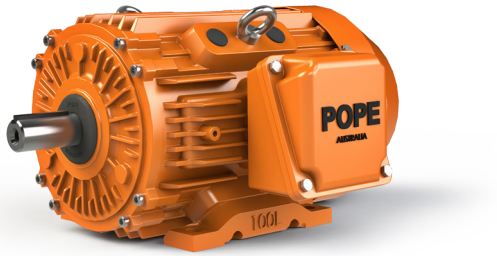
# POPE ELECTRIC MOTORS INSTALLATION AND SAFETY GUIDE

POPE FLEXI-FRAME®
THE BENCHMARK IN ELECTRIC MOTORS




## HEALTH & SAFETY AT WORK

POPE Electric Motors Pty Ltd is a Quality Endorsed Company accredited to the highest International Quality Standards ISO 9001-2008. This manual gives guidance for installation and maintenance procedures for the TEFC range of squirrel cage induction motors. It should be carefully read in conjunction with local codes & the following standards prior to installation and commissioning.

| | |
|---|---|
| AS1359 | Rotating Electrical Machines. General Requirements. |
| AS1359.101 | Rating and Performance. |
| AS4024 | Safeguarding of Machinery. |
| AS3000 | Electrical Installation (known as SAA Wiring Rules). |
| IEC 60034 | Rotating Electrical Machines |

Further information can be obtained by contacting POPE Electric Motors

## LIFTING

- Use all lifting facilities provided:
- Safe lifting practices should be followed. See nameplate for weight.
- Vertical lifting: Prevent uncontrolled rotation of the motor.

## INSPECTION AND STORAGE

☑ **TICK WHEN CHECKED**

☐ 01 Ensure correct motor is received.
☐ 02 Check for transit damage.
☐ 03 Report damages to POPE Electric Motors giving complete details.

**STORAGE**

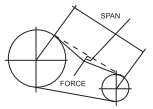
☐ 04 Ensure motors are stored in a dry location within an ambient temperature range of -20°C to +45°C
☐ 05 Energise anti-condensation heaters if fitted.
☐ 06 Ensure all plugs originally provided are in place (e.g. Cable entry hole plugs, drain plugs.
☐ 07 Every 24 months rotate shaft.
☐ 08 Ensure shaft locking clamp is in place and tight.

## INSTALLATION CHECKS

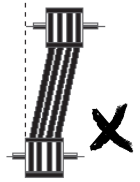
☐ 09 Electric motors must be protected with correctly sized thermal overload devices with phase loss / imbalance protection. All POPE Flexi-Frame motors are fitted with PTC thermistors. A suitable thermistor relay is highly recommended.
☐ 10 Fan cover not damaged or touching fan. Minimum 80mm gap between fan cover and nearest barrier.
☐ 11 Foot not broken or cracked. Fixing bolts tight.
☐ 12 Shaft not damaged or bent.
☐ 13 Check all the name plate details.
☐ 14 Check free running by hand.
☐ 15 Check grease condition if motor is idle for more than 24 months.
☐ 16 Add appropriate lubrication to oil seals: if required.
☐ 17 Check mounting alignment / plane. Add shims if necessary. (A)
☐ 18 Verify belt tension where applicable. (A)
☐ 19 Check for any misalignment in motor & drive shaft. (A)
☐ 20 Ensure clean and level mounting surfaces to feet, flange & shaft.
☐ 21 While mounting use appropriate fasteners & tightening torques. (T)
☐ 22 Check all the gaskets, sealants & guards are correctly fitted.
☐ 23 Ensure correct drain hole position. Refer to mount positions / drain holes. (M)
☐ 24 Ensure both power supply system and motor is grounded.
☐ 25 Check insulation resistance of all windings with 500V DC megger. If < 10 megger Ω dry out following correct procedure.
☐ 26 Ensure the equipment is fused and isolated correctly.
☐ 27 Ensure all the covers are fitted and sealed, interior of terminal box is clean & free of cable residues and foreign objects.
☐ 28 Seal unused cable entries.
☐ 29 Check connection diagram and ensure correct terminal arrangement. (C)
☐ 30 Ensure all the connections are tight and clean. (T)
☐ 31 Ensure air clearance between phases & phases to earth. (C)
☐ 32 Check rotation, uncoupled.
☐ 33 Ensure rating of fuse - circuit breaker is correct.
☐ 34 Ensure space heater (if provided) is off while motor is operating.
☐ 35 Altitude in excess of 1000 metres contact POPE Electric Motors.
☐ 36 Ambient temperature higher than 40°C contact POPE Electric Motors.
☐ 37 If operated from a speed controller contact POPE Electric Motors.
☐ 38 If motor marked with "Ex" symbol for hazardous area refer to appropriate standards and installation manuals.
☐ 39 Installation must only be carried out by qualified trade personnel in accordance with local standards.

## (A) ALIGNMENT: BELT DRIVES

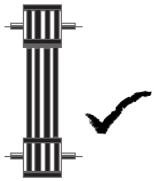
☐ 40 When fitting belt drives, the belt manufacturers recommendations for installation and tensioning must be strictly adhered to.




**DO NOT OVER TENSION V - BELTS**



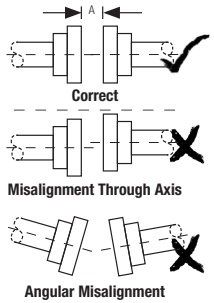
**1.INCORRECT INSTALLATION**
Shafts are parallel and in alignment, but pulleys are not aligned.



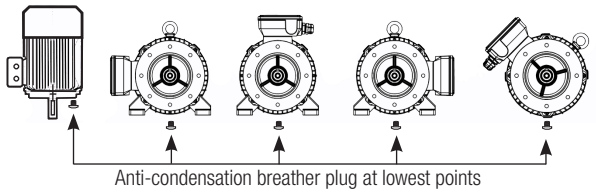
**2.CORRECT INSTALLATION.**
Both shafts and pulleys are parallel and in alignment.

## (A) ALIGNMENT: DIRECT COUPLING

☐ 41 Care must be taken in checking alignment of driving and driven shafts.
Dimension "A" should be the same when measured at any location on coupling face using a thickness gauge.
After fitting and connecting check for vibration and out of balance.




## (M) MOUNTING POSITIONS / BREATHER PLUG




☐ 42 **POPE Flexi-Frame** 83-400 Frame motors have bolt on mounting feet, relocating the feet allows the terminal box to be left side, right side, or top mount. When changing feet position ensure:

- Location keys are fitted correctly and fasteners are tightened to recommended torque (see chart (T)).
- Unused mounting holes on frames 63-112 are sealed with rubber grommets, screws or sealant to prevent water/dust ingress.
- Drain hole plugs/holes are located at the lowest point to allow condensation to drain, IP66 motors generally have the drain hole sealed.

## C CONNECTION & TERMINATIONS

☐ 43 Typical connection diagrams for standard motors.
All motors are provided with suitable earthing studs.

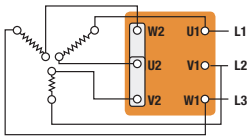


FIGURE 1

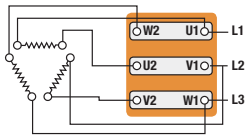


FIGURE 2

### Y STAR CONNECTION

0.09 kW to 3 kW are fitted with Star Y connected bridging bars for operation at 400V to 415V 50Hz / 440V to 480V 60Hz. Motors can be reconnected in Delta Δ **(FIGURE 1)** for use with 240V 1ø input inverter with 220/240V 3ø output.

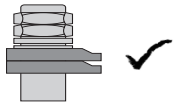
### Δ DELTA CONNECTIONS

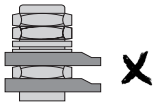
4kW and above are fitted with Delta Δ connected bridging bars for operation at 400V to 415V 50Hz / 440V to 480V 60Hz. Motors can be reconnected in Star Y **(FIGURE 2)** for use on 690V 50Hz supply.

**FOR MULTI SPEED & 1000V CONNECTIONS CONTACT POPE ELECTRIC MOTORS**

☐ 44 **CABLE TERMINATIONS**

When connecting the supply cable to the motor terminal studs, the position of cable lugs, connectors and washers should be arranged such that the terminal stud is not used as a conductor. Tight terminals must be maintained. It is advisable to tighten nuts or bolts to the recommended torques. (See table (T) below).


Correct terminal connection.


Incorrect terminal connection.

☐ 45 The correct creepages and clearances between phases and phase and earth should be maintained: 600V & below 10mm / 600V to 1250V 20mm or use POPE phase barriers.

## T RECOMMENDED TIGHTENING TORQUE

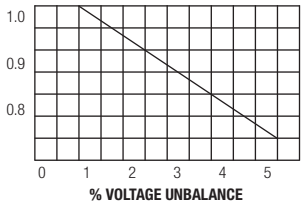
☐ 46

| FIXING SIZE (mm) | TERMINAL POST | CAST BODY (General fixings) |
|---|---|---|
| | Newton Metres ±10% (Nm) | |
| 4 | 1.7 | 3.5 |
| 5 | 2.8 | 7.0 |
| 6 | 7.3 | 10.0 |
| 8 | 15 | 18.0 |
| 10 | 26 | 37.0 |
| 12 | 65 | 65.0 |
| 16 | 130 | 80.0 |

## OPERATION

### NO LOAD OPERATION

☐ 47 Run motor with load uncoupled. Ensure rated voltage is applied to motor terminals and balanced in all three phases. The maximum allowable imbalance is 1%. Should voltage imbalance be greater than 1%, moderate motor output or reduce motor load as per graph below.




☐ 48 Check that three phase currents at No Load are balanced.
Note: The No Load currents will be more if the voltage is higher. They will be less if the voltage is less. The increase & decrease will not be in linear proportion with voltage.

☐ 49 No abnormal noise.

☐ 50 Check direction of rotation if specific.

☐ 51 Check vibration.

## STARTING AND OPERATING ON LOAD

☐ 52 Squirrel Cage Motors are generally suitable for DOL, Star/Delta, auto transformer starting and AC speed controllers.

☐ 53 Maximum DOL starts per hour at maximum load inertia, equally spaced, includes one cold start at 40°C ambient.

| Pole | FRAME / STARTS PER HOUR | | | | | |
|---|---|---|---|---|---|---|
| | 63 - 112 | 132-160 | 180 - 200 | 225 - 250 | 280 | 315M |
| 2 | 12 | 10 | 8 | 5 | 3 | 3 |
| 4 | 21 | 19 | 15 | 10 | 6 | 4 |
| 6 | 27 | 24 | 19 | 12 | 8 | 6 |
| *More starts can generally be achieved by using an AC drive.* | | | | | | |

☐ 54 Ensure rated voltage at the motor terminal during start up and check starting time within designed limit. For normal application, the time required will not be more than 5 seconds at DOL. For high inertia load the starting time is longer but special design is required to cater for this. For star/delta & reduced voltage starter the time will be longer than DOL start.

☐ 55 Ensure full load currents are balanced in all phases (maximum imbalance 8% corresponding to 1% imbalance of voltage) and the value is within nameplate data. In case of pulsating load we recommend the maximum current to be within nameplate value.

☐ 56 No abnormal noise or vibration (If change in vibration level is observed, check alignment again with motor at normal running temperature).

☐ 57 Check maximum air inlet temperature 40°C maximum.

☐ 58 Check motor temperature after approximately 2 hours of full load operation, maximum 80°C measured at bearing housing including ambient i.e. measured 45°C @ 20°C ambient and predicted summer ambient +20°C = 65°C OK.

## PREVENTIVE MAINTENANCE & LUBRICATION

☐ 59 Motor should be kept clean and free from oil, dust and moisture (with the exception of the POPE Extreme motor).

☐ 60 Care should be taken to see that ventilation passages are not blocked.

☐ 61 The earthing conductor should be regularly inspected and checked for continuity.

☐ 62 The insulation resistance of stator should be checked regularly between respective terminals and the frame.

☐ 63 Always fit shaft clamp during transportation 200 frames and above.

☐ 64 Grease replenishment (Sinopec HPXT grease recommended, or equivalent lithium based grease) should be carried out at predetermined intervals.

**NEVER MIX GREASE TYPES**

Note: Rewinding motors may reduce motor efficiency and increase running costs. Contact POPE Electric Motors Pty Ltd for additional information.

Abuse of electrical equipment can be hazardous. Every effort should be made to eliminate these hazards and this guide should assist in minimising these risks.

Qualified engineering advice should be sought to determine the correct selection, sizing, safety and installation of electrical equipment.

POPE Electric Motors Pty Ltd makes no warranty as to the completeness or accuracy of any material contained in this guide and shall not be liable for any errors or omissions. POPE Electric Motors Pty Ltd cannot accept responsibility for the way in which this installation & safety guide it is interpreted, or any consequence as a result.

**RECORDS**

Installed By.....

Serial No.....

Date: / / /

For further information please contact POPE Electric Motors
Phone Australia (61) 1300 553 552

**AGENT**