

# COBRA PLUS

Dry Screw Vacuum Pumps  
DX 0650 A PLUS, DX 0950 A PLUS  
Air-Cooled Version (ACV)

## 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 manufacturer 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

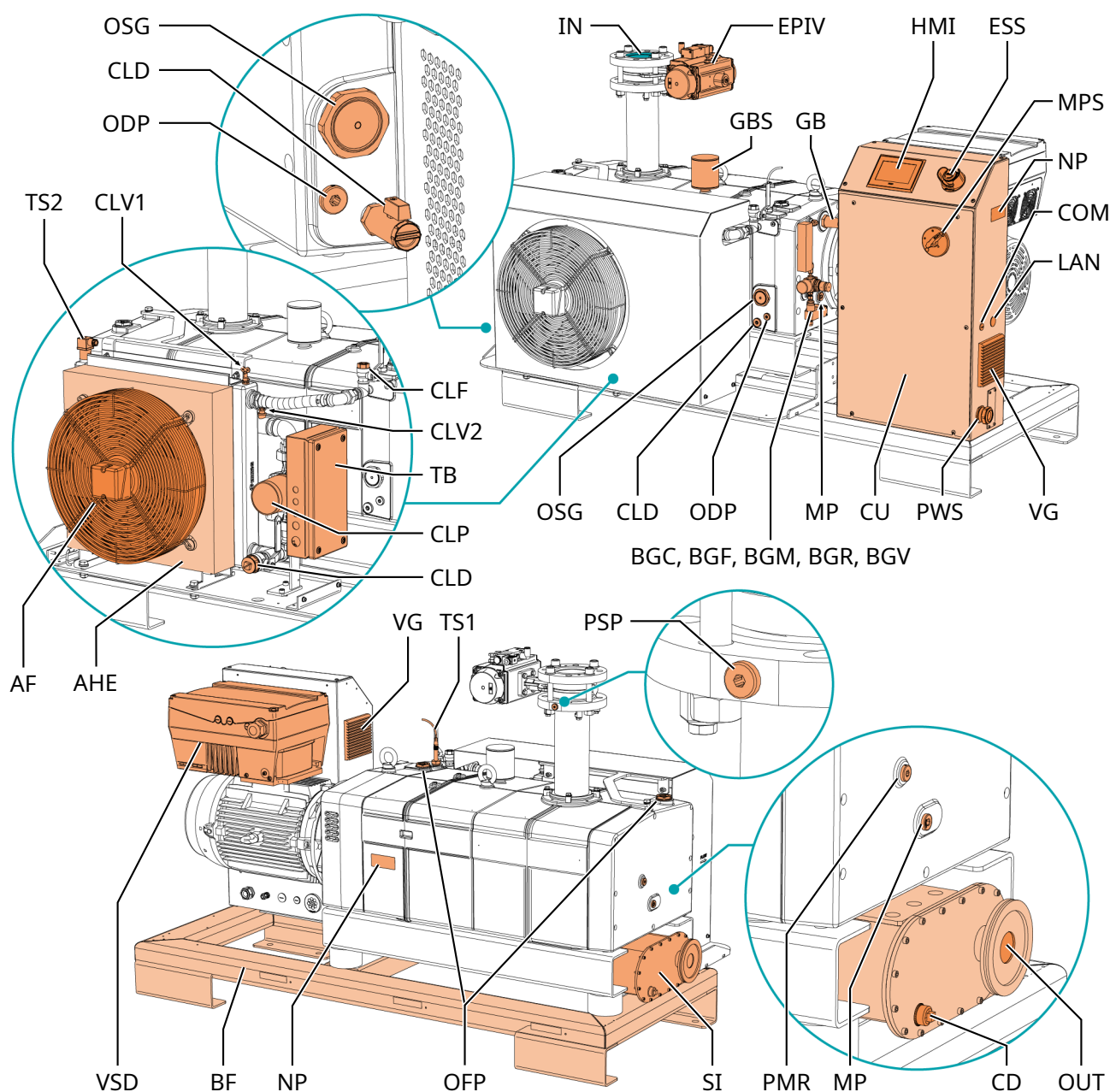
... indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

## 2 Product Description

### NOTE

#### Illustrations.

In this instruction manual, the machine illustrations are of the COBRA DX 0950 A. Although they differ from the COBRA DX 0650 A, the principles and operation are similar.



#### Description

|     |                                        |     |                                       |
|-----|----------------------------------------|-----|---------------------------------------|
| IN  | Inlet connection                       | OUT | Discharge (Exhaust outlet)            |
| AHE | Air-water heat exchanger               | AF  | Axial fan                             |
| BF  | Base frame                             | BGC | Barrier gas connection – option*      |
| BGF | Barrier gas flow meter (FME) – option* | BGM | Barrier gas manometer (MAN) – option* |

| Description |                                                |      |                                                 |
|-------------|------------------------------------------------|------|-------------------------------------------------|
| BGR         | Barrier gas pressure regulator (PRV) – option* | BGV  | Solenoid valve (Barrier gas) – option*          |
| CD          | Condensate drain                               | COM  | Communication I/O port - option                 |
| CU          | Control unit                                   | CLD  | Cooling liquid drain plug                       |
| CLF         | Cooling liquid fill plug                       | CLP  | Cooling liquid pump                             |
| CLV1        | Cooling liquid vent valve (Heat exchanger)     | CLV2 | Cooling liquid vent plug (Machine)              |
| EPIV        | Electro-pneumatic inlet valve - option         | ESS  | Emergency stop switch                           |
| GB          | Gas ballast valve - option                     | GBS  | Gas ballast silencer - option                   |
| HMI         | User interface (Human-machine)                 | LAN  | LAN Communication port (Modbus TCP/IP) - option |
| MP          | Magnetic plug                                  | MPS  | Main power switch - option                      |
| NP          | Nameplate                                      | ODP  | Oil drain plug                                  |
| OFP         | Oil fill plug                                  | OSG  | Oil sight glass                                 |
| PMR         | Plug for manual rotation of rotors             | PSP  | Pressure sensor plug                            |
| PWS         | Power supply (Cable gland)                     | SI   | Silencer - option                               |
| TB          | Terminal box (Cooling system)                  | TS1  | Temperature switch (Machine)                    |
| TS2         | Temperature switch (Cooling system)            | VG   | Ventilation grid                                |
| VSD         | Variable speed drive                           |      |                                                 |

\* See *Barrier Gas System Connection (Optional)* [→ 20]



## NOTE

### Technical term.

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



## NOTE

### Illustrations.

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

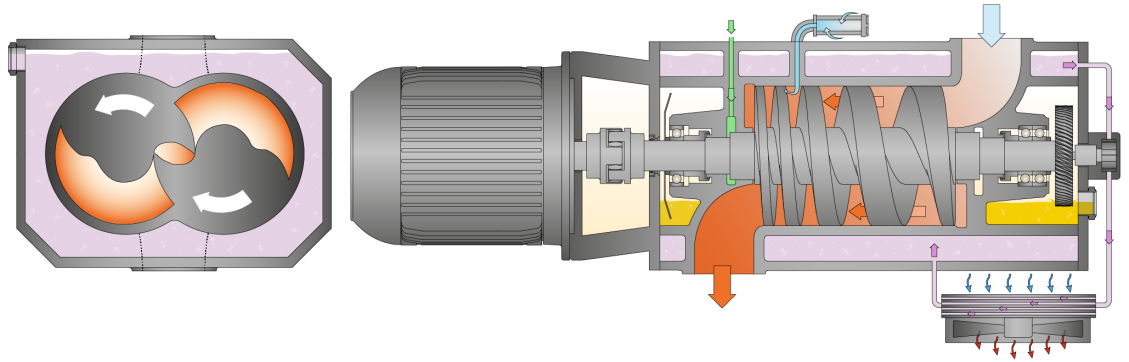


## NOTE

### Illustrations.

In this instruction manual, some maintenance illustrations are those of the COBRA NX 0950 A. Although they are slightly different from the COBRA DX 0650-0950 A PLUS, the principles are similar.

## 2.1 Operating Principle



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

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

## 2.2 Intended Use



### WARNING

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

**Risk of injuries!**

**Risk of damage to the machine!**

**Risk of damage to the environment!**

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

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

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

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

The machine is designed for indoor installations. For outdoor installations, consult your Busch representative for special precautions.

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

The machine is suitable for continuous operation.

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 life-time!**

- Check if the process gases are compatible with those following materials:
  - Cast iron
  - Steel
  - Fluor elastomer (FKM/FPM)
- Contact your Busch representative for further advice and information.

## 2.3 Start Controls

The machine is equipped with a Variable Speed Drive (VSD) including a PLC and a Touch Screen.

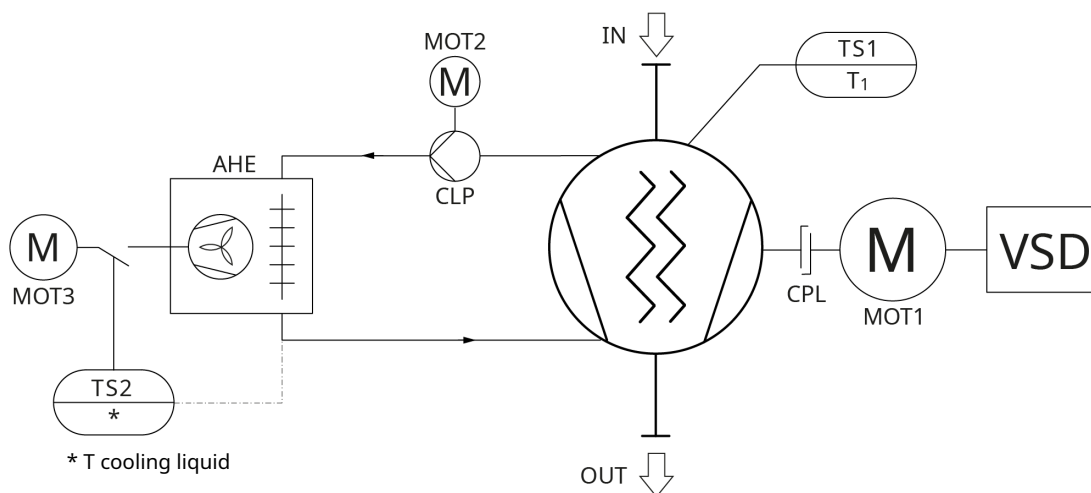
## 2.4 Standard Features

### 2.4.1 Air Cooling

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

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

The cooling liquid is cooled by an air-water heat exchanger (AHE).



| Description |                              |      |                                     |
|-------------|------------------------------|------|-------------------------------------|
| IN          | Inlet connection             | OUT  | Discharge connection (Outlet)       |
| AHE         | Air-water heat exchanger     | CLP  | Cooling liquid pump                 |
| CPL         | Coupling                     | MOT1 | Motor (Machine)                     |
| MOT2        | Motor (Cooling liquid pump)  | MOT3 | Motor (Air-water heat exchanger)    |
| TS1         | Temperature switch (Machine) | TS2  | Temperature switch (Cooling system) |
| VSD         | Variable Speed Drive         |      |                                     |

### 2.4.2 Temperature Switch

The temperature switch monitors the cooling water temperature of the machine.

The temperature switch has one switch point:

|                |                                                           |
|----------------|-----------------------------------------------------------|
| DX 0650 A PLUS | Switch point T = 90°C. Trip, the machine must be stopped. |
| DX 0950 A PLUS | Switch point T = 90°C. Trip, the machine must be stopped. |

### 2.4.3 Sealing Systems

The machine is equipped with labyrinth seals on the motor side and inlet 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* [→ 9].

## 2.5 Optional Accessories

### 2.5.1 Gas Ballast Valve

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

The gas ballast valve has an influence on the ultimate pressure of the machine, see Technical Data.

### 2.5.2 Silencer

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

- Interface DN 100 ISO-K

### 2.5.3 Barrier Gas System

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

### 2.5.4 Electro-pneumatic Inlet Valve



#### WARNING

**Maximum permissible inlet weight (inlet connection).**

**The maximum permissible inlet weight is 100 kg.**

- Do not exceed the maximum permissible weight!



#### CAUTION

**Electro-pneumatic inlet valve pressure.**

**Risk of injuries!**

**Risk of damage to the machine!**

- Busch recommends the installation of a pressure sensor with the following range and accuracy values.

#### Pressure sensor range and accuracy

Range: 0-1000 mbar

Accuracy: +/- 7.0 mbar



#### NOTE

**To actuate the valve, compressed air or nitrogen must be supplied.**

Default position of the valve: "normally closed".

Connection size:

- DN100 ISO-F

The electro-pneumatic inlet valve is pilot operated and opens automatically when the machine starts and closes when it stops.

The opening and closing of the valve can be delayed by the Warm-up & Cool-down\* modes of the machine (\*Shutdown/Drying).

## 2.5.5 OTTO IoT Box



The machine can be equipped with the OTTO IoT Box.

It allows the vacuum pump to be connected to the Busch Cloud and collect live measured data during its operation.

The IoT system consists in:

- The IoT Box
- A GSM antenna
- Sensors (Pressure sensor, resistance thermometer, vibration sensor)

For the activation and setup of this optional function, please contact your Busch representative.

For any additional information, refer to the specific document "OTTO IoT Box User's Manual, art. no. 0870236702" or contact your Busch representative.

## 2.5.6 I/O and Communication Port

If the "Remote package control" option is selected (recommended when combining several COBRA DX machines with a BUSCH ECOTORQUE Master Control):

The control unit (CU) is equipped with a M12 I/O port and a RJ45 communication port (MODBUS) that can allow remote control and monitoring of the machine.

By using the cable supplied with the machine and making the bridges described below in the customer's electrical installation, it is possible to operate the machine in one of three following modes:

- Setup I/O port,
- Power supply,
- Machine remote start.

### Setup I/O port

Connector type: M12 12p female A coded (connection cable included in the scope of supply).



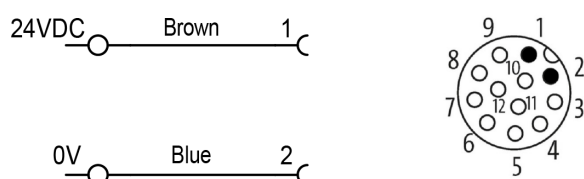
## NOTICE

**Wiring diagrams.**

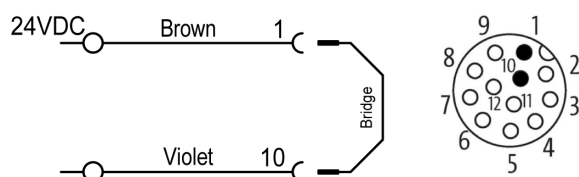
**For more information on all the wiring diagrams below, please refer to the electrical wiring diagram inside the control unit (CU).**

## Power Supply

- 24VDC power supply - Max 1.5A



## Remote Pump Start



It allows the machine to be started by an external signal.

If pins 1 and 10 are bridged, the machine will start according to the settings of the HMI.



### NOTE

**In case of a remote-control start, the machine must be integrated in the user's safety chain (signal warning the user to stop the machine in case of problem or emergency stop).**

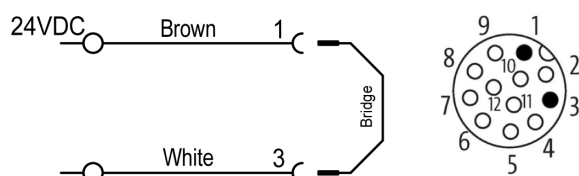


### NOTE

**According to the standard factory setting, there is a bridge on the terminals inside the control unit (CU).**

- Remove the bridge and connect to "Remote pump start" according to the wiring diagram inside the control unit (CU).

## Emergency Start



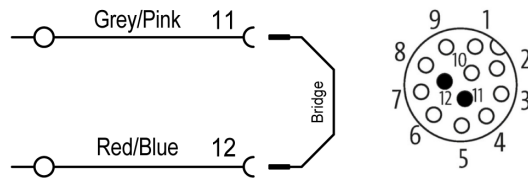
In case of HMI failure, refer to the electrical wiring diagram inside the control unit (CU). The machine then operates at 100% speed and the inlet valve is open.



### NOTE

**No more settings are possible, but the safety chain and the dry contact remain functional.**

## External Safety Switch



It allows to add an external safety element.

Remove the bridge and put a dry contact instead.



### NOTE

The bridge is mandatory in case of a remote-control use.



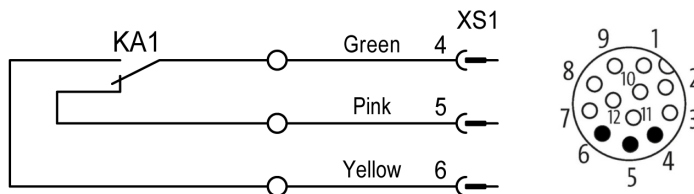
### NOTE

According to the standard factory setting, there is a bridge on the terminals inside the control unit (CU).

- Remove the bridge and connect to "Remote safety contact" according to the wiring diagram inside the control unit (CU).

## External Contact (Pump Status)

- M12 connector Max 30VAC/DC 1.5A
- On terminal Max 250VAC/DC 10A



### NOTE

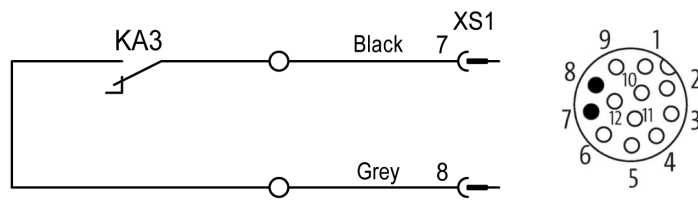
System error, chain safety, EMO.

This contact gives information about the status of the machine and changes its status if an event such as an error, a thermal fault or an emergency stop occurs.

- Status:
  - Normal run: Pin 4-6 OFF / Pin 4-5 ON
  - In case of error: Pin 4-6 ON / Pin 4-5 OFF

### Dry Contact

- M12 connector: Max 30VAC/DC 1.5A
- On terminal: Max 250VAC/DC 10A



- Activation according to the settings of the HMI.

### Modbus Control

For more information:

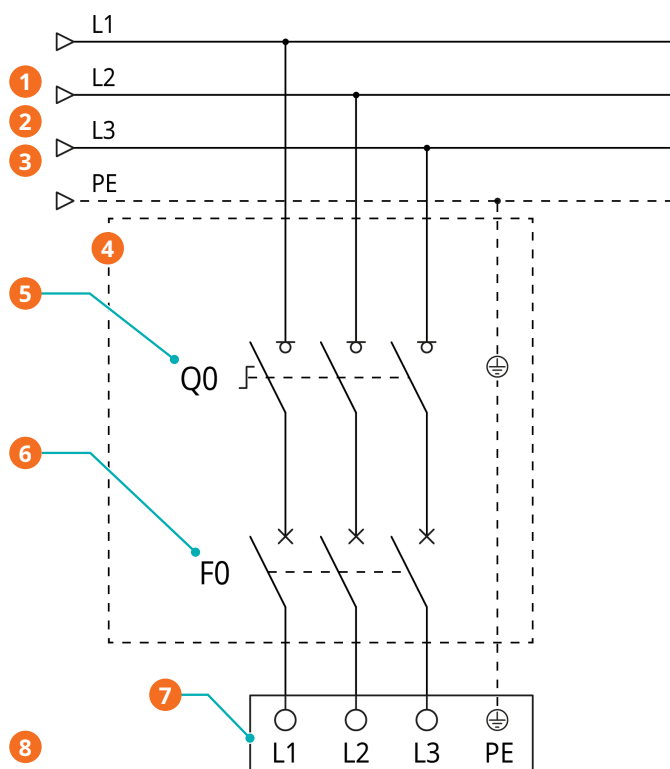
- See *Modbus Control and Ethernet Settings* [→ 28].

## 2.5.7 Main Power Switch / Breaker

The machine can be equipped with a power switch for connecting or disconnecting it from the mains.

In case this power switch is not installed, an equivalent device must be installed in the customer's system.

### Customer power supply



| Description |                                                                     |   |                                                                                          |
|-------------|---------------------------------------------------------------------|---|------------------------------------------------------------------------------------------|
| 1           | Power supply Standard Control Unit: 3L+PE 380-440V +/-10% (50/60Hz) | 2 | Power supply Optional Control Unit: 3L+PE 380-460V +/-10% (50/60Hz)                      |
| 3           | Wire gauge according to EN 60204-1                                  | 4 | Must be provided by the customer                                                         |
| 5           | Lockable disconnect switch                                          | 6 | Overload protection*                                                                     |
| 7           | Vacuum pump terminal board (L1, L2, L3, PE to the control unit)     | 8 | The complete wiring diagram of the control unit is placed inside the electrical cabinet. |

\* C-curve - 80A.

Cable gland size of the power input:

- M40 x 1.5 (cable  $\varnothing$  ► 20 ... 33 mm)

## 2.5.8 Industrial Quick Connector

The standard version of the machine is equipped with a cable gland (PWS).

The machine can be equipped with an industrial quick connector (see *Main Power Supply Connection* [→ 27]).

### 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

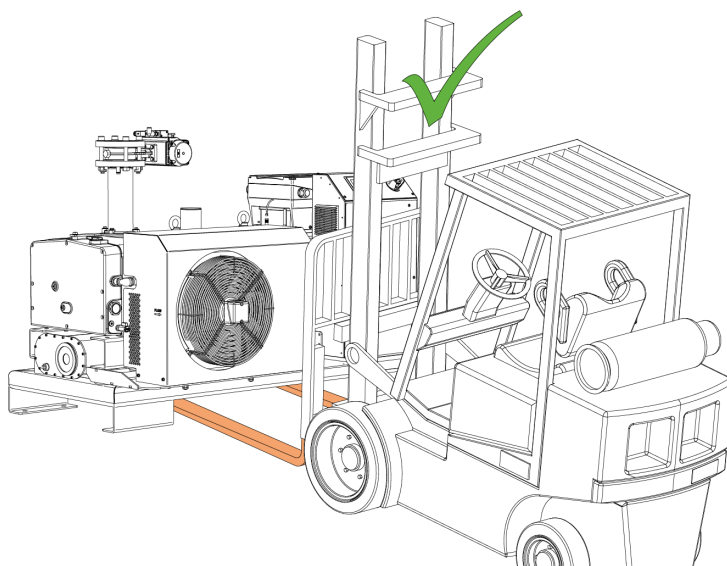
**In case the machine is already filled with oil.**

**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 vertically transport the machine.

#### Transport with a forklift

The machine must always be handled with care, using either a forklift or a pallet jack. Handling access must be from the underneath of the base frame (BF).



- Check the machine for transport damage.

If the machine is secured to a base plate:

- Remove the machine from the base plate.

## 4 Storage

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

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

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



### NOTICE

**Long storage time (over 12 months).**

**Risk of damage to the machine!**

- Due to a long storage time, the capacitors of the variable speed drive can lose efficiency because of electrochemical processes. In the worst case, it can lead to a short-circuit and therefore to a damage to the variable speed drive of the machine.
  - Connect the machine every 18 months for 60 minutes to the mains.
-

## 5 Installation

### 5.1 Installation Conditions



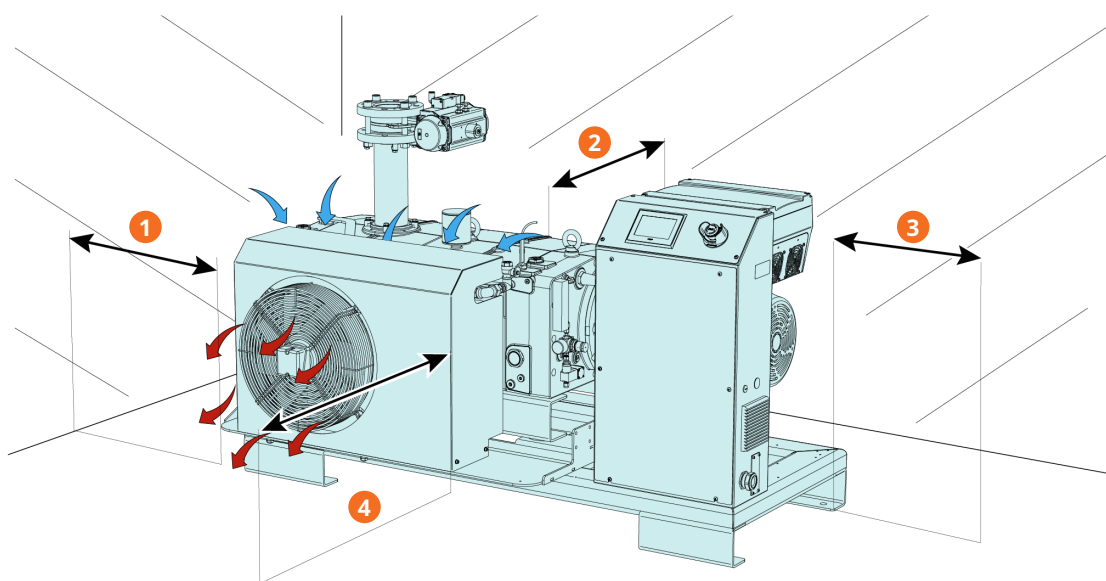
#### NOTICE

**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.



#### Description

|   |         |   |        |
|---|---------|---|--------|
| 1 | ~120 cm | 2 | ~5 cm  |
| 3 | ~50 cm  | 4 | ~50 cm |

- 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 cooling air inlets and outlets are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.
- Make sure that the oil sight glass (OSG) remains easily visible.
- Make sure that enough space remains for maintenance work.
- Make sure that the machine is placed or mounted horizontally, a maximum deviation of 1° in any direction is acceptable.
- Check the oil level, see *Oil Level Inspection* [→ 50].
- Check the cooling liquid level, see *Cooling Liquid Level Inspection* [→ 51].

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

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

## 5.2 Connecting Lines / Pipes

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

In case of long connection lines:

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

### 5.2.1 Inlet Connection



#### WARNING

**Unprotected inlet connection.**

**Risk of severe injury!**

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



#### NOTICE

**Ingress of foreign objects or liquids.**

**Risk of damage to the machine!**

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

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

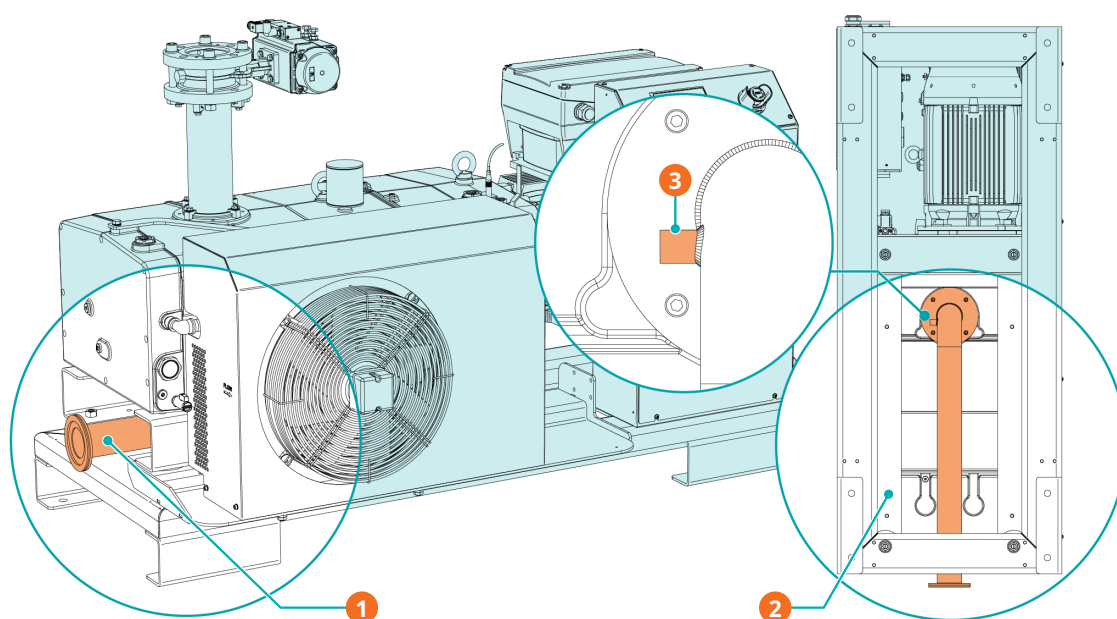
Connection size(s):

- With inlet flange: ISO-K DN100, DIN 28404
- Without inlet flange: Ø 99 mm, M8 x8

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

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

## 5.2.2 Discharge Connection



| Description |                                        |   |                            |
|-------------|----------------------------------------|---|----------------------------|
| 1           | Standard exhaust without silencer (SI) | 2 | Bottom view of the machine |
| 3           | Auxiliary port                         |   |                            |



### NOTICE

**Discharge gas flow obstructed.**

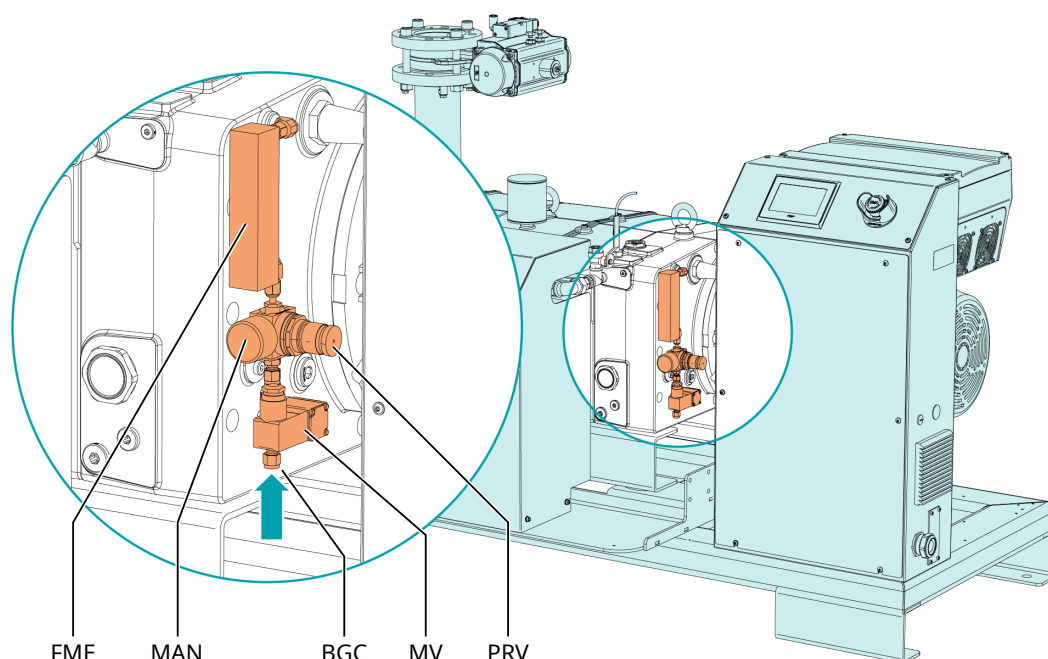
**Risk of damage to the machine!**

- 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):

- ISO-K DN100, DIN 28404
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet 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 Barrier Gas System Connection (Optional)



#### Description

|     |                           |     |                |
|-----|---------------------------|-----|----------------|
| BGC | Barrier gas connection    | FME | Flow meter     |
| MAN | Manometer                 | MV  | Solenoid valve |
| PRV | Pressure regulating valve |     |                |

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

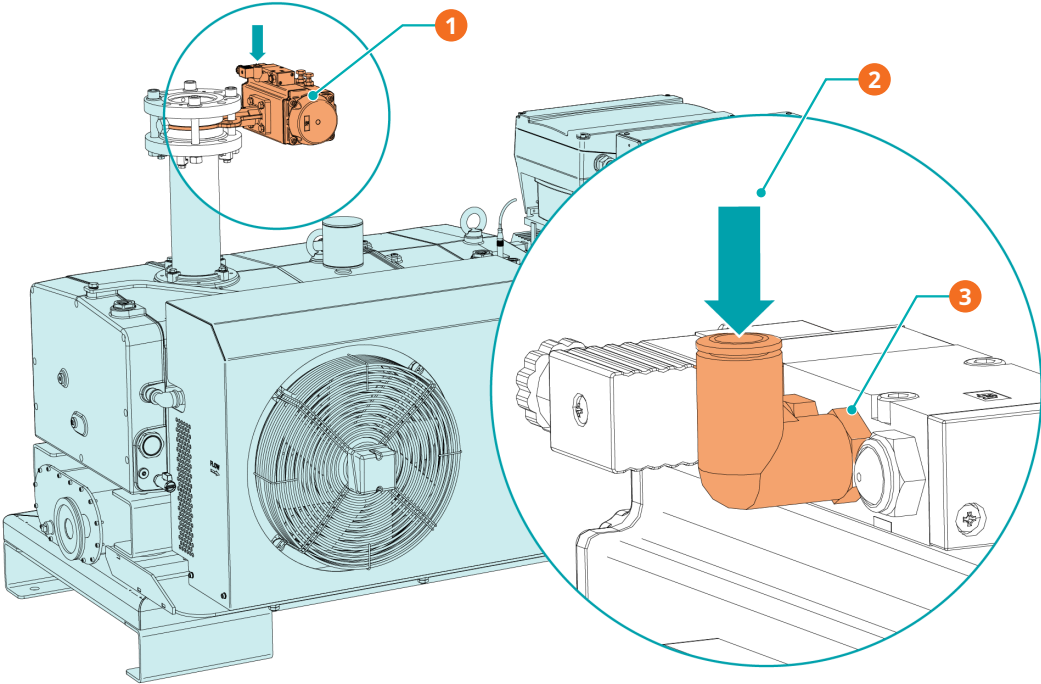
Connection size:

- G1/4", ISO 228-1

- Make sure that the gas complies with the following requirements:

|                                                                     |                                 |              |
|---------------------------------------------------------------------|---------------------------------|--------------|
| Gas type                                                            | Dry nitrogen or air             |              |
| Gas temperature                                                     | °C                              | 0 ... 60     |
| Maximum gas pressure                                                | bar (g)                         | 13           |
| Recommended pressure setting at the pressure regulating valve (PRV) | bar (g)                         | 3            |
| Filtration                                                          | µm                              | 5            |
| Recommended flow rate                                               | SLM (standard liter per minute) | 15 ... 20    |
| Air quality (only for air)                                          | Acc. to ISO 8573-1              | Class 5.4.4. |

5.2.4      **Electro-Pneumatic Inlet Valve Connection (Optional)**



| Description |                                             |   |                                   |
|-------------|---------------------------------------------|---|-----------------------------------|
| 1           | Electro-pneumatic inlet valve (EPIV)        | 2 | Compressed air or nitrogen intake |
| 3           | Elbow screw fitting, connexion size Ø 10 mm |   |                                   |

Connection size:

- DN100 ISO-F

The electro-pneumatic inlet valve (EPIV) must be connected to compressed air or compressed nitrogen gas source.

- Make sure the gas complies with the following requirements:

|                                |                                |           |
|--------------------------------|--------------------------------|-----------|
| Gas type                       | Dry nitrogen or air            |           |
| Gas temperature                | °C                             | 0 ... 50  |
| Pressure setting for actuation | bar (g)                        | 1.5 ... 8 |
| Actuation mode                 | Single acting actuator         |           |
|                                | Normally closed by lack of air |           |

## 5.3 Filling Oil

### ! NOTICE

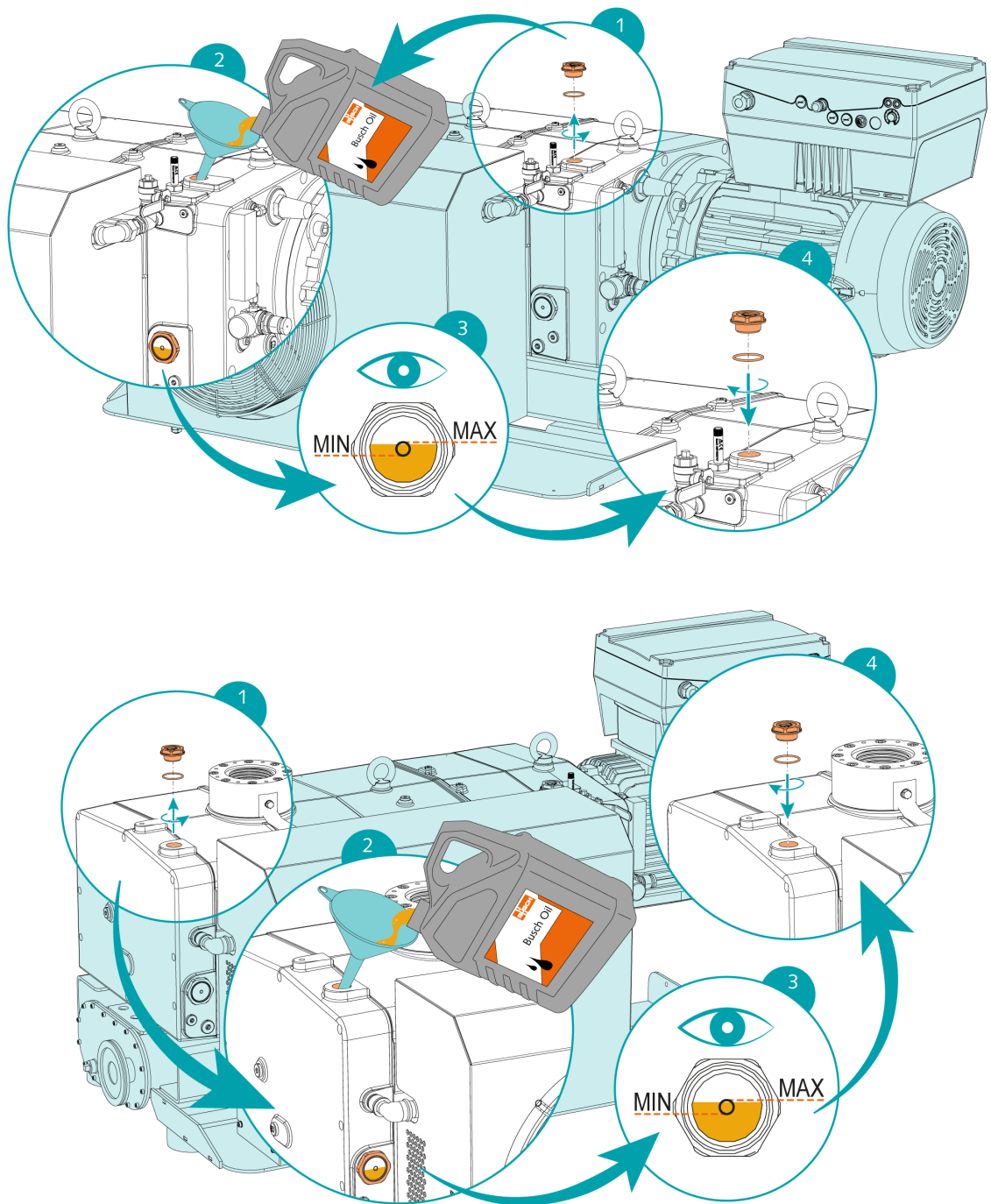
**Use of inappropriate oil.**

**Risk of premature failure!**

**Loss of efficiency!**

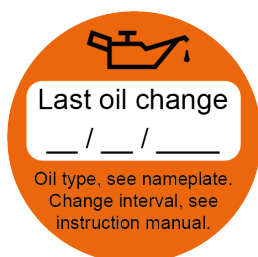
- Use only a type of oil previously approved and recommended by the manufacturer.

For oil type and oil capacity see Technical Data and *Oil* [→ 62] chapters.



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.

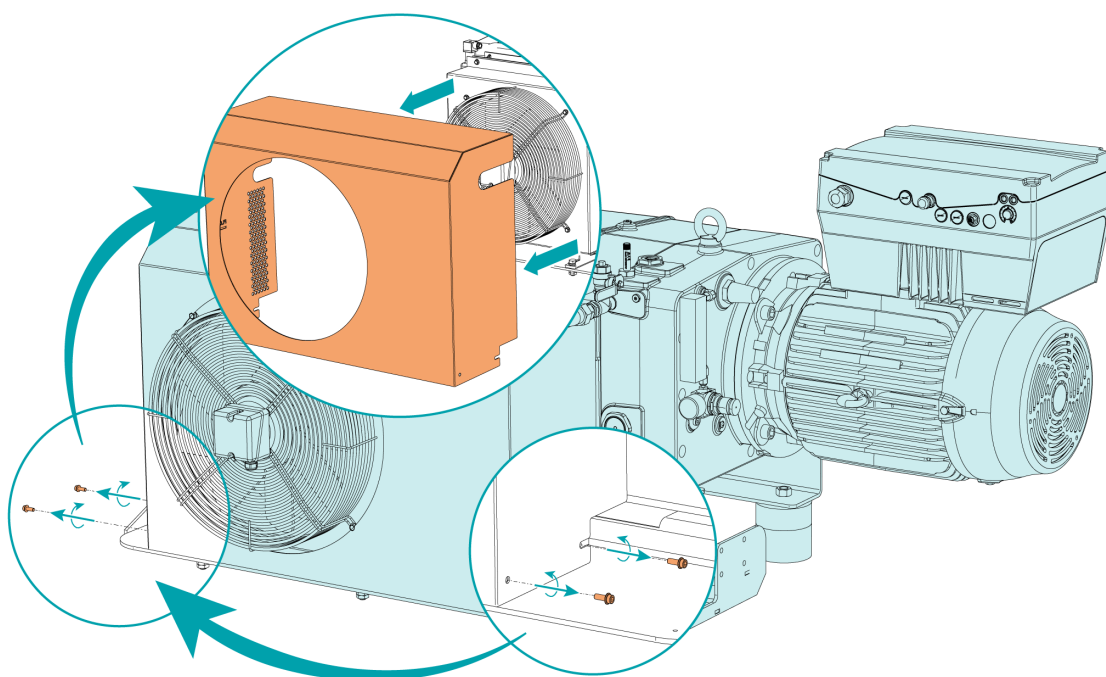
## 5.4 Cooling System Cover Removal



### NOTE

**Before filling or changing the cooling liquid and electrically connecting the cooling system.**

- Remove the cooling system cover.



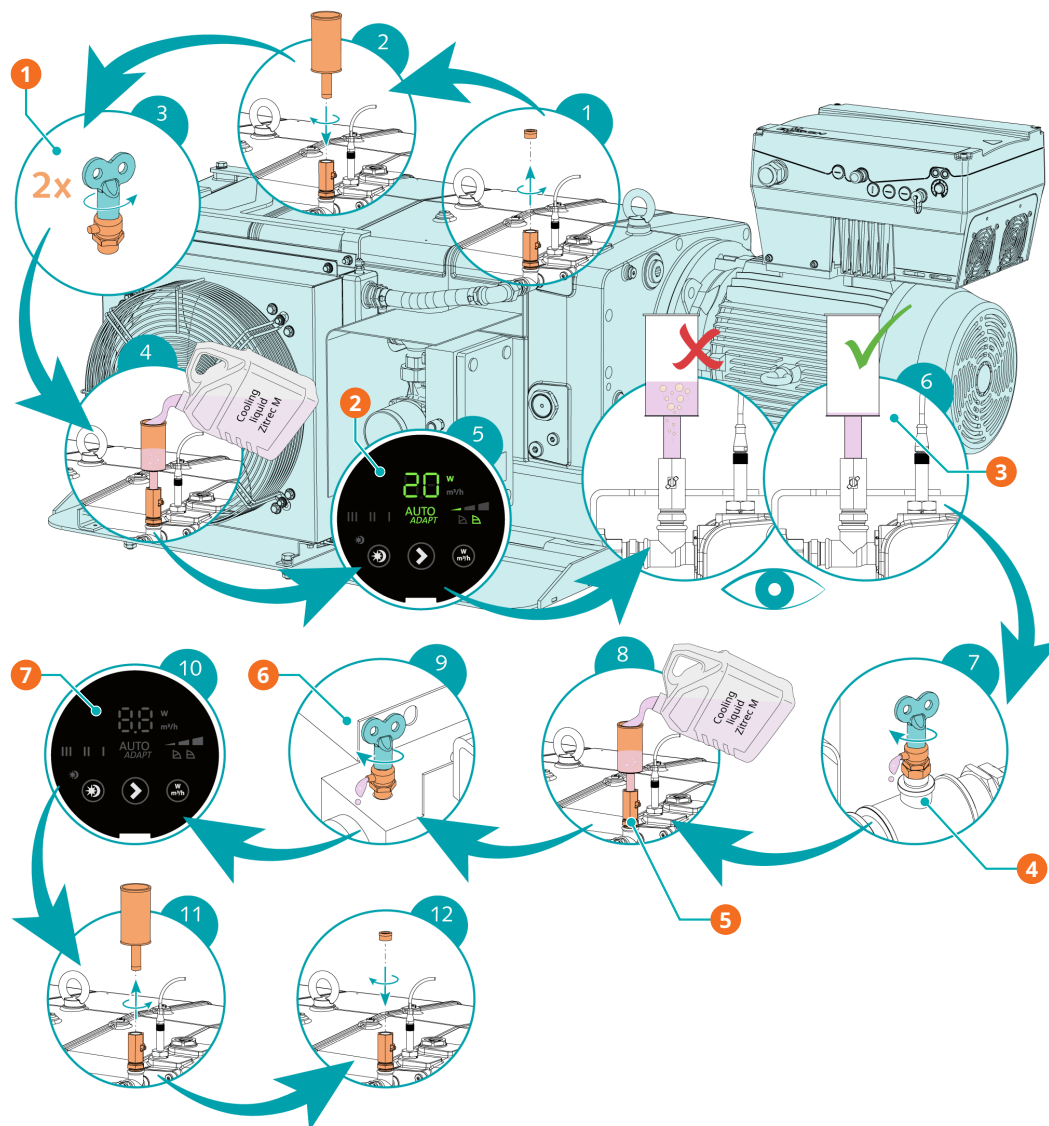
## 5.5 Filling Cooling Liquid

The machine is already dispatched with cooling liquid.

If it is not the case:

- Electrically connect the cooling system, see *Electrical Connection of the Cooling System* [→ 29].
- Fill in the machine with cooling liquid according to the following procedure.

For cooling liquid type and cooling liquid capacity see Technical Data and *Cooling Liquid* [→ 63].



| Description |                                                          |   |                                                                                            |
|-------------|----------------------------------------------------------|---|--------------------------------------------------------------------------------------------|
| 1           | Step 3: Open the cooling liquid vent valves (CLV1, CLV2) | 2 | Step 5: Switch on the cooling liquid pump (CLP)                                            |
| 3           | Step 6: Vent air from the cooling system                 | 4 | Step 7: Close the cooling liquid vent valve (CLV2) when the cooling liquid is spilling out |
| 5           | Step 8: Resume cooling liquid filling                    | 6 | Step 9: Close the cooling liquid vent valve (CLV1) when the cooling liquid is spilling out |
| 7           | Step 10: Switch off the cooling liquid pump (CLP)        |   |                                                                                            |

## 6 Electrical Connection



### DANGER

**Live wires.**

**Risk of electrical shock!**

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

### INSTALLATION(S) CURRENT PROTECTION:



### DANGER

**Missing current protection.**

**Risk of electrical shock!**

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



### NOTICE

**Electromagnetic compatibility.**

- Make sure that the motor of the machine will not be affected by electric or electromagnetic disturbance from the mains. If necessary, contact your Busch representative for more information.
- Make sure that the EMC of the machine is compliant with the requirements of your supply network system, if necessary, provide further interference suppression (EMC of the machine, see *EU Declaration of Conformity* [→ 64] or *UK Declaration of Conformity* [→ 65]).

## 6.1 PLUS Machine



### DANGER

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

**Risk of electrical shock!**

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



### DANGER

**Maintenance work without switching-off the power supply to the control unit.**

**Risk of electrical shock!**

- Switch-off the power supply to the control unit with a lockable disconnect switch before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after disconnection of the electrical supply.
- Always ensure by using a suitable multimeter that no voltage is present on any drive power terminals prior to commencing any work.



### DANGER

**Maintenance work without disconnecting the variable speed drive.**

**Risk of electrical shock!**

- Disconnect and isolate the variable speed drive before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after disconnection of the electrical supply.
- Always ensure by using a suitable multimeter that no voltage is present on any drive power terminals prior to commencing any work.
- Make sure that the power supply is compatible with the data on the nameplate of the control unit.
- If the machine is equipped with a power connector, install a residual current protective device to protect persons in case of a defective insulation.
  - Busch recommends installing a type B residual protective device suitable for the electrical installation.
- If the control unit is not equipped with a lockable disconnect switch, provide it on the power line so that the machine is completely secured during maintenance tasks, or in case of an emergency.
- Provide an overload protection according to EN 60204-1.
  - Busch recommends installing a C-curve circuit breaker.
- Connect the protective earth conductor.
- Electrically connect the machine to the main power supply.
  - See *Main Power Supply Connection* [→ 27].

**NOTICE**

The admissible motor speed exceeds the recommendation.

Risk of damage to the machine!

- Check the admissible motor speed range, see Technical Data.

**NOTICE**

The motor frequency is below 20 Hz.

Risk of damage to the machine!

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

**NOTICE**

Incorrect connection.

Risk of damage to the control unit!

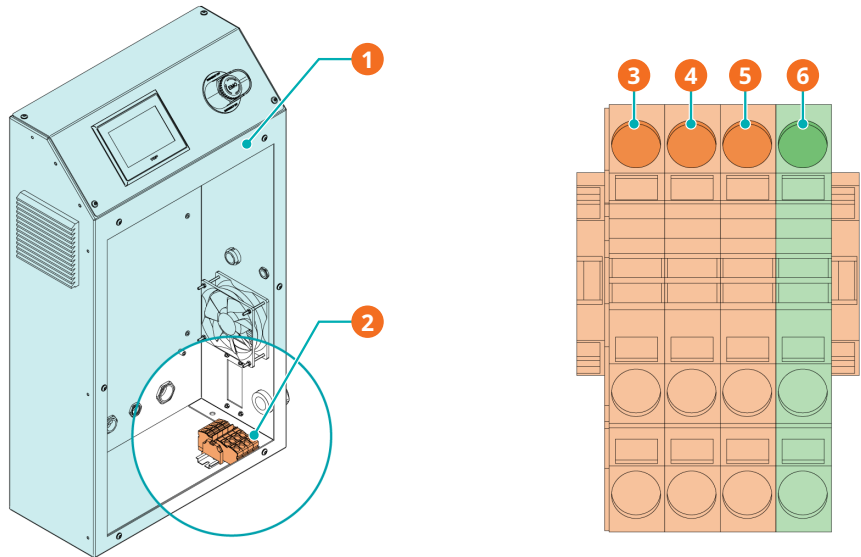
- The wiring diagrams given below are typical. Check the inside of the control unit for connection instructions/diagrams.

6.2 Main Power Supply Connection

Cable gland size of the power input:

- M40 x 1.5 (cable Ø ► 20 ... 33 mm)

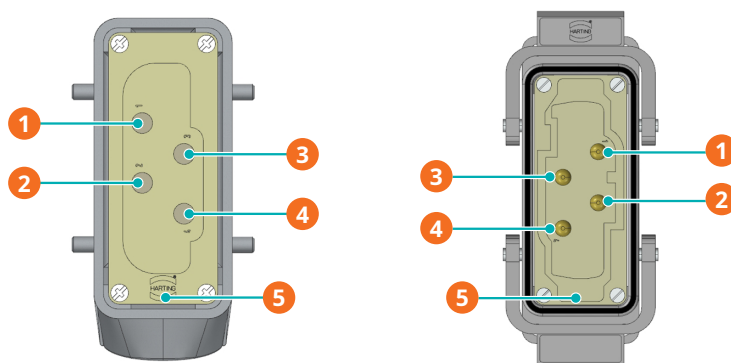
Standard Connector



| Description |                   |   |                              |
|-------------|-------------------|---|------------------------------|
| 1           | Control unit (CU) | 2 | Main power supply connection |
| 3           | L1                | 4 | L2                           |
| 5           | L3                | 6 | PE                           |

**Optional Industrial Quick Connector [→ 14]**

- Pin configuration (380-460VAC)



| Description |    |   |          |
|-------------|----|---|----------|
| 1           | L1 | 2 | L2       |
| 3           | L3 | 4 | Not used |
| 5           | PE |   |          |

| Plug            |                               |
|-----------------|-------------------------------|
| Maximum current | 80A @ 40°C                    |
| Maximum voltage | 480V                          |
| Square cable    | sq 1.5 ... 16 mm <sup>2</sup> |
| AWG gauge       | AWG 16 ... 6                  |
| Cable entry     | M32 x 1.5mm                   |

## 6.3 Modbus Control and Ethernet Settings

The user interface (HMI) works in Modbus with "Holding Registers", readable and writable, 16 bits. The default ethernet settings are the following:

| Description  | Default value               |
|--------------|-----------------------------|
| IP address   | 192.168.0.100               |
| Subnet mask  | 255.255.255.0               |
| Gateway      | 192.168.0.1                 |
| Port no.     | 502 (cannot be changed)     |
| Slave ID no. | 1-255 (all are functioning) |

To control the machine via Modbus TCP/IP:

- Select the control mode "Remote/Modbus control".
- Connect your system to the ethernet RJ45 port located on the right side of the control unit.
- Configure the *Ethernet Settings* [→ 46].

### NOTE

**Monitoring via Modbus.**

**Do not activate Remote/Modbus for sole monitoring purpose.**

**This mode is only activated if the machine is fully controlled via Modbus.**

## 6.4 Electrical Connection of the Cooling System



### DANGER

Live wires.

Risk of electrical shock!

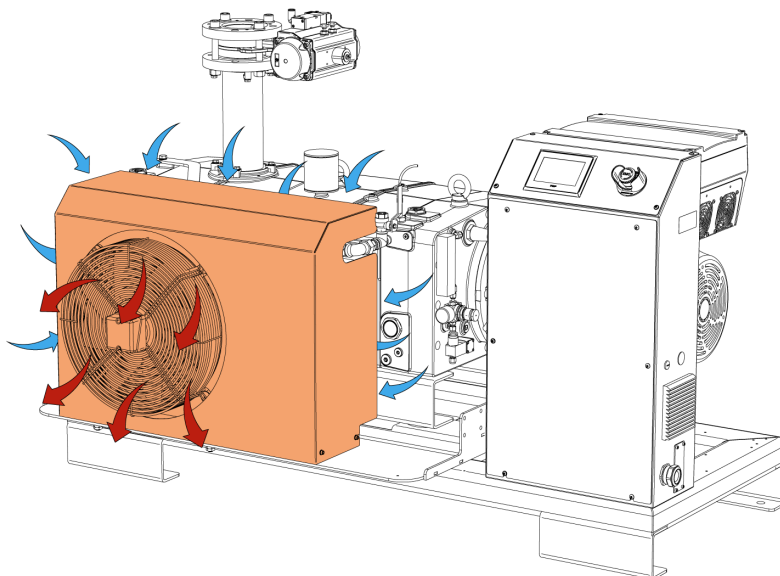
- Electrical installation work must only be executed by qualified personnel.



### NOTE

No additional wiring is required to connect the air-cooling system of the machine. There is only one connection to be made to the main power supply of the machine.

- Make sure that the power supply for the motor is compatible with the data on the nameplate of the motor.
- Make sure that the air flow blows in the right direction according to the following illustration.



## 7 Commissioning



### CAUTION

**During operation the surface of the machine can reach temperatures over 70°C.**

#### **Risk of burns!**

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



### CAUTION



**Noise of running machine.**

#### **Risk of damage to hearing!**

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

- Make sure to wear hearing protection.



### NOTICE

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

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

- Prior to commissioning, the machine must be filled with oil, see *Filling Oil* [→ 22].



### 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* [→ 17] are met.

If the machine is equipped with an electro-pneumatic inlet valve:

- Open the electro-pneumatic inlet valve supply.

If the machine is equipped with a barrier gas system:

- Turn on the barrier gas supply.
- Adjust the barrier gas pressure.
- Make sure that the cooling system is in operation (axial fan (AF) and cooling liquid pump (CLP)). The setting of the cooling liquid pump does not matter. All settings are allowed.
- Switch the machine "on" or "off" at the Touch Screen. The Touch Screen shows the actual machine status and the data of the different sensors and of the variable speed drive (see *Description of User Interface Functions* [→ 31]).
- 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* [→ 50].
- After a few minutes of operation, perform a *Cooling Liquid Level Inspection* [→ 51].

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

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



## NOTE

**COBRA machines require a certain warm-up time to reach maximum performance.**

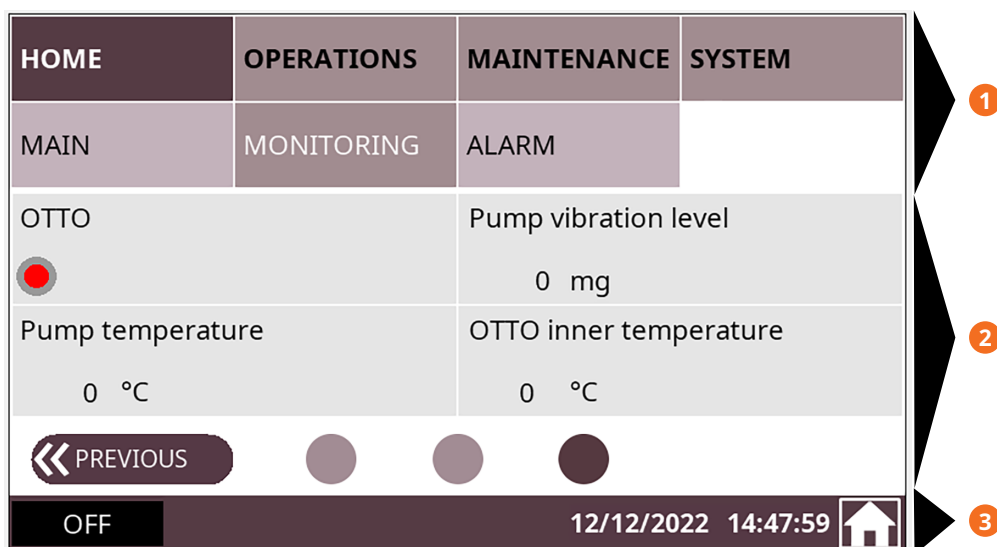
## 7.1 Description of User Interface Functions

The following functions and parameters are available on the TOUCH SCREEN - HMI interface:

- Language selection (English at first step)
- Date and time
- Units such as pressure (mbar, hPa, TORR) and temperature (°C and °F)
- Inlet pressure
- Ethernet settings
- P&ID control settings
- Pressure control settings
- Service indicator such as operating hours, hours to next oil service

### Interface overview

The menu consists of four main tabs (Home, Operations, Maintenance, System) with their own sub-tabs.



| Description |                        |   |                   |
|-------------|------------------------|---|-------------------|
| 1           | Menu tabs and sub-tabs | 2 | Information panel |
| 3           | Bottom bar             |   |                   |

## 7.1.1 Roles and Users

Three roles of user rights are predefined in the system.

### Role 1 ► Operator

This role is intended for machine operators to control the machine (limited rights) or monitor operating values. It does not require any password.

### Role 2 ► Installation/Maintenance technician

This role is intended for installation/maintenance technicians to configure the machine according to the application. The password for this role can be found in the separate sheet attached to this instruction manual and allows an access to the following features:

- Change operating mode,
- Reset hours before the next service,
- Set the remote control and monitoring parameters.

### Role 3 ► Busch Service

Only authorized personnel from Busch Service have this level of access rights.



## NOTE

**In case of any questions related to the machine settings:**

- Contact Busch Service.

When a password is required, the display shows the following screen:

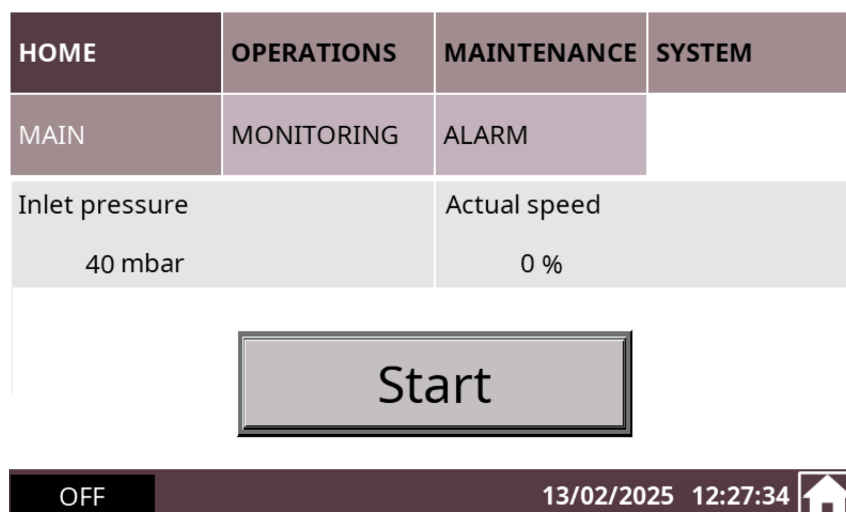
- Press the stars in the password field.
- Enter the correct password in the number pad according to your access right.
- Press "Save".
- From now on, the specific rights are open for a limited period ► delay of 5 minutes.

## 7.1.2 Home

### 7.1.2.1 Main

The display "HOME > MAIN" is the main display.

It is mainly useful for live monitoring.

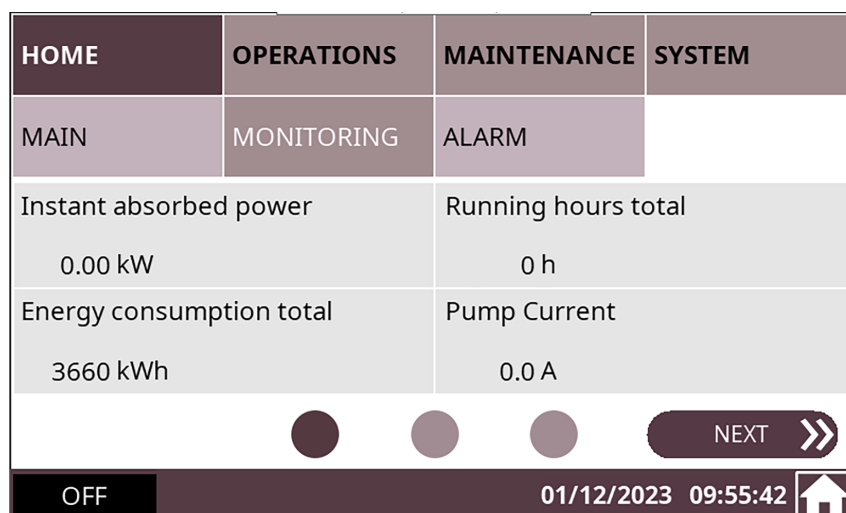


### 7.1.2.2 Monitoring (Operating Data)

The display "HOME" > "MONITORING" shows the operating values.

It is divided into three different screens/pages.

#### Screen/Page MONITORING 1



**Instant absorbed power.** Indicates in kW the absorbed power in real time.

**Running hours total.** Indicates the total number of operating hours since the first machine commissioning.

**Energy consumption total.** Indicates in kWh the total consumption of energy since the first machine commissioning.

**Pump current.** Indicates in ampere unit (A) the value of the pump current in real time.

## Screen/Page MONITORING 2

| HOME                | OPERATIONS | MAINTENANCE         | SYSTEM |
|---------------------|------------|---------------------|--------|
| MAIN                | MONITORING | ALARM               |        |
| Inlet pressure      |            | Motor frequency     |        |
| Option not selected |            | 0.0 Hz              |        |
| IGBT temperature    |            | Inner temperature   |        |
| 0.0 °C              |            | 0.0 °C              |        |
| PREVIOUS            |            | NEXT                |        |
| OFF                 |            | 12/12/2022 14:47:52 |        |

**Inlet pressure.** Indicates the pressure at the inlet of the pump when the pump is equipped with the inlet valve and when the function is activated.

**Motor frequency.** Indicates in Hz the current drive frequency.

**IGBT temperature.** Indicates the temperature of the insulated-gate bipolar transistor inside the variable speed drive (VSD).

**Inner temperature.** Indicates the temperature of the pump coolant. If the temperature is too high, an alarm occurs.

## Screen/Page MONITORING 3

| HOME             | OPERATIONS | MAINTENANCE            | SYSTEM |
|------------------|------------|------------------------|--------|
| MAIN             | MONITORING | ALARM                  |        |
| OTTO             |            | Pump vibration level   |        |
|                  |            | 0 mg                   |        |
| Pump temperature |            | OTTO inner temperature |        |
| 0 °C             |            | 0 °C                   |        |
| PREVIOUS         |            |                        |        |
| OFF              |            | 12/12/2022 14:47:59    |        |

**OTTO.** Indicates if the IoT function is activated.

**Pump vibration level.** Indicates in mg the level of vibration of the pump.

**Pump temperature.** Indicates the temperature of the pump. If the temperature is too high, an alarm occurs.

**OTTO inner temperature.** Indicates the temperature value of the IoT Box.

### 7.1.2.3 Alarms

The display "HOME" > "ALARM" shows the history of the alarms' signals registered by the pump monitoring sensors.

| HOME         | OPERATIONS   | MAINTENANCE         | SYSTEM        |
|--------------|--------------|---------------------|---------------|
| MAIN         | MONITORING   | ALARM               |               |
| Trigger Date | Trigger Time | Message             | Current alarm |
|              |              |                     |               |
|              |              |                     |               |
|              |              |                     |               |
|              |              |                     |               |
|              |              |                     |               |
| OFF          |              | 01/12/2023 10:11:26 |               |

When an alarm occurs, an audible alarm sounds, and the user must acknowledge the default on the HMI interface.

| HOME         | OPERATIONS   | MAINTENANCE    | SYSTEM              |
|--------------|--------------|----------------|---------------------|
| MAIN         | MONITORING   | ALARM          |                     |
| Trigger Date | Trigger Time | Message        | Current alarm       |
| 2025-02-13   | 09:28:11     | OTTO COM loss  |                     |
| 2025-02-13   | 09:27:48     | VSD COM loss   |                     |
| 2025-02-13   | 09:25:24     | Power time out |                     |
|              |              |                |                     |
|              |              |                |                     |
| OFF          |              | ALARM          | 13/02/2025 09:28:50 |

By pressing the "Current alarm" button, the display changes to "History alarm".

| HOME         |              | OPERATIONS                   |  | MAINTENANCE                                                                         |              | SYSTEM                                                                                                                                                                                          |  |
|--------------|--------------|------------------------------|--|-------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| MAIN         |              | MONITORING                   |  | ALARM                                                                               |              |                                                                                                            |  |
| Trigger Date | Trigger Time | Message                      |  | Recover Date                                                                        | Recover Time | <br>History alarm<br> |  |
| 2025-02-13   | 09:39:25     | Cable break at analogue in 1 |  | 2025-02-13                                                                          | 09:39:50     |                                                                                                            |  |
| 2025-02-13   | 09:30:06     | Power time out               |  | 0000-00-00                                                                          | 00:00:00     |                                                                                                            |  |
| 2025-02-13   | 09:28:11     | OTTO COM loss                |  | 2025-02-13                                                                          | 09:29:21     |                                                                                                                                                                                                 |  |
| 2025-02-13   | 09:27:48     | VSD COM loss                 |  | 2025-02-13                                                                          | 09:29:21     |                                                                                                                                                                                                 |  |
| 2025-02-13   | 09:25:24     | Power time out               |  | 2025-02-13                                                                          | 09:29:54     |                                                                                                                                                                                                 |  |
| OFF          |              | ALARM                        |  |  |              | 13/02/2025 09:53:14                                                                                        |  |

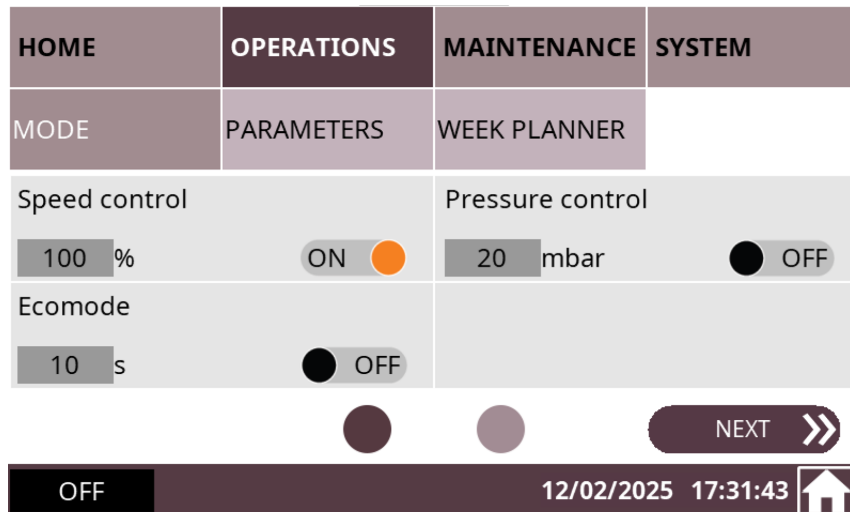
## 7.1.3 Operations

### 7.1.3.1 Operation Modes

The display "OPERATIONS > MODE" shows the modes of operation.

It allows the control of the machine.

- To access the operating mode menu:
  - Go to "OPERATIONS" > "MODE" and stay on the first screen/page.



**Speed control (Standard).** Configured by default with a vacuum pump speed of 100 %, the speed control mode allows the variation of the motor frequency.

- To change the vacuum pump speed:
  - Press on the speed percentage (password required, see *Roles and Users* [→ 32]).
  - Assign the desired frequency on the keypad and press "Enter".

| Parameter                    | Default value | Adjustment range* |
|------------------------------|---------------|-------------------|
| Speed control (target speed) | 100 %         | 1 ... 100 %       |

\* In percentage of the operating speed range

- For more information on "pumping speed" versus "% speed", refer to the vacuum pump performance curves.

**Pressure control (Option).** The pressure control mode allows to maintain a constant pressure level (target pressure) by automatically adapting the motor frequency.

- To switch from speed control to pressure control:
  - Press on the target pressure value (password required, see *Roles and Users* [→ 32]).
  - Assign the target pressure on the keypad and press "Enter".
  - Press on the switch button.

| Parameter                          | Default value | Adjustment range |
|------------------------------------|---------------|------------------|
| Pressure control (target pressure) | 20            | <5 ... 1000 mbar |

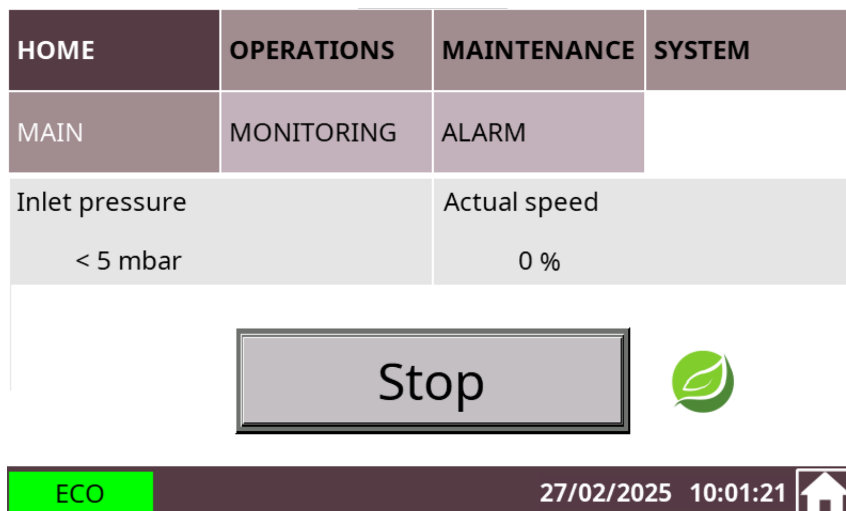
- For smooth process pressure control, it is required to adjust the PID parameters.
- For more information, contact your Busch representative.

**Ecomode (Option - function associated to the Pressure control).**

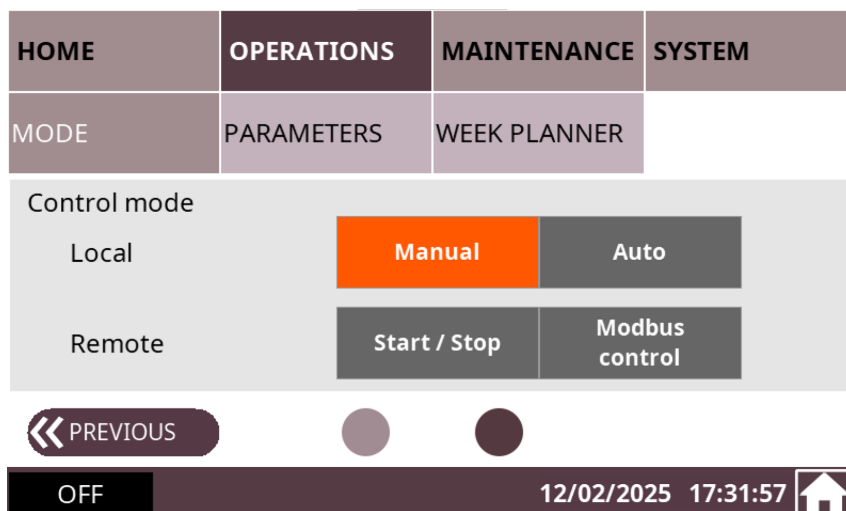
The Ecomode stops the machine when the inlet pressure has reached the preset "ecomode pressure" within a defined time delay and will restart once the inlet pressure exceeds the "restart pressure".

- To activate and set the Ecomode:
  - Press on the Ecomode switch button (password required, see *Roles and Users* [→ 32]).

A green symbol flashes on the HMI as follows indicating that the Ecomode is activated:



The second screen/page of the display "OPERATIONS > MODE" shows the active **Control mode** of the machine.



### 7.1.3.2 Operation Parameters



## NOTICE

**Change parameter values.**

**Risk of damage to the machine!**

- For all the following functions with parameterization, Busch strongly recommends waiting until the end of a pump cycle before changing any parameter value!

The display “OPERATIONS > PARAMETERS” shows the operation parameters.

It is divided into three different screens/pages.

#### Screen/Page PARAMETERS 1

| HOME                                                                      | OPERATIONS | MAINTENANCE                         | SYSTEM |
|---------------------------------------------------------------------------|------------|-------------------------------------|--------|
| MODE                                                                      | PARAMETERS | WEEK PLANNER                        |        |
| Warm-up                                                                   |            | Cool-down                           |        |
| 30 min <input checked="" type="checkbox"/> ON                             |            | 30 min <input type="checkbox"/> OFF |        |
|                                                                           |            |                                     |        |
| <div> <div></div> <div></div> <div></div> <div>NEXT &gt;&gt;</div> </div> |            |                                     |        |
| OFF                                                                       |            | 12/02/2025 17:32:06                 |        |

#### Warm-up and Cool-down\* modes (\*Shutdown/Drying).

The warm-up mode allows the machine to obtain a suitable operating temperature for the process.

The cool-down\* mode (\*shutdown/drying) allows the evacuation of any condensable vapors, refer to chapter *Conveying Condensable Vapors* [→ 47] for conditions to be met.

During these phases, the machine operates at maximum speed, recommended with the gas ballast valve open to warm up and evacuate a maximum of humidity.

The warm-up mode and the cool-down\* mode (\*shutdown/drying) can both be set with a target time (default value = 30 minutes).

- To activate these two modes:
  - Go to “OPERATIONS” > “PARAMETERS”.
  - Press on warm-up and/or cool-down\* (\*shutdown/drying) switch button (password required, see *Roles and Users* [→ 32]).

Screen/Page PARAMETERS 2

|      |            |              |        |
|------|------------|--------------|--------|
| HOME | OPERATIONS | MAINTENANCE  | SYSTEM |
| MODE | PARAMETERS | WEEK PLANNER |        |

Opening delay after pump start-up

Optional inlet valve control

10 s

Open / Closed

OFF

Closing delay before pump shut-down

10 s

PREVIOUS

NEXT

OFF

12/02/2025 17:32:18

Inlet valve control (Option).

This menu allows the control and setting of the opening parameters of an inlet valve installed at the inlet side of the vacuum pump (not included in the scope of delivery of the vacuum pump).

- To activate the optional inlet valve control:
  - Go to “OPERATIONS” > “PARAMETERS”.
  - Go to the second screen/page.
  - Switch the optional inlet valve control on (password required, see *Roles and Users* [→ 32]).

The Opening delay after pump start-up default value is 10 seconds.

- Press to change it.

Once the inlet valve control is enabled, the Open/Closed indicator light switches from black to orange.

 **NOTE**

**This function starts at the end of the warm-up phase of the machine.**

Screen/Page PARAMETERS 3

HOMEOPERATIONSMAINTENANCESYSTEM

MODEPARAMETERSWEEK PLANNER

Dry contact

Time delay

● OFF

Opening delay after pump start-up

10 s

Pressure control

● OFF

Start pressure

20 mbar

On / Off

●

◀◀ PREVIOUS

●

●

●

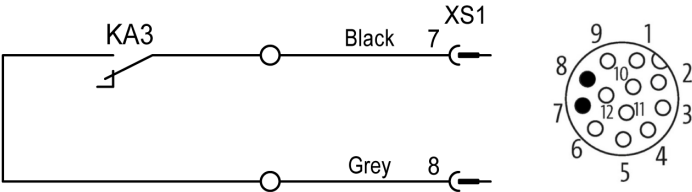
OFF

12/02/2025 17:32:26

🏠

Dry Contact

- M12 connector: Max 30VAC/DC 1.5A
- On terminal: Max 250VAC/DC 10A



- Activation according to the settings of the HMI.

7.1.3.3 Operation Week Planner

The "week planner" function allows definition of a weekly schedule for starting or stopping the machine automatically using the current local settings. A single start and stop a day is possible.

To configure the weekly schedule:

- Go to "OPERATIONS" > "WEEK PLANNER".
- Press on the days when automatic start and stop are required.
- Set up the start and stop times.

HOMEOPERATIONSMAINTENANCESYSTEM

MODEPARAMETERSWEEK PLANNER

| Day       | Start at | Stop at | Day      | Start at | Stop at |
|-----------|----------|---------|----------|----------|---------|
| Monday    | 0 : 0    | 0 : 1   | Thursday | 0 : 0    | 0 : 1   |
| Tuesday   | 0 : 0    | 0 : 1   | Friday   | 0 : 0    | 0 : 1   |
| Wednesday | 0 : 0    | 0 : 1   | Saturday | 0 : 0    | 0 : 1   |
|           |          |         | Sunday   | 0 : 0    | 0 : 1   |

OFF

09/01/2025 11:19:38

🏠

| HOME                                     |          | OPERATIONS          |                                           | MAINTENANCE  |         | SYSTEM |  |
|------------------------------------------|----------|---------------------|-------------------------------------------|--------------|---------|--------|--|
| MODE                                     |          | PARAMETERS          |                                           | WEEK PLANNER |         |        |  |
| Day                                      | Start at | Stop at             | Day                                       | Start at     | Stop at |        |  |
| <input checked="" type="radio"/> Monday  | 6 : 0    | 18 : 0              | <input checked="" type="radio"/> Thursday | 6 : 0        | 23 : 59 |        |  |
| <input checked="" type="radio"/> Tuesday | 6 : 0    | 18 : 0              | <input checked="" type="radio"/> Friday   | 0 : 0        | 18 : 0  |        |  |
| <input type="radio"/> Wednesday          | 0 : 0    | 0 : 1               | <input type="radio"/> Saturday            | 0 : 0        | 0 : 1   |        |  |
|                                          |          |                     | <input type="radio"/> Sunday              | 0 : 0        | 0 : 1   |        |  |
| OFF                                      |          | 09/01/2025 11:21:44 |                                           |              |         |        |  |

As soon as the schedule is filled in, the control mode "Local/Auto" has to be activated (by "Role 2" users only, see *Roles and Users* [→ 32]):

- Go the second screen/page of "OPERATIONS" > "MODE" (see chapter Operation Modes).
- Select the mode "AUTO" in the "LOCAL" field (password required).



## WARNING

**The machine may start without notice.**

**Risk of severe injury!**

As soon as the mode "Local/Auto" is activated:

- Make sure the machine is fully operational when the programmed schedule begins.



## NOTE

**To allow the machine to operate non-stop from one day to the next one, select 23:59 as the stop time on the first day and 00:00 as the start time on the second day.**



## NOTE

**Manual starts and stops.**

**The week planner still allows manual starts and stops.**

### 7.1.4 Maintenance

The display “MAINTENANCE” shows the maintenance and service intervals of the machine.

| HOME                                          | OPERATIONS | MAINTENANCE                                                                                             | SYSTEM |
|-----------------------------------------------|------------|---------------------------------------------------------------------------------------------------------|--------|
| Next oil service<br>8500 h<br>Reset           |            | Oil service interval<br>8500 h<br>Set                                                                   |        |
| Last service:<br>21.11.2024<br>0Running hours |            |                                                                                                         |        |
| Next overhaul<br>34 month(s)<br>Reset         |            | Overhaul interval<br>34 month(s)<br>Set                                                                 |        |
| Last service:<br>21.11.2024<br>0Running hours |            |                                                                                                         |        |
| OFF                                           |            | 21/11/2024 15:21:58  |        |

- Press “Set” to define the “Oil service” and “Overhaul” intervals.
- Press “Reset” to reset the operating hours (running hours) to 0 after an oil change and/or overhaul.

### 7.1.5 System

#### 7.1.5.1 System Settings

The display “SYSTEM > SETTING” allows to set or change system settings.

##### Screen/Page SETTING 1

| HOME                     | OPERATIONS | MAINTENANCE                                                                                               | SYSTEM   |
|--------------------------|------------|-----------------------------------------------------------------------------------------------------------|----------|
| SETTING                  | CONTACT    | MODEL                                                                                                     | ETHERNET |
| Date ><br>12 / 02 / 2025 |            | Language ><br>English                                                                                     |          |
| Time ><br>17 : 35        |            | Units ><br>mbar °C                                                                                        |          |
|                          |            |  NEXT >>               |          |
| OFF                      |            | 12/02/2025 17:35:03  |          |

- To edit the system settings such as date, time, language, and units:
  - Go to “SYSTEM” > “SETTINGS”.
  - Press on the value to change the selected data.

### Screen/Page SETTING 2

| HOME                                                                                                 | OPERATIONS | MAINTENANCE                            | SYSTEM   |
|------------------------------------------------------------------------------------------------------|------------|----------------------------------------|----------|
| SETTING                                                                                              | CONTACT    | MODEL                                  | ETHERNET |
| Vacuum pump model                                                                                    |            | Pressure sensor option                 |          |
| DX 0950 A PLUS                                                                                       |            | ON <input checked="" type="checkbox"/> |          |
| Pressure control settings                                                                            |            | OTTO                                   |          |
| P: 1.00 I: 0.50 D: 0.00                                                                              |            | ON <input checked="" type="checkbox"/> |          |
| <div> <div>« PREVIOUS</div> <div></div> <div></div> <div></div> <div></div> <div>NEXT »</div> </div> |            |                                        |          |
| <div> <div>OFF</div> <div>12/02/2025 17:35:24</div> <div></div> </div>                               |            |                                        |          |

On the second screen/page, it is possible to edit some pump parameters like the pressure control settings (PID) or to activate/deactivate pump functions such as the pressure sensor (Option) or OTTO.

### Screen/Page SETTING 3

| HOME                                                                                                 | OPERATIONS | MAINTENANCE                  | SYSTEM   |
|------------------------------------------------------------------------------------------------------|------------|------------------------------|----------|
| SETTING                                                                                              | CONTACT    | MODEL                        | ETHERNET |
| Pressure sensor type 0-160mbar                                                                       |            | HMI settings access          |          |
| <input type="checkbox"/> OFF                                                                         |            | <input type="checkbox"/> OFF |          |
| <div> <div>« PREVIOUS</div> <div></div> <div></div> <div></div> <div></div> <div>NEXT »</div> </div> |            |                              |          |
| <div> <div>OFF</div> <div>12/02/2025 17:35:34</div> <div></div> </div>                               |            |                              |          |

On the third screen/page, it is possible to access the internal settings of the **HMI** by pressing the button for two seconds.

If a pressure sensor is installed, a 0 ... 160 mbar range is displayed:

- Press "ON" to activate the associated function.

## Screen/Page SETTING 4

| HOME                                               | OPERATIONS | MAINTENANCE                  | SYSTEM   |
|----------------------------------------------------|------------|------------------------------|----------|
| SETTING                                            | CONTACT    | MODEL                        | ETHERNET |
| Pressure sensor disconnected                       |            | Remote access                |          |
| Stop in case of alarm <input type="checkbox"/> OFF |            | <input type="checkbox"/> OFF |          |
|                                                    |            |                              |          |

◀ PREVIOUS

OFF
12/02/2025 17:35:50


On the fourth screen/page, if a pressure sensor is installed, it is possible to activate/deactivate the **pressure sensor disconnection** alarm.

The **Remote access** function allows to take remote control of the HMI using the VNC protocol:

- The VNC protocol is a protocol for remote access to HMI interfaces via a LAN connection (HMI RJ45 port). This protocol uses the IP address of the HMI (192.168.0.100 by default), port 5900 and a password ("adm" by default). A remote viewer such as VNC can also be used.
- For more information, contact your Busch representative.

## 7.1.5.2 Model

### Screen/Page MODEL 1

| HOME             | OPERATIONS | MAINTENANCE       | SYSTEM   |
|------------------|------------|-------------------|----------|
| SETTING          | CONTACT    | MODEL             | ETHERNET |
| Vacuum pump type |            | Vacuum pump model |          |
| COBRA PLUS       |            | DX 0950 A PLUS    |          |
| Software HMI     |            | Software VSD PLC  |          |
| 3.0              |            | 3.0               |          |

● ● **NEXT** >>

**OFF** 12/02/2025 17:39:11 

### Screen/Page MODEL 2

| HOME          | OPERATIONS | MAINTENANCE     | SYSTEM   |
|---------------|------------|-----------------|----------|
| SETTING       | CONTACT    | MODEL           | ETHERNET |
| Serial number |            | IMEI            |          |
| CHM125012545  |            | 864200050719062 |          |
|               |            |                 |          |

<< **PREVIOUS** ● ●

**OFF** 12/02/2025 17:39:28 

The "SYSTEM > MODEL" display provides the following information.

On screen/page 1:

- Type and model of vacuum pump,
- Version of HMI software,
- Version of the VSD PLC software.

On screen/page 2:

- Serial number of the vacuum pump,
- IMEI of the OTTO IoT Box if the vacuum pump is equipped with this option.

### 7.1.5.3 Ethernet Settings

- To configure the ethernet settings according to your network:
  - Go to "SYSTEM" > "ETHERNET".

| HOME    | OPERATIONS | MAINTENANCE | SYSTEM   |
|---------|------------|-------------|----------|
| SETTING | CONTACT    | MODEL       | ETHERNET |

Ethernet settings  
 Current IP address  
 192 . 168 . 0 . 100  
 Current subnet mask  
 255 . 255 . 255 . 0  
 Current gateway  
 192 . 168 . 0 . 1

Change settings ☐ OFF  
 New IP address  
 192 . 168 . 0 . 100  
 New subnet mask  
 255 . 255 . 255 . 0  
 New gateway  
 192 . 168 . 0 . 1

OFF

12/02/2025 17:39:37 

- Change the values on the right side of the screen (Change settings).
- Press on the switch button to save the new settings.

#### NOTE

The current Ethernet values are displayed in the left side of the screen (Ethernet settings).

To change these values, it is necessary to fill in all the fields in the right side of the screen (Change settings) before applying the changes by pressing on the switch button:

- New IP address
  - New subnet mask
  - New gateway
- To change the Ethernet settings, it is recommended to connect the vacuum pump with the desired equipment beforehand via the Ethernet port available on the right side of the control cabinet (LAN - see illustration in the chapter "Product Description" of the instruction manual of the vacuum pump).

The default ethernet settings are the following:

| Description  | Default value               |
|--------------|-----------------------------|
| IP address   | 192.168.0.100               |
| Subnet mask  | 255.255.255.0               |
| Gateway      | 192.168.0.1                 |
| Port no.     | 502 (cannot be changed)     |
| Slave ID no. | 1-255 (all are functioning) |

For more information:

- See *Modbus Control and Ethernet Settings* [→ 28].

## 7.2 Conveying Condensable Vapors



### CAUTION

**Venting the machine.**

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

**Risk of burns!**

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

Observe the following when conveying condensable vapors, e.g. water vapors:

#### START

- Close the isolation valve\*
- Start the machine
- Warm up the machine for 30 minutes (WARM-UP MODE)
- Open the isolation valve\* and perform the process
- Close the isolation valve\*
- Dry the machine (COOL-DOWN\*\* MODE)
- Wait 30 minutes
- Stop the machine

#### END

\* Not included in the scope of delivery.

\*\* (Shutdown/Drying)

- Ensure that the barrier gas system\* (dry compressed air) is connected. Check the volume flow on the barrier gas flow meter (BGF), see *Barrier Gas System Connection (Optional)* [→ 20].

\* option

- Make sure that the air gas ballast\* (GB) is mounted and open. If the gas ballast filter is dirty, it must be cleaned periodically (unscrew and wash out).

\* option

- Make sure that the electro-pneumatic inlet valve\* (dry compressed air) is connected. Reminder: the default position of the electro-pneumatic inlet valve is "normally closed" (no air).

\*option

- Make sure that no liquid can enter the machine via the silencer on the pressure side. Install pipes connected on the outlet side with a gradient away from the vacuum pump. In the case of rising exhaust pipes, provide a condensate trap (e.g. "dead leg") with drain.
- Water vapor within the gas flow is tolerated within certain limits. The conveyance of other vapors shall be agreed upon with Busch.

## 8 Maintenance



### DANGER

**Live wires.**

**Risk of electrical shock!**

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



### DANGER

**Maintenance work without disconnecting the variable speed drive.**

**Risk of electrical shock!**

- Disconnect and isolate the variable speed drive before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after disconnection of the electrical supply.
- Always ensure by using a suitable multimeter that no voltage is present on any drive power terminals prior to commencing any work.



### DANGER

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

**Risk of electrical shock!**

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



### WARNING



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

**Risk of poisoning!**

**Risk of infection!**

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.



### CAUTION

**Hot surface.**

**Risk of burns!**

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



## CAUTION

**Hot liquids.**

**Risk of burns!**

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



## CAUTION

**Failing to properly maintain the machine.**

**Risk of injuries!**

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

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



## NOTICE

**Using inappropriate cleaners.**

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

- Do not use incompatible solvents to clean the machine.

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

If the machine is equipped with an electro-pneumatic inlet valve:

- Close the electro-pneumatic inlet valve supply.

If the machine is equipped with a barrier gas system:

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

If necessary:

- Disconnect all connections.

## 8.1 Maintenance Schedule

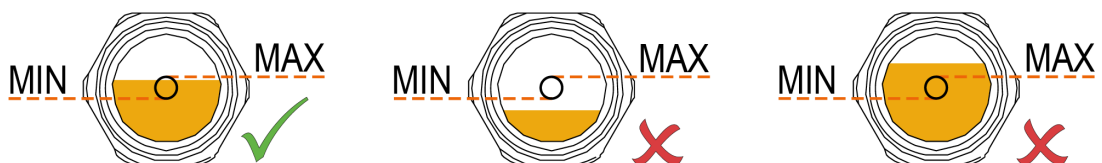
The maintenance intervals depend very much on the individual operating conditions. The intervals given below are considered as starting values which should be individually shortened or extended as appropriate.

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

| Interval                                                     | Maintenance work                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Monthly                                                      | <ul style="list-style-type: none"> <li>Check the oil level, see <i>Oil Level Inspection</i> [→ 50].</li> <li>Check the cooling liquid level, see <i>Cooling Liquid Level Inspection</i> [→ 51].</li> <li>Check the machine for oil leaks. In case of leaks, have the machine repaired (Contact Busch).</li> </ul>                                                                                                                                                                                |
| Yearly                                                       | <ul style="list-style-type: none"> <li>Carry out a visual inspection and clean the machine from dust and dirt.</li> <li>Check the electrical connections and the monitoring devices.</li> </ul>                                                                                                                                                                                                                                                                                                  |
| Yearly<br>If one or more of these accessories are installed. | <ul style="list-style-type: none"> <li>Check the filter of the gas ballast valve (GB) and clean it if necessary, see <i>Cleaning the Gas Ballast Filter (Optional)</i> [→ 51].</li> <li>Check the silencer (SI) and clean it if necessary, see <i>Cleaning the Silencer (Optional)</i> [→ 52].</li> <li>Check the inlet valve and clean it if necessary.</li> <li>If the inlet is equipped with a mesh screen, check the condition of the mesh screen, clean or replace if necessary.</li> </ul> |
| Every 8500 hours or after 1 year                             | <ul style="list-style-type: none"> <li>Change the oil of the gear and bearing housings (both sides), see <i>Oil Change</i> [→ 52].</li> <li>Change the cooling liquid, see <i>Cooling Liquid Change</i> [→ 55].</li> <li>Clean the magnetic plugs (MP).</li> </ul>                                                                                                                                                                                                                               |
| Every 25000 hours or after 4 years                           | <ul style="list-style-type: none"> <li>Have a major overhaul on the machine (contact Busch).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                          |

## 8.2 Oil Level Inspection

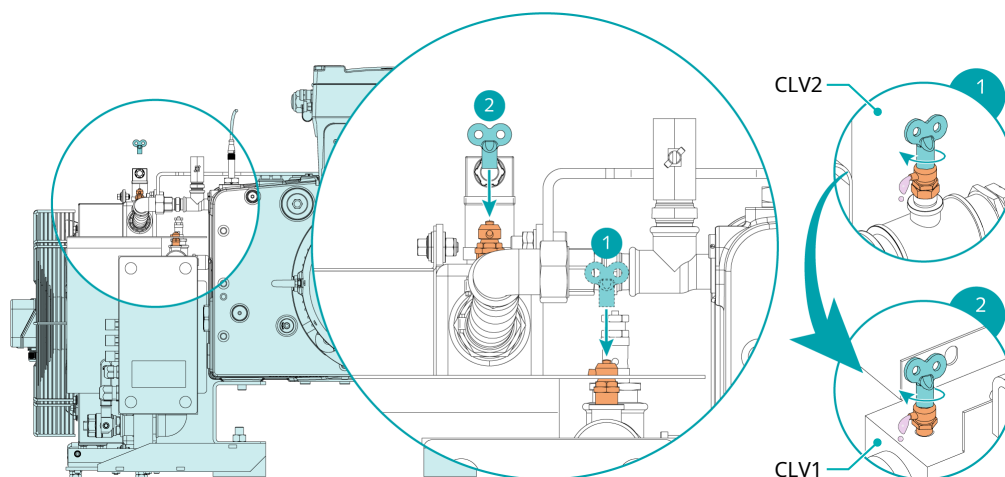
- Stop the machine.
- Wait 1 minute.
- Check the oil level.



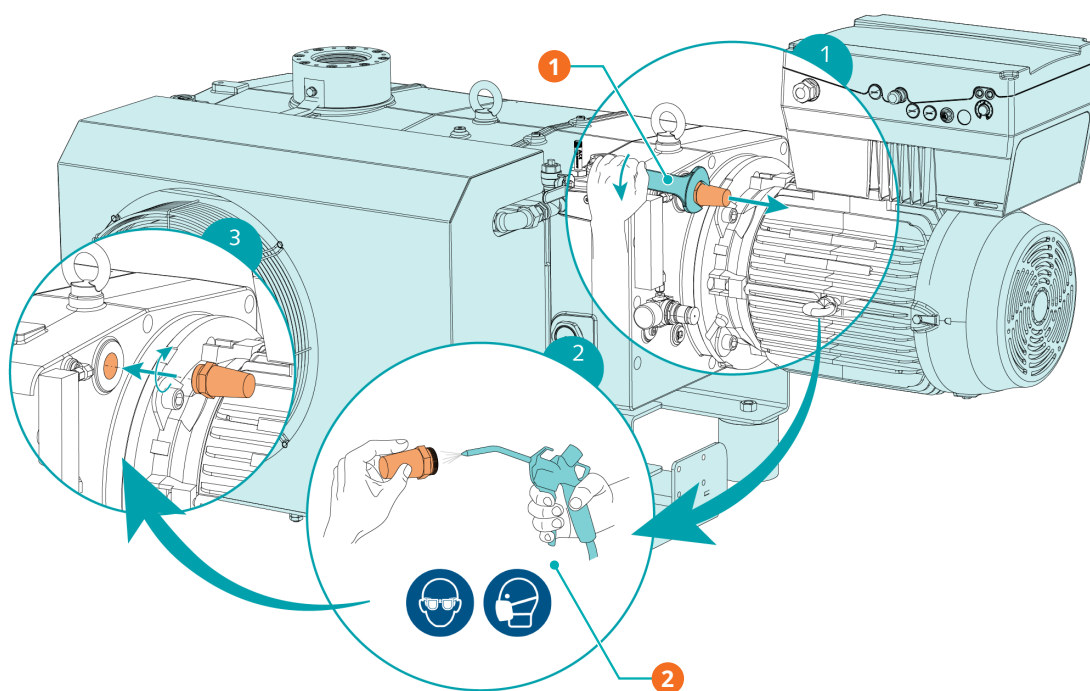
- Fill up if necessary, see *Filling Oil* [→ 22].

## 8.3 Cooling Liquid Level Inspection

- Stop the machine.
- Let the machine cool down.
- Open the cooling liquid vent valves (CLV1 – CLV2).
- Fill up if necessary, see *Filling Cooling Liquid* [→ 24].
- Close the cooling liquid vent valves (CLV1 – CLV2) in the following order when the cooling liquid is spilling out.



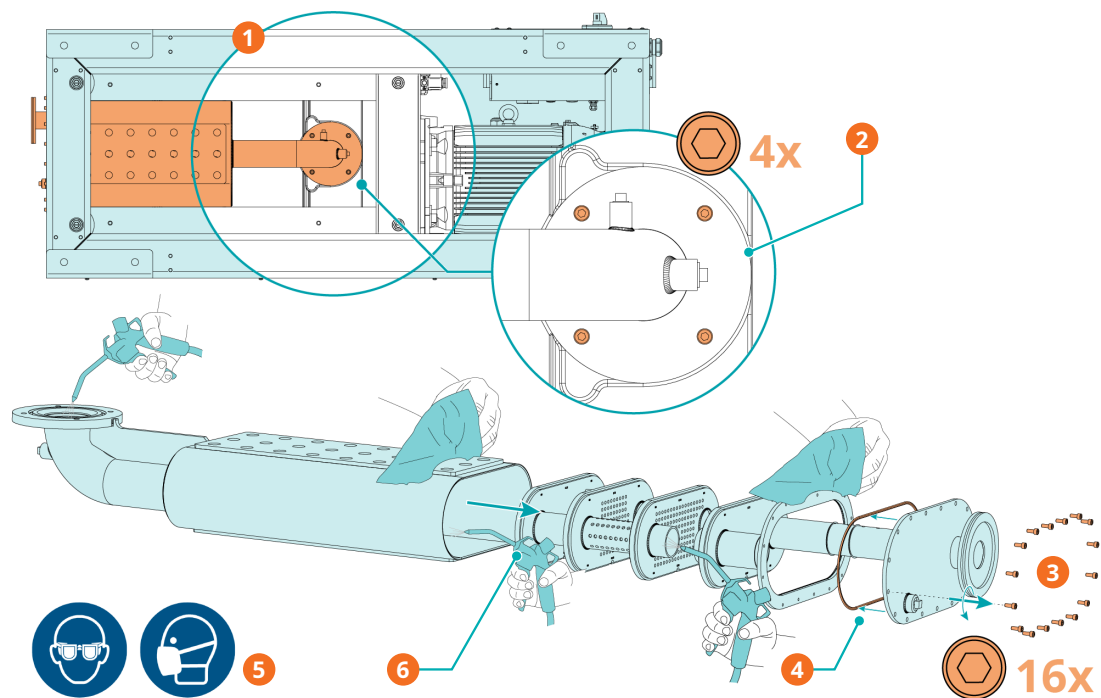
## 8.4 Cleaning the Gas Ballast Filter (Optional)



### Description

|   |                    |   |                                                         |
|---|--------------------|---|---------------------------------------------------------|
| 1 | Use a 36 mm wrench | 2 | Use compressed air and wear protective eyewear and mask |
|---|--------------------|---|---------------------------------------------------------|

## 8.5 Cleaning the Silencer (Optional)



| Description |                                                             |   |                                                                                         |
|-------------|-------------------------------------------------------------|---|-----------------------------------------------------------------------------------------|
| 1           | Bottom view of the machine                                  | 2 | Unscrew the 4 hexagonal screws to remove the silencer                                   |
| 3           | Unscrew the 16 hexagonal screws to disassemble the silencer | 4 | Be careful with the gasket, clean it with a clean cloth                                 |
| 5           | Wear protective eyewear and mask                            | 6 | Use compressed air and cleaning clothes to clean the inside and outside of the silencer |

## 8.6 Oil Change

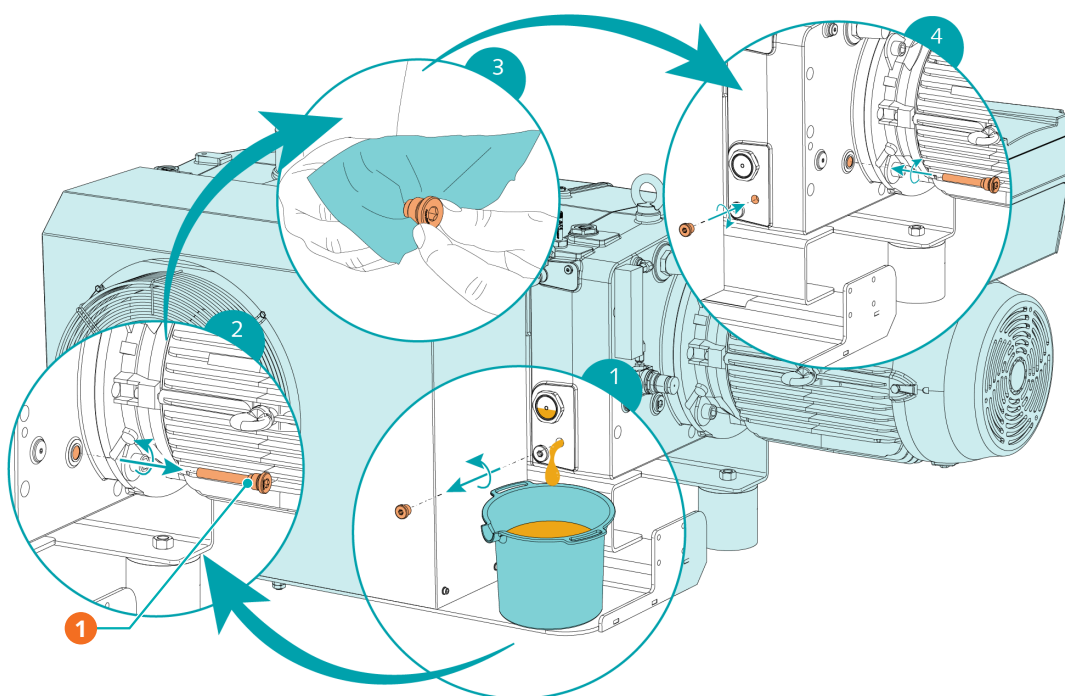
### NOTICE

**Use of inappropriate oil.**

**Risk of premature failure!**

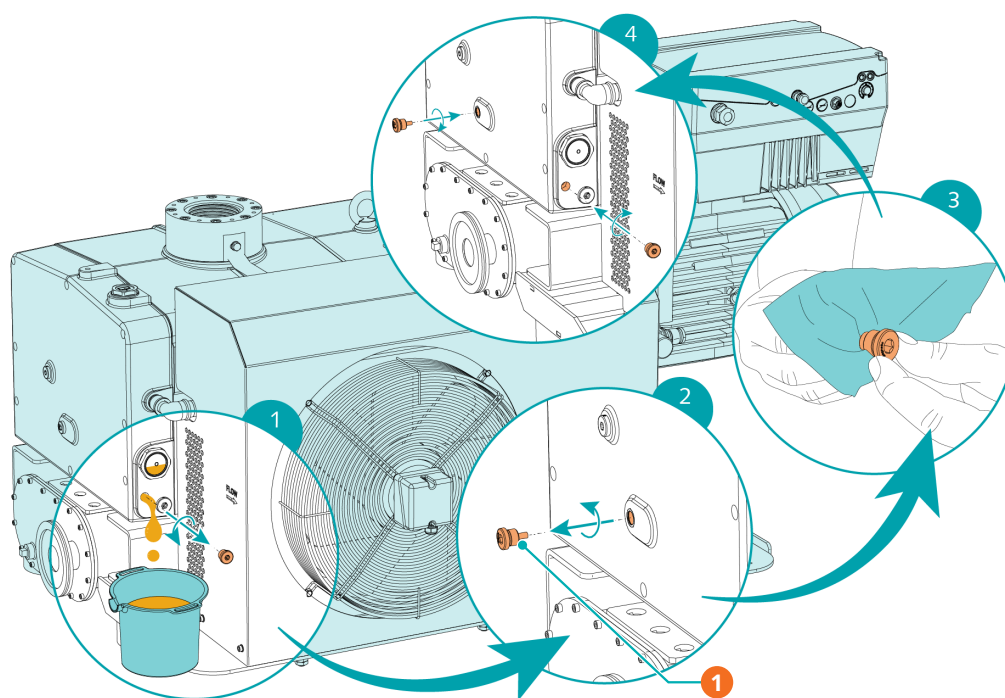
**Loss of efficiency!**

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



### Description

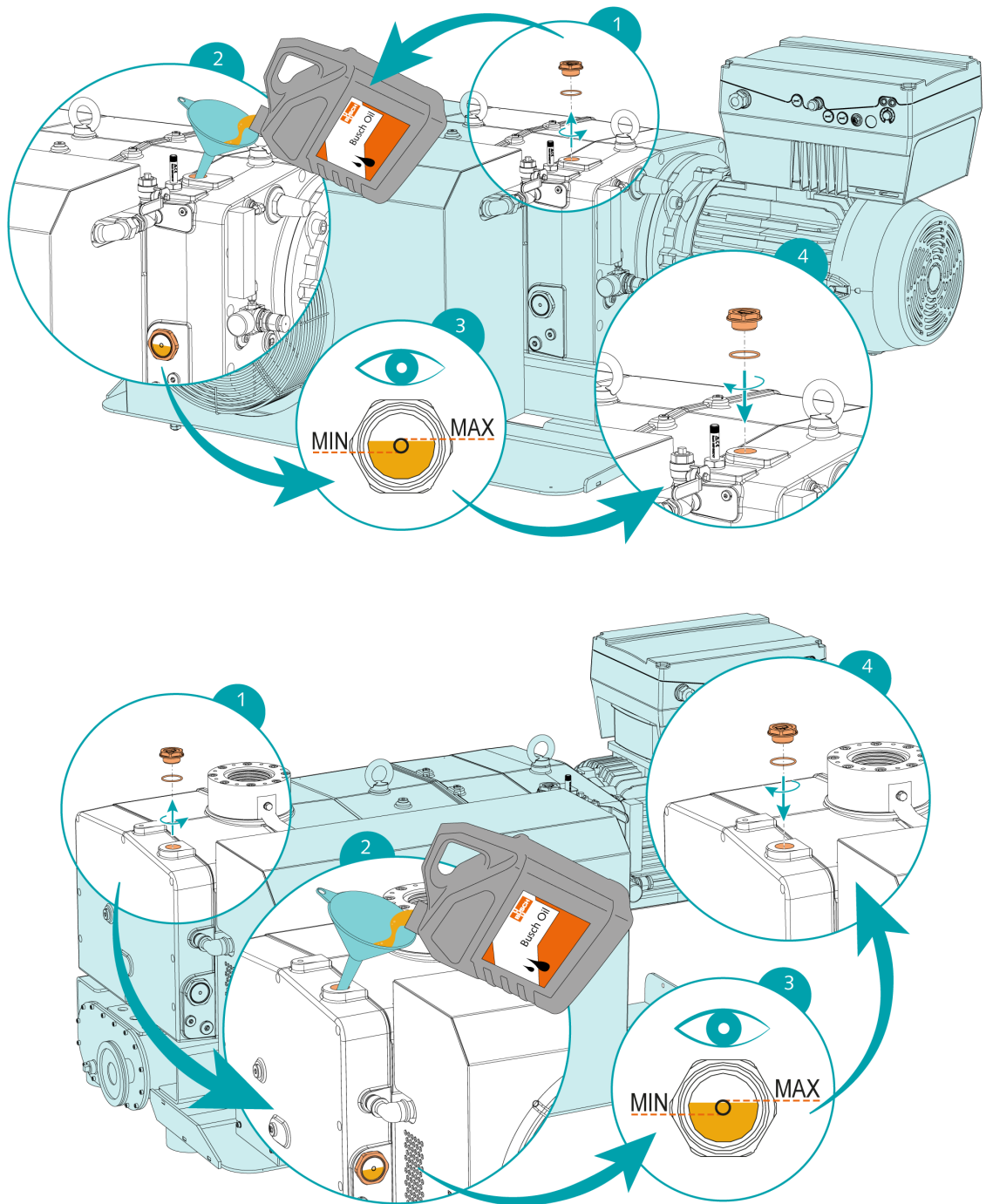
|   |               |  |  |
|---|---------------|--|--|
| 1 | Magnetic plug |  |  |
|---|---------------|--|--|



### Description

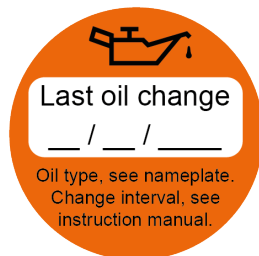
|   |               |  |  |
|---|---------------|--|--|
| 1 | Magnetic plug |  |  |
|---|---------------|--|--|

For oil type and oil capacity see Technical Data and Oil [→ 62] chapters.



When the oil filling is achieved:

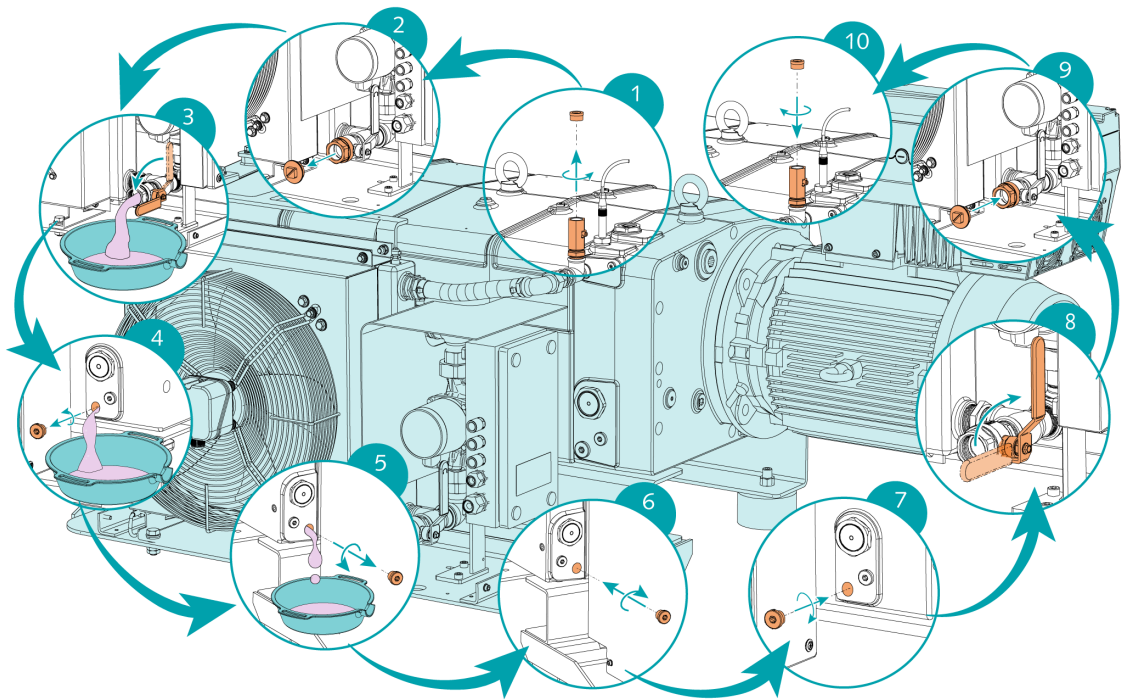
- Write down the oil change date on the sticker.



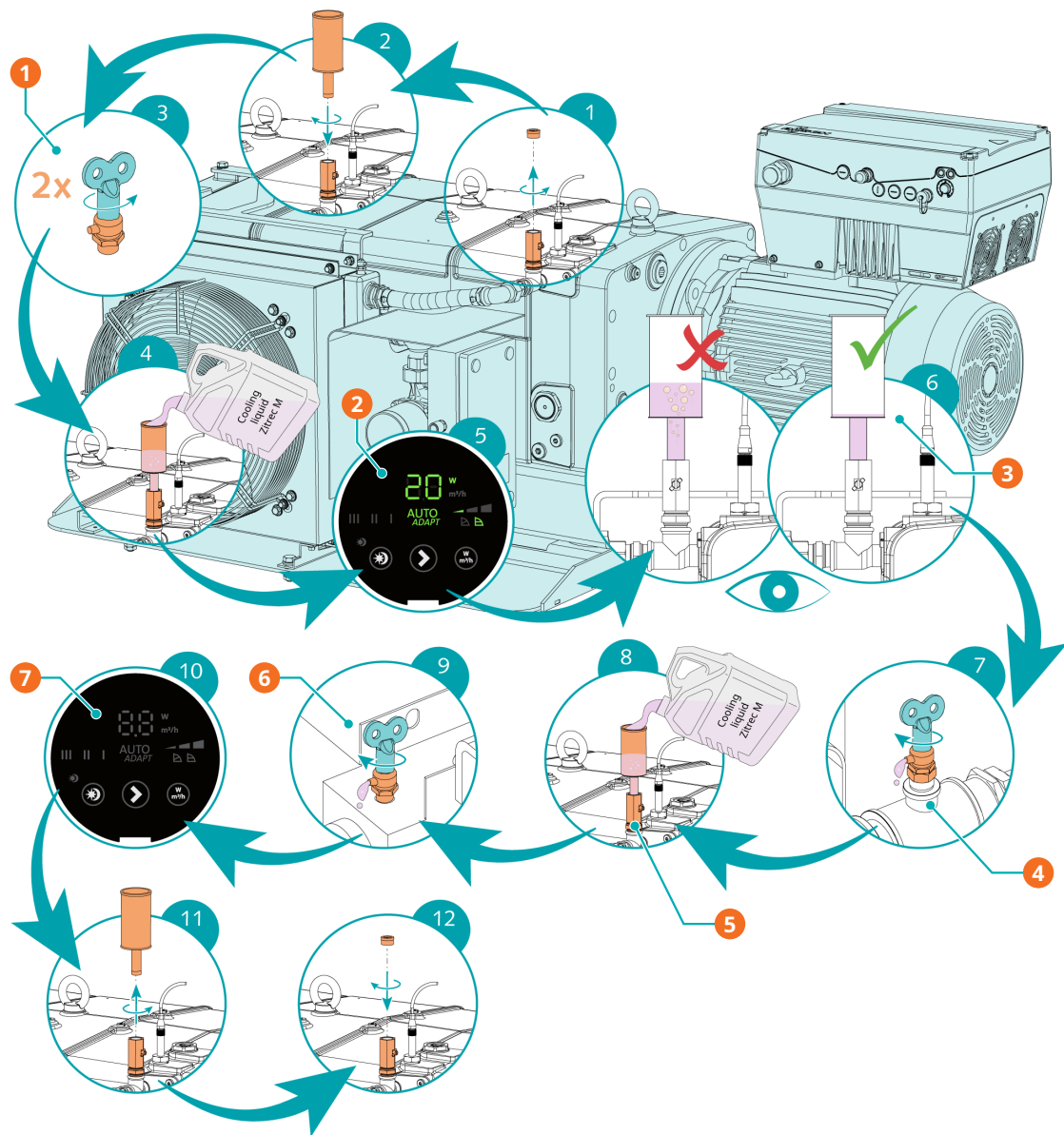
If there is no sticker (part no. 0565 568 959) on the machine:

- Order it from your Busch representative.

## 8.7 Cooling Liquid Change



For cooling liquid type and cooling liquid capacity see Technical Data and *Cooling Liquid* [→ 63].



| Description |                                                          |   |                                                                                            |
|-------------|----------------------------------------------------------|---|--------------------------------------------------------------------------------------------|
| 1           | Step 3: Open the cooling liquid vent valves (CLV1, CLV2) | 2 | Step 5: Switch on the cooling liquid pump (CLP)                                            |
| 3           | Step 6: Vent air from the cooling system                 | 4 | Step 7: Close the cooling liquid vent valve (CLV2) when the cooling liquid is spilling out |
| 5           | Step 8: Resume cooling liquid filling                    | 6 | Step 9: Close the cooling liquid vent valve (CLV1) when the cooling liquid is spilling out |
| 7           | Step 10: Switch off the cooling liquid pump (CLP)        |   |                                                                                            |

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

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

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

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

## 10 Decommissioning



### DANGER

**Live wires.**

**Risk of electrical shock!**

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



### CAUTION

**Hot surface.**

**Risk of burns!**

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



### CAUTION

**Hot liquids.**

**Risk of burns!**

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

- Stop the machine and lock it to prevent accidental start-up.
- Disconnect the power supply.

If the machine is equipped with an electro-pneumatic inlet valve:

- Close the electro-pneumatic inlet valve supply.

If the machine is equipped with a barrier gas system:

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

If the machine is to be stored:

- See *Storage* [→ 16].

### 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 Troubleshooting



## DANGER

**Live wires.**

**Risk of electrical shock!**

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



## CAUTION

**Hot surface.**

**Risk of burns!**

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



## CAUTION

**Hot liquids.**

**Risk of burns!**

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

| Problem                       | Possible Cause                                                    | Remedy                                                                                                                                                                                                 |
|-------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Alarm buzzer is on.           | Alarm from monitoring sensors or electric drive.                  | <ul style="list-style-type: none"> <li>• Check details of the alarm on the HMI Touch Screen (buttons "Current alarm" and "History alarm", click on the highlighted alarm for more details).</li> </ul> |
| Alarm cannot be acknowledged. | Alarm not identified.                                             | <ul style="list-style-type: none"> <li>• Perform a "Hard-reset" by switching off the machine's power supply - the alarm will be deleted.</li> </ul>                                                    |
| The machine does not start.   | The machine is not supplied with the correct voltage.             | <ul style="list-style-type: none"> <li>• Check the power supply.</li> </ul>                                                                                                                            |
|                               | The rotors are jammed or seized.                                  | <ul style="list-style-type: none"> <li>• Rotors inspection or repair the machine (contact Busch).</li> </ul>                                                                                           |
|                               | Solid foreign matter has entered the machine.                     | <ul style="list-style-type: none"> <li>• Remove the solid foreign matter or repair the machine (contact Busch).</li> </ul>                                                                             |
|                               | Alarm trip of the monitoring sensors or the variable speed drive. | <ul style="list-style-type: none"> <li>• Let the machine cool down.</li> <li>• Check the alarm notifications on the HMI Touch Screen.</li> </ul>                                                       |
|                               | The motor is defective.                                           | <ul style="list-style-type: none"> <li>• Replace the motor.</li> </ul>                                                                                                                                 |

| Problem                                                                | Possible Cause                                                     | Remedy                                                                                                                                                                                                                    |
|------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The machine does not reach the usual pressure at the inlet connection. | Suction or discharge lines too long or section diameter too small. | <ul style="list-style-type: none"> <li>• Use larger diameter or shorter lines.</li> <li>• Seek advice from your local Busch representative.</li> </ul>                                                                    |
|                                                                        | The motor runs in the wrong direction.                             | <ul style="list-style-type: none"> <li>• Check the direction of rotation, see <i>Direction of Rotation</i>.</li> </ul>                                                                                                    |
|                                                                        | Internal parts are worn or damaged.                                | <ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>                                                                                                                                   |
| The machine runs very noisily.                                         | Wrong oil quantity or unsuitable oil type.                         | <ul style="list-style-type: none"> <li>• Use one of the recommended oils in the correct quantity, see <i>Oil</i> [→ 62].</li> </ul>                                                                                       |
|                                                                        | Defective gears, bearings or coupling element.                     | <ul style="list-style-type: none"> <li>• Repair machine (contact Busch).</li> </ul>                                                                                                                                       |
| The machine makes a strange noise.                                     | Air bubbles are present in the cooling system.                     | <ul style="list-style-type: none"> <li>• Vent air from the cooling system, see <i>Filling Cooling Liquid</i> [→ 24].</li> <li>• Check that the cooling liquid pump (CLP) is running at speed 1 (approx. 20 W).</li> </ul> |
| The machine runs too hot.                                              | Ambient temperature too high.                                      | <ul style="list-style-type: none"> <li>• Observe the permitted ambient temperature, see <i>Technical Data</i>.</li> </ul>                                                                                                 |
|                                                                        | Temperature of the process gases at the inlet too high.            | <ul style="list-style-type: none"> <li>• Observe the permitted gas inlet temperature, see <i>Technical Data</i>.</li> </ul>                                                                                               |
|                                                                        | The cooling liquid pump is defective.                              | <ul style="list-style-type: none"> <li>• Repair the machine.</li> </ul>                                                                                                                                                   |
|                                                                        | Oil level too low.                                                 | <ul style="list-style-type: none"> <li>• Top up oil.</li> </ul>                                                                                                                                                           |
|                                                                        | Cooling liquid level too low.                                      | <ul style="list-style-type: none"> <li>• Top up cooling liquid.</li> </ul>                                                                                                                                                |
| The oil is black.                                                      | Oil change intervals are too long.                                 | <ul style="list-style-type: none"> <li>• Drain the oil and fill in new oil, see <i>Oil Change</i> [→ 52].</li> </ul>                                                                                                      |
|                                                                        | The machine runs too hot.                                          | <ul style="list-style-type: none"> <li>• See problem "The machine runs too hot".</li> </ul>                                                                                                                               |

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

## 12 Technical Data

|                                                                         |                   | DX 0650 A PLUS             | DX 0950 A PLUS        |
|-------------------------------------------------------------------------|-------------------|----------------------------|-----------------------|
| Pumping speed                                                           | m <sup>3</sup> /h | 650                        | 950                   |
| Ultimate pressure without gas ballast                                   | hPa (mbar) abs.   | ≤ 0.1                      | ≤ 0.01                |
| Ultimate pressure with gas ballast                                      | hPa (mbar) abs.   | ≤ 0.5                      | ≤ 0.05                |
| Nominal motor rating                                                    | kW                | 15 (50 Hz)                 | 18.5                  |
| Nominal motor speed                                                     | min <sup>-1</sup> | 3000 (50 Hz)               | 4320 (72 Hz)          |
| Maximum intensity                                                       | A                 | 28                         | 42                    |
| Circuit breaker (MCCB) *                                                | A                 | 60 (SCCR 10kA @ 400V)      | 80 (SCCR 10kA @ 400V) |
| Sound pressure level (ISO 2151)<br>KpA = 3 dB                           | dB(A)             | ≤ 67                       | ≤ 75                  |
| Ambient temperature range                                               | °C                | 5 ... 40                   |                       |
| Maximum allowable counter pressure at discharge                         | hPa (mbar) rel.   | 200                        |                       |
| Maximum allowable gas inlet temperature according to the inlet pressure | °C                | ≤ 50 hPa (mbar) abs. : 200 |                       |
|                                                                         |                   | > 50 hPa (mbar) abs. : 70  |                       |
| Ambient relative humidity                                               | at 30°C           | 90 %                       |                       |
| Ambient pressure                                                        |                   | Atmospheric pressure       |                       |
| Cooling liquid capacity approx.                                         | l                 | 47                         |                       |
| Oil capacity - Motor side                                               | l                 | 1.0                        |                       |
| Oil capacity - Inlet side                                               | l                 | 1.0                        |                       |
| Dimensions (L x W x H)                                                  | mm                | 1700 x 982 x 1020          |                       |
| Weight approx.                                                          | kg                | 1125                       |                       |



### WARNING

\* Circuit breaker (MCCB)

**Not included in the scope of delivery!**

- Line protection must be provided at the customer's site.
- For voltages above 460V, contact your Busch representative.

## 13 Oil

| VSC 100                    |              |
|----------------------------|--------------|
| ISO-VG                     | 100          |
| Oil type                   | Synthetic    |
| Part number 1 L packaging  | 0831 168 356 |
| Part number 5 L packaging  | 0831 168 357 |
| Part number 10 L packaging | 0831 210 162 |
| Part number 20 L packaging | 0831 168 359 |

### Oil suitability

- **Oil VSC 100:** Suitable for harsh applications.

## 14 Cooling Liquid

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

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

# 15 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 is determined by the serial number:

Serial number starts with **CHM1...**

**Ateliers Busch S.A.**  
**Zone industrielle**  
**2906 Chevenez**  
**Switzerland**

Serial number starts with **KRM1...**

**Busch Manufacturing Korea, Ltd.**  
**189-51, Soicheon-ro, Majang-myun**  
**Icheon-si, Gyunggi-do, 467-813**  
**Republic of Korea**

declares that the machine: COBRA DX 0650 A PLUS; COBRA DX 0950 A PLUS

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

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

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

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

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

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

Chevenez, 19.12.2023

Icheon-si, 19.12.2023



**Christian Hoffmann**  
**General Manager**  
**Ateliers Busch S.A.**



**Jaihong Kim**  
**General Manager**  
**Busch Manufacturing Korea, Ltd**

# 16 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 is determined by the serial number:

Serial number starts with **CHM1...**

**Ateliers Busch S.A.**  
**Zone industrielle**  
**2906 Chevenez**  
**Switzerland**

Serial number starts with **KRM1...**

**Busch Manufacturing Korea, Ltd.**  
**189-51, Soicheon-ro, Majang-myun**  
**Icheon-si, Gyunggi-do, 467-813**  
**Republic of Korea**

declares that the machine: COBRA DX 0650 A PLUS; COBRA DX 0950 A PLUS

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

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

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

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

Legal person authorized to compile the technical file and importer in the UK (if the manufacturer is not located in the UK): **Busch (UK) Ltd**  
**30 Hortonwood**  
**Telford - UK**

Chevenez, 19.12.2023



**Christian Hoffmann**  
**General Manager**  
**Ateliers Busch S.A.**

Icheon-si, 19.12.2023



**Jeihong Kim**  
**General Manager**  
**Busch Manufacturing Korea, Ltd**

## Notes

Grid of dots for notes.

# BUSCH GROUP

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



● Busch Group companies

▲ Busch Group production sites

● Busch Group service centers

■ Busch Group local representatives

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

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