VACUUM SOLUTIONS

Part of the BUSCH GROUP

MINK

Claw Vacuum Pumps
MV 0040 E ECOTORQUE
MV 0060 E ECOTORQUE
MV 0080 E ECOTORQUE

Instruction Manual



SERVICE
AND SPARE PARTS, INSTRUCTION MANUALS ...
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1 Safety

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

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

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

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

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

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

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



DANGER

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



WARNING

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



CAUTION

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



NOTICE

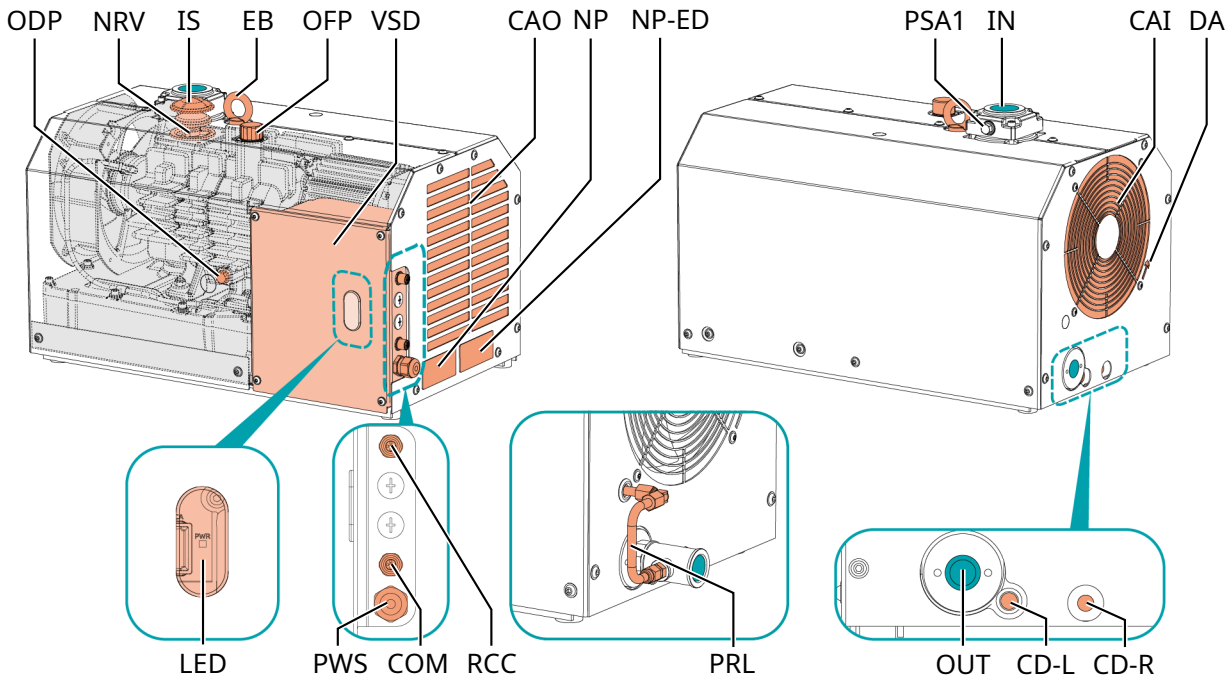
... indicates a potentially dangerous situation that could result in damage to property.



NOTE

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

2 Product Description



Description			
IN	Inlet connection	OUT	Exhaust connection
OFP	Oil fill plug / venting valve	ODP	Oil drain plug (under the cover)
IS	Inlet screen (integrated)	NRV	Non-return valve (integrated)
CAI	Cooling air inlet (active cooling fan)	CAO	Cooling air outlet
EB	Eye bolt	DA	Directional arrow
VSD	Variable speed drive	LED	Function indicator
COM	Communication I/O port (M12) 'A-coded'	RCC (optional)	Remote control connection (M12) 'A-coded'
PWS	Power supply	PRL (optional)	Pressure relief line (gas leakage optimized version)
CD-L (optional)	Condensate drain left (aqua version)	CD-R (optional)	Condensate drain right (aqua version)
NP	Name plate	NP-ED	Name plate electrical data
PSA1 (optional)	Pressure transmitter (for OTTO IoT Box)	PSA2 (optional)	Pressure transmitter for pressure control (not shown)

NOTE

Technical term.

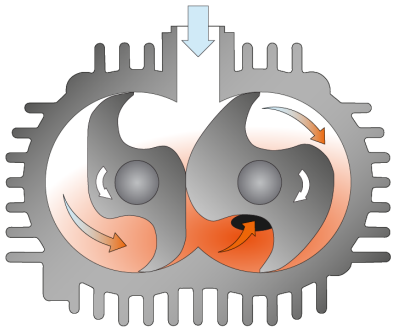
In this instruction manual, we consider that the term 'machine' refers to the 'vacuum pump'.

NOTE

Illustrations.

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

2.1 Operating Principle



The machine works on the claw principle.

The MINK is fully air-cooled thanks to an electrical fan.

In order to avoid solids from entering, the machine is equipped with an inlet screen (IS).

Inlet screen (IS):

- See *Cleaning from Dust and Dirt* [➔ 27]
- See *Troubleshooting* [➔ 33]

In order to avoid reverse rotation after switching off, the machine is equipped with a non-return valve (NRV).

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.
- Make sure to operate the machine only when all provided covers, guards, hoods, etc. are mounted.
- Entanglement prevention: Do not wear loose clothing and long hair must be tied back securely before operating the machine.

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

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

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

The machine is 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* [➔ 40].

The machine is suitable for continuous operation.

Note: The non-return valve (NRV) shouldn't be used as a non-return valve or isolation valve for the system. The non-return valve is only to protect the machine.

If the machine needs to be maintained after shutdown:

- Provide an additional manual or automatic operated non-return valve in the suction line.

Permitted environmental conditions, see *Technical Data* [➔ 40].

2.3 Design Options

The design options described in the following chapters might be combined.

Please refer to the nameplate (NP) to identify the corresponding design option of your machine.

Design option	Codification	Example
Standard (no design option)	0	MV 0080 E 0**0**
Aqua version	A	MV 0080 E 0**A**
Gas leakage optimized version	L	MV 0080 E 0**L**
ATEX version *	E	MV 0080 E 0**E**

* ATEX-version machines have a separate dedicated 'ATEX Instruction Manual' document.

2.3.1 Aqua Version

This machine is specifically equipped with:

- corrosion protection coating
- an internal condensate return
- two condensate drains

2.3.2 ATEX Version

Please refer to the specific MINK ATEX Instruction Manual part no.: **2000 309 385**

2.3.3 Gas Leakage Optimized Version



WARNING



Media potentially dangerous.

Risk of poisoning!

Risk of infection!

- Wear appropriate personal protective equipment in case of high concentration of the medium in the ambient atmosphere of the machine.

NOTE: This design option reduces gas leakages from the pump stage into the environment as well as from the environment into the pump stage.

This option is not a gas tight design!

The gas leakage optimized version is a design option for applications where the process gas should remain in the machine as long as possible.

This is an important feature for applications where the process gas is run in a closed circuit without significant back pressure at the exhaust connection (OUT). It minimizes leakage of the process gas into the environment and contamination of the process gas by the ambient atmosphere.

This machine is specifically equipped with:

- pipe work with collecting line from holes for atmospheric ventilation to the exhaust connection (OUT)

Requirements for a proper functioning:

Ambient pressure	The gas leakage optimized machine allows a pressure at the gas exhaust connection (OUT) of +/-50 mbar (g) in relation to the ambient pressure over the entire operating range.
Leakage rate	The gas leakage rate of the machine cannot be stated due to different possible run speeds and the applied back pressure and the condition of all involved sealings. Thermal, electrical or mechanical overloading of the entire machine by increasing the back pressure at the exhaust connection (OUT) is not permitted and can lead to damages.
Ambient environment	Closed air cooling systems are not suitable and therefore prohibited. • Make sure that the machine is sufficiently vented (see *Installation Conditions* [➔ 12]).

2.4 Standard Features

2.4.1 ECOTORQUE Variable Speed Drive

The machine is equipped with an ECOTORQUE Variable Speed Drive (VSD).

The ECOTORQUE Variable Speed Drive (VSD) regulates the pumping speed of the machine and saves energy. For more information contact your Busch representative.

NOTICE

ECOTORQUE Variable Speed Drive (VSD) should primarily be controlled using Busch Vacuum Manager software, available at *www.buschvacuum.com* (free of charge).

Any changes to parameters outside of those done by Busch or certified representatives, particularly if made using methods other than the Busch Vacuum Manager software, which result in damage or malfunction of the ECOTORQUE Variable Speed Drive (VSD) or the machine, are not covered under the product warranty or liability.

The following parameters of ECOTORQUE VSD can be controlled:

1. Speed- / Pressure control
2. Auto / Manual START/STOP
3. Preset speed
4. Inlet pressure target setpoint
5. Ecomode
6. Regulation gains
7. Relais output settings and delays
8. Ramp time ‘Acceleration / Deceleration’

2.5 Optional Accessories

2.5.1 Communication Cable

In order to select between speed- or pressure control, using the **Busch Vacuum Manager** software, an M12 - USB communication cable is required for connection to a computer.

– Art. no. 0987 208 730 : M12 - USB Communicable cable

2.5.2 Inlet Filter

The inlet filter protects the machine against dust and other solids in the process gas. The inlet filter is available with a paper or polyester cartridge.

2.5.3 Condensate Drain

Aqua version only

The optional ball valve (CD) is recommended to drain condensate from the silencer.
NOTE: Set of 2 units are required.

2.5.4 Remote Control Package

Remote control package (RCC) with an M12 female connector on the machine for customer-sided digital START/STOP-signal.

A 5 m customer cable with M12 male connector is within the delivery scope.

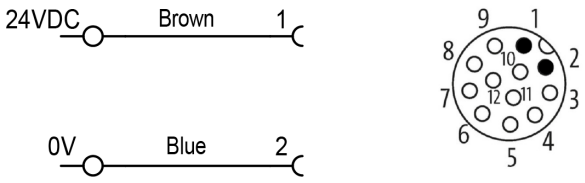
2.5.5 I/O and Communication Port

If the “Remote control package” option is selected:

The machine is equipped with a M12 I/O port that allows remote control and monitoring of the machine.

Power Supply

- 24V DC power supply - Max 40 mA



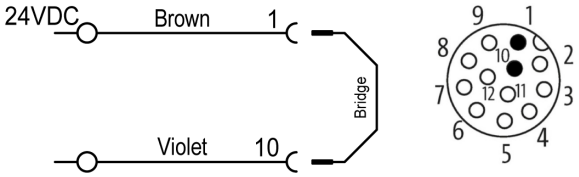
Remote Pump START/STOP

CAUTION

The machine will start immediately when power is supplied.

Risk of inadvertent start-up!

- Make sure that a start-up will not lead to a dangerous situation.



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

NOTE

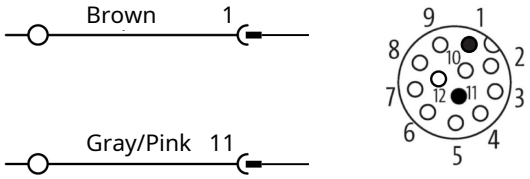
In case of a remote-control start, the machine must be integrated in the user's safety chain (signal warning the user to stop the machine in case of problem or emergency stop).

NOTE

According to the standard factory setting, there is a bridge inside the variable speed drive (VSD).

- Remove the bridge and connect to “Remote pump start” according to the wiring diagram delivered with the machine.

Reset Fault



It allows resetting remotely faults from the ECOTORQUE Variable Speed Drive (VSD) in case of alarm. Using a toggle switch is recommended to reset the ECOTORQUE Variable Speed Drive (VSD). Rising edge on the input will reset the fault..

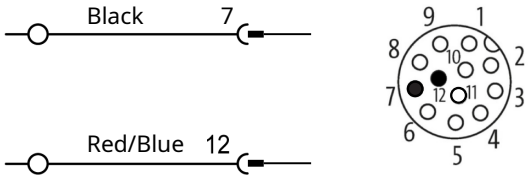
Relay Output

- M12 connector max. 230V AC, 1.5 A / 24V DC, 1.5 A



Customer Emergency OFF (EMO)

- A lockable disconnect switch or an emergency stop switch can be provided so the machine is completely secured in case of an emergency situation.



It allows to add an external safety element (dry contact).

2.5.6 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.

For the activation and setup of this optional function, 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.

3 Transport and Handling



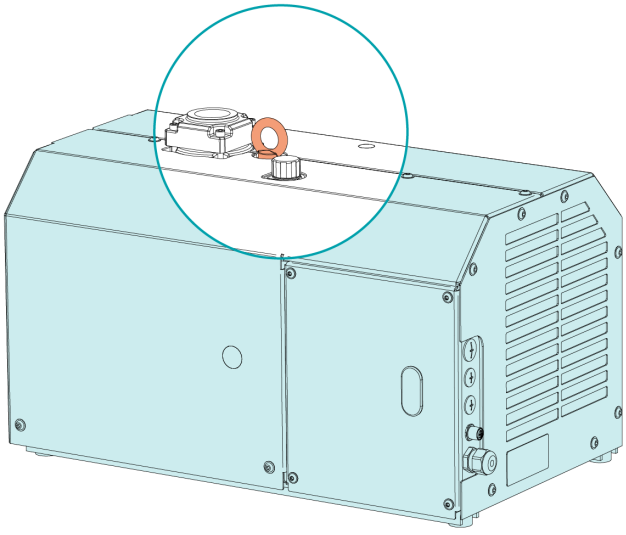
WARNING

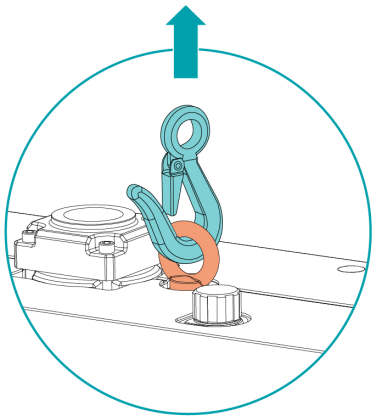
Suspended load.

Risk of severe injury!

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

- To find out the weight of the machine, refer to the chapter *Technical Data* [➔ 40] or the name plate (NP).
- Make sure that the eye bolt(s) (EB) is/are in faultless condition, fully screwed in and tightened by hand.





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

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

- Remove the machine from the transport support before installation.

4 Storage

- Seal hermetically all apertures with the caps provided with the machine, or with adhesive tape if the caps are no longer available.
- Store the machine indoors, in a dry place, away from dust and vibrations and if possible, in original packaging, preferably at temperatures between 0 ... 40 °C.

NOTICE

Long storage time.

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.
- Recommendation: Run the machine at ultimate pressure for 30 minutes every 6 month to maintain the proper function of the shaft seals.
- Connect the machine every 18 months for 30 minutes to the mains.

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.
- Store the machine indoors, in a dry place, away from dust and vibrations and if possible, in original packaging, preferably at temperatures between 0 ... 40 °C.

5 Installation

5.1 Installation Conditions

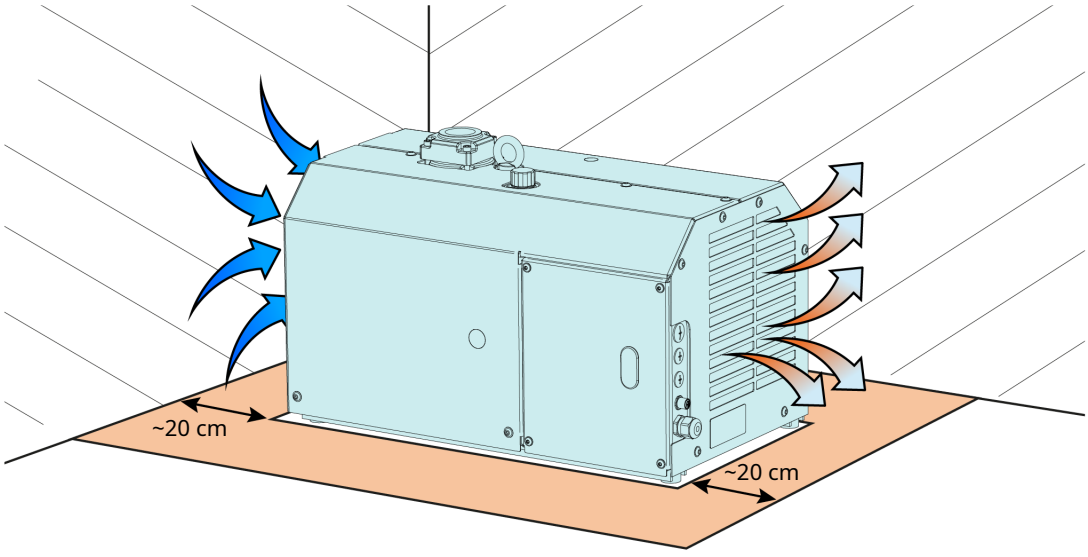
NOTICE

Use of the machine outside of the permitted installation conditions.

Risk of premature failure!

Loss of efficiency!

- Make sure that the installation conditions are fully respected.



- Make sure that the environment of the machine is not potentially explosive.
- Make sure that the ambient conditions comply with the *Technical Data* [➔ 40].
- 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 protected from weather and lightning.
- 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 (CAI) and outlets (CAO) are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.
- 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* [➔ 26].
- Make sure that all provided covers, guards, hoods, etc. are mounted.

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



WARNING

Rotating Parts.

Risk of severe injury!

- Do not operate the machine without inlet connection installed.

- Remove all protective covers before installation.
- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.
- Make sure that the diameter of the connecting lines over the entire length is at least as large as the connections of the machine.
- Make sure that there is no counter pressure (also called “back pressure”) at the exhaust connection (OUT).

In case of long connecting lines:

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

NOTICE

Potential condensate flows from the piping to the machine.

Risk of damage to the machine!

- Make sure that the inlet and outlet connecting pipes of the machine are installed in such a way as to prevent any possible condensate from flowing from the piping into the machine.
- Busch recommends the use of the optional horizontal inlet filter and exhaust condensate drain (or drip leg), to collect condensate and prevent it from flowing into the machine.

5.2.1 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):

– G1 ¼”

- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.

5.2.2 Exhaust Connection

NOTICE

Exhaust gas flow obstructed.

Risk of damage to the machine!

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

Connection size(s):

– G ¾”

Unless the air drawn in is directly released into the environment right at the machine:

- Make sure that the exhaust line slopes away from the machine. In the opposite case, provide a liquid separator or a siphon with a drain cock, to prevent liquids from flowing back into the machine.
- Make sure that the connecting lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines at the inlet and exhaust connections.

5.3 Filling Oil

NOTICE

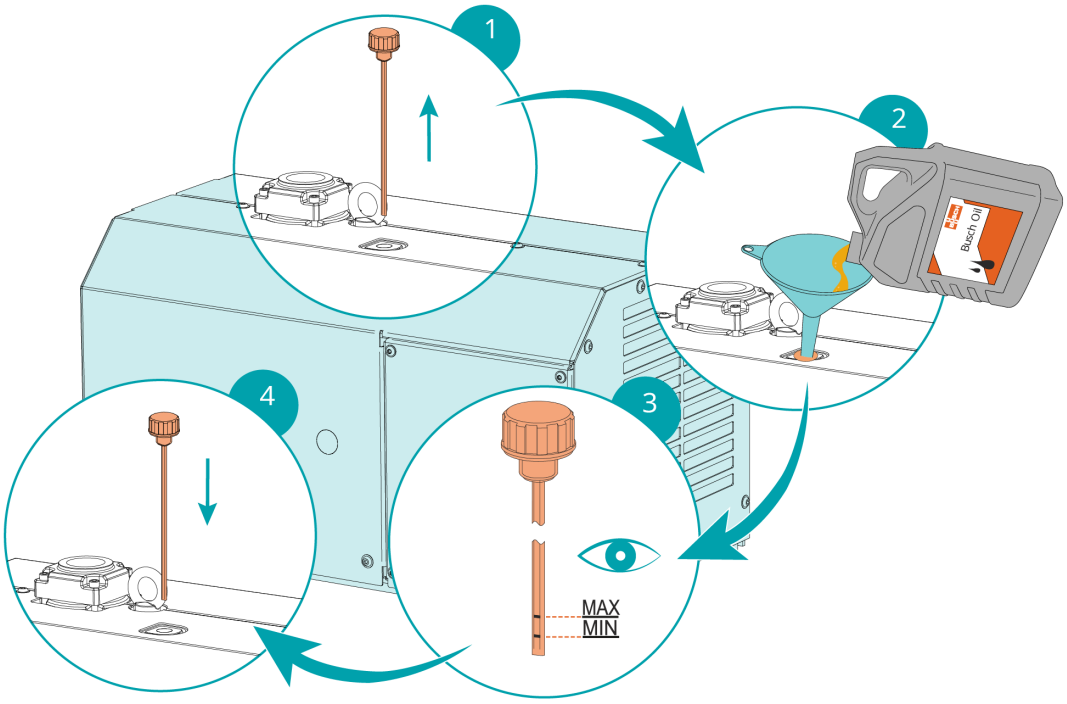
Use of inappropriate oil.

Risk of premature failure!

Loss of efficiency!

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

- For information on oil type and filling capacities, see the *Technical Data* [➔ 40] and *Oil* [➔ 39] chapters.



The oil level should stay constant over the lifetime of the oil. If the level does fall, this indicates a leak and the machine requires repair.

6 Electrical Connection

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.
- Use only the supplied contact screws when installing the VSD cover to ensure proper grounding!



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

Risk of induced voltage / regeneration.

Risk of severe injuries!

Risk of damage to the machine!

The machine uses a permanent magnet synchronous motor and an ECOTORQUE VSD without braking capability. If the machine is driven by reverse airflow or back-pressure (e.g. due to a missing or faulty non-return valve), the motor will act as a generator and may induce dangerous voltages into the ECOTORQUE VSD.

- Always make sure that the non-return valve (NRV) is functioning correctly to prevent reverse rotation of the pump.
- Do not allow the pump to spin freely after shutdown.
- Generated voltages can cause overvoltage faults, damage to the ECOTORQUE VSD, or pose an electrical hazard.
- Always verify zero voltage on ECOTORQUE VSD terminals before maintenance.

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* [➔ 41] or *UK Declaration of Conformity* [➔ 42]).

Mains Connection – Precondition

To guarantee that the controls function properly, the following points must be ensured:

- The mains voltage must correspond to the voltage stated on the nameplate (NP).
- For three-phase power supply, a clockwise rotation field is required.

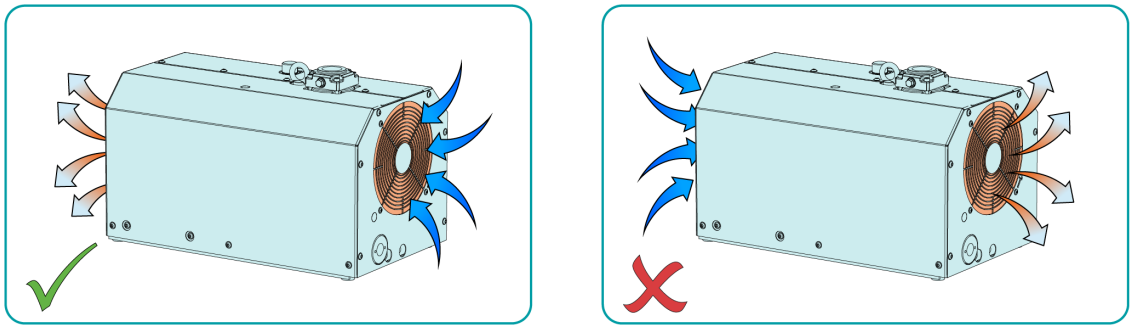
Connection of the Cooling Fan – correct direction

CAUTION

Insufficient cooling due to incorrect rotation of the cooling fan!

Damage to the machine!

- Make sure the cooling fan rotation is correct.
- If the cooling fan is rotating in the wrong direction, switch any of the two power supply wires.



NOTICE

After the machine has been shut down by a digital signal but the mains supply to the machine is still ON, the active cooling fan will run for an extended time of 5 min.

6.1 Machine delivered with an ECOTORQUE Variable Speed Drive

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.

NOTICE

Incorrect connection.

Risk of damage to the variable speed drive!

- The wiring diagrams below are examples only. Refer to the connection instructions and diagrams of the variable speed drive.

- Make sure that the power supply is compatible with the data on the machine's nameplate (NP).
- If the machine is equipped with a power connector, install a residual current protective device to protect persons in case of a defective insulation.
  - Busch recommends installing a type B residual protective device suitable for the electrical installation.
- Provide a lockable disconnect switch or an emergency stop switch on the power line so that the machine is completely secured in case of an emergency situation.
- Provide an overload protection according to EN 60204-1.
- Connect the protective earth conductor.

6.2 Wiring Diagram ECOTORQUE Variable Speed Drive (VSD)

DANGER

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

Risk of electrical shock!

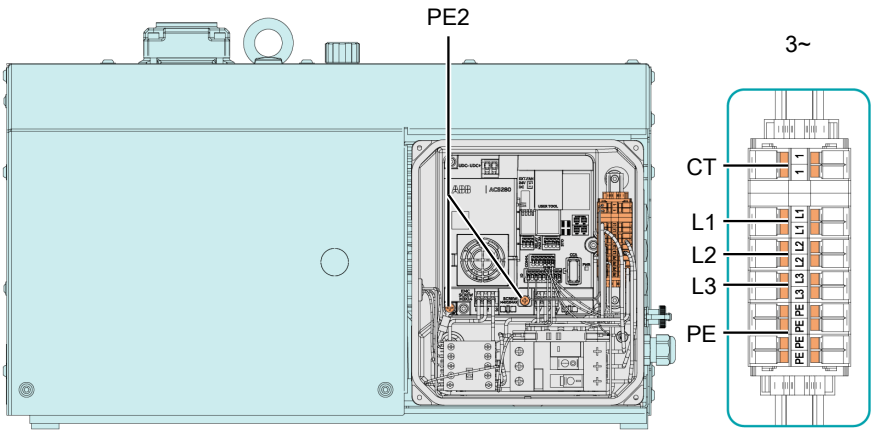
- Switch off the power supply to the control unit with a lockable disconnect switch before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after disconnecting the electrical supply.
- Always ensure, by using a suitable two-pole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

CAUTION

The machine will start immediately when power is supplied.

Risk of inadvertent start-up!

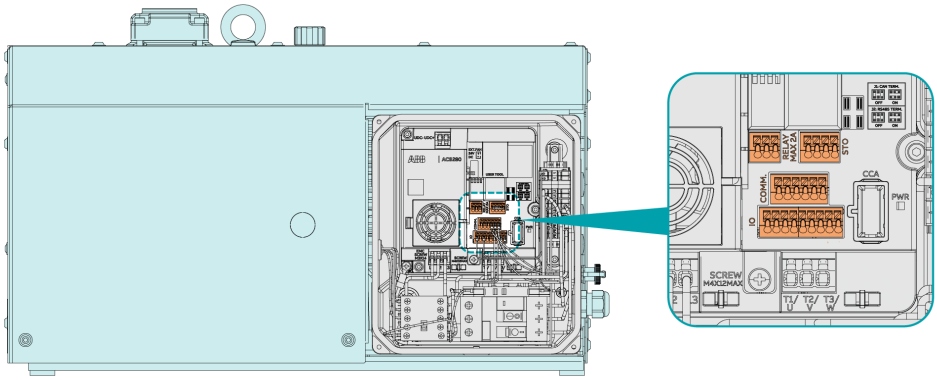
- Make sure that a start-up will not lead to a dangerous situation.



The leakage current exceeds 3.5 mA (AC). According to EN 61800-5-1 an additional protective earth conductor (PE2) must be provided:

- Connect the additional protective earth conductor (PE2). Use at least the same cross section as for PE.

6.3 Control Unit Connection



The machine is preset ex-works in such a way that the machine starts automatically and accelerates to the maximum speed when connected to the power.

The control settings can be changed by changing the terminal ports on the control unit:

- Bridge available for 24 V operation from terminal 3 to terminal 1 (digital input 1).
- Speed control of the machine (terminal 5: digital input 3).
- Pressure control of the machine (terminal 5: analog input 1).
- The ready for operation signal can be read via terminal 16/17 (relay output 1).

Delivery Condition / Autostart

Default I/O connections

Terminals		Descriptions
		Digital inputs and outputs
3	24 V	Aux. voltage output +24 V DC, max. 100 mA
4	GND	Aux. voltage output common
1	DI1	Digital Input 1: Stop (0)/Start (1)
2	DI2	Digital Input 2: Fault Reset
		Analog inputs and outputs
5	AI1/DI3	Analog Input 1: Pressure sensor (4 ... 20 mA)
6	DI4/AI2	Not available: Thermal Motor Protection
9	GND	Analog input circuit common
8	DO1/AO1	Not available: DO1 for Fan Control
7	10 V	Given voltage +10 V DC
		CANopen protocol
10	CAN-H	
11	CAN-L	Built-in CANopen (CAN)
12	GND	
		EIA-485 Modbus RTU
13	A-	
14	B+	Built-in Modbus RTU (EIA-485)
15	GND	
		Relay Output
16	RO NC	
17	RO COM	No fault [Fault (-1)]
18	RO NO	
		Safe Torque Off (STO)
19	S+	Safety Torque Off function (STO).
20	SGND	Factory connection.
21	S1	Drive starts only when both circuits
22	S2	are closed.

7 Commissioning



DANGER

Strong Magnetic Field: Hazard to individuals with active medical implants (e.g., pacemakers and insulin pumps), regardless of whether the machine is powered on or off.

Risk of death for persons with pacemakers!

Risk of severe injuries!

Risk of damage to magnetically sensitive items / products!

- Make sure that personnel with pacemakers do not perform any work on the machine.
- Make sure that pregnant personnel do not perform any work on the machine.
- Secure the working area; if necessary, isolate the area:
  - Make sure that prohibited personnel keep a safe distance of at least 1m from the motor.
  - Make sure that no magnetizable parts can be attracted by the motor.
  - Make sure that the motor cannot be attracted by magnetizable metal parts.

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.



CAUTION

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

Risk of burns!

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

CAUTION



Noise of running machine.

Risk of damage to hearing!

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

- Make sure to wear hearing protection.

- Make sure that the *Installation Conditions* [➔ 12] are met.
- Start the machine.

NOTICE

Frequent starts and stops by connecting and disconnecting from the power supply.

Risk of damage to the machine!

Starting the machine by connecting and disconnecting the power supply is permitted max. 1x per 10 minute. Between disconnecting and connecting at least 10 seconds must have been passed. If the process requires more frequent starts/stops of the machine:

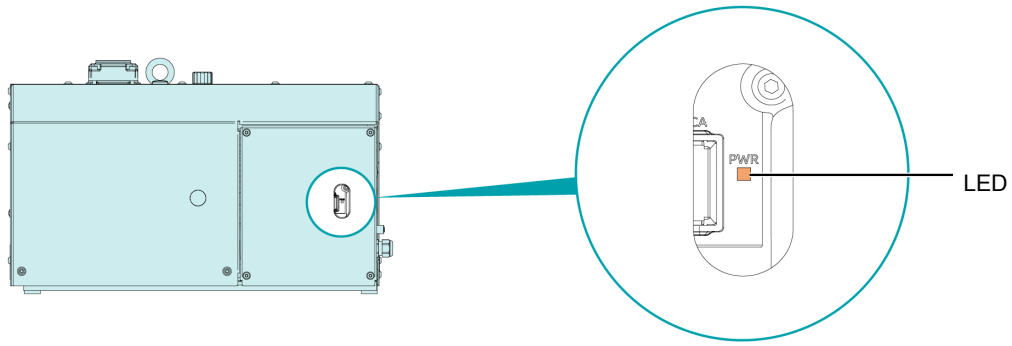
- Use the digital start signal.

- Maximum permissible number of starts by using the digital signal: unlimited

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.

7.1 Variable Speed Drive Overview



LED	Description
PWR	Light is off: The Drive has no power.
PWR	Green light: The drive is ready to operate, there are no faults nor warnings.
PWR	Green light flashing: A warning signal is active.
PWR	Red light: There is a fault, the drive can't start, reset the fault is necessary to return the drive back to normal running.

7.2 Pressure Control

Pressure control of the machine requires a pressure transmitter. A suitable Busch pressure transmitter is available as accessory.

In case of dusty application a filter must be installed upstream the pressure transmitter to avoid malfunction or damage to the pressure transmitter.

Install the pressure sensor according to the wiring diagram. To activate it, use the Busch Vacuum Manager.

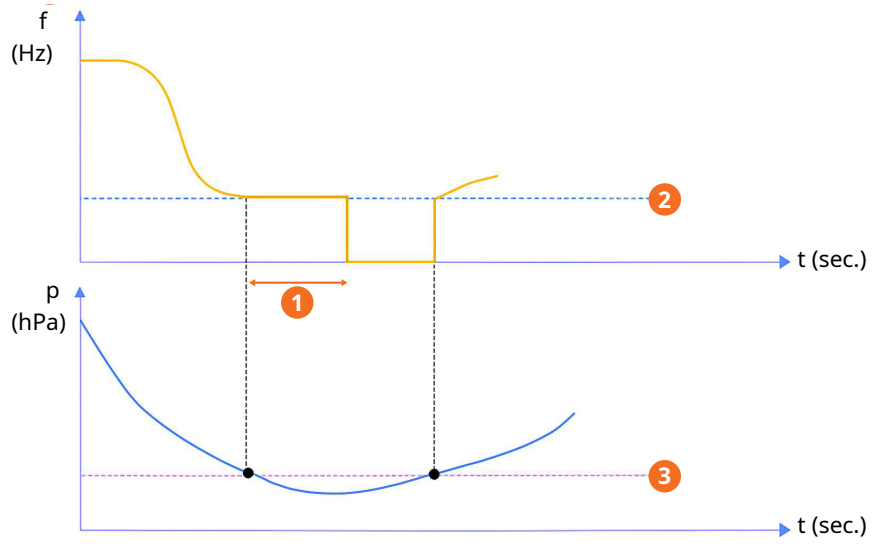
During pressure control, the machine controls the speed according to the deviation between the actual pressure value and the set pressure value. Ex-works setting is 400 mbar(g).

If the actual pressure value is higher than the set pressure value, the machine speed increases. If the actual pressure value falls below the set pressure value, the machine speed decreases.

7.2.1 Ecomode in Pressure Control

This function can provide additional energy savings in pressure control mode, by stopping the machine when the target pressure is reached for a defined time (Ecomode stand-by time to be set in **Busch Vacuum Manager** software), instead of running at minimum speed (see *Technical Data* [➔ 40])

Once the pressure value (**p**) is higher than the target value (**3**), the machine will start again.



Description			
1	Ecomode stand-by time	2	Minimum speed (60 Hz / 1200 min^{-1})
3	Target pressure		

In **Busch Vacuum Manager** software, the Ecomode can be activated by clicking on the toggle switch. Toggle turned orange means that the Ecomode is activated.

If the drive controller runs for this set time at its minimum speed, the machine is stopped (0 Hz) to save energy.

Ecomode stand-by time value	Description
0	Ecomode disabled (default)
> 0	Waiting time [sec.] until stand-by function is enabled. (maximum 10000 sec), to be adapted at customer process.

7.3 Fault Reset

A fault is indicated by lighting of the LED 'PWR' (see *Variable Speed Drive Overview* [➔ 21]) and if connected by the not existing ready for operation signal (terminal 20 of the control unit).

- Prior to reset a fault find out the possible cause and remedy the fault.

CAUTION

The machine will start immediately when power is supplied.

Risk of inadvertent start-up!

- Make sure that a start-up will not lead to a dangerous situation.

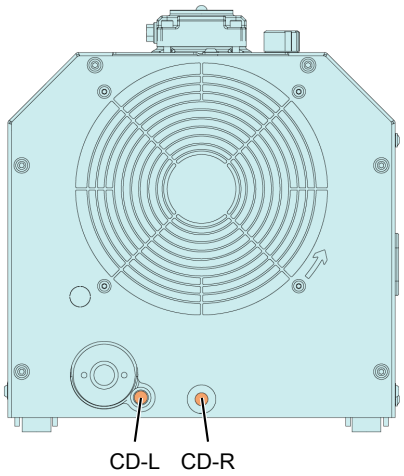
- Reset the fault by disconnecting and reconnecting the power supply for at least 30 seconds or by using a digital signal on terminal 2 (Digital In 2) of the control unit.

7.4 Conveying Condensable Vapors

Use the machine in Aqua version for conveying water vapor or other condensable vapors. The machine in Aqua version is able to convey up to 100% saturated water vapor.

The conveyance of vapors other than water vapor shall be agreed upon with Busch.

- Make sure that any condensate from the suction side will not enter the non-operating machine.



Description			
CD-L	Condesate drain (left)	CD-R	Condensate drain (right)

Before processing:

- Warm up the machine by running the machine with closed suction side for approximately 15 minutes.

After process:

- During process condensate may occur in the machine. To remove the condensate from the machine, convey dry air at 200-400 mbar with the machine's maximum speed after the process. The condensate drain (CD-L) must be opened constantly. The condensate drain (CD-R) must be opened for at least 1 minute.

NOTE

Condensate drains.

In case of very high condensate formation the condensate drain (CD-L) can remain open during the process. The opening of the condensate drain (CD-R) leads to a strong increase of the noise level and is not necessary during the process.

8 Maintenance



DANGER

Strong Magnetic Field: Hazard to individuals with active medical implants (e.g., pacemakers and insulin pumps), regardless of whether the machine is powered on or off.

Risk of death for persons with pacemakers!

Risk of severe injuries!

Risk of damage to magnetically sensitive items / products!

- Make sure that personnel with pacemakers do not perform any work on the machine.
- Make sure that pregnant personnel do not perform any work on the machine.
- Secure the working area; if necessary, isolate the area:
  - Make sure that prohibited personnel keep a safe distance of at least 1m from the motor.
  - Make sure that no magnetizable parts can be attracted by the motor.
  - Make sure that the motor cannot be attracted by magnetizable metal parts.



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 disconnecting the electrical supply.
- Always ensure, by using a suitable two-pole voltage tester, that no voltage is present on any drive power terminals before starting 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

Draining the condensate while operating.

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.



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.

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.
- 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 can make it necessary to shorten the maintenance intervals significantly.

(For example, applications with many short intervals between ultimate pressure and low vacuum levels, operation at low vacuum levels or constant operation at ultimate pressure. For more information, contact Busch.)

Wear parts are excluded from the maintenance schedule and must be replaced as required.

Interval	Maintenance work
Monthly	• Check the inlet screen (IS), clean if necessary. • Check the oil level, see *Oil Level Inspection* [➔ 26]. In case of an inlet filter (IF) being installed: • Check the inlet filter cartridge, replace if necessary.
Every 3 months	• Check the machine for oil leaks.
Every 6 months	• Clean the machine from dust and dirt, see *Cleaning from Dust and Dirt* [➔ 27].
Every 8000 hours or once a year	• Change the oil. Gas leakage optimized version only: • Check that pressure relief lines (PRL) are not clogged, see *Pressure Relief Lines Maintenance* [➔ 29].
Every 30000 hours or after 6 years	• Have a major overhaul on the machine (contact Busch).

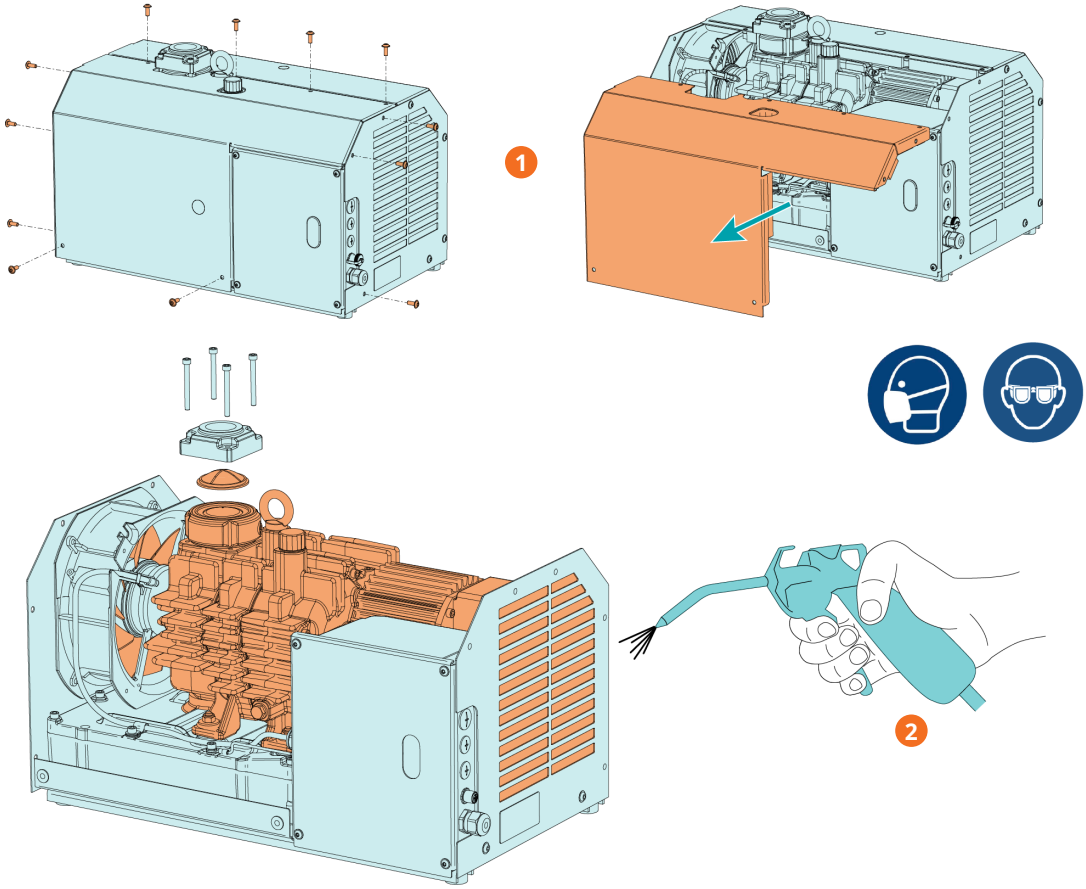
8.2 Oil Level Inspection

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

The oil level should stay constant over the lifetime of the oil. If the level does fall, this indicates a leak and the machine requires repair.

- Fill up if necessary, see *Filling Oil* [➔ 15].

8.3 Cleaning from Dust and Dirt



Description			
1	Remove the covers	2	Clean the ventilation grilles, fans, inlet screen and cooling fins

8.4 Oil Change

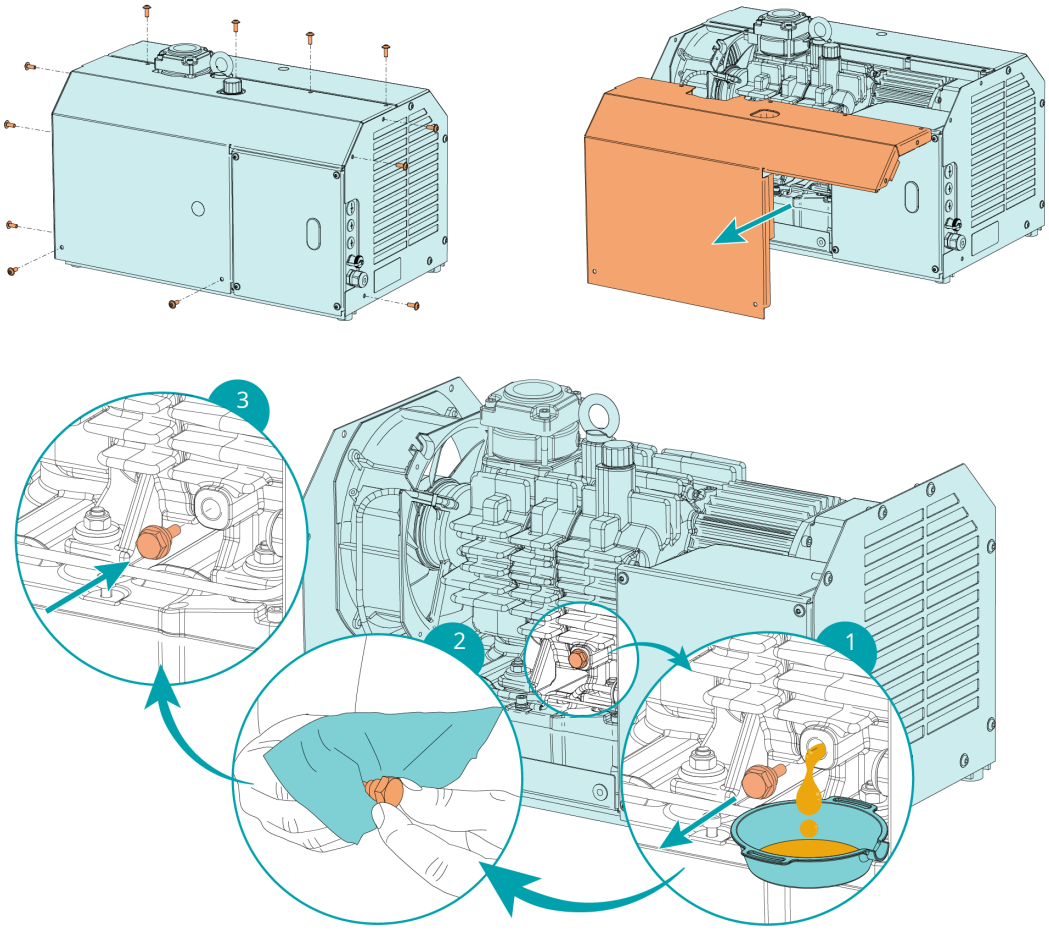
NOTICE

Use of inappropriate oil.

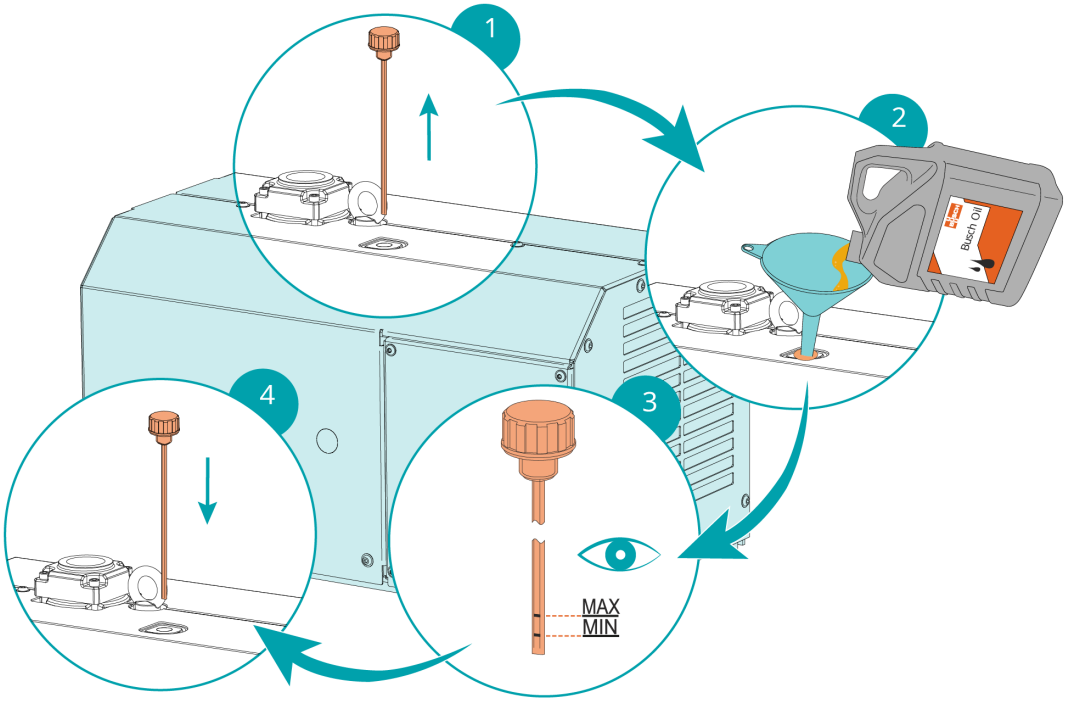
Risk of premature failure!

Loss of efficiency!

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



- For information on oil type and filling capacities, see the *Technical Data* [➔ 40] and *Oil* [➔ 39] chapters.



The oil level should stay constant over the lifetime of the oil. If the level does fall, this indicates a leak and the machine requires repair.

8.5 Pressure Relief Lines Maintenance



WARNING



Media potentially dangerous.

Risk of poisoning!

Risk of infection!

- Wear appropriate personal protective equipment in case of high concentration of the medium in the ambient atmosphere of the machine.

- Check that pressure relief lines (PRL) are not clogged as described in the following illustrations.

NOTICE

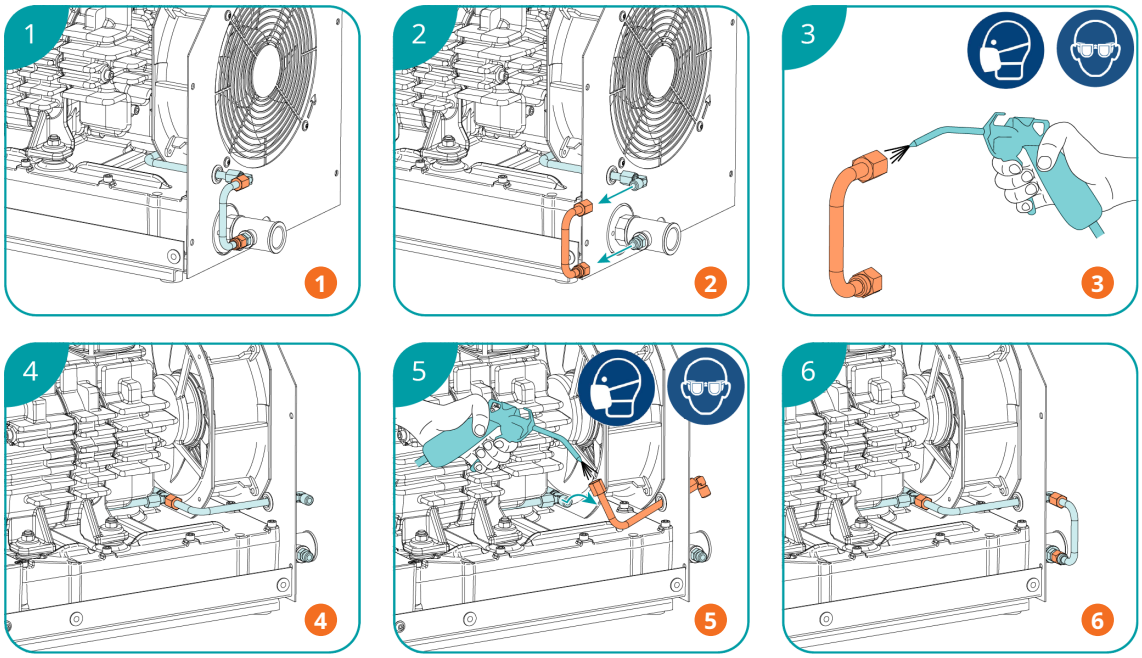
Pressurized air systems supply too high pressure.

Risk of damage to the machine!

- Adjust the pressurized air to 0.2 bar(g) by means of a pressure regulator.

In case of clogged pressure relief lines (PRL):

- Remove the clogging or have the machine repaired (contact Busch).



Description			
1	Unscrew the nuts for line segment 1	2	Remove the line segment 1
3	Blow pressurized air into the line segment 1	4	Unscrew the nut for line segment 2
5	Remove and blow pressurized air into the line segment 2	6	Reinstall the lines and fasten all nuts

9 Overhaul



DANGER

Strong Magnetic Field: Hazard to individuals with active medical implants (e.g., pacemakers and insulin pumps), regardless of whether the machine is powered on or off.

Risk of death for persons with pacemakers!

Risk of severe injuries!

Risk of damage to magnetically sensitive items / products!

- Make sure that personnel with pacemakers do not perform any work on the machine.
- Make sure that pregnant personnel do not perform any work on the machine.
- Secure the working area; if necessary, isolate the area:
  - Make sure that prohibited personnel keep a safe distance of at least 1m from the motor.
  - Make sure that no magnetizable parts can be attracted by the motor.
  - Make sure that the motor cannot be attracted by magnetizable metal parts.



WARNING



The machine is contaminated with hazardous material.

Risk of poisoning!

Risk of infection!

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.

NOTICE

Incorrect assembly.

Risk of premature failure!

Loss of efficiency!

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

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

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

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

10 Decommissioning



DANGER

Strong Magnetic Field: Hazard to individuals with active medical implants (e.g., pacemakers and insulin pumps), regardless of whether the machine is powered on or off.

Risk of death for persons with pacemakers!

Risk of severe injuries!

Risk of damage to magnetically sensitive items / products!

- Make sure that personnel with pacemakers do not perform any work on the machine.
- Make sure that pregnant personnel do not perform any work on the machine.
- Secure the working area; if necessary, isolate the area:
  - Make sure that prohibited personnel keep a safe distance of at least 1m from the motor.
  - Make sure that no magnetizable parts can be attracted by the motor.
  - Make sure that the motor cannot be attracted by magnetizable metal parts.



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 disconnecting the electrical supply.
- Always ensure, by using a suitable two-pole voltage tester, that no voltage is present on any drive power terminals before starting any work.



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.
- Vent the connected lines to atmospheric pressure.
- Disconnect all connections.

If the machine is to be stored:

- See *Storage* [➔ 12].

10.1 Dismantling and Disposal

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

11 Spare Parts

NOTICE

Use of non-Busch genuine spare parts.

Risk of premature failure!

Loss of efficiency!

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

Spare part	Description	Article number
Inlet screen (IS)		0534 000 018

If other parts are required:

- Contact your Busch representative.

12 Troubleshooting



DANGER

Strong Magnetic Field: Hazard to individuals with active medical implants (e.g., pacemakers and insulin pumps), regardless of whether the machine is powered on or off.

Risk of death for persons with pacemakers!

Risk of severe injuries!

Risk of damage to magnetically sensitive items / products!

- Make sure that personnel with pacemakers do not perform any work on the machine.
- Make sure that pregnant personnel do not perform any work on the machine.
- Secure the working area; if necessary, isolate the area:
  - Make sure that prohibited personnel keep a safe distance of at least 1m from the motor.
  - Make sure that no magnetizable parts can be attracted by the motor.
  - Make sure that the motor cannot be attracted by magnetizable metal parts.



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 disconnecting the electrical supply.
- Always ensure, by using a suitable two-pole voltage tester, that no voltage is present on any drive power terminals before starting any work.



CAUTION

Hot surface.

Risk of burns!

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



CAUTION

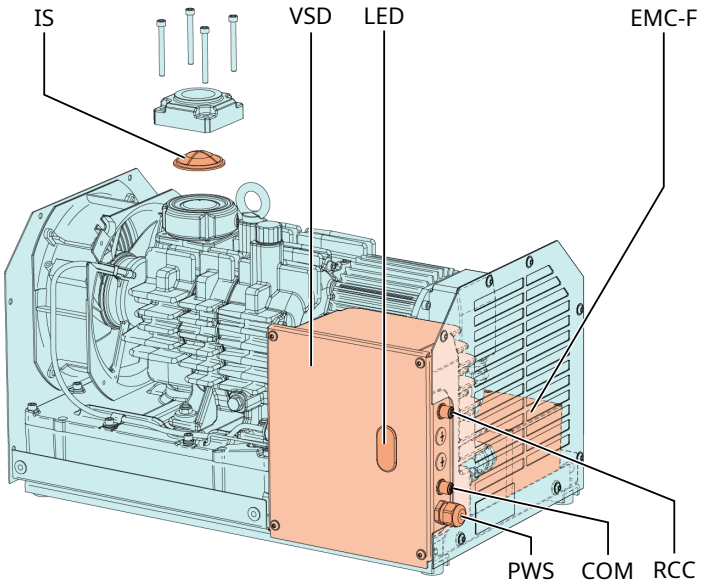
Hot liquids.

Risk of burns!

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

NOTE

For detailed FAULT-CODES information,
see *Pump Control Instructions* [document No.: 0870 166 596].



Description			
IS	Inlet screen	VSD	Variable speed drive
LED	Function indicator	RCC	Remote control connection (optional)
PWS	Power supply	COM	Communication I/O port (M12) A-coded
EMC-F	EMC filter		

The machine does not start.	
Possible Cause	**Remedy**
The motor is not supplied with the correct voltage.	• Check the power supply.
The ECOTORQUE variable speed drive (VSD) is not supplied with the correct voltage.	• Check the power supply.
The motor is defective.	• Replace the motor (contact Busch).
The motor or the ECOTORQUE variable speed drive (VSD) is defective.	• Replace the motor or the ECOTORQUE variable speed drive (VSD).
The cable of inlet pressure transmitter (PSA) is damaged.	• Replace the cable (contact Busch).

The machine does not reach the usual pressure at the inlet connection.	
Possible Cause	**Remedy**
The inlet screen (IS) is partially clogged.	• Clean the inlet screen (IS).
The inlet filter cartridge (optional) is partially clogged.	• Replace the inlet filter cartridge.
Internal parts are worn or damaged.	• Repair the machine (contact Busch).

The machine runs very noisily.	
Possible Cause	**Remedy**
Oil level too low.	• Check the machine for leakage. • Top up oil.
Defective bearings.	• Repair the machine (contact Busch).

The machine runs too hot. Possible Cause	Remedy
Insufficient cooling.	• Remove dust and dirt from the machine.
The cooling fan's direction of rotation is incorrect.	• Check the direction of rotation of the cooling fan, see *Machine delivered with an ECOTORQUE Variable Speed Drive* [➔ 17].
The cooling fan is not running (due to a tripped circuit breaker). **MV 0040 E** 3~ 380 - 480 V = 0.11 A 3~ 208 - 240 V = 0.13 A **MV 0060 E** 3~ 380 - 480 V = 0.15 A 3~ 208 - 240 V = 0.25 A **MV 0080 E** 3~ 380 - 480 V = 0.15 A	• Open the control cabinet and check the circuit breaker, switch it ON if it has tripped.
Ambient temperature is too high.	• Observe the permitted ambient temperature, see *Technical Data* [➔ 40].
Temperature of the process gases at the inlet too high.	• Observe the permitted gas inlet temperature, see *Technical Data* [➔ 40].
Oil level too low.	• Check the machine for leakage. • Top up oil.

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

12.1 Troubleshooting ECOTORQUE Variable Speed Drive (VSD)





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.

12.1.1 List of Errors

The variable speed drive shuts down if an error occurs. Consult the flash code table / PC tool for the corresponding error numbers.



NOTE

Error messages can only be acknowledged once the error has been remedied.

Error messages can be acknowledged as follows:

- Digital input 2, see wiring diagram delivered with the machine
- switch device off and on again
- Busch Vacuum Manager Software

The following section contains a list of possible error messages.

Contact your Busch representative if you encounter errors that are not listed here.

No.	Error name	Description of error	Possible causes / remedy
1	Undervoltage 24 V application	Supply voltage for the application is less than 15 V.	24 V supply overload.
2	Overvoltage 24 V application	Supply voltage for the application is greater than 31 V.	Internal 24 V supply is not OK, or external supply is not OK.
4	Warning: Customer PLC runtime environment	Customer PLC is not running.	The customer PLC is being downloaded / The customer PLC has a programming error, e.g. division by 0.
6	Customer PLC version error	The version of the customer PLC doesn't match the device firmware.	Check the version numbers of the customer PLC and device firmware.
8	Communication application<>power	Internal communication between the application plate and the power-conducting plate is not OK.	EMC interference.
9	Warning: Warning: multi-pump error	A fault has occurred in the multi-pump system: One participant has a fault. The CAN open connection is disturbed/interrupted.	Check that all participants are available, and the status LED is green. Check CAN open connection.
10	Parameter distributor.	The internal distribution of parameters during initialization failed.	Parameter set is incomplete.
11	Time-out power	The power part does not respond.	Operation with 24 V without mains feed-in.
13	Cable break at analog in 1 (4–20 mA / 2–10 V)	Current or voltage is less than the lower limit of analog input 1.	Cable break, faulty external sensor.
14	Cable break at analog in 2 (4–40 mA / 2–10 V)	Current or voltage is less than the lower limit of analog input 2.	Cable break, faulty external sensor.
15	Blocking detection	The drive shaft of the motor is stalled.	Remove the blockage.
16	PID dry run	No PID actual value despite maximum speed.	PID actual value sensor defective Extend dry run time parameter.
17	Start-up error	Motor not starting up or starting up incorrectly.	Check motor connections / check motor and controller parameters.
18	Excess temperature for frequency converter application	Inner temperature too high.	Insufficient cooling, low motor speed and high torque, switching frequency too high.
19	Firmware update error	A firmware update could not be completed.	Connection aborted during a FW update. Repeat the FW update. The variable speed drive is supplied externally with 24 V. **Note:** During a firmware update, 24 V must not be connected externally.
21	Bus time-out	No response from bus sharing unit or remote control/PC.	Check bus wiring.
22	Acknowledgement error	The number of maximum automatic acknowledgements was exceeded.	Check error history and remedy error.

No.	Error name	Description of error	Possible causes / remedy
23	External fault 1	The parameterized fault input is active.	Correct the external error.
24	External fault 2	The parameterized fault input is active.	Correct the external error.
25	Motor detection	Motor identification error.	Check variable speed drive/ motor and PC / remote control / variable speed drive connections / restart motor identification.
26	STO inputs plausibility	The statuses of the two STO inputs have not been identical for more than 2 sec.	Incorrect activation of the STO inputs. Check corresponding external wiring / Indoor temperature too high.
27	Bus address invalid	CAN open fieldbus address invalid.	The ID must be > 0 and < 127.
28	Limit frequency exceeded / not met	The parameterized minimum / maximum frequency has not been met / has been exceeded.	Motor blocked / Brake not opened / Motor overloaded.
32	Trip IGBT	Protection of the IGBT module against overcurrent has been triggered.	Short circuit in the motor or motor feed line / controller settings.
33	Overvoltage of intermediate circuit	The maximum intermediate circuit voltage has been exceeded.	Feedback by motor in generator mode / supply voltage too high / incorrect setting of speed controller / brake resistor not connected or defective / ramp times too short / operation on transformer / operation with mains choke.
34	Undervoltage of intermediate circuit	The minimum intermediate circuit voltage has not been reached.	Mains voltage too low, mains connection defective / check wiring.
35	Excess motor temperature	Motor PTC has been triggered.	Overload of the motor (e.g. high torque at low motor speed) / ambient temperature too high.
36	Power failure	The grid voltage has dropped briefly.	Grid fluctuation / grid voltage interrupted.
38	Excess IGBT module temperature	Excess IGBT module temperature.	Insufficient cooling, low motor speed and high torque, switching frequency too high.
39	Overcurrent	Maximum output current of variable speed drive exceeded.	Motor stalled / check motor connection / incorrect speed controller setting / check motor parameters / ramp times too short / brake not open.
40	Excess frequency converter temperature	Inner temperature too high.	Insufficient cooling / low motor speed and high torque / switching frequency too high permanent overload / reduce ambient temperature / check fan.
42	I2t motor protection shutoff	The internal I2t motor protection (can be parameterized) has been triggered.	Permanent overload.

No.	Error name	Description of error	Possible causes / remedy
43	Ground leak	Ground leak during a motor phase.	Insulation fault.
45	Motor connection disrupted	No motor current despite control through frequency converter.	No motor connected or not completely connected. Check phases or motor connections and connect correctly when necessary.
46	Motor parameters	Plausibility check for motor parameters failed.	Parameter set not OK.
47	Variable speed drive parameters	Plausibility check for variable speed drive parameters failed.	Parameter sets are not OK, motor type and control method are not plausible.
48	Type plate data	No motor data entered.	Please enter the motor data according to the motor nameplate.
49	Power class restriction	Max. overload of the variable speed drive exceeded more than 60 sec.	Check application / reduce load / use larger variable speed drive.
53	Motor tipped	Only for synchronous motors, field orientation lost.	Load too high Optimize controller parameters.
56	Grid overvoltage	The mains input voltage is above 528 V AC.	Check the mains supply.
57	**Warning:** Switching frequency reduction active	The switching frequency was reduced due to the ambient temperature.	Insufficient cooling / low speed and high torque / permanent overload/reduce ambient temperature/check fan.
58	IGBT module overheating	The IGBT module overheating at high starting current and high clocking frequency.	Reduce clocking frequency. Reduce load in the lower speed range.
-	Pressure / Speed target not reached	Speed limitation to avoid overloading the motor.	Control possible overload due to excessive exhaust back pressure: pressure drops in the exhaust line downstream of the machine, clogged exhaust filters. In cold ambient conditions, pre-heat the machine for 5 minutes at start-up.

13 Electrical Data of Control Unit Terminals

Terminal		Technical Information
Digital inputs and outputs		
3	24 V	Aux. Voltage output + 24 V DC, max. 100 mA
4	DGND	Aux. Voltage output common
1	DI1	Digital input 1: Stop (0) / Start (1)
2	DI2	Digital input 1: Forward (0) / Reverse (1)
Analog inputs and outputs		
5	AI1 / DI3	Analog Input 1: Pressure sensor (4 ... 20 mA)
6	AI2 / DI4	Unused
9	AGND	Analog input circuit common terminal
8	AO1 / DO1	Analog Output: Output frequency (0 ... 10 V)
7	10 V	Given voltage +10 V DC
CANopen protocol		
10	CAN-H	Built-in CANopen
11	CAN-L	
12	GND	
EIA-485 Modbus RTU		
13	A -	Built-in Modbus RTU (EIA-485)
14	B +	
15	GND	
Relay Output		
16	NC	No fault [Fault (-1)]
17	COM	
18	NO	
Safety Torque OFF (STO)		
19	S +	Safety Torque OFF function. Factory connection. The converter can only start when both circuits are closed.
20	SGND	
21	S 1	
22	S 2	

Ex-works terminal assignment: see *Control Unit Connection* [➔ 19]

14 Oil

Name	ISO-VG	Oil type	1 L packing	5 L packing	10 L packing	20 L packing
VSL 100	100	Synthetic	0831 122 573	0831 122 572	-	-

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

Oil suitability

- **Oil VSL 100**: Suitable for food applications (H1).

15 Technical Data

		MV 0040 E	MV 0060 E	MV 0080 E
Nominal pumping speed	m^3/h	40	60	80
	ACFM	23.5	35.3	47
Ultimate pressure	hPa (mbar) abs.	40		
	TORR abs.	30		
Nominal motor rating (motor and fan)	kW	1.3	1.7	2.1
	hp	1.7	2.3	2.8
Nominal current 3~ 380-480 V 3~ 208-240 V	A	 4.1 7.1	 5.0 8.5	 6.5 -
Nominal motor speed	min^{-1}	1200 ... 4200	1200 ... 4200	1200 ... 4800
	rpm	1200 ... 4200	1200 ... 4200	1200 ... 4800
Nominal motor frequency	Hz	60 ... 210	60 ... 210	60 ... 240
Sound pressure level (ISO 3744), 1 m distance, at medium load (60 Hz fan speed)	dB(A)	60	66	69
Ambient temperature	°C	0 ... 40 *		
	°F	32 ... 104 *		
Inlet gas temperature	°C	0 ... 40 *		
	°F	32 ... 104 *		
Ambient pressure		Atmospheric pressure		
Installation altitude		Up to 1000 m: no derating 100% load capacity At 1000 ... 3000 m: derating 1% per 100 m		
Protection class	IP	44		
Permitted stationary vibration: sinusoidal		5 Hz < f < 11.5 Hz: 7.55 mm 11.5 Hz < f < 1000 Hz: 4g acc. IEC 60068-2-6		
Oil capacity	l	0.6		
	qts.	0.63		
Weight approx.	kg	80 **	85 **	90 **
	Lbs.	180 **	190 **	195 **
Supply network		TN- and TT-network (can't be used with corner grounded networks)		
Immunity		EN 61800-3, 1st and 2nd environment		
Emissions		EN 61800-3, category C2 as standard		
Certificates		All relevant electrical components are certificated either UL, CSA or UR		

* In case of higher or lower temperatures, consult your Busch representative.

** The weight can vary depending on the order.

16 EU Declaration of Conformity

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

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

The manufacturer

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the machine: vacuum pump MINK MV 0040 E; MINK MV 0060 E; MINK MV 0080 E

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

- 'Machinery Directive' 2006/42/EC, if the serial number is less than or equal to DEM127029999 (until January 19, 2027).
- 'Machinery Regulation' (EU) 2023/1230, if the serial number is greater than or equal to DEM127030000 (from January 20, 2027).
  The conformity assessment has been carried out according to internal production control procedure (Module A), in accordance with the requirements of the 'Machinery Regulation'.
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment
  (incl. all related applicable amendments)
- 'Cyber Resilience Act' [1)], Regulation (EU) 2024/2847, if the serial number is greater than or equal to DEM127480000 (from December 11, 2027).
  The conformity assessment has been carried out according to internal production control procedure (Module A), in accordance with the requirements of the 'Cyber Resilience Act'.

and comply(-ies) with the following harmonized standards, common specifications or other technical specifications:

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 3744 : 2010	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
EN IEC 63000 : 2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
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
EN IEC 62443-3-3 : 2019	Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels

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

Maulburg, 2026.10.01



Dr. Martin Gutmann, General Manager

Busch Produktions GmbH

[1)] The **'Cyber Resilience Act'** regulation is applicable if the machine is delivered ex-factory with digital elements containing programmable or digital functions, such as a control box, a VSD (Variable Speed Drive), an OTTO IoT Box, a Busch PLC (Programmable Logic Controller) ...

17 UK Declaration of Conformity

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

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

The manufacturer

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the machine: vacuum pump MINK MV 0040 E; MINK MV 0060 E; MINK MV 0080 E

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, common specifications or other technical specifications:

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 3744 : 2010	Acoustics - Determination of sound power levels and sound energy levels of noise sources using sound pressure - Engineering methods for an essentially free field over a reflecting plane
EN IEC 63000 : 2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances
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
EN IEC 62443-3-3 : 2019	Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels

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

Maulburg, 2026.10.01



Dr. Martin Gutmann, General Manager

Busch Produktions GmbH

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

www.pfeiffer-vacuum.com

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