

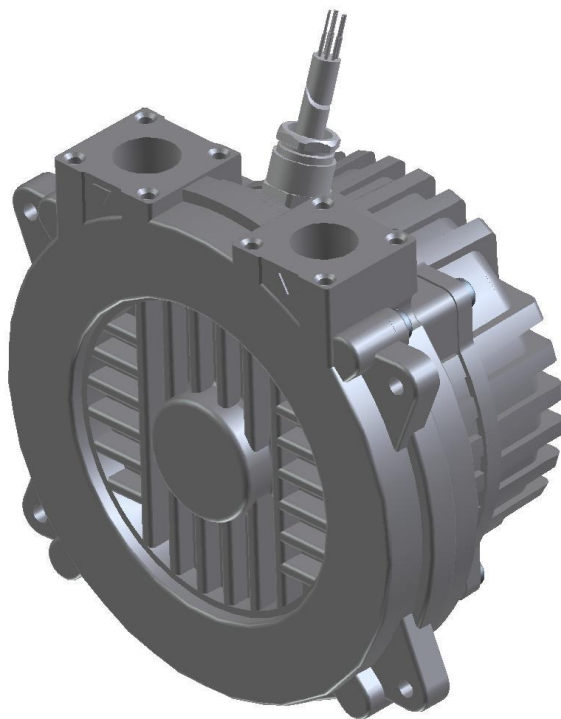
AIRTECH[®]

VACUUM

3BA1002

Installation, Operation and Maintenance

3BA1002-AA22 (110 Watts, 12 Volts)
3BA1002-AB22 (110 Watts, 24 Volts)
3BA1002-AB52 (300 Watts, 24 Volts)
3BA1002-BB52 (300 Watts, 48 Volts)



Read Instructions
Before Operating

INSTALLATION & OPERATING MANUAL

3BA1002

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1.0 Safety Considerations

Before beginning work on the 3BA1002 unit, be sure the electricity is off and locked out and that the pump is not under vacuum or pressure at either connection.

Do not operate the 3BA1002 without both the inlet and discharge of the pump connected to piping to avoid accidental damage to limbs from entering the suction or discharge of the machine. It is recommended to use a small pipe, at least 5 inches long (120 mm) to any open connection to make contact with the impeller impossible.

Do not remove the suction and discharge piping until the impeller has come to a complete stop.


Do not operate the 3BA1002 with the motor cap removed. Removal of the motor cap will result in loss of warranty coverage on the entire unit. There are no user serviceable parts in the motor housing.

Do not attempt to connect the unit to a power source without the advice of a qualified electrician.

Electrical connections, including those to and from the DC control board, must be housed in a suitable enclosure to protect against dust, debris and humidity.

To ensure proper operation, a minimum of 15 mm clearance on each side and 2 mm clearance at the pump lid should be maintained. This will ensure adequate cooling air flow.

Surfaces on the 3BA1002 can reach very high temperature, which can cause burns or scalding if contact is made with the unit. Do not touch the unit during operation and wait until the unit cools before attempting to service the unit. The end user is responsible for ensuring adequate guarding, insulation, warning or symbol as shown below:

Symbol	Reference	Colors	Corresponding Standard & Registration Number
	Warning: Risk of high temperature	Background: Yellow Triangular band: Black Symbol: Black	IEC 60417-5041

The motor and motor connections must be protected against electrostatic discharges (ESD). Do not remove the ESD protective bag surrounding the leads until immediately prior to electrical hook-up of the unit. Ensure adequate protection against ESD prior to beginning electrical connection of the unit.

2.0 Acceptable Use

The 3BA1002 is a single stage regenerative blower driven by a brushless, DC electric motor. The machines can operate as either vacuum pumps or compressors.

The machines in general should be limited to handling dry air or other dry, inert gases. If explosive or chemically reactive gases are to be handled, please consult with your Airtech Vacuum sales professional.

The gas stream entering the pump should be free of particulates and liquid droplets or mists. Use of a suitable filter or knock-out pot can eliminate potential particulate or liquid carryover respectively.

There are five basic models of the 3AB1002 including:

- 3BA1002AB22 with 110 Watt, 24 Volt motor
- 3BA1002AA22 with 110 Watt, 12 Volt motor
- 3BA1002AB52 with 300 Watt, 24 Volt motor
- 3BA1002BB52 with 300 Watt, 48 Volt motor

Each blower features flanged connections, with both a threaded pipe connection and hose connection available to configure the blower to your specific requirements. The blower is supplied without the connection configured --- order the required flange or pipe connectors from your Airtech sales representative.

Operating above the indicated maximum pressure or vacuum would overload the motor and/or overheat the unit. In addition to the maximum allowable pressure difference, careful consideration should be given to matching the motor protection devices (provided by others) to the expected current draw. In no case should the blower be operated with inadequate motor overload protection.

This blower is intended for industrial use in continuous operation. Should the blower be cycled on and off very frequently or if the blower is to be installed in a non-industrial application, please contact Airtech for assistance.

Do not use the 3BA1002 blowers in applications other than those mentioned above without consulting Airtech. Any modifications to the 3BA1002 are prohibited and may void your warranty. Repair or maintenance work not specifically outlined in this manual should be done only by Airtech authorized repair personnel.

3.0 Technical Information

Nominal Pump Operating Parameters

Type	3BA1002-AB22	3BA1002-AA22	3BA1002-AB52	3BA1002-BB52
Weight	2.6 lbs (1.2kgs)	2.6 lbs (1.2 kgs)	3.3 lbs (1.5 kgs)	3.3 lbs (1.5 kgs)
Dimensions	See Figure 1 and 2	See Figures 1 and 2	See Figures 1 and 2	See figures 1 and 2
Sound Level ¹	48 dBA	48 dBA	55 dBA	55 dBA
Maximum Vacuum Operation ²	40 inches H2O (100 mbar)	40 inches H2O (100 mbar)	74 inches H2O (185 mbar)	74 inches H2O (185 mbar)
Maximum Pressure Operation ²	48 inches H2O (120 mbar)	48 inches H2O (120 mbar)	100 inches H2O (250 mbar)	100 inches H2O (250 mbar)
Max Ambient Temperature	104 F (40 C)	104 F (40 C)	104 F (40 C)	104 F (40 C)
Maximum Speed	9,000 rpm	9,000 rpm	15,000 rpm	15,000 rpm
Bearing Life	20,000 hrs	20,000 hrs	20,000 hrs	20,000 hrs

1 – Sound pressure level is measured at 1 meter distant with both the inlet and outlet piped to a location remote from the measurement area. Sound readings are taken while operating at approximately 60 percent of the maximum pressure.

2 – Stated maximum vacuum and pressure values are for operation within the recommended range of the blower and are for operation on 60 F (15 C) air only.

4.0 Motor and Electronics Data

TYPE: 3BA1002-AB22 (internal or external electronics)		
Voltage Range	16 to 28	V DC
Nominal Voltage	24	V DC
Max Input Current	7	Amps
Nominal Speed	9500	rpm
Motor Rating	110	Watts
Speed Control Range	700 to 9500	rpm
Permissible Ambient Temperatures	14 to 104	F
	-10 to 40	C

TYPE: 3BA1002-AA22 (internal electronics)		
Voltage Range	10.5 to 14	V DC
Nominal Voltage	12	V DC
Max Input Current	14	Amps
Nominal Speed	9500	rpm
Motor Rating	110	Watts
Speed Control Range	700 to 9500	rpm
Permissible Ambient Temperatures	14 to 104	F
	-10 to 40	C

TYPE: 3BA1002-AA52 (external electronics)		
Voltage Range	16 to 28	V DC
Nominal Voltage	24	V DC
Max Input Current	24	Amps
Nominal Speed	12,960	rpm
Motor Rating	300	Watts
Speed Control Range	1000 to 12,960	rpm
Permissible Ambient Temperatures	14 to 104	F
	-10 to 40	C

TYPE: 3BA1002-BB52 (external electronics)		
Voltage Range	38 to 52	V DC
Nominal Voltage	48	V DC
Max Input Current	7	Amps
Nominal Speed	15,000	rpm
Motor Rating	300	Watts
Speed Control Range	1000 to 15,000	rpm
Permissible Ambient Temperatures	14 to 104	F
	-10 to 40	C

Due to PWM control of the electronics, the power supply is loaded with short, high current pulses. The supply voltage must be blocked or filtered using a capacitor (low ESR type, suitable for high frequency use and high current switching, larger than 1 Farad (1000 uF) to suppress noise. Usually, such a capacitor is part of the power supply. Some supplies, however, such as switch mode supplies, have a smaller capacitor than necessary, which could result in interference. When using such a supply, an additional capacitor, connected close to the motor, should be employed.

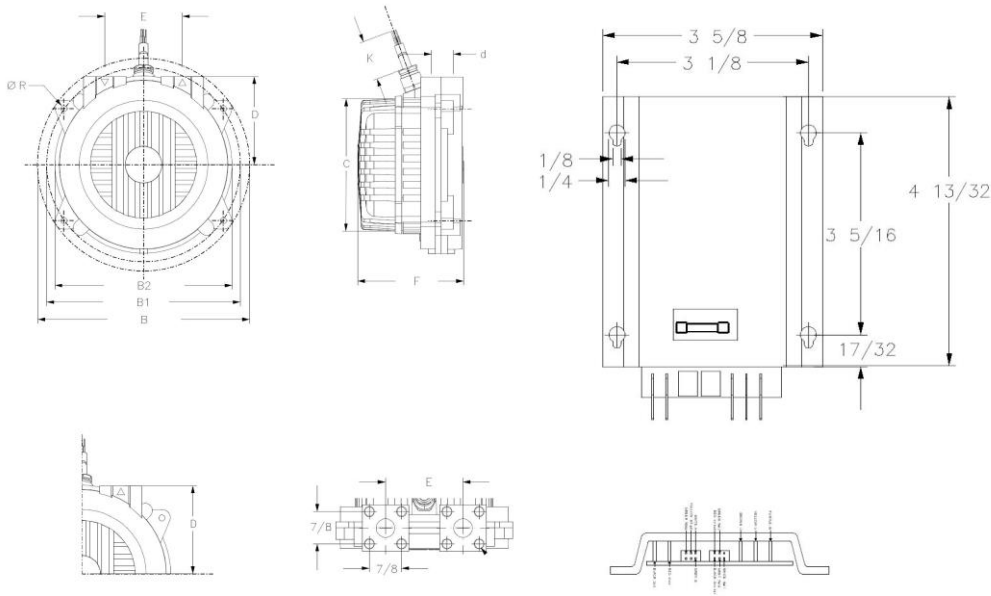


Figure 1. Blower Dimensional Drawing

Table 1. Dimensions of 3BA1002 blowers (Refer to Figure 1; all dimensions in inches)

Model	B	B1	B2	D	E	R	d	C	F
3BA1002-AA22	5.65	5.18	4.5	2.4	2.05	.165	.593	3.53	2.82
3BA1002-AB22	5.65	5.18	4.5	2.4	2.05	.165	.593	3.53	2.82
3BA1002-AB52	5.65	5.18	4.5	2.4	2.05	.165	.593	3.55	3.6
3BA1002-AA52	5.65	5.18	4.5	2.4	2.05	.165	.593	3.55	3.6

5.0 Packaging

The 3BA1002 blower is packed in a cardboard box from the factory. Unconnected leads are protected by ESD prevention plastic. DO NOT remove this plastic until immediately prior to installation to avoid ESD damage to the motor or controller.

6.0 Installation

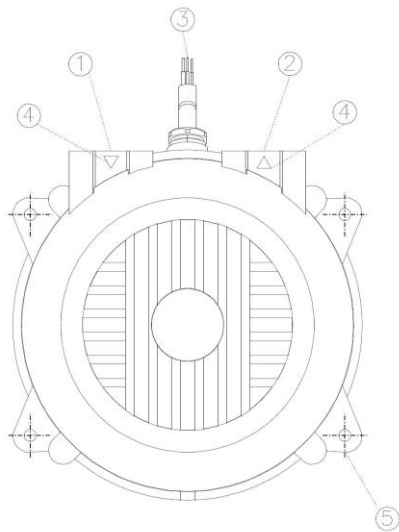


Figure 2: Blower Components

1. Suction
2. Discharge
3. Electrical connection cable
4. Flow directional labels
5. Mounting lugs

Figure 2 shows the components of the 3BA1002.

In general, the 3BA1002 can be mounted in any configuration so long as the vibration is limited. Be sure to provide for a minimum of 0.6 inches (15 mm) clearance on each side and 0.08 inches (2 mm) clearance on the face of the blower to ensure proper cooling air flow.

If sound and vibration are unacceptable in a particular installation, you can add rubber or metal shims to the mounting bracket to isolate the blower from sources of resonance.

Place the shims between the mounting lugs (Figure 2, No. 5) and the mounting surface. Fasten the 3BA1002 to the surface via the mounting lugs using four bolts/nuts.

7.0 Electrical Connection

The 3BA1002 is supplied in two possible configurations – with internal or external electronics. In order to determine the type of 3BA1002 you have, compare the leads from the pump with the diagrams that follow. For 160 and 300 Watt versions, only the external electronics are available. For the 110 Watt, 12 Volt versions, only the internal electronics are available. Only for the 110 Watt, 24 Volt versions is it possible to elect internal or external electronics.

8.0 External Electronics

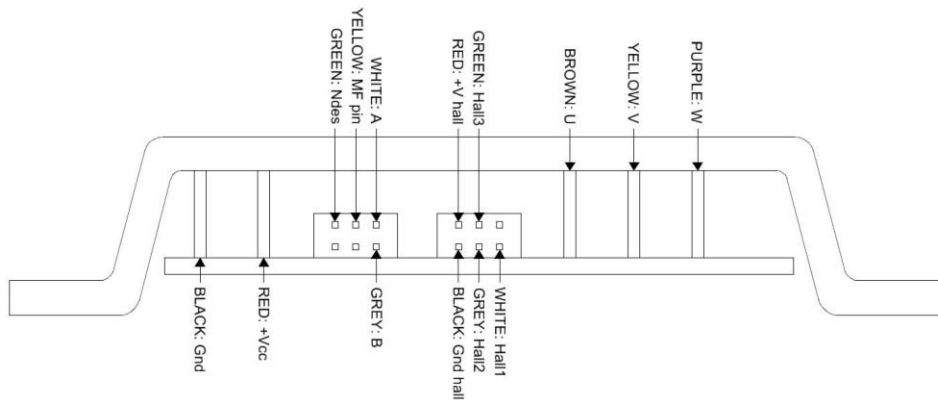
The intended operating direction of the 3BA1002 is counter-clockwise, as indicated by the arrow cast into the 3BA1002 body near the inlet and the outlet. Clockwise rotation is possible, but performance will be degraded from that shown in the literature.

The connecting cable between the blower motor and the external electronics can be at most 19.5 inches (0.5 meters) in length.

If switching the pump off rapidly, a back current is possible. This can be prevented by use of a Schottky diode rated for the maximum amperage as indicated in the Technical Data portion of this manual. Install the diode in the supply lead (Vcc+).

If the ambient temperature where the electronics are installed exceeds 122 F (50 C), power output may be reduced. Consult with your Airtech sales representative prior to installation in these environments.

The following diagrams illustrate the connection method for the electronics and the motor. Please pay careful attention to the diagrams and ensure that you are protected from ESD prior to beginning work on the connections.



LEVEL A (WHITE)	LEVEL B (GREY)	MODE OF OPERATION
0 (GROUND)	0 (GROUND)	OUTPUT DISABLED (NO CURRENT)
0 (GROUND)	1 (DIGITAL INPUT 3.3V-24V)	COUNTER-CLOCKWISE ROTATION MAIN/OPERATING DIRECTION OF ROTATION
1 (DIGITAL INPUT 3.3V-24V)	0 (GROUND)	CLOCKWISE ROTATION
1 (DIGITAL INPUT 3.3V-24V)	1 (DIGITAL INPUT 3.3V-24V)	BREAKING

NOTES:

1. RED: +Vcc is the (+) DC operating voltage. Connect to (+) of 24V supply.
2. BLACK: Gnd is the (-) DC operating voltage. Connect to (-) of 24V supply.
3. GREEN: Ndes is the Speed Reference Value. Range is 0-10 V DC. Connect to (+) of 10V control voltage supply.
4. Control signals WHITE: A and GREY: B are digital inputs that determine the mode of operation.
5. All grounds and (-) of 24V supply should be tied together.

Figure 3. Connection diagram for external electronics (same for all size blowers with external electronics).

If there is no connector connected to the motor cable of the 3BA1002, the loose lead ends are surrounded by an ESD prevention bag. In this case, the socket connector should first be connected to the motor cables.

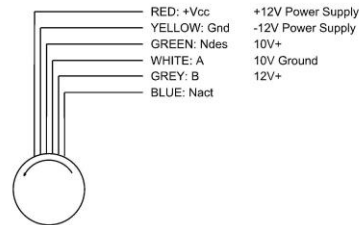
The scope of supply of the external electronics includes a connector with 12 inches (300 mm) wiring harness to connect the electronics to the supply voltage and control voltage.

In order to ensure electromagnetic compatibility, a suitable EMI filter (for example, CORCOM, Type 6ETI, 6A) must be connected in series with the external electronics. In no case should the connecting cable between the EMI filter and the motor be greater than 12 inches (300 mm) in length.

9.0 Internal Electronics

Internal electronics have the drive controller installed in the motor housing. This installation is sensitive to heat build up and care must be taken to ensure adequate cooling is supplied to the blower.

12 Volt Connection, internal:

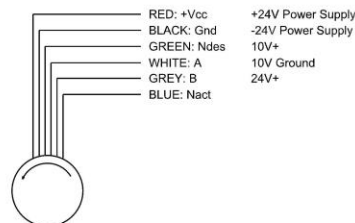


LEVEL A (WHITE)	LEVEL B (GREY)	MODE OF OPERATION
0 (GROUND)	0 (GROUND)	OUTPUT DISABLED (NO CURRENT)
0 (GROUND)	1 (DIGITAL INPUT 3.3V-12V)	COUNTER-CLOCKWISE ROTATION MAIN/OPERATING DIRECTION OF ROTATION
1 (DIGITAL INPUT 3.3V-12V)	0 (GROUND)	CLOCKWISE ROTATION
1 (DIGITAL INPUT 3.3V-12V)	1 (DIGITAL INPUT 3.3V-12V)	BREAKING

NOTES:

1. RED: +Vcc is the (+) DC operating voltage. Connect to (+) of 12V supply.
2. YELLOW: Gnd is the (-) DC operating voltage. Connect to (-) of 12V supply.
3. GREEN: Ndes is the Speed Reference Value. Range is 0-10 V DC. Connect to (+) of 10V control voltage supply.
4. Control signals WHITE: A and GREY: B are digital inputs that determine the mode of operation.
5. All grounds and (-) of 12V supply should be tied together.

24 Volt Connection, internal:



LEVEL A (WHITE)	LEVEL B (GREY)	MODE OF OPERATION
0 (GROUND)	0 (GROUND)	OUTPUT DISABLED (NO CURRENT)
0 (GROUND)	1 (DIGITAL INPUT 3.3V-24V)	COUNTER-CLOCKWISE ROTATION MAIN/OPERATING DIRECTION OF ROTATION
1 (DIGITAL INPUT 3.3V-24V)	0 (GROUND)	CLOCKWISE ROTATION
1 (DIGITAL INPUT 3.3V-24V)	1 (DIGITAL INPUT 3.3V-24V)	BREAKING

NOTES:

1. RED: +Vcc is the (+) DC operating voltage. Connect to (+) of 24V supply.
2. BLACK: Gnd is the (-) DC operating voltage. Connect to (-) of 24V supply.
3. GREEN: Ndes is the Speed Reference Value. Range is 0-10 V DC. Connect to (+) of 10V control voltage supply.
4. Control signals WHITE: A and GREY: B are digital inputs that determine the mode of operation.
5. All grounds and (-) of 24V supply should be tied together.

Figure 4. Connection Diagram for internal electronics.

In order to control electromagnetic interference, an EMI filter should be used. (e.g. CORCOM Type 6ETI F7003, 6A). When connecting the EMI filter, ensure the distance between the filter and the motor is no more than 19.5 inches (0.5 meters).

A diode has been integrated into the control board to ensure that the unit speed may be changed at any time as quickly as desired without tripping the controller board due to back currents generated by changing motor impeller rotational speed.

10.0 Speed Reference

The speed of the unit can be measured by use of the Hall Effect Transducer (the Hall Effect refers to the production of a voltage in response to a magnetic field in any conductor perpendicular to the field) speed reference lead. This lead can be used with an Oscilloscope to measure the frequency of the rotating motor, which can give a speed. For each 1 Hz measured, 30 rpm are recorded. For example, if a reading of 100 Hz is detected by the Oscilloscope, then the blower is operating at 3000 rpm.

11.0 Pipe and Hose Connections

On delivery, the 3BA1002 can be fitted with either a pipe connection flange or a hose connection barb. Both are available as accessories from your Airtech sales representative.

The inlet and discharge are delivered with a plastic plug to prevent debris and other foreign objects from entering the blower. Remove the plugs only prior to hook-up of the inlet and discharge piping to avoid debris from entering the pump.

Refer to Figure 2 for connection locations.

12.0 Commissioning

Confirm that the suction and discharge connections are secure and that the pump is securely fastened to its mounting location.

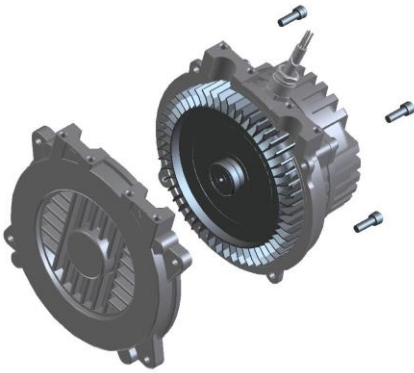
Switch on the power supply of the proper voltage to match the motor rating of the 3BA1002.

Set the control voltage to 0 Volts and gradually increase the voltage to achieve the desired speed.

Check all connections for tightness.

To change the speed during operation, simply change the control voltage, making sure to maintain a maximum control voltage of 10 V.

13.0 Maintenance



WARNING! There are no user-serviceable parts inside the motor housing. Removal of the motor housing is not recommended and may void the warranty.

Periodically clean the exterior of the pump by wiping it with a wet cloth.

CAUTION! The surface of the pump may be hot. Wait an appropriate time to allow the surface to cool before cleaning.

Figure 5. Blower disassembly.

WARNING! Be sure to disconnect the supply voltage from the pump prior to disassembly of the pump housing.

To clean the interior of the pump, remove the pump lid by removing the four bolts and pulling the lid in the axial direction (See Figure 5). Remove any lint or dust found with a tweezers or small pliers.

Reassemble the pump lid by setting the lid so that the locating pin is aligned. Do not force the lid into an improper alignment. Carefully place the lid back on the pump in the axial direction, and then secure the lid to the pump by reinserting the mounting bolts. Use Loctite No. 243 to add to prevent the screws from backing out due to vibration and tighten the screws to no more than 2 Nm torque.

14.0 Periodic Checks

Check all of the following on a periodic basis (monthly or more frequently as required by the application):

Ensure that the pump is securely fastened to the mounting surface.

Tighten screwed cable glands, where applicable.

Check both suction and discharge connections for tightness.

Replace any worn parts in the piping connections.

Airtech uses sealed bearings on the pump which are bonded in place with a very strong adhesive. Therefore, re-greasing of the bearings is not possible. Should a problem be experienced with bearing lubrication or performance, the entire casing will have to be replaced

15.0 Troubleshooting

Fault	Cause	Remedy
Motor does not start, no motor noise	At least two power supply leads are interrupted.	Check fuses, terminals and supply leads and correct as necessary.
	No signal at control signal input.	Apply control signals (See section on Electrical Connection)
	No speed reference value.	Set speed reference value between 0 and 10 Volts (See section on Electrical Connection)
Motor does not start, humming noise.	Impeller jammed	Open pump lid as described in the section for cleaning and remove any debris.
	Impeller Damaged	Replace impeller
	Motor bearing damaged.	Replace complete casing including motor bearing.
	Wrong connection of motor leads.	Check connections to ensure that they match the diagrams in this manual. Correct as necessary.
High Power Consumption	Winding short circuit.	Have winding checked by a qualified electrician.
	Motor overload.	Reduce operating pressure. Check and clean filters, piping and other possible sources of excessive pressure drop.
	Impeller jammed.	See section titled "Motor does not start – humming noise"
No or too little vacuum or pressure.	Leak in the system	Plug or seal leak.
	Wrong direction of rotation.	Check connection of pump and correct as necessary.
	Speed reference value too low.	Increase speed reference value to increase vacuum or pressure to desired level.
	Electronics exposed to excessive temperature.	Adjust installation of electronics to ensure proper cooling. For internal electronics, provide additional ventilation to the pump installation location.
	Blower too small for the application.	Contact Airtech for assistance in sizing a larger blower.
	Impeller dirty.	Clean internals per Maintenance section of this manual.
Abnormal noise	Flow velocity too high	Increase pipe size or clean pipe.
	Damaged bearing	Replace casing assembly, including bearing.

Impeller leak	Pressure difference between the compressor and surroundings is too high.	The maximum differential between the pump internals and ambient pressure should not be exceeded. Contact Airtech for assistance.
Back current to mains	Switching off or rapidly reducing the speed of the compressor can cause a back current flow.	Insert a diode (Schottky diode, 10A for the 24 Volt, 20 A for the 12 Volt unit).

16.0 Shutdown and Long-term storage

Storage of the blower for more than 1 year without operation may affect the bearing lifetime.

After shutdown, seal the suction and discharge ports with plastic pipe plugs. After removing the wiring from the controller, ensure the ends of the wire are protected by an ESD prevention bag.

Storage of the blower in ambient of -40 F (-20 C) to 160 F (70 C) is acceptable. Storage at lower or higher ambient temperatures is not recommended. Maintain relative humidity at 10 to 95 percent in the storage area. Ensure that the pump is not exposed to liquids during the duration of its storage.

To use the blower after prolonged storage, ensure that the contacts are clean and that the electrical cables are not damaged. If no problems are detected, proceed with the installation and commissioning as described in this manual.

Airtech, Inc. ("Company") Warranty Statement

Company warrants that on the date of shipment to Purchaser the goods will be of the kind and quality described herein, merchantable, and free of all defects in workmanship and materials.

If within one year from the date of initial operation, but not more than eighteen months from date of shipment by the Company, of any item of the goods, Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such defect by, at the Company's option, adjustment, repair or replacement of the item and any affected part of the good. Purchaser shall assume all responsibility and expense for removal, reinstallation and freight in connection with the foregoing remedy. The same obligations and conditions shall extend to replacement items furnished by the Company hereunder. Company shall have the right of disposal of items replaced by it. Purchaser shall grant Company access to the goods at all reasonable times in order for Company to determine any defect in the goods. In the event that adjustment, repair or replacement does not remedy the defect, the Company and Purchaser shall negotiate in good faith an equitable adjustment in the contract price.

The Company's responsibility does not extend to any item of the goods which has not been manufactured and sold by the Company. Such item shall be covered only by the express warranty, if any, by the manufacturer thereof. The Company and its suppliers shall also have no responsibility if the goods have been improperly stored, handled or installed, or if the goods have not been operated or maintained according to their ratings or according to the instructions in Company or supplier furnished manuals, or if unauthorized repairs or modifications have been made to the goods.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES (EXCEPT TITLE) INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE GOODS.

The forgoing states Purchaser's exclusive remedy against Company and its suppliers for any defect in the good or for failure of the goods to be as warranted, whether Purchaser's remedy is based on contract, warranty, failure of such remedy to achieve its essential purpose, tort (including negligence), strict liability, indemnity, or any other legal theory, and whether arising out of warranties, representations, instructions, installations, or defects from any cause.

Neither Company nor its suppliers shall be liable, whether in contract, warranty, failure of a remedy to meet its essential purpose, tort (including negligence), strict liability, indemnity or any other legal theory, for loss of use, revenue or profit or for cost of capital or of substitute use or performance or for indirect, liquidated, incidental or consequential damages or for any other loss or cost of a similar type, or for claims by Purchaser for damages of Purchaser's customers.

For Further Information Please contact:



150 South Van Brunt St.
Englewood, NJ 07631
Tel: 201-569-1173
Fax: 201-569-1696
Airtech@airtechusa.com



2211 Newmarket Parkway
Marietta, GA 30067
Tel: 770-690-0700
Fax: 770-690-0709
airtechsouth@airtechusa.com



42 Digital Drive #9
Novato, CA 94949
Tel: 415-382-9000
Fax: 415-382-9700
airtechwest@airtechusa.com

AIRTECH[®]
VACUUM

301 Veterans Boulevard
Rutherford, NJ 07070
Tel: 1 888 222 9940
Fax: 201 569 1696
airtech@airtechusa.com

AIRTECH[®] SOUTH
VACUUM

2121 Newmarket Pkwy. Suite 110
Marietta, GA 30067
Tel: 770 690 0700
Fax: 770 690 0709
airtechsouth@airtechusa.com

AIRTECH[®] WEST
VACUUM

42 Digital Drive #9
Novato, CA 94949
Tel: 415 382 9000
Fax: 415 382 9700
airtechwest@airtechusa.com

AIRTECH[®]
CHINA

2nd Building,
Jiangbian Second Industrial Park
Songgang Town, Bao'an District
Shenzhen, China
Tel: +86 755 81730991(Ext.8018)
Fax: +86 755 81730986
www.airtechchina.com



10 / 9 Sainsbury Road
O'Connor 6163
WA
Australia
Tel: +61 8 9304 6121
Fax: +61 8 9331 4813
www.vacuvane.com.au

AIRTECH[®]
EUROPE

Vacuvane
Vacuum Technology GMBH
Pfaffenpfad 5
D-97440 Werneck
Germany
Tel: +49 9722 943 96 0
Fax: +49 9722 943 96 29
www.vacuvane.com

AIRTECH[®]
EUROPE

HPE
Pressure & Vacuum Technology
C. dels Amics d'Argentona, 40
08310 Argentona (Barcelona)
Spain
Tel: +34 93 797 17 66
Fax: +34 93 797 17 54
www.hpe-technology.com