Operating Instructions

COBRA DH 2760 | 4560 | 6260 | 2780 | 4580 |6280

Pumping station

Get technical data, instruction manuals, service kits

VACUUM APP

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1 About this manual

Note

IMPORTANT

Read carefully before use.

Keep the manual for future consultation.

1.1 Validity

These operating instructions are a Busch Group customer document. The operating instructions describe the functions of the named product and provide the most important information for the safe use of the unit. The description is written in accordance with the valid directives. The information in these operating instructions refers to the product's current state of development. The document shall remain valid provided that the customer does not make any changes to the product.

1.1.1 Applicable documents

Document	Number
Operating instructions HiLobe 2703 | 4503 | 6203	PW0348 BN
Operating instructions COBRA NS 0600 C	0870565684/-0006
Operating instructions COBRA NS 0800 A	0870207461/-0001
Declaration of conformity	A component of these instructions

Operating instructions of single pumps are not included in scope of delivery. Please download the respective manuals on the website of Busch for COBRA and on the website of Pfeiffer for HiLobe.

1.1.2 Variants

These instructions apply to COBRA DH line pumping stations:

- COBRA DH 2760
- COBRA DH 4560
- COBRA DH 6260
- COBRA DH 2780
- COBRA DH 4580
- COBRA DH 6280

1.2 Target group

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

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

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

1.3 Conventions

1.3.1 Instructions in the text

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

Individual action step

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

► This is an individual action step.

Sequence of multi-part action steps

The numerical list indicates an action with multiple necessary steps.

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

1.3.2 Pictographs

Pictographs used in the document indicate useful information.

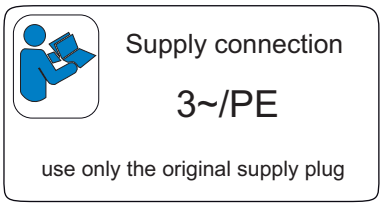
Note

Tip

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

1.3.3 Labels on product

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

	**Rating plate (example)** The rating plate for the pumping station is located on the side of the metal cladding.
	**Mains connection** This sticker indicates that you must use the original power supply connector.
	**Electrical voltage warning** The sticker warns of the risk of electric shock when working with the housing open.

	**Operating instructions note** This sticker indicates that this operating instructions must be read before performing any tasks.
	**Warning hot surface** This label warns of injuries caused by high temperatures as a result of contact without protection during operation.

Tbl. 1: Labels on product

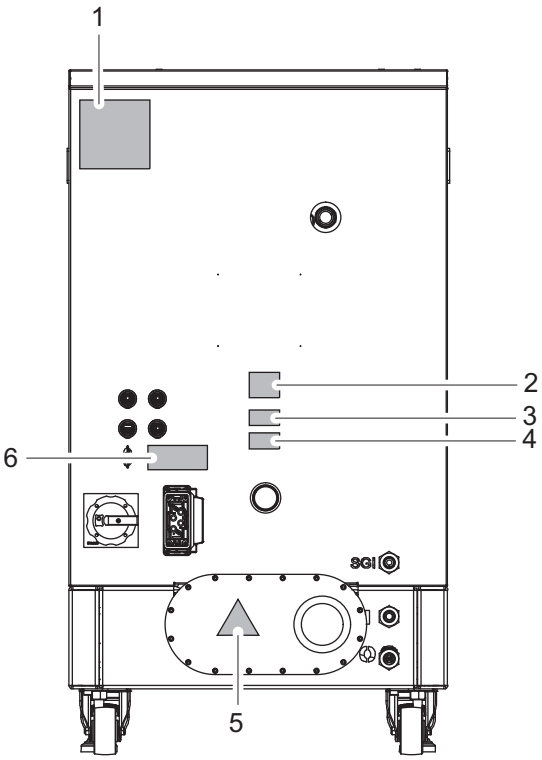


Fig. 1: Position of the labels on the product

1 Pumping station rating plate
2 Note: Read the operating instructions
3 Warning sign for live voltage
4 Warning sign for live voltage
5 Warning notice: hot surface
6 Note: Mains connection

1.3.4 Abbreviations

Abbreviation	Explanation
BA	Operating instructions
DGC	Dilution gas connection
FC	Frequency converter
I	Cooling water connection, inlet (cooling water inlet)
O	Cooling water connection, outlet (cooling water outlet)
SGI	Auxiliary gas

Tbl. 2: Abbreviations used

2 Safety

2.1 General safety information

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

DANGER

Immediately pending danger

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

► Instructions to avoid the danger situation

WARNING

Potential pending danger

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

► Instructions to avoid the danger situation

CAUTION

Potential pending danger

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

► Instructions to avoid the danger situation

NOTICE

Danger of damage to property

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

► Instructions to avoid damage to property

Note

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

2.2 Safety instructions

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

Risks during transport

WARNING

Risk of serious injury from swinging, toppling or falling objects

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

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

Risks during installation

DANGER

Danger to life from electric shock

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

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

DANGER

Danger to life from electric shock

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

- ▶ Connect only suitable devices to the bus system.

WARNING

Risk of danger to life through missing mains disconnection device

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

- ▶ Install a suitable motor protection switch.

WARNING

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

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

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

WARNING

Risk of crushing from rotating parts

Fingers and hands may be caught by rotating pistons within the connection flange. This results in severe injuries.

- ► Keep limbs out of the reach of the roots pump.

WARNING

Risk of scalding from suddenly escaping hot cooling water

The cooling water connections are open to both sides. When connecting the cooling water supply, there is a risk of scalding from the sudden escape of overpressurized hot water.

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

CAUTION

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

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

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

CAUTION

Electric shock and damage to the vacuum pump and electronic drive unit due to improper connection and disconnection of components

With existing power supply connection to the switch box, there is a risk of electric shock when making contact with the motor connecting plug. Even after the power supply has been switched off, the vacuum pump continues to deliver electrical energy during its run-down period. If the units are disconnected prematurely, there is the risk of electric shock, and destruction of electric components.

- ► Always interrupt the power supply connection at the switch box before connecting the power supply plug to the motor.
- ► With existing power supply connection to the switch box or when the pistons are running, never disconnect the motor connecting plug.
- ► After switching off, wait at least another 5 minutes until the capacitors have discharged before separating the cable connection.

CAUTION

Danger of burns on hot surfaces

Depending on the operating and ambient conditions, the surface temperature of the vacuum pump can increase to above 70 °C. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

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

Risks during operation

WARNING

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

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

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

CAUTION

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

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

- ► Route the exhaust line without shut-off units.
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CAUTION

Danger of burns on hot surfaces

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

Risks during maintenance, decommissioning and in the event of malfunctions

WARNING

Danger to life from electric shock during maintenance and service work

There is a danger to life from electric shock when making contact with live components that still exist after the vacuum pump has been switched off.

- ► Disconnect the vacuum pump safely from the mains.
- ► Wait until the vacuum pump comes to a standstill (rotation speed = 0).
- ► After switching off the vacuum pump, wait another 5 minutes until the capacitors have discharged.

WARNING

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

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

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

WARNING

Risk of crushing from rotating parts

Fingers and hands may be caught by rotating pistons within the connection flange. This results in severe injuries.

- ► Keep limbs out of the reach of the roots pump.

WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

CAUTION

Scalding from hot lubricant

Danger of scalding when draining lubricant if it comes into contact with the skin.

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

NOTICE

Damage from placing objects on the sheet metal cladding

Objects placed on the sheet metal cladding can lead to damage at the pumping station.

- ► Do not place or set anything on the pumping station.
- ► The sheet metal cladding must not be loaded from the outside.

2.3 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 re-evaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

General safety precautions

- ► Do not expose body parts to the vacuum.
- ► Observe the safety and accident prevention regulations, if necessary wear personal protective equipment.
- ► Check all safety measures at regular intervals.
- ► Always ensure a secure connection to the earthed conductor (PE), protection class I.
- ► During operation, make sure that plug-and-socket connections are securely fitted.
- ► Never operate the vacuum pump with open vacuum flange.
- ► Never make your own conversions or modifications to the vacuum pump.
- ► Before returning the vacuum pump, observe the notes in the chapter Service.

2.4 Limits of use

Parameter	COBRA DH
Installation location	Weatherproof (internal space)
Installation altitude	max. 2000 m above m.s.l.
Orientation	horizontal, max. permissible angle of inclination: ±3°
Ambient temperature	+5°C to +45°C
Relative air humidity	max. 85%
Degree of pollution	2
Protection class	I
Overvoltage category	II
Permissible protection degree	IP54 Type 12 according to UL 50E

Tbl. 3: Permissible ambient conditions

2.5 Proper use

- Utilize the pumping station exclusively for generating a high vacuum.
- Utilize the pumping station only in closed indoor areas.
- Operate only the as-delivered variant of the pumping station with the accessories approved for it.

2.6 Foreseeable improper use

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

- Establishing the voltage supply without correct installation
- Installing with non-specified fastening material
- Starting up without correct installation (including a trial run)
- Pumping toxic media
- Pumping radioactive media
- Pumping biologically contaminated media
- Pumping explosive media

- Pumping of corrosive media
- Pumping of condensing vapors
- Pumping of fluids
- Pumping of dust
- Operating with excessive irradiated heat output
- Operating in impermissible high magnetic fields
- Venting with impermissible high venting rates
- Using for pressure generation
- Using in areas with ionizing radiation
- Operation in potentially explosive areas
- Using in systems in which sporadic loads and vibrations or periodic forces act on the device
- Causing of hazardous operating conditions by a presetting on the electronic drive unit that is contrary to the process
- Using of accessories or spare parts that are not listed in these instructions
- Use as a transport tool

2.7 Personnel qualification

The work described in this document may only be carried out by persons who have appropriate professional qualifications and the necessary experience.

Training people

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

2.7.1 Ensuring personnel qualification

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

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

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

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

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

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

2.7.2 Personnel qualification for maintenance and repair

Adequately trained individuals are:

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

3 Product description

3.1 Function

The pumping stations in the COBRA DH model series are dry-compressing, fully integrated pump units. The station is designed as a mobile free-standing model; it consists of a roots pump and a backing pump specially matched to it.

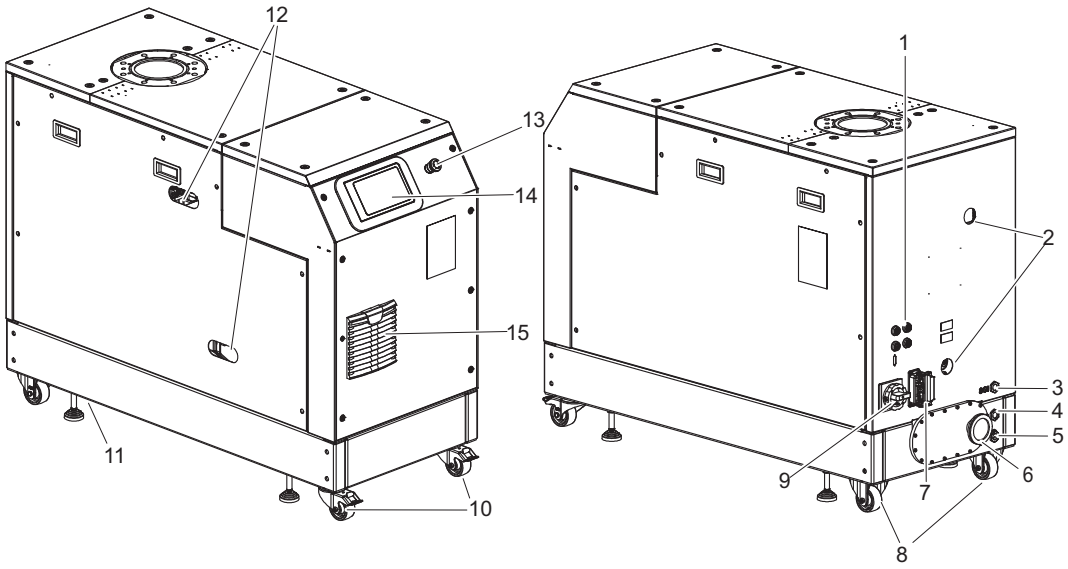

Fig. 2: COBRA DH Pumping station

1 RJ-45 connector, 3×, USB connector 1×
2 Sight glass, 2×
3 Auxiliary gas connector
4 Cooling water connection, inlet
5 Cooling water connection, outlet
6 Exhaust connection, silencer (optional)
7 D-Sub bushing
8 Fixed roller, 2×
9 Main switch (optional)
10 Castors, 2×
11 Adjustable foot, 4×
12 Sight glass, 2×
13 Emergency stop (optional)
14 7" touch display
15 Ventilation grille

3.1.1 Operating interface

The integrated user interface is used to control the entire pumping station. The 7" touch display is located on the front side of the unit.

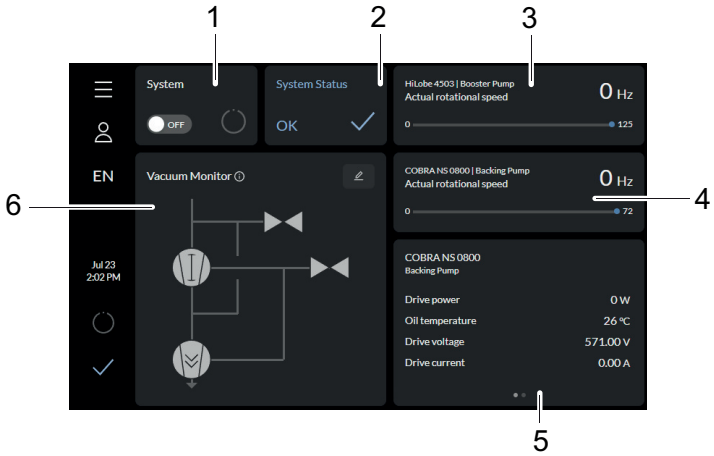

Fig. 3: COBRA DH Dashboard

1 Display for pumping station/switching on the pumping station (system)
2 System status
3 Actual rotation speed of roots pump
4 Actual rotation speed of backing pump
5 Parameter list
6 Vacuum diagram (vacuum monitor)

3.1.2 Cooling

The pumping station has water cooling.

The electronic drive unit automatically regulates the drive power down in the event of excessive temperatures.

3.2 Identifying product

To ensure unambiguous identification of the product when communicating with the Busch Group, always keep all of the information on the rating plate at hand.

The following information is shown on the rating plates:

- Pump model
- Model number
- Type and quantity of the lubricant
- Max. allowable pump rotation speed
- Date of manufacture
- Input voltage range (motor rating plate)

3.3 Product features

Feature	COBRA DH
HV flange	DN 160 ISO-F PN 16
Control unit	7" touch display
Roots pump	HiLobe 2703 | 4503 | 6203
Screw-type vacuum pump	COBRA NS 0600 C COBRA NS 0800 A

Tbl. 4: COBRA DH | Combining components

3.4 Scope of delivery

- COBRA DH pumping station
- Protective cap for the high vacuum flange
- Mating plug for mains connection
- Operating fluid
- Operating instructions for pumping station

4 Transportation and Storage

4.1 Transporting the pumping station

WARNING

Danger of serious injury due to falling objects

Due to falling objects there is a risk of injuries to limbs through to broken bones.

- ► Take particular care and pay special attention when transporting products manually.
- ► Do not stack the products.
- ► Wear protective equipment, e.g. safety shoes.

CAUTION

Danger of injury due to the pumping station tipping or rolling away

Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.

- ► Place the pumping station on a flat installation surface.
- ► Anchor the pumping station at the installation location.
- ► Wear personal protective equipment.

Packing

We recommend keeping the transport packaging and original protective cover.

General information regarding safe transport

- ► Observe the weight specified on the packaging.
- ► Use personal protective equipment, e.g. safety shoes.
- ► Utilize transport equipment, e.g., fork lift truck or pallet truck.
- ► Where possible, always transport or ship the pumping station in the original packaging.
- ► Always move the product upright, and over the flattest possible surface.
- ► Always place the product on an adequately sized, level surface.
- ► Remove the protective cap only immediately prior to installation.

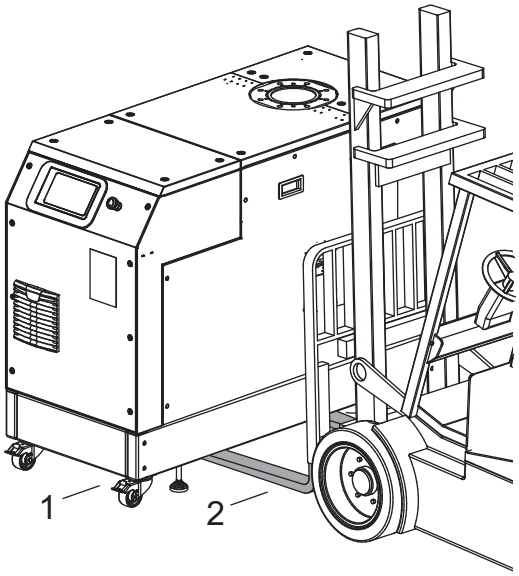

Fig. 4: Transporting pumping station with fork lift truck

1 Pumping station 2 Fork arms

Transporting pumping station with fork lift truck

1. Position the fork arms beneath the base frame.
2. You must take utmost care at all times when transporting the pumping station using a fork lift truck or a pallet truck.

4.2 Store pumping station

Packing
We recommend storing the product in its original packaging.

Store pumping station

1. Seal the flange opening with the original protective cover.
2. Seal all other connections (e.g., exhaust) with the corresponding protective caps.
3. Store the pumping station only in dry, dust-free rooms, within the specified ambient conditions.
4. In rooms with humid or aggressive atmospheres: Hermetically seal the pumping station together with a drying agent in a plastic bag.

5 Installation

5.1 Preparing for set-up

WARNING

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

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

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

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.

5.2 Setting up the pumping station

CAUTION

Danger of burns on hot surfaces

Depending on the operating and ambient conditions, the surface temperature of the vacuum pump can increase to above 70 °C. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

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

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.

Procedure

1. Check the carrying capacity of the floor at the installation location.
2. Ensure sufficient space under the vacuum pump for a collection receptacle when filling or changing lubricant.
3. Ensure the prescribed mounting orientation of the vacuum pump before the vacuum pump is filled with lubricant for the first time.
4. Place the vacuum pump on a flat, horizontal and fixed surface, to safeguard the lubricant supply.
   - Reference surface is the vacuum flange.
5. Screw the vacuum pump to the base without tension.
6. Maintain the minimum distances to bordering surfaces to guarantee sufficient air circulation.
7. Leave the filling/drain holes and sight glasses freely accessible.
8. Fill with lubricant prior to first commissioning.

Note

Screwing down adjustable feet at installation location

Screw down the 4 adjustable feat at the installation location to avoid the pumping station resting on its rollers.

5.3 Filling with lubricant

WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic lubricants 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 lubricant.

NOTICE

Property damage from using non-approved lubricant

Attainment of product-specific performance data is not ensured. If non-approved lubricants are used, all liability and warranty claims against Pfeiffer Vacuum are excluded.

- ► Use only lubricants approved by Pfeiffer Vacuum.
- ► Use alternative, application-specific lubricants only following consultation with Pfeiffer Vacuum.

Note

Please note that the vacuum pumps are shipped pre-filled with lubricant. Filling with lubricant should only be done if the vacuum pump is not already pre-filled.

Prerequisite

- Side panels removed

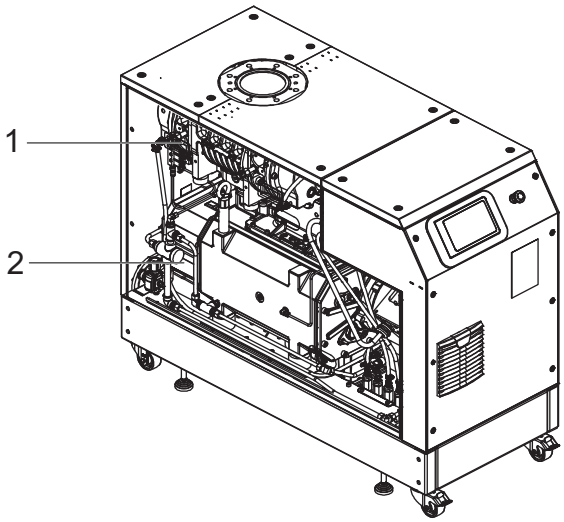

Fig. 5: Side panel removed

1 Roots pump 2 Backing pump

Permissible lubricants

- D2/VSC 100 (standard operating fluid)
- YLC 250 B
- Other lubricants on request

The lubricant type is specified on the rating plate

► Please refer to rating plate of the vacuum pump for type and quantity of intended lubricant.
  – Only the lubricant used during initial installation is permissible.
► Contact your Busch Group representative if you want to use another type of lubricant.

Roots pump

Required consumables

- Lubricant of the vacuum pump

Required tools

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

Required aids

- Collection receptacle

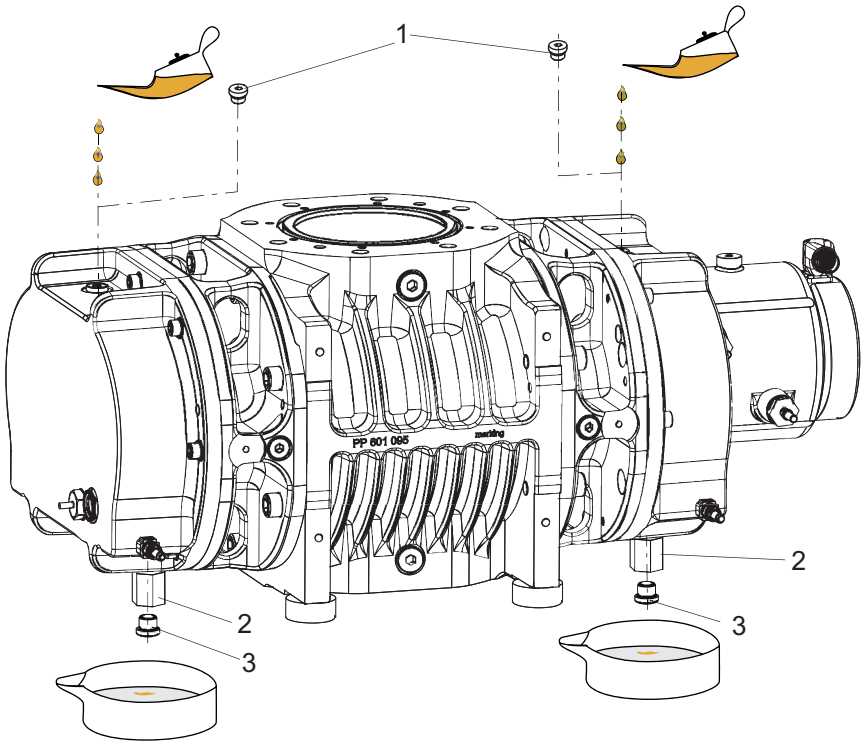

Fig. 6: Filling with lubricant, roots pump

1 Filler screw, 2x
2 Fill level limiter
3 Drain screw

Filling up lubricant

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

- Filling quantity motor side: approx. 0.50 l
- Filling quantity opposite side: approx. 0.50 l

Filling with lubricant, roots pump

1. Make sure that there is sufficient space underneath the pump to be able to place a collection receptacle for the lubricant.
2. Unscrew the filler screws.

3. Hold the fill level limiter with the ring spanner and unscrew the drain screw at the same time.
4. Place a collection receptacle under each drain.
5. Fill the lubricant on both sides up to the maximum fill level.
   - Once full, lubricant overfills the fill level limiter, and drips out of the drain hole.
   - Fill level is visible in the center of the sight glass.
6. Screw the filler and drain screws back in.

Backing pump

Required consumables

- Lubricant of the vacuum pump

Required tools

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

Required aids

- Collection receptacle

Filling up lubricant

The oil chambers of the screw-type vacuum pump are each equipped with an oil sight glass.

- Filling quantity motor side: approx. 0.80 l
- Filling quantity intake side: approx. 0.80 l

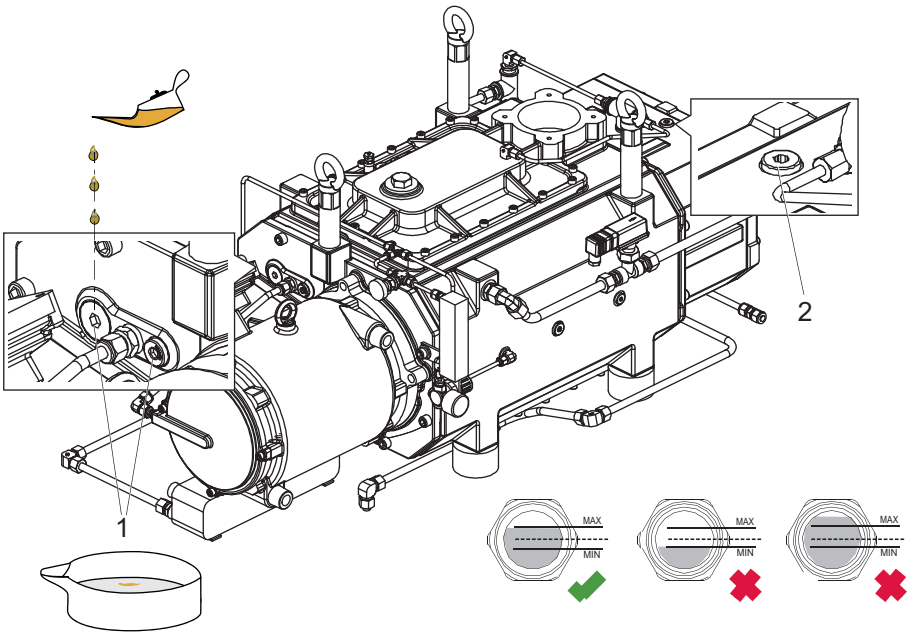

Fig. 7: Filling with lubricant, backing pump

1 Filler screw motor side, 2x 2 Filler screw, opposite side

Filling with lubricant, backing pump

1. Unscrew the filler screws.
2. Fill with lubricant up to the maximum fill level.
   - Fill level is visible in the center of the sight glass.
3. Screw the filler screws back in.

5.4 Filling with cooling liquid

Note

Please note that the vacuum pumps are shipped pre-filled with cooling liquid. Filling with cooling liquid should only be done if the vacuum pump is not already pre-filled.

Required consumables

- Cooling liquid (Zitrec M 25), see Technical Data for quantity

Required tool

- Allen key, **WAF 10**

Required aids

- Funnel (optional)

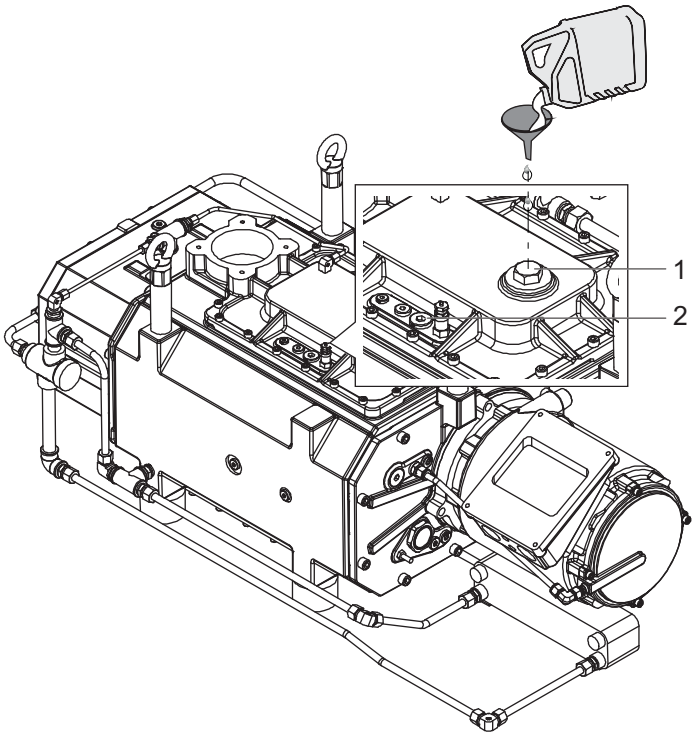

Fig. 8: Filling with cooling liquid

1 Filler screw 2 Vent screw

Filling with cooling liquid

1. Unscrew the filler screw.
2. Unscrew the venting screw.
3. Fill up with cooling liquid to the top of the vent orifice.
4. Screw in the venting screw.
5. Screw in the filler screw.

5.5 Connecting the vacuum side

WARNING

Risk of crushing from rotating parts

Fingers and hands may be caught by rotating pistons within the connection flange. This results in severe injuries.

► Keep limbs out of the reach of the roots pump.

NOTICE

Property damage from intake of solid particles

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

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

Required tools

- Ring spanner, **WAF 13** with flange DN 160 ISO-F
- Ring spanner, **WAF 30** with flange DN 150 PN16

Connecting the vacuum side

1. Degrease the connection flange.
2. Clear welded lines of any scaling, loose particles etc. prior to installation.
3. Route the piping between the vacuum pump and vacuum chamber so that it remains as short as possible; at a minimum, the nominal diameter of the pump flange.
4. Select a larger nominal diameter for pipe lengths > 5 m.
5. Support or suspend the piping to the vacuum pump so that no piping system forces act on the vacuum pump.
6. Always use **all** prescribed bolts for fastening the flanges and consider the prescribed pressure stage for PN 16.

5.6 Making cooling water connection

WARNING

Risk of scalding from suddenly escaping hot cooling water

The cooling water connections are open to both sides. When connecting the cooling water supply, there is a risk of scalding from the sudden escape of overpressurized hot water.

► Prior to installation, ensure that pressure is discharged from the cooling water system, and that it is cooled down.
► Wear protective equipment, e.g., safety goggles and gloves.

Parameter	Cooling water
Cooling water temperature	5 – 30°C
Water pressure	1.5 - 5.0 barg (relative pressure)
Necessary differential pressure between flow and return flow	1.5 bar
Total min. water flow	14 l/min

Parameter	Cooling water
Water hardness	< 5° dH (Germany)
	< 9° fH (France)
	< 1.25° e (England)
	< 90 mg/kg CaCO3 (USA)
Appearance	• filtered • mechanically clear • visually clear • no turbidity • no sediment • free from grease and oil
pH value	7 to 9
Particle size	< 200 mm
Chloride	< 100 mg/l
Free chlorine	< 0.3 mg/l
Substances in contact with media	Stainless steel, copper

Tbl. 5: Requirements on the cooling water composition

5.7 Connecting accessories

Installation and operation of accessories

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

- Information and ordering options for approved accessories can be found online.
- Described accessories are not included in the shipment.

5.8 Connecting the auxiliary gas

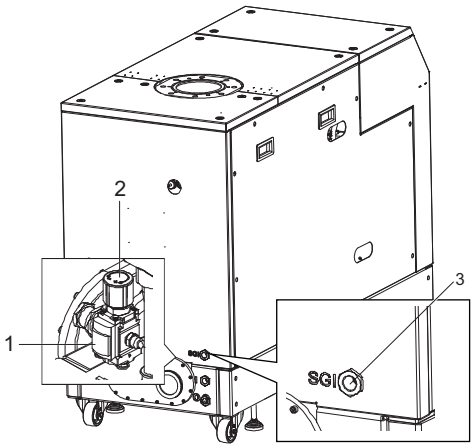

Fig. 9: Connecting auxiliary gas external supply

1 Pressure regulator
2 Pressure reading
3 Auxiliary gas connector

Connecting auxiliary gas external supply

1. Screw a connecting coupling with sealing ring into the G 1/2" filter bore.
2. Connect an external supply with nitrogen (N_2) or another dry, inert gas to the coupling.
3. With the gas supply, observe the maximum permissible inlet pressure.
4. Set the inlet pressure of the auxiliary gas at the pressure reducer.
   – The desired quantity of sealing gas can be also set on the dosing valve of the flow meter of the COBRA pumping station (see page 58).

5.9 Connecting to mains power supply

DANGER

Danger to life from electric shock

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

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

WARNING

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

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

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

The vacuum pumps are intended for operation only with original electronic drive unit and frequency converter. The respectively valid input voltage range can be seen on the rating plate.

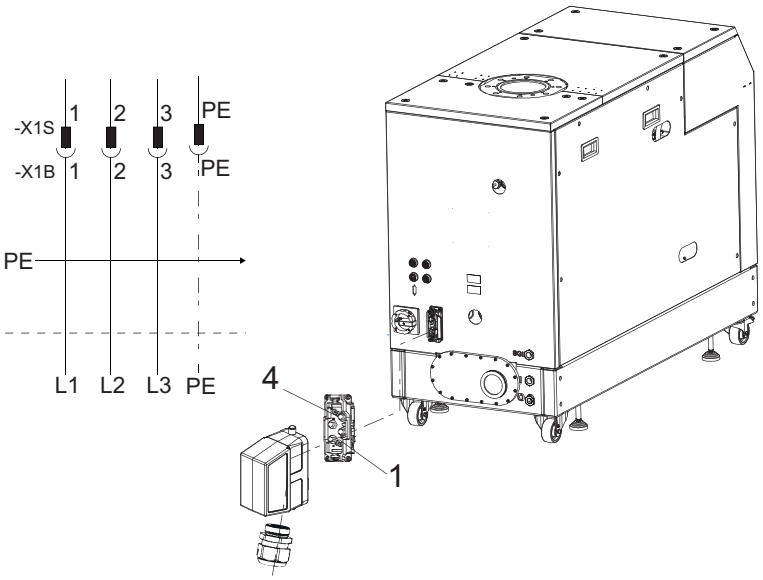

Fig. 10: Mains connection pin assignment

1	Phase L1	3	Phase L3
2	Phase L2	PE	Earthed conductor

L1 | L2 | L3 and PE cable cross section	Dielectric strength	Flammability properties
=16 mm²	≥ 600 V	flame-retardant

Tbl. 6: Required properties of the power supply cable

Connecting to mains power supply

- ► Ensure the correct supply voltage (see chapter “Technical data”, page 83).
- ► Assemble your own power supply cable using the original power supply connector from the scope of delivery.

6 Interfaces

6.1 "Remote" interface

NOTICE

Property damage on the electronics

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

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

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

- ► Utilize the screened plug and cable.

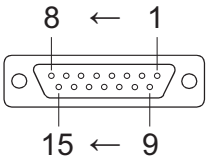

Fig. 11: Pin assignment of the D-Sub socket, 15-pin

Pin	Function	Description, factory setting
1	n.c.	
2	DI access request	V+: Control via DIs, --> GND/open: Control unlocked
3	DI1	V+: Rotation speed setting mode, --> GND/open: no rotation speed setting mode
4	DI2	V+: External error, --> GND: no external error
5	DI pumping station	V+: Vacuum pump on, --> GND/open: Vacuum pump off
6	DI stand-by	V+: Stand-by, --> GND/open: no stand-by
7	+24 V DC output (V+)	Reference voltage for all digital inputs (5 W max.)
8	DO1	GND: Error, V+: no error (current max. 80 mA)
9	DO2	GND: Vacuum pump off, V+: Vacuum pump on (current max. 80 mA)
10	n.c.	
11	n.c.	
12	n.c.	
13	RS-485	D+
14	RS-485	D-
15	Ground (GND)	Ground connection of the voltage supply; reference ground for all digital inputs and outputs

Tbl. 7: Plug arrangement of the D-Sub socket, 15-pin

6.1.1 Voltage output

24 V DC output / pin 7: Inputs 2 to 6 are activated if they are connected to pin 7 (active high) with +24 VDC. They can also be activated via an external PLC. The functions are deactivated by "PLC high level" and by "PLC low level".

- PLC High level: +13 V to +33 V
- PLC Low level: -33 V to +7 V
- Ri: 7 kΩ
- I_{max} < 200 mA

6.1.2 Inputs

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

DI remote priority/pin 2

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

DI1 (rotation speed setting mode)/pin 3

V+:	Rotation speed setting mode "active"
open	Rotation speed setting mode "inactive"

DI2/pin 4

V+:	External error, --> GND: no external error.

DI pumping station/pin 5

V+:	Vacuum pump on. Control of all components connected and malfunction acknowledgement.
open	Vacuum pump off

DI stand-by / pin 6

V+:	Stand-by activated The stand-by rotation speed is fixed at 30 Hz.
GND/ open	Stand-by off

6.1.3 Outputs

The digital outputs have a maximum load limit of 24 V/80 mA per output. All outputs listed are configurable with the Pfeiffer Vacuum parameter set via the RS-485 interface (description relates to factory settings).

DO1/Pin 8

V+:	No errors After applying the voltage supply, the digital output DO1 permanently outputs V+ meaning which means "no error".
GND	Error "Active low" signifies "Error" (common error message).

DO2/Pin 9

V+:	Vacuum pump on "Active high" means ''Vacuum pump on'' and rotates at set rotation speed. Example: use the signal for the message vacuum pump "Ready for operation".
GND:	Vacuum pump off

6.1.4 RS-485

Connecting RS-485 via D-Sub

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

6.2 Using RS-485 interface

DANGER

Danger to life from electric shock

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

- ► Connect only suitable devices to the bus system.

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

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

Tbl. 8: Features of the RS-485 interface

Connecting Pfeiffer Vacuum control units or a PC

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

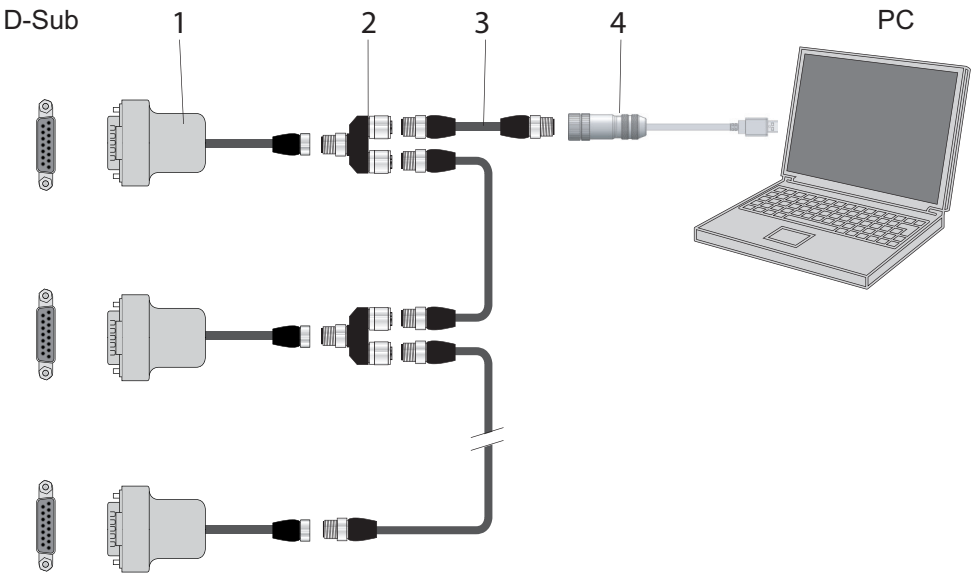

Fig. 12: Cross-link via connection RS-485 using connection cables and accessories

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

Networking as RS-485 bus

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

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

6.3 Pfeiffer Vacuum protocol for RS-485 interface

6.3.1 Telegram frame

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

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

a2 – a0	Device address ○ ● Individual address of the unit ["001";"255"] ● Group address "9xx" for all identical units (no response) ● Global address "000" for all units on the bus (no response)
*	Action according to telegram description
n2 – n0	Pfeiffer Vacuum parameter numbers
I1 – I0	Data length dn to d0
dn – d0	Data in the respective data type (see chapter “Data types”, page 35).
c2 – c0	Checksum (sum of ASCII values of cells a2 to d0) modulo 256
C_R	carriage return (ASCII 13)

6.3.2 Telegram description

Data query 💻 --> ○ ?

a2	a1	a0	0	0	n2	n1	n0	0	2	=	?	c2	c1	c0	c_R

Control command 💻 --> ○ !

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

Data response / Control command understood ○ --> 💻

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

Error message ○ --> 💻

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

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

6.3.3 Telegram example 1

Data query

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

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

Data response: 633 Hz
Current rotation speed (parameter **[P:309]**, device address: "123")

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

6.3.4 Telegram example 2

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

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

Control command understood
Switch on the pumping station (parameter **[P:010]**, device address: "042"

○ --> 💻	0	4	2	1	0	0	1	0	0	6	1	1	1	1	1	1	0	2	0	c_R
ASCII	48	52	50	49	48	48	49	48	48	54	49	49	49	49	49	49	48	50	48	13

6.3.5 Data types

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

6.4 Connect to web interface

Connecting operating unit with web interface

- ► Connect the operating unit (e.g., laptop or PC) to the same network as the COBRA DH pumping station.
- ► If needed, open a connection to a computer that uses Remote Desktop to access the same network as the COBRA DH pumping station.
  - – The web interface runs on the Remote Desktop computer.

Default network settings of the COBRA DH pumping station

- DHCP
- DHCP fallback
- The HiCube Neo falls back to its static IP address if the connected network does not have a DHCP server (router).
- Default IP address: 192.168.1.100
- You can configure the static IP address for static network operation and/or for DHCP fallback.

6.4.1 Connecting web interface via factory pre-set DHCP network configuration

Prerequisites

- Operating unit and COBRA DH connected to the same network
- Network has a router or DHCP server
- DHCP server on the network has automatically assigned IP addresses to the operating unit and COBRA DH

Options for discovering the IP address assigned to the COBRA DH pumping station

- Read off the IP address from the Help page on the display.
- View the network devices on the router.
- Perform a network scan with the operating unit.

Procedure

1. Type the IP address determined for the COBRA DH pumping station into the browser address bar.
2. Press Enter.
   - The browser connects to the COBRA DH pumping station and the Dashboard appears.

6.4.2 Connecting web interface via factory pre-set static IP address

Note

DHCP server not found on the network

- The COBRA DH pumping station falls back to its pre-set IP address if DHCP is enabled on the COBRA DH but it cannot find a DHCP server on the network.
- Default IP address: 192.168.1.100

Prerequisites

- Operating unit and COBRA DH connected to the same network, e.g., via a direct connection
- Network does not have a router or DHCP server
- Operating unit configured with an IP address on the same network as the COBRA DH pumping station (e.g., 192.168.1.101)

Procedure

► Type the default IP address of the COBRA DH pumping station in the browser address bar.
► Press Enter.
   - The browser connects to the COBRA DH pumping station and the Dashboard appears.

6.4.3 Connect web interface via user-defined IP address

Note

Unknown IP address

If you have changed the IP address and lost the new IP address, please contact Pfeiffer Vacuum.

Procedure

1. Type the user-defined IP address of the COBRA DH into the browser address bar.
2. Press Enter.
   – The browser connects to the COBRA DH pumping station and the Dashboard appears.

6.5 "Ethernet" (LAN) connector

The "Ethernet" connector enables direct communication with the unit via a computer in addition to standard control via the display.

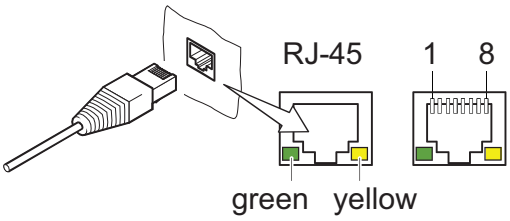

Fig. 13: "Ethernet" (LAN) connector

1 Data line (D1+)	5 Data line (D3+)
2 Data line (D1-)	6 Data line (D3-)
3 Data line (D2+)	7 Data line (D4+)
4 Data line (D2-)	8 Data line (D4-)

LED	Status	Meaning
Green (link)	lights up	Hardware connection exists
	dark	No hardware connection
Yellow (activity)	lit up (flickering)	Data transmission runs
	dark	no data transmission / no connection

Tbl. 9: Status of the Ethernet connection

7 Parameter set

7.1 General

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

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

Note

Non-volatile data storage

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

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

Tbl. 10: Explanation and meaning of the parameters

7.2 Control commands

Parameter	Parameter name	Designations	Access	Data type	Min	Max	Default	Functions	
P002	Stand-by	Stand-by	RW	0	0	1	0	0 = off 1 = on	✓
P006	Auto stdby	Automatic standby	RW	0	0	1	0	0 = off 1 = on	✓
P009	ErrorAckn	Malfunction acknowledgement	WO	0	0	1	0	1 = Malfunction acknowledgement	
P010	PumpgStatn	Pumping station	RW	0	0	1	0	0 = off 1 = on	✓
P025	ExhPmpMode	Exhaust pump operating mode	RW	7	0	3	0	0 = closed 1 = open 2 = Stand-by	✓
P026	SpdSetMode	Rotation speed setting mode	RW	7	0	1	0	0 = off 1 = on	✓

Parameter	Parameter name	Designations	Access	Data type	Min	Max	Default	Functions	💾
P035	Cfg Acc A1	Configuration accessory connection A1	RW	7	0	7	0	0 = Sealing gas valve 1 = Purge valve 2 = Exhaust gas pump 3 = Cooling gas valve 6 = always 0 7 = always 1	✓
P036	Cfg Acc B1	Configuration accessory connection B1	RW	7	0	7	2	See P035	✓
P037	Cfg Acc A2	Configuration accessory connection A2	RW	7	0	7	1	See P035	✓
P038	Cfg Acc B2	Configuration accessory connection B2	RW	7	0	7	2	See P035	✓
P050	SealingGas	Sealing gas	RW	0	0	1	0	0 = off 1 = on	✓
P051	CoolingGas	Cooling gas	RW	0	0	1	0	0 = off 1 = on	✓
P052	PurgeGas	Flushing gas	RW	0	0	1	0	0 = off 1 = on	✓
P060	CtrlViaInt	Operate via interface	RW	7	0				✓
P061	IntSelLckd	Interface selection locked	RW	0	0				✓
P068	Cfg Acc C1	Configuration accessory connection C1	RW	7	0	7	3	See P035	✓
P072	PGMode	Flushing gas operating mode	RW	7	0	2	0	0 = closed 1 = open 2 = auto	✓
P073	CGMode	Cooling gas operating mode	RW	7	0	2	0	0 = off 1 = Direct cool 2 = Temperature controlled	✓
P074	Cfg Acc C2	Configuration accessory connection C2	RW	7	0	7	6	See P035	✓
P075	SGMode	Sealing gas operating mode	RW	7	0	2	0	0 = closed 1 = open 2 = auto	✓
P080	ExhPmp	Exhaust gas pump	RW	0	0	1	0	0 = off 1 = on	✓
P081	PrgGasType	Gas type flushing gas	RW	7	0	27	1	Semi-standard E52-0703	✓
P082	PrgMFC	Flushing gas MFC	RW	0	0	1	0	0 = off 1 = on	✓
P095	FactorySet	Factory settings	WO	0	0	1	0	0 = off 1 = on	

Tbl. 11: Parameter set | Control commands

7.3 Status requests

Parameter	Indicator	Designations	Component	Access type	Unit	Data type
P303	Error code	Error code		RO		4
P306	SetSpdAtt	Set rotation speed reached	Booster	RO		0
P308	SetRotSpd	Set rotation speed	Booster	RO	Hz	1
P309	ActualSpd	Actual speed	Booster	RO	Hz	1
P310	DrvCurrent	Drive current	Booster	RO	A	2
P312	Fv version	Control unit software version		RO		4
P313	DrvVoltage	Intermediate circuit voltage	Booster	RO	V	2
P314	OpHrsElec	Control unit operating hours		RO	h	1
P315	Nominal Spd	Nominal rotation speed	Booster	RO	Hz	1
P316	DrvPower	Drive power	Booster	RO	W	1
P317	MotCurrent	Motor current	Booster	RO	A	2
P324	TmpPwrStg	Temperature power stage	Booster	RO	°C	1
P337	PrgGasAVal	Flushing gas flow		RO	slm	2
P342	TempOilL	Current oil temperature, floating bearing side	Booster	RO	°C	1
P343	TempExhGas	Current exhaust gas temperature	Booster	RO	°C	1
P347	TempOilF	Current oil temperature, fixed bearing side	Booster	RO	°C	1
P349	ElecName	Device name designation		RO		4
P352	FWVERSDRV	Firmware of the FC	Booster	RO		4
P354	HW Version	Hardware version interface circuit board		RO		4
P355	Serial No	Serial number		RO		11
P360	ErrHist1	Error code history, item 1		RO		4
P361	ErrHist2	Error code history, item 2		RO		4
P362	ErrHist3	Error code history, item 3		RO		4
P363	ErrHist4	Error code history, item 4		RO		4
P364	ErrHist5	Error code history, item 5		RO		4
P365	ErrHist6	Error code history, item 6		RO		4
P366	ErrHist7	Error code history, item 7		RO		4
P367	ErrHist8	Error code history, item 8		RO		4
P368	ErrHist9	Error code history, item 9		RO		4
P369	ErrHist10	Error code history, item 10		RO		4
P370	SetRSpdBKP	Set rotation speed	Backing pump	RO	Hz	1
P371	ActSpdBKP	Actual speed	Backing pump	RO	Hz	1
P372	DrvCurrBKP	Drive current	Backing pump	RO	A	2
P373	DrvVoltBKP	Intermediate circuit voltage	Backing pump	RO	V	2
P374	NomSpdBKP	Nominal rotation speed	Backing pump	RO	Hz	1
P375	DrvPwrBKP	Drive power	Backing pump	RO	W	1
P376	MotCurrBKP	Motor current	Backing pump	RO	A	2
P377	FWVDRVBKP	Firmware of the FC	Backing pump	RO		4
P378	ActSpdBKP	Actual speed	Backing pump	RO	rpm	1

Parameter	Indicator	Designations	Component	Access type	Unit	Data type
P379	NomSpdBKP	Nominal rotation speed	Backing pump	RO	rpm	1
P380	TempPwrBKP	Temperature power stage	Backing pump	RO	°C	1
P381	TempExhBKP	Current exhaust gas temperature	Backing pump	RO	°C	1
P382	TempOilBKP	Current oil temperature	Backing pump	RO	°C	1
P383	SetSAttBKP	Set rotation speed reached	Backing pump	RO		0
P384	CoolFlow	Cooling water flow		RO	l/min	2
P385	VibSnsCurr	Vibration sensor current signal		RO	%	2
P398	ActualSpd	Actual speed	Booster	RO	rpm	1
P399	NominalSpd	Nominal rotation speed	Booster	RO	rpm	1

Tbl. 12: Parameter set | Status requests

7.4 Reference value inputs

Parameter	Indicator	Designations	Components	Access type	Unit	Data type	min.	max.	default	💾
P706	DefaultSpd	Specification in normal operation	Booster	RW	%	2	25	100	100	✓
P707	SpdSVal	Set value in rotation speed setting mode	Booster	RW	%	2	25	100	75	✓
P709	PrgGasSVal	Flushing gas flow set-point		RW	slm	2	0	50	0	✓
P717	StbySVal	Rotation speed set value in stand-by operation	Booster	RW	%	2	25	100	30	✓
P740	Pressure 1	Pressure value, booster inlet		RO	hPa	10				
P750	Pressure 2	Pressure value, backing pump inlet		RO	hPa	10				
P760	Pressure 3	Pressure value, backing pump exhaust gas		RW	hPa	10				
P766	DefSpdBKP	Specification in normal operation	Backing pump	RW	%	2	67	100	100	✓
P767	SpdSValBKP	Set value in rotation speed setting mode	Backing pump	RW	%	2	67	100	75	✓
P768	StbSValBKP	Rotation speed set value in stand-by operation	Backing pump	RW	%	2	67	100	67	✓
P770	CGTempSwPt	Cooling gas temperature switch point		RW	°C	1	0	350	250	✓
P771	ExhPrsSwPt	Exhaust gas pressure switch point		RW	hPa	10	1000	1.00E-05	10	✓
P775	ASCurrOff	Switch-off threshold backing pump for auto standby		RW	%	2	40	100	65	✓

Parameter	Indicator	Designations	Components	Access type	Unit	Data type	min.	max.	default	
P776	ASCurrOn	Switch-on threshold backing pump for auto standby		RW	%	2	30	75	55	✓
P797	RS485Adr	RS-485 Interface address		RW		1	1	255	1	✓

Tbl. 13: Parameter set | Reference value inputs

7.5 Additional parameters for the control unit

Note

Additional parameters in the control unit

The basic parameter set is set in the electronic drive unit ex-factory. For controlling connected external components (e.g. vacuum measuring equipment), additional parameters (extended parameter set) are available in the corresponding Pfeiffer Vacuum control units.

- Refer to the corresponding operating instructions of the respective components.
- Select the extended parameter set with parameter **[P:794]** = 1.

Parameter	Indicator	Description	Functions	Data type	Access type	Unit	min.	max.	default	
340	Pressure	Actual pressure value (ActiveLine)		7	R	hPa	$1 \cdot 10^{-10}$	$1 \cdot 10^{3}$		
350	Ctr Name	Control unit type		4	R					
351	Ctr Software	Control unit software version		4	R					
738	Gauge type	Type of pressure gauge		4	RW					
794	Param set	Parameter set	0 = Basic parameter set 1 = Extended parameter set	7	RW		0	1	0	
795	Servicelin	Insert service line		7	RW				795	

Tbl. 14: Parameters for control unit functions

8 Operation

NOTICE

Damage to the device due to unintended operation

Unintended operation can result in damage to the device.

► To ensure correct settings, ensure that the operating instructions are available to qualified personnel and operators.

8.1 Dashboard

The dashboard appears automatically when you switch on the COBRA DH pumping station. The Dashboard provides information about:

- Operating status of the connected vacuum pump
- System status
- Status of the components in operation/during shutdown
- Parameter list
- Actual rotation speed

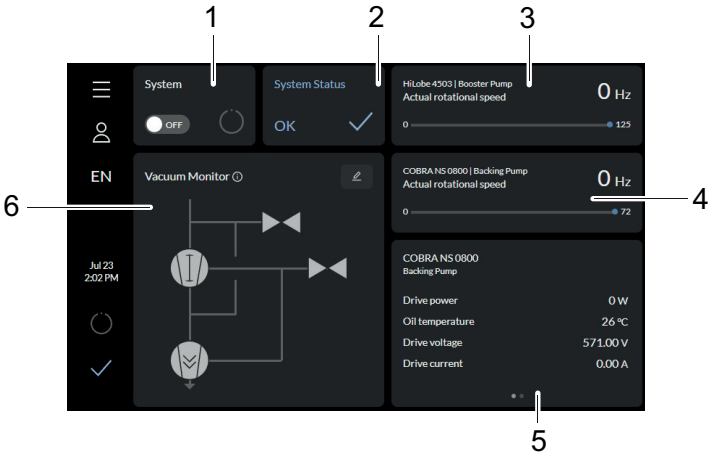

Fig. 14: COBRA DH Dashboard

1 Display for pumping station/switching on the pumping station (system)
2 System status
3 Actual rotation speed of roots pump
4 Actual rotation speed of backing pump
5 Parameter list
6 Vacuum diagram (vacuum monitor)

8.2 Main menu

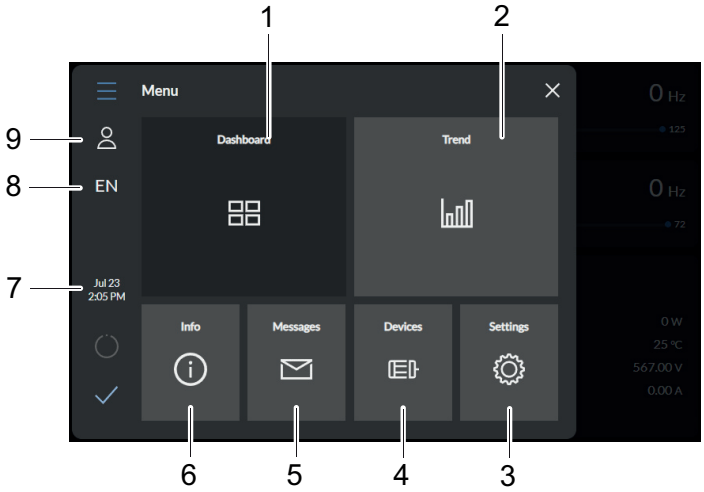

Fig. 15: Main menu view for COBRA DH

1 Dashboard
2 Trend menu
3 Settings
4 Devices
5 Messages
6 Help
7 Date and time
8 Language selection (DE/EN)
9 Profile

Navigating to other items from main menu

► Navigate from the main menu to:
- Dashboard
- Trend menu
- Help page
- Messages overview
- Device management
- Settings.

8.3 Submenus

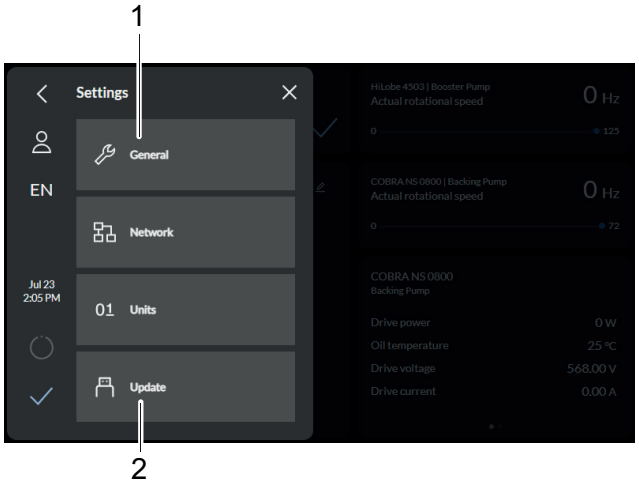

Fig. 16: Submenu COBRA DH settings

1 General
2 Update

Calling up submenu

► Tap on the desired submenu to call up the matching menu item.

8.4 Vacuum monitor

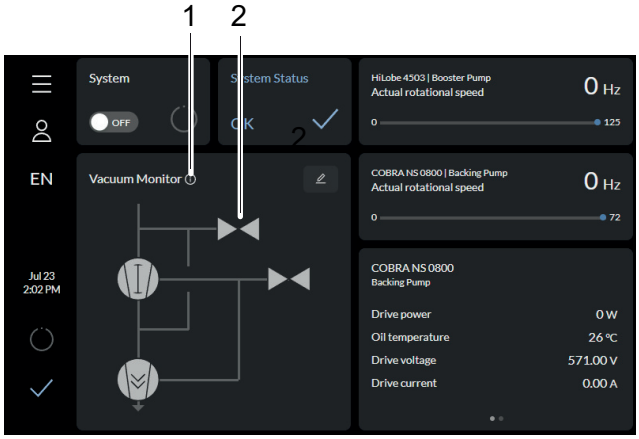

Fig. 17: Calling up the Info panel

1 Calling up the Info panel 2 Vacuum monitor

The vacuum monitor shows the status information of the individual components as a graphical display.

Calling up the Info panel

- Tap i to call up the Info panel of the vacuum monitor.

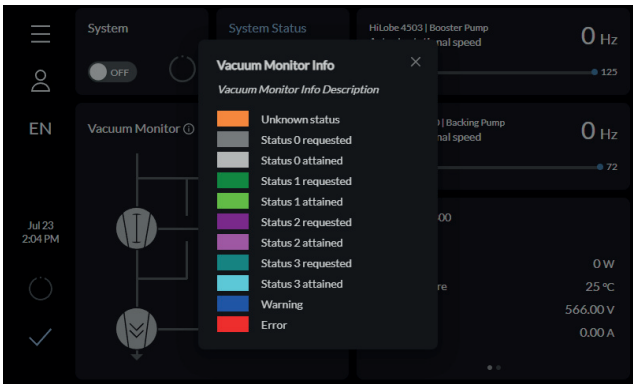

Fig. 18: Vacuum monitor Info panel

Accessing individual components

- Access the individual components directly by tapping on the components in the vacuum monitor.

	Designations	Status 0	Status 1	Status 2	Status 3
Roots pump	P1	Off	On	Rotation speed setting mode	Stand-by
Backing pump	P2	Off	On	Rotation speed setting mode	Stand-by
Sealing gas valve	VBG1	Closed, shut	Open	Reserved	Reserved
Flushing gas valve	VDG1	Closed, shut	Open	Reserved	Reserved
Cooling gas connection	VCG1	Closed, shut	Open	Reserved	Reserved
VacBoost	EP1	Closed, shut	Open	Reserved	Reserved
Gauge Roots pump	G1	Underrange	In Range	Reserved	Reserved
Gauge Backing pump	G2	Underrange	In Range	Reserved	Reserved

Tbl. 15: Status information

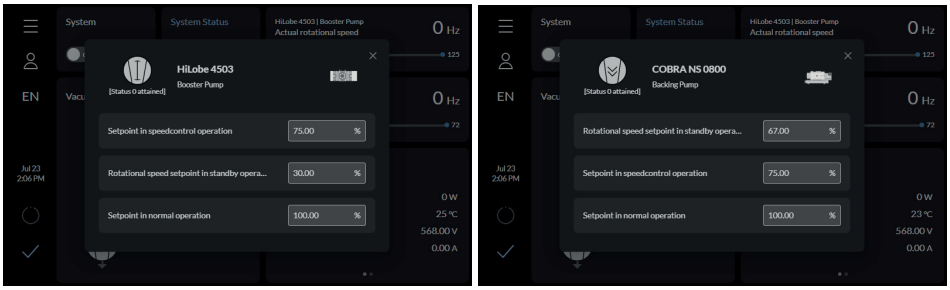

Fig. 19: Parameters in the vacuum monitor

Navigating to parameters

- ► Tap on the individual components in the vacuum monitor to navigate to the parameters of a unit on the dashboard.

8.5 Switching pumping station on/off

WARNING

Risk of cuts on moving, sharp-edged parts when reaching into the open high vacuum flange

With the high vacuum flange open, access to sharp-edged parts is possible. A manual rotation of the rotor increases the danger situation. There is the risk of cuts, up to the separation of body parts (e.g. fingertips). There is a risk of hair and loose clothing being drawn in. Objects falling in destroy the turbopump during subsequent operation.

- ► Only remove the original protective covers immediately prior to connecting the high vacuum flange.
- ► Do not reach into the high vacuum connection.
- ► Wear protective gloves during installation.
- ► Do not start the turbopump with open vacuum connections.
- ► Always carry out the mechanical installation before electrical connection.
- ► Prevent access to the high vacuum connection of the turbopump from the operator side (e.g. open vacuum chamber).

CAUTION

Danger of injury due to the pumping station tipping or rolling away

Superstructural parts change the center of gravity. There is a danger of crushing due to rolling away or tipping.

- ► Place the pumping station on a flat installation surface.
- ► Anchor the pumping station at the installation location.
- ► Wear personal protective equipment.

NOTICE

Risk of damage due to incorrect counter flange design

Unevenness on the operator-side counter flange results in stresses in the vacuum pump housing, even when properly attached. This can produce leakage or negative changes in running characteristics.

- ► Adhere to the shape tolerances for the counter flange.
- ► Observe the maximum flatness deviations over the entire surface.

Prerequisite

- Vacuum chamber connected on the HV side

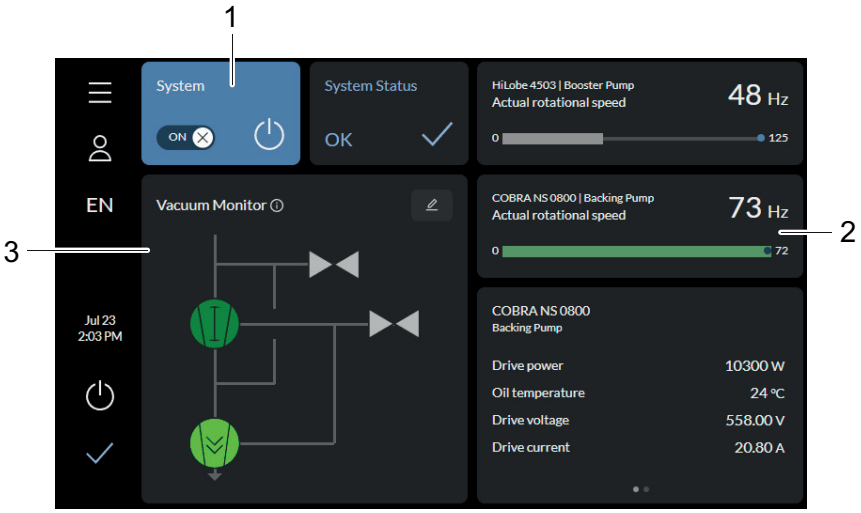

Fig. 20: Pumping station in operation

1 Display indicating pumping station in operation

2 Actual rotation speed

3 Status of the components during operation

Start pumping station

1. Tap the **Dashboard** button in the main menu.
2. Tap the **ON/OFF switch** to start the pumping station.

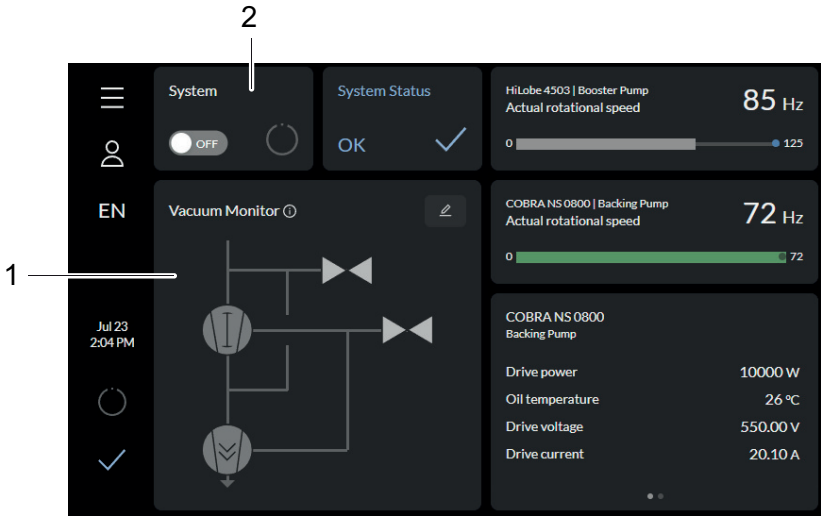

Fig. 21: Stop pumping station

1 Status of the components during shutdown

2 Display for pumping station shutting down

Stop pumping station

► Tap the **ON/OFF switch** to stop the pumping station.

8.6 Trends

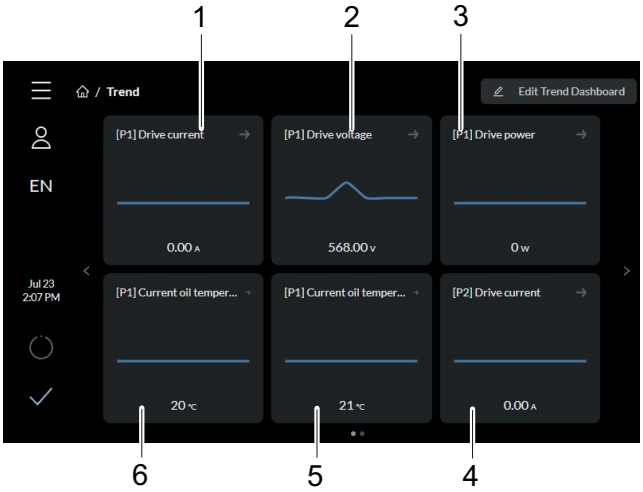

Fig. 22: Trend overview page COBRA DH

1 [P1] Drive current display (drive current)
2 [P1] Drive voltage display (drive voltage)
3 [P1] Drive power display (drive power)
4 [P2] Drive current display (drive current)
5 [P1] Current oil temperature display (current oil temperature)
6 [P1] Current oil temperature display (current oil temperature)

In the Trend view, you can view various items of process data, add new trends, and edit and delete existing trends.

Trend overview

1. In the Trend view, you can view various items of process data, add new trends, and edit and delete existing trends.

Device overview

P1	Roots pump	G1	Gauges Roots pump
P2	Backing pump	G2	Gauges Backing pump

8.6.1 Adding and editing trends

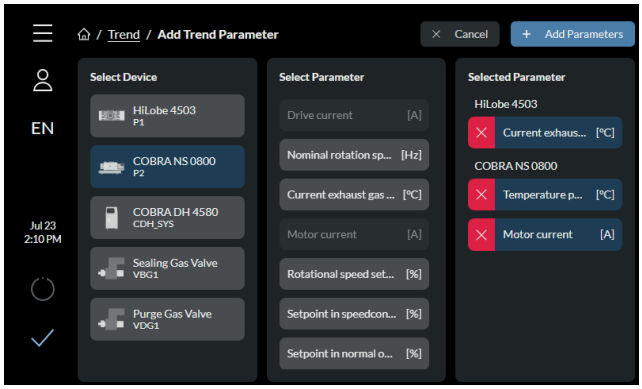

Fig. 23: Adding new trends

Adding new trends

1. Tap the **Edit Trend Dashboard** button.
2. Tap **[Add]** to add the new trend parameter.
3. Select the device.
   - You can add the parameters for multiple devices.
4. Select the parameter or parameters.
   - The **Selected Parameter** column shows you an overview of the parameters you have selected.

5. Tap **[Add Parameter]** to finish the procedure.
6. Tap **[Cancel]** to cancel the procedure.

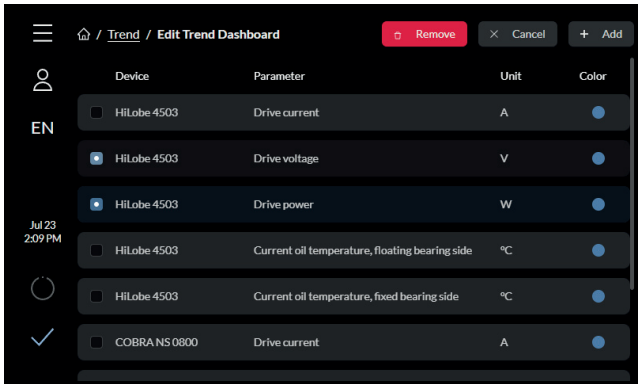

Fig. 24: Deleting trends

Deleting trends

1. Tap the **Edit Trend Dashboard** button to edit the dashboard.
   - You see an overview of all the added trends.
2. Select the parameters that you want to delete.
3. Tap **[Remove]** to delete the selected parameters.

8.6.2 Viewing details of a trend

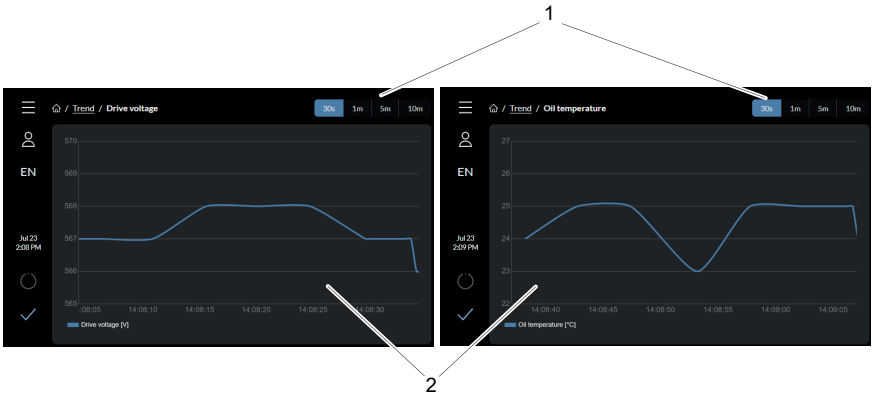

Fig. 25: Viewing details of a trend

1 Time interval display 2 Trend display

Viewing details of a trend

1. Select a trend.
2. Select a pre-set time interval.
   - You can select a time interval of 30 seconds, 1 minute, 5 minutes, or 10 minutes.

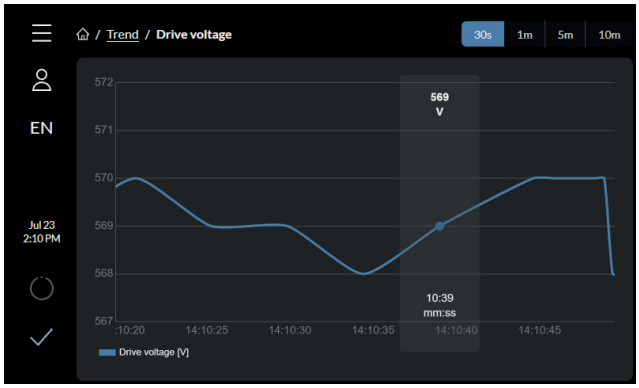

Fig. 26: Viewing detailed value

Viewing detailed value

► Tap on the required time in the trend overview to view the exact value for this time.

8.7 Device management

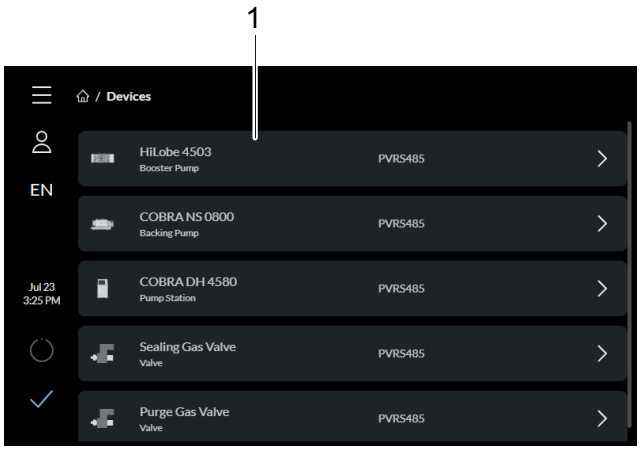

Fig. 27: Device overview screen

1 Component displays

Calling up overview page

► Tap on the **Devices** button in the main menu to access the overview page for all the added devices.

8.7.1 Adding new device

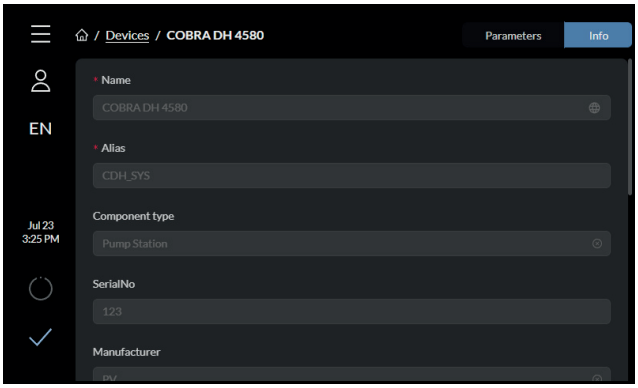

Fig. 28: Entering information

Entering information

1. To add information about a new device, tap **[Add Device]** on the device overview screen.
2. Enter the name, ID, and connection of the device in the corresponding fields.
   – You can also add the component type, serial number, and address of the device.

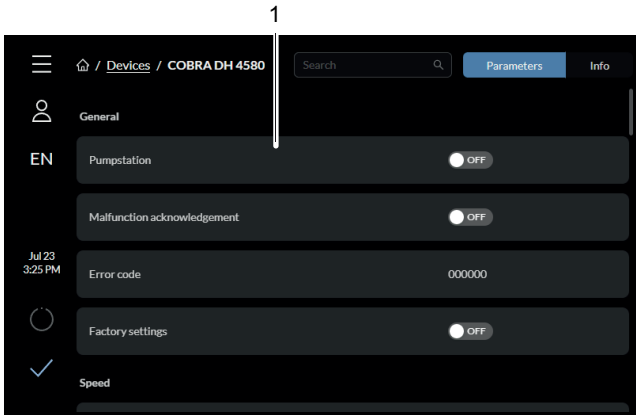

Fig. 29: Adding new device

1 Displaying device information

Adding new device

1. Enter the name of the device in the search box.
2. Select the desired device.
3. Click **[Submit]**.

8.7.2 Editing and filtering detailed information

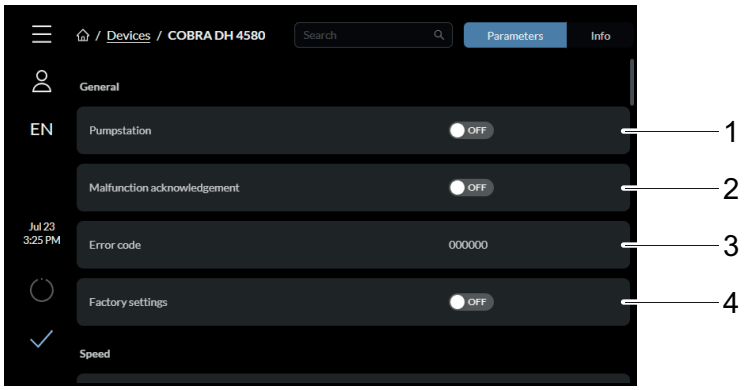

Fig. 30: Parameter list of a device

1 Pumpstation
2 Malfunction acknowledgment
3 Error code
4 Factory settings

Parameter list of a device

▶ In the parameter list, you can view the parameters of a device, filter the search by certain parameters, view the detailed information of a specific parameter, and edit the detailed information.

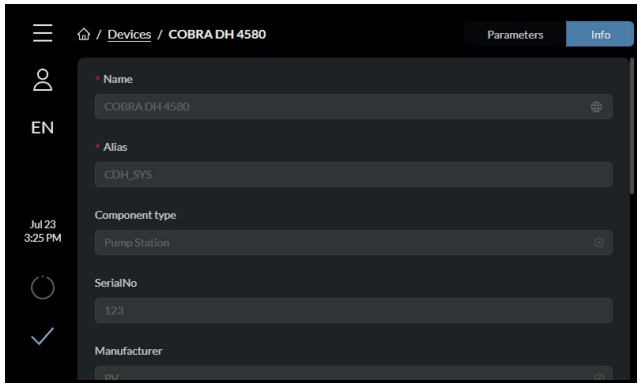

Fig. 31: Viewing and editing detailed information

Viewing and editing detailed information

1. Tap the name of the desired device to view its detailed information.
2. Edit the desired parameter or parameters.
3. Tap **[Submit]** to apply the changes.

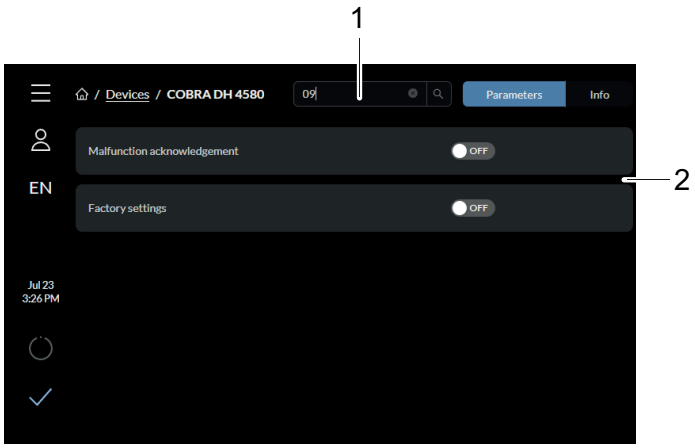

Fig. 32: Filtering parameter list by code/name

1 Input field for code/name for parameters
2 Search results

Filtering parameter list by Pfeiffer Vacuum code/name

► To filter the parameters, enter the desired name/code in the search box.
  – You will find codes and names in the operating instructions for backing pumps and the roots pumps (see chapter “Applicable documents”, page 8).

8.8 Help page

The Help page provides information about the software and hardware versions of the device. The Help page also provides the digital rating plate.

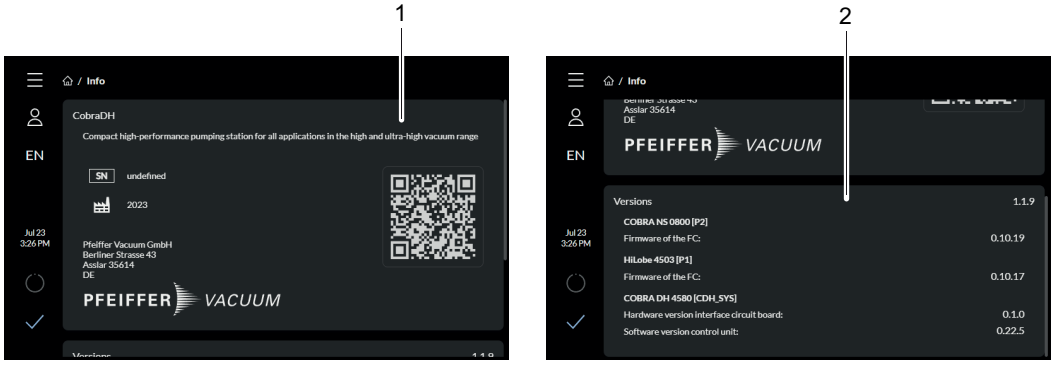

Fig. 33: HiCube Neo help page

1 Display of the digital rating plate
2 Display of the software and hardware versions of a device

Calling up Help page

► Tap on the **Help** button in the main menu to access the Help page.

8.9 Settings

8.9.1 General settings

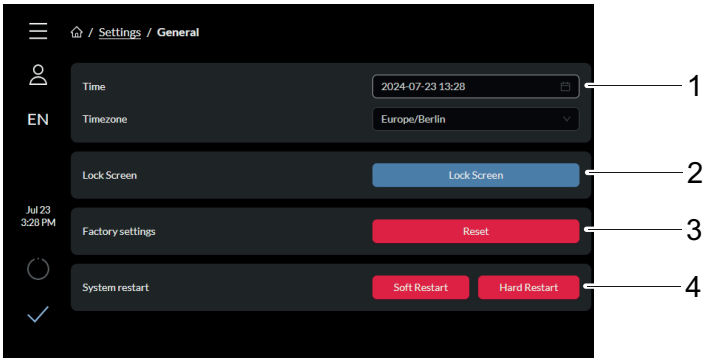

Fig. 34: General settings

1 Time/timezone display
2 Lock screen
3 Reset to factory settings
4 System restart

Updating system time

- ▶ Tap **[Time]** to set the time and date.
- ▶ Tap **[Timezone]** to set the timezone.
  - – You can filter the timezones by name.

Setting COBRA DH to factory settings

- ▶ Tap **[Reset to factory settings]**, to reset the COBRA DH to its factory settings.

8.9.2 Network settings

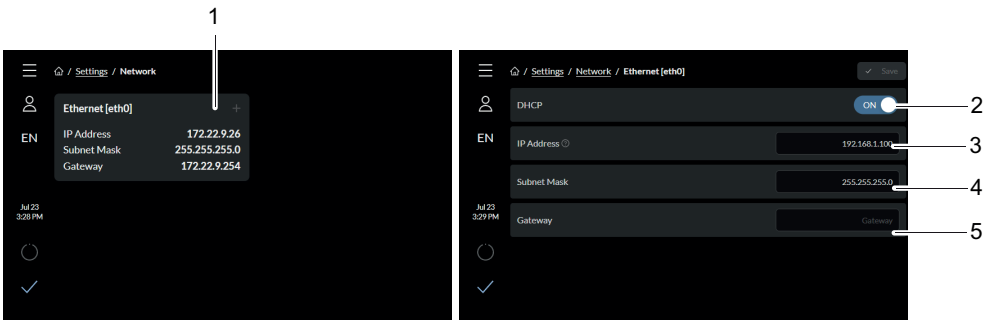

Fig. 35: Change IP Address

1 Ethernet [eth0]
2 DHCP
3 IP Address (IP address)
4 Subnet mask
5 Gateway

Change IP address

1. Tap the **Settings** button in the main menu.
2. Tap **[Network]**.
3. Tap **[Ethernet [eth0]]** to change the IP address.
   - – If you enable DHCP, the static IP address is kept.

8.9.3 Converting units

Fig. 36: Overview of units

1 Temperature
2 Pressure
3 Frequency

Converting units

1. Tap the **Settings** button in the main menu.
2. Tap **[Units]**.
3. Select a suitable unit in the drop-down menu.

8.10 Updating firmware via the cloud

Prerequisites

- COBRA DH switched on
- Internet connection available

8.10.1 Uploading firmware to device

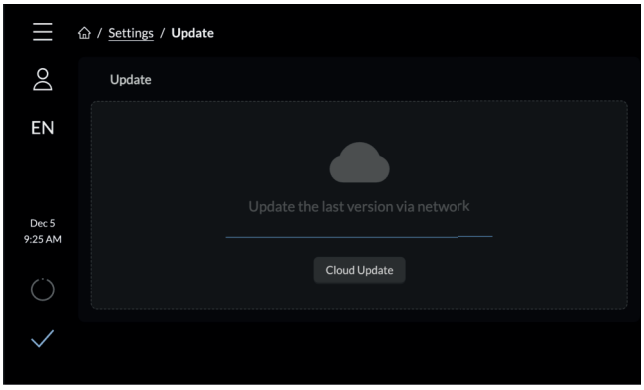

Fig. 37: Uploading firmware to device

Uploading firmware to device

1. Tap on **[Cloud update]**.
   - You can only update the firmware via the web or the cloud. It is not possible to use a USB stick to update the firmware.
2. The update starts automatically.
   - The update window shows the transfer action.

8.10.2 Update procedure

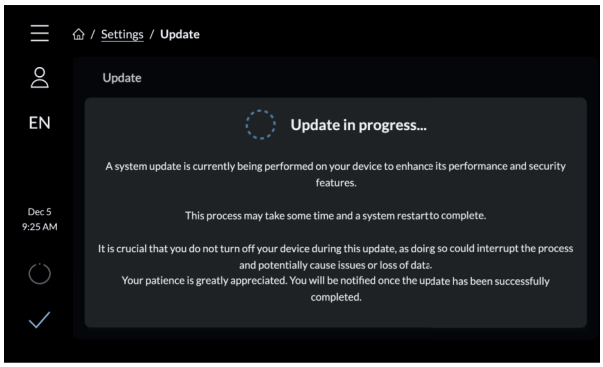

Fig. 38: Update procedure

The update starts automatically after uploading the firmware. Switching the device off during the update can lead to loss of data or to the update action being canceled. You will see a message once the update is complete.

8.10.3 Finishing an update

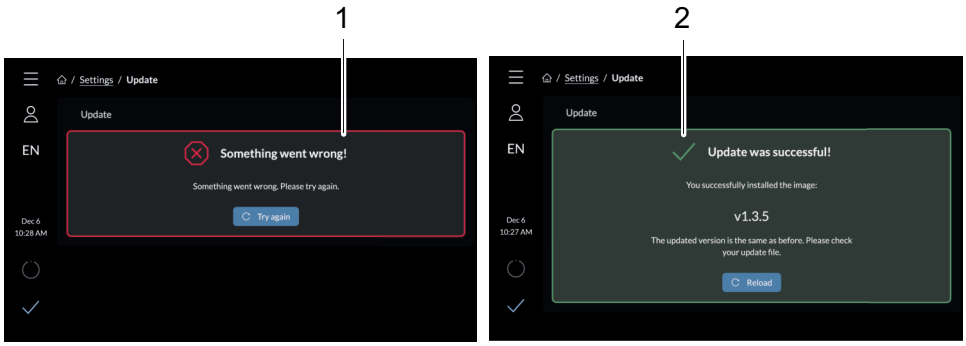

Fig. 39: Finishing an update

1 Message: update failed
2 Message: update successful

Finishing an update

- If errors occurred, restart the update procedure.
- If the internet connection is interrupted during the update procedure, an "Connection interrupted" message is displayed.

  The update procedure is resumed automatically as soon as an internet connection is reestablished.
- The system then restarts in order to finish the update procedure.

8.11 User maintenance

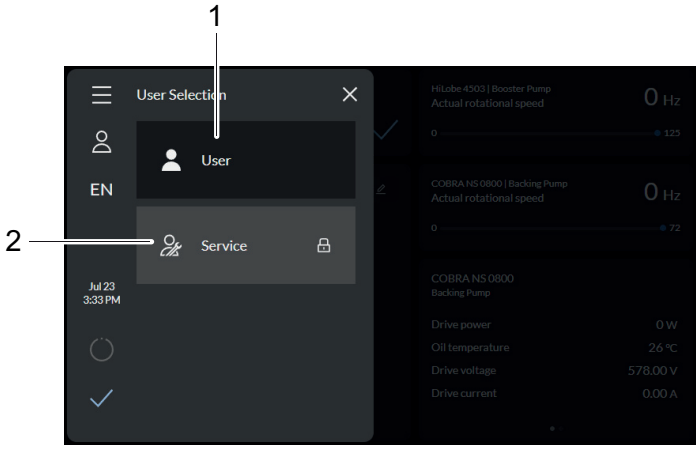

Fig. 40: Overview of all users

1 User 2 Service user

9 Operation

9.1 Commissioning vacuum pump

WARNING

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

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

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

CAUTION

Danger of burns on hot surfaces

Depending on the operating and ambient conditions, the surface temperature of the vacuum pump can increase to above 70 °C. If access to the vacuum pump is unrestricted, there is a danger of burns due to contact with hot surfaces.

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

Observe before switching on

- Check the lubricant levels on both sight glasses.
- Make sure the backing pump cooling system is filled with cooling liquid.
- Make sure that the suction chamber is free from all foreign matters.
  - Protect the vacuum pump from sucking in contaminants using suitable measures (e.g. dust filter).
- Check the vacuum pump for visible damage and put the vacuum pump into operation only in a correct state.
- Make sure that the shut-off units on the pressure side open before starting the pump.
- Check the plausibility of the measured values for oil temperature and gas temperature.
- Make sure cooling water is supplied to the pumping station.

9.2 Switching on the pumping station

The "PumpgStatn" parameter **[P:010]** comprises operation of the pumping station, including control of all connected interfaces and configurations.

Switching on via integrated display

After successfully completing the self-test, the electronic drive unit resets pending and corrected error messages.

You can switch on the pumping station in every pressure range, between atmospheric pressure and final pressure.

1. Switch voltage supply on.
2. Tap the **ON/OFF** switch on the display to switch on the pumping station.
3. Allow the vacuum pump to warm up prior to process start, with the vacuum flange closed, for approx. 60 minutes.

Alternative: Switch on via the Pfeiffer Vacuum parameter

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

9.3 Setting supply pressure of auxiliary gas system (optional)

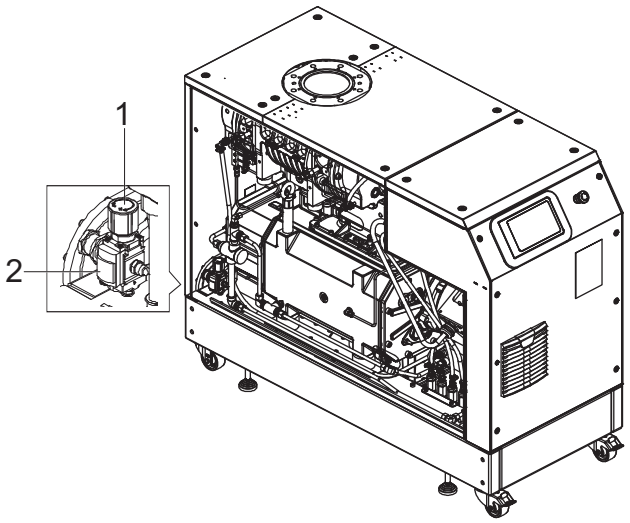

Fig. 41: Setting supply pressure of auxiliary gas system

1 Pressure regulator 2 Pressure reading

Setting supply pressure of auxiliary gas system

1. Remove the left side panel.
2. Open the sealing gas supply on the gas cylinder.
3. Set the desired quantity of sealing gas on the dosing valve of the flow meter.

Gas type	Dry nitrogen or air
Gas temperature	0 – 60°C
Max. gas pressure	13 bar (g)
Recommended pressure setting at the pressure regulating valve (PRV)	3 bar (g)
Filtration	5 µm
Air quality (for compressed air only)	Class 5.4.4 (acc. to ISO 8573-1)

Tbl. 16: Requirements for the gas

9.4 Setting dilution gas flow (optional)

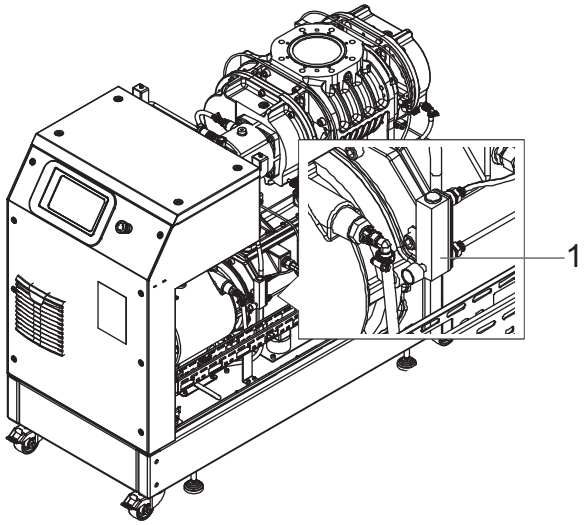

Fig. 42: Setting dilution gas flow

1 Flow meter

Setting dilution gas flow

1. Remove the side panel.
2. Connect the dilution gas connection (DGC) to the gas supply.
   – Connection size: G1/4, ISO 228-1

Gas type	Dry nitrogen or air
Gas temperature	0 – 60°C
Max. gas pressure	13 bar (g)
Recommended pressure setting at the pressure regulating valve (PRV)	2.5 bar (g)
Filtration	5 µm
Recommended flow rate	30 SLM

Tbl. 17: Requirements for the gas

9.5 Operating modes

The pumping station can only be operated using the 7" display.

9.5.1 Normal operation

Note

Permissible rotation speed range of the vacuum pump

Parameterization is subject to the permissible rotation speed range of the respective vacuum pump. The electronic drive unit regulates automatically to the next valid value.

The vacuum pump starts in normal operation with the pump-specific nominal rotation speed.

Setting parameters of roots pump

1. Set parameter **[P:002]** and **[P:026]**to "0".
2. Query the actual rotation speed of the roots pump via parameter **[P:309]**.
3. Set the desired rotation speed of the roots pump via parameter **[P:706]**.

Setting parameters of backing pump

1. Set parameter **[P:002]** and **[P:026]**to "0".
2. Query the actual rotation speed of the backing pump via parameter **[P:371]**.
3. Set the desired rotation speed of the backing pump via parameter **[P:766]**.

9.5.2 Stand-by operation

Note

Permissible rotation speed range of the vacuum pump

Parameterization is subject to the permissible rotation speed range of the respective vacuum pump. The electronic drive unit regulates automatically to the next valid value.

Pfeiffer Vacuum recommends stand-by operation for the roots pump during breaks in processes or production.

- While stand-by operation is active, the electronic drive unit reduces the rotation speed of the backing pump in the range of **67 to 100%** of the nominal speed; the default is **100%**.
- The standard rotation speed of the backing pump is 100%.
- While stand-by operation is active, the electronic drive unit reduces the rotation speed of the roots pump in the range of **15 to 100%** of the nominal speed.
- The standard rotation speed of the roots pump is 30%.
- Stand-by operation has priority over rotation speed setting mode.

Setting stand-by rotation speed of roots pump

1. Set the parameter **[P:707]** to the required value in %.
2. Set the parameter **[P:002]** to "1".
3. Query the actual speed via parameter **[P:309]**.

Setting stand-by rotation speed of backing pump

1. Set the parameter **[P:768]** to the required value in %.
2. Set the parameter **[P:002]** to "1".
3. Query the actual speed via parameter **[P:371]**.

9.5.3 Rotation speed setting mode

Note

Permissible rotation speed range of the vacuum pump

Parameterization in rotation speed setting mode is subject to the permissible rotation speed range of the respective vacuum pump. The electronic drive unit regulates automatically to the next valid value.

See (see chapter “Stand-by operation”, page 60) supported ranges for the backing pump and roots pump. The default for the two pumps is **75%**.

Rotation speed setting mode has priority over normal operation.

Setting rotation speed setting mode for roots pump

1. Set the parameter **[P:707]** to the required value in %.
2. Set the parameter **[P:026]** to "1".
3. Query the set rotation speed via parameter **[P:398]**.

Setting rotation speed setting mode for backing pump

1. Set the parameter **[P:767]** to the required value in %.
2. Set the parameter **[P:026]** to "1".
3. Query the set rotation speed via parameter **[P:371]**.

9.6 Operation monitoring

9.6.1 Temperature monitoring

Depending on the sensor type, temperature thresholds for warning and malfunction messages are stored immutably in the parameter set of the electronic drive unit. If a measured value exceeds the threshold, the vacuum pump is switched to a safe state.

Warnings

- A "**Warning**" is output at an oil temperature of (T > 85 °C).
- A "**Warning**" is output at a gas temperature of (T > 250 °C).

Malfunction messages

- At an oil temperature of (T > 95 °C), the vacuum pump switches off with a "**Malfunction message**".
- At a gas temperature of (T > 300 °C), the vacuum pump switches off with a "**Malfunction message**".
- If the oil temperature sensor is not connected or is defective, the vacuum pump does not start up and a **malfunction message** is displayed.

Acknowledge error - Query status

After cooling down, the vacuum pump does **not** start automatically.

► Tap the **ON/OFF** switch to switch the pumping station back on.

9.6.2 Check the lubricant level

Check the lubricant level

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

9.7 Switching off and venting

WARNING

Risk of crushing on rotating parts when reaching into the open flange

The rotors continue to run in the vacuum after switching off the motor, and can trap fingers and hands within their reach.

► Wait until the vacuum pump comes to a complete standstill.
► Secure the vacuum pump against re-start.

NOTICE

Risk of damage from gas backflow into the roots pump

Due to the backflow of process gas, the electronic equipment is susceptible to irreversible damage caused by regenerative energy produced with rotation of the piston.

► Equip the vacuum pump with a facility that prevents the backflow of gases.
► Use, e.g. a shut-off facility on the fore-vacuum side and block the line directly after switching off the vacuum pump.
► As an alternative, use a backing pump with integrated vacuum safety valve.

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

Procedure with clean processes

You can switch off the vacuum pump in every pressure range, between atmospheric pressure and ultimate pressure directly after the process end.

1. Close the shut-off valve in the vacuum line and disconnect the vacuum pump from the process.
2. Tap the **ON/OFF** switch to switch off the pumping station.
3. Vent the vacuum pump via the intake side to avoid the gas backstreaming.
4. Switch off the process- and pump-specific media supply (e.g. the sealing gas supply).

Procedure with contaminated medium

1. Close the shut-off valve in the vacuum line and disconnect the vacuum pump from the process.
2. At the end of the process, continue to operate the vacuum pump with flushing gas supply at the vacuum flange for another approx. 20 to 40 minutes.
   - Use dry air or nitrogen.
3. Then stop the flushing gas supply.
4. Switch off the vacuum pump.
5. Vent the vacuum pump via the intake side to avoid the gas backstreaming.
6. Switch off the process- and pump-specific media supply (e.g. the sealing gas supply).

10 Maintenance

10.1 Maintenance information

WARNING

Danger to life from electric shock during maintenance and service work

There is a danger to life from electric shock when making contact with live components that still exist after the vacuum pump has been switched off.

- ► Disconnect the vacuum pump safely from the mains.
- ► Wait until the vacuum pump comes to a standstill (rotation speed = 0).
- ► After switching off the vacuum pump, wait another 5 minutes until the capacitors have discharged.

WARNING

Risk of crushing from rotating parts

Fingers and hands may be caught by rotating pistons within the connection flange. This results in severe injuries.

- ► Keep limbs out of the reach of the roots pump.

NOTICE

Danger of property damage from improper maintenance

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

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

Service work

- Changing lubricant
- Changing coolant
- Cleaning air filter

Preparing maintenance

1. Shut down pumping station.
2. Allow the pumping station to cool down as necessary.

10.2 Maintenance intervals and responsibilities

Instructions for carrying out maintenance

1. Carry out the required maintenance on the pumping station components, in accordance with the instructions in the individual operating instructions.
2. Clean the turbopump station exterior with a lint-free cloth and a little isopropanol.
3. Consult Pfeiffer Vacuum Service about shorter maintenance intervals for extreme loads or impure processes.
4. For all other cleaning, maintenance or repair work, contact the appropriate Pfeiffer Vacuum Service location.

10.3 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 Pfeiffer Vacuum Service if you wish to reduce the maintenance frequency.

Action	Inspection				
described in document	**BA**	**BA**	**SA**	**SA**	**SA**
Interval	**Monthly**	**Yearly**	**Every 1000 hours**	**Every 5000 hours or after 1 year**	**Every 40000 hours or after 4 years**
Inspection					
Visual and acoustic pump test • Checking lubricant level and color of the lubricant • Check pumping station for leaks • Check cooling liquid	■				
• Perform visual inspection • Clean pumping station to remove dust and dirt • Check electrical connections • Replace the air filter (2x) on the electronic drive unit • Change lubricant in gear and bearing housings (both sides) (D2/VSC 100)		■			
• Check silencer • Clean silencer as needed			■		
• Changing the cooling liquid • Clean magnetic plug				■	
• Perform general overhaul					■

Tbl. 18: Maintenance intervals

Action	Inspection				
described in document	**BA**	**BA**	**BA**	**BA**	**SA**
Interval	**Monthly**	**Yearly**	**Every 1000 hours**	**Every 5000 hours or after 1 year**	**Every 16000 hours or after 4 years**
Inspection					
• Change lubricant in gear and bearing housings (both sides) (YLC 250)					■

Tbl. 19: Maintenance intervals

10.4 Switching pumping station off

Note

Before carrying out any work, safely disconnect device from mains

1. Shut down the device.
2. Wait until all components are at a complete standstill.
3. Switch off the master switch.
4. Disconnect the mains cable from the device.

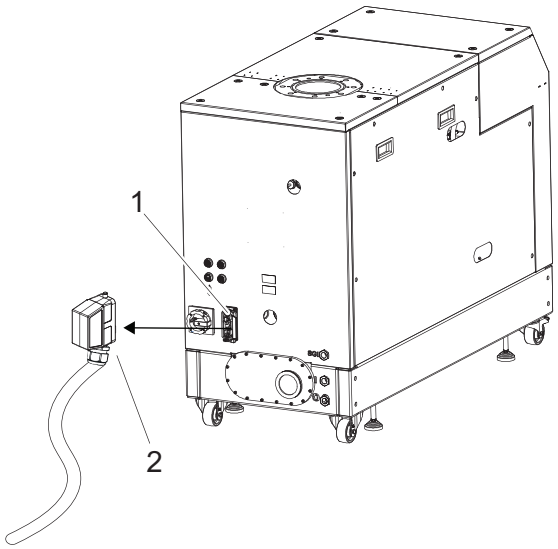

Fig. 43: Removing electrical connections

1 Main switch 2 Mains supply plug

Switching pumping station off

1. Disconnect the power supply plug to switch off the pumping station via the main switch.

10.5 Changing lubricant

WARNING

Health hazard and environmental damage from toxic contaminated lubricant

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

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

WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic lubricants 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 lubricant.

CAUTION

Scalding from hot lubricant

Danger of scalding when draining lubricant if it comes into contact with the skin.

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

Note

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

The usable life may deviate from the reference value specified depending on thermic and chemical loads, or due to penetrating process media in gear and bearing chambers.

Safety data sheets

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

10.5.1 Draining lubricant

Roots pump

Required tools

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

Required aids

- Collection receptacle

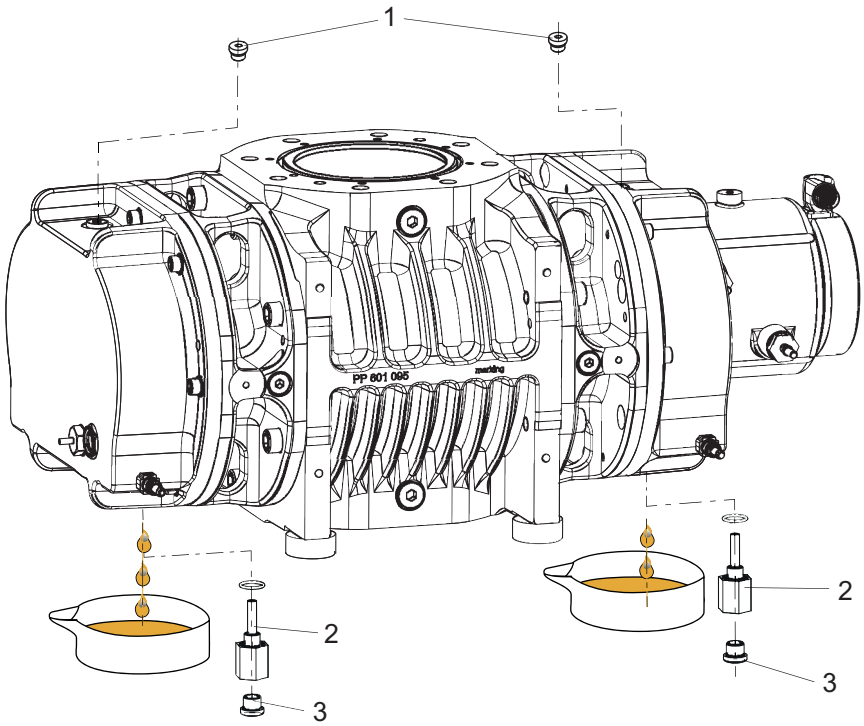

Fig. 44: Drain the lubricant, roots pump

1 Filler screws with seal
2 Fill level limiter
3 Drain screws with seal

Drain the lubricant, roots pump

Note

Unscrew the fill level limiter

To drain the lubricant, in addition to the drain screw, also unscrew the fill level limiter on the pump bottom side.

1. Make sure that there is sufficient space underneath the vacuum pump to place a collection receptacle for the lubricant.
2. Unscrew the filler screws.
3. Place the collection receptacle underneath.
4. Hold the fill level limiter with the ring spanner and unscrew the drain screw at the same time.
5. Unscrew the fill level limiter and allow the lubricant to drain.

Backing pump

Required tools

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

Required aids

- Collection receptacle
- Clean, lint-free cloth

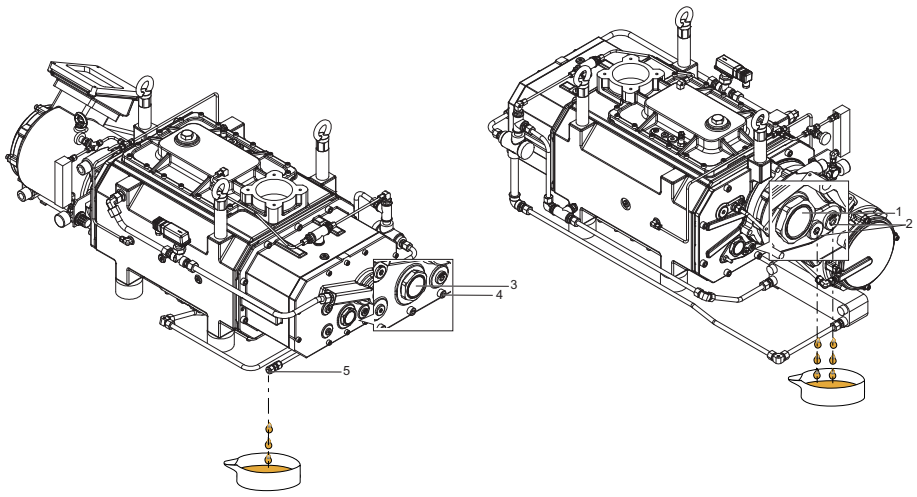

Fig. 45: Drain the lubricant, backing pump

1 Sight glass, motor side
2 Magnetic sealing plug, motor side, 2x
3 Sight glass, opposite side
4 Housing bolt
5 Oil drain

Drain the lubricant, backing pump

1. Make sure that there is sufficient space underneath the vacuum pump to place a collection receptacle for the lubricant.
2. Place the collection receptacle under each drain.
3. Unscrew the magnetic sealing plugs on the motor side and allow the lubricant to drain.
4. Clean the magnetic sealing plugs using a clean, lint-free cloth.
5. Screw the magnetic sealing plugs back into place.
6. Unscrew the cylinder screw from the oil drain.
7. Unscrew the magnetic sealing plug on the opposite side.
8. Clean the magnetic sealing plug using a clean, lint-free cloth.
9. Allow the lubricant to drain.
10. Screw cylinder screw and the magnetic sealing plug back into place.

10.5.2 Filling with lubricant

WARNING

Danger of poisoning from toxic vapors

Igniting and heating synthetic lubricants 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 lubricant.

NOTICE

Property damage from using non-approved lubricant

Attainment of product-specific performance data is not ensured. If non-approved lubricants are used, all liability and warranty claims against Pfeiffer Vacuum are excluded.

- ► Use only lubricants approved by Pfeiffer Vacuum.
- ► Use alternative, application-specific lubricants only following consultation with Pfeiffer Vacuum.

Note

Please note that the vacuum pumps are shipped pre-filled with lubricant. Filling with lubricant should only be done if the vacuum pump is not already pre-filled.

Prerequisite

- Side panels removed

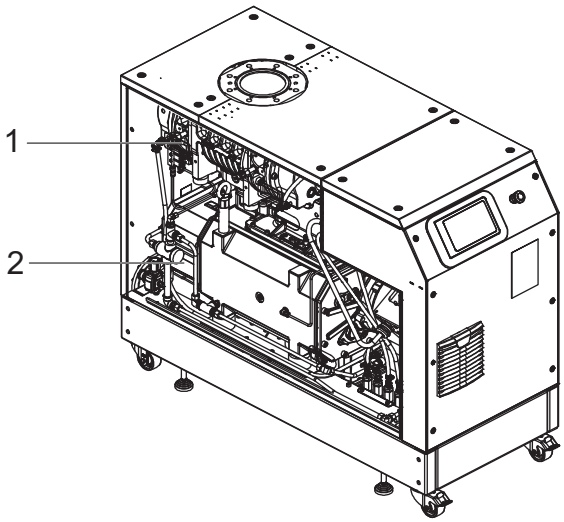

Fig. 46: Side panel removed

1 Roots pump 2 Backing pump

Permissible lubricants

- D2/VSC 100 (standard operating fluid)
- YLC 250 B
- Other lubricants on request

The lubricant type is specified on the rating plate

► Please refer to rating plate of the vacuum pump for type and quantity of intended lubricant.
  – Only the lubricant used during initial installation is permissible.
► Contact your Busch Group representative if you want to use another type of lubricant.

Roots pump

Required consumables

- Lubricant of the vacuum pump

Required tools

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

Required aids

- Collection receptacle

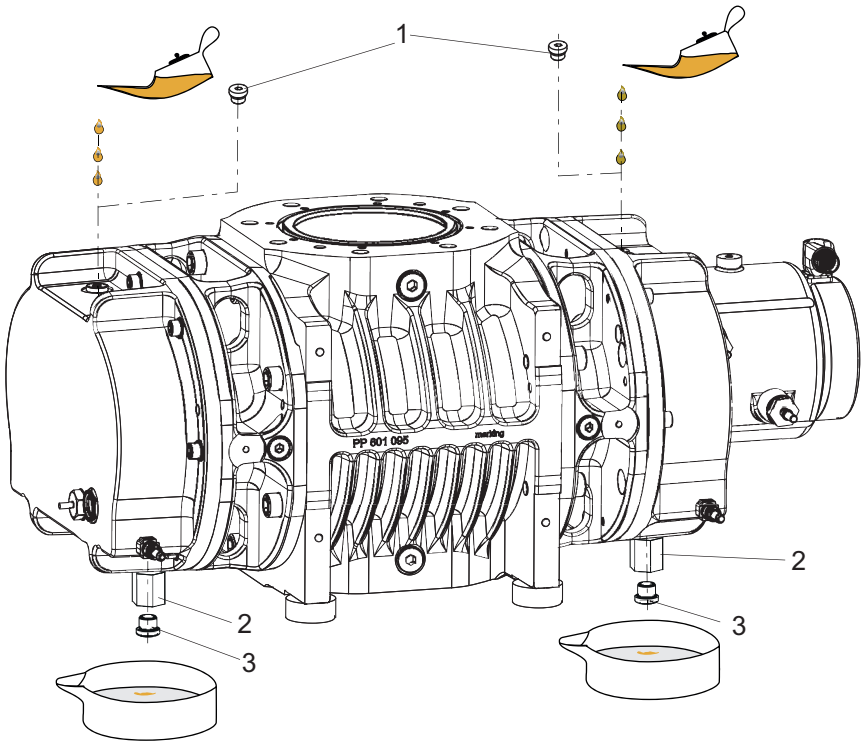

Fig. 47: Filling with lubricant, roots pump

1 Filler screw, 2x
2 Fill level limiter
3 Drain screw

Filling up lubricant

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

- Filling quantity motor side: approx. 0.50 l
- Filling quantity opposite side: approx. 0.50 l

Filling with lubricant, roots pump

1. Make sure that there is sufficient space underneath the pump to be able to place a collection receptacle for the lubricant.
2. Unscrew the filler screws.
3. Hold the fill level limiter with the ring spanner and unscrew the drain screw at the same time.
4. Place a collection receptacle under each drain.

5. Fill the lubricant on both sides up to the maximum fill level.
   - Once full, lubricant overfills the fill level limiter, and drips out of the drain hole.
   - Fill level is visible in the center of the sight glass.
6. Screw the filler and drain screws back in.

Backing pump

Required consumables

- Lubricant of the vacuum pump

Required tools

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

Required aids

- Collection receptacle

Filling up lubricant

The oil chambers of the screw-type vacuum pump are each equipped with an oil sight glass.

- Filling quantity motor side: approx. 0.80 l
- Filling quantity intake side: approx. 0.80 l

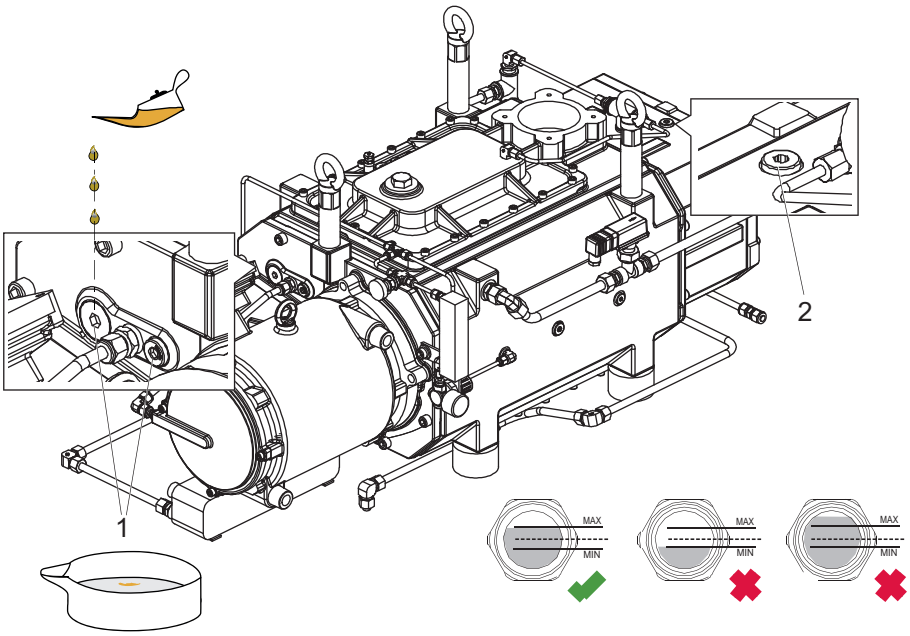

Fig. 48: Filling with lubricant, backing pump

1 Filler screw motor side, 2x 2 Filler screw, opposite side

Filling with lubricant, backing pump

1. Unscrew the filler screws.
2. Fill with lubricant up to the maximum fill level.
   - Fill level is visible in the center of the sight glass.
3. Screw the filler screws back in.

10.6 Changing coolant

Required tools

- Allen key, **WAF 8**
- Ring spanner, **WAF 27**
- Allen key, **WAF 10**

Required consumables

- Cooling liquid (Zitrec M 25), see Technical Data for quantity

Required aids

- Collection receptacle
- Funnel (optional)

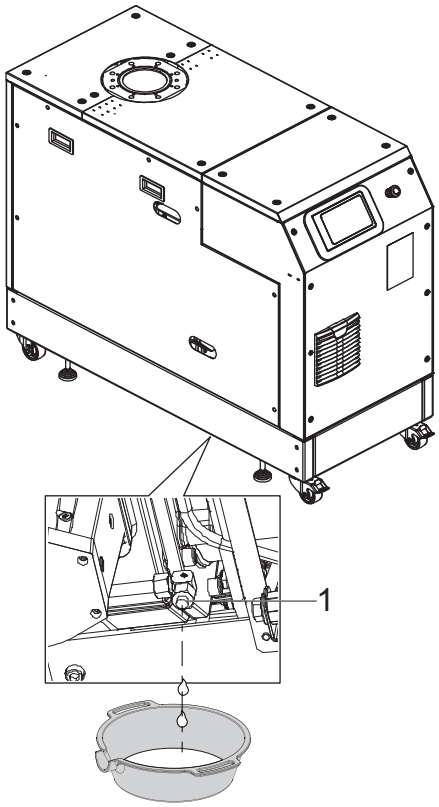

Fig. 49: Draining coolant

1 Drain screw

Draining coolant

1. Use a fork lift truck to lift the pumping station.
2. Make sure that there is sufficient space underneath the pumping station to place a collection receptacle for the coolant.
3. Unscrew the drain screw.
4. Place the collection receptacle underneath.
5. Allow the coolant to drain.
6. Screw the drain screw back in.

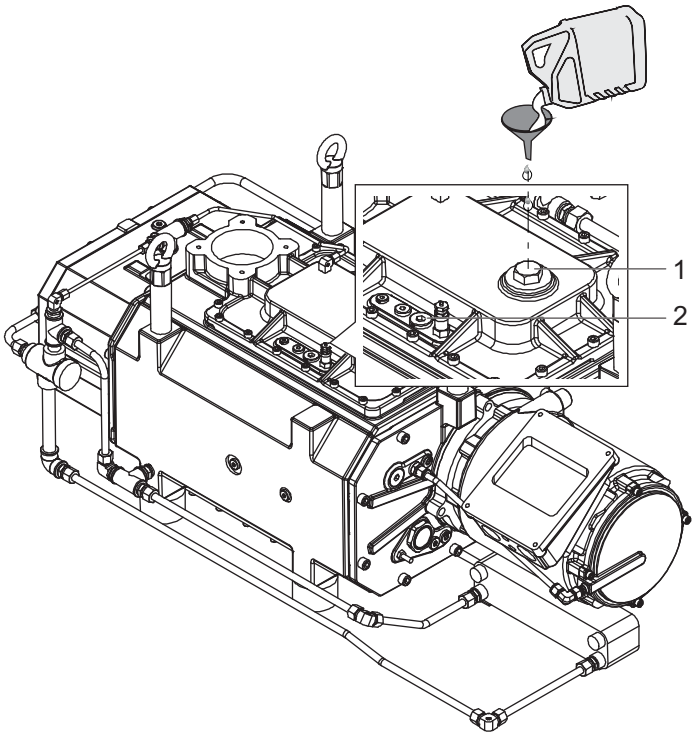

Fig. 50: Filling with cooling liquid

1 Filler screw 2 Vent screw

Filling with cooling liquid

1. Unscrew the filler screw.
2. Unscrew the venting screw.
3. Fill up with cooling liquid to the top of the vent orifice.
4. Screw in the venting screw.
5. Screw in the filler screw.

10.7 Cleaning or replacing air filter

Required tools

- Screwdriver

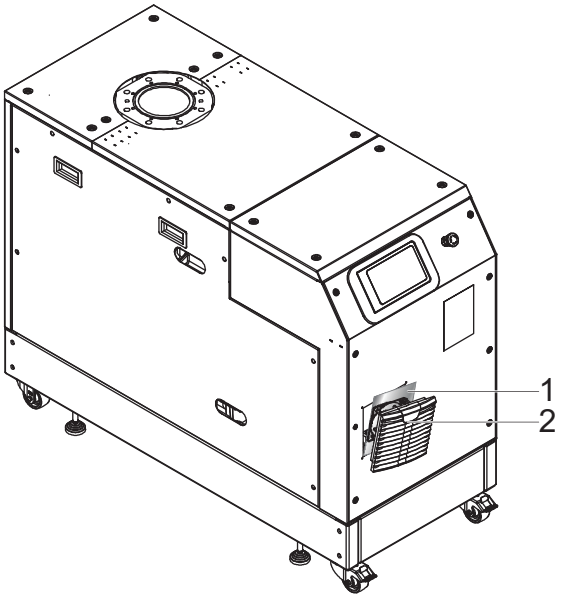

Fig. 51: Cleaning or replacing air filter

1 Filter mat 2 Ventilation grille

Cleaning or replacing air filter

1. Carefully lever off the louver grille using a screwdriver.
2. Remove the filter mat.
3. Clean or replace the filter mat.
4. Pay attention to the intake side and outlet side of the louver grille.
   – The direction of flow is from the soft side of the filter mat to the rough side.
5. Close the louver grille.

11 Decommissioning

11.1 Shutting down for longer periods

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

Procedure for a longer downtime of the vacuum pump (> 1 year)

1. Allow the vacuum pump to cool down.
2. Clean suction chamber.
3. Change the lubricant.
4. Drain the cooling water and empty the cooling water chambers.
5. Seal the vacuum flange and fore-vacuum flange and any other openings with screw caps.
6. Evacuate the pump interior via the measurement connection on the vacuum side, to $p < 1$ hPa.
7. Fill the suction chamber with nitrogen.
8. Store the vacuum pump in dry, dust-free rooms, within the specified ambient conditions.
9. In rooms with damp or aggressive atmospheres, you should package the vacuum pump in a plastic bag together with a drying agent, and seal it so that it is airtight.
10. For storage durations longer than 2 years, we recommend you carry out maintenance and a lubricant change prior to recommissioning.
11. Please note, the vacuum pump may not be stored in the vicinity of machines, traffic routes, etc., as strong vibrations may damage the bearing.

11.2 Recommissioning

NOTICE

Damage to the roots pump due to aging of the lubricant

The useful life of the lubricant is limited (max. 2 years). Prior to recommissioning, carry out the following operations following inactivity of **2 years or more**:

- ► Observe the maintenance instructions – consult Pfeiffer Vacuum where necessary.
- ► Change the lubricant.
- ► Check the bearings and replace any aged elastomer parts.

Procedure when recommissioning the vacuum pump

1. Check the roots pump for visible damage and operate the roots pump only in an appropriate operating status.
2. Check the interior of the pump for contaminants.
3. Remove any drying pearls from the suction chamber.
4. Do not operate the vacuum pump if there is evidence of rust on the parts which form the housing. Contact Pfeiffer Vacuum Service.
5. Perform a leak test prior to recommissioning the vacuum pump as required.

12 Recycling and disposal

WARNING

Health hazard through poisoning from toxic contaminated components or devices

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

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

Note

Environmental protection

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

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

12.1 General disposal information

Pfeiffer Vacuum products contain materials that you must recycle.

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

13 Malfunctions

13.1 General

WARNING

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

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

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

CAUTION

Danger of burns on hot surfaces

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

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

Note

No automatic restart following a power failure or error state

After restoring the power supply, the vacuum pump remains in the "Switched Off" state.

- Switch the vacuum pump on actively.

Vacuum pump and electronic drive unit malfunctions always result in a warning or error message. In both cases, you will receive an error code that you can read out via the interfaces of the electronic drive unit. Generally, the LEDs on the control panel display the operating messages. If an error occurs, switch off the vacuum pump and connected devices.

13.2 Troubleshooting

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

Problem	Possible causes	Remedy
The vacuum pump does not start up, no LED lights up on the operator panel of the electronic drive unit	• No mains voltage or operating voltage incorrect	• Check the mains voltage. • Check the mains fuse.
	• Electronic drive unit defective	• Contact Pfeiffer Vacuum Service.
	• Suction chamber dirty	• Switch off the vacuum pump immediately. • Clean suction chamber. • If necessary, contact Pfeiffer Vacuum Service.
Vacuum pump switches off after a while after being started	• Thermal protection switch of the motor or the vacuum pump has triggered	• Determine the cause and eliminate the fault. • Allow the vacuum pump or the motor to cool as necessary.
Vacuum pump/pumping station does not reach ultimate pressure	• Backing pump faulty	• Check the backing pump.
	• Leak in system	• Examine the system for leaks and, if necessary, carry out a leak test. • Eliminate leaks.

Problem	Possible causes	Remedy
Unusual noises during operation	• Suction chamber dirty	• Switch off the vacuum pump immediately. • Clean suction chamber.
	• Damage to the bearing or gear wheels	• Switch off the vacuum pump immediately. • Contact Pfeiffer Vacuum Service.
The vacuum pump keeps reaching the temperature limits (cooling water error)	• Cooling water circuit inactive • Leakage in cooling water system	• Switch off the vacuum pump immediately. • Check and ensure the cooling water supply. • Contact Pfeiffer Vacuum Service.

Tbl. 20: Troubleshooting

13.3 Error codes

Error messages are displayed on the dashboard and in the navigation bar. You will additionally find an error message history in the Messages menu. A more detailed explanation of the error messages can be found in the operating instructions for the individual components.

Malfunction messages

For error messages, a warning icon appears on the left side of the navigation bar and in the “System Status” panel on the dashboard. Pressing the warning icon or the “System status” button displays the error message overview.

Error code	Problem	Possible causes	Remedy
Err001	Emergency stop	• Emergency stop is confirmed • Error in the frequency converter (FC)	• Unlock emergency stop • Contact your Busch Group representative
Err002	Motor excess voltage	• Error in the frequency converter (FC)	• Contact your Busch Group representative
Err003	Motor excess voltage Backing Pump	• Error in the frequency converter (FC)	• Contact your Busch Group representative
Err006	Ramp-up time error	• Pumps do not reach nominal rotation speed • Error in the frequency converter (FC)	• Contact your Busch Group representative
Err023	Motor undervoltage Roots Pump	• Error in the frequency converter (FC)	• Contact your Busch Group representative • Check mains input voltage
Err024	Motor undervoltage Backing Pump	• Error in the frequency converter (FC)	• Contact your Busch Group representative • Check mains input voltage
Err045	Excess temperature of motor Backing Pump	• Insufficient cooling	• Check the cooling
Err046	Excess temperature of motor Roots Pump	• Insufficient cooling	• Check the cooling
Err046	Excess temperature of braking resistor Backing Pump	• Insufficient cooling	• Check the cooling
Err098	Internal communication error Roots pump	• Failure of the internal voltages, as a result of Err023 • Internal wiring incorrect	• Check the mains input voltage • Contact your Busch Group representative
Err099	Internal communication error Backing pump	• Failure of the internal voltages, as a result of Err023 • Internal wiring incorrect	• Check the mains input voltage • Contact your Busch Group representative
Err104	External error	• Error in external application	• Check the external application

Error code	Problem	Possible causes	Remedy
Err107	Overloading of the FC Roots Pump	• Error in the frequency converter (FC)	• Contact your Busch Group representative
Err108	Overloading of the FC Back-ingPump	• Error in the frequency converter (FC)	• Contact your Busch Group representative
Err115	Invalid pump temperature signal Roots Pump, Oil1	• Oil temperature sensors defective or not connected	• Check the sensors and their cables • Replace the sensors and their cables, if required
Err116	Invalid pump temperature signal Backing Pump, Oil2	• Oil temperature sensors defective or not connected	• Check the sensors and their cables • Replace the sensors and their cables, if required
Err117	Pump temperature signal invalid Roots Pump, Gas1	Gas temperature sensor defective or not connected	• Check the sensors and their cables • Replace the sensors and their cables, if required
Err118	Pump temperature signal invalid Backing Pump, Oil3	Gas temperature sensor defective or not connected	• Check the sensors and their cables • Replace the sensors and their cables, if required
Err119	Excess temperature Roots Pump, Temperature Oil1 loose bearing side	• Insufficient cooling	• Check the cooling
Err120	Excess temperature Roots Pump, Temperature Oil2 fixed bearing side	• Insufficient cooling	• Check the cooling
Err121	Excess temperature Roots Pump, Temperature Gas1 exhaust gas	• Insufficient cooling	• Check the cooling
Err122	Excess temperature Backing Pump, Temperature Oil3 motor	• Insufficient cooling	• Check the cooling
Err123	Overtemperature of the power outpur stage (FC) Roots Pump	• Insufficient cooling	• Check the cooling
Err124	Overtemperature of the power outpur stage (FC) Backing Pump	• Insufficient cooling	• Check the cooling
Err173	Motor excess current (FC) Roots Pump	• Suction chamber dirty • Short-circuit	• Check the vacuum pump • Contact your Busch Group representative
Err174	Motor excess current (FC) Backing Pump	• Suction chamber dirty • Short-circuit	• Check the vacuum pump • Contact your Busch Group representative
Err180	Exhaust gas overpressure	• Dirty or blocked exhaust	• Check the exhaust valves • Clean the exhaust valves
Err181	Cooling water flow too low	• Insufficient Cooling water pressure • Insufficient Cooling water volume • Damaged Cooling-water line	• Check the cooling water connection

Tbl. 21: Error messages of the pumping station

Error code	Problem	Possible causes	Remedy
Wrn030	Pre-alarm: Excess temperature Roots Pump, Temperature Oil1 loose bearing side	• Insufficient cooling	• Check the cooling
Wrn031	Pre-alarm: Excess temperature Roots Pump, Temperature Oil2 fixedbearing side	• Insufficient cooling	• Check the cooling
Wrn032	Pre-alarm: Excess temperature Roots Pump, Temperature Gas1 Exhaust gas	• Insufficient cooling	• Check the cooling
Wrn033	Pre-alarm: Excess temperature Backing Pump, Temperature Oil3 Motor	• Insufficient cooling	• Check the cooling
Wrn034	Pre-alarm: Excess temperature Backing Pump, Temperature Gas2 Exhaust gas	• Insufficient cooling	• Check the cooling
Wrn100	Current rotation speed outside of value range for stand-by operation	• Minimum rotation speed in accordance with specification in [P:717] stand-by operation not reached	• Target rotation speed is automatically raised. • Change the permissible rotation speed range in [P:717]

Tbl. 22: Warning messages of the pumping station

14 Busch Group service solutions

To resolve problems not listed in the troubleshooting table, please contact your Busch Group representative.

15 Ordering spare part packages

Observe the following instructions when ordering spare parts:

Procedure

- ► Have the vacuum pump part number, and any other necessary details from the rating plate, to hand when ordering spare parts.
- ► Use only original spare parts.

Spare part packages	Pump version	Order number
Maintenance kit 1	HiLobe 2703 HiLobe 4503 HiLobe 6203	PP E47 100 -T
Maintenance kit 3	HiLobe 2703 HiLobe 4503 HiLobe 6203	PP E42 100 -T
Maintenance kit for cleaning suction chamber	HiLobe 2703 HiLobe 4503 HiLobe 6203	PP E48 100 -T

Tbl. 23: HiLobe spare part packages

Spare part package COBRA NS

There are no standard spare part packages for this product.

If you require Busch original parts:

- Please contact your Busch Group representative.

Spare part packages	Order number
VSC 100 (standard operating fluid), 1 L	0831 168 356
VSC 100 (standard operating fluid), 5 L	0831 168 357
VSC 100 (standard operating fluid), 10 L	0831 210 162
VSC 100 (standard operating fluid), 20 L	0831 168 359
YLC 250 B, 0.5 L	0831 131 400
YLC 250 B, 1 L	0831 108 878
YLC 250 B, 5 L	0831 108 879
Cooling liquid	On request

Tbl. 24: COBRA DH spare part packages

16 Technical data and dimensions

16.1 General

Basis for the technical data of Pfeiffer Vacuum roots pumps

- Specifications according to PNEUROP committee PN5
- ISO 21360-1: 2016 “Vacuum technology - Standard methods for measuring vacuum-pump performance - General description”
- Leak test to ascertain the integral leakage rate according to EN 1779: 1999 technique A1; with 100 % helium concentration, 10 s measurement duration
- Sound pressure level: distance to vacuum pump 1 m

	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						

Tbl. 25: Conversion table: Pressure units

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

Tbl. 26: Conversion table: Units for gas throughput

Note

Special versions

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

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

16.2 Substances in contact with media

Pump parts	Substances in contact with media
Pump housing	Cast iron (nodular graphite cast iron)
Rotor	Cast iron (nodular graphite cast iron)
Seals	FKM
Silencer/exhaust	Stainless steel

Tbl. 27: Materials that make contact with the process media

16.3 Technical data

Type designation	COBRA DH 2760	COBRA DH 4560	COBRA DH 6260
Part number	PP S50 003	PP S50 004	PP S50 005
Main flange type	ISO-F	ISO-F	ISO-F
Main flange size	DN 160	DN 160	DN 160
Main flange type 2	PN 16	PN 16	PN 16
Main flange size 2	DN 150	DN 150	DN 150
Secondary flange type	ISO-F	ISO-F	ISO-F
Secondary flange size	DN 63	DN 63	DN 63
Nominal pumping speed	2700 – 2700 m^3/h	2700 – 4500 m^3/h	2700 – 6200 m^3/h
Pumping speed, max.	2112 m^3/h	3077 m^3/h	3781 m^3/h
Emission sound pressure level (EN ISO 2151) at intake pressure 1 hPa	< 69 dB(A)	< 69 dB(A)	< 69 dB(A)
Cooling method	Water	Water	Water
Cooling water pressure	1500 – 5000 hPa	1500 – 5000 hPa	1500 – 5000 hPa
Cooling water temperature	5 – 30 °C	5 – 30 °C	5 – 30 °C
Cooling water flow, min.	10 l/min	10 l/min	10 l/min
Input voltage(s)	380 – 480 V AC (±10 %), 50/60 Hz	380 – 480 V AC (±10 %), 50/60 Hz	380 – 480 V AC (±10 %), 50/60 Hz
I/O interfaces	RS485	RS485	RS485
Protection degree	IP54, Type 12	IP54, Type 12	IP54, Type 12
Integral leak rate	$1 \cdot 10^{-6}$ Pa m^3/s	$1 \cdot 10^{-6}$ Pa m^3/s	$1 \cdot 10^{-6}$ Pa m^3/s
Operating fluid amount	2.6 l	2.6 l	2.6 l
Paint finish color	RAL 7035	RAL 7035	RAL 7035
Ambient temperature	5 – 45 °C	5 – 45 °C	5 – 45 °C
Temperature: Shipping	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Operating fluid	D2, VSC 100	D2, VSC 100	D2, VSC 100
Temperature: Storage	-25 – 50 °C	-25 – 50 °C	-25 – 50 °C
Cooling water connection (in)	G 1/2''	G 1/2''	G 1/2''
Cooling water connection (out)	G 1/2''	G 1/2''	G 1/2''
Recommended on-site electric fuse protection	63 A	63 A	63 A
Ultimate pressure	$< 1 \cdot 10^{-3}$ hPa	$< 1 \cdot 10^{-3}$ hPa	$< 1 \cdot 10^{-3}$ hPa
Power consumption at ultimate pressure	9.3 kW	9.5 kW	9.7 kW
Power consumption at ultimate pressure, max (with energy saving module)	2.7 kW	2.7 kW	2.7 kW
Auxiliary gas consumption (purge gas)	25 l/min	25 l/min	25 l/min
Auxiliary gas consumption (sealing gas)	16 l/min	16 l/min	16 l/min
Auxiliary gas consumption (VacBoost)	26 l/min	26 l/min	26 l/min
Dimensions (L x W x H)	1446 x 630 x 1140 mm	1446 x 630 x 1140 mm	1446 x 630 x 1140 mm
Weight	950 kg	950 kg	950 kg

Tbl. 28: Technical data COBRA DH 2760 | 4560 | 6260

Type designation	COBRA DH 2780	COBRA DH 4580	COBRA DH 6280
Part number	PP S50 006	PP S50 007	PP S50 008
Main flange type	ISO-F	ISO-F	ISO-F
Main flange size	DN 160	DN 160	DN 160
Main flange type 2	PN 16	PN 16	PN 16
Main flange size 2	DN 150	DN 150	DN 150

Type designation	COBRA DH 2780	COBRA DH 4580	COBRA DH 6280
Secondary flange type	ISO-F	ISO-F	ISO-F
Secondary flange size	DN 63	DN 63	DN 63
Nominal pumping speed	2700 – 2700 m^3/h	2700 – 4500 m^3/h	2700 – 6200 m^3/h
Pumping speed, max.	2250 m^3/h	3510 m^3/h	4650 m^3/h
Emission sound pressure level (EN ISO 2151) at intake pressure 1 hPa	< 69 dB(A)	< 69 dB(A)	< 69 dB(A)
Cooling method	Water	Water	Water
Cooling water pressure	1500 – 5000 hPa	1500 – 5000 hPa	1500 – 5000 hPa
Cooling water temperature	5 – 30 °C	5 – 30 °C	5 – 30 °C
Cooling water flow, min.	10 l/min	10 l/min	10 l/min
Input voltage(s)	380 – 480 V AC (±10 %), 50/60 Hz	380 – 480 V AC (±10 %), 50/60 Hz	380 – 480 V AC (±10 %), 50/60 Hz
I/O interfaces	RS485	RS485	RS485
Protection degree	IP54, Type 12	IP54, Type 12	IP54, Type 12
Integral leak rate	$1 \cdot 10^{-6}$ Pa m^3/s	$1 \cdot 10^{-6}$ Pa m^3/s	$1 \cdot 10^{-6}$ Pa m^3/s
Operating fluid amount	2.6 l	2.6 l	2.6 l
Paint finish color	RAL 7035	RAL 7035	RAL 7035
Ambient temperature	5 – 45 °C	5 – 45 °C	5 – 45 °C
Temperature: Shipping	-10 – 50 °C	-10 – 50 °C	-10 – 50 °C
Operating fluid	D2, VSC 100	D2, VSC 100	D2, VSC 100
Temperature: Storage	-25 – 50 °C	-25 – 50 °C	-25 – 50 °C
Cooling water connection (in)	G 1/2''	G 1/2''	G 1/2''
Cooling water connection (out)	G 1/2''	G 1/2''	G 1/2''
Recommended on-site electric fuse protection	63 A	63 A	63 A
Ultimate pressure	$< 1 \cdot 10^{-3}$ hPa	$< 1 \cdot 10^{-3}$ hPa	$< 1 \cdot 10^{-3}$ hPa
Power consumption at ultimate pressure	10 kW	10.2 kW	10.4 kW
Power consumption at ultimate pressure, max (with energy saving module)	3.6 kW	3.6 kW	3.6 kW
Auxiliary gas consumption (purge gas)	25 l/min	25 l/min	25 l/min
Auxiliary gas consumption (sealing gas)	16 l/min	16 l/min	16 l/min
Auxiliary gas consumption (VacBoost)	26 l/min	26 l/min	26 l/min
Dimensions (L x W x H)	1446 x 630 x 1140 mm	1446 x 630 x 1140 mm	1446 x 630 x 1140 mm
Weight	950 kg	950 kg	950 kg

Tbl. 29: Technical data COBRA DH 2780 | 4580 | 6280

16.4 Dimensions

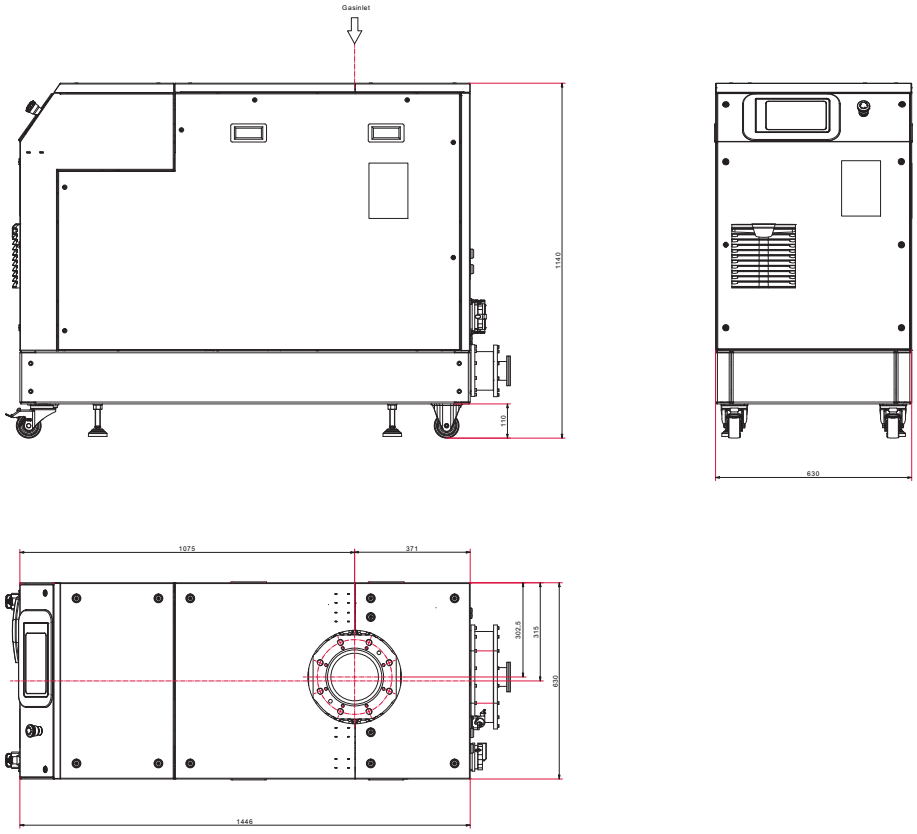

Fig. 52: Dimensions COBRA DH 2760 | 4560| 6260 | 2780 | 4580 | 6280
Dimensions in mm

EC Declaration of Conformity

Declaration for product(s) of the type:

Pumping station
COBRA DH 2760
COBRA DH 4560
COBRA DH 6260
COBRA DH 2780
COBRA DH 4580
COBRA DH 6280

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

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

Harmonized standards and applied national standards and specifications:

DIN EN ISO 12100: 2011
DIN EN 1012-2: 2011
DIN EN ISO 13857: 2020
DIN ISO 21360-1: 2020
ISO 21360-2: 2020
DIN EN ISO 2151: 2009
DIN EN 60204-1: 2019
DIN EN IEC 61000-6-2: 2019
DIN EN IEC 61000-6-4: 2020
DIN EN 60529: 2014
DIN EN IEC 63000: 2019

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

Signature:

Pfeiffer Vacuum GmbH
Berliner Straße 43
35614 Asslar
Germany

(Daniel Sälzer)
Managing Director

Asslar, 2019-10-09

CE

UK Declaration of Conformity

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

Declaration for product(s) of the type:

Pumping station
COBRA DH 2760
COBRA DH 4560
COBRA DH 6260
COBRA DH 2780
COBRA DH 4580
COBRA DH 6280

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

Supply of Machinery (Safety) Regulations 2008
Electrical Equipment (Safety) Regulations 2016
Electromagnetic Compatibility Regulations 2016
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

Harmonized standards and applied national standards and specifications:

ISO 12100: 2010
EN 1012-2+A1:1996
ISO 13857: 2019
ISO 21360-1: 2020
ISO 21360-2: 2020
EN ISO 2151: 2008
EN 60204-1: 2018
EN IEC 61000-6-2: 2019
EN IEC 61000-6-4: 2019
EN 60529: 1991 + A1: 2000 + A2: 2013
EN IEC 63000: 2018

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

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(Daniel Sälzer)
Managing Director

Asslar, 2022-09-02

UK CA

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Vacuum Solutions

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