⚠ CAUTION

Touching hot surfaces

Touching hot surfaces may cause injury from burns.

- ▶ Wear work gloves.
- ▶ Do not touch components during operation.
- ▶ Allow the components to cool down before commencing work on the product.

8.2 Troubleshooting

Fault	Cause	Rectification
The vacuum pump does not start and makes no noise.	Interruption in the power supply.	▶ Eliminate the interruption in fuses, terminals or supply lines.
The vacuum pump does not start and makes noise.	Interruption in a line of the power supply.	▶ Eliminate the interruption in fuses, terminals or supply lines.
	The impeller is grinding or the rotor is jammed	▶ Open the pump, remove foreign objects, clean or replace parts.
	The impeller is faulty.	▶ Replace the impeller
	The roller bearing is faulty.	▶ Replace the roller bearing.
The vacuum pump rotates unevenly.	The motor cable is faulty.	▶ Check the motor cable.
Overcurrent protection trips again after activation; power consumption too high.	Motor overload. The throttling differs from the rating plate.	▶ Reduce throttling.
	Short circuit in the winding.	▶ Check the winding.
	Filters, silencer inserts or connecting pipes blocked.	▶ Clean filters, silencer inserts and connecting pipes.
	Impeller grinds or rotor is jammed.	▶ Open the pump, remove foreign bodies, clean or replace parts.
The vacuum pump does not reach the desired speed or produces no or insufficient pressure difference.	Incorrect direction of rotation.	▶ Check the direction of rotation.
	Different density of the pumping media.	▶ Note the conversion of the pressure values; check with the manufacturer.
	Filters clogged.	▶ Clean the filters and replace if necessary.
	Leak in the system.	▶ Seal the system

Fault	Cause	Rectification
	Radial shaft seal faulty.	▶ Replace the radial shaft seal.
	Change of blade profile due to contamination.	▶ Clean impeller, check for wear and replace if necessary.
Abnormal flow noise.	Flow velocity too high.	▶ Clean pipes, use pipes with a larger cross-section if necessary.
Vacuum pump leaking.	Loose screw connections.	▶ Check tightening torques and tighten screws.
The vacuum pump does not generate a vacuum.	No operating fluid.	▶ Add operating fluid.
	Leaks	▶ and seal the system.
	Incorrect direction of rotation	▶ Change the direction of rotation by swapping over two electrical connection lines.
The vacuum pump produces an insufficient vacuum.	Suction line too long or too thin	▶ Use a shorter or thicker pipe for the suction line.
	Suction-side hose connections or suction line leaking	▶ Check the suction-side hose connections and suction line and seal if required.
	Operating fluid flow too low	▶ Check the operating fluid line and the operating fluid bore of the installed pump for blockage. Eliminate any blockage.
	Insufficient operating fluid in the separator	▶ Top up operating fluid
	Operating fluid too hot	▶ Clean the cooling fins.
	Small leak	▶ Seal the vacuum pump and system.
	Suction filter (accessory) contaminated.	▶ Replace the suction filter.
	Vacuum regulating valve (accessory) set incorrectly	▶ Check and correct the setting of the vacuum regulating valve.
	Vacuum pump too small	▶ Use larger vacuum pump.
Water spraying out of gas outlet	Condensate is no longer suctioned off	▶ Check the air filter for contamination and clean/replace if necessary.
		Clean the restrictors (25 and 26) <ol style="list-style-type: none"> 1. Shut down the vacuum pump and secure against reactivation. 2. Remove cover plate (6) and protective grid (7). 3. Undo hose connections at the relevant points. 4. Clean the restrictors. 5. Blow through hose lines to the condensation cooler with compressed air. 6. Check the connections of the hose lines on the condensation cooler for continuity. 7. Reinstall parts and seal the system.
	Operating fluid level in the separator too high	▶ Install an automatic drain regulator (accessory) if water is also conveyed.

Fault	Cause	Rectification
		<ul style="list-style-type: none"> ▶ Check the correct function of the feed regulator (accessory).
Sharp rise in water consumption	The restrictors are blocked.	<ul style="list-style-type: none"> ▶ Clean the restrictors (see above).
	The filters are clogged.	<ul style="list-style-type: none"> ▶ Replace filters (28).
	Cooling fins of cooler contaminated	<ul style="list-style-type: none"> ▶ Clean the cooling fins (e.g. with compressed air).

See also

 Declaration of Decontamination [} 39]

9 Maintenance

9.1 Safety Instructions



⚠ CAUTION

Touching hot surfaces

Touching hot surfaces may cause injury from burns.

- ▶ Wear work gloves.
- ▶ Do not touch components during operation.
- ▶ Allow the components to cool down before commencing work on the product.



⚠ CAUTION

Failure to properly maintain the machine.

Risk of injury!

Risk of premature machine failure and loss of efficiency.

- ▶ Observe the maintenance intervals or contact your Schmalz representative. He or she will be glad to help you.

1. Switch off and lock the vacuum pump to prevent unintentional activation.
2. Vent all connected lines to the atmospheric pressure.
3. If necessary, disconnect all connections.

9.2 Maintenance Plan

The maintenance intervals are very dependent on the individual operating conditions. The intervals provided below should be considered guidelines and individually shortened or extended.

It may be necessary to significantly shorten the maintenance intervals, particularly in the case of a heavy workload, high dust exposure in the environment or the process gas, or other contamination, or the ingress of process material.

Maintenance work	Interval	
	Normal use	Heavy workload
1. External: Check the cooling fins of the cooler, surfaces and attachments for deposits and clean if necessary (e.g. with compressed air). 2. Internal: Check media-conveying parts for deposits and clean or replace if necessary.	Dependent on level of contamination	
▶ Replace operating fluid contaminated by dust with new operating fluid.	Dependent on level of dust contamination	
1. Install a separator, filter or sieve in the supply line. 2. Rinse the vacuum pump.	Dependent on the concentration of dirt particles in the operating fluid	
▶ Check the control for error messages by disconnecting the sensors (e.g. bimetal switches, PTC thermistors). In case of malfunction, rectify the cause of the fault.	Yearly	

1. Soften the operating fluid.
2. Decalcify the vacuum pump.

Dependent on the water hardness of the operating fluid (monthly for lime content > 15 °dH / water hardness > 2.675 mmol/l [> 267 ppm])

9.3 Rinsing the Vacuum Pump

1. Shut down the vacuum pump.
2. Disconnect the pipes and hoses on the system side.
3. Attach the rinsing fluid hoses to the operating fluid supply and to the gas outlet (24).
4. Place a collecting vessel below the pump drain (31) and the separator drain (13).
5. Open the pump drain and the separator drain.
6. Use a non-hazardous and clean medium as the rinsing fluid (water). Supply flushing fluid via the hoses. Contamination is flushed out of the pump housing / separator by the rinsing fluid. Continue rinsing until the rinsing fluid is free of contamination.
7. Remove the hoses.
8. Close the sealing screws of all drain holes.
Tightening torque: 2 to 3 Nm [1.48 to 2.21 ft lbs].
9. Reconnect pipes and hoses and return the vacuum pump to its original operating state.

9.4 Decalcifying the Vacuum Pump

1. Put on personal protective equipment (gloves and goggles).
2. Shut down the vacuum pump.
3. Drain the vacuum pump.
4. Disconnect the pipes and hoses at the gas inlet (5).
5. Use 10% citric acid or another commercial, citric-acid-based decalcifier (e.g. Sotin 212) as the decalcifying agent.
6. Fill the vacuum pump with the decalcifying agent via the gas inlet (filling level = calcification level).
7. Briefly operate the vacuum pump with the gas inlet disconnected and the inlet and outlet (8) closed in order to distribute the decalcifying agent. Allow the decalcifying agent to work for at least four hours.
8. Drain the decalcifying agent.
9. Check whether calcifications have been removed; repeat steps 5. to 8. if necessary.
10. Rinse the vacuum pump.
11. Reconnect pipes and hoses to the gas inlet and return the vacuum pump to its original operating state.
12. Put the vacuum pump into operation.
13. Dispose of the decalcifying agent in accordance with local regulations.

9.5 Repairs and Complaints

Coordinate repairs and complaints with Service before accepting returns.

10 Warranty

IMPORTANT!

A warranty claim can only be accepted by Schmalz if the pump has been installed and used in accordance with its corresponding operating instructions. In the case of inappropriate handling or use of force, any warranty and liability claims shall be void.

Damage and defects resulting from inadequate maintenance and cleaning, improper use, repair or attempted repair by unauthorized persons, as well as damage and defects resulting from alterations or modifications to the pump and from replaced parts or materials that do not conform to the original specification are excluded from the warranty.

11 Taking the Product Out of Operation and Disposal

Only qualified specialist staff may prepare the product for disposal.



The vacuum pump can remain in the system or be removed for storage.

Draining

1. Rotate the locking pin 90° counter-clockwise.
2. Remove the cover plate (6).
3. Remove any screws.
4. Remove the protective grid (7).
5. Open the operating fluid drain (31).
6. Open the operating fluid drain (13).
7. Open the cooler drain.
8. Drain the operating fluid.
9. Close all drain holes.
10. Fit the protective grid.
11. Fit the protective grid screws (if applicable).
12. Fit the cover plate.
13. Rotate the locking pin 90° clockwise.

Corrosion Inhibitor for Storage



- ✓ Fill the vacuum pump with corrosion inhibitor if it is to remain shut down for more than 4 weeks or if there is a risk of frost.
1. Rotate the locking pin 90° counter-clockwise.
 2. Remove the cover plate (6).
 3. Remove any screws.
 4. Remove the protective grid (7).
 5. Disconnect the hose from the gas outlet (24).
 6. Pour the corrosion inhibitor into the gas outlet using a funnel.
(> [See ch. 4.2 Fill Quantities, p. 14](#))
 7. During filling, rotate the fan wheel approx. one revolution by hand.
 8. Attach the disconnected hoses.
Hose clamp: 2.7 to 3.3 Nm
 9. Fit the protective grid.
 10. Fit the protective grid screws (if applicable).
 11. Fit the cover plate.
 12. Rotate the locking pin clockwise.

Disassembly

1. Disconnect all electrical connections of the vacuum pump.
2. Disconnect the pipelines and hoses.
3. Close open connections.
4. Store or dispose of the vacuum pump.

Disposal



WARNING

Scalding, chemical burns or poisoning!

Risk of injury due to contact with hazardous materials remaining in the vacuum pump.

- ▶ Decontaminate the vacuum pump according to the manufacturer's instructions to remove the hazardous materials.

1. Do not mix solvents, lime cleaners, antifreeze, paint residues and greases, and dispose of these substances in accordance with local regulations.
2. Dispose of components in accordance with local regulations or have them recycled.

For proper disposal, contact a company specializing in the disposal of technical goods and instruct the company to observe the applicable disposal and environmental regulations.

12 Declarations of Conformity

12.1 EU Conformity

EU Declaration of Conformity

The manufacturer Schmalz confirms that the vacuum pump EVE-WR described in these operating instructions fulfills the following applicable EU directives:

2006/42/EC	Machinery Directive
2011/65/EU	RoHS Directive

The following harmonized standards were applied:

EN 1012-1	Compressors and Vacuum Pumps - Safety requirements - Part 1: compressors
EN 1012-2: 1996 +A1:2009	Compressors and Vacuum Pumps - Safety requirements - Part 2: Vacuum pumps
EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN 60034-1	Rotating electrical machines – Part 1: Rating and performance
EN 60204-1+A1+AC	Safety of machinery - Electrical equipment of machines - Part 1: General requirements



The EU Declaration of Conformity valid at the time of product delivery is delivered with product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

12.2 UKCA Conformity

Declaration of Conformity (UKCA)

The manufacturer Schmalz confirms that the product described in these operating instructions fulfills the following applicable UK regulations:

2008	Supply of Machinery (Safety) Regulations
2012	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations

The following designated standards were applied:

EN 1012-1	Compressors and Vacuum Pumps - Safety requirements - Part 1: compressors
EN 1012-2: 1996 +A1:2009	Compressors and Vacuum Pumps - Safety requirements - Part 2: Vacuum pumps
EN ISO 12100	Safety of machinery — General principles for design — Risk assessment and risk reduction
EN 60034-1	Rotating electrical machines – Part 1: Rating and performance
EN 60204-1+A1+AC	Safety of machinery - Electrical equipment of machines - Part 1: General requirements



The Declaration of Conformity (UKCA) valid at the time of product delivery is delivered with the product or made available online. The standards and directives cited here reflect the status at the time of publication of the operating and assembly instructions.

13 Declaration of Decontamination

- ✓ A customer certificate regarding the conveyed medium and pump cleaning (declaration of decontamination) is a prerequisite for Schmalz to repair the pump.
- ▶ **Copy** this page. Enter the pump model, serial number and the conveyed medium in the form below and send the signed form to the Schmalz customer service together with the flushed and cleaned pump.

J. Schmalz GmbH
 Customer service
 Johannes-Schmalz-Str. 1
 72293 Glatten, Germany

Customer Declaration of Decontamination for the Repair Order

We confirm that the following media were conveyed with the pump listed below and that the pump has been flushed and cleaned.

Pump model	
Serial number	
Conveyed media	Medium 1 ...
	Where applicable, medium 2 ...
	Where applicable, medium 3 ...
	Where applicable, medium 4 ...
	Where applicable, medium 5 ...

There are no aggressive, biological, radioactive, poisonous or other hazardous media in the pump.

Company

Date/signature

At Your Service Worldwide



Vacuum automation

WWW.SCHMALZ.COM/AUTOMATION

Handling systems

WWW.SCHMALZ.COM/EN-US/VACUUM-LIFTERS-AND-CRANE-SYSTEMS

J. Schmalz GmbH
Johannes-Schmalz-Str. 1
72293 Glatten, Germany
T: +49 (0) 7443 2403-0
schmalz@schmalz.de
WWW.SCHMALZ.COM