

COBRA

Dry Screw Vacuum Pumps
NS 0070 C, NS 0160 C
Industry Version

Instruction Manual

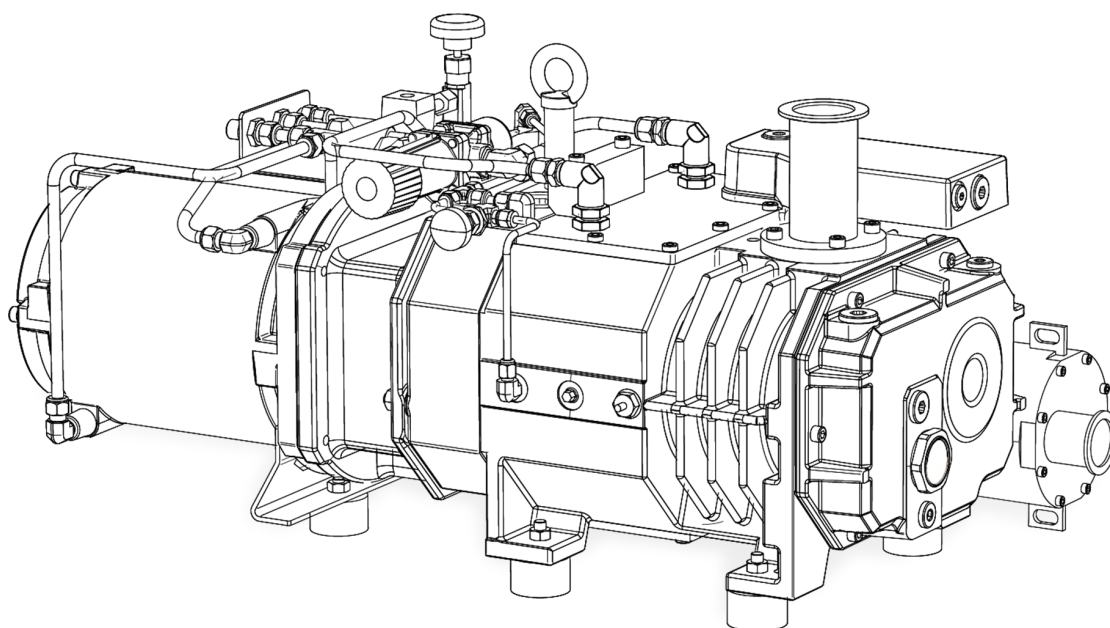


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1 Safety

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* [→ 7].

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

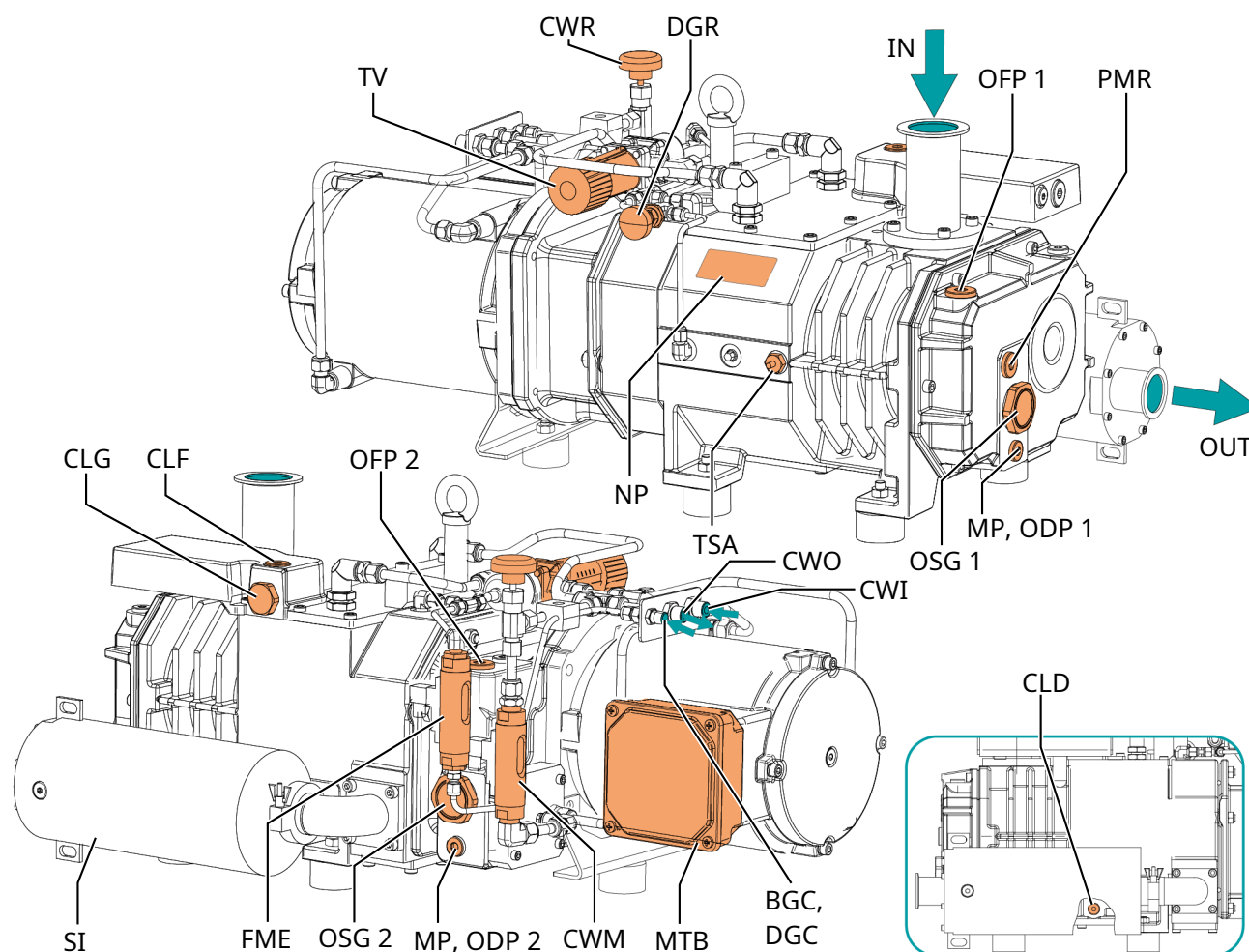
... indicates a potentially dangerous situation that could result in damage to property.



NOTE

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

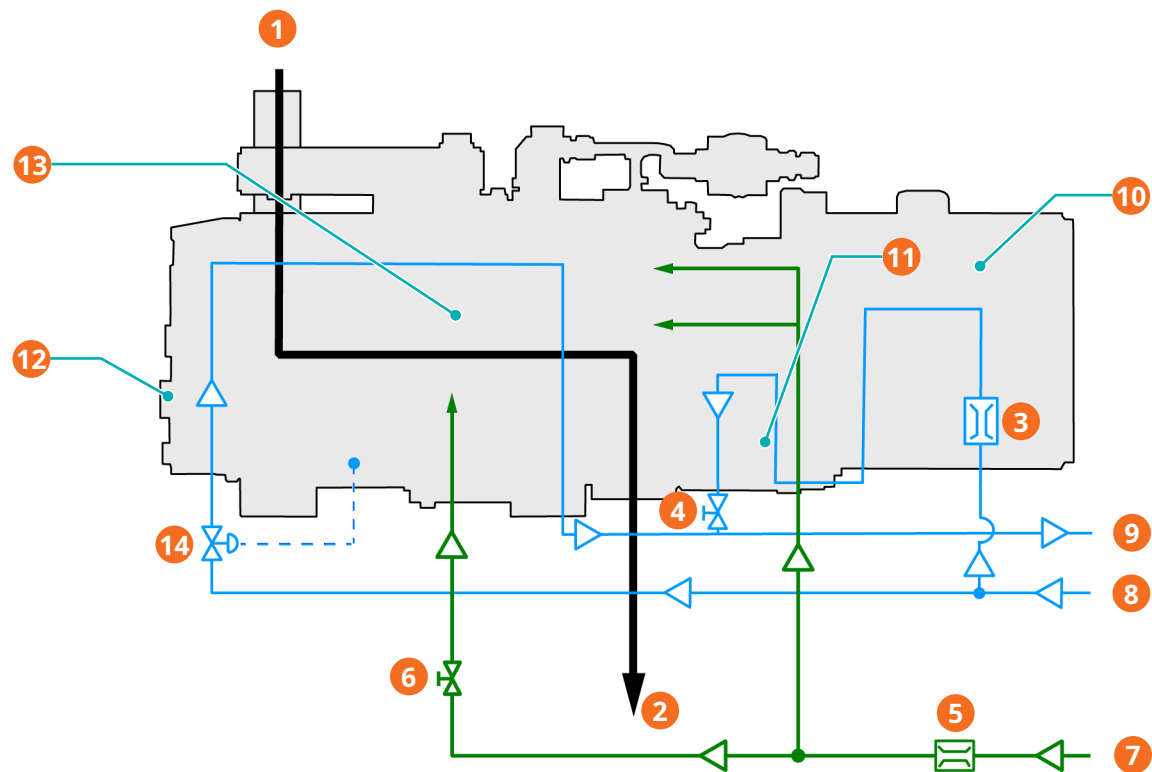
2 Product Description



Description

BGC / DGC	Barrier / Dilution gas connection	CLD	Cooling liquid drain plug
CLF	Cooling liquid filler plug	CLG	Cooling liquid sight glass
CWI	Cooling water inlet	CWO	Cooling water outlet
CWM	Cooling water flowmeter	CWR	Cooling water regulating valve
DGR	Dilution gas regulating valve (option)	FME	Nitrogen flowmeter (option)
IN	Suction connection	MP	Magnetic plug
MTB	Motor terminal box	NP	Nameplate
OFP 1	Oil filler plug	OFP 2	Oil filler plug
ODP 1	Oil drain plug	ODP 2	Oil drain plug
OSG 1	Oil sight glass	OSG 2	Oil sight glass
OUT	Discharge connection	SI	Silencer
TSA	Resistance thermometer	TV	Thermostatic valve
PMR	Plug for manual rotation of rotors		

P&ID "Piping and Instrumentation Diagram"



Description			
1	Process gas inlet	2	Process gas outlet
3	Cooling water flow meter (CWM)	4	Cooling water regulating valve (CWR)
5	Nitrogen flow meter (option) (FME)	6	Regulating valve (option) (DGR)
7	Nitrogen supply	8	Cooling water inlet
9	Cooling water outlet	10	Motor DP (MOT 1)
11	Oil sight glass (OSG 1)	12	Oil sight glass (OSG 2)
13	Resistance thermometer (TSA)	14	Thermostatic valve (TV)

i NOTE

Technical term.

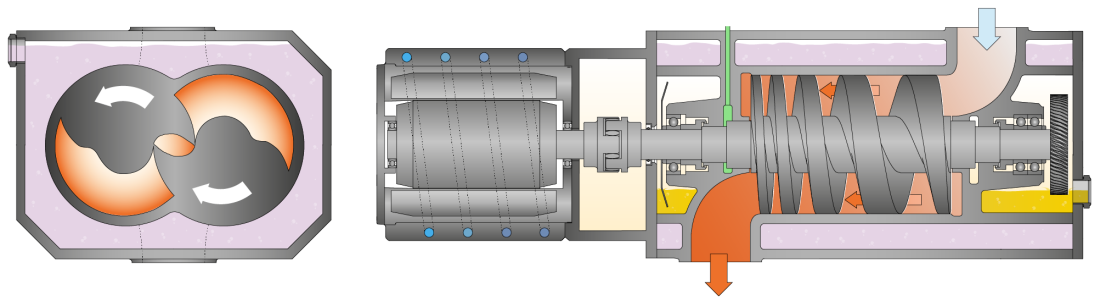
In this instruction manual, we consider that the term ‘machine’ refers to the ‘vacuum pump’.

i 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.

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 intended for the placement in a non-potentially explosive environment.

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

Permitted environmental conditions, see Technical Data.



NOTICE

Chemical compatibility of the process gases with the machine component materials.

Risk of corrosion inside the compression chamber which can reduce performance and its lifetime!

- Check if the process gases are compatible with those following materials:
 - Ductile cast iron
 - Nickel
 - Polytetrafluoroethylene (PTFE)
 - Steel
 - Stainless Steel
 - Fluor elastomer (FKM/FPM)
- In doubt, please contact your Busch representative.

Solid particles must not get into the vacuum pump. Procedural errors can result in the pump sucking in a certain quantity of liquid. If the pump has sucked in liquid, a short drying time is necessary at the end of the process.

2.3 Start Controls

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

2.4 Standard Features

2.4.1 Water Cooling

The machine is cooled by an internal, closed cooling liquid circuit in the cylinder cover and cylinder. Cooling water is cooling the cooling liquid, the motor and the gearbox.

The cooling water flow for the motor cooling is factory set on 2.5 l/min and can be adjusted with the regulating valve (CWR).

The thermostatic valve (TV) allows a temperature regulation of the machine by regulating the cooling water flow.

The adjustment of thermostatic valve from position 1 (cool position) to the position 5 (hot position) alters the cooling water temperature and must correspond to the application requirements.



NOTE

Busch recommendations for the thermostatic valve adjustment:

- The position 1 (cold position) is mainly intended for applications with a risk of polymerization.
- The position 5 (hot position) is mainly intended for applications with a risk of condensation .

2.4.2 Silencer

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

2.4.3 Resistance Thermometer (TSA)

The resistance thermometer monitors the housing temperature of the machine.

Warning and trip signals must be set, see *Wiring Diagram Resistance Thermometer* [→ 23].

2.4.4 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.

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

2.5 Optional Accessories

2.5.1 Silencer

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

2.5.2 Barrier Gas System

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

2.5.3 Dilution Gas System

The dilution gas system prevents the formation of condensates or dilutes them. The nitrogen is fed directly into the cylinder.

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.

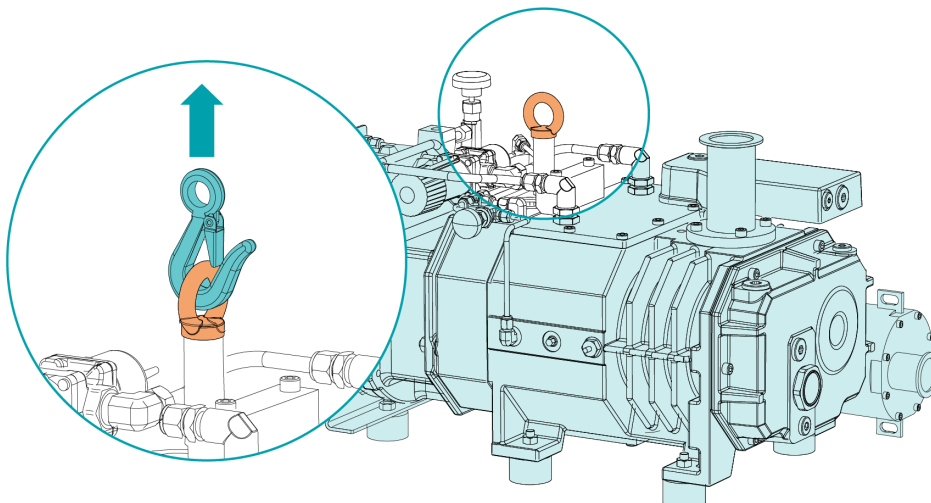


NOTICE

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).
- Make sure that the eye bolt(s) (EB) is/are in faultless condition, fully screwed in and tightened by hand.



- 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 all apertures with adhesive tape or reuse provided caps.

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

- Wrap the machine in a corrosion inhibiting film.
- Store the machine indoors, in a dry and dust free environment and if possible, in original packaging, preferably at temperatures between 5 ... 50 °C.

5 Installation

5.1 Installation Conditions



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 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* [→ 28].
- Check the cooling liquid level, see *Cooling Liquid Level Inspection* [→ 29].
- Make sure that the cooling water complies with the requirements, see *Cooling Water Connection* [→ 14].

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, it is recommended to use larger diameters to avoid a loss of efficiency. In case, contact your Busch representative.

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):

- DN40 ISO KF for NS 0070 C
- DN50 ISO KF for NS 0160 C

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.

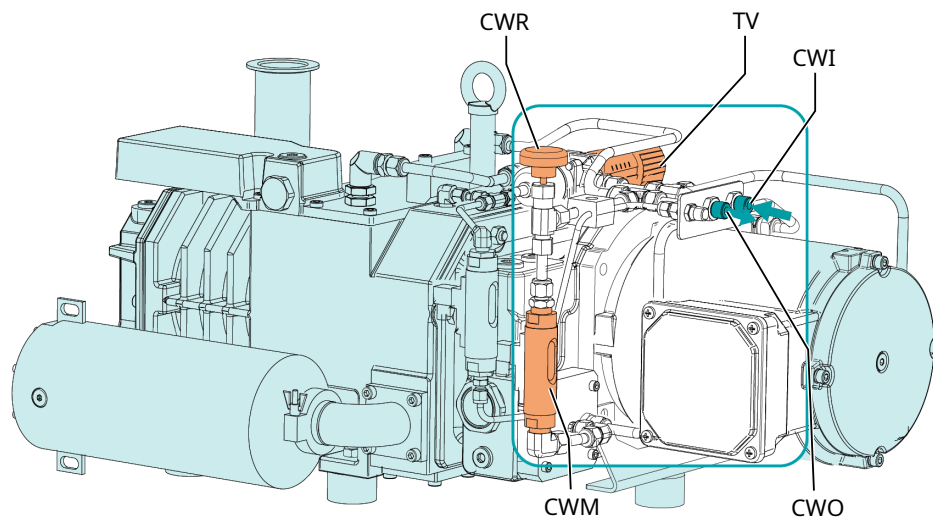
Risk of damage to the machine !

- 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):

- DN40 ISO KF for NS 0070-0160 C
- 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	CWM	Cooling water flowmeter
CWO	Cooling water outlet	CWR	Cooling water regulating valve
TV	Thermostatic valve		



NOTE

The thermostatic valve (TV) allows a temperature regulation of the machine by regulating the cooling water flow.

Risk of damage to the machine!

Busch recommendations for the thermostatic valve adjustment:

- The position 1 (cold position) is mainly intended for applications with a risk of polymerization.
- The position 5 (hot position) is mainly intended for applications with a risk of condensation.
- Do not go directly from position 5 to position 1, or vice versa. The transition from position 5 to position 1, or vice versa, must be done in stages.
- Allow the vacuum pump to stabilize between each position change (15 minutes).
- For optimal adjustment position of the thermostatic valve, seek advice from your Busch representative.

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

Connection size:

- 3/8" NPT for the cooling water inlet (CWI) and outlet (CWO).
- Make sure that the cooling water complies with the following requirements:

Supply capacity	l/min	≥ 3
Water pressure	bar (g)	3 ... 6
Supply temperature	°C	+10 ... +30
Required pressure differential across supply and return	bar (g)	≥ 3

- 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 ... 9	
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, copper	

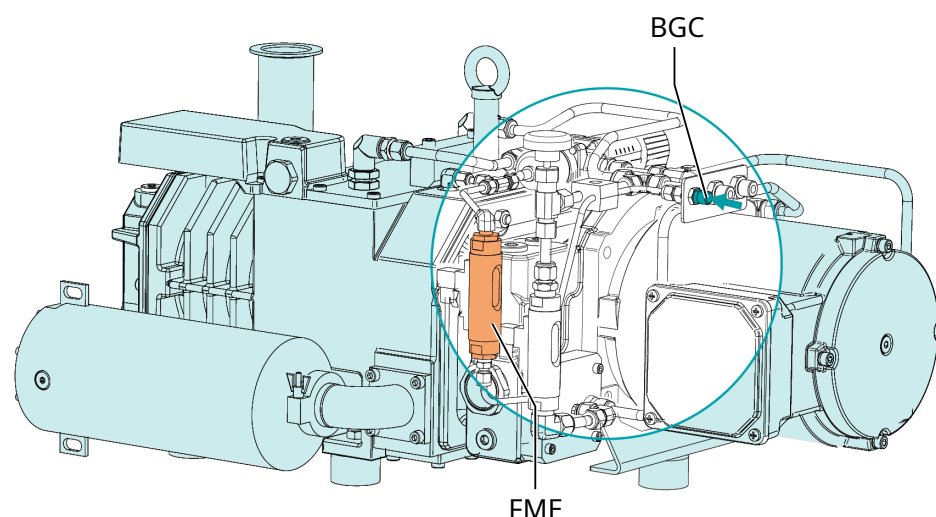


NOTE

Water hardness unit conversion.

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

5.2.4 Barrier Gas System Connection (Optional)



Description

BGC	Barrier gas connection	FME	Nitrogen flowmeter
-----	------------------------	-----	--------------------

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

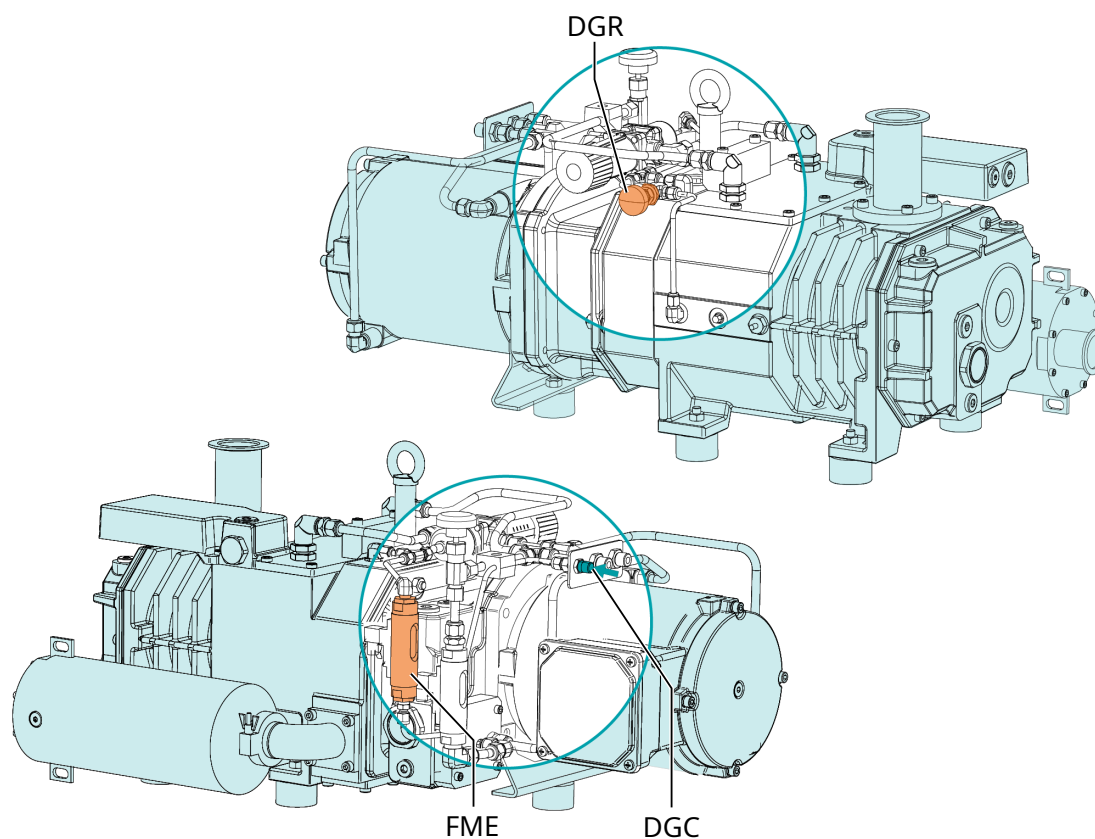
Connection size:

- 1/4" NPT
- Make sure that the gas complies with the following requirements:

Gas type	Dry nitrogen, air or other suitable gas	
Gas temperature	°C	0 ... 60
Maximum gas pressure	bar (g)	13
Recommended pressure setting at the pressure regulating valve (PRV)	bar (g)	1.5

Filtration	µm	5
Recommended flow rate	SLM (standard liter per minute)	8 - 10

5.2.5 Dilution Gas System Connection (Optional)



Description			
DGC	Dilution gas connection	DGR	Dilution gas regulating valve
FME	Nitrogen flowmeter		

- Connect the dilution gas connection (DGC) to the gas supply.

Connection size:

- 1/4" NPT
- Make sure that the gas complies with the following requirements:

Gas type	Dry nitrogen, air or other suitable gas	
Gas temperature	°C	0 ... 60
Maximum gas pressure	bar (g)	13
Recommended pressure setting at the pressure regulating valve (PRV)	bar (g)	1.5 (max. 3.0)
Filtration	µm	5
Recommended flow rate	SLM (standard liter per minute)	18 (depends on process)

5.3 Filling Oil

! NOTICE

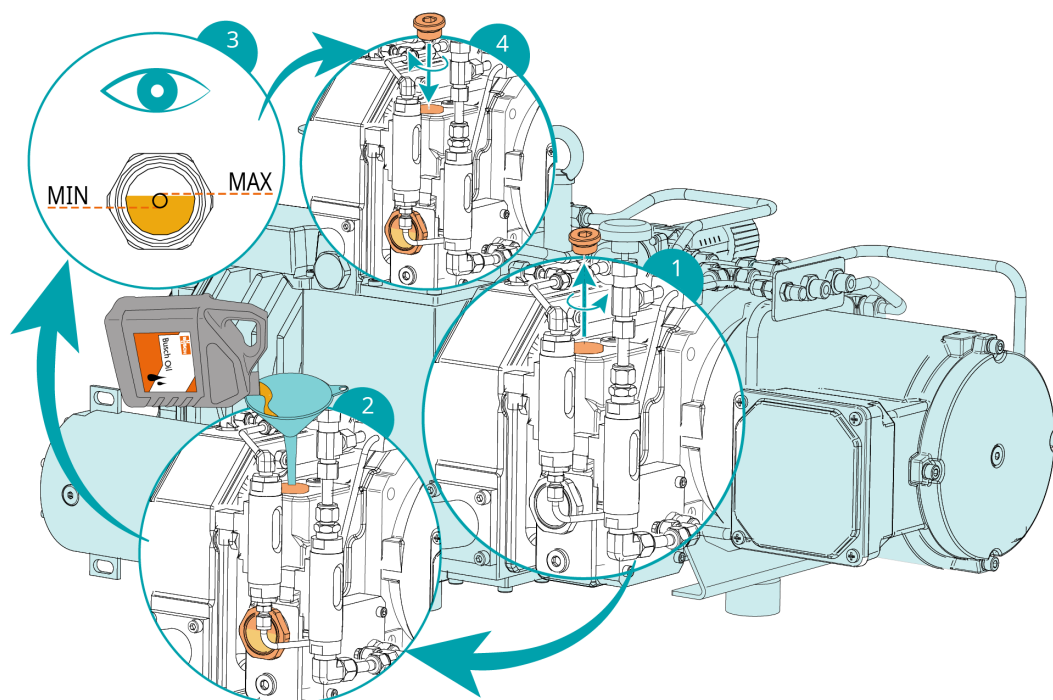
Use of an inappropriate oil.

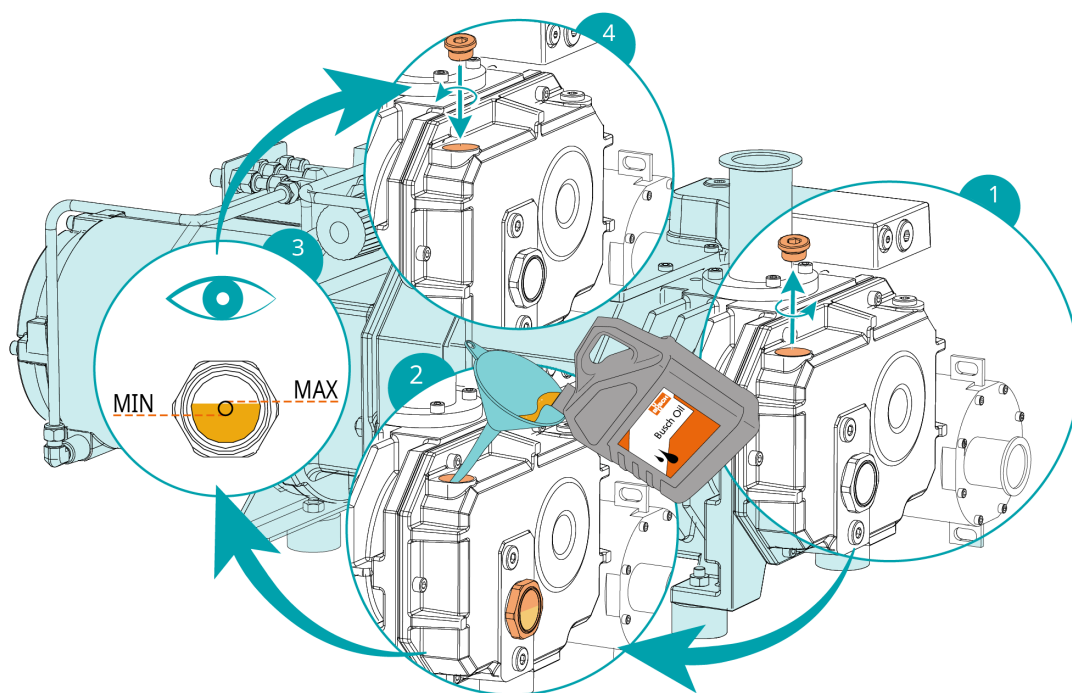
Risk of premature failure!

Loss of efficiency!

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

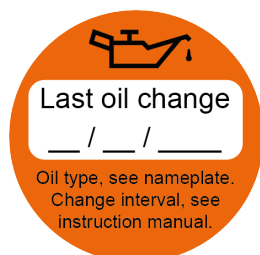
For oil type and oil capacity see Technical Data and *Oil* [→ 41].





When the oil filling is achieved:

- Write down the oil change date on the sticker.

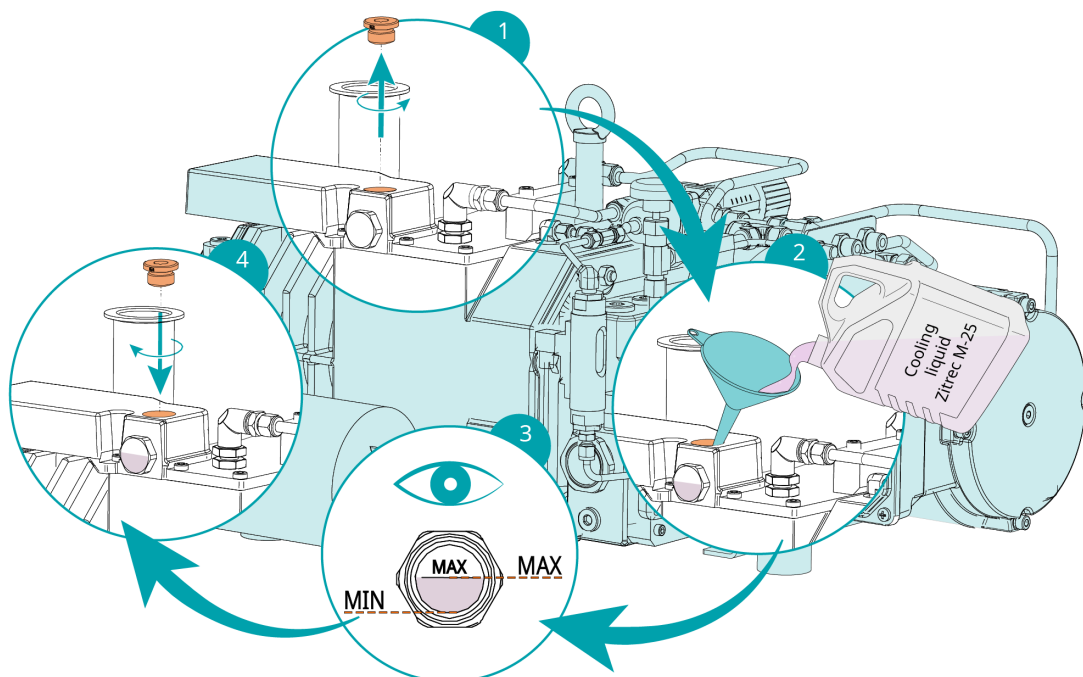


If there is no sticker (part no. 0565 568 959) on the machine:

- 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* [→ 40].



6 Electrical Connection



DANGER

Live wires.

Risk of electrical shock.

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

CURRENT PROTECTION OF THE CUSTOMER INSTALLATION:



DANGER

Missing current protection.

Risk of electrical shock.

- Current protection in accordance with EN 60204-1 must be provided by the customers on their 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, seek advice from Busch.
- 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* [→ 42] or *UK Declaration of Conformity* [→ 43]).



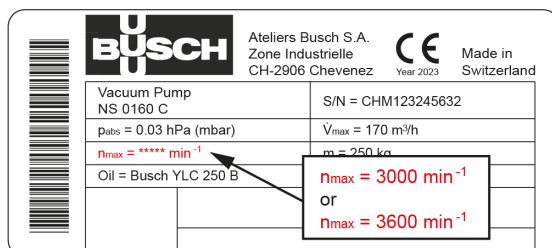
WARNING

The operating rotational speed of the drive motor must correspond to the pump's nameplate value. Do not exceed the mentioned rotational speed.

$n_{\max} = 3000 \text{ min}^{-1} \rightarrow 50\text{Hz}$

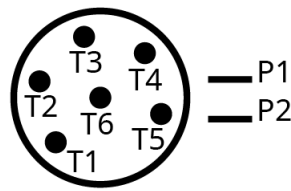
$n_{\max} = 3600 \text{ min}^{-1} \rightarrow 60\text{Hz}$

Risk of damage to the vacuum pump!



6.1 Wiring Diagram Three-Phase Motor (Pump Drive)

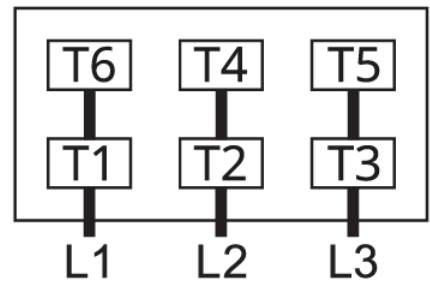
Motor connectors:



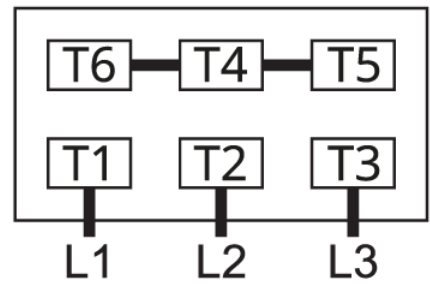
Connection of motor temperature switch (recommended):



Only apply voltages ≤ 250 VAC
 Max. current: 1.6 A
 MTS = Motor temperature switch (in motor coil)
 Delta connection (low voltage):



Star connection (high voltage):





NOTICE

The tightening torque does not comply with the recommendation.

Risk of damage the connector threads!

- When connecting up the wires into the terminal box, make sure the tightening torque of 3 Nm is applied and checked with a calibrated torque wrench.

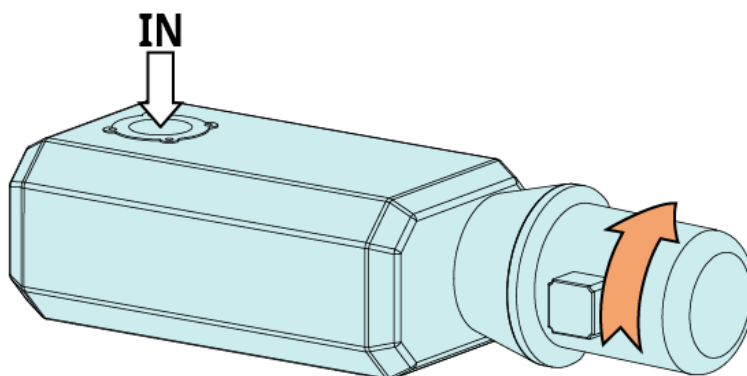
! NOTICE

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.

6.2 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.

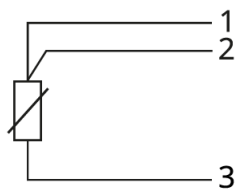
6.2.1 Wiring Diagram Resistance Thermometer

Part no.: 0651 573 439

Supplier reference: Jumo Mess- und Regeltechnik AG

PT100, 3-wire, cable length 2m

Warning: 110°C - **Alarm trip:** 130°C



1 = Red; 2 = Blue; 3 = White

6.2.2 Wiring Diagram Flow Switch

Cooling water flowmeter (CWM):

Part no.: 0657 525 718

Supplier reference: Bachofen

U = 250 VAC; I = 1.5 A

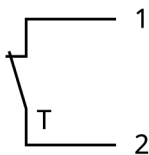
Max. 50 VA, IP65

Pressure resistance: 16 bar

Alarm / stop setting: < 2 l/min

Cooling water flow setting: 2.5 l/min, adjustable with regulating valve (CWR)

Contact: Normally closed



Nitrogen flowmeter (FME):

Part no.: 0657 525 717

Supplier reference: Bachofen

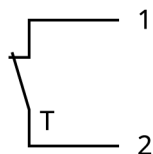
U = 250 VAC; I = 1.5 A

Max. 50 VA, IP65

Alarm / stop setting: < 16 l/min

Nitrogen flow setting: 18 l/min, adjustable with regulating valve (DGR)

Contact: Normally closed



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* [→ 17].



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* [→ 19].



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* [→ 12] are met.
- Turn on the water supply.

Make sure that the machine does not contain a potentially explosive atmosphere. In case of doubt, the machine must be purged by an inert gas.

- Turn on the barrier gas 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* [→ 28].
- After a few minutes of operation, perform a *Cooling Liquid Level Inspection* [→ 29].

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.



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.

- Shut down the machine and lock against inadvertent start up.
- Turn off the water supply.
- Vent the connected lines to atmospheric pressure.

If necessary:

- Disconnect all connections.

8.1 Maintenance Schedule

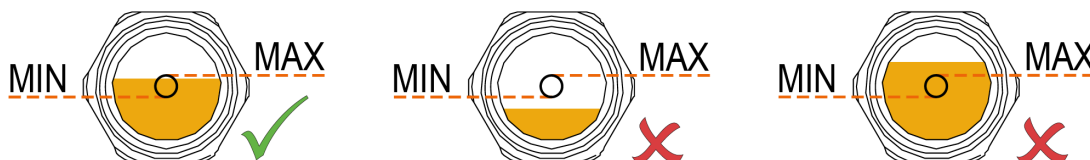
The maintenance intervals depend very much on the individual operating conditions. The intervals given below are considered as starting values which should be individually shortened or extended as appropriate.

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

Interval	Maintenance work
Monthly	- Check the oil level, see <i>Oil Level Inspection</i> [→ 28]. - Check the cooling liquid level, see <i>Cooling Liquid Level Inspection</i> [→ 29]. - Check the machine for oil leaks. In case of leaks, have the machine repaired (Contact Busch).
Yearly	- Carry out a visual inspection and clean the machine from dust and dirt - Check the electrical connections and the monitoring devices. - Change the cooling liquid, see <i>Cooling Liquid Change</i> [→ 32]. - Clean the magnetic plugs (MP).
Every 16000 hours or after 4 years	- Change the oil of the gear and bearing housings (both sides), see <i>Oil Change</i> [→ 29]. - Have a major overhaul on the machine (contact Busch).

8.2 Oil Level Inspection

- Shut down the machine.
- When the machine is stopped, wait 1 minute before checking the oil level.



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

8.3 Oil Color Inspection



WARNING

Oil "YLC 250 B" contaminated chemically or by foreign bodies.

Risk of explosion!

If the oil becomes dark:

- Contact your Busch representative without delay.
- Make sure that the oil is either light or transparent.

If the oil becomes dark or looks different from the initial color:

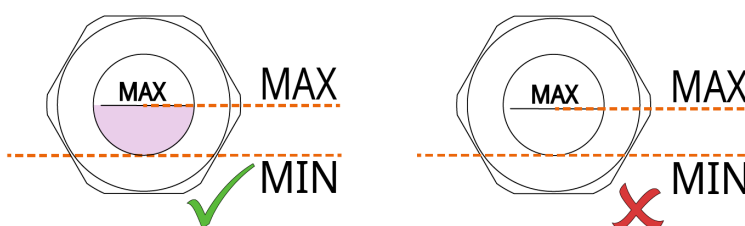
- Change the oil immediately, see *Oil Change* [→ 29].



You can consult your Busch representative in order to find out why this color change has occurred.

8.4 Cooling Liquid Level Inspection

- Shut down the machine.
- Let the machine cool down.



- Fill up if necessary, see *Filling Cooling Liquid* [→ 19].

8.5 Oil Change

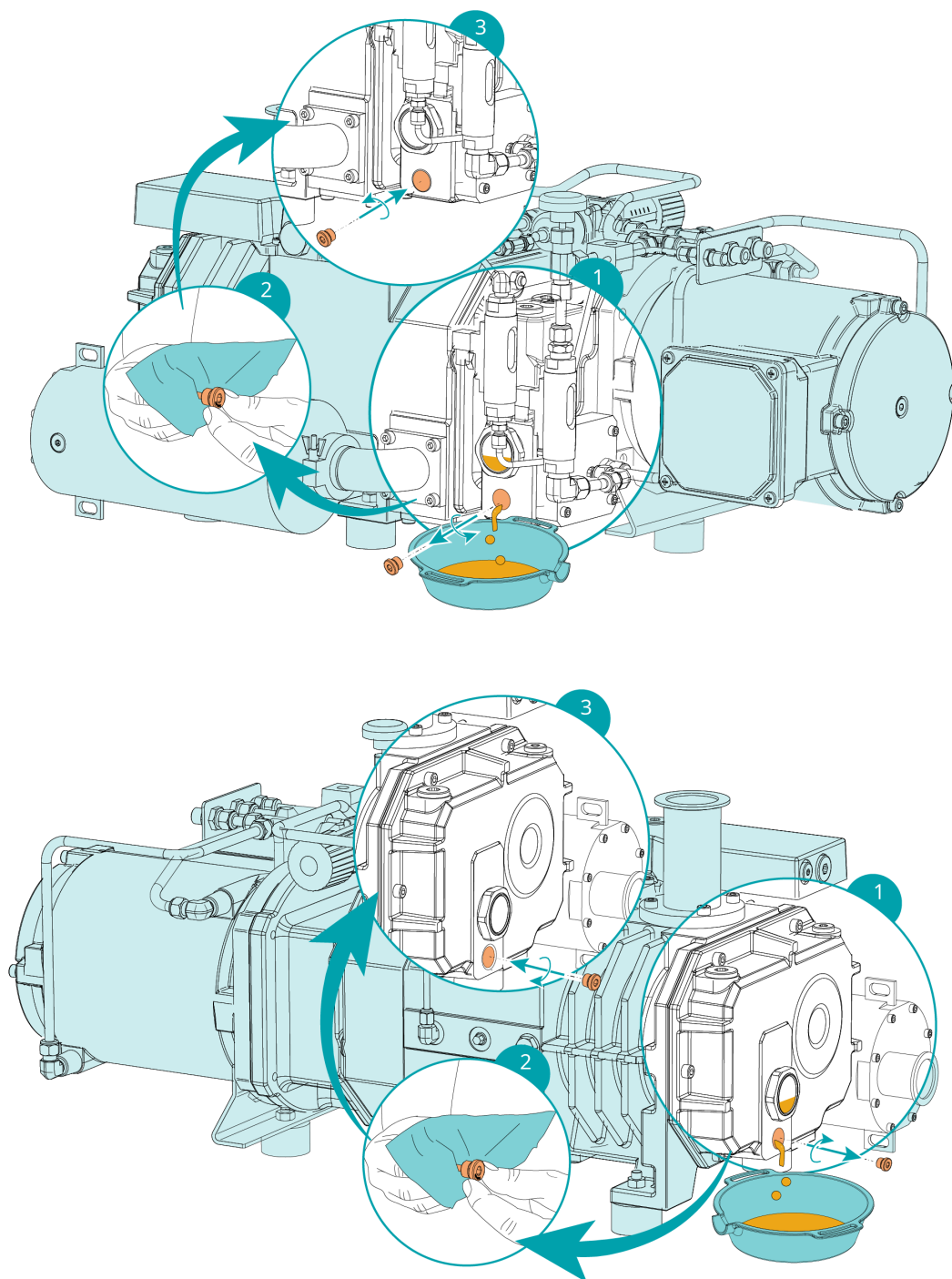
! NOTICE

Use of an inappropriate oil.

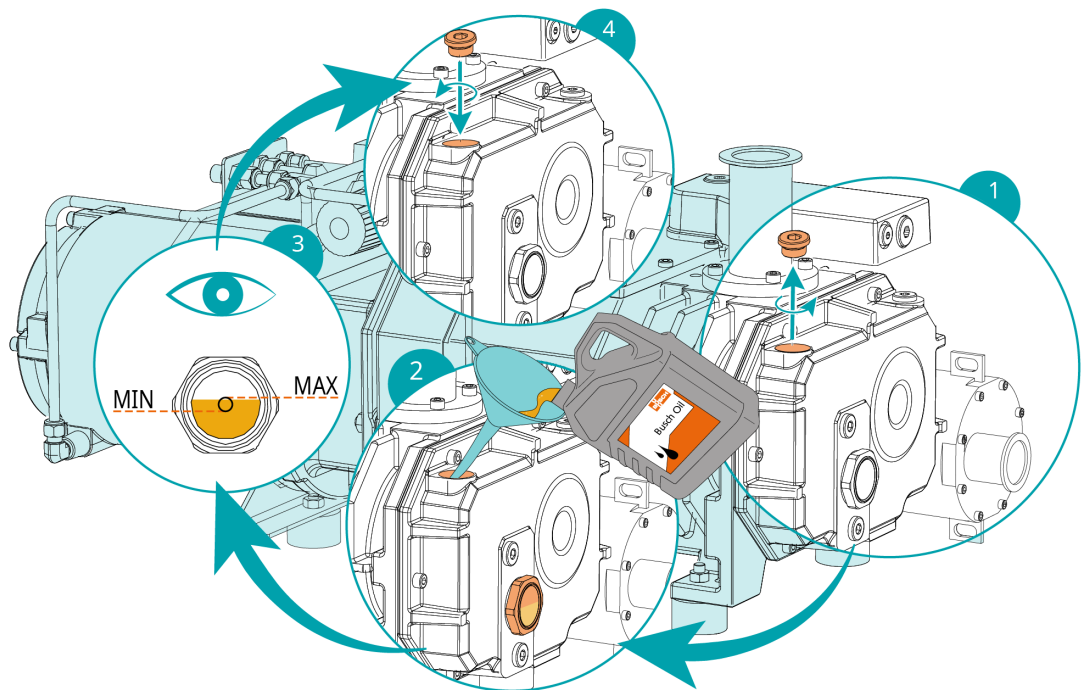
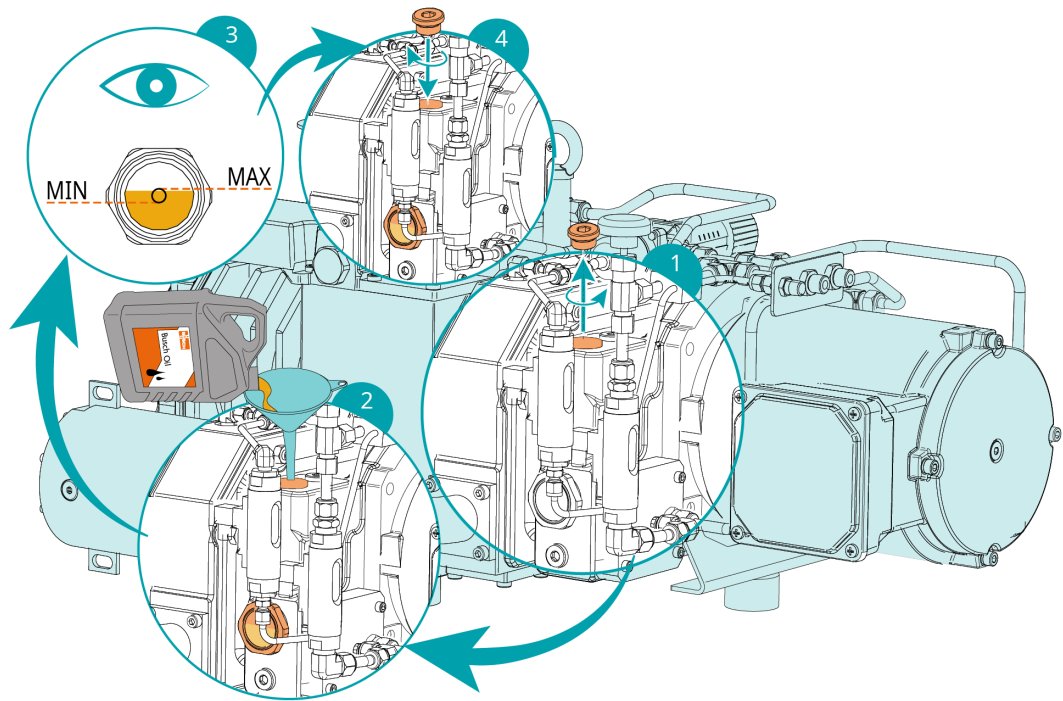
Risk of premature failure!

Loss of efficiency!

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

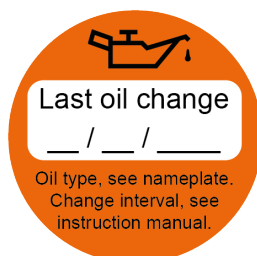


For oil type and oil capacity see Technical Data and *Oil* [→ 41].



When the oil filling is achieved:

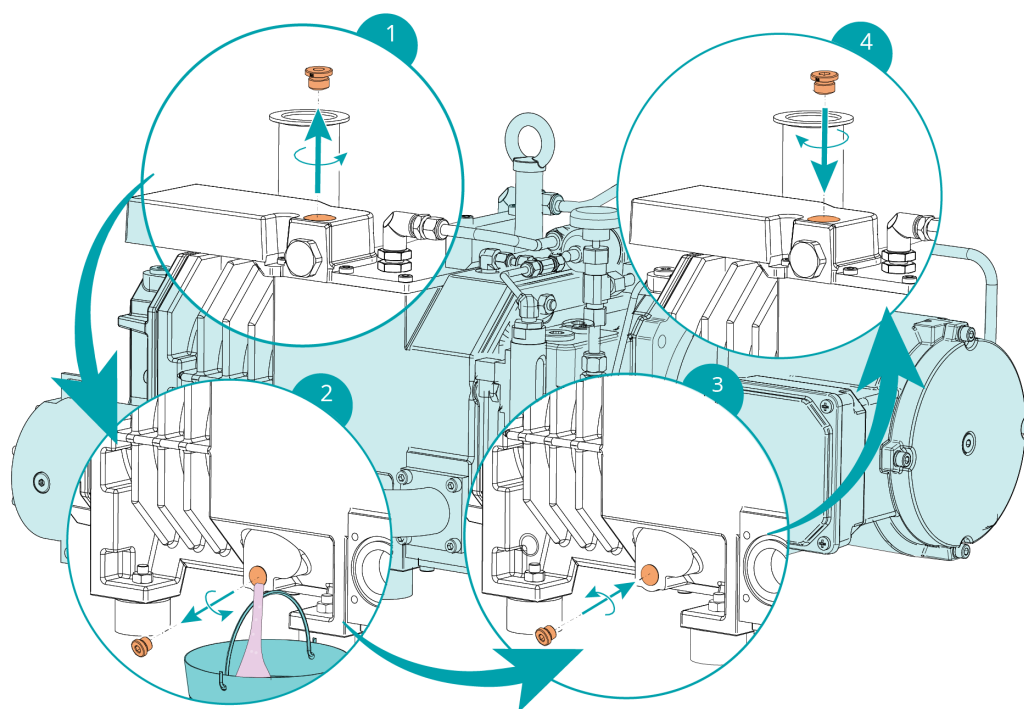
- Write down the oil change date on the sticker.



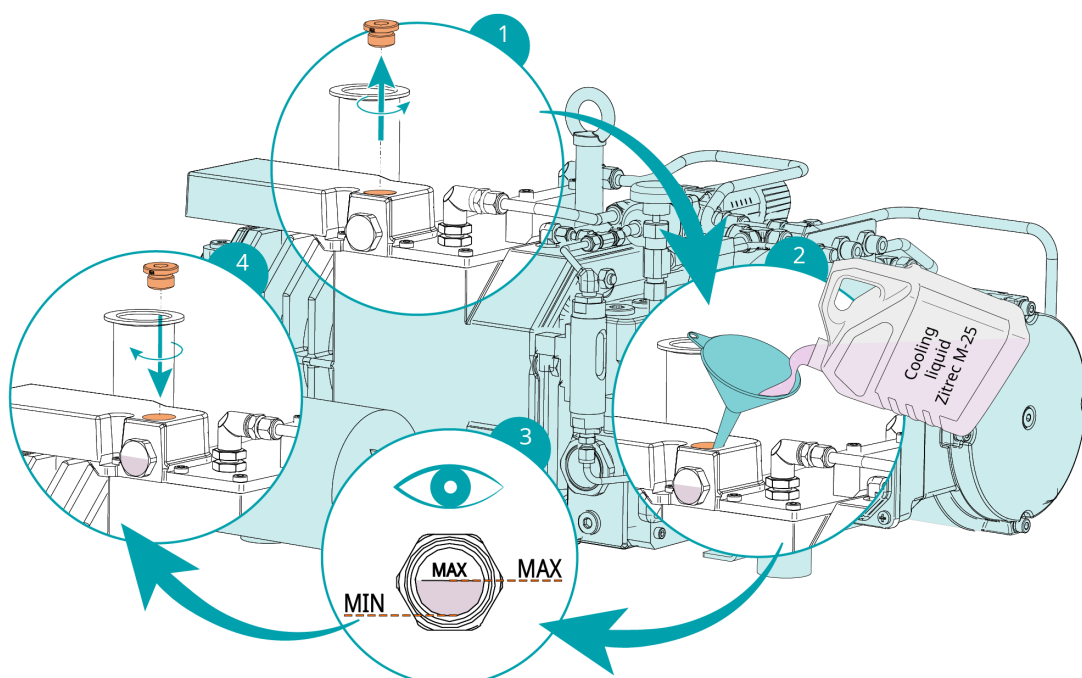
If there is no sticker (part no. 0565 568 959) on the machine:

- Order it from your Busch representative.

8.6 Cooling Liquid Change



For cooling liquid type and cooling liquid capacity see Technical Data and *Cooling Liquid* [→ 40].



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.

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.

- Shut down the machine and lock against inadvertent 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* [→ 11].

10.1 Dismantling and Disposal

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

11 Spare Parts



NOTICE

Use of non-Busch genuine spare parts.

Risk of premature failure!

Loss of efficiency!

- The exclusive use of Busch genuine spare parts and consumables is recommended for the correct functioning of the machine and to validate the warranty.

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

If you require Busch genuine 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.	• Check the power supply.
	The rotors are jammed or seized.	• Turn the screw rotors manually from the rotor access plug (PMR). • Repair the machine (contact Busch).
	Solid foreign matter has entered the machine.	• Remove the solid foreign matter or repair the machine (contact Busch). • Install an inlet filter if necessary.
	A temperature sensor has reached the switch point.	• Let the machine cool down. • See problem "The machine runs too hot".
	Corrosion in the machine from remaining condensate.	• Repair the machine. • Check the process and follow the recommendation in case of Conveying Condensable Vapours.
	The motor is defective.	• Replace the motor.

Problem	Possible Cause	Remedy
The machine does not reach the usual pressure on the suction connection.	Suction or discharge lines too long or section diameter too small.	• Use larger diameter or shorter lines. • Seek advice from your local Busch representative.
	Process deposits on the pumping components	• Flush the machine.
	If an inlet screen or an inlet filter is installed, it can be partially clogged.	• Clean the inlet screen or replace the inlet filter cartridge.
	The machine runs in the wrong direction.	• Check the direction of rotation, see <i>Wiring Diagram Three-Phase Motor (Pump Drive)</i> [→ 21].
	Internal parts are worn or damaged.	• Repair the machine (contact Busch).
The machine runs very noisily.	Wrong oil quantity or unsuitable oil type.	• Use one of the recommended oils in the correct quantity, see <i>Oil</i> [→ 41].
	Defective gears, bearings or coupling element.	• Repair machine (contact Busch).
The machine runs too hot.	Insufficient cooling.	• Make sure to comply with the cooling water requirements, see <i>Cooling Water Connection</i> [→ 14].
	Ambient temperature too high.	• Observe the permitted ambient temperature, see <i>Technical Data</i>.
	Temperature of the process gases at the inlet too high.	• Observe the permitted gas inlet temperature, see <i>Technical Data</i>.
	Oil level too low.	• Top up oil.
The oil is black.	Oil change intervals are too long.	• Drain the oil and fill in new oil, see <i>Oil Change</i> [→ 29].
	The machine runs too hot.	• See problem "The machine runs too hot".
	Internal parts are worn or damaged.	• Repair the machine (contact Busch).

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

13 Technical Data

		NS 0070 C	NS 0160 C
Nominal pumping speed	m ³ /h (50 / 60 Hz)	70 / 85	135 / 170
Ultimate pressure	TORR hPa (mbar)	$2.2 \cdot 10^{-2}$ $3.0 \cdot 10^{-2}$	$2.2 \cdot 10^{-2}$ $3.0 \cdot 10^{-2}$
Nominal motor rating backing pump	kW (50 / 60 Hz)	4.0 / 4.4	5.5 / 6.6
Operating voltage and nominal motor current (50 Hz)	Δ 200 / 230 / 255 V	15.9 / 16.6 / 20	21 / 20.5 / 25
	Y 346 / 400 / 440 V A	9.2 / 9.5 / 11.7	12.2 / 11.7 / 14.3
Operating voltage and nominal motor current (60 Hz)	Δ 200 / 277 V	17.2 / 15.8	27 / 21
	Y 346 / 480 V A	9.9 / 9.1	15.4 / 12.0
Nominal motor speed	min ⁻¹ (50 / 60 Hz)	3000 / 3600	3000 / 3600
Maximum inlet pressure		Atmospheric pressure	
Sound pressure level (ISO 2151) * KpA = 3 dB	dB(A)	62	68
Ambient temperature range	°C	0 ... 40	0 ... 40
	°F	32 ... 104	32 ... 104
Maximum allowable gas inlet temperature ac- cording to the inlet pres- sure > 50 hPa (mbar)	°C	70	70
Maximum allowable gas inlet temperature ac- cording to the inlet pres- sure ≤ 50 hPa (mbar)	°C	200	200
Maximum allowable counter pressure at dis- charge	hPa (mbar)	200	200
Water consumption	l/min	≥ 3	≥ 3
Cooling water tempera- ture	°C	10 - 30	10 - 30
Cooling water pressure	bar / ΔP	3 - 6	3 - 6
Nitrogen consumption	l/min	0 - 18	0 - 18
Nitrogen overpressure	bar	1.5	1.5
Maximal allowed operational speed		see nameplate (NP)	
Leak rate	mbar·L/s	≤ 1 x 10 ⁻⁶	≤ 1 x 10 ⁻⁶
Oil capacity - Motor side	l	1.15	1.15
Oil capacity - Suction side	l	0.5	0.5
Cooling liquid capacity approx.	l	4	4

		NS 0070 C	NS 0160 C
Weight approx.	kg	250	250

* with silencer at exhaust

14 Cooling Liquid

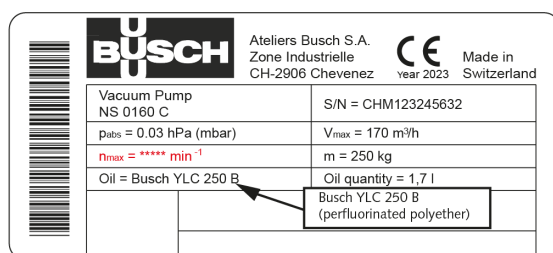
Zitrec® M (Ready-to-use)	
Part number 5 L packaging	0831 563 469
Part number 20 L packaging	0831 238 761

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

15 Oil

YLC 250 B	
ISO-VG	250
Oil Type	Synthetic
Part number 0.5 L packaging	0831 131 400
Part number 1 L packaging	0831 108 878
Part number 5 L packaging	0831 108 879

To find out which oil needs to be filled into the machine, please refer to the nameplate (NP).



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 NS 0070 C; COBRA NS 0160 C

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:

Standards	Title of the Standard
EN ISO 12100 : 2010	Safety of machinery - Basic concepts, general principles of design
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 60204-1 : 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
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 NS 0070 C; COBRA NS 0160 C

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:

Standards	Title of the Standard
EN ISO 12100 : 2010	Safety of machinery - Basic concepts, general principles of design
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 60204-1 : 2018	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
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**

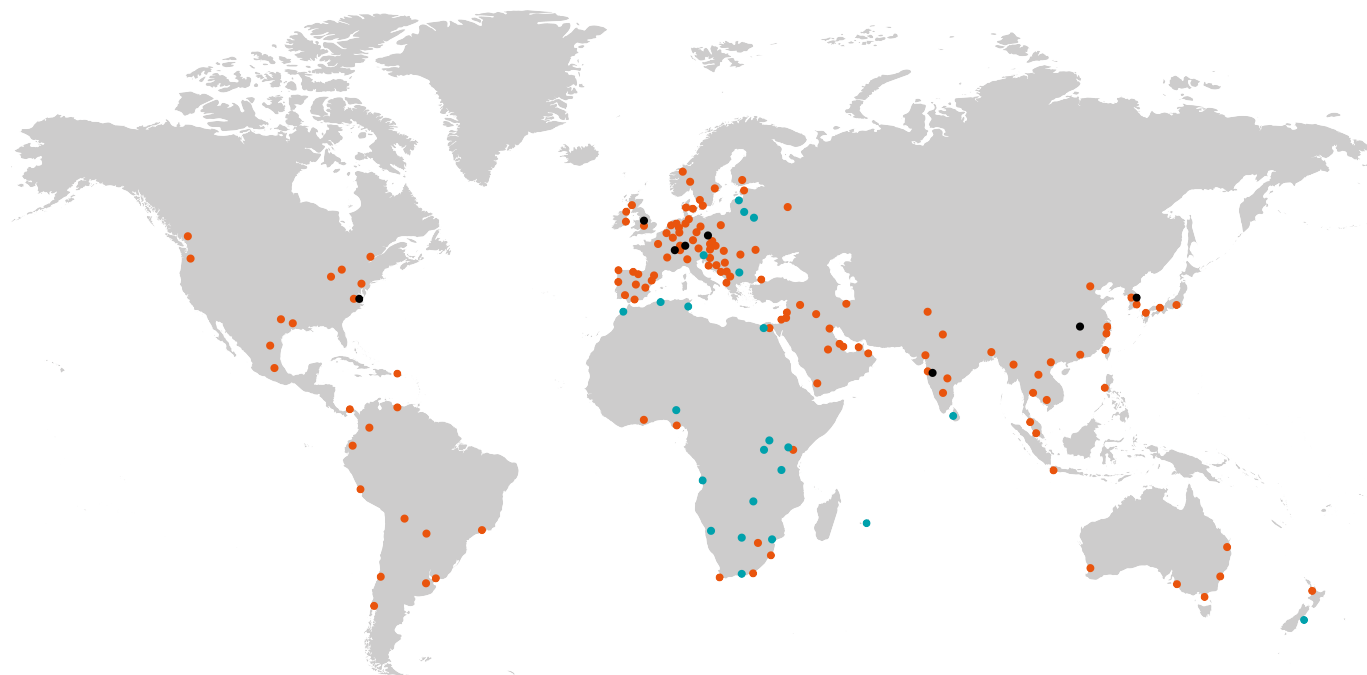
Chevenez, 01.03.2023



Christian Hoffmann, General Manager

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