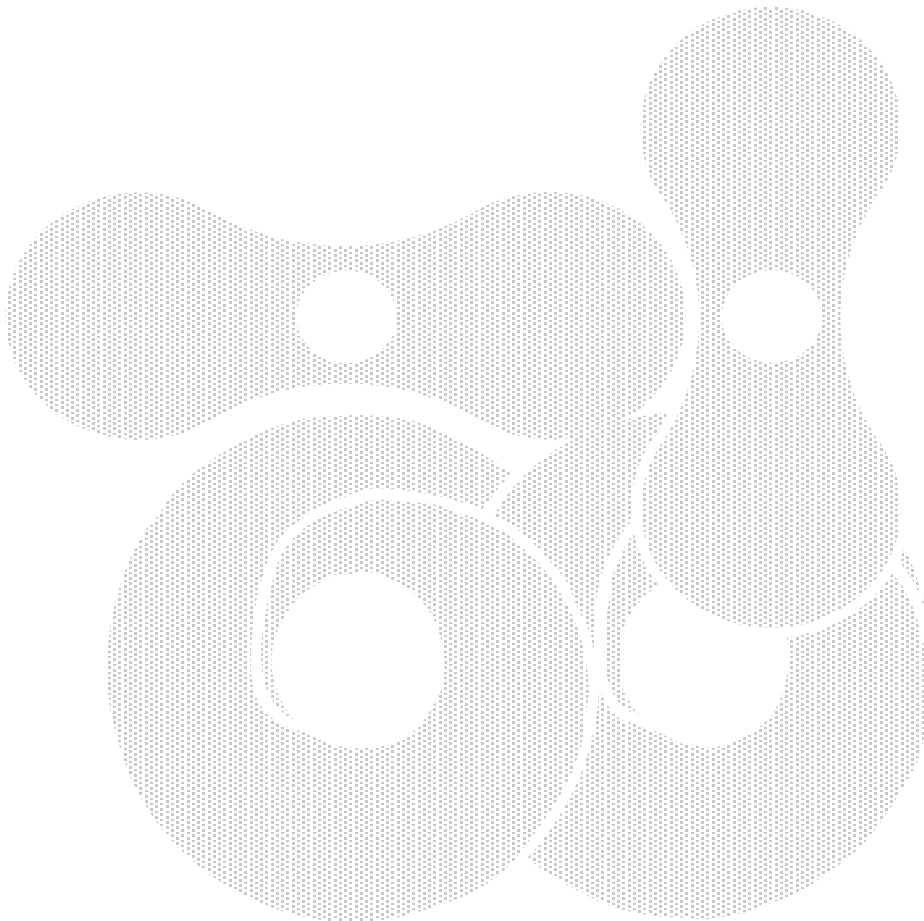


Installation and Maintenance Instructions



Combi Screw and Roots
Vacuum Pumps

COBRA DS 2610 E

Standard version



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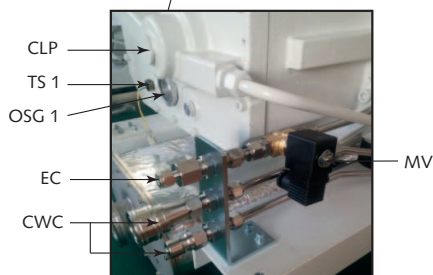
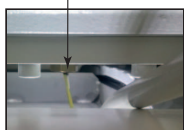
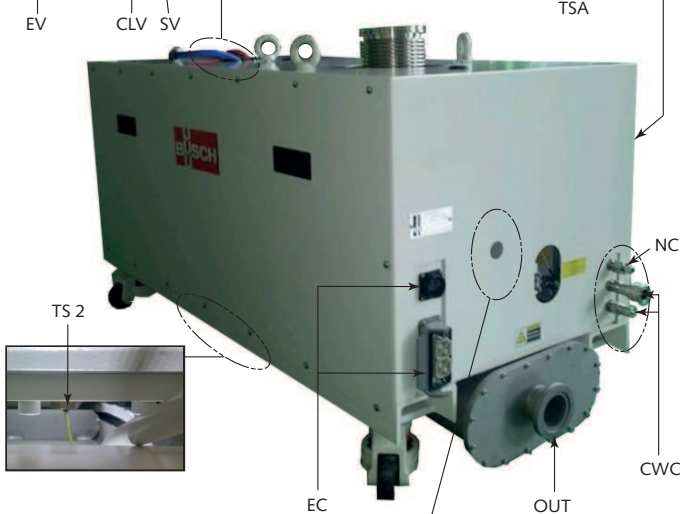
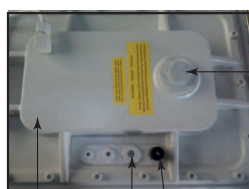
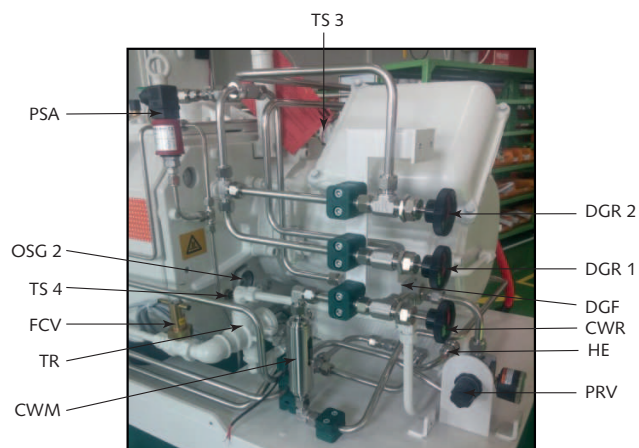
Preface

Congratulations on your purchase of the Busch vacuum pump. With watchful observation of the field's requirements, innovation and steady development Busch delivers modern vacuum and pressure solutions worldwide.

For the purpose of these instructions, "handling" the vacuum pump means the transport, storage, installation, commissioning, influence on operating conditions, maintenance, troubleshooting and overhaul of the vacuum pump.

Prior to handling the vacuum pump these operating instructions shall be read and understood. If anything remains to be clarified please contact your Busch representative.

Keep these operating instructions and, if applicable, other pertinent operating instructions available on site.



COBRA DS 2610 E

CWC Cooling water connection (CWI & CWO)

CLF Cooling liquid filler plug

CLP Recirculating pump

CLV Cooling liquid purge plug

CWM Cooling water flow meter

CWR Cooling water regulating valve

DGF Nitrogen flow meter

DGR 2 Regulating valve, dilution gas (end of cylinder)

DGR 1 Regulating valve, dilution gas (middle of cylinder)

EC Combined power and sensor connection

EV Expansion vessel

FCV Cooling water flow switch

HE Heat exchanger

IN Inlet

MV Solenoid valve, nitrogen system

NC Nitrogen connection

OSG 1 Oil sight glass

OSG 2 Oil sight glass

OUT Discharge (to silencer)

SV Safety valve

TR Temperature regulator, 55°C

TS 1 Temperature switch, oil temperature, 120°C

TS 2 Temperature switch, cooling liquid temperature, 100°C

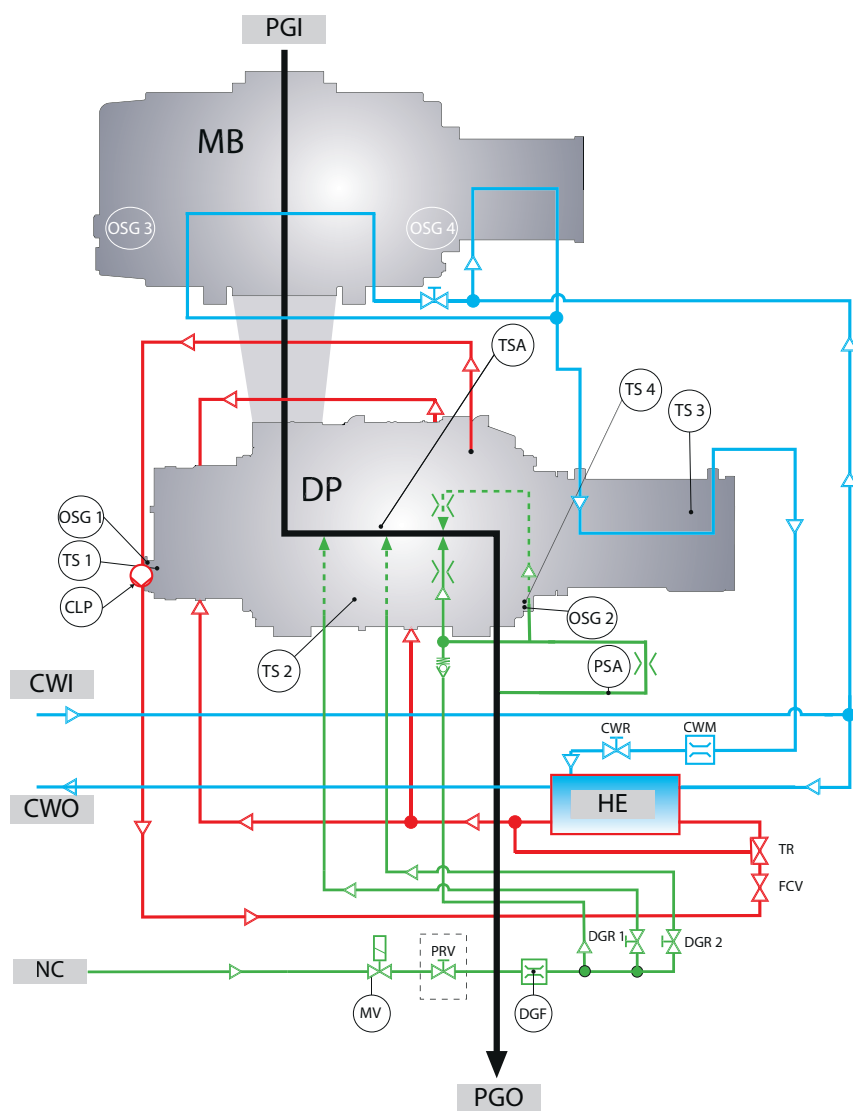
TS 3 DP motor klixon cable

TS 4 Temperature switch, oil temperature, 140°C

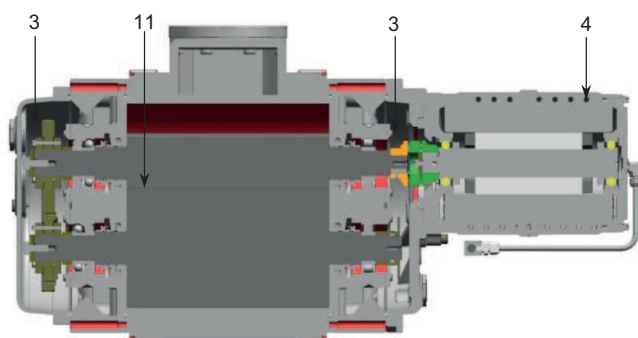
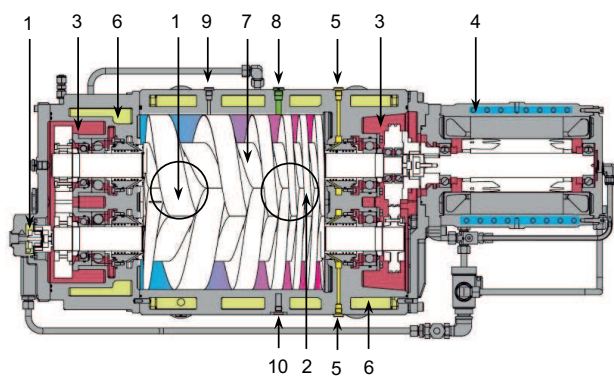
PSA Overpressure sensor

TSA Temperature sensor PT100

PRV Nitrogen regulating valve



- CLP Recirculating pump
- CWI Cooling water inlet
- CWO Cooling water outlet
- CWM Cooling water flow meter
- CWR Cooling water regulating valve
- DGR 2 Regulating valve, dilution gas
- DGR 1 Regulating valve, dilution gas
- DGF Nitrogen flow meter
- FCV Flow controller
- HE Exchanger water/ oil
- MV Solenoid valve, nitrogen system
- NC Nitrogen supply
- OSG 1 Oil level indicator DP
- OSG 2 Oil level indicator DP
- OSG 3 Oil level indicator MB
- OSG 4 Oil level indicator MB
- PGI Process gas inlet
- PGO Process gas outlet
- PRV Nitrogen regulating valve
- PSA Pressure switch
- TR Temperature regulator, 55°C
- TS 1 Temperature switch, oil temperature, 120°C
- TS 2 Temperature switch, cooling liquid temperature, 100°C
- TS 3 Temperature switch, 155°C
- TS 4 Temperature switch, 140°C
- TSA Temperature sensor PT100



- 1 Inlet
- 2 Discharge
- 3 Oil
- 4 Cooling water
- 5 Barrier gas
- 6 Cooling liquid
- 7 Screw rotors
- 8 Dilution gas (dil 2)
- 9 Dilution gas (dil 1)
- 10 Temperature sensor
- 11 Lobe rotors

Product description

Use

The COBRA DS vacuum pumps are designed for use in the field of microelectronics and similar industries.

They can be used to draw in gases and gas mixtures.



WARNING

**When using toxic, inflammable and/ or explosive gases, make sure that the system corresponds in design to applicable local and national safety regulations and that all applicable safety measures are followed.
All product-specific safety regulations must be observed.**

Solid particles must not get into the vacuum pump. Procedural errors can result in the pump drawing in a certain quantity of liquid. If the pump has drawn in liquid, a short drying time is necessary at the end of the procedure.

The allowed maximum inlet gas temperature depends on the inlet pressure and the type of gas: the lower the inlet pressure (Pa), the higher the drawn gas temperature (T_{Gas}) can be.

The following indicative values for air can be considered:

- Pa > 50 mbar, T_{Gas} < 80°C
- Pa < 50 mbar, T_{Gas} < 200°C

The vacuum pump is intended for use in a potentially non-explosive environment.

Max. permissible number of startings per hour: 6.

As far as temperature is concerned, the pump is suitable for continuous duty at any pressure between atmosphere and ultimate pressure.

The vacuum pump is tight down to ultimate pressure.

Operating principle

The COBRA DS vacuum pumps are a combination of a COBRA NS (DP) vacuum pump with cooling water and nitrogen circuits and a WZ (MB) rotary lobes vacuum pump.

The COBRA NS vacuum pumps work by the principle of screw pumps. Two parallel screws (8) rotate in opposite directions in the pump body. Entering gases are trapped between the flights of the screws and the pump body. The gases are conveyed by the rotation of the screws to the exhaust, where they are discharged.

The COBRA NS vacuum pumps are driven by water-cooled motors.

The WZ rotary lobes vacuum pumps operate according to the approved principle of the Roots type machine. Operation is both simple and effective. Two lobes rotors (11) with identical profiles rotate in opposite directions within a casing. As they rotate, gas is drawn into the space between each rotor and the casing where it is trapped and by the rotation pushed out into the discharge. This action is repeated twice for each revolution of each rotor and therefore four times for each revolution of the drive shaft. There is no mechanical contact between rotors and cylinder. So no oil lubrication is required.

The WZ rotary lobes vacuum pumps are driven by water-cooled motors.

The WZ rotary lobes vacuum pumps are equipped with an automatic by-pass valve that limits the differential pressure between inlet and outlet.

Oil circuit

Since the complete operating principle works without contact, no oil circuit is needed in the work area.

Cooling

The COBRA DS vacuum pump is cooled by

- the filling of cooling liquid (mix of water and glycol) inside the water chambers (6) of cylinder and end plate of cylinder B-side. An indirect circuit is made with a water pump mounted at the motor

endplate. The flow of the cooling liquid is controlled by a flowmeter controller FCV. If the flow is under 1 l/min during a minimum time of 30 seconds, then the pump stops. The temperature regulator TS 2 will give an emergency signal if the temperature of the cooling liquid is above 100°C. The pump will stop immediately after the emergency alarm ring.

- a direct cooling water circuit in the motors in the cylinder covers A and B side of WZ rotary lobes vacuum pump and COBRA NS vacuum pump. The cooling water flow is preset at 8 l/min at the factory and can be adjusted with valve CWR. The flow is controlled by flowmeter CWM. The cooling water circuit stabilizes the temperature of cooling liquid. When flow is too low a warning then an alarm signal is generated by flowmeter CWM to the PLC. Status of the pump depends on the alarm function set by user (factory setting: EMO, pump stops after alarm condition)

NOTE: The COBRA DS vacuum pumps are generally dispatched with oil and cooling liquid already in the vacuum pump but, without cooling water. Before vacuum pump first startup, control the oil level and the cooling liquid level. In the event of absence of one or the other of these lubricants, please carry out the filling (please refer to the various chapters of filling). Do not forget to connect the cooling water supply before the first startup. Operation without these coolants can result in damage to the vacuum pump.

Nitrogen system

The nitrogen system performs two main functions

- nitrogen is used as dilution gas. It is injected inside the cylinder on two ports. Nitrogen flow injected in the middle hole (8) is preset at 40 l/min and can be adjusted with valve DGR 2, depending on the application. Nitrogen flow injected in the hole on cylinder endplate side (9) is preset at 20 l/min and can be adjusted with valve DGR 1, depending on the application. When flow is too low a warning then an alarm signal is generated by flowmeter DGF to the PLC. Status of the pump depends on the alarm function set by user (factory setting : None, pump continues running with an alarm). Dilution improves the screws functioning, especially when drawing in corrosive gases.
- the nitrogen is used as sealing gas. The nitrogen is injected into the intermediate chamber (5) in the cover of the cylinder of the NS pump to achieve good closeness.

Optional functions/ Use of available accessories

The relief valve (SV) prevents excessively high pressure in the expansion tank (EV), relief pressure: 6 bar.

A pressure switch (optional) with normally closed contact mounted in the expansion tank monitors the pressure of the cooling liquid. It must be connected in such a way that actuation causes the vacuum pump to be switched off when the pressure exceeds a value of 3 bar.

A pressure switch mounted at the exhaust, controls the overpressure at the exhaust. If overpressure is above 0,2 bar, pressure switch gives a warning then an alarm signal. Status of the pump depends on the alarm function set by user (factory setting: None, pump continues running with an alarm).

A temperature sensor PT100 (10) mounted on the cylinder, measures the temperature inside the cylinder.

A silencer or sound absorber (accessory) at the exhaust reduces the noise of the pump and collects any condensate.

A leak-protection non-return valve (optional) at the exhaust traps the condensate in the pump when the pump is switched off.

The nitrogen can also be used as flushing gas. Depending on the application, flushing is recommended after every use to ensure troublefree operation of the vacuum pump. The nitrogen is injected directly into the intake port. In the absence of nitrogen flushing can also be performed with the help of air.

The LCD controller processes the data of the sensors (see chapter "Communication with the equipment") as follows:

- discharge pressure (option)
- temperature in the cylinder (option)
- current
- nitrogen flow rate
- cooling water flow rate
- oil temperature
- control of the cooling liquid flow
- cooling liquid temperature

See "Installation and Maintenance Instructions, Busch PLC and Busch LCD (No. 0870758077)".

On/ Off switch

The vacuum pump is delivered with a circuit breaker. The function start/ stop can be done in Local by using the LCD controller or in Remote by the production machine.

Safety

Intended use

DEFINITION: To rule out any misunderstanding, the term "handling" of the vacuum pump covers transport, storage, installation and operation of the pump as well as effects on operating states and troubleshooting on the vacuum pump.

The vacuum pump is intended for industrial use. It may only be operated by qualified personnel.

The different application possibilities and limit values for operation described in "Product description" and "Installation requirements" must be observed by the manufacturer of the system into which the vacuum pump is to be integrated and by users.

The need for personal safety regulations depends in principle on the type of use. The operator must provide the users with the necessary means and must inform his personnel about the dangers emanating from the processed product.

The operator of the vacuum pump must observe the safety regulations and must train and instruct his personnel accordingly.

Local regulations regarding the motors and electric control elements must be observed when installing the pump in potentially explosive environments.

The maintenance instructions must be followed and observed.

These installation and maintenance instructions must be read and understood before the vacuum pump is used. If you have any doubts, contact your Busch representative.

Safety information

The vacuum pump is designed and manufactured in compliance with the latest technical standards and safety regulations. Nevertheless an element of residual risk remains.

Various safety instructions are to be found in this handbook and on the pump. These instructions must be followed. You can recognise these instructions by the signal words DANGER, WARNING and CAUTION, which are defined as follows:



DANGER

Disregard of this safety instruction will always result in death, serious injuries or severe damage.



WARNING

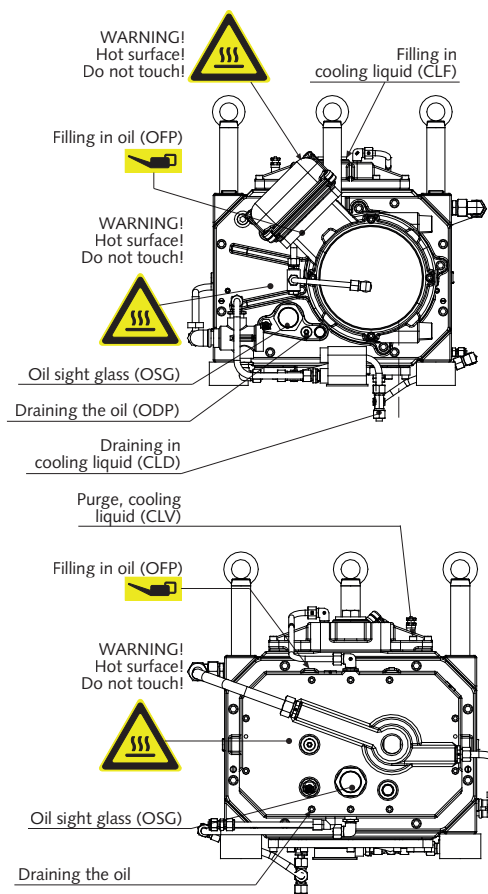
Disregard of this safety instruction may result in death, serious injuries or severe damage.



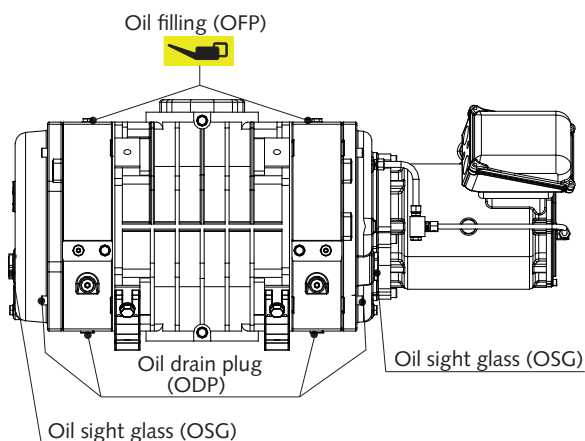
CAUTION

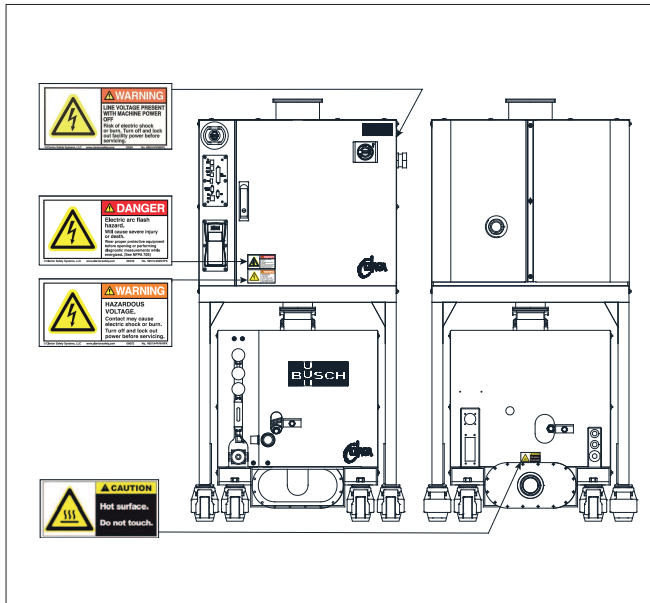
Disregard of this safety instruction may result in minor or moderate injuries or damage.

COBRA NS vacuum pump



WZ rotary lobes vacuum pump





Noise emission

Refer to the table "Technical data" for the permissible noise level in free field conditions according to EN ISO 2151.

CAUTION

The intensity of the noise of the vacuum pump is higher within a certain area of the pump.

Risk of hearing damage.

Users must wear ear protection when spending a longer period of time in the vicinity of a non-insulated vacuum pump.

Maintenance clearance

Before any maintenance action, ensure a maintenance clearance around the pump of min. 610 [mm].

Electrical safety

Types of Electrical Work

The following are the four types of electrical work defined by the SEMI S2, latest version, guideline:

Type 1

Equipment is fully deenergized.

Type 2

Equipment is energized. Energized circuits are covered or insulated.

NOTE : Type 2 work includes tasks where the energized circuits are or can be measured by placing probes through suitable openings in the covers or insulators.

Type 3

Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are no greater than 30 volts rms, 42.4 volts peak, 60 volts dc or 240 volt-amp in dry locations.

Type 4

Equipment is energized. Energized circuits are exposed and inadvertent contact with uninsulated energized parts is possible. Potential exposures are greater than 30 volts rms, 42.4 volts peak, 60 volts dc, or 240 volt-amp in dry locations. Potential exposures to

radio-frequency currents, whether induced or via contact, exceed the limits in Table A5-1 of Appendix 5 (SEMI S2 guideline).

Lock Out/ Tag Out procedure (Type 1 of electrical work)

- Stop the pump with the remote control (press on STOP button during 10s)
- Press on emergency stop button
- Switch off the main disconnect switch
- Switch off the customer's power supply
- Switch off the water (inlet first, then outlet) and nitrogen quick connections
- Put the label or warning board "Maintenance processing" on or next to the pump

Safety Lockout procedure

- Take off the label or warning board "Maintenance processing"
- Check the cooling liquid and oil levels according to the chapters "Checking the oil level" and "Checking the cooling liquid level"
- Close the cover
- Switch on the main disconnect switch
- Release the emergency stop button
- Switch on the water (outlet first, then inlet) and nitrogen quick connections
- Start the pump with the remote control (press on START button)

Emergency off circuit description

- The Emergency off circuit may be opened by pressing on emergency stop button. If this element shows, then the pump will immediately stop. The PLC will remain energized to save the pump status.
- If the emergency stop button was pressed, check the start up of the pump then release this button to restart the pump. Press on Start button on the remote control, the pump will restart.

Lock out/ Tag out for hydraulics and pneumatics

- ◆ Hydraulics: cooling water
- ◆ Pneumatics: nitrogen

Lock Out/ Tag Out procedure (Type 1 of electrical work)

- Stop the pump with the remote control (press on STOP button during 10s)
- Press on emergency stop button
- Switch off the main disconnect switch
- Switch off the customer's power supply
- Switch off the water (inlet first, then outlet) and nitrogen quick connections
- Put the label or warning board "Maintenance processing" on or next to the pump

The end user is responsible for providing energy isolation capabilities on the water and nitrogen

Transport

The COBRA DS vacuum pumps are tested and checked in our factory before careful packing. Check the packaging for transport damage when the goods arrive. The pump can withstand temperatures between -25°C and +55°C during transport.

Transport in packed state

Packed on a pallet, the vacuum pump can be moved with a hand forklift truck.

Transport in unpacked state

The vacuum pump is fastened to the pallet with fixing pins:

- ◆ Unscrew the fastening nuts underneath the pallet.



CAUTION

Do not work, walk or stand under suspended loads.



CAUTION

Please check out the weight of the vacuum pump before lifting it up (see "Technical Data").

Use adequate lifting gear for this.

If the pump is fastened to a pallet with fixing pins:

- ◆ Unscrew the fixing pins in the base frame



CAUTION

In the case of a vacuum pump filled with oil, you ensure that the angle of inclination of the vacuum pump at the time of rise does not exceed 5° compared to the horizontal. In the event of too important slope (> 5°), risk of oil leakage in the workspace.

Before each transport requiring a means of adapted lifting, control the slope of the vacuum pump (< 5°).

The packaging material must be disposed of in accordance with local and national regulations.

This handbook is contained in the delivery package.

Storage

Temporary storage

- Make sure that the intake and exhaust flanges are closed (put on the protective caps included in the delivery package of the vacuum pump)
- Store the vacuum pump
 - if possible, the vacuum pump should be stored in its original packaging,
 - indoors,
 - dry,
 - in a dust-free and
 - vibration-free room

Removal of the pump

Before starting a vacuum pump that has been stored outside the building for a while, the vacuum pump must be moved to a room with ambient temperature, where it should rest for a day.

Preservation

If the vacuum pump will be exposed to unfavourable ambient conditions (for example, aggressive environment, frequent temperature changes), begin immediately with preservation work on the vacuum pump.

In the case of favourable ambient conditions, perform preservation work on the vacuum pump if a storage period of more than three months is planned.

- Make sure that all openings are hermetically sealed; use adhesive tape to fasten loose parts (seal rings, flat seals, etc.).

NOTE: VCI is the abbreviation for "volatile corrosion inhibitor". The VCI molecule is an organic corrosion inhibitor in the vapour phase. Integrated in various carriers such as film, cardboard, paper, foam, liquid and powder, it protects the parts against corrosion as a result of its action in the vapour phase. However, VCI packaging can attack synthetic surfaces and surfaces of other elastomers. If in doubt, please

contact your nearest distributor. VCI packaging provides several years of protection against corrosion, even under the harshest of conditions: overseas shipment, extended storage before use.

- Wrap the vacuum pump in a VCI film
- Store the vacuum pump
 - if possible, the vacuum pump should be stored in its original packaging,
 - indoors,
 - dry,
 - in a dust-free and
 - vibration-free room

Start-up of the vacuum pump after storage:

- Make sure that all protective elements, stoppers or adhesive tapes attached before preservation have been removed
- Switch on the vacuum pump in the sequence described in the chapter "Installation and start-up"

Installation and start-up

Necessary installation instructions



CAUTION

If the necessary installation instructions are not followed and particularly in the case of inadequate cooling:

Risk of damage to and total destruction of the vacuum pump and its components!

Risk of personal injury!

The necessary installation instructions must be followed.

- Make sure that the integration of the vacuum pump in its new environment complies with the safety regulations according to the Machinery Directive 2006/42/EC (regarding the responsibility of the manufacturer of the system in which the vacuum pump is to be integrated, see information in the Declaration of Conformity).



WARNING

Local regulations regarding the motors and electric control elements must be observed when installing the pump in potentially explosive environments. Make sure before start-up that all safety measures have been followed.

Installation site and installation

- Make sure that the environment of the vacuum pump is not potentially explosive
- Make sure that the following ambient conditions are fulfilled:
 - Ambient temperature: 0 ... 40 °C (32 ... 104 °F)
 - Ambient pressure: atmosphere
 - Humidity range: 20 to 95%
 - Altitude: up to 1000 m
- Make sure that the cooling water fulfills the following requirements:
 - Temperature: 10 - 25 °C
 - Water pressure: 2 - 5 bar (relative)
 - Approximative flow rate: min. 8 l/min for the standard version
 - Water hardness: < 5° dGH

NOTE: 1° (german degree = 1° dGH) = 1,78° (french degree) = 1,25° (english degree) = 17,9 mg/kg CaCO₃ (american hardness)

- Make sure that the cooling water is neutral and clean
- Make sure that the cooling water outlet is unpressurised

- Overpressure: 1,5 bar
- Standard flow rate dil 1: 20 l/min
- Standard flow rate dil 2: 40 l/min
- Max. flow rate: 200 NI/ min
- Make sure that the ambient conditions correspond to the protection class of the motor (according to nameplate)
- Make sure that the vacuum pump is placed on or fastened to a horizontal surface
- Make sure that the vacuum pump is level
- Make sure that the vacuum pump is at least 1 m away from any wall to ensure good cooling
- Make sure that the vacuum pump is easily accessible and that the selected installation site fulfills the requirements for assembly/ dismantling
- Make sure that no temperature-sensitive parts (for example, of plastic, wood, cardboard, paper, electronic parts) come into contact with the hot surfaces of the vacuum pump
- Make sure that the installation site or assembly area is ventilated in such a way that adequate cooling of the vacuum pump is ensured



CAUTION

The surface temperature of the vacuum pump can exceed 50°C when the vacuum pump is in operation.

Danger of burns!

- Make sure that no-one can touch the vacuum pump accidentally. If necessary, attach safeguard
- Make sure that the oil sight glasses are easily accessible

If oil changes are to be made on site:

- ◆ Make sure that the oil drain and oil filler are easily accessible

Inlet connection



CAUTION

Do not put hands into the inlet aperture.

Risk of body damage!

- Make sure that the protection that was attached to prevent penetration of particles during transport has been removed before the vacuum pump is connected to the vacuum line



CAUTION

The intake of liquids or solid particles can lead to the destruction of the vacuum pump.

If the drawn gas contains dusts or solid foreign bodies:

- ◆ Make sure that a filter or protective grating is installed at the extraction point
- Make sure that the nominal diameter of the intake line is at least equal to the diameter of the intake flange of the vacuum pump to prevent a drop in the performance of the vacuum pump in the case of a smaller cross-section
- Make sure that the vacuum pump is connected with leakproof lines



CAUTION

When the intake lines have been connected, make sure that the system does not leak. Leakages of dangerous substances must be prevented!

- Make sure that the intake lines are equipped with a shut-off device upstream of the intake flange so that the flow of drawn gas can be stopped

- Make sure that the intake lines do not exercise any force on the intake flange. Mount bellows if necessary
- The inlet flange has the following dimension:
- DN 160 ISO-K

In the case of long intake lines, the line cross-section should be larger than the intake flange to prevent a drop in the performance of the vacuum pump. If you have any doubts, contact your Busch representative.

Discharge connection



CAUTION

Do not put hands into the outlet aperture.

Risk of body damage!

The following instructions for connection to the discharge only apply if the drawn gas is discharged by the vacuum pump into a suitable environment.

- Make sure that the protection that was attached to prevent penetration of particles during transport has been removed before the vacuum pump is connected to the vacuum line
- Make sure that the nominal diameter of the exhaust line is at least equal to the diameter of the exhaust flange of the vacuum pump to prevent a drop in the performance of the vacuum pump in the case of a smaller cross-section
- Make sure that the vacuum pump is connected with leakproof lines



CAUTION

When the discharge lines have been connected, make sure that the system does not leak. Leakages of dangerous substances must be prevented!

- Make sure that the discharge line is mounted in such a way that condensate cannot penetrate into the pump (siphon trap, gradient)
- Make sure that no shut-off devices are mounted in the discharge line
- Make sure that the discharge lines do not exercise any force on the discharge flange. Mount bellows if necessary
- The discharge flange has the following dimension:
- DN 63 ISO-K

In the case of long discharge lines the line cross-section should be larger than the discharge flange to prevent a drop in the performance of the vacuum pump. If you have any doubts, contact your Busch representative.

Cooling water connection

The cooling water is generally connected with a hose.

The cooling water outlet must be unpressurised.

Connection diameter: 3/8 NPT

Nitrogen connection

The nitrogen is connected with a pipe (leakproof against oxygen).

Connection diameter: 1/4 NPT

Electrical connection/ Checks

- Make sure that the regulations of the Electromagnetic Compatibility Directive 2014/30/EU as well as standard EN norms, safety directives and especially local and national regulations are observed (this is the responsibility of the manufacturer of the system into which the vacuum pump is integrated according to the Declaration of Conformity)
- Make sure that the mains power supply corresponds to the data on the nameplate of the motor

- Make sure that an overload cut-out according to EN 60204-1 is provided for the motor
- Make sure that the drive of the vacuum pump is not disturbed by any electric or electromagnetic interferences. If you have any doubts, contact your Busch representative

Installation

Mounting

- Make sure that the "Necessary installation instructions" are followed
- Fasten or install the pump at its final installation site

Electrical connection



WARNING

Risk of electrocution, risk of damage.

Electrical installation must be performed by a suitably qualified electrician who knows and follows the following regulations:

- IEC 364 or CENELEC HD 384 or DIN VDE 0100,
- IEC Report 664 or DIN VDE 0110,
- VBG 4 or corresponding national regulations on accident prevention



CAUTION

The circuit diagrams described below conform to the standard. Other circuit diagrams might be used. This depends on the particular order and the market.

Risk of damage to the motors!

Check the connection of the motors inside the terminal box according to the circuit diagram.

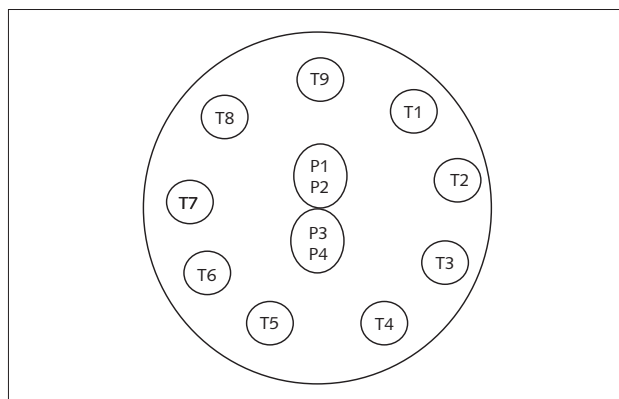
Motor of screw pump DS is connected at factory.



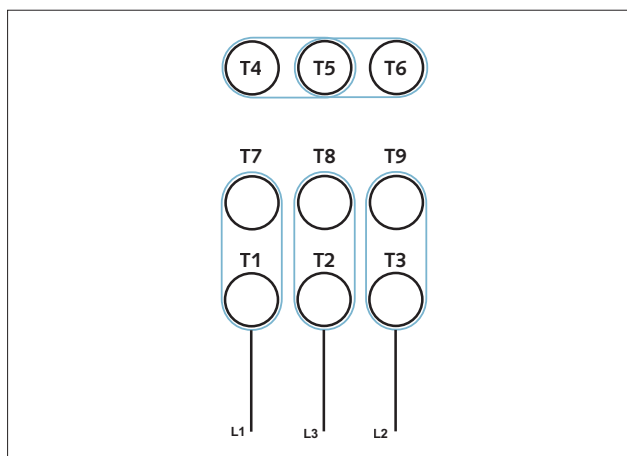
CAUTION

When connecting up the wires into the terminal box: please make sure the tightening torque of 2 Nm is adhered to and check with a calibrated torque wrench (Nuts M6).

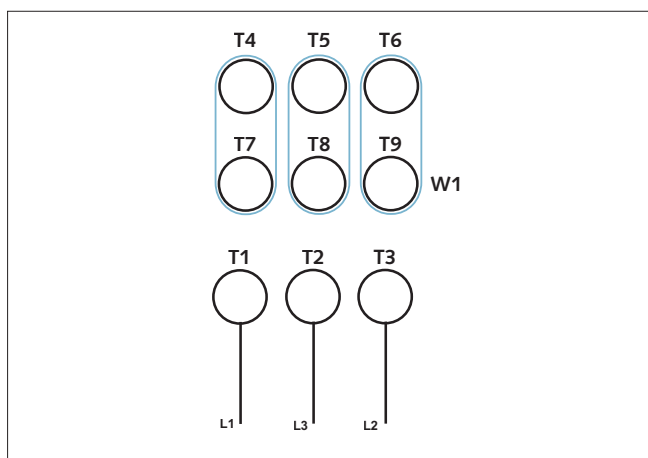
Three phase motor connection



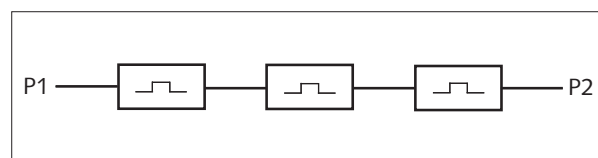
Star-star connection (Low voltage)



Star connection (High voltage)



Thermo switch connection

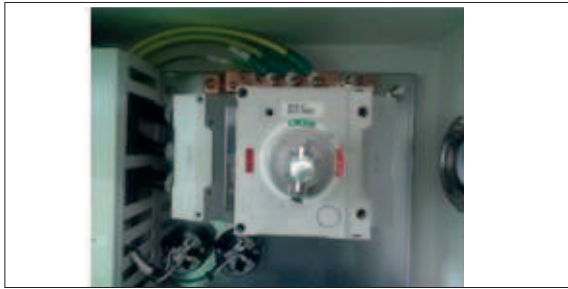


Procedure to connect the inline power cable

- Pass the cable through the inline power stuffing box



- Loosen the screw of the incoming power line side



- Connect the inline cable to each position (R, S, T, E)



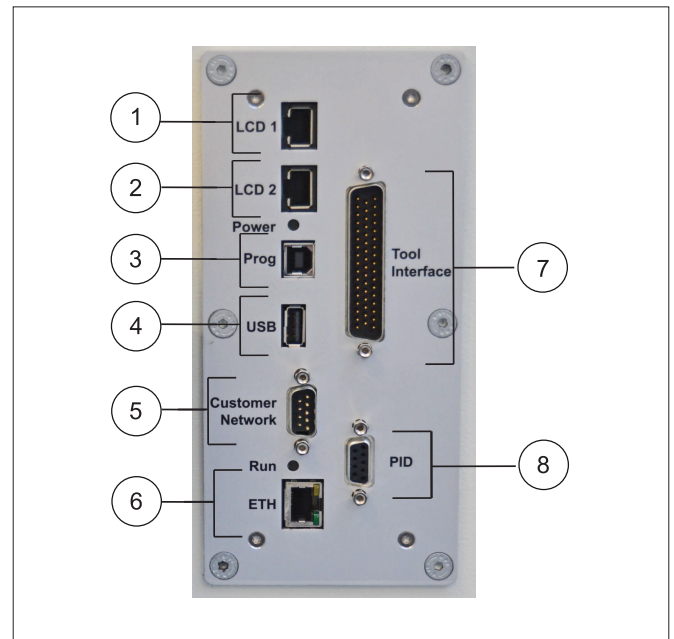
CAUTION

If the vacuum pump is operated with a motor that turns in the wrong direction, it can be destroyed, even if this is the case for only a short moment.

Make sure that the vacuum pump is connected correctly before switching it on.

- Determine rotation sense of the motor by using a measure tool or by placing a rubber plate on the inlet.
 - Press the on/off switch briefly
 - Make sure that the vacuum pump draws in
- If the direction of rotation has to be changed:
- ◆ Exchange two of the three feeder leads

Equipment connections (with options)



- 1 LCD serial wiring (RJ45), LCD1
- 2 LCD serial wiring (RJ45), LCD2
- 3 PC serial wiring (9 poles) (option)
- 4 USB connection
- 5 Customer Network, Communication modbus RTU RS 232
- 6 Ethernet network connection (Busch Monitoring System) (option)
- 7 Interface connection (50 poles) (option)
- 8 PID Interface (9 poles) (option)

The information concerning the use of the Busch PLC and the Busch LCD can be found in the Operation and Maintenance manual (Art-No. 0870758077).

Connection of the lines/pipes

- Connect the intake lines
- Connect the discharge lines
- Make sure that all caps, safeguards and similar covers are mounted
- Make sure that the inlet and outlet for the cooling air are not covered or closed and that the flow of cooling air is not impaired in any way

Oil filling

The COBRA DS vacuum pumps are generally dispatched with oil already in the vacuum pump. Before vacuum pump first startup, control the oil level. In the event of absence of this lubricant, please carry out the filling (see the chapter "Oil types" for information on the recommended oils).

COBRA NS (DP) vacuum pump

- Prepare the quantity of oil specified in the table "Oil quantity"

NOTE: The quantity of oil specified in the installation handbook is of informative nature only. Check the oil level with the help of the various oil sight glasses (OSG 1, OSG 2) on the vacuum pump.



CAUTION

Before you change the type of oil, make sure that the new type is compatible with the old type. If necessary, flush the vacuum pump.

- Unscrew the oil filler cap (OFP)
- Fill in oil
- Make sure that the oil level is in the top quarter of the oil sight glasses
- Make sure that the seals of the oil filler cap are not damaged. Replace them if necessary
- Screw on the oil filler cap hermetically tight

NOTE: It is easier to switch on the vacuum pump with cold oil when the intake line is not closed or when the intake flange is not covered by a rubber plate.

- Start the vacuum pump

If the intake line is equipped with a shut-off device:

- ◆ Close the shut-off device

If the intake line is not equipped with a shut-off device:

- ◆ Place a rubber plate on the intake flange
- Let the vacuum pump run for a few minutes
- Stop the vacuum pump and wait a few minutes
- Make sure that the oil level still lies in the upper third level of the oil sight glasses

If the oil level is below the upper third level :

- ◆ Fill in more oil

If the intake line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the intake line is not equipped with a shut-off device:

Remove the rubber plate from the intake flange and connect the intake line to the intake flange



CAUTION

In case of a vacuum pump filled with oil, make sure that by lifting the inclination angle of the vacuum pump do not exceed 5° from the horizontal. In case of too high inclination (>5°), risk of oil leak within the work area

- Make sure before every transport using the appropriate lifting mean that the inclination of the vacuum pump is less than 5°.



CAUTION

The vacuum pump must remain in a horizontal position when it has been filled with oil.

WZ (MB) rotary lobes vacuum pump

- Prepare the quantity of oil specified in the table "Oil quantity"

NOTE: The quantity of oil specified in the installation handbook is of informative nature only. Check the oil level with the help of the various oil sight glasses (OSG 3, OSG 4) on the vacuum pump.



CAUTION

Before you change the type of oil, make sure that the new type is compatible with the old type. If necessary, flush the vacuum pump.

- Unscrew the oil filler cap (OFP)
- Fill in oil
- Make sure that the oil level lies between the MIN and MAX markings on the oil sight glasses

- Make sure that the seals of the oil filler cap are not damaged. Replace them if necessary
- Screw on the oil filler cap hermetically tight

NOTE: It is easier to switch on the vacuum pump with cold oil when the intake line is not closed or when the intake flange is not covered by a rubber plate.

COBRA DS vacuum pump

- Start the vacuum pump

If the intake line is equipped with a shut-off device:

- ◆ Close the shut-off device

If the intake line is not equipped with a shut-off device:

- ◆ Place a rubber plate on the intake flange
- Let the vacuum pump run for a few minutes
- Stop the vacuum pump and wait a few minutes

COBRA NS (DP) vacuum pump

- Make sure that the oil level still lies in the upper third level on the oil sight glasses

If the oil level is below the upper third level:

- ◆ Fill in more oil

If the intake line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the intake line is not equipped with a shut-off device:

- ◆ Remove the rubber plate from the intake flange and connect the intake line to the intake flange

WZ (MB) rotary lobes vacuum pump

- Make sure that the oil level still lies between the MIN and MAX markings on the oil sight glasses

If the oil level is below the MIN marking:

- ◆ Fill in more oil into the two vacuum pumps

If the intake line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the intake line is not equipped with a shut-off device:

- ◆ Remove the rubber plate from the intake flange and connect the intake line to the intake flange



CAUTION

In the case of a vacuum pump filled with oil, you ensure that the angle of inclination of the vacuum pump at the time of rise does not exceed 5° compared to the horizontal. In the event of too important slope (> 5°), risk of oil leakage in the workspace.

- Before each transport requiring a means of adapted lifting, control the slope of the vacuum pump (< 5°).



CAUTION

The vacuum pump must remain in a horizontal position when it has been filled with oil.

Filling in cooling liquid

The COBRA DS vacuum pumps are generally dispatched with cooling liquid already in the vacuum pump. Before vacuum pump first startup, control the cooling liquid level. In the event of absence of this lubricant, please carry out the filling (see the chapter "Cooling liquid types" for information on the recommended cooling liquids).

- Prepare the quantity of cooling liquid specified in the table "Cooling liquid quantity"

NOTE: The quantity of cooling liquid specified in the installation handbook is of informative nature only. Respect the procedure of filling the cooling liquid.

- Unscrew filler cap (CLF) of cooling liquid on cylinder upper plate
- Open purge cap (CLV) on cylinder upper plate and purge cap (CLV) on cylinder endplate B-side
- Fill in by filler hole until cooling liquid flows by purge cap on cylinder endplate B-side
- Stop filling in cooling liquid
- Close the purge cap on cylinder endplate B-side
- Fill in again by filler hole until cooling liquid flows by purge cap of cylinder upper plate
- Close the purge cap of cylinder upper plate
- Screw on the filler cap for the cooling liquid again
- If liquid has run on to the outside surfaces of the vacuum pump, wipe it off
- Start the vacuum pump

If the intake line is equipped with a shut-off device:

- ◆ Close the shut-off device

If the intake line is not equipped with a shut-off device:

- ◆ Place a rubber plate on the intake flange
- Let the vacuum pump run for a few minutes
- Stop the vacuum pump and wait a few minutes
- Unscrew purge cap on cylinder upper plate
- Control that cooling liquid level is just under cylinder upper plate

In case cooling liquid level is below required level:

- ◆ Fill in more cooling liquid

If the intake line is equipped with a shut-off device:

- ◆ Open the shut-off device

If the intake line is not equipped with a shut-off device:

- Remove the rubber plate from the intake flange and connect the intake line to the intake flange

Checking the direct cooling

The flow of the cooling water is checked by the flowmeter CWM. The flowmeter must be connected in such a way that switching-on leads to an alarm and stopping of the vacuum pump when the flow drops below 7 l/min.

Checking the nitrogen supply

The flow of the nitrogen is checked by the flowmeter DGF. The flowmeter must be connected in such a way that switching-on leads to an alarm. The alarm limit can be adjusted depending the type of process.

Saving the operating parameters

As soon as the vacuum pump is working under normal conditions after being switched on:

- Measure the working current of the DP and MB motors and save them as reference values for all future maintenance and repair work

Recommendations on operation

Application



WARNING

The vacuum pump is designed for use under the conditions specified here.

If these conditions are not met, there is a risk of damage to or total destruction of the vacuum pump and its components!

The vacuum pump may only be switched on under the specified conditions.

The COBRA DS vacuum pumps are designed for use in the field of microelectronics and similar industries.

They can be used to suck gases and gas mixtures.



WARNING

When using toxic, inflammable and/or explosive gases, make sure that the system corresponds in design to applicable local and national safety regulations and that all applicable safety measures are followed.

All product-specific safety regulations must be observed.

Solid particles must not get into the vacuum pump. Procedural errors can result in the pump drawing in a certain quantity of liquid. If the pump has drawn in liquid, a short drying time is necessary at the end of the procedure.

The allowed maximum inlet gas temperature depends on the inlet pressure and the type of gas: the lower the inlet pressure (Pa), the higher the drawn gas temperature (T_{Gas}) can be.

The following indicative values for air can be considered:

- Pa > 50 mbar, T_{Gas} < 80°C
- Pa < 50 mbar, T_{Gas} < 200°C

The vacuum pump is intended for use in a potentially non-explosive environment.

Max. permissible number of startings per hour: 6.

As far as temperature is concerned, the pump is suitable for continuous duty at any pressure between atmosphere and ultimate pressure.

The vacuum pump is tight down to ultimate pressure.



CAUTION

The surface temperature of the vacuum pump can exceed 50 °C when the vacuum pump is in operation.

Danger of burns!

The vacuum pump may not be touched when it is in operation. If touching the pump is unavoidable, wait until the surface temperature has cooled down or wear protective gloves.



CAUTION

The intensity of the noise of the vacuum pump is higher within a certain area of the pump.

Risk of hearing damage.

Users must wear ear protection when spending a longer period of time in the vicinity of a non-insulated vacuum pump.



CAUTION

The COBRA DS vacuum pumps can be delivered without oil.

Operation without oil will result in damage to the vacuum pump!

The vacuum pump must remain in a horizontal position when it has been filled with oil.



CAUTION

The COBRA DS vacuum pumps can be delivered without cooling liquid.

Operation without cooling liquid will result in damage to the vacuum pump!



CAUTION

The cooling water flow, which is checked by the flowmeter CWM, must be at least 8 l/min.

- Make sure that all caps, safeguards and similar covers are mounted
- Make sure that the safeguards are switched on
- Make sure that the inlet and outlet for the cooling air are not covered or closed and that the flow of cooling air is not impaired in any way
- Make sure that the system does not leak. Leakages of dangerous substances must be prevented
- Make sure that the "Necessary installation instructions" are followed and especially that adequate cooling is ensured

The following must be noted when the pump is shut down for a longer period of time:



CAUTION

If there is a risk of frost, all the cooling water must be drained out of the vacuum pump if the pump is shut down for a longer period of time!

- Drain the cooling liquid
 - ◆ Unscrew the filler cap for the cooling liquid
 - ◆ Drain the cooling liquid completely
 - ◆ Screw on the filler cap for the cooling liquid again
 - ◆ Collect the cooling liquid and recycle it or dispose of it according to local or national regulations
- Drain the cooling water
 - ◆ Pull off the connections for the inlet and outlet of the cooling water
 - ◆ Drain the cooling water completely
 - ◆ If necessary, drain the cooling water with the help of compressed air to prevent any risk of frost or corrosion

NOTE: When the pump has not been in operation for a few days or when a sticky substance has been drawn in, it is possible that the two screw rotors of the NS (DP) vacuum pump will stick to each other. Screw open the access cover to the screw rotors. Loosen the rotors from each other with the help of an Allan key by turning them in clockwise direction by hand.

Switching the vacuum pump on/ off

First start-up of the system

- Make sure that the "Necessary installation instructions" are followed

If the system is equipped with a solenoid gate valve (customer option) in the cooling water circuit:

- ◆ Open the solenoid gate valve

- Make sure that the cooling water flow is set correctly
 - The cooling water flow is factory set on 8 NI/min and can be adjusted at the regulating cock CWR. This water circuit is used to cool the motor of the DP and MB vacuum pumps.
- Make sure that the nitrogen flow is set correctly
 - Nitrogen flow injected in the middle hole (8) is preset at 40 NI/min and can be adjusted with valve DGR 2. Nitrogen flow injected in the hole on cylinder end-plate side (9) is preset at 20 NI/min and can be adjusted with valve DGR 1.
- Switch on the vacuum pump
- Make sure that the system does not leak

If the system is equipped with a solenoid gate valve at the intake:

- ◆ Open the solenoid gate valve

Switching the system off

If the system is equipped with a solenoid gate valve at the intake:

- ◆ Close the solenoid gate valve
- Switch off the vacuum pump
- Shut off the nitrogen supply
- Shut off the cooling water supply

If the system is equipped with a solenoid gate valve (customer option) in the cooling water circuit:

- ◆ Close the solenoid gate valve
- Make sure that the system is electrically isolated

Maintenance



DANGER

In case the vacuum pump has conveyed gases that have been contaminated with foreign materials that are dangerous to health, the oil and condensates will also be contaminated.

These foreign materials can infiltrate the pores, recesses and other internal spaces of the vacuum pump.

Danger to health when the vacuum pump is dismantled.

Danger to the environment.

Always wear protective clothing when carrying out maintenance work.

Before any maintenance work, the inlet and outlet piping as well as the vacuum pump itself must be flushed with nitrogen.



CAUTION

Only authorised personnel may carry out dismantling work on the vacuum pump. Before work begins, the operator of the vacuum pump must fill in a form or a "Declaration Regarding Contamination of Equipment and Components" that provides information on possible dangers and appropriate measures. If this form has not been filled in completely and signed, the vacuum pump may not be dismantled.



CAUTION

Before maintenance work is started, a safety area of at least 610 [mm] around the machine must be set up.



CAUTION

The surface temperature of the vacuum pump can exceed 50°C when the vacuum pump is in operation.

Danger of burns!

Before starting maintenance work, make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally. Follow the shutdown procedure in the section "Lock Out/ Tag Out procedure":

- stop the pump with the remote control (press on STOP button during 10s)
- press on emergency stop button
- switch off the main disconnect switch
- switch off the customer's power supply
- switch off the water (inlet first, then outlet) and nitrogen quick connections
- put the label or warning board "Maintenance processing" on or next to the pump



CAUTION

The oil temperature can reach a value of 90°C!

Danger of burns!

- Make sure that the oil circuit and the coolant circuit have been emptied before moving the vacuum pump
- Make sure that there are no cleaning tools in the pump anymore according to local and national regulations

Before pulling off the different connections, make sure that the intake and exhaust lines of the vacuum pump correspond to atmospheric pressure

When the maintenance work has been finished, follow the procedure "Safety Lockout procedure":

- take off the label or warning board "Maintenance processing"
- check the cooling liquid and oil levels according to the chapters "Checking the oil level" and "Checking the cooling liquid level"
- open the power box cover and check that the FDP1 thermal relay is on manual reset position
- close the cover
- switch on the main disconnect switch
- release the emergency stop button
- switch on the water (outlet first, then inlet) and nitrogen quick connections
- make sure that the "Necessary installation instructions" are followed
- start the pump with the remote control (press on START button)

Maintenance program

NOTE: The maintenance intervals depend on the operating conditions. The following intervals are basic values, which can be shortened or lengthened depending on operating conditions. In especially difficult operating conditions such as, for example, a very dusty environment the maintenance intervals must be shortened considerably.

Weekly:

- Check the oil level and the colour of the oil (see "Checking the oil")
- Check the level of the cooling liquid (see "Checking the cooling liquid")
- Check the cooling water flow (see "Checking the cooling water")
- Check the nitrogen flow (see "Checking the nitrogen")
- Inspect the vacuum pump for oil leaks - if there are leaks, repair the vacuum pump (Busch)

- Inspect the vacuum pump for leaks of cooling liquid - if there are leaks, repair the vacuum pump (Busch)
- Inspect the vacuum pump for leaks of cooling water - if there are leaks, repair the vacuum pump (Busch)

Monthly:

In the case of operation in a dusty environment:

- ◆ Make sure that the operating room is clean and free of dust; clean if necessary
- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Check the electrical connections
- Carry out a visual inspection of the vacuum pump

Yearly:

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally

If the intake is equipped with a sieve:

- ◆ Check the sieve at the intake and clean if necessary
- Check the measuring and safety equipment for working order

If the discharge is equipped with a sound absorber:

- ◆ Clean the sound absorber

If the discharge is equipped with a leak-protection non-return valve:

- ◆ Clean the leak-protection non-return valve
- Drain the cooling liquid (see "Draining the cooling liquid")

If the cooling water line is equipped with a filter:

- ◆ Check the filter and clean or replace if necessary
- Check the seals and replace if necessary
- Check the intake and discharge lines and clean or replace if necessary

Every 16 000 hours of operation, at the latest after 4 years:

- Drain the oil (see "Draining the oil")

A main inspection of the vacuum pump (Busch)

Lock Out/ Tag Out procedure

- Stop the pump with the remote control (press on STOP button during 10s)
- Press on emergency stop button
- Switch off the main disconnect switch
- Switch off the customer's power supply
- Switch off the water (inlet first, then outlet) and nitrogen quick connections
- Put the label or warning board "Maintenance processing" on or next to the pump

Safety Lockout procedure

- Take off the label or warning board "Maintenance processing"
- Check the cooling liquid and oil levels according to the chapters "Checking the oil level" and "Checking the cooling liquid level"
- Open the power box cover and check that the FDP1 thermal relay is on manual reset position
- Close the cover
- Switch on the main disconnect switch
- Release the emergency stop button
- Switch on the water (outlet first, then inlet) and nitrogen quick connections
- Make sure that the "Necessary installation instructions" are followed

- Start the pump with the remote control (press on START button)

Checking the oil

Checking the oil level

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Indication of the oil level on the various oil sight glasses

COBRA NS (DP) vacuum pump

If the oil level lies below the upper third level:

- ◆ Top up with oil (see "Refilling oil")

If the oil level exceeds the upper third level:

- ◆ Check the condensate drain
- Drain the oil (see "Draining the oil")

WZ (MB) rotary lobes vacuum pump

If the oil level does not reach the MIN marking:

- ◆ Top up with oil (see "Refilling oil")

If the oil level exceeds the MAX marking:

- ◆ Check the condensate drain
- Drain the oil (see "Draining the oil")

Refilling oil

NOTE: Oil does not normally have to be refilled outside the recommended oil change intervals. A drop in the oil level indicates a fault (see "Troubleshooting").



CAUTION

Only fill in oil through the oil filler plugs.



CAUTION

Danger of burns when the oil filler plugs are open.

Danger of injuries when the oil filler cap is not screwed on properly.

Only unscrew the oil filler cap when the vacuum pump has been switched off.

The vacuum pump may only be switched on when the oil filler cap is properly closed and tight.

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Unscrew the oil filler plugs of the DP and MB vacuum pumps (if necessary)

COBRA NS (DP) vacuum pump

- Fill in oil up to the upper third level of the oil sight glasses
- Make sure that the oil level is in the upper third level of the oil sight glasses
- Make sure that the seals of the filler cap are not damaged and that they sit properly. Replace them if necessary
- Screw on the filler cap again

WZ (MB) rotary lobes vacuum pump

- Fill in oil up to the middle of the oil sight glasses
- Make sure that the oil level lies between the MIN and MAX markings on the oil sight glasses
- Make sure that the seals of the filler cap are not damaged and that they sit properly. Replace them if necessary
- Screw on the filler cap again

Checking the colour of the oil

NOTE: The oil must be clear and transparent. A permanent milky colour is an indication for contamination by foreign bodies. A dark colour is an indication for oil that has been chemically altered or contaminated by foreign bodies.



WARNING

Dark colored oil may indicate a hazardous pump condition which could cause personal injury.



If dark oil similar to the example shown is observed, you have to contact the Busch Customer Service without delay.

Oil change



DANGER

If the vacuum pump has pumped gases that were contaminated with foreign bodies that are hazardous to health, the oil is also contaminated with these foreign bodies.

There is a health hazard when changing contaminated oil.

There is also a danger to the environment.

Wear protective clothing when replacing contaminated oil.

Contaminated oil must be treated specially and must be disposed of according to applicable regulations.

Draining used oil

NOTE: After switching off the vacuum pump at normal operating temperature wait no more than 20 minutes before the oil is drained.

- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Make sure that the vacuum pump is vented to atmospheric pressure

COBRA NS (DP) vacuum pump

- Put a drain tray underneath the oil drain plugs (ODP)
- Unscrew the oil drain plugs (ODP)
- Carefully remove the drain plugs
- Drain the oil
- Because of wear and tear on the seal replace the current drain plugs with new ones

When the oil flow has stopped:

- Close the oil drain plugs (ODP)
- Switch on the vacuum pump for a few seconds
- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Carefully remove the oil drain plugs again and drain any remaining oil
- Check that no metal swarf sticks to the magnet of the drain plug, clean if necessary

- Refit the oil drain plugs and tighten up
- Dispose of the used oil in compliance with applicable regulations



CAUTION

Because the ends of the drain plugs are magnetic, metal swarf can stick to them. Always clean away this swarf when removing the drain plugs.

Because of wear and tear of the seals, it is recommended to replace the drain plugs whenever the oil is changed.

WZ (MB) rotary lobes vacuum pump

- Put a drain tray underneath the oil drain plugs (ODP)
- Unscrew the oil drain plugs (ODP)
- Drain the oil

When the oil flow has stopped:

- Refit the oil drain plugs (ODP) again
- Switch on the vacuum pump for a brief moment and let it run for a few seconds
- Make sure that the vacuum pump is switched off and cannot accidentally be switched on again
- Carefully remove the oil drain plugs again and drain any remaining oil
- Make sure that the seals of the drain plugs are not damaged and that they sit properly. Replace them if necessary
- Refit the oil drain plugs and tighten them up
- Dispose of the used oil in compliance with applicable regulations

Filling in new oil

COBRA NS (DP) vacuum pump

- Prepare the quantity of oil needed (see "Oil type/quantity")



WARNING

The use of chemically contaminated or polluted oil can lead to hazardous pump conditions which could cause personal injury.

NOTE: The quantity of oil specified in the installation handbook is of informative nature only. Check the oil level with the help of the various oil sight glasses on the vacuum pump.

- Make sure that the drain plugs have been fitted properly and that they do not leak



CAUTION

Only fill in oil through the oil filler opening.

- Unscrew the oil filler cap (OFP)
- Fill in oil up to the upper third level of the oil sight glasses
- Make sure that the oil level is in the upper third level of the oil sight glasses
- Make sure that the seals of the filler cap are not damaged and that they sit properly. Replace them if necessary
- Screw on the filler cap again

WZ (MB) rotary lobes vacuum pump

- Prepare the quantity of oil needed (see "Oil type/quantity")

NOTE: The quantity of oil specified in the installation handbook is of informative nature only. Check the oil level with the help of the various oil sight glasses on the vacuum pump.

- Make sure that the drain plugs have been fitted properly and that they do not leak



CAUTION

Only fill in oil through the oil filler opening.

- Unscrew the oil filler cap (OFP)
- Fill in oil up to the middle of the oil sight glass
- Make sure that the oil level lies between the MIN and MAX markings on the oil sight glasses
- Make sure that the seals of the filler cap are not damaged and that they sit properly. Replace them if necessary
- Screw on the filler cap again

Checking the cooling liquid

Checking the level of the cooling liquid

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Check the level of the cooling liquid.
 - ◆ Unscrew purge cap (CLV) on cylinder upper plate.

Cooling liquid level should be just under the plate.

If the level is below:

- ◆ Top up with cooling liquid (see "Refilling cooling liquid")

Refilling cooling liquid

NOTE: Cooling liquid does not normally have to be refilled outside the recommended change intervals. A drop in the level of the liquid indicates a fault (see "Troubleshooting").

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Unscrew the filler cap (CLF) for the cooling liquid
- Open purge cap (CLV) on cylinder upper plate and purge cap on cylinder endplate B-side
- Fill in by filler hole until cooling liquid flows by purge cap on cylinder endplate B-side
- Stop fill in
- Close the purge cap on cylinder endplate B-side
- Fill in again by filler hole until cooling liquid flows by purge cap of cylinder upper plate
- Close the purge cap of cylinder upper plate
- Screw on the cooling liquid filler cap again
- If liquid has run on to the outside surfaces of the vacuum pump, wipe it off

Draining the cooling liquid

- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally
- Make sure that the vacuum pump has adjusted to atmospheric pressure
- Place a container under the drain plug (CLD) for the cooling liquid
- Unscrew purge cap on cylinder upper plate
- Unscrew purge cap on cylinder endplate B-side
- Unscrew drain plug of cooling liquid
- Drain the cooling liquid

When cooling liquid stops running out:

- Close the drain plug for the cooling liquid
- Screw purge caps
- Switch on the vacuum pump and let it run for a few seconds
- Make sure that the vacuum pump has been switched off and that it cannot be switched on again accidentally

- Unscrew again purge cap (CLV) on cylinder upper plate
- Unscrew again purge cap (CLV) on cylinder endplate B-side
- Unscrew the drain plug for the cooling liquid again and drain the remaining liquid
- Make sure that the seal of the drain plug is not damaged and that it sits properly. Replace it if necessary
- Screw on the drain plug again
- Screw purge caps
- Dispose of the used cooling liquid according to applicable environmental protection regulations

Filling in new cooling liquid

- Prepare the quantity of cooling liquid needed (see "Cooling liquid type/quantity")

NOTE: The quantity of cooling liquid specified is of informative nature only. Respect the procedure of filling the cooling liquid.

- Make sure that the drain plug sits properly and does not leak
- Unscrew purge cap on cylinder upper plate
- Unscrew purge cap on cylinder endplate B-side
- Unscrew the filler cap for the cooling liquid
- Fill in by filler hole until cooling liquid flows by purge cap of cylinder endplate B-side
- Stop fill in
- Close the purge cap on cylinder endplate B-side
- Fill in again by filler hole until cooling liquid flows by purge cap of cylinder upper plate
- Close the purge cap on cylinder upper plate
- Make sure that the seal of the filler cap are not damaged and that they sit properly. Replace them if necessary
- Screw on the filler cap again
- Wipe cooling liquid that may have run on outside surfaces of vacuum pump

Checking the cooling water

Checking the cooling water flow

- Check the cooling water flow regularly

If the flow drops, check for leaks

- ◆ Make sure that the specifications of the cooling water are followed

Checking the nitrogen

Checking the nitrogen flow

- Check the nitrogen flow regularly

If the flow drops, check for leaks

- ◆ Make sure that the specifications of the nitrogen are followed

Checking the current consumption

- Check the current intensity of the motors of the DP and MB vacuum pumps

An increased intensity is an indication for a fault (see "Troubleshooting")

Checking the sound absorber (accessory)

- Make sure that the condensate does not collect at the exhaust of the vacuum pump
- Drain the condensate at the drain opening and collect it in a container

- Dispose of the condensate according to applicable environmental protection regulations
- Check the sound absorber regularly and clean it if necessary

Checking the leak-protection non-return valve (accessory)

- Check the leak-protection non-return valve regularly and clean it if necessary



CAUTION

Wear protective clothing when carrying out maintenance work on the sound absorber and leak-protection non-return valve.

There could still be residues of contamination.

Overhaul



CAUTION

Inappropriate maintenance work on the vacuum pump can damage the pump.

Danger of explosion!

If requirements are not met, the vacuum pump may not be switched on!

Should work exceed the dismantling work described in this handbook, it may only be carried out by authorised persons.



DANGER

If the vacuum pump has pumped gases that were contaminated with foreign bodies that are hazardous to health, the oil and condensate are also contaminated with these foreign bodies.

These foreign bodies can penetrate into pores, openings and other internal parts of the vacuum pump.

There is a health hazard when dismantling the vacuum pump.

There is also a danger to the environment.

Prior to shipping, the vacuum pump must imperatively be decontaminated and the degree of contamination must be documented in a declaration of decontamination ("Declaration of Decontamination"), which can be downloaded from www.buschvacuum.com.

Busch service will only accept vacuum pumps that come with a completely filled in and legally binding signed form.

Removal from service

Temporary removal from service

Before disconnecting the intake and exhaust lines and switching off the cooling water and nitrogen lines, make sure that the lines have adjusted to atmospheric pressure

Recommissioning



CAUTION

If the vacuum pump was switched off for a longer period of time, the rotors of the COBRA NS vacuum pump can be jammed.

Turn the screw rotors by hand.

- Make sure that the various protective elements, stoppers or adhesive tapes have been removed
- Switch on the vacuum pump by following the procedure described in the chapter "Installation and start-up"

Dismantling and disposal



DANGER

If the vacuum pump has pumped gases that were contaminated with foreign bodies that are hazardous to health, the oil and condensate are also contaminated with these foreign bodies.

These foreign bodies can penetrate into pores, openings and other internal parts of the vacuum pump.

There is a health hazard when dismantling the vacuum pump.

There is also a danger to the environment.

Protective clothing must be worn when dismantling the vacuum pump.

Prior to shipping, the vacuum pump must imperatively be decontaminated and the degree of contamination must be documented in a declaration of decontamination ("Declaration of Decontamination"), which can be downloaded from www.buschvacuum.com.

Dispose of the used oil and condensate according to applicable environmental protection regulations.

When the product has reached the end of its lifetime:

- decontaminate the vacuum pump



CAUTION

Only authorised personnel may carry out dismantling work on the vacuum pump. Before work begins, the operator of the vacuum pump must fill in a form or a "Declaration of Decontamination" that provides information on possible dangers and appropriate measures.

If this form has not been filled in completely and signed, the vacuum pump may not be dismantled.

- drain the oil
 - ◆ dispose of the oil according to local environmental protection regulations
- drain the cooling liquid
 - ◆ dispose of the cooling liquid according to local environmental protection regulations
- begin dismantling the vacuum pump



CAUTION


Wear protective clothing when carrying out dismantling work.

- ◆ dispose of the vacuum pump as scrap metal
 - dispose of the individual parts of the machine according to local regulations
- A lithium battery is present inside the PLC:
- eliminate the lithium battery according to local and national regulations in place, relating to environment

Oil type/ quantity

Oil type

- Make sure that the oil type corresponds to specification:
- Busch YLC 250 B, Art. No. 0831 000 054 (0,5 l \pm 1 kg)



WARNING

The use of chemically contaminated or polluted oil can lead to hazardous pump conditions which could cause personal injury.

Oil quantity

The quantity of oil specified in the following table is of informative nature only. Check the oil level with the help of the various oil sight glasses on the vacuum pump.

Quantity [l]	Motor side (A)	Inlet side (B)
NS 600 C	0,8	0,8
Quantity [l]	Motor side	Gear side
WZ 2000 B	2,1	2,5

Cooling liquid type/ quantity

Cooling liquid type

- Make sure that the cooling liquid type corresponds to specifications :

Specifications	Zitrec M-25 (ready-to-use)	
	25 litres can	5 litres can
	part no. 0831 563 468	part no. 0831 563 469

Cooling liquid quantity

The quantity of cooling liquid specified in this instructions manual is of informative nature only. Respect the procedure of filling the cooling liquid.

Quantity	Zitrec M-25 (already mixed ready-to-use)
DS 2610 E	approx. 26 litres



CAUTION

The proportion of pure glycol and water for the cooling liquid corresponds to a percentage of 40% pure glycol and 60% water. It is therefore not necessary to prepare the mix before use. But when using pure glycol, it is imperative to prepare the mix prior to filling the pump and to respect this proportion.

Technical data

Technical data				DS 2610 E
Nominal suction capacity		60 Hz	m ³ /h (cfm)	2200 (1290)
Ultimate pressure			Torr mbar	7,5 x 10 ⁻³ 1,0 x 10 ⁻²
Electric power capacity at ultimate pressure		60 Hz	kW (MB: 60 Hz)	11,0
Motor rating	DP MB	60 Hz 50/ 60 Hz	kW	15 5,5/ 6,6
Nominal motor speed	DP	60 Hz	min ⁻¹	3600
Nominal motor speed	MB	50/ 60 Hz	min ⁻¹	3000/ 3600
Noise level (EN ISO 2151)		50 Hz 60 Hz	dB(A) dB(A)	< 75
Ambient temperature			°C (°F)	0-40 (32-104)
Maximal counter pressure	Discharge		bar	0,2
Cooling water requirement (motors cooling)			l/ min	min. 8.0
Cooling water pressure			bar/ ΔP	2 ... 5
Cooling water temperature			°C	10 - 25
Nitrogen requirement	approx.		l/ min	0 - 200
Nitrogen overpressure			bar	1,5
Weight	approx.		kg	1380



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:

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



declare that the machine(s) **DS 2610 E**

with a serial number from **K1701...** to **K1852...**

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 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; Part 1 and 3
EN 61000-6-4:2007 + A1:2011	Electromagnetic compatibility (EMC) – Generic standards. Emission standard for industrial environments
EN ISO 13849-1:2015 ⁽¹⁾	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design and 2

Person authorised to compile the technical file:

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Icheon-si, 18.05.2016

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⁽¹⁾ In case control systems are integrated.

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