

TECO Induction Motors up to 600kW Installation and Maintenance Instructions

Before Installation & Use

1. Ensure nameplate data corresponds with your requirements
2. Ensure the motor is undamaged
3. Remove any shaft clamp (but refit prior to transportation)
4. Slowly rotate the shaft to ensure free movement
5. Ensure the mounting/shaft orientation design and drain hole positions are correct for the application

Warnings

The following safety precautions must be observed:

1. Electrical



Electric rotating machinery and electricity can cause serious or fatal injury if the motor is improperly installed, operated or maintained.



Responsible personnel must be fully trained to understand the hazards to themselves and others before being involved in installing, operating, maintaining and decommissioning electric motors.

European Union Safety information can be obtained from such as:
BS4999; EN 60204-1; EN292; EN294

IEE Wiring Regulations

Particular industries and countries have further safety requirements. Refer to their trade & safety bodies, British Standards Institution, Dept of Trade & Industry, etc., for further information. For instance, in the USA, refer to NEMA MG2, the National Electrical Code, local safety requirements etc.

2. Servicing.



When servicing, all power sources to the motor and to the accessory devices should be de-energised and disconnected and all rotating parts at standstill.

3. Lifting means, such as eyebolts, on the motor are for lifting only the motor itself. Assemblies which are not part of the motor must be removed prior to using the motor lifting means. When more than one lifting means is provided on the motor, all must be used together, for instance by attaching a supporting chain to each, to share the load. Ensure that lifting means are fully attached to the motor before lifting.

4. Suitable ear protection must be worn near machinery emitting high audible noise to reduce the noise reaching the ear to a safe level.

Expect sound pressure levels above 85dB at 1 metre from TECO model AEEB standard motors connected to a 50Hz supply as follows:

- 2 pole - 37kW and above
- 4 pole - 90kW and above

Noise generally increases with frequency. Refer to TECO for noise levels at other poles and frequencies. Refer also for noise levels from other models and particular motors where for instance TECO have provided additional silencing.

Refer to BS EN 60034-9:1994 for further information on noise from rotating electrical machines

5. Safety guards and other protective devices must neither be bypassed nor rendered inoperative.

6. Earthing



The motor must be earthed. Refer to relevant standards such as EN60204-1, IEE Wiring Regulations etc.

7. A suitable enclosure must be provided for the motor to prevent access to moving parts. Extra caution should be observed around a motor that is automatically started or has automatic resetting relays or is remotely started in case such starting means has not been properly disabled and the motor starts unexpectedly.
8. Ensure all shaft keys present on moving parts are fully captive before the motor is started.
9. Ensure adequate safeguards have been made to protect against the consequences of a brake failure, particularly on crane/hoist applications.
10. TECO UL listed explosion proof motors must only be used in countries where the UL certification is recognised as being appropriate for the application. They are constructed to comply with UL regulations and any repairs to them must be made by TECO or a UL listed service centre in order to maintain the UL listing.
11. When using a motor in a variable speed application ensure that it will not be driven above its safe maximum speed limit. Consult TECO if in doubt. Also ensure the motor is not overloaded: It should be remembered that as speed reduces, fans driven by the main shaft do not provide as much cooling air and an auxiliary fan may be required.
12. Protect the motor from overload, preferably by monitoring the winding temperature. TECO can fit thermistors to give indication that the winding is getting too hot and the thermistors can be connected to switchgear that will automatically trip on the signal from the thermistors.
13. Capacitors



Capacitors such as in single phase motors may remain charged even when isolated from the mains supply. Discharge capacitors and earth their terminals before handling any connections.

Location

1. Motors with drip-proof enclosures are intended for use where the atmosphere is relatively clean, dry, well ventilated and non-corrosive. Refer to BS 4999 Part 105 for more detailed information on suitability of a particular enclosure rating.
2. Totally-enclosed motors may be installed where dirt, moisture or dust are present and in outdoor locations. Refer to BS 4999 Part 105 for more detailed information on suitability of a particular enclosure rating.
3. Explosion proof motors have many different categories because hazardous atmospheres can consist of many different gases which may or may not be present continuously. Individual countries/users can differ in their safety requirements so the suitability of an explosion proof motor for any particular hazardous location must be assessed against the standards and specifications in force for that location. They must not be used in hazardous locations unless it has been established that they do comply with the safety standards and specifications in force for that location.
4. Type N motors to BS 5000: Part 16 have been designed to reduce the likelihood of sparking in normal operation and have surface temperature limitations. They may be acceptable in locations where an explosive gas-air mixture is not likely to occur in normal operation and if it occurs it will only exist for a short time. Before using any type N motor in such a location, ensure that safety standards and specifications in force for that location permit its use.
5. Chemical duty enclosed motors are designed for installation in locations where they may encounter corrosive substances and/or high moisture.

Note: In all locations the surroundings must not obstruct the normal flow of ventilating air to and from the motor.

Mounting

1. Ensure the orientation of the frame is appropriate for the design of the motor. For instance, motors designed for B3 (horizontal shaft), may not be suitable without modification for V5 (vertical shaft) because any drain holes will be in the wrong position, additional fixings may be required to prevent the shaft sliding through the bearings and different bearings may be needed to withstand the thrust force.

Drip proof motors may not be drip proof in the wrong orientation.

Consult TECO to establish whether a motor may be safely used in an orientation different from that ordered.
2. Where the motor is to be subject to a high degree of vibration (such as on a vibrating screen), high humidity (typically above 95%), abnormal ambient temperature (typically outside the range -20 to +45°C), or high altitude (typically above 1000metre) ensure that the motor specification is appropriate.

3. When mounting the motor, ensure this is done securely using steel nuts and bolts through each of the fixing holes provided, fully tightened. Where the location is likely to cause rusting, such as in the presence of sea water, stainless steel fixing bolts may be an advantage. Where there is significant vibration, ensure there are shakeproof washers under the nuts.
4. Where the drain holes are to be left open, ensure they are guarded from access when the motor windings are connected to a power supply
5. With a directly-coupled load ensure the motor and load shafts are accurately aligned and use a flexible coupling between them. Mounting bolts must be carefully tightened to avoid alignment changes and the alignment rechecked to ensure it is correct when the bolts are fully tight.
6. With a side-coupled load, such as a belt or gear drive, ensure the side force on the shaft will not damage the motor. Consult TECO if in doubt.

Power Supply and Connections

1. Wiring of the motor and its controller, overload protection and earthing should be in accordance with the current edition of the IEE wiring regulations, EN60204 and all local safety requirements
2. Refer to the nameplate voltage and frequency to ensure the motor is correct for the power supply to which it is to be connected. Unless specified otherwise the motor may be assumed to be suitable for the nameplate voltage +/- 5% and nameplate frequency +/- 1%.
3. Connection diagrams for the motor are generally supplied with it, either on the nameplate, fixed to the motor or placed in the terminal box.
4. Temperature limiting devices



All TECO UL listed Explosion Proof motors have temperature limiting devices in the motor enclosure to help prevent excessive external surface temperature of the motor in accordance with UL standards. Terminals (P1, P2) of thermal protectors in these motors must be connected to the motor control equipment according to the connection diagram inside the terminal box.

Note: these motors are not certified for use in hazardous areas in the European Union and must only be used in locations where the UL recognition is in force.

Start Up

1. Initially, run the motor unloaded and establish that the rotation direction is as required. If not, **switch off and when rotation has stopped:**
 - If the motor is a three-phase motor - interchange any two phases.
 - If the motor is a single-phase motor - interchange the connections to the auxiliary winding circuit, leaving the connections to the main winding unchanged.
2. Then start the motor fully loaded. If it does not start quickly and run smoothly, switch off immediately and when rotation has stopped, isolate from the power supply and examine the assembly for mechanical faults or poor connections.
3. If there is excessive vibration it could be caused by poorly aligned couplings, loose mounting bolts, lack of rigidity in the supports, transmitted vibration from adjacent machinery, etc. Excessive vibration can lead to motor damage, for instance to the bearings making them noisy, and hence vibration should be minimised.
4. Ensure the current drawn is commensurate with that shown on the nameplate and that the currents in each phase are similar.
5. If a single phase motor does not start, this may be due to the internal starting switch not closing when the rotor is stationary or a faulty starting capacitor.

Long Term Storage and Humid Environments

If the motor has been stored for an extensive period or subjected to adverse moisture conditions, ensure the insulation resistance is greater than 1MΩ before switching on. Also, regrease the bearings and if they are rusty, replace them.

When the insulation resistance is not greater than 1MΩ, dry out the motor as described below. If after drying out the insulation resistance is still not greater than 1MΩ, the motor will need repairing.

Drying Out

This may be carried out either:

1. By baking in an oven at up to 90°C. Ensure the interior and exterior of the oven are well ventilated.

- By locking the rotor so it cannot move and connecting a low voltage to the motor windings. Gradually increase the voltage from zero until the current is about one third the rating plate value. Trim the voltage as necessary so that the winding temperature remains below 90°C.

Drying out is complete when the insulation resistance stops changing.

Maintenance

Inspection

Inspect the motor at regular intervals. Ensure it is kept clean with clear ventilation openings, there is no excessive vibration and noises emitted from the motor are normal. Ensure fixings and fasteners have not loosened nor so corroded that either their strength has been reduced significantly or earthing has been impaired. Ensure also that electrical connections are tight and uncorroded and that earthing is intact.

Inspect shaft seals and terminal box gaskets to ensure they are in position and not significantly worn. Contact TECO if the seal/gasket types on the motor are unknown. Examine the paint finish and repaint if necessary to avoid excessive corrosion. Ensure that shaft couplings are fixed firmly and that shaft alignment is correct. Ensure also that there is no build up of liquid inside the motor that would adversely affect its performance and drain if there is.

Lubrication

Motors with double shielded (suffix "ZZ" on bearing type) bearings are lubricated for life and cannot be relubricated.

Larger frames (usually Frames D200 and above, D180 2 pole and C180 and above) in particular have regreasing facilities. These motors are shipped already-greased and the grease should be replaced at regular intervals. The length of the interval varies with size of motor and how it is used. The table below gives a guide to relubrication intervals. Excessive or too frequent lubrication may actually damage the motor.

Rated kW output	Poles	Relubrication intervals		
		Standard conditions	Severe conditions	Extreme conditions
0-30	4 upwards	7 years	3 years	6 months
37-75	4 upwards	210 days	70 days	30 days
90-185	4 upwards	90 days	30 days	15 days
0-18.5	2	5 years	2 years	3 months
22-75	2	180 days	60 days	30 days
90-110	2	90 days	30 days	30 days
132-600	2	90 days	30 days	15 days

For other ratings please refer to TECO.

Definitions

Standard conditions: 8 hour operation per day with rated or light loading in a clean low-vibration environment.

Severe conditions: 24 hour operation per day with rated/light loading or in a dirty/dusty environment or where the motor is subject to vibration/light shock loading.

Extreme conditions: Where there is heavy shock loading or high vibration or a very dirty/dusty environment.

Regreasing Operation



If regreasing is to be carried out with the motor running, ensure it is done only by properly-trained personnel and that live and moving parts are fully guarded.

Ensure the grease exit is open and the grease nipple is clean

Attach a low pressure grease gun to the nipple and pump in grease until clean grease emerges at the grease exit.

Remove the grease gun. Fully guard live and moving parts and then run the motor for 10-30 minutes ensuring that any surplus grease is properly disposed of, and then refit any grease exit plug.

Grease Type

Ensure only the correct type of grease is used. Greases incompatible with that in the bearings can greatly reduce the bearing life. Consult TECO if you are not sure of the type supplied in your TECO motor.

TECO standard regreasable motors use Esso Unirex Lithium N3 grease.

Spares

Use only genuine TECO spares or alternatives recommended by TECO. When ordering, please give full nameplate details and in particular:

Frame Number	
Type	
Poles	
kW	
Serial Number	
Quantity required	

For further information, please contact:

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