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## VANEMASTER FANS SERIES AVD VANEAXIAL FAN INSTALLATION/MAINTENANCE INSTRUCTIONS



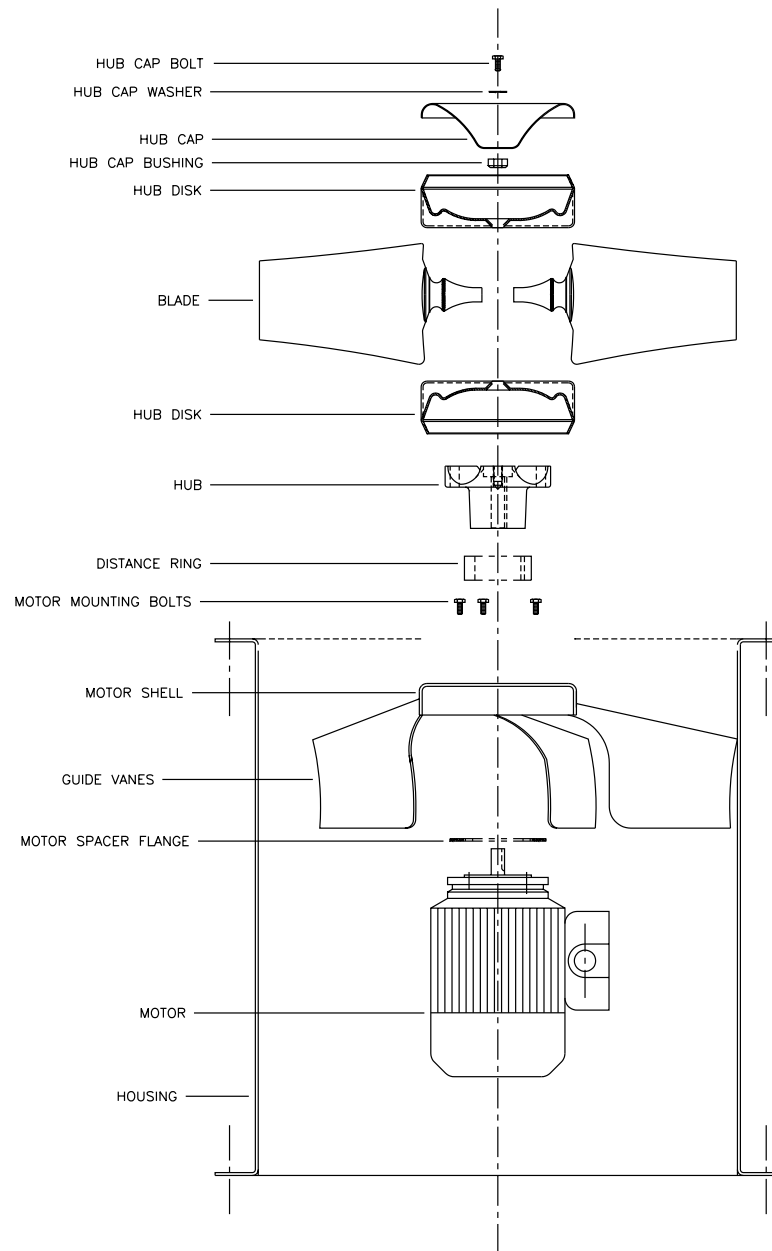
### I. Introduction

Your vaneaxial fan is a carefully engineered and constructed piece of machinery which will give long, satisfactory service provided correct installation and proper maintenance practices are observed. **DO NOT DESTROY THIS DOCUMENT AFTER INSTALLATION - RETAIN WITH THE UNIT FOR MAINTENANCE.** Preventative maintenance including periodic inspection, testing, cleaning, lubrication and replacement of worn parts will forestall equipment breakdowns and minimize equipment shut-downs.

In addition to this manual, all fans are shipped with the Air Movement and Control Association (AMCA) Publication 410-90. "Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans". If you did not receive this booklet, immediately contact the factory to obtain a copy or contact AMCA directly. The AMCA Safety Publication 410-90 should be read before installing and operating the equipment to insure safety of personnel and equipment.

### AMCA ARRANGEMENT 4 - DIRECT DRIVE

The basic AVD fan consists of a housing, impeller, guide vanes, motor shell and a motor. The AVD impeller consists of two assembled, die formed, galvanized steel hub disks with cavities to house the blades at preset angles. The impeller blades are cast aluminum. The AVD blades can be set at an angle between 25 and 60 degrees to allow precise performance selection. The impellers are statically and dynamically balanced at the blade angle required to obtain the specified point of operation. The AVD fan housing is accurately formed from plate steel with integrally rolled inlet and outlet flanges. High efficiency straightening vanes of heavy gauge steel are installed downstream of the impeller to eliminate swirl and regain static pressure. The AVD straightening vanes are structurally designed to support the weight of the motor and impeller. TEFC, flange mounted motors are provided as standard. The completely assembled fan is given a running check test and inspection before final shipment.



## II. AVD ACCESSORIES

A wide range of accessories and options are available for the AVD fan:

1. **Safety Guards** are utilized to prevent contact with rotating parts and prohibit foreign objects from being drawn into the fan. The wire guard is designed as a heavy gauge wire screen which can be supplied on the flanged fan housing or inlet bell.
2. **Inlet Bells** are recommended whenever the fan is intended for operation with an open inlet. Inlet bells are formed from heavy gauge steel to provide a smooth entrance condition to the fan inlet and minimize performance losses.
3. **Housing Support Options** fabricated of heavy steel plate include: horizontal mounting feet for floor mounting or ceiling suspension.
4. **Outlet Cones (Diffusers)** are generally used on the fan outlet to increase pressure. These diffusers are sometimes used on the inlet of the fan. The cones are fabricated of heavy gauge steel and are available in a short and long version.

5. **Roof Curb Mounting Base** is designed for vertical roof mounted units consisting of a one piece, heavy gauge, reinforced steel mounting platform for bolting to the fan flange.
6. **Discharge Hood** for vertical mounted units is designed for weather protection on either the inlet or outlet side of the fan. The discharge hood is constructed of heavy gauge steel.
7. **Other Available Options**
  - Access Doors in Housing
  - Sound Attenuation
  - Vibration Isolators
  - Variable Frequency Drives

### III. Installation and Start-Up

#### A. Receiving

Acme Eng. & Mfg. Corp.'s equipment is thoroughly inspected and packaged at the factory. When a carrier signs the Acme Engineering & Manufacturing Corporation's bill of lading, the carrier accepts the responsibility for any subsequent shortages or damage, evident or concealed, and **any claim must be made against the carrier by the purchaser within 15 days after receipt.** Evident shortage or damage should be noted on the carrier's delivery document before signature of acceptance. Inspection by the carrier of damage evident or concealed must be requested. After inspection, issue a purchase order for necessary parts or arrange for return of the equipment to the Acme factory for repair.

#### B. Handling

Acme Engineering & Manufacturing Corporation fans are shipped completely assembled and packaged. The units may be handled and moved using good rigging techniques, being careful to avoid concentrated stresses that will distort any of the parts.

#### C. Safety Precautions

In addition to this manual, all fans are shipped with the Air Movement and Control Association (AMCA) Publication 410-90, Recommended Safety Practices of Users and Installers of Industrial and Commercial Fans. If you did not

receive this booklet, immediately contact the factory to obtain a copy or contact AMCA directly. The AMCA Safety Publication 410-90 should be read before installing and operating the equipment to promote safety of personnel and equipment. This unit has rotating parts and safety precautions should be exercised during installation, operation and maintenance.

The maximum operating speed for which this fan is designed must not be exceeded. These limits are available through Acme Engineering & Manufacturing Corporation's Applications Group.

The maximum operating temperatures are given in "Installation" Section B.5, Item 9 below.

Do not use fans in hazardous environments where fan's electrical system could provide ignition to combustible or flammable materials unless built specifically for the environment.

#### D. Storage

Acme provides sufficient protection for shipping the equipment to the jobsite. If the equipment is not installed immediately, additional precautions are necessary. For storage:

1. Equipment shall be kept in a dry area, free from rigid and extreme changes in humidity and protected from low temperature. The unit should not be exposed to vibration.
2. Rotor should be blocked to prevent windmilling.
3. The impeller should be rotated several revolutions every 90 days to re-coat the motor bearings with grease and to minimize brinelling of the motor bearings.
4. Every 6 months, add high quality grease to bearings to purge and replace old grease.
5. Upon removal from storage, bearings should be supplied with an ample supply of fresh grease to purge and replace the old grease. High quality ball bearing grease should be used per the motor manufacturers recommendations.
6. Acme does not recommend use of any plastic to cover the fan equipment as this can create condensation, rusting and equipment damage.

## E. Installation

1. The basic fan consists of a housing, impeller, guide vanes and a motor. The motor is factory installed. The impeller is supplied from the factory with the blades set to the angle that corresponds to the specified point of operation (volume flow rate and pressure) for the fan speed. The impeller has been statically and dynamically balanced with the blade angle set to this position.

The impeller design permits adjustment of the blade angle over the full performance range (25 to 60 degrees). The quadrant at the base of the blade covers an angular adjustment range from 70 to 0 degrees in 5 degree increments. An increase in the blade angle will increase the motor load, therefore, it must be determined that the motor is capable of handling the additional load. Changes in blade angle (increase or decrease) may also disrupt the balance of the impeller causing increased vibration levels. Please contact Acme's Application Engineering group before making any adjustment of the blade angle.

2. Before installing the fan, check all fasteners for tightness; particularly the impeller and motor.

Turn the impeller by hand to make sure it does not strike the fan housing. The tip clearance of the impeller should be close to the same along the entire circumference of the housing. If this is not the case, adjust the motor location in the suspension arrangement. (See the maintenance instructions for dismantling and re-assembly of the fan for motor servicing).

3. The fan is provided with an arrow label showing the rotation and direction of air flow through the fan. The fan should be so installed that the required air flow direction in the system is achieved.
4. If the motor is provided with condensation drain holes, the fan should be so installed that the drain

hole(s) are at the lowest point of the motor.

5. The fan can be installed in a number of ways, either horizontally or vertically:

The fans can be supplied with mounting feet (optional)  
Supported by ductwork if sufficiently braced to support the weight of the fan  
Ceiling suspended by specially designed supports or hangers

When the fan is finally secured in place, make sure that the impeller rotates freely in the fan housing. The tip clearance between the impeller and the fan housing should be close to the same along the entire housing circumference.

6. Ducts on the inlet and outlet side should be so arranged that the airflow to and away from the fan is straight and unobstructed; i.e. there must be no sharp bends immediately in front of the inlet or outlet opening for at least three (3) duct diameters.

Sharp ends or other obstructions at the inlet or outlet of the fan can result in reduced fan performance and/or increased sound levels.

7. To prevent vibration from being transmitted to the surroundings, the fans can be furnished with optional vibration isolation and flexible duct connections (by others).
8. The natural frequency of the fan mounting structure must differ by a minimum of 20% from the fan speed.
9. Temperature Limitations

As standard, the fans are designed for a gas temperature range of -20 C (-4 F) to +40 C (+104 F). The temperature range can be increased to -40 C (-40 F) to +150 C (+302 F) with special motors (lubrication), reduced speed and/or increased tip clearance.

**CAUTION!** For applications at elevated temperatures, the fan must operate

after the process has been shut down until the exhaust air or gas is cooled sufficiently to protect fan components from overheating.

#### 10. Electrical Connections

Connections with the electrical supply main should be made directly to the outside terminal box located on the fan housing.

When the power supply has been connected, make sure that the direction of rotation of the impeller is in accordance with the arrow label on the outside of the fan.

### F. Pre-operating Check List

After the equipment has been installed correctly and a check has been made for tightness of all hardware and mounting bolts, the fan will be ready to operate after these final safety checks to prevent injury to personnel or damage to the equipment.

1. Check for correct supply voltage.
2. Remove all foreign matter from the vicinity of the fan inlet(s)/outlet(s), ductwork and interior of fan.
3. Check blade angle setting for desired air performance (blade angle setting for specified point of operation can be found on fan nameplate).
5. Make sure that all safety guards are in place.
6. Momentarily energize the fan to check the direction of rotation.
7. Start the fan and check for the following:
  - Motor amperage in each phase for balance and correct motor load.
  - Excessive vibration (not to exceed a peak-to-peak velocity of 7mm/sec (0.28 ins/sec).
  - Unusual noise.

### IV. General Operation and Maintenance

- A. CAUTION! Before proceeding with any maintenance, make sure the motor starter or disconnect switch to the fan is locked in the "OFF" position.
- B. The fan housing and impeller require no maintenance other than ordinary cleaning. The motor needs to be kept clean along with the fan housing and impeller.

Excessive vibration occurring after the fan has been in operation for some time will usually be due to an accumulation of dust or dirt on the impeller and should disappear after cleaning. Dust buildups, in general, occur uniformly with time not creating a balance problem until the buildup reaches a thickness where a portion of the buildup flies off of the impeller initiating an unbalance condition. If dust or dirt is not the problem, a balancing specialist should be consulted to analyze and rectify the problem.

- C. To service the motor, the following steps are required:
  1. Disconnect the electrical cables from the motor terminal box on the fan housing.
  2. Remove any ductwork adjacent to the fan inlet and outlet.
  3. Remove the impeller center bolt, washer and hub cover.
  4. Remove the impeller by means of a pulley remover fastened to the two threaded holes of the hub boss.
  5. The motor will need to be supported while the retaining bolts are being loosened and removed from the motor shell. The motor is now completely accessible for service.

After servicing the motor:

1. New bolts, lock washers and nuts should be utilized in re-assembling the fan.
2. Re-mount the motor on the motor mounting plate. Care must be taken to locate the motor shaft in the exact center of the housing. Motor mounting bolts must be tight.

3. Mount the impeller on the motor shaft by aligning impeller on the motor shaft. Utilize the impeller center bolt, washer, hub cover and drilled/threaded motor shaft to pull impeller hub boss up against the shoulder on the motor shaft. Tighten the impeller center bolt securely.
  4. Ensure that the tip clearance of the impeller to the fan housing is close to the same along the entire circumference of the housing. If this is not the case, loosen and adjust the motor location on the motor mounting plate. Re-tighten the motor mounting bolts when the impeller is centered in the fan housing.
  5. Re-connect the electrical cables to the motor terminal box. Check for proper rotation.
  6. Replace all inlet and/or outlet ductwork.
  7. Start fan and check vibration levels. Vibration levels shall not exceed a peak-to-peak velocity of 7mm/sec (0.28 ins/sec).
- D. The following steps are required to change fan air performance by blade angle adjustment.
1. Make certain that the required air performance adjustment will not overload the motor. You may need to talk with Acme's Application Engineering group.
  2. CAUTION! Before proceeding, make sure the electrical service to the fan is locked in the "OFF" position. Disconnect the electrical cables from the motor terminal box on the fan housing.
  3. Remove any ductwork adjacent to the fan inlet.
  4. Remove the impeller center bolt, washer and hub cover.
  5. Remove the impeller by means of a pulley remover fastened to the two threaded holes of the hub boss. The weight of the impeller must be properly supported to prevent blade damage.
  6. Loosen the bolts near the outer diameter of the hub disc to a "snug" tightness.
  7. Adjust the blade angle by hand to obtain the desired performance. **It is critical that all blades be set at the same blade angle.**
  8. Tighten the bolts near the outer diameter of the hub disc securely.
  9. Mount the impeller by aligning impeller hub boss on the motor shaft. Utilize the impeller center bolt, washer, hub cover and drilled/threaded motor shaft to pull impeller hub boss up against the shoulder on the motor shaft. Tighten the center bolt securely.
  10. Replace the ductwork at the fan inlet.
  11. Return the electrical service to the fan. Check for proper rotation.
  12. Start fan and check vibration levels. Vibration levels shall not exceed a peak-to-peak velocity of 7 mm/sec (0.28 ins/sec).

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# NOTES

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## TERMS AND CONDITIONS

**DESIGN CHANGES** The Company reserves the right to make changes in design, improvements and additions in and to its products any time without imposing any liability or obligations to itself to apply or install the same in any product manufactured by it.

**TITLE** The title and right of possession of the equipment sold herein shall remain with the Company and such equipment shall remain personal property until all payments herein (in-

cluding deferred payments whether evidenced by notes or otherwise) shall have been made in full in cash and the Purchaser agrees to do all acts necessary to perfect and maintain such right and title in the Company.

**SAFETY ACCESSORIES** The Company manufactures equipment designed to serve multiple applications and offers a wide range of safety equipment, including guards and other devices, as may be required to meet customer specifica-

tions. Without exception, the Company recommends that all orders include applicable safety devices. Equipment ordered without applicable safety devices is clearly the responsibility of the Purchaser. Further, the Purchaser warrants that he has determined and acquired any and all safety devices required for equipment sold by the Company. Weather covers and guards for motor and V-belt drives, couplings, shafts and bearings, along with inlet and outlet screens, are optional accessories noted in the price list.

These instructions cover the usual installation, operation and maintenance methods for which the product(s) was designed. They do not purport to cover all details or variations in the product(s) nor to provide for every possible contingency that might be met in connection with the installation, operation and maintenance. For any departures from these instructions, or should particular problems arise which are not covered sufficiently for the purchaser's purpose, the matter should be referred to the Company.

**WARNING** The Company products are designed and manufactured to provide reliable performance but they are not guaranteed to be 100% free of defects. Even reliable products will experience occasional failures and this possibility should be recognized by the User. If these products are used in a life support ventilation system where failure could result in loss or injury, the User should provide adequate back-up ventilation, supplementary natural ventilation or failure alarm system, or acknowledge willingness to accept the risk of such loss or injury.

**WARNING** DO NOT use in HAZARDOUS ENVIRONMENTS where fan's electrical system could provide ignition to combustible or flammable materials unless unit is specifically built for hazardous environments.

**CAUTION** Guards must be installed when fan is within reach of personnel or within seven (7) feet (2.134 m) of working level or when deemed advisable for safety.

**DISCLAIMER** The Company has made a diligent effort to illustrate and describe the products in this literature accurately; however, such illustrations and descriptions are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions or dimensions.

## LIMITED WARRANTY

**WARRANTY AND DISCLAIMER:** The Company extends this limited warranty to the original buyer and warrants that products manufactured by the Company shall be free from original defects in workmanship and materials for two years from date of shipment, unless otherwise noted (see specific product literature), provided same have been properly stored, installed, serviced, maintained and operated. This warranty shall not apply to products which have been altered or repaired without the Company's express authorization, or altered or repaired in any way so as, in the Company's judgment, to affect its performance or reliability, nor which have been improperly installed or subjected to misuse, negligence, or accident, or incorrectly used in combination with other substances. The Buyer assumes all risks and liability for results of use of the products. Warranties on purchased parts, such as but not limited to bearings, sheaves, belts, couplings, electric motors, pumps and controls are limited to the terms of warranty extended by our supplier.

Polyethylene tubing and cooling pads are warranted to be free of defects in material and workmanship for a period of 90 days from date of shipment and a like warranty applies to the cross fluted cellular type cooling cells for a period of two years from date of shipment provided same have been properly handled, stored, installed, serviced, maintained and operated. And further, not subjected to excessive heat, corrosive agents or chemicals, or mechanical abuse that may cause tearing, crushing or undue deterioration nor used on a system or in a manner other than that for which it was designed as explained in the product literature.

**LIMITATION OF REMEDY AND DAMAGES:** All claims under this warranty must be made in writing and delivered to P. O. Box 978, Muskogee, Oklahoma, 74402, within 15 days after discovery of the defect and prior to the expiration of the warranty period from the date of ship-

ment by the Company of the product claimed defective, and Buyer shall be barred from any remedy if Buyer fails to make such claim within such period.

Within 30 days after receipt of a timely claim, the Company shall have the option either to inspect the product while in Buyer's possession or to request Buyer to return the product to the Company at Buyer's expense for inspection by the Company. The Company shall replace, or at its option repair, free of charge, any product it determines to be defective, and it shall ship the repaired or replacement product to Buyer F.O.B. point of shipment; provided, however, if circumstances are such as in the Company's judgment to prohibit repair or replacement to remedy the warranted defects, the Buyer's sole and exclusive remedy shall be a refund to the Buyer of any part of the invoice price, paid to the Company, for the defective product or part.

The Company is not responsible for the cost of removal of the defective product or part, damages due to removal, or any expenses incurred in shipping the product or part to or from the Company's plant, or the installation of the repaired or replaced product or part.

Implied warranties, when applicable, shall commence upon the same date as the express warranty provided above, and shall, except for warranties of title, extend only for the duration of the express warranty. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. The only remedy provided to you under an applicable implied warranty and the express warranty shall be the remedy provided under the express warranty, subject to the terms and conditions contained therein. The Company shall not be liable for incidental and consequential losses and damages under the express warranty, any applicable implied warranty, or claims for negligence, except to the extent that this limitation is found to be unenforceable un-

der applicable state law. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

No employee, agent, dealer, or other person is authorized to give any warranties on behalf of the Company or to assume for the Company any other liability in connection with any of its products except in writing and signed by an officer of the Company.

**REPLACEMENT PARTS** If replacement parts are ordered, buyer warrants that the original components in which these replacement parts will be placed are in satisfactory working condition, and when said replacement parts are installed, the resultant installation will operate in a safe manner, at speeds and temperatures for which the original equipment was purchased.

**TECHNICAL ADVICE AND RECOMMENDATIONS, DISCLAIMER:** Notwithstanding any past practice or dealings or any custom of the trade, sales shall not include the furnishing of technical advice or assistance or system design. Any such assistance shall be at the Company's sole option and may be subject to additional charge.

The Company assumes no obligation or liability on account of any recommendations, opinions or advice as to the choice, installation or use of products. Any such recommendations, opinions or advice are given and shall be accepted at your own risk and shall not constitute any warranty or guarantee of such products or their performance.

**GENERAL** In no event shall any claim for consequential damages be made by either party. The Company will comply with all applicable Federal, State, and local laws.