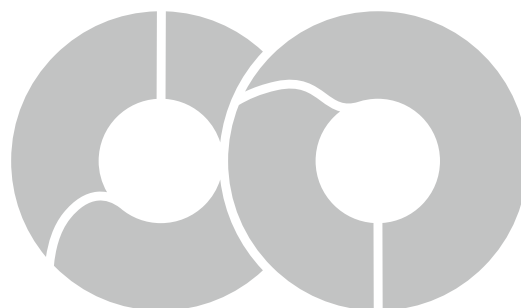


# Instruction Manual

## COBRA

Dry Screw Vacuum Pumps  
BA 0100 C



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

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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 according to state-of-the-art methods. Nevertheless, residual risks may remain. 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.

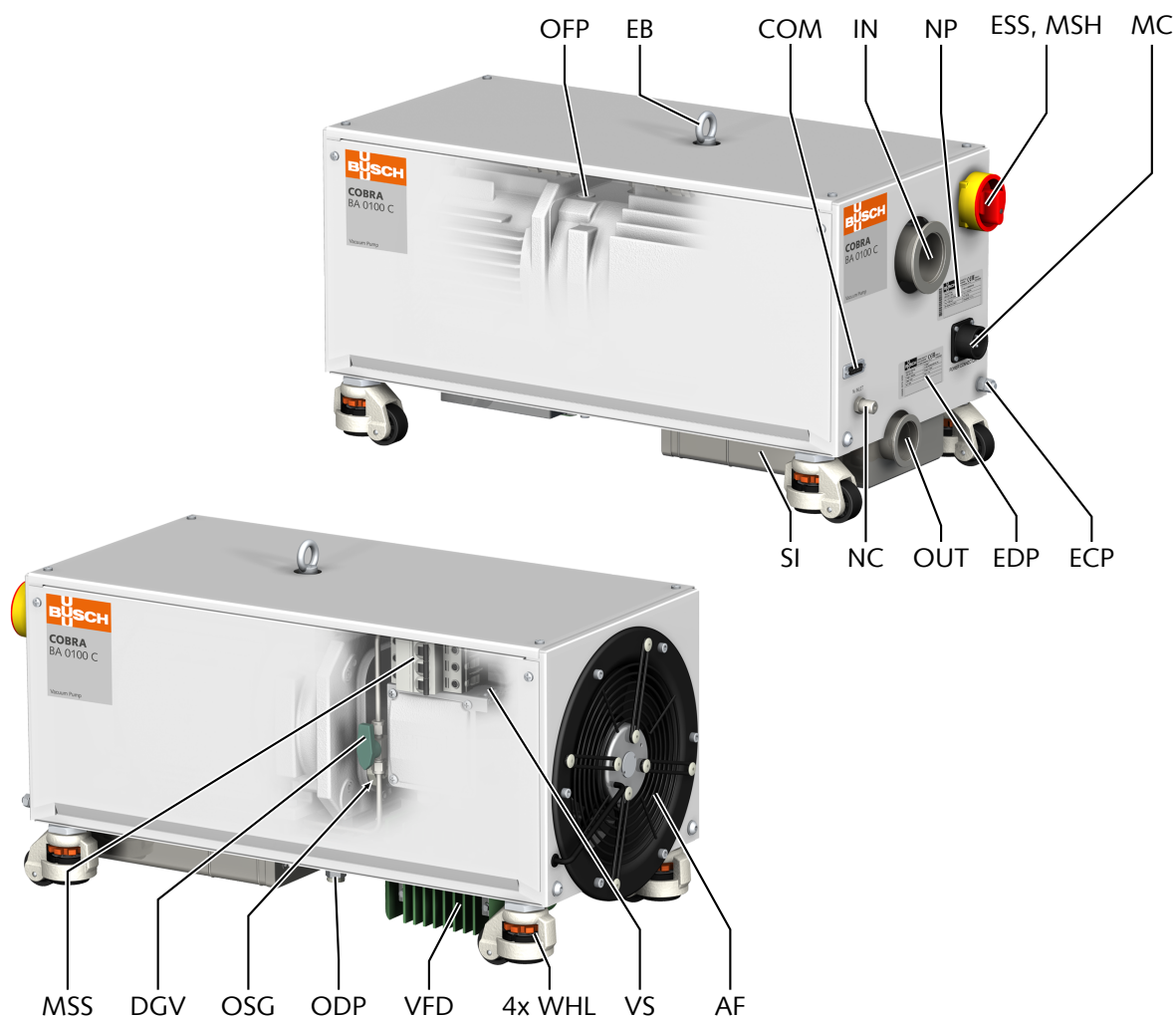
## **NOTICE**

... 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



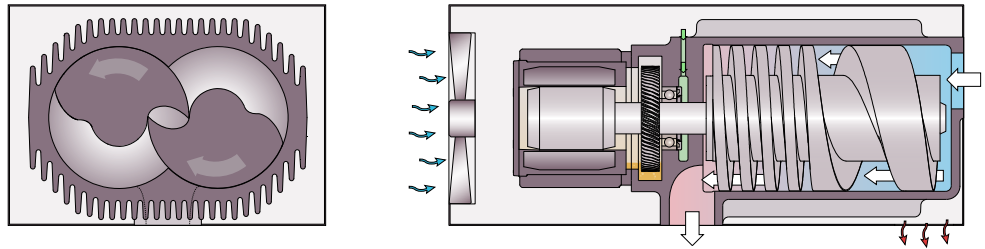
AF	Axial fan	COM	I/O and communication port (with VFD only)
DGV	Dilution gas valve (Optional)	EB	Eye bolt
ECP	Earth connection (machine)	EDP	Electrical data plate
ESS	Emergency stop switch	IN	Inlet connection
MC	Mains connection	MSH	Main switch
MSS	Motor safety switch	NC	Nitrogen connection (Optional)
NP	Nameplate	OFF	Oil fill plug
ODP	Oil drain plug	OSG	Oil sight glass
OUT	Discharge connection	SI	Silencer
VFD	Variable-frequency drive (Optional)	VS	Voltage switch (with VFD only)
WHL	Wheels		

### NOTE

#### Technical term.

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

## 2.1 Operating Principle



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

Two screw rotors are rotating inside the cylinder. The pumped medium is trapped between the cylinder and screw chambers, compressed, and transported to the gas outlet. During the compression process, the two screw rotors do not come into contact with each other nor with the cylinder. There is no need for a lubrication or an operating fluid in the compression chamber.

The COBRA BA is fully air-cooled thanks to an integrated fan in the protective hood.

## 2.2 Application

The machine is intended for the suction of air and other dry, toxic, non-aggressive 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 suitable for continuous operation but limited to a suction pressure of 150 hPa (mbar). The machine is allowed to operate at atmospheric pressure for up to 5 minutes.

Permitted environmental conditions, see Technical Data [► 21].

## 2.3 Drive Variants

The machine can be equipped with either a direct drive or a variable-frequency drive (VFD).

## 2.4 Standard Features

### 2.4.1 Wheels

Four wheels are fitted to the bottom of the machine to facilitate transportation and installation.

### 2.4.2 Emergency Stop Switch

The machine is equipped in standard with an emergency stop switch (ESS).

### 2.4.3 I/O and Communication Port (With VFD Only)

The D-Sub 15 supports maintained dry contact remote control and monitoring of the machine.

### 2.4.4 Silencer

A silencer at the discharge connection (OUT) is provided as standard to reduce the exhaust gas noise.

## 2.5 Optional Accessories

### 2.5.1 Nitrogen System

The nitrogen connection (NC) supplies nitrogen or clean dry compressed air for:

- The barrier gas system (gas sealing between the compression chamber and gears/bearing housing).
- The dilution gas system.

## 3 Transport



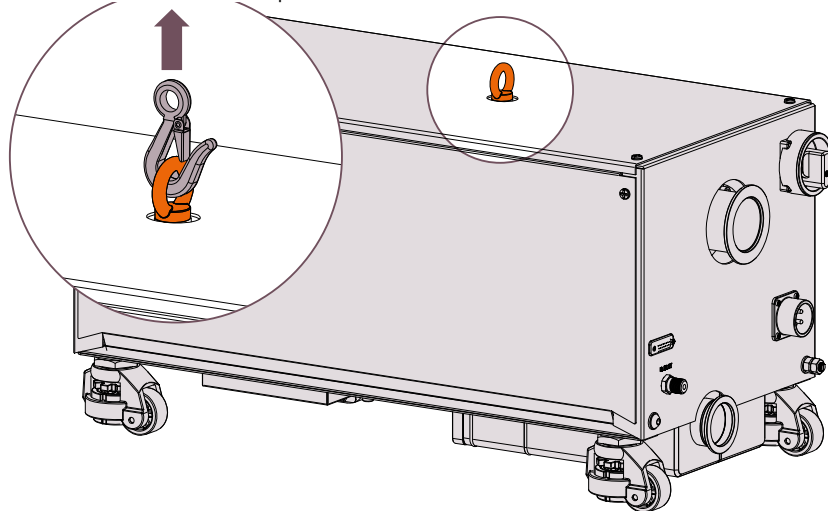
### WARNING

Suspended load.

#### Risk of severe injury!

- Do not walk, stand or work under suspended loads.
- Make sure that the eyebolt (EB) is in faultless condition, fully screwed in and tightened by hand.

Machine weight:  
see the technical data or the nameplate (NP)



- 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-frequency drive can lose efficiency because of electrochemical processes. In worst case it can lead to a short-circuit and therefore to a damage to the variable-frequency drive of the machine.
- 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, dry, dust free and if possible in original packaging preferably at temperatures between -20 ... 60 °C.

## 5 Installation

### 5.1 Installation Conditions

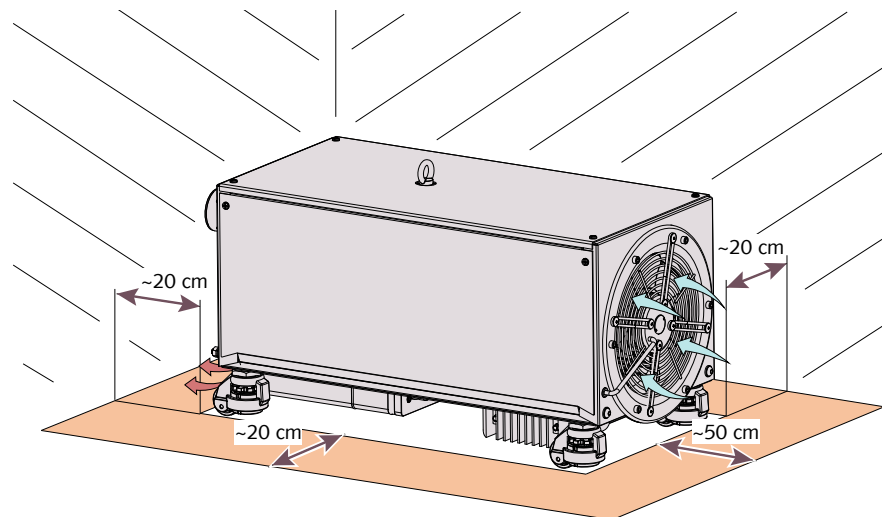
### ! NOTICE

Use of the machine outside of the permitted installation conditions.

#### **Risk of premature failure!**

#### **Loss of efficiency!**

- Take care that the installation conditions are fully complied with.



- Make sure that the environment of the machine is not potentially explosive.
- Make sure that the ambient conditions comply with the Technical Data [► 21].
- Make sure that the installation space or location is vented such that sufficient cooling of the machine is provided.
- Make sure that cooling air inlets and outlets are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.

- Make sure that enough space remains for maintenance work.
- Make sure that the machine is placed or mounted horizontally, a maximum of 1° in any direction.
- Check the oil level, see Oil Level Inspection [► 15].
- 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

- Remove all protective caps before installation.
- Make sure that the connection lines cause no stress on the machine's connection; if necessary use flexible joints.
- Make sure that the line size of the connection lines over the entire length is at least as large as the connections of the machine.

In case of very long connection lines it is advisable to use larger line sizes in order to avoid a loss of efficiency. Seek advice from your Busch representative.

### 5.2.1 Suction Connection

#### **WARNING**

Unprotected suction connection.

#### **Risk of severe injury!**

- Keep long hair, loose articles of clothing, etc. away from 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:

- ISO-KF 50

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

- Busch recommends the installation of an isolation valve in order to prevent the machine from turning backwards.

### 5.2.2 Discharge Connection

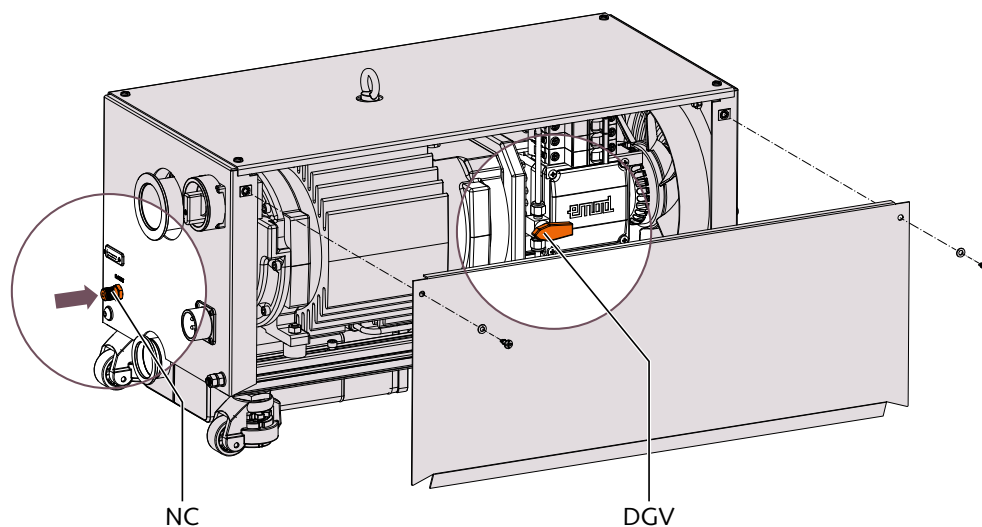
Connection size:

- ISO-KF 40

- Make sure that the discharged gas will flow without obstruction. Do not shut off or throttle the discharge line or use it as a pressurised air source.
- Make sure that the counter pressure (also termed back pressure) at the discharge connection (OUT) does not exceed the maximum allowable discharge pressure, see Technical Data [► 21].



### 5.2.3 Nitrogen System Connection (Optional)



DGV Dilution gas valve

NC Nitrogen connection

- Connect the nitrogen connection (NC) to the gas supply.

Connection size:

- G1/4, ISO 228-1 (NC)

To access the dilution gas valve (DGV):

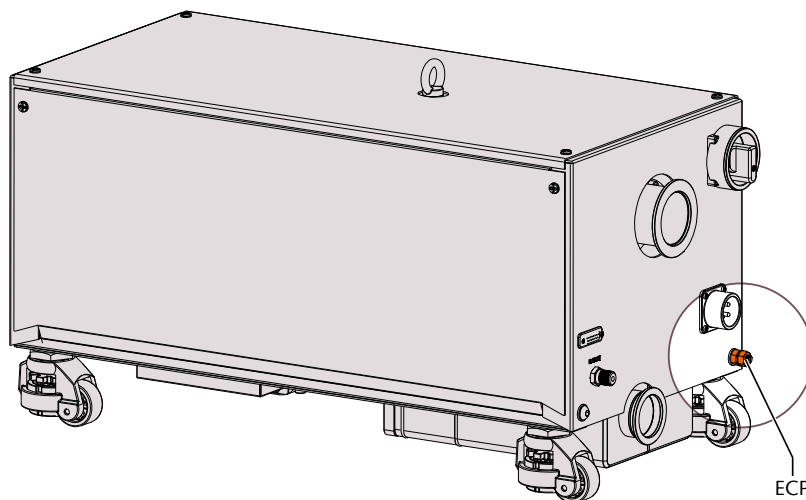
- Remove the two cruciform head screws at the top corners of the side cover.
- Lift the side cover to remove it from the frame.
- Make sure that the gas complies with the following requirements:

Gas type	Dry nitrogen or air	
Gas temperature	°C	0 ... 60
Maximum gas supply pressure	bar	6
Minimum gas supply pressure	bar	2.7
Filtration	µm	5
Air quality (only for air)	Acc. To ISO 8573-1	Class 5.4.4.
Flow rate (with DGV closed):	SLM*	19 ... 33
Flow rate (with DGV open):	SLM*	25 ... 51

\* standard litre per minute

## 5.3 Earth Connection

- Connect the earth connection of the machine (ECP).



## 5.4 Filling Oil

### ! NOTICE

Use of an inappropriate oil.

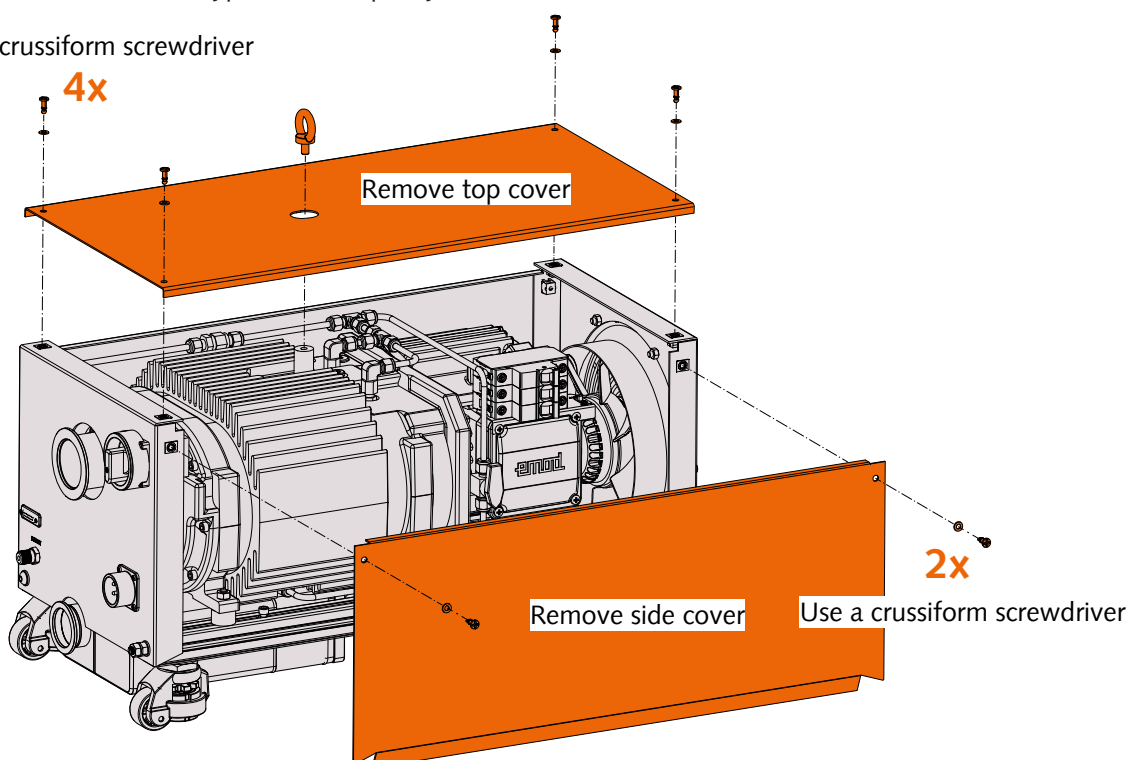
**Risk of premature failure!**

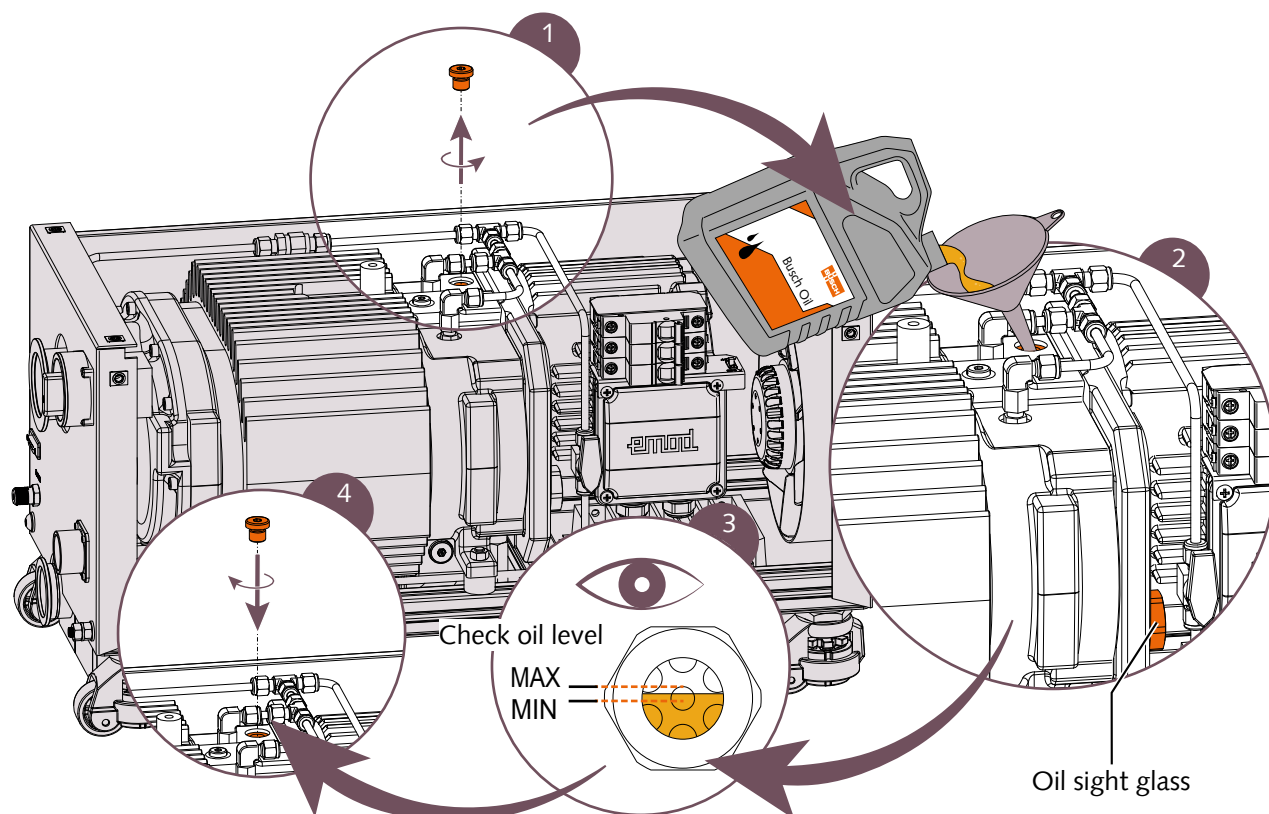
**Loss of efficiency!**

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

For oil type and oil capacity see Technical Data [► 21] and Oil [► 21].

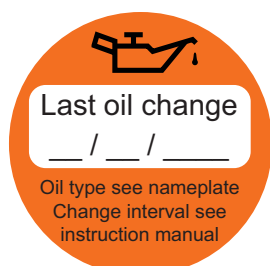
Use a crussiform screwdriver





When the oil filling is achieved:

- Write down the oil change date on the sticker.



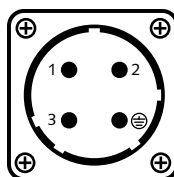
If there is no sticker (part no. 0565 568 959) on the machine:

- Order it from your Busch representative.

## 5.5 Electrical Connection

- Wire the mating connector (delivered loose) in accordance with the scheme below:

Mains connection (MC)



4-pin connector

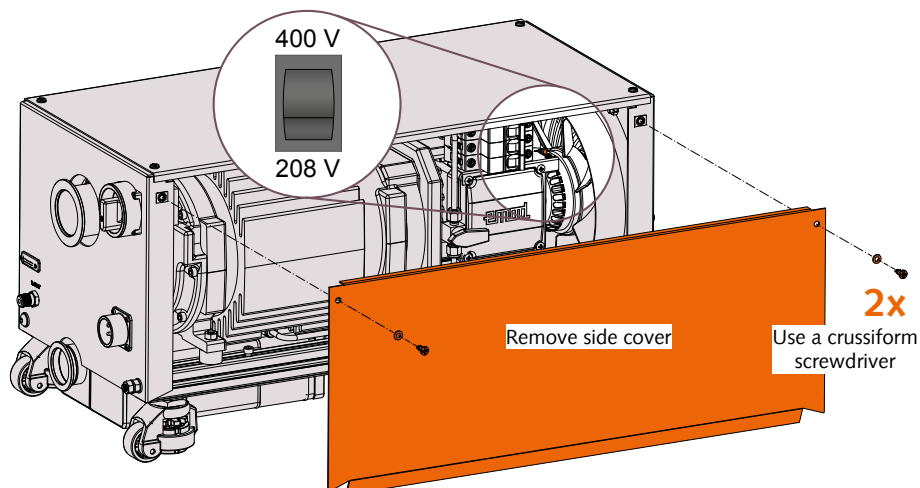
- 1 = Phase 1
- 2 = Phase 2
- 3 = Phase 3
- (4) = Earth

- Electrically connect the machine directly to the mains connection (MC).

### 5.5.1 Voltage Switch 208 - 400 V

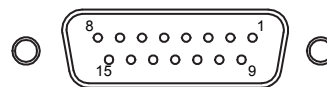
- Make sure that the main switch (MSH) is in “OFF” position.
- Select the needed voltage from the voltage switch (VS) (factory default setting ► 400 V).

The 208 V setting is used for 200-240 VAC and the 400 V switch position is used for 380-480 VAC.



### 5.6 I/O and Communication Port Schematic (With VFD Only)

**Connector:** D-Sub15, 15-pin, female



Pin Nr.	Description	Signal
1	N/A	N/A
2	Digital Input 2	Start pump Open: Stop Closed: Start
3 ... 4	N/A	N/A
5	24 V OUT	Power supply (max. 10 mA)
6	Digital Input 1	Preset speed DI1 = 0 ► 50 Hz DI2 = 1 ► 60 Hz
7	Fault relay IN	Contact NC (normally closed)
8	Fault relay OUT	Umax = 250 VDC / Imax = 2 A
9 ... 14	N/A	N/A
15	24 V OUT	Power supply (max. 10 mA)

## 6 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.

### NOTICE

Running without air-cooled system.

#### **Risk of damage to the machine!**

- Make sure that the fan (AF) is running whenever the machine is running.

### CAUTION

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

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

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



### CAUTION

Noise of running machine.

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

If persons are present in the vicinity of a non noise insulated machine over extended periods:

- Make sure that ear protection is being used.
- Make sure that the installation conditions (see Installation Conditions [► 7]) are complied with.

If the machine is equipped with a nitrogen system:

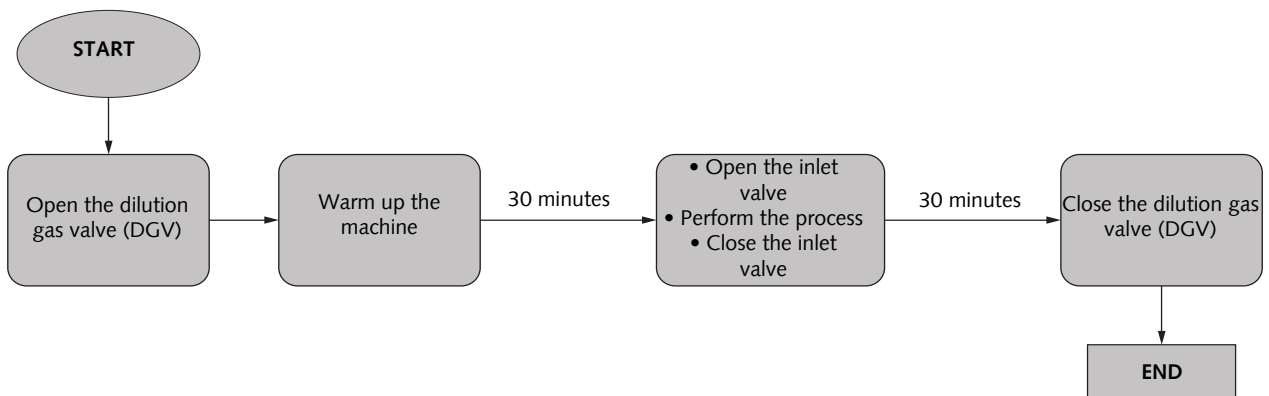
- Turn on the nitrogen supply.
- Switch on the machine
- Make sure that the maximum permissible number of starts does not exceed 6 starts per hour.
- Make sure that the operating conditions are complied with, see Technical Data [► 21].
- After a few minutes of operation, perform an Oil Level Inspection [► 15].

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.

## 6.1 Conveying Condensable Vapours

The machine, equipped with a dilution gas sytem, is suitable for the conveyance of condensable vapour within the gas flow.



## 6.2 Restart Procedure

If the machine has stopped unintentionally:

- Find out why the machine has stopped and solve the problem, see Troubleshooting [► 19].
- Let the machine cool down (approx. 1 hour).
- Switch on the motor safety switch (MSS).
- Start up the machine again with the main switch (MSH).

# 7 Maintenance



### WARNING

Machines 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!**

- Prior to any action requiring touching the machine, let the machine cool down first.

### NOTICE

Using inappropriate cleaners.

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

- Do not use incompatible solvents to clean the machine.

## ! NOTICE

Failing to properly maintain the machine.

**Risk of premature failure!**

**Loss of efficiency!**

- Respect the maintenance intervals or ask your Busch representative for service.

- Shut down the machine and lock against inadvertent start up.

If the machine is equipped with a barrier gas system:

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

If necessary:

- Disconnect all connections.

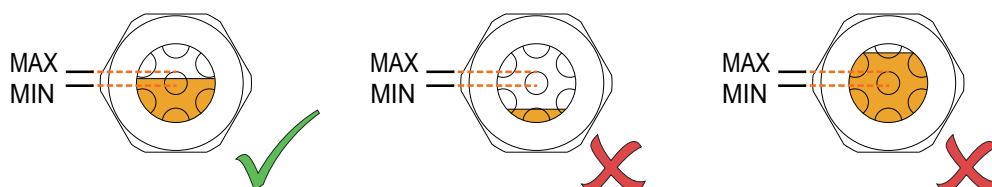
## 7.1 Maintenance Schedule

The maintenance intervals depend very much on the individual operating conditions. The intervals given below are desired to be considered as starting values which should be shortened or extended as appropriate. Particularly harsh applications or heavy duty operation, such as high dust loads in the environment or in the process gas, other contamination or ingress of process material, can make it necessary to shorten the maintenance intervals significantly.

Interval	Maintenance work
Monthly	<ul style="list-style-type: none"> <li>• Check the oil level, see Oil Level Inspection [► 15].</li> <li>• Check the machine for oil leaks - in case of leaks have the machine repaired (contact Busch).</li> </ul>
Yearly	<ul style="list-style-type: none"> <li>• Carry out a visual inspection and clean the machine from dust and dirt.</li> <li>• Check the electrical connections and the monitoring devices.</li> </ul>
Every 16000 hours, at the latest after 4 years	<ul style="list-style-type: none"> <li>• Change the oil of the gear and bearings, see Oil Change [► 16].</li> <li>• If necessary, have a major overhaul on the machine (contact Busch).</li> </ul>

## 7.2 Oil Level Inspection

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



- Fill up if necessary, see Oil Filling [► 10].

## 7.3 Oil Colour Inspection

### WARNING

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

#### **Risk of explosion!**

If the oil becomes dark:

- Contact your Busch representative without delay.
- Make sure that the oil is always transparent.

If the oil becomes dark, white or looks different from the initial colour:

- Change the oil immediately, see Oil Change [► 16].

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

## 7.4 Oil Change

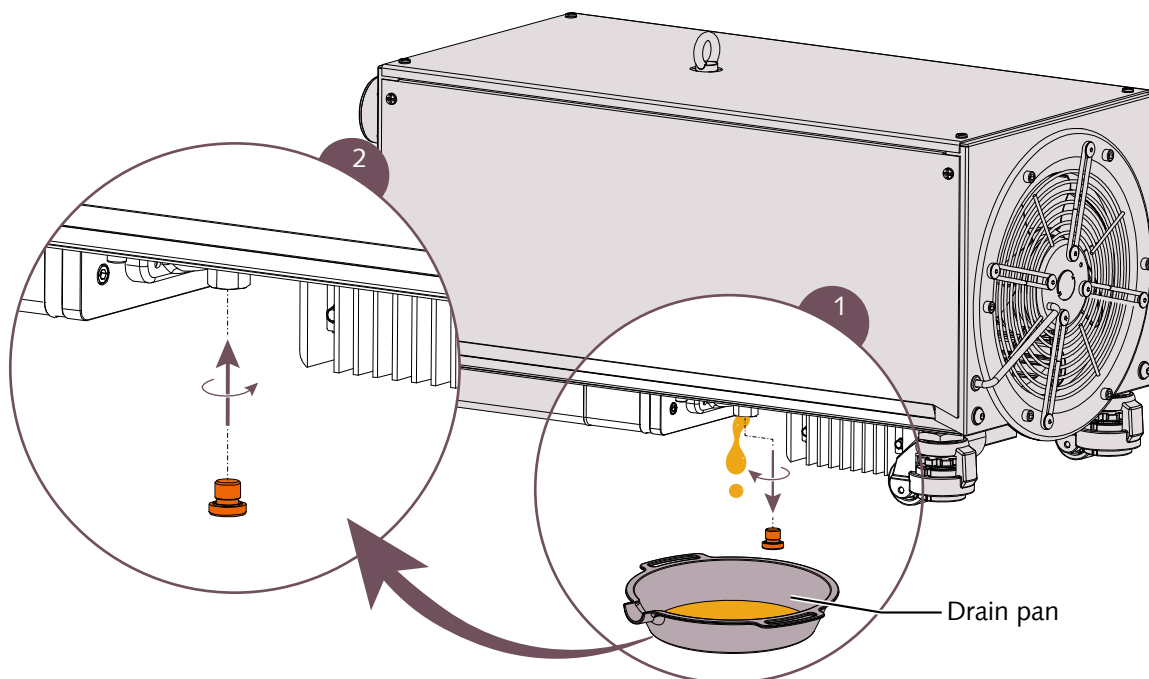
### NOTICE

Use of an inappropriate oil.

#### **Risk of premature failure!**

#### **Loss of efficiency!**

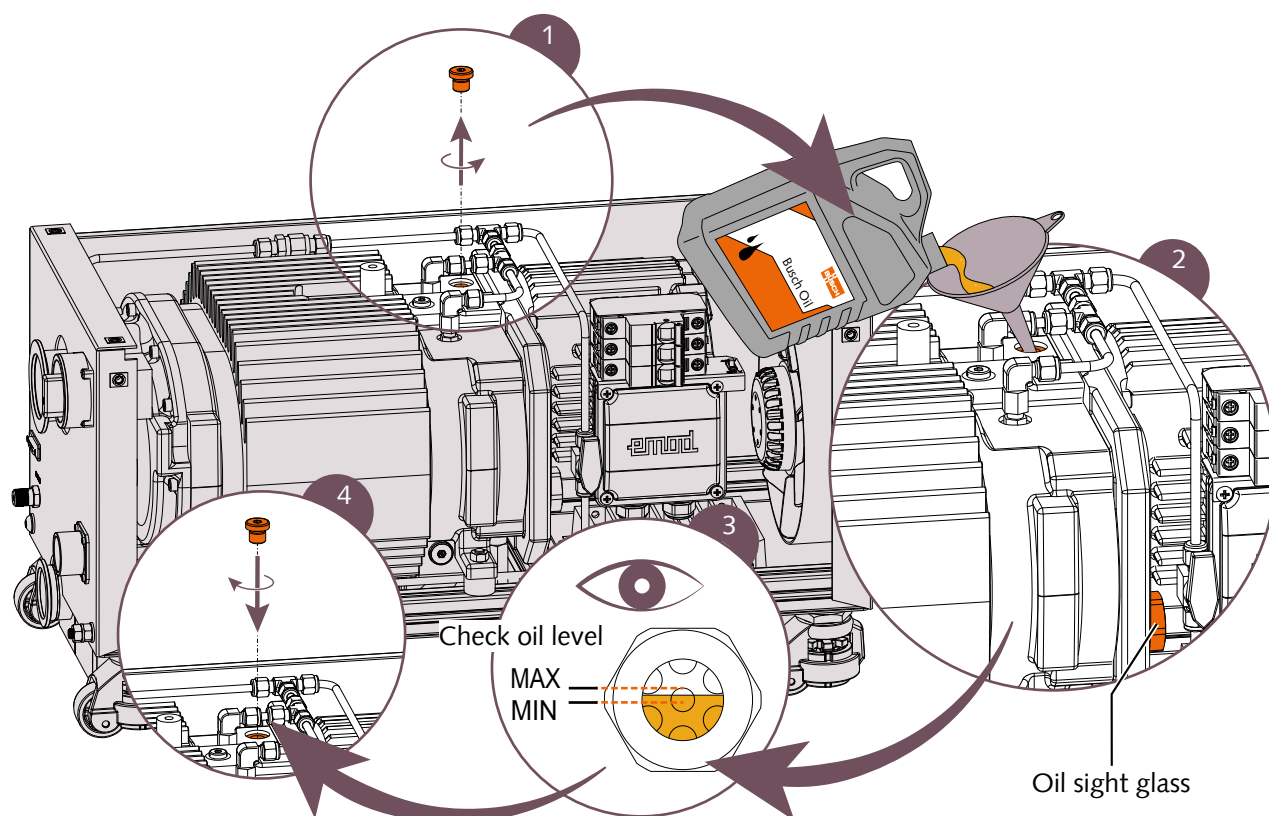
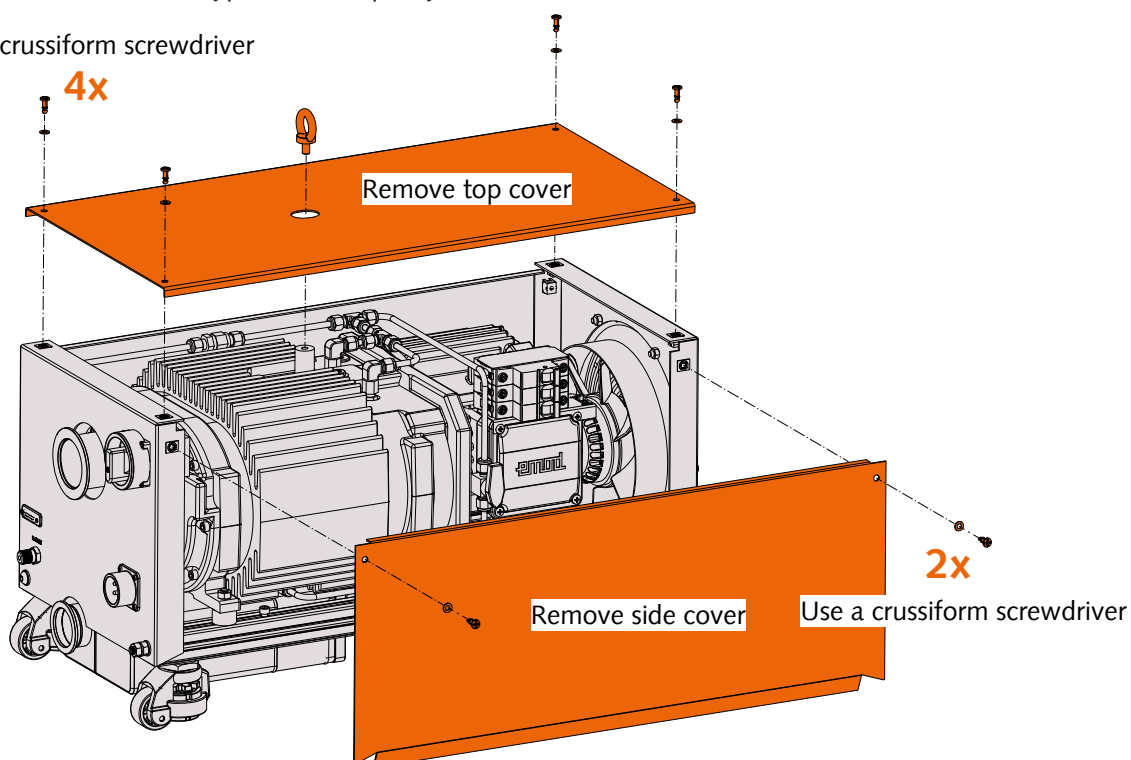
- Only use an oil type which has previously been approved and recommended by Busch.





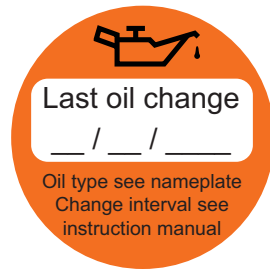
For oil type and oil capacity see Technical Data [► 21] and Oil [► 21].

Use a crussiform screwdriver



When the oil filling is achieved:

- Write down the oil change date on the sticker.



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

- Order it from your Busch representative.

## 8 Overhaul

### ! NOTICE

Improper assembly.

**Risk of premature failure!**

**Loss of efficiency!**

- It is highly recommended that any dismantling of the machine that goes beyond anything that is described in this manual should be done through Busch.



### ⚠ WARNING

Machines contaminated with hazardous material.

**Risk of poisoning!**

**Risk of infection!**

If the machine is contaminated with hazardous material:

- Wear appropriate personal protective equipment.

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

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

Busch will only accept machines that come with a completely filled in and legally binding signed 'Declaration of Contamination'.

(Form downloadable from [www.buschvacuum.com](http://www.buschvacuum.com))

## 9 Decommissioning

- Shut down the machine and lock against inadvertent start up.

If the machine is equipped with a barrier gas system:

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

If the machine is going to be stored:

- See Storage [► 7].

## 9.1 Dismantling and Disposal

- Separate special waste from the machine.
- Dispose of special waste in compliance with applicable regulations.
- Dispose of the machine as scrap metal.

## 10 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 proper function of the machine and for granting of warranty.

There is no standard spare parts kits available for this product, if you require Busch genuine parts:

- Contact your Busch representative for the detailed spare parts list.

## 11 Troubleshooting

Problem	Possible Cause	Remedy
The machine does not start.	The machine is not supplied with the correct voltage.	<ul style="list-style-type: none"> <li>• Check the power supply.</li> </ul>
	Internal parts are worn or damaged	<ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>
	The motor safety switch (MSS) has tripped.	<ul style="list-style-type: none"> <li>• Check the electrical installation.</li> <li>• Turn on the motor safety switch.</li> </ul>
	The motor is defective.	<ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>
The machine does not reach the usual pressure on the suction connection.	Suction lines are too long or section diameter is too small.	<ul style="list-style-type: none"> <li>• Use larger diameter or shorter lines.</li> <li>• Seek advice from your local Busch representative.</li> </ul>
	Measurement method or reading is false.	<ul style="list-style-type: none"> <li>• Check the gauge, check ultimate pressure directly at isolated inlet connection.</li> </ul>
	Excessive counter pressure	<ul style="list-style-type: none"> <li>• Make sure internal or external check valve is not stuck.</li> </ul>
	Leak in the system.	<ul style="list-style-type: none"> <li>• Repair leak.</li> </ul>
	Internal parts are worn or damaged.	<ul style="list-style-type: none"> <li>• Repair the machine (contact Busch).</li> </ul>

The machine runs too hot.	Ambient temperature too high.	<ul style="list-style-type: none"> <li>• Observe the permitted ambient temperature, see Technical Data [► 21].</li> </ul>
	The fan inlet (AF) is dirty or obstructed.	<ul style="list-style-type: none"> <li>• Clean it and make sure that the air flow path is clear of all obstacles.</li> </ul>
	Temperature of the process gases at the inlet too high.	<ul style="list-style-type: none"> <li>• Observe the permitted gas inlet temperature, see Technical Data [► 21].</li> </ul>
The machine runs very noisily.	Wrong oil quantity or unsuitable oil type.	<ul style="list-style-type: none"> <li>• Use one of the recommended oils in the correct quantity, see Oil [► 21].</li> </ul>
	Defective gears, bearings or coupling element.	<ul style="list-style-type: none"> <li>• Repair machine (contact Busch).</li> </ul>
The oil is no longer transparent	Oil change intervals are too long.	<ul style="list-style-type: none"> <li>• Drain the oil and fill in new oil, see Oil Change [► 16].</li> </ul>
	The machine runs too hot.	<ul style="list-style-type: none"> <li>• See problem "The machine runs too hot".</li> </ul>
	The oil is emulsified due to contamination by the process.	<ul style="list-style-type: none"> <li>• Drain the oil and fill in new oil, see Oil Change [► 16].</li> </ul>

## 12 Technical Data

		BA 0100 C
Nominal pumping speed (50Hz / 60Hz)	m <sup>3</sup> /h	85 / 105 105*
Ultimate pressure	hPa (mbar) abs. Torr	0.01 0.0075
Max. continuous suction pressure	hPa (mbar) abs. Torr	150 112.5
Max. allowable discharge pressure	hPa (mbar) rel. PSIG	200 2.9
Water vapour capacity	g/h	1000
Leak rate (helium)	mbar·L·s <sup>-1</sup> (sccs)	≤1 x 10 <sup>-6</sup>
Nominal motor rating (50Hz / 60Hz)	kW	1.5 / 1.8
Nominal system rating*	kW	2.2*
Power consumption at ultimate pressure (50Hz / 60Hz)	kWh	1.1 / 1.25 1.3*
Operating voltages (50Hz / 60Hz)	V	380-415 / 200-240
Operating voltages* (50Hz / 60Hz)	V	208-240 / 380-480*
Nominal motor speed (50Hz / 60Hz)	min <sup>-1</sup>	3000 / 3600 3600*
Noise level (EN ISO 2151) (50Hz / 60Hz)	dB(A)	58
Ambient temperature range	°C °F	0 ... 40 32 ... 104
Oil capacity	l	0.12
Dimensions (L x W x H)	mm	634 x 304 x 338
Weight approx.	kg	120

\* with integrated variable-frequency drive

## 13 Oil

	YLC 250 B
Part number 0.12 L packaging	0831 564 840
Part number 0.5 L packaging (~1 kg)	0831 131 400

# 14 EU Declaration of Conformity

This Declaration of Conformity and the CE-mark 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-mark.

The manufacturer

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



declare that the machine(s): **COBRA BA 0100 C**

has (have) been manufactured in accordance with the European Directives:

- 'Machinery' 2006/42/EC
- 'Electromagnetic Compatibility' 2014/30/EU
- 'RoHS' 2011/65/EU, restriction of the use of certain hazardous substances in electrical and electronic equipment

and following the standards.

Standard	Title of the Standard
EN ISO 12100:2010	Safety of machinery - Basic concepts, general principles of design
EN ISO 13857:2008	Safety of machinery - Safety distances to prevent hazard zones being reached by the upper and lower limbs
EN 1012-1:2010 EN 1012-2:1996 + A1:2009	Compressors and vacuum pumps - Safety requirements - Part 1 and Part 2
EN ISO 2151:2008	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) - Generic standards. Immunity for industrial environments
EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) - Generic standards. Emission standard for industrial environments
EN ISO 13849-1:2015 <sup>(1)</sup>	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design

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Chevenez, 11.01.2018

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<sup>(1)</sup> In case control systems are integrated.



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