

MINK

Claw Vacuum Pumps

MV 0040 D, MV 0060 D, MV 0080 D

Instruction Manual



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1 Safety

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

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

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

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

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

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

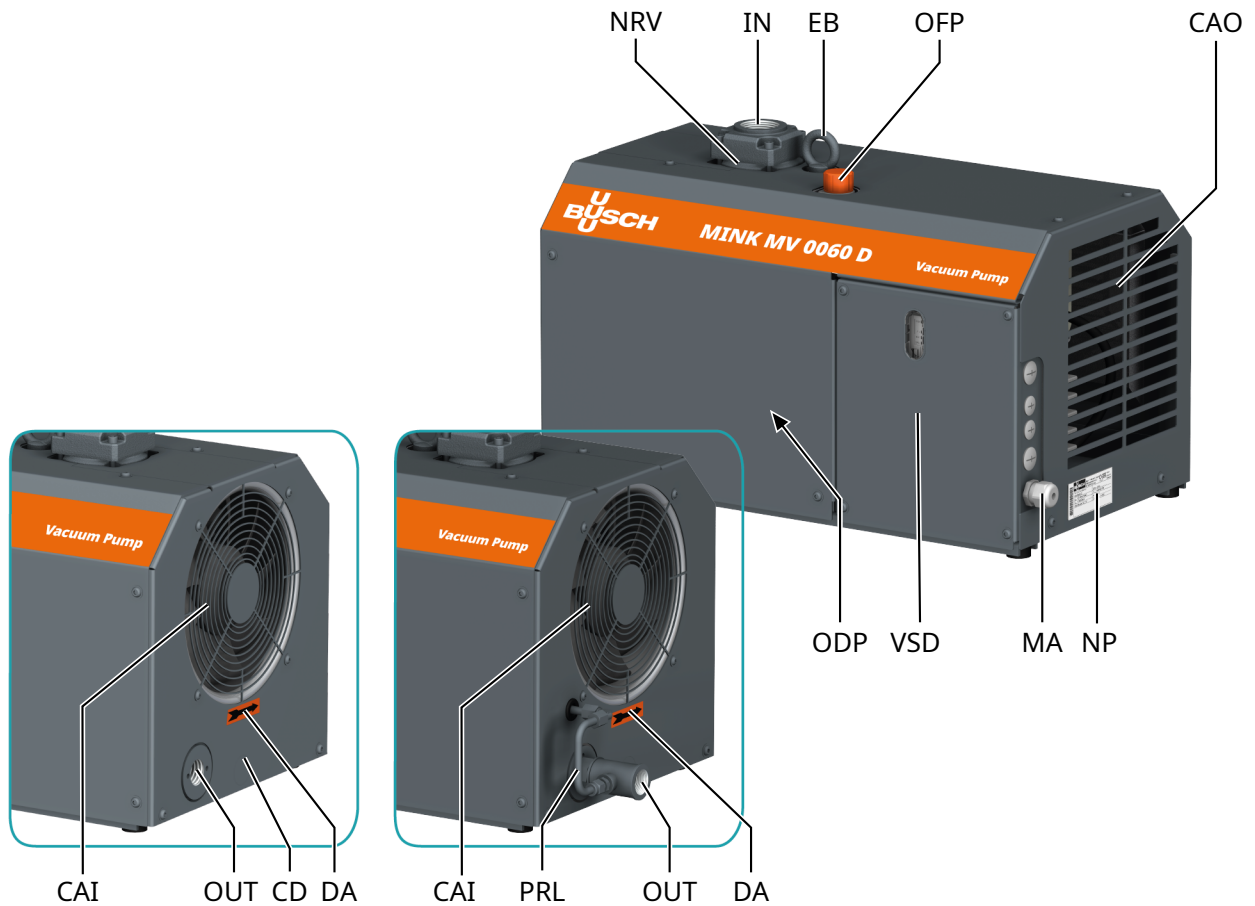
... indicates a potentially dangerous situation that could result in damage to property.



NOTE

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

2 Product Description



Description			
IN	Suction connection	OUT	Discharge connection
OFP	Oil fill plug (= oil dip stick)	ODP	Oil drain plug (under the hood)
CAI	Cooling air inlet	CAO	Cooling air outlet
NRV	Non-return valve (integrated)	EB	Eye bolt
VSD	Variable speed drive	MA	Mains connection
CD	Condensate drains (optional)	PRL	Pressure relief line (gas leakage optimized version only)
DA	Directional arrow	NP	Nameplate

i NOTE

Technical term.

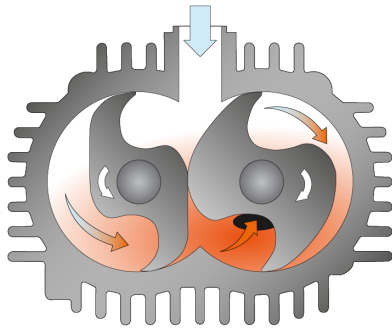
In this instruction manual, we consider that the term 'machine' refers to the 'vacuum pump'.

i NOTE

Illustrations.

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

2.1 Operating Principle



The machine works on the 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).

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.

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

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

The machine is intended for the 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* [→ 37].

The machine is suitable for continuous operation.

Note: The non-return valve (NRV) shouldn't be used as a non-return or shut off 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* [→ 37].

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 0060 D 00
Aqua version	A	MV 0060 D 0A
Gas leakage optimized version	L	MV 0060 D 0L

2.3.1 Aqua Version

This machine is specifically equipped with:

- corrosion protection coating
- a condensate reservoir
- two condensate drains

2.3.2 ATEX Version

Please refer to the specific MINK ATEX Instruction Manual part no.: **0870 234 413**

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 discharge (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 gas discharge

Requirements for a proper functioning:

Ambient pressure	The gas leakage optimized machine requires an ambient pressure at the gas discharge during the whole operation range of +/- 50 hPa (mbar).
Leakage rate	The gas leakage rate of the machine can't be stated due to different possible run speeds and the applied counterpressure and the condition of all involved sealings. Thermal, electrical or mechanical overloading of the entire pump by increasing the counterpressure at the discharge is not permitted and can lead to damages.

Ambient environment	Closed air cooling systems are not suitable and therefore prohibited. <ul style="list-style-type: none">• Make sure that the machine is sufficiently vented (see <i>Installation Conditions</i> [→ 11]).
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2.4 Optional Accessories

2.4.1 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.

2.4.2 Parameter Configuration Kit incl. PC-Software

Parameter configuration kit incl. PC-Software and appropriate connection cable can be provided. Recommended for easy parameter setting and monitoring.

2.4.3 Manual Control Unit

Control panel can be used for simply controlling the machine and parameter setting in the field.

2.4.4 Fieldbus Option Board

The machine can be upgraded with fieldbus option boards with different fieldbus systems.

2.4.5 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.

3 Transport

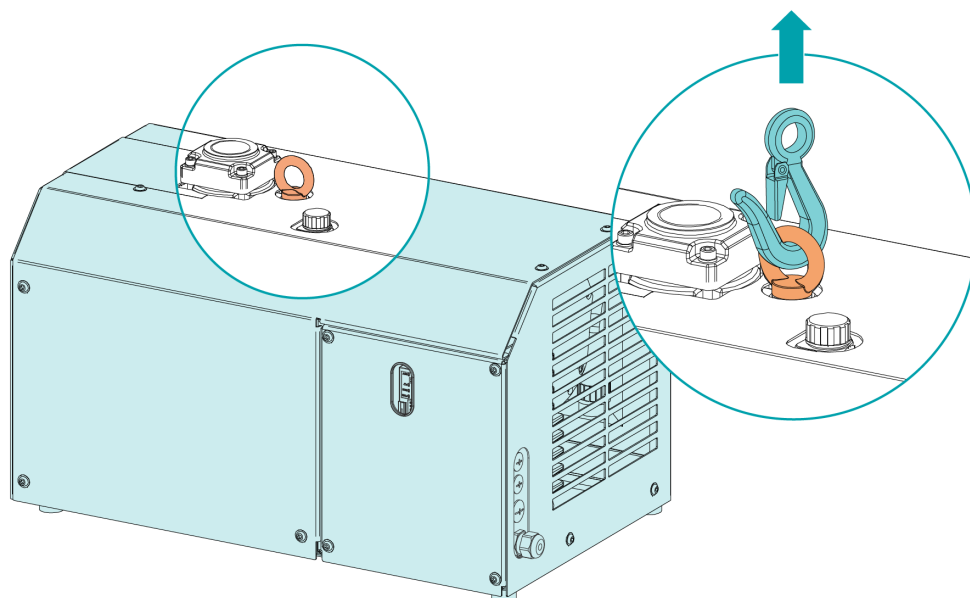


WARNING

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* [→ 37] 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 the machine for transport damage.
- If the machine is secured to a base plate:
- Remove the machine from the base plate.

4 Storage

- Seal all apertures with adhesive tape or reuse provided caps.



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:

- Wrap the machine in a corrosion inhibiting film.
- Store the machine indoors, in a dry and dust free environment and if possible, in original packaging, preferably at temperatures between 0 ... 40 °C.

5 Installation

5.1 Installation Conditions

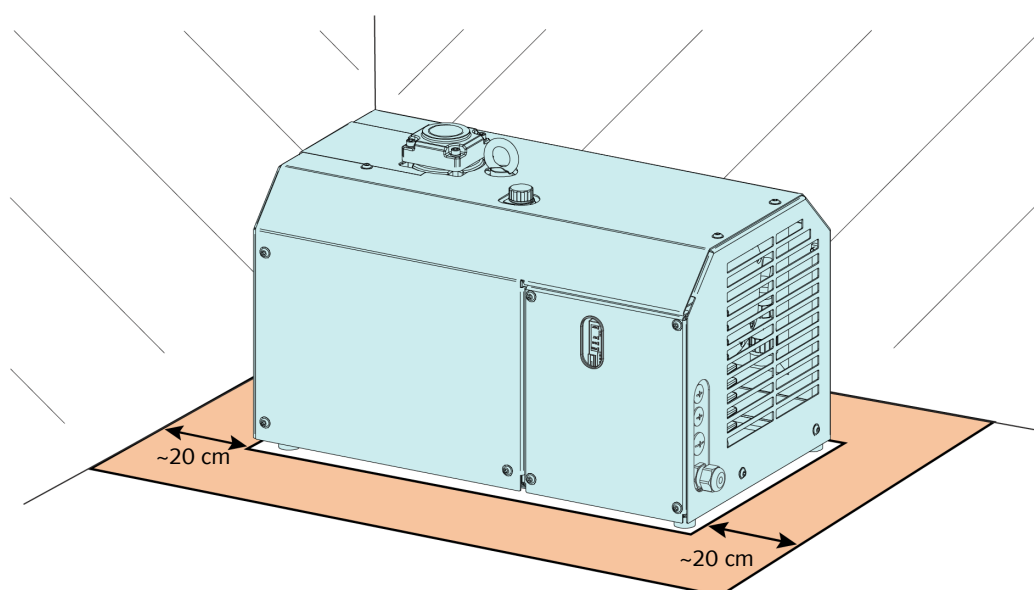
NOTICE

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* [→ 37].
- 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* [→ 24].
- 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 Busch representative, the motor should 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 suction connection installed.
- Remove all protective covers before installation.
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.
- Make sure that the diameter of the connection lines over the entire length is at least as large as the connections of the machine.
- Make sure that there is no counter pressure (also called "back pressure") at the discharge connection (OUT).

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

5.2.1 Suction Connection



NOTICE

Ingress of foreign objects or liquids.

Risk of damage to the machine !

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

- Install a suitable filter (5 micron or less) upstream from the machine.

Connection size(s):

- G1 ¼"
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.

5.2.2 Discharge Connection

! NOTICE

Discharge gas flow obstructed.

Risk of damage to the machine !

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

Connection size(s):

- G 3/4"

Unless the aspirated air is discharged to the environment right at the machine.

- Make sure that the discharge line either slopes away from the machine or provide a liquid separator or a siphon with a drain cock, so that no liquids can flow back into the machine.
- Make sure that the connection lines cause no stress on the connections of the machine. Therefore, we recommend installing flexible lines on the suction and discharge connections.

5.3 Filling Oil

! NOTICE

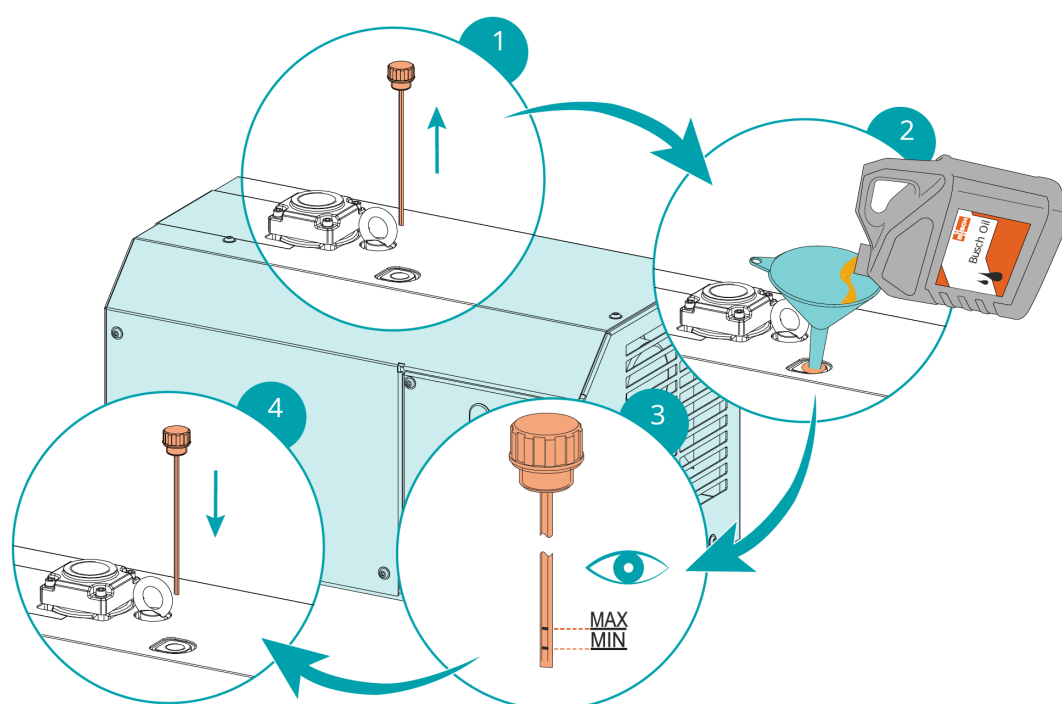
Use of an inappropriate oil.

Risk of premature failure!

Loss of efficiency!

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

For oil type and oil capacity see *Technical Data* [→ 37] and *Oil* [→ 38].



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



DANGER

Live wires.

Risk of electrical shock.

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

CURRENT PROTECTION OF THE CUSTOMER INSTALLATION:



DANGER

Missing current protection.

Risk of electrical shock.

- Current protection in accordance with EN 60204-1 must be provided by the customers on their installation(s).
 - The electrical installation must comply with the applicable national and international standards.
-



NOTICE

Electromagnetic compatibility.

- Make sure that the motor of the machine will not be affected by electric or electromagnetic disturbance from the mains, if necessary, seek advice from Busch.
 - Make sure that the EMC of the machine is compliant with the requirements of your supply network system, if necessary, provide further interference suppression (EMC of the machine, see *EU Declaration of Conformity* [→ 39] or *UK Declaration of Conformity* [→ 40]).
-

6.1 Machine delivered with a Variable Speed Drive



NOTICE

Incorrect connection.

Risk of damage to the variable speed drive!

- The wiring diagrams given below are typical. Check the connection instructions/diagrams.



NOTICE

Incorrect rotation direction.

Risk of overheating and damage to the machine!

- Make sure to check the rotation direction of the cooling fan in order to prevent overheating of the machine.
- If the cooling fan is rotating in the wrong direction, switch any of the two power supply wires.
- Make sure that the power supply for the drive 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 on the power line so that the machine is completely secured during maintenance tasks.
- Provide an overload protection according to EN 60204-1.
- Connect the protective earth conductor.

6.2 Wiring Diagram Variable Speed Drive (VSD)

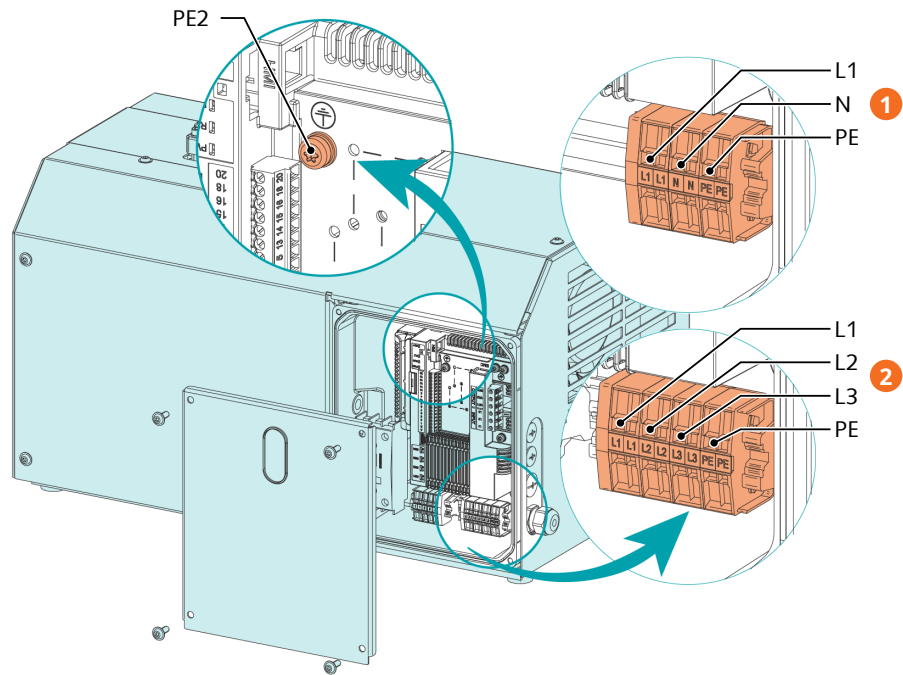


CAUTION

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.



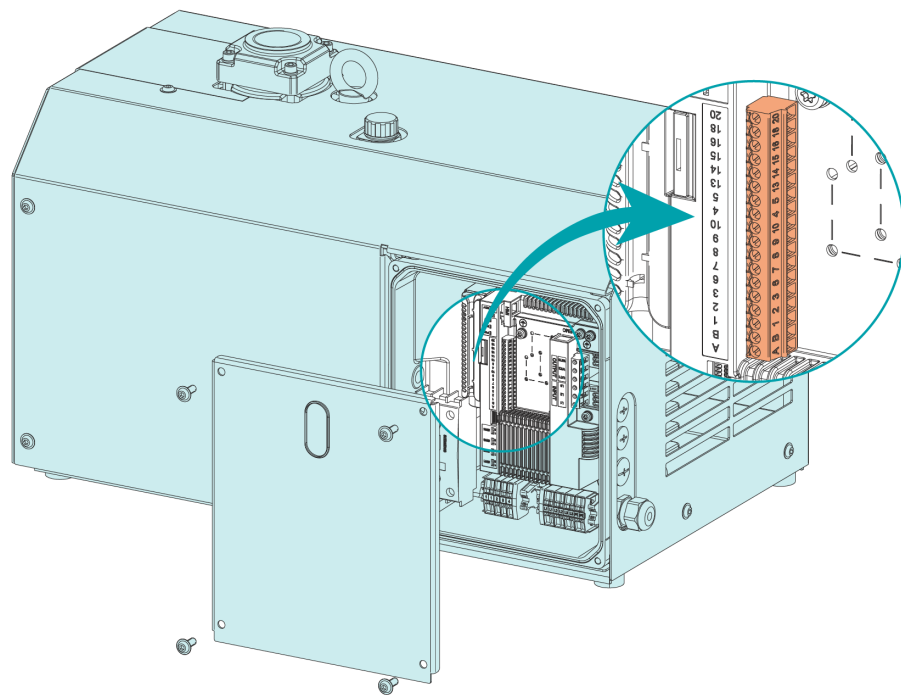
Description

1	single-phase version	2	three-phase version
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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 of the machine can be changed as followed by respectively connections on the control unit:

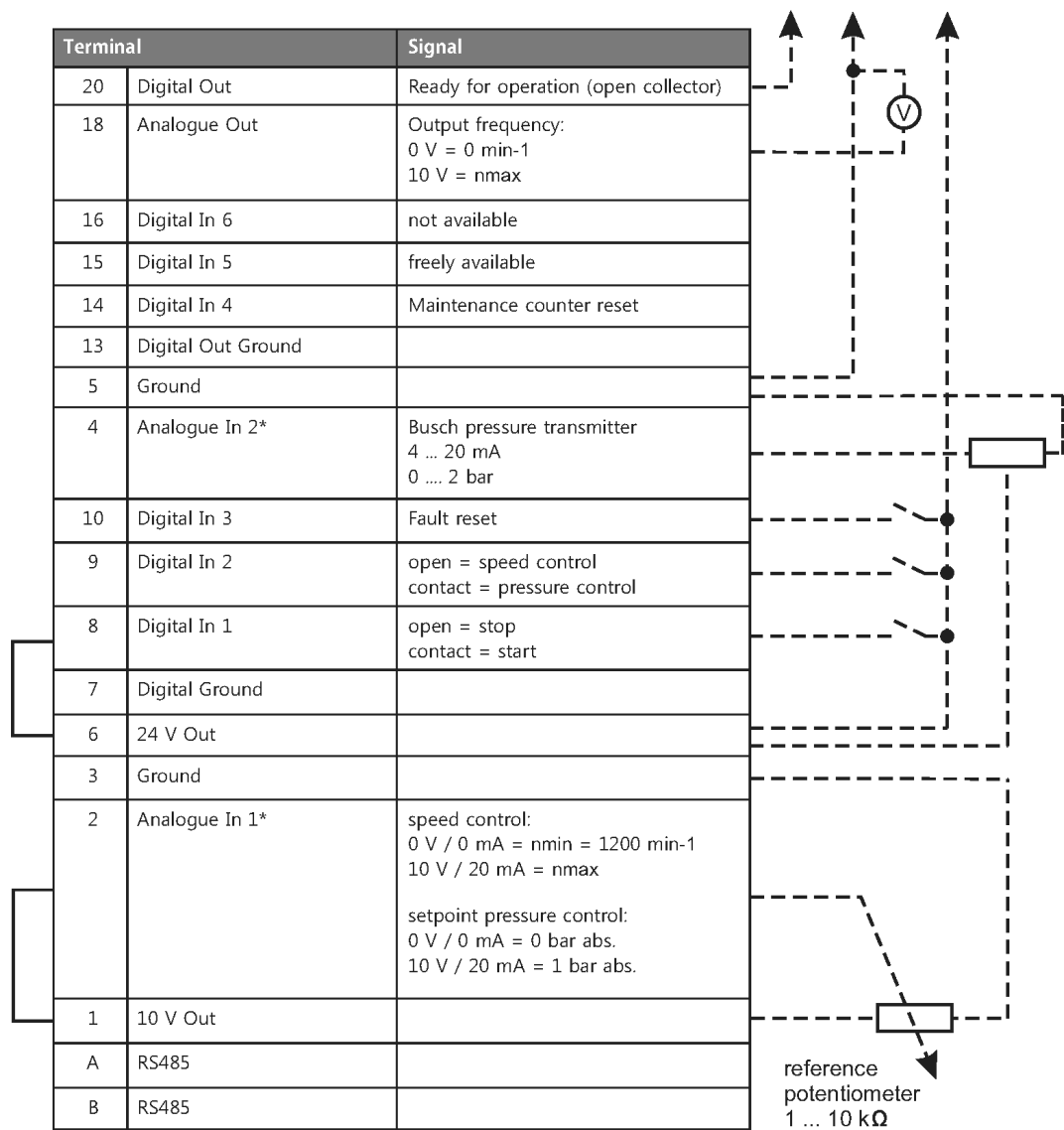
- Start / stop the machine by using a digital signal (terminal 8: digital input 1).
- Speed or pressure control of the machine (terminal 9: digital input 2).
- The ready for operation signal can be read via terminal 20 (digital output).



NOTE

To control the variable speed drive, using either the “Parameterization-Kit” or the “Manual Control Unit (KEYPAD)” is highly recommended.

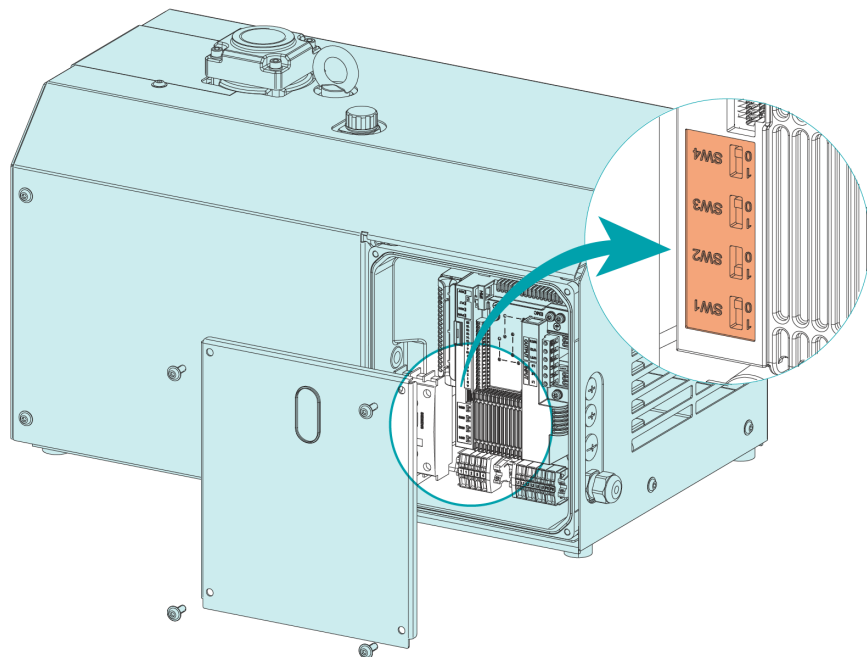
For detailed information, see *Pump Control Instructions* [document No.: 0870 166 596].



*Selectable with DIP switches between voltage and current signal.

The left side shows the connection diagram ex-works. The right side shows examples of possible connections.

6.4 DIP Switches



DIP Switches	Description	Default
SW4	Not available	0
SW3	0 = Analog Input 2 works in current mode (4 ... 20 mA) 1 = Analog Input 2 works in voltage mode (2 ... 10 V)	0
SW2	0 = Analog Input 1 works in current mode (4 ... 20 mA) 1 = Analog Input 1 works in voltage mode (2 ... 10 V)	1
SW1	0 = Digital Inputs are connected to the ground 1 = Digital Inputs are isolated from the ground	0

7 Commissioning

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

During operation the surface of the machine may reach temperatures of more than 70°C.

Risk of burns!

- Avoid contact with the machine during and directly after operation.
- Make sure that the *Installation Conditions* [→ 11] 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 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 operated under normal operating conditions:

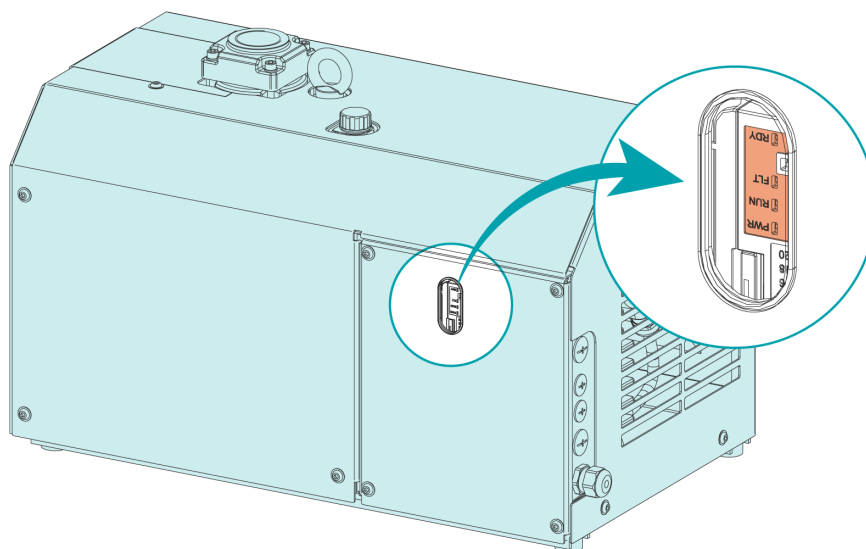
- Measure the motor current and record it as reference for future maintenance and troubleshooting work.

NOTE

To control the variable speed drive, using either the “Parameterization-Kit” or the “Manual Control Unit (KEYPAD)” is highly recommended.

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

7.1 Variable Speed Drive Overview



LED	Description
PWR	Lights when the machine is connected to the power supply.
RUN	Lights during operation of the machine.
FLT	Lights when a fault occurs. Blinks if maintenance is necessary (every 8000 operating hours). Maintenance counter can be reset via terminal 14 (Digital In 4) of the control unit. Fault codes: see chapter 9.1 'Fault Tracing' in the document 'Pump Control Instructions' part no. 0870166596
RDY	Lights when the machine is ready for operation and no faults occur. Blinks in case of a warning.

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.

Depends on the pressure transmitter the DIP switch SW3 must be switched either to current mode (4 ... 20 mA) or to voltage mode (2 ... 10 V) (see *DIP Switches* [→ 19]).

During pressure control the machine controls the speed according to deviation between the actual value and the desired pressure value.

In case of the actual value is above the desired pressure value the speed of the machine increases. Drops the actual value below the desired pressure value the speed of the machine decreases.

In case of a long operation with the minimum speed the machine switches to the sleep mode, that means the machine stops and starts automatically when the actual value exceeds the desired pressure value by 50 mbar.

7.3 Fault Reset

A fault is indicated by lighting of the LED 'FLT' (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!

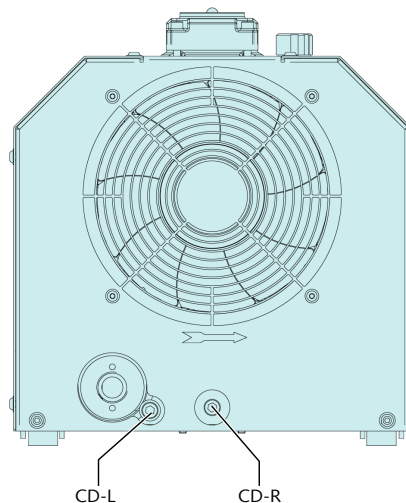
- Make sure that a start-up will not lead to a dangerous situation.
-
- Reset the fault by disconnecting and reconnecting the power supply for at least 30 seconds or by using a digital signal on terminal 10 (Digital In 3) of the control unit.

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 other vapors 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.



Before process:

- 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

Live wires.

Risk of electrical shock.

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



WARNING



The machine is contaminated with hazardous material.

Risk of poisoning!

Risk of infection!

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.



CAUTION

Hot surface.

Risk of burns!

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



CAUTION

Failing to properly maintain the machine.

Risk of injuries!

Risk of premature failure and loss of efficiency!

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



NOTICE

Using inappropriate cleaners.

Risk of removing safety stickers and protective paint!

- Do not use incompatible solvents to clean the machine.

- Shut down the machine and lock against inadvertent start up.
- 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	<ul style="list-style-type: none"> • Check the inlet screen (IS), clean if necessary. • Check the oil level, see <i>Oil Level Inspection</i> [→ 24]. <p>Aqua version only:</p> <ul style="list-style-type: none"> • Check the inlet filter cartridge of the condensate reservoir, replace if necessary, see <i>Drain Condensate Reservoir (Aqua Version)</i> [→ 27]. <p>In case of an inlet filter (IF) being installed:</p> <ul style="list-style-type: none"> • Check the inlet filter cartridge, replace if necessary.
Every 3 months	<ul style="list-style-type: none"> • Check the machine for oil leaks.
Every 6 months	<ul style="list-style-type: none"> • Clean the machine from dust and dirt, see <i>Cleaning from Dust and Dirt</i> [→ 25].
Every 8000 hours or once a year	<ul style="list-style-type: none"> • Change the oil. • Reset the maintenance counter, e.g. by applying a jumper between terminal 14 (Digital In 4) and terminal 6 (24 V Out) of the control unit. <p>Aqua version only:</p> <ul style="list-style-type: none"> • Empty the condensate reservoir, see <i>Drain Condensate Reservoir (Aqua Version)</i> [→ 27]. <p>Gas leakage optimized version only:</p> <ul style="list-style-type: none"> • Check that pressure relief lines (PRL) are not clogged, see <i>Pressure Relief Lines Maintenance</i> [→ 28].
Every 30000 hours or after 6 years	<ul style="list-style-type: none"> • Have a major overhaul on the machine (contact Busch).

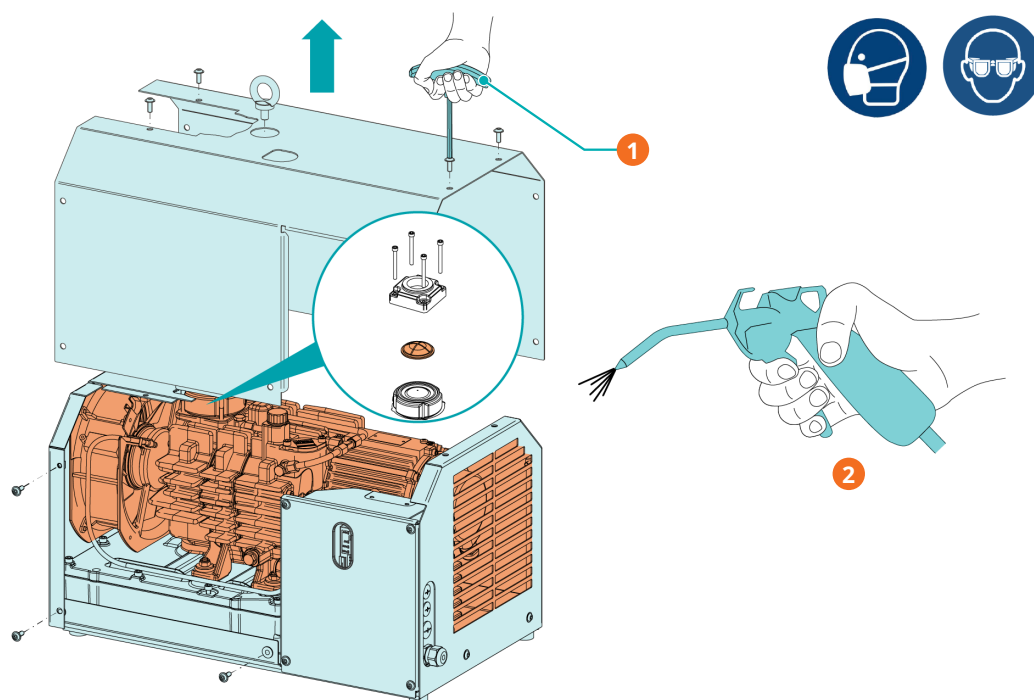
8.2 Oil Level Inspection

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

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 *Oil Filling* [→ 13].

8.3 Cleaning from Dust and Dirt



Description

1	4 mm hex key	2	Clean the ventilation grid, screen, fan and cooling fins
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8.4 Oil Change

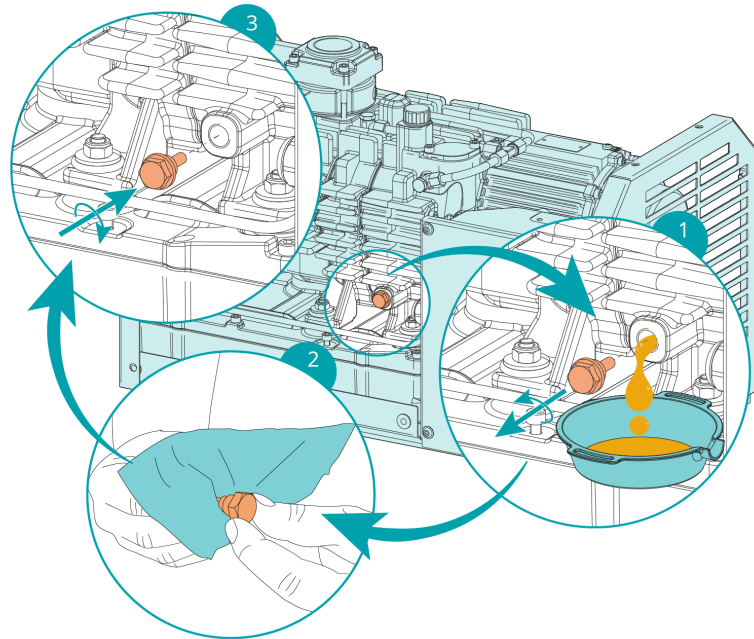
! NOTICE

Use of an inappropriate oil.

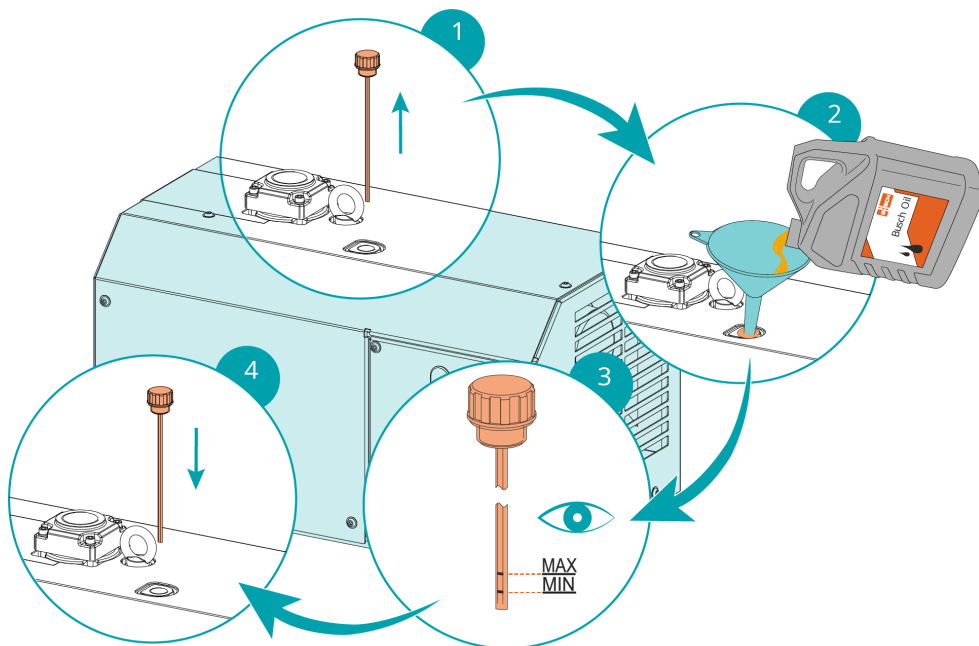
Risk of premature failure!

Loss of efficiency!

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

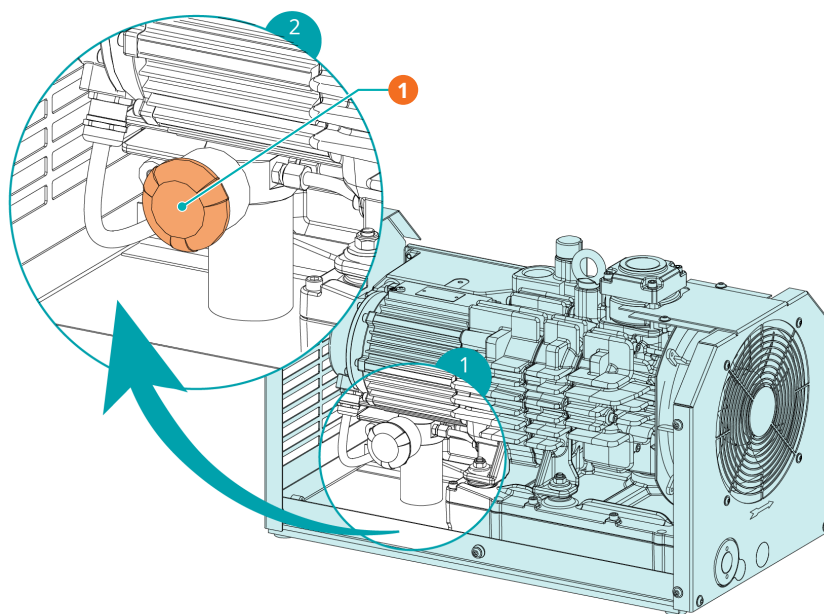


For oil type and oil capacity see *Technical Data* [→ 37] and *Oil* [→ 38].



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.

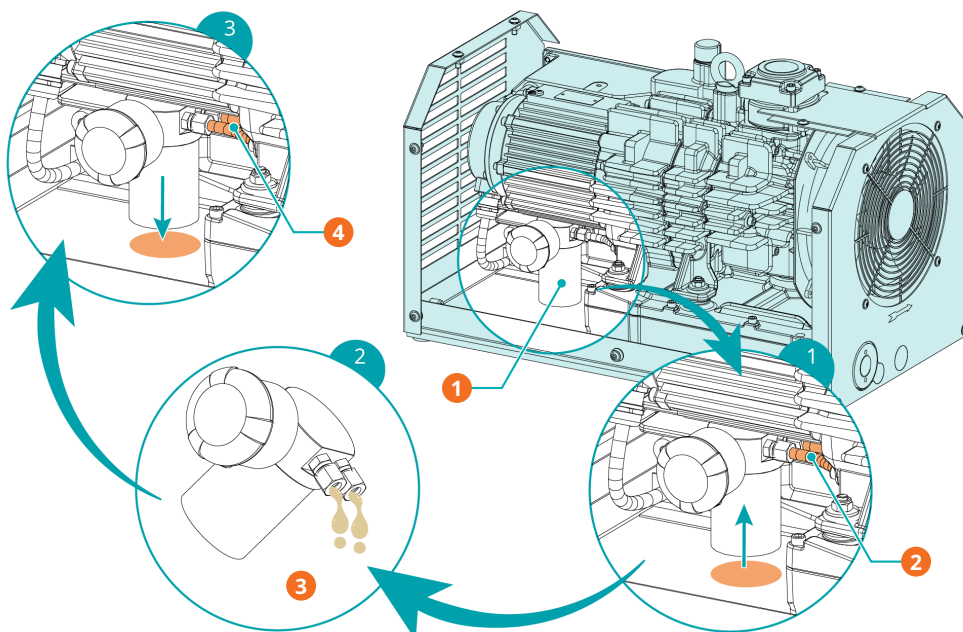
8.5 Filter change of Condensate Reservoir (Aqua Version)



Description

1	Remove the cover from the filter and replace the filter cartridge if necessary		
---	--	--	--

8.6 Drain Condensate Reservoir (Aqua Version)



Description

1	Condensate reservoir	2	Remove both hoses from the condensate reservoir
3	Drain the condensate reservoir	4	Remount both hoses to the condensate reservoir

8.7 Pressure Relief Lines Maintenance

(Gas Leakage Optimized Version Only)



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

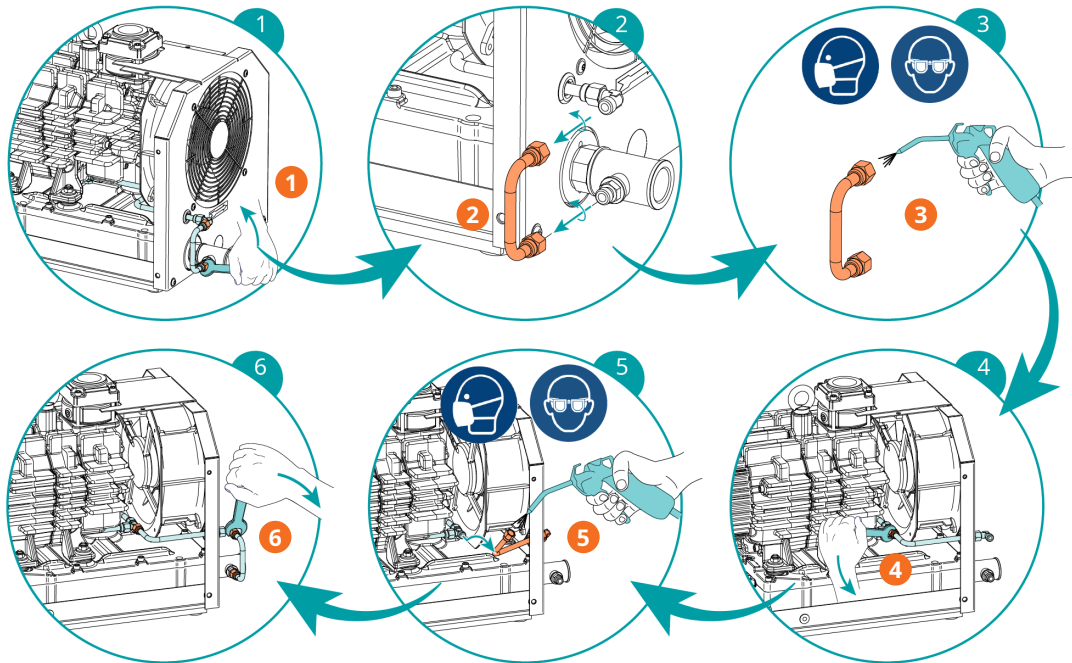
Pressurized air systems supply too high pressure.

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
2	Remove the line
3	Blow into the line
4	Unscrew the nut
5	Remove- and blow into the line
6	Reinstall the lines and fasten all the nuts

9 Overhaul



WARNING



The machine is contaminated with hazardous material.

Risk of poisoning!

Risk of infection!

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.



NOTICE

Improper assembly.

Risk of premature failure!

Loss of efficiency!

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

In case of the machine having conveyed gas that was contaminated with foreign materials which are dangerous to health:

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

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

10 Decommissioning



DANGER

Live wires.

Risk of electrical shock.

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



CAUTION

Hot surface.

Risk of burns!

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

- Shut down the machine and lock against inadvertent start up.
- Disconnect the power supply.
- Vent the connected lines to atmospheric pressure.
- Disconnect all connections.

If the machine is to be stored:

- See *Storage* [→ 10].

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!

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

Spare parts kit	Description	Part no.
Service kit (Aqua version)	Includes all the necessary parts for maintenance.	0992 201 056

If other parts are required:

- Contact your Busch representative.

12 Troubleshooting



DANGER

Live wires.

Risk of electrical shock.

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



CAUTION

Hot surface.

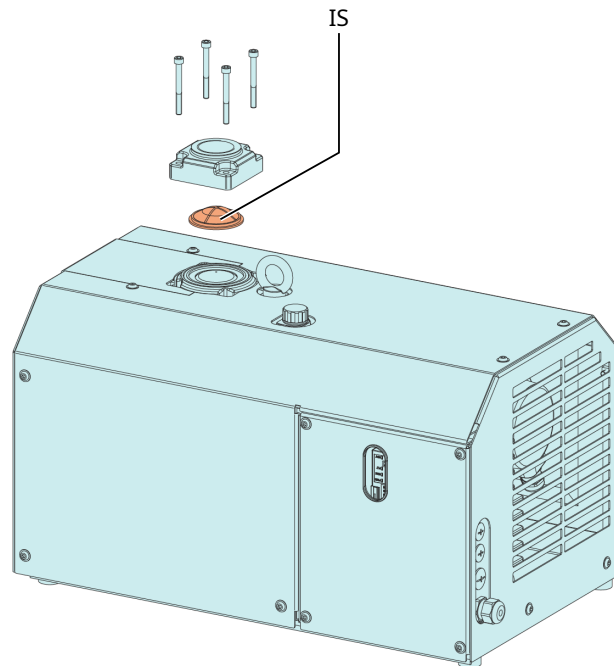
Risk of burns!

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



NOTE

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



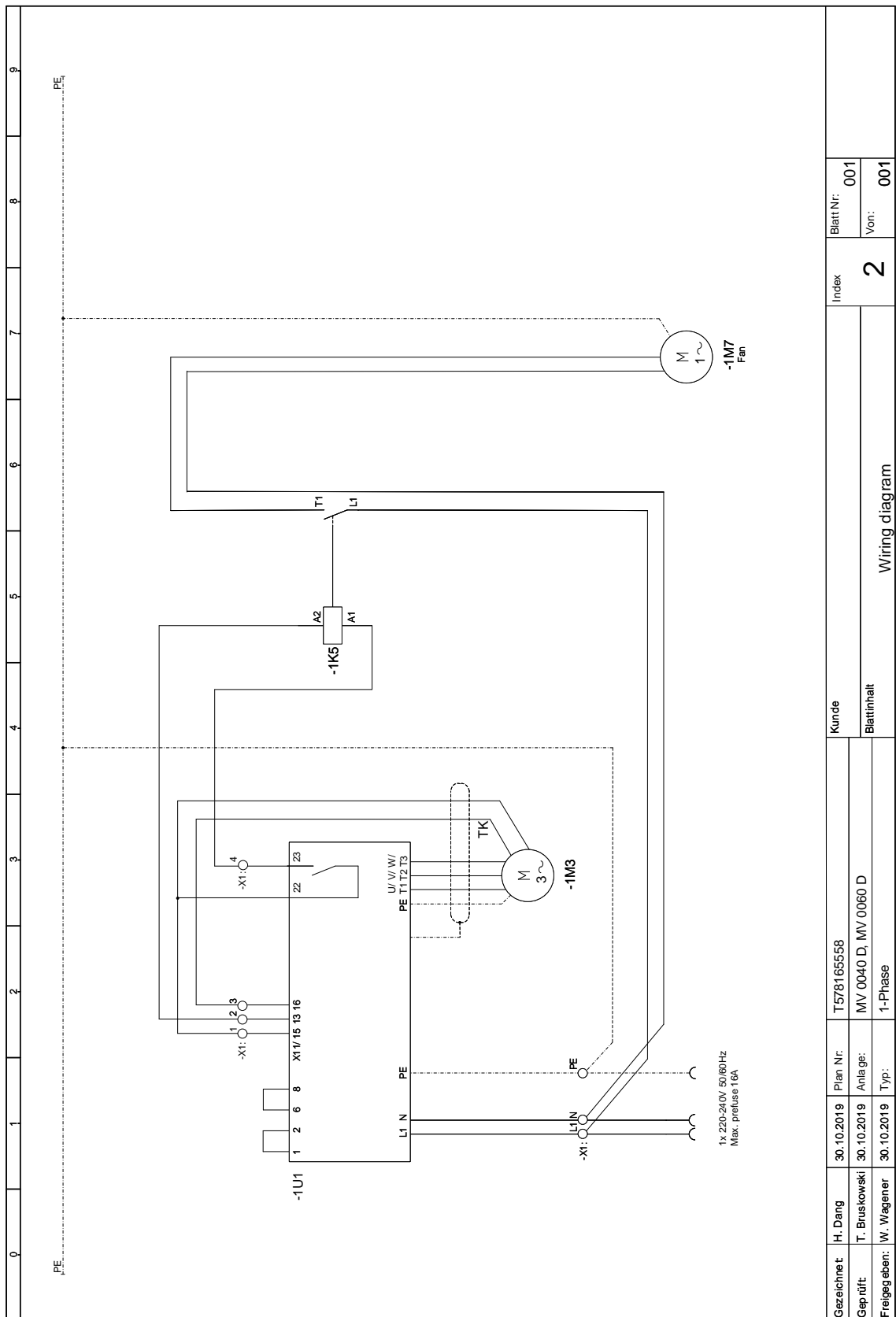
Description	
IS	Inlet screen

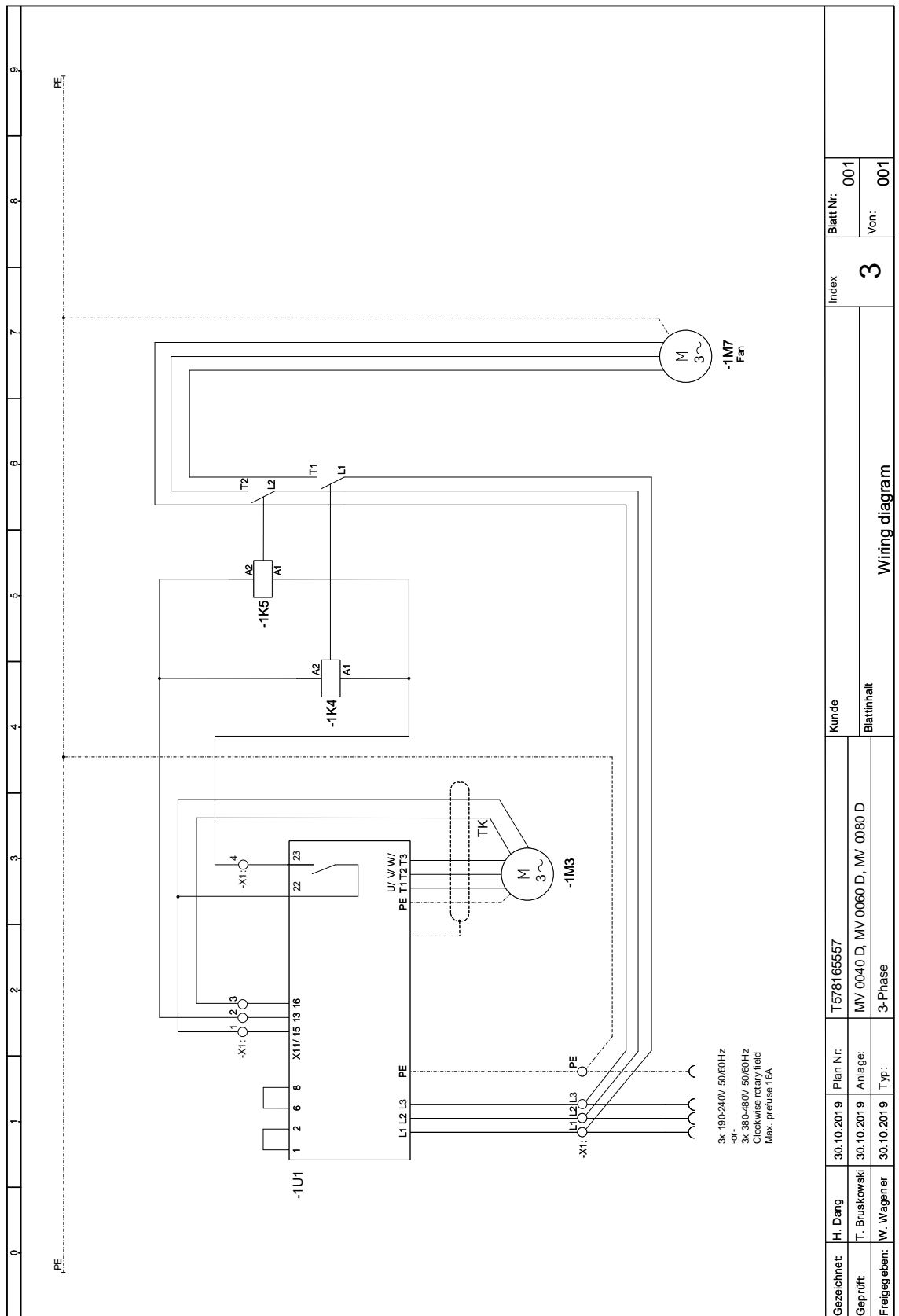
Problem	Possible Cause	Remedy
The machine does not start.	The motor is not supplied with the correct voltage.	<ul style="list-style-type: none"> • Check the power supply.
	The motor is defective.	<ul style="list-style-type: none"> • Repair the machine (contact Busch).

Problem	Possible Cause	Remedy
The machine does not reach the usual pressure on the suction connection.	The inlet screen (IS) is partially clogged.	<ul style="list-style-type: none"> • Clean the inlet screen (IS).
	The inlet filter cartridge (optional) is partially clogged.	<ul style="list-style-type: none"> • Replace the inlet filter cartridge.
	Internal parts are worn or damaged.	<ul style="list-style-type: none"> • Repair the machine (contact Busch).
The machine runs very noisily.	Oil level too low.	<ul style="list-style-type: none"> • Top up oil.
	Defective bearings.	<ul style="list-style-type: none"> • Repair the machine (contact Busch).
The machine runs too hot.	Insufficient cooling.	<ul style="list-style-type: none"> • Remove dust and dirt from the machine .
	The cooling fan's rotation direction is incorrect.	<ul style="list-style-type: none"> • Check the rotation direction of the cooling fan, see <i>Machine delivered with a Variable Speed Drive</i> [→ 15].
	Ambient temperature too high.	<ul style="list-style-type: none"> • Observe the permitted ambient temperature, see <i>Technical Data</i> [→ 37].
	Temperature of the process gases at the inlet too high.	<ul style="list-style-type: none"> • Observe the permitted gas inlet temperature, see <i>Technical Data</i> [→ 37].
	Oil level too low.	<ul style="list-style-type: none"> • Top up oil.

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

13 Circuit Diagram





Gezeichnet:	H. Dang	Plan Nr.:	T578165557	Kunde:	T578165557		Blatt Nr.:	001
Gepf.:	T. Bruskowski	Anlage:	MV 0040 D, MV 0060 D, MV 0080 D	Blattinhalt:	Blattinhalt		Von:	001
Freigegeben:	W. Wagener	T.yp.:	3-Phase	Wiring diagram		Index:	3	

14 Electrical Data of Control Unit Terminals

Terminal	Technical Information	
20	Digital Out	Open collector max. 35 V / 50 mA
18	Analog Out	0 ... 10 V (max. 30 mA); Short-circuit protected; Resolution 0.1%; accuracy +/-2.5%
16	Digital In 6	Positive or negative logic Ri = min. 4 kΩ; 15 ... 30 V = '1' 0 ... 5 V = '0'
15	Digital In 5	
14	Digital In 4	
13	Digital Out Ground	Ground for digital output 1
5	Ground	Ground for reference and controls (connected internally to frame earth through 2MΩ)
4	Analog In 2	0 ... +10 V (Ri = 200 kΩ); 4 ... 20 mA (Ri = 250 Ω); Resolution 0.05%; accuracy +/-1%; Voltage or current (selectable with DIP-switch SW3)
10	Digital In 1	Positive or negative logic Ri = min. 4 kΩ; 15 ... 30 V = '1' 0 ... 5 V = '0'
9	Digital In 2	
8	Digital In 3	
7	Digital Ground	Ground for digital inputs. Connected to ground with DIP-switch SW1
6	24 V Out	24 V +/-10 %; max. voltage ripple <100 mVrms; max. 100 mA; Short-circuit protected; Can be used with an external power supply (with a current limiter or fuse protected) to supply the control unit and field-bus for backup purposed. Dimensioning: max. 1000 mA / control unit.
3	Ground	Ground for reference and controls (connected internally to frame earth through 2MΩ)
2	Analog In 1	0 ... +10 V (Ri = 200 kΩ); 4 ... 20 mA (Ri = 250 Ω); Resolution 0.05%; accuracy +/-1%; Voltage or current (selectable with DIP-switch SW3)
1	10 V Out	+10 V, +/-5 %; max. 10 mA
A	RS485	Not used
B	RS485	Not used

15 Technical Data

		MV 0040 D Synchro	MV 0060 D Synchro	MV 0080 D Synchro
Nominal pumping speed (60 Hz)	m ³ /h	40	60	80
	ACFM	23.5	35.3	47
Ultimate pressure	hPa (mbar) abs.	40		
	TORR abs.	30		
Nominal motor rating (60 Hz)	kW	1.3	1.7	2.1
	HP	1.7	2.3	2.8
Nominal current for 3~ 380-480 V for 3~ 190-240 V for 1~ 220-240 V	A	4.1	5.0	6.5
		7.1	8.5	-
		12.3	14.2	-
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, in- let (IN) piped out and outlet (OUT) not piped	dB(A)	60	66	69
Ambient temperature range	°C	0... 40 *		
	°F	32 ... 104 *		
Inlet gas temperature range	°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 type		IP 44		
Permitted stationary vibration: si- nusoidal		3 Hz < f < 8.43 Hz: 7.5 mm 8.43 Hz < f < 200 Hz: 2g 3M6 acc. IEC 60721-3-3		
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, please consult your Busch representative.

** The weight can vary depending on the order.

16 Oil

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

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

Oil suitability

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

17 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

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the machine: MINK MV 0040 D; MINK MV 0060 D; MINK MV 0080 D

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

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

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

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

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

Busch Dienste GmbH
Schauinslandstr. 1
DE-79689 Maulburg

Maulburg, 02.01.2024



Dr. Martin Gutmann
General Manager
Busch Produktions GmbH

18 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

Busch Produktions GmbH
Schauinslandstr. 1
DE-79689 Maulburg

declares that the machine: MINK MV 0040 D; MINK MV 0060 D; MINK MV 0080 D

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

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

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

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

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

Busch (UK) Ltd
30 Hortonwood
Telford - UK

Maulburg, 02.01.2024



Dr. Martin Gutmann
General Manager
Busch Produktions GmbH

Notes

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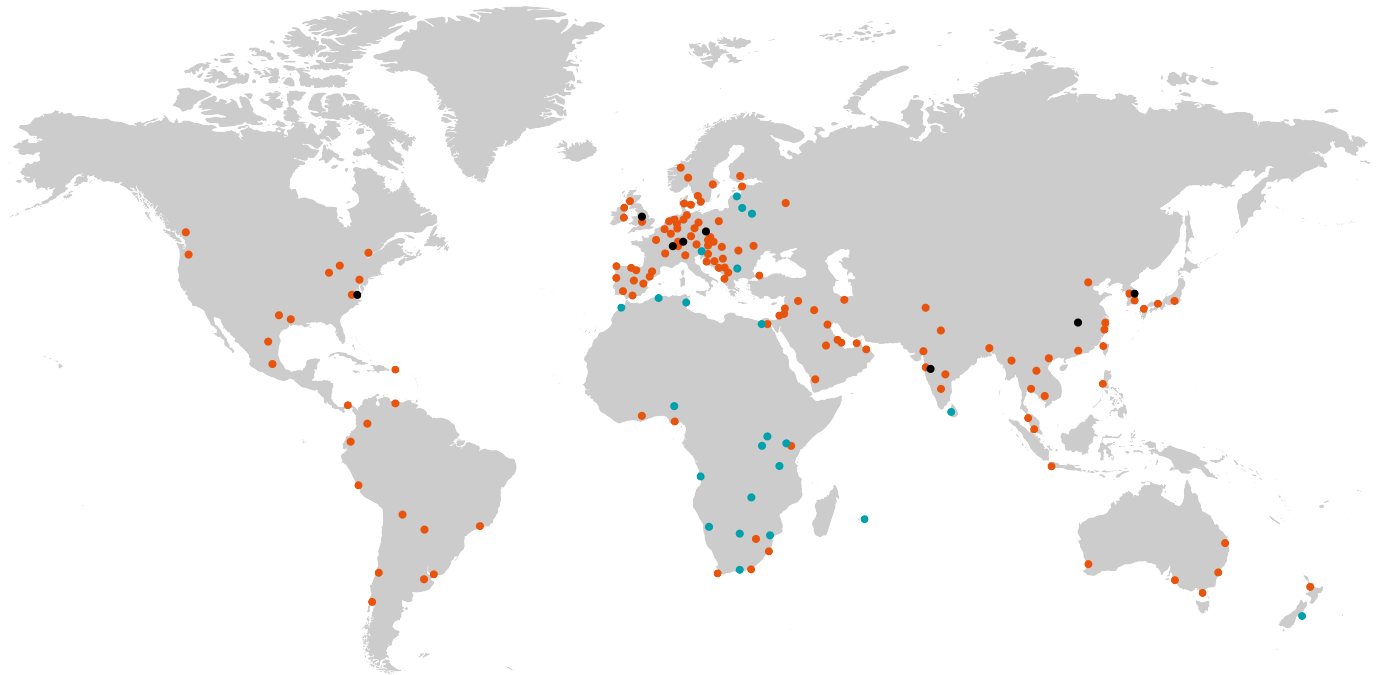
A large grid of small dots for taking notes, consisting of 20 columns and 30 rows of dots.

A large grid of small dots, intended for taking notes. The grid consists of approximately 30 columns and 40 rows of dots, covering most of the page area below the header and above the footer.

Busch

Vacuum Solutions

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

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