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Installation and Maintenance Instructions



Screw Vacuum Pumps

COBRA BA 0100 A

Specific version

CE

Ateliers Busch S.A.
Zone industrielle
2906 Chevenez
Switzerland

0870551577 / 090910 / Original instructions / Subject to change without notice

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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.

These operating instructions contain information for

- product description,
- safety,
- transport,
- storage,
- installation and commissioning
- maintenance,
- overhaul and
- troubleshooting

of the vacuum pump.

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.

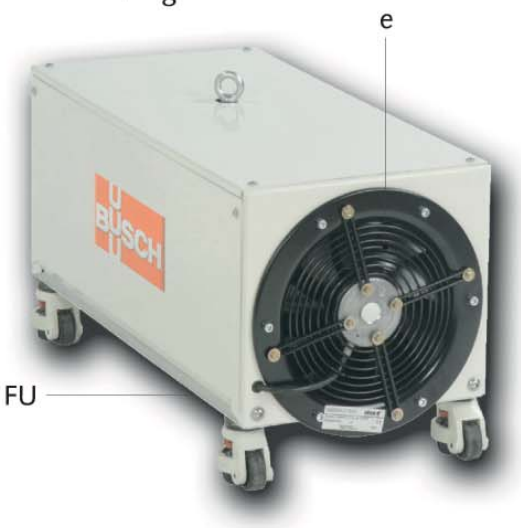
Prior to handling the vacuum pump these operating instructions shall be read and understood. If anything remains to be clarified please contact your Busch representative.

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



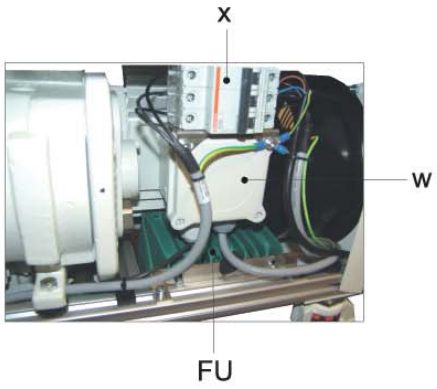


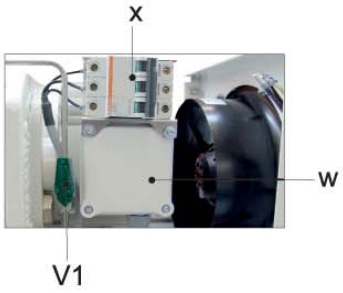


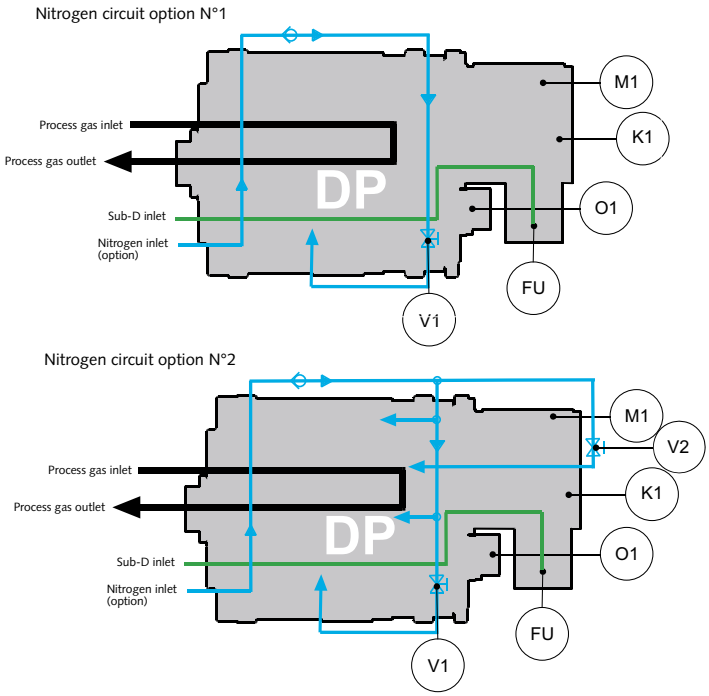


Pump description BA 0100 A

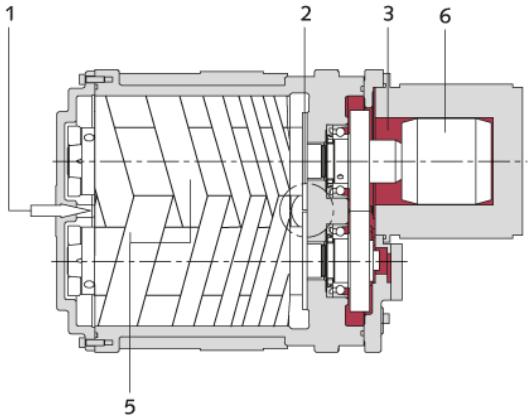
a Inlet
b Discharge
c Oil filler plug
d Oil sight glass
e Fan
f Sub-D jumper
g Nitrogen inlet (option)
q Electrical connection
v Lifting bracket
w Terminal box
x Main circuit breaker
S1 On/ Off switch
FU Frequency variator
V1 Nitrogen regulating valve, dilution (option)







O1 Oil level indicator
M1 Motor
K1 Motor klixon
FU Frequency variator
V1 Nitrogen regulating valve, dilution (option)
V2 Nitrogen regulating valve, dilution (option)



1 Inlet
2 Discharge
3 Oil
5 Screw rotors
6 Motor klixon

Product description

Use

The COBRA BA 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 sucking in a certain quantity of liquid. If the pump has sucked in liquid, a short drying time is necessary at the end of the procedure.

The temperature of sucked gas depends on the dilution flow of nitrogen injected in the vaccum pump. Higher the flow is, lower is the temperature of sucked gas (TGa). We can consider for air following indications:

- Pa > 50 mbar, TGa < 80°C
- Pa < 50 mbar, TGa < 200°C

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

As far as temperature is concerned, the pump is suitable for evacuation of a 300 liters tank. The pump is not suitable for continuous duty at a pressure more or equal than 150 mbar. Caution, the operating cycle of 150 mbar must not exceed more than 5 min. For other applications, contact your Busch representative.

The vacuum pump is tight down to ultimate pressure.

Principle of operation

The COBRA BA 0100 A vacuum pumps are COBRA NA screw vacuum pumps.

The COBRA NA screw vacuum pumps work by the principle of spiral pumps. Two parallel screws (5) 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 NA screw vacuum pumps are driven by air-cooled motors.

Oil circuit

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

Cooling

The vacuum pump is cooled by

- a cooling air circuit. This cooling air circuit is used to cool the motor of the pump and also the body of the NA pump and the frequency inverter.

NOTE: The COBRA BA vacuum pumps are always delivered without oil. Operation without this coolant can result in damage to the vacuum pump.

Nitrogen System (option)

The nitrogen system performs the following main functions:

- Option N° 1: nitrogen is used as dilution gas. It is injected inside the cylinder on one port. Nitrogen flow injected is preset at 4 l/min and can be adjusted with valve V1, depending on the application.Dilution improves the screws functioning, especially when sucking corrosive gases.
- Option N° 2:
- nitrogen is used as dilution gas. It is injected inside the cylinder on two ports. Nitrogen flow injected is preset at 4 l/min and can be adjusted with valves V1 and V2, depending on the application.Dilution improves the screws functioning, especially when sucking corrosive gases.
- nitrogen is used as to improve the sealing, the N2 gas is injected between the transmission and the process gas.

Optional functions/Use of available accessories

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.

On / Off switch

Start-up and switch-off of the vacuum pump on local mode are carried out with the On/ Off switch (S1). There is also a possibility to drive the pump by using the Sub-D 15 P connector.

Versions

Further vacuum pump descriptions state the nominal displacement and the design level.

Example: BA 0100 A
BA= standard version
0100 = 100 m^3/h
A = Design

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

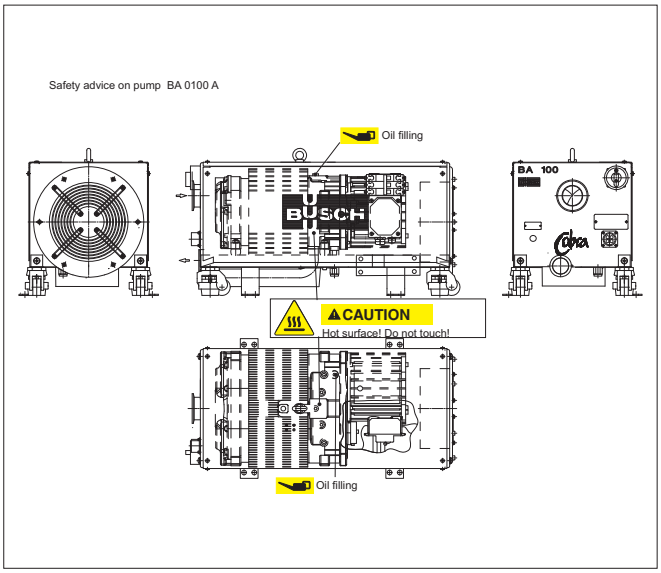
Disregard of this safety instruction will always result in death, serious injuries or severe damage.

⚠WARNING

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

⚠CAUTION

Indication of a possibly dangerous situation. Disregard of this safety instruction may result in minor or moderate injuries or damage. Also warning of material damage



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

CAUTION

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. Potentila 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 On/Off Switch button (S1) in local mode or with th eremote signal in remote mode
- Switch off the main disconnect switch (S1) in case of using the remote function
- Switch off the customer's power supply
- Switch off nitrogen quick connection (inlet first, then outlet)
- 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 oil level according to the chapters "Checking the oil level"
- Switch on the main disconnect switch (S1) in case of using the remote function
- Release the emergency stop button
- Switch on the nitrogen quick connexion
- Start the pump with the remote control with the main switch (S1) in local mode

Emergency off circuit description

- There is no "Emergency off circuit" but the following signals are at the end user's disposal:

– Motor overtemperature. NC contact on pin 14 and 15 of X1 (sub-D 15 P)

– Inverter default. NC contact on pin 7 and 8 of X1 (sub-D 15 P)

Safety interlock description

See "Interlock table".

Lock out/ Tag out for hydraulics and pneumatics

- Pneumatics: nitrogen

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

- Stop the pump with the On/Off Switch button (S1) in local mode or with the remote signal in remote mode
- Switch off the main disconnect switch (S1)
- Switch off the customer's power supply
- Switch off the nitrogen quick connection
- 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 nitrogen

Interlock table

Interlock event	Sensor	Response	
Motor overcurrent	Thermal overload relay	Inverter set in default and remove power to motor	H
Motor overtemperature (t° > 150°C)	Thermo switch B11 (klixon)	The NC of B11 opens (pin 14 and 15 of X1): the pump continues running if this contact is not used by the end customer	H
Oil level too low	Level O1	The pump continues running. Check the oil level before use	H

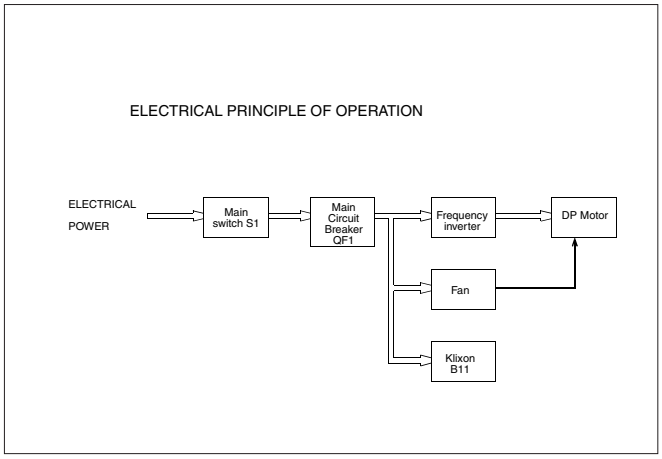
H= Hardware, S= Software

Lock Out/ Tag Out procedure

- Switch off the On/ Off switch
- Put the label or warning board "Maintenance processing" on or next to the pump

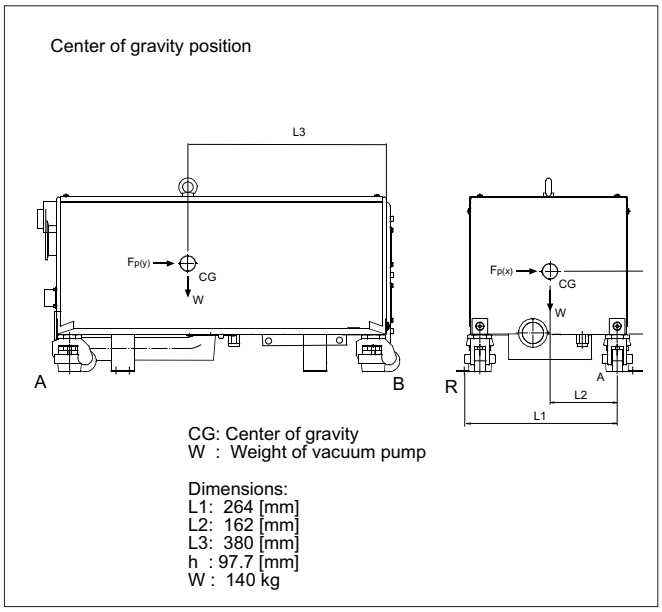
Safety Lockout procedure

- Take off the label or warning board "Maintenance processing"
- Check the oil level according to the chapters "Checking the oil level"
- Switch on the On/ Off switch



Position of the pump gravity center

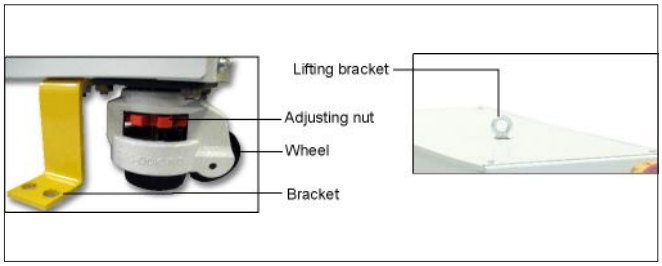
- The gravity center of the BA 0100 A pump is determined according to the drawing



Installation of the vacuum pump in a seismic zone

Upon receipt, the vacuum pump is fixed on the transport pallet with four yellow brackets.

- Convey the pump to its final location with a pallet truck before removing it from its support
- Unscrew the fixing screws of the pump on the transport pallet and remove the machine from its support with an appropriate lifting system by using the lifting brackets made for this purpose

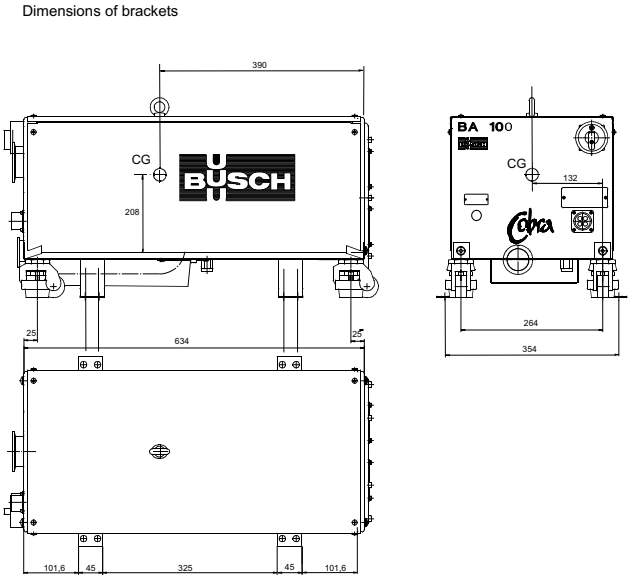


- The pump must not lay only on the brackets. Unscrew the four adjusting nuts until the machine legs touch the ground
- Check that the wheels no longer touch the ground

CAUTION

The vacuum pump is fixed to the ground with four M10 screws, one screw per bracket. The fixing screw must stand a 1200 N tensible force (per bracket).
The final user must adapt the type od screws depending on the ground material.

The ground space requirement for the brackets is to be read on the following figure



- Check the brackets geometry after an earth tremor. Replace the defective brackets if deformed.

Information over the lubricants

Oil

Busch PFPE VF0250 n°.-art. 0831 000 054 (0.5l of Fomblin)

Quantity: BA 0100 A : 0,12 l

Replacement: After 5000 h (see chapter "Maintenance")

Technical data sheet: Please refer to chapter "Technical data".

Decommissioning procedure

When the product arrives at the end of the lifetime, it is necessary to proceed to the decontamination of the vacuum pump

WARNING

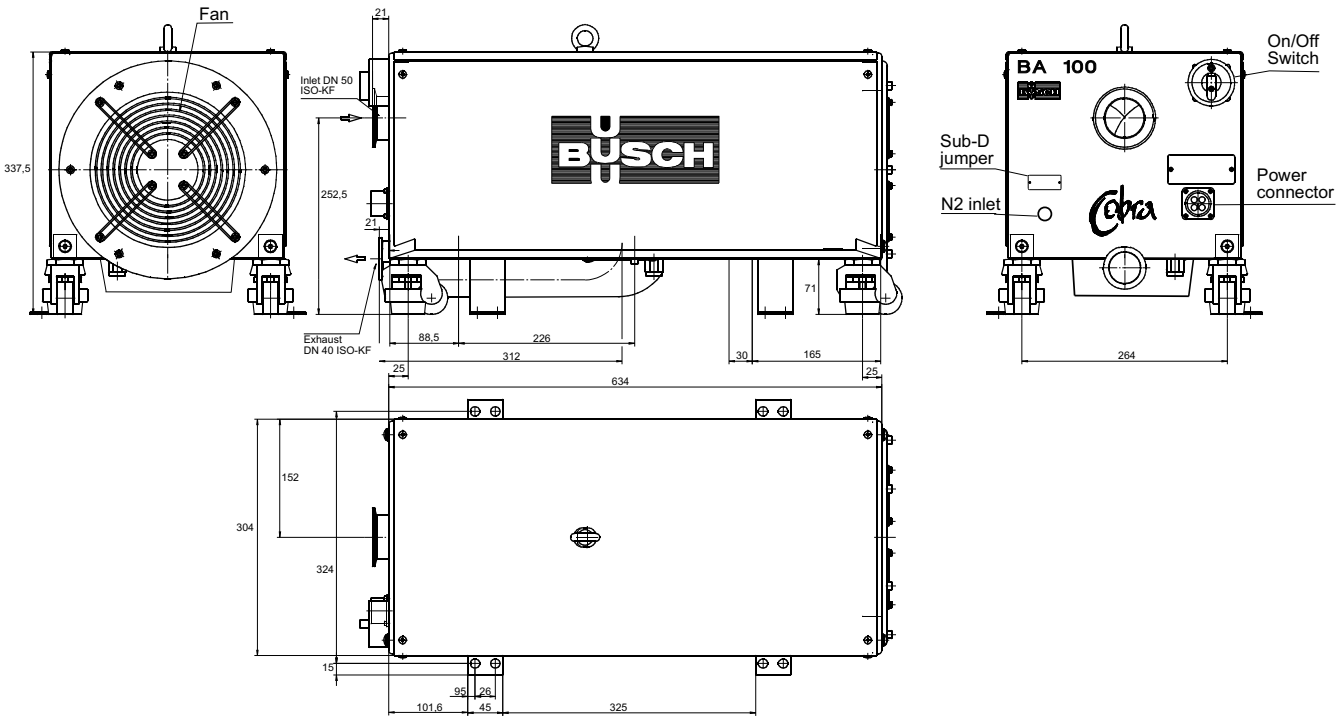
Any disassembly of the vacuum pump should only be carried out by staff trained for this purpose. Before disassembly, the user of the vacuum pump should complete a form or "Declaration about absence of danger" which indicates any dangers and corresponding actions. Without this form duly completed and signed by a legally responsible person, the pump should not be disassembled.

- Proceed to disassembly of the vacuum pump. Please make sure to wear a personal protective equipment (PPE) prior to any intervention on the vacuum pump. Some residue may remain inside.
- Proceed to decommissioning of the different parts according to the current local and national laws

Appliance after warehousing

Prior to reoperate a vacuum pump which remained outside the buiding for a certain period of time, make sure to let it stand at ambient temperature in a room for a whole day.

Dimensions drawing



Transport

The COBRA BA 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 beweeen -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 brackets (yellow):

- Unscrew the fastening nuts of the brackets 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.

NOTE: The suspension eyes are located at about the centre-of-gravity of the vacuum pump. If the vacuum pump is equipped with accessories that could influence the centre-of-gravity, this must be taken into account when lifting and a belt must additionally be attached to a specific point.

- Fasten the hoist to the suspension eye on the cylinder
- Use a hoist that is equipped with a hook and safety lock
- Lift the vacuum pump

CAUTION

The vacuum pump may not be lifted anymore when it has been filled with oil.

- Take off the four yellow brackets

CAUTION

Do not through away the yellow brackets, they can be re-used later for setting the vacuum pump on the ground.

Moving of the vacuum pump is simple using the four wheels placed under the vacuum pump frame.

The design of the baseframe is such that transport of the pump can be made with a Europe palett truck.

Make sure before every transport that the oil has been drained out of the vacuum pump.

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 manufacture§r 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 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

NOTE: The levelling of the pump is facilitated by the adjustment stroke (~15 mm) of the four machine foots.

- Make sure that the four rollers do not touch the ground

NOTE: In order to ensure the fixation of the pump to the ground, it is possible to use again the four yellow brackets that were removed at the reception of the machine.

- 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 (d) 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

- 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

Do not put hands into the inlet aperture.

Risk of body damage !

CAUTION

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

If the sucked 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 sucked 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 50 ISO KF

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 sucked 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 40 ISO KF

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.

Nitrogen connexion (option)

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 2004/ 108/ EC and Low Voltage Directive 2006/ 95/ EC 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

Equipment connection



1 General supply connection
2 Sub-D jumper connection

Interfacing with frequency inverter (Varmeca 30)

Sub-D 15 connector

Sub-D 15P female on frame	Signals on pump
Pin 1	Pin 11 frequency inverter: 24 VDC
Pin 2	Pin 8 frequency inverter: DI2 start pump
Pin 3	Pin 11 frequency inverter: 24 VDC
Pin 4	Pin 10 frequency inverter: D|4 speed 2

Pin 5	Pin 12 frequency inverter: 24 VDC
Pin 6	Pin 7 frequency inverter: D I 1 speed 3
Pin 7	Pin 13 frequency inverter: default relay
Pin 8	Pin 14 frequency inverter: default relay
Pin 9	-
Pin 10	-
Pin 11	**OPTION** Pin 1 frequency inverter: 10 VDC
Pin 12	**OPTION** Pin 2 frequency inverter: AD I 02 analog reference
Pin 13	-
Pin 14	Klixon motor (155°C) pin Y. NC contact
Pin 15	Klixon motor (155°C) pin Z. NC contact

Speed selection

CAUTION

All modifications of the parameters engage only the customer. Ateliers Busch S.A. will not be responsible for eventual caused damages and will not take the repair costs in guaranty.

D I 4	D I 1	Selection	Value
0	0	Analog reference	F. Max calibrated in Porrentruy
1	0	Preset speed 2: idle 1	10Hz
0	1	Preset speed 1: idle 2	20Hz
1	1	Preset speed 4: f. Max calibrated in Porrentruy	48-53Hz

Default bridges on the frequency inverter

Bridge between pin 1 and 2 on the frequency inverter

Bridge between pin 3 and 4 on the frequency inverter

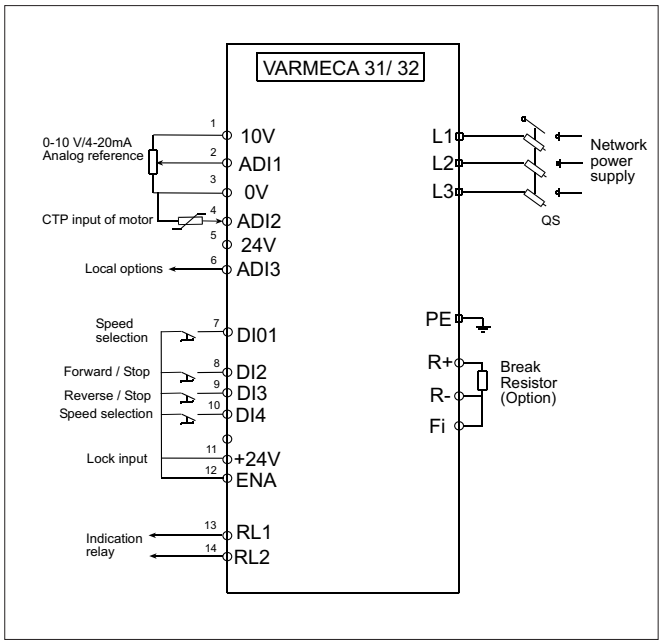
Bridge between pin 11 and 12 on the frequency inverter

Bridges with"jumper" Sub-D 15P male for Preset speed 4 (delivered with pump)

Bridges:

- pin 1-pin 2 => Forward
- pin 3-pin 4 => D I 4 set at "1" Speed 4
- pin 5-pin 6=> D I 1 set at "1" Speed 4

Schematics



Installation

Mounting

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

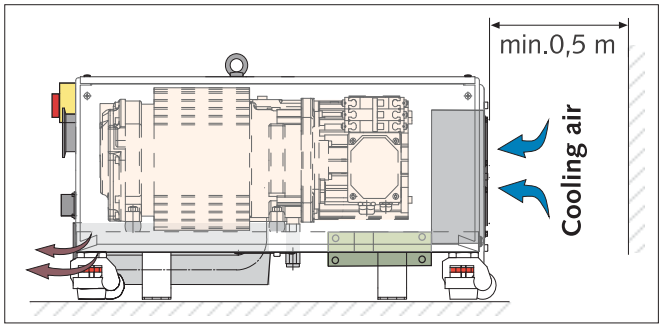
Rotation sense of cooling fan

CAUTION

Check the rotation sense of the cooling fan with the direction arrow placed on the cooling fan and put your hand, palm against the cooling fan grid.

Press the on/ off switch briefly and check that the cooling fan sucks air inside and through the whole vacuum pump.

If the direction of rotation has to be changed: exchange two of the three feeder leads.



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 motor!

Motor of screw pump COBRA BA 0100 A is connected at factory.

- Connect supply cable on the female connection (q) of the vacuum pump

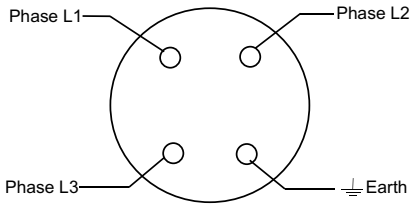
CAUTION

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.

Power wiring connection

Power wiring 4 poles	
1	Phase L1
2	Phase L2
3	Phase L3
4	Ground



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 BA 0100 A vacuum pumps are always delivered without oil (see the chapter "Oil types" for information on the recommended oils).

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

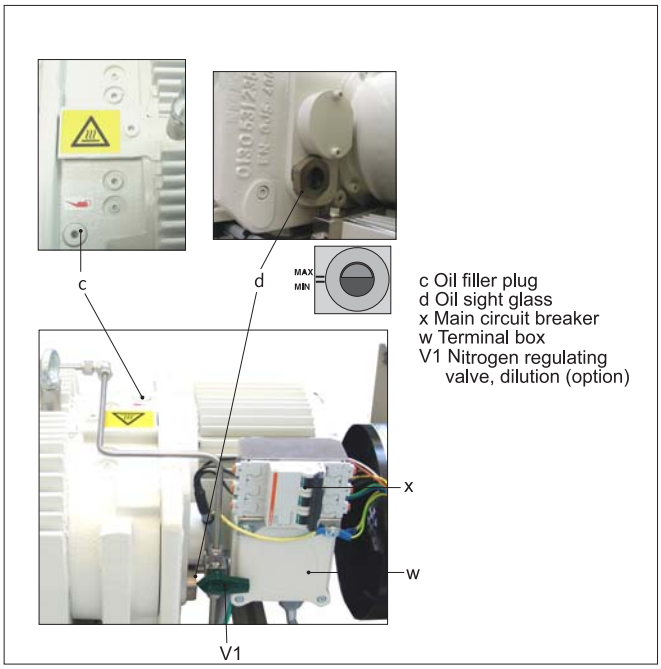
Oil filling	BA 0100 A	Oil Type
Oil capacity [Liter]	0,12	Busch PFPE VF 0250, Art. No 0831 000 054, Fomblin

NOTE: The quantity of oil specified in the installation handbook is of informative nature only. Check the oil level with the help of the oil sight glass (d) 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 (c)
- Fill in oil
- Make sure that the oil level lies between the MIN and MAX markings on the oil sight glass



- Make sure that the seal of the oil filler cap is not damaged. Replace it 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 between the MIN and MAX markings on the oil sight glass

If the oil level is below the MIN marking:

- ◆ 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

The vacuum pump may not be lifted anymore when it has been filled with oil.

- Make sure before every transport that the oil has been drained out of the vacuum pump.

CAUTION

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

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 motor and save it as reference value 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 BA 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 sucking in a certain quantity of liquid. If the pump has sucked in liquid, a short drying time is necessary at the end of the procedure.

The temperature of sucked gas depends on the dilution flow of nitrogen injected in the vaccum pump. Higher the flow is, lower is the temperature of sucked gas (TGa). We can consider for air the following indications:

- Pa > 50 mbar, TGa < 80°C
- Pa < 50 mbar, TGa < 200°C

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

As far as temperature is concerned, the pump is suitable for evacuation of a 300 liters tank. The pump is not suitable for continuous duty at a pressure more or equal than 150 mbar. Caution, the operating cycle of 150 mbar must not exceed more than 5 min. For other applications, contact your Busch representative.

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 BA 0100 A vacuum pumps are always 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.

- 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

Switching the vacuum pump on/off

First start-up of the system

- Make sure that the “Necessary installation instructions” are followed
- Switch on the vacuum pump
- Make sure that the system does not leak

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
- Make sure that the system is currentless

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":

- switch off the On/ Off switch (S1)
- 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 has 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 oil level according to the chapter "Checking the oil level"
- make sure that the "Necessary installation instructions" are followed
- switch on the On/ Off switch (S1)

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.

Daily:

- Check the oil level and the colour of the oil (see "Checking the oil")

Weekly:

- Inspect the vacuum pump for oil leaks - 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

Every 1000 hours of operation:

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

Every 5000 hours of operation:

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

Every 10 000 hours of operation:

- 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:

A main inspection of the vacuum pump (Busch)

Lock Out/ Tag Out procedure

- Switch off the On/ Off switch
- 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 oil level according to the chapter "Checking the oil level"
- Make sure that the "Necessary installation instructions" are followed
- Switch on the On/ Off switch

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 oil sight glass

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 opening.

CAUTION

Danger of burns when the oil filler cap is 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 cap (c)
- 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 glass
- Make sure that the seal of the filler cap is not damaged and that they sit properly. Replace it if necessary
- Screw on the filler cap again

Checking the colour of the oil

NOTE: The oil must be clear and transparent or foamy or slightly cloudy. A permanent milky colour is an indication for contamination by foreign bodies. A dark colour is an indication for oil that has to be replaced because it has been burnt or contaminated by foreign bodies.

Lifetime of the oil

The lifetime of the oil depends mainly on the operating conditions. Under ideal conditions the oil must be replaced every 5000 hours of operation or at the latest after six months.

Under slightly worse operating conditions the oil can expire after less than 500 hours of operation. A short lifetime is an indication that either there is a fault (see "Troubleshooting") or the operating conditions are not appropriate.

If you do not yet have any experience on the lifetime of the oil, we recommend that you analyse the oil every 500 hours of operation and fix the maintenance intervals accordingly.

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
- Put a drain tray underneath the oil drain plug
- Unscrew the oil drain plug (178)
- Drain the oil

When the oil flow has stopped:

  - ◆ Refit the oil drain plug
- 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
- Remove the oil drain plug again and drain any remaining oil
- Carefully unscrew and remove the magnetic plug (180)
- Check that no metal swarf sticks to the magnet of the magnetic plug, clean if necessary
- Make sure that the sealing washer on the magnetic plug is not damaged, replace it if necessary
- Refit the magnetic plug and tighten up
- Make sure that the sealing washer on the drain plug is undamaged and correctly positioned, replace it if necessary
- Refit the oil drain plug and tighten up
- Dispose of the used oil in compliance with applicable regulations

CAUTION

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

Filling in new oil

- 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 oil sight glass on the vacuum pump.

- Make sure that the drain plug has been fitted properly and that they do not leak

CAUTION

Only fill in oil through the oil filler opening.

- Unscrew the oil filler cap (c)
- 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 glass
- Make sure that the seal of the filler cap is not damaged and that it sit properly. Replace it if necessary
- Screw on the filler cap again

Checking the current consumption

- Check the current intensity of the motor

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

Inappropiate 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.busch-vacuum.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, make sure that the lines have adjusted to atmospheric pressure

Recommissioning

- 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.busch-vacuum.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

Dismantling work must be carried out by authorised personnel. 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
– 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

Troubleshooting

N°	Problem	Cause/ Check items	Actions
1	Evacuation difficulties	• Obstruction in the inlet piping • Leakage from inlet piping • Product accumulated in the pump • Leakage from oil filling plug	• Clean the piping • Check the piping • Disassemble the pump • Check tighting of the plug
2	Motor overtemperature	• Back pressure of pump too high • Tightness of the rotors • Mechanical problems in the pump • Failure of the fan • Pump contaminated with product residues • Ambient temperature too high	• Check the discharge piping • Purge the pump with N2, release if necessary • Disassemble the pump • Check the fan • Disassemble the pump • Check the limits of use

Oil type/ quantity

Oil type

- Make sure that the oil type corresponds to specification:

– Busch PFPE VF 0250, Art. No. 0831 000 054 (0,5 l ≅ 1 kg)
(Fomblin YLC 250 B)

NOTE: Read technical sheet in appendix for more details on the product

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 oil sight glass on the vacuum pump.

Quantity [Liter]	Quantity [Liter]
BA 0100 A	0,12

FOMBLIN ®

1) Product name :	Fomblin Y (for all types)
Chemical Name :	PERFLUOROPOLYETERS
Molar mass :	1500-7000
Chemical formula :	CF3-(0-CF-CF2)m-(0-CF2)m-0-CF3 CF3
Case nr	69991-67-9

2) COMPOSITIONAL INFORMATION

PERFLUOROPOLYETERS

3) CLASSIFICATION OF DANGER :

Based on the most important information sources over the chemical and physical properties actually known, the FOMBLINs' are not classified in any danger class forseen by the italian and communitary rules over the packaging, the marking and the storage of the chemical dangerous substances.

4) First aid mesures

INGESTION :
Even thus the products are not mixible with the organic liquids and therefore cannot be absorbed gastrically, it is recommended to have the person vomiting or proceed to stomac purge.

EYE OR SKIN CONTACT
Even thus the products do not provocate irritation, it is recommended to flush with copious amounts of water the parts concerned until all traces of products have disappeard.

5) FIRE AND EXPLOSION RISKS

Ininflammable and incombustible substances

The first aid stuff shal wear appropriated individual protection equipement .

Do not build explosive mixture with air .

FIRE : cool the recipient exposed to fire by spraying water

If the flammes happen to come in contact with the products (which have the possibilty to decompose themselves and build toxical substances as HF and COF2), wear the individual equipment protection with the independent respiration devices and pulverize abondently water.

6) ACCIDENTAL REALEASE AND LOSS

Eliminate the flammes in the zone.

Stop and indicate the loss, recover the released material and send it to elimination.

METHODES OF CLEANING: absorb the liquide with earth, sand or sawdust.

7) HANDLING AND STORAGE

Do not store products at temperatures near decomposition (260°C), avoid in all cases the contact of the product with flammes or hot surfaces, avoid to contact with tabbacco with abstention of smoking or carry burning cigares and/or cigarettes in the rooms where the products are being handled.
During handling some electrostatical discharges can be generated. Take the necessary mesures in order to prevent it.
Do not storage the products with some inflammable or explosive material (see point 10).

To storage or transport the products, bottles or smal tanks in glass or out of polyethylen are being used.

In the storage rooms, on the reservoirs or on the recipients, it is obligatory to have shilds or sticks mentioning the nature of the products and the instructions for the emergency mesures.

8) SAFETY MESURES

The persons who manipulate the products shall be informed over its properties.

Limit values of exposition : are only applicable on the limits of the products derived of the thermical decomposition :
TLV/FWA (HF) : 2,5 mg/m3
TLV/TWA (COF2) : 5,0 mg/m3

PERSONNAL PROTECTION EQUIPEMENT :
Eye protection : security glasses
Hands protection : caoutchouc gloves
Body protection : working clothing or caoutchouc overall

9) PHYSICAL AND CHEMICAL PROPERTIES

physical appearance :	viscous liquide, colorless
Odor :	odorless
Fire point :	ininflammable
Limit of explosivity:	non explosive
Vapor tension (20°C) :	< 0.01 mbar
Density at 20°C :	1,84-1,93 g/ml
Solubility in water :	not miscible
Solubility in organical solvents :	soluble fluored solvents

10) STABILITY AND REACTIVITY

Stability : the production is stable in normal conditions of use

Conditions to avoid : avoid to expose the product to free flammes or at temperatures over 290°C .

Materials to avoid : avoid the contact with akcali metals and ammoniac, strong alkalis or non acqueous, the Lewis acids (as AIC13, sbF5, CoF3) over 100°C.

11) TOXICOLOGICAL INFORMATION

Ingestion, inhalation.

Dangerous effects
Only the products due to thermical decomposition may be toxical in case of inhalation

Local effects / irritative properties
Not irritative

Retention effect / sensibilisation
Not sensibilisator

Chronical effects
No chronical effect known

Cancerous effects
No cancerous effects known

Mutagen effects
No mutagen effect known
Experimental data of toxicology:
Very low acute toxicity by ingestion:
Ingestion LD50 : > 15-25 g/kg (rat)
No effect with these proportionings.

Inhalation LC50: > 2000 ppm for 4 hours (rar)
No change of behaviour to these proportionings.

12) ECOLOGICAL INFORMATION

To use the product according to work practices adapted
To avoid discharging it into environment

13) CONSIDERATIONS ON ELIMINATION

To send the worn product in treatment plants of waste authorized or in incinerators using of the adapted equipment

14) INFORMATION ON TRANSPORT

General information
U.N. number: not classified
packing Group: not classified

International rule for road transport/rail (ADR/RID)
Classification: not classified

National rule for rail transport
Classification: not classified

International rule for maritime transport (IMDG/IMO)
Classification: not classified

National rules for maritime transport (MMM)
Classification: not classified

15) INFORMATION ON THE REGULATION

Labelling:
Commercial name: FOMBLIN Y
Classification: not necessary

European rule for the people protection and environment:
DPR 303/56 (general Rule for safety and hygiene on the working place)
Not mentioned.

16) ANOTHER INFORMATION

bibliography

I.N. Sax- Dangerous properties of industrial materials-1987

Data card of safety according to directive EEC 91/155

Information contained in this document is given exclusively with a objective of safety. It is given in good faith and based on best the knowledge and experiment of the company at the date of its publication. The company is not responsible for the damage caused by use for the product in applications for which it was not envisaged or under use conditions with the outside for its control.

Technical data

Technical data			BA 0100 A
Nominal suction capacity		m^3/h	100
Ultimate pressure		hPa(mbar)/ mTorr	0,01/ 7,5
Nominal motor rating		kW	1,8
Power consumption at 1 mbar		kW	1,3
Noise level (EN ISO 2151)		dB(A)	<58
Ambient temperature		°C (°F)	0-40 (32-104)
Maximal counter pressure	Discharge	bar	0,2
Weight	ap.	kg	120

EC-Declaration of Conformity

NOTE: This Declaration of Conformity and the CE-mark affixed to the nameplate are valid for the vacuum pump within the Busch-scope of delivery. When this vacuum pump is integrated into a larger machinery the manufacturer of the larger machinery (this can be the operator, too) must conduct the conformity assessment process acc. to the Directive Machinery 2006/42/EC for the larger machine, issue the Declaration of Conformity for it and affix the CE-mark.

We

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declare that the vacuum pumps **BA 0100 A**

in accordance with the European Directives

"Machinery" 2006/42/EC,

"Electrical Equipment Designed for Use within Certain Voltage Limits" (so called "Low Voltage") 2006/95/EC,

"Electromagnatic Compatibility" 2004/108/EC

have been designed and manufactured to the following specifications:

Standard	Title of the Standard
Harmonised Standards	
EN ISO 12100-1 EN ISO 12100-2	Safety of machinery - Basic concepts, general principles of design - Part 1 and 2
EN ISO 13857	Safety of machinery - Safety distance to prevent hazard zones being reached by upper and lower limbs
EN 1012-1 EN 1012-2	Compressors and vacuum pumps - Safety requirements - Part 1 and 2
EN 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN 61000-6-1 EN 61000-6-3	Electromagnetic compatibility (EMC) – Generic standards – Immunity and emission for residential, commercial and light-industrial environments; Part 1 and 3
EN 61000-6-2 EN 61000-6-4	Electromagnetic compatibility (EMC) – Generic standards – Immunity and emission standard for industrial environments; Part 2 and 4
National Standard	
EN ISO 2151	Acoustics - Noise test code for compressors and vacuum pumps - Engineering method (grade 2)

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