HITACHI

INSTRUCTION MANUAL

HITACHI
VORTEX BLOWER
E-U SERIES
E2 SERIES

Thank you for the recent purchase of a **HITACHI** Vortex Blower. Please read this instruction manual carefully for installation, maintenance and inspection guidelines of the **HITACHI** Vortex Blower. After reading this instruction manual, please keep it on hand for future reference.

REQUEST

This instruction manual should be delivered to the personnel operating the **HITACHI** Vortex Blower.

VB-060-E2

CONTENTS

NA201X

1. SAFETY INFORMATION

Safety is extremely important. To ensure safe operation, many important safety messages are provided in this instruction manual and on the Vortex Blower. Please read and follow all safety messages carefully.

⚠ = SAFETY ALERT SYMBOL

The safety alert symbol is used to alert personnel of hazards of extreme danger. The safety alert symbol and the word "WARNING" will precede all safety messages. The definition of "WARNING" is described below

⚠ WARNING Serious injury may occur if any "WARNING" instructions are not followed.

All safety messages do the following:

1.) Identify a hazard
2.) Give an explanation for reducing the chances of injury
3.) Detail the consequences if the safety instructions are not followed.

⚠ WARNING

GENERAL

Concern/Alarm	Possible Consequences
Do not use the Vortex Blower in an explosive environment.	**Installation in explosive environments can lead to personal injury, fire to machinery, etc.**
Do not perform any service work while the power supply is still on.	**Performing service work while the power supply is on can lead to electric shock.**
Do not perform any work while the Vortex Blower is operating. Verify that rotation of the shaft of the Vortex Blower has completely stopped.	**Performing any work while the Vortex Blower is operating can lead to personal injury or electric shock.**
Properly trained personnel should perform all transportation, installation, piping, wiring,maintenance,inspection and operation of the Vortex Blower.	**Improperly trained personnel performing work on the Vortex Blower can lead to electric shock, personal injury, fire to the machinery, etc.**
Use the Vortex Blower in the specified application (Do not use in an unspecified application).	**Failure to use the Vortex Blower in the specified application can lead to electric shock, personal injury, damage to machinery, etc.**
Use the power supply specified on the Vortex Blower nameplate.	**Using a different power supply can lead to damage to the Vortex Blower or fire.**
Do not put any human body parts and/or any objects in the open points of the Vortex Blower.	**This can lead to personal injury, electric shock, fire to the machinery, etc.**
Do not use a damaged Vortex Blower.	**Using a damaged Vortex Blower can lead to personal injury, fire to the machinery, etc.**
Do not make any modifications to the Vortex Blower.	**Hitachi does not take any responsibility for any modifications made to the Vortex Blower.**
Do not place any obstacles in front of the nameplate of the Vortex Blower.	**Placing obstacles in front of the Vortex Blower nameplate will prevent easy access to important information regarding the Vortex Blower.**
Do not remove the nameplate.	**Removing the nameplate will hinder attempts to retrieve important information on the Vortex Blower.**

TRANSPORTING & TRANSFERRING

Concern/Alarm	Possible Consequences
If equipped, utilize the eye bolt to lift the Vortex Blower.	**Failure to use the eyebolt can lead to dropping and damaging of the Vortex Blower.**
Do not use the motor hook at any time.	**Using the motor hook can cause the Vortex Blower to be dropped and damaged.**
Before lifting the Vortex Blower, verify the weight on nameplate, packing list, drawings and catalogs. Select a properly sized sling work tool for the appropriate load.	**If the weight is higher than the rated load of the sling work tool , personal injury and/or damage caused by a dropped Vortex Blower may occur.**
Do not use the Vortex Blower if it has been dropped during transportation.	**The Vortex Blower may be damaged from the fall, and this can lead to personal injury, fire to the machinery, etc.**
Do not use the eyebolt with the Vortex Blower to lift up whole machine after the Vortex Blower has been installed.	**Using the eyebolt after installation can lead to personal injury, damage to the Vortex Blower, or fire to the machinery.**

⚠ WARNING

UNPACKING

Concern/Alarm	Possible Consequences
Before handling the packing box or crate of the Vortex Blower, verify that the packing box or crate is right side up.	**Improper handling of the packing box may lead to personal injury.**
Verify that the Vortex Blower is the correctly ordered product.	**Installing the wrong type of Vortex Blower can lead to personal injury and damage to machinery.**

INSTALLATION AND ADJUSTMENT

Concern/Alarm	Possible Consequences
Properly ground the earth terminal bolt inside the terminal box.	**Failure to properly ground the earth terminal bolt can lead to electric shock.**
Do not install the Vortex Blower near combustible items.	**Combustible items can cause fire to the machinery.**
Do not use the Vortex Blower near any corrosive liquids and corrosive gases (such as: acids, alkalis, and corrosive gases,etc..).	**Operating the Vortex Blower around these items will result in a risk of fire or explosion.**
Do not use the Vortex Blower near any inflammable or explosive gases (such as: hydrogen, methane and gasoline,etc.).	**Operating the Vortex Blower around these items will result in a risk of fire or explosion.**
Do not use the Vortex Blower near any inflammable or explosive dust (such as: magnesium, aluminum, wheat, iron and rubber,etc.). If any of these items are handled by the Vortex Blower, install a filter to ensure no particles enter the Vortex Blower.	**Operating the Vortex Blower around these items can lead to heat caused by friction with the sedimentary particles and/or accumulation of heat in the Vortex Blower. This will result in a risk of fire or explosion.**
Avoid using the Vortex Blower in a small or sealed room.	**A small or sealed room will result in excessive heat generated by the Vortex Blower.**
Do not touch the Vortex Blower casing during operation, as excessive heat is generated.	**Touching the Vortex Blower during operation will lead to personal injury and burns.**
Do not cover the Vortex Blower.	**Covering or storing the Vortex Blower with combustible materials can lead to fire.**
Do not use the Vortex Blower if the suction/discharge ports become clogged with dirt or any foreigh objects.	**This will result in excessive temperature rise and damage to the Vortex Blower.**
Take precautions against the excessive heat rise in the discharge temperature of the Vortex Blower. See the graphs on **page 8** for reference.	**Taking the proper precautions will avoid personal injury, burns and fire to the machinery.**
Do not hang from or get on the Vortex Blower.	**These actions may cause personal injury or damage to the Vortex Blower .**
Do not install the Vortex Blower in an area where water can accumulate or come into direct contact with the Vortex Blower.	**Water coming into contact with the Vortex Blower can lead to personal injury, electric shock, fire to the machinery, etc, due to deterioration of the electric insulation .**
Do not install the Vortex Blower in an area of high temperatures or in an area where the Vortex Blower can come into direct contact with fire.	**High temperatures and fire can lead to personal injury, electric shock, fire to the machinery, etc**
Do not install the Vortex Blower in a place where relative humidity exceeds 90%.	**Installing the Vortex Blower in an area of high humidity can lead to personal injury, electric shock, fire to the machinery, etc, because of electric insulation deteriorating with humidity.**

⚠ WARNING

PIPING & WIRING

Concern/Alarm	Possible Consequences
Connect the power supply cable correctly. (see page 13)	If the power supply is installed incorrectly, electric shock or fire to the machinery can occur.
Do not bend or pull the power supply cable or lead wires of the Vortex Blower.	Bending or pulling wires can lead to electric shock or fire to the machinery.
Do not put any the power supply cable or lead wires between machinery.	Installing the power supply cable or lead wires between machinery can lead to electric shock or fire to the machinery.
Do not touch the terminals during measurement of the insulation resistance.	Touching the terminals can lead to electric shock.
Properly trained personnel should wire the Vortex Blower in accordance with electrical equipment standards.	Failure to wire in accordance with the standards and/or utilizing improperly trainer personnel can lead to burn out of the motor or fire to the machinery.
Installation of an overload protector is approved in accordance with electrical equipment standards (overload protector is not included on theVortex Blower). Install the overload protector in the power supply circuit of the Vortex Blower (see page 13).	Failure to install an overload protector can lead todamage to the Vortex Blower, burn out of the motor or fire to the machinery.
Install a ground connection prior to using the Vortex Blower. Properly ground (Class 3 ground) the equipment.	Installing a ground connection properly will prevent accidents due to current leakage caused by electric insulation deterioration.
Install an independent earth leakage (ground) circuit breaker prior to using the Vortex Blower.	Installing an earth leakage (ground) circuit breaker will prevent accidents due to current leakage caused by electric insulation deterioration.
Install an independent electromagnetic switch in the power supply ciruit as protection for the Vortex Blower.	Failure to install an electromagnetic switch can lead to damage to the Vortex Blower, burn out of the motor or fire to the machinery.
Do not allow the Vortex Blower to inhale any type of water.	Inhaling water can lead to current leaks, electric shocks, rusting or bearing damage.

OPERATION

Concern/Alarm	Possible Consequences
Do not operate the Vortex Blower while the terminal box cover is removed.	Operating while the terminal box cover is removed can lead to electric shock.
After servicing the Vortex Blower, verify that the terminal box cover is properly mounted to the case.	Failure to properly mount the terminal box cover can lead to electric shock.
During operation, do not approach or touch any of the rotating parts of the Vortex Blower.	Touching any of the rotating parts during operation can lead to personal injury.
If a power loss occurs, turn off the power supply.	Turning off the power supply prevents personal injury.
Do not touch the Vortex Blower during operation, as excessive heat is generated.	Touching the hot Vortex Blower can lead to personal injury and burns.
Do not touch the Vortex Blower if the power supply is still **ON**. This applies even if the Vortex Blower is stopped.	The Vortex Blower may suddenly start, resulting in an personal injury or electric shock.

⚠ WARNING

MAINTENANCE & INSPECTION

Concern/Alarm	Possible Consequences
Connect the power supply cable correctly.	**If the power supply is installed incorrectly, electric shock or fire to the machinery can occur.**
Do not touch the terminals during measurement of the motor insulation resistance.	**Touching the terminals can lead to electric shock.**
Do not touch the Vortex Blower during operation, as excessive heat is generated.	**Touching the hot Vortex Blower can lead to personal injury and burns.**
Perform daily inspection of the Vortex Blower.	**Failure to perform daily inspection can lead to damage the Voltex Blower.**

REPAIR

Concern/Alarm	Possible Consequences
Properly trained personnel should perform all repairs of the Vortex Blower.	**Utilizing improperly trained personnel can lead to personal injury, electric shock and fire to the machinery.**
Turn off the power supply before performing any service work to the Vortex Blower.	**Turning off the power supply prevents personal injury.**

DISPOSAL

Concern/Alarm	Possible Consequences
Do not just discard a replaced Vortex Blower.	**The Vortex Blower should be processed and disposed of as general industrial waste.**

2. PRE-INSTALLATION PROCEDURE

After Receipt of the Vortex Blower

1. Check the nameplate to confirm that the Vortex Blower that was ordered is the same as the Vortex Blower that was received.
2. Inspect the Vortex Blower to verify that there has been no damage made during transportation.
3. Insert a rod through the end cover hole and gently rotate the outer fan to confirm that the outer fan rotates smoothly.
4. Review and confirm that the planned conditions are satisfactory.

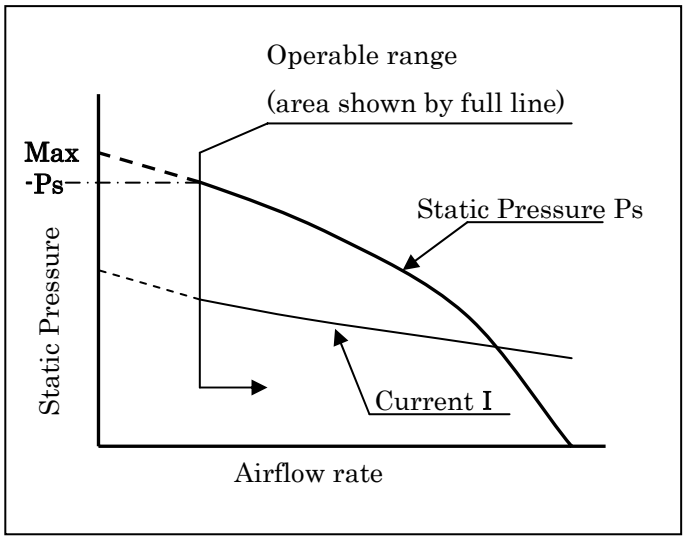
Do Not Use the Vortex Blower under the Following Circumstances:

1. Environmental Conditions (Do not use Vortex Blower if the requirements below are not met)
    a. Ambient Temperature = -4˚ F to 104˚ F (-20˚C to 40˚C)
    b. Relative Humidity = 90% or less
    c. Indoor Use

Do use the Vortex Blower near any corrosive liquids, corrosive gases, and any inflammable or explosive gases. **(see page 4)**

2. High Starting Frequency
    a. High starting frequency will lead to motor damage. **(NOTE: The permissible starting frequency varies depending on the operating conditions. Please contact the local Hitachi distributor for more details)**.

3. Operable Range (Do not use the Vortex Blower if scheduled performance is not within the operable range)
    a. **Please review the graph to the right.** The area enclosed by the maximum operating static pressure (**Max-Ps**) and airflow lying below the current (**I**) is the operable range. **Operating the Vortex Blower outside of the operable range can lead to damage of the ball bearings due to the rise in temperature.**



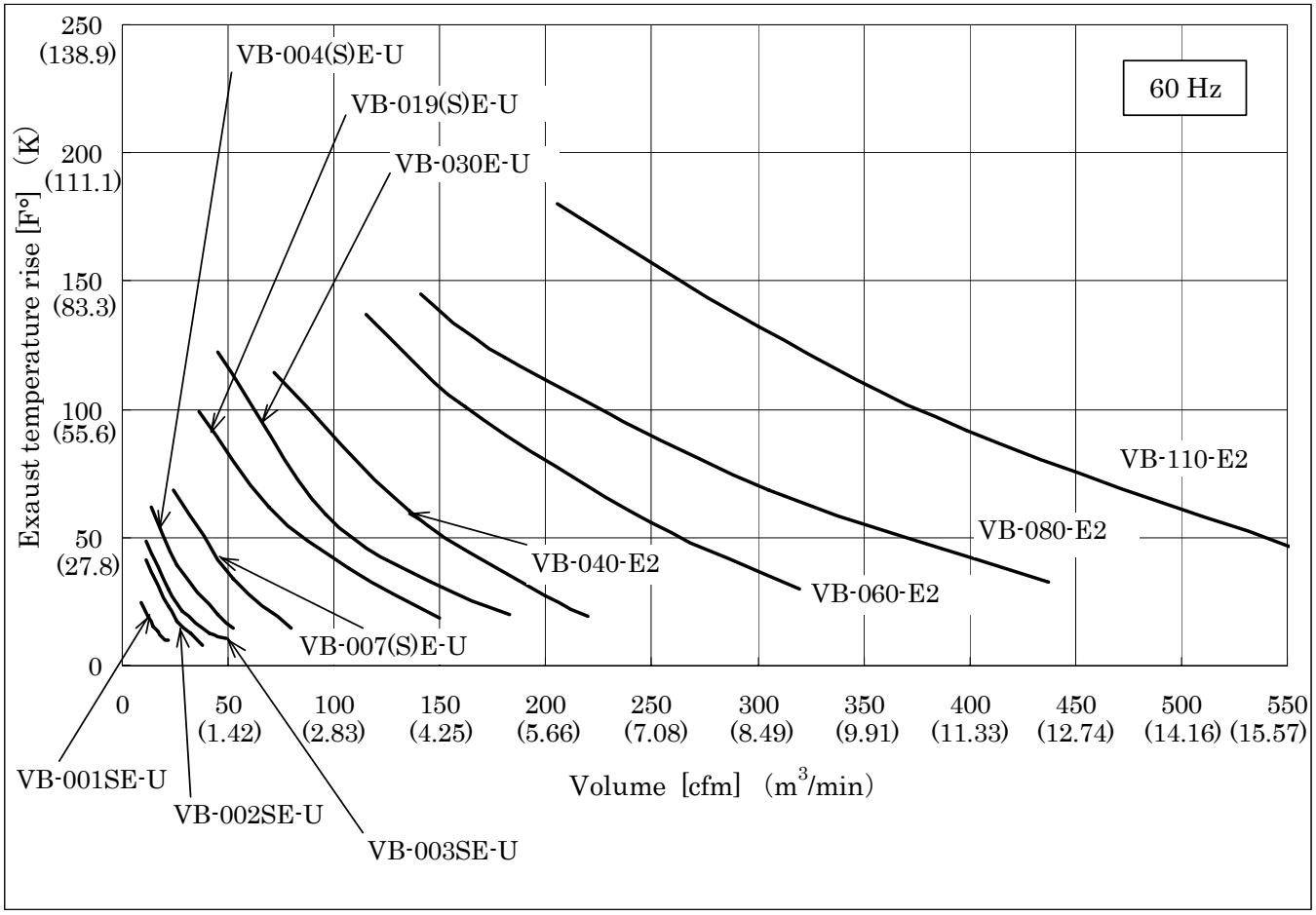
4. Rotation Direction

Verify that the rotation direction of the Vortex Blower coincides with the proper air flow direction.

5. High Discharge Air Temperature

Take precautions against high discharge air temperature especially in a small flow application. (Please see the chart below.)

Excessive Heat Rise in Discharge temperatures Chart of the Vortex Blower.



NOTES:

1. Suction air temperature must be added to calculate the exhaust temperature.
2. These temperature rise values are for reference only, as these values may change due to differing operating conditions.

3. INSTALLATION

1. Lifting the Vortex Blower

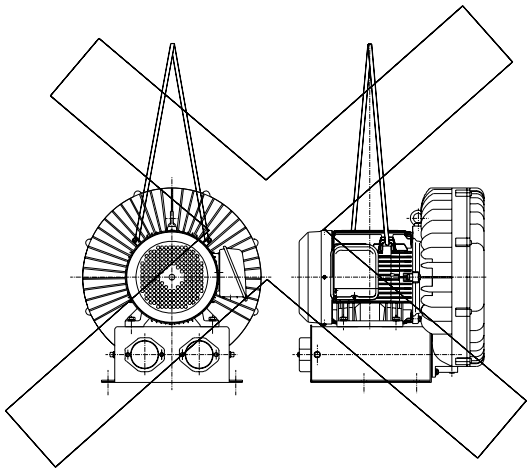
To lift the Vortex Blower by crane, please review the table and illustration below.

Vortex Blower Hangar Construction Table

Model	Motor	Blower	Proper Lifting Procedure
VB-001SE-U, VB-002SE-U, VB-002SE-U, VB-004(S)E-U, VB-007(S)E-U	No hanger	No hanger	By Hand
VB-019(S)E-U, VB-030E-U	Eyebolt on the housing	No hanger	Use eyebolt
VB-040-E2	Motor hooks on housing **Do not use to lift (See fig.3.1)**	Eyebolt on **the casing**	Use eyebolt **(See fig.3.2)**
VB-060-E2, VB-080-E2	Motor hooks on housing **Do not use to lift (See fig.3.1)**	Eyebolt on **the bracket**	Use eyebolt **(See fig.3.2)**
VB-110-E2	Motor hooks on housing **Do not use to lift (See fig.3.1)**	Eyebolt on **the bracket**	Eyebolt and lope **(See fig. 3.3)**

NOTES:

- Use the eyebolt on the motor housing for Vortex Blower model VB-019(S)E-U and VB-030E-U.
- Use the eyebolt on the blower casing for Vortex Blower model VB-040-E2.
- Use the eyebolt on the bracket for Vortex Blower model VB-060-E2 to VB-110-E2.
- **Do not use the motor hooks constructed on the motor housing. This motor hooks can break and cause damage to the Vortex Blower.**



Do not use the motor hooks.

Fig.3.1 Strictly Prohibited

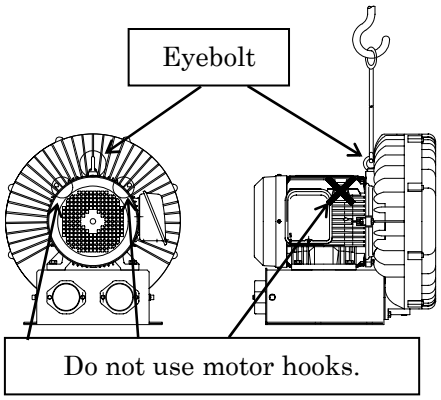


Fig.3.2 VB-040 to 080-E2

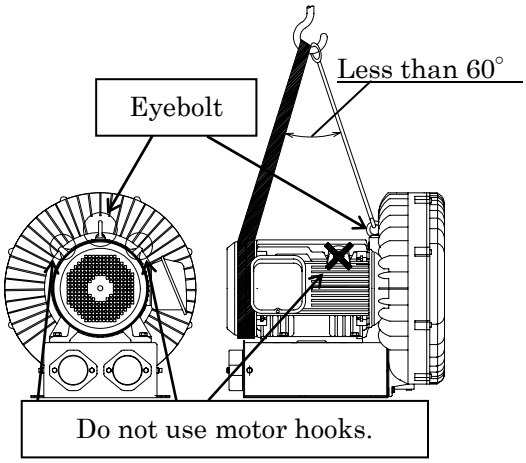
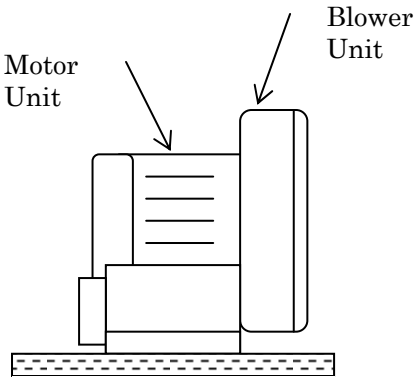


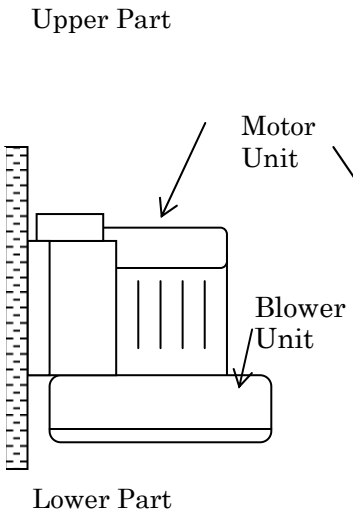
fig.3.3 VB-110-E2

2. Installation Direction

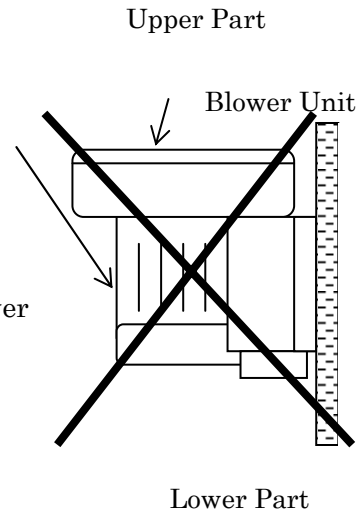
- In order to keep the shaft of the Vortex Blower level, mount the Vortex Blower horizontally **(see Horizontal Installation below)**.
- Wall or upright installation is possible for models VB-019(S)-E-U or smaller. In these instances, verify that blower unit faces downward **(see Vertical Installation I below)**.
  Do not perform vertical installation VB-030E-U or larger.
- Do not perform vertical installation as shown in **Vertical Installation II**.



Horizontal Installation



Vertical Installation I
(Do not perform this installation on VB-030E-U and larger)

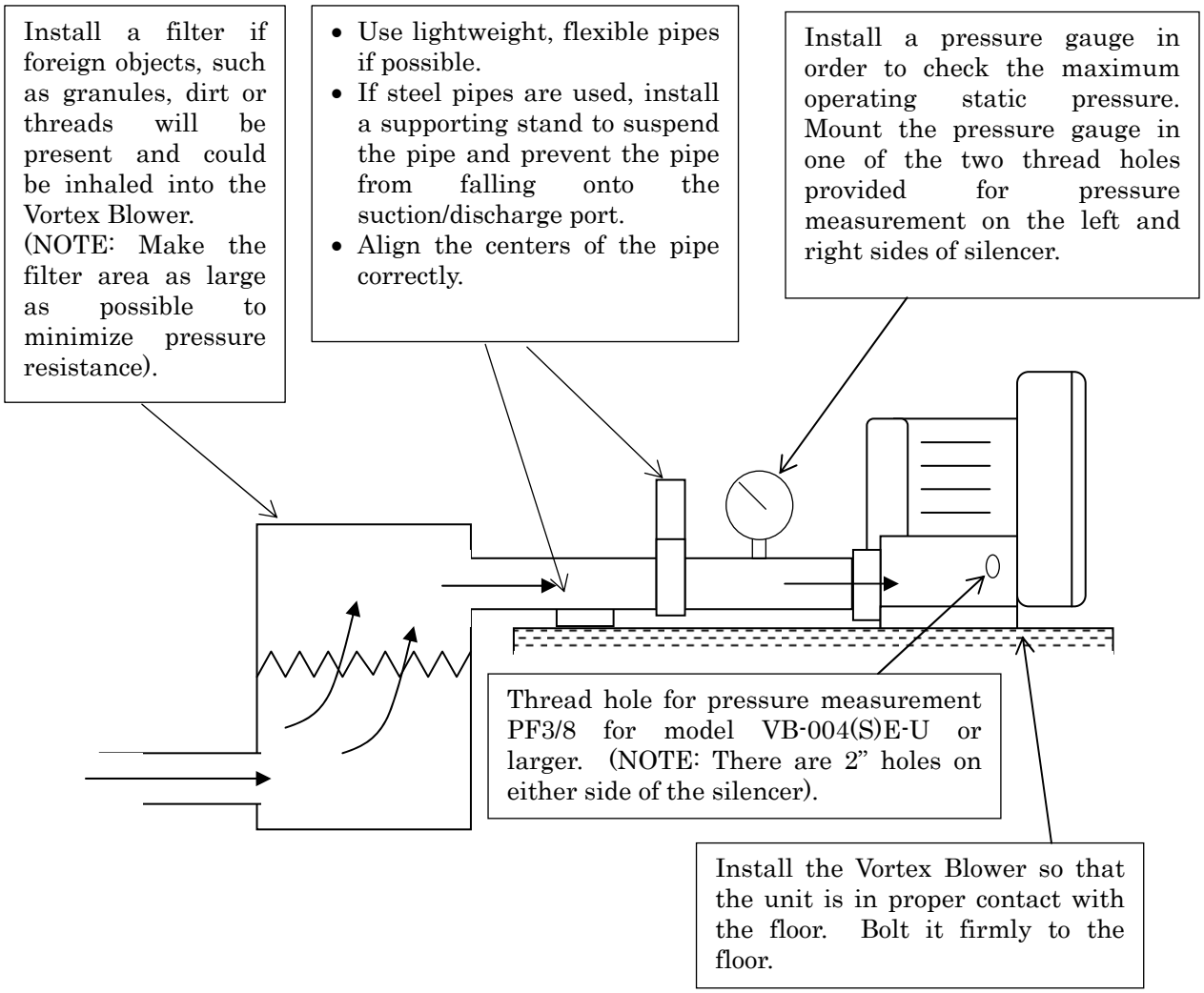


Vertical Installation II

3. Installation Location

- Installation of the Vortex Blower should **be indoors**.

4. Installation Piping



Flange Connection

(a) Models; VB-001SE-U to 003SE-U

The flange size of Vortex Blower is shown on the table to the right. Please see the illustration below **(Fig. 3.4)** detailing how to properly connect the hose to the Vortex Blower.

Flange Connection Sizes

MODEL	φA
VB-001SE-U	φ1 inn. (φ25.5mm)
VB-002SE-U	φ1 1/4 inn. (φ32.5mm)
VB-003SE-U	φ1 1/2 inn. (φ40.5mm)

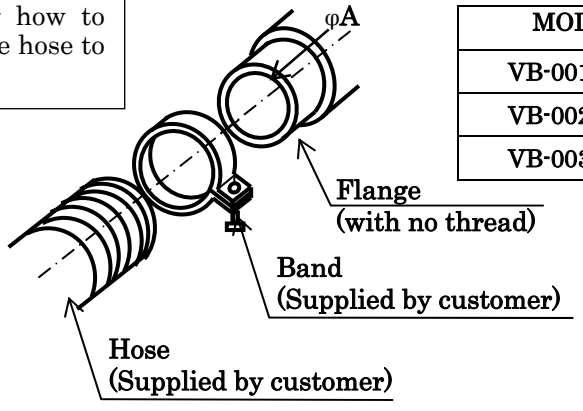


Fig. 3.4 Pipe connection

(b) Models; VB-004(S)E-U to 110-E2

The flange size of Vortex Blower is shown on the table below. Please see the illustration to the right **(Fig. 3.5)** detailing how to properly connect the thread pipe to the Vortex Blower. Inspect for any leaks after installation.

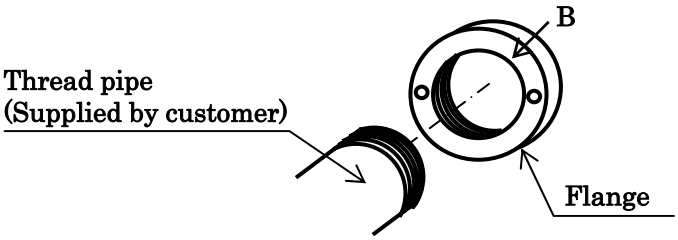


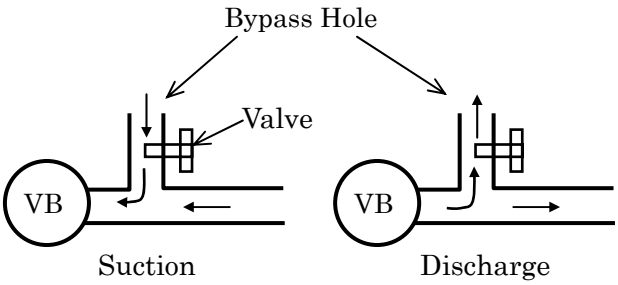
Fig. 3.5 Pipe connection

Flange Connection Sizes

MODEL	B	MODEL	B
VB-004(S)E-U	NPSC 1 1/4	**VB-040-E2**	NPSC 2
VB-007(S)E-U	NPSC 1 1/2	**VB-060-E2**	NPSC2 1/2
VB-019(S)E-U	NPSC 1 1/2	**VB-080-E2**	NPSC 3
VB-030E-U	NPSC 2	**VB-110-E2**	NPSC 3

5. Bypass Hole Installation

For an application where the Vortex Blower may be operated in a small airflow range outside the operable range, provide a bypass hole near the suction or discharge port of the Vortex Blower **(see illustration to the right)**. This enables the Vortex Blower to operate within the operable range by adjusting the valve in the bypass hole.



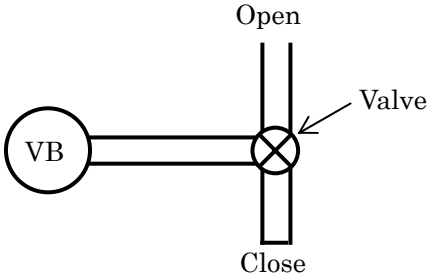
6. Changeover Valve Installation

In the event that the starting frequency of the Vortex Blower is too high, the motor temperature will rise due to the starting current. The starting torque will cause a developing clearance in the tolerances between the impeller and the shaft, **which can lead to motor burnout or impeller contact (this will affect the life of the ball bearing)**.

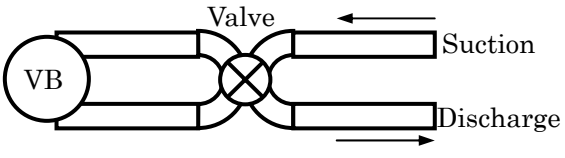
During unavoidable intermittent operation, a changeover valve system can be installed to prevent this event from occurring **(see the illustrations below)**.

To operate the Vortex Blower without the changeover valve system, please contact the local Hitachi distributor.

Intermittent air requirements



Intermittent suction or discharge requirements



4. WIRING

1. Be sure to use the proper wiring equipment and tools. Follow the electrical equipment standards, internal wiring regulations and regulations of the local power utilities company.
   All wiring must conform to local and national electric codes.
   Please contact a certified electrician.
2. Properly ground (**Class 3 ground**) the equipment. A ground terminal is provided in the terminal box.
3. For long wiring distances, inspect the voltage to verify that there are no large **voltage drops**.
   Be sure to use a larger wire gage if power line length exceeds 66 ft. (20m).
4. In the case that an inverter is utilized with the power supply of the Vortex Blower, use the recommended wire gage for the inverter. (NOTE: An inverter can only be applied to 3 phase model Vortex Blowers).
5. Use and install an earth leakage (ground) breaker and an electromagnetic switch (electromagnetic contactor with thermal relay) as protection for the Vortex Blower.
6. Choose the capacity of the earth leakage (ground) breaker, after taking into consideration the power supply and wiring specifications of the Vortex Blower.

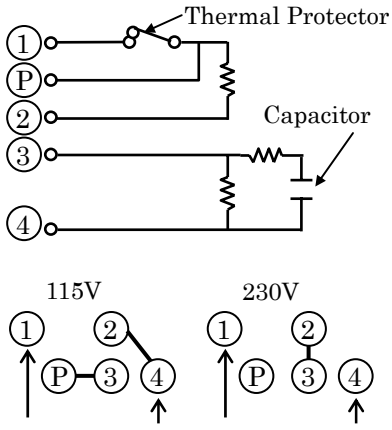
1 Phase Wiring Reference Data (60Hz)

Model No.	Motor Output		Insulation	Phase	Standard Voltage (V)	Full Load AMPS (Vacuum) (A)	Locked Rotor AMPS(A)	Minimum Wire Size
	kW	HP						
VB-001SE-U	0.1	1/8	B	1	115	1.4	4.0	AWG14
					230	0.7	2.2	
VB-002SE-U	0.2	1/4	B	1	115	2.4	8.2	AWG14
					230	1.2	4.1	
VB-003SE-U	0.3	2/5	B	1	115	3.5	10.6	AWG14
					230	1.7	5.3	
VB-004SE-U	0.4	1/2	B	1	115	6.0	20.0	AWG14
					230	3.0	10.0	
VB-007SE-U	0.75	1	B	1	115	9.4	44.0	AWG14
					230	4.7	22.0	
VB-019SE-U	1.9	2 1/2	B	1	115	19	100.0	AWG13
					230	9.5	50.0	

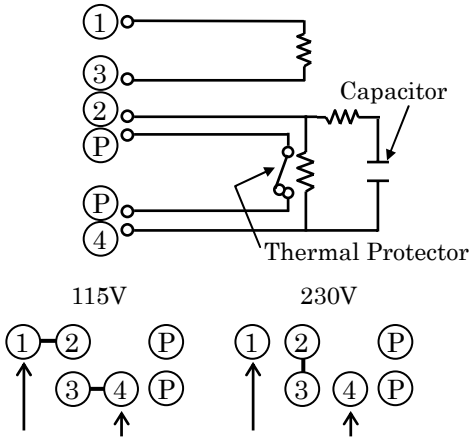
1 Phase wiring diagrams for VB-001SE-U thru VB-019SE-U

1 Phase wiring diagrams: 115 Volt and 230 Volt

VB-001SE-U and 007SE-U



VB-019SE-U



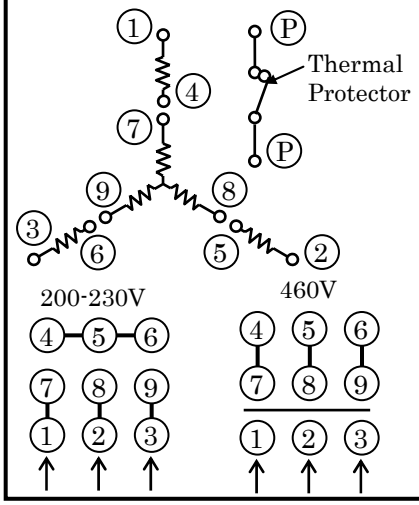
3 Phase Wiring Reference Data (60Hz)

Model No.	Motor Output		Insulation	Phase	Standard Voltage (V)	Full Load AMPS (Vacuum) (A)	Locked Rotor AMPS(A)	Minimum Wire Size
	kW	HP						
VB-004E-U	0.4	1/2	B	3	200	1.9	8.0	AWG14
					230	1.7	9.0	
					460	0.85	5.0	
VB-007E-U	0.75	1	B	3	200	3.2	15.0	AWG14
					230	3.0	17.0	
					460	1.5	9.0	
VB-019E-U	1.9	2 1/2	B	3	200	6.7	45.0	AWG14
					230	6.1	54.0	
					460	3.1	27.0	
VB-030E-U	3.0	4	B	3	200	9.1	82	AWG14
					230	8.2	97	
					460	4.1	49	
VB-040-E2	3.7	5	B	3	200	12	105	AWG9
					230	11	120	
					460	5.5	60	
VB-060-E2	7.5	10	B	3	200	22	168	AWG9
					230	20	200	
					460	10	100	
VB-080-E2	9	12	B	3	200	31	230	AWG6
					230	28	275	
					460	14	138	
VB-110-E2	15	20	B	3	200	43	375	AWG4
					230	41	445	
					460	20	223	

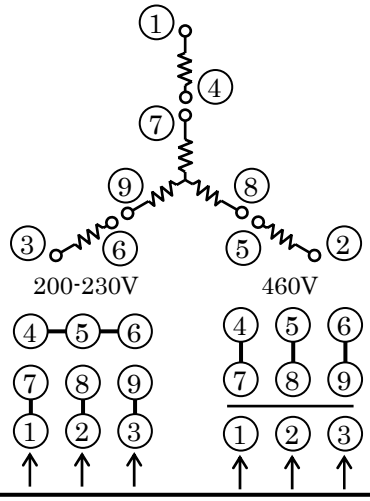
3 Phase wiring diagrams for VB-004E-U thru VB-110-E2

3 Phase wiring diagrams: 200 Volt, 230 Volt and 460 Volt

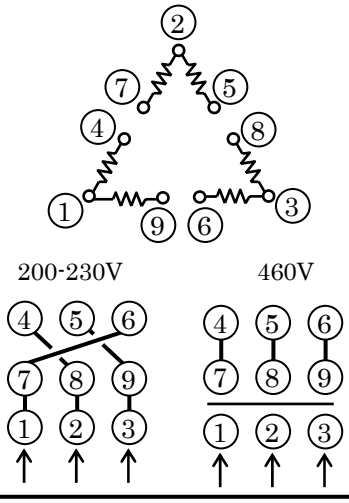
VB-004E-U thru VB-030E-U



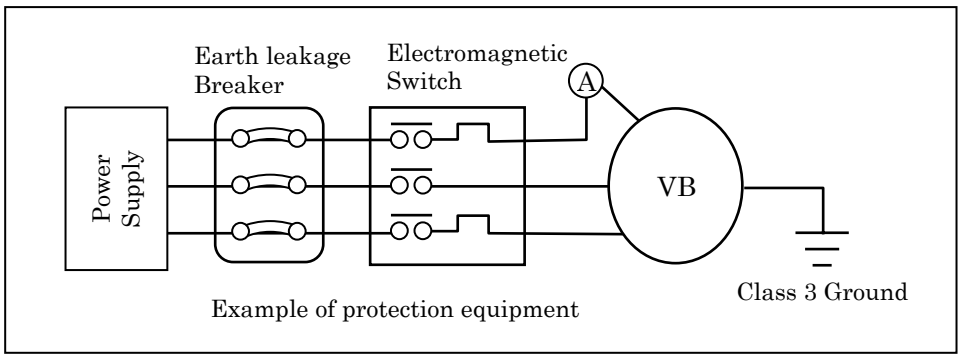
VB-040-E2



VB-060-E2 thru VB-110-E2



Motor control wiring diagram for 3 Phase models for standard connection



NOTES:

(1) Indicate the minimum wiring size range.

(2) Automatic thermal protection

In models VB-001SE-U thru VB-007SE-U, the thermal protector is in direct line with the power to the motor windings. If a thermal overload occurs, the thermal protector opens at 248°F ± 9°F (120°C ± 5°C) and power is interrupted to the motor windings. Power will be restored when the thermal protector measures 170.6°F ± 27°F (77°C ± 15°C) and the motor will resume at full speed.

(See page 14)

(3) Pilot duty thermal protection

In models VB-019SE-U, and VB-004E-U thru VB-030E-U, the thermal protector must be put in series with the electromagnetic switch. The thermal protector opens at 248°F ± 9°F (120°C ± 5°C) and closes at 170.6°F ± 27°F (77°C ± 15°C). The electromagnetic switch must be reset manually in most cases, but some electrical circuits may vary. Please review the system electrical drawings or contact a certified electrician to troubleshoot the circuit.

(See page 15)

(4) Models VB-040-E2 thru VB-110-E2 do not have an integrated thermal protector.

5. START UP

Follow the steps below during start up of the Vortex Blower.

1. **Power Supply Check**

Check: • Switch Capacity • Ground • Power Supply Connections • Contact Defect In A Switch	If current does not flow through the wire because of a break in the power supply or a contact defect in a switch, the Vortex Blower operation will single phase. **This may cause the motor burnout.**

2. **Rotation Direction Check**

Inspect the Vortex Blower for proper rotation direction as shown on the nameplate. Rotation direction can be checked using the following two (2) procedures: • Insert a rod through the hole in the end cover and rotating the outer fan. • Confirm whether the air flow of the Vortex Blower suction/discharge ports coincides with the IN or OUT directional stickers.	If the rotation direction is reversed, change the connections of two of the three power supply cables. (The rotation direction does not reverse on the 1 phase Vortex Blower.)

3. **Operating Static Pressure and Amperage Current Check**

Use a pressure gauge and ammeter to verify that the operating static pressure and amperage current are less than the maximum ratings.	Provide a bypass hole that will allow air to escape if the static pressure is greater than the maximum operating static pressure.

4. **Operating Conditions Check**

Inspect: • Is there an unbalanced voltage on the power supply? • Is there excessive vibration or noise?	• Current unbalance: Less than ± 5% • Voltage fluctuation: Less than ± 10% **If these values are not within the operating ranges, the Vortex Blower motor may fail.**

6. OPERATION AND DAILY INSPECTION

OPERATION

1. Continuous Operation Limitations
   - Continuous operation should be maintained on or within the solid line of the performance curve.
   - Maximum operating pressure is indicated on the Vortex Blower nameplate.
   - Check the maximum operating pressure by using a pressure gauge.
   - For continuous operation at low air volume (close to zero (0) volume or on the dotted portion of performance curve), provide a bypass hole in the piping and operate at a pressure lower than maximum operating pressure.
2. Temperature Rise
   - The motor is a NEMA class B insulation system.
   - Maximum winding temperature is 266°F (130°C).
   - If the thermal protector, or thermal relay, activates due to an excessive motor temperature rise to the motor, the following items should be researched:
     - Vortex Blower has a phase unbalance (must be within than ±5%).
     - Vortex Blower has a voltage fluctuation (must be within than ±10% of the rated voltage).
     - Vortex Blower is operating in a dusty environment that may impair impeller performance.
     - Vortex Blower's operating pressure is higher than the maximum operating pressure.
     - Vortex Blower is operating at no flow or on the dotted portion of performance curve
     - Vortex Blower has single phased (this only applies with a 3 phase motor)

DAILY INSPECTION

1. Verify that the operating static pressure is below the maximum operating static pressure using a pressure gauge.
2. Verify that the amperage current is below the maximum amperage current using an ammeter.
3. Inspect for excessive vibration and noise.
   - Vibration in the motor unit should be less than 40μm (double amplitude).
   - Vibration in the blower unit should be less than 100μm (double amplitude).
4. Inspect for dust accumulation on the outer surface of the motor and Vortex Blower. To prevent dust from interfering with the cooling function, clean the outer surface of the motor and Vortex Blower periodically.
5. During a power failure shut off the power supply to the Vortex Blower.
6. Turn off the power supply to the Vortex Blower before performing any disassembly work.

7. SECTION DRAWING OF VORTEX BLOWER

Models VB-001SE-U thru VB-003SE-U

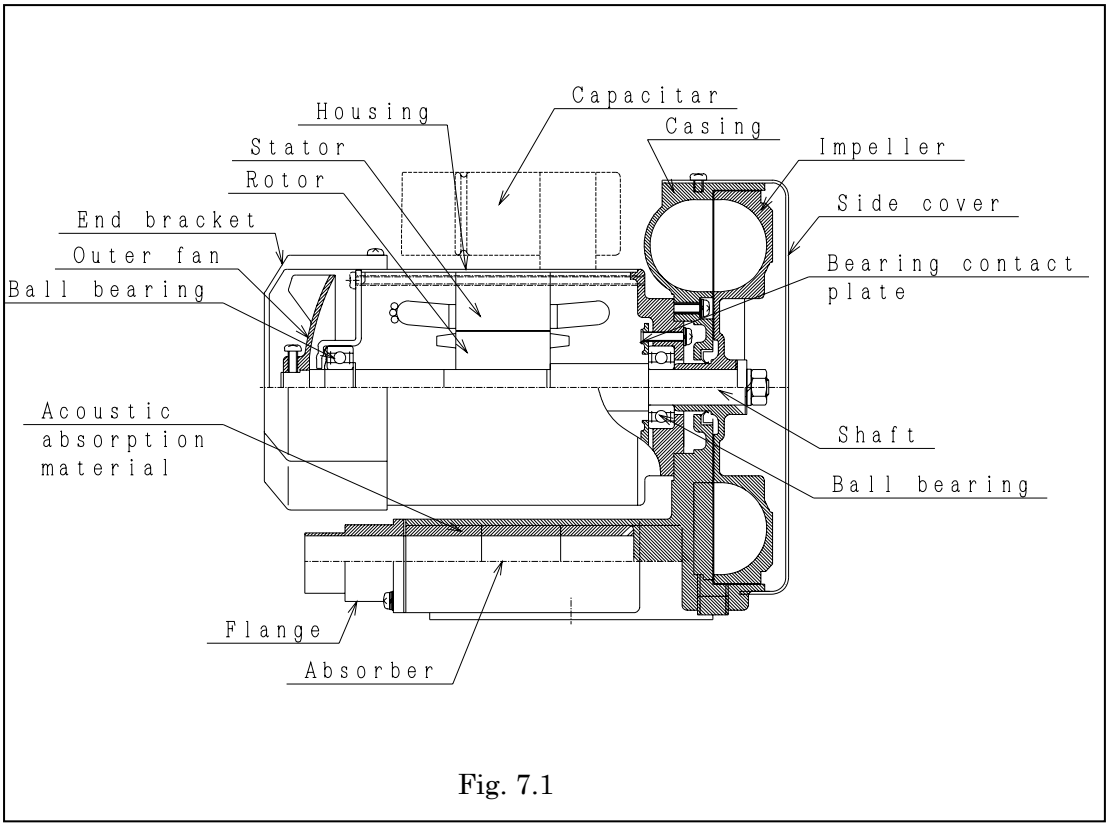


Fig. 7.1

Models VB-004E-U thru VB-040-E2

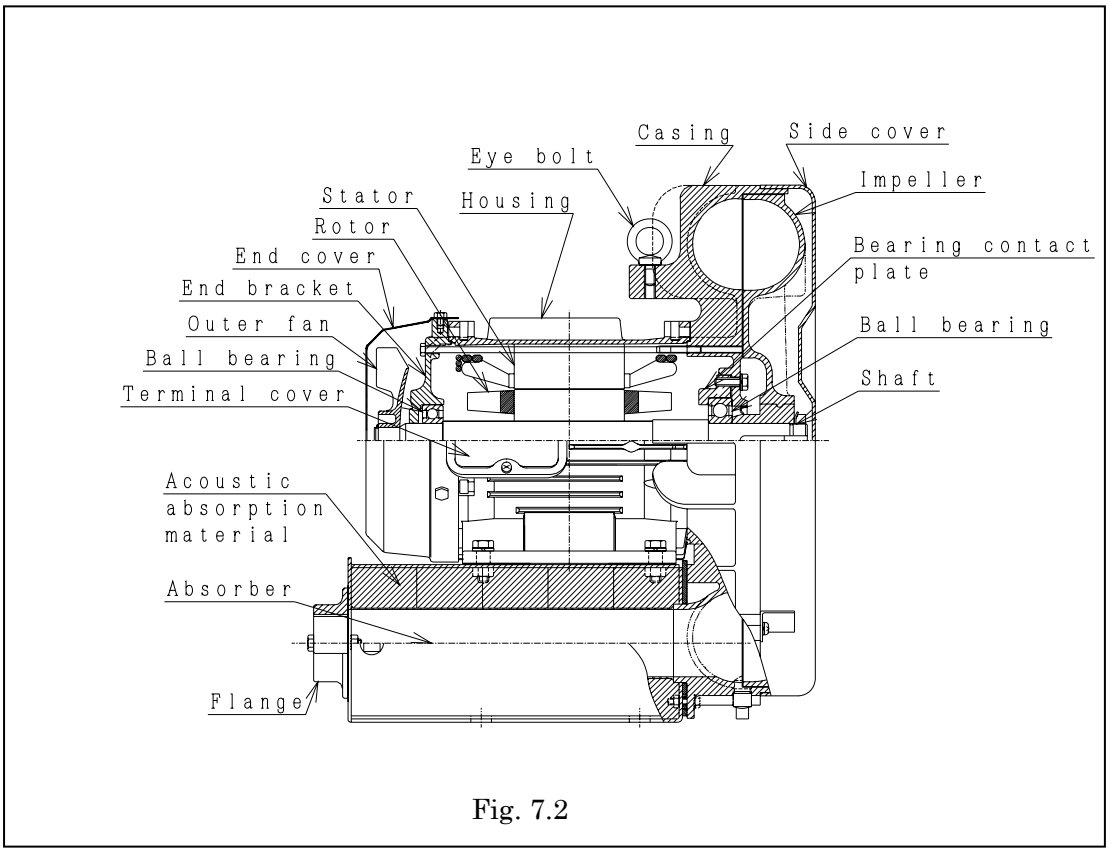


Fig. 7.2

Models VB-060-E2 thru VB-110-E2

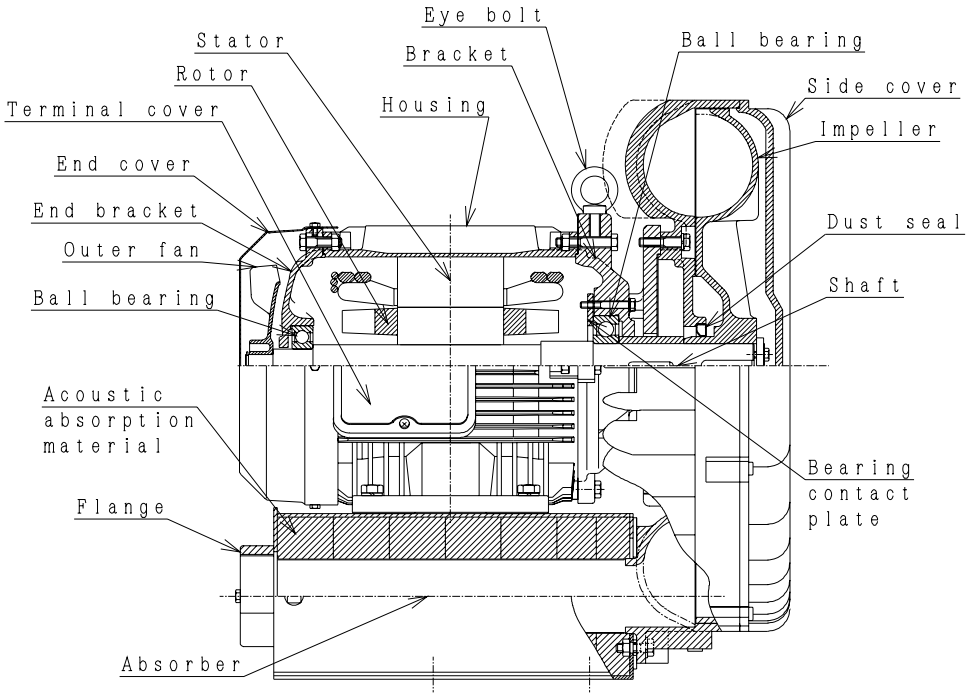


Fig. 7.3

8. TROUBLESHOOTING

Type of Problem		Cause	Corrective Action
Vortex Blower does not rotate	Power switch turns off	Terminal short circuit	Repair or replace the wiring.
		Stator coil short circuit	Contact the local Hitachi distributor for repair.
	Vortex Blower is making a droning sound	Contact defect in switch	Replace the contact or switch.
		Power supply has been damaged.	Inspect and fix the power as necessary.
		Phase failure in the power supply.	Inspect and fix the power as necessary.
		Stator coil is damaged.	Contact the local Hitachi distributor for repair.
		Damaged ball bearing has caused contact between the rotor and the stator.	Contact the local Hitachi distributor for repair.
		Foreign objects have been inhaled, causing restriction to the impeller.	Contact the local Hitachi distributor for repair.
		Impeller and the casing come in contact at the side cover.	Contact the local Hitachi distributor for repair.
	Vortex Blower makes no sound	Power supply has been damaged.	Inspect and fix the power as necessary.
		Phase failure in the power supply.	Inspect and fix the power as necessary.
		Stator coil is damaged.	Contact the local Hitachi distributor for repair.
		Contact defect in switch	Replace the contact or switch.
		Power failure	Contact the local power utilities company.
		Thermal protector failure	Check the thermal protector and verify that it is not actuated. Turn off the power supply, fix the problem and restart the Vortex Blower after the motor has cooled down.

	Type of Problem	Cause	Corrective Action
Vortex Blower rotates	Electromagnetic switch turns off	Capacity of the electromagnetic switch is inadequate	Correct or replace with a properly sized the electromagnetic switch.
	Motor has overheated	Voltage has dropped or become unbalanced	Contact the local power utilities company.
		Foreign objects have been inhaled, causing restriction to the impeller.	Contact the local Hitachi distributor for repair.
		Ambient temperature in the installation room is excessively high.	Improve the ventilation to the room to lower the ambient temperature.
	Vortex Blower is making a droning sound	Stator coil short circuit	Contact the local Hitachi distributor for repair.
		Improper gap spacing between the stator and the coil.	Contact the local Hitachi distributor for repair.
	Vortex Blower is making unusual or excessive noise	If the sound is *Metallic*, there may be impeller contact.	Contact the local Hitachi distributor for repair.
		If the sound is *Rumbling*, there may be damage to the ball bearing.	Contact the local Hitachi distributor for repair.
	Vortex Blower has poor airflow	There is a leak in the piping.	Firmly tighten all joints.
		There is a clog in the piping.	Inspect and remove restrictions to improve airflow.
	Rotation is reversed	Power supply connection is incorrect or backwards.	Change the connections of two of the three wires of the three-phase power supply.

Note the Vortex Blower's specifications below for future reference.

Model	VB-
Vortex Blower MFG.No.	
Installation Date	Day month year
Start Up Date	Day month year
Local Hitachi Distributor	Phone Primary Contact: