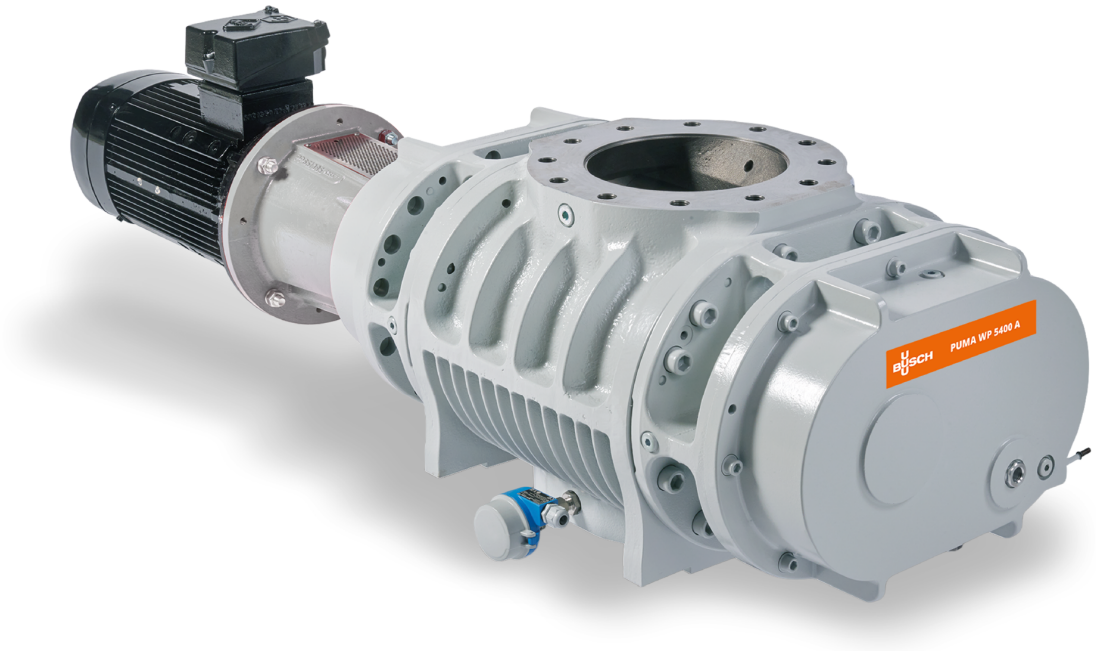
VACUUM SOLUTIONS

Part of the BUSCH GROUP

PUMA

Vacuum Boosters
WP 5400 A, WP 8100 A

Instruction Manual



SERVICE
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1 About this Manual

NOTE

Important

Read carefully before use.

- Keep the manual for future consultation.

1.1 Validity

This instruction manual is a customer document of Busch. The instruction manual describes 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 instruction manual 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 this instruction manual

1.1.2 Variants

These instructions apply to vacuum booster of the following versions:

Permissible temperature range	Lubricant type	Type
+5 °C ≤ Ta ≤ +40 °C	P3	WP 5400/8100 A
-20 °C ≤ Ta ≤ +40 °C	H1	WP 5400/8100 A
+5 °C ≤ Ta ≤ +40 °C	VSC100/D2	WP 5400/8100 A

1.2 Target Group

This instruction manual is aimed at all persons performing the following activities on the product:

- *Transport* [➔ 11]
- *Setup* (*Installation* [➔ 13])
- *Usage* and *Operation* [➔ 25]
- *Decommissioning* [➔ 35]
- *Maintenance* [➔ 29] and *Cleaning*
- *Storage* [➔ 12] or *Disposing* [➔ 36]

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 Busch.

2 Safety

2.1 General Safety Information

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

DANGER

... indicates an imminent dangerous situation that will result in death or serious injuries if not prevented.

WARNING

... indicates a potentially dangerous situation that could result in death or serious injuries.

CAUTION

... indicates a potentially dangerous situation that could result in minor injuries.

NOTICE

... indicates a potentially dangerous situation that could result in damage to property.

NOTE

... indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

2.2 Safety Precautions

NOTE

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.

NOTE

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 reevaluate 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

- Do not expose body parts to the vacuum.
- Check all safety measures at regular intervals.
- Observe the safety and accident prevention regulations, if necessary, wear personal protective equipment.
- Always ensure a secure connection to the earthed conductor (PE), protection class I.
- Never operate the vacuum booster with open vacuum flange.
- Provide suitable touch protection, if the surface temperature exceeds 70 °C.
- Provide suitable noise protection measures as necessary.
- During operation, make sure that plug-and-socket connections are securely fitted.
- Before working on the inlet connection, wait until the vacuum booster is at a complete standstill.
- Never make your own conversions or modifications to the vacuum booster.
- Before returning the vacuum booster, observe the notes in chapter *Service Solutions* [➔ 38].

2.3 Limits of Use of the Product

Parameter	Limit value
Relative air humidity	Max. 85% (depending on the motor version)
Pumped medium intake temperature, max.	≤40 °C

2.4 Intended Use

- Adhere to the installation, commissioning, operating, and maintenance instructions.
- Do not use any accessory parts other than those recommended by Busch.
- Use barrier gas as appropriate for the process.
- Use the vacuum booster only to create a vacuum in connection with a suitable backing pump.
- Operate the vacuum booster within the *Limits of Use of the Product* [➔ 7] and in compliance with the technical data.
  - When operating the vacuum booster with frequency converter, make sure that the vacuum booster never exceeds the max. permissible rotation speed, even in the event that the frequency converter malfunctions. Increased bearing wear is therefore avoided.
  - When operating the vacuum booster with a rotation speed of less than 1500 min-1, as can be the case in “windmilling” operation for example, you must ensure continuous vibration monitoring. Therefore any bearing damage that is caused by deficient lubrication can be detected in advance.
  - If this cannot be ensured, you must circumnavigate the vacuum booster by means of a bypass, until it can be operated with the minimum rotation speed.

2.5 Foreseeable Misuse

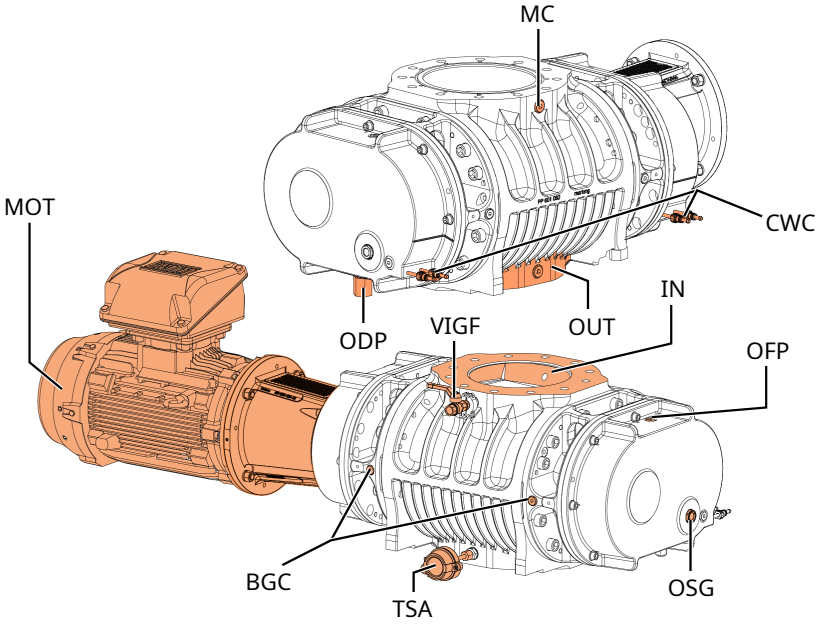
Improper use of the product invalidates all warranty and liability claims. Any use that is counter to the purpose of the product, whether intentional or unintentional, is regarded as improper use; in particular:

- Pumping media that can corrode or not be withstood by the vacuum booster materials
- Pumping explosive media
- Pumping media that form adhesive deposits inside the vacuum chamber and cause the lobes to touch or jam
- Pumping pressurized media (> atmospheric pressure)
- Pumping fluids – the use of fluids is permitted for cleaning purposes
- Pumping radioactive media
- Pumping media prone to spontaneous, specific exothermic reactions
- Use of the vacuum booster for cyclic evacuation procedures at and above atmospheric pressure (load lock)
- Use of the vacuum booster in systems in which sporadic loads and vibrations or periodic forces act on the unit
- Using the vacuum booster in strong electrical, magnetic, or electromagnetic fields
- Use of the vacuum booster without blocking the bypass valve for pumps with blocked version
- Use of the vacuum booster with open vacuum and/or forevacuum flange open to the atmosphere
- Use of pipes to lift the vacuum booster
- Use of accessories or spare parts not listed in these instructions
- Use of the vacuum booster as a climbing aid
- Use of oil other than that specified by Busch
- Use of the vacuum booster outside the temperature range stated on the nameplate
- Use of mineral-based oil, such as P3 when the process has an oxygen concentration > 21%
- Mineral-based lubricants 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.

3 Product Description

3.1 Function

The operating principle of the vacuum booster is based on 2 synchronous pistons that rotate in a housing without touching. The pumping effect is produced as a result of the opposing rotation of 2 figure-of-eight shaped roots pistons. While vacuum chambers are formed between the rolling pistons and the housing, the rolling pistons continuously form a mutual seal without touching each other or the housing. A pair of gears positioned on the extended shaft ends, causes the opposing, synchronous running of the roots pistons. Lubrication is limited to the two bearing and gear chambers which are arranged separately from the vacuum chambers.



Graphic 1: PUMA WP 5400 A, PUMA WP 8100 A design

Description			
MOT	Motor	ODP	Oil drain plug
MC	Mesurement connection	CWC	Cooling water connection
OUT	Exhaust connection	IN	Vacuum inlet
OFP	Oil fill plug	OSG	Oil sight glass
TSA	Thermocouple	BGC	Barrier gas connections
VIGF	Valve for inert gas filling (mounted on the measurement connection)		

3.1.1 Actuator

An asynchronous motor powers the vacuum booster via a magnetic coupling. A frequency converter controls the vacuum booster and adjusts the rotation speed to match the actual process requirements.

3.1.2 Mounting Orientations

The vacuum booster is suitable for vertical direction of flow.

3.2 Scope of Delivery

- Vacuum booster with motor / motor provided by the customer
- Connection flanges produced in accordance with PN 16
- Seal for the connection flange
- Protective cover for the connection flange
- Screw kit for the exhaust/inlet connections
- Locking screw
- Instruction manual
- Instruction manual of the motor
- Oil

3.3 Identifying the Product

To ensure clear identification of the product when communicating with Busch, always keep all of the information on the name plate to hand.

The following information is shown on the nameplates:

- Vacuum booster model
- Article number
- Type and quantity of the oil
- Max. allowable pumping speed
- Date of manufacture
- Input voltage range (motor nameplate)

3.3.1 Product Features

Pump type	Nominal pumping speed	Motor rated power	Inlet/direction of flow
WP 5400 A	2700 – 6480 m^3/h	11 kW	top/vertical
WP 8100 A	2700 – 8100 m^3/h	18.5 kW	top/vertical

4 Transport and Storage

4.1 Transport

WARNING

Suspended load.

Risk of severe injury!

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

WARNING

Risk of crushing and impact on swinging or falling.

Risk of severe injuries!

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 safety shoes.

NOTE

Instructions for safe transport.

- Only remove the protective cover for the connection flange once the pipes have been mounted.
- Fill the gear and bearing chambers with oil only once the final installation position is reached.

NOTE

We recommend keeping the transport packaging and original protective cover.

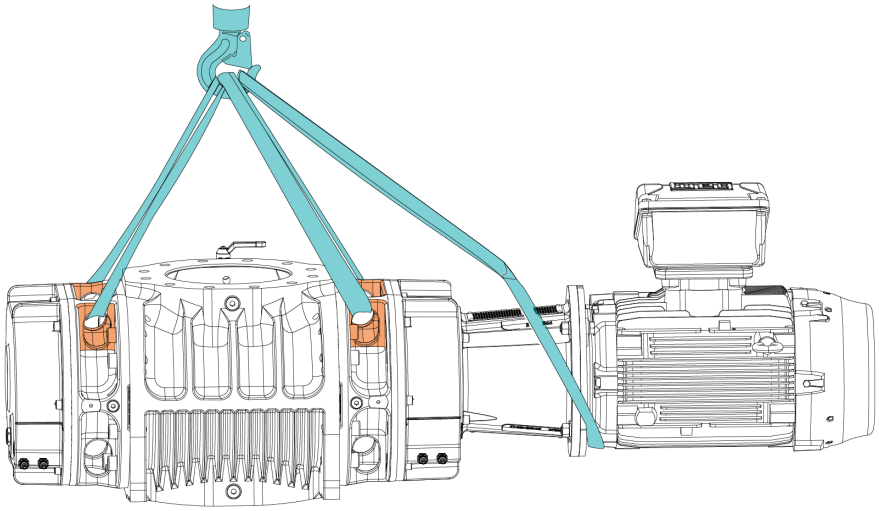
Safe transport of the product

- Transport the vacuum booster only within the permissible temperature limits.
- Observe weight specified on the nameplate.
- Where possible, always transport or ship the vacuum booster in its original packaging.
- Remove the protective cover only immediately prior to installation.

Transport the vacuum booster in its packaging

- Use a forklift to transport the vacuum booster in its packaging.
- Note the center of gravity of the load.

- Observe safe handling of manually operated transport devices.
- Ensure harmonious movements and moderate speeds.
- Ensure a flat substrate.
- Wear protective equipment, e.g. safety shoes.



Graphic 2: Transporting vacuum booster

Transport the vacuum booster without its packaging

- Unpack the vacuum booster.
- Pay attention to the correct use and fastening of the lifting equipment.
- If a motor is installed, use an additional strap at a suitable location.
- Lift the vacuum booster out of the transport packaging vertically.

4.2 Storage

NOTE

We recommend keeping the transport packaging and original protective cover.

Neither the vacuum chamber nor the lobes in the vacuum booster interior are provided with **corrosion protection**.

Storing the vacuum booster

- Vacuum-seal exhaust/inlet connections with protective covers.
- Seal all other connections (e.g. venting connection) with the corresponding original parts.
- Store the vacuum booster only in dry, dust-free rooms, within the specified ambient conditions.
- Evacuate and then fill the vacuum chamber with nitrogen to achieve the best corrosion protection for the vacuum booster.
- In rooms with humid or aggressive atmospheres: Hermetically seal the vacuum booster together with a drying agent in a plastic bag.
- Change the oil if the storage period is longer than 2 years.
- If you intend to store the vacuum booster for longer periods, we recommend that you use a special corrosion protection agreed with Busch.

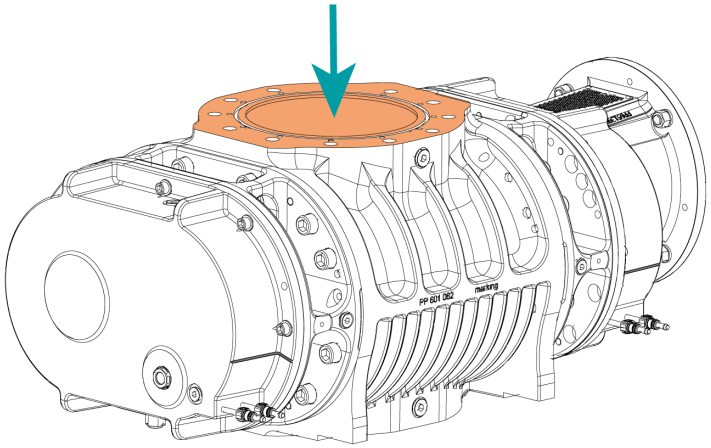
5 Installation

5.1 Mounting Orientations

NOTICE

Damage to the vacuum booster due to incorrect mounting orientation.

Impermissible mounting orientations will result in contamination of the process vacuum or damage to the vacuum booster.



Graphic 3: Permissible mountain orientation of the vacuum booster: Vertical direction of flow

5.2 Setting Up the Vacuum Pump

CAUTION

Tipping and falling hazard, if machine is not anchored on standing surface.

Risk of severe injury!

Risk of damage to the machine!

During setup, there is a risk of injury from tipping, if the vacuum booster is not anchored on the standing surface.

- Secure the vacuum booster using suitable lifting gear.
- Wear personal protective equipment.

General notes for the installation of vacuum components

- Choose an installation location that permits access to the product and to supply lines at all times.
- Observe the ambient conditions given for the limits of use.
- Provide the highest possible level of cleanliness during assembly.
- Ensure that flange components during installation are grease-free, dust-free and dry.

Required aids

- Fastening material 4 × M12

Procedure

- Check the carrying capacity of the floor at the installation location.
- Place the vacuum booster on a flat, horizontal and fixed surface, to safeguard the oil supply.
  - Reference surface is the inlet connection.
- Evenly screw the 4 feet of the vacuum booster onto the base without distorting the pump housing.
- Use shims from the range of *Accessories* [➔ 40] for vacuum booster to mount the feet horizontally.
- When installing the vacuum booster in a closed housing, ensure adequate air circulation.
- Keep both oil sight glasses freely accessible for checks and maintenance.
- Keep the filling/drain holes freely accessible.
- Ensure that the motor nameplate always remains accessible for a clear view of the voltage and frequency specifications.
- Maintain the minimum distances to bordering surfaces to guarantee sufficient air circulation.
- Fill with oil prior to first commissioning.

5.3 Filling Oil

WARNING

Igniting and heating synthetic oil generates toxic vapors. Poisoning when inhaling toxic vapors.

Risk of poisoning!

Risk to the health!

Igniting and heating synthetic oil 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 oil.

NOTICE

Risk of damage due to the use of non-approved oil.

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

- Only use approved oils.
- Only use other application-specific oils after consultation with Busch.

Permitted oil

- P3 (+5 °C ≤ Ta ≤ +40 °C)
- H1 (-20 °C ≤ Ta ≤ +40 °C)
- VSC100/D2 (+5 °C ≤ Ta ≤ +40 °C)

The oil type is listed on the nameplate

- Refer to the nameplate for type and quantity of intended oil.
- Only the oil used during initial installation is permissible.
- Contact BUSCH Group in case of using another type of oil.

Required consumables

- Oil of the vacuum booster

Required tools

- Hex key, **WAF 8**
- Ring spanner, **WAF 27**

NOTE

Filling the Oil.

The oil chambers of the vacuum booster are each equipped with a fill level limiter. A riser tube limits the max. fill level.

- Filling quantity, motor side: approx. 1.60 l
- Filling quantity, opposite side: approx. 1.40 l

5.4 Inlet Connection

WARNING

Limbs, hair and clothing might be caught by rotating parts.

Risk of severe injuries!

- Wait until the vacuum booster comes to a complete standstill.
- Keep limbs out of the reach of the vacuum booster.
- Secure the vacuum booster against restart.

NOTICE

Property damage from intake of solid particles.

During commissioning, there is a risk of damage to the vacuum chamber from dirt from the system or the pipes.

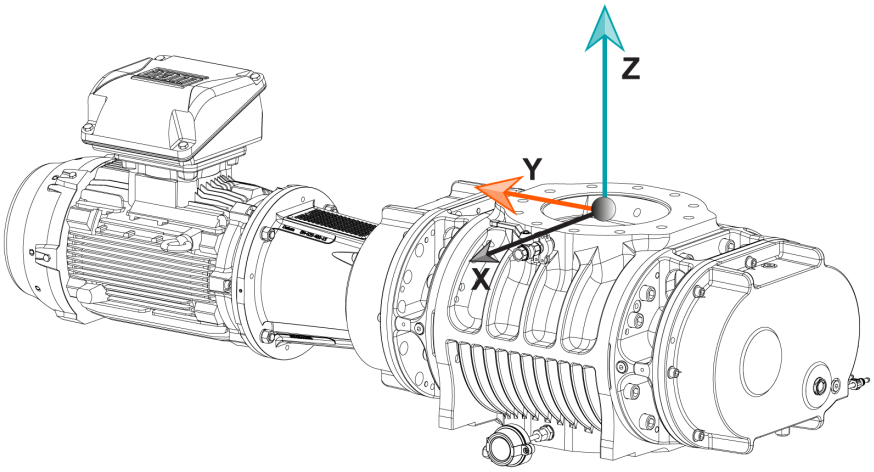
- Use a suitable protection strainer ("start-up strainer") in the intake flange.
- Ensure that this strainer is only removed when the risk of solid particles entering the vacuum booster can be excluded.
- Observe any pumping speed decrease.

Required tools

- Ring spanner, **WAF 30** with flange DN 250 PN16

Procedure

- Degrease the connection flanges.
- Clear welded lines of any tinder, loose parts or similar before installation.
- Route the piping between the vacuum booster and vacuum chamber so that it remains as short as possible, at a minimum, the nominal diameter of the vacuum booster flange.
  - Select a larger nominal diameter for pipe lengths > 5 m.
- Support or suspend the piping to the vacuum booster so that no piping system forces act on the vacuum booster.
- Always use all prescribed screws to fasten the flange.



Graphic 4: Loading capacity of the connection flange

NOTE

Installation of superstructural parts on the connection flange is the responsibility of the operating company. The loading capacity is specific for the vacuum booster used. The total weight of superstructural parts must not exceed the maximum values specified.

Maximum permissible forces	[N]	Maximum permissible torques	[Nm]
F_X	30000	M_X	10000
F_Y	15000	M_Y	8000
F_Z	-45000	M_Z	18000

5.5 Exhaust Connection

WARNING

Limbs, hair and clothing might be caught by rotating parts.

Risk of severe injuries!

- Wait until the vacuum booster comes to a complete standstill.
- Keep limbs out of the reach of the vacuum booster.
- Secure the vacuum booster against restart.

CAUTION

Faulty or inadequate exhaust pipes and hoses lead to dangerous situations, e.g. increasing exhaust pressure. Danger of bursting parts and flying fragments from the high pressure.

Risk of severe injuries!

- 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.

Required tools

- Ring spanner, **WAF 30** with flange DN 250 PN16

Procedure

- Degrease the connection flanges.
- Choose a minimum pipe cross section equal to the nominal diameter of the pressure flange.
- Clear welded lines of any tinder, loose parts or similar before installation.
- Route the pipes so that no mechanical tension can act on the vacuum booster or the backing pump.
- Install a bellows in the piping if necessary.
- Ensure that mating flanges are in a parallel position.
- Install the pipes downward from the vacuum booster, so that condensate does not flow back into the vacuum booster.
- Install a condensate separator if necessary.
- If a syphon is created in the system, then install a condensate drain facility at the lowest point.

5.6 Connecting the Cooling Water Supply

WARNING

Risk of scalding from suddenly escaping hot cooling water.

The vacuum booster water connections are open to both sides. When connecting the cooling water supply, there is a risk of scalding from suddenly escaping, hot cooling water at over pressure.

- Prior to installation, ensure that pressure is discharged from the cooling water system, and that it is cooled down.
- Wear safety goggles and gloves.

Parameter	Cooling water
Appearance	• filtered • mechanically clear • visually clear • no turbidity • no sediment • free from grease and oil
pH value	7 to 9
Carbonate hardness, max.	10 °dH 12.53 °e 17.8 °fH 178 ppm $CaC0_3$
Chloride content, max.	100 mg/l
Sulfate content, max.	240 mg/l
Carbonic acid content, max.	not detectable
Ammonia content, max.	not detectable
Electrical conductivity, max.	500 µS/cm
Particle size, max.	150 µm
Cooling water temperature	see "Technical data"
Cooling water flow	see "Technical data"
Cooling water pressure, max.	6000 hPa

There are two possible versions for the design of the cooling water circuit:

Type of cooling water circuit	Connection
Connecting line switched in series	Quick fitting coupling for hose cable Ø 6 × 8
Connecting line switched parallel (optional)	Quick fitting coupling for hose cable Ø 6 × 8

NOTE

Pressure test.

Perform a pressure test following installation and all subsequent work on the cooling water connections:

- Test pressure: 1×10^4 hPa

Prerequisites

- The cooling system provided by the customer is closed and depressurized.
- The provided hose connections correspond to the vacuum booster connections.

Consumables

- Cooling water hoses Ø 6×8
- Hose clamps 4×

Required tools

- Screwdriver

Procedure

Busch recommends the use of a dirt trap in the supply line.

- Connect the cooling water supply line to the hose nozzle of the quick fitting coupling at the designated cooling water inlet.
- Connect the cooling water return line to the hose nozzle of the quick fitting coupling at the designated cooling water outlet.
- Secure the hose lines on the vacuum booster with hose clamps.
- Monitor the on-site flow.

5.7 Connecting to the Mains

DANGER

Live wires.

Risk of electrical shock!

- Electrical installation work must only be executed by qualified personnel.

DANGER

Missing current protection.

Risk of electrical shock!

- Provide current protection in accordance with EN 60204-1 on your installation(s).
- The electrical installation must comply with the applicable national and international standards.
- Use only the supplied contact screws when installing the VSD cover to ensure proper grounding!

DANGER

Contact with exposed live parts can cause electric shock.

Improper connection of the mains supply can result in accessible live components.

Risk of death!

Risk of electric shock!

- 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.

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 restart.

NOTICE

Risk of property damage from excess voltage.

Incorrect or excessive mains voltage will destroy the motor.

- Always observe the motor nameplate specifications.
- Route the mains connection in accordance with locally applicable provisions.
- Always provide a suitable mains fuse to protect the motor and supply cable in the event of a fault. Busch recommends type "K" circuit breakers with slow tripping characteristics.

NOTICE

Motor damage from overheating.

Limited motor fan cooling capacity, caused by low speeds, causes the motor to overheat.

- During operation with a frequency converter, observe the rotational speed range specified in the technical data.

The vacuum boosters are equipped with three-phase motors for different voltages and frequencies. The applicable motor type is shown on the motor nameplate.

Standard versions

- Three phase motor with PTC, without switch and mains cable

Avoid electromagnetic interferences

- If possible, use shielded cables and EMC cable glands for motor and control cables.

5.7.1 Connecting a Three-Phase Motor with a 6-pin Terminal Board

NOTICE

Property damage from high starting torque.

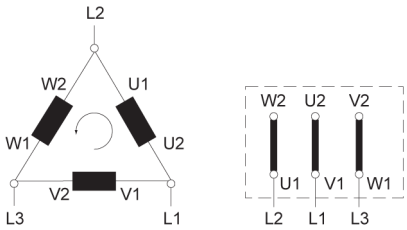
The specific load behavior of the vacuum booster requires motor operation exclusively with a frequency converter. Engine damage can occur if a different starting circuit is used.

- Observe the motor manufacturers documentation.

Prerequisites

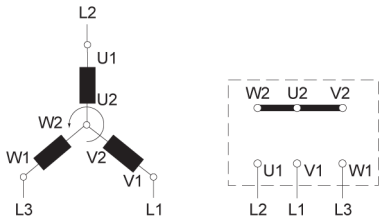
- Vacuum booster switched off

Connectors U1 – L2, V1 – L1 and W1 – L3 rotate the motor shaft clockwise when looking at the motor fan.



Graphic 5: Delta connection for Low Voltage

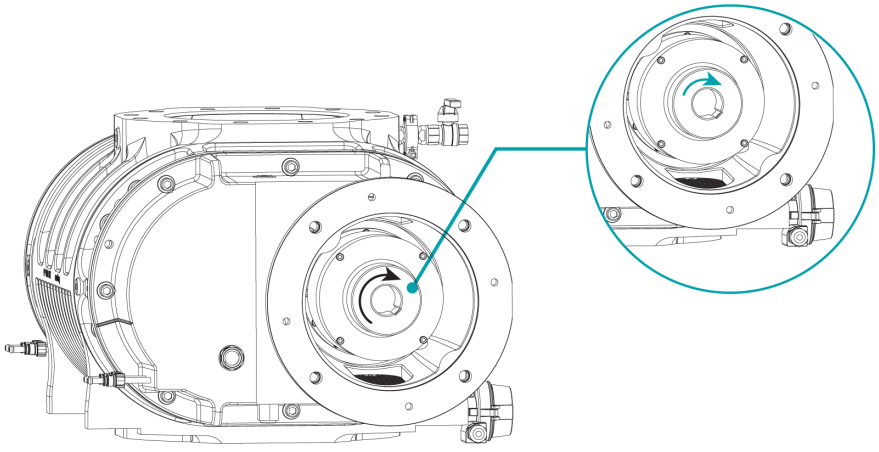
The 3 phases are connected in series, and their connection points connected to the mains. The voltage per phase is equal to the mains voltage, while the mains current is √3 times the phase current. The delta connection is marked with the Δ symbol. The voltage between the incoming mains supply lines is called mains voltage. The mains current is the current flowing in the incoming supply lines.



Graphic 6: Star connection for High Voltage

The ends of the 3 phases are connected in the star point. The terminal voltage is √3 times the phase voltage, the mains current is equal to the phase current. The star connection is marked with the Y symbol.

5.7.2 Checking the Direction of Rotation



Graphic 7: Check of direction of rotation

Procedure

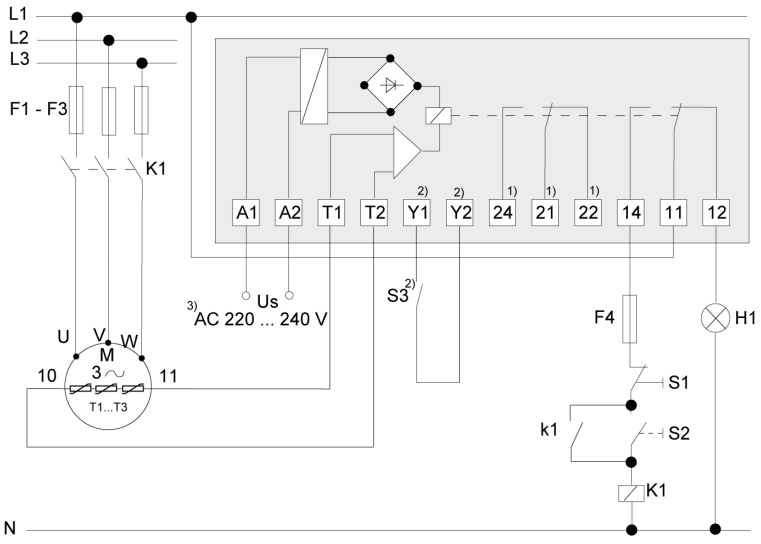
- Switch on the vacuum booster briefly (2 to 3 seconds).
  - The motor and motor fan must rotate clockwise (see the arrow on the fan cover).
- If the direction of rotation is incorrect, exchange the 2 phases on the connection cable.

5.7.3 Connecting a PTC Thermistor Tripping Unit

NOTE

Tripping units store the shut-down.

Busch recommends connecting motors with PTC (positive temperature coefficient) in the stator winding to a PTC thermistor tripping unit for protection against overload.



Graphic 8: Connection example with PTC thermistor tripping unit

Position	Description	Position	Description
U_S	Supply voltage	T1-T3	PTC resistor sensor
S_1	OFF button	H1	Tripping indicator
S_2	ON button	M	Motor, 3-phase
S_3	RESET button	1)	For devices with two relay outputs only
K1	Contactor	2)	For MSR type (model) only
F1-F4	Fuses	3)	Only for article number: 2000028243 and 2000028242

Procedure

- After shut-down, switch the tripping unit back on manually via the installed RESET button or via the external RESET S3.
  - Switching on the mains is detected as automatic RESET.

5.8 Observing the Motor Torque

When the magnetic coupling is overloaded, there is a loss of synchronization between the inner and outer coupling. The eddy currents that are caused as a result lead to the overheating of the magnetic coupling. When the vacuum booster is used as intended, the magnetic coupling will not become overloaded.

Causes of overloading if not used as intended

- The backing pump cannot handle the volume of gas required by the vacuum booster (increased pressure build-up between the vacuum booster and the backing pump). You must observe the volume flow ratio of ≤ 6:1 between the vacuum booster and the backing pump.
- Failure of the backing pump. In this case, you must switch the vacuum booster off immediately.
- Increased starting torque, e.g. caused by a motor not specified by Busch.
- The piston is blocked due to deposits.
- The vacuum booster was switched on before the backing pump.

NOTE

Torque limitation.

A soft starter (e.g., Siemens 3RW30, Eaton DS7) or a frequency converter enables you to limit the torque.

- Maximum permissible motor torque **100 Nm**

6 Operation

6.1 Commissioning

Before starting the vacuum booster

- Check the oil levels on both oil sight glasses (OSG).
- Compare the specifications on the motor nameplate with the available mains voltage and frequency.
- Make sure that the vacuum chamber is free from all foreign matters.
- Check the vacuum booster for visible damage and put the vacuum booster into operation only in a correct state.
- Protect the vacuum booster from sucking in contamination using suitable measures (e.g. dust filter).
- Make sure that the shut-off units on the exhaust side open before starting the vacuum booster.
- Open the cooling water flow and ensure the flow rate.
- If necessary, vent the cooling chambers.

6.2 Operating with Variable Speed Drive

6.2.1 Observe the Voltage Slew Rate

NOTICE

Damage to motor components when operating with variable speed drive

Operation of the motors with standard insulation resistance on a frequency converter may lead to potential damage of the motor insulation from an output voltage of > 480 V.

- Use a suitable filter to smooth voltage peaks as output switching of the frequency converter, e.g. sinus filter.
- Observe the permissible voltage slew rate.
- SR max (Δu/Δt) = **1.5 kV/µs**
- Observe the permissible impulse voltage at the motor terminals.
- V max. = **1.35 kV**

Variable speed drives generate a pulse width modulated (PWM) motor voltage that comprises voltage blocks with a relatively steep rise and fall speed. The steepness of the flanks of the voltage blocks define the voltage slew rate (SR = Δu/Δt). Factors which influence the voltage slew rate are the line length, line cross-section and shielding. Information is provided by the motor manufacturer in accordance with IEC60034 and IEC61800-2.

Configuring the variable speed drive

- Observe the instructions of the manufacturer regarding installation and operation.
- Observe the maximum permissible torque of the motor.
- Set the current limit according to the rated motor current.
- Observe the permissible speed range of the vacuum booster.

6.2.2 Observe the Mechanical Resonance

NOTICE

Damage from mechanical resonance when operating with frequency converter.

The use of a frequency converter allows operation of the vacuum booster with variable speed ranges. Potentially critical speed ranges lead to increased frequencies and vibrations. Permanent operation in critical speed ranges impairs running behavior of the vacuum booster. Damage is caused to the housing, gear, bearings, seals and motor.

- Decouple the vacuum booster mechanically by means of an anti-vibration buffer on the pump feet.
- Install the compensators at the inlet and outlet flange.
- When installing the vacuum booster, always ensure a new vibration-capable arrangement with specific structure resonance frequencies.

6.3 Starting the Vacuum Booster

WARNING

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

If operated without an exhaust line, the vacuum booster will discharge gases and vapors directly into the ambiant air. In processes involving toxic media, this can result in severe injury or death due to poisoning.

Risk of poisoning!

Risk of infection!

- 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.

CAUTION

Hot surface.

Risk of burns!

- Before doing anything that requires touching the machine, let it cool down first.

Notes on operation with FC

- Allow the vacuum booster to warm up prior to process start, with the vacuum flange closed, for approx. 30 minutes.
- During parameterization, observe the motor's rated torque.
  - If necessary, obtain this information from a separate rating plate for FC operation.

6.4 Adjusting the Barrier Gas Amount

WARNING

Uncontrolled ingress of air or oxygen-containing gases can create reactive, potentially explosive, or otherwise hazardous gas/air mixtures within the vacuum system.

Risk of severe injuries!

Risk of explosion!

- Use only inert gases for supplying the barrier gas supply in order to avoid a potential ignition.

NOTICE

Property damage from impermissibly high barrier gas pressure.

Excessive barrier gas pressure leads to damage to the seals after switching on the vacuum booster.

- Make sure that the barrier gas pressure inside the vacuum booster does not exceed 1200 hPa.
- Stop the barrier gas supply immediately after switching off the vacuum booster.

Procedure

The set quantity of barrier gas influences effective pumping speed and achievable ultimate pressure. Depending on the operating pressure, the empirical value for the supplied barrier gas amount is between 1% (for a high operating pressure) and 8% (for a lower operating pressure) of the effective suction capacity.

Inert gases, mostly nitrogen (N_2), are used as barrier gas.

- Open the barrier gas supply on the gas cylinder.
- Set a max. pressure of 2500 hPa on the pressure reducer.
- Set the desired quantity of barrier gas on the dosing valve of the flow meter.

Formula for calculating barrier gas flow:

$Q_S = (S_{th} \times p \times A_S)/p_0$

At discharge pressures > 100 hPa:

$Q_S = (S_{th} \times (p_V - \Delta p) \times A_S)/p_0$

- Q_S = Barrier gas flow under standard conditions [Nm^3/h]
- S_{th} = Rated volume flow rate of the vacuum booster [m^3/h]
- p = Inlet pressure [hPa]
- Δp = Differential pressure max. [hPa]
- p_V = Forevacuum pressure [hPa]
- A_S = Barrier gas content at the operating gas flow ($0.01 \leq A_S \leq 0.08$)
- p_0 = Ambient pressure under standard conditions [hPa]

Example for PUMA WP 5400 A; PUMA WP 8100 A with e.g. 50 hPa intake pressure and 8 % sealing gas content:

- $Q_s = (8100 \times 50 \times 0.08)/1013$
- $Q_s = 32.0\ Nm^3/h$

6.5 Stopping and Venting

WARNING

Limbs, hair and clothing might be caught by rotating parts.

Risk of severe injuries!

- Wait until the vacuum booster comes to a complete standstill.
- Keep limbs out of the reach of the vacuum booster.
- Secure the vacuum booster against restart.

NOTICE

Property damage from impermissibly high barrier gas pressure.

Excessive barrier gas pressure leads to damage to the seals after switching on the vacuum booster.

- Make sure that the barrier gas pressure inside the vacuum booster does not exceed 1200 hPa.
- Stop the barrier gas supply immediately after switching off the vacuum booster.

Procedure with clean processes

It is possible to switch off the vacuum booster in every pressure range, between atmospheric pressure and ultimate pressure directly after the process end.

- Close the shut-off valve in the vacuum line and disconnect the vacuum booster from the process.
- Switch off the vacuum booster.
- Vent the vacuum booster via the inlet side.
- Make sure that you do not vent the vacuum chambers through the vacuum booster.
- Switch off the process- and pump-specific media supply (e.g. the barrier gas supply).

Procedure with contaminated medium

With media that heavily contaminate the vacuum chamber, flush the vacuum chamber with air, nitrogen or any other suitable flushing medium at the end of the process.

- Close shut-off devices in the vacuum line and disconnect the vacuum booster from the process.
- At the end of the process, continue to operate the vacuum booster with flushing gas supply at the vacuum flange for another approx. 20-40 minutes.
- Then stop the flushing gas supply.
- Switch off the vacuum booster.
- Vent the vacuum booster via the inlet side.
- Make sure that you do not vent the vacuum chambers through the vacuum booster.
- Switch off the process- and pump-specific media supply (e.g. the barrier gas supply).

7 Maintenance

7.1 General Maintenance Information

DANGER

Live wires.

Risk of electrical shock!

- Electrical installation work must only be executed by qualified personnel.

WARNING

The thickness of the paint can generate an electrostatic charge.

Risk of severe injury!

Risk of explosion!

- Wipe the machine surface with a damp cloth only!

WARNING

Create a potentially explosive atmosphere by opening and/or venting the machine.

Risk of severe injury!

Risk of explosion!

- Make sure that processed media and/or gas mixtures inside the machine and its connections do not generate an explosive atmosphere when combined with the ambient atmosphere.

CAUTION

Hot surface.

Risk of burns!

- Before doing anything that requires touching the machine, let it cool down first.

CAUTION

Hot liquids.

Risk of burns!

- Before draining liquids, let the machine cool down first.

CAUTION

Failing to properly maintain the machine.

Risk of injuries!

Risk of premature failure and loss of efficiency!

- Maintenance work must only be executed by qualified personnel.
- Respect the maintenance intervals or ask your Busch representative for service.

NOTICE

Using inappropriate cleaners.

Risk of removing safety stickers and protective paint!

- Do not use incompatible solvents to clean the machine.

Maintenance instructions

- Switch off the vacuum booster and allow it to cool if necessary.
- Vent the vacuum booster to atmospheric pressure via the vacuum side.
- Safely disconnect the motor from the mains.
- Secure the motor against unintentional reactivation.
- Remove the vacuum booster from the system if necessary.
- Dispose of used oil according to applicable regulations in each case.
- For maintenance work, only dismantle the vacuum booster to the extent needed.
- Only clean the vacuum booster parts using industrial alcohol, isopropanol or similar media.
- Avoid residues of cleaning agent inside the vacuum booster.

7.2 Checklist for Inspection and Maintenance

NOTE

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 Busch Service if you wish to reduce the maintenance frequency.

Maintenance work at **maintenance level 1** can be carried out by the user.

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

Maintenance intervals

Action	Interval	Required material
Inspection: Instruction Manual		
Visual check: • Check level and color of the oil. • Check the vacuum booster for leaks.	Daily	
Acoustic check: • Check the vacuum booster for the running noises.	Daily	
Maintenance Level 1: Instruction- / Maintenance Manual		
Cleaning and flushing: • Clean the vacuum booster housing from outside. • Flush the vacuum chamber.	≤ 1 year as required	• Oil • Suitable cleaning agent, compatible with the process
• Changing oil	≤ 1 year	• Oil
Maintenance Level 3: Service Instructions		
Dismantling and cleaning the vacuum booster: • Replace the seals and all wearing parts. • Replace 4 piston bearings (ball bearings/roller bearings)	≤ 3 years	• Overhaul kit • Oil **Option** • Magnetic coupling set • Set of gear wheels
Checking/replacing critical parts if necessary: • Magnetic coupling (check magnets for damage) • Thermometer (calibrate the sensor with the reference temperature) • Gear wheels (check the teeth for breaks) • Check the runout of the motor shaft (in accordance with DIN EN 50347:2001)	≤ 3 years	
Depending on the process, the required maintenance intervals can be shorter than the reference values specified in the table. Please consult Busch if necessary.		

7.3 Changing the Oil

WARNING

The machine is contaminated with hazardous material.

Risk of poisoning!

Risk of infection!

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.

CAUTION

Hot surface.

Risk of burns!

- Before doing anything that requires touching the machine, let it cool down first.

CAUTION

Hot liquids.

Risk of burns!

- Before draining liquids, let the machine cool down first.

NOTE

Busch recommends determining the precise service life of the oil within the first maintenance frequency.

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

NOTE

Safety data sheets.

Safety data sheets for operating fluids can be obtained from Busch on request, or from the Busch Download Center.

Consumable

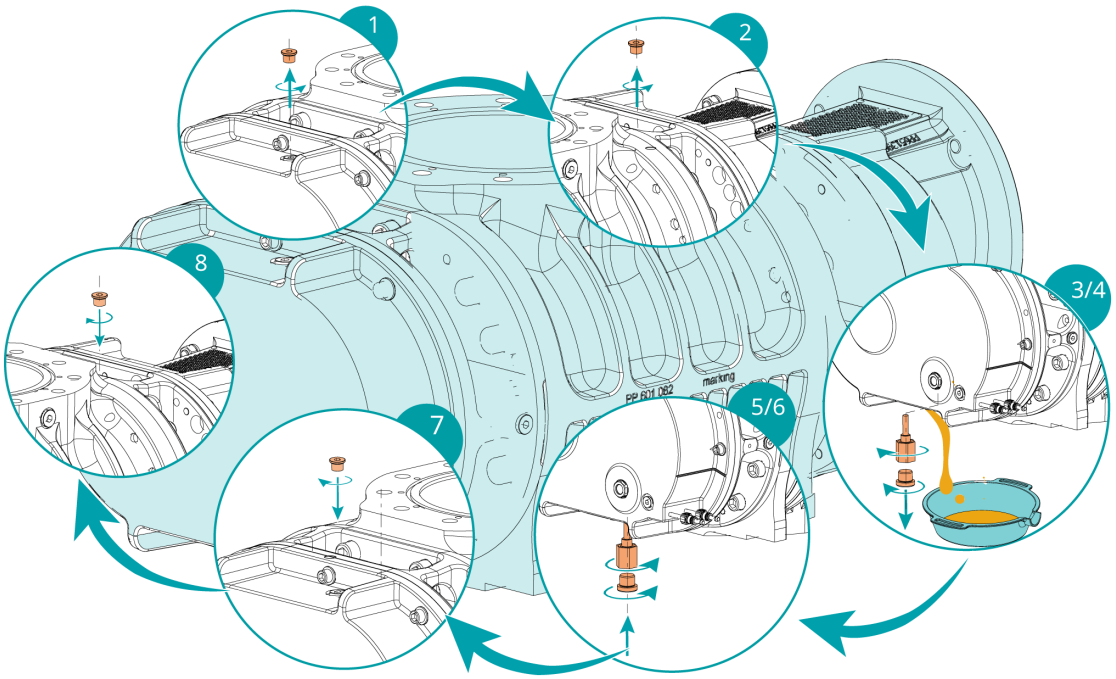
- Oil

Required tools

- Hex key, **WAF 8 mm**
- Ring spanner, **WAF 27 mm**

Required aids

- Collection receptacle



Graphic 9: Draining the oil

NOTE

Unscrew the fill level limiter.

To drain the oil, in addition to the drain screw, also unscrew the fill level limiter on the vacuum booster bottom side.

Procedure

- Fill the oil on both sides until the max. fill level is reached *Filling Oil* [➔ 14].
- Screw in the oil fill plugs again.

7.4 Cleaning the Vacuum Chamber

WARNING

Limbs, hair and clothing might be caught by rotating parts.

Risk of severe injuries!

- Wait until the vacuum booster comes to a complete standstill.
- Keep limbs out of the reach of the vacuum booster.
- Secure the vacuum booster against restart.

NOTICE

Property damage from incorrect cleaning procedure.

Flushing fluid and process media that enters the bearing and oil chambers will stick.

- During the cleaning processes, always protect all bearings with barrier gas in order to prevent a contamination of the oil and bearing chambers.

The clearance between lobes and housing are within a tenth of a millimeter range. Sustained, accumulating contamination has the following effect:

- the friction heat inside the vacuum booster increases
- the power consumption of the vacuum booster increases
- the lobes jam

Required aids

- Brushes and cleaning agents
- Suitable vessel for collecting the cleaning fluid
- Absorbent materials for absorbing the cleaning fluid

Procedure

- Dismantle the pipes from the inlet and exhaust connections.
- Clean the vacuum chamber and the overflow channel with suitable brushes and cleaning agents.
- After cleaning, completely remove remaining fluids using absorbent materials, and dry the vacuum chamber.
- After cleaning, mount all pipes.
- Screw in the drain plugs.

8 Decommissioning

8.1 Long-term Shutdown

Before shutting down the vacuum booster, observe the following instructions to adequately protect the interior of the vacuum booster (vacuum chamber) from corrosion:

Shutting down the vacuum booster

- Stop the vacuum booster.
- Allow the vacuum booster to cool down.
- Clean the vacuum chamber.
- Change the oil.
- Seal the vacuum and forevacuum flanges as well as any other openings with blind flanges from the Busch accessories range.
- Evacuate the vacuum booster interior via the measurement connection on the vacuum side to $p < 1$ hPa.
- Vent the vacuum chamber of the vacuum booster through the measurement connection with dry air or nitrogen.
- Store the vacuum booster in dry, dust-free rooms, within the specified ambient conditions.
- In rooms with damp or aggressive atmospheres, you should pack the vacuum booster in a plastic bag together with a drying agent, and seal it so that it is airtight.
- For storage durations longer than 2 years, we recommend to carry out maintenance and an oil change prior to recommissioning.
- The vacuum booster may not be stored in the vicinity of machines, traffic routes, etc., as strong vibrations may damage the bearing.

8.2 Recommissioning

NOTICE

Risk of damage to vacuum booster as a result of oil aging.

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

- Change the oil.
- Change the shaft seals and other elastomer parts, if required.
- Observe the maintenance instructions – consult Busch if necessary.

Procedure when recommissioning the vacuum booster

- Check the vacuum booster for visible damage and operate the vacuum booster only in an appropriate operating status.
- Check the interior of the vacuum booster for contaminants.
- Remove any drying agent from the vacuum chamber.
- Do not operate the vacuum booster if there is evidence of rust on the parts which form the housing.
- Contact Busch Service, if required.
- If possible perform a leak test prior to recommissioning the vacuum booster.

9 Recycling and Disposal

NOTE

Environmental protection.

Disposal of the product and its components must be carried out in accordance with all applicable regulations for the protection of people, the environment and nature.

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

9.1 General Disposal Information

Busch products contain materials that must be recycled.

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

9.2 Disposing

Busch vacuum boosters of the PUMA WP 5400 A; PUMA WP 8100 A series contain materials that must be recycled.

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

10 Troubleshooting

NOTICE

Danger of property damage from improper maintenance.

Unprofessional work on the vacuum booster will lead to damage for which Busch accepts no liability.

- Contact Busch for service support.
- When ordering spare parts, specify the information on the nameplate.

Problem	Possible causes	Remedy
Vacuum booster will not start up.	• Mains voltage is missing, or the incorrect operating voltage is present.	• Check the mains voltage and mains fuse. • Check the motor switch.
	• Thermal protection switch has triggered.	• Determine the cause and eliminate the fault. • Allow the vacuum booster to cool if needed.
	• Vacuum chamber contaminated.	• Clean vacuum chamber. • If necessary, contact Busch service.
	• Gear (gear wheels) damaged.	• Switch off the vacuum booster immediately. • If necessary, contact Busch service.
	• Bearing damaged.	• Contact Busch service to change the bearing.
	• Motor faulty	• Replace the motor.
Vacuum booster switches off after a while after being started	• Thermal protection switch of the motor has triggered.	• Determine and eliminate the cause of overheating. • Allow the motor to cool down.
Vacuum booster does not reach the specified final pressure	• Vacuum chamber dirty.	• Clean the vacuum chamber.
	• Oil soiled.	• Change the oil.
	• Backing pump operates incorrectly.	• Check the backing pump.
	• Leak in the system.	• Locate and eliminate the leak.
	• Loss of oil at the shaft seals or on the mechanical seal.	• Check the shaft seals or the mechanical seal. • Contact Busch service.
Unusual noises during operation	• Vacuum chamber dirty.	• Switch off the vacuum booster immediately. • Clean the vacuum chamber.
	• Damage to the bearing or the gear wheels.	• Switch off the vacuum booster immediately. • Contact Busch service.
	• Damage to the motor bearing.	• Switch off the vacuum booster immediately. • Change the motor. • Contact Busch service.

11 Service Solutions

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 Busch, our service is far from over. This is often exactly where service begins. Obviously, in proven Busch quality.

For a quick and smooth service process, we recommend the following steps:

- Fill out the *online service request*.
- Your request will be sent to the competent Service Center in your country/region.

A copy of your request and a ticket number will be emailed to you.

Remember to print out the declaration of contamination, sign it and return it to Busch.
You will receive the pre-filled declaration by E-mail after submitting the online service request.

In addition, follow the steps below:

- Prepare the product for safe transport according to the specifications from the declaration on contamination.
- Attach the Declaration of Contamination on the outside of the shipping box.
- Next, send your product to your local *Service Center* (you will receive the shipping address by E-Mail).
- You will receive response from Busch.

12 Spare Parts

NOTE

Ordering and using spare parts.

Spare parts for service work are grouped into packs. These vary according to vacuum booster version.

- Ask Busch Service for spare parts pack article numbers.
- Have the full vacuum booster article number (with index where applicable) to hand. It is available on the nameplate of the machine.
- Replace all parts contained in the pack.

13 Accessories

NOTE

View the range of accessories for Busch vacuum boosters on our website.

13.1 Accessory Information

Fixing materials

Type-specific assembled packages ensure secure fastening of the vacuum booster. Optionally with splinter shield or protective screen.

Display units and cable

Display and operating units are used to check and adjust operating parameters. Mains, interface, connection, and extension cables provide a secure and suitable connection. Different lengths on request.

Process accessories

Gearbox evacuation, barrier gas set, spraying equipment and temperature sensors permit process-specific adaptions.

13.2 Ordering Accessories

Accessories for vacuum booster

Description	Article number
Screw set, zinc-plated steel	PP 045 884 -T
Blank flange set	PP 045 889 -T
Set of seals (FKM)	PP 045 890 -T
Spray lance G1/2"	PP 046 146 -U

14 Technical Data and Dimensions

14.1 General

This section describes the basis for the technical data of Busch vacuum booster.

- Specifications according to PNEUROP committee PN5
- ISO 21360-1: 2016 “Vacuum technology - Standard methods for measuring vacuum booster performance - General description”
- Integral leakage rate with 100% helium concentration, 10 s measurement duration
- Sound pressure level at distance to vacuum booster = 1 m

Conversion table: Pressure units

	mbar	bar	Pa	hPa	kPa	Torr | mm Hg
mbar	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
bar	1000	1	$1 \cdot 10^{5}$	1000	100	750
Pa	0.01	$1 \cdot 10^{-5}$	1	0.01	$1 \cdot 10^{-3}$	$7.5 \cdot 10^{-3}$
hPa	1	$1 \cdot 10^{-3}$	100	1	0.1	0.75
kPa	10	0.01	1000	10	1	7.5
Torr | mm Hg	1.33	$1.33 \cdot 10^{-3}$	133.32	1.33	0.133	1
1 Pa = 1 N/m^2						

Conversion table: units for gas throughput

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

NOTE

Special versions.

The technical data and dimensions for the vacuum booster refer to the specified standard version.

- For deviations in special versions, please refer to the nameplates or the enclosed information.

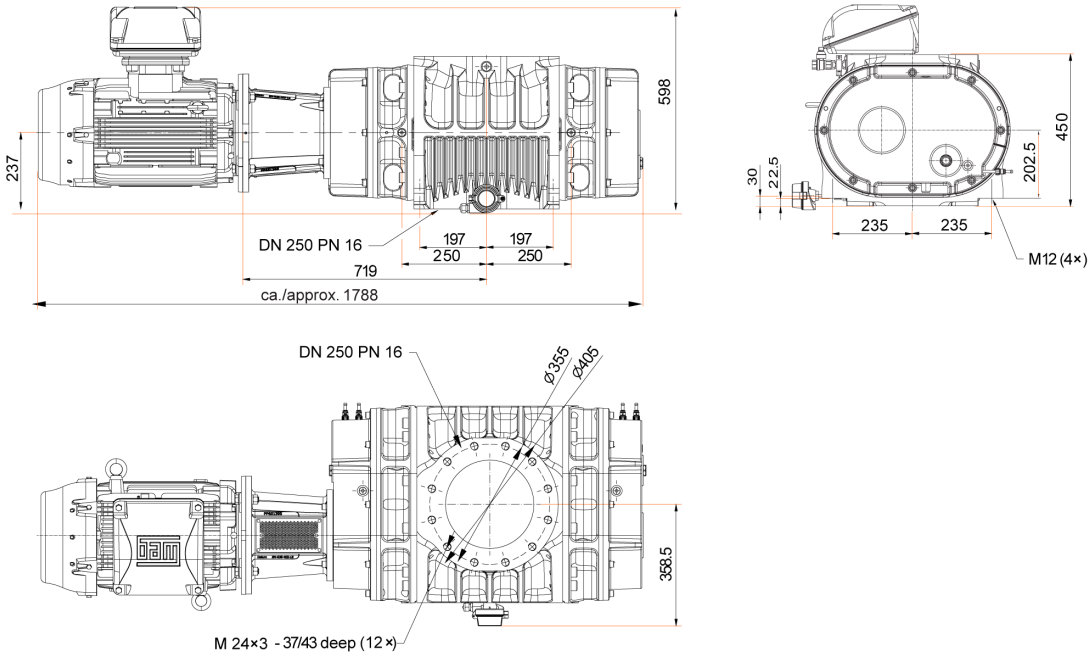
14.2 Substances in Contact with Media

vacuum booster parts	Substances in contact with media
Pump housing	Cast iron (nodular graphite cast iron)
Rotor	Cast iron (nodular graphite cast iron)
Seals	FKM (Fluororubber)

Table 1: Materials in contact with the process media

14.3 Dimensions

Dimensions in mm



Graphic 10: Dimensions PUMA WP 5400/8100 A

14.4 Technical Data

Technical Data PUMA WP 5400 A

Type designation	WP 5400 A
Connection flange (IN)	DN 250 PN 16
Connection flange (OUT)	DN 250 PN 16
Nominal motor speed	2700 – 6480 m^3/h
Input voltage: tolerance	±5 %
Input voltage 50 Hz	400 / 690 V
Motor speed	1500 – 3600 rpm
Rated power 50 Hz	11 kW
Rated power 60 Hz	11 kW
Sound pressure level (EN ISO 2151) at intake pressure 1 hPa	74 dB(A)
Motor coupling	Magnet coupling
Motor seal	Hermetic sealing
Cooling method	Water
Cooling water pressure	2000 – 6000 hPa
Cooling water flow, min.	2 l/min
Cooling water temperature	5 – 35 °C
Integral leak rate	$1 \cdot 10^{-6}$ Pa m^3/s
Sound pressure level (EN ISO 2151) at intake pressure 10 hPa	79 dB(A)
Motor protection	3TF
Protection degree	IP55
Oil amount	3 l
Temperature: Shipping	-10 – 40 °C
Temperature: Storage	-10 – 40 °C
Weight (depending on motor):	appr. 760 kg

Technical Data PUMA WP 8100 A

Type designation	WP 8100 A
Connection flange (IN)	DN 250 PN 16
Connection flange (OUT)	DN 250 PN 16
Nominal motor speed	2700 – 8100 m^3/h
Input voltage: tolerance	±5 %
Input voltage 50 Hz	400 / 690 V
Motor speed	1500 – 4500 rpm
Rated power 50 Hz	18.5 kW
Rated power 60 Hz	18.5 kW
Sound pressure level (EN ISO 2151) at intake pressure 1 hPa	74 dB(A)
Motor coupling	Magnet coupling
Motor seal	Hermetic sealing
Cooling method	Water
Cooling water pressure	2000 – 6000 hPa
Cooling water flow, min.	2 l/min
Cooling water temperature	5 – 35 °C
Integral leak rate	$1 \cdot 10^{-6}$ Pa m^3/s
Sound pressure level (EN ISO 2151) at intake pressure 10 hPa	79 dB(A)
Motor protection	3TF
Protection degree	IP55
Oil amount	3 l
Temperature: Shipping	-10 – 40 °C
Temperature: Storage	-10 – 40 °C
Weight (depending on motor):	appr. 760 kg

15 Oil

To know which oil has been filled in the machine, refer to the nameplate.

Consumables

Description	Article number
P3, mineral oil, 1 l	2000025858
P3, mineral oil, 5 l	2000025859
P3, mineral oil, 20 l	2000025860
H1, 1 l	2000025889
H1, 5 l	2000025890
H1, 20 l	2000025891
H1, 208 l	2000025892
VSC 100/D2, 1 l	0831168356
VSC 100/D2, 5 l	0831168357
VSC 100/D2, 10 l	0831210162

16 EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the name plate are valid for the machine(s) within the Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine(s) is integrated into a superordinate machinery, the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the CE-marking.

The manufacturer

Pfeiffer Vacuum GmbH
Berliner Straße 43
DE-35614 Asslar

declares that the machine(s): PUMA WP 5400 A; PUMA WP 8100 A

fulfill(s) all the relevant provisions from EU directives:

- 'Machinery' 2006/42/EC
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

and comply(-ies) with the following harmonized standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN ISO 12100 : 2011	Safety of machinery - Basic concepts, general principles of design
EN 1012-2 : 2011	Vacuum pumps - Safety requirements - Part 2
EN ISO 13857 : 2020	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN ISO 2151 : 2009	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN IEC 63000 : 2019	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
EN 61000-3-2 : 2019 Class A (industry)	Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3 : 2020	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.
ISO 21360-1 : 2012	Vacuum technology - Standard methods for measuring vacuum-pump performance - Part 1: General description

Legal person authorized to compile the technical file and authorized representative in the EU (if the manufacturer is not located in the EU):

Dr. Adrian Wirth
Pfeiffer Vacuum+Fab Solutions GmbH
Berliner Str. 43
DE-35614 Asslar

Asslar, 2025.01.16

Daniel Sälzer, General Manager

17 UK Declaration of Conformity

This Declaration of Conformity and the UKCA-markings affixed to the name plate are valid for the machine(s) within Busch scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine(s) is integrated into a superordinate machinery, the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the UKCA-marking.

The manufacturer

Pfeiffer Vacuum GmbH
Berliner Straße 43
DE-35614 Asslar

declares that the machine(s): PUMA WP 5400 A; PUMA WP 8100 A

fulfill(s) all the relevant provisions from UK legislations:

- Supply of Machinery (Safety) Regulations 2008
- Electromagnetic Compatibility Regulations 2016
- Restriction of the use of certain hazardous substances in Electrical and Electronic Equipment Regulations 2012

and comply(-ies) with the following designated standards that have been used to fulfill those provisions:

Standard	Title of the Standard
EN ISO 12100 : 2011	Safety of machinery - Basic concepts, general principles of design
EN 1012-2 : 2011	Vacuum pumps - Safety requirements - Part 2
EN ISO 13857 : 2020	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN ISO 2151 : 2009	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN IEC 63000 : 2019	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
EN 61000-3-2 : 2019 Class A (industry)	Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3 : 2020	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.
ISO 21360-1 : 2012	Vacuum technology - Standard methods for measuring vacuum-pump performance - Part 1: General description

Legal person authorized to compile the technical file and importer in the UK (if the manufacturer is not located in the UK):

Pfeiffer Vacuum+Fab Solutions Ltd
16 Plover Close, Interchange Park
UK-MK169PS Newport Pagnell

Asslar, 2025.01.16

Daniel Sälzer, General Manager

BUSCH GROUP

The Busch Group is one of the world's largest manufacturers of vacuum pumps, vacuum systems, blowers, compressors and gas abatement systems. Under its umbrella, the group houses two well-known brands: Busch Vacuum Solutions and Pfeiffer Vacuum+Fab Solutions. Together, they offer solutions to a wide range of industries. A global network of highly competent local teams in 44 countries ensures that expert, tailor-made support is always available near you. Wherever you are. Whatever your business.

- Busch Group companies
- Busch Group production sites
- Busch Group service centers
- Busch Group local representatives

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