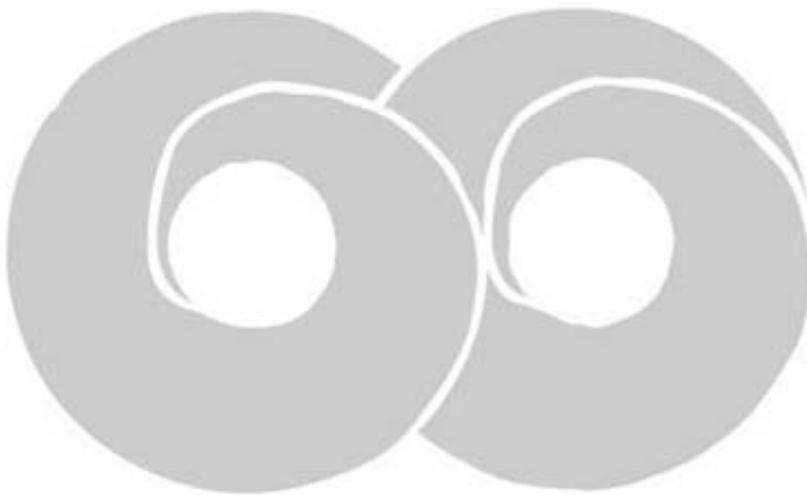




Installation and Operating Instructions



Screw Vacuum Pumps COBRA NC 0100, 0200, 0300 B

Busch LLC
516 Viking Drive
Virginia Beach, VA 23452
Phone: (757) 463-7800
Fax: (757) 463-7407

TABLE OF CONTENTS

	Page
GENERAL	2
Identification	2
Intended Use	2
Operating Principles	2
1.0 INSTALLATION	2
1.1 Unpacking	2
1.2 Location	2
1.3 Power Requirements	2
1.4 Temperature Control	4
1.5 Cooling Water Supply Piping	4
1.6 Cooling Water Discharge Piping	4
1.7 Process Gas Stream	4
1.8 Vacuum Connections	4
1.9 Exhaust Piping	5
1.10 Piping Stress	5
1.11 Filling Oil Reservoir	5
2.0 OPERATION	5
2.1 Start-up	5
2.2 Auto Purge (if equipped)	6
2.3 Motor Side Seal Gas System (if equipped)	6
2.4 Stopping the Pump	6
2.5 Operating Temperature	6
2.6 Solvent Flushing (if equipped)	6
3.0 ROUTINE MAINTENANCE	6
3.1 Oil Reservoir	6
3.2 Gear Case Check Valve/Vent	7
3.3 Vacuum Inlet Filter	7
3.4 Coolant Level	7
3.5 Cleaning of Radiator, Motor and Filters	7
3.6 Draining Condensate from Silencer	7
3.7 Seals	7
4.0 LIMITED STANDARD WARRANTY	8
5.0 TROUBLESHOOTING	9
6.0 TECHNICAL INFORMATION	12
Technical Specifications	12
NC 0100-0300 B Direct Cooling System Illustration	13
NC 0100-0300 B Radiator Cooled System Illustration	14
NC 0100-0300 B Exploded View Illustration	15
Typical Control Panel Wiring (for reference only)	16

We reserve the right to change the product at any time without any form of notification. The information in this publication is accurate to the best of our ability at the time of printing. Busch LLC will not be responsible for errors encountered when attempting to perform tasks outlined in this publication which is copyright protected.

GENERAL

This manual is written to provide installation and operation information on the following models:

COBRA NC 0100, 0200 and 0300 B series.

Identification

For model identification, see the nameplate mounted on the pump. When ordering parts, it is necessary to include the model and serial number identification stamped into the nameplate.

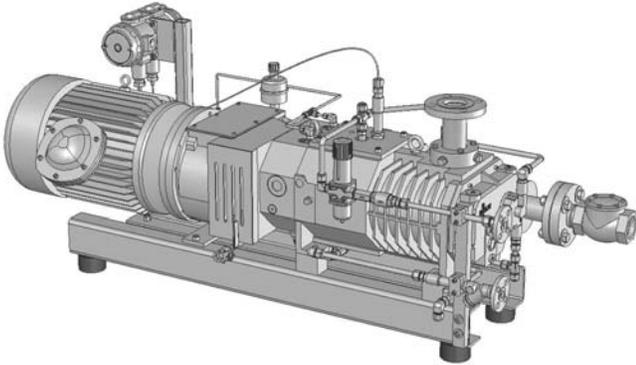


Fig. 1 - Direct Cooled NC Series COBRA

Intended Use

These pumps are designed for use in fields of course to fine vacuum and can operate at any pressure level between atmosphere and ultimate pressure. They can be used to draw off gases and mixtures of gases. Before using this pump with flammable, explosive, aggressive or toxic gases, you must contact the Busch LLC factory in Virginia Beach, Virginia.

Particles must not enter the pump, therefore Busch recommends a filter or protection screen at the inlet.

If the pump draws in liquid due to process error, the pump must be dried after the end of the process by using purge gas. The silencer must also be drained.

The maximum allowed temperature of the drawn gas depends upon the inlet pressure and the nature of the gasses. The lower the inlet pressure (Pa), the higher the drawn gas temperature (TGa) can be. For example:

- Pa < 37.5 Torr, TGa < 392°F
- Pa > 37.5 Torr, TGa < 158°F

The pump is designed for the following ambient conditions:

- ambient temperature: 32°F to **104°F
**122°F with approved motor

- ambient pressure: atmospheric
- humidity range: 20% to 90%
- altitude: 3280 feet

The maximum discharge pressure for continuous operation is 3 psig. In case of other operating conditions, please contact the factory.

Operating Principles

The NC Series B version, Single Stage, Dry Vacuum Pumps are of a direct-driven, water-cooled, positive displacement, variable pitch screw design. This pump consists of a drive screw and a driven screw mounted inside a cylinder case. The process gas is drawn into the pump through the inlet at the idler end of the screws (the side opposite the motor). As the screws turn, a quantity of gas fills the void between the screws and is trapped between the two screws and the cylinder case. The gas is then compressed (by the turning action of the screw) and moved to the other end of the pump and is discharged out the exhaust port. Evacuation at the inlet will continue until the desired pressure (vacuum) is reached or the pump capacity is reached.

1.0 INSTALLATION

1.1 Unpacking

Inspect the crate and pump for signs of damage incurred in transit. Pumps are usually shipped FOB our factory, and such damage is normally the responsibility of the carrier and should be reported to them.

Remove the top section of the crate. Unscrew the lag screws securing the pump to the bottom of the crate.

The inlet port of the pump is covered prior to shipment to prevent dirt and foreign material from entering the pump. Do not remove this cover until the pump is actually ready for connection to the system.

1.2 Location

The pump should be installed in a horizontal position on a level surface. The feet on the mounting frame have holes that can be used to mount the frame to the floor. Allow adequate space between the pump and any obstructions to permit servicing the pump. Also, adequate ventilation must be provided for the fan on the pump and the motor. Do not locate the pump in a stagnant air location. When installing the pump in hazardous areas, local, state or federal regulations against explosions have to be considered.

1.3 Power Requirements

The schematic diagram for the electrical connections is located in the junction box or on the nameplate of the pump motor.

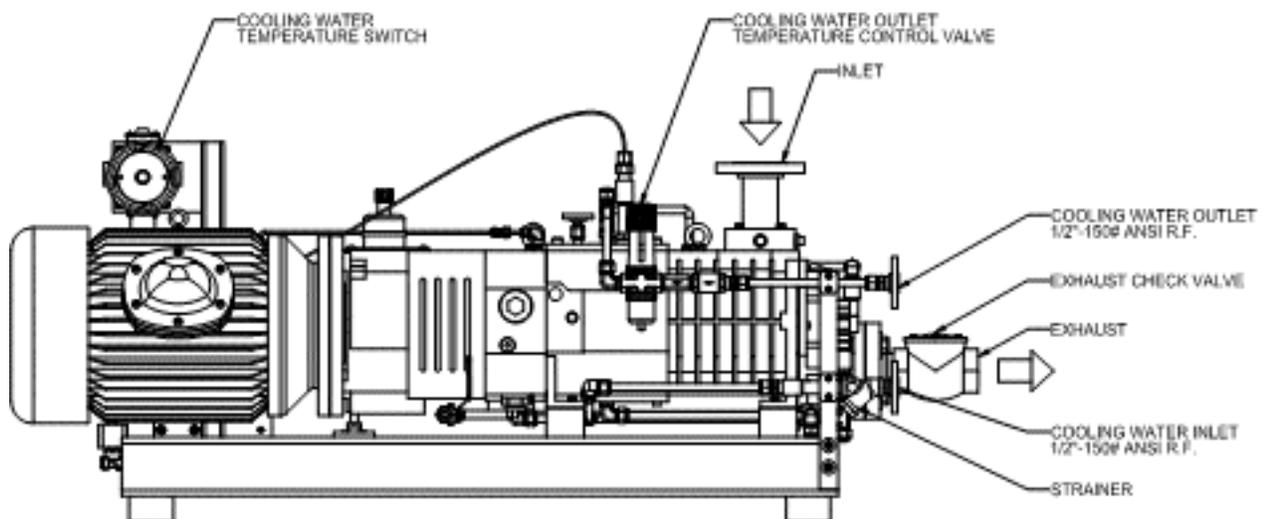
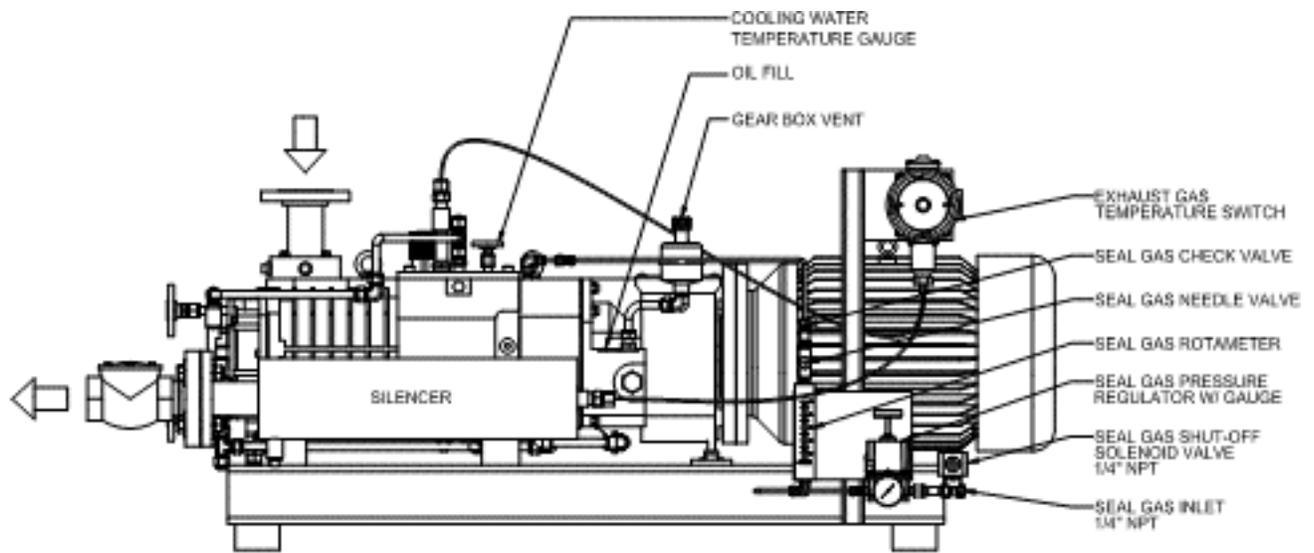


Fig. 2 - Direct Cooled COBRA with Mechanical Seals

The motor must be connected according to the electrical codes through a fused switch to provide protection for the motor against electrical or mechanical over-loads. The motor starter has to be set consistent with the ampere rating listed on the motor nameplate. Refer to the motor manufacturer's manual for start-up and maintenance of the motor.

CAUTION: The best and most reliable safe-guard for the pump is the motor starter over-load protection. It is very important that the starter be set to trip at the correct load rating. Consult the motor nameplate, starter manufacturer and the latest edition of the National Electrical Code to arrive at the correct trip setting.

Correct direction of rotation is marked by an arrow on the fan housing and is clockwise when looking at the motor from the motor's fan end.

CAUTION: Damage can result from running the pump backwards.

Open the inlet port and jog the motor briefly to make sure the rotation is correct. Allow the pump to make no more than 6 to 8 revolutions. If it is backwards, reverse any two leads of the three at the power connection.

1.4 Temperature Control

COBRA NC vacuum pumps are equipped with two temperature switches (see Fig. 2) mounted on the pump. The exhaust temperature switch is located in the pump silencer, and the cooling water temperature switch is located in the water jacket. The temperature switches provide protection from damage to the pump due to high temperature in the pump.

1.5 Cooling Water Supply Piping

The standard COBRA is a direct water-cooled pump (see Fig. 1, 2 and 3). See Section 6.0 Technical Information for water flow rates.

CAUTION: If the pump is subjected to ambient temperatures below 32°F, do not shut off the pump without taking measures to prevent the cooling water from freezing and damaging the pump. Consult the factory.

The cooling water entering the pump should be clean and reasonably free of mineral deposits in accordance with the following guidelines. Contact the factory Engineering Department if there is any doubt about the quality of the water.

- water temperature: 50 - 77°F
- water pressure: 15 psig - 87 psig
- water pressure: 15 psid minimum
- water hardness: <17.9 mg/kg CaCO₃

A radiator cooled pump (optional) is available where cooling water is not readily available, not desired or not practical (see Fig. 4).

1.6 Cooling Water Discharge Piping

Do not restrict the flow of (direct cooled version) discharge water as the cooling system is designed to be a free flowing system and will not cool properly when the discharge is impeded.

1.7 Process Gas Stream

It is a good operating practice to install an inlet filter. It is necessary to install an inlet filter if the process contains solids larger than 10 microns. It is also a good practice to install a knock-out pot if there are liquid slugs entering the pump from the process.

Note: Consult the factory Engineering Department if you have any doubt about the quality of the process gas in your application.

If your process gas at the pump inlet will exceed the values indicated in the "Limits of Use" section, consult the factory Engineering Department for advice.

1.8 Vacuum Connections

Use a line size to the vacuum system that is at least as large as that of the pump inlet. Smaller lines will result in pumping speeds lower than the rated values.

Install a knock-out pot on the horizontal piping and/or a drip leg and drain on the vertical pipe near the pump inlet. Drain the knock-out pot/drip leg often to prevent liquid from entering the pump.

If more than one vacuum pump is connected to a common vacuum line, each pump must have its own automatic operated inlet isolation valve or inlet check valve.

Remove the plastic protective cap from the inlet port prior to connection of the pump to the system. Vertical connection of the vacuum line can be made directly to the pump inlet.

If the gas that is pumped contains dust or other foreign particles, a suitable inlet filter (10 micron rating or smaller) should be connected to the inlet port. Consult the factory for a recommendation.

1.9 Exhaust Piping

WARNING: Do not touch the exhaust piping. The exhaust system can reach high temperatures. For operator safety, the exhaust piping should be insulated.

Discharge piping should be the same size as the outlet of the pump. Provide a knock-out pot or drip-leg if there is any possibility of liquid forming in the exhaust.

DO NOT ALLOW LIQUID TO BACK-UP INTO THE PUMP FROM THE EXHAUST PIPING. Install the exhaust piping so that it slopes away from the pump. Utilize a flexible connector when piping to a manifold or exhaust gas stack. The pump comes equipped with an external exhaust check valve. The check valve is used to prevent the pump from running backwards when it is shut off. Without this valve, air at atmospheric pressure will rush back through the pump exhaust (when it is shut off) to the lower pressure of the system under vacuum, causing the pump to run backwards and potentially damaging the pump.

An exhaust valve is not recommended. But, if more than one pump discharges into a common exhaust main line, an exhaust valve is necessary. In this case, special care must be taken to make absolutely certain the pump cannot start unless the exhaust valve is open.

Any exhaust valving must be interlocked to prevent operation of the pump when the exhaust valve is closed, or the pump warranty is void.

An exhaust silencer is provided as standard equipment on the pump.

1.10 Piping Stress

All piping to the pumps should be independently supported to prevent a strain on the pump. Caution should be taken to allow for thermal expansion of the piping, especially for outdoor locations.

1.11 Filling Oil Reservoir

The pump is shipped with oil in both end cases. After level installation of the pump has been established, verify that the oil level is between the "MAX" and the "MIN" lines at the oil sight glass (Ref. 174/184) on both the motor side and the inlet side (see Fig. 5). See Section 3.1 for filling instructions.

2.0 OPERATION

2.1 Start-up

Verify the pump gear case is filled with oil as described in section 3.1 - Oil Reservoir. Check the rotation of the motor as described in section 1.3 - Power Requirements.

CAUTION: Do not make changes in the water flow by adjusting the temperature control valve during operation. Adjust the temperature control valve with the pump stopped and allow one hour before restarting the pump otherwise mechanical damage will result. The valve is preset at the factory, but adjustment may be necessary based on the specific requirements of the end user.

On Direct Cooled Models, connect the water supply and remove the vent plug (see Fig. 3, Ref. 375). Allow the water to flow through the cooling jacket until water flows out of the vent plug. Turn off the water and re-install the vent plug. The pump is equipped with a temperature control valve (see Fig. 2) which regulates the cooling jacket temperature. The operating scale ranges from 1 to 5, where 1 represents a colder operating temperature while 5 represents a warmer operating temperature.

CAUTION: Do not operate the pump with the temperature control valve set below 2. Operation below 2 causes unstable water jacket temperatures and may damage the pump.

Before starting the pump, open the cooling water supply and seal purge system (if equipped).

On Radiator Cooled Models, the coolant system is drained prior to shipment from the factory, so make sure the system is filled before the pump is placed in operation. Plain water with rust inhibitors can be used as coolant as long as the pump is not subjected to freezing conditions. Be sure to use a suitable glycol mixture (40% glycol and 60% water mixture is recommended) for cold weather operation. Thoroughly mix the anti-freeze water solution before pouring it into the pump.

CAUTION: A pump that is left in temperatures below 40°F will be difficult to start.

Note: Radiator cooled models are shipped with a nominal amount of anti-freeze in the pump to prevent residual water within the pump from freezing. If you drain or flush this residual mixture from the pump, take the necessary steps to dispose of it in accordance with environmental regulations in your area.

Prior to initial start-up, or otherwise, if the cooling system requires refilling, anti-freeze/water must be added to the cooling system (see Fig. 4). The approximate volume of the coolant system for the 0100 - 0300 radiator cooled pumps is shown below:

Pump jacket	4 liters (4.23 quarts)
Radiator	6.5 liters (6.87 quarts)
Expansion tank	0.5 liters (0.53 quarts)

In order to add the mixture, add the necessary ratio of anti-freeze to water, as listed on page 5, according to the following steps.

- 1) Make sure the pump is not operating.
- 2) Remove plug (Ref. 355 or instrumentation in that position) on top of the pump cylinder and fill to the top. Reinstall the plug or instrumentation. Remove the cap from the plastic overflow (expansion) tank (Ref. 9000).
- 3) Remove plug (Ref. 392) and fill with coolant mixture until the mixture flows out of the plug hole.
- 4) Re-install plug (Ref. 392) and fill the plastic overflow (expansion) tank (Ref. 9000) to approximately 1/2 full. Re-install the cap on the overflow tank.
- 5) Once the pump is in operation, verify coolant flow at the flow indicator (Ref. 396). Maintain a half full overflow reservoir. Note: coolant level in overflow reservoir will vary during operation.

2.2 Auto Purge

An additional option is to inject an inert gas into the pump inlet. Injecting nitrogen or an inert gas into the pump will warm the pump up prior to going on process and will purge the pump of process gases prior to shutting down to prevent condensation of process gases within the pump.

2.3 Motor Side Seal Gas System

On models that are equipped with a seal gas purge system, set the seal gas pressure regulator to 7 psig and the seal gas rotameter to 20-55 SCFH.

The solenoid shut-off valve must be wired into the pump motor starter, and it should be closed when the pump is shut down.

Note: The gas regulator pressure and flow may fluctuate during start-up. If erratic behavior is experienced, check the system for leaks.

2.4 Stopping the Pump

To stop the pump, turn off the power. A check valve installed in the exhaust port is used to prevent "back-streaming" through the pump, which causes reverse rotation. In cases where the pump is handling condensable vapors the pump must be purged prior to shutdown by running it on an air or nitrogen bleed and isolated from the process. Busch offers an optional automatic purge package to warm-up and purge the pump. Consult the factory Engineering Department in Virginia Beach, VA. for further information.

CAUTION: Do not run the pump with the water shut-off or the cooling system inoperable.

CAUTION: Do not allow the pump cooling water to freeze and damage the cooling system. Drain the cooling system when the pump is not in operation; a danger of freezing exists.

2.5 Operating Temperature

When starting, allow the pump to reach its operating temperature before opening the inlet valve to the process stream. Time required varies, but expect 10 to 15 minutes.

Note: When a hot, direct water cooled pump is shut off, the heat from the screws can cause the non-circulating cooling water to go above 160°F, opening the cooling water temperature switch, preventing the pump motor from starting until it cools. This can be prevented by allowing the cooling water to flow a few minutes after the pump is shut off. The water temperature switch on a radiator cooled pump is set to open at 210°F.

2.6 Solvent Flushing (Optional)

A solvent flushing system is available for use when a process stream leaves deposits that can be flushed out of the pump. Contact the factory Engineering Department in Virginia Beach, VA. for details.

3.0 ROUTINE MAINTENANCE

COBRA Series single stage, rotary screw vacuum pumps require very little maintenance; however, to insure pump performance, it is recommended that the items within this section be observed.

3.1 Oil Reservoir

CAUTION: No oil should be added while the pump is running, since oil may escape through the oil fill port.

WARNING: Hot oil may cause burns if allowed to contact skin. Oil temperature can reach 212°F.

With the pump shut off, make sure there is a sufficient amount of clean oil in each gear case. The oil level should be observed on a daily basis. Maintain the oil level between the "MAX" or upper mark and "MIN" or lower mark on the sight glasses (Ref. 174/184). All oil

level readings should be taken only when the pump is not running. Allow the oil to settle before adding any oil. The oil might appear to be foamy, which is a normal phenomenon with aerated oil. After the pump is shut off and the oil has had sufficient time to drip to the bottom of the case, oil can be added at the fill port by removing the oil fill plug (See Fig. 5, Ref. 170 and 373).

Under normal circumstances, it should not be necessary to add or drain oil from the pump between recommended oil changes. A significant drop in oil level means there is an oil leak. Oil leaks can be from a bad seal, allowing the oil to migrate into the process.

Note: If the motor side gear case vent is plugged, it can create pressure and blow out the seals.

It is normal for the oil to be foamy and light colored in an operating pump. However, if the oil is dark colored, it is contaminated or burned and must be changed.

The pump is shipped with Busch VE 101 oil in both end cases. Busch VE 101 oil is available through your nearest Busch LLC representative.

The approximate oil capacity of the pump is 1.16 quarts (1.1 liter) in the motor side and .48 quart (0.45 liter) in the inlet side. Use the sight glass level to observe the exact capacity.

Change the oil when it appears dark and contaminated or at least every 4,000 operating hours, or every 6 months, whichever occurs first. Let the pump run until the oil is warm before draining it. Keep the drain plug open long enough to allow all the oil to drip down out of to the sump area. Reinstall the oil drain plug and refill the reservoir until the oil level is between the "MAX" or upper mark and "MIN" or lower mark on the sight glass.

3.2 Gear Case Check Valve/Vent

CAUTION: Do not allow the gear case check valve/vent to become plugged, as damage to the seals could result.

Inspect and/or clean the gear case oil fill vent filter monthly. The motorside gear case contains a check valve/vent (see Fig. 3, Ref. 175) attached to the oil fill plug. Unscrew the check valve and examine it to be sure it is operating. If it is sticking or dirty, clean it with hot soapy water until it functions properly. Dry it off, and screw it back into the case.

3.3 Vacuum Inlet Filter

If the pump is equipped with a special vacuum inlet filter in applications where powder, dust, or grit is present, the filter cartridge should be cleaned or replaced on a regular basis, depending on the amount

of foreign particles to which the pump is exposed.

3.4 Coolant Level

On Radiator Cooled Models verify the coolant level at least monthly by observing the coolant level in the plastic overflow tank. Maintain the appropriate level of coolant within the system. Add coolant, if necessary, to maintain the proper coolant level. The procedure and appropriate water to anti-freeze ratios are indicated in Section 2.0. If the coolant level does not remain constant from day to day there is likely a leak in the coolant system. Contact the Busch LLC Service Department in Virginia Beach, Va. for instructions.

The coolant should be drained and the system refilled with fresh coolant approximately once a year.

3.5 Cleaning Radiator, Motor and Filters

Radiator, motor hood and filters should be inspected at least weekly in a dusty and hot environment and at least monthly in a clean environment. Compressed air is useful in accomplishing this task.

3.6 Draining Condensate from Silencer

If your pump has a silencer then it should be checked between once a day and once a month for condensate. The condensate must be drained off continuously through the outlet or collected in a suitable vessel and disposed of in accordance with local environmental regulations.

The silencer should be flushed/cleaned approximately every 1000 hours of operation. In order to clean it you must remove the silencer, fill it with solvent, slosh the solvent around inside the silencer in an attempt to loosen debris, drain and dry it and then reinstall the silencer.

3.7 Seals

If your pump has oil lubricated mechanical seals they must be replaced after every 10,000 operating hours. These seals use a small amount of oil (max. 1.5 cc/month). Higher use likely indicates faulty seals, and they should be replaced.

If your pump has gas lubricated mechanical seals they should never be opened. In case of failure, replace the mechanical seals.

4.0 LIMITED STANDARD WARRANTY

Busch LLC warrants that all products furnished by it are free from defects in material and workmanship at the time of shipment for a period of 18 months from the date of shipment, or 12 months from the date of installation, whichever occurs first. Claims must be made during that period and are limited to the replacement or repair of parts claimed to be defective.

In the case of components purchased by Busch LLC such as starters, controls, mechanical seals, motors, couplings, etc., the warranty of that manufacturer will be extended to the purchaser in lieu of any warranty by Busch LLC. The replacement of wear items including, but not limited to, seals, bearings, couplings, exhaust cover gaskets, oil drain plugs, oil fill plugs etc., made in connection with normal service, are not covered by this Warranty.

The Limited Standard Warranty is valid only when the product has been properly installed, used in a normal manner, and serviced according to the operating manual. This warranty shall not extend to products that have been misused, neglected, altered, or repaired without factory authorization during the warranty period. We highly recommend the use of Busch oils and parts to achieve documented performance and efficient operation. The use of oils or parts other than Busch could limit the life expectancy of the equipment and could void any warranties if they are the cause of any

damage. Operating conditions beyond our control such as improper voltage or water pressure, excessive ambient temperatures, or other conditions that would affect the performance or life of the product will also cause the warranty to become void.

Permission to return parts for warranty repair must be obtained, and all returns must be prepaid to the factory. If, after examination, the product or part is found to be defective, it will be repaired or replaced on a no-charge basis and returned, FOB the factory. If it is determined that the Warranty has not been breached by Busch LLC, then the usual charges for repair or replacement will be made, FOB the factory. Parts or products that are obsolete or those made to special order are not returnable.

This Limited Standard Warranty applies only to the above and is for the period set forth. Busch LLC's maximum liability shall not, in any case, exceed the contract price for the product, part, or component claimed to be defective; and Busch LLC assumes no liability for any special, indirect, or consequential damages arising from defective equipment.

THERE ARE NO WARRANTIES IMPLIED OR EXPRESSED THAT EXTEND BEYOND THOSE CONTAINED IN THIS LIMITED STANDARD WARRANTY.

5.0 Troubleshooting

Problem	Possible Cause	Remedy
No vacuum	Incorrect direction of motor rotation	Reverse polarity of any 2 phases of the power supply
	Inlet piping obstructed	Clean the piping
	Leakage in suction line	Check the piping for leaks
	Pump contaminated with product residues	Disassemble the pump and clean out product residues
Lower vacuum than normal, or Motor draws a higher current than normal, or Evacuation of the system takes too long	Leakage in the system or suction line	Check the piping and system components for leaks
	Knock-out Pot or inlet filter (if equipped) may be clogged	Clean component filters, screens or meshes
	Partial clogging of inlet or outlet lines	Remove any clogs
	Inlet side or outlet side piping runs are too long or too small of a diameter	Shorten piping runs or use larger diameter piping runs
	Internal parts are worn	Repair the pump. Contact the Busch LLC Service Department in Virginia Beach, Virginia to order parts or to arrange for pump repair
Motor overload	Motor wiring or supply voltage wiring is incorrect	Check the wiring and verify the supply voltage is correct
	Worn screws and/or worn cylinder bores	Disassemble the pump and replace the components as necessary
	The back pressure of the pump is too high	Check the discharge piping. Install a pressure switch.
	Pump contaminated with product residues	Disassemble the pump and clean out product residues
Oil is black	Oil change intervals are too long or the oil was overheated	Drain and refill with new oil. Contact the Busch LLC Service Department in Virginia Beach, Virginia for suggestions
Low oil level	Oil leakage to the outside or to the inside	Check tightness of the oil chambers (covers, seals). Check the mechanical seal on the inlet side

Problem	Possible Cause	Remedy
Pump does not start	The drive motor is not supplied with the correct voltage or is overloaded	Supply the drive motor with the correct voltage
	The motor starter overload protection is too small or trip level is too low	Compare the trip level of the motor starter overload protection with the data on the motor nameplate. Correct if necessary. In case of high ambient temperature set the trip level of the motor starter overload protection 5% above the nominal motor current
	A fuse is blown	Check the fuses, replace if necessary
	Connection wiring is too small or runs are too long causing too great a voltage drop	Use proper wiring size
	Drive motor is defective	Replace the drive motor
High back pressure	The discharge piping is obstructed	Remove the obstruction from the piping
The pump is blocked or clogged	Solid foreign matter has entered the pump	Have the pump repaired by contacting the Busch LLC Service Department in Virginia Beach, Virginia Make sure the inlet line has a mesh screen and additional filter if necessary
	Corrosion in the pump from remaining condensate	Have the pump repaired by contacting the Busch LLC Service Department in Virginia Beach, Virginia Check the process
	Condensate ran into the pump	Have the pump repaired by contacting Busch LLC Service Department in Virginia Beach, Virginia Make sure no condensate enters the pump and provide a drip leg and drain on the inlet side piping Drain the condensate regularly
	The pump is blocked	Remove the pump and clean if necessary

Problem	Possible Cause	Remedy
The pump starts but labors, rattles or runs noisily	The pump has remained idle for a several weeks or months	Let the pump run warm with the inlet closed
	Oil viscosity is too high for the ambient conditions	Make sure pump has been filled with the normally recommended oil
	Improper oil quantity or incorrect oil	Use the correct oil and amount per the this manual
	Too long a frequency between oil changes	Perform oil changes in accordance with this manual
	Foreign objects in the pump or stuck bearings	Repair the pump. Contact the Busch LLC Service Department in Virginia Beach, Virginia
	Worn coupling elements	Replace the coupling element
The purge or cooling gas flow or pressure is low	The flow or pressure is not properly adjusted	Adjust the flow or pressure by adjusting the regulator or flow meter
	The gas piping is obstructed	Clean the piping
	The gas is leaking	Replace the pipe
	Instrument failure	Replace the faulty instrument
Low cooling water flow	The water supply is not connected	Check and connect the water supply
	The water supply strainer is clogged	Clean the strainer
	Low cooling water pressure	Apply proper water pressure
	A valve in the cooling water supply is partially closed	Make sure all cooling water supply valves are fully open
	The flowmeter (if equipped) has failed	Replace the flowmeter
Cooling water level is routinely low	There is a leak in the system	Fix any leaks. Contact the Busch LLC Service Department in Virginia Beach, Virginia
Cooling water is discolored or contaminated	Poor quality water is being used	Use a clean water supply

Problem	Possible Cause	Remedy
High pump temperature	Worn Screws and/or worn cylinder bores.	Disassemble the pump and replace the components as necessary
	Insufficient cooling liquid or cooling water flow	Check the cooling liquid and flow of cooling water. Add coolant or adjust water supply if necessary
	Back pressure of the pump is too high	Check the discharge piping for obstructions
	Gas temperature is raised due to special process gases	Restart the pump after cooling sufficiently
	The pump is contaminated with product residues	Disassemble the pump and/or check the cooling circuit
	Ambient temperature is too high	Observe the allowed ambient conditions. Contact Busch LLC Service Department in Virginia Beach, Virginia
	Temperature of inlet gas is too high	Observe the permitted temperatures for the inlet gas
	Oil level is too low	Top with oil, check oil fill plugs, check the mechanical seal (if equipped) by contacting Busch LLC Service Department in Virginia Beach, Virginia
	Oil burning occurs by overheating the pump	Drain the oil and refill with fresh oil. If oil life seems too short contact Busch LLC Service Department in Virginia Beach, Virginia for suggestions
	Supply voltage varies	Provide a stable source of electricity
	Screens or meshes of inlet filters or Knock-out pot (if equipped) on inlet side pump may be clogged	Clean or replace screens or meshes
	Partial clogging in inlet or discharge line	Remove the clogging
	Inlet or discharge line has too small of a diameter	Use larger piping

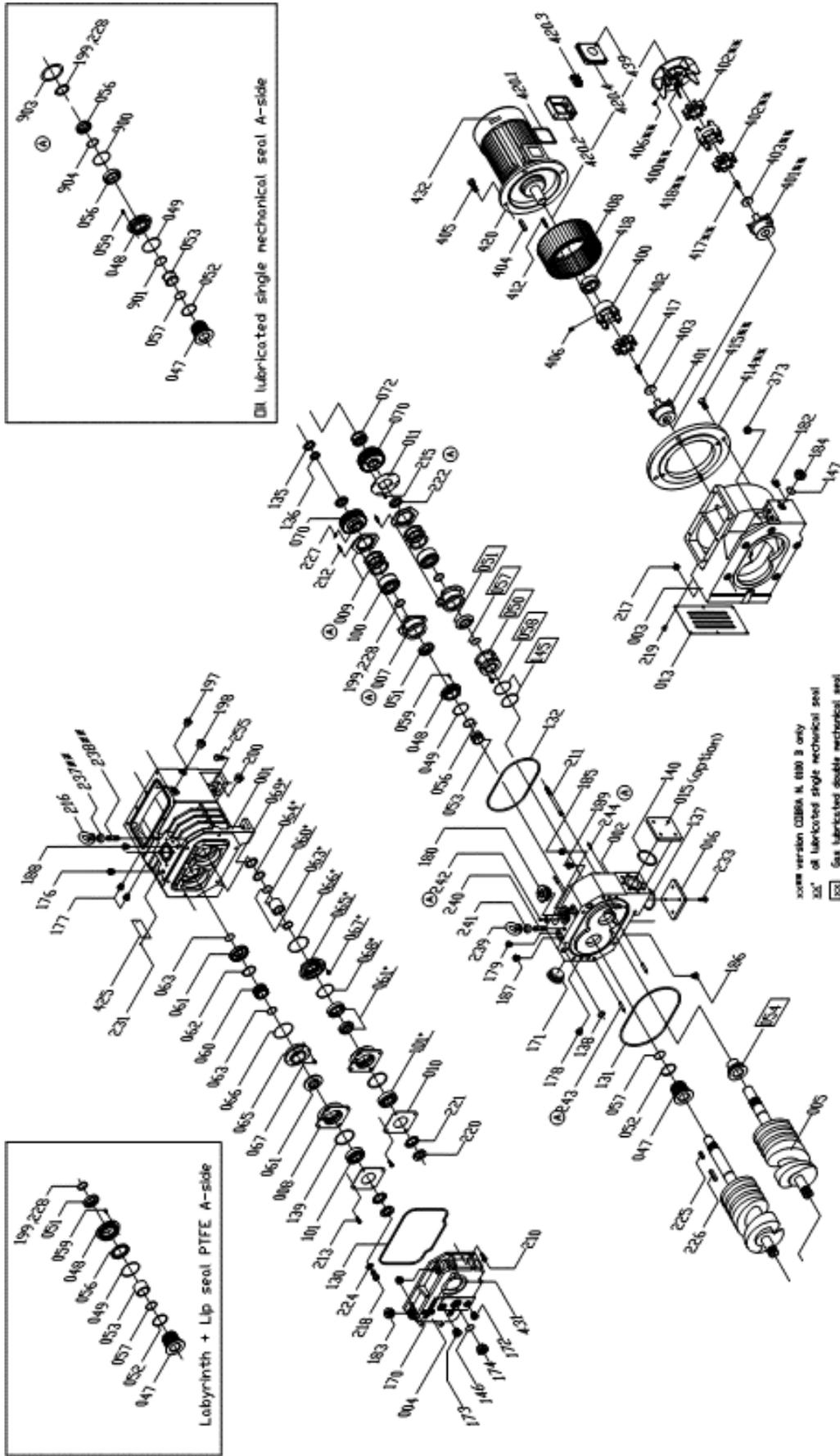
6.0 TECHNICAL INFORMATION

Technical Specifications

Model		0100	0200	0300
Nominal pumping speed	ACFM	82	160	225
Maximum sound level	dBA	75	78	80
Ultimate pressure	Torr	.0075	.0075	.0075
Motor size @ 3600RPM	HP	5	10	15
Oil sump capacity				
Motor end	Qts. (approx.)	1.2	1.2	1.2
Inlet end	Qts. (approx.)	0.5	0.5	0.5
Water usage rate*	GPM	1	1	1
Approx. weight**				
Direct cooled w/Mech. seals	Lbs.	730	908	1160
Radiator cooled w/Mech.seals	Lbs.	798	976	1228
Direct cooled w/Lab. seals	Lbs.	612	822	934
Radiator cooled w/Lab. seals	Lbs.	680	890	1002

Consult factory for blower/pump systems with higher capacities and lower ultimate pressures.

*Applies to direct cooled models only. **As shown in Fig. 3 & 4.



(From Busch Dwg. T133 538 814 A)

Fig. 5 - NC 0100-0300 B Exploded View Illustration

NOTES

1. UNLESS NOTED OTHERWISE, PANEL TO BE WIRED PER GENERAL WORK INSTRUCTION AND GUIDELINES FOR PANEL FABRICATION.
2. BUSCH COBRA PUMP IS EQUIPPED WITH TWO SAFETY SWITCHES AS STANDARD. OPTIONAL SWITCHES ARE SHOWN WITH DOTTED LINES.
3. SAFETY SWITCH POSITIONS SHOWN ARE FOR NORMAL PRESTART CONDITIONS.
4. IF KOP LEVEL HI-HI SWITCH (LSHH) IS REQUIRED, REMOVE JUMPER BETWEEN TERMINAL 7 AND 8.
5. KOP LEVEL HIGH SWITCH (LSH) IS FOR USE BY OTHERS.

WIRE COLOR CODE

INTERNAL PANEL WIRING—AWG—16 TFFN
 EXTERNAL FIELD WIRING—AWG—14 THHN
 SHIELDED CABLE—18AWG 1PR W/DRAIN
 UNLESS OTHERWISE NOTED & WHERE APPLICABLE.

BLACK - LINE VOLTAGE
 RED - HOT, 120VAC
 WHITE - NEUTRAL, 120VAC
 GREEN - GROUND
 DARK BLUE - 24VDC +/-
 LIGHT BLUE - INTRINSICALLY SAFE
 YELLOW - EXTERNAL SOURCE WIRING, LESS THAN OR EQUAL TO 120VAC

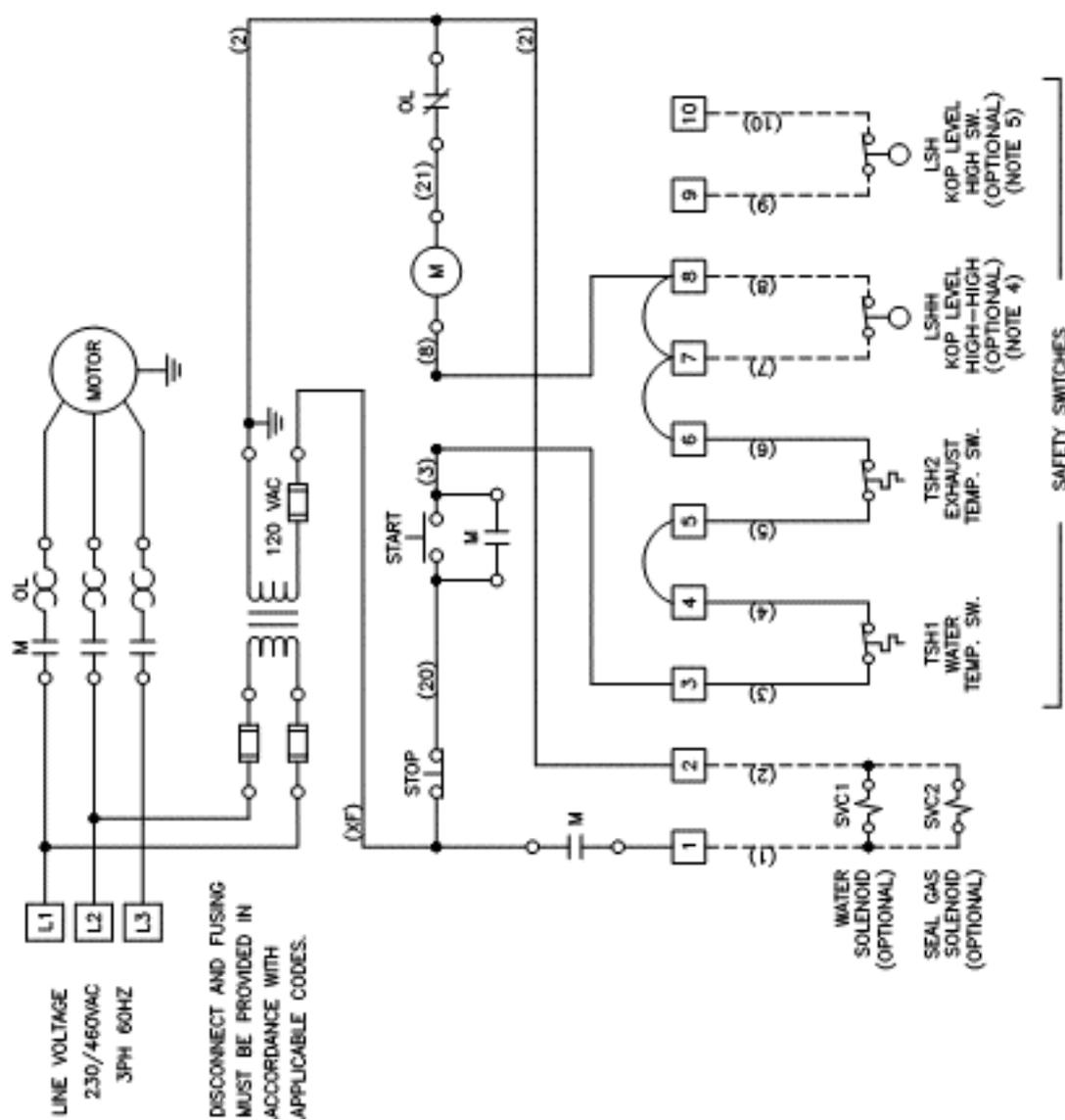
- - WIRING BY BUSCH
- - - - - WIRING NOT INSTALLED
-  - SHIELDED CABLE

TERMINAL LEGEND

-  TERMINAL BLOCK INTERNAL TO BUSCH CONTROL PANEL
-  TERMINAL BLOCK IN VFD
-  TERMINAL BLOCK IN JUNCTION BOX
-  TERMINAL ON DEVICE

FUSE REPLACEMENT

FU1	ATOR-4	600V
FU2	TRM-10	250V



WARNING:
 MULTIPLE POWER SOURCES.
 DISCONNECT ALL POWER SOURCES
 BEFORE SERVICING.

(From Busch Dwg. B2044C)

Fig. 6 - Typical Control Panel Wiring (for reference only)

Australia
Busch Australia Pty. Ltd.
30 Lakeside Drive
Broadmeadows, Vic. 3047
Tel: (03) 93 55 06 00
Fax: (03) 93 55 06 99

Austria
Busch Austria GmbH
Industriepark Nord
2100 Korneuburg
Tel: 02262 / 756 65-0
Fax: 02262 / 756 65-20

Belgium
Busch N.V./Busch SA
Kruinstraat 7
9160 Lokeren
Tel: (0)9 / 348 47 22
Fax: (0)9 / 348 65 35

Brazil
Busch do Brasil Ltda.
Rod. Edgard Máximo Zambotto, Km 64
13240-000 Jarinú-SP
Tel: (55) 11-4016 1400
Fax: (55) 11-4016 1077

Canada
Busch Vacuum Technics Inc.
1740, Boulevard Lionel Bertrand
Boisbriand (Montréal)
Québec J7H 1N7
Tel: 450 435 6899
Fax: 450 430 5132

China
Busch Vacuum (Shanghai) Co., Ltd
18 Bin Yang Road, Shanghai
China 200235
Tel: +86 21 6436 1919
Fax: +86 21 5031 5766

Czech Republic
Busch Vakuum s.r.o.
Pra ákova 10
619 00 Horní Heršpice
Brno
Tel.: +420 543 42 48 55
Fax: +420 543 42 48 56

Denmark
Busch Vakuumtechnik A/S
Parallelvej 11
8680 Ry
Tel: +45 87 88 07 77
Fax: +45 87 88 07 88

Finland
Busch Vakuumtechnik Oy
Sinikellonpolku 3
01300 VANTAA
Tel: 09 774 60 60
Fax: 09 774 60 666

France
Busch France S.A.
Parc Technologique
de Bois Chaland CE 2922
91029 Evry Cedex
Tel: 01 69 89 89 89
Fax: 01 60 86 16 74

Germany
Dr.-Ing. K. Busch GmbH
Schauinslandstr. 1
79689 Maulburg
Tel: (0 76 22) 6 81-0
Fax: (0 76 22) 6 81-194
e-mail: sec.bu@busch.de

Dr.-Ing. K. Busch GmbH
Niederlassung Nord
Ernst-Abbe-Str. 1-3
25451 Quickborn
Tel: (0 41 06) 7 99 67-0
Fax: (0 41 06) 7 99 67-77

Dr.-Ing. K. Busch GmbH
Niederlassung West
Nordring 35
64807 Dieburg
Tel: (0 60 71) 92 82-0
Fax: (0 60 71) 14 71

Dr.-Ing. K. Busch GmbH
Niederlassung Süd-Ost
Gewerbestraße 3
90579 Langenzenn
Tel: (09 01) 90 25-0
Fax: (09 01) 90 25-25

Dr.-Ing. K. Busch GmbH
Außenstelle Zella-Mehlis
Am Rain 11
98544 Zella-Mehlis
Tel: (0 36 82) 46 92 71
Fax: (0 36 82) 46 92 73

Ireland
Busch Ireland Ltd.
A10-11 Howth Junction Business Centre
Kilbarrack, Dublin 5
Tel: 00353 1 832 1466
Fax: 00353 1 832 1470

Italy
Busch Italia S.r.l.
Via Ettore Majorana, 16
20054 Nova Milanese
Tel: 0362 370 91
Fax: 0362 370 999

Japan
Nippon Busch K.K.
1-23-33, Megumigaoka
Hiratsuka City, Kanagawa
Japan 259-1220
Tel: 0463-50-4000
Fax: 0463-50-4004

Korea
Busch Korea Ltd.
392-1 Yangji-Ri, Yangji-Myun,
Yongin-si, Kyunggi-Do
Tel: 031) 321-8114
Fax: 031) 321 4330

Malaysia
Busch (Malaysia) Sdn Bhd.
6 Jalan Taboh 33/22
Shah Alam Technology Park
Section 33
40400 Shah Alam
Selangor D. E.
Tel: 03 5122 2128
Fax: 03 5122 2108

Netherlands
Busch B.V.
Pompomolenlaan 2
3447 GK Woerden
Postbus 2091
3440 DB Woerden
Tel: (0)348 - 462300
Fax: (0)348 - 422939

New Zealand
Busch New Zealand Ltd.
Unit D, Arrenway Drive
Albany, Auckland 1311
P O Box 302696
North Harbour, Auckland 1330
Tel: 0-9-414 7782
Fax: 0-9-414 7783

Norway
Busch Vakuumteknikk AS
Hestehagen 2
1440 Drøbak
Tel: 64 98 98 50
Fax: 64 93 66 21

Poland
Busch Polska Sp. z o.o.
Ul. Chopina 27
87800 Włocławek
Tel: (054) 2315400
Fax: (054) 2327076

Singapore
Busch Vacuum Singapore Pte Ltd
20 Shaw Road
#01-03 Ching Shine Building
Singapore 36 79 56
Tel: (65) 6 408 0866
Fax: (65) 6 288 0877

Spain
Busch Ibérica S.A.
C/. Penedès, 47-49
08192 Sant Quirze del Vallès
Tel: 93 721 77 77
Fax: 93 721 42 07

Sweden
Busch Vakuumtechnik AB
Bråta Industriområde
435 33 Mölnlycke
Tel: 031 - 338 00 80
Fax: 031 - 338 00 89

Switzerland
Busch AG
Waldweg 22
4312 Magden
Tel: 061 / 845 90 90
Fax: 061 / 845 90 99

Taiwan
Busch Taiwan Corporation
8F, No.5, Lane 155, Sec. 3, Pei Shen Rd.
Shen Keng Hsiang,
Taipei Hsien,
Taiwan (222), R.O.C
Tel: (02) 2662 0775
Fax: (02) 2662 0796

Turkey
VAKUTEK
Emlak Kredi Ishani No: 179
81130 Üsküdar-Istanbul
Tel: (216) 310 0573
Fax: (216) 343 5126

United Kingdom
Busch (UK) Ltd
Hortonwood 30-35
Telford
Shropshire
TF1 7YB
Tel: 01952 677 432
Fax: 01952 677 423

USA
Busch LLC
516 Viking Drive
Virginia Beach, VA 23452
Tel: (757) 463-7800
Fax: (757) 463-7407