**Introduction**

The purpose of this manual is to provide instructions that complement good general practices when installing or operating fans manufactured by Azen Manufacturing Pte Ltd (A Twin City Fan Company). It is the responsibility of the purchaser to provide qualified personnel experienced in the installation, operation, and maintenance of air moving equipment.

Instructions given in the body of this manual are general in nature and apply to a variety of models manufactured by Azen Manufacturing Pte Ltd. Most units can be installed and maintained with the instructions given.

The detailed description of the unit supplied is shown on the name plate attached to the fan unit. Further information is shown on the delivery order accompanying the unit. All information should be cross checked and if doubt or clarification is required, then Azen Manufacturing Pte Ltd should be consulted.

The design, nature and use of products do inevitably mean that in some instances, our equipment is supplied to customers with certain safety aspects to be provided by others. (Examples: adequate guarding / protection of rotating components within the ducting in the case of ducted fans and fan unit electrical isolation.) In such cases, any declaration made for Azen's fan equipment are dependent on the fan equipment being placed within installations, themselves fulfilling the requirements of EEC machinery directive 89/392/EEC to current revision standard.

As always, follow good safety practices when installing, maintaining and operating your air moving equipment. A variety of safety devices are available. It is the user's responsibility to determine adequate safety measures and to obtain the required safety equipment.

In summary, it is paramount that all installation and maintenance instructions are correctly and fully adhered to. Prior to dispatch, all fan units have been inspected and mechanically run. Due consideration is given to the smooth running of the unit, electrical inputs and rotation speed. Hence Azen Manufacturing Pte Ltd expects that if handled correctly and installed professionally, then it should give trouble free service. Azen Manufacturing Pte Ltd shall not warrant its fans and equipment due to improper installation, handling and wrong connection.

**Handling and Storage**

Handling of all air moving equipment should be conducted by trained personnel and should be consistent with safe handling practices. Verify the lift capacity and operating condition of handling equipment. Maintain handling equipment to avoid serious personal injury.

Units shipped completely assembled may be lifted with slings and spreader bars. Use well-padded chains, cables or nylon straps. On most units, lifting lugs are provided for attaching chains. Lift the fan in a fashion that protects the fan and fan coating from damage. Never lift a fan by the inlet or discharge flange, shafting or drives, wheel or impeller, motor or motor base, or in any other manner that may bend or distort parts.

If fan installation is to be delayed, store the unit in a protected area. Protect the fan and motor bearings from moisture and vibration (or shock loading). For extended storage, wrap entire unit in plastic. Extended storage requires monthly inspections. Check for corrosion or damage to the unit and for debris within the fan. Rotate the fan wheel a few revolutions. Stop the wheel in a position other than the initial position. Grease the bearings every month with grease compatible with the grease supplied with the bearings.

Do not store fan near vibrating machinery or fan bearings might suffer damage. Always store the right way up. If the unit is going to be subjected to any vibration in its stored location or is going to remain stored for longer than one month, then Azen Manufacturing Pte Ltd should be consulted for special instructions in writing.

**Fan Installation, Factory Assembled Units**

The fan equipment should be again be visually inspected to check that it has not received any site damage. The impeller should again be rotated by hand to ensure smooth running and that no transit damage has occurred. Azen Manufacturing Pte Ltd should be contacted with any queries concerning the fan equipment before it is “powered-up”. The electrical supply for the fan unit must be in accordance with the fan nameplate stamping and subject to normal supply tolerances and design conditions. Full load / starting current are indicated on the fan nameplate. If the fan unit incorporates a terminal box on the casing exterior we recommend that flexible conduit be used for connection to this box. If this is of a non-conductive material, it should incorporate an earth lead connected to the earth point in the terminal box. Weatherproof units and short duct axial incorporating weatherproof motors require weatherproof conduit.
Starting Up of Axial Fan

Before starting the axial fan
1. Rotate the fan impeller manually by hand to ensure motor bearing is free moving.
2. Check all bolts for tightness.
3. Check that rotating parts are free and that unwanted articles, dust, dirt etc., have been removed from the inside of the casing and ducts.
4. Check that duct fixing bolts do not protrude into the fan to foul the impeller and the impeller is truly aligned in the casing.
5. Check that safety precautions have been taken and personnel are clear of the fan.
6. Check that all three phases are live at starter terminals connected to 3 phase fan motor.

Motor Installation

Weatherproof motors, if fitted, are sealed against the entry of airborne moisture from saturated air and incorporate drain holes to allow any condensation to escape from the motor carcass. It is essential therefore that these drain holes are positioned at the lowest point of the fan motor when horizontally mounted.

A.C. motors with outputs of 1.10 KW and above are provided with six terminals and are suitable for direct on line or star/delta starting. For short duct axial where the wiring is taken direct to the motor terminal box, a diagram is included in the terminal box lid, indication the necessary linkage. With long duct units including a terminal box on the casing exterior, generally there are connected for direct on line or during manufacture.

Fileproof motors due to the operating conditions prevailing, are generally supplied for wiring and connection with drawn conduit, direct to the terminal box, on site by the client. Connections and fitting used must be in accordance with current BASEEFA approved standards and requirements.

Unless otherwise designated on the casing or motor frame, all bearing are pre-packed with grease and require no further attention at this stage.

General Motor Maintenance

The three basic rules of motor maintenance are: keep the motor clean, keep it dry, and keep it properly and appropriately lubricated. Lubrication requirements are normally attached to the motor. Do not over-lubricate.

Blow dust off periodically (with low pressure air) to prevent the motor from overheating. For motors located in a dusty or dirty environment or running 24 hours a day, divide the service interval by 2. If the environment is very dirty or high temperatures exist, divide the service interval by 4.

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5. Check that safety precautions have been taken and personnel are clear of the fan.
6. Check that all three phases are live at starter terminals connected to 3 phase fan motor.

Note: The flexible conduit must not be used as an earth conductor. The wiring diagram within this terminal enclosure or the motor terminal box if appropriate will contain an electrical connection diagram.

Any fuse ratings should be sufficient to withstand the starting current; however they should not be used for the purpose of overload protection.

Fan Maintenance

Due to the different periods of operation, rigid inspection and maintenance period is recommended. It is suggested therefore that inspection and if necessary fan cleaning (by non-abrasive means) is carried out at regular intervals of at least 5000 running hours or 12 months, whichever is sooner.

All fastenings, of whatever type should be checked for tightness. The integrity of the rotating items should be checked.

Bearings are normally sealed for life type; hence will not need detailed inspection. Motor cleanliness must be checked especially in relation to its cooling fan if fitted.

If it becomes necessary to change the blade angle then Azen Manufacturing Pte Ltd should be contacted and detailed instructions received together with any limitations of change/use.

Fan accessories should be checked, cleaned and replaced as necessary. Should you have any queries related to our accessories pricing and delivery, kindly contact us at: Tel: (65) 6261 0277, Fax: (65) 6261 7785, or Email: inquiry@azen.com.sg.
Lubrication. Motors normally include shielded bearing which are pre-packed with grease and required no periodic attention. Motors equipped with grease fittings and relief plug should be re-lubricated by the following procedure, using a low pressure grease gun:

1. Wipe clean the regions around the motor grease fittings.
2. Remove the relief plug and free the relief hole of any hardened grease.
3. Add grease with the motor at standstill until new grease is expelled through the relief hole.
4. Run the motor for about 10 min with the relief plug removed to expel excess grease, before replacing relief plug.
5. Do not over-lubricate.

Bearings. Depending on the severity of service, the motor bearings should be checked for wear at 2/3 yearly intervals. If replacement is necessary the bearings should be removed from the shoulders with proper extraction tools, to avoid damaging the shaft. When bearings are being rectified, they should be lightly tapped along the face of the inner race, with the shaft supported at the other end. It should be noted that force is not recommended during this operation and if used could be harmful to the components.

Troubleshooting

When a fan system is not functioning properly, there may be more than one cause. Look out for all possible causes and eliminate them systematically.

Fan System Malfunction may show up as one or more of the following:

- Insufficient air flow
- Too much air flow
- Power consumption high
- Bad starting
- Noise or Vibration
- If Fan Doesn’t Start

Insufficient Air Flow

- Check direction of rotation. The rotation should be counter clockwise when viewed from the supply side i.e. on the impeller side.
- Check impeller handling. Right hand blades should be used.
- Check running speed.
- To determine the actual volume, choose a straight section of ducting, where disturbance from upstream conditions is likely to minimal, preferable upstream of the fan.

Apart from the above likely causes, normal losses may arise from:

- Badly designed transition duct.
- An inlet or outlet grille or guard made of perforated sheets.
- An overload filter which should be cleaned periodically.
- An accumulation of foreign matter.

Power Consumption High

- The blade angle is adjusted too high.
- A fine pitch axial fan operating against excessive back pressure.
- Single phasing of a three phase motor (a supply fault on one of the phase.)
- Any A.C. motor running below its normal speed due to a winding or starting fault, or low supply voltage.
- Check if motor selected is undersized.

Bad Starting could be due to excessive power consumption (please see previous section), but in many cases, it could also arise from the following:

- Low supply voltage.
- Wrong type of fuses or breakers fitted for coping with starting condition.
- A motor fault resulting in a “dip” in its torque characteristic.
- Failure to take full account of inertia of fan and drive components in selection of motor and starter.
- Ensure correct size DOL starter is used.

Noise or Vibration

Noise arises to some degree from practically every fan. It is only a problem when its level is unbearable. It may be generated as air noise, mechanical noise or electrical hum or some combination of all three. While air noise can be aggravated by some obstruction in close proximity to the inlet or outlet of a fan it most commonly results from unsuitable selection of the fan. This latter condition can only be cured by substituting a quieter fan (usually of larger diameter and lower speed) or by apply sound attenuating techniques.
**Electrical Noise** can arise from eccentricity between rotor and stator, porosity or faults in rotor die-castings, vibration of windings etc. It is nearly always present to a greater or lesser extent. Noise can be greatly increased or decreased according to the method of motor mounting.

**Vibration** at an unacceptable level can arise from genuine out-balance or from an unsuitable mounting structure or a combination of both. When a natural frequency of a mounting structure is somewhere near the fan running speed, no amount for accurate balancing is likely to cure the vibration. Steps must be taken to strengthen the structure which supports the fan and its related accessories. All fan blades are factory balanced. As such vibration attributed to unbalance of fan blade does not arise.

**Fan Doesn’t Start**
- Check whether emergency stop switch is de-activated or the main switch box is turned off.
- If trip light comes on, re-set overload contactor.
- After reset, if the fan is still tripping, check the overloading setting. Adjust overload to higher amperage or replacing to a higher rating overload, if necessary.
- Assuming above action has been taken and fan still cannot start, check MCB/motor terminals for any loose connection.
- Check whether motor is burnt-out.

Do contact Azen Manufacturing Pte Ltd if any assistance is required.

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**Contact Information**
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