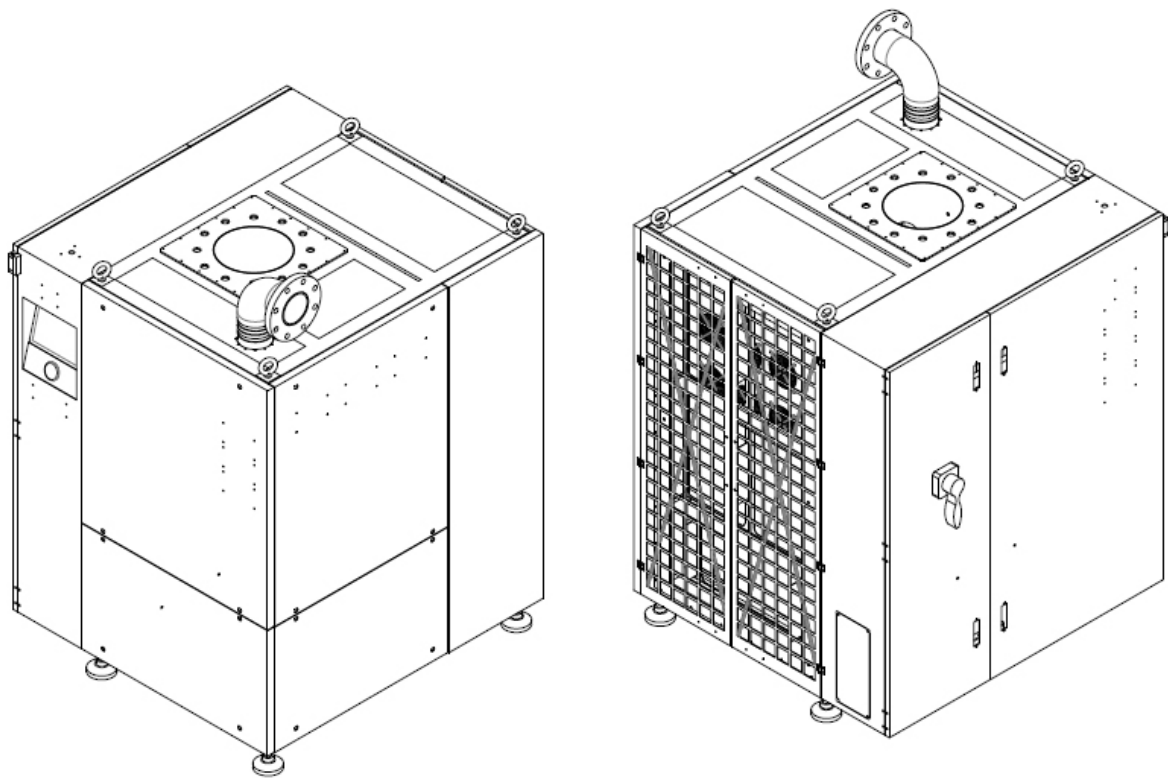




TURBO BLOWER O&M MANUAL



Touch screen version

Aerzen Turbo Co., Ltd.

OM_G4.5_MAN20131122_003_IN

Version: 20131122, November 22, 2013 released

Originator: Hasemann

Revision: 003

Blowers • Compressors • Gasmeters



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***EC-Declaration of Conformity According to
Machinery Directive 2006/42/EC
Low Voltage directive 2006/95/EC***

The Manufacturer:
AERZEN TURBO Co., Ltd.
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herewith declares:

The following products have been tested by us with the listed standards and found in compliance with the European Community Machinery Directive (MD) 2006/42/EC and Low Voltage Directive 2006/95/EC. Assessment of compliance of the product with the requirements was based on the following standards:

Standards:

EN ISO 12100:2010
EN 60204-1/AC:2010
EN 61000-6-2/AC:2005
EN 61000-6-4/A1:2011

Designation: **TURBO BLOWER**

Unit types: **AT25, AT30, AT50, AT75, AT100, AT150, AT200, AT250, AT300, AT400**

Mr. JungMin Ko, Customer Service Manager at AERZEN TURBO Co., Ltd., has been authorized to compile the documentation / technical files. If required, he will electronically submit specific documents to the national authorities.

Sejong, 22 January 2013



Signature Representative Director



Signature Technical Director

Korea Exchange Bank (KEB) Account No. 630-007462-419 • BIC: KOEXKRSE

VAT No. 317-81-22143
Comm. Registry No. 150114-0002640

Basic Function and parameter description of a Turbo Blower

The Aerzen Turbo Blower is a high efficient machine that is conveying and compressing air. It's function is characterized by a certain pressure rise and a certain volume flow range. It's used to supply compressed air to waste water treatment plants and for other applications.

It consist of a turbomachinery part, an electric motor, an inverter and a controller. All this components are arranged in a closed and noise insulated package. The fresh air is sucked through a filter in the package by the rotating impeller of the turbomachine. The impeller is driven by the high speed electric PM motor. The electric power has to be connected to the package and it's converted and inverted by the vfd to supply the motor with AC current. The controller is operating the vfd and the connection to the user is done by a HMI or a connection to the central controlling unit via Internet.

The compressed air leaves the package through a flange on top of the blower that should be connected via a flexible joint and a check valve to the user piping system.

The cooling air is discharged through an elbow on top of the blower and can be used in a separate piping system as required.

The blower package should always kept closed. Opening is only allowed by special service personal after switching of the main circuit breaker. Any manipulation of the parts inside, disassembly or change of the settings is only allowed by special educated personal.

The blower and it's parts should only be used for conveying air as described in this text and in the owners manual. The use of other gases is not allowed.

The blower cannot convey liquids and solids and chaffing of parts is also impossible. This will destroy the blower and will impact persons.

If you have any problems with the blower, please call the Aerzen Turbo Service.

Preface

This manual contains essential information related to the installation, operation, and maintenance of the turbo blowers manufactured by Aerzen Turbo Co., Ltd. This manual does not contain complete details of every variation in equipment.

Carefully read this manual before installing and operating the equipment. Following the instructions in this manual can prevent potential dangerous situations during operation and maintenance.

If you have any further questions or need additional technical assistance, please contact your nearest Aerzen Turbo Co., Ltd. representative.

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1. Introduction

1.1. General Articles

Aerzen Turbo Co., Ltd. vouches for the quality of their products and are responsible for any defects in the product that occur within 24 months of delivery. If the period of warranty specified is other than 24-months it may have priority.

1.1.1. Warranty

Aerzen Turbo Co., Ltd. will repair defective products at no cost to the owner within the term of the warranty. Damage or defects resulting from improper handling, storage, maintenance, operation, or damage resulting from practices that do not follow the operations and maintenance manual will be the responsibility of the owner.

1.1.2. Limitation of Liability

Aerzen Turbo Co., Ltd. is responsible only for defects of the products. Aerzen is not responsible for the secondary loss caused from the defects of any of the products.

1.1.3. Applicable Models

The content of this manual is applicable to all of Aerzen Turbo Co., Ltd. blowers G4.5.

1.1.4. Unacceptable Operating Practices

- ➡ Starting and stopping the blower without first operating in unloaded mode



allowing the blower motor to cool down.

- Stopping the blower by pushing the Emergency Stop button under normal operating conditions.
- Exerting static or dynamic forces onto the blower discharge flange and thus also the discharge cones.
- Operation in improperly ventilated areas.
- Operation with pressure spikes causing the blower to go into surge mode and shut down without unloading and cooling the motor off.
- Operating with unacceptable voltages, voltage fluctuations, and residual harmonics in the power supply.
- Operation with incorrect and / or improper maintained air filters or without air filters
- Operation with removed sound enclosure panels (will affect or completely void the warranty)
- Operation below minimum and above maximum blower speed
- Operation with too much pressure loss on motor and / or variable speed drive cooling ducts
- Operation without that the customer pipe work is properly support under all operating conditions
- Operation with any other medium than air
- Outdoor operation without proper weather protection.
- Placing foreign objects or substances into the blower package. Do not place foreign objects or substances near the blower package or suction piping/housing where they may be pulled into the blower suction. Foreign objects and substances sucked into the high-speed impeller may cause serious damage or injury. Do not change or modify intake filters during blower operation.
- Exceeding the maximum nameplate pressure rating of the blower.
- Closing any installed main suction or discharge valves during operation. Unexpected closure of these valves may result in surge.
- Maintaining the blower during operation.

1.1.5. Recommended Operating Practices

- Quick energizing and de-energizing of the DC link voltage upon longer standstill periods.

- ➡ Operation in idle mode if the blower is being shut down more than 5 times a day.
- ➡ Always switch to unload mode prior to shut down. Suggested time period 10 minutes.
- ➡ Operation with hardwired inputs and outputs.
- ➡ Operating in Current mode is preferred.

1.1.6. Allowable Operating Frequency of Aerzen Turbo Blower

The two following operation modes are developed to protect the machine und the electric parts, as motors, VFD, IGBT's (Insulated-gate bipolar Transistor) as well as the safe discharge of capacitors.

1.1.6.1. Operation Mode START/STOP (LOAD/OFF)

Blower- Type	Starts	Time for Restart lock (t_2)
AT150	3 Starts per hour	20 min*
AT200	3 Starts per hour	20 min*
AT300	2 Starts per hour	30 min*
AT400	2 Starts per hour	30 min*
\leq AT100	3 Starts per hour	20 min*

* Higher operating frequency only after consultation with Manufacturer.

For control and protection the restart lock is necessary and the proposed times (t_2) of restart lock must be observed strictly.

The starts must be evenly spread over one hour.

1.1.6.2. Operation Mode START/IDLE/STOP (LOAD/UNLOAD/OFF)

If the Turbo Blower is started more than 12 times per day from operating mode START/STOP (LOAD/OFF), it's mandatory necessary to select the operating mode START/IDLE/ STOP. At this in the idle phase a cool down time (t_3) and after the STOP a restart lock of (t_4) is mandatory.

Blower Type	Starts per day	Cool down time (t_3)	Time for Restart lock (t_4)
AT150	12 Starts per day	120 min engine idle*	15 min*
AT200	12 Starts per day	120 min engine idle*	15 min*
AT300	10 Starts per day	150 min engine idle*	20 min*
AT400	8 Starts per day	180 min engine idle*	20 min*
\leq AT100	12 Starts per day	120 min engine idle*	15 min*

* Higher operating frequency and shorter cool down times only after consultation with Manufacturer.

For control and protection a cool down time and a restart lock is mandatory and the recommended times (t_2) and (t_3) are to be strongly maintained. The starts must be evenly spread over one day.

1.2. Specification

AERZEN		TUV NRTL US		CE	
Type					
Flow rate	m3/min	scfm	Fluid Type	AIR	
Discharge Pressure	kPa	psi			
Power	kW			HP	
Rated Voltage / Frequency	V			Hz	
Rated Current	A				
Discharge Flange					
Weight	kg			lbs	
Temp. Range	degC			degF	
Rotating Speed	krpm				
Date of Manufacture					
Serial No.					

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Figure1-1 Name Plate

The blower nameplate is located on the left side panel of the blower package. The nameplate contains data specific to the blower model.

Item	Specification	Comment
Type	Turbo blower with PM motor/air bearing/VFD	
Flow Control	By Speed variation	
Motor Drive	Inverter drive with VFD control	
Voltage / Frequency	440 V ~ 480 V, 60 Hz, 3 PHASE and 380 V ~ 400 V, 50/60 Hz, 3 PHASE	
Blow Off valve	Pneumatic or Solenoid	
Cooling	Air-cooled or Water-cooled(above 400HP)	
Vibration	Below 2 mm/s (0.08 inch/s)	
Sound Noise	78 dB ~ 84 dB	@ 1 m
Temperature	-20°C ~ +44°C (-4°F ~ +104°F)	
Humidity	~ 95 %RH	
Atmosphere	~ 101.325 kPa _A (14.7 psi _A)	

Table 1-1 General Specification

1.3 Machine Description

1.3.1. Compressor & Impeller

Impellers are made from SUS 630 by precision die-casting using the lost-wax method. The impeller blades are designed using three dimensional computational fluid dynamics numeric analysis.

1.3.2. Shaft and air foil bearing

The main motor shaft is directly connected to the impeller. Hydrodynamic air foil bearings are used to provide oil-less lubrication system for the motor shaft. Hydrodynamic forces produce a pressure gradient around the shaft resulting in a bearing system with no mechanical contact between the shaft and journal bearing. The use of air foil bearings eliminates the need for oil bearings, oil seals, oil filters, oil coolers, etc.

1.3.3. Variable frequency driver (VFD)

The variable frequency driver and permanent magnet motor combine to control the speed of impeller, which in turn controls the flow rate and/or discharge pressure.

1.3.4. PM motor

The PM (permanent magnet) motor rotates due to the electromagnetic interactions between the stator coils and the rotor, which is constructed from permanent magnets. The motor can start with only 10% of the full load current. The PM motors can operate at speeds up to 48,000 rpm and with 95% efficiencies.

1.3.5. Touch-LCD Display

The colored Touch-LCD has various functions as listed below;

- Operating data display
- Graph of machine's operating point
- Operating history which has each second and every one hour.
- The fault summary data and its error code
- Instance graphic view of each operating value.
- Operation mode set-up
- On- off control
- Communication mode set-up

1.3.6. Sensors

- Sensors for the measurement of intake/discharge temperature
- Sensor for the measurement of discharge pressure
- Sensor for the measurement of intake differential pressure
- Current sensor
- Thermal switches to protect the VFD over-heating.

1.3.7. Aux. Components

- Flexible joint assemblies
- Discharge check valves
- Stop valve

1.3.8. Option(s)

- Harmonic filter

2.1. Safety







No.	Warning and Caution Labels	Position	Comments
1	 CAUTION PROTECTIVE EARTH. Establish and maintain protective earth ground according to the operator's manual.	Left Panel: Base of blower unit near BUS BAR	PROTECTIVE EARTH Protective earth. Establish and maintain protective earth ground according to the operator's manual.
2	 WARNING ELECTRIC SHOCK HAZARD. Electric current is still alive when the machine stops. This unit is to be serviced by trained personnel only.	Left Panel: Center of power box door	ELECTRIC SHOCK HAZARD Electric shock hazard. Electric current is still alive when the machine stops. This unit is to be serviced by trained personnel only.
3	 WARNING Noise hazard. Wear approved ear protection in this area.	3 Panels: Except back panel	NOISE HAZARD Noise hazard. Wear approved ear protection in this area.
4	 WARNING HOT SURFACE. Do Not Touch. TURN OFF POWER and allow to cool before servicing.	Right Panel: Near exit of motor cooling air discharge Air collection drum (twin type)	HOT SURFACE Hot surface, Do not touch. TURN OFF POWER and allow to cool before servicing.
5	 WARNING Avoid Injury. This unit is to be serviced by trained personnel only.	Front Panel: Under LCD (or TFT)	AVOID INJURY Avoid injury. This unit is to be serviced by trained personnel only.
6	 WARNING Read and understand operator's manual and all other safety instructions before using this equipment.	Front Panel: Under LCD (or TFT)	READ OPERATORS MANUAL Read and understand operator manual and all other safety instructions before using this equipment.

Table 2-1. Warning and Caution Labels

Major warning and caution labels are shown in Table 2-1 for keeping the safety. The position of each label is shown in Figure 2-1 and Figure 2-2 for the single and twin volute blower packages respectively.

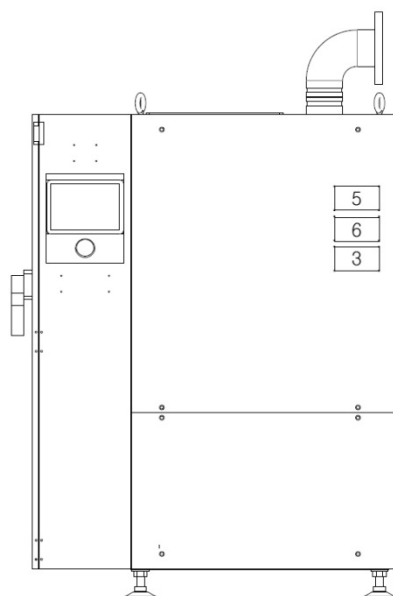


Figure 2 – 1 (a) Signs on the front side

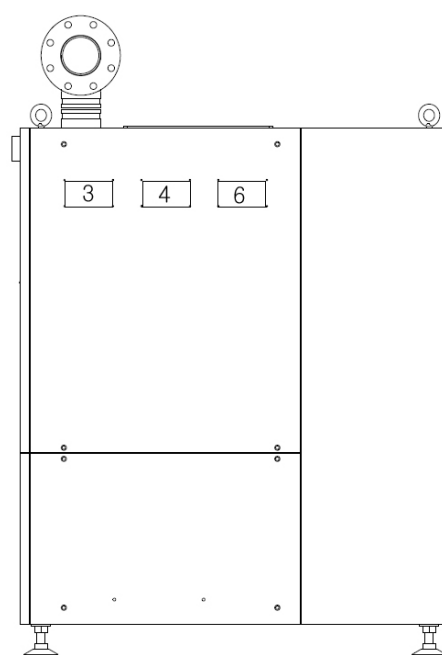


Figure 2-1 (b) Signs on the right side

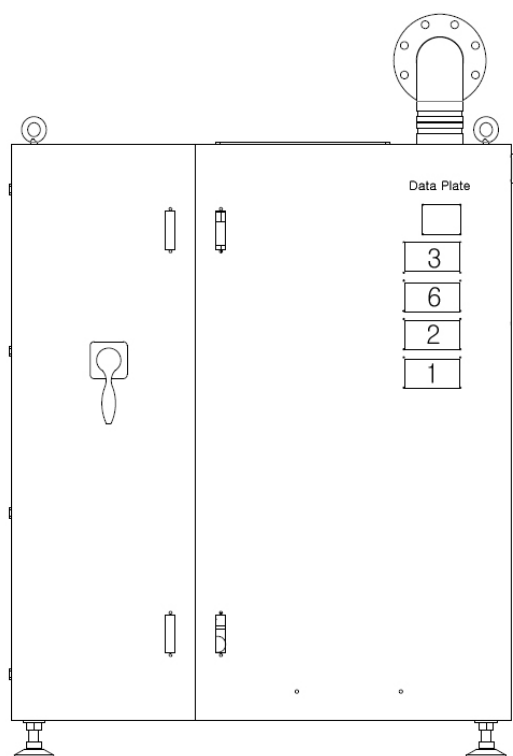



Figure 2-1 (c) Signs on the left side

	Warning	The equipment might be damaged or performance issue.
<ul style="list-style-type: none"> * Read and understand operator's manual and all other safety instructions before using this equipment. * Do not modify components or structures without authorization from Aerzen Turbo Co., Ltd.. Abnormal operation may cause serious injury or financial losses. Please consult with Aerzen technician for support and assistance. * Do not place foreign objects or substances into the blower package. Do not place foreign objects or substances near the blower package or suction piping/housing where they may be pulled into the blower suction. Foreign objects and substances sucked into the high-speed impeller may cause serious damage or injury. Do not change or modify intake filters during 		

blower operation.

- * Do not exceed the maximum nameplate pressure rating of the blower.
- * Do not close the main suction or discharge valve during operation. Unexpected closure of these valves may result in surge.
- * Do not perform any maintenance during blower operation.
- * Electric current inside the inverter is still energized for approximately 10 minutes after the blower is completely shut down. Do not attempt to access any blower panels, including filters, for a minimum of 10 minutes after complete shut down.
- * Electric power for lamps and displays at the filter panel are energized regardless of the status of the main breaker in the blower package. Risk of electric shock is present even though this breaker is in the off position.
- * Do not add unauthorized circuits to the control panel. Please contact an Aerzen Turbo Co., Ltd. technician for support and assistance.
- * All grounding should be completed in accordance with international electric standards. Use the special type 3 grounding method (Ground impedance : below 10Ω for 460V class).
- * Working on or disassembling the inverter is dangerous. Please contact a Aerzen Turbo Co., Ltd. technician for support and assistance.
- * The blower package does not meet standards for explosion proof equipment. Do not install or operate this blower in a classified space or a potentially explosive environment.
- * Noise levels may exceed 85 dB during operation. Wear protective hearing equipment while working around the blowers. Failing to use proper protective hearing equipment may expose you to noise levels that are dangerous.

Table 2-2. Important safety regulations

3. Storage

It is important to store equipment and materials in accordance with the manufacturers written instructions to prevent damage to equipment and materials prior to installation.

3.1. Storage up to 120 days

Blowers are shipped sealed in an air-tight plastic enclosure to protect the units from excessive dust and moisture. If this seal is not compromised, special means of storage is not necessary. If the seal is compromised, the products should be stored in a dust free environment where ambient temperature and humidity are controlled. Supplemental ventilation may be necessary for the electric components if the humidity is excessive.

3.2. Storage longer than 120 days

Blowers are shipped sealed in an air-tight plastic enclosure to protect the units from excessive dust and moisture. If this seal is not compromised, long term storage beyond 120 days can be accomplished by placing the equipment in a dry environment with temperatures ranging between 40 and 100 degrees F. If the seal is compromised or removed, the following guidelines should be followed:

- Store equipment in a location free from excessive dust and humidity. Cover the blower package to prevent dust from migrating and settling inside the blower package.
- Maintain the storage temperature as constant as possible. Condensation due to ambient temperature variation may result in corrosion and/or damage to electrical components.
- Store with dehydrates such as silica gel to prevent condensation.
- Install space heaters or 100 watt electric light bulbs to facilitate removal of moisture.

* Improper product storage may affect warranty durations. Please consult with your local Aerzen Turbo representatives, if you have any special storage case.

4. Installation

4.1. Inspection of the Components

Blowers and blower enclosures are shipped completely assembled, **except the clamp between scroll and diffusing cone that has to be checked and fastened after connecting the blower to the customer piping system, to make sure that there are no loads on the blower.** Components external to the blower enclosure (valves, flexible fittings, silencers, etc.) are shipped loose for installation by the contractor.

Upon receiving a shipment the owner should inspect all the components to ensure no components are missing and that no components have been damaged during shipping. If components are missing or damaged they should be noted in Table 4–1 below. Please include this table along with a brief description of the damaged or missing component and forward it to your local representative or contact the Aerzen office.

classification	Components	Missing*	Damaged**
Main body	Motor/Core Assembly, Inverter, Controller, Casing		
	Intake Filter		
	Blow-Off Valve		
	Blower-Off Valve Silencer		
Aux. element	Flexible Connection (suction and/or discharge)		
	Discharge Silencer		
	Discharge Check Valve		
	Discharge Isolation Valve		
Option	Harmonic & EMC Filter		

(* please check “√ “)

Table 4–1. Delivery Check List

4.2. Installation Location

Selecting the appropriate installation environment and equipment arrangement is important and will save both installation and maintenance costs. Equipment should be installed to provide safe and easy access for operations and

maintenance personnel.

4.2.1. The ideal location to install the blower is indoors and out of the weather where adequate lighting and space exist for operation and maintenance activities, In this atmosphere the blower package is not subjected to excessive climatic changes or dust. If the blower is installed indoors but in a dusty environment, the intake filter will require more frequent cleanings and changes. Excessive humidity, even if indoors, may also contribute to electrical and electronic component problems.

4.2.2. The blowers should not be installed in locations where the blower or the suction intake of the blower will be subjected to various pollution sources such as smokestacks, cooling towers, high temperature exhaust gases, steam, etc.

4.2.3. If the blower is installed outdoors a suitable means should be provided to protect the blower enclosure and the blower suction inlet from precipitation.

4.2.4. The blower package should be installed where adequate ventilation is available to provide an adequate fresh source of air for the blower intake (if applicable) and the blower cooling system. Reject heat from the blower is estimated at 3% of total power consumption and should be accounted for in any room ventilation system.

4.2.5. Provide suitable working space around the blower for operations and maintenance activities. Activities might include inspection, repair, assembly, and disassembly. Table 4-2 shows recommended working spaces for each blower type.

Model	Between machines	Between wall	Height
Under AT100	< 1.5m (4.9ft)	< 1m (3.3ft)	< 5m (16.4ft)
AT200	< 1.5m (4.9ft)	< 1m (3.3ft)	< 5m (16.4ft)
AT300	< 2m (6.6ft)	< 1m (3.3ft)	< 5m (16.4ft)
AT400	< 2m (6.6ft)	< 1m (3.3ft)	< 5m (16.4ft)

* Height is adjustable if the discharge piping system arranges to horizontal.

Table 4-2 Recommended ample space

4.2.6. If the blowers are to be installed above grade or on a second floor of a building appropriate access ways should be provided to get spare or replacement parts into the facility.

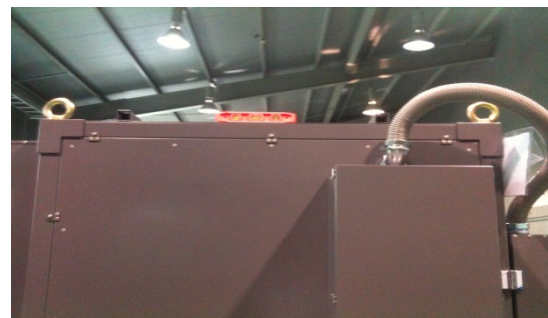
4.2.7. Install the blower on a flat, level, horizontal surface. The surface should be able to accommodate all static loads. The blowers do not impart a dynamic load to the installed base. Vibration from other devices should be effectively isolated so they do not impact the blower equipment base. Anchor bolts may be used to restrain blower movement due to external vibration or seismic activity.



Figure 4-1 Foundation



<Level Check in front view>



<Level Check in side view>

Figure 4-2. Level Check



Figure 4-3 Anchoring

4.3. Preparations for Installation

Before installation, the following items should be checked.

Place :		Date of Check :	
Model : AT		Date of Delivery :	
Classification		CHECK POINT	Results
Operating condition	Pressure	Nominal operating pressure	
	Flow rate	Nominal operating flow rate	
	Drawing	Preparation of drawings with respect to piping	
	usage	Fitness for the process	
Place	space	Enough space for inspection	
	suitability	Environmental suitability for installation	
	maintenance	Enough space for maintenance	
Electricity	power	Security for stabilized power source	
	transformer	Enough capacity for operation	
	Switching Board	Capacity of NFB(No Fuse Breaker) & power cable	
		Distance between NFB and installation place	
Piping	discharge	Status of discharge piping	
	Accessory	Status of Check valve, Flexible, silencer	
	intake	Status of intake piping (if available)	
Etc	Environmental Condition	Mechanical vibration level	
		Sound noise level	
		Amount of dust	
		Flatness of ground	
	CCR operation	REMOTE/local operation	
		Application for MCP	
	Picture	Pictures at the installation place	
	etc	The other items	

Table 4-3. Check sheet for installation.

4.4. Transportation

Products should be transported or moved using the following procedures.

4.4.1. Ensure that there are no obstacles around the installation location.

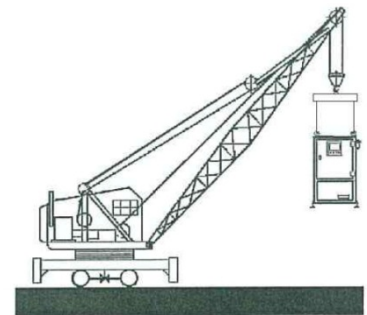
4.4.2. Lift and move the blower from underneath using either a hand pallette jack or a forklift. Take precautions to avoid mechanical shocks while moving the equipment. If using the eyebolts please make sure that there are only tractive forces and no bending forces.



Hand Palette Jack



Fork Lift



Truck Crane

Figure 4-4. Transportation

4.5. Piping

4.5.1. Line up the centerline of the discharge piping with the centerline of the blower discharge on the enclosure as shown in Figure 4-5. Verify that the height shown on the drawing agrees with the actual measured height at installation.

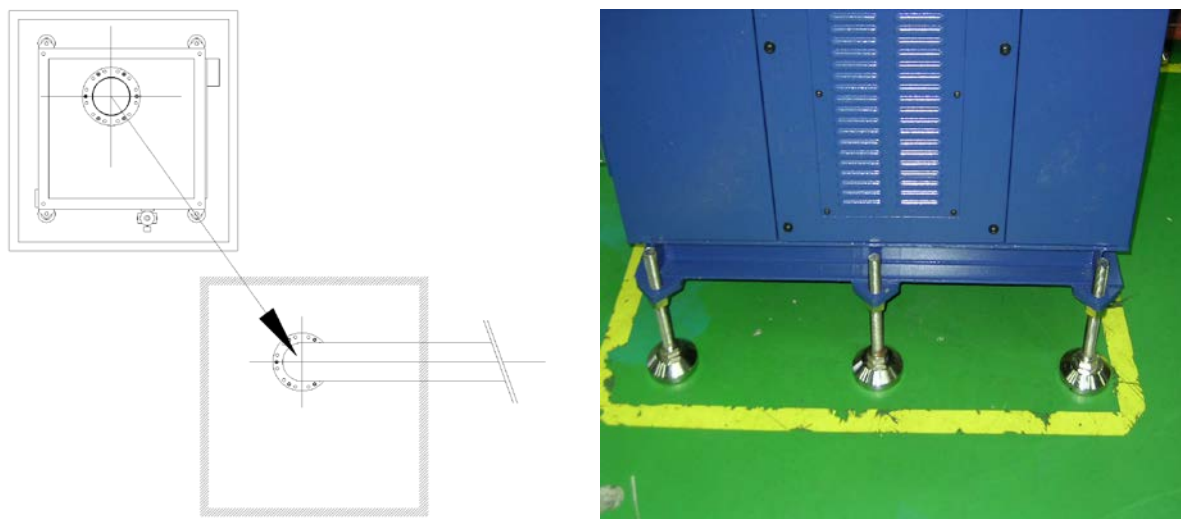


Figure 4-5. Aligning the Blower and Marking the Position

4.5.2. Rotate the blower about the discharge pipe center so as to get accurate position of the blower feet. Then adjust horizontal level by adjusting the leveling feet beneath the blower as shown in Figure 4-6.

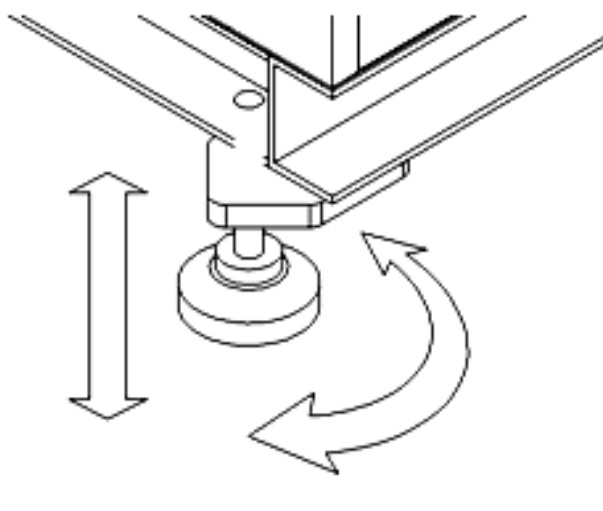


Figure 4-6. Leveling Feet

4.5.3. Discharge Piping & Motor cooling Piping

4.5.3.1. Install discharge accessories in accordance with Figure 4–7. Discharge components may include expansion joint, check valve and isolation valve. Verify gaskets are properly inserted at this time.

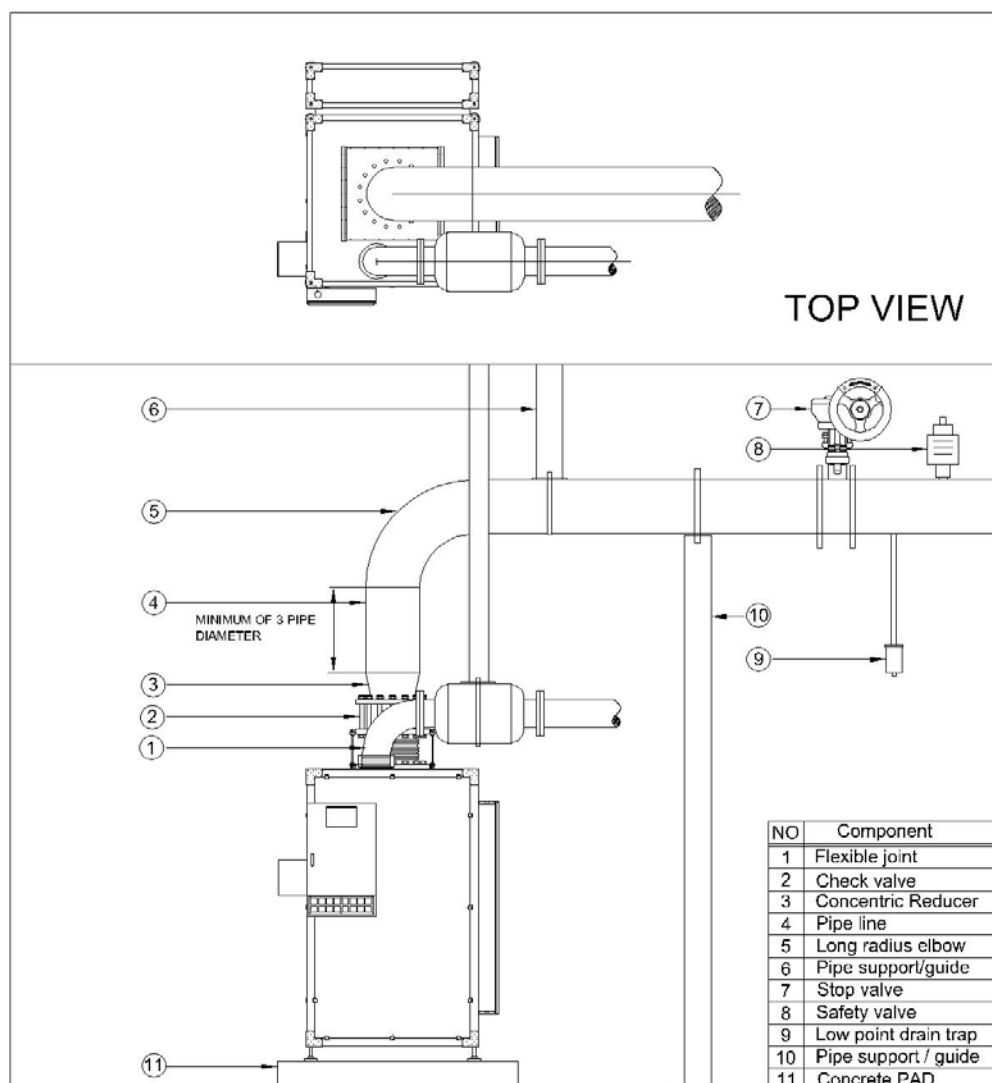


Figure 4–7. Discharge Piping Example

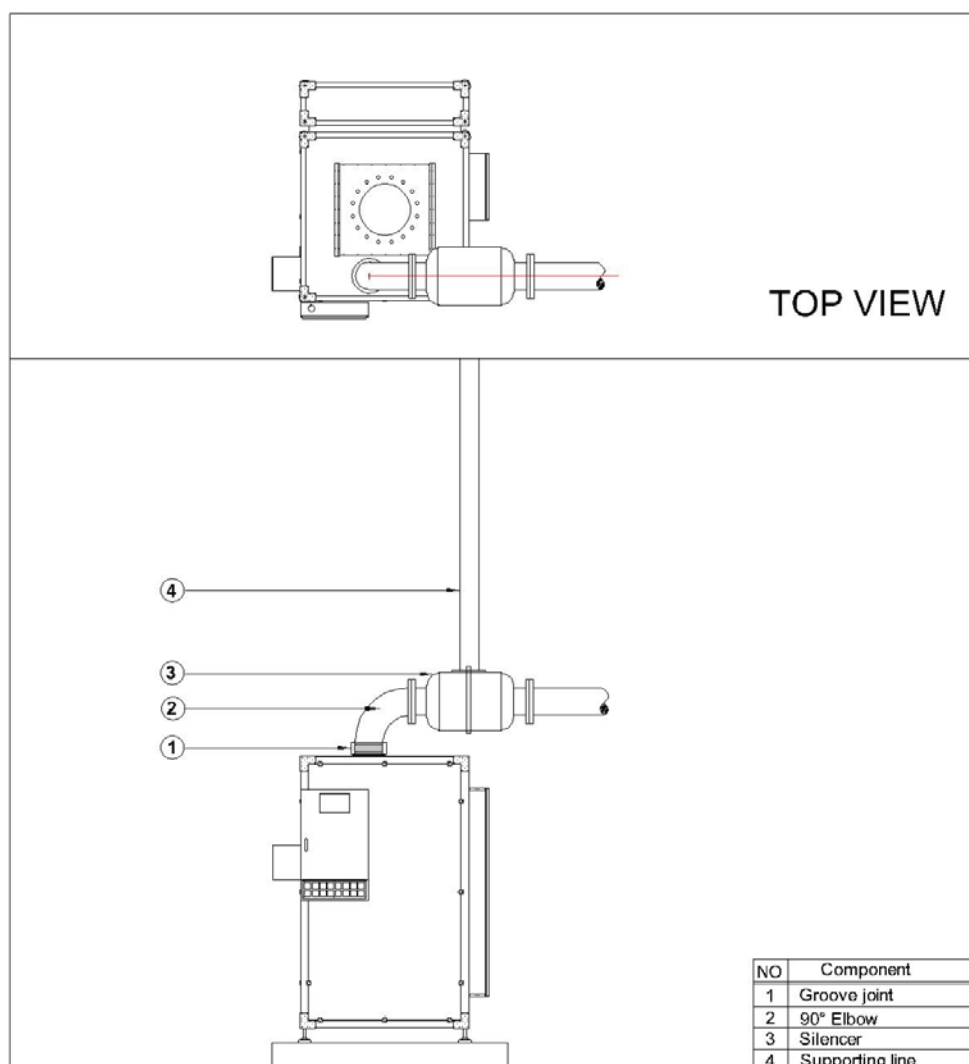


Figure 4-8. BOV & Motor cooling Piping configuration Example

4.5.3.2. Install the flexible joint directly to the blower discharge flange/adaptor. Support all piping and accessories independently from the blower. The weight of piping and accessories should not be transmitted to the blower package. After piping work is finished, check gap between Scroll and Diffusing Cone (3.5 to 5mm) and mount clamp! Don't start Blower without this clamp (clamp not pre-installed)!

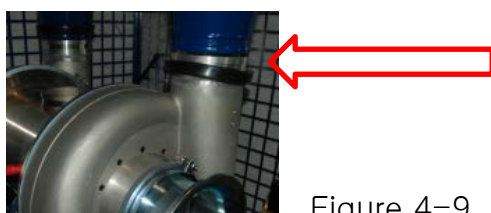


Figure 4-9. Gap between Scroll and Diffusing Cone

4.5.3.3. If possible, maintain at least 3 straight pipe diameters after the discharge check valve.

4.5.3.4. Verify the flow direction is consistent with the check valve operation. The check valve should be installed near the machine.

4.5.3.5. Install the isolation valves (stop valve) after the check valve for future maintenance.

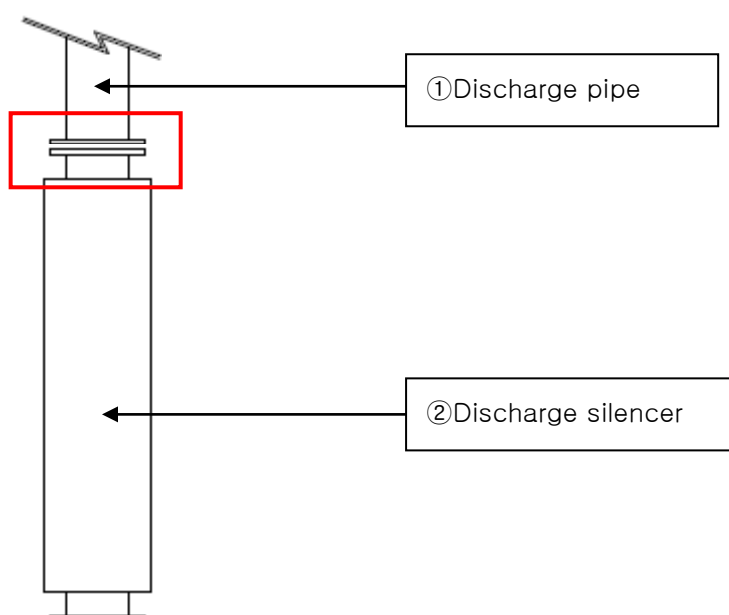


Figure 4–10. Isolation(Butterfly) Valve

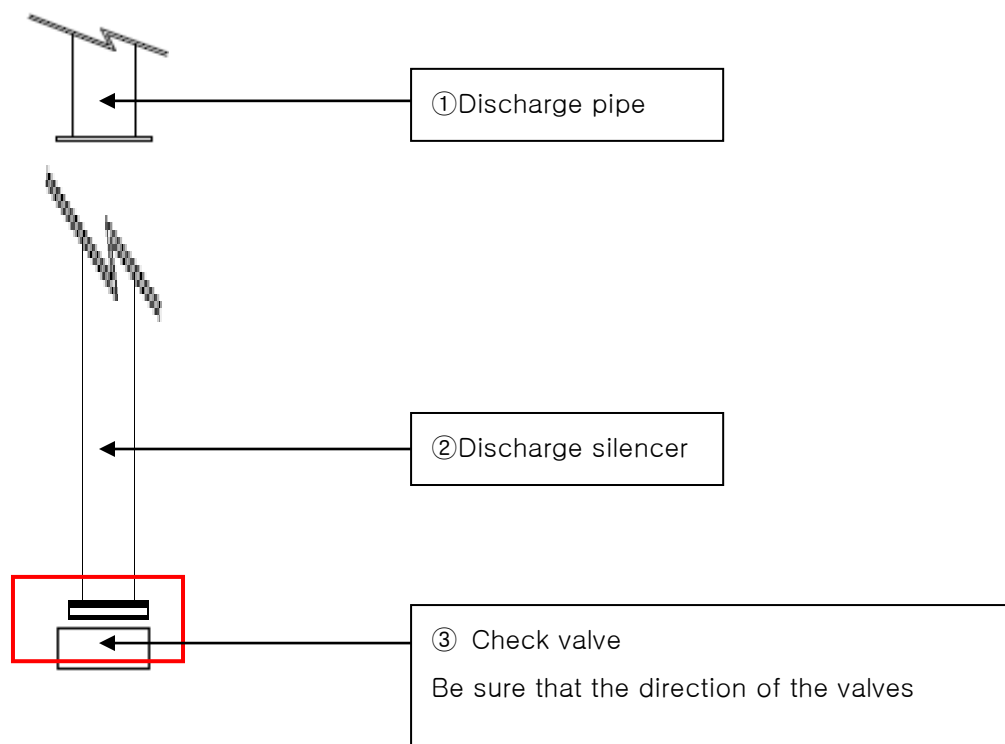
4.5.4. Piping connection

◇ Piping connection order on vertical arrangement

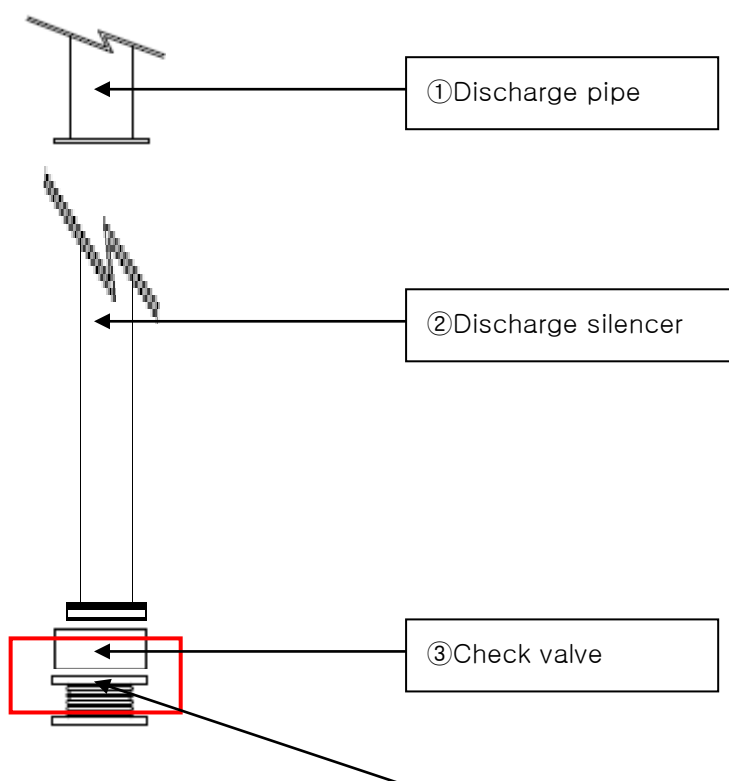
1) Connect the discharge silencer to the customer piping system.(① + ②)



2) Connect the Silencer and Check valve.(① + ② + ③)



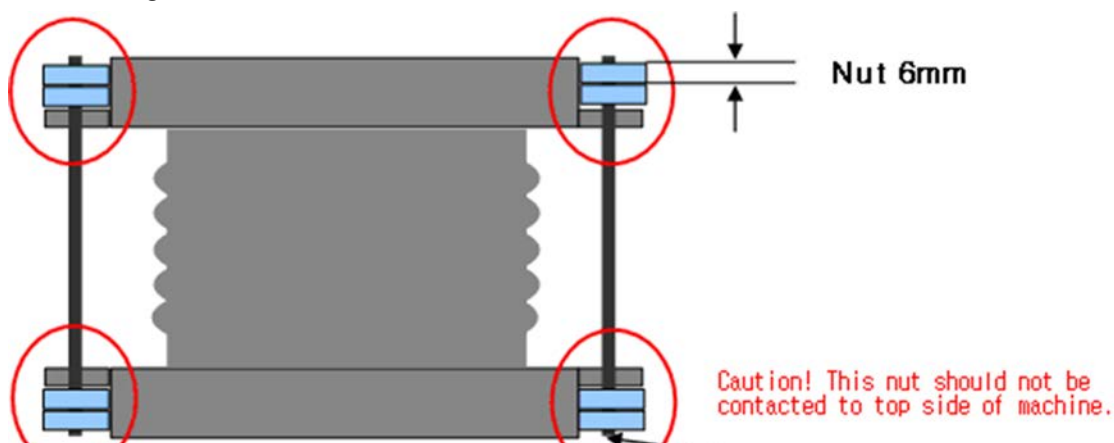
3) Connect the Check valve and Flexible joint.(① + ② + ③ + ④)



④Flexible joint

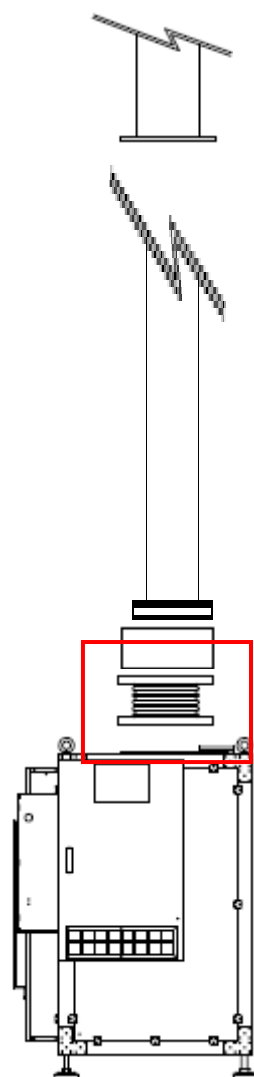
■ Flexible joint

To prevent over expansion, please put the Limiter bar every 120 degrees on the flexible joint and tight it with a six (6) mm double nut.

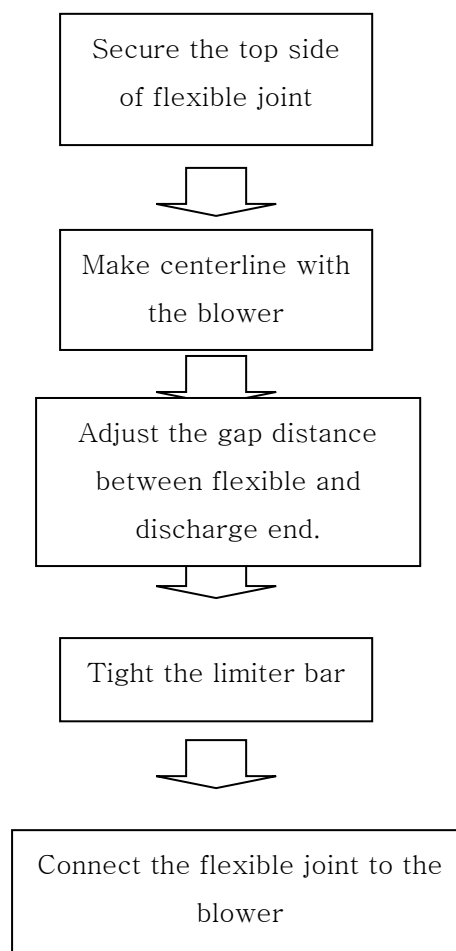


5) Connect the flexible joint to the Aerzen high speed turbo blower discharge end.

- ① First thing is to make sure the top side of flexible joint is firmly connected with the discharge check valve and its centerline should be aligned with blower's discharge end center.
- ② The gap between the bottom of flexible joint and the top discharge end of the blower is adjustable with the limiter.
- ③ Adjust this gap within 1mm on every direction between the bottom of the flexible joint and gasket placed on the discharge end of the blower. The adjustment is made by loosening the limiter nuts on the flexible joint or adjusting the blower level feet.
- ④ After adjusting the gap properly, tight the limiter wingnut and put it on double nut to prevent loosening the securing nut.
Put on the marking point on nuts to check its status.
- ⑤ Connect the bottom side of the flexible joint to the blower's discharge end.

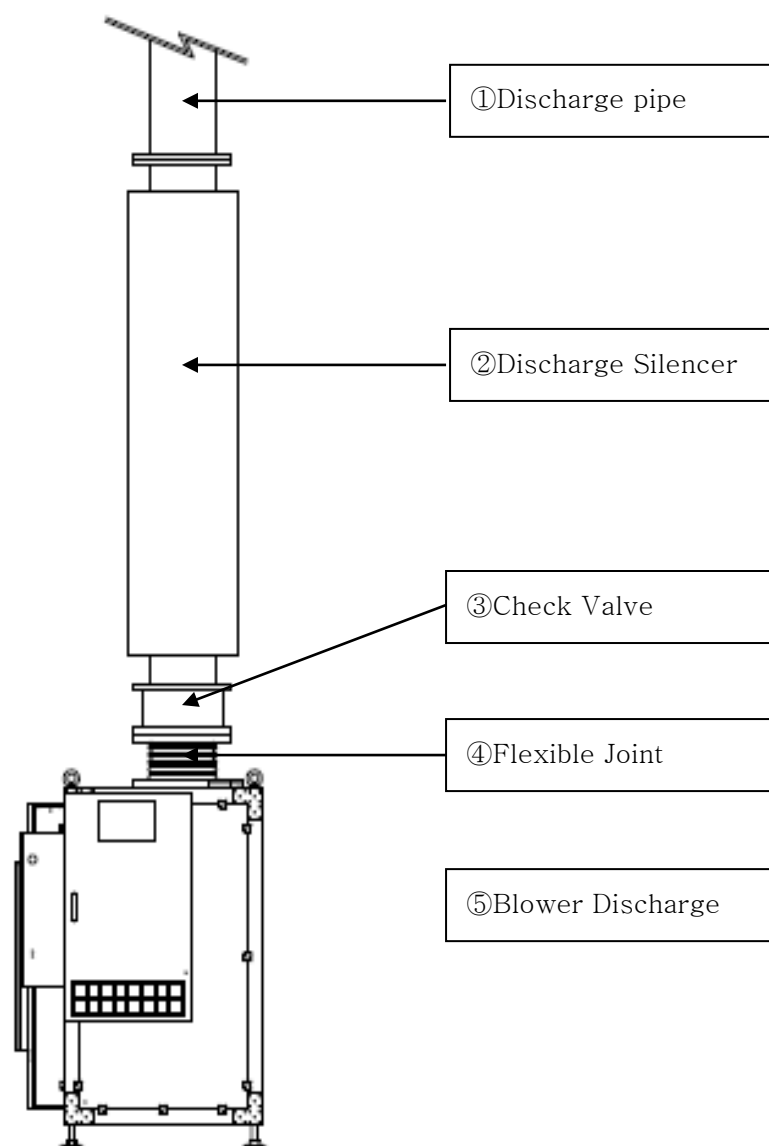


■ Flexible joint connection order



■ Make sure its connection order is as listed below;

- ① Customer's piping system -> ② Check valve -> ③ Elbow -> ④ Flexible joint ->
- ⑤ Aerzen Turbo blower discharge end.

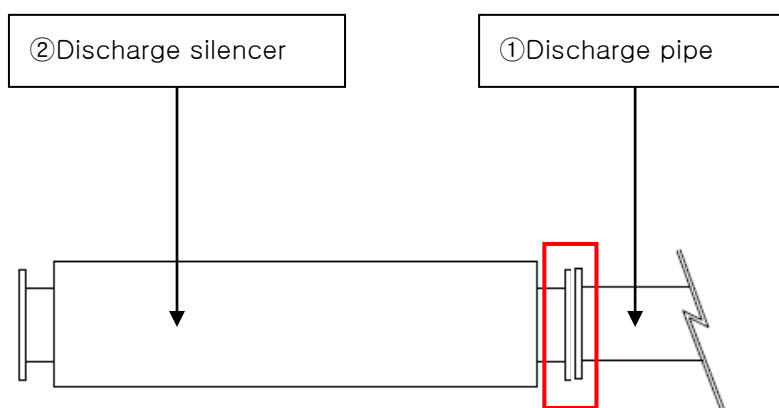


■ Caution

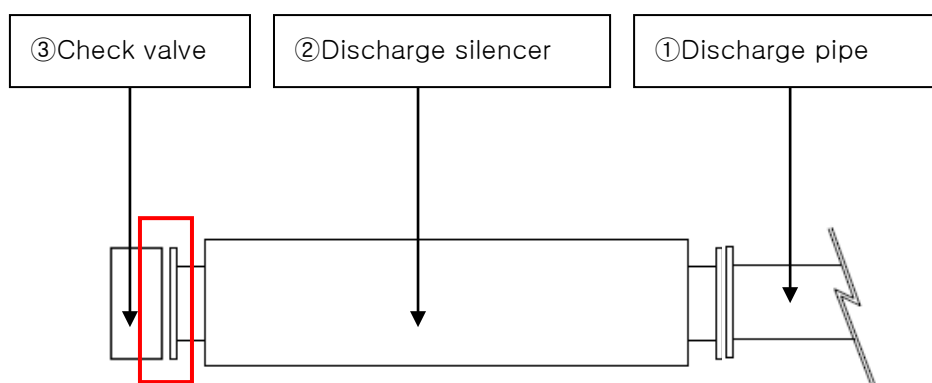
1. Make sure the piping support system is properly installed. Every discharge piping material's weights are free from the top side of the blower package including the discharge flexible joint.
2. If you have a more than 12 PSI (1 bar) machine, please do not forget to install the anchoring device.
3. A gasket is required at every flanged connection.

◇ Piping connection order on horizontal arrangement

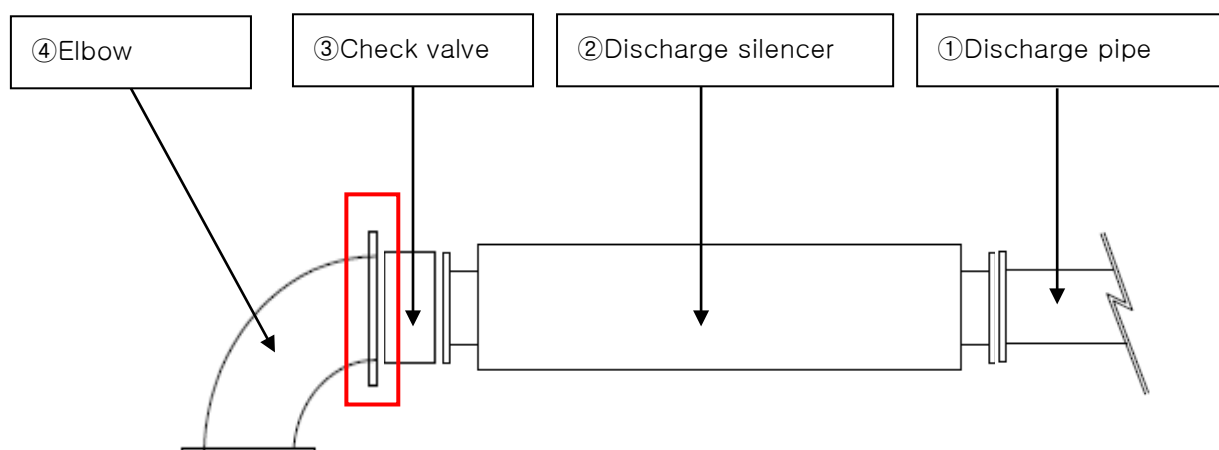
1) Connect the discharge check valve to the customer piping system. (① + ②)



2) Connect the elbow to the discharge check valve. (① + ② + ③)

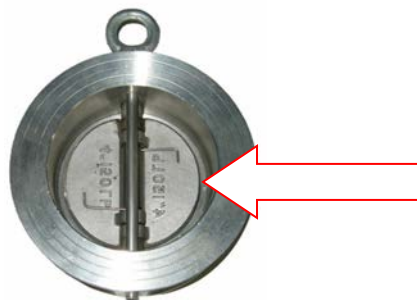


3) Connect the Check valve to the Elbow. (① + ② + ③ + ④)

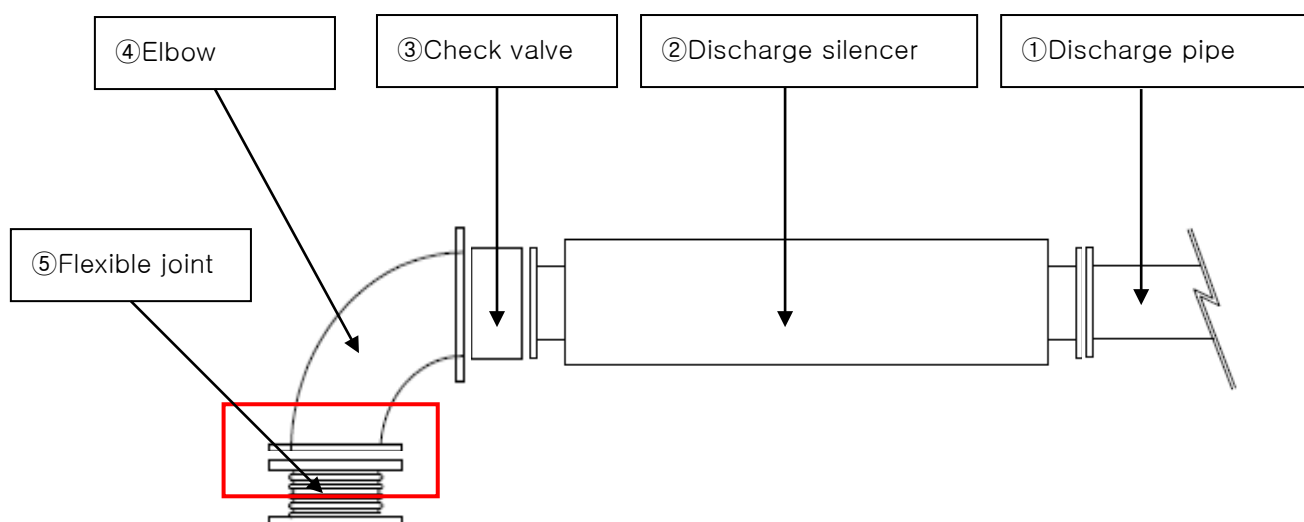


■ Caution to connect the discharge check valve with vertical direction.

- 1) You have to check its arrow mark on the surface of valve.
- 2) Additionally, Its shaft should be located to the top side. (Refer to the attached photo.)

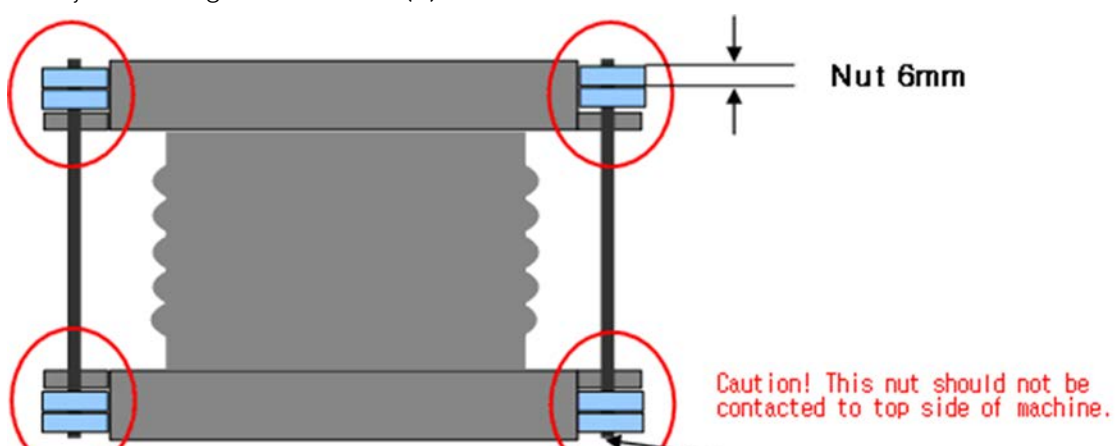


- 4) Join the flexible joint to the elbow. (① + ② + ③ + ④)



■ Flexible joint

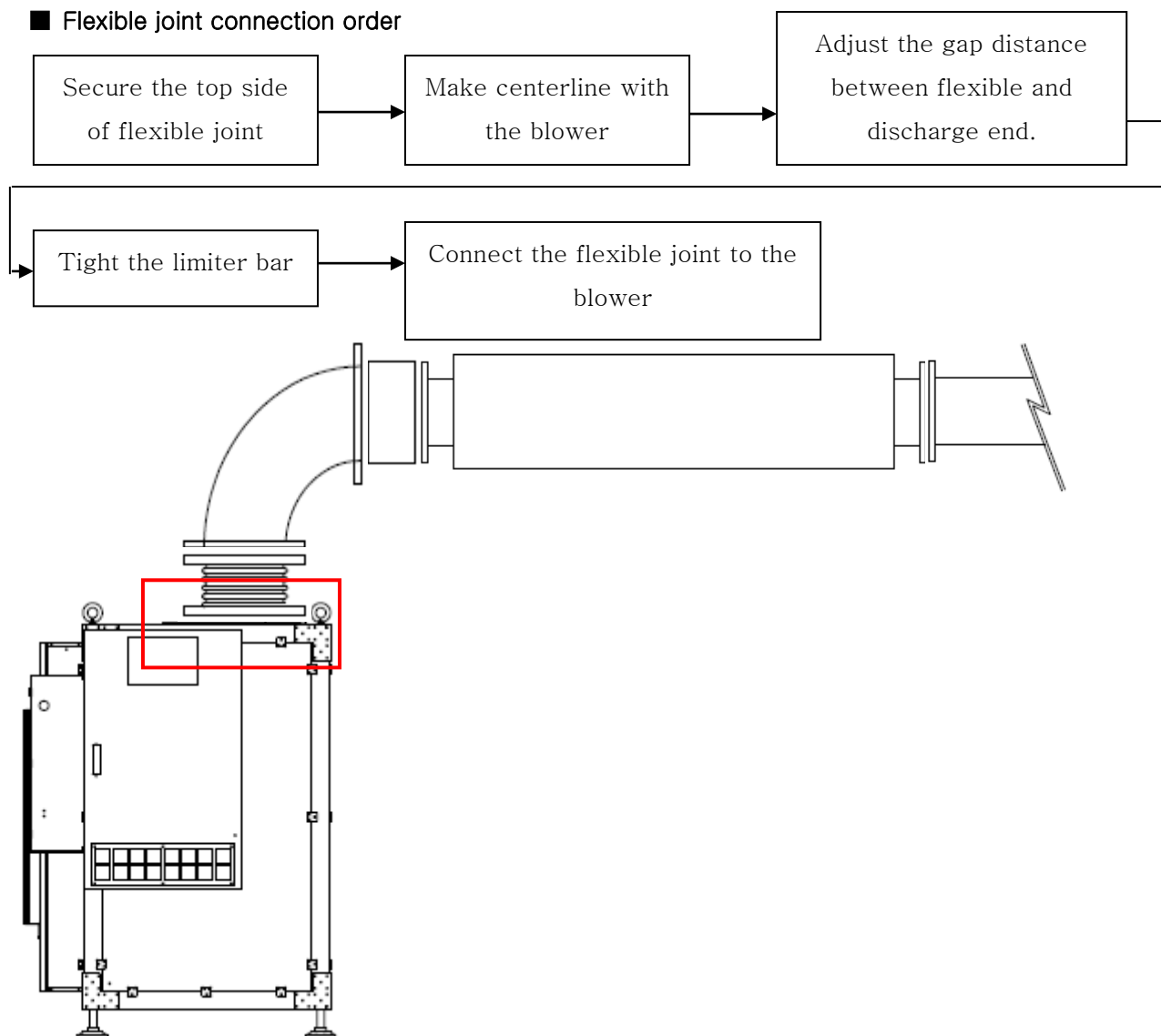
; To prevent over expansion, please put the Limiter bar every 120 degrees on the flexible joint and tight it with a six (6) mm double nut.



5) Connect the flexible joint to the Aerzen Turbo high speed turbo blower discharge end.

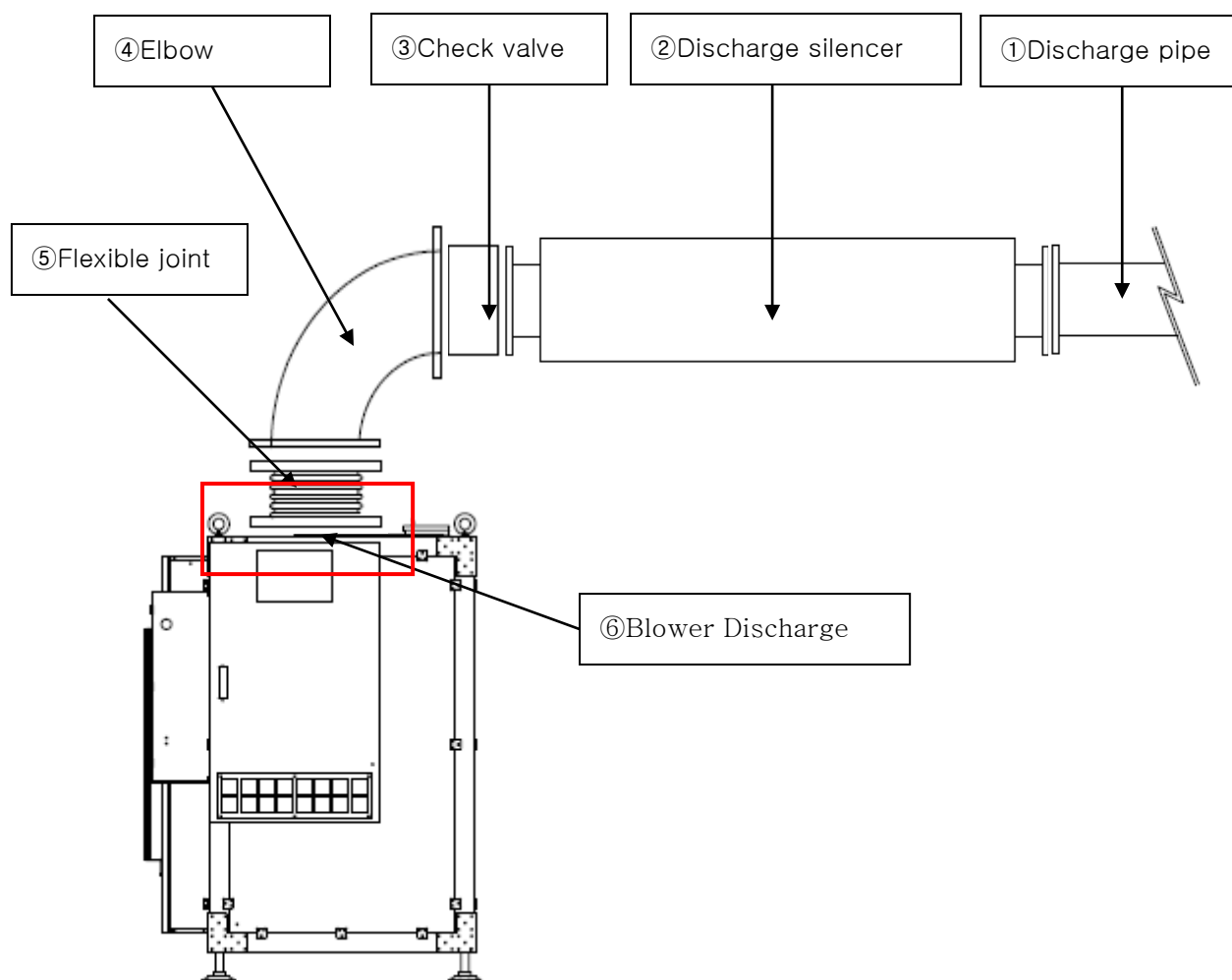
- ① First thing is to make sure the top side of flexible joint is firmly connected with the discharge check valve and its centerline should be aligned with blower's discharge end center.
- ② The gap between the bottom of flexible joint and the top discharge end of the blower is adjustable with the limiter.
- ③ Adjust this gap within 1mm on every direction between the bottom of the flexible joint and gasket placed on the discharge end of the blower. The adjustment is made by loosening the limiter nuts on the flexible joint or adjusting the blower level feet.
- ④ After adjusting the gap properly, tight the limiter bar nut and put it on double nut to prevent loosening the securing nut.
Put on the marking point to check its status.
- ⑤ Connect the bottom side of the flexible joint to the blower's discharge end.

■ Flexible joint connection order



■ Make sure its connection order is as listed below;

① Discharge pipe → ② Silencer → ③ Check valve → ④ Elbow → ⑤ Flexible joint →
⑥ Blower Discharge



■ Caution

1. Make sure the piping support system is properly installed. Every discharge piping material's weights have to be carried by client and not put on the top side of the blower package.
2. If you have a more than 12 PSI (1 bar) machine, please do not forget to install the anchoring device.
3. A gasket is required at every flanged connection.

4.5.5. Intake Systems

4.5.5.1. Verify that the fine intake filters are attached to the back of the unit.

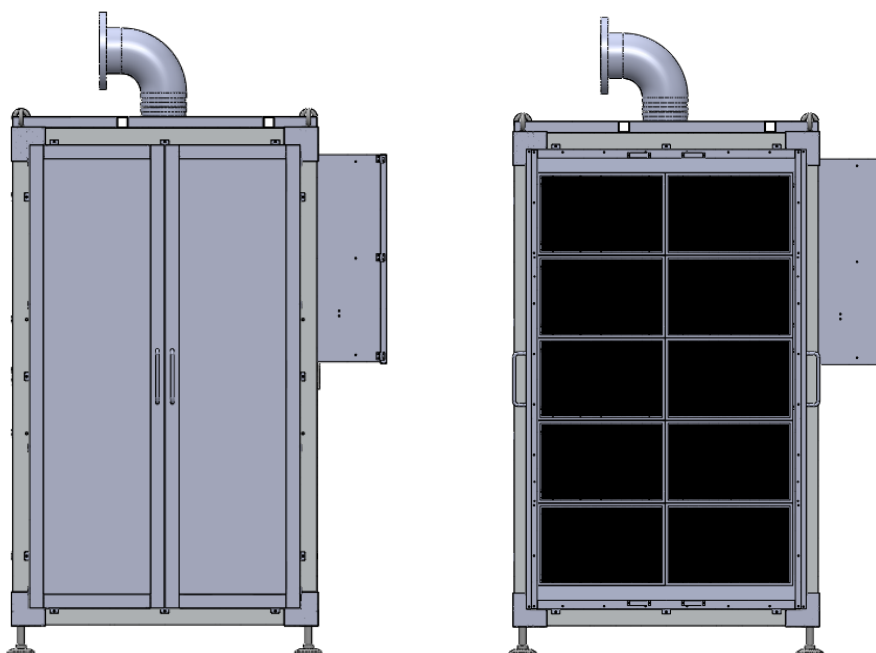


Figure 4-11. Main intake filter Assembly

4.5.5.2. If external intake filtering system is selected, the filter specifications should be designed to remove 98% of 4 μm particles. The differential pressure through the filter should never exceed 2 kPa (0.3 psi) during operation.

4.5.6. Other Precautions

4.5.6.1. Particle Transportation

- Install a pressure relief valve off of the discharge piping.
- Consider installing a surge tank if pressure fluctuations are high.
- Construct pipelines with smooth curves for the good particle transport.

4.5.6.2. Connecting in Parallel with Positive Displace Blowers

- Do not directly connect a turbo blower with a positive displacement blower.
- Install 5 m³ (1300 gallon) surge tank between the blower discharges.
- Install a drain valve under the surge tank.

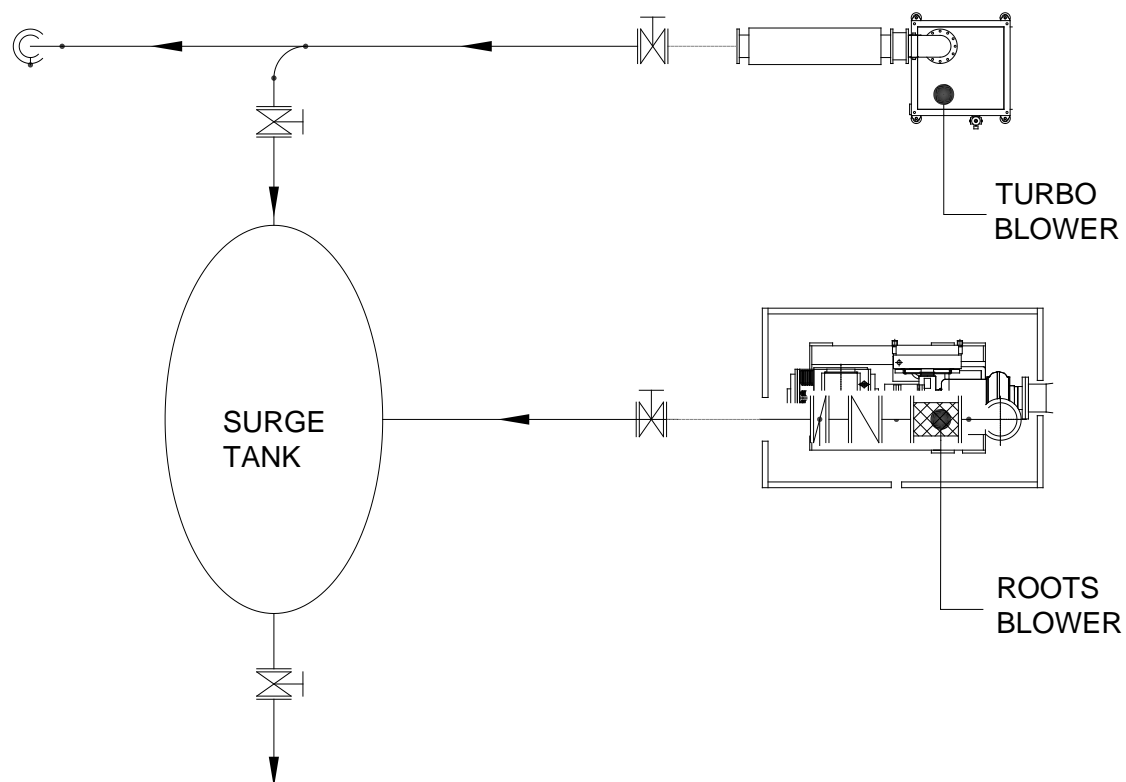


Figure 4-12. Recommended parallel Connection with Positive Displacement Blowers to prevent Turbo from pulsations in Piping System. Only necessary if piping volume is small

4.6. Power cable & Ground

4.6.1. Table 4-4 shows the specification for main power and ground cable as determined by “KS C IEC 60364-5-52:2004”. Cables should be connected as shown in Figure 4-11(Please follow local regulations.)

4.6.2. R/L1-S/L2-T/L3 sequence is not applicable for models of 200 HP or less. For models 300 hp and larger the phase should be adjusted.

4.6.3. Ground cable color should be Green/Yellow. These color cables should not be used for any other purpose. Use the special type 3 grounding method (Ground impedance: below 10Ω above 400 V).

Model rating	kW	Input voltage = 380 V				Input voltage = 400 V			
		Amp(In)	cable(mm ²)	GND(mm ²)	ELCB	Amp(In)	cable(mm ²)	GND(mm ²)	ELCB
25	21	35	10	10	50AT	33	10	10	50AT
50	42	69	25	16	100AT	66	25	16	100AT
75	63	104	35	25	150AT	99	25	16	150AT
100	84	138	50	25	200AT	132	50	25	200AT
150	126	208	70	35	300AT	197	70	35	300AT
200	168	277	120	70	400AT	263	120	70	400AT
250	210	346	150	95	500AT	329	150	95	500AT
300	252	415	240	120	600AT	395	240	120	600AT
400	336	554	185 x 2	185	800AT	526	150 x 2	150	800AT
500	420	692	240 x 2	240	1000AT	658	240 x 2	240	1000AT
600	504	831	300 x 2	300	1200AT	789	300 x 2	300	1200AT

★ Applicable for 600V CV cable

Model rating	kW	Input voltage = 440 V				Input voltage = 460 V			
		Amp(In)	cable(mm ²)	GND(mm ²)	ELCB	Amp(In)	cable(mm ²)	GND(mm ²)	ELCB
25	21	30	10	10	50AT	29	6	6	40AT
50	42	60	16	16	100AT	57	16	16	80AT
75	63	90	25	16	150AT	86	25	16	150AT
100	84	120	50	25	200AT	114	50	25	175AT
150	126	179	70	35	300AT	172	70	35	300AT
200	168	239	120	70	400AT	229	120	70	350AT
250	210	299	120	70	500AT	286	120	70	400AT
300	252	359	150	95	600AT	343	150	95	500AT
400	336	478	150 x 2	150	800AT	458	240	120	700AT
500	420	598	185 x 2	185	1000AT	572	185 x 2	185	800AT
600	504	718	300 x 2	300	1200AT	686	240 x 2	240	1000AT

★ Applicable for 600V CV cable

Model rating	kW	Input voltage = 480 V				Input voltage = 575 V			
		Amp(In)	cable(mm ²)	GND(mm ²)	ELCB	Amp(In)	cable(mm ²)	GND(mm ²)	ELCB
25	21	27	6	6	40AT	23	6	6	30AT
50	42	55	16	16	80AT	46	10	10	60AT
75	63	82	25	16	150AT	69	16	16	100AT
100	84	110	25	16	175AT	92	25	16	150AT
150	126	164	70	35	300AT	137	50	25	200AT
200	168	219	120	70	350AT	183	70	35	300AT
250	210	274	120	70	400AT	229	120	70	350AT
300	252	329	150	95	500AT	275	120	70	400AT
400	336	439	240	120	700AT	366	150	95	600AT
500	420	548	185 x 2	185	800AT	458	240	120	700AT
600	504	658	240 x 2	240	1000AT	549	185 x 2	185	800AT

★ Applicable for 600V CV cable

Table 4-4. Size of Power & Ground wire (Reference only)

Gray highlighted models actually not in use

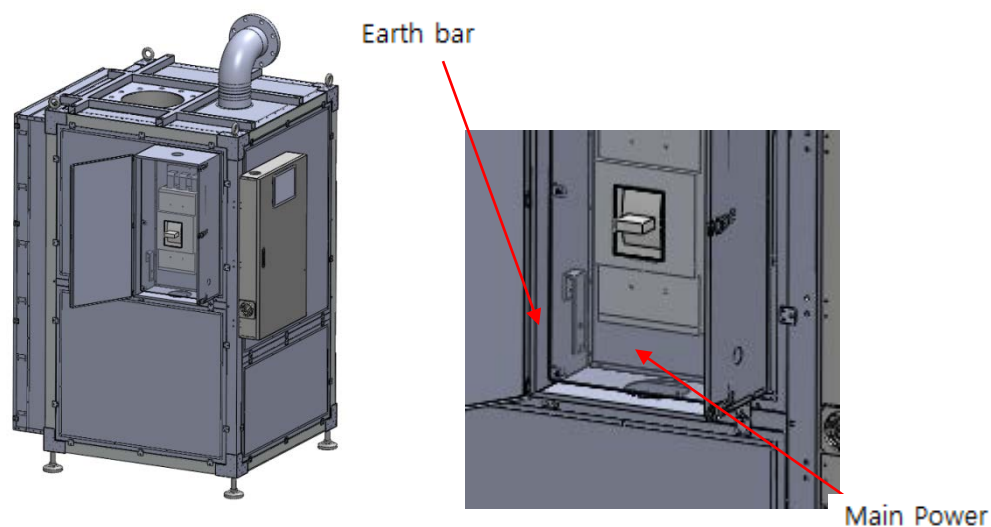


Figure 4-13. Connection point of AC inlet and ground

4.6.4. Insulation Resistance

If the blower is located in high humidity conditions the insulation resistance should be measured. With 1000V between main power and ground the resistance should be above 2000 M Ω .

4.7. Customer connection wiring

This is just for case of remote operation selection which is generally called hard wiring control connection.

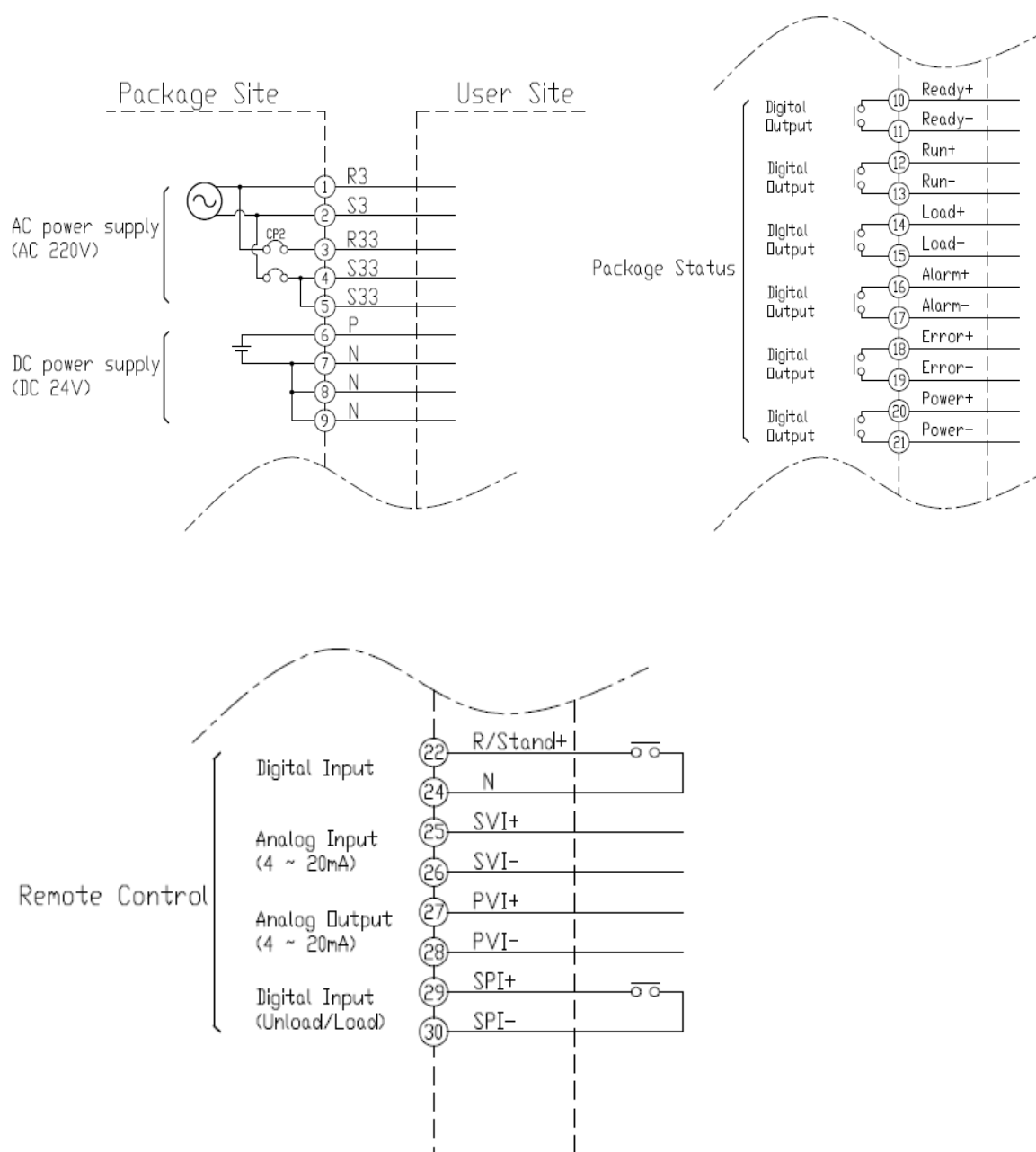


Figure 4-14. Terminal Block

4.8. Preparations for start-up

The following items should be checked prior to initial startup.

Pre-startup check list				
Date				Serial no.
Blower no.				In charge
Division	Items	Details	Pass or Fail	Remarks
Before Operating	Motor room	The assembly state of the temperature sensor(T1, T2), $\Delta P1$, $\Delta P2$, P3 is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Impeller rotation is OK during operation.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		There is no substance on the surface and inside of the motor.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The motor cooling-pipe and BOV piping are fixed well.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The space between motor scroll and conical pipe/diffuser is suitable. (3-5mm)	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Motor connection is fixed well.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The assembly of bus-bar(U,V,W) on motor power supply is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	VFD (Inverter) room	Floor surface of the package and inverter are fixed strongly.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The bus-bar connection between input(R, S, T) and output(U, V, W) is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The circuit breaker is selected and assembled well.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The 220V transformer tab is connected well to fit on input power.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Fixed state and connection of boards (K1B, DRV3K, DRV U etc.) is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Fixed state and connection of the bus-bar of DC Choke and DC Reactor are OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Control panel	Fixed state of the I/O board and CPU board is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Insulated state of the I/O board connector is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Fixed state of the pressure sensor of I/O board is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Insulated state and fixed state of the relay is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Fixed state and connection of the isolator is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Exterior	The package storage is suitable.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The pipe size of discharge is suitable.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		There is no obstacle in the discharging pipe.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Pipe installation of the motor cooling air discharge is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
Installation State	Installation	The package is horizontal. (front and side)	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Fixing state of the flexible pipe is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Space control bolt of the flexible pipe is released.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The check valve is the dual type. (attention direction)	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		The support beam of the discharge pipe is installed.	Y <input type="checkbox"/> / N <input type="checkbox"/>	

		Fixing state of the floor surface of the blower's level foot is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		Main header size is suitable when blowers are operating multiple.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
		direction of discharge is suitable.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
Power & Controller	Power supply voltage	Power among each phase is OK and matched with necessary power.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Power cable loss	Connection tightness and R,S,T phase connection are OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	External controller loss	All terminal connection are correct.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Using UPS	Power connection is correct.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Cable size	Capacity of the power cable is enough.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Using communication line	All connection are OK between UTP cable and terminal.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
	Protocol converter	Each terminal connection is OK.	Y <input type="checkbox"/> / N <input type="checkbox"/>	
Remarks				

Table 4-5. CHECK LIST for Initial Startup

5. Operation

Aerzen Turbo blower can be controlled with any of the following methods:

LOCAL – Using with LCD or TFT display

REMOTE – Using with hard wiring through the customer connection terminal block

LAN – Using with Ether-Net connection

5.1. Local Operation

5.1.1. Touch Screen Display



Fig.5-1. Touch Screen Display

① Model		⑥ ERROR CODE	
② Operation Mode		⑦ Current SV	
③ LAN/ LOCAL/ REMOTE		⑧ Operation Status	
④ YEAR / MONTH/ DAY, HH: MM: SS		⑨ SUB MENU	
⑤ DISPLAY By CP [17](see 5.1.14)		⑩ HMI Shutdown	
Item	Explanation	Item	Explanation

ΔP	Differential pressure across intake filter (kPa)	T1	Intake air temperature (°C)
P	Discharge pressure (bar)	T2	Discharge air temperature (°C)
VOLUME FLOWRATE	Flow rate of air (Nm ³ /min)	SPEED	Rotating speed of motor (RPM)
RUN TIME ON-OFF	Accumulated run time (hours)	INPUT POWER	Input power (kW)
DCLink	DC voltage (V)	ERROR CODE	Information for error code

Table 5-1. Details for the Display Screen

5.1.2. Operating mode SETUP

The Operating MODE is usually set up to perform the initial startup.

Constant Current Set

In this operating mode the electric current is maintained constant. This mode is primarily used for aeration process.

Constant Flow Set

In this operating mode the electric current is adjusted to maintain a constant flow rate. This mode is primarily used for particle transport.

POUT

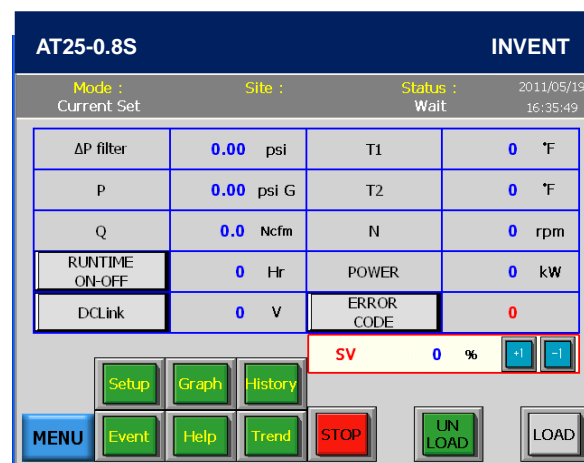
This operating mode is used to maintain constant blower pressure.

DO control

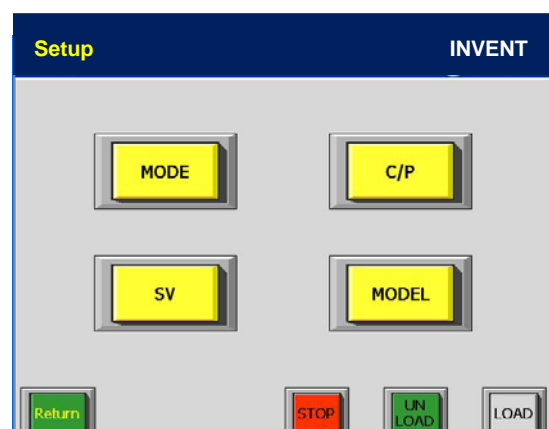
This operating mode is used to maintain constant dissolved oxygen.

Press **MENU** at the base screen.

Then you see six green sub-menus.



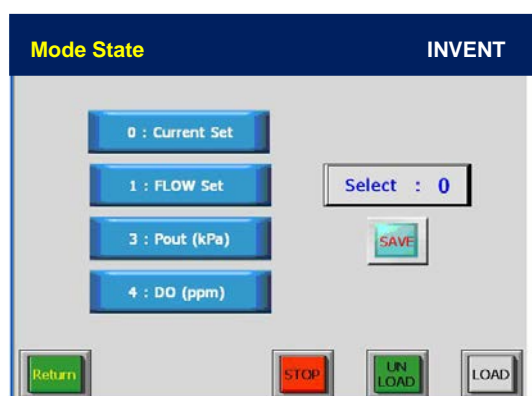
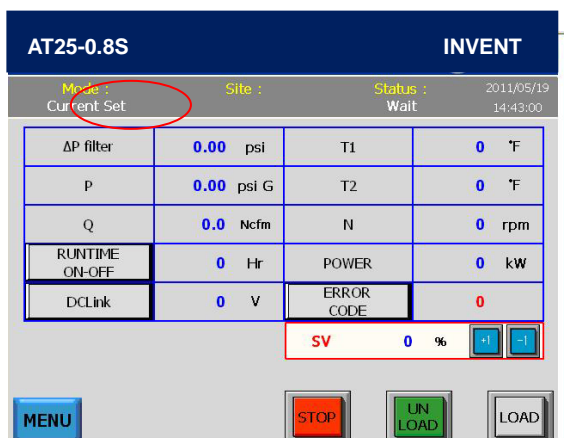
Press **Setup** to go to Setup menu.



Press **MODE** to see mode selection screen.

(cf) Pressing **O** in the below figure will get

you the same result.



Press **0: Current Set** to select (electric) current mode and verify select=0.

Press **SAVE** and **Return** to go to the home screen.

5.1.3. SETUP SV

The following units are used for the SV (Set Value) according to the selected operating MODE.

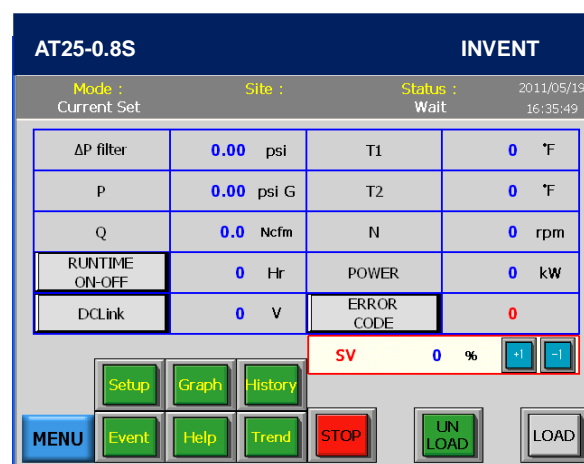
MODE	INPUT	unit
CURRENT	% of max. current	%
FLOW	Volume flow rate	m ³ /min
RPM	% of max. speed	%

Pout	Discharge pressure	bar
DO	Dissolve oxygen	ppm

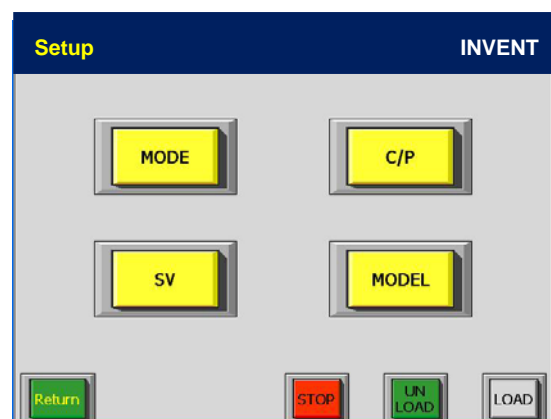
Table 5-2. Input Units for SV

SV can be adjusted at any time using the below procedure.

Press **MENU** at the base screen to bring up the six green sub-menus.

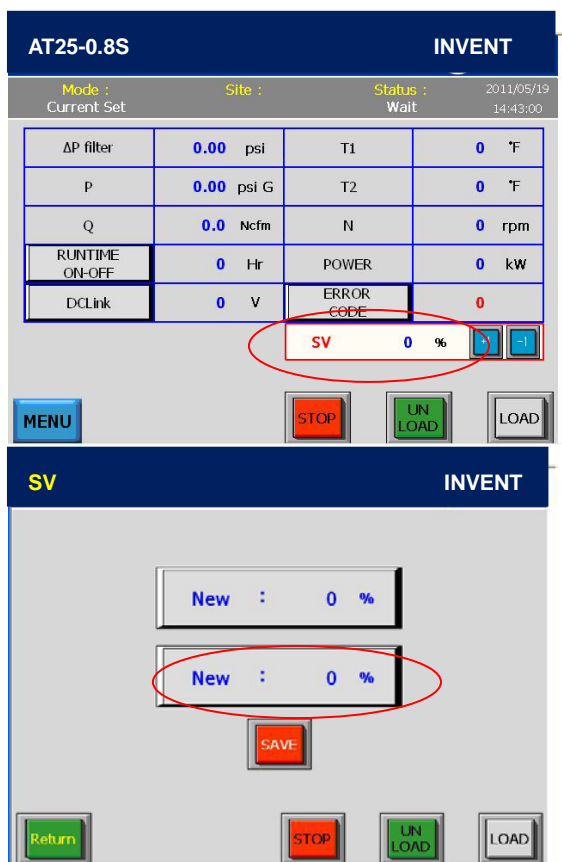


Press **Setup** to go to Setup menu.

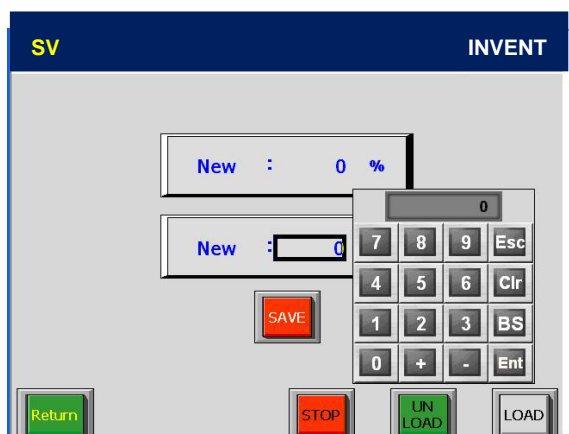


Press **SV** to adjust SV.

(cf) Pressing **0** in the next figure will get you the same result.




Press **SV** in the above figure to see next screen.



Enter a new SV using the numeric keypad.

Press **Ent**, **SAVE**, and **Return** to go back to the home screen.

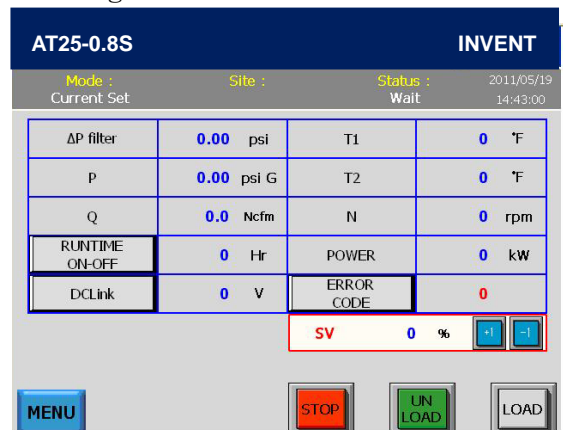
5.1.4. SETUP Control Parameters



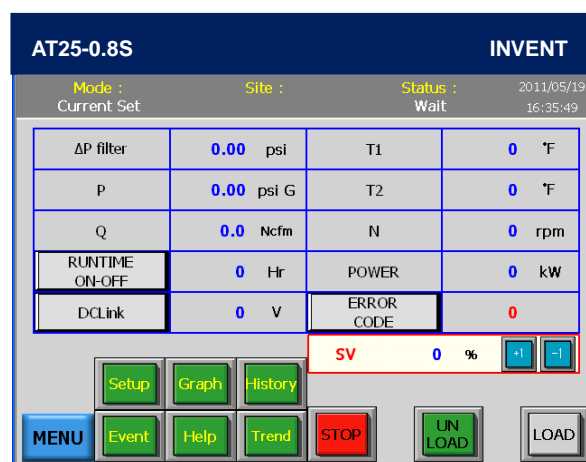
Change of control parameters (C/P) may cause serious damage to the machine.

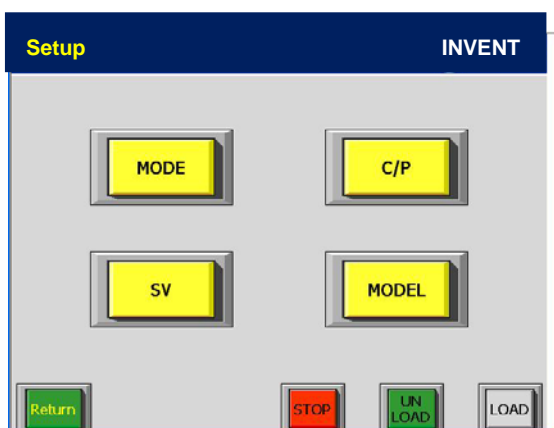
(Warning) It should be done only under permission of trained personnel.

Press **MENU** at the base screen to display the six green sub-menus.

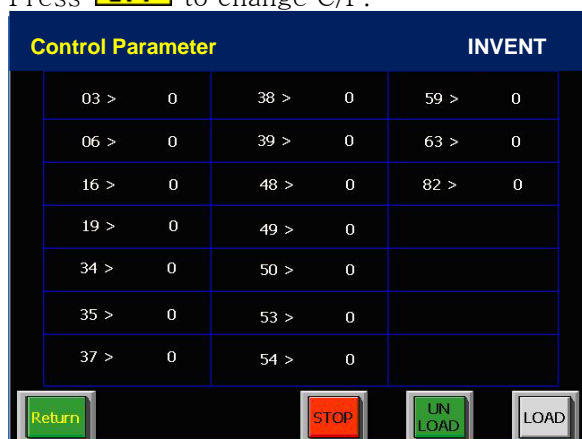


Press **Setup** to go to Setup menu.

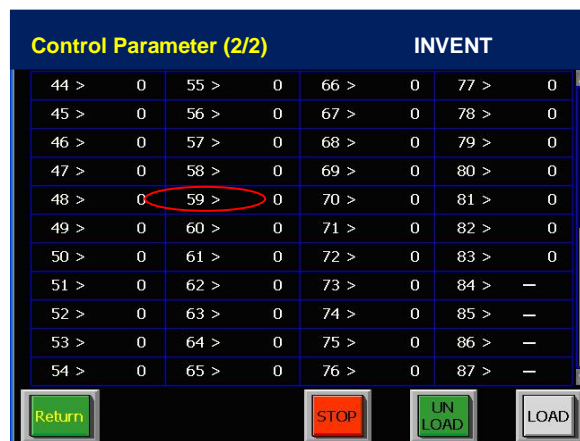




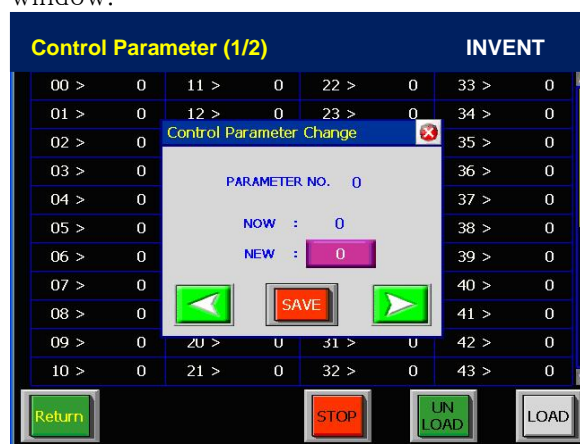
Press **C/P** to change C/P.



Two screens can be toggled by **Next** and **Previous**.



Press **0** in the above figure to see new window.



Enter new value using numeric keypad.

Press **Ent**, **SAVE**, and **Return** to go to the home screen.

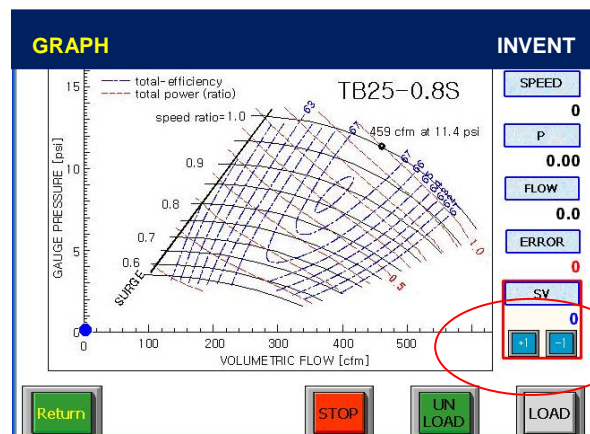
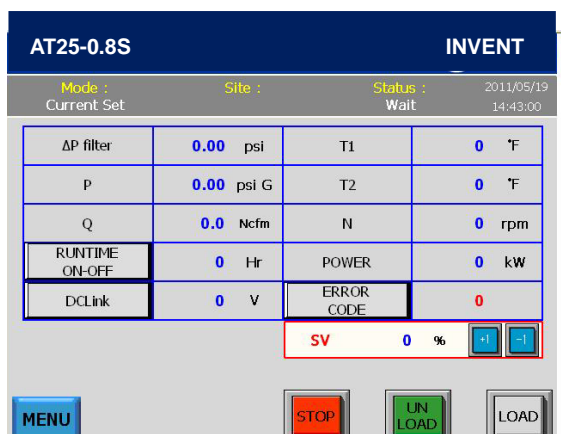
Press **0** to remove the window.

5.1.5. SETUP CLOCK

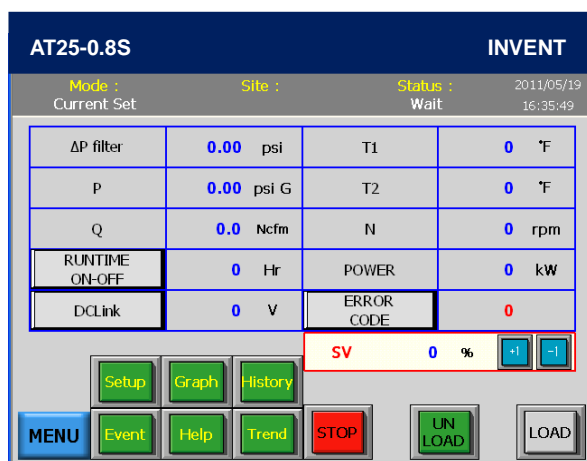
The touch screen program is based on Windows CE. The system clock can only be changed in the operating system and cannot be changed at the LCD screen.

5.1.6. Graph Menu

Press **MENU** at the base screen to display the six green sub-menus.



Press **Return** to go to the home screen.



5.1.7. History #1

Press **MENU** and **History** from the home screen to display History Data #1.

screen to display History Data #1.

History DATA #1 (1 sec)

INVENT

DATE	ΔP	P	Q	I	CP[50]	T1	T2	SPEED[kw]	POWER	ERROR	CP[17]	SV
2011/05/19 15:22:59	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:58	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:57	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:56	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:55	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:54	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:53	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:52	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:51	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:50	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:49	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:48	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:47	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:46	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:45	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:44	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:43	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:42	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:41	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:40	0	0	0	0	0	0	0	0	0	0	0	0
2011/05/19 15:22:39	0	0	0	0	0	0	0	0	0	0	0	0

Return

1 Hour

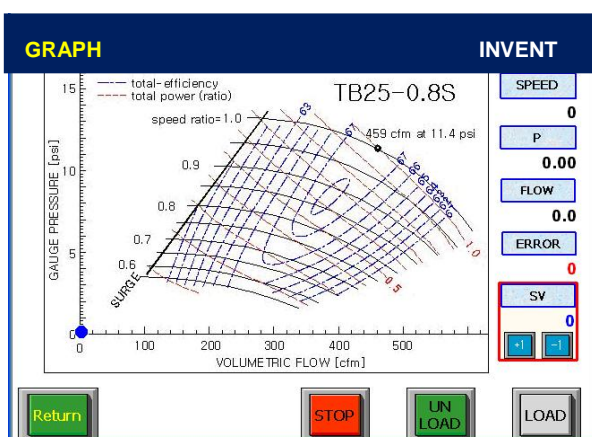
Backup

STOP

UN
LOAD

LOAD

Press **Graph** to see the operating point on the performance curve.



Press **+1** or **-1** in **SV** to change the SV by incremental steps.

Data are logged once a second for the past 5 minutes and recorded in the non-volatile stack memory.

Press **Return** to go to the home screen.

Back up key is used to transfer data into USB memory card.

Data are logged once an hour for the past 24 hours. Press **1 Hour** to go to History Data #2 screen.

Press **Return** to go to the home screen.

The Event Log records every error start time, clearing time, and code.

5.1.10. Trend

Press **MENU** and **Trend** at the home screen to display the Trend screen.

The selected item is trended in graphical form in one second intervals.



X-axis: time

Y-axis: value range

graph: trend screen

 ΔP : intake differential pressure

T1: intake temperature

P: discharge pressure

T2: discharge temperature

Q: flow rate [Nm³/min]

S: speed

I: electric current

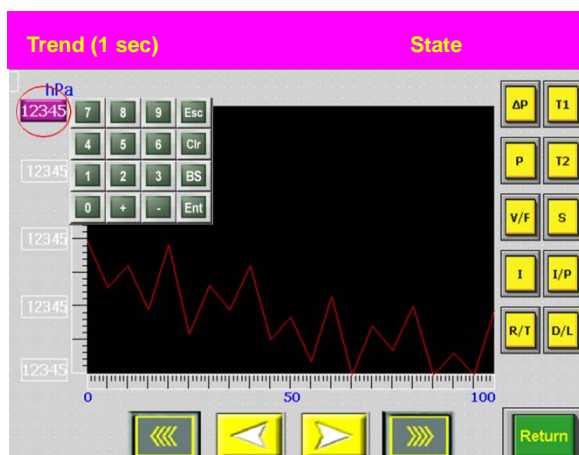
I/P: input power

R/T: Run Time

D/L: DC Link

Use the following method to select the trend parameter.

Select item to see ($\Delta P \sim D/L$).

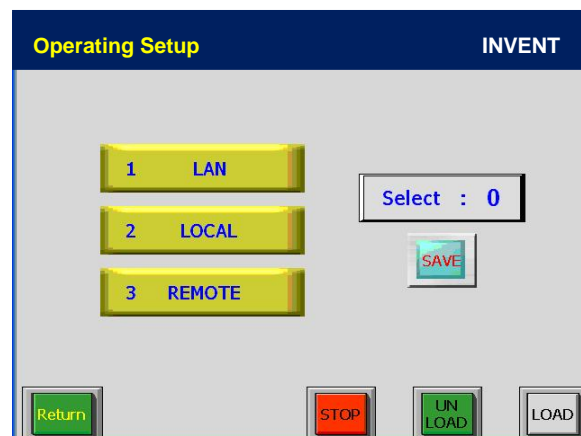
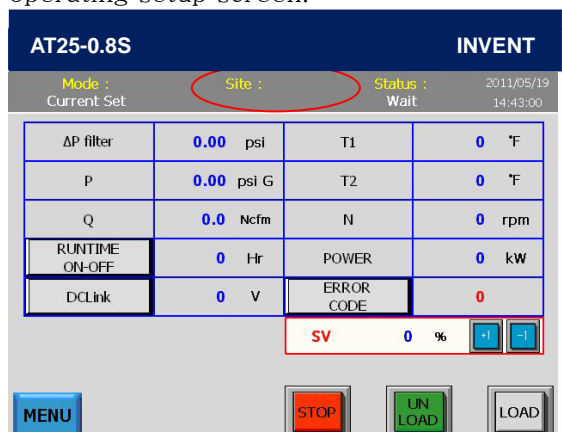


Input the maximum Y-value.

Press **O** in the above figure. Use numeric keypad to input the maximum Y value for the selected item, and press **Ent**.

5.1.11 Setup of Control Method

Press **O** at the home screen to go to the operating setup screen.




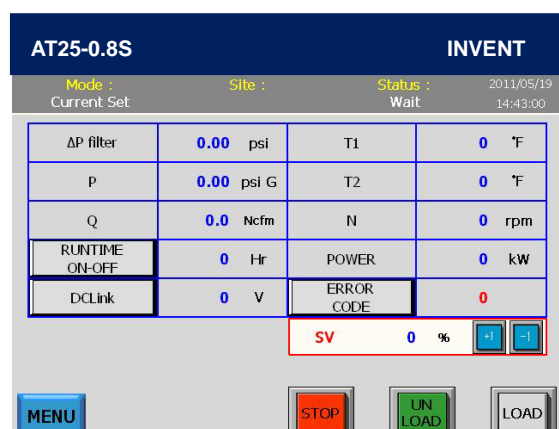
Press **2 LOCAL** to change the current control location to LOCAL.

Verify “select” value becomes **Select 2** and press **SAVE**.

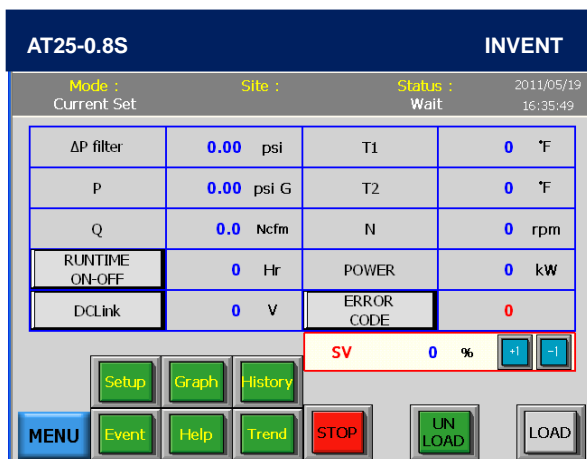
Press **Return** to go to the home screen.

5.1.12. Model Selection

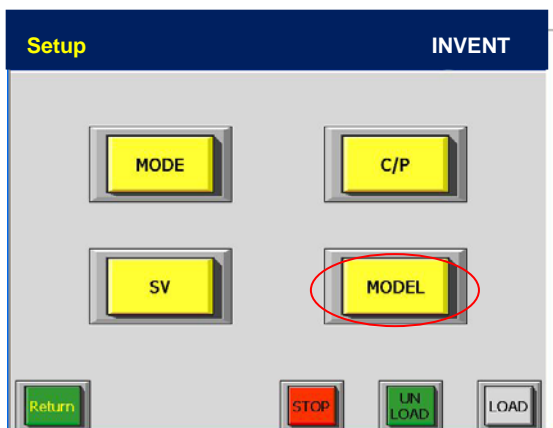
	This is the part of control parameter area. No change is recommended.
	(warning)



Press menu at the home screen to go to the model selection screen.



There are 6 sub menus. Press Setup for model selection.



Press **O** for model selection.



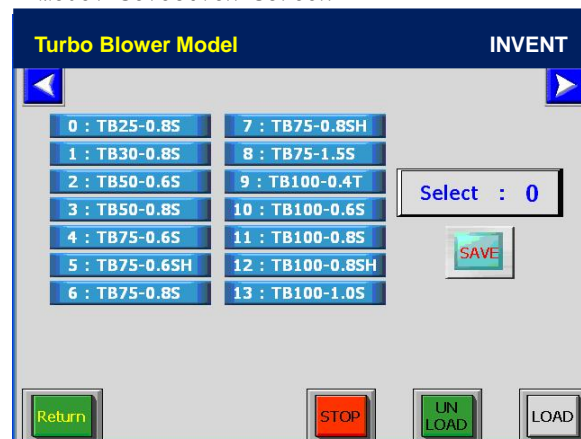
Pop-up screen for PIN.

Press appropriate PIN for proceed.

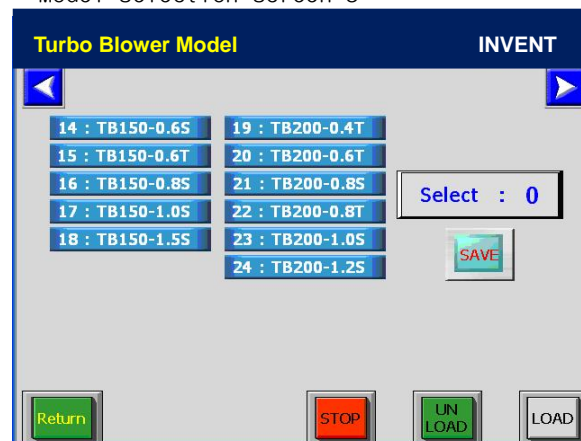
- Model selection screen 1 -



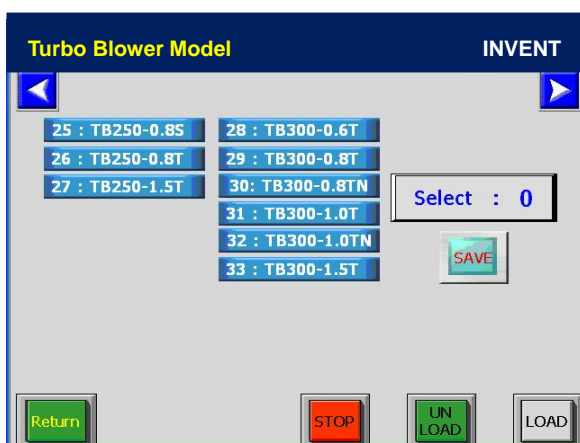
- Model selection screen 2 -



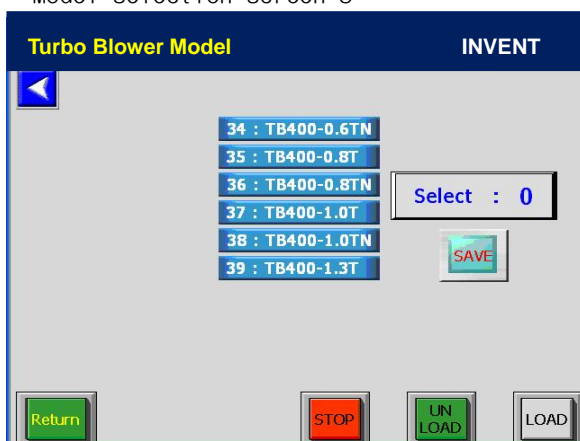
- Model selection screen 3 -



- Model selection screen 4 -



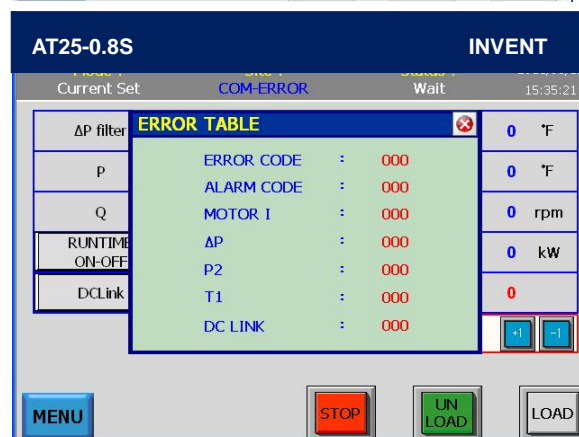
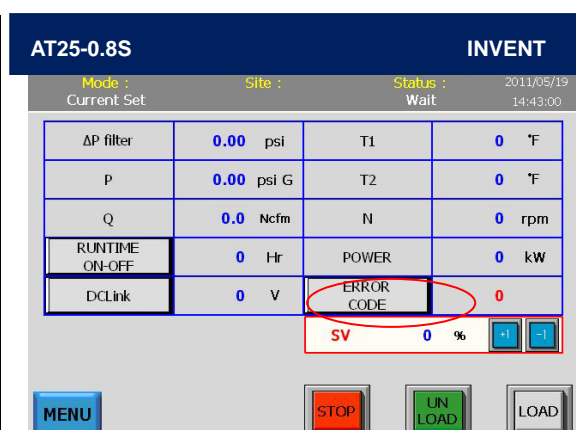
- Model selection screen 5 -



Select the appropriate value, and press **SAVE**, **Return**

5.1.13. Error Code Table

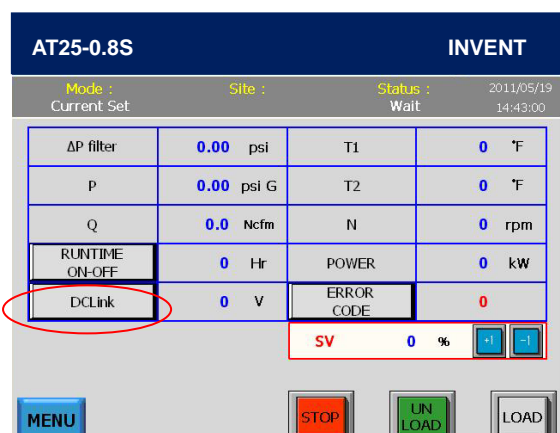
Press **0** in the next figure to display ERROR TABLE. See Chapter 7 for error details.

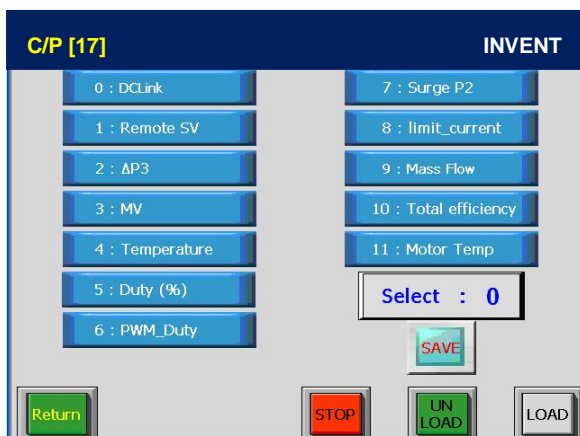


Press  to remove the ERROR TABLE.

5.1.14. About C/P[17]

Press **0** in the next figure to display items related to C/P[17].

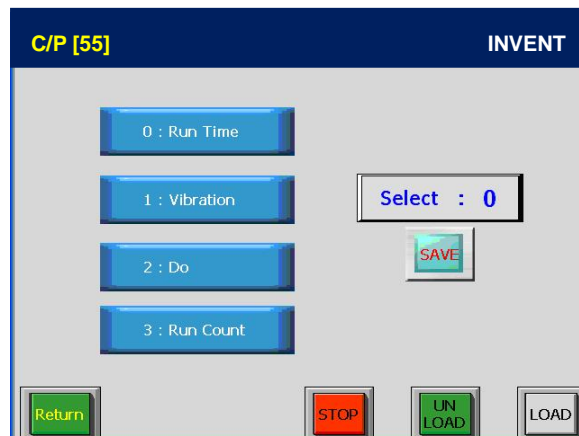
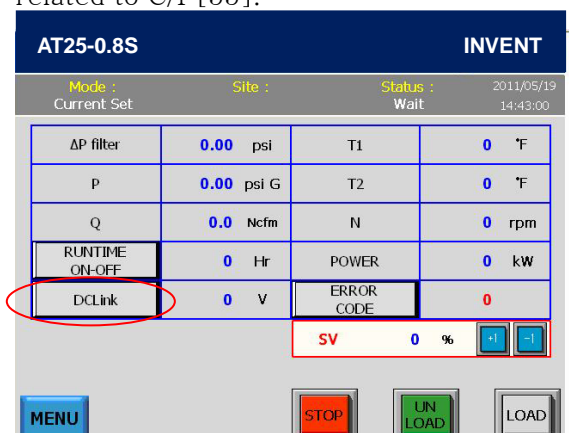




- 0 : DC Link voltage (V)
- 1 : Remote SV (0–100%)
- 2 : differential pressure (Pa)
- 3 : motor input voltage (V)
- 4 : magnet temperature (°C)
- 5 : Duty_ratio(%)
- 6 : pwm_duty
- 7 : surge discharge pressure (kPa)
- 8 : limit current
- 9 : maximum ppm on DO control

5.1.15. About C/P[55]

Press **O** in the next figure to display items related to C/P[55].



- 0 : Run Time(Hr)
- 1 : Vibration(0–100%)
- 2 : DO values (ppm)
- 3 : Run count (times)

5.1.16. HELP

The HELP screen shows the contact information of Aerzen Turbo Co., Ltd.




5.1.17. START and STOP the machine.

5.1.17.1. Turn on the electric power and verify the LCD displays.


5.1.17.2. Make sure that the selected operating MODE is suitable for your plant.

5.1.17.3. The status displays “READY” means that the system is ready for normal operation. But if the status displays “wait” means that the system is still working for ready of operation thus, wait until status indicates “READY”.

5.1.17.4. After the status display “READY”, You can touch the  button once means that the system start to charging the capacitor and after several second the machine shall start to rotate.


5.1.17.5. Check the machine’s status which is any abnormal sound or vibration.

5.1.17.6. The blower will perform unloading operations at 10,000~15,000 rpm. At the moment, the machine exhausted the compressed air to atmosphere through the blow off valve (BOV).

5.1.17.7. After get the stable operation around 1 minute, the system is ready to put the load, therefore you can touch the  button in the case of LOCAL operation mode. When in the REMOTE or LAN control mode the “LOAD” and “UNLOAD” commands are follow through the SCADA system.

5.1.17.8. After the blower has been loaded the speed and power are increased to meet the Pre-set SV. After the machine ramps-up to SV amount (determined at startup) the BOV will be closed automatically. Check the system status and record the operating status for your future reference.

5.1.17.9. See Section 5.1.3. to modify the SV.

5.1.17.10. If you want to stop the machine, simply touch the  sign on the screen to stop the blower. The blower will immediately open the BOV valve and ramp-down the speed until preset amount which is the 10,000~15,000.

The blower will keep running for an additional 3~5 minutes to cool-down the system.

5.1.17.11. After complete shut down the blower should not be restarted until the DC link



voltage drops below 70V. This takes approximately 2~10 minutes.

5.2. Remote Operation

Aerzen Turbo Co., Ltd. blowers can be operated remotely with a relay CONTACT and analog signals.

5.2.1. Signals

Remote control is achieved through terminal block (TB4) located in the control Panel. Figure 5-3 shows the inputs and outputs available at TB4.

Signal	Contact	Comment
READY	#10, #11	“ON” when READY (2A)
RUN	#12, #13	“ON” when RUN (2A)
LOAD	#14, #15	“ON” during load operation (2A)
ALARM	#16, #17	“ON” when ALARM takes place (2A)
ERROR	#18, #19	“ON” when ERROR takes place (2A)
POWER	#17, #18	“ON” when control power is “ON” (2A)
START/STOP	#20, #21	INPUT, RELAY open (ON), close (OFF)
SV (set value)	#24, #25	INPUT, Set mode of operation 4~20mA input
PV (present value)	#26, #27	OUTPUT, present flow/current/rpm 4~20mA output
Load/Unload	#28, #29	Open (Unload), Close(Load)

Table 5-3 Customer connection point descriptions

5.2.1.1. Remote Ready

If the operational mode is set to "REMOTE" at the LCD panel and there are no error signals at the blower, then the Remote Ready relay contact will be “CLOSED”. If there is an error or fault in the blower or the blower has a “STOP” status, the Remote Ready relay will be “OPEN”.

5.2.1.2. Unload

Unload signal is "ON" if the blower is in operation.



5.2.1.3. START/STOP

The relay status is "CLOSED (ON)" for run and "OPEN (OFF)" for stop.

5.2.1.4. SV (set-point value)

An analog input signal from MCP or equivalent unit which is 4~20mA can be control the operating amount of air volume or % of amperage.

5.2.1.5. PV (present value)

An Analog output signal from the blower (4~20mA) is available to use the SCADA system as present value of the machine which is flow, current, pressure, or DO.

5.2.1.6. ALARM

Whenever the blower's operating condition reaches to warning level, then the coil energize and throw the signal to the circuit.

5.2.1.7. ERROR

The relay status is closed (ON) when an error occurs and the unit will shut down the machine.

5.2.1.8. POWER

The relay status is "OPEN" when power is disconnected and "CLOSED" when power is connected.

5.2.1.9. LOAD

The relay status is "OPEN" during unload operations and "CLOSED" during load operations.

5.2.2. Procedures for remote control

The signal for "Start" can be enabled only if the signal for "Remote Ready" is ON. The blower normally stops if the start signal is OFF, and emergency stops if an error occurs. When the blower stops, signals for "Remote Ready" and "Normal Operation" are all OFF. Restart is possible after the unit has been stopped for at least 20.

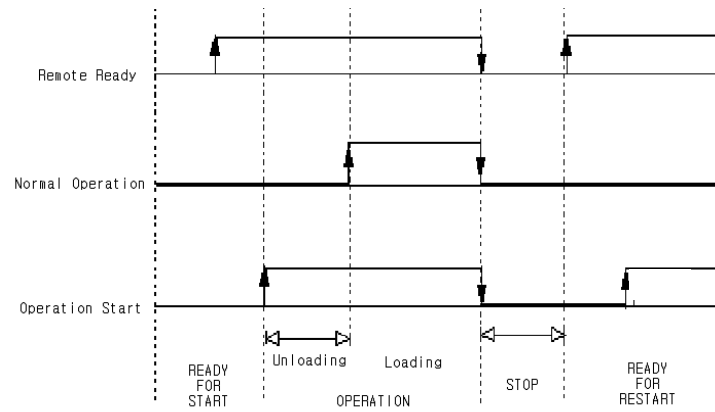


Figure 5-4. Procedures for Remote Control

5.2.2.1. Set operating mode to "REMOTE" using the LCD display on the blower front panel.

5.2.2.2. Verify that the signal for "Remote Ready" is ON (relay "CLOSED").

5.2.2.3. Turn on the blower by making the signal for "Operational Start" ON. (See chapter 4)

5.2.2.4. Verify that the signal for "Normal Operation" is ON (relay CLOSED).

5.2.2.5. Shut down the blower by making the signal for "Operation start" OFF.

5.2.2.6. More than 2 minutes may be necessary before restarting the blower after it has been shut down. The required time delay varies from model to model. During this time all signals are OFF (relays "OPEN").

5.3. LAN Operation

Aerzen Turbo Co., Ltd. blower equipped COMMUNICATION module which is capable to communicate with plant PLC or SCADA system.

5.3.1. MODBUS Communication protocol

MODBUS protocol that is commonly used as universal MODBUS protocol supports traditional and recently developed RS232/RS485/RS422 device also supports Ethernet devices. Therefore, most industrial devices (PLC, DCS, HMI, instrumentation, etc.) using MODBUS communications as standard and is the situation. Our equipment also RS422 (4 wire) or RS485 (2 wire) using the MODBUS RTU protocol and also to use the Ethernet link to support the MODBUS TCP protocol.

5.3.2. Communication module set-up

Run “ezConfig.exe”, and click the “PROBE” button. If there is no problem with the network you will see a dialog box named “ezConfig – exTCP” displaying “LOCAL IP ADDRESS” at the top. If you do not receive this dialog box the procedure failed and you will need to repair the LAN problem and rerun the file.

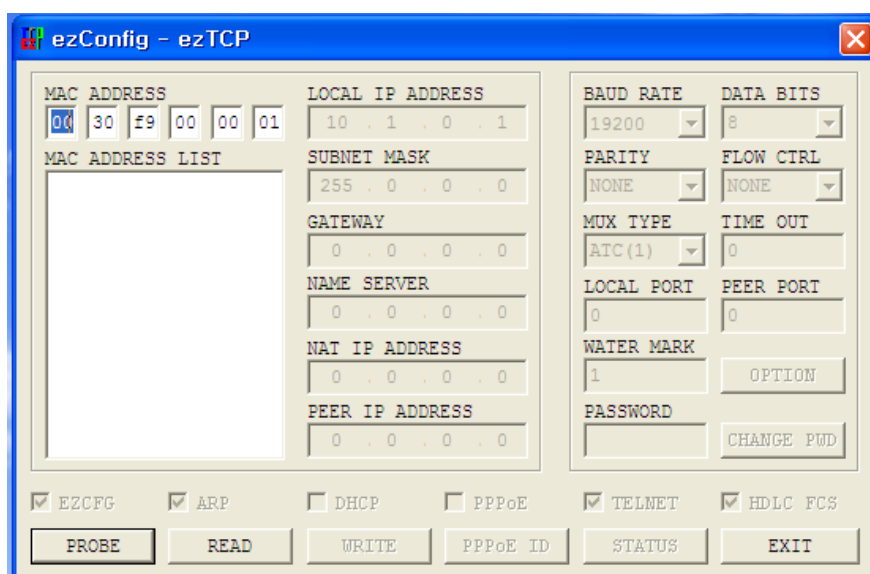


Figure 5-6. ezConfig.exe

5.3.2.1 Input communication data into the dialog box. Make sure do not write the same address into the clients and the server column.

LOCAL IP ADDRESS	IP address of the client (blower)
SUBNET MASK	Subnet address of host computer
GATEWAY	Gateway of host computer
NAME SERVER	Inactive dialog box (0.0.0.0)
NAT IP ADDRESS	Inactive dialog box (0.0.0.0)
PEER IP ADDRESS	IP address of host computer
BAUD RATE	19200
PARITY	NONE
MUX TYPE	Inactive dialog box, COD(2)
LOCAL PORT	Inactive dialog box (0)
WATER MARK	Inactive dialog box (1)
PASSWORD	Inactive dialog box
DATA BITS	8
FLOW CTRL	NONE
TIME OUT	50
PEER PORT	Connection key number(10000 ~ 10007) (connect client NO. 1 ~ NO. 8, each)

Table 5-4. Communication Data



Figure 5-7. Connection of LAN Cable to Our Blower

6. Preventative Maintenance

6.1. Matters which should be always reminded

6.1.1. Preventative Maintenance helps to save energy and money. Check regularly to ensure that Main Blower and cooling fans are operating normally. Our General Maintenance Schedule is conservative and should be adjusted to the individual local conditions during commissioning with Aerzen Turbo Technicians or Aerzen CS. Please feel free to contact us to develop an individual plan that fits best to you.

6.1.2. Do not disassemble or reassemble blowers without permission from Aerzen Turbo technicians. Repair costs as a result of unauthorized assembly or disassembly will not be covered under warranty.

6.1.3. If abnormal operation is observed shut the blower down and contact the Aerzen Turbo technician for assistance. In the event of a blower failure and automatic shut down, record the three digits Error Code and contact an Aerzen Turbo technician prior to restarting the blower.

6.2. Maintenance Schedule

Maintenance schedule may differ depending on blower room conditions and working period. Under the severely dirty condition, make sure the maintenance schedule.

6.2.1. Inverter

No.	Part name	Period of inspection	Check point	Recommended Replacement period
1	CON./INV. Drive board	Once a year	Damage heat/dust	3-5 years
2	CON./INV. IGBT	Once a year	Resistance, function	10 years
3	Diode (SCR)	Once a year	Resistance, function	10 years
4	Cooling fan	Once a year	Function/Dirt	3-5 years
5	DC reactor	Once a year	Measure L value	10 years
6	Motor control board	Once a year	Inspect the function	5 years
7	Soft starter board	Once a year	Inspect the function	5 years
8	Power capacitor	Once a year	Inspect the capacity	5 years
9	Film capacitor	Once a year	Inspect the capacity	5 years
10	Control power transformer	Once a year	Measure the output current	10 years



6.2.2. Motor

No.	Part name	Check point	Recommended overhaul cycle	Remark
1	Motor	Major overhaul	3 to 5 years	Determine after the inspection

6.2.3. Control panel

No.	Part name	Period of inspection	Check point	Recommended replacement cycle
1	I/O Board	Once a year	IO testing and correction	5 years
2	VT Board	Once a year	IO testing	5 years
3	TEMP. Sensor	Once a year	Testing and correction	10 years
4	Pressure Sensor	Once a year	Testing and correction	10 years
5	CPU Board	Once a year	Operation test	5 years
6	Communication card	Once a year	Operation test	5 years
7	Signal isolator	Once a year	IO testing	10 years
8	Touch Display unit	Once a year	Operation test	10 years
9	LCD Display unit	Once a year	Operation test	5 years
10	Control panel	Once a year	Operation test	10 years

6.2.4. Filter replacement

No.	Part name	Period of inspection	Check point	Recommended replacement cycle
1	Filter for compressor	Once a month	Depending on the condition	In case if severely dirty 3 to 6 months
2	Check valve	Once a year	Depending of function and leakage	In case if leakage occurred 3 years

7. Error Code

7.1. Fail before operation

NO.	FAULT	CAUSE	INSPECTION/MAINTENANCE
1	Pressure sensor	DP1 > 5 kPa DP2 > 5 kPa P2 > 70 kPa	Change sensor / controller
2	Temp sensor	T1 > 100 °C or T2 > 150 °C	Change sensor / controller
4	DCL	DCL > 700V	Check VFD, change controller
16	VFD	VFD error	Check VFD, change controller
17	Fan VFD fault	Fan VFD error	Check Fan VFD, change controller
32	VFD cooling	Temp switch "ON" of VFD	Check VFD, controller
64	speed	RPM > 10000	Change VFD driver, CPU

7.2. Warning during operation

NO.	WARNING	CAUSE	INSPECTION/MAINTENANCE	C/P
101	Filter blockage	DP1 > CP value	Clean/change filter Check controller and CP value	28
102	high T2	T2 > CP value	Check temp sensor, controller, operating condition	29
103	high T1	T1 > CP value	Check temp sensor, controller, operating condition	30
104	high P2	P2 > CP value * 0.98	Check operating condition	9
105	High speed	Speed > CP value * 0.98	Check operating condition	14
106	Surge	flow < surge flow + CP	Check operating condition, CP value	18
110	High magnet temp.	Magnet temp > 280°C	Check motor, CP value	75 83
111	High duty	Duty > 90%	Check motor voltage, CP value	83
113	High VFD temp	VFD temp > cp[11]*0.95	Check ambient & VFD temperature	11
114	Low SV	SV > 10%	Check SV value and corresponding wiring	
126	High motor temp	Motor temperature > 180 °C	Check motor cooling	

7.3. Fail during operation

NO.	FAULT	CAUSE	INSPECTION/MAINTENANCE	C/P	tripping pattern
201	Filter blockage	Δp at filter > CP Value	Clean/change filter Check controller and CP value	8	Idling stop
202	P2 Limit	$P2 > CP$ Value	Check operating condition	9	stop
204	Current Limit	Current > CP Value	Check operating condition, CP value	15	Idling stop
205	Low DC Link	$DCL < CP$ Value	Check VFD, controller, CP value	12	stop
206	High DC Link	$DCL > CP$ Value	Check VFD, controller, CP value	13	stop
207	Over speed	$RPM > CP$ Value	Check operating condition, out of synchronization, CP value	14	stop
210	Inverter problem	Error signal from inverter	Check inverter		stop
211	Inverter Overheat	Overheat of heat sink	Check job site, fan motion, operating condition		stop
214	Start	Fail on DCL rise within time	Check charging status, controller, wiring		stop
215	Start	Below 10000 rpm after start	Check motor, VFD, CP value	1	stop
216	Start	No movement	Check motor, VFD		stop
220	Cooling Fan	No action of cooling fan or MC	Check MC2, wiring		stop
221	Motor	Speed < 9000 rpm	Check motor and CP value	1	stop
222	T1 Limit	$T1 > CP$ Value	Check job site, operating condition, controller, T1 sensor, and CP value	10	Idling stop
223	BOV	Not closed	Check job site and CP value	44, 45	
224	surge	Surge	Check job site, operating condition, and CP value	64 ~67	stop
225	Real time surge	Real time surge	Check job site and CP value	44	Stop
230	Switching error	Manual stop at remote control	Check job site and controller		Idling Stop
236	Emergency stop	Touch screen version only	Press emergency stop button		Stop
238	Motor winding temp. high	Motor temp > 200°C	Checking cooling system		Stop
239	AC power fail	Utility power interrupted	Check utility power		Stop
240	Bearing fault	Failed motor bearing	Check bearing		Stop
250	High VFD intake temperature	VFD inlet temp > cp[11]	Check ambient & VFD temperature	11	Idling Stop
255	EEPROM	Cannot be read from EEPROM	Change CPU		Stop

7.4. Fan VFD & Motor Error

NO.	WARNING	CAUSE	INSPECTION/MAINTENANCE	C/P
127	Motor Temp High Warning	Over 180℃	Check cooling status	
241	Motor Fail Trip	After starting, RPM<8,000	Check motor status	
242	VFD DCL Low trip	DCL < C/P 12	Check input voltage or CP12	12
243	VFD DCL High Trip	DCL > C/P13	Check input voltage or CP13	13
244	Motor starting Fail Trip	In 3 Min, RPM < 5,000	Check motor status	
245	Motor Temp high Trip	Over 200℃	Fix cooling part	
246	VFD Fault Trip	Fan VFD trip	Check VFD	