

# AEROFOIL AXIAL FLOW FANS

SAFETY, INSTALLATION AND MAINTENANCE INSTRUCTIONS PART NO. 416421



## CONTENTS

	PAGE
<b>1 SAFETY</b>	<b>3</b>
<b>2 INTRODUCTION &amp; PURPOSE - GENERAL</b>	<b>3</b>
<b>3 STORAGE &amp; HANDLING</b>	<b>3</b>
<b>4 MECHANICAL INSTALLATION</b>	<b>4</b>
<b>5 ELECTRICAL INSTALLATION &amp; OPERATION</b>	<b>5</b>
5.1 - CAPACITORS	6
5.2 - OVERHEAT PROTECTION	6
5.3 - BEARING TEMPERATURE, VIBRATION & LEVEL MONITORING SENSORS	6
5.4 - ANTI-CONDENSATION HEATER	6
5.5 - EMERGENCY-USE FANS	6
5.6 - FANS WITH HAZARDOUS AREA MOTORS	7
5.7 - SWITCH-ON	7
<b>6 MAINTENANCE</b>	<b>7</b>
6.1 - FIXINGS	8
6.2 - LUBRICATION	8
6.3 - INFREQUENT USE	8
<b>7 OVERHAUL / EXTENDED MAINTENANCE</b>	<b>8</b>
<b>8 FAULT FINDING</b>	<b>9</b>
8.1 - ELECTRICAL	9
8.2 - MECHANICAL	9
<b>9 DISPOSAL</b>	<b>9</b>
<b>10 EUROPEAN MACHINERY DIRECTIVE 2006/42/EC 10</b>	<b>10</b>

## TABLE

<b>1 ROUTINE MAINTENANCE PROCEDURES</b>	<b>11</b>
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## FIGURES

<b>1 TWO STAGE CONTRA-ROTATING INSTALLATION</b>	<b>12</b>
<b>2 FIXING ARRANGEMENT OF TERMINAL BLOCK (DRAWING NO: D258302 F)</b>	<b>12</b>
<b>3 WIRING DETAIL - SINGLE PHASE FANS WITH DUCT MOUNTED TERMINAL BOX</b>	<b>13</b>
<b>4 WIRING DETAIL - SINGLE PHASE FANS USING TERMINAL BOX ON MOTOR</b>	<b>13</b>
<b>5 WIRING DETAIL - SINGLE-PHASE DIRECT-DRIVE MOTOR WITH SPEED CONTROLLER</b>	<b>14</b>
<b>6 WIRING DETAIL - SINGLE PHASE WEG MOTORS</b>	<b>14</b>
<b>7 WIRING DETAIL - THREE PHASE FANS WITH DUCT MOUNTED TERMINAL BOX</b>	<b>15</b>
<b>8 WIRING DETAIL - THREE PHASE FANS USING TERMINAL BOX ON MOTOR</b>	<b>16</b>
<b>9 WIRING DETAIL - THREE-PHASE MOTOR WITH ISOLATOR FITTED</b>	<b>16</b>
<b>10 WIRING DETAIL - THREE-PHASE DIRECT-DRIVE MOTOR WITH TRANSFORMER TYPE SPEED CONTROLLER</b>	<b>17</b>
<b>11 WIRING DETAIL - THREE-PHASE DIRECT-DRIVE MOTOR WITH ELECTRONIC TYPE SPEED CONTROLLER</b>	<b>17</b>
<b>12 WIRING DETAIL (THREE-PHASE DIRECT-DRIVE MOTOR WITH CHANGEOVER SWITCH)</b>	<b>17</b>
<b>13 DRAWINGS OF FAN COMPONENTS WITH FIXING METHODS SHOWN</b>	<b>18</b>
<b>14 DRAWING OF TORQUE SETTINGS FOR FIXINGS (DRAWING NO: D248284 K)</b>	<b>19</b>

## 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

**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, Fläkt Woods Limited or their representative should 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.

## 2. 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 5.5). Please refer to our "HT Series Smoke venting equipment" document (our part number 412111).

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 should be implemented without referring to Fläkt Woods Limited head office (located in Colchester in the UK). Any queries regarding safety or operating problems should be referred to your local Fläkt Woods office, sales centre or representative, together with full fan/motor nameplate details. Should a fan failure occur whilst the product is under warranty, the Fläkt Woods service centre in Colchester should 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 Fläkt Woods Limited.**

## 3. 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 should 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 should be used to transport the product. The fan should 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 should not be in the same angular position after rotation.

When dismantling the crate to gain access to the fan assembly care should 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 Fläkt Woods Limited service team before commissioning is undertaken.

## 4. 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 Fläkt woods Limited.



### **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 should 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 should be measured (at 500V dc). Where any reading is less than ten megohms, the motor should 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 should 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 12).

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 should 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 Fläkt Woods Limited 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 should 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 should 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 9 (page 9).

## 5. ELECTRICAL INSTALLATION & OPERATION



### **DANGER!**

No work should 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; Fläkt Woods Limited or their representative should 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 should 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 should 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 13 to 17) show wiring terminal details for smaller fans. Figure 2 (page 12) 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 should 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 should be taken to ensure that the fan motor is suitable for speed control. Please contact Fläkt Woods Limited for advice on all forms of speed controller and other control equipment supplied by the Company. Speed controllers should not be used without prior agreement with Fläkt Woods Limited.

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 should 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 should not be over-tightened.

## 5.1 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 should be taken into consideration when installing and operating the product.

## 5.2 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 should 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 5.5).



### 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.

## 5.3 BEARING TEMPERATURE AND VIBRATION MONITORING SENSORS

If monitoring sensors are fitted into the fan control system, then they should 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 5.5).

## 5.4 ANTI-CONDENSATION HEATER

If monitoring sensors are fitted into the fan control system, then they should 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).

## 5.5 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 Fläkt Woods Limited directly. Also refer to our HT Series document – P/N 412111).

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 9), and replaced as necessary.

## 5.6 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 should 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 carcass, which could then create an additional risk.

## 5.7 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.

## 6. MAINTENANCE



### **DANGER!**

No maintenance work should 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, should be adequately certified to carry the weight of the equipment being lifted. (See paragraph 4).



### **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 11).

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.

## 6.1 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, should be checked at 95% of their original torque setting to ensure that no unnecessary disturbance of the fixing has occurred. See Figure 13 (Page 18) for torque setting details. If in doubt, please contact Fläkt Woods Limited for advice in relation to specific fixing torque values.

## 6.2 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 should 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 Fläkt Woods Limited directly.

## 6.3 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 should be carried out, and a record kept:

- Resistance of motor windings to earth, should be measured (at 500V dc) each month. If these readings are less than ten megohms, the motor should 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 should also ensure that the emergency use control system overrides all other control devices (except where matched Frequency converters are used) (see Paragraph 5.5 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.

## 7. 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 Fläkt Woods Limited service centre in Colchester.

For emergency use fans we recommend that motor shaft seals and bearings should 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), even when the existence of condensation within the motor has been ruled out, then to ensure that adequate insulation life is available should the fan be required for emergency operation, then we recommend that the motor should 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 Certification. The motor manufacturer's specification sheets are available through Fläkt Woods Limited. After overhaul/extended maintenance the fan assembly must be correctly installed back into its original position in accordance Paragraphs 1, 2, 3 and 4 of this document.

After conducting overhaul /extended maintenance the fan assembly must be correctly installed back into its original position in accordance Paragraphs 1, 2, 3 and 4 of this document. For advice on "switching on" after maintenance, please refer to paragraph 5.7.



## 8. FAULT FINDING

Please refer to the safety warnings ("attention" items) stated within paragraph 6.



### NOTE!

Routine maintenance procedures detailed in Paragraph 6, and Table 1 (page 11), of this document are designed to help keep your fan operational and fault free.

### 8.1 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 Fläkt Woods Limited UK (Colchester Office).

### 8.2 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.

## 9. 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 should 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).

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

#### CLAUSES I) AND J)

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

#### CLAUSE K)

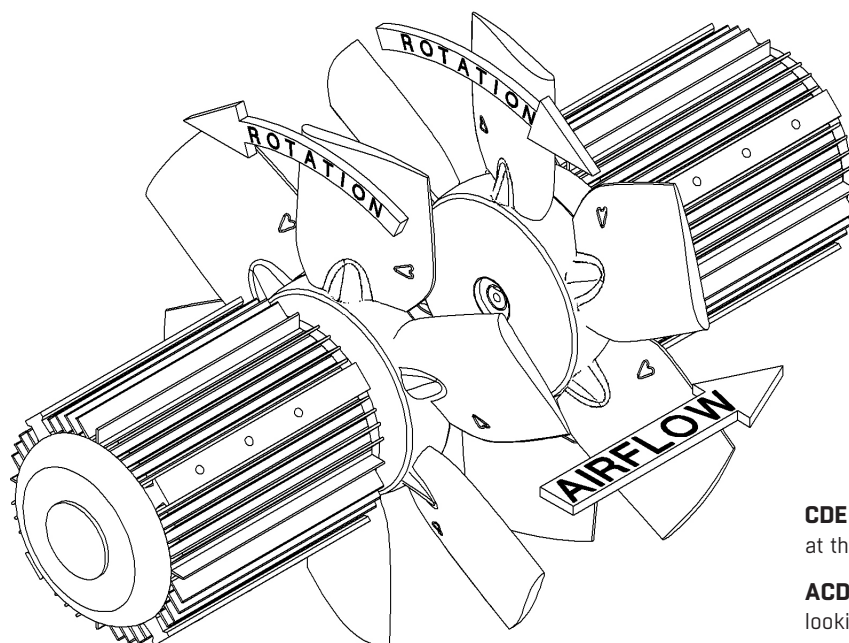
Care should be taken when installing fans to ensure that the product orientation is correct in relation to direction arrows which indicate direction of air movement and impeller rotation direction. Where two-stage fans are shipped as two separate fan units, please refer to the appropriate two-stage assembly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

 A FläktGroup Company		EC Declaration of Conformity	
<p>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 <b>EC Council directives on Machinery and Electromagnetic Compatibility</b>. 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.</p>			
Designation of equipment:	<b>Direct Drive Axial Flow Fan</b>		
Series / type:			
Fläkt Woods Limited order no:			
Relevant EC Council directives:	Machinery Directive (2006/42/EC). Electromagnetic Compatibility Directive (2014/30/EU) where applicable (1) Guideline number: 327/2011 (EU) where applicable Guideline number: 1253/2014 (EU) where applicable		
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:	Iain Kinghorn Axial Way, Colchester, CO4 5ZD, United Kingdom		
Signed for and on behalf of the manufacturer by:			Place: Colchester Date: 20/07/2020
Position of signatory:	Steve Chesney Managing Director		
<b>Notes:</b>			
(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.			
Fläkt Woods Limited Axial Way Colchester CO4 5ZD United Kingdom Tel: +44 (0) 1206 222555 Email: <a href="mailto:info.uk@flaktgroup.com">info.uk@flaktgroup.com</a> Website: <a href="http://www.flaktgroup.com">www.flaktgroup.com</a>		Registered in England no. 233771 Registered office: Axial Way, Colchester, CO4 5ZD, United Kingdom © Fläkt Woods Limited July 2020	
			

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 Fläkt Woods for advice related blade tip gap. Ensure that the impeller blades are secure. Blade angle must not be changed before contacting Fläkt Woods Ltd 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 6.1). If in doubt, please contact Fläkt Woods Ltd 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 6.1) 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 6.2
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 should 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

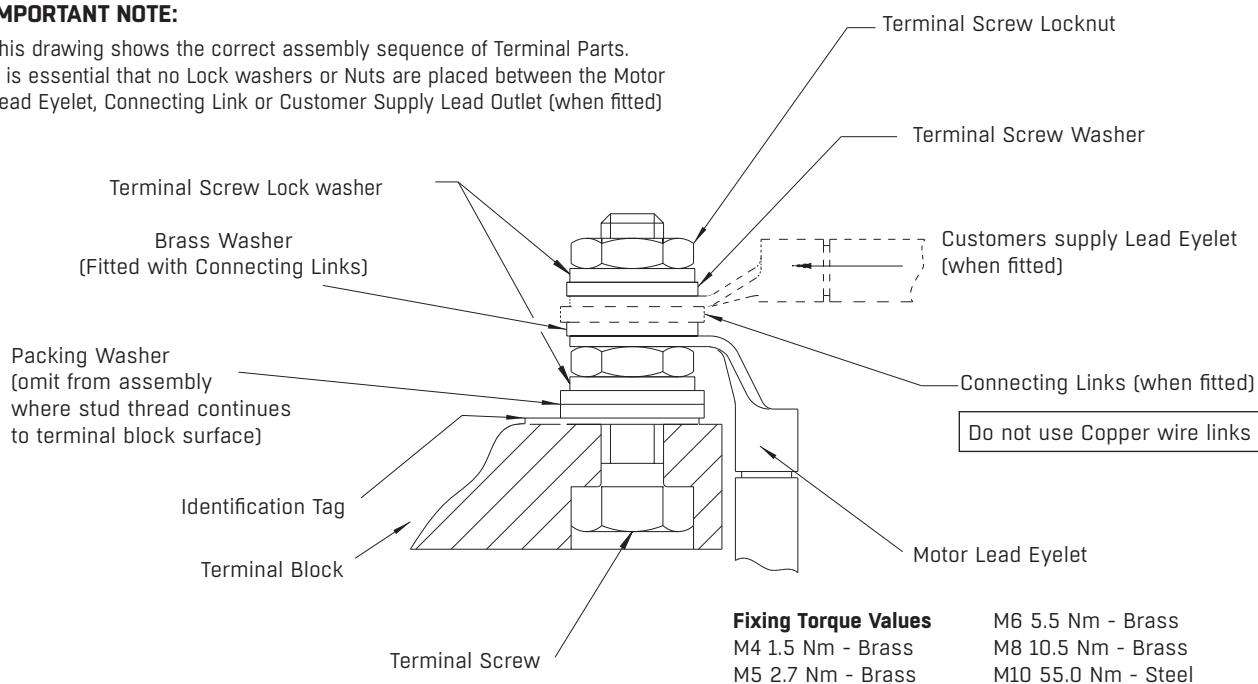
**A STANDARD TWO STAGE CONTRA-ROTATING AXIAL FAN COMPRISES 1 OFF FORM A RIGHT-HAND IMPELLER FOLLOWED BY 1 OFF FORM B, LEFT-HAND IMPELLER**

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 Outlet (when fitted)



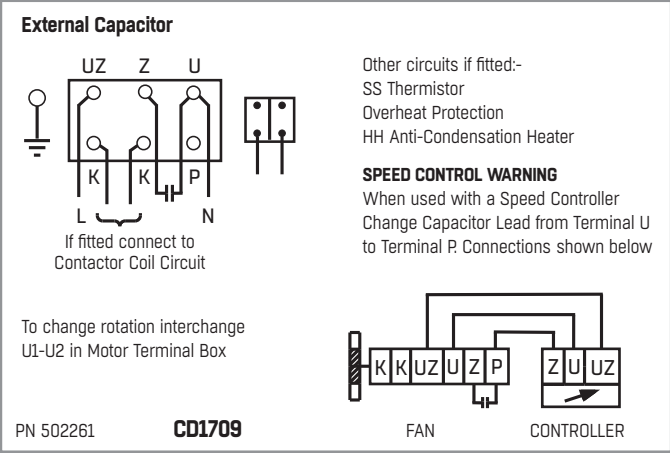
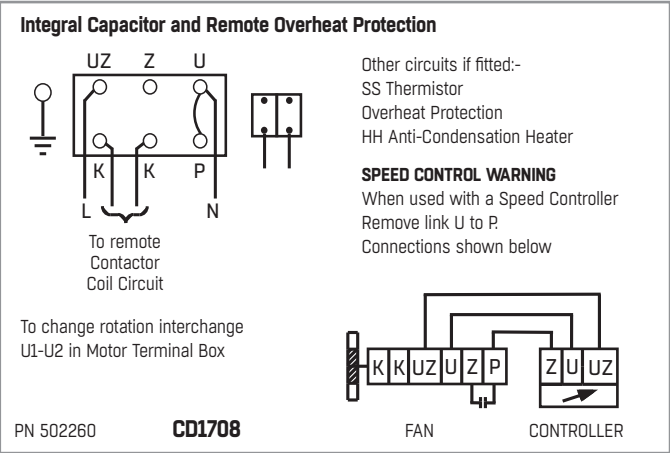
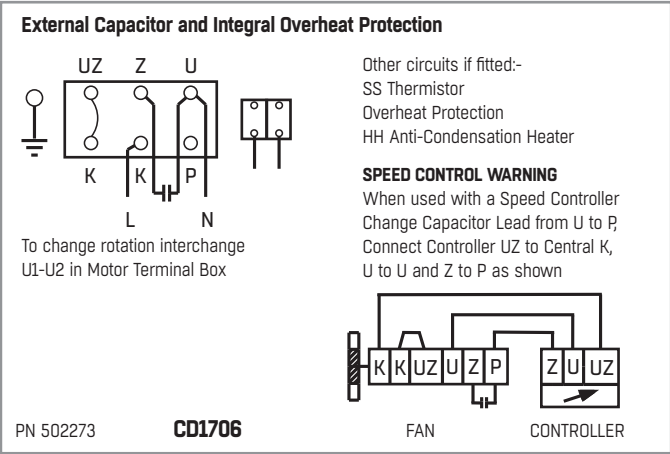
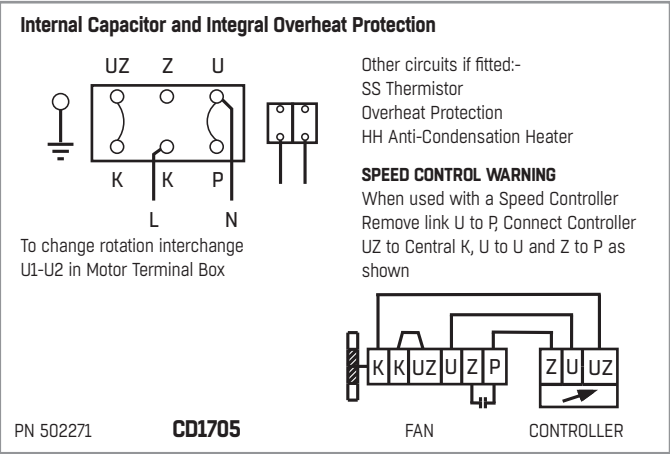
**FIXING ARRANGEMENT OF TERMINAL BLOCK**

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

Wiring diagrams are generic and for reference only.  
Please refer to specific diagrams supplied with each fan, which  
are normally included inside the duct mounted terminal box.

1 PHASE

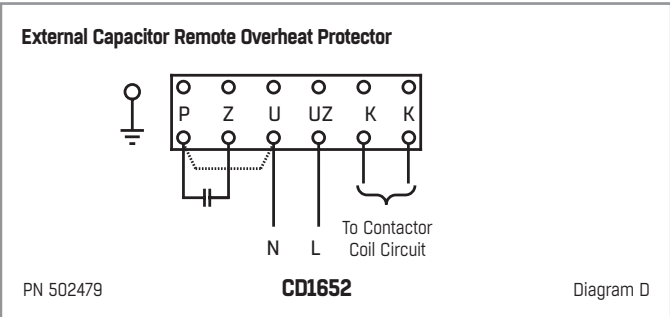
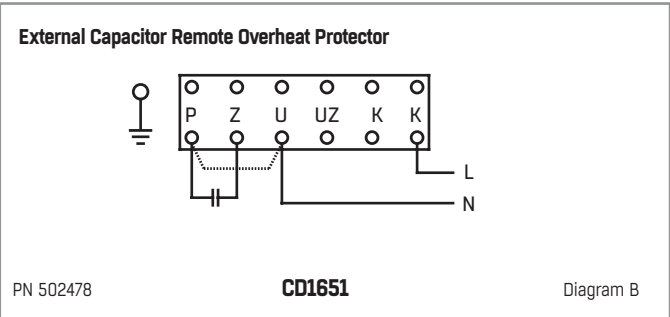
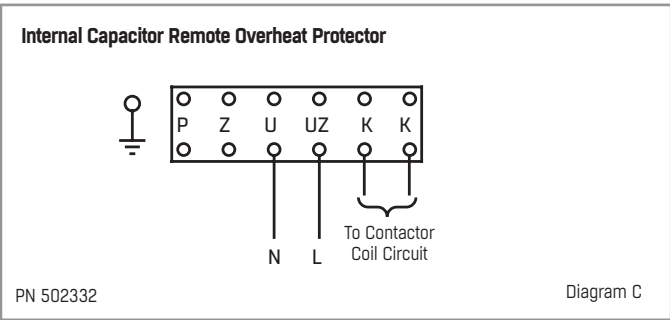
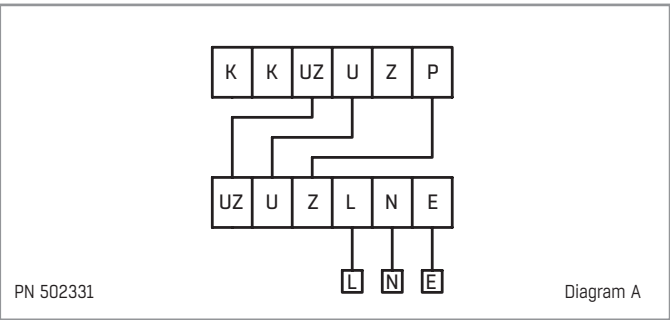
FIGURE 3



**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

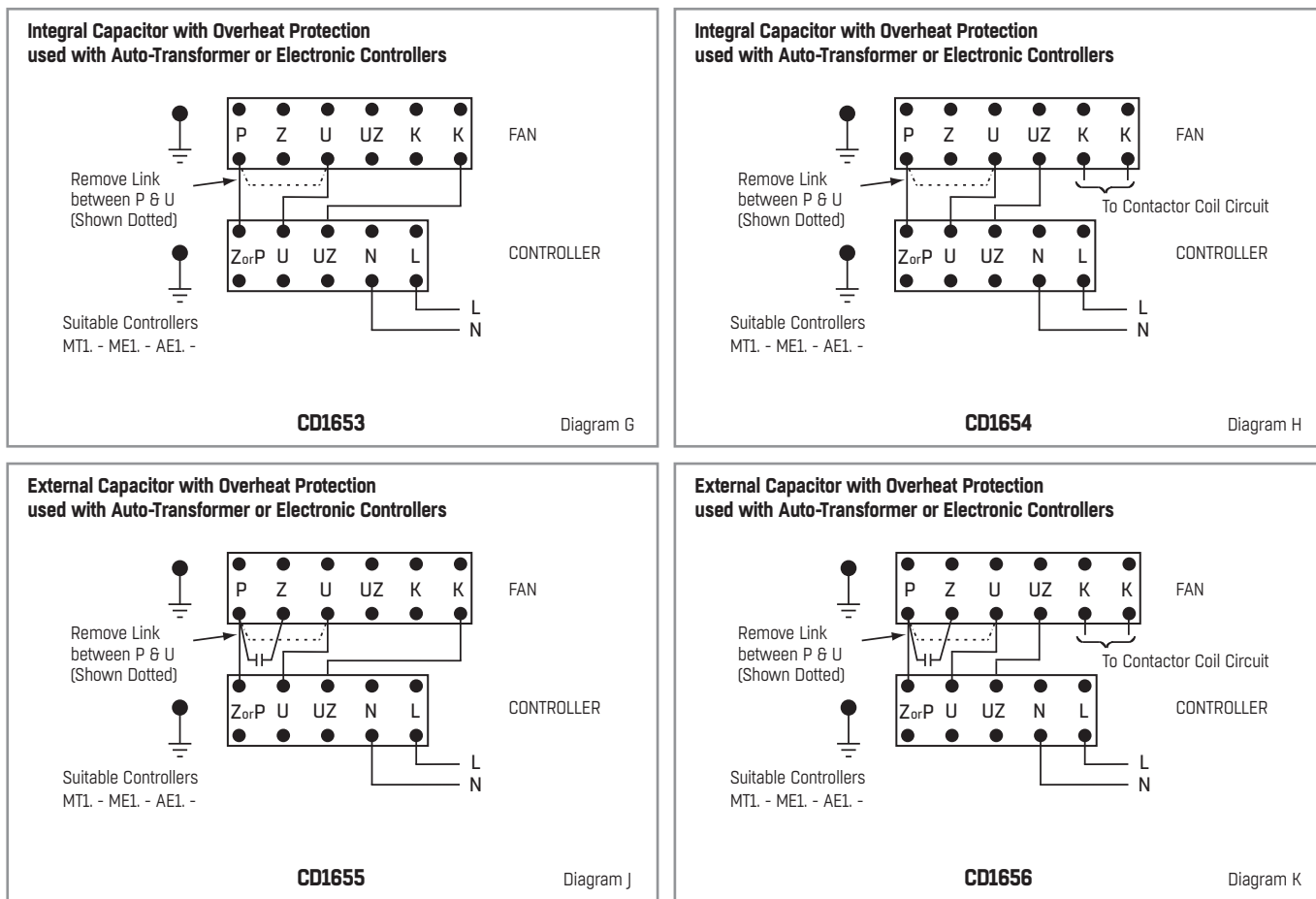
FIGURE 4



**WIRING DETAIL: SINGLE PHASE FANS USING TERMINAL BOX ON MOTOR**

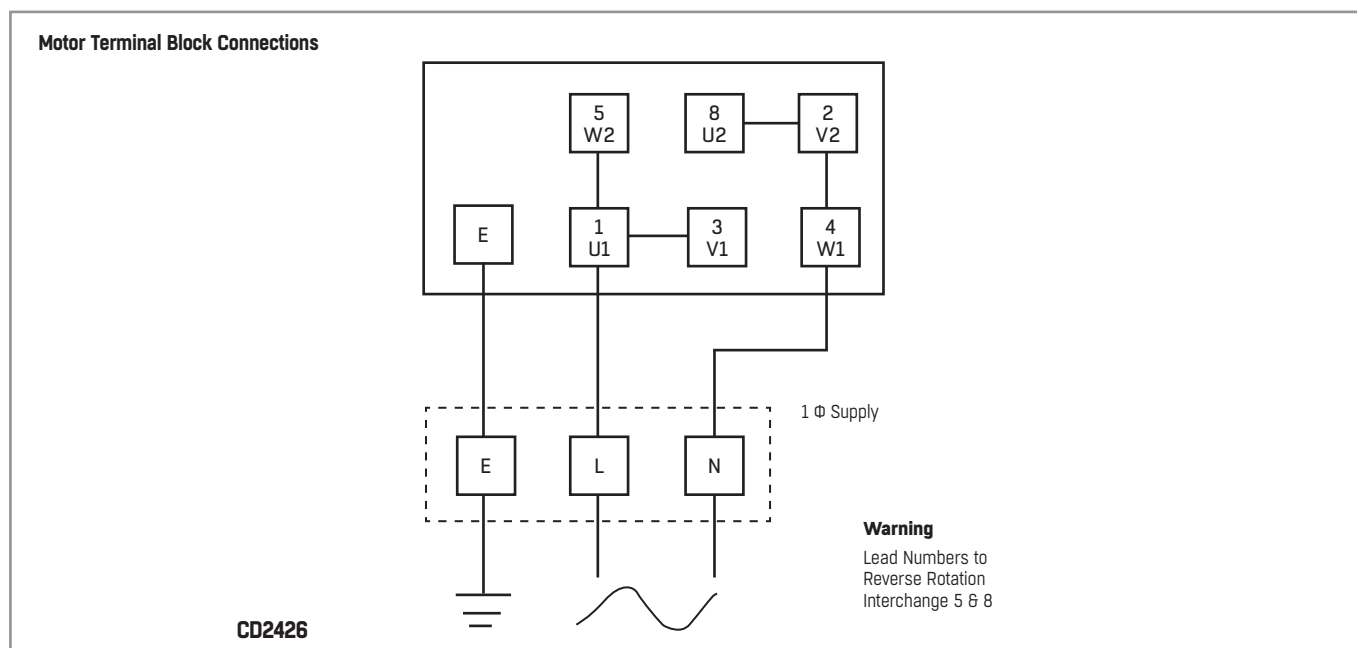
**FIGURE 5**

**1 PHASE**

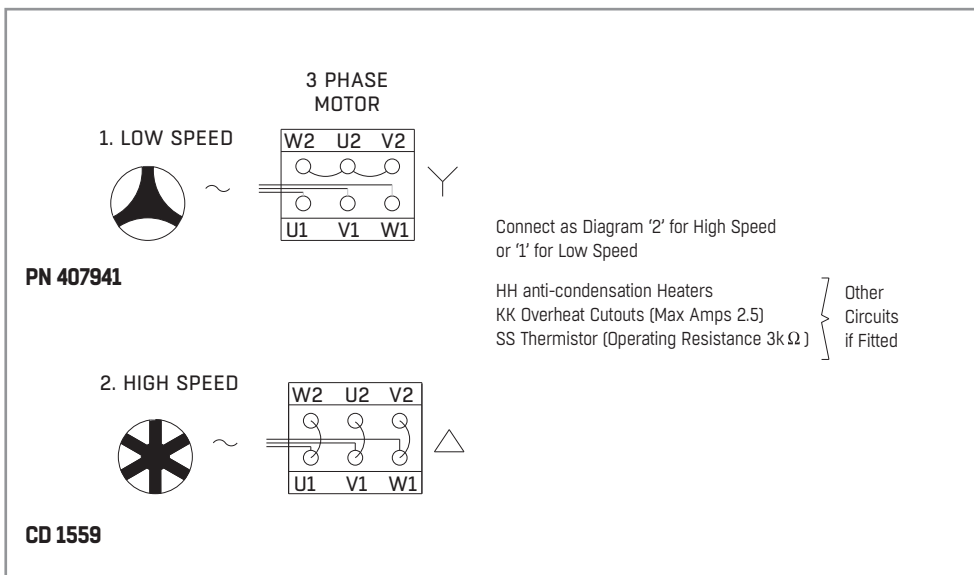
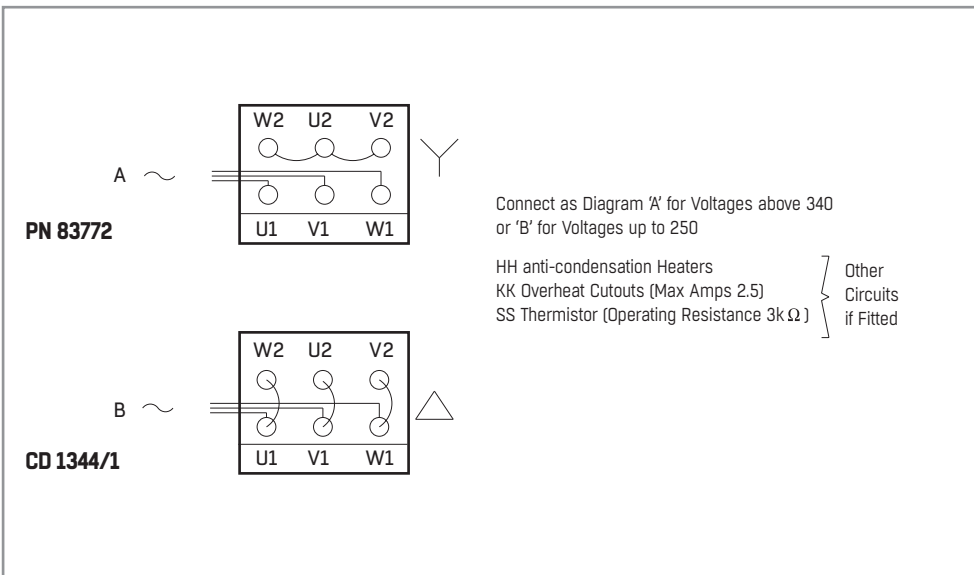
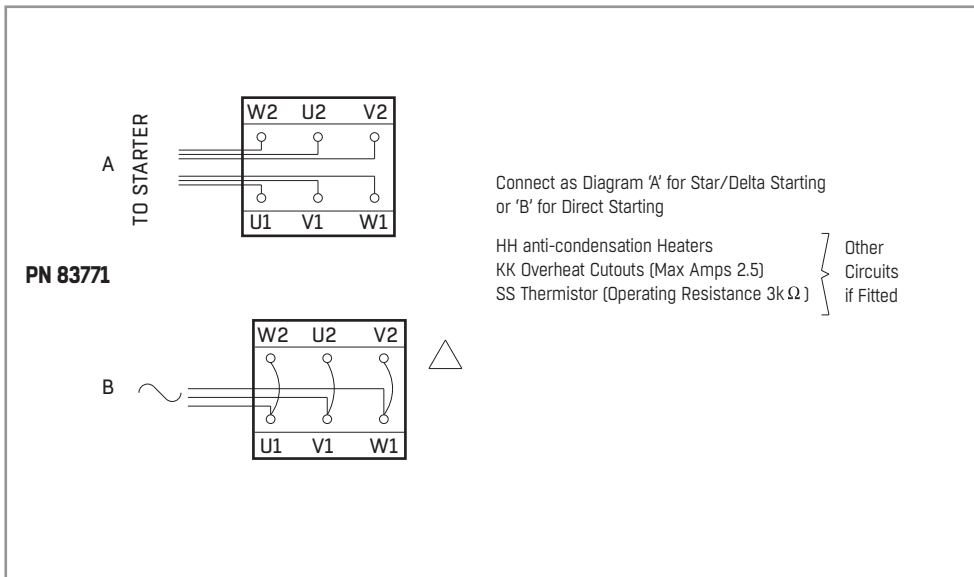


**WIRING DETAIL: SINGLE-PHASE DIRECT-DRIVE MOTOR WITH SPEED CONTROLLER**

**FIGURE 6**



**WIRING DETAIL: SINGLE PHASE WEG MOTORS**



WIRING DETAIL: THREE PHASE FANS WITH DUCT MOUNTED TERMINAL BOX

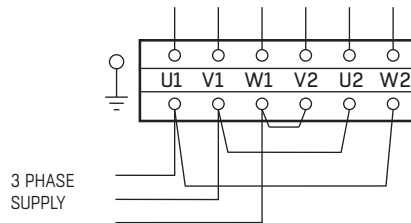
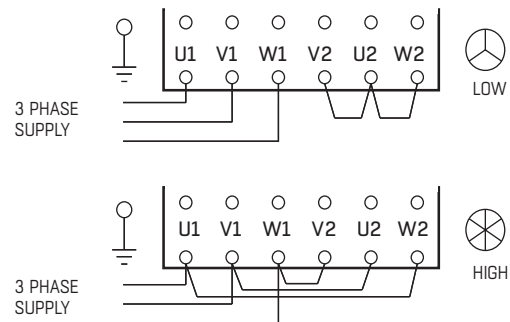
**FIGURE 8**
**3 PHASE**
**Constant speed (Single Voltage) Unregulated**

**CD1683**

**PN502334**

Diagram F

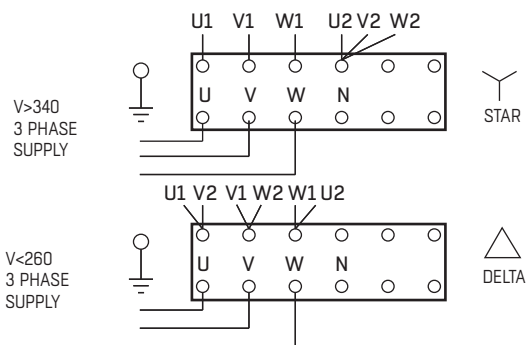
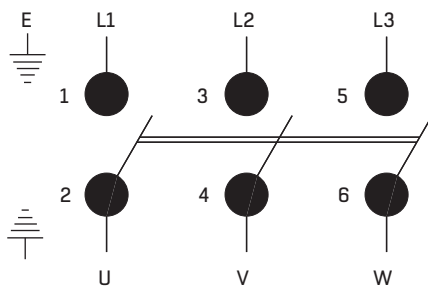
**Constant speed (Dual Voltage Single Speed)**

**PN502333**

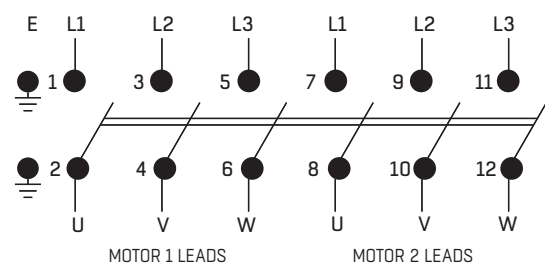
Diagram E

**WIRING DETAIL: THREE PHASE FANS USING TERMINAL BOX ON MOTOR**
**FIGURE 9**
**3 PHASE**


MOTOR LEADS

**CD1545**

PN. 406607



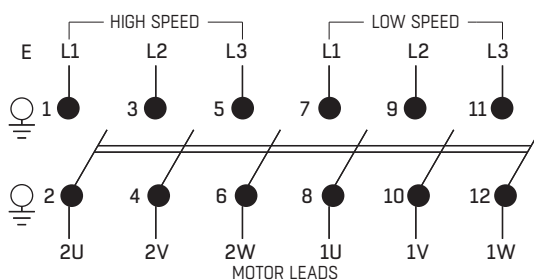
MOTOR 1 LEADS

MOTOR 2 LEADS

STANDBY MOTOR UNITS

**CD1546**

PN. 406608

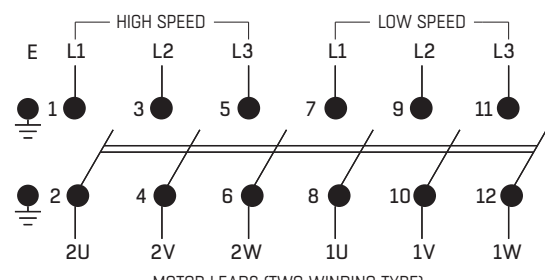


**Warning :-** Control Gear must suit Pole Change (Tapped Wound, Dahlander or Pam)  
Windings provided Suitable Woods Starter / Change Over Unit EDC19

TWO SPEED MOTOR UNITS. POLE CHANGING TYPE

**CD1550**

PN. 407356



MOTOR LEADS (TWO WINDING TYPE)

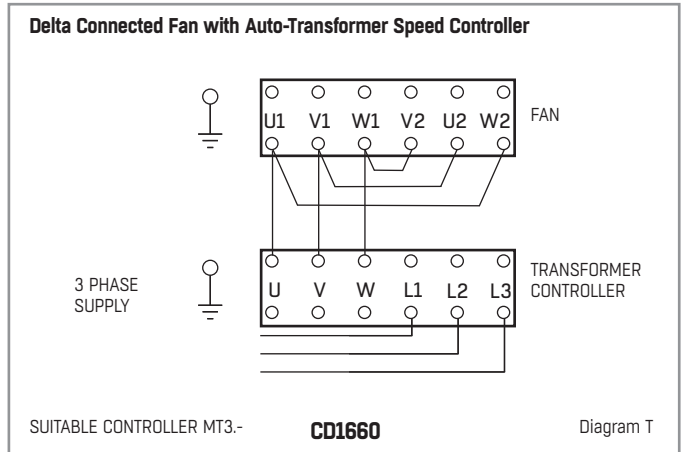
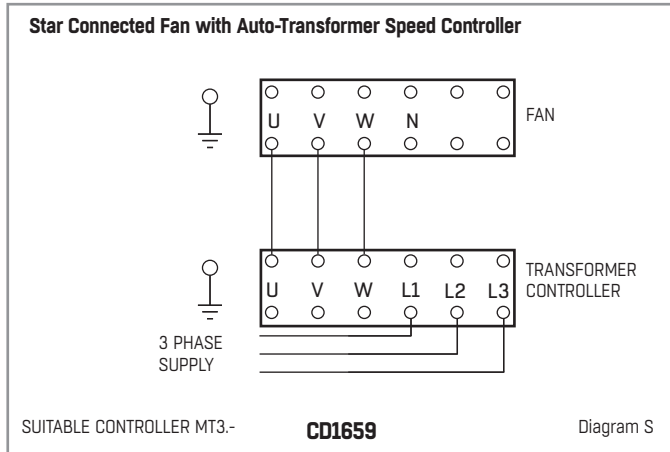
TWO SPEED MOTOR UNITS. TWO WINDING TYPE

**CD1547**

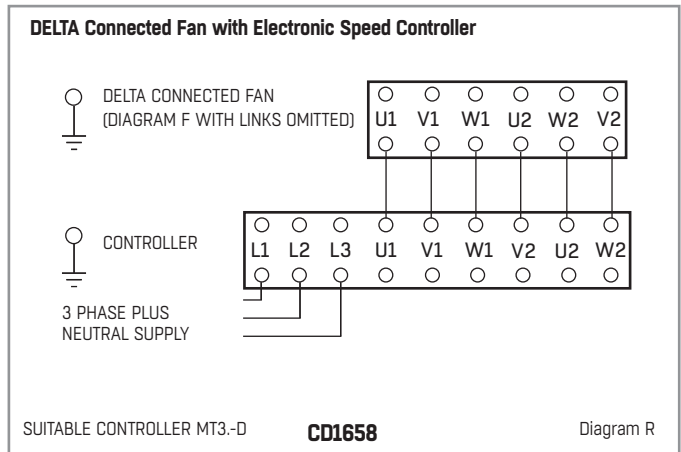
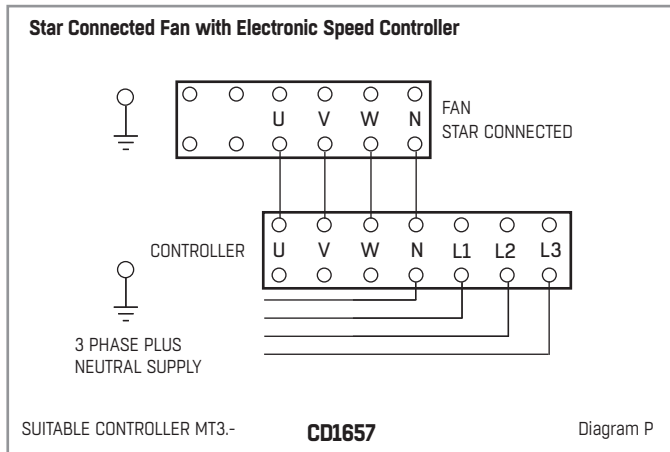
PN. 406609

**WIRING DETAIL: THREE-PHASE MOTOR, WITH ISOLATOR FITTED**

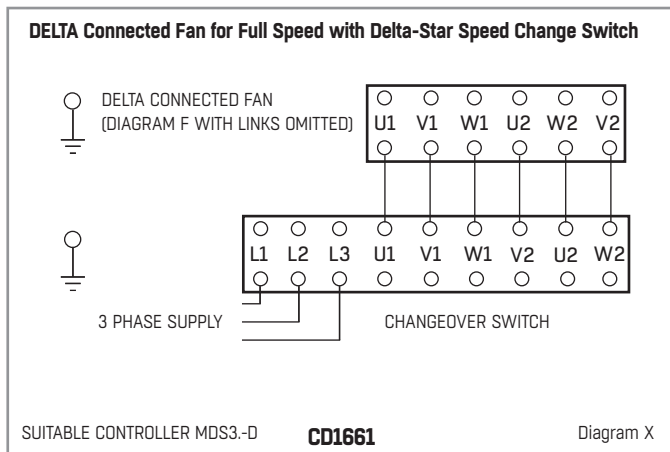




WIRING DETAIL: THREE-PHASE DIRECT-DRIVE MOTOR WITH TRANSFORMER TYPE SPEED CONTROLLER



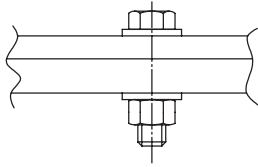
WIRING DETAIL: THREE-PHASE DIRECT-DRIVE MOTOR WITH ELECTRONIC TYPE SPEED CONTROLLER



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

**FIGURE 13**

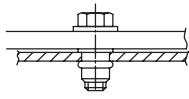
(1)(2)(3)



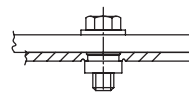
**Type 1**

Plain Screw and Nut with Washers holding Two Plates together.

(6)



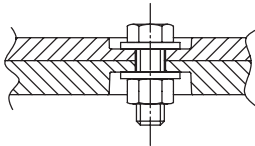
(10)



**Type 7**

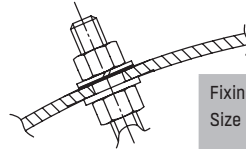
Screw and Washers through Plate into Nutsert or Prestinert for a Welded Nut see Mild Steel figures.

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.

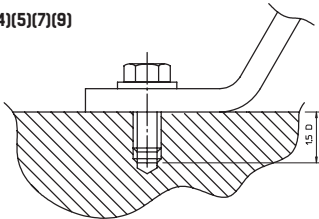


Fixing Size	Stainless Steel PVC Duct
M8	10.00

**Type 8**

Tightening of Studs on outside of PVC Ducts.

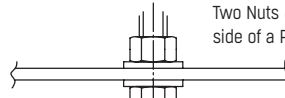
(4)(5)(7)(9)



**Type 3**

Screw with Washer Holding Plate screwed into Tapped Metal.

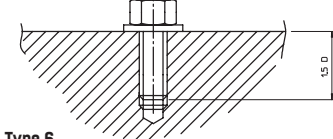
(1)(2)(3)



**Type 5**

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

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

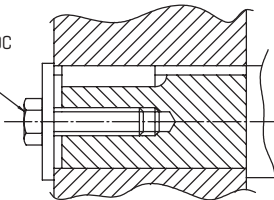


**Type 6**

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

(10)

LONGLOC  
TUFLOK/ESLOC  
Screw



**Type 4**

Locking Screw & Heavy Washer into material for Shaft Application. These should be shown on specific table Nylon Patch will hold Screw locked against vibration.

**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.  $\text{lbf-ft} = \text{Nm} \times 0.7375$ .
- D) There is a tolerance on Torque Wrenches up to  $\pm 5\%$ .
- 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	(10) 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

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

\*Includes T Bolts

**(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	

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

**NOTE:** All Foot Mounted Motor Fixings should be applied with Loctite Compound. For any fixings exceeding M24 please contact Engineering for details. At least x1.5D thread engagement available for Cast Iron Motors and x2D Aluminium Motors if insufficient contact engineering.

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