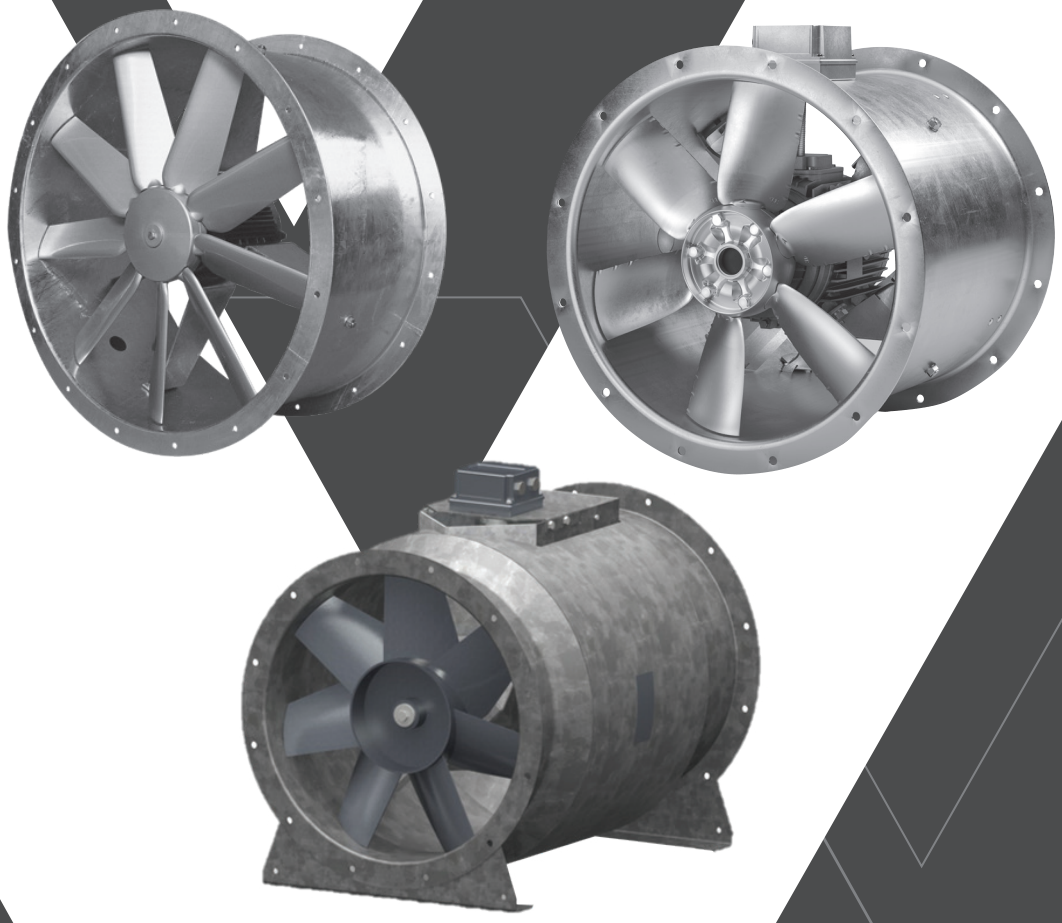
Woods
AIR MOVEMENT

AEROFOIL AXIAL FLOW FANS - HT & STANDARD

Safety, installation and maintenance instructions



Part Number 905 989

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THIS LEAFLET MUST BE PASSED TO THE USER
TO ENABLE THE FAN TO BE MAINTAINED IN A SAFE CONDITION.

HT SERIES SMOKE VENTING EQUIPMENT

Fans for emergency operation at high ambients for a limited period

1. SAFETY

Warning and safety information relevant to specific operations are contained within each section. The following warning or advice categories are used:

DANGER! Failure to follow these instructions may result in serious injury or death to the user in addition to serious damage to the equipment.

WARNING! Failure to follow these instructions may result in minor injury or damage to the equipment.

CAUTION! Failure to follow these instructions may result in malfunction or damage to the equipment

DANGER!

This product contains rotating parts and electrical connections which can be a danger and cause injury. It is of paramount importance for any fan that is required to function in emergency conditions, that the installer and user must follow all relevant instructions contained within this leaflet, as well as those contained within our general Instruction leaflet, which is supplied with this product.

To ensure that fans will operate continuously during a high air temperature emergency, the electrical system must have been designed and installed to accommodate the specific emergency conditions of temperature and duration. A maintenance procedure must be put in place and a record of the activities that have been performed must be kept.

2. INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

These instructions apply to all axial fans, including Aerofoil and Bifurcated Fan variants. They must be read in conjunction with advice related to our standard temperature fans (see sections 12 onwards). Note: Where fans have a foot mounted motor fitted, then the motor mounting feet must be positioned underneath the motor. Foot mounted motors must never be suspended from their mounting feet. If in doubt, please refer to Woods Air Movement UK (Colchester Office).

3. SITE STORAGE, SUPPLY, INSTALLATION

WARNING!

When fans are stored (prior to installation), please ensure that access by un-authorised persons is prevented, by using guards, barriers or secure premises to ensure that fan impellers (which may be rotating) do not present a hazard. For more specific advice please refer to sections 12 onwards.

These instructions relate to all fans rated up to and including 600°C for 2 hours which are designed to be mounted into or on the end of ductwork that is situated outside the fire zone. All fans (including our F600 Bifurcated fan range) are also certified for use within fully immersed conditions (i.e. mounted inside the fire zone). However, in this case, when using our F600/F400 Bifurcated fan range, please request additional installation instructions which relate to motor cooling duct connections, auxiliary cooling fan selection advice, anti-vibration spring mount and flexible connector selections.

4. OPERATING CONDITIONS

Under emergency conditions, these fans are suitable for the temperature/time capability stated on their name plate or in accompanying documentation. e.g. “HT300/1” or “F300 (60)” denotes that a fan is suitable for a single use at an emergency condition of 300°C for 1 hour (60 minutes). Our JMF Bifurcated fan range can operate up to 600°C for 2 hours provided that the air temperature at entry to the motor compartment does not exceed 40°C. If the emergency air temperature exceed 400°C, a means of ducting hot air away from the motor compartment to a safe location must be provided. In addition, a means must also be provided to force ventilate the motor compartment, in order to supply cooling air which is at less than 40°C. Motor cooling fan and associated ductwork shall be provided by others.

Unless otherwise stated fans are suitable for continuous operation, prior to the emergency, in ambient temperatures of -40 to +40°C. They are only suitable for start-up between -20 to +40°C. On the fan nameplate, the maximum temperature may be shown as +40°C but when installed for emergency use, the temperature/time capability will be as shown on an additional label adjacent to the main nameplate.

5. CONNECTION

The wiring to the fan must be in accordance with the connection diagram in the terminal box.

Fans are designed for a 3 phase electrical supply. On commissioning, the rotation of the impeller should always be checked to ensure that it is running in the correct direction.

6. CABLE

Suitable fire-resistant cable must be used between the main supply, starter controls and the fan. The mains supply must be from a guaranteed or separately maintained source, to enable the fan to continue running under emergency conditions. Duct-mounted terminal boxes for all HT fan specifications are designed to accommodate MICC supply cables.

7. CONTROL

High Temperature rated fans can either be run Direct-on-Line during their emergency [high temperature] operation, or via an approved inverter (VSD), which has been selected in accordance with our EN12101-3:2015 certification. Where required, a voltage waveform filter should also be fitted between the VSD and the fan drive motor. If in doubt, please seek advice from Woods Air Movement.

Our HT fans can be soft-started, and speed controlled when operating in a normal ventilation mode. Use of non-approved drives is permitted as long as the drive is by-passed from the control circuit once the fan is running at full speed. Variable Speed Drives (VSDs) must not be located in the same fire compartment as the extract fans. They should instead be located within a suitable fire protected compartment, remote from the fan. VSDs must be connected to the fans using appropriate HT cable for the application and where required with screened cables to minimise the impact of EMC affects. VSDs should also be fitted with appropriately selected voltage waveform, RFI or Harmonic filters, depending on the application.

Over-heat protection, vibration sensors, bearing sensors and inverter motor over-heat protection circuits must be disabled during emergency mode if provided.

8. MAINTENANCE - HT FANS

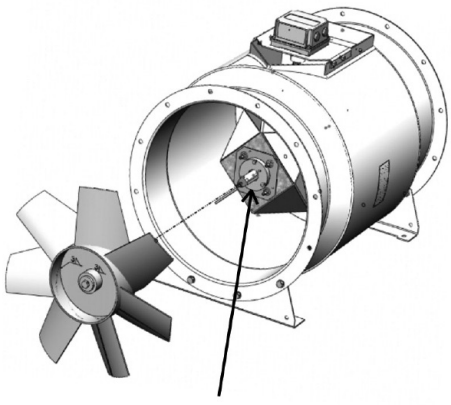
For normal operation and planned preventative maintenance please refer to sections 17 and 18.

AT 3 MONTHLY INTERVALS WHEN FANS ARE NOT NORMALLY RUN

If the fan is intended for emergency use only, the resistance of its windings to earth should be measured (at 500v dc). If the resistance value is found to be less than 10 MΩ (Megaohm), then the motor should be dried out and re-checked. Run the motor for at least 15 minutes to prevent hardening of the grease and to minimise bearing corrosion issues.

AT 6 MONTHLY INTERVALS

For bifurcated fans only; remove the impeller and check the condition of the shaft packing seal located behind the shaft seal retaining plate. Replace the packing seal (Part No. 407212) if necessary.



Part No. 407212

9. LUBRICATION - HT FANS

CAUTION!

It is necessary to record the number of hours the motor has operated in order to determine when bearing relubrication is required. If the motor is not running continuously, the date of installation must be recorded, since relubrication is recommended every three to six months, even if the motor has not been run during this time.

WARNING!

Beware of all rotating parts!

Grease can cause skin and eye irritation when re-greasing. Follow all safety precautions specified by the grease manufacturer.

SHIELDED/SEALED BEARINGS

Small motors (WEG 80-132 frames or Brook 71-180 frames) which are fitted with 'sealed for life' ZZ/2Z bearings (that are pre-greased), must be replaced after 20,000 running hours (if fans are continuously running). If the fan is a "dual mode" fan or if it is a dedicated fire safety (smoke extract) fan, checks should take place every 6 months to determine if the fan (motor) bearings have become noisy or appear to have become unbalanced. Check motor nameplate for determining the bearing type used.

MOTORS FITTED WITH GREASE RE-LUBRICATION POINTS

Bearing grease re-lubrication points are usually fitted to larger frame motors than those mentioned above. Regular maintenance and adherence to re-greasing procedures will prolong bearing life. Failure to do this may shorten bearing life considerably.

Maintenance includes:

a) Attention to the overall bearing condition;

b) Cleaning and lubrication;

c) Detailed inspection of the bearings.

Although bearing problems may often be detected by listening for unusual bearing noise, more sophisticated equipment should be used to obtain a quantified bearing condition analysis. Bearings must be lubricated to avoid metallic and direct contact of the moving parts, and to provide protection against corrosion and wear. Lubricant properties deteriorate over time due to mechanical operation, furthermore, all lubricants are subject to contamination under working conditions. For this reason, lubricants must be renewed or replenished on a regular basis, in accordance with motor manufacturers recommendations.

NOTE!

Bearings with grease re-lubrication points must be replaced after 40,000 running hours or 5 years, whichever occurs first.

LUBRICATION INTERVALS

It should be noted that some grease types may cause higher bearing noise levels particularly at low temperatures, or when intermittent operation does not allow the running temperature to exceed +20 °C.
Please contact Woods Air Movement if the normal fan and motor operating temperature is below -5 °C.

Grease type, lubrication intervals, grease quantity used, and the bearing type and its associated component clearances, are all indicated on the motor nameplate. Lubrication intervals are dependent on motor size, running speed, working conditions, grease type and the ambient operating temperature. If required, please contact Woods Air Movement for further advice related to bearing lubrication or replacement.

NOTE!

If the supplied fan and motor assembly was intended and designed) for horizontal operation but is then operated in a vertical position (i.e. with the motor shaft in the vertically up or vertically down position), then bearing lubrication intervals must be reduced by half (i.e. must be more frequent).

CORRECT GREASE QUANTITY

Correct lubrication is very important to ensure that bearings operate reliably i.e. grease must be applied correctly and in a sufficient amount. Lack of grease or excessive greasing may cause bearing damage.

CAUTION!

We recommend that one grease shot is measured in order to determine its weight, so that the number of grease shots required, can be matched to the quantity (i.e. weight) as stated on the motor nameplate.

Excessive greasing causes overheating by increasing the resistance to free movement of its rotating parts and, in particular, by the lubricant being compacted so that it loses its lubricating characteristic. An excessive application of grease may also cause it to leak into the motor, contaminating the winding. Lack of grease causes overheating due to increased friction levels between the rolling elements, outer ring and inner race, which will ultimately result in premature bearing failure.

GREASE COMPATIBILITY

Incompatibility between different grease types can cause problems.

ATTENTION

Never mix greases of different bases.

Example: lithium-based grease must never be mixed with sodium or calcium-based grease.

ATTENTION

To avoid any eventual grease incompatibility, always re-grease bearings with the grease type indicated on the motor nameplate.

As a general rule, greases with the same specification are compatible, however this is dependent on the formula. Before mixing grease types, therefore, please consult the grease supplier.

DRIVE END AND NON-DRIVE END BEARING RELUBRICATION STEPS

1. Before lubricating the bearing, clean the area around the grease re-lubrication points with clean cotton cloth;
2. With the motor running, add the amount of grease indicated on the bearing nameplate;
3. Leave the motor running for sufficient time to spread the grease on the bearing;
4. Check bearing temperature to make sure there is no significant variation.

NOTE!

On first start of the equipment or after a bearing re-lubrication, there may be a slight temperature rise for the initial 10-20 hours of running.

If the motor cannot be lubricated while it is running under normal conditions, lubrication can be carried out as detailed below:

1. Inject about half amount of required grease, and run the motor at full speed for 5 minutes;
2. Switch off the motor and inject the remaining grease;
3. Start the motor again to ensure that grease is correctly distributed within the bearing.

CAUTION!

The bearing life is estimated by calculations according to ISO 281:2007-02 to give a L10 life. Beyond each periodical maintenance, our recommended bearing condition check frequency is at each lubrication. Depending on the results, bearings may need to be replaced.

CAUTION!

Lubrication intervals are based on a bearing operating temperature of 75°C (frames 63 to 200) and 85°C (frames 225 to 500). Some designs may vary. An increase of the ambient temperature will raise the bearing temperature correspondingly. For each 15°C of temperature rise, the relubrication period must be reduced by half (i.e. must be more frequent).

ATTENTION!

Where motors are mounted inside fan ducts, and where grease re-lubrication points have been mounted on the exterior of the duct, there will be an additional nameplate affixed to the product which will state the grease type, quantity and re-lubrication interval.

MOTORS WITHOUT LUBRICATORS

Where motors are not fitted with bearings that can be re-lubricated (WEG 80-132 frames or Brook 71-180 frames), then the following steps must be taken::

Motors operating in ambient temperatures up to 50°C;

After 20,000 hours running, or 3 years, whichever is the shorter, (10,000 hours where motor speed exceeds 1800 rpm), the motor should be dismantled, shaft seals and bearings replaced and the bearings re-lubricated.

Motors mounted in airstream, operating at temperatures of 200°C (i.e. motors designed for smoke extraction use);

To re-lubricate motors which are mounted in an airstream with a temperature above 199°C (where the motor is designed for used within a Smoke Extraction fan), the special grease used has a very low fill requirement. These fans, therefore, do not have re-lubrication facilities. Any old grease must be washed out with a designated solvent. The bearings must be refilled with grease leaving the housing empty. If a bearing is removed from the rotor, it must be discarded and a new one fitted, using the approved grease.

10. TESTING (FANS AND CONTROLS)

It is recommended that fire safety systems are tested every 6 months. However, ideally, these tests should be more frequent (once per month or once every 3 months). This test must review all elements of the system [fans, controls, dampers etc.] to confirm correct operation.

Note: Fans must only be run for short periods as no thermal overloads are in circuit for emergency condition.

11. LONG TERM RELIABILITY

Maintenance Engineers should consider performing a major refit after fans have been operating for 50,000 hours or if they have been installed for a period of 10 years. If the condition of the motor winding has been seen to deteriorate during regular maintenance (as detailed within section 8), then the motor must be replaced. Motors used within Fire Safety fans must NOT be re-wound. It could potentially be extremely dangerous to refurbish such as motor using a standard motor rewind facility, as these motors are specially developed for the smoke control application. The new motor must be manufactured in accordance with current requirements as stated within the EN12101-3 specification.

Guidance on operating times before a re-fit is required can be obtained from Woods Air Movement Limited on receipt of full operational information, duty cycle, “HT” category, and other nameplate data. To maintain CE / UKCA marking of High Temperature Fans; motor replacement must be conducted by Woods Air Movement Limited or our nominated service representatives.

STANDARD VENTILATION FANS

12. SAFETY

WARNING! Only approved, qualified personnel familiar with the assessment of hazards and risks associated with fans, and with the use of tools and test equipment required to service such fans, should install, operate and maintain the product.

CAUTION! If the installer or user is unable to understand the information in this manual, or has any doubt that a safe and reliable installation, operation and maintenance of the equipment can be assured, Woods Air Movement or their representative must be contacted for advice.

WARNING! When fans are retained in storage, access by unauthorised persons must be prevented with the use of guards, barriers or secure premises such that fan impellers which may be rotating do not present a hazard.

13. INTRODUCTION & PURPOSE - GENERAL

The Aerofoil Axial Flow Fan is a highly efficient air movement product, designed to operate between a temperature range of -40° to +50°C (-20°C on starting). When operating at low temperatures, ice formation on the fan assembly must be prevented. Some fans may also have a specification which requires them to operate in a high temperature emergency condition (i.e. Smoke Extract). This capability will be identified on a special label affixed to the fan casing (see also Paragraph 16.5). Please refer sections 1 to 11 of this document for specific guidance related to our HT Series Smoke venting equipment.

Each fan assembly has been manufactured to specifically to fulfil the requirement of the installation for which it was designed. No deviation from the original requirement must be implemented without referring to Woods Air Movement head office (located in Colchester in the UK). Any queries regarding safety or operating problems must be referred to your local Woods Air Movement Limited office,, sales centre or representative, together with full fan/motor nameplate details. Should a fan failure occur whilst the product is under warranty, the Woods Air Movement service centre in Colchester must be contacted before any repair work is undertaken.

If speed control is to be provided by means of a frequency inverter, then please seek drive selection and compatibility advice from Woods Air Movement.

14. STORAGE & HANDLING

WARNING!

While storing fan assemblies, please ensure that access by unauthorised personnel is prevented by using guards, barriers or secure premises, so that fan impellers, which may be rotating (wind milling), do not present a hazard.

If the fan assembly is to be stored; check immediately on receipt that it is as ordered and that it has not been damaged in transit. Where the fan is delivered in a crate (or similar) the crate must be considered as a protective device only. The crate must not have other equipment stacked on top of it and it must not be stacked on top of other equipment. The crate structure must not be used as a lifting aid, unless otherwise indicated.

Where a fan is packed inside a crate, a fork-lift truck or similar must be used to transport the product. The fan must be stored in a safe, clean, dry, vibration free location. If such storage conditions are not available, the motor anti-condensation heater (if fitted) should be connected to an appropriate electrical power supply to prevent motor condensation forming, while the fan should be stored in an appropriate enclosure. Each month, the fan impeller should be given a manual rapid spin to help prevent grease from hardening and possible bearing brinelling; the impeller must not be in the same angular position after rotation.

When dismantling the crate to gain access to the fan assembly care must be taken to avoid injury from sharp edges, nails, staples, splinters, etc. If the fan is to be stored for 12 months or more, then we recommend that the fan is inspected by a member of the Woods Air Movement service team before commissioning is undertaken.

15. MECHANICAL INSTALLATION

DANGER!

It is recommended that suitable safety guards form part of the Installation. Such devices, and advice on safety devices, are available from Woods Air Movement.

WARNING!

Where the fan is delivered in a crate (or similar), the crate must be considered as a protective device only, and must not be used as a lifting aid unless otherwise indicated.

WARNING!

All lifting aids used during installation must be adequately certified to carry the weight of the equipment being lifted.

WARNING!

Always wear appropriate protective clothing (including hard hats, eye protectors and ear defenders) when working in the vicinity of the fan assembly.

WARNING!

During lifting of the fan all personnel must be clear of the area below the suspended fan.

NOTE!

Before fan assembly installation, check that no damage has occurred in transit, that there is no fan casing deformation, that the impeller rotates freely and that the fan and motor nameplate data complies with its use requirement. If the fan assembly has been stored (for an extended period) the motor winding resistance to earth must be measured (at 500V dc). Where any reading is less than 10 MΩ (Megaohm), the motor must be dried out and re-checked before it is switched on.

Fan assemblies can sometimes be very heavy (depending on fan and motor size and which ancillary equipment has been fitted, such as silencers, guards and bellmouths etc.), which can make them unwieldy during handling. They must therefore be lifted slowly to prevent damage or distortion. Proper precautions must be taken, and certified lifting aids used, to ensure that the fan is well supported and stable before lifting into position.

Flange holes or mounting feet holes can be used for lifting but more than one hole must be used to spread the load. If special lifting points are provided, they must be used. The fan must be installed such that it is correctly positioned in accordance with the required airflow direction. An airflow indication arrow is shown on the fan nameplate. For two-stage, contra-rotating fans see Figure 1 (on page 18).

Sharp bends in the ductwork close to the fan must be avoided. Adequate room must be allowed round the fan for inspection and maintenance. Component parts of the fan assembly, including (if fitted) anti-vibration mounts, silencers, bellmouths, air operated dampers, flexible connectors (and their clips), purlin boxes, weather proofing, platforms, supports, chains and harnesses, etc. must be fully aligned before being bolted together so that no distortion or stress is placed on the equipment. Air operated dampers must be installed downstream of the fan (on the fan discharge) to ensure that fan performance is not adversely impacted.

Appropriate fixings, with the correct torque applied, must be used to secure the fan into position. If in doubt, please contact Woods Air Movement for advice related to torque settings for each fixing. The fan mounting and support structure must be strong and rigid enough to take the weight and operating forces of the fan and any other weight applied during installation. Vibration isolators must be appropriate for the weight and thrust of the fan, in order to minimise the transmission of fan vibration to surrounding structures. When vibration isolators are used, flexible connectors and flexible electrical conduit must also be used. Vibration isolators and flexible connectors must not be used to compensate for misaligned component fixing points. If any component parts do not easily fit together the root cause must be investigated and rectified.

A drain hole is included within in each motor end cover and electrical connection terminal box. The motor drain hole must be located at the lowest point of the motor, when the fan is installed. Plugs which close drain holes should either be removed entirely (if condensation is liable to occur due to large variations in operating temperature) or removed periodically to allow any general build-up of condensation to drain away. The frequency of plug removal will depend on by environmental conditions and should be recorded within maintenance records. Where bifurcated fans have their airflow axis horizontal, then the 'motor tunnel opening' must be facing downwards between the 3 o'clock and 9 o'clock positions, in order to minimise the risk of water ingress.

After installation all packing materials must be disposed of in accordance with Paragraph 20 (page 15).

16. ELECTRICAL INSTALLATION & OPERATION

DANGER!
No work must be attempted before completely isolating the fan assembly, its anti-condensation heater (if fitted), and its controls from all electrical supplies. Ensure that rotating parts come to rest.

WARNING!
Before entering the area where the fan is installed, please ensure that all fumes, dust, toxic emissions, heat etc. have dispersed from the local environment, and that the fan blades are not likely to rotate.

DANGER!
The fan assembly contains rotating parts and electrical connections which can be a danger and cause injury. If there is any doubt that a safe and reliable fan installation can be assured; Woods Air Movement or their representative must be contacted for advice.

WARNING!
If the fan assembly is designed for high-temperature emergency-use; it is imperative that the wiring used is rated and designed for the appropriate high temperature category, and that all switches and controls are overridden during the emergency operation. Only Frequency Converters which have been fully tested and certified in accordance with EN12101-3:2015 may be used.

CAUTION!
If the fan stops operating due to an overheat situation, the overheat protection thermostat may reset as the temperature cools and then automatically restart the fan if power is still applied.

WARNING!
Always wear appropriate protective clothing (including hard hats, eye protectors and ear defenders etc.) when working in the vicinity of the fan assembly.

Each fan assembly has either a terminal box mounted on the motor or on the fan duct. The fan assembly electrical supply must be connected to the terminal box by a qualified and competent electrician. It is good practice to fit a clearly marked isolator switch close to the fan. In addition, we recommend the use of a second clearly marked and accessible switch remote from the fan. Using two switches provides an enhanced level of safety when isolating the fan during maintenance.
A suitable earth must also be connected. Sufficient cable length must be provided to allow for movement of the fan on its mountings.

A connection diagram providing wiring details is supplied with all fan assemblies (typically inside the terminal box lid). Figures 3 to 12 (pages 19 to 23) show wiring terminal details for smaller fans. Figure 2 (page 18) shows the correct assembly sequence of terminal box parts, and recommended torque values to be applied. It is essential that no lock washers or nuts are used between the motor lead eyelet, connecting link or customers supply lead eyelet (when fitted).

Electrical control circuit Fuses must be correctly selected to carry the rated starting current as indicated on the motor or fan nameplate but should only be regarded as offering protection against wiring short circuits or earth faults. Fuses are not designed to provide overload protection. To provide full protection for the motor, a starter panel with overload protection must be used. We also recommend that an electrical isolator switch is incorporated into the connection circuit and that it is of the lockable type, which will allow the operator or maintenance engineer to isolate the fan from the electrical supply before working on the assembly.

If a speed controller, or other control equipment, forms part of the system it must be able to control the fan within safe limits. When running fans at low speed, care must be taken to ensure that any shutters (dampers), which may be mounted in the airflow, will open and operate correctly. Control equipment should be securely located, and should not be, or cause, a radiation hazard.

For single phase electrical supplies, three-wire speed control is preferable to the two-wire control method. Two-wire control can be used for motors up to a full load current of 3 amps, but above 3 amps three-wire control is recommended to avoid increased temperature rises within motor windings. Care must be taken to ensure that the fan motor is suitable for speed control. Please contact Woods Air Movement for advice on all forms of speed controller and other control equipment supplied by the Company. Speed controllers must not be used without prior agreement with Woods Air Movement.

Fans with a duct-mounted terminal box must have their electrical supply cables routed through an entry point in the side of the box. Unused entry points must be sealed with weatherproof plugs or grommets. Fans with a motor-mounted terminal box must also have its electrical supply routed through an entry point in the side of the terminal box.
Cables must be routed via a gland assembly. The gland assembly should be tightened sufficiently to hold the cable and provide a weatherproof seal, but it must not be over-tightened.

16.1 CAPACITORS (SINGLE PHASE MOTORS ONLY)

Capacitors which are physically small in size, are normally mounted on the motor during manufacture. Larger capacitors are supplied separately and must be fitted remotely from the motor. Capacitors associated with fans and motors designed for use within hazardous areas must be located outside the hazardous area.

WARNING!
Be aware that electrical components can operate at high temperatures. Keep Flammable Materials away from these components and their connections. Whilst it is extremely rare, the possibility of component malfunction must be taken into consideration when installing and operating the product.

16.2 OVERHEAT PROTECTION

Motor overheat protection (if fitted) can be enabled on all single-phase and three-phase motors and can be achieved by using either thermostats or thermistors. Protection device connected options are listed below:

- Where single-phase or three-phase motors have a full load current of up to and including 6.3 Amps: thermostats can be wired in series. Where the unexpected re-closure of self-resetting of a thermal cut-out can cause a hazard, or is prohibited by regulation, it must be connected into a control circuit that will not allow the fan to restart until the circuit has been manually reset.

- Where single-phase or three-phase motors have a full load current above 6.3 Amps: thermostats must be wired to separate terminals (K – K) within the terminal box; they operate by opening and closing, depending on the temperature and must be wired to directly control the motor start contactor. Where thermistors are used these must be wired to separate terminals (S –S) within the terminal box; they operate by changing their resistive value with temperature and must be wired to control the motor start contactor via a suitable relay.

NOTE!
When the fan is intended to be used for emergency high temperature operation, overheat protection must be by passed in the event of an emergency (see Section 16.5).

NOTE!
When a motor cools down, an over-heat protection thermostat will reset. However, to maintain safe operation, the motor must not be allowed to start until the motor start contactor is manually reset.

16.3 BEARING TEMPERATURE AND VIBRATION MONITORING SENSORS

If monitoring sensors are fitted into the fan control system, then they must be wired to automatically switch the fan off if a fault occurs, or to provide a fault indication. If the fan is automatically switched off by a monitoring sensor the control system (via a PLC for example), must ensure that the fan is fully isolated from the electrical supply, so that it will not automatically reset and re-start. If the fan is designed for emergency use, then the control system must ensure that all monitoring devices are overridden so that the fan is immediately switched on during an emergency situation (see Section 16.5).

16.4 ANTI-CONDENSATION HEATER

If monitoring sensors are fitted into the fan control system, then they must be wired to automatically switch the fan off if a fault occurs, or to provide a fault indication. If the fan is automatically switched off by a monitoring sensor the control system must ensure that the fan is fully isolated from the electrical supply, so that it will not automatically reset and re-start. If the fan is designed for emergency use, then the control system must ensure that all monitoring devices are overridden so that the fan is immediately switched on during an emergency situation (see Section 5.5).

16.5 EMERGENCY-USE FANS

Where the fan assembly is designed for emergency-use (smoke-extraction) at high temperature, the temperature / time capability of the product will be shown on a special label adjacent to the main nameplate. We recommend that an automatic control system, or a clearly marked remotely sited emergency-use switch, is fitted to override all other switches and controls, so that the fan is immediately switched on when an emergency situation occurs. The only exception is where a matched and certified Frequency Converter drive is fitted, as this can remain “in-circuit” if appropriately selected. If you require further information or advice, please contact Woods Air Movement directly. Also refer to sections 1 to 11 of this document for more detailed guidance related to our HT Series fans..

Appropriately rated high temperature cable must be used to supply power to the fan, while the electrical supply must be from a guaranteed or separately maintained source to enable that the fan continues to run during the emergency condition. After such an emergency the fan must be removed, refurbished or safely disposed of (see Paragraph 20), and replaced as necessary.

16.6 FANS WITH ATEX OR HAZARDOUS AREA MOTORS

Fans with ATEX/hazardous area motors fitted are designed for use in locations where fumes, dust or flammable/explosive gases may be present. Installation should be carried out by qualified and competent personnel. Special care must be exercised when connecting such units to an electrical supply to ensure that a secure and safe ATEX/hazardous area connection is achieved.

Great care must be taken to ensure that cable gland or conduit thread standards match their corresponding connector thread standard, so that the entire installation achieves the required level of protection. Long cased, fully ducted fans fitted with ENV89 motors are not fitted with an external duct-mounted terminal box. The electrical supply cable must be routed through a conduit entry in the fan duct and connected directly into the motor terminal box before the fan is fully installed (i.e. before the inlet and outlet ducts are fitted).

Any electrical control gear (including a capacitor in the case of single-phase motors) must be located outside the hazardous area, if these items are not certified for use in that zone. The motor must not be allowed to become coated with dirt/dust, etc. as this reduces motor cooling capability and will consequently raise the temperature of the motor carcase, which could then create an additional risk.

16.7 SWITCH ON

Before switching on, confirm that the electrical supply is fully compliant with the requirement of the motor as detailed on the motor or fan nameplate, that the fan is correctly installed, all component parts and fixings are secure, safety guards are in place and no loose items or associated equipment are present in the vicinity.

Immediately after switch-on check that the rotation direction is correct. For three phase motors, if the rotation direction is incorrect, then this can be rectified by interchanging any two incoming phase connections of the electrical supply at the motor terminal block. For single-phase motors, the motor winding leads should be interchanged at the motor terminal block. In the case of BT and CT motors, these are identified by black and red coloured wires. In the case of other motors these wires are labelled “U1” and “U2”.

Check the assembly for smooth, low vibration running, and check that the current consumption is within the full load current specified on the nameplate. The fan motor must not be repeatedly or rapidly switched on and off as this could cause overheating of the motor or its associated wiring connections.

17. MAINTENANCE

DANGER!

No maintenance work must be attempted before switching off and completely isolating the fan assembly, its anti-condensation heater (If fitted), and its controls, from all electrical supplies and allowing the rotating parts of the fan to come to rest.

WARNING!

Before entering the area ensure that all fumes, dust, toxic emission, heat etc. have dispersed from the local environment, and the fan blades are not likely to freely rotate.

WARNING!

All lifting aids used during maintenance, and all lifting points utilised, must be adequately certified to carry the weight of the equipment being lifted. (See paragraph 15).

WARNING!

Always wear appropriate protective clothing (including hard hats, eye protectors and ear defenders etc.) when working in the vicinity of the fan assembly.

Fan assembly maintenance must be carried out by appropriately qualified and competent personnel using the correct tools and equipment. A regular maintenance schedule should be established, and a record kept. Recommended maintenance intervals are given within Table 1 (page 17).

Where the environment is particularly dirty, it may be necessary to reduce maintenance / service intervals. Internal and external fan surfaces may be cleaned with low pressure clean water and non-abrasive additives. Water or liquid cleaning agents must not be directed at motor drain holes, as this could cause liquid ingress.

After maintenance has been conducted and before the fan is re-started, always ensure that there are no loose items of equipment present in the vicinity of the fan, that all safety guards, chains or steel ropes, etc., are properly secured into their original location, and that any temporary device used to stop the fan blades from rotating has been removed.

17.1 FIXINGS

It is essential to ensure that all fan assembly fixings are secure. When examining and checking the security of fixings during routine maintenance (see Table 1 Items 10 and 11), any fixings which have locking devices fitted or are painted over, need not be disturbed if it can be seen that they are secure. Any locking devices that are disturbed during maintenance must be discarded and replaced with new identical devices. Thread forming screws must have locking compound applied when being reused. Any fixings which have no locking devices fitted and are not painted over, must be checked at 95% of their original torque setting to ensure that no unnecessary disturbance of the fixing has occurred. See Figure 13 (Page 24) for torque setting details. If in doubt, please contact Woods Air Movement for advice in relation to specific fixing torque values.

17.2 LUBRICATION

In addition to routine maintenance, motor bearings will, in the longer term, require attention. If motor bearings are greased through extended lubricators, then the required quantity of grease must periodically be applied in accordance with information stated on the fan or motor nameplate and/or as per any instructions provided. A fully compatible grease type must be used, and it is essential that all traces of water and dirt are removed from around the grease points and that a clean grease gun is used. It is only necessary to apply a small amount of pressure when injecting the specified quantity of grease into the re-gearing point. If grease injection requires the maintenance engineer to apply a high pressure, then the cause should be investigated. Grease points are generally located close to the fan duct-mounted terminal box.

Where motors require re-lubrication, a separate instruction is normally issued with each fan/motor configuration. This gives details of lubrication intervals and well as the type and quantity of grease to be used. If further details are required, please contact Woods Air Movement directly.

17.3 INFREQUENT USE

If the fan assembly is used less frequently than once a month, or is designed for emergency-use only, the following additional maintenance procedures must be carried out, and a record kept:

- Resistance of motor windings to earth, must be measured (at 500V dc) each month. If these readings are less than 10 MΩ (Megaohm), the motor must be dried out in a warm airflow (typically at 40°C) and re-checked before running the motor.
- The fan should be operated between 15 and 30 minutes each month ensure that correct lubricant conditions are maintained within the bearings (i.e. to prevent grease hardening).
- An 'emergency-use' system should be run continuously for a minimum of fifteen minutes each month. The test should not only confirm that the fan operates correctly but must also ensure that the emergency use control system overrides all other control devices (except where matched Frequency converters are used) (see Paragraphs 1 to 11 and 16.5 for more information).
- If anti-condensation heaters are fitted, check each month that they automatically switch on (i.e. they are drawing current) when the motor is switched off.

18. OVERHAUL / EXTENDED MAINTENANCE

Advice on motor overhaul procedures, bearing /seal replacement, motor replacement, motor rewinding, spare parts, condition monitoring, vibration analysis, refurbishment, etc. is available from Woods Air Movement service centre in Colchester.

For emergency use fans we recommend that motor shaft seals and bearings must be replaced after 20,000 hours or 5 years of normal operation whichever occurs first.

After 40,000 hours of running, we strongly recommend that a qualified and competent electrician performs a motor "health check" (as described within section 8, Fault finding) to determine the motor insulation condition.

If motor insulation readings are less than 10 MΩ (Megaohm), available when the fan is used during an emergency operation, to ensure that adequate insulation life is available should the fan be required for emergency operation, then we recommend that the motor must be replaced with a new motor which has been manufactured in accordance with current requirements as stated within the EN12101-3 specification.

NOTE!

When dealing with High Temperature Smoke Extract fans, only an authorised company may undertake the maintenance. Failure to do so may invalidate any warranty and CE / UKCA Certification. The motor manufacturer's specification sheets are available through Woods Air Movement. After overhaul/extended maintenance the fan assembly must be correctly installed back into its original position in accordance Paragraphs 12, 13, 14 and 15 of this document.

After conducting overhaul /extended maintenance the fan assembly must be correctly installed back into its original position in accordance Paragraphs 12, 13, 14 and 15 of this document. For advice on "switching on" after maintenance, please refer to paragraph 16.7.

19. FAULT FINDING

Please refer to the safety warnings (“attention” items) stated within paragraph 17.

NOTE!

Routine maintenance procedures detailed in Paragraph 17, and Table 1 (page 17), of this document are designed to help keep your fan operational and fault free.

19.1 ELECTRICAL

Check that electrical connections to the fan are secure and are in accordance with the wiring connection diagram.

Check that the voltage applied at each fan terminal is as specified on the fan nameplate and is balanced. Measure the current on each phase (one phase in the case of single-phase motors) of the motor in turn and check that the current consumption is within the full load current specified on the motor or fan nameplate.

Measure each motor winding to earth, and between each winding, using a 500V dc insulation tester. If the reading is less than 10 MΩ (Megaohm) the reason is likely to be dampness within the motor. To dry out the motor place it in a warm dry airstream (typically at 40°C) and regularly monitor the motor until the insulation reading is restored to 10 MΩ (Megaohm) or greater. If the reading remains at less than ten, then this could indicate that a break-down in motor winding insulation has occurred, which may require the motor to be either rewound/overhauled (standard temperature machines) or replaced with a new motor which been manufactured in accordance with current requirements as stated within the EN12101-3 specification. (smoke extraction machines).

If a smell of burnt motor insulation is detected, then please seek immediate advice from Woods Air Movement UK (Colchester Office).

19.2 MECHANICAL

Check that there are no obstructions to the motor shaft or impeller blades, that the blades are clean, and that there are no loose components, items or debris in the vicinity.

Rotate the motor shaft by hand. Investigate any grinding noises, internal chaffing, rubbing or stiffness. If any of these defects are observed, this may indicate that bearings require lubrication or replacement.

Ensure that all fixings are secure and tightened to the correct torque values.

20. DISPOSAL

Metal components of the fan/motor should be segregated and separately recycled. The following items of material should be safely disposed of in accordance with local health and safety regulations:

- electrical lead coverings,
- motor winding insulation materials,
- bearing lubricant,
- motor/fan terminal block,
- paintwork,
- plastic parts,
- packing materials,
- silencer infill (Note that a face mask and gloves must be worn when handling the infill. If the infill is particularly dry or is damaged it should be damped down before disposal),
- Thermal motor packing seal (bifurcated fans).

21. EUROPEAN MACHINERY DIRECTIVE 2006/42/EC

1.7.4.2 CONTENTS OF THE INSTRUCTIONS CLAUSE C)

Please see a typical example of an EC declaration of conformity certificate (below), which shows particulars of the machinery offered.

CLAUSES G) AND H)

Fans must not be operated above their maximum indicated speed or run where the fan is operating in a stalled condition. Fans must also not be run in reverse unless specific advice is sought from Woods Air Movement.

CLAUSES I) AND J)

Fans must be isolated from support structures by means of anti-vibration mounts and from adjacent ductwork by flexible connections.

CLAUSE K)

Care must be taken when installing fans to ensure that the product orientation is correct in relation to direction arrows which indicate direction of air movement and impeller rotation direction. Where two-stage fans are shipped as two separate fan units, please refer to the appropriate two-stage assembly drawing, which is available on request.
Also see figure 1 within this document.

Woods
AIR MOVEMENT

EC Declaration of Conformity

Herewith we declare that the air movement equipment designated below, on the basis of its design and construction, in the form brought on to the market by us, is in accordance with the relevant health and safety requirements of the **EC Council directives on Machinery and Electromagnetic Compatibility and also ecodesign requirements for energy-related products.** If alterations are made to the machinery without prior consultations with us, this declaration becomes invalid. We further declare that the equipment identified below may be intended to be assembled with other equipment/machines to constitute machinery, which shall not be put into service until the assembled machinery has been declared in conformity with the provisions of these EC Council directives.

Designation of equipment:	
Series / type:	
Fläkt Woods Limited order no:	**/ 0**
Relevant EC Council directives:	Machinery Directive (2006/42/EC). Electromagnetic Compatibility Directive (2014/30/EU) where applicable (1) Energy-related products Directive (2009/125/EC) relevant implementing measures: REGULATION (EU) No 327/2011, REGULATION (EU) No 1253/2014, where appropriate
Applied harmonized standards in particular (2):	EN ISO 12100:2010, EN 60204-1:2018, EN ISO 12499:2008, EN ISO 5136:2010 EN ISO 5801:2017, EN ISO 13350:2015, EN IEC 61000-6-2:2019, EN 61000-6-1:2007 EN 61000-6-3:2007/A1:2011/AC:2012, EN 61000-6-4:2007/A1:2011
Applied national standards and technical specifications in particular (3):	BS 848.2-1:2004 (BS ISO 13347-1:2004/A1:2010) BS 848.6:2003 (BS ISO 14695:2003) BS 848.7:2003 (ISO 14694:2003/A1:2011)
Basis of self attestation:	Quality Assurance to BS EN ISO 9001:2015 BSI Reg Firm Cert No. FM 155.
Technical file compiled by:	Ömer Tüzer FläktGroup Holding GmbH, Bahnhofstr. 65-71, 44623 Herne, Germany
Signed for and on behalf of the manufacturer by:	Place: Colchester Date: 03/10/2023
Position of signatory:	Stéphane Maravel Chief Officer Woods

Notes:

(1) Fläkt Woods fans are driven by AC induction motors which are inherently compliant if supplied with a truly sinusoidal AC supply. Where the fan motor is supplied via an inverter or other electronic control, verification of its compatibility together with cabling should be sought from the control supplier.

(2) For a complete list of applied standards and technical specifications see Fläkt Woods documentation.

(3) Where no relevant harmonised standards exist.

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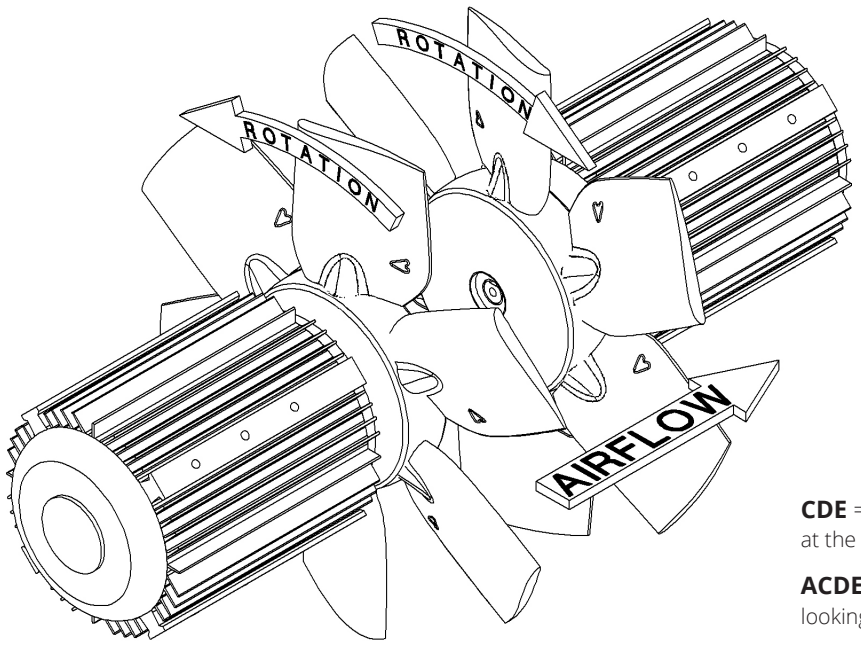
Registered in England no. 233771
Registered office: Axial Way, Colchester, CO4 5ZD, United Kingdom

CE

TABLE 1

Routine Maintenance Schedule	Every 6 Months	Every 12 Months	Comments
1. Examine fan guards (if fitted)	✓		Remove any debris that may have accumulated round or on the guard surface.
2. Examine motor cooling fins	✓		Remove any material or dirt which has build-up between the motor cooling fins.
3. Examine impeller for dirt build-up or any physical damage	✓		Remove any build-up of dirt. Ensure impeller is secure. Replace impeller if it is damaged.
4. Check condition and tautness of fan safety support chains/harnesses/ropes (if fitted)	✓		Clean and inspect safety supports. Replace if there is any deterioration / corrosion detected.
5. Examine and operate vibration sensors (if fitted), and temperature sensors (if fitted)	✓		Check operation using built-in sensor test features or dummy signals. Check that the fan is automatically switched off, or that a warning indication is provided, when the sensors / switches indicates a fault.
6. Examine condition of safety guards (if fitted) and associated fixings	✓		Clean safety guards. Replace if there are any signs of excessive corrosion or damage
7. Check operation of anti-condensation heaters (if fitted)	✓		Switch off power to the motor. Check that the anti-condensation heater is energised (i.e. it is drawing current).
8. inspect the condition of the packing located behind the motor shaft-seal retaining plate where the fan is of the 'bifurcated' type	✓		Replace the 130mm Duramid seal if it is damaged
9. Examine the clearance between the fan impeller blade tips and fan duct. Check the angle, and the security of the impeller blades		✓	Ensure that the gap between the impeller blade ends and the fan duct is even and adequate. If in doubt, please contact Woods Air Movement for advice related blade tip gap. Ensure that the impeller blades are secure. Blade angle must not be changed before contacting Woods Air Movement for advice.
10. Check torque of fixings used to secure the fan to its support structure.		✓	It is essential to confirm that all fixings are properly fitted, are tight, and are fully driven home (see Paragraph 17.1). If in doubt, please contact Woods Air Movement for advice related to the torque value of a particular fixing.
11. Examine motor, fan and ancillary equipment fixings		✓	It is essential to confirm that all fixings are properly fitted, are tight, and are fully driven home (see Paragraph 17.1) If in doubt about the torque of a fixing contact Fläkt Woods Ltd for advice.
12. Check movement (deflection) of vibration isolators (if fitted)		✓	Check freedom of movement. Tighten anti-vibration mount fixings if necessary.
13. Check motor voltage and current consumption		✓	Ensure voltage and full load current are as specified on the motor nameplate
14. Inspect paintwork / galvanising finish		✓	Treat any areas of damage with suitable anti-corrosion paint.
15. Grease motor bearings		✓	Check requirement in accordance with paragraph 17.2
16. Check fan assembly wiring		✓	Check security and condition of all wiring (including the earth).
17. Check fan operation for excessive vibration levels		✓	Vibration levels, whilst the fan is operating, should not be excessive. If levels are seen to have increased since the previous inspection, the fan must not be operated until the root cause has been identified and rectified.

FIGURE 1



CDE = Clockwise (rotation) looking at the Driven (impeller) End

ACDE = Anti-Clockwise (rotation) looking at the Driven (impeller) End

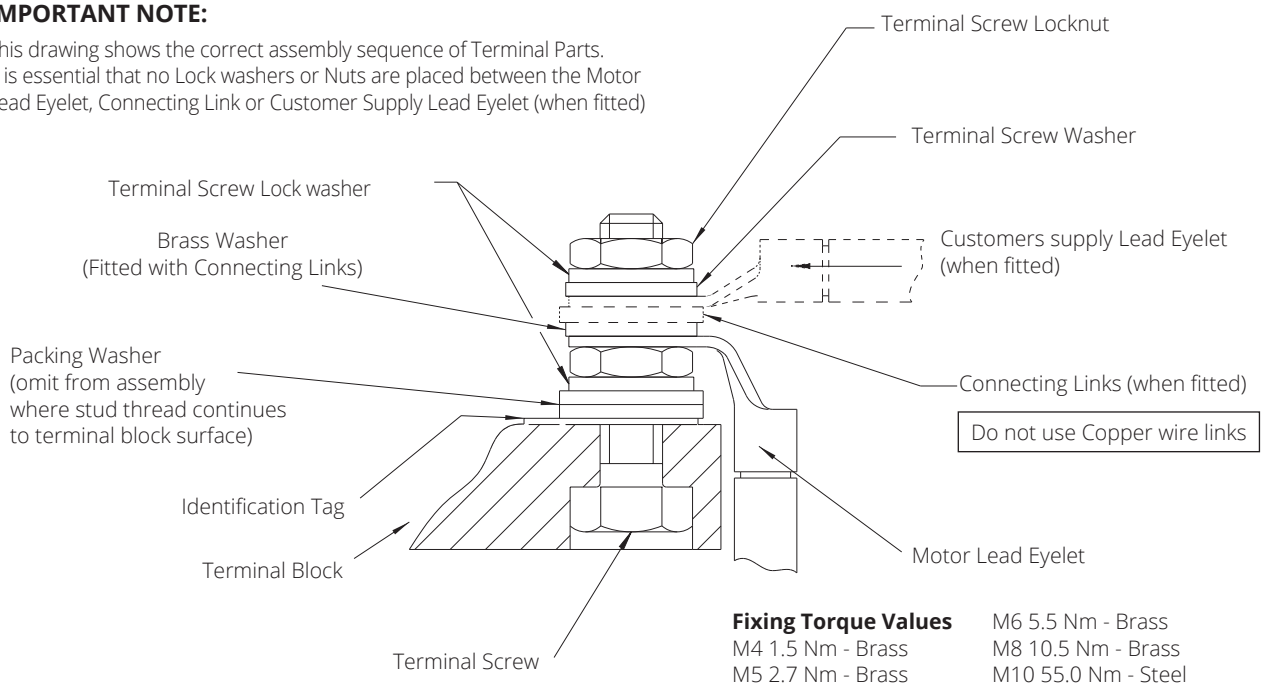
A STANDARD TWO STAGE CONTRA-ROTATING AXIAL FAN COMPRISES 1 OFF FORM A RIGHT-HAND IMPELLER FOLLOWED BY 1 OFF FORM B, LEFT-HAND IMPELLER

This arrangement does not apply to: identical fans in series, Bifurcated Fans or fans fitted with guide vanes.

FIGURE 2

IMPORTANT NOTE:

This drawing shows the correct assembly sequence of Terminal Parts.
It is essential that no Lock washers or Nuts are placed between the Motor Lead Eyelet, Connecting Link or Customer Supply Lead Eyelet (when fitted)



Fixing Torque Values

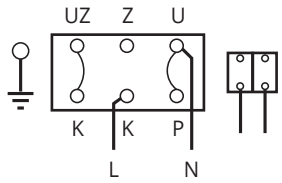
M4 1.5 Nm - Brass	M6 5.5 Nm - Brass
M5 2.7 Nm - Brass	M8 10.5 Nm - Brass
	M10 55.0 Nm - Steel

FIXING ARRANGEMENT OF TERMINAL BLOCK

Diagram only applies to HT (high temperature smoke venting fans) and Bifurcated JM fans.
It does not apply to Series 33 Bifurcated JM fans

1 PHASE FIGURE 3

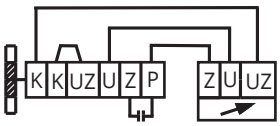
Internal Capacitor and Integral Overheat Protection



To change rotation interchange U1-U2 in Motor Terminal Box

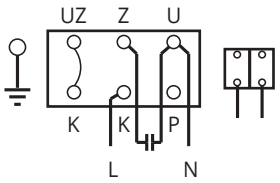
Other circuits if fitted:-
SS Thermistor
Overheat Protection
HH Anti-Condensation Heater

SPEED CONTROL WARNING
When used with a Speed Controller Remove link U to P, Connect Controller UZ to Central K, U to U and Z to P as shown



PN 502271 **CD1705** FAN CONTROLLER

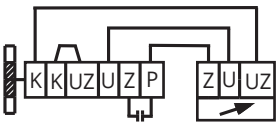
External Capacitor and Integral Overheat Protection



To change rotation interchange U1-U2 in Motor Terminal Box

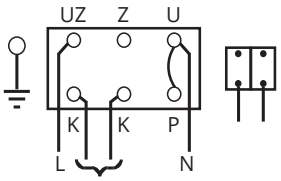
Other circuits if fitted:-
SS Thermistor
Overheat Protection
HH Anti-Condensation Heater

SPEED CONTROL WARNING
When used with a Speed Controller Change Capacitor Lead from U to P, Connect Controller UZ to Central K, U to U and Z to P as shown



PN 502273 **CD1706** FAN CONTROLLER

Integral Capacitor and Remote Overheat Protection

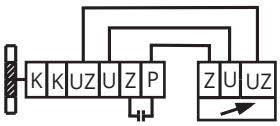


To remote Contactor Coil Circuit

To change rotation interchange U1-U2 in Motor Terminal Box

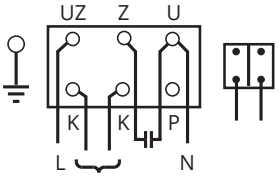
Other circuits if fitted:-
SS Thermistor
Overheat Protection
HH Anti-Condensation Heater

SPEED CONTROL WARNING
When used with a Speed Controller Remove link U to P. Connections shown below



PN 502260 **CD1708** FAN CONTROLLER

External Capacitor

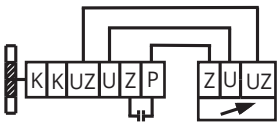


If fitted connect to Contactor Coil Circuit

To change rotation interchange U1-U2 in Motor Terminal Box

Other circuits if fitted:-
SS Thermistor
Overheat Protection
HH Anti-Condensation Heater

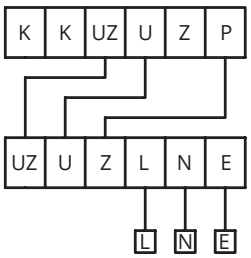
SPEED CONTROL WARNING
When used with a Speed Controller Change Capacitor Lead from Terminal U to Terminal P. Connections shown below



PN 502261 **CD1709** FAN CONTROLLER

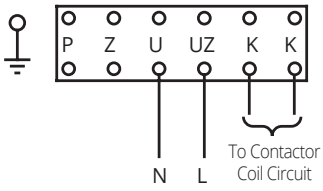
WIRING DETAIL: SINGLE PHASE FANS WITH DUCT MOUNTED TERMINAL BOX
Wiring leads in BT/CT motors are black and red in colour instead of being marked as “U1” and “U2”.

1 PHASE FIGURE 4



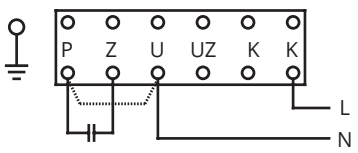
PN 502331 Diagram A

Internal Capacitor Remote Overheat Protector



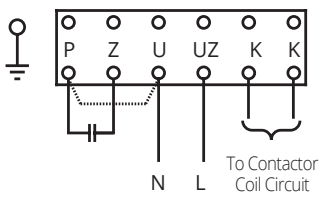
PN 502332 Diagram C

External Capacitor Remote Overheat Protector



PN 502478 **CD1651** Diagram B

External Capacitor Remote Overheat Protector

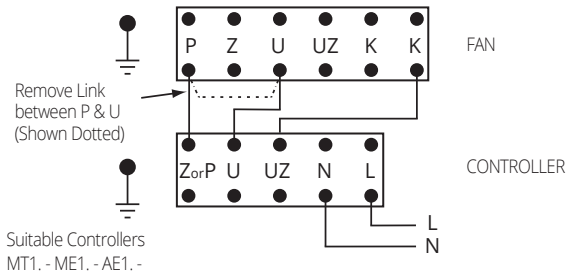


PN 502479 **CD1652** Diagram D

WIRING DETAIL: SINGLE PHASE FANS USING TERMINAL BOX ON MOTOR

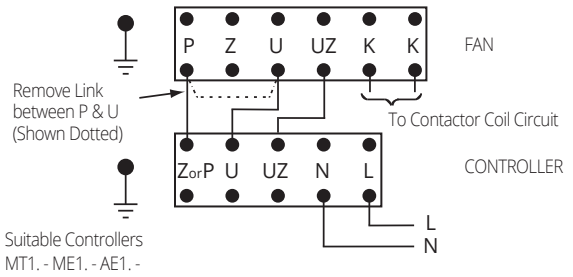
FIGURE 5 1 PHASE

Integral Capacitor with Overheat Protection used with Auto-Transformer or Electronic Controllers



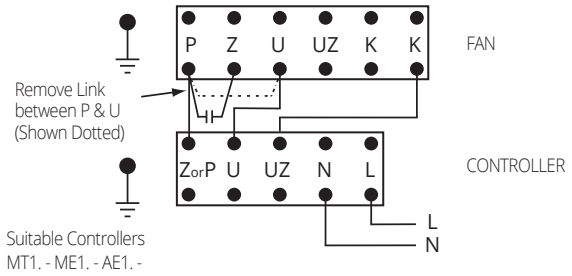
CD1653 Diagram G

Integral Capacitor with Overheat Protection used with Auto-Transformer or Electronic Controllers



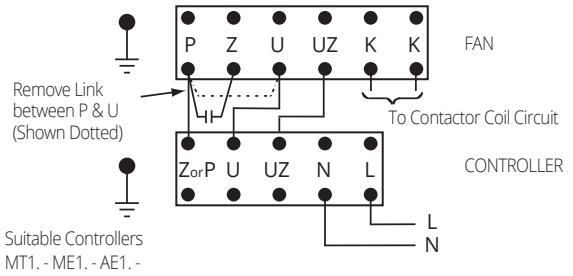
CD1654 Diagram H

External Capacitor with Overheat Protection used with Auto-Transformer or Electronic Controllers



CD1655 Diagram J

External Capacitor with Overheat Protection used with Auto-Transformer or Electronic Controllers

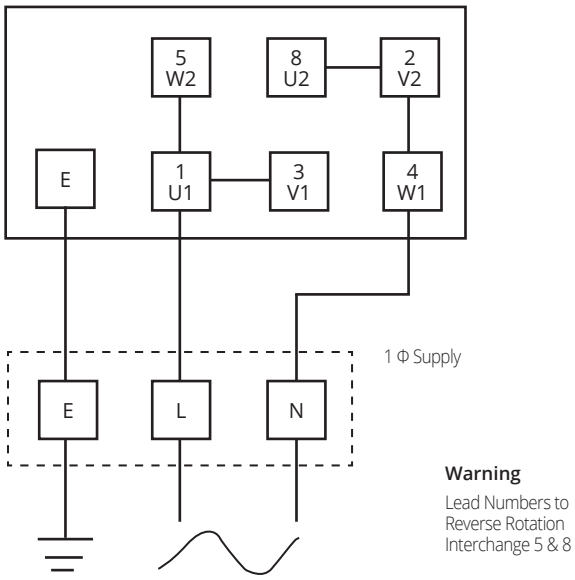


CD1656 Diagram K

WIRING DETAIL: SINGLE-PHASE DIRECT-DRIVE MOTOR WITH SPEED CONTROLLER

FIGURE 6

Motor Terminal Block Connections

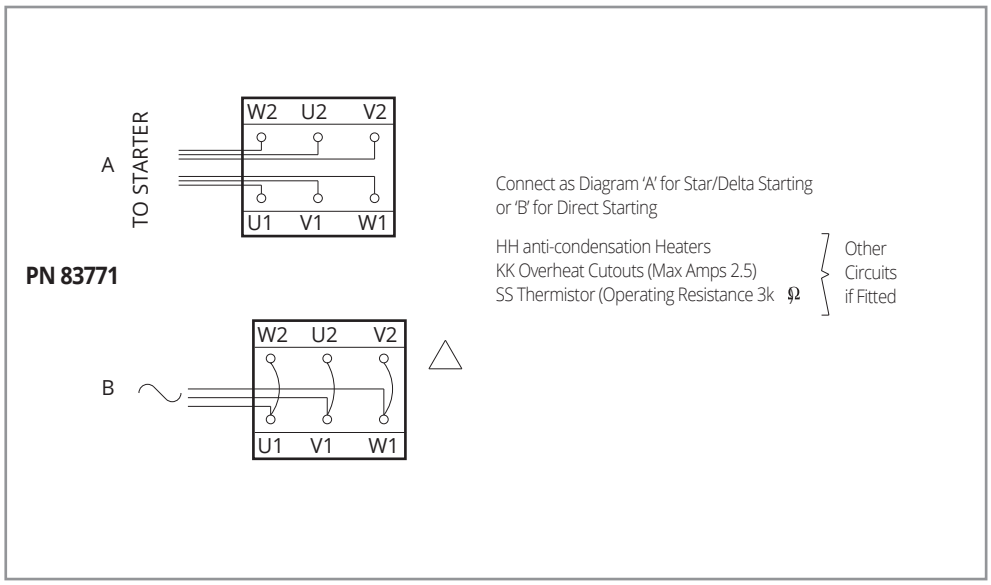


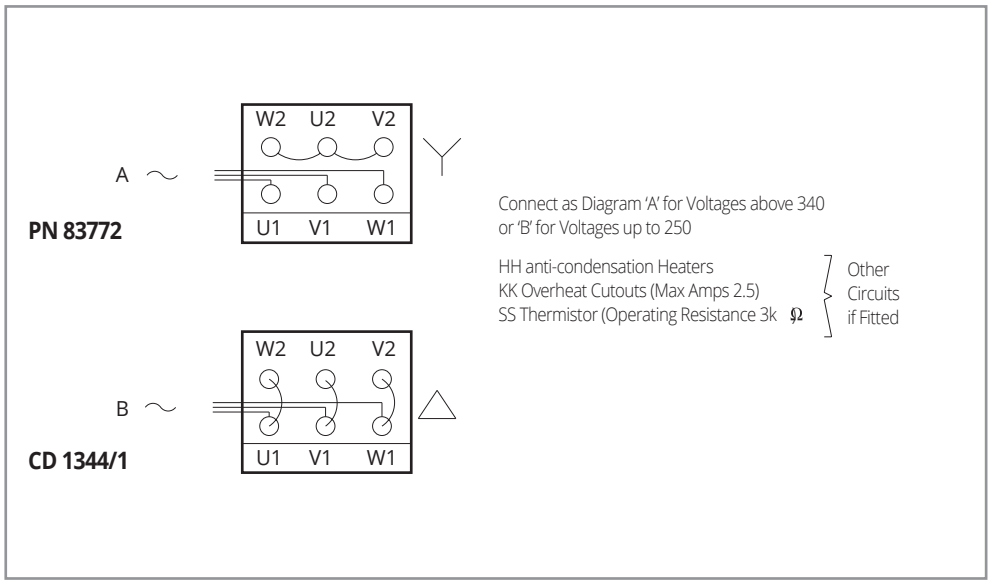
CD2426

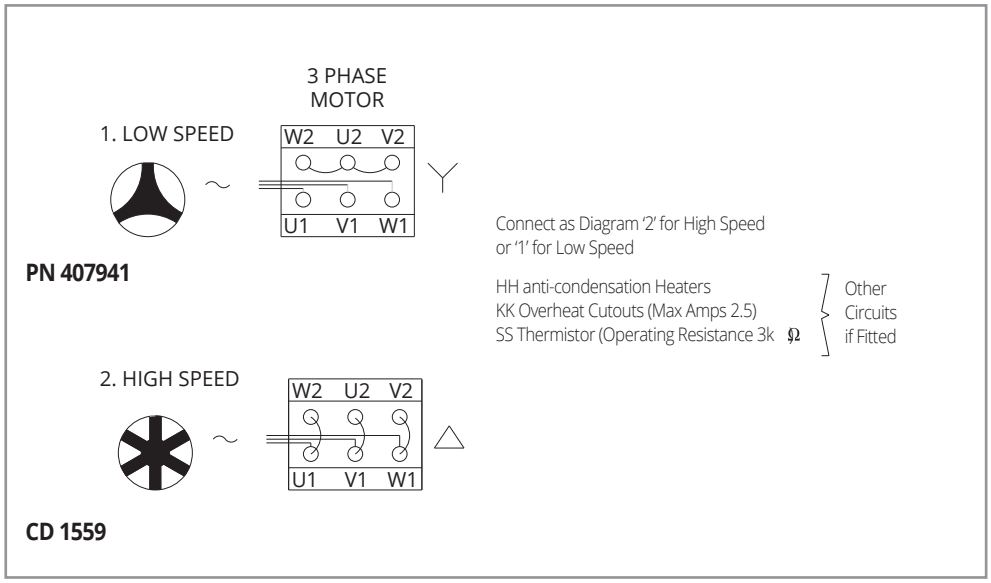
WIRING DETAIL: SINGLE PHASE WEG MOTORS

3 PHASE

FIGURE 7



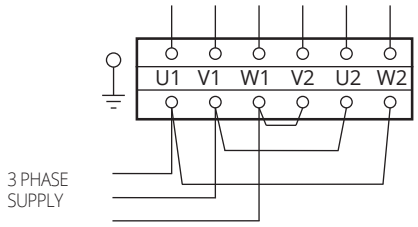




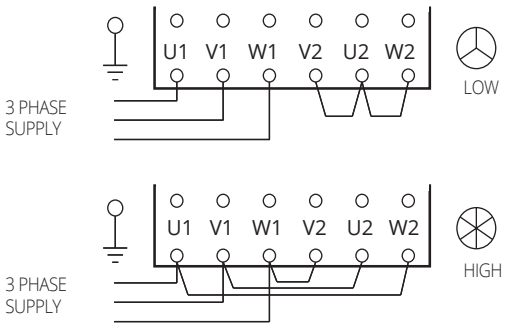
WIRING DETAIL: THREE PHASE FANS WITH DUCT MOUNTED TERMINAL BOX

FIGURE 8 — 3 PHASE

Constant speed (Single Voltage) Unregulated

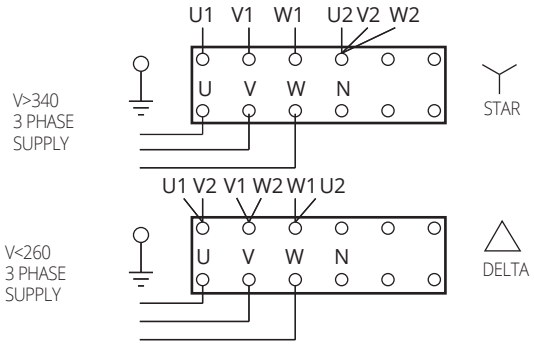


CD1683



PN502334 Diagram F

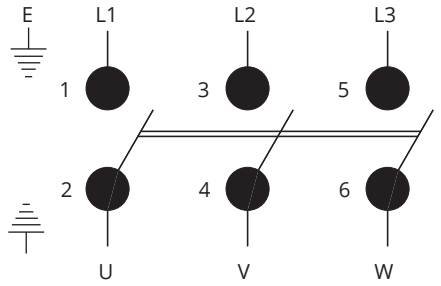
Constant speed (Dual Voltage Single Speed)



PN502333 Diagram E

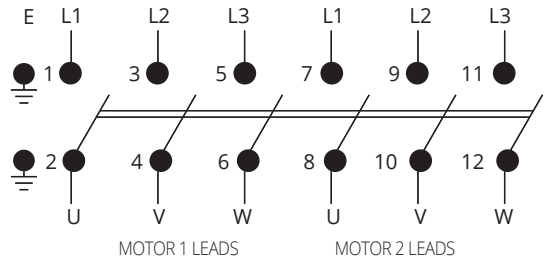
WIRING DETAIL: THREE PHASE FANS USING TERMINAL BOX ON MOTOR

FIGURE 9 — 3 PHASE



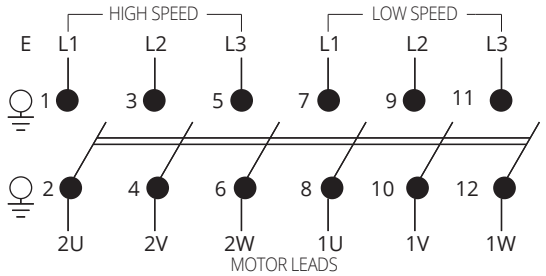
MOTOR LEADS

CD1545 P.N. 406607



STANDBY MOTOR UNITS

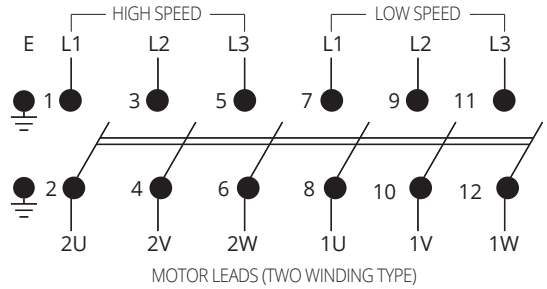
CD1546 P.N. 406608



Warning :- Control Gear must suit Pole Change (Tapped Wound, Dahlander or Pam) Windings provided Suitable Woods Starter / Change Over Unit EDC19

TWO SPEED MOTOR UNITS. POLE CHANGING TYPE

CD1550 P.N. 407356



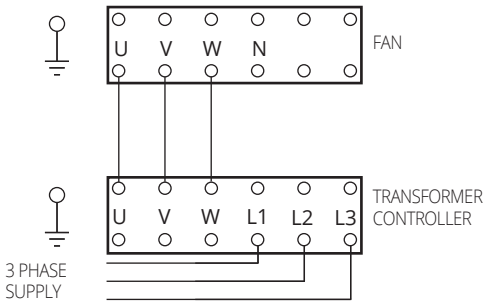
TWO SPEED MOTOR UNITS. TWO WINDING TYPE

CD1547 P.N. 406609

WIRING DETAIL: THREE-PHASE MOTOR, WITH ISOLATOR FITTED

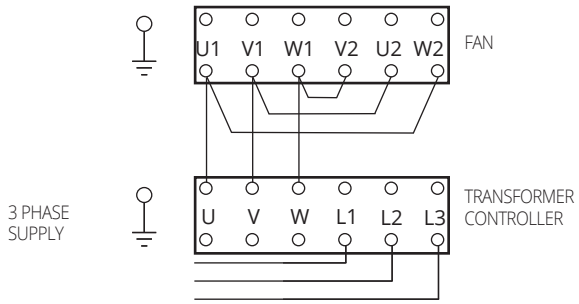
3 PHASE FIGURE 10

Star Connected Fan with Auto-Transformer Speed Controller



SUITABLE CONTROLLER MT3.- **CD1659** Diagram S

Delta Connected Fan with Auto-Transformer Speed Controller

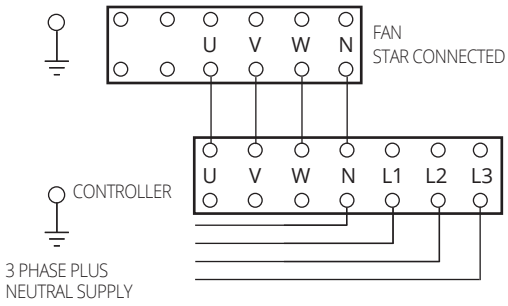


SUITABLE CONTROLLER MT3.- **CD1660** Diagram T

WIRING DETAIL: THREE-PHASE DIRECT-DRIVE MOTOR WITH TRANSFORMER TYPE SPEED CONTROLLER

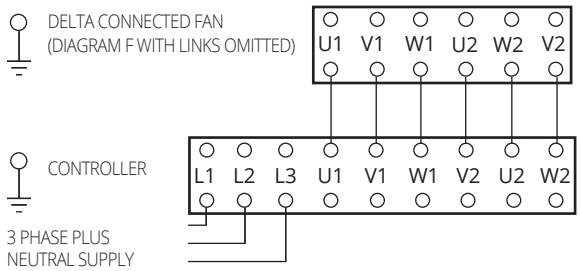
3 PHASE FIGURE 11

Star Connected Fan with Electronic Speed Controller



SUITABLE CONTROLLER MT3.- **CD1657** Diagram P

DELTA Connected Fan with Electronic Speed Controller

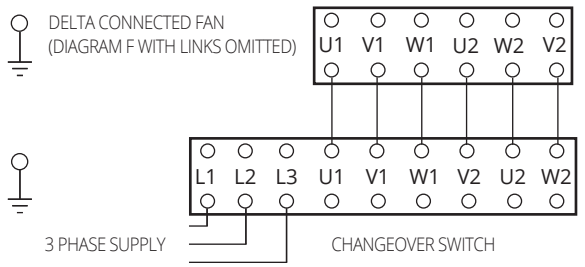


SUITABLE CONTROLLER MT3.-D **CD1658** Diagram R

WIRING DETAIL: THREE-PHASE DIRECT-DRIVE MOTOR WITH ELECTRONIC TYPE SPEED CONTROLLER

3 PHASE FIGURE 12

DELTA Connected Fan for Full Speed with Delta-Star Speed Change Switch

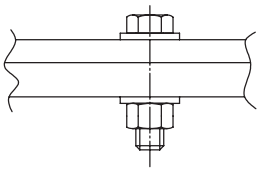


SUITABLE CONTROLLER MDS3.-D **CD1661** Diagram X

WIRING DETAIL (THREE-PHASE DIRECT-DRIVE MOTOR WITH CHANGEOVER SWITCH)

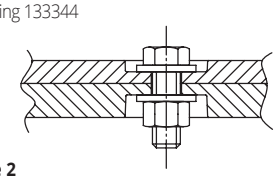
FIGURE 13

(1)(2)(3)



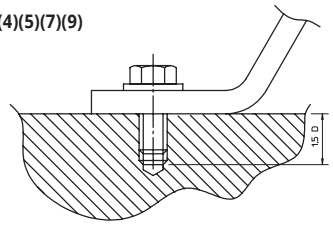
Type 1
Plain Screw and Nut with Washers holding Two Plates together.

All figures for Clamp Plates appear on Drawing 133344



Type 2
Hex HD Screw with Nut Clamping Two Hub Halves together for JM and Climafans figure for ASSY & Re ASSY are on the relative ASSY Drawings.

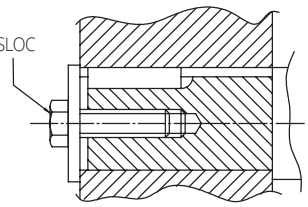
(4)(5)(7)(9)



Type 3
Screw with Washer Holdig Plate screwed into Tapped Metal.

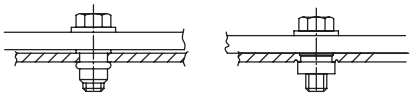
(10)

LONGLOC
TUFLOK/ESLOC
Screw

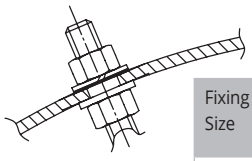


Type 4
Locking Screw & Heavy Washer fitted into the motor shaft. Details are be shown on the associated specific table. Nylon Patch is designed to hold Screw locked against vibration.

(6) **(10)**



Type 7
Screw and Washers through Plate into Nutsert or Prestincert for a Welded Nut see Mild Steel figures.



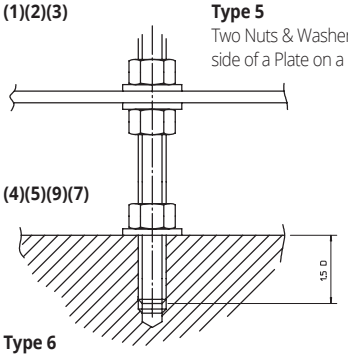
Fixing Size	Stainless Steel PVC Duct
M8	10.00

Type 8
Tightening of Studs on outside of PVC Ducts.

(1)(2)(3)

Type 5
Two Nuts & Washers either side of a Plate on a Stud.

(4)(5)(9)(7)



Type 6
Studding screwed into material with Nut & Washer hold them in place.

NOTE

A) These figures shown apply unless shown otherwise on specific Assembly drawings.

B) All Joints are to be dry except Stainless Steel which is to have MOLYCOTE 1000 Paste Compound, prior treatment of Loctite Activator T will decrease curing time if necessary.

C) All values are in Nm The conversion factor is given for lbf-ft equipment. lbf-ft = Nm x 0.7375.

D) There is a tolerance on Torque Wrenches up to ± 5%.

E) Nuts are to be tightened only once so no over tightening can occur.

F) The Head of the Screw makes no difference to torque figures other than how the torque is supplied. The Screw or Base Material are the important factors for torque.

G) When using two materials always use the lowest figure of the two

H) The figure to be used on AEG Capacitor Studs is 4 Nm.

I) The material being clamped is only to be taken into consideration if it is Hollow, very Ductile or Plastic. Please seek advice where necessary.

J) For special applications or if you have specific queries, please ask for advice.

DIAGRAM NOTE FOR FIXING TYPES: The numbers shown thus **(1)** in the boxes are to show the Screw Types and Tapped Materials which are applicable to the diagram shown.

FIGURE 14

Fixing Size	**(1)** Steel 8.8	**(2)** Stainless Steel A2, A4 Prop 70	**(3)** M.S Fixings Not 8.8 Grade	**(4)** Steel into Tapped M.S	**(5)** Steel into Extruded AL	**(6)** Nutsert	**(7)** Screw into Cast Alum Also see Motor Table below	**(8)** Taptite Self Forming	**(9)** Into Cast Iron Also see Motor Table below	**(2)** Stainless Steel A2, A4 Prop 80
M4	3.5000	2.0000	2.0000	2.0000	-	3.50	-	3.000	1.000	2.7
M5	7.0000	3.9	3.5000	3.5000	-	7.00	-	6.000	1.750	5.3
M6	12.000	6.9	6.0000	6.0000	5.00	12.00	7.00	10.000	3.000	9.2
M8	28.000	17.0	15.000	15.000	10.00	28.00	14.00	25.000	7.500	22.0
M10	55.000	33.0	30.000	30.000	20.00	40.00	28.00	55.000	15.000	43.0
M12	100.00	56.0	50.000	50.000	36.00	55.00	50.00	95.000	25.000	75.0
M14	155.00	89.0	80.000	80.000	60.00	-	85.00	-	40.000	119.0
M16	245.00	136.0	120.00	120.00	95.00	-	135.00	-	60.000	181.0
M18	335.00	191.00	170.00	170.00	-	-	-	-	85.000	254.0
M20	475.00	267.00	240.00	240.00	178.00	-	200.00	-	120.000	356.0
M22	645.00	364.00	325.00	325.00	245.00	-	300.00	-	-	485.0
M24	820.00	460.00	410.00*	410.00	310.00	-	420.00	-	450.000	613.0

*Includes T Bolts

Fixing Size	**(10)** Prestincert
M4	9
M5	11.5
M6	12
M8	21
M10	23
M12	35

(B) NOTE: that all Taptite Screws may need a high torque to start the thread forming process.

NOTE: Brass Fixings have half the shear strength of cast iron so use half the figures for Tapped Cast Iron.

Pad and Foot Mounted Torque Settings					
On Hollow Foot use Load Spreading Washers and same Torque as Solid Foot					
		Motor Pad to Arm		Foot Mount	
Frame Size	Thread Hole	Aluminium	Cast Iron	All	Washer
		Torque Settings in Nm			
D63/71	M8 Taptite	20-25	20-25	20-25	
M8 Taptite Reassembly		15	15		
D63/71	M8	15	15		
	M10	35	35	50	
D80	M12	55	55	85	83770
D90	M12	55	55	85	1504
D100	M12	55	55	85	411590
D112	M12	55	55	85	4115990
D132	M16	135	135	180	251691
D160/180	M20	240	240	350	251692
D200-315	M24		450	450	267652
Larger	M24		450	450	

NOTE: All Foot Mounted Motor Fixings must have Loctite Compound applied. Where any fixings exceed M24, please contact Woods Air Movement Limited - Engineering Department) for assistance. There must be at least x1.5D thread engagement available for Cast Iron Motors and x2D for Aluminium Motors. If in doubt, please contact Woods Air Movement Limited - Engineering Department.

Table 10 Shaft End Fixngs		
Motor Size	Thread Size	Torque Value
BT4, 5 & 9		
CT5,CT9 &D80	M6	006.000
D90S & D90L	M8	015.000
F22, D100L & D112M	M10	030.000
DS132S, D132M	M12	050.000
D160M, D160L		
D180M, D180L	M16	120.00
D200L, D225S		
D225M, D250S		
D250M, D280S	M20	180.00
D280M, D315S		
D315M		
D315 ABB	M24	295.000
Larger	M24	295.000

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