



**VACUUM SOLUTIONS**

Part of the **BUSCH** GROUP

# COBRA

Dry Screw Vacuum Pumps  
NC 1000 B Water-Cooled Version (WCV)

## Instruction Manual



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# 1 Safety

Prior to handling the machine, this instruction manual should be read and understood. If anything needs to be clarified, contact your manufacturer representative.

Read this instruction manual carefully before use and keep for future reference.

This instruction manual remains valid as long as the customer does not change anything on the product.

The machine is intended for industrial use. It must be handled only by technically trained personnel.

Always wear appropriate personal protective equipment in accordance with the local regulations.

The machine has been designed and manufactured in accordance with the state-of-the-art methods. Nevertheless, residual risks may remain, as described in the following chapters and in accordance with the chapter *Intended Use* [→ 6].

This instruction manual highlights potential hazards where appropriate. Safety notes and warning messages are tagged with one of the keywords DANGER, WARNING, CAUTION, NOTICE and NOTE as follows:



## DANGER

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



## WARNING

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



## CAUTION

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



## NOTICE

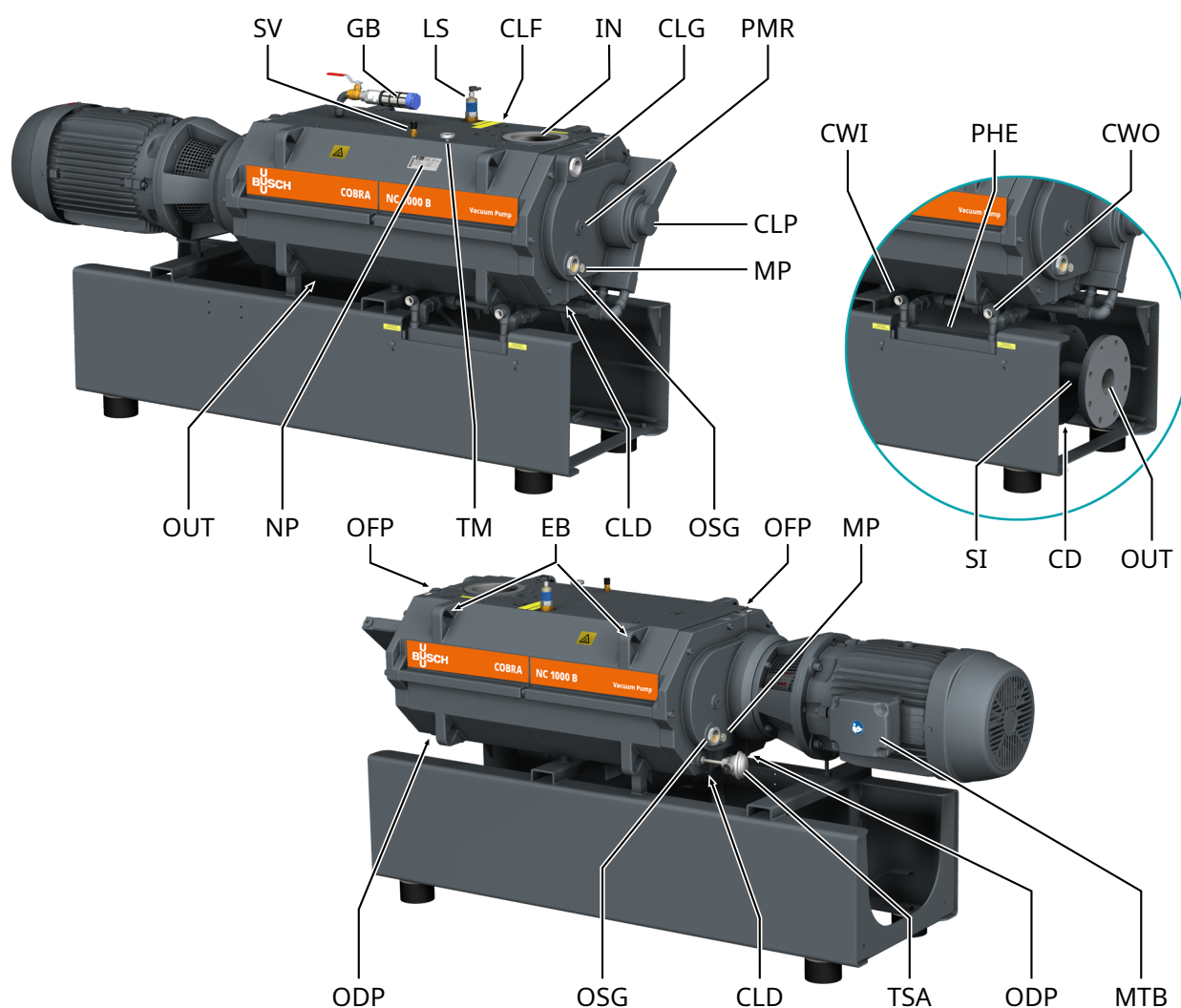
... indicates a potentially dangerous situation that could result in damage to property.



## NOTE

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

## 2 Product Description



### Description

|     |                          |     |                                    |
|-----|--------------------------|-----|------------------------------------|
| IN  | Inlet connection         | OUT | Exhaust connection                 |
| CD  | Condensate drain         | CLD | Cooling liquid drain plug          |
| CLF | Cooling liquid fill plug | CLG | Cooling liquid sight glass         |
| CLP | Cooling liquid pump      | CWI | Cooling water inlet                |
| CWO | Cooling water outlet     | EB  | Eye bolt                           |
| GB  | Gas-ballast valve        | LS  | Level switch                       |
| MP  | Magnetic plug            | MTB | Motor terminal box                 |
| NP  | Name plate               | ODP | Oil drain plug                     |
| OFP | Oil fill plug            | OSG | Oil sight glass                    |
| PHE | Plate heat exchanger     | PMR | Plug for manual rotation of rotors |
| SI  | Silencer                 | SV  | Safety valve                       |
| TM  | Thermometer              | TSA | Resistance thermometer             |

## NOTE

**Technical term.**

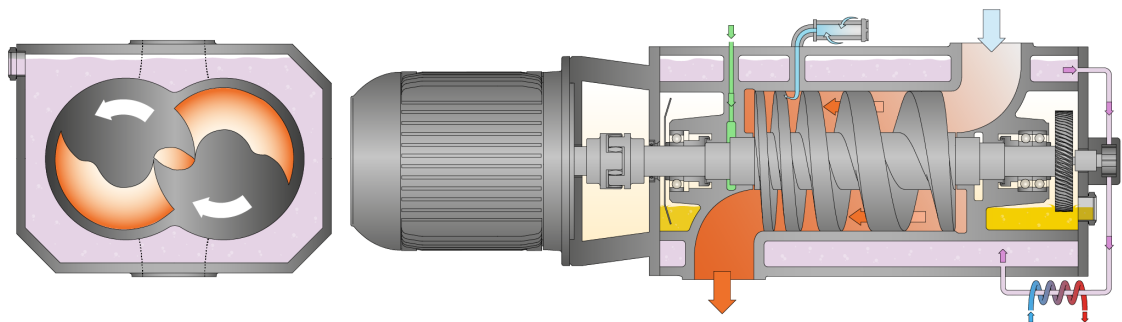
In this instruction manual, we consider that the term 'machine' refers to the 'vacuum pump'.

## NOTE

**Illustrations.**

In this instruction manual, the illustrations may differ from the appearance of the machine.

## 2.1 Operating Principle



The machine works on the one-stage, twin-screw pump principle.

Two screw rotors rotate inside the cylinder. The pumped medium is trapped between the cylinder and screw chambers, compressed, and transported to the gas outlet. During the compression process, the two screw rotors do not come into contact with each other or with the cylinder. There is no need for a lubrication or an operating fluid in the compression chamber.

## 2.2 Intended Use



### WARNING

**In case of foreseeable misuse outside the intended use of the machine.**

**Risk of injuries!**

**Risk of damage to the machine!**

**Risk of damage to the environment!**

- Make sure to follow all instructions described in this manual.

The machine is intended for the suction of air and other dry, non-aggressive, non-toxic, non-ignitable and non-explosive gases.

Conveying of other media leads to an increased thermal and/or mechanical load on the machine and is permissible only after a consultation with the manufacturer.

The machine is intended for placement in a potentially non-explosive environment.

The machine is capable of maintaining ultimate pressure, see *Technical Data* [→ 37].

The machine is suitable for continuous operation.

Permitted environmental conditions, see *Technical Data* [→ 37].

## 2.3 Start Controls

The machine comes without start controls. The control of the machine is to be provided in the course of installation.

The machine can be equipped with a soft-starter or a variable speed drive (not included in the scope of supply).

## 2.4 Standard Features

### 2.4.1 Water Cooling

The machine is cooled by a cooling liquid circuit in the cylinder cover and cylinder.

The cooling liquid pump (CLP) allows a recirculating flow in the cooling liquid chamber.

The cooling liquid is cooled by a plate heat exchanger (PHE) which must be connected to the water main.

### 2.4.2 Resistance Thermometer

The resistance thermometer monitors the cooling liquid temperature of the machine.

A trip signal must be set. The machine must be stopped when the cooling liquid temperature reaches 70 °C.



#### NOTE

**This temperature monitoring device must be electrically connected.**

- For more information, see *Electrical Connection of the Monitoring Devices* [→ 22].

### 2.4.3 Level Switch

The level switch monitors the cooling liquid level in the cylinder.

The machine must be stopped when the cooling liquid level is too low.

### 2.4.4 Thermometer

The thermometer allows a visual display of the cooling liquid temperature.

### 2.4.5 Sealing Systems

The machine is equipped with labyrinth seals on the motor side and inlet side.

Other sealing systems are optionally available, see *Mechanical Seals* [→ 8].

Sealing systems prevent the process gas going to the bearings chambers.

Depending on the application, the sealing systems efficiency can be improved with a barrier gas system, see *Barrier Gas System* [→ 8].

## 2.5 Optional Accessories

### 2.5.1 Gas-Ballast Valve

The gas-ballast valve mixes the process gas with a limited quantity of ambient air to counteract the condensation of vapor inside the machine.

The gas-ballast valve has an influence on the ultimate pressure of the machine, see *Technical Data* [→ 37].

A ball valve allows the flow of ballast gas to be opened or closed.

## 2.5.2 Silencer

A silencer at the exhaust connection (OUT) can be installed to reduce the exhaust gas noise.

## 2.5.3 Barrier Gas System

The barrier gas system allows the supply of compressed air or nitrogen into the motor side shaft seals to improve the sealing efficiency.

## 2.5.4 Mechanical Seals

The sealing systems can be equipped with mechanical seals. The following variants are possible:

- Oil-lubricated single mechanical seals on the motor side and labyrinth seals on the inlet side.
- Oil-lubricated single mechanical seals on the motor side and on the inlet side.



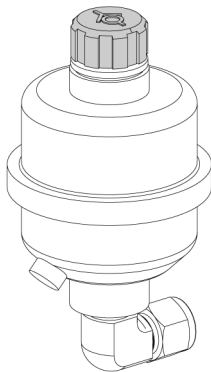
### NOTICE

**When the machine is equipped with a motor-side sealing system featuring mechanical seals, it is also optionally equipped with a *Gearbox Pressure Relief Valve* [→ 8].**

---

## 2.5.5 Gearbox Pressure Relief Valve

If the machine is equipped with a motor-side sealing system featuring mechanical seals, it will also be optionally equipped with a gearbox pressure relief valve.



The pressure relief valve is installed on the motor-side of the machine. It incorporates an oil mist filter to prevent oil leaks, which will be replaced during the general overhaul of the machine.

- For more information, contact your Busch representative.

### 3 Transport and Handling



#### WARNING

**Suspended load.**

**Risk of severe injury!**

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



#### WARNING

**Lifting the machine using the motor eye bolt.**

**Risk of severe injury!**

- Do not lift the machine using the eye bolt fitted to the motor.
- Only lift the machine as shown.

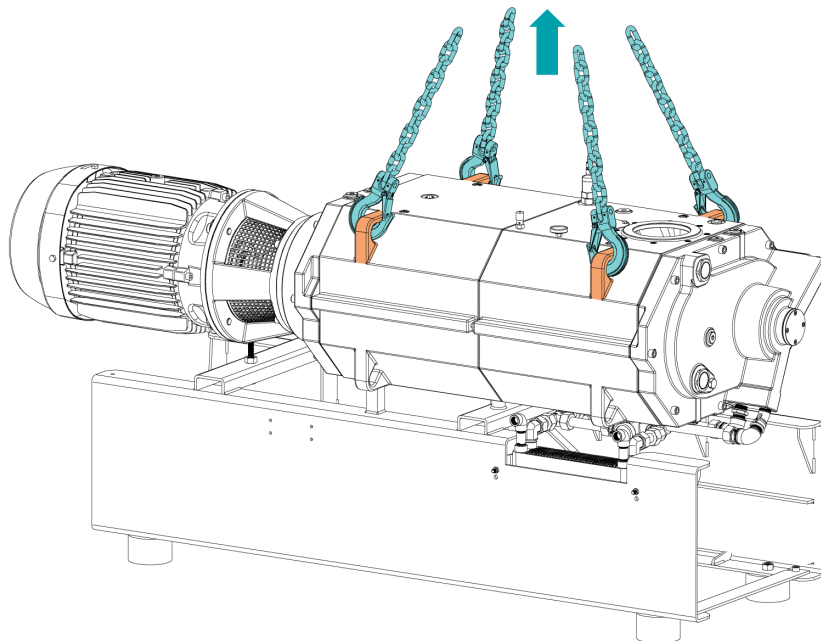


#### NOTICE

**If the machine is already filled with oil.**

**Tilting a machine already filled with oil can cause a large amount of oil to ingress into the cylinder.**

- Drain the oil before each transport or always transport the machine horizontally.
- To find out the weight of the machine, refer to the chapter *Technical Data* [→ 37] or the name plate (NP).



- Check that the machine has not been damaged during transport.

If the machine is mounted and secured on a transport support (pallet):

- Remove the machine from the transport support before installation.

## 4 Storage

- Seal hermetically all apertures with the caps provided with the machine, or with adhesive tape if the caps are no longer available.
- Store the machine indoors, in a dry place, away from dust and vibrations and if possible, in original packaging, preferably at temperatures between 5 ... 55 °C.

If the machine is to be stored for more than 3 months:

- Seal hermetically all apertures with the caps provided with the machine, or with adhesive tape if the caps are no longer available.
- Wrap the machine in a corrosion inhibitor film.
- Store the machine indoors, in a dry place, away from dust and vibrations and if possible, in original packaging, preferably at temperatures between 5 ... 55 °C.



### NOTICE

**Long storage time.**

**Risk of damage to the machine!**

- If the machine is equipped with oil lubricated mechanical seals, we recommend to completely fill the oil chamber before a long storage, see "Oil filling" in chapter *Oil Change* [→ 28]. This protects the mechanical seals during a long storage. Use the standard pump oil, see chapter Oil.
  - Before restarting the machine, drain the oil to the normal oil level, see "Oil draining" in chapter *Oil Change* [→ 28].
-

## 5 Installation

### 5.1 Installation Conditions



#### WARNING

**If the machine is installed in a potentially explosive environment or if the machine is used to draw toxic, inflammable or non-inert gases:**

**Risk of injuries!**

**Risk of death!**

- Ensure that the machine complies with all local, national rules and safety regulations.



#### NOTICE

**Use of the machine outside of the permitted installation conditions.**

**Risk of premature failure!**

**Loss of efficiency!**

- Make sure that the installation conditions are fully respected.
- Make sure that the environment of the machine is not potentially explosive.
- Make sure that the ambient conditions comply with the *Technical Data* [→ 37].
- Make sure that the environmental conditions comply with the protection class of the motor and the electrical elements.
- Make sure that the installation space or location is vented such that sufficient cooling of the machine is provided.
- Make sure that cooling air inlets and outlets of the motor fan are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.
- Make sure that the oil sight glass (OSG) remains easily visible.
- Make sure that enough space remains for maintenance work.
- Make sure that the machine is placed or mounted horizontally, a maximum deviation of 1° in any direction is acceptable.
- Check the oil level, see *Oil Level Inspection* [→ 27].
- Check the cooling liquid level, see *Cooling Liquid Level Inspection* [→ 27].
- Make sure that the cooling water complies with the requirements, see *Cooling Water Connection* [→ 14].

**If the machine is installed at an altitude greater than 1000 meters above sea level:**

- Contact your manufacturer representative, the motor must be derated or the ambient temperature limited.

## 5.2 Connecting Lines / Pipes

- Remove all protective covers before installation.
- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.
- Make sure that the diameter of the connecting lines over the entire length is at least as large as the connections of the machine.

In case of long connecting lines:

- Use larger diameters to avoid a loss of efficiency.
- Contact your manufacturer representative for more information.

### 5.2.1 Inlet Connection



#### WARNING

**Unprotected inlet connection.**

**Risk of severe injury!**

- Do not put hand or fingers in the inlet connection.



#### NOTICE

**Ingress of foreign objects or liquids.**

**Risk of damage to the machine!**

If the inlet gas contains dust or other foreign solid particles:

- Install a suitable filter (5 micron or less) at the inlet of the machine.

Connection size(s):

- DN125 PN16, EN 1092-1

If the machine is used as part of a vacuum system:

- Busch recommends the installation and use of an isolation valve to prevent the machine from running backwards.
- Busch also recommends not opening the isolation valve until at least the minimum machine speed has been reached.
- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.

## 5.2.2 Exhaust Connection



### NOTICE

**Exhaust gas flow obstructed.**

**Risk of damage to the machine!**

- Make sure that the exhaust gas will flow without obstruction. Do not shut off or throttle the exhaust line or use it as a pressurized air source.

Connection size(s):

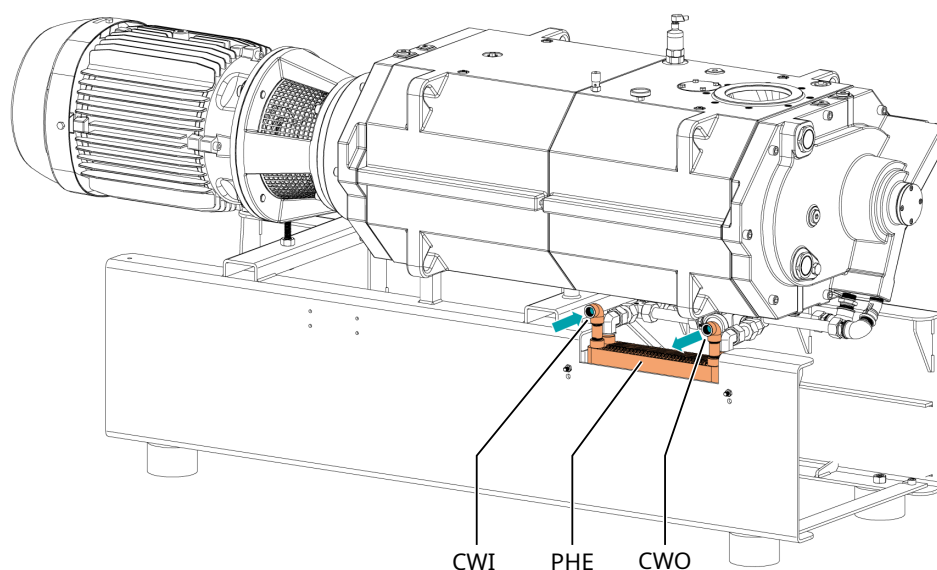
At the machine exhaust connection:

- DN125 PN16, EN 1092-1

At the silencer (SI) exhaust connection (two optional versions available):

- DN125 PN16, EN 1092-1
- DN100 ISO-K, DIN 28404
- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.
- Make sure that the counter pressure (also called "back pressure") at the exhaust connection (OUT) does not exceed the maximum allowable exhaust pressure, see *Technical Data* [→ 37].

### 5.2.3 Cooling Water Connection



#### Description

|     |                      |     |                      |
|-----|----------------------|-----|----------------------|
| CWI | Cooling water inlet  | CWO | Cooling water outlet |
| PHE | Plate heat exchanger |     |                      |

- Connect the cooling water connections (CWI / CWO) to the water supply.

Connection size(s):

- G ½", ISO 228-1 (CWI / CWO)
- Make sure that the cooling water complies with the following requirements:

|                                                         |         |            |
|---------------------------------------------------------|---------|------------|
| Supply capacity                                         | l/min   | 15         |
| Water pressure                                          | bar (g) | 1 ... 6    |
| Supply temperature                                      | °C      | +5 ... +30 |
| Required pressure differential across supply and return | bar (g) | ≥ 1        |

- To reduce the maintenance effort and ensure a long product lifetime, we recommend the following cooling water quality:

|                                             |                 |       |
|---------------------------------------------|-----------------|-------|
| Hardness                                    | mg/l (ppm)      | < 90  |
| Properties                                  | Clean & clear   |       |
| PH value                                    | 7 ... 8         |       |
| Particle size                               | µm              | < 200 |
| Chloride                                    | mg/l            | < 100 |
| Electrical conductivity                     | µS/cm           | ≤ 100 |
| Free chloride                               | mg/l            | < 0.3 |
| Materials in contact with the cooling water | Stainless steel |       |



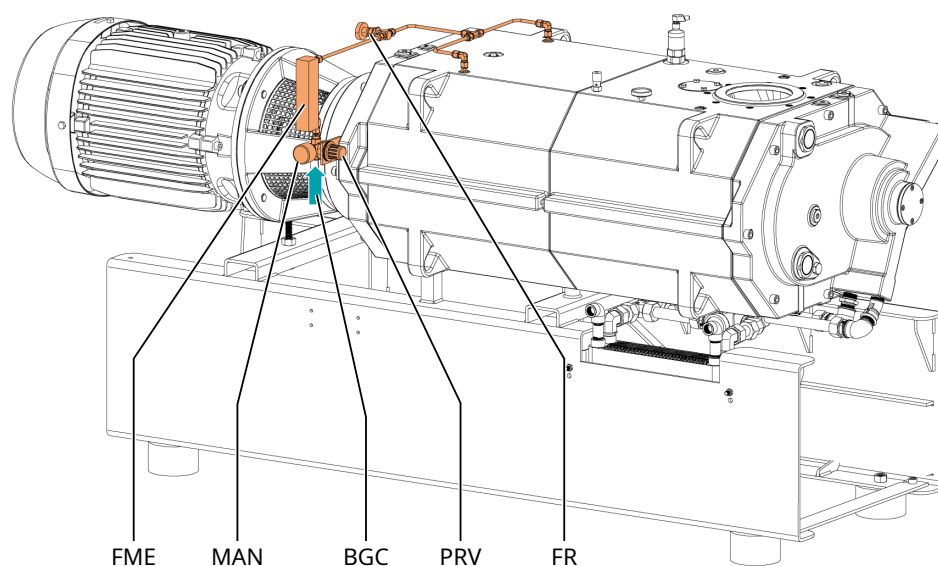
#### NOTE

**Water hardness unit conversion.**

**1 mg/l (ppm) = 0.056 °dh (german degree) = 0.07 °e (english degree) = 0.1 °fH (french degree)**

## 5.2.4 Barrier Gas System Connection (Optional)

### Without nitrogen panel



#### Description

|     |                           |     |            |
|-----|---------------------------|-----|------------|
| BGC | Barrier gas connection    | FME | Flow meter |
| FR  | Flow regulator            | MAN | Manometer  |
| PRV | Pressure regulating valve |     |            |

- Connect the barrier gas connection (BGC) to the gas supply.

Connection size:

- G1/4", ISO 228-1
- Make sure that the gas complies with the following requirements:

|                                                                     |                                 |              |
|---------------------------------------------------------------------|---------------------------------|--------------|
| Gas type                                                            | Dry nitrogen or air             |              |
| Gas temperature                                                     | °C                              | 0 ... 60     |
| Maximum gas pressure                                                | bar (g)                         | 13           |
| Recommended pressure setting at the pressure regulating valve (PRV) | bar (g)                         | 3            |
| Filtration                                                          | µm                              | 5            |
| Recommended flow rate                                               | SLM (standard liter per minute) | 30           |
| Air quality (only for air)                                          | Acc. to ISO 8573-1              | Class 5.4.4. |

## 5.3 Filling Oil

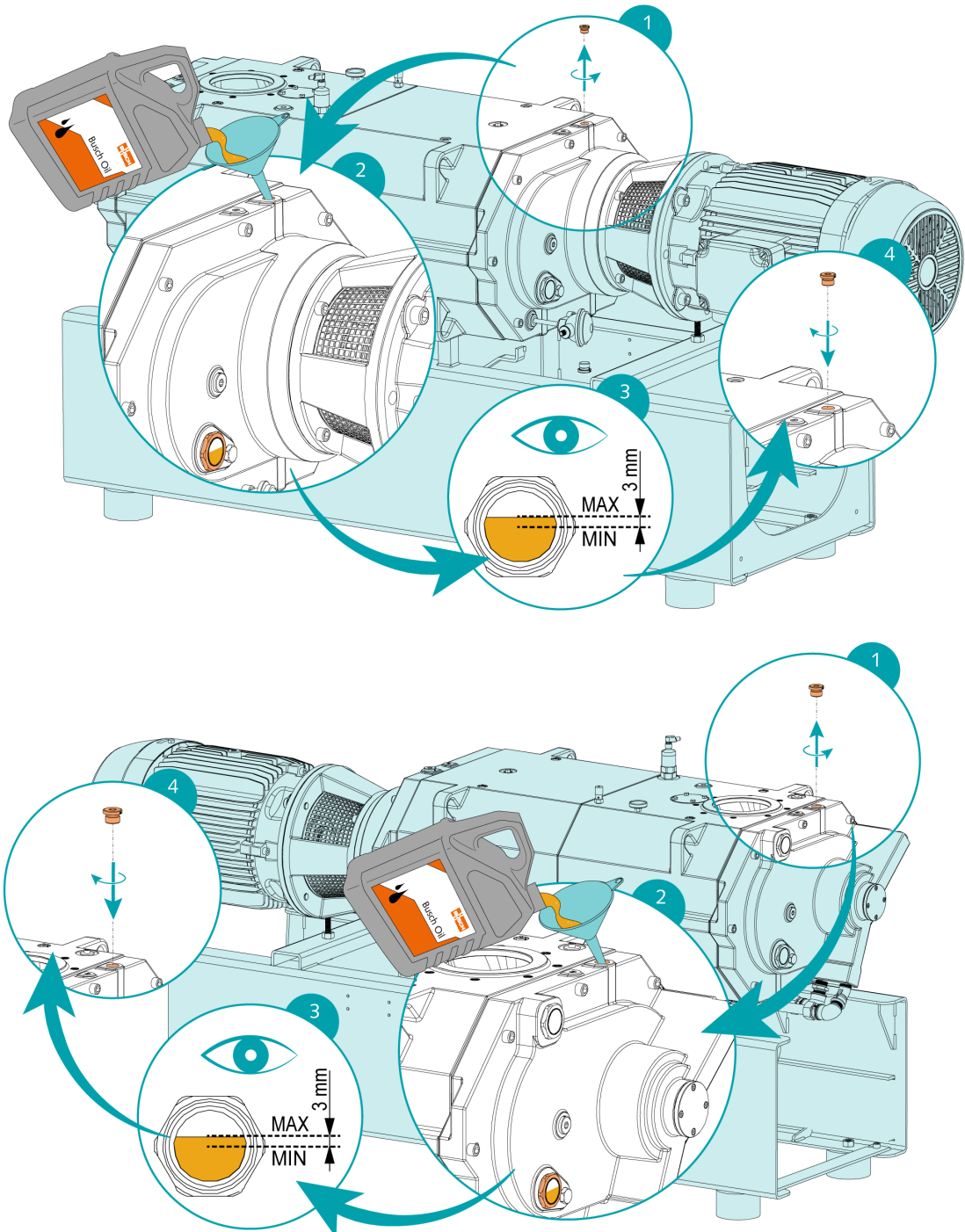
### ! NOTICE

**Use of inappropriate oil.**

**Risk of premature failure!**

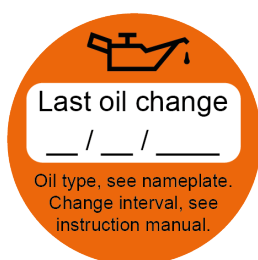
**Loss of efficiency!**

- Use only a type of oil previously approved and recommended by the manufacturer.
- For information on oil type and filling capacities, see the *Technical Data* [→ 37] and *Oil* [→ 37] chapters.



When oil filling is complete:

- Note the date of the oil change on the sticker.

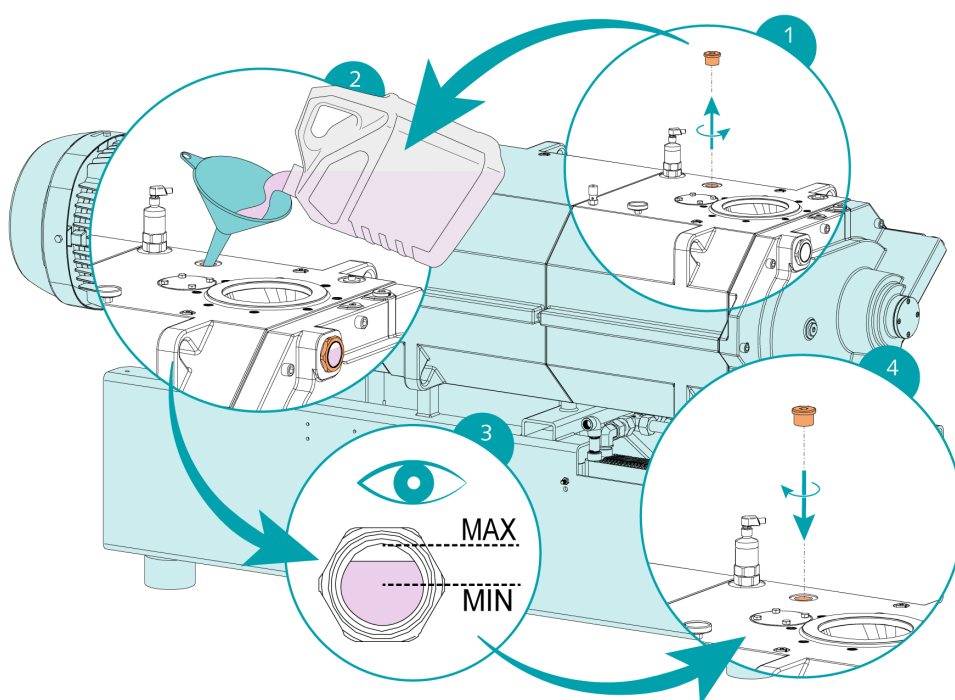


If there is no sticker on the machine:

- Order it from your Busch representative (article number 0565 568 959).

## 5.4 Filling Cooling Liquid

For cooling liquid type and cooling liquid capacity see *Technical Data* [→ 37] and *Cooling Liquid* [→ 37].



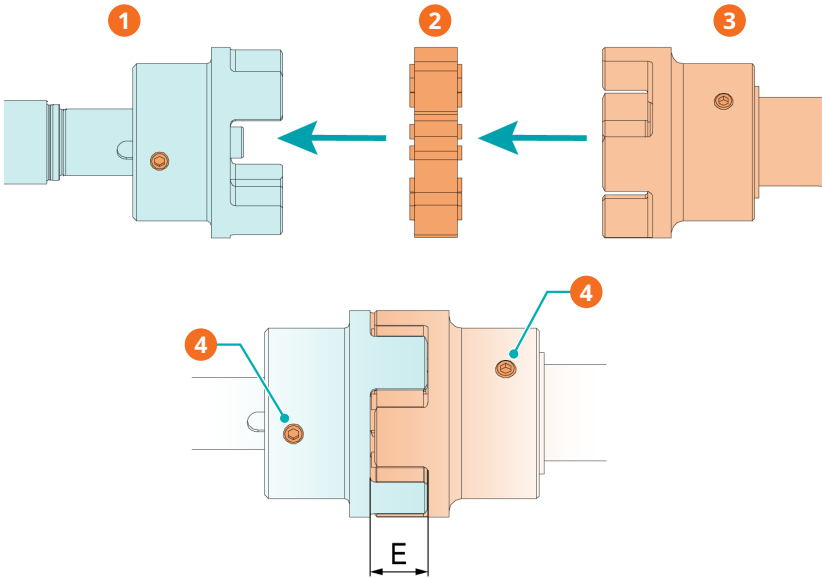
## 5.5 Fitting the Coupling



### NOTE

Radial screws.

For trouble-free operation, use thread locking glue to secure any radial screw.



| Description |                             |   |                                         |
|-------------|-----------------------------|---|-----------------------------------------|
| 1           | Coupling hub (machine side) | 2 | Coupling spider                         |
| 3           | Coupling hub (motor side)   | 4 | Radial screws / Tightening torque: 10Nm |

| Machine type | Coupling size | Value "E" (mm) |
|--------------|---------------|----------------|
| NC 1000 B    | ROTEX® 48     | 28             |

In case of delivery of a machine without motor:

- Mount the second coupling hub on the motor shaft (delivered separately).
- Axially adjust the hub in such a way until value "E" is reached.
- Once the coupling has been adjusted, lock the coupling hub by tightening the radial screw.
- Mount the motor on the machine by including the coupling spider.

For further coupling information, go to [www.ktr.com](http://www.ktr.com) and download the instruction manual of the ROTEX® coupling.

| English                             | German                             | French                             |
|-------------------------------------|------------------------------------|------------------------------------|
|                                     |                                    |                                    |
| <i>Instruction Manual - English</i> | <i>Instruction Manual - German</i> | <i>Instruction Manual - French</i> |

## 6 Electrical Connection



### DANGER

**Live wires.**

**Risk of electrical shock!**

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

#### INSTALLATION(S) CURRENT PROTECTION:



### DANGER

**Missing current protection.**

**Risk of electrical shock!**

- Provide current protection in accordance with EN 60204-1 on your installation(s).
- The electrical installation must comply with the applicable national and international standards.



### NOTICE

**Electromagnetic compatibility.**

- Make sure that the motor of the machine will not be affected by electric or electromagnetic disturbance from the mains. If necessary, contact your Busch representative for more information.
- Make sure that the EMC of the machine is compliant with the requirements of your supply network system, if necessary, provide further interference suppression (EMC of the machine, see *EU Declaration of Conformity* [→ 38] or *UK Declaration of Conformity* [→ 39]).

### 6.1 Machine delivered without Control Box or Variable Speed Drive (VSD)



### DANGER

**Live wires.**

**Risk of electrical shock!**

- Electrical installation work must only be executed by qualified personnel.
- Make sure that the power supply for the motor is compatible with the data on the name plate of the motor.
- If the machine is equipped with a power connector, install a residual current protective device to protect persons in case of a defective insulation.
  - Busch recommends installing a type B residual protective device suitable for the electrical installation.
- Provide a lockable disconnect switch or an emergency stop switch on the power line so that the machine is completely secured in case of an emergency situation.

- Provide a lockable disconnect switch on the power line so that the machine is completely secured during maintenance tasks.
- Provide an overload protection according to EN 60204-1 for the motor.
- Connect the protective earth conductor.
- Electrically connect the motor.



## NOTICE

**The motor frequency is below 30 Hz.**

**Risk of damage to the machine!**

- The motor nominal speed must always be higher than  $1800 \text{ min}^{-1}$  (30 Hz).
- 



## NOTICE

**The admissible motor nominal speed exceeds the recommendation.**

**Risk of damage to the machine!**

- Check the admissible motor nominal speed ( $n_{\text{max}}$ ) on the name plate of the machine (NP).
  - Make sure to comply with it.
  - For more information, consult the chapter *Technical Data* [→ 37].
- 



## NOTICE

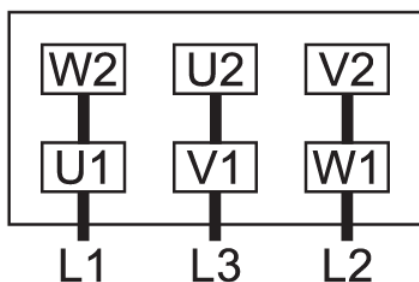
**Incorrect connection.**

**Risk of damage to the motor!**

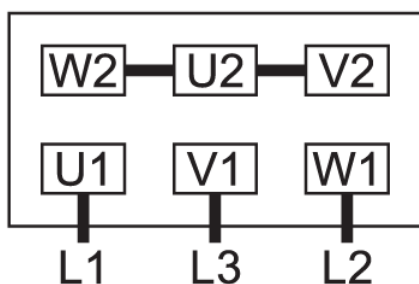
- The wiring diagrams below are examples only. See inside the terminal box for motor connection instructions and diagrams.
-

## 6.2 Wiring Diagram Three-Phase Motor (Pump Drive)

Delta connection (low voltage):



Star connection (high voltage):



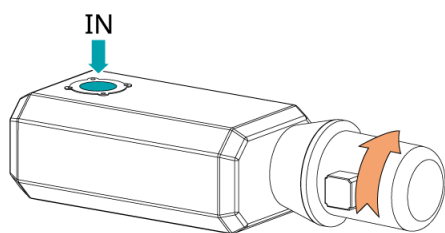
### NOTICE

**Incorrect rotation direction.**

**Risk of damage to the machine!**

- Operating the machine in the wrong direction of rotation can destroy it very quickly! Before starting, make sure that the motor of the machine is rotating in the correct direction.

The intended rotation direction of the motor is defined by the illustration below:



- Jog the motor briefly.
- Watch the fan wheel of the motor and determine the direction of rotation just before the fan wheel stops.

If the rotation of the motor must be changed:

- Switch any two of the motor phase wires.

## 6.3 Electrical Connection of the Monitoring Devices



### NOTE

To prevent potential nuisance alarms, Busch recommends that the control system is configured with a time delay of at least 20 seconds.

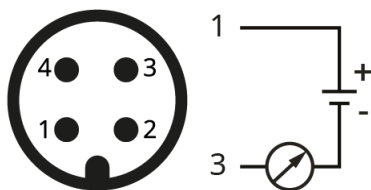
### 6.3.1 Wiring Diagram Resistance Thermometer

**Article number:** 0651 552 252

**Connector:** M12x1, 4-pin

**Electrical Data:**  $U = 7.5 \dots 30 \text{ VDC}$ ;  $4 \dots 20 \text{ mA}$  ►  $-50 \dots 150 \text{ }^{\circ}\text{C}$

**Trip signal:**  $T_{\text{trip}}$ :  $70 \text{ }^{\circ}\text{C}$



1 = Brown; 3 = Blue

### 6.3.2 Wiring Diagram Level Switch

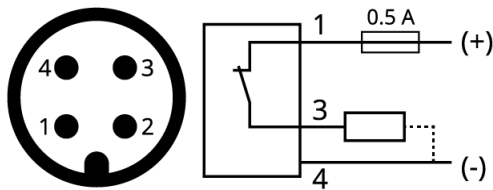
**Article number:** 0652 569 236

**Connector:** M12x1, 4-pin

**Electrical Data:**  $U = 10 \dots 30 \text{ VDC (DC-PNP)}$ ;  $I_{\text{max}} = 200 \text{ mA}$

**Contact:** Normally closed

**Switch point:**  $L_{\text{trip}}$  ► pin 1 + 4 ► low level "stop the machine"



1 = Brown; 3 = Blue; 4 = Black

## 7 Commissioning



### CAUTION

**In operation, the surface of the machine may reach temperatures over 70°C.**

**Risk of burns!**

- Avoid contact with the machine during and directly after operation.



### CAUTION



**Noise of running machine.**

**Risk of damage to hearing!**

If people are present in the vicinity of a machine that is not insulated from noise for extended periods of time:

- Make sure to wear hearing protection.



### NOTICE

**The machine is normally shipped without oil.**

**Operation without oil will ruin the machine in short time!**

- Before commissioning, the machine must be filled with oil, see *Filling Oil* [→ 16].



### NOTICE

**The machine can be shipped without cooling liquid.**

**Operation without cooling liquid will ruin the machine in short time!**

- Before commissioning, the machine must be filled with cooling liquid, see *Filling Cooling Liquid* [→ 17].



### NOTICE

**Lubricating a dry running machine (compression chamber).**

**Risk of damage to the machine!**

- Do not lubricate the compression chamber of the machine with oil or grease.

- Make sure that the *Installation Conditions* [→ 11] are met.
- Open the water supply.

If the machine is equipped with a barrier gas system:

- Open the barrier gas supply.
- Adjust the barrier gas pressure and volume flow.
- Start the machine.
- Make sure that the maximum permissible number of starts does not exceed 6 starts per hour. Those starts should be spread within the hour.

- Make sure that the operating conditions comply with the *Technical Data* [→ 37].
- After a few minutes of operation, perform an *Oil Level Inspection* [→ 27].
- After a few minutes of operation, perform a *Cooling Liquid Level Inspection* [→ 27].

As soon as the machine is used under normal operating conditions:

- Measure the motor current and record it as reference for future maintenance and troubleshooting work.

## 7.1 Conveying Condensable Vapors



### CAUTION

**Venting the machine.**

**The discharged gases and/or liquids may reach temperatures above 70°C!**

**Risk of burns!**

- Avoid direct contact with the flow of gases and/or liquids.
- 

The machine, equipped either with a gas-ballast valve or a dilution gas system, is suitable for conveying condensable vapors in the gas stream.

If condensable vapors are to be conveyed:

#### START

- Open the gas-ballast valve\* or the dilution gas system\* (Solenoid valve).
- Warm up the machine for 30 minutes.
- Open the inlet valve.
- Perform the process.
- Close the inlet valve.
- Wait 30 minutes.
- Close the gas-ballast valve\* or the dilution gas system\* (Solenoid valve).

#### END

\* Optional accessories

- Continuously drain condensate from the condensate drain plug (CD) of the silencer (SI) (Optional).

## 8 Maintenance



### DANGER

**Live wires.**

**Risk of electrical shock!**

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



### DANGER

**Live wires. Carry out any work on the variable speed drive and motor.**

**Risk of electrical shock!**

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



### WARNING



**The machine is contaminated with hazardous material.**

**Risk of poisoning!**

**Risk of infection!**

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.



### CAUTION

**Hot surface.**

**Risk of burns!**

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



### CAUTION

**Hot liquids.**

**Risk of burns!**

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



### CAUTION

**Failing to properly maintain the machine.**

**Risk of injuries!**

**Risk of premature failure and loss of efficiency!**

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



## NOTICE

**Using inappropriate cleaners.**

**Risk of removing safety stickers and protective paint!**

- Do not use incompatible solvents to clean the machine.

- Stop the machine and lock it to prevent accidental start-up.
- Close the water supply.

If the machine is equipped with a barrier gas system:

- Close the barrier gas supply.
- Vent the connected lines to atmospheric pressure.

If necessary:

- Disconnect all connections.

## 8.1 Maintenance Schedule

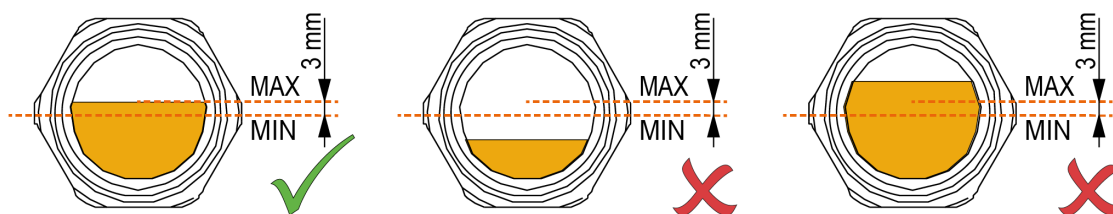
The maintenance intervals depend very much on the individual operating conditions. The intervals given below are considered as starting values which should be individually shortened or extended as appropriate.

Particularly harsh applications or heavy-duty operation, such as high dust loads in the environment or in the process gas, other contamination or ingress of process material, can make it necessary to shorten the maintenance intervals significantly.

| Interval                                                     | Maintenance work                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monthly                                                      | <ul style="list-style-type: none"> <li>• Check the oil level, see <i>Oil Level Inspection</i> [→ 27].</li> <li>• Check the cooling liquid level, see <i>Cooling Liquid Level Inspection</i> [→ 27].</li> <li>• Check the machine for oil leaks. In case of leaks, have the machine repaired (contact Busch).</li> </ul> |
| Yearly                                                       | <ul style="list-style-type: none"> <li>• Carry out a visual inspection and clean the machine from dust and dirt.</li> <li>• Check the electrical connections and the monitoring devices.</li> </ul>                                                                                                                     |
| Yearly<br>If one or more of these accessories are installed. | <ul style="list-style-type: none"> <li>• Check the filter of the gas-ballast valve (GB) and change it if necessary, see <i>Gas-Ballast Filter Replacement (Optional)</i> [→ 27].</li> <li>• Check the silencer (SI) and clean it if necessary.</li> </ul>                                                               |
| Every 5000 hours or after 1 year                             | <ul style="list-style-type: none"> <li>• Change the oil of the gear and bearing housings (both sides), see <i>Oil Change</i> [→ 28].</li> <li>• Change the cooling liquid, see <i>Cooling Liquid Change</i> [→ 31].</li> <li>• Clean the magnetic plugs (MP).</li> </ul>                                                |
| Every 16000 hours or after 4 years                           | <ul style="list-style-type: none"> <li>• Carry out a major overhaul on the machine (contact Busch).</li> </ul>                                                                                                                                                                                                          |
| Refer to motor name plate for interval and grease type       | <ul style="list-style-type: none"> <li>• Regrease motor bearings.</li> </ul>                                                                                                                                                                                                                                            |

## 8.2 Oil Level Inspection

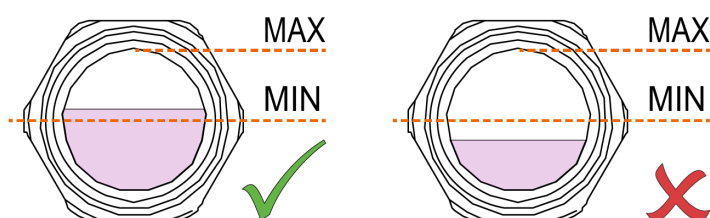
- Stop the machine.
- Wait 1 minute.
- Check the oil level.



- Make sure that the oil level is between the middle of the oil sight glass and 3mm above it.
- Fill up if necessary, see *Filling Oil* [→ 16].

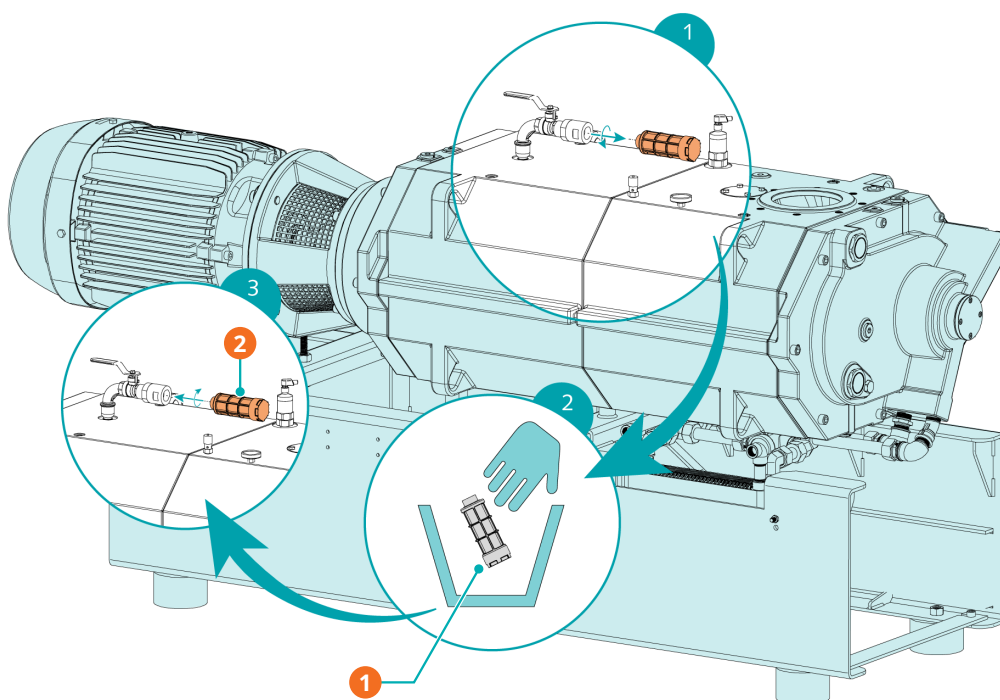
## 8.3 Cooling Liquid Level Inspection

- Stop the machine.



- Fill up if necessary, see *Filling Cooling Liquid* [→ 17].

## 8.4 Gas-Ballast Filter Replacement (Optional)



### Description

|   |                       |   |                                                                      |
|---|-----------------------|---|----------------------------------------------------------------------|
| 1 | Discard the used part | 2 | Gas-ballast filter, art. no. 0562 550 434 (Busch genuine spare part) |
|---|-----------------------|---|----------------------------------------------------------------------|

# 8.5 Oil Change

!

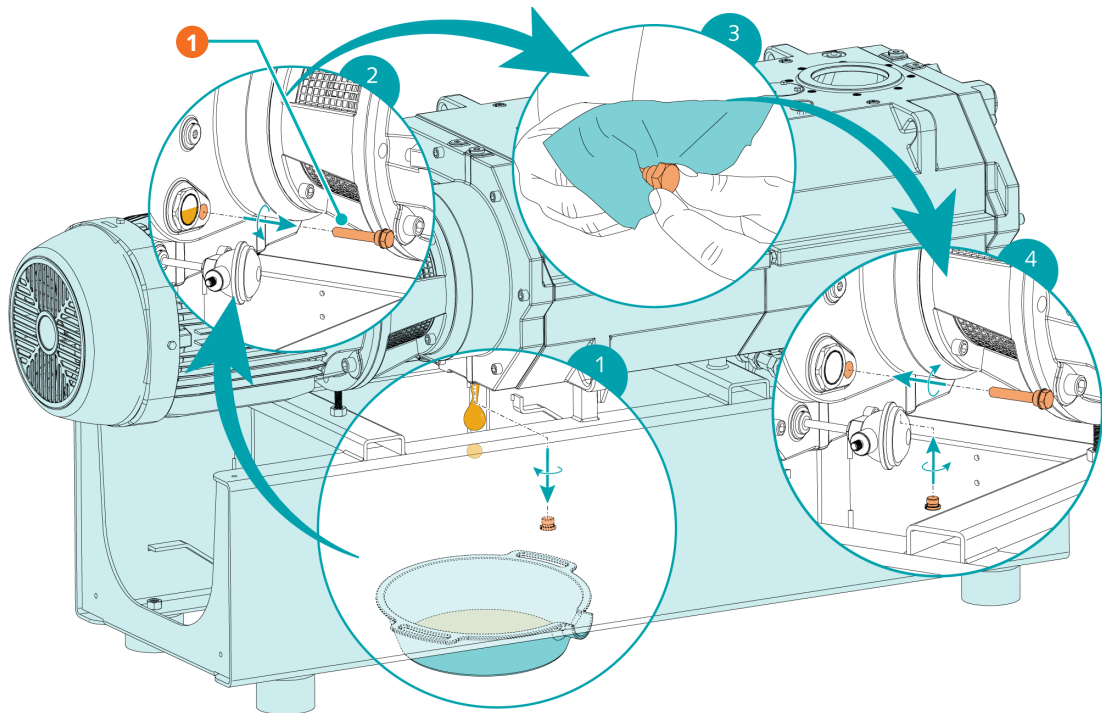
NOTICE

Use of inappropriate oil.

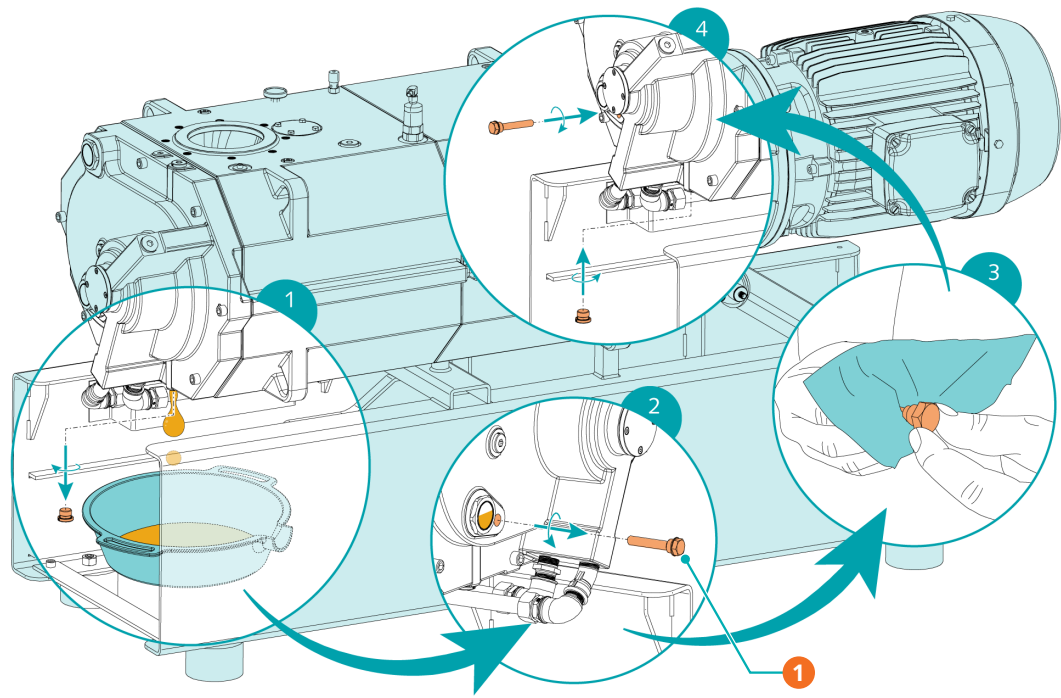
Risk of premature failure!

Loss of efficiency!

- Use only a type of oil previously approved and recommended by the manufacturer.



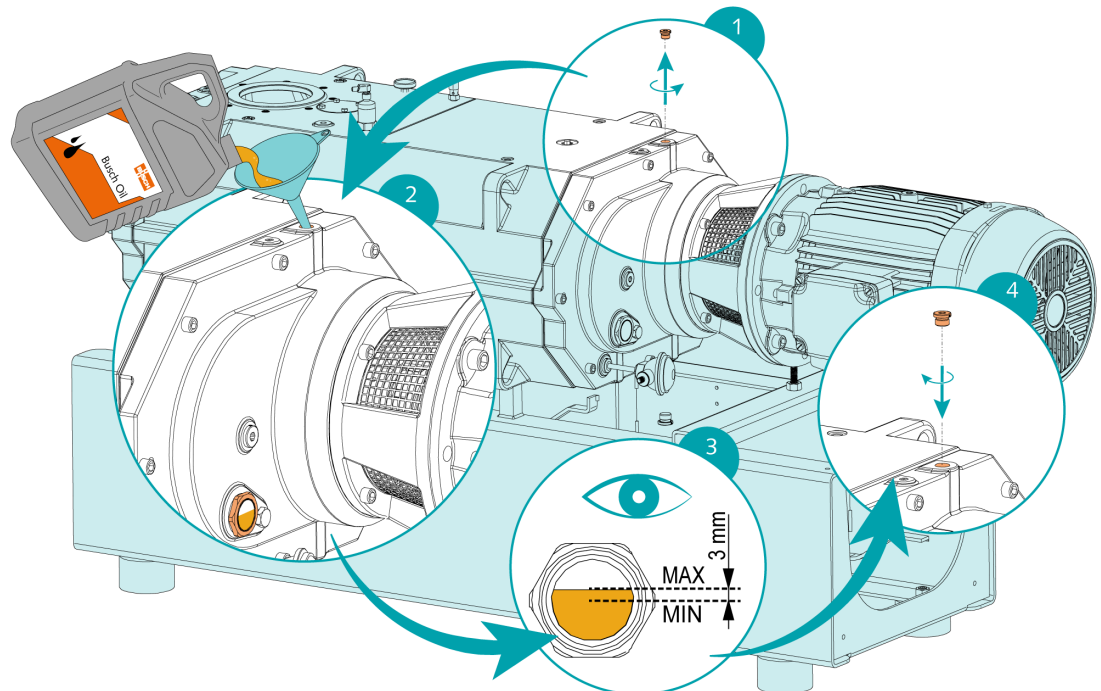
| Description |               |  |
|-------------|---------------|--|
| 1           | Magnetic plug |  |

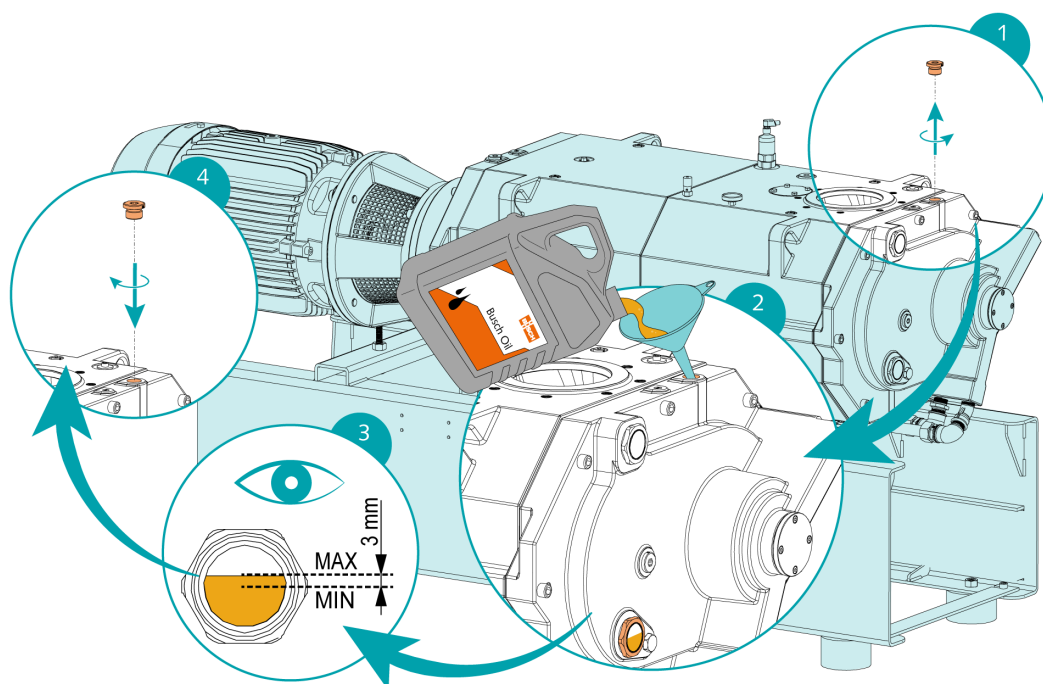


### Description

|   |               |
|---|---------------|
| 1 | Magnetic plug |
|---|---------------|

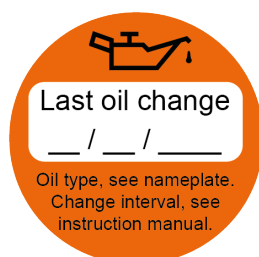
- For information on oil type and filling capacities, see the *Technical Data* [→ 37] and *Oil* [→ 37] chapters.





When oil filling is complete:

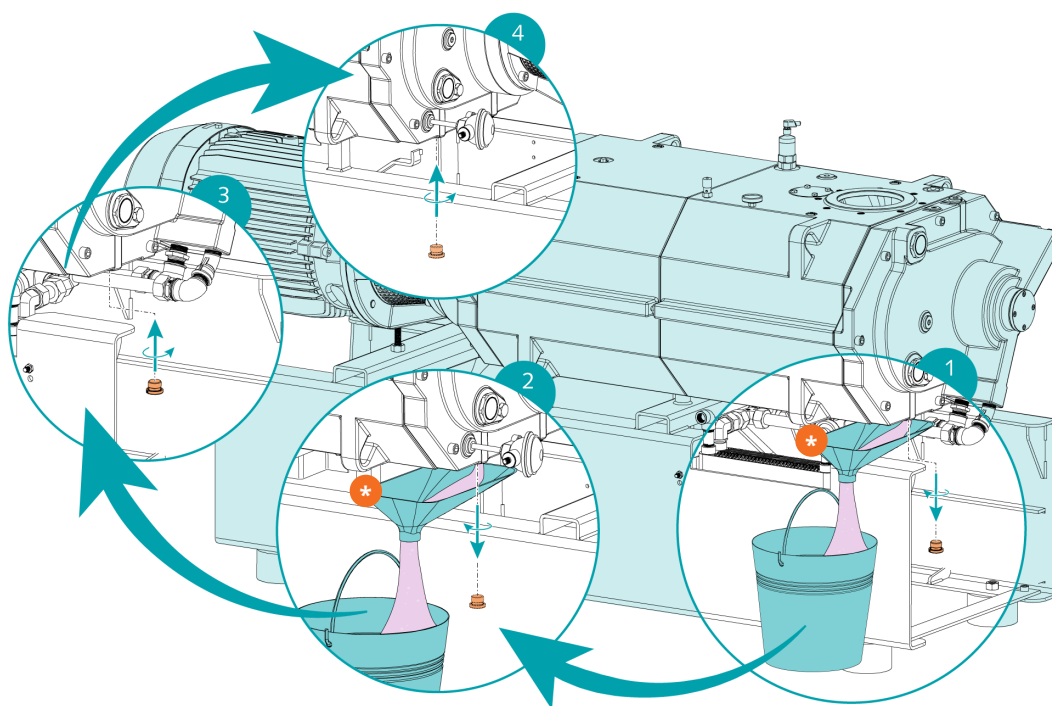
- Note the date of the oil change on the sticker.



If there is no sticker on the machine:

- Order it from your Busch representative (article number 0565 568 959).

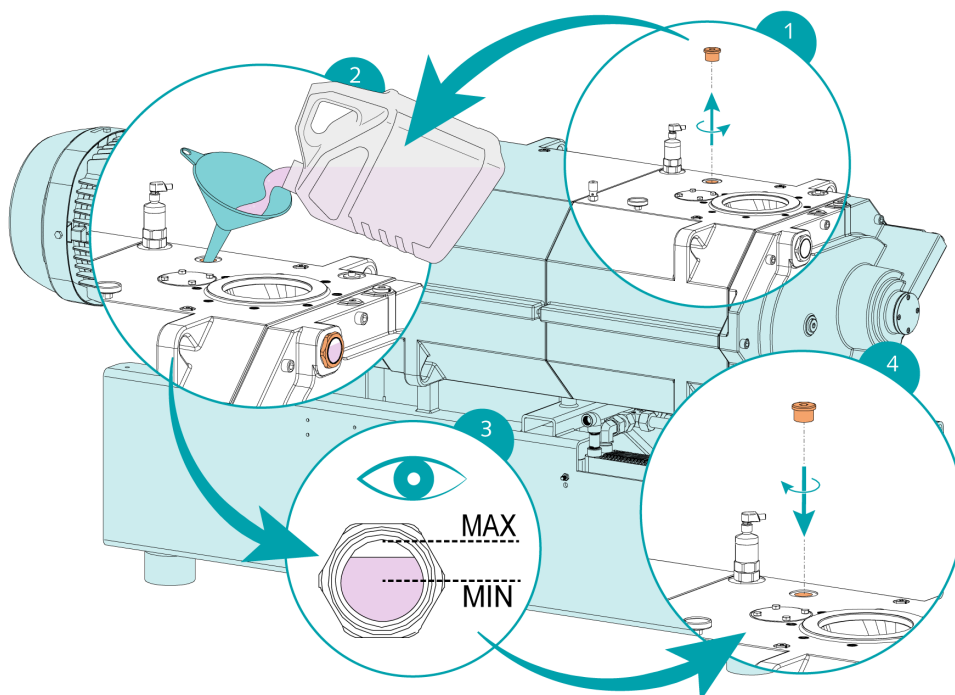
## 8.6 Cooling Liquid Change



### Description

\* Use a funnel or a liquid deflector

For cooling liquid type and cooling liquid capacity see *Technical Data* [→ 37] and *Cooling Liquid* [→ 37].



## 9 Overhaul



### WARNING



**The machine is contaminated with hazardous material.**

**Risk of poisoning!**

**Risk of infection!**

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.



### NOTICE

**Incorrect assembly.**

**Risk of premature failure!**

**Loss of efficiency!**

- Any disassembly of the machine beyond that described in this manual must be carried out by technicians approved by Busch.

If the machine has conveyed gas contaminated with foreign materials which are hazardous to health:

- Decontaminate the machine as much as possible and state the contamination status in a 'Declaration of Contamination'.

The manufacturer will only accept machine accompanied by a signed, fully completed and legally binding "declaration of contamination", downloadable from the following link: [buschvacuum.com/declaration-of-contamination](https://buschvacuum.com/declaration-of-contamination).

## 10 Decommissioning



### DANGER

**Live wires.**

**Risk of electrical shock!**

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



### CAUTION

**Hot surface.**

**Risk of burns!**

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



### CAUTION

**Hot liquids.**

**Risk of burns!**

- Before draining liquids, let the machine cool down first.
- Stop the machine and lock it to prevent accidental start-up.
- Disconnect the power supply.
- Close the water supply.

If the machine is equipped with a barrier gas system:

- Close the barrier gas supply.
- Vent the connected lines to atmospheric pressure.
- Disconnect all connections.

If the machine is to be stored:

- See *Storage* [→ 10].

### 10.1 Dismantling and Disposal

- Drain and collect the oil.
- Make sure that no oil drips onto the floor.
- Drain and collect the cooling liquid.
- Make sure that no cooling liquid drips onto the floor.
- Separate special waste from the machine.
- Dispose of special waste in compliance with applicable regulations.
- Dispose of the machine as scrap metal.

# 11 Spare Parts



## NOTICE

**Use of non-Busch genuine spare parts.**

**Risk of premature failure!**

**Loss of efficiency!**

- Use only Busch genuine spare parts, consumables and supplies to ensure correct operation of the machine and to validate the warranty.
- 

There are no standard spare parts kits available for this product.

For Busch genuine spare parts:

- Contact your Busch representative.

## 12 Troubleshooting



### DANGER

**Live wires.**

**Risk of electrical shock!**

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



### CAUTION

**Hot surface.**

**Risk of burns!**

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



### CAUTION

**Hot liquids.**

**Risk of burns!**

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

| Problem                     | Possible Cause                                             | Remedy                                                                                                                                                                       |
|-----------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The machine does not start. | The motor is not supplied with the correct voltage.        | <ul style="list-style-type: none"> <li>• Check the power supply.</li> </ul>                                                                                                  |
|                             | The rotors are jammed or seized.                           | <ul style="list-style-type: none"> <li>• Turn the screw rotors manually from the rotor access plug (PMR).</li> <li>• Repair the machine (contact Busch).</li> </ul>          |
|                             | Solid foreign matter has entered the machine.              | <ul style="list-style-type: none"> <li>• Remove the solid foreign matter or repair the machine (contact Busch).</li> <li>• Install an inlet filter if necessary.</li> </ul>  |
|                             | The resistance thermometer (TSA) reached the switch point. | <ul style="list-style-type: none"> <li>• Let the machine cool down.</li> <li>• See problem "The machine runs too hot".</li> </ul>                                            |
|                             | Corrosion in the machine from remaining condensate.        | <ul style="list-style-type: none"> <li>• Repair the machine.</li> <li>• Check the process and follow the recommendation in case of Conveying Condensable Vapours.</li> </ul> |
|                             | The motor is defective.                                    | <ul style="list-style-type: none"> <li>• Replace the motor.</li> </ul>                                                                                                       |

| Problem                                                                | Possible Cause                                                   | Remedy                                                                                                                                                   |
|------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| The machine does not reach the usual pressure at the inlet connection. | Suction or exhaust lines too long or section diameter too small. | <ul style="list-style-type: none"> <li>• Use larger diameter or shorter lines.</li> <li>• Seek advice from your local Busch representative.</li> </ul>   |
|                                                                        | Process deposits on the pumping components                       | <ul style="list-style-type: none"> <li>• Flush the machine.</li> </ul>                                                                                   |
|                                                                        | The machine runs in the wrong direction.                         | <ul style="list-style-type: none"> <li>• Check the direction of rotation, see <i>Wiring Diagram Three-Phase Motor (Pump Drive)</i> [→ 21].</li> </ul>    |
|                                                                        | Internal parts are worn or damaged.                              | <ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>                                                                  |
| The machine runs very noisily.                                         | Wrong oil quantity or unsuitable oil type.                       | <ul style="list-style-type: none"> <li>• Use one of the recommended oils in the correct quantity, see <i>Oil</i>.</li> </ul>                             |
|                                                                        | Defective gears, bearings or coupling element.                   | <ul style="list-style-type: none"> <li>• Repair machine (contact Busch).</li> </ul>                                                                      |
| The machine runs too hot.                                              | Insufficient cooling.                                            | <ul style="list-style-type: none"> <li>• Make sure to comply with the cooling water requirements, see <i>Cooling Water Connection</i> [→ 14].</li> </ul> |
|                                                                        | Ambient temperature too high.                                    | <ul style="list-style-type: none"> <li>• Observe the permitted ambient temperature, see <i>Technical Data</i> [→ 37].</li> </ul>                         |
|                                                                        | Temperature of the process gases at the inlet too high.          | <ul style="list-style-type: none"> <li>• Observe the permitted gas inlet temperature, see <i>Technical Data</i> [→ 37].</li> </ul>                       |
|                                                                        | The cooling water pump is defective.                             | <ul style="list-style-type: none"> <li>• Repair the machine.</li> </ul>                                                                                  |
|                                                                        | Oil level too low.                                               | <ul style="list-style-type: none"> <li>• Top up oil.</li> </ul>                                                                                          |
| The oil is black.                                                      | Oil change intervals are too long.                               | <ul style="list-style-type: none"> <li>• Drain the oil and fill in new oil, see <i>Oil Change</i> [→ 28].</li> </ul>                                     |
|                                                                        | The machine runs too hot.                                        | <ul style="list-style-type: none"> <li>• See problem "The machine runs too hot".</li> </ul>                                                              |

For resolution of problems not listed in the troubleshooting table, contact your Busch representative.

## 13 Technical Data

| NC 1000 B                                                               |                                            |                            |
|-------------------------------------------------------------------------|--------------------------------------------|----------------------------|
| Pumping speed (50/60 Hz)                                                | m <sup>3</sup> /h                          | 840 / 1000                 |
| Ultimate pressure without gas ballast (50/60 Hz)                        | hPa (mbar) abs.                            | ≤ 0.05 / ≤ 0.01            |
| Ultimate pressure with gas ballast (50/60 Hz)                           | hPa (mbar) abs.                            | ≤ 0.5 / ≤ 0.5              |
| Nominal motor rating (50/60 Hz)                                         | kW                                         | 22 / 25                    |
| Nominal motor speed (50/60 Hz)                                          | min <sup>-1</sup>                          | 3000 / 3600                |
| Sound pressure level (ISO 2151)<br>KpA = 3 dB (50/60 Hz)                | dB(A)                                      | ≤ 75 / ≤ 81                |
| Ambient temperature                                                     | °C                                         | 5 ... 50                   |
| Maximum allowable counter pressure at exhaust connection                | hPa (mbar) rel.                            | 200                        |
| Maximum allowable gas inlet temperature according to the inlet pressure | °C                                         | ≤ 50 hPa (mbar) abs. : 200 |
|                                                                         |                                            | > 50 hPa (mbar) abs. : 70  |
| Relative humidity                                                       | at 30°C                                    | 90 %                       |
| Ambient pressure                                                        |                                            | Atmospheric pressure       |
| Cooling water requirements                                              | See <i>Cooling Water Connection</i> [→ 14] |                            |
| Oil capacity - Inlet side                                               | l                                          | 1.5                        |
| Oil capacity - Motor side                                               | l                                          | 1.3                        |
| Cooling liquid capacity approx.                                         | l                                          | 44                         |
| Weight approx.                                                          | kg                                         | 1500                       |

## 14 Cooling Liquid

| CLA 25 (Ready-to-use)         |              |
|-------------------------------|--------------|
| Article number 5 L packaging  | 2000 241 757 |
| Article number 20 L packaging | 2000 241 738 |

**CLA 25** cooling liquid is ready-to-use and requires no additional water.

For more information, contact your Busch representative.

## 15 Oil

| Name    | ISO-VG | Oil type  | 1 L packing  | 5 L packing  | 10 L packing | 20 L packing |
|---------|--------|-----------|--------------|--------------|--------------|--------------|
| VSC 100 | 100    | Synthetic | 0831 168 356 | 0831 168 357 | -            | 0831 168 359 |

# 16 EU Declaration of Conformity

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

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

The manufacturer

**Ateliers Busch S.A.  
Zone Industrielle  
CH-2906 Chevenez**

declares that the machine: vacuum pump COBRA NC 1000 B; COBRA NX 1000 B

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

- 'Machinery Directive' 2006/42/EC, if the serial number is less than or equal to CHM127029999 (until January 19, 2027).
- 'Machinery Regulation' (EU) 2023/1230, if the serial number is greater than or equal to CHM127030000 (from January 20, 2027). The conformity assessment has been carried out according to internal production control procedure (Module A), in accordance with the requirements of the 'Machinery Regulation'.
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

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

| Standard                     | Title of the Standard                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------|
| EN ISO 12100 : 2010          | Safety of machinery - Basic concepts, general principles of design                                        |
| EN 1012-2 : 1996 + A1 : 2009 | Vacuum pumps - Safety requirements - Part 2                                                               |
| EN 60204-1 : 2018            | Safety of machinery - Electrical equipment of machines - Part 1: General requirements                     |
| EN ISO 13857 : 2019          | Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs |
| EN ISO 2151 : 2008           | Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)               |
| EN IEC 61000-6-2 : 2019      | Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments             |
| EN IEC 61000-6-4 : 2019      | Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments    |

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

**Busch Dienste GmbH, Schauinslandstr. 1, DE-79689 Maulburg**

Chevenez, 2026.06.17



**Christian Hoffmann, General Manager**

**Ateliers Busch S.A.**

# 17 UK Declaration of Conformity

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

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

The manufacturer

**Ateliers Busch S.A.  
Zone Industrielle  
CH-2906 Chevenez**

declares that the machine: vacuum pump COBRA NC 1000 B; COBRA NX 1000 B

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

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

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

| Standard                     | Title of the Standard                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------|
| EN ISO 12100 : 2010          | Safety of machinery - Basic concepts, general principles of design                                        |
| EN 1012-2 : 1996 + A1 : 2009 | Vacuum pumps - Safety requirements - Part 2                                                               |
| EN 60204-1 : 2018            | Safety of machinery - Electrical equipment of machines - Part 1: General requirements                     |
| EN ISO 13857 : 2019          | Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs |
| EN ISO 2151 : 2008           | Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)               |
| EN IEC 61000-6-2 : 2019      | Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments             |
| EN IEC 61000-6-4 : 2019      | Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments    |

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

**Busch (UK) Ltd, 30 Hortonwood, Telford - UK**

Chevenez, 2026.06.17



**Christian Hoffmann, General Manager**

**Ateliers Busch S.A.**

# BUSCH GROUP

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



● Busch Group companies

▲ Busch Group production sites

● Busch Group service centers

■ Busch Group local representatives

[www.buschvacuum.com](http://www.buschvacuum.com)

[www.pfeiffer-vacuum.com](http://www.pfeiffer-vacuum.com)