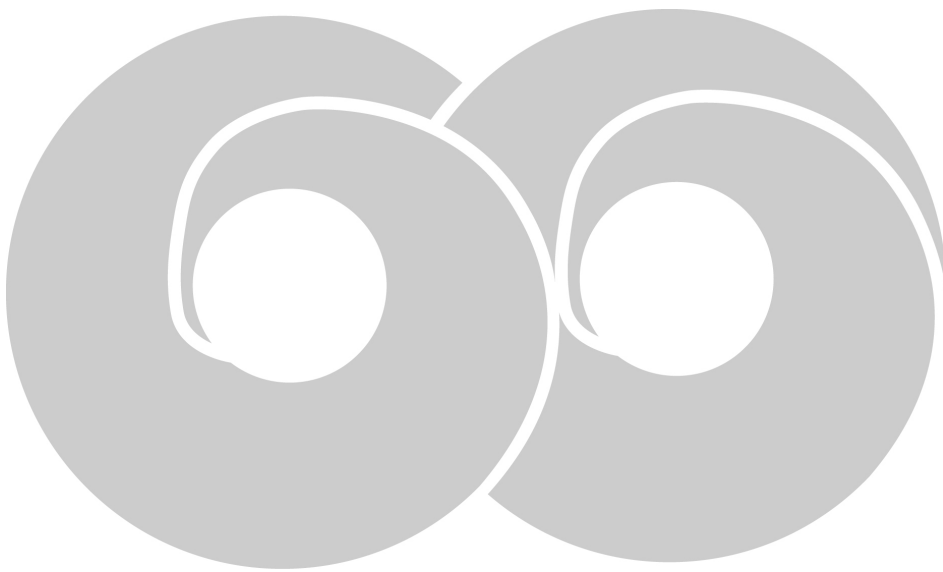


# Installation and Maintenance Instructions



## Screw Vacuum Pumps COBRA NS 0070-0160 C



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# Table of Contents

<b>Introduction.</b>	<b>2</b>
<b>Product Description.</b>	<b>4</b>
Use . . . . .	4
Principle of operation . . . . .	4
Oil circuit . . . . .	4
Cooling . . . . .	4
Sealing systems . . . . .	4
Operational Options/ Use of Available Accessories . . . . .	4
On/ Off switch . . . . .	5
<b>Safety . . . . .</b>	<b>5</b>
Intended use . . . . .	5
Safety information . . . . .	5
Safety indications, NS 0070/ 0160 C . . . . .	5
Noise emission . . . . .	5
Safety area . . . . .	5
Stopping procedure for maintenance. . . . .	5
Start-up procedure after maintenance . . . . .	5
<b>Transport . . . . .</b>	<b>6</b>
Transportation of packaged pump . . . . .	6
Transport in unpacked state . . . . .	6
<b>Storage . . . . .</b>	<b>6</b>
Short-term Storage . . . . .	6
Removal from storage . . . . .	6
Conservation . . . . .	6
Starting-up of the vacuum pump after storage. . . . .	6
<b>Installation and Commissioning . . . . .</b>	<b>6</b>
Installation prerequisites . . . . .	6
Local installation . . . . .	6
Suction Connection . . . . .	7
Discharge connection . . . . .	7
Cooling water connections. . . . .	8
Motor cooling water connections . . . . .	8
Nitrogen system connections (option) . . . . .	8
Electrical connection/ Checks . . . . .	8
Installation . . . . .	8
Fitting . . . . .	8
Electrical connection . . . . .	8
Electrical motor connection . . . . .	8
Connecting up of lines/ pipes . . . . .	9
Filling up with oil. . . . .	9
Filling in cooling liquid . . . . .	9
Checking the cooling water temperature . . . . .	10
Checking the cooling water flow (option). . . . .	10
Checking the nitrogen supply. . . . .	10
Saving the operating parameters . . . . .	10
Recommendations on operation. . . . .	10
Application . . . . .	10
Switching the vacuum pump on/ off . . . . .	11
First start-up of the system . . . . .	11
Switching off the system . . . . .	11
<b>Maintenance . . . . .</b>	<b>11</b>
Maintenance program. . . . .	12
Weekly: . . . . .	12
Monthly: . . . . .	12
Yearly: . . . . .	12
Every 16'000 operating hours, at the latest after 4 Years: . . . . .	12
Stopping procedure for maintenance . . . . .	12
Start-up after maintenance . . . . .	12
Checking the oil. . . . .	12
Checking the oil level. . . . .	12
Topping up with oil. . . . .	12
Checking the colour of the oil . . . . .	13
Oil change . . . . .	13
Draining used oil . . . . .	13
Filling in new oil . . . . .	13
Checking the cooling liquid . . . . .	13
Checking the level of the cooling liquid. . . . .	13
Top up with cooling liquid . . . . .	13
Draining the cooling liquid . . . . .	14
Filling up with new cooling liquid . . . . .	14
Checking the cooling water . . . . .	14
Checking the cooling water temperature . . . . .	14
Checking the current consumption . . . . .	14
Checking the silencer (accessory) . . . . .	14

<b>Overhaul . . . . .</b>	<b>14</b>
<b>Removal from service . . . . .</b>	<b>15</b>
Temporary removal from service . . . . .	15
Recommissioning . . . . .	15
Dismantling and Disposal of the vacuum pump . . . . .	15
<b>Troubleshooting. . . . .</b>	<b>16</b>
<b>Exploded view . . . . .</b>	<b>18</b>
<b>Spare parts . . . . .</b>	<b>20</b>
Overhaul kit. . . . .	20
Set of seals . . . . .	21
<b>Oil type/ quantity . . . . .</b>	<b>22</b>
Oil type. . . . .	22
Oil quantity. . . . .	22
<b>Cooling liquid type/ quantity . . . . .</b>	<b>23</b>
Cooling liquid type . . . . .	23
Cooling liquid quantity . . . . .	23
<b>Technical data . . . . .</b>	<b>24</b>
<b>EU-Declaration of Conformity. . . . .</b>	<b>25</b>

## Introduction

Congratulations on your purchase of the Busch vacuum pump. With watchful observation of the field's requirements, innovation and steady development Busch delivers modern vacuum and pressure solutions worldwide.

These operating instructions contain information for

- product description,
- security,
- transport,
- storage,
- installation and commissioning,
- maintenance,
- overhaul,
- troubleshooting

of the vacuum pump.

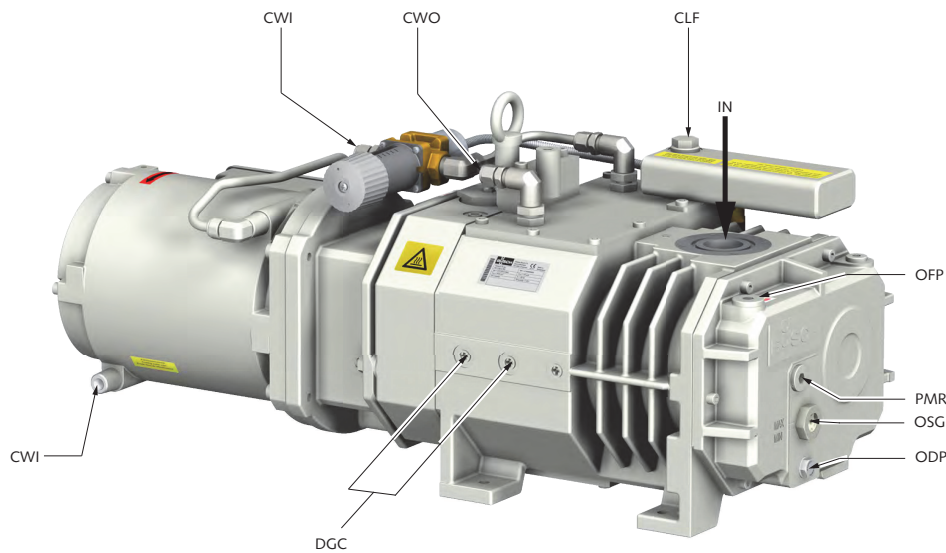
For the purpose of these instructions, "handling" the vacuum system means the transport, storage, installation, commissioning, influence on operating conditions, maintenance, troubleshooting and overhaul of the vacuum system.

**Prior to handling the vacuum system, these operating instructions shall be read and understood.**

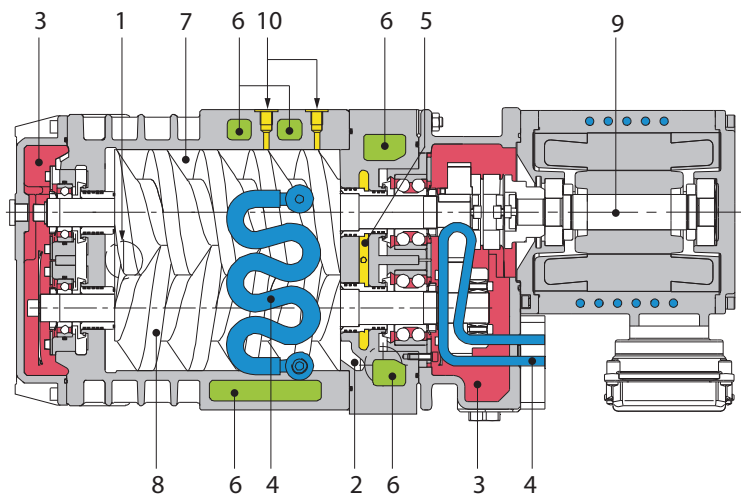
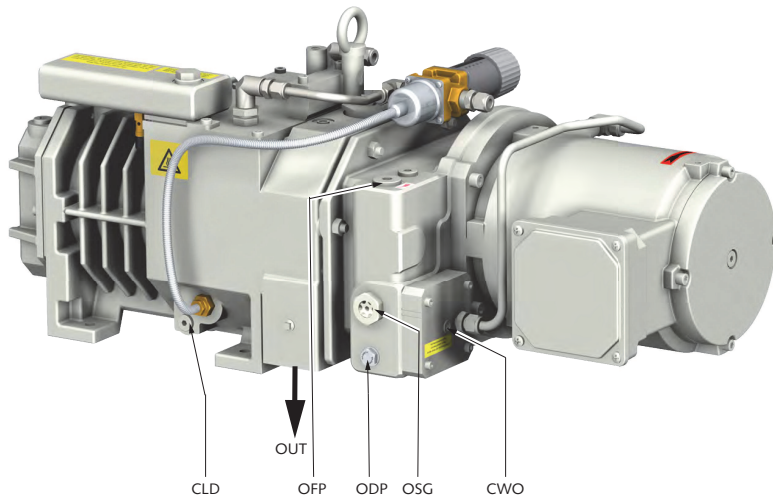
**It is mandatory that this operating instructions be read and understood.**

**If anything remains to be clarified please contact your Busch representative!**

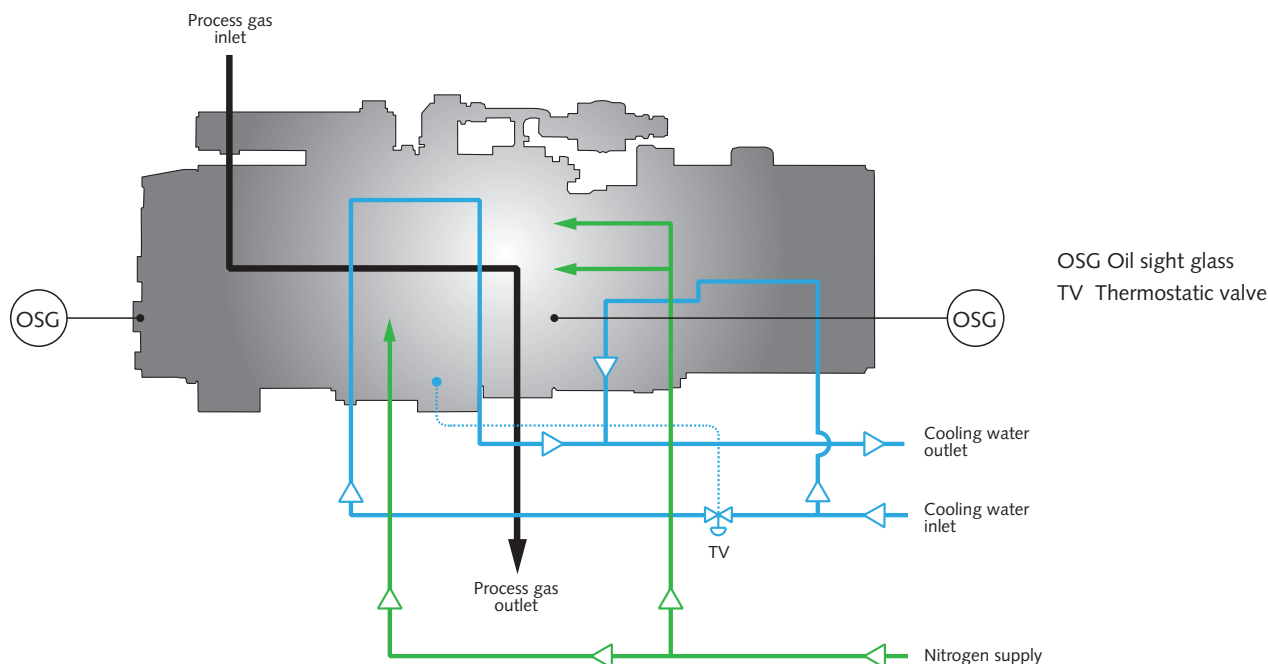
**Keep these operating instructions and, if applicable, other pertinent operating instructions available on site.**



- IN Inlet
- OUT Discharge
- CWi Cooling water inlet
- CWo Cooling water outlet
- OFP Oil filler plug
- OSG Oil sight glass
- ODP Oil drain plug
- CLF Cooling liquid filler plug
- CLD Cooling liquid drain plug
- DGC Dilution gas connection
- PMR Unblocking screw for rotors



- 1 Inlet
- 2 Discharge
- 3 Oil
- 4 Cooling water
- 5 Barrier gas
- 6 Cooling liquid
- 7 Pumped gas
- 8 Screw rotors
- 9 Motor klixon
- 10 Dilution gas



## Product Description

### Use

The COBRA NS vacuum pumps are designed for use in the field of industrial applications and similar industries.

They can be used to draw gases and gas mixtures.



#### WARNING

**When using toxic, inflammable and/ or explosive gases, make sure that the system corresponds in design to applicable local and national safety regulations and that all applicable safety measures are followed.**

**All product-specific safety regulations must be observed.**

Solid particles must not get into the vacuum pump. Procedural errors can result in the pump drawing in a certain quantity of liquid. If the pump has drawn in liquid, a short drying time will be necessary at the end of the process. In case a silencer (accessory) is fitted at the outlet:

- ◆ Drain the silencer (accessory)

The allowed maximum inlet gas temperature depends on the inlet pressure and the type of the gas: the lower the inlet pressure (Pa), the higher the drawn gas temperature (TGas) can be. The following indicative values for air can be considered:

- Pa > 50 mbar, TGas < 80°C
- Pa < 50 mbar, TGas < 200°C

The vacuum pump is designed for use in an environment which is non-explosive.

Max. permissible number of startings per hour: 6.

The vacuum pump is thermally suitable for continuous operation at any pressure between atmospheric pressure and ultimate pressure.

### Principle of operation

The COBRA NS vacuum pumps are screw vacuum pumps with cooling water circuit.

The COBRA NS vacuum pumps the principle of screw pumps. Two parallel screws (8) rotate in opposite directions in the pump body. Entering gases are trapped between the pitches of the screws and the

pump body. The gases are conveyed by the rotation of the screws to the exhaust side where they are discharged.

The COBRA NS vacuum pump is driven by a water-cooled motor.

### Oil circuit

Since the complete operating principle works without contact, no oil circuit is needed in the work area.

### Cooling

The vacuum pump is cooled by

- the filling of cooling liquid (mix of water and glycol) inside the water chambers (6) of cylinder and end plate of cylinder B-side. An indirect circuit is made with a water pump mounted at the motor end-plate.
- a cooling water circuit (4) in the cylinder and endplate of cylinder B-side.
- a direct cooling water in the motor. The cooling water flow must be set at 4 l/min. The direct water cooling circuit stabilises the temperature of the cooling liquid.

**NOTE:** Before vacuum pump first startup, control the oil level and the cooling level. In the event of absence of one or the other of these lubricants, please carry out the filling (please refer to the various chapter of filling). Do not forget to connect the cooling water supply before the first startup. Operation without these coolants can result in damage to the vacuum pump.

### Sealing systems

The COBRA NS vacuum pumps are equipped with labyrinth seals on the motor side (A-side) and inlet side (B-side) as standard.

### Operational Options/ Use of Available Accessories

The relief valve prevents excessively high pressure in the cylinder, relief pressure: 6 bar.

A silencer or sound absorber (accessory) at the outlet of the pump reduces the noise of the pump and collects any condensates.



A temperature switch TS (option) allows the monitoring of the cooling liquid temperature in the cylinder. When the temperature exceeds 100°C, the pump must stop.

A resistance thermometer TSA (option) allows the monitoring of the cooling liquid temperature. When the temperature exceeds 100°C, the pump must be switched off.

A nitrogen supply system fitted to the base frame allows the supply of nitrogen to a number of different points on the vacuum pump. The system allows to adjust pressure and volume flow separately. This gas can be used in a number of different ways:

- A purge gas system fitted to the inlet flange allows to flush the vacuum pump after use or during operation. This system consists of a solenoid valve which enables to open and close the purge circuit. The filtered gas is fed directly into the inlet flange.
- Barrier gas for the labyrinth seals or the oil-lubricated single mechanical seal: this option seals off the process gases and the gear oil. The nitrogen is fed into the intermediary chambers (5).
- Dilution gas: this option prevents the formation of condensates or dilutes them, depending on the application. The nitrogen is fed directly into the cylinder of the vacuum pump.

## On/ Off switch

The vacuum pump is delivered without on/ off switch. The control of the vacuum pump must be provided in the course of the installation.

# Safety

## Intended use

**DEFINITION:** For the purpose of correct understanding, the “handling” of the vacuum pump implies the transport, storage, installation, commissioning, the influence on operating conditions, maintenance, troubleshooting and overhaul of the vacuum pump.

The vacuum pump is intended for industrial use. It should only be handled by qualified staff.

The different applications for use and operational limits of the vacuum pump as laid out in the “Product Description” and the “Installation Prerequisites” of the vacuum pump must be observed both by the manufacturer of the machinery into which the vacuum pump is to be incorporated and by the end user.

The need for personal safety regulations depends mainly on the application the pump will be used in. The end user must provide the operators with all necessary means and tools and must inform his personnel about any dangers emanating from the processed products.

The operator of the vacuum pump must observe the safety regulations and must train and instruct his personnel accordingly.

Local regulations regarding the motors and electric control elements must be observed when installing the pump in potentially explosive environments.

The maintenance instructions must be observed and respected.

It is vital that these installation and maintenance instructions are read and understood before the vacuum pump is used. If you have any doubts, please contact your local Busch representative.

## Safety information

The vacuum pump has been designed and manufactured in accordance with the latest technical and safety standards. Nevertheless, residual risks may remain.

A lot of safety information is mentioned in these Installation and Operating Instructions as well as on the pump. The safety instructions must be observed. The safety information can quickly be detected through key words like DANGER, WARNING and CAUTION and is defined as follows:



**DANGER**

Disregard of this safety note will always lead to accidents with potentially fatal injuries and serious damages.



**WARNING**

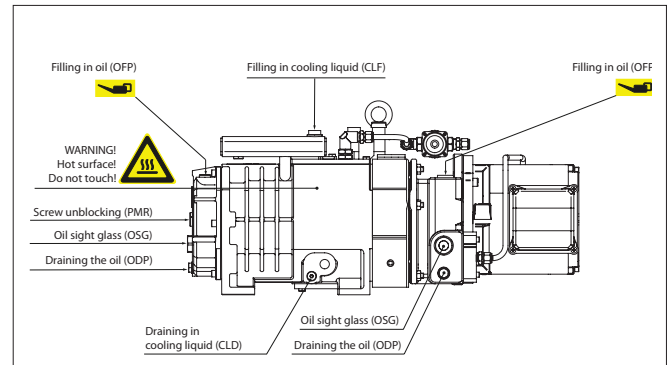
Disregard of this safety note may lead to accidents with potentially fatal injuries and serious damages.



**CAUTION**

Disregard of this safety note will always lead to accidents with minor injuries and damages to property.

## Safety indications, NS 0070/ 0160 C



## Noise emission

Refer to the table “Technical data” for permissible noise levels in free field conditions according to EN ISO 2151.



**CAUTION**

The sound level of the vacuum pump within a certain perimeter of the pump is high.

Risk of hearing damage.

Users who are spending a longer period of time in the vicinity of a non-insulated vacuum pump must wear suitable ear protection.

## Safety area

Before any maintenance action, ensure a safety perimeter of at least 1 [m] around the pump.

## Stopping procedure for maintenance

- Stop the vacuum pump
- Switch off power supply (the vacuum pump must be fully disconnected from any power supply)
- Disconnect water connections (inlet first, then outlet)
- Put up label or warning board “Maintenance in progress” on or next to the pump.

## Start-up procedure after maintenance

- Remove label or warning board “Maintenance in progress”
- Check cooling liquid and oil levels according to the chapters “Checking the oil level” and “Checking the cooling liquid level”
- Switch on power supply (the vacuum pump must be connected to the power supply)
- Connect the water connections (outlet first, then inlet)
- Check that the “Installation prerequisites” are observed
- Start the vacuum pump

# Transport

The COBRA NS vacuum pumps are tested and checked in our factory before careful packing. Check the packaging for transport damage when the goods arrive. The pump can withstand temperatures between -25°C and +55°C during transport.

## Transportation of packaged pump

Packed on a pallet, the vacuum pump can be transported with a forklift.

## Transport in unpacked state

The vacuum pump is bolted to a pallet or a base plate:

- ◆ Remove the bolts between the vacuum pump and the pallet or base plate



CAUTION

Do not walk, work or stand under suspended loads.



CAUTION

Please check out the weight of the vacuum pump before lifting it up (see "Technical data").

Use adequate lifting gear for this.

**NOTE:** The eyebolts are fitted more or less at equal distance from the centre of gravity of the vacuum pump incl. drive motor. If any accessories that could upset the balance of the vacuum pump, are installed, or if the vacuum pump is delivered without drive motor, it is necessary to add a belt or rope at a suitable point when lifting the pump.

- Attach lifting gear securely to the eyebolt or eyebolts
- Use lifting gear with a crane hook equipped with safety latch.
- Lift the vacuum pump

In case the vacuum pump was bolted to a pallet with fixing bolts:

- ◆ Unscrew the fixing bolts in the base frame



CAUTION

Once filled with oil, the vacuum pump cannot be lifted anymore.

Prior to every transport make sure that the oil has been drained from the vacuum pump

The packaging material must be disposed of in accordance with local and national regulations.

This operating instructions is part of the delivery package.

## Storage

### Short-term Storage

- Make sure that the inlet / discharge connections are closed (leave the provided plugs in the pump)
- Store the vacuum pump
  - if possible in its original packaging,
  - indoors,
  - dry,
  - in a dust free room and
  - free from vibrations

### Removal from storage

Before starting up a vacuum pump that has been stored outside the building for a while, the vacuum pump must be moved to a room with ambient temperature, where it should rest for a day.

## Conservation

In case of adverse ambient conditions (e.g. aggressive atmosphere, frequent temperature changes) conserve the vacuum pump immediately. In case of favourable ambient conditions conserve the vacuum pump if a storage of more than 3 months is anticipated.

- Make sure that all openings are hermetically sealed; use adhesive tape to fasten loose parts (such as o-rings, flat seals, etc.).

**NOTE:** VCI is the abbreviation for "volatile corrosion inhibitor". The VCI molecule is an organic corrosion inhibitor in the vapour phase. Integrated in various carriers such as film, cardboard, paper, foam, liquid and powder, it protects parts against corrosion as a result of its action in vapour phase. However, VCI packaging can attack plastic surfaces and surfaces of other elastomers. If in doubt, please contact your nearest distributor. VCI packaging provides several years of protection against corrosion, even under harshest conditions: overseas shipment, extended storage before use.

- Wrap the vacuum pump in VCI film
- Store the vacuum pump
  - if possible in its original packaging,
  - indoors,
  - dry,
  - in a dust free and
  - vibration free area

### Starting-up of the vacuum pump after storage

- Please ensure that all protective agents such as gaskets, plugs or adhesive tapes that were used for the protection of the pump, are removed.
- Commission the vacuum pump as described in chapter "Installation and Commissioning"

## Installation and Commissioning

### Installation prerequisites



CAUTION

In case of non-compliance with the installation prerequisites, particularly in case of insufficient cooling:

Risk of damage or destruction of the vacuum pump and its components!

Risk of personal injury!

The installation prerequisites must be complied with.

- Please ensure that the integration of the vacuum pump is compliant with the safety requirements of the Machine Directive 2006/42/ EC (concerning the responsibility of the system's manufacturer into which the vacuum pump is to be incorporated, please also refer to the note in the EC-Declaration of Conformity).



WARNING

Local regulations regarding the motors and electric control elements must be observed when installing the pump in potentially explosive environments. Before start-up, make sure that all safety measures have been followed.

### Local installation

- Make sure that the environment of the vacuum pump is not potentially explosive
- Make sure that the following ambient conditions are adhered to:
  - Ambient temperature: 0 ... 40 °C (32 ... 104°F)
  - Ambient pressure: atmospheric

- Humidity range: 20 à 95%
- Altitude: up to 1000 m
- Make sure that the cooling water fulfills the following requirements:
  - Temperature: 10 - 20 °C
  - Water pressure: 2 - 5 bar (relative)
  - Approximate flow rate: 3 - 4 l/ min
  - Water hardness: < 5° dGH

**NOTE:** 1° (German degree = 1° dGH) = 1,78° (French degree) = 1,25 e (English degree) = 17,9 mg/kg CaCO<sub>3</sub> (American hardness)

- Make sure that the cooling water is neutral and clean
- Make sure that the cooling water outlet is unpressurised
- Make sure that the nitrogen fulfills the following requirements:
  - Overpressure: 1,5 bar
  - Approximate flow rate: 0 - 18 NI/ min
- Make sure that the environment conditions correspond to the protection class of the motor (according to motor nameplate)
- Make sure that the vacuum pump is placed on or fastened to a horizontal surface
- Make sure that the vacuum pump is level and even
- Make sure that the vacuum pump cannot inadvertently or intentionally be used as a support for heavy objects
- Make sure that the vacuum pump cannot be hit by falling objects
- Make sure that the vacuum pump is at least 1 m away from any wall
- Make sure that the vacuum pump is easily accessible and that the selected installation site fulfills the requirements for assembly/ dismantling
- Make sure that no temperature-sensitive part (such as plastic, wood, cardboard, paper, electronic parts) come into direct contact with the hot surfaces of the vacuum pump
- Make sure that the installation site or assembly area is ventilated in such a way that adequate cooling of the vacuum pump is assured



**CAUTION**

During operation the surface of the vacuum pump may exceed temperatures of 90° C.

Risk of burns!

- Make sure that the vacuum pump cannot be touched inadvertently during operation, provide a guard if necessary
- Make sure that the oil sight glasses (OSG) will remain easily accessible

If the oil change is meant to be performed on site:

- ◆ Make sure that the oil drain plugs as well as the oil filler plugs, are easily accessible.

## Suction Connection



**CAUTION**

Do not put hands into the inlet aperture.

Risk of body damage !

- Make sure that the protection that prevents the ingress of foreign matter during transport, has been removed before connecting up the vacuum pump to the piping.



**CAUTION**

The ingress of foreign objects or liquids can destroy the vacuum pump.

In case the inlet gases can contain dust or other foreign solid particles:

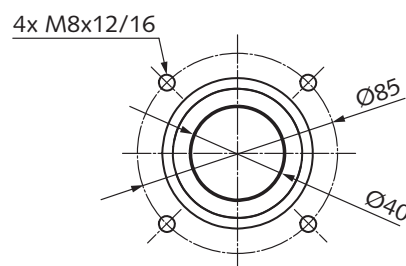
- ◆ Make sure that a suitable filter or protection screen is installed at the inlet of the vacuum pump
- Make sure that the nominal diameter of the inlet line is at least equal to the diameter of the inlet flange to prevent a drop in the performance of the vacuum pump in the case of a smaller cross-section.
- Make sure that the vacuum pump is connected with leak proof lines.



**CAUTION**

Once the inlet line has been connected up, make sure that the system does not leak. Leakage of dangerous substances must be prevented!

- Make sure that the inlet line is equipped with a shut-off device upstream of the inlet flange, so that the flow of drawn gases can be stopped
- Make sure that the inlet line does not exercise any pressure on the inlet flange. Use bellows if necessary.
- The inlet flange has the following dimension:
  - DN 40



In case of long inlet lines the pipe diameter should be larger than the inlet flange to prevent a drop in the performance of the vacuum pump. If you have any doubts, contact your Busch representative.

## Discharge connection



**CAUTION**

Do not put hands into the outlet aperture.

Risk of body damage !

The following instructions for connection to the discharge side only apply if the drawn gas is discharged into a suitable environment by the vacuum pump.

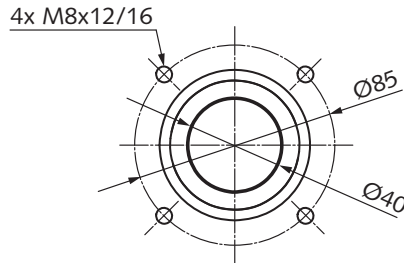
- Make sure that the protection, that was fitted to prevent the ingress of particles during transport, has been removed before the vacuum pump is connected up to the vacuum pipe
- Make sure that the nominal diameter of the discharge line corresponds at least to the diameter of the exhaust flange of the vacuum pump in order to prevent a drop in the performance of the vacuum pump, in case of use of a smaller cross-section



**CAUTION**

When the discharge piping has been connected up, make sure that the system does not leak. Leakage of dangerous substances must be prevented!

- Make sure that the discharge line is fitted in such a way so as to prevent any liquids or condensates to re-enter the vacuum pump (siphon, discharge line sloping away from the pump)
- Make sure that the discharge line is not equipped with a shut-off device
- Make sure that the discharge line does not exercise any pressure onto the exhaust flange. Mount bellows if necessary.
- The outlet flange has the following dimension:
  - DN 40



In the case of long discharge lines, the line cross-section should be larger than the exhaust flange in order to prevent a drop in the performance of the vacuum pump. If you have any doubts, contact your Busch representative.

## Cooling water connections

The cooling water is generally connected up with a flexible hose.

The cooling water outlet must be unpressurised.

Connection diameter:

- cooling water inlet: 1/4 NPT
- cooling water outlet: 1/4 NPT

## Motor cooling water connections

The motor cooling water is generally connected up with a tight hose to the electrical motor.

- Connection diameter: 1/4 NPT

## Nitrogen system connections (option)

The connection of the nitrogen system is generally done using flexible hoses (diameter 1/4")

- Connection diameter: 1/4 NPT

## Electrical connection/ Checks

- Make sure that the requirements according to EMC-Directive 2014/30/EU as well as the current EN-standards, electrical and occupational safety directives and the local or national regulations respectively, are complied with (this is the responsibility of the designer of the machinery into which the vacuum pump is to be incorporated; see also the corresponding comments in the EC-Declaration of Conformity).
- Make sure that the power supply is compatible with the data on the nameplate of the drive motor
- Make sure that an overload protection according to EN 60204-1 is provided for the drive motor
- Make sure that the drive of the vacuum pump will not be affected by electric or electromagnetic interference; if unsure please seek advice from your Busch representative

## Installation

### Fitting

- Make sure that the "Installation Prerequisites" are complied with
- Fit or install the vacuum pump at its final location

## Electrical connection



Risk of electrical shock, risk of damage to equipment.

Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations:

- IEC 364 or CENELEC HD 384 or DIN VDE 0100, respectively,
- IEC-Report 664 or DIN VDE 0110,
- BGV A2 (VBG 4) or corresponding national accident prevention regulation.



The connection schemes given below are typical. Specific orders or deviating connection schemes for certain markets may apply.

Risk of damage to the drive motor!

Please check drive motor connections inside the terminal box and refer to the drive motor connection instructions.

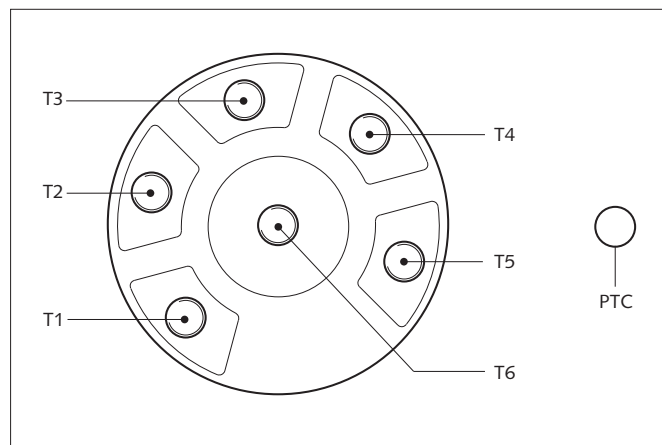
- Connect the drive motor electrically
- Connect the earth line

## Electrical motor connection

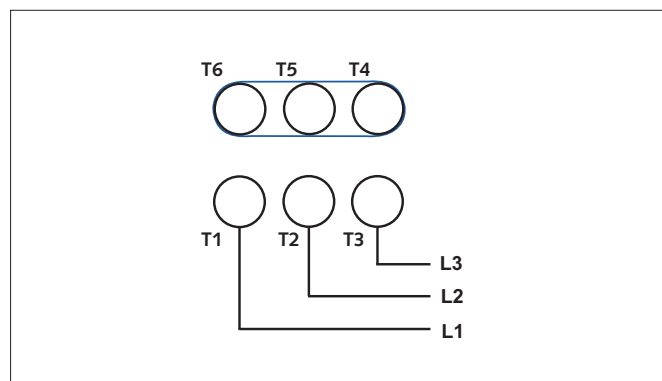


When connecting up the wires into the terminal box: please make sure the tightening torque of **3 Nm** is adhered to and check with a calibrated torque wrench (Nuts M5).

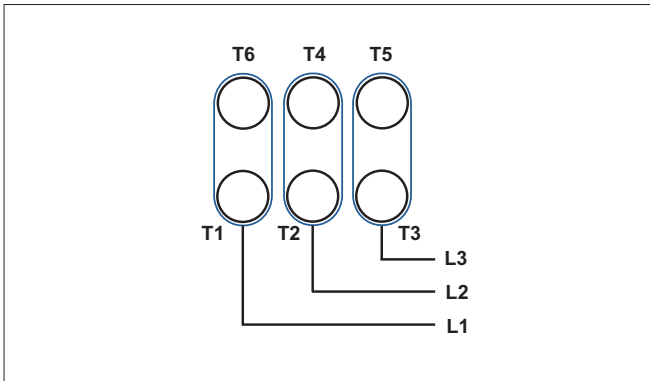
Three phase motor connection:



Star motor connection (High voltage) 400V:



Delta motor connection (Low voltage) 200V:



#### CAUTION

Operation of the pump in the wrong direction of rotation, even for a short period of time, can destroy the vacuum pump.

Risk of damage of the drive motor!

Prior to starting-up of the vacuum pump, please ensure that the vacuum pump is connected up correctly.

- Determine the direction of rotation by using a pressure measure tool or by placing a rubber plate on the inlet
- Press the on/ off switch and hold briefly
- Make sure that the pump draws in

If the direction has to be changed:

- ◆ Switch around any two of the drive motor wires in the terminal box

### Connecting up of lines/ pipes

- Connect the suction line
- Connect the discharge line
- Make sure that all provided covers, guards, hoods etc. are fitted

### Filling up with oil

The COBRA NS vacuum pumps are always delivered without oil (see chapter "Oil Type" for information on recommended oils).

- Prepare the quantity of oil specified in the table "Oil quantity"

**NOTE:** The quantity of oil specified in the operating instructions is of informative nature only. Check the oil level with the help of the various oil sight glasses (OSG) on the vacuum pump.



#### CAUTION

Before changing the type of oil, make sure that the new type is compatible with the old type. If necessary, flush the vacuum pump.

- Unscrew the oil filler plugs (OFP)
- Fill in oil
- Make sure that the filling level is about 3/4 of the oil sight glasses (OSG)
- Make sure that the seal ring in the oil filler plugs is not damaged, replace plugs if necessary
- Fit the oil filler plugs and tighten up

**NOTE:** Starting the vacuum pump when the oil is cold is made easier when the suction line is left open or the rubber plate is removed.

- Switch on the vacuum pump

In case the suction line is equipped with a shut-off valve:

- ◆ Close the shut-off valve

In case the suction line is not equipped with a shut-off valve:

- ◆ Cover the inlet connection with a rubber plate
- Let the vacuum pump run for a few minutes
- Switch off the vacuum pump and wait for a few minutes
- Check that the filling level is always approximately 3/4 of the oil sight glasses (OSG)

If the oil level is below the middle of the oil sight glasses:

- ◆ Top-up with oil

In case the suction line is equipped with a shut-off valve:

- ◆ Open the shut-off valve

In case the suction line is not equipped with a shut-off valve:

- ◆ Remove the rubber plate from the suction flange and connect the suction line to the suction flange
- Before any transport, make sure that the oil has been drained out of the vacuum pump.



#### CAUTION

Once filled with oil, the vacuum pump should not be lifted or moved anymore.



#### CAUTION

The vacuum pump must remain in a horizontal position once it has been filled with oil.

### Filling in cooling liquid

The COBRA NS vacuum pumps are always delivered without cooling liquid (see chapter "Cooling liquid types" for information on the recommended cooling liquids).

- Prepare the quantity of cooling liquid as specified in the table "Cooling liquid quantity"

**NOTE:** The quantity of cooling liquid specified in the installation handbook is of informative nature only. Follow the procedure of filling the cooling liquid. Check the level of the cooling liquid at the liquid level indicator located at the filler or with a measuring scale. The level of the cooling liquid in the expansion vessel may never exceed 5 mm seen from the bottom of the vessel.

- Remove the cooling liquid filler plug (CLF) on the expansion vessel
- Fill the cooling liquid in by hole
- Stop filling in cooling liquid
- Fill in again by filler hole until the level of the liquid reaches the bottom of the cylinder surface
- Screw the cooling liquid filler plug (CLF)
- If liquid has run on to the surface of the vacuum pump, wipe it off
- Start the vacuum pump

If the inlet line is equipped with a shut-off device:

- ◆ Close the shut-off device

If the inlet line is not equipped with a shut-off device:

- ◆ Place a rubber plate on the suction flange

- Let the vacuum pump run for maximum 5 minutes
- Stop the vacuum pump and wait for a few minutes
- Check the filling level

In case the cooling liquid level is below the required level:

- ◆ Fill in more cooling liquid

If the inlet line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the inlet line is not equipped with a shut-off device:

- ◆ Remove the rubber plate from the suction flange and connect the suction line to the suction flange



## Checking the cooling water temperature

As standard, the vacuum pump is delivered without water temperature control device. Regularly check the temperature of the cooling water. Too high temperature of the cooling water will not make it possible to regulate the temperature of the cooling liquid.

## Checking the cooling water flow (option)

As option, the flow of the cooling water is checked by the flowmeter CWM. The flowmeter must be connected in such a way that switching-on leads to an alarm and stopping of the vacuum pump when the flow drops below 3 l/min.

## Checking the nitrogen supply

As option, the flow nitrogen is checked by the flowmeter DGF. The flowmeter must be connected in such a way that switching-on leads to an alarm. The alarm limit can be adjusted depending on the type of process.

## Saving the operating parameters

As soon as the vacuum pump is working under normal conditions after being switched on:

- Measure the working current of the motor and keep it as reference value for all future maintenance and repair work

## Recommendations on operation

### Application



#### WARNING

The vacuum pump is designed for operation under the conditions described below.

In case of disrespect of the above, risk of damage or destruction of the vacuum pump!

The vacuum pump must only be operated under the conditions described below.

The COBRA NS vacuum pumps have been designed for use in industrial applications and similar industries.

They can be used to draw gases and gas mixtures.



#### WARNING

When using toxic, inflammable and/ or explosive gases, make sure that the system corresponds to applicable local and national safety regulations and that all applicable safety measures are followed. All product-specific safety regulations must be observed.

Solid particles must not enter the vacuum pump. In case of process errors, the pump can draw in a certain amount of liquids. If the pump has drawn in liquid, a short drying run will be necessary at the end of the process and, in case a silencer (accessory) is mounted at the outlet:

- ◆ Drain the silencer (accessory)

The vacuum pump is intended for use in a potentially non-explosive environment.

Max. permissible number of startings per hour: 6.

The vacuum pump is thermally suitable for continuous use at any pressure between atmospheric pressure and ultimate pressure.



#### CAUTION

During operation the surface of the vacuum pump can exceed temperatures of 90°C.

Risk of burns!

The vacuum pump must be protected against contact during operation. If touching the pump is unavoidable, wait until the surface temperature has cooled down or wear protective gloves.



#### CAUTION

The sound level of the pump within a certain perimeter of the pump is high.

Risk of hearing damage.

Users, who are spending a longer period of time in the vicinity of a non-insulated vacuum pump, must wear suitable ear protection.



#### CAUTION

The COBRA NS vacuum pumps are always delivered without oil.

Operation without oil will destroy the vacuum pump within a short period of time.

The vacuum pump must remain in a horizontal position once it has been filled with oil.



#### CAUTION

The COBRA NS vacuum pumps are always delivered without cooling liquid.

Operation without cooling liquid will destroy the vacuum pump within a short period of time!

- Make sure that all provided covers, guards, hoods etc. remain fitted
- Make sure that protective devices will not be disconnected
- Make sure that there is no leakage in the system, the escape of dangerous substances must be avoided
- Make sure that the "Installation Prerequisites" are complied with and will remain so, and ensure that adequate cooling is guaranteed

If the pump is shut down for a longer period of time:



#### CAUTION

If there is a risk of frost, all the cooling water must be drained out of the vacuum pump if the pump is shut down for a longer period of time!

- Drain the cooling liquid
  - ◆ Open the cooling liquid drain plug (CLD)
  - ◆ Drain the cooling liquid
  - ◆ Refit the cooling liquid drain plug
  - ◆ Collect the cooling liquid and re-use it or dispose of it according to local or national regulations
- Drain the cooling water
  - ◆ Disconnect the cooling water inlet / outlet connections
  - ◆ Drain the cooling water completely
  - ◆ If necessary, drain the cooling water with the help of compressed air in order to prevent any risk of frost or corrosion



**NOTE:** When the pump has not been in operation for a few days or when a sticky substance has been drawn, it is possible that the two rotor screws of the COBRA NS vacuum pump stick to each other.

## Switching the vacuum pump on/ off

### First start-up of the system

- Make sure that the "Installation Prerequisites" are followed

If the system is equipped with a solenoid valve on the cooling water circuit:

- ◆ Open the solenoid valve
- Open the cooling water supply

If the vacuum pump is equipped with a barrier gas system:

- ◆ Open the solenoid valve
- ◆ Open the nitrogen supply
- ◆ Adjust the barrier gas pressure

If the vacuum pump is equipped with a purge gas system:

- ◆ Open the solenoid valve
- ◆ Open the nitrogen supply
- ◆ Adjust the pressure and volume flow for the purge gas

If the vacuum pump is equipped with a dilution gas system:

- ◆ Open the solenoid valve
- ◆ Open the nitrogen supply
- ◆ Adjust the pressure and volume flow for the dilution gas
- Start the vacuum pump

If the vacuum pump is equipped with a solenoid valve at the inlet:

- ◆ Open the solenoid valve

If the vacuum pump is equipped with a shut-off valve at the inlet:

- ◆ Open the shut-off valve

### Switching off the system

If the vacuum pump is equipped with a solenoid valve at the inlet:

- ◆ Close the solenoid valve

If the vacuum pump is equipped with a shut-off valve at the inlet:

- ◆ Close the shut-off valve

If the vacuum pump is equipped with a purge gas system:

- ◆ Open the solenoid valve on the flushing device
- ◆ Flush the vacuum pump for 20 - 40 minutes
- ◆ Close the solenoid valve on the flushing device
- Switch off the vacuum pump
- Close the cooling water supply

If the vacuum pump is equipped with a solenoid valve on the cooling water circuit:

- ◆ Close the solenoid valve

If the vacuum pump is equipped with a barrier gas, purge or dilution gas system:

- ◆ Close the nitrogen supply
- ◆ Close the solenoid valve(s)
- The system must be disconnected from the power supply

## Maintenance



In case the vacuum pump has conveyed gases that have been contaminated with harmful foreign material which are harmful to health, the oil and the condensates will also be contaminated with harmful foreign material.

These foreign materials can infiltrate the pores, recesses and other internal spaces of the vacuum pump.

**Danger to health during dismantling of the vacuum pump.**

**Danger to the environment.**

**During dismantling of the vacuum pump protective equipment and clothing must be worn.**

**Before any maintenance work, the inlet and outlet piping as well as the vacuum pump itself must be flushed with nitrogen.**



Only authorised personnel may carry out any dismantling on the vacuum pump. Before work begins, the operator of the vacuum pump must fill in a form or a "Declaration Regarding Contamination of Vacuum Equipment and Components" that provides information on possible dangers and appropriate measures. If this form has not been filled in completely and signed by a responsible person, the vacuum pump may not be dismantled.



Before any maintenance work is started, a safety perimeter of at least 1 [m] around the machine must be set up.



During operation the surface of the vacuum pump may reach temperatures in excess of 90 °C.

**Risk of burns!**

Before starting any maintenance work, make sure that the vacuum pump has been fully switched off and that it cannot accidentally be switched on again. Follow the shutdown procedure in the section "Stopping procedure for maintenance":

- Stop the vacuum pump
- Switch off the power supply (the vacuum pump must be fully disconnected from the power supply)
- Disconnect the cooling water connections (inlet first, then outlet)
- Put up label or warning board "Maintenance in progress" on or next to the pump



The oil temperature can reach a value of 100°C!

**Danger of burns!**

- Make sure that the oil circuit and the cooling liquid circuit have been drained before moving the vacuum pump
- Make sure that any cleaning materials used to clean the vacuum pumps have been disposed of according to local and national regulations

Before disconnecting the different connections, make sure that the inlet and exhaust lines of the vacuum pump have been brought to atmospheric pressure

When the maintenance work has been finished, follow the procedure "Start-up procedure after maintenance":

- Remove the label or warning board "Maintenance in progress"
- Check the cooling liquid and oil levels according to chapters "Checking the oil level" and "Checking the cooling liquid level"
- Connect the pump up to the power supply
- Reconnect the cooling water connections (outlet first, then inlet)
- Make sure that the "Installation Prerequisites" are followed
- Start the pump

## Maintenance program

**NOTE:** The maintenance intervals depend on the individual operating conditions. The intervals given below should be considered as initial guidelines which should be shortened or extended as appropriate. In particularly heavy duty operation such as high dust loads in the environment or in the process gas, it can become necessary to shorten the maintenance intervals significantly.

### Weekly:

- Check the oil level and the colour (see "Checking the Oil")
- Check the level of the cooling liquid (see "Checking the Cooling liquid")
- Check the cooling water flow (see "Checking the cooling water")
- Check the vacuum pump for oil leaks - in case of leaks, have the vacuum pump repaired (Busch service)
- Check the vacuum pump for cooling liquid leaks - in case of leaks, have the vacuum pump repaired (Busch service)
- Check the vacuum pump for cooling water leaks - in case of leaks, have the vacuum pump repaired (Busch service)

### Monthly:

In case of operation in a dusty environment:

- ◆ Make sure that the operating room is clean and free of dust; clean the room if necessary
- Make sure that the vacuum pump has been switched off and that it cannot accidentally be switched on again
- Check the electrical connections
- Carry out a visual inspection of the vacuum pump
- Check the operation of the gas ballast assembly, disassemble and clean as required. In the case of excessive discolouration of the inlet filter change this item

### Yearly:

- Make sure that the vacuum pump has been switched off and that it cannot accidentally be switched on again
- Check the correct operation of the gas ballast assembly, disassemble and clean as required. Change the gas ballast inlet filter

If the inlet is equipped with a mesh screen:

- ◆ Check the mesh screen at the inlet and clean it if necessary
- Check the correct operation of the measurement and safety equipment

If the discharge is equipped with a silencer:

- ◆ Bleed the condensation of the silencer through the purge system
- Drain the cooling liquid (see "Draining the cooling liquid")

If an filter is installed on the cooling water line:

- ◆ Check the filter, clean or replace it, if necessary
- Check the seals and replace them if necessary
- Check the inlet and discharge lines and clean or replace them if necessary

## Every 16'000 operating hours, at the latest after 4 Years:

- Drain the oil (see "Draining the Oil")
- Have a major overhaul done on the vacuum pump (Busch service)

## Stopping procedure for maintenance

- Stop the vacuum pump
- Switch off the power supply (the vacuum pump must be disconnected from the power supply)
- Disconnect the cooling water connections (inlet first, then outlet)
- Put up label or warning board "Maintenance in progress" on or next to the pump.

## Start-up after maintenance

- Remove label or warning board "Maintenance in progress"
- Check the cooling liquid and oil levels according to the chapters "Checking the oil level" and "Checking the cooling liquid level"
- Connect the pump up to the power supply
- Reconnect the cooling water connections (outlet first, then inlet)
- Make sure that the "Necessary installation instructions" are followed
- Start the vacuum pump

## Checking the oil

### Checking the oil level

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Check the oil level on the different oil sight glasses

If the oil level is below the 3/4 of the oil sight glasses:

- ◆ Top up with oil (see "Topping up Oil")

If the oil level is above the 3/4 of the oil sight glasses:

- ◆ Check the evacuation of the condensates.
- ◆ Change the oil (see "Change the oil")

## Topping up with oil

**NOTE:** Under normal conditions there should be no need to top up with oil in-between the recommended oil change intervals. A significant drop in the oil level indicates a malfunction (see "Troubleshooting").



CAUTION

Fill in oil only through the oil filler holes.



CAUTION

Risk of injury (burns) with open oil filler orifice.

Risk of injury in case of badly screwed-in plugs.

Remove the oil filler plugs only when the vacuum pump is stopped.

The vacuum pump must only be operated when the oil filler plugs are firmly tightened up and do not leak.

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Remove the oil filler plugs (OFP)
- Top up with oil until 3/4 of the oil sight glasses
- Make sure that the oil level is 3/4 of the oil sight glass
- Make sure that the seals of the oil filler plugs are not damaged and replace plugs if necessary

- Refit the oil filler plugs and tighten up

## Checking the colour of the oil

**NOTE:** The oil must be clear and transparent. A permanent milky colour is an indication for contamination by foreign bodies. A dark colour is an indication for oil that has been chemically altered or contaminated by foreign bodies.



Dark coloured oil may indicate a hazardous pump condition which could cause personal injury.



If dark oil similar to the example shown is observed, you have to contact the Busch Customer Service without delay.

## Oil change



In case the vacuum pump has conveyed gases that have been contaminated with harmful foreign materials, the oil will also be contaminated.

Danger to health during the change of contaminated oil.

Danger to the environment.

Wear protective equipment during the change of contaminated oil.

Contaminated oil is hazardous waste and must be disposed of separately in compliance with applicable regulations.

## Draining used oil

**NOTE:** After switching off the vacuum pump at normal operating temperature wait no more than 20 minutes before the oil is drained.

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Make sure that the vacuum pump is vented to atmospheric pressure
- Put a drain tray underneath the oil drain plugs (ODP)
- Remove the oil drain plugs (ODP)
- Carefully remove the drain plugs
- Drain the oil
- Because of wear and tear on the seals replace the current drain plugs with new ones

When the oil flow has stopped:

- Close the oil drain plugs (ODP)
- Switch on the vacuum pump for a few seconds
- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Remove the oil drain plugs again and drain any remaining oil
- Check that no metal swarf sticks to the magnet of the drain plug, clean if necessary
- Refit the oil drain plugs and tighten up
- Dispose of the used oil in compliance with applicable regulations



### CAUTION

Because the ends of the drain plugs are magnetic, metal swarf can stick to them. Always clean away this swarf when removing the drain plugs.

Because of wear and tear of the seals, it is recommended to replace the drain plugs whenever the oil is changed.

## Filling in new oil

- Prepare the quantity of oil needed (see "Oil type/quantity")



The use of chemically contaminated or polluted oil can lead to hazardous pump conditions which could cause personal injury.

**NOTE:** The quantity of oil specified in the operating instructions is of informative nature only. Check the oil level with the help of the various oil sight glasses on the vacuum pump.

- Make sure that the oil drain plugs have been fitted properly and that they do not leak



### CAUTION

Only fill in oil through the oil filler orifices.

- Remove the oil filler plugs (OFP)
- Fill in oil until 3/4 of the oil sight glasses
- Make sure that the oil level is 3/4 of the oil sight glass
- Make sure that the seals of the oil filler plugs are not damaged and replace plugs if necessary
- Refit the oil filler plugs and tighten up

## Checking the cooling liquid

### Checking the level of the cooling liquid

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Check the level of the cooling liquid
- Open the plug on cylinder upper plate
  - ◆ The filling level must be just under the cylinder upper plate

If the level is below:

- ◆ Top up with cooling liquid (see "Refilling cooling liquid")

### Top up with cooling liquid

**NOTE:** Under normal conditions there should be no need to top up with cooling liquid in-between the recommended change intervals. A significant drop in the cooling liquid level indicates a malfunction (see "Troubleshooting").

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Remove the cooling liquid filler plug (CLF) on the expansion vessel
- Open the plug on cylinder upper plate
- Fill in cooling liquid by filler hole until the cooling liquid flows of the plug on cylinder upper plate
- Stop the filling
- Close the cooling liquid filler plug (CLF) on the expansion vessel
- Fit the plug on cylinder upper plate
- Make sure that the seal rings of the cooling liquid filler plug (CLF) and cooling liquid drain plug (CLD) are not damaged, replace plugs if necessary
- If there is any spillage on the surface of the vacuum pump, wipe it up

## Draining the cooling liquid

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Make sure that the vacuum pump is vented to atmospheric pressure
- Put a drain tray underneath the cooling liquid drain plug (CLD)
- Remove the cooling liquid drain plug (CLD)
- Drain the cooling liquid

When cooling liquid stops flowing out:

- ◆ Drain any remaining cooling liquid
- Close the cooling liquid drain plug (CLD)
- Start the vacuum pump and let it run for about 5 seconds
- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Unscrew the cooling liquid drain plug (CLD) again
- Drain any remaining cooling liquid
- Make sure that the seals of the cooling liquid drain plugs are not damaged, replace plugs if necessary
- Refit the cooling liquid drain plugs again and tighten up
- Collect the cooling liquid and re-use it or dispose of it according to local or national regulations

## Filling up with new cooling liquid

- Prepare the quantity of cooling liquid needed (see "Cooling liquid type/ quantity")

**NOTE:** The quantity of cooling liquid specified in the operating instructions is of informative nature only.

- Remove the cooling liquid filler plug (CLF) on cylinder upper plate
- Fill in cooling liquid by filler hole until the cooling liquid flows of the cooling drain plug (CLD) on cylinder endplate B-side
- Stop the filling
- Fit the cooling liquid filler plug (CLF) on cylinder upper plate
- If there is any spillage on the surface of the vacuum pump, wipe it up
- Start the vacuum pump

If the inlet line is equipped with a shut-off device:

- ◆ Close the shut-off device

If the inlet line is not equipped with a shut-off device:

- ◆ Place a rubber plate on the suction flange
- Let the vacuum pump run for maximum 5 minutes
- Stop the vacuum pump and wait for a few minutes
- Check that the filling level is just under the cylinder upper plate

In case the cooling liquid level is below the required level:

- ◆ Fill in more cooling liquid

If the inlet line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the inlet line is not equipped with a shut-off device:

- ◆ Remove the rubber plate from the inlet flange and connect the inlet line to the inlet flange

## Checking the cooling water

### Checking the cooling water temperature

- Check regularly the cooling water temperature
  - ◆ Make sure that the specifications of the cooling water are followed

### Checking the current consumption

- Check the current of the motor

An increased current indicates a fault (see "Troubleshooting")

### Checking the silencer (accessory)

- Make sure that the condensates do not collect at the outlet of the vacuum pump
- Drain the condensates via the drain provided and collect them in a container
- Dispose of the condensates in compliance with applicable environmental protection regulations
- Check regularly the silencer and clean it if necessary



#### CAUTION

Wear protective clothing when carrying out maintenance work on the silencer.

Risk of contaminated process residues.

## Overhaul



#### CAUTION

Improper maintenance work on the vacuum pump can damage it.

Risk of explosion!

Non-adherence to the procedure will cancel approval for start-up of the pump !

Any dismantling of the vacuum pump beyond of what is described in this manual must be done by specially trained Busch service staff only.



#### DANGER

In case the vacuum pump has conveyed gases that have been contaminated with foreign materials that are dangerous to health, the oil and condensates will also be contaminated.

These foreign materials can infiltrate the pores, recesses and other internal spaces of the vacuum pump.

Danger to health when the vacuum pump is dismantled.

Danger to the environment.

Prior to shipping, the vacuum pump must imperatively be decontaminated and the degree of contamination must be documented in a declaration of decontamination ("Declaration of Decontamination"), which can be downloaded from [www.buschvacuum.com](http://www.buschvacuum.com).

Busch service will only accept vacuum pumps that come with a completely filled in and legally binding signed form.

# Removal from service

## Temporary removal from service

Prior to disconnecting inlet and outlet pipes as well as cooling water pipes, make sure that all piping is vented to atmospheric pressure

## Recommissioning



### CAUTION

After a long period of inactivity, it is possible that the rotor screws of the COBRA NS vacuum pump are stuck.

- Make sure that all gaskets, plugs or adhesive tapes have been removed.
- Start the vacuum pump as described in the chapter "Installation and Commissioning"

## Dismantling and Disposal of the vacuum pump



### DANGER

In case the vacuum pump has conveyed gases that have been contaminated with harmful foreign material which are harmful to health, the oil and the condensates will also be contaminated with harmful foreign material.

These foreign materials can infiltrate the pores, recesses and other internal spaces of the vacuum pump.

**Danger to health during dismantling of the vacuum pump.**

**Danger to the environment.**

**During dismantling of the vacuum pump protective equipment and clothing must be worn.**

**The vacuum pump must be decontaminated prior to disposal.**

**Prior to shipping, the vacuum pump must imperatively be decontaminated and the degree of contamination must be documented in a declaration of decontamination ("Declaration of Decontamination"), which can be downloaded from [www.buschvacuum.com](http://www.buschvacuum.com).**

**Used oil and condensates must be disposed of separately in compliance with applicable environmental regulations.**

When the vacuum pump comes to the end of its life:

- it must be decontaminated



### CAUTION

Only authorised personnel may carry out dismantling work on the vacuum pump. Before work begins, the operator of the vacuum pump must fill in a form or a "Declaration of Decontamination" that provides information on possible dangers and appropriate measures.

If this form has not been filled in completely and signed, the vacuum pump may not be dismantled.

- drain the oil
  - ◆ dispose of the used oil in compliance with applicable environmental regulations
- drain the cooling liquid
  - ◆ dispose of the cooling liquid in compliance with applicable environmental regulations
- dismantle the vacuum pump



### CAUTION

During dismantling of the vacuum pump protective equipment and clothing must be worn

- ◆ dispose of the vacuum pump as scrap metal
- dispose of the different components of the pump in compliance with applicable regulations



# Troubleshooting



## WARNING

Risk of electrical shock, risk of damage to equipment.

Electrical installation work must only be executed by qualified personnel that knows and observes the following regulations:

- IEC 364 or CENELEC HD 384 or DIN VDE 0100, respectively,
- IEC-Report 664 or DIN VDE 0110,
- BGV A2 (VBG 4) or equivalent national accident prevention regulation.



## CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 90 °C.

Risk of burns!

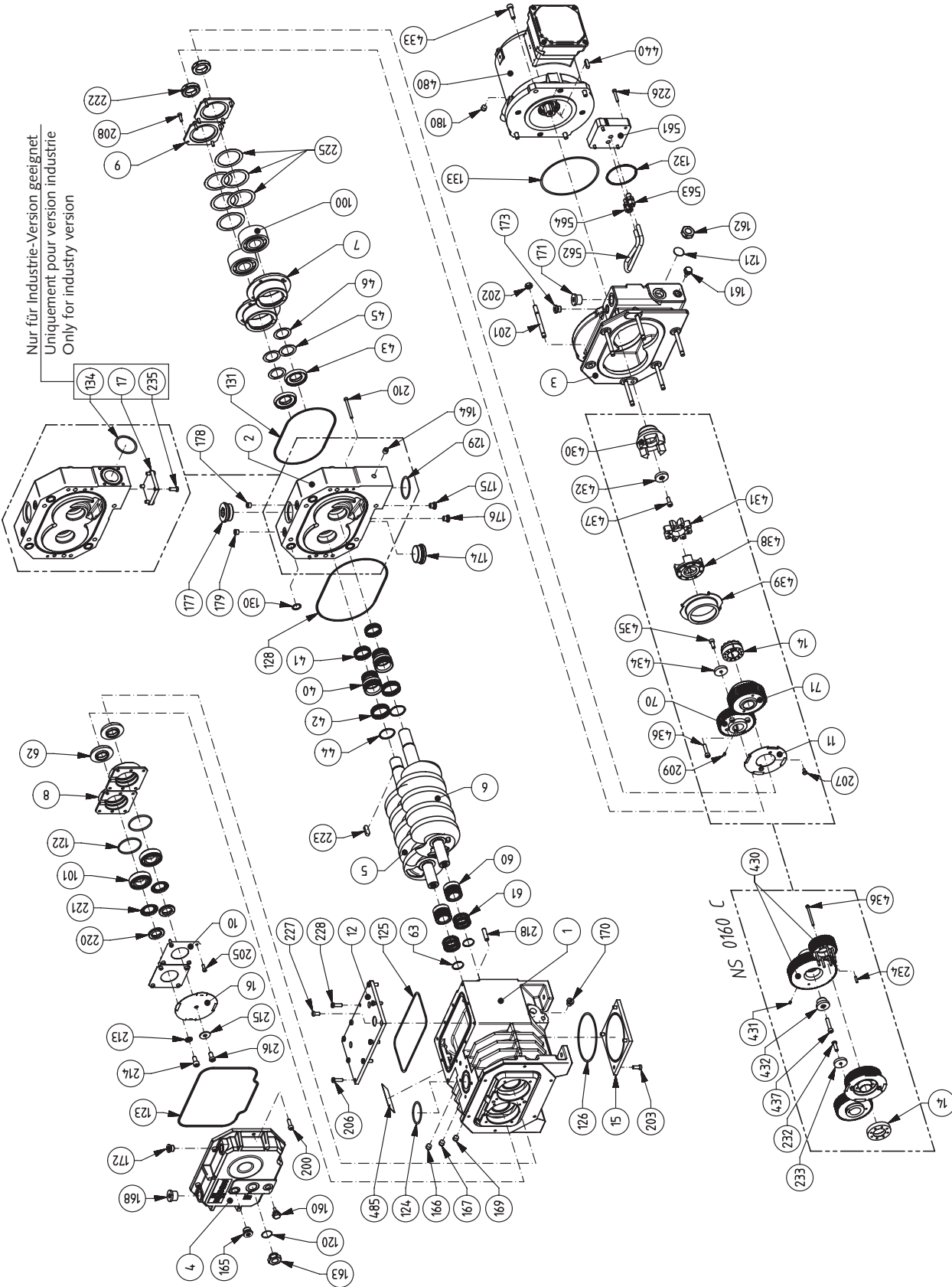
Let the vacuum pump cool down prior to a required contact or wear heat protection gloves.

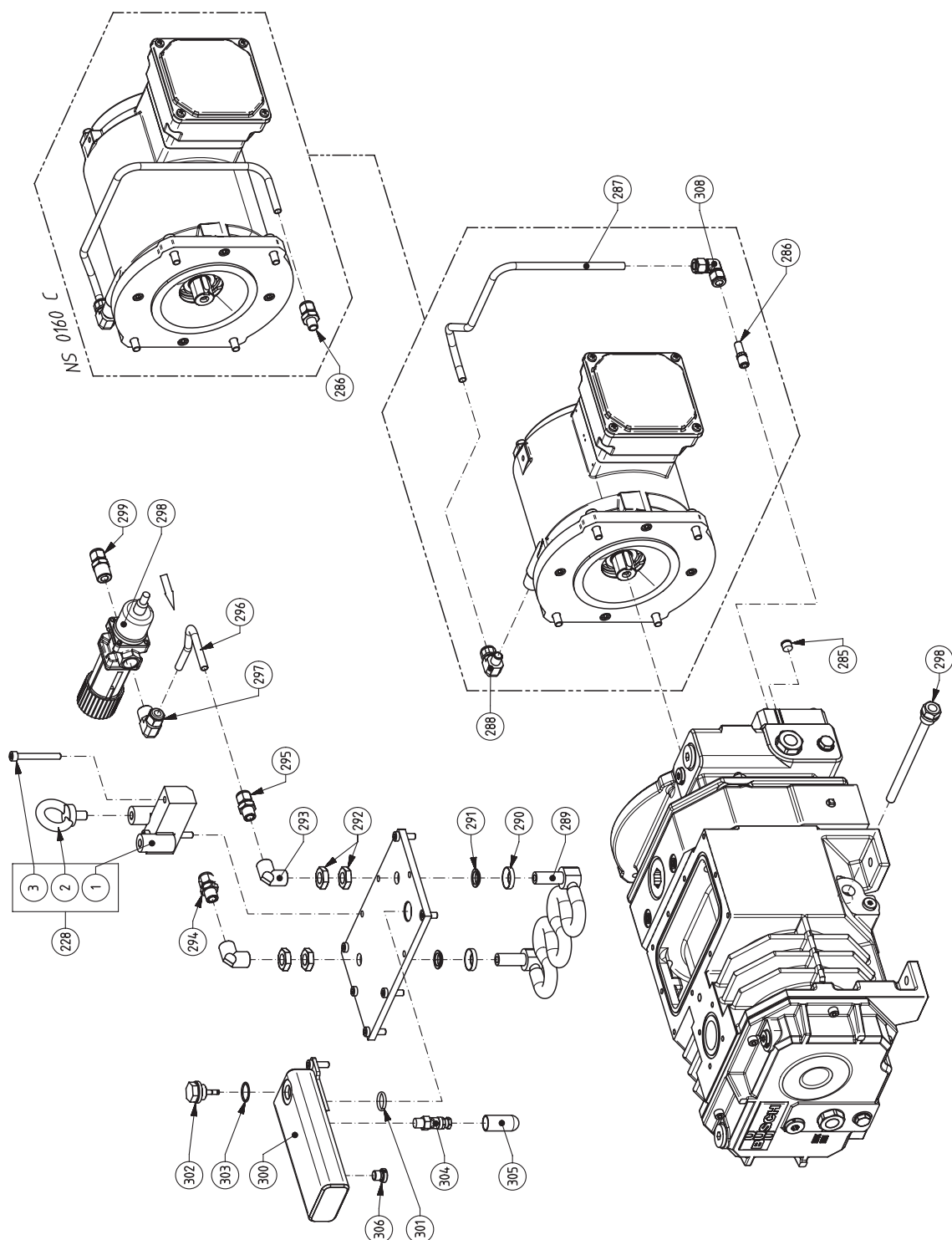
Problem	Possible Cause	Remedy
The vacuum pump does not reach the usual pressure	The vacuum system or suction line is not leak-tight	Check the hose or pipe connections for possible leak
	Partial clogging in the suction, discharge or pressure line	Remove the clogging
	Long suction, discharge or pressure line with too small diameter	Use larger diameter
	Internal parts worn or damaged	Repair the vacuum pump (Busch service)
The vacuum pump does not start	The drive motor is not supplied with the correct voltage or is overloaded	Supply the drive motor with the correct voltage
	The drive motor starter overload protection is too small or trip level is too low	Compare the trip level of the drive motor starter overload protection with the data on the name-plate Correct if necessary In case of high ambient temperature: Set the trip level of the drive motor starter overload protection 5 percent above the nominal drive motor current
	The connection cable is too small or too long causing a voltage drop at the vacuum pump	Use sufficiently dimensioned cable
	The drive motor is defective	Replace the drive motor (Busch service)
The vacuum pump is blocked	Solid foreign matter has entered the vacuum pump	Repair the vacuum pump (Busch service) Make sure the suction line is equipped with a mesh screen If necessary, additionally provide a filter
	Corrosion in the vacuum pump from remaining condensate	Repair the vacuum pump (Busch service) Check the process Observe the chapter "Installation and Commissioning, Operating Notes"
	The vacuum pump was run in the wrong direction	Repair the vacuum pump (Busch service) When connecting the vacuum pump make sure the vacuum pump will run in the correct direction (see "Installation")



	Condensate ran into the vacuum pump	Repair the vacuum pump (Busch service) Make sure no condensate will enter the vacuum pump, if necessary provide a drip leg and a drain cock Drain condensate regularly
The vacuum pump starts, but labours or runs noisily or rattles The drive motor draws a too high current (compare with initial value after commissioning)	Connections in the drive motor terminal box are defective	Check the proper connection of the wires against the connection diagram
	Not all drive motor coils are properly connected	Tighten or replace loose connections
	The drive motor operates on two phases only	
	The vacuum pump runs in the wrong direction	Verification and rectification see "Installation and Commissioning", correct if necessary
	Standstill over several weeks or months	Let the vacuum pump run warm with inlet closed
	Improper oil quantity, unsuitable oil type	Use the proper quantity of one of the recommended oils (see "Oil", oil change see "Maintenance")
The vacuum pump runs very noisily The vacuum pump runs very hot (the oil sump temperature shall not exceed 100 °C)	No oil change over extended period of time	Perform oil change incl. flushing (see "Maintenance")
	Foreign objects in the vacuum pump Stuck bearings	Repair the vacuum pump (Busch service)
	Defective bearings	Repair the vacuum pump (Busch service)
	Cooling water flow too low	Check the cooling water circuit and adjust the flow if necessary
	Ambient temperature too high	Observe the permitted ambient temperatures
	Temperature of the inlet gas too high	Observe the permitted temperatures for the inlet gas
Cooling water too low	Oil level too low	Top up oil Check the oil filler plugs Check the mechanical seals (option)
	Mains frequency or voltage outside tolerance range	Provide a more stable power supply
	Partial clogging in the suction or discharge line	Remove the clogging
	Long suction, discharge or pressure line with too small diameter	Use larger diameter
	Quick coupler for cooling water dislocated	Connect the quick couple
	Water supply pressure too low	Apply proper pressure
Pump temperature too high	Cooling water piping obstructed	Clean/ replace piping
	Leakage of cooling water piping	Replace seals
	Failure of discharge line	Check the discharge line
	Back pressure of pump too high	Check the discharge piping
	Cooling water flow too low	Check the cooling system
	Vacuum pump contaminated with product residues	Disassemble the vacuum pump
Oil level too low	Ambient temperature too high	Check the limits of use
	Oil too low	Check the oil casing sealings
	Oil leakage	Refill with oil
Cooling liquid temperature too high	Lack of cooling liquid Escape of cooling liquid	Fill with cooling liquid Check off the cooling liquid circuit

# Exploded view





# Spare parts

**NOTE:** When ordering spare parts or accessories acc. to the table below please always quote the type and the serial no. of the vacuum pump. This will allow Busch service to check if the vacuum pump is compatible with a modified or improved part.

This parts list applies to a typical configuration of the standard vacuum pump. Depending on the specific order deviating parts data may apply.

## Overhaul kit

The overhaul kit consists of the set of seals and all wearing parts

Article number : 0993 567 077 - NS 0070 C			
Pos.	Description	Qt	Article n°.
41	Piston ring	6	0488 000 301
42	Tolerance washer	6	0433 517 594
45	Shim ring	2	0433 523 336
46	Shim ring	2	0433 523 337
61	Piston ring	8	0488 000 301
100	Angular ball bearing	2	0473 517 564
101	Deep groove ball bearing	2	0473 517 563
160	Screw plug with magnet	1	0415 134 870
161	Screw plug with magnet	1	0415 134 870
221	Tab washer	2	0432 512 801
225	Tolerance washer	2	0433 534 091
225	Shim ring	2	0433 509 250
225	Shim ring	2	0433 509 251
431	Gear rim	1	0512 000 103
480	Compensation washer	1	0433 508 933
480	Grooved ball bearing single row	2	0473 558 817
-	Set of seals	1	0990 567 090

Article number : 0993 567 289 - NS 0160 C			
Pos.	Description	Qt	Article n°.
41	Piston ring	6	0488 000 301
42	Tolerance washer	6	0433 517 594
45	Shim ring	2	0433 523 336
46	Shim ring	2	0433 523 337
61	Piston ring	8	0488 000 301
100	Angular ball bearing	2	0473 517 564
101	Deep groove ball bearing	2	0473 517 563
160	Screw plug with magnet	1	0415 134 870
161	Screw plug with magnet	1	0415 134 870
221	Tab washer	2	0432 512 801
225	Tolerance washer	2	0433 534 091
225	Shim ring	2	0433 509 250
225	Shim ring	2	0433 509 251
431	Gear rim	1	0512 000 103
480	Compensation washer	1	0433 508 933
480	Grooved ball bearing single row	2	0473 558 817
-	Set of seals	1	0990 567 090

## Set of seals

The set of seals consists of all necessary seals.





Article number : 0990 567 090 - NS 0070 C			
Pos.	Description	Qt	Article n°.
44	O-ring	2	0486 547 326
63	O-ring	2	0486 000 915
120	O-ring	1	0486 000 633
121	O-ring	1	0486 000 633
122	O-ring	1	0486 508 907
123	O-ring	1	0486 517 554
124	O-ring	1	0486 519 108
125	O-ring	1	0486 531 569
126	O-ring	1	0486 531 571
127	O-ring	1	0486 509 689
128	O-ring	1	0486 517 555
129	O-ring	1	0486 519 108
130	O-ring	3	0486 544 899
131	O-ring	1	0486 517 556
132	O-ring	1	0486 518 790
133	O-ring	1	0486 517 557
291	O-ring	2	0480 000 502
301	O-ring	1	0486 518 796
303	O-ring	1	0486 000 505
480	O-ring	2	0486 566 140
480	O-ring	1	0486 566 141

Article number : 0990 567 090 - NS 0160 C			
Pos.	Description	Qt	Article n°.
44	O-ring	2	0486 547 326
63	O-ring	2	0486 000 915
120	O-ring	1	0486 000 633
121	O-ring	1	0486 000 633
122	O-ring	1	0486 508 907
123	O-ring	1	0486 517 554
124	O-ring	1	0486 519 108
125	O-ring	1	0486 531 569
126	O-ring	1	0486 531 571
127	O-ring	1	0486 509 689
128	O-ring	1	0486 517 555
129	O-ring	1	0486 519 108
130	O-ring	3	0486 544 899
131	O-ring	1	0486 517 556
132	O-ring	1	0486 518 790
133	O-ring	1	0486 517 557
291	O-ring	2	0480 000 502
301	O-ring	1	0486 518 796
303	O-ring	1	0486 000 505
480	O-ring	2	0486 566 140
480	O-ring	1	0486 566 141

# Oil type/ quantity

## Oil type

- Make sure that the oil type corresponds to specifications:
- Busch YLC 250 B, n° art. 0831 000 054 (0,5l≅ 1 kg)



WARNING

The use of chemically contaminated or polluted oil can lead to hazardous pump conditions which could cause personal injury.

## Oil quantity

The quantity of oil specified in the following table is of informative nature only. Check the oil level with the help of the various oil sight glasses on the vacuum pump.

Quantity [Litre]	COBRA NS	
	Motor side (A)	Gear side (B)
NS 0070 C	1,15	0,5
NS 0160 C	1,15	0,5



# Cooling liquid type/ quantity

## Cooling liquid type

- Make sure that the cooling liquid type corresponds to specifications :

Specifications	Zitrec M-25 (ready-to-use)	
	25 litres can	5 litres can
	part no. 0831 563 468	part no. 0831 563 469

## Cooling liquid quantity

The quantity of cooling liquid specified in this instructions manual is of informative nature only. Respect the procedure of filling the cooling liquid.

Quantity	Zitrec M-25 (already mixed ready-to-use)
NS 0070, 0160 C	approx. 4 litres



### CAUTION

The proportion of pure glycol and water for the cooling liquid corresponds to a percentage of 40% pure glycol and 60% water. It is therefore not necessary to prepare the mix before use. But when using pure glycol, it is imperative to prepare the mix prior to filling the pump and to respect this proportion.

# Technical data

Technical data				NS 0070 C	NS 0160 C
Nominal suction capacity	*	50 Hz 60 Hz 85 Hz	m <sup>3</sup> /h (cfm) m <sup>3</sup> /h (cfm) m <sup>3</sup> /h (cfm)	70 (41) 85 (50) -	135 (79) 170 (94) -
Ultimate pressure			Torr mbar	2,2 x 10 <sup>-2</sup> 3 x 10 <sup>-2</sup>	2,2 x 10 <sup>-2</sup> 3 x 10 <sup>-2</sup>
Nominal motor rating	*	50 Hz 60 Hz 85 Hz	kW kW kW	4,0 4,4 -	5,5 6,6 -
Maximal intensity	Y / Δ	*	50Hz 60 Hz 85 Hz	A A A	11.7/ 20.5 15.4/ 27 -
Nominal motor speed	*	50 Hz 60 Hz 85 Hz	min <sup>-1</sup> min <sup>-1</sup> min <sup>-1</sup>	2840 3380 -	2870 3440 -
Noise level (EN ISO 2151)		50 Hz 60 Hz	dB(A) dB(A)	62	68
Ambient temperature			°C (°F)	0-40 (32-104)	0-40 (32-104)
Maximal counter pressure at the discharge side			bar	0,2	0,2
Cooling water requirement			l/ min	3 - 4	3 - 4
Cooling water pressure			bar	2 - 5	2 - 5
Cooling water temperature			°C	10 - 20	10 - 20
Nitrogen requirement	approx.		l/ min	0 - 18	0 - 18
Nitrogen overpressure			bar	1,5	1,5
Weight	approx.		kg	210	225

\* with frequency variable driver



## EU-Declaration of Conformity

This Declaration of Conformity and the CE-mark 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-mark.

The manufacturer:

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



declare that the machine(s) **NS 0070 C; NS 0160 C**

with a serial number from **C1701...** to **C1852...**

has (have) been manufactured in accordance with the European Directives:

- "Machinery" 2006/42/EC
- "Electromagnetic Compatibility" 2014/30/EU
- "RoHS" 2011/65/EU, restriction of the use of certain hazardous substances in electrical and electronic equipment

and following the standards:

Standard	Title of the standard
EN ISO 12100:2010	Safety of machinery - Basic concepts, general principles of design
EN ISO 13857:2008	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN 1012-1:2010 EN 1012-2:1996 + A1:2009	Compressors and vacuum pumps - Safety requirements - Part 1 and 2
EN ISO 2151:2008	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) – Generic standards. Immunity for industrial environments; Part 1 and 3
EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) – Generic standards. Emission standard for industrial environments
EN ISO 13849-1:2015 <sup>(1)</sup>	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design and 2

Person authorised to compile the technical file:

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Chevenez, 16.03.2016

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<sup>(1)</sup> In case control systems are integrated.

**Note**

**Note**

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