



VACUUM SOLUTIONS

Part of the **BUSCH** GROUP

MINK

Claw Vacuum Pumps

MV 1202 B

MV 1200 B ECOTORQUE

Instruction Manual



Table of Contents

1	Safety	4
2	Product Description	5
2.1	Operating Principle	7
2.2	Intended Use	7
2.3	Design Options.....	8
2.3.1	Aqua Version	8
2.4	Start Controls.....	8
2.5	Standard Features.....	8
2.5.1	Vacuum Relief Valve	8
2.5.2	Pressure Monitoring	8
2.5.3	ECOTORQUE Variable Speed Drive.....	9
2.6	Optional Accessories.....	9
2.6.1	Communication Cable.....	9
2.6.2	Inlet Filter	9
2.6.3	Process Pressure Monitoring.....	9
2.6.4	Non-return Valve	9
2.6.5	Remote Control Package	10
2.6.6	I/O and Communication Port.....	10
2.6.7	OTTO IoT Box	12
3	Transport and Handling	13
4	Storage.....	14
5	Installation.....	15
5.1	Installation Conditions	15
5.2	Connecting Lines / Pipes	16
5.2.1	Inlet Connection	16
5.2.2	Exhaust Connection	16
5.3	Filling Oil.....	17
6	Electrical Connection	18
6.1	Machine delivered without Control Box or Variable Speed Drive (VSD)	18
6.2	Machine delivered with an ECOTORQUE VSD.....	19
6.3	Start / Stop Connection	20
6.3.1	ECO-Mode in Pressure Control	20
6.4	Wiring Diagram Three-Phase Motor.....	21
6.5	Electrical Connection of the Monitoring Devices	23
6.5.1	Wiring Diagram Inlet Pressure Transmitter.....	23
7	Commissioning	24
7.1	Conveying Condensable Vapors.....	25
8	Maintenance	26
8.1	Maintenance Schedule	28
8.2	Oil Level Inspection.....	29
8.3	Cleaning from Dust and Dirt.....	29
8.4	Oil Change.....	30
9	Overhaul	31
10	Decommissioning	32
10.1	Dismantling and Disposal	32
11	Spare Parts	33

12	Troubleshooting	34
12.1	Troubleshooting ECOTORQUE Variable Speed Drive (VSD)	37
12.1.1	LED Flash Codes.....	37
12.1.2	List of Errors	38
13	Technical Data	41
14	Oil	43
15	EU Declaration of Conformity	44
16	UK Declaration of Conformity.....	45

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* [→ 7].

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



DANGER

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



WARNING

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



CAUTION

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



NOTICE

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

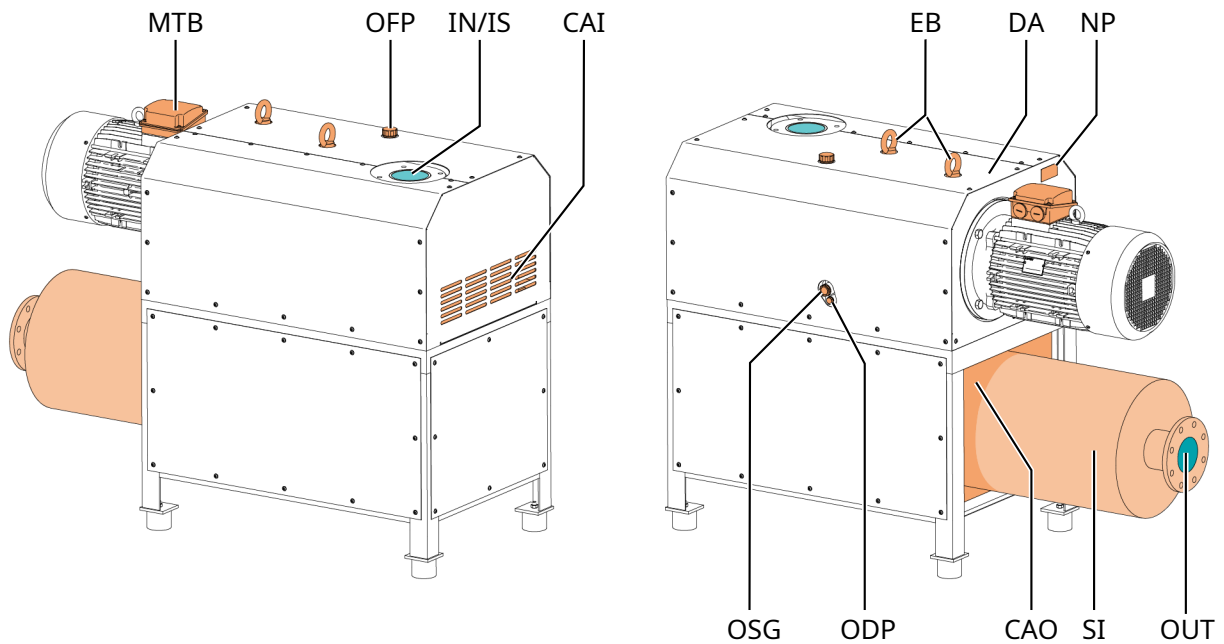


NOTE

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

2 Product Description

MV 1202 B



Description

IN/IS	Inlet connection / Inlet screen	OUT	Exhaust connection
OFP	Oil fill plug / venting valve	ODP	Oil drain plug
CAI	Cooling air inlet	CAO	Cooling air outlet
OSG	Oil sight glass	MTB	Motor terminal box
EB	Eye bolt	DA	Directional arrow
NP	Nameplate	SI	Silencer

i NOTE

Technical term.

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

i NOTE

Illustrations.

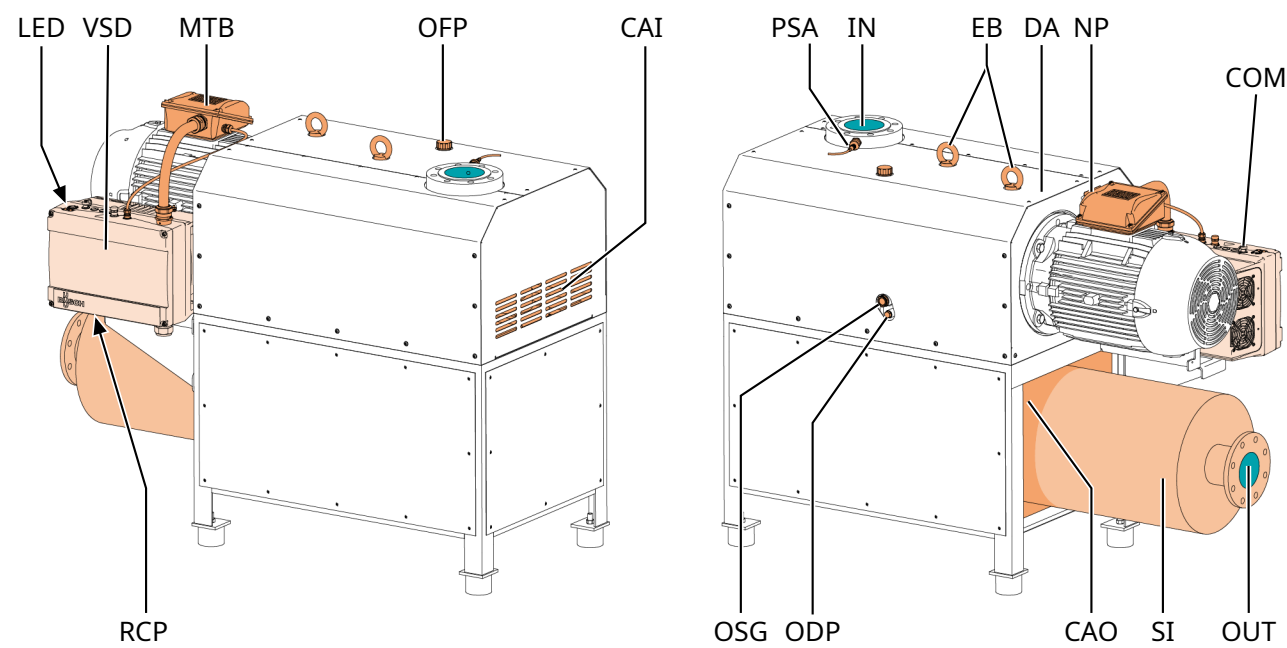
In this instruction manual, the illustrations may differ from the appearance of the machine.

i NOTE

Product origin.

The serial number on the name plate (NP) determines the manufacturing plant.

MV 1200 B ECOTORQUE



Description			
IN	Inlet connection	OUT	Exhaust connection
CAI	Cooling air inlet	CAO	Cooling air outlet
COM	Communication port (M12) A-coded	DA	Directional arrow
EB	Eye bolt	LED	Function indicator
MTB	Motor terminal box	NP	Nameplate
ODP	Oil drain plug	OFP	Oil fill plug / venting valve
OSG	Oil sight glass	PSA	Pressure transmitter (inlet)
PSA2	Pressure transmitter (optional customer process pressure regulation; not shown)	RCP	Remote control I/O port (M12)
SI	Silencer	VSD	Variable speed drive

 **NOTE**

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

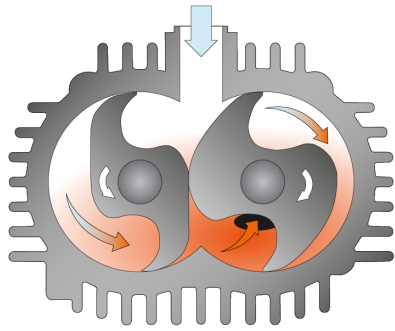
 **NOTE**

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

 **NOTE**

Product origin.
The serial number on the name plate (NP) determines the manufacturing plant.

2.1 Operating Principle



The machine works on the claw principle.

The MINK is fully air-cooled thanks to an integrated fan in the drive unit.

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* [→ 29]
- See *Troubleshooting* [→ 34]

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.

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 not capable of maintaining ultimate pressure.

- The minimum allowed ultimate pressure is to be read from the nameplate (NP) of the machine.
- By means of process control and/or vacuum relief valves it must be made sure that the minimum allowed ultimate pressure will not be underrun.

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* [→ 41].

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 1202 B 00
Aqua version	A	MV 1202 B 0A

2.3.1 Aqua Version

The Aqua version is a design option for conveying condensable vapors (water).

This machine is specifically equipped with:

- corrosion protection coating.

2.4 Start Controls

(MV 1202 B Only)

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

The machine can be equipped with a soft-starter.

2.5 Standard Features

2.5.1 Vacuum Relief Valve

(MV 1202 B Only)

The ultimate pressure is limited by a vacuum relief valve (VRE). The vacuum relief valve is adjusted ex-works to the minimum permitted ultimate pressure shown on the nameplate (NP).

2.5.2 Pressure Monitoring

(MV 1200 B ECOTORQUE Only)



NOTICE

The pressure transmitter (PSA) serves exclusively as a safety element for vacuum limitation and is not intended for process regulation. Relocation of the pressure transmitter is prohibited.

The pressure transmitter (PSA) is used to detect high inlet pressure and protects the machine by reducing the pumping speed if the inlet pressure drops below the permissible ultimate pressure.

The pressure transmitter (PSA) continuously monitors and controls the pumping speed to ensure that the target pressure is maintained.

2.5.3 ECOTORQUE Variable Speed Drive

(MV 1200 B ECOTORQUE Only)

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) can only 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. ECO-Mode

2.6 Optional Accessories

2.6.1 Communication Cable

(MV 1200 B ECOTORQUE Only)

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

2.6.2 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.

2.6.3 Process Pressure Monitoring

(MV 1200 B ECOTORQUE Only)

The pressure transmitter (PSA2) is used to monitor customer-side process pressure, including 5 meter cable.

- The optional pressure transmitter (PSA2) continuously monitors the customer-side process pressure and regulates the pumping speed to ensure that the target pressure is maintained.
- If the optional pressure transmitter PSA2 is in operation, the main pressure transmitter PSA functions as a safety sensor to protect the machine.

2.6.4 Non-return Valve

The non-return valve (NRV) prevents the reverse rotation / suck-back after switching off the machine.

Note: The non-return valve (NRV) is no reliable means to prevent suction and shall not be used as a non-return valve or shut-off valve for the system.

2.6.5 Remote Control Package

(MV 1200 B ECOTORQUE Only)

Remote control package (RCP) 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.

2.6.6 I/O and Communication Port

(MV 1200 B ECOTORQUE Only)

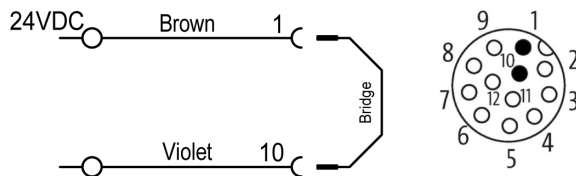
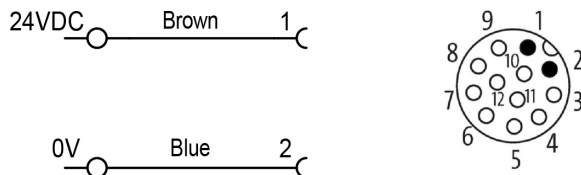
If the "Remote control package" option is selected:

Setup I/O port

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

Power Supply

- 24V DC power supply - Max



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).

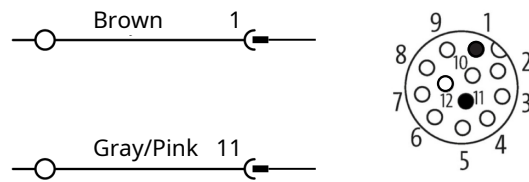


NOTE

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.

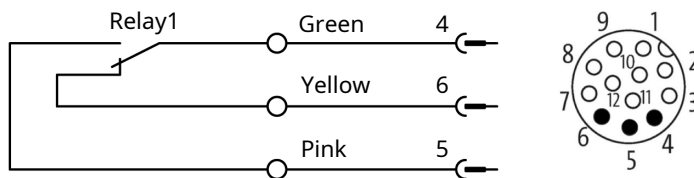
Reset Fault



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..

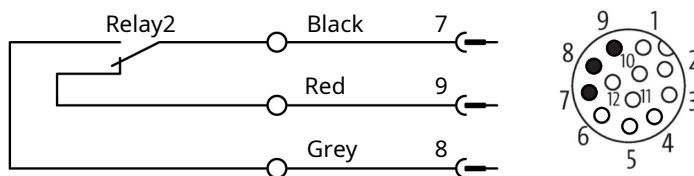
Alarm Output

- M12 connector max. 30V DC, 2 A



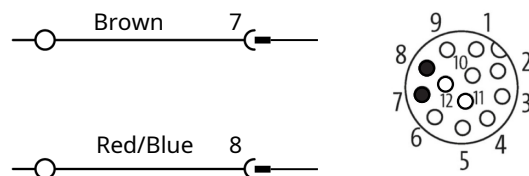
Operation Output

- M12 connector max. 30V DC 2 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.



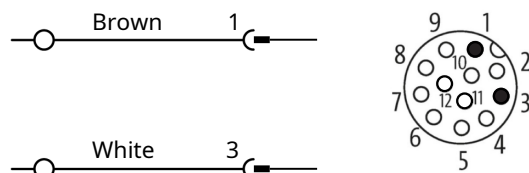
It allows to add an external safety element (dry contact).

Speed- / Pressure Control Selection

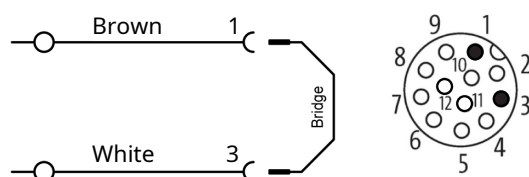
NOTE

The factory setting of the ECOTORQUE Variable Speed Drive (VSD) is Speed Control mode.

Speed Control (default factory setting)



Pressure Control



2.6.7 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.



WARNING

Lifting the machine using the motor eye bolt.

Risk of severe injury!

- Do not lift the machine using the eye bolt fitted to the motor.
- Only lift the machine as shown.

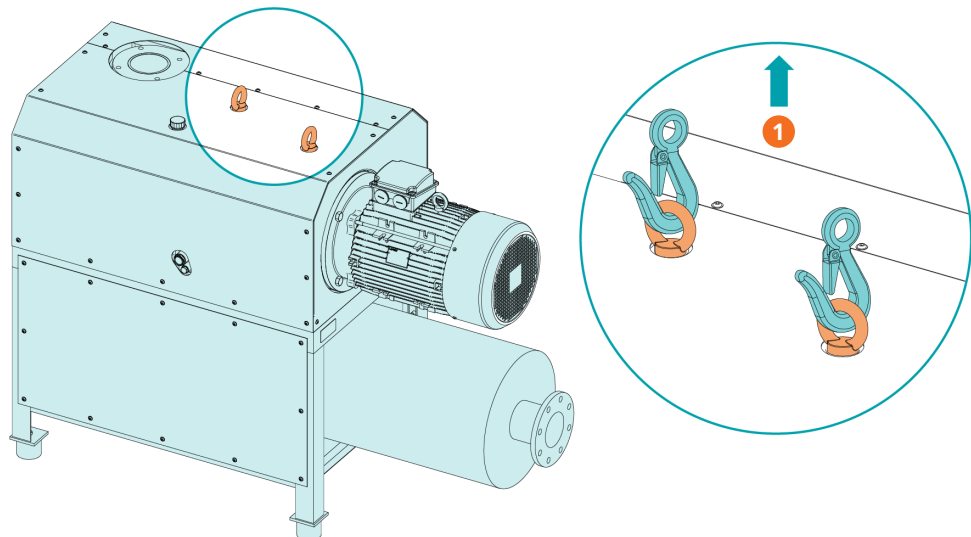


NOTICE

In case the machine is already filled with oil.

Tilting a machine that is already filled with oil can cause large quantities of oil to pass through the labyrinth seal into the cylinder.

- Drain the oil prior to every transport or always horizontally transport the machine.
- To find out the weight of the machine, refer to the chapter *Technical Data* [→ 41] 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.



Description

1	Use both eye bolts!
---	---------------------

- 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.
- Mount the rubber feet, delivered loose, to the machine's base frame.

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.

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

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

5 Installation

5.1 Installation Conditions



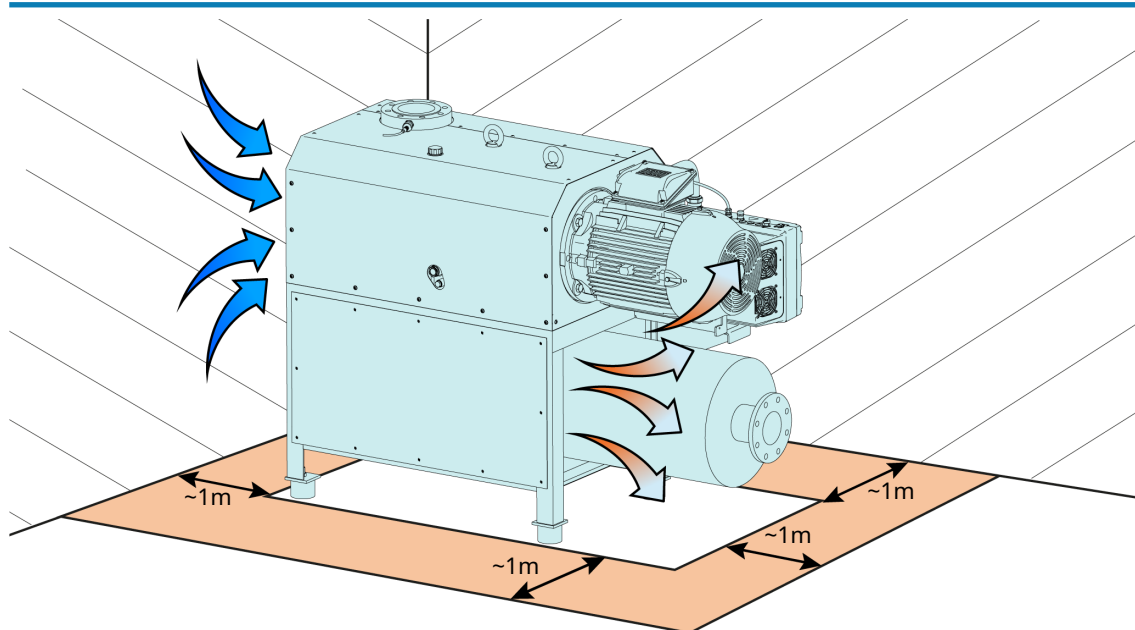
NOTICE

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* [→ 41].
- 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 the oil sight glass (OSG) remains easily visible.
- Make sure that enough space remains for maintenance work.
- Make sure that the machine is placed or mounted horizontally, a maximum deviation of 1° in any direction is acceptable.
- Check the oil level, see *Oil Level Inspection* [→ 29].
- 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 and exhaust connections 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 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.

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):

- DN100 PN10/16

Depending on the specific configuration ordered, other connection dimensions may apply.

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

- DN100 PN10/16

Depending on the specific configuration ordered, other connection dimensions may apply.

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 connection 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

The machine is shipped without oil.

Operation without oil will damage the machine in short time!

- Prior to commissioning, the machine must be filled with oil, see *Filling Oil* [→ 17].

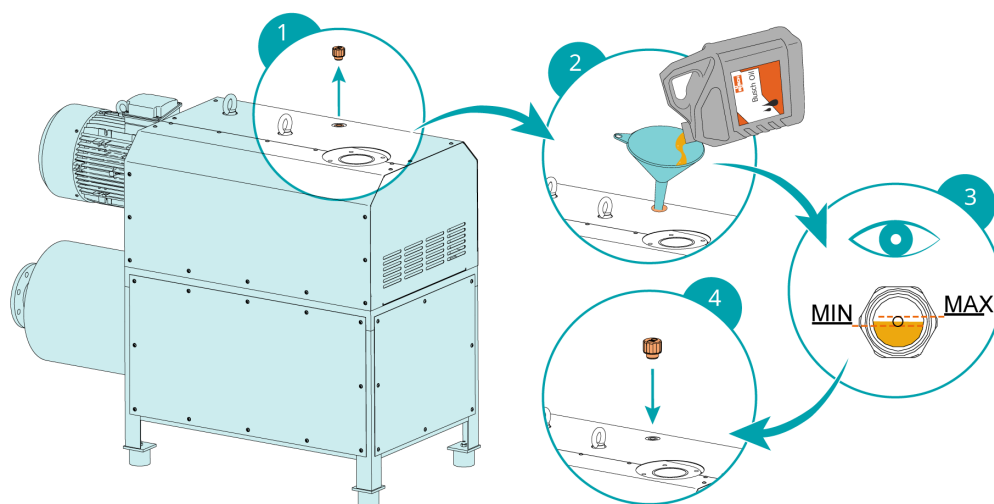
! NOTICE

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* [→ 41] and *Oil* [→ 43] 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



DANGER

Live wires.

Risk of electrical shock!

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



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.
- Install a semiconductor temperature detector to the release device in accordance with the wiring diagram.



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 or UK Declaration of Conformity).

6.1 Machine delivered without Control Box or Variable Speed Drive (VSD)

(MV 1202 B Only)



DANGER

Live wires.

Risk of electrical shock!

- Electrical installation work must only be executed by qualified personnel.
- Make sure that the power supply for the motor is compatible with the data on the name plate of the motor.
- 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 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 for the motor.
 - Busch recommends installing a K-curve circuit breaker.
- Connect the protective earth conductor.
- Electrically connect the motor.



NOTICE

Incorrect connection.

Risk of damage to the motor!

- The wiring diagrams below are examples only. See inside the terminal box for motor connection instructions and diagrams.

6.2

Machine delivered with an ECOTORQUE VSD

(MV 1200 B ECOTORQUE Only)



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.
- Make sure that the power supply for the drive is compatible with the data on the name plate of the variable speed drive.
- If the machine is equipped with a power connector, install a residual current protective device to protect persons in case of a defective insulation.
 - Busch recommends installing a type B residual protective device suitable for the electrical installation.
- If the variable speed drive is not equipped with a lockable disconnect switch, provide it on the power line so that the machine is completely secured during maintenance tasks.
- 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.

6.3 Start / Stop Connection



NOTICE

Risk of phase loss or voltage imbalance.

Risk of damage to the machine!

If a phase loss or significant voltage imbalance occurs, the ECOTORQUE VSD may experience:

- **Reduced Output Power:** The ECOTORQUE VSD may not be able to deliver the full rated power to the connected machine.
- **Increased Heat Generation:** Operating under unbalanced conditions can lead to higher thermal stress on the ECOTORQUE VSD components.
- **Potential Fault Triggers:** The ECOTORQUE VSD might enter a fault state to protect itself from damage.

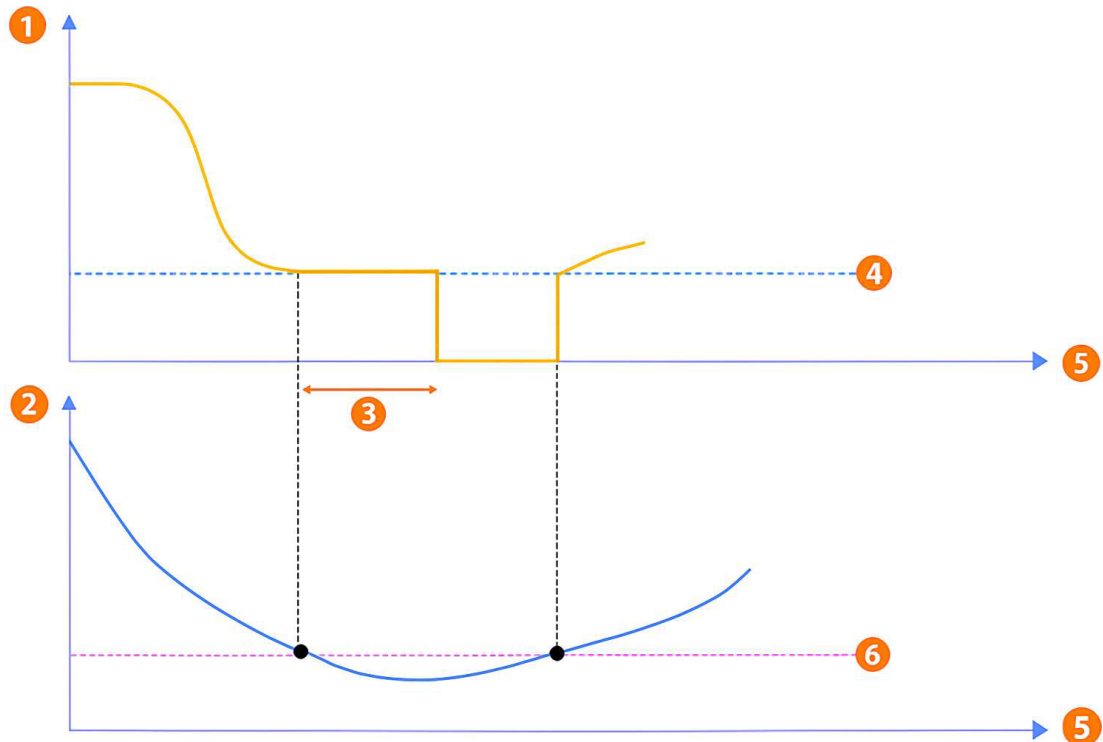
The following applies to machines equipped with an on-board variable speed drive (VSD).

- The ECOTORQUE Variable Speed Drive (VSD) is delivered with preset factory parameters. Please refer to the specific wiring diagram 2000269636.
- Contact your local Busch agency or your Busch representative to check if your machine is a custom or a standard one.

6.3.1 ECO-Mode 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 (ECO-Mode stand-by time to be set in **Busch Vacuum Manager** software), instead of running at minimum speed (see *Technical Data* [→ 41])

Once the pressure value (2) is higher than the target value (6), the machine will start again.



Description			
1	Frequency	2	Pressure
3	ECO-Mode stand-by time	4	Minimum speed (20 Hz / 1200 min ⁻¹)
5	Time	6	Target pressure

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

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

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

6.4 Wiring Diagram Three-Phase Motor

(MV 1202 B Only)



NOTICE

Incorrect direction of rotation.

Risk of damage to the machine!

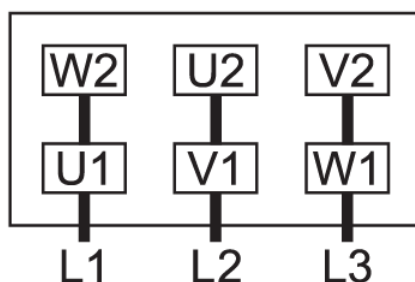
- Operation in the wrong direction of rotation can destroy the machine in a short time! Prior to start-up, ensure that the machine is operated in the right direction.

- Determine the intended direction of rotation with the arrow (stuck on or cast).
- Jog the motor briefly.

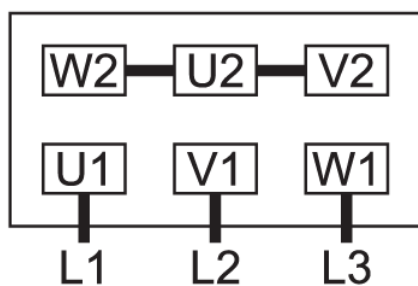
If the rotation of the motor must be changed:

- Switch any two of the motor phase wires.

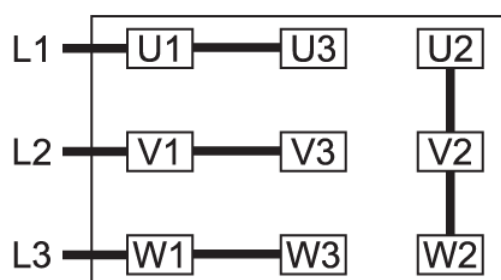
Delta connection (low voltage):



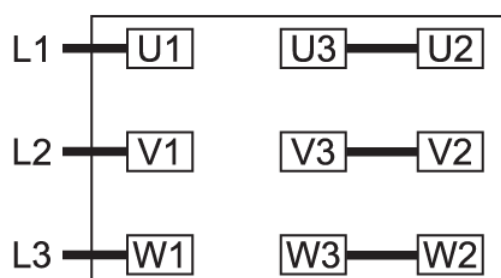
Star connection (high voltage):



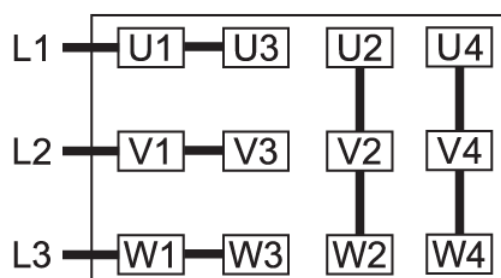
Double star connection, multi-voltage motor with 9 pins (low voltage):



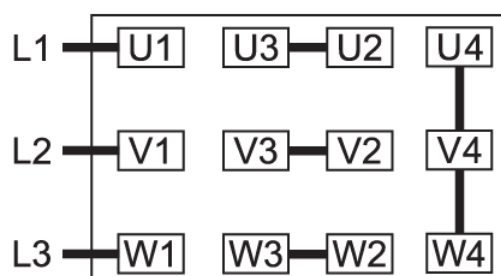
Star connection, multi-voltage motor with 9 pins (high voltage):



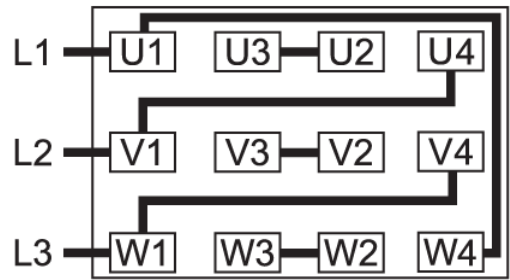
Double star connection, multi-voltage motor with 12 pins (low voltage):



Star connection, multi-voltage motor with 12 pins (high voltage):



Delta connection, multi-voltage motor with 12 pins (middle voltage):



6.5 Electrical Connection of the Monitoring Devices

 **NOTE**

To prevent potential nuisance alarms, Busch recommends that the control system is configured with a time delay of at least 20 seconds.

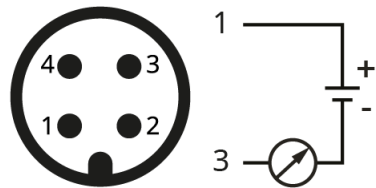
6.5.1 Wiring Diagram Inlet Pressure Transmitter

 **NOTE**

Already connected to the ECOTORQUE Variable Speed Drive.

- No wiring required on ECOTORQUE machines.

Article number: 0653 233 987
Connector: M12x1, 4-pin
Electrical data: 4 ... 20 mA ► 0 ... 1 bar (abs.)



1 = Brown; 3 = Blue

7 Commissioning



NOTICE

The machine is shipped without oil.

Operation without oil will damage the machine in short time!

- Prior to commissioning, the machine must be filled with oil, see *Filling Oil* [→ 17].



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

While operating and/or venting the machine, the discharged gases and/or liquids may reach temperatures above 70°C.

Risk of burns!

- Avoid direct contact with the exhaust connection (OUT) and installed lines or pipes.
- Avoid direct contact with the gas and/or liquid stream, in case the gas discharge (OUT) has no connections (lines or pipes) installed.



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* [→ 15] are met.
- Start the machine.
- Make sure that the maximum permissible number of starts does not exceed 12 starts per hour. Those starts should be spread within the hour.
- Make sure that the operating conditions comply with the *Technical Data* [→ 41].

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

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

7.1 Conveying Condensable Vapors



CAUTION

In operation, the surface of the inlet and exhaust connections may reach temperatures over 70°C.

Risk of burns!

- Avoid contact with these surfaces 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.

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 inlet side will not enter the non-operating machine.

Before process:

- Warm up the machine by running the machine for 30 minutes.

After process:

- During process condensate may occur in the machine. To remove the condensate from the machine, convey dry air at 400 mbar with the machine's maximum speed for 30 minutes, after the process and at least once a day.

8 Maintenance



DANGER

Live wires.

Risk of electrical shock!

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



DANGER

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

Risk of electrical shock!

- Switch off the power supply to the control unit with a lockable disconnect switch before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after 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

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

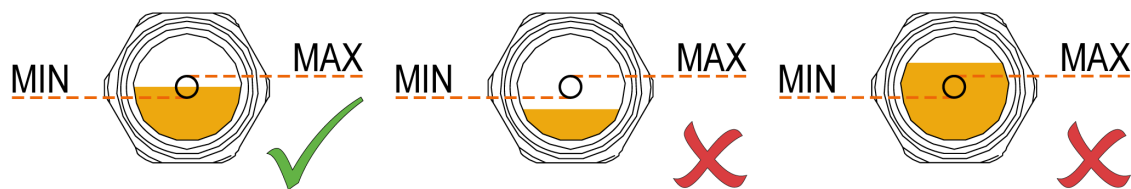
The maintenance intervals depend very much on the individual operating conditions. The intervals given below are considered as starting values which should be individually shortened or extended as appropriate.

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

Interval	Maintenance work
Monthly	• Check the inlet screen (IS), clean if necessary. • Check the oil level, see <i>Oil Level Inspection</i> [→ 29]. In case of an inlet filter (IF) being installed: • Check the inlet filter cartridge, replace if necessary.
Every 6 months	• Clean the machine from dust and dirt. In case of a coupling (CPL) being installed: • Check the coupling (CPL) for backlash and wear.
Every 20000 hours	• Change the oil. The change interval of 20000 operating hours is valid for Busch approved oils only. The change interval depends very much on the operating conditions. Borderline operation may reduce the change interval down to approximately 5000 operating hours. Other oils may reduce the change interval.
Every 40000 hours or after 6 years	• Have a major overhaul on the machine (contact Busch).

8.2 Oil Level Inspection

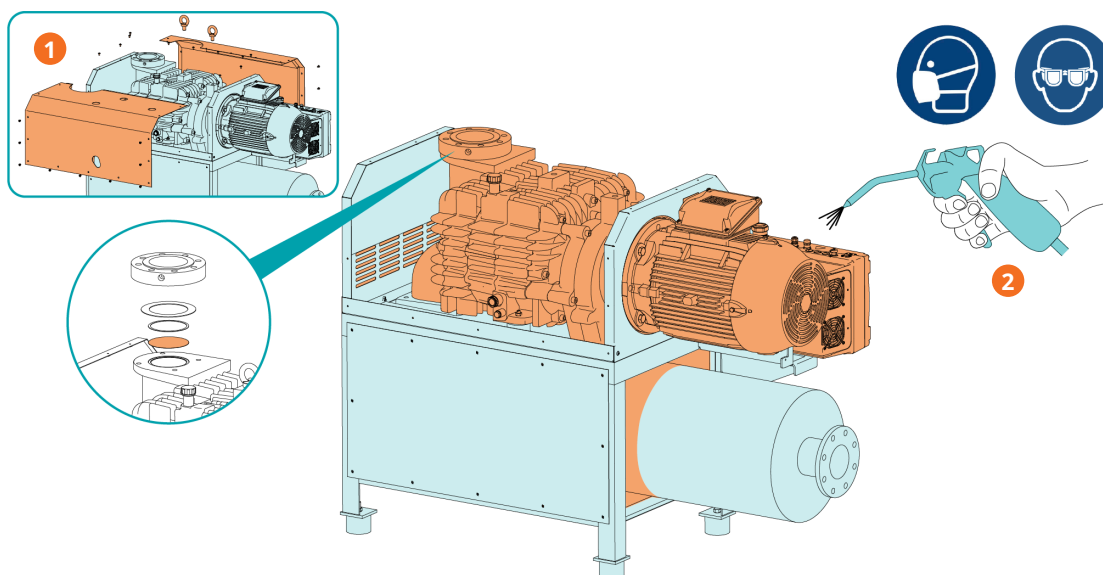
- Stop the machine.
- Wait 1 minute.
- Check the oil level.



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* [→ 17].

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

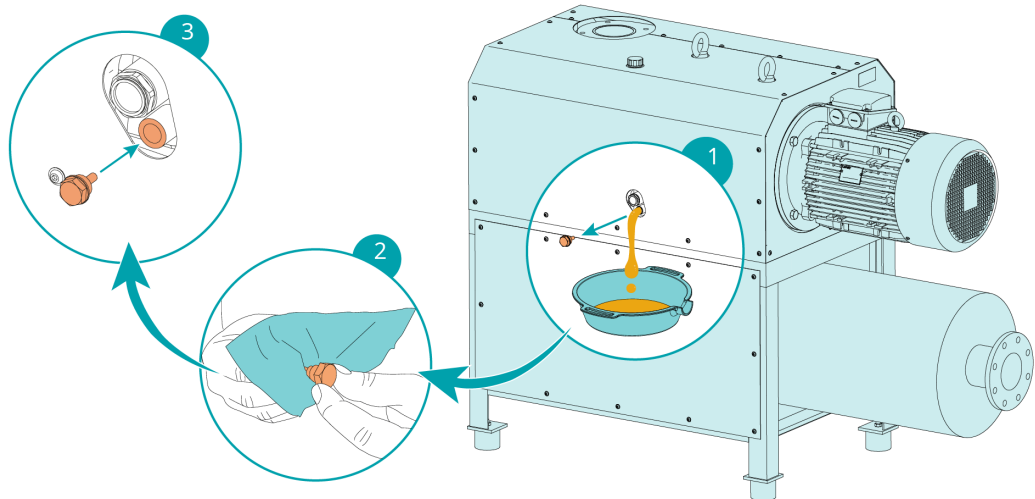
! NOTICE

Use of inappropriate oil.

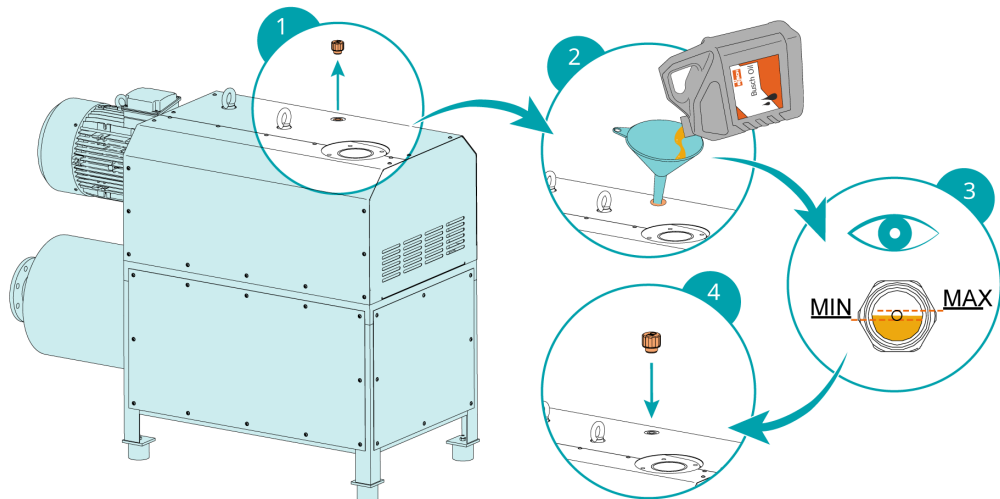
Risk of premature failure!

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* [→ 41] and *Oil* [→ 43] 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.

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**

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

Live wires.

Risk of electrical shock!

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



DANGER

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

Risk of electrical shock!

- Switch off the power supply to the control unit with a lockable disconnect switch before attempting any work on it. High voltages are present at the terminals and within the variable speed drive for up to 10 minutes after 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* [→ 14].

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
Service kit	Includes all parts to perform maintenance work	2000 317 460
Inlet screen (IS)		0534 159 449

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.



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.

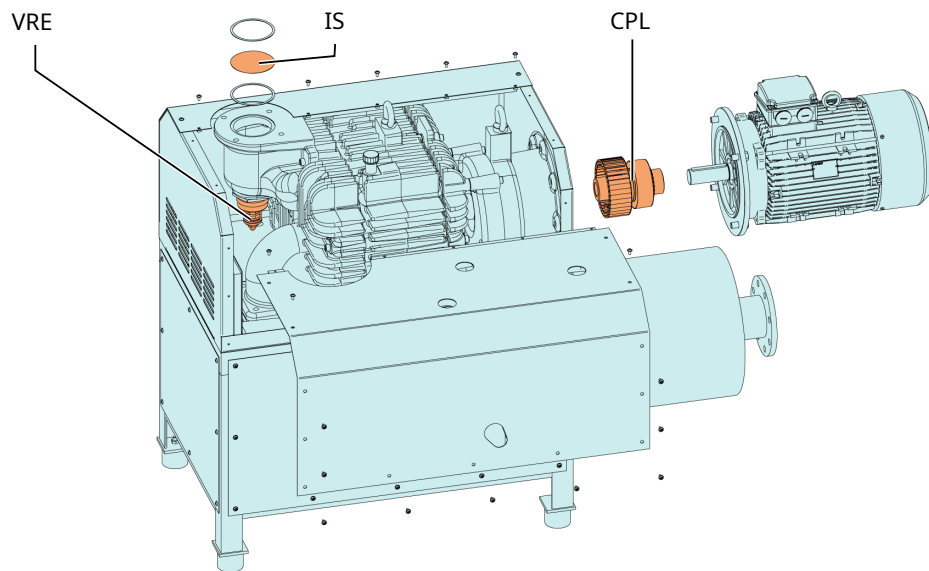


CAUTION

Hot liquids.

Risk of burns!

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



Description			
IS	Inlet Screen	CPL	Coupling
VRE	Vacuum relief valve		

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 coupling (CPL) is defective.	Replace the coupling (CPL) (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.
The vacuum relief valve (VRE) is misadjusted or defective.	Adjust, repair or replace, respectively.
Internal parts are worn or damaged.	Repair the machine (contact Busch).

The machine runs very noisily.	
Possible Cause	Remedy
Worn coupling (CPL).	Replace the coupling (CPL) (contact Busch)
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.
Ambient temperature is too high.	• Observe the permitted ambient temperature, see <i>Technical Data</i> [→ 41].
Temperature of the process gases at the inlet too high.	• Observe the permitted gas inlet temperature, see <i>Technical Data</i> [→ 41].
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 LED Flash Codes

When an error occurs, the LEDs on the variable speed drive display a flashing code that allows the errors to be diagnosed.

The following table contains an overview:

Red LED	Green LED	State	
		Boot loader active (flashing in turn)	
		Ready for operation (activate En_HW for operation)	
		Operation / ready	
		Warning	
		Error	
		Identification of motor data	
		Initialisation	
		Firmware update	
		Bus error operation	
		Bus error ready for operation	
Key			
	LED off	 	LED on
 	LED flashing	 	LED flashing quickly

12.1.2 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.

No.	Error name	Description of error	Possible causes / remedy
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.
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.

No.	Error name	Description of error	Possible causes / remedy
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.
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 Technical Data

MV 1202 B		
Nominal pumping speed (50 / 60 Hz)	m ³ /h	950 / 1150
	ACFM	– / 677
Ultimate pressure	hPa (mbar) abs.	200
	TORR abs.	150
Nominal motor rating (50 / 60 Hz)	kW	18.5 / 22.0
	hp	– / 30
Nominal motor speed (50 / 60 Hz)	min ⁻¹	3000 / 3600
	RPM	3000 / 3600
Permitted motor speed	min ⁻¹	1200 ... 3600 at ≥ 200 *** hPa (mbar) abs.
	RPM	1200 ... 3600 at ≥ 150 *** TORR abs.
Sound pressure level (ISO 3744), 1 m distance, at medium load (50 / 60 Hz)	dB(A)	79 / 82
Ambient temperature	°C	0 ... 40 *
	°F	32 ... 104 *
Inlet gas temperature	°C	0 ... 40 *
	°F	32 ... 104 *
Ambient pressure		Atmospheric pressure
Oil capacity	l	3.5
	qts.	3.7
Weight approx.	kg	900 **
	Lbs.	2100 **

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

** The weight can vary depending on the order.

*** Operating time limit at ultimate pressure, see Intended Use.

MV 1200 B ECOTORQUE		
Nominal pumping speed (60 Hz)	m ³ /h	1150
	ACFM	560 / 677
Ultimate pressure	hPa (mbar) abs.	200
	Torr abs.	150
Nominal motor rating (60 Hz)	kW	25
	hp	33.5
Nominal motor speed (20 – 60 Hz)	min ⁻¹	1200 – 3600
	rpm	1200 – 3600
Sound pressure level (ISO 3744), 1 m distance, at medium load (3600 min ⁻¹)	dB(A)	82 +/-3
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
Permitted stationary vibration: sinusoidal		3 Hz < f < 8.72 Hz: 10 mm 8.72 Hz < f < 200 Hz: 3g 3M7 acc. IEC 60721-3-3
Oil capacity	l	3.5
	qts.	3.5
Weight approx.	kg	950 **
	Lbs.	2095**
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

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

** The weight can vary depending on the order.

14 Oil

Name	ISO-VG	Oil type	1 L packing	5 L packing	10 L packing	20 L packing
VS 220	220	Synthetic	0831 217 852	0831 217 853	-	0831 217 855

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

Oil suitability

- **Oil VS 220:** Suitable for standard applications.

15 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

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

declares that the machine: vacuum pump MV 1202 B; MINK MV 1200 B ECOTORQUE

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

- 'Machinery Directive' 2006/42/EC, if the serial number is less than or equal to XXX126999999
- 'Machinery Regulation' (EU) 2023/1230, if the serial number is greater than or equal to XXX127000000
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

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

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

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

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

Chevenez, 2025.12.01



Christian Hoffmann, General Manager

Ateliers Busch S.A.

16 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

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

declares that the machine: vacuum pump MV 1202 B; MINK MV 1200 B ECOTORQUE

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

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

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

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

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

Busch (UK) Ltd, 30 Hortonwood, Telford – UK

Chevenez, 2025.12.01



Christian Hoffmann, General Manager

Ateliers Busch S.A.

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