

# COBRA

Dry Screw Vacuum Pumps  
NC 0500 B

## 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, please contact your Busch representative.

Read this 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* [→ 5].

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

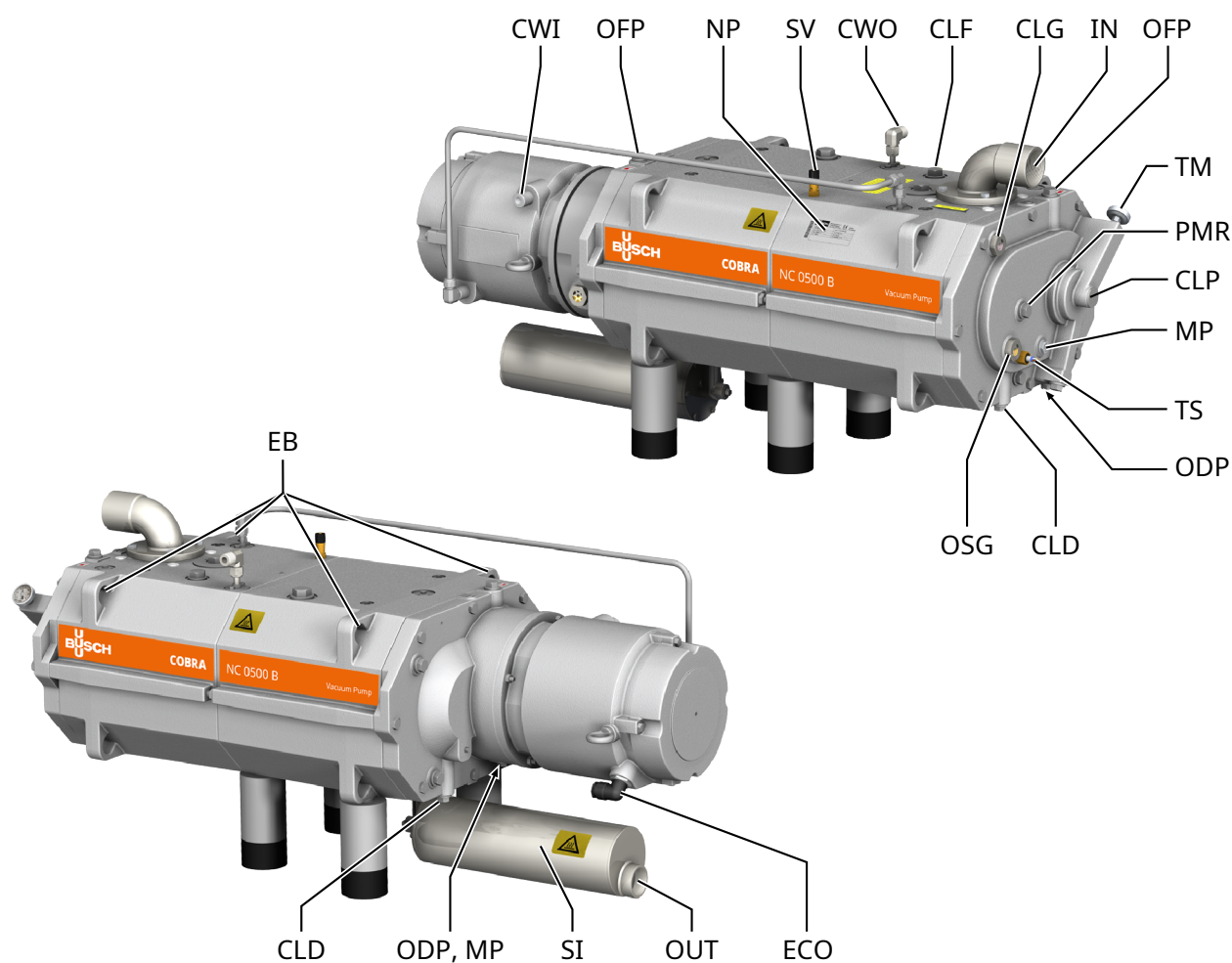
... indicates a potentially dangerous situation that could result in damage to property.



## NOTE

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

## 2 Product Description



### Description

|     |                            |     |                                    |
|-----|----------------------------|-----|------------------------------------|
| IN  | Suction connection (Inlet) | OUT | Discharge connection (Outlet)      |
| 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                   | ECO | Electrical connection              |
| MP  | Magnetic plug              | NP  | Nameplate                          |
| ODP | Oil drain plug             | OFP | Oil fill plug                      |
| OSG | Oil sight glass            | PMR | Plug for manual rotation of rotors |
| SI  | Silencer                   | SV  | Safety valve                       |
| TM  | Thermometer                | TS  | Temperature switch                 |



### NOTE

**Technical term.**

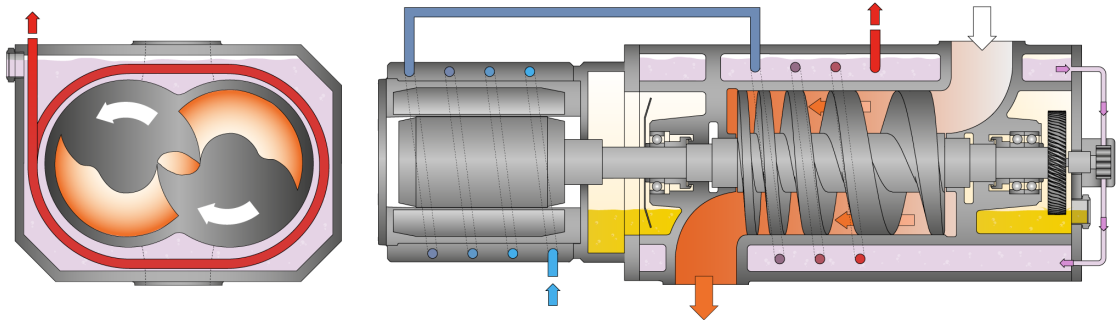
**In this instruction manual, we consider that the term 'machine' refers to the 'vacuum pump'.**

## 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 Busch.

The machine is capable of maintaining ultimate pressure, see Technical Data.

The machine is suitable for continuous operation.

The machine is suitable for use in an installation with a vacuum chamber volume no larger than 80 liters.

Permitted environmental conditions, see Technical Data.

## **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 an internal heat exchanger. This cooling system integrates the cooling of the water-cooled motor and must be connected to the water main.

### **2.4.2 Temperature Switch**

The temperature switch monitors the oil temperature of the machine.

The machine must be stopped when the temperature switch trips (100 °C).

### **2.4.3 Thermometer**

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

### **2.4.4 Silencer**

The silencer reduces the exhaust gas noise at the machine discharge (OUT).

### **2.4.5 Sealing Systems**

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

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

### 3 Transport



#### 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.

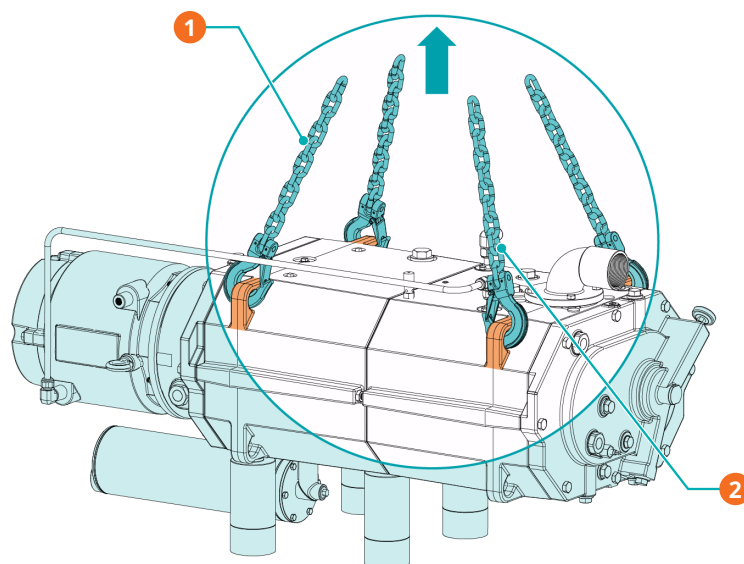


#### NOTICE

**In case the machine is already filled with oil.**

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

- Drain the oil prior to every transport or always horizontally transport the machine.
- To find out the weight of the machine, refer to the chapter Technical Data or the nameplate (NP).



#### Description

|   |                                    |   |                |
|---|------------------------------------|---|----------------|
| 1 | Length of each slings (x3): 600 mm | 2 | Optional sling |
|---|------------------------------------|---|----------------|

- Check the machine for transport damage.

If the machine is secured to a base plate:

- Remove the machine from the base plate.

## 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.
- To avoid frost damage, drain the cooling water (see *Draining the Cooling Water* [→ 19]).



### 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* [→ 20]. This protects the mechanical seals during a long storage. Use the standard pump oil, see chapter *Oil* [→ 31].
  - Before restarting the machine, drain the oil to the normal oil level, see "Oil draining" in chapter *Oil Change* [→ 20].
-

## 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.
- Make sure that the environmental conditions comply with the protection class of the motor and the electrical elements.
- Make sure that the vacuum chamber volume does not exceed 80 liters.
- Make sure that the installation space or location is vented such that sufficient cooling of the machine is provided.
- 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* [→ 20].
- Check the cooling liquid level, see *Cooling Liquid Level Inspection* [→ 20].
- Make sure that the cooling water complies with the requirements, see *Cooling Water Connection* [→ 11].

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

- Contact your Busch 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 connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.
- Make sure that the diameter of the connection lines over the entire length is at least as large as the connections of the machine.

In case of long connection lines:

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

## 5.2.1 Suction Connection



### WARNING

**Unprotected suction connection.**

**Risk of severe injury!**

- Do not put hand or fingers in the suction 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) upstream from the machine.

Connection size(s):

- G2" – without inlet filter (IF)
- G2 ½" - with inlet filter (IF)

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

- Busch recommends the installation of an isolation valve in order to prevent the machine from turning backwards.
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.

## 5.2.2 Discharge Connection



### NOTICE

**Discharge gas flow obstructed.**

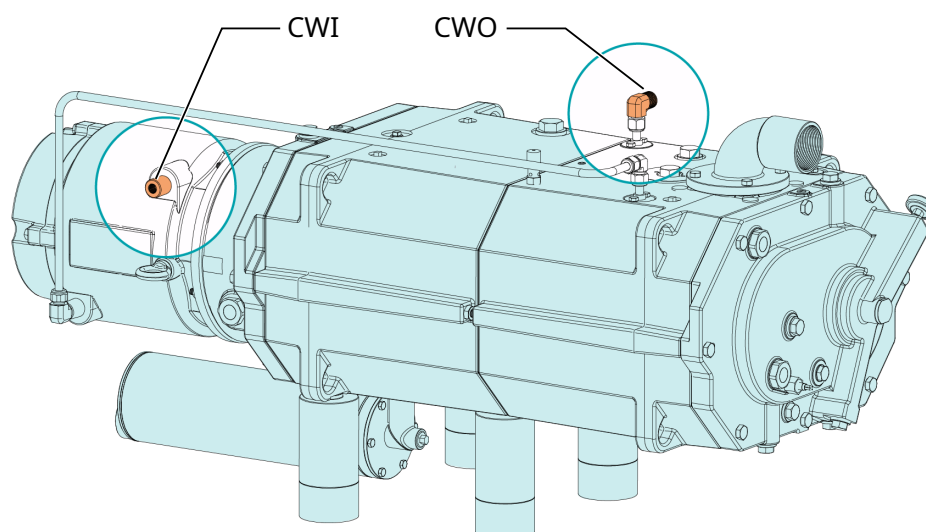
**Risk of damage to the machine!**

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

Connection size(s):

- G1 ½"
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.
- Make sure that the counter pressure (also called "back pressure") at the discharge connection (OUT) does not exceed the maximum allowable discharge pressure, see Technical Data.

## 5.2.3 Cooling Water Connection



### Description

|     |                     |     |                      |
|-----|---------------------|-----|----------------------|
| CWI | Cooling water inlet | CWO | Cooling water outlet |
|-----|---------------------|-----|----------------------|

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

Connection size:

- G ¼" for the cooling water inlet (CWI)
- R ½" for the cooling water outlet (CWO)

- Make sure that the cooling water complies with the following requirements:

|                                                         |         |             |
|---------------------------------------------------------|---------|-------------|
| Supply capacity                                         | l/min   | 5           |
| Water pressure                                          | bar (g) | 3 ... 6     |
| Supply temperature                                      | °C      | +10 ... +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)**

## 5.3 Filling Oil

### ! NOTICE

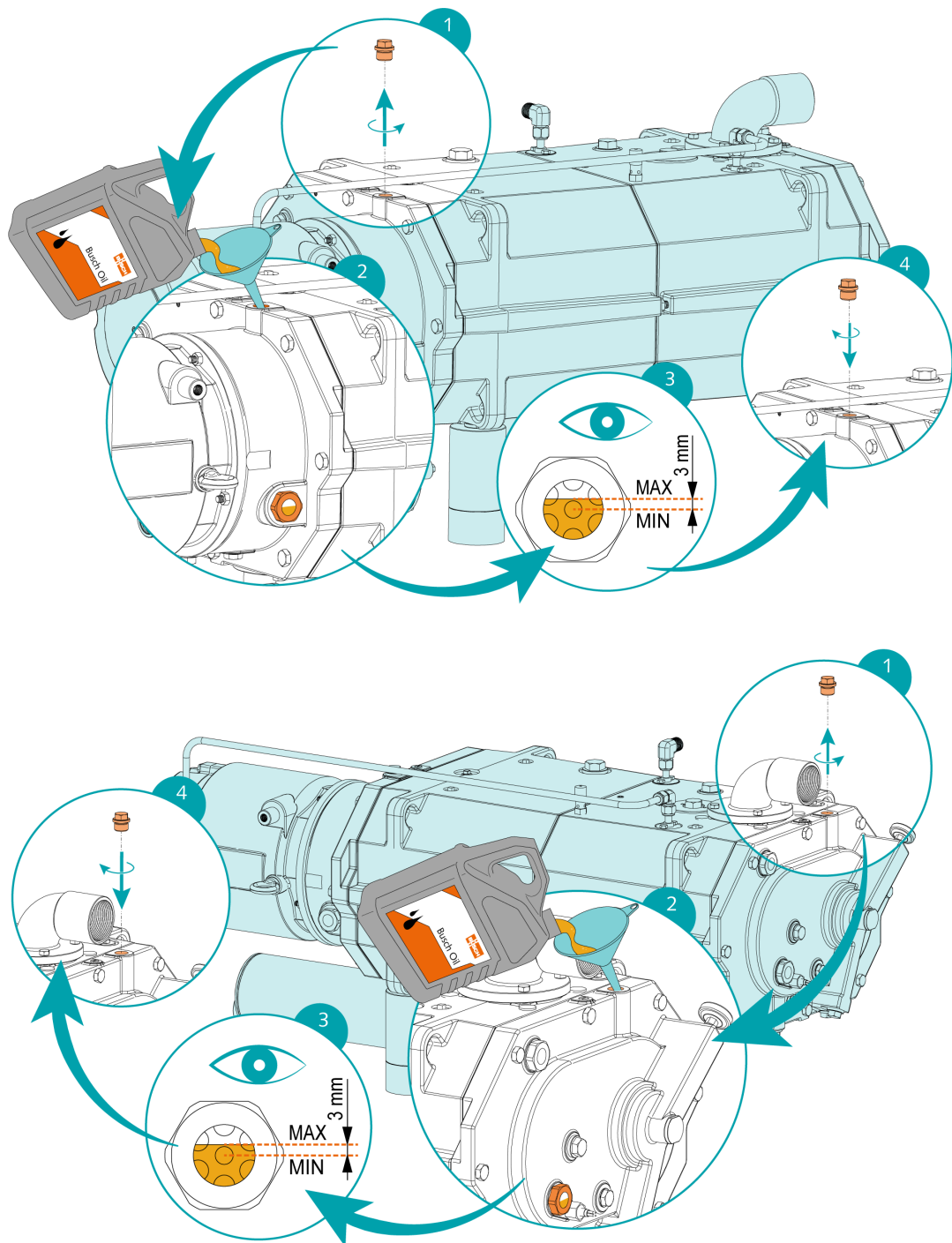
**Use of an inappropriate oil.**

**Risk of premature failure!**

**Loss of efficiency!**

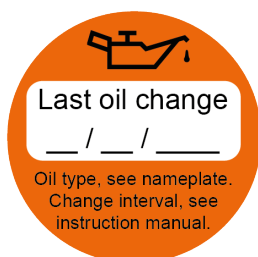
- Only use an oil type which has previously been approved and recommended by Busch.

For oil type and oil capacity see Technical Data and *Oil* [→ 31].



When the oil filling is achieved:

- Write down the oil change date on the sticker.

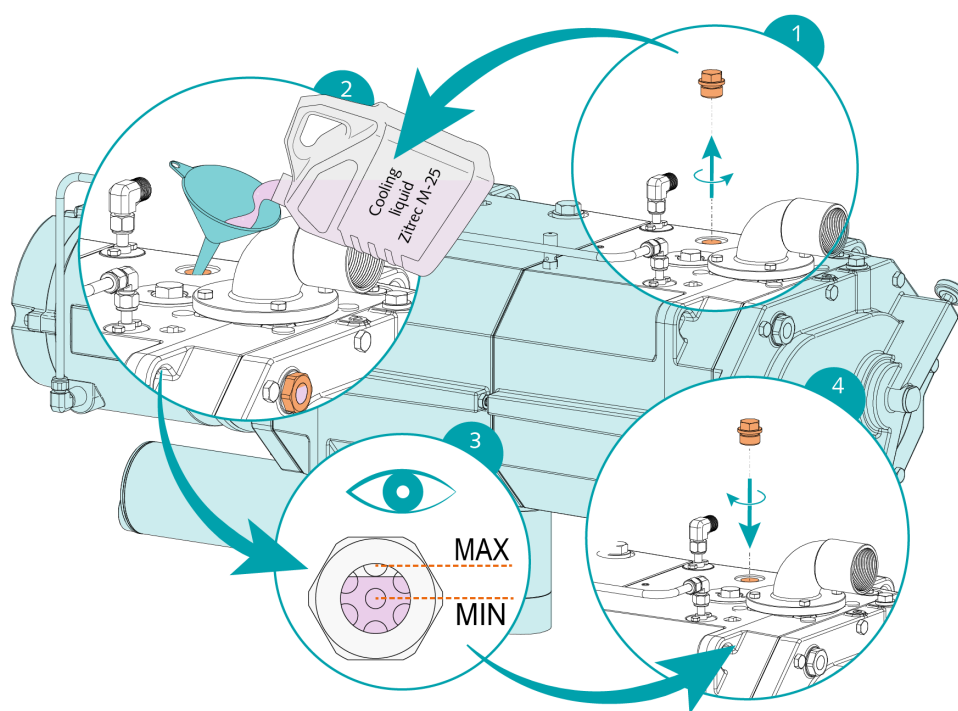


If there is no sticker (part no. 0565 568 959) on the machine:

- Order it from your Busch representative.

## 5.4 Filling Cooling Liquid

For cooling liquid type and cooling liquid capacity see Technical Data and *Cooling Liquid* [→ 30].



## 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* [→ 32] or *UK Declaration of Conformity* [→ 33]).

### 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 nameplate 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 20 Hz.

**Risk of damage to the machine!**

- The motor nominal speed must always be higher than 1200 min<sup>-1</sup> (20 Hz).

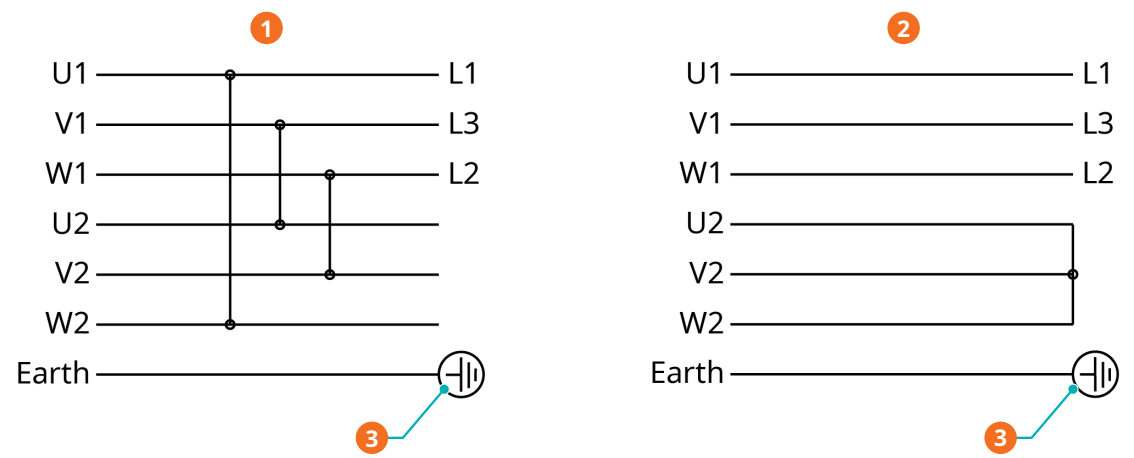
 **NOTICE**

The admissible motor nominal speed exceeds the recommendation.

**Risk of damage to the machine!**

- Check the admissible motor nominal speed ( $n_{max}$ ) on the nameplate of the machine (NP).
- Make sure to comply with it.
- Consult the Technical Data to get more information.

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



| Description |                                |   |                                |
|-------------|--------------------------------|---|--------------------------------|
| 1           | Delta connection (low voltage) | 2 | Star connection (high voltage) |
| 3           | Earth connection               |   |                                |

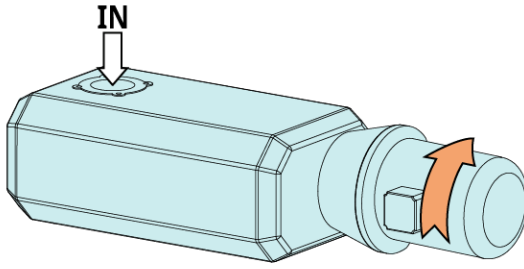
 **NOTICE**

**Incorrect direction of rotation.**

**Risk of damage to the machine!**

- Operation in the wrong direction of rotation can destroy the machine in a short time! Prior to start-up, ensure that the machine is operated in the right direction.

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



- Jog the motor briefly.
- With a phase rotation tester, check if the wiring corresponds to the correct direction of rotation.

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 Temperature Switch

**Part no.:** 0651 541 566

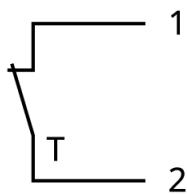
U = 250 VAC; I = 2.5 A ►  $\cos\varphi = 1$

U = 250 VAC; I = 1.6 A ►  $\cos\varphi = 0.6$

U = 48 VDC; I = 1.25 A

**Contact:** Normally closed

**Switch point:**  $T_{\text{trip}} = 100\text{ }^{\circ}\text{C}$



1 = White; 2 = Brown

## 7

## Commissioning



### CAUTION

During operation the surface of the machine may reach temperatures of more than 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 can be shipped without oil.**

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

- Prior to commissioning, the machine must be filled with oil, see *Filling Oil* [→ 12].



### NOTICE

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

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

- Prior to commissioning, the machine must be filled with cooling liquid, see *Filling Cooling Liquid* [→ 13].



### 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* [→ 9] are met.
- Turn on the water supply.
- 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.
- After a few minutes of operation, perform an *Oil Level Inspection* [→ 20].
- After a few minutes of operation, perform a *Cooling Liquid Level Inspection* [→ 20].

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

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

## 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

**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.
- Turn off the water supply.
- Vent the connected lines to atmospheric pressure.

If necessary:

- Disconnect all connections.

## 8.1 Draining the Cooling Water

- Make sure the machine is switched off and cannot be accidentally switched back on.
- Place a drip tray under the cooling water connections (CWI, CWO).
- Disconnect the cooling water connections (CWI, CWO).
- Use compressed air to force the remaining cooling water out of the cooling water circuit. Blow compressed air into the cooling water inlet (CWI) for 30 seconds until the air comes out dry.

## 8.2 Maintenance Schedule

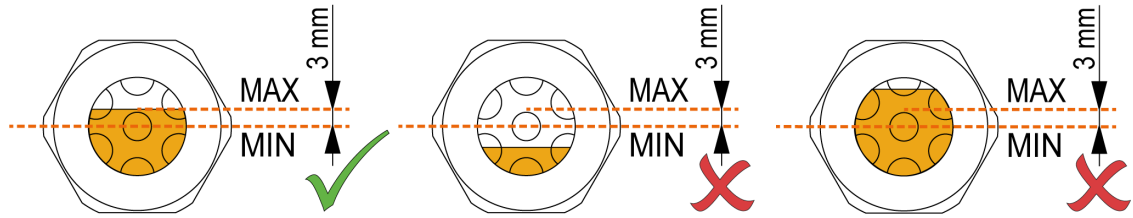
The maintenance intervals depend very much on the individual operating conditions. The intervals given below are considered as starting values which should be individually shortened or extended as appropriate.

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> [→ 20].</li> <li>• Check the cooling liquid level, see <i>Cooling Liquid Level Inspection</i> [→ 20].</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>                                                                                                                     |
| Every 1000 hours.                  | <ul style="list-style-type: none"> <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> [→ 20].</li> <li>• Change the cooling liquid, see <i>Cooling Liquid Change</i> [→ 23].</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>                                                                                                                                                                                                          |

## 8.3 Oil Level Inspection

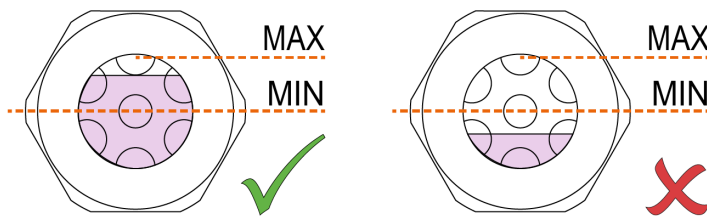
- Stop the machine.
- Wait 1 minute.
- Check the oil level.



- Make sure that the oil level is between the middle of the oil sight glass and 3mm above it.
- Fill up if necessary, see *Oil Filling* [→ 12].

## 8.4 Cooling Liquid Level Inspection

- Stop the machine.



- Fill up if necessary, see *Filling Cooling Liquid* [→ 13].

## 8.5 Oil Change



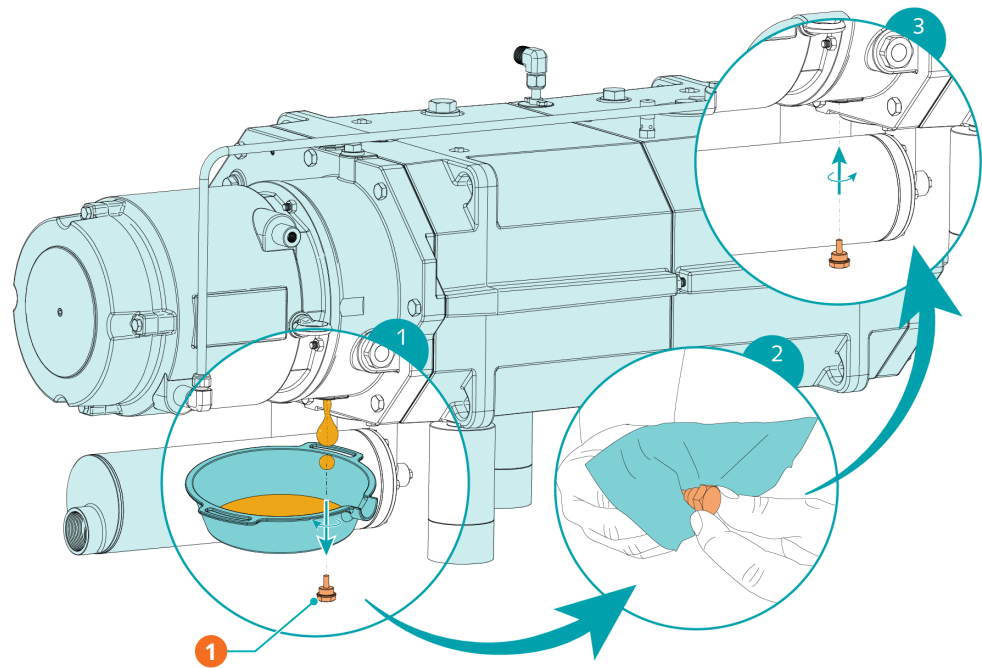
### NOTICE

**Use of an inappropriate oil.**

**Risk of premature failure!**

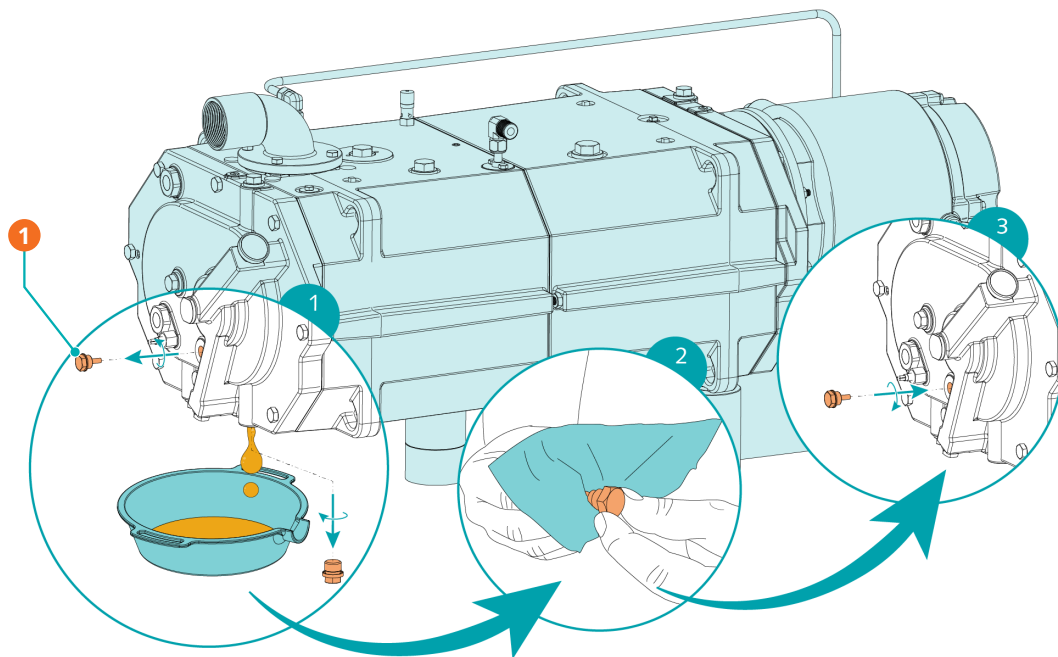
**Loss of efficiency!**

- Only use an oil type which has previously been approved and recommended by Busch.



#### Description

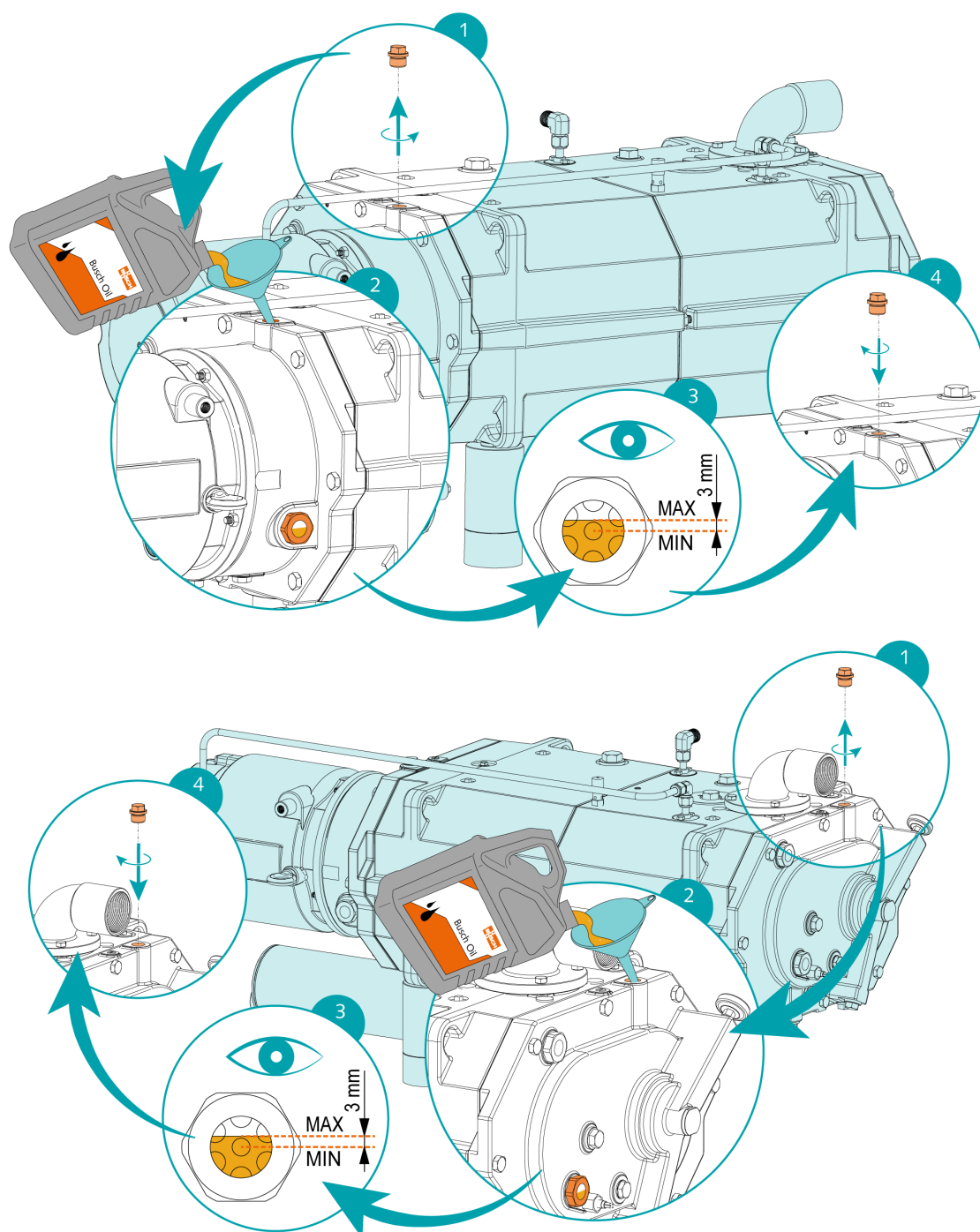
|   |               |
|---|---------------|
| 1 | Magnetic plug |
|---|---------------|



#### Description

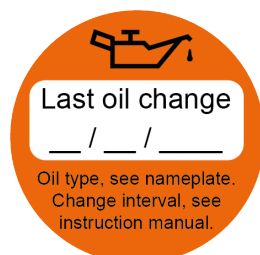
|   |               |
|---|---------------|
| 1 | Magnetic plug |
|---|---------------|

For oil type and oil capacity see Technical Data and Oil [→ 31].



When the oil filling is achieved:

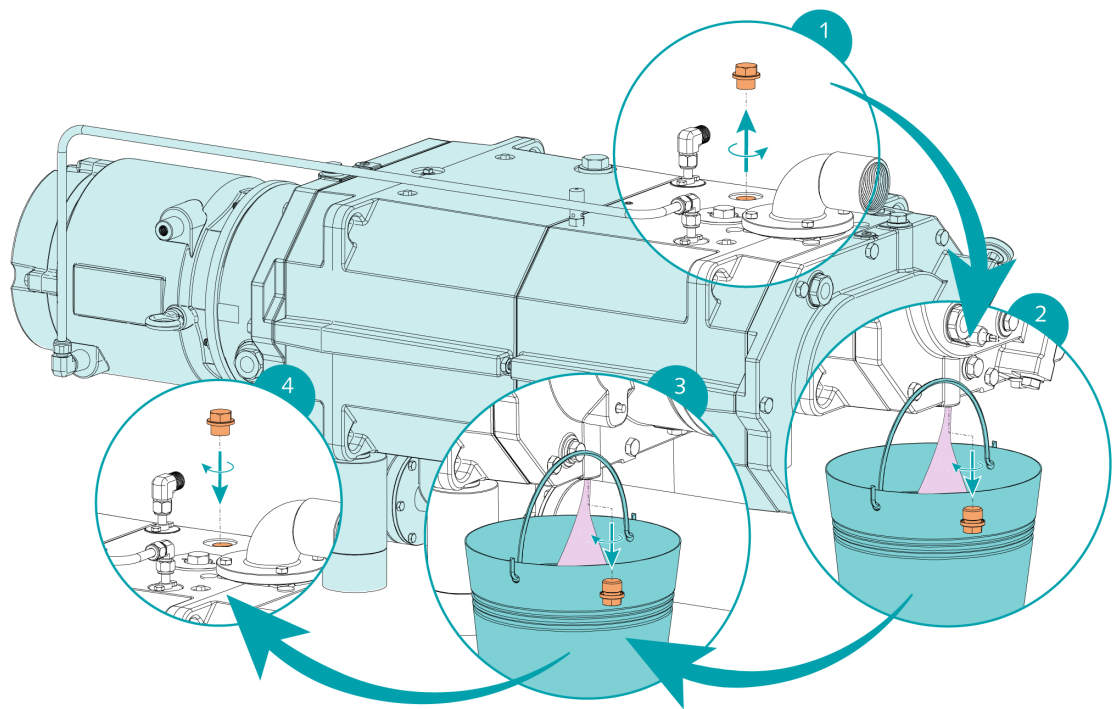
- Write down the oil change date on the sticker.



If there is no sticker (part no. 0565 568 959) on the machine:

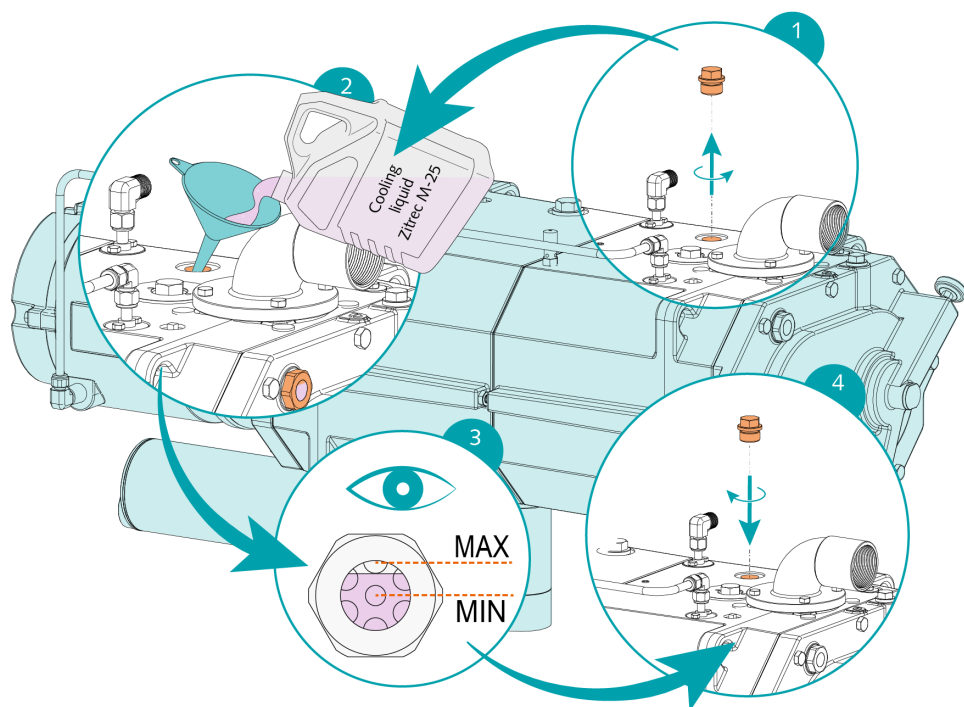
- Order it from your Busch representative.

## 8.6 Cooling Liquid Change



- Refit all plugs.

For cooling liquid type and cooling liquid capacity see Technical Data and *Cooling Liquid* [→ 30].



## 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

**Improper assembly.**

**Risk of premature failure!**

**Loss of efficiency!**

- Any dismantling of the machine that goes beyond anything that is described in this manual should be done by Busch authorized technicians.

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'.

Busch 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.

- Stop the machine and lock it to prevent accidental start-up.
- Disconnect the power supply.
- Turn off the water supply.
- Vent the connected lines to atmospheric pressure.
- Disconnect all connections.

If the machine is to be stored:

- See *Storage* [→ 8].

### 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 original spare parts.**

**Risk of premature failure!**

**Loss of efficiency!**

- Use only original Busch 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 original Busch 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.

| 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 temperature switch (TS) 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> </ul>                                                                                                     |
|                                                                          | The motor is defective.                                            | <ul style="list-style-type: none"> <li>• Replace the motor.</li> </ul>                                                                                                      |
| The machine does not reach the usual pressure on the suction connection. | Suction or discharge 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> [→ 15].</li> </ul>                       |
|                                                                          | Internal parts are worn or damaged.                                | <ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>                                                                                     |

| Problem                        | Possible Cause                                          | Remedy                                                                                                                                                 |
|--------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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> [→ 31].</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> [→ 11].</li> </ul> |
|                                | Ambient temperature too high.                           | <ul style="list-style-type: none"> <li>Observe the permitted ambient temperature, see Technical Data.</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 Technical Data.</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> [→ 20].</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, please contact your Busch representative.

## 13 Technical Data

| NC 0500 B                                                               |                   |                                               |
|-------------------------------------------------------------------------|-------------------|-----------------------------------------------|
| Pumping speed                                                           | m <sup>3</sup> /h | 490                                           |
| Ultimate pressure                                                       | hPa (mbar) abs.   | ≤ 0.01                                        |
| Nominal motor rating                                                    | kW                | 9.0                                           |
| Operating voltage                                                       | V (50 Hz)         | 190–210 / 380–420                             |
|                                                                         | V (60 Hz)         | 200–240 / 380–460                             |
| Nominal motor speed (50 / 60 Hz)                                        | min <sup>-1</sup> | 2900–2930 / 3470–3540                         |
| Supply current                                                          | A (50 Hz)         | 35–36 / 22–25                                 |
|                                                                         | A (60 Hz)         | 33–31 / 19–23                                 |
| Sound pressure level (ISO 2151)<br>KpA = 3 dB                           | dB(A)             | ≤ 69                                          |
| Ambient temperature range                                               | °C                | 5 ... 50                                      |
| Maximum allowable counter pressure at discharge                         | hPa (mbar) rel.   | 100                                           |
| 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><br>[→ 11] |
| Oil capacity - Motor side                                               | l                 | 0.5                                           |
| Oil capacity - Suction side                                             | l                 | 0.5                                           |
| Cooling liquid capacity approx.                                         | l                 | 23                                            |
| Weight approx.                                                          | kg                | 460                                           |

# 14      Cooling Liquid

| Zitrec® M-25 (Ready-to-use) |              |
|-----------------------------|--------------|
| Part number 5 L packaging   | 0831 563 469 |
| Part number 20 L packaging  | 0831 238 761 |

**Zitrec® M-25** coolant (Cooling liquid) is ready-to-use and requires no additional water.  
For more information, visit [www.arteco-coolants.com](http://www.arteco-coolants.com).

# 15

# Oil

| VSL 100                   |              |
|---------------------------|--------------|
| ISO-VG                    | 100          |
| Part number 1 L packaging | 0831 122 573 |
| Part number 5 L packaging | 0831 122 572 |

# 16 EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the nameplate 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: COBRA NC 0500 B

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

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

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

| Standard                     | Title of the Standard                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------------------------------|
| EN ISO 12100 : 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, 01.03.2023



**Christian Hoffmann, General Manager**

# 17 UK Declaration of Conformity

This Declaration of Conformity and the UKCA-markings affixed to the nameplate 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: COBRA NC 0500 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, 01.03.2023



**Christian Hoffmann, General Manager**

## Notes

Grid area for notes.

# Busch Vacuum Solutions

With a network of over 60 companies in more than 40 countries and agencies worldwide, Busch has a global presence. In every country, highly competent local personnel delivers custom-tailored support backed by a global network of expertise. Wherever you are. Whatever your business. We are there for you.



● Busch companies and Busch employees    ● Local representatives and distributors    ● Busch production site

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