### Part Detail

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A-C MOTOR PERFORMANCE CURVES

- HP
- TYPE
- PHASE/HERTZ
- RPM
- VOLTS
- AMPS
- DUTY
- AMB
- S.F.
- NEMA DESIGN CODE LETTER
- ENCLOSURE
- E/S
- ROTOR
- TEST S.O.
- TEST DATE
- STATOR RES. @ 25 C

- AMPERES SHOWN FOR a-C MOTOR
- PERFORMANCE CURVES

- DR. BY
- CK. BY
- APP. BY
- DATE
- ISSUE DATE

Note: Amperes will vary inversely with the rated voltage. Connections other than the standard connections may cause different results.
### A-C Motor Data

**Performance**

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**Remarks:**

- The remarks section contains additional notes about the motor's performance and design features.
- The remarks may include details about the motor's performance under various load conditions.
A-C MOTOR
CONNECTION DIAGRAM
STANDARD 3 LEAD CONNECTED

(N.P. 1575-BA)
Integral Horsepower
AC Induction Motors
ODP, WPI Enclosures
TENV, TEAO, TEFC Enclosure
Explosion Proof
Installation & Operating Manual

3/09 MN408
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<tr>
<td>10</td>
<td></td>
<td>General Information</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>General Information</td>
</tr>
</tbody>
</table>
This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements.

**Warning**
A Warning statement indicates a possible unsafe condition that can cause harm to personnel.

**Caution**
A Caution statement indicates a condition that can cause damage to equipment.

**Important:** This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual contains general guidelines that apply to most of the motor products shipped by Baldor. If you have a question about a procedure or are uncertain about any detail, **Do Not Proceed.** Please contact your Baldor distributor for more information or clarification.

Before you install, operate or perform maintenance, become familiar with the following:

- ANSI/NFPA 70: National Electrical Code (NEC) and local codes and practices.
- Before you install, operate or perform maintenance, become familiar with the following:

**Limited Warranty**

The Baldor Electric Company, through its authorized distributors, warrant this motor to be free from defects in material and workmanship that could prevent its operation. The warranty is void if the motor has been subjected to overload, improper operation, or has been subjected to äncient processes or chemicals that would affect its performance. The warranty shall not extend beyond the time that the motor is no longer needed for its intended use.

**Safety Notice**

This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment. Be sure that you are fully familiar with NEMA publication MG-2, safety standards for construction and guide for selection, installation and use of electric motors and generators, the National Electrical Code and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

**Warning:** Do not touch electrical connections before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

**Warning:** Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.

**Warning:** Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.

**Warning:** Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.

**Warning:** Surface temperatures of motor enclosures may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect electrical contacts from hot surfaces. Failure to observe this precaution could result in bodily injury.

**Warning:** This equipment may be connected to other machinery that has rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt to install, operate or maintain this equipment.

**Warning:** Do not bypass or disable protective devices or safety guards. Safety features are designed to prevent damage to personnel or equipment. These devices can only provide protection if they remain operative.

**Warning:** Avoid the use of automatic reset devices if the automatic restarting of equipment can be hazardous to personnel or equipment.

**Warning:** Be sure the load is properly coupled to the motor shaft before applying power. The shaft key must be fully captive by the load device. Improper coupling can cause harm to personnel or equipment if the load decouples from the shaft during operation.

**Warning:** UL Listed motors must only be serviced by UL Approved Authorized Baldor Service Centers if these motors are to be returned to a hazardous and/or explosive atmosphere.

**Warning:** Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.
WARNING: Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.

WARNING: Pacemaker danger - Magnetic and electromagnetic fields in the vicinity of current carrying conductors and permanent magnet motors can result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay away from the area surrounding a permanent magnet motor.

WARNING: Before performing any motor maintenance procedure, be sure that the equipment connected to the motor shaft cannot cause shaft rotation. If the load can cause shaft rotation, disconnect the load from the motor shaft before maintenance is performed. Unexpected mechanical rotation of the motor parts can cause injury or motor damage.

WARNING: Do not use non UL/CSA listed explosion proof motors in the presence of flammable or combustible vapors or dust. These motors are not designed for atmospheric conditions that require explosion proof operation.

WARNING: Motors that are to be used in flammable and/or explosive atmospheres must display the UL label on the nameplate along with CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Caution: To prevent premature equipment failure or damage, only qualified maintenance personnel should perform maintenance.

Caution: Do not over lubricate motor as this may cause premature bearing failure.

Caution: Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

Caution: If eye bolts are used for lifting a motor, be sure they are securely tightened. The lifting direction should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.

Caution: To prevent equipment damage, be sure the electrical service is not capable of delivering more than the maximum motor rated amps listed on the rating plate.

Caution: If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your Baldor distributor or an Authorized Baldor Service Center.

Receiving

Each Baldor Electric Motor is thoroughly tested at the factory and carefully packaged for shipment. When you receive your motor, there are several things you should do immediately.

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.

2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

Handling

The motor should be handled using the lifting lugs provided. Caution: Do not lift the motor and its driven load by the motor lifting hardware. The motor lifting hardware is adequate for lifting only the motor. Disconnect the load (gears, pumps, compressors, or other driven equipment) from the motor shaft before lifting the motor.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift the motor and its unused shaft extensions. The motor lifting hardware should not exceed a 20° angle from the shank of the eye bolt or lifting lug. Excessive lifting angles can cause damage.

2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.

3. If a HI POT test (High Potential Insulation test) must be performed, follow the precautions and procedure in NEMA MG1 and MG2 standards to avoid equipment damage.
General Information

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.

Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

A wooden crate “shell” should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and reclosing many times without damage to the “shell”.

Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, whichever is greater. Minimum resistance is calculated as follows:

\[ R_m = kV + \frac{1}{20} \]

where: \( R_m \) is minimum resistance to ground in Meg-Ohms and \( kV \) is rated nameplate voltage defined as Kilo-Volts.

Example: For a 480VAC rated motor \( R_m = 1.48 \text{ meg} \) (use 5 MΩ).

For a 4160VAC rated motor \( R_m = 5.16 \text{ meg} \).

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.

2. Store in a clean, dry, protected warehouse where control is maintained as follows:
   a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit, vibration isolation pads must be used.
   b. Storage temperatures of 10°C (50°F) to 49°C (120°F) must be maintained.
   c. Relative humidity must not exceed 60%.
   d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional. A wooden crate “shell” should be constructed to secure the motor during transportation during storage.

3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
   a. If motor insulation resistance decreases below the minimum resistance, contact your Baldor District office.
   b. Place new desiccant inside the vapor bag and re-seal by taping it closed.
   c. If a zipper-closing type bag is used instead of the heat-sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
   d. Place the shell over the motor and secure with lag bolts.

4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.

5. Inspect motors before shipping and inspect them upon arrival. The motors must be mounted to the proper mounting base, the bearings must be pre-lubricated, and the field windings must be pre-inserted.

6. Inspect motors after storage and ready for shipment. The motors must be mounted to the proper mounting base, the bearings must be pre-lubricated, and the field windings must be pre-inserted.
General Information

1. Remove all packing material.

Removal From Storage

1. Remove all packing material.

Non-Regreasable Motors

Non-regreasable motors with "Do Not Lubricate" on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

All Other Motor Types

Before storage, the following procedure must be performed.

1. Remove the grease drain plug, if supplied, (opposite the grease fitting) on the bottom of each bracket prior to lubricating the motor.

2. The motor with regreasable bearing must be greased as instructed in Section 3 of this manual.

3. Replace the grease drain plug after greasing.

4. The motor shaft must be rotated a minimum of 15 times before greasing.

5. Bearings are to be greased at the time of removal from storage.

6. Bearings are to be greased at the time of removal from storage.

7. All breathers and accessible glands or mechanical glands are to be removed before the motor is to be moved. The motor shaft position must be maintained.

8. The motor shaft must be rotated a minimum of 15 times before greasing.

Maintenance

Motors with anti-friction bearings are to be greased at the time of going into extended storage.

1. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

2. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

3. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

4. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

5. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

6. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

7. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.

8. Members Anti-Friction: The motors are to be greased at the time of going into extended storage.
IEC certified products have special markings that identify the protection concept and environment. The markings are as follows:

- ExnA: Motor Classification (ExnA)
- ExnA IIC: Gas Group (IIC)
- Tamb: Temperature Class
- II 3 G: ATEX Equipment Group and Category (II3)
- Sira: ATEX Specific Marking
- IECEx: European Conformity Mark
- MFG. BY BALDOR ELECTRIC  FORT SMITH, AR 72901    USA

If the motor certificate number is followed by the symbol "X", this indicates that the motor has specific conditions of use. Review the product certification in conjunction with this instruction manual.

Operation On Frequency Converters:
If the motor is evaluated for operation with an adjustable speed drive, the type of converter (for example, PWM for Pulse Width Modulated) and safe speed ranges (for example, 0-120Hz) will be specified in the certification documents. Consult the adjustable speed drive manual for proper set up.

General Information
- 1. Ex Protection Concept (ExnA)
- 2. Gas Group (IIC)
- 3. Temperature Class
- 4. ATEX Specific Marking of Explosion Protection
- 5. ATEX Equipment Group and Category (II3)

Type of Atmosphere: G-Gas, D-Dust (G)
Ambient Range
European Conformity Mark
Place of Manufacture
Specific Conditions of Use
If the motor is evaluated for operation with an adjustable speed drive, the type of converter and safe speed ranges will be specified in the certification documents or on motor nameplates. It is necessary to consult the adjustable speed drive manual for proper set up.
Section 2
Installation & Operation

Installation should conform to the National Electrical Code as well as local codes and practices. The correct location of the motor and its enclosure is essential to ensure safe and efficient operation. Failure to properly install the motor can result in reduced efficiency, increased maintenance, and potential damage.

### Installation

- **Enclosure Clearance**
  - TEFC / TENV (IC0141) Enclosures:
    - Fan Cover Air Intake: 180° – 210T Frame 1" (< 25mm)
    - Fan Cover Air Intake: 250° – 449T Frame 4" (< 100mm)
    - IEC 112 – 132: 1" (< 25mm)
    - IEC 160 – 280: 4" (< 100mm)

- **Exhaust Envelope**
  - Equal to the P Dimension on the motor dimension sheet

- **Installation**
  - The motor should be mounted in a location compatible with the motor enclosure and specific ambient conditions. To allow adequate air flow, the following clearances must be maintained between the motor and any surrounding obstructions:

- **Mounting**
  - The motor must be securely mounted to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and shaft load. Failure to provide a proper mounting surface may cause vibration, misalignment, and bearing damage.

### Operation

- **Location**
  - Motors may be installed in locations where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers, or flyings. Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements and are designated with appropriate equipment ratings.

- **Baldor Service Center**
  - For further information, contact your local Baldor distributor or authorized Baldor Service Center.

### Table 2-1: Endurance Clearances

<table>
<thead>
<tr>
<th>Frame</th>
<th>Endurance Clearances</th>
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<tbody>
<tr>
<td>100-125</td>
<td>180° – 210T Frame 1&quot; (&lt; 25mm)</td>
</tr>
<tr>
<td>160-180</td>
<td>250° – 449T Frame 4&quot; (&lt; 100mm)</td>
</tr>
<tr>
<td>200-280</td>
<td>IEC 112 – 132: 1&quot; (&lt; 25mm)</td>
</tr>
<tr>
<td>280-355</td>
<td>IEC 160 – 280: 4&quot; (&lt; 100mm)</td>
</tr>
</tbody>
</table>

- **TEFC / TENV (IC0141) Enclosures**
  - Exhaust at the P Dimension on the motor.
Some motors have standardized frames containing 6 or 8 mounting holes. If field reversal of mounting from F1 to F2, etc. is required, the proper mounting holes to use are indicated in Figure 2-2. For field reversed mounting, Figures F-1 to F-2 indicate the proper mounting holes to use.

Frame Mounting Holes

- **Caution**: Do not over tension belts. Excessive tension may damage the motor or driven equipment.

- **Figure 2-2**
  - Top View: Allows F-1 to F-2 Conversion on 8 hole frames. Not present on 6 hole frames.
  - For short frame designations: 182, 213, 254, 284, 324, 364, 404, 444 (NEMA)
  - For long frame designations: 184, 215, 256, 286, 326, 365, 405, 445 (NEMA)
Doweling & Bolting

After proper alignment is verified, dowel pins should be inserted through the motor feet into the foundation. This will maintain the correct motor position should motor removal be required. (Baldor/C0083 Reliance motors are designed for doweling.)

1. Drill dowel holes in diagonally opposite motor feet in the locations provided.
2. Drill corresponding holes in the foundation.
3. Ream all holes.
4. Install proper fitting dowels.
5. Mounting bolts must be carefully tightened to prevent changes in alignment.

Use a flat washer and lock washer under each nut or bolt head to hold the motor feet secure. Flanged nuts or bolts may be used as an alternative to washers.

WARNING: Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.

Guarding

Guards must be installed for rotating parts such as couplings, pulleys, external fans and unused shaft extensions. Some satisfactory methods of guarding are:
1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Power Connection

Motor and control wiring, overload protection, disconnects, accessories and grounding should conform to the National Electrical Code and local codes and practices.

For ExnA hazardous location motors, it is a specific condition of use that all terminations in a conduit box be fully insulated. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

Grounding

In the USA consult the National Electrical Code, Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor or generator terminal housing, and the motor or generator frame. In non-US locations consult the appropriate national or local code applicable.

Motors with resilient cushion rings usually must be provided with a bonding conductor across the resilient member. Some motors are supplied with the bonding conductor on the concealed side of the cushion ring to protect the bond from damage. Motors with bonded cushion rings should usually be grounded at the time of installation in accordance with the above recommendations for grounding of group motors with bonded cushion rings. Where the motor is mounted on a commutator driven rotating device, where the ground connection is made to the motor frame, the grounding conductor should be securely fastened to the motor frame to prevent accidental disconnection. Where the motor is mounted on a commutator driven rotating device and the ground is to be grounded at the motor frame, the grounding conductor should be securely fastened to the motor frame to prevent accidental disconnection.

Select a motor starter and over current protection suitable for this motor and its application. Consult motor starter application data as well as the National Electric Code and/or other applicable local codes.

For motors installed in compliance with IEC requirements, the following minimum cross sectional area of the protective conductors should be used:

<table>
<thead>
<tr>
<th>Cross-sectional area of phase conductors, S</th>
<th>Minimum cross-sectional area of the corresponding protective conductor, S_p</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 16</td>
<td>16</td>
</tr>
<tr>
<td>≥ 16</td>
<td>S_p = S</td>
</tr>
</tbody>
</table>

An equipotential bonding connection shall be made using a conductor with a cross-sectional area of at least 4 mm².
Conduit Box

For ease of making connections, an oversize conduit box is provided. Most conduit boxes can be rotated 360° in 90° increments. Auxiliary conduit boxes are provided on some motors for accessories such as space heaters, RTD's etc.

AC Power

Each heater has two leads, red and white, labeled H1 and H2. Leads for each heater are tied together.

Leads are labeled 1TD1, 1TD2, 1TD3, 2TD1, 2TD2, 2TD3 etc.

Winding RTDs are installed in windings (2) per phase.

Three thermistors are installed in windings and lead in series.

Each winding RTD is installed in drive endplate (PUEP) leads.

 Leads for each winding are labeled TD1 & TD2.

A combined variation in voltage and frequency of ±10% (sum of absolute values) of rated values, provided the frequency variation does not exceed ±5% of rated frequency.

Performance within these voltage and frequency bands are shown in Figure 2-4.

AC Power

The connection diagram in the motor shows the location of all leads, as well as the location of all terminals. All leads are color-coded and labeled according to the following guidelines:

- AC power is within ±10% of rated voltage with rated frequency
- AC power is within ±10% of rated voltage with reduced frequency
- V1, V2, and V3 are the same terminals for flywheel and auxiliary power
- V1, V2, and V3 are the same terminals for flywheel and auxiliary power
- Leads are color-coded according to the following:
  - Red: Phase B
  - Black: Phase C
  - White: Phase A
  - Yellow: Neutral

Proper grounding is critical to ensuring long-term motor life and maximizing performance. Consult the drive manufacturer's manuals for proper grounding techniques.
Note: Main power leads for CE Marked Motors may be marked U,V,W – for standard configurations.

Connection Diagrams:

**AC Motor Connection Diagram**

Please consult connection diagrams.

Diagram: Main power leads for CE Marked Motors may be marked U,V,W – for standard configurations.
2-6 Installation & Operation

Connection Diagrams

Continued
Initial Lubrication

Baldor-Reliance motors are shipped from the factory with the bearings properly packed with grease in place as received. Fully enclosed bearings feature grease seals and are normally equipped with automatic grease lubrication which may be stopped by removing the grease nipple. Primarily, Reliance recommendations that condensation drain plugs be removed, should be followed unless otherwise instructed by the motor manufacturer. Condensation drain plugs, if present, are located in the lower portion of the end-shields.

Verify all coupling guards and protective devices are installed. Ensure motor is properly ventilated.

After 1 hour of operation, disconnect power and connect the load to the motor shaft.

If so, run the motor for 1 hour with no load connected.

9. Start the motor and ensure operation is smooth without excessive vibration or noise.

Verify rotation direction before you continue.

10. If motor rotation is wrong, be sure power is off and change the motor lead connections.

11. Inspect all parts and covers that were removed during installation.

1. Be sure all shipping materials and braces (used) are removed from motor shaft.

2. Make sure the mechanical insulation is secure. All bolts and nuts are tightened.

3. Be sure the load and motor cause mechanical rotation of the motor shaft.

4. Where applicable, remove the motor shield to ensure that it slides freely.

5. Assemble starting materials and braces (used) are reinstalled on motor shaft.

6. Motor rotation is wrong, but you want to continue.

7. Remove all parts and covers that were removed during installation.

8. Verify rotation direction before you continue.

12. If motor noise does not improve, inspect the motor for dirt or debris. Adjust venting if necessary.

First Time Start Up

1. Be sure that all power to motor and accessories is off. Be sure the motor shaft is disconnected from the load and will not cause mechanical rotation of the motor shaft.

2. Make sure the mechanical insulation is secure. All bolts and nuts are tightened.

3. Be sure the load and motor cause mechanical rotation of the motor shaft.

4. Assemble starting materials and braces (used) are reinstalled on motor shaft.

5. Momentarily apply power and check the direction of rotation of the motor shaft.

6. Full-load current is wrong, be sure power is off and change the motor lead connections.

7. Be sure all shipping materials and braces (used) are removed from motor shaft.

8. Momentarily apply power and check the direction of rotation of the motor shaft.

9. Full-load current is wrong, but you want to continue.

10. Remove all parts and covers that were removed during installation.

11. Be sure all shipping materials and braces (used) are removed from motor shaft.

12. Assemble starting materials and braces (used) are reinstalled on motor shaft.

13. Momentarily apply power and check the direction of rotation of the motor shaft.

14. Full-load current is wrong, be sure power is off and change the motor lead connections.

15. Momentarily apply power and check the direction of rotation of the motor shaft.

16. Full-load current is wrong, but you want to continue.

17. Remove all parts and covers that were removed during installation.

18. Be sure all shipping materials and braces (used) are removed from motor shaft.

19. Assemble starting materials and braces (used) are reinstalled on motor shaft.

20. Momentarily apply power and check the direction of rotation of the motor shaft.

21. Full-load current is wrong, be sure power is off and change the motor lead connections.

22. Momentarily apply power and check the direction of rotation of the motor shaft.

23. Full-load current is wrong, but you want to continue.
Coupled Start Up

This procedure assumes a coupled start. Also, that the procedure assumes successful installation and operation of the motor.

1. Check the coupling and ensure that all guards and protective devices are installed.
2. Check that the coupling is properly aligned and not binding.
3. The first coupled start should be with no load. Apply power and verify that the load is not transmitting excessive vibration back to the motor through the coupling or the foundation. Vibration should be at an acceptable level.
4. Run for approximately 1 hour with the driven equipment in an unloaded condition.

The equipment can now be loaded and operated within specified limits. Do not exceed the name plate ratings for amperes for steady continuous loads.

Jogging and Repeated Starts

Repeated starts and/or jogs of induction motors generally reduce the life of the motor winding insulation. A much greater amount of heat is produced by each acceleration or jog than by the same motor under full load. If it is necessary to repeatedly start or jog the motor, it is advisable to check the application with your local Baldor distributor or Baldor Service Center.

Heating

- Duty rating and maximum ambient temperature are stated on the motor name plate. Do not exceed these values.

Hazardous Locations

In the US and in most international markets, areas are classified in Zones. In some newer installations, areas are classified with respect to risk and exposure to the hazard. In the US market, areas are classified with respect to risk and exposure to the hazard.

Protection Concepts

Class I Division 1 / Zone 1 (Equipment Group I (mining) or II (surface), Equipment Protection Level (EPL) Gb, Mb)

Baldor offers a range of motors suitable for installation in a Division 1 or Zone 1 environment. These motors are known as explosion proof or flameproof. (Insert flameproof motor cut away drawing)

Motors that are explosion proof or flameproof use specially machined flameproof joints between the end bell or bracket and the frame, as well as along the rotating shaft and at connection box covers and entries. The fit of these flameproof joints are designed to contain the combustion or quench the flame of an explosive gas atmosphere prior to it exiting the motor. These flameproof joints have lengths and widths selected and tested based on the gas group present in the atmosphere. Baldor/Reliance motors are typically designed to meet Class I (Division 1) Group C and D (explosion proof) or Ex d IIB (flameproof).

An application note regarding equipment applied in accordance with the US National Electric Code (NFPA 70-2008) - according to Article 500.8(C) Marking, sub clause (2) in the fine print note, it is noted that Equipment not marked to indicate a division is suitable for both Division 1 and Division 2 locations. These motors are not gas tight. To the contrary, this protection concept assumes that due to the normal heating and cooling cycle of motor operation that any gas present will be drawn into the motor. Since flameproof or explosion proof motors are designed to contain the combustion and extinguish any flame transmission, for this protection concept, only external surface temperatures are of concern. Thermal limiting devices such as thermostats, thermistors or RTDs may be provided on these motors to limit the external surface temperature during overloads conditions.

For the protection concept, any external source of heat around the motor, such as other equipment, will be deemed as an external source of heat. The thermal limiting devices will be provided on these motors to limit the external surface temperature during overloads conditions.
If thermostats are provided as a condition of certification, it is the installer's responsibility to make sure that these devices are properly connected to a suitable switching device.

The ATEX directive requires that motor shutdown on thermal trip be accomplished without an intermediate software command.

Flameproof motors, internationally referred to as Ex d use a protection concept similar to that used in Class I Division 1 motors, with minor differences in the flameproof joints and cable entry designs.

Flameproof and explosion proof motors are both type tested. Representative motors are connected to a reference gas and ignited in laboratory conditions to verify that the flame is not transmitted outside the motor enclosure and to determine the maximum internal pressure encountered.

Explosion proof and Flame proof motors shipped without a conduit box require use of a certified box of suitable dimensions and that is appropriate for the classification.

**Class I Division 2 / Zone 2 Ex nA** [Equipment Protection Level (EPL) Gc]

This protection concept relies on having no sources of ignition present such as arcing parts or hot surfaces. For this protection concept, internal temperatures as well as external temperatures are considered. In many cases, the internal temperatures are higher than the external temperatures and therefore become the limiting factor in determination of temperature code designation. In these applications, it is very important to use a motor that has been evaluated thermally for use with an inverter or converter, if variable speed operation is desired. Thermostats used for Class I Division 2 and Ex nA motors are used to protect the motor only. For motors using flying lead construction, it is important to use connection lugs and insulate with heat shrink tubing or a double wrap of insulation grade electrical tape to avoid the risk of spark or ignition.

**Class II Division 1 / Zone 21** [Equipment Group III, Equipment Protection Level (EPL) Db]

This area classification is one where the risk of ignitable concentrations of dust is present at all or some of the time. The protection concepts used for Class II Division 1 is similar to flamepath, except with additional dust exclusion paths designed for the rotating shaft. In the international designations, this concept is referred to as dust ignition proof or Ex tD. External surface temperature remains the limiting factor. Thermal limiting devices such as thermostats, thermistors or RTDs may be provided on these motors to limit the external surface temperature during overload conditions. If thermostats are provided, they must be selected to the desired current rating of the motor enclosure. If thermostats are not provided, the maximum surface temperature of the motor enclosure shall not exceed the rated value of the motor.

**Class II Division 2 / Zone 22** [Equipment Group III, Equipment Protection Level (EPL) Dc]

This area classification is one where the risk of exposure to ignitable concentrations of dust are not likely to occur under normal operating conditions and relies heavily on the housekeeping practices within the installation.

**Sine Wave Power Operation for Division 1 or 2 and Zone 1 or 2 and Zone 21 or 22 Hazardous Location.**

These motors are designed to operate at or below the maximum surface temperature (or T-code) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a Division 1 or 2 / Zone 1 or 2 and Zone 21 or 22 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperatures above nameplate value
3. Voltages above or below nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Voltage above or below nameplate value
7. Severity of duty cycle of operated time
8. More than 1000 meters above sea level
9. Motor reversing
10. Single phase operation of polyphase equipment
11. Variable Frequency Power Operation for Division 1 or 2 and Zone 1 or 2 and Zone 21 or 22 Hazardous Location.

**Variable Frequency Power Operation for Division 1 or 2 and Zone 1 or 2 and Zone 21 or 22 Hazardous Location (motors with maximum surface temperature listed on the nameplate).**

Only motors with nameplates marked for use on inverter (variable frequency) power, and labeled for specific hazardous areas may be used in those hazardous areas on inverter power. The motor is designed to operate at or below the maximum surface temperature (or T-code) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded.
If applied in a Division 1 or 2 / Zone 1 or 2 and Zone 21 or 22 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

1. Motor load exceeding service factor nameplate value
2. Ambient temperature above nameplate value
3. Voltage (at each operating frequency) above or below rated nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Operation outside of the nameplate speed / frequency range
7. Altitudes above 3300 feet / 1000 meters
8. Single phase operation of polyphase equipment
9. Any combination of the above nameplate values

**Thermal Limiting**

1. Motor load exceeding service factor nameplate value
2. Ambient temperature above nameplate value
3. Voltage (at each operating frequency) above or below rated nameplate value
4. Loss of proper ventilation
5. Operation outside of the nameplate speed / frequency range
6. Any combination of the above nameplate values

**Repair of Motors used in Hazardous Locations**

Repair of hazardous certified motors requires additional information, skill, and care. It is the customer's responsibility to select service shops with proper qualifications to repair hazardous location motors. Contact the manufacturer for additional repair details. Use only original manufacturer's parts.

**Repair of Explosion Proof or Flame Proof Motors Class I Division 1 and Zone 1**

In the North American market, recertification programs are offered by Underwriters Laboratories and Canadian Standards Association which allow authorized service shops to mark the rebuilt motors as certified. Use only Baldor replacement thermostats, if provided.

**Repair of Dust Ignition Proof Motors Class II Division 1 and 2, Zone 21 and 22**

Proper sealing is required. Do not modify the motor or add any additional opening. Use only original manufacturer's parts. Use only Baldor replacement thermostats, if provided.

**Repair of Class I Division 2 and Zone 2 Motors**

For Division 2 and Zone 2 motors, the normal and expected temperature of the motor is the temperature of the motor without any load. The motor may be used without any load as long as the temperature is maintained below any specified limits.
WARNING: UL and EX Listed motors must only be serviced by UL or EX Approved Authorized Baldor Service.

Section 3
Maintenance & Troubleshooting

- Maintenance & Troubleshooting

WARNING: UL and EX Listed motors must only be serviced by UL or EX Approved Authorized Baldor Service.

General Inspection

Inspect the motor at regular intervals, approximately every 500 hours of operation or every 3 months, whichever occurs first. Kept the motor clean and the ventilation openings clear. The following general inspection procedure should be performed:

1. Check that the motor is clean. Check that the interior and exterior of the motor is free of dirt, oil, grease, water, etc. Oily vapor, paper pulp, textile lint, etc. can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.

2. Perform a dwell test. A dwell test is used to detect voltage leakage and can occur because there is a decrease in insulation resistance. Perform a dwell test with mains power applied to measure the integrity of the winding insulation. Perform a dwell test in accordance with the manufacturer's recommendations.

3. Check all electrical connections to be sure they are tight.

Electrical Shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

Ball Bearing Motors

WELCOME TO THE BALDOR RELIANCE PRODUCT INFORMATION PACKET. ECP84404T-4 - 75HP, 1185 RPM, 3PH, 60HZ, 405T, A4072M, TEFC, F

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Maintenance & Troubleshooting

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Maintenance & Troubleshooting

WARNING: UL and EX Listed motors must only be serviced by UL or EX Approved Authorized Baldor Service.
Table 3-2  Relubrication Intervals *

<table>
<thead>
<tr>
<th>NEMA / (IEC) Frame Size</th>
<th>Rated Speed - RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10000</td>
</tr>
<tr>
<td></td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>3600</td>
</tr>
<tr>
<td></td>
<td>1800</td>
</tr>
<tr>
<td></td>
<td>1200</td>
</tr>
<tr>
<td></td>
<td>900</td>
</tr>
<tr>
<td>Up to 210 incl. (132)</td>
<td>2700 Hrs.</td>
</tr>
<tr>
<td></td>
<td>5500 Hrs.</td>
</tr>
<tr>
<td></td>
<td>12000 Hrs.</td>
</tr>
<tr>
<td></td>
<td>18000 Hrs.</td>
</tr>
<tr>
<td></td>
<td>22000 Hrs.</td>
</tr>
<tr>
<td>Over 210 to 280 incl. (180)</td>
<td>3600 Hrs.</td>
</tr>
<tr>
<td></td>
<td>9500 Hrs.</td>
</tr>
<tr>
<td></td>
<td>15000 Hrs.</td>
</tr>
<tr>
<td></td>
<td>18000 Hrs.</td>
</tr>
<tr>
<td>Over 280 to 360 incl. (225)</td>
<td>2200 Hrs.</td>
</tr>
<tr>
<td></td>
<td>7400 Hrs.</td>
</tr>
<tr>
<td></td>
<td>12000 Hrs.</td>
</tr>
<tr>
<td></td>
<td>15000 Hrs.</td>
</tr>
</tbody>
</table>

* Relubrication intervals are for ball bearings.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

Table 3-3  Service Conditions

<table>
<thead>
<tr>
<th>Severity of Service</th>
<th>Hours per day of Operation</th>
<th>Ambient Temperature °C</th>
<th>Atmospheric Contamination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>8</td>
<td>40</td>
<td>Clean, Little Corrosion</td>
</tr>
<tr>
<td></td>
<td>16 Plus</td>
<td>50</td>
<td>Moderate dirt, Corrosion</td>
</tr>
<tr>
<td></td>
<td>16 Plus</td>
<td>&gt;50</td>
<td>Extreme</td>
</tr>
</tbody>
</table>

For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

For severe high temperature grease, see note below. Dow Corning DC44 is recommended for bearing lubrication.

Table 3-4  Relubrication Interval Multiplier

<table>
<thead>
<tr>
<th>Severity of Service</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1.0</td>
</tr>
<tr>
<td>Severe</td>
<td>0.5</td>
</tr>
<tr>
<td>Extreme</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Low Temperature 3-2 Maintenance & Troubleshooting MN408

Some motor designs use different bearings on each motor end. This is normally indicated on the motor nameplate.

Appropriate amount of grease for each bearing size (not the same for both).

In this case, the critical bearing is indicated on the motor Drive endplate. For other applications, consult the motor manufacturer.

Refer to additional information contained in Tables 3-2, 3-3, 3-4, and 3-5.
### Table 3-5  Bearings Sizes and Types

<table>
<thead>
<tr>
<th>Frame Size NEMA (IEC)</th>
<th>Bearing Description</th>
<th>Weight of Grease to add *</th>
<th>Volume of grease to be added</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(These are the “Large” bearings (Shaft End) in each frame size)</td>
<td>oz (Grams)</td>
<td>in³</td>
</tr>
<tr>
<td>56 to 140 (90)</td>
<td>6203</td>
<td>0.08 (2.4)</td>
<td>0.15</td>
</tr>
<tr>
<td>140 (90)</td>
<td>6205</td>
<td>0.15 (3.9)</td>
<td>0.2</td>
</tr>
<tr>
<td>180 (100–112)</td>
<td>6206</td>
<td>0.19 (5.0)</td>
<td>0.3</td>
</tr>
<tr>
<td>210 (132)</td>
<td>6307</td>
<td>0.30 (8.4)</td>
<td>0.6</td>
</tr>
<tr>
<td>250 (160)</td>
<td>6309</td>
<td>0.47 (12.5)</td>
<td>0.7</td>
</tr>
<tr>
<td>280 (180)</td>
<td>6311</td>
<td>0.61 (17)</td>
<td>1.2</td>
</tr>
<tr>
<td>320 (200)</td>
<td>6312</td>
<td>0.76 (20.1)</td>
<td>1.2</td>
</tr>
<tr>
<td>360 (225)</td>
<td>6313</td>
<td>0.81 (23)</td>
<td>1.5</td>
</tr>
<tr>
<td>400 (250)</td>
<td>6316</td>
<td>1.25 (33)</td>
<td>2.0</td>
</tr>
<tr>
<td>440 (280)</td>
<td>6319</td>
<td>2.12 (60)</td>
<td>4.1</td>
</tr>
<tr>
<td>5000 to 5800 (315–450)</td>
<td>6328</td>
<td>4.70 (130)</td>
<td>9.2</td>
</tr>
<tr>
<td>5000 to 5800 (315–450)</td>
<td>NU328</td>
<td>4.70 (130)</td>
<td>9.2</td>
</tr>
<tr>
<td>360 to 449 (225–280)</td>
<td>NU319</td>
<td>2.12 (60)</td>
<td>4.1</td>
</tr>
</tbody>
</table>

**AC Induction Servo**

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Bearing</th>
<th>Weight of Grease to add *</th>
<th>Volume of grease to be added</th>
</tr>
</thead>
<tbody>
<tr>
<td>76 Frame 180 (112)</td>
<td>6207</td>
<td>0.22 (6.1)</td>
<td>0.44</td>
</tr>
<tr>
<td>77 Frame 210 (132)</td>
<td>6210</td>
<td>0.32 (9.0)</td>
<td>0.64</td>
</tr>
<tr>
<td>80 Frame 250 (160)</td>
<td>6213</td>
<td>0.49 (14.0)</td>
<td>0.99</td>
</tr>
</tbody>
</table>

* Weight in grams = .005 DB of grease to be added

Note: Not all bearing sizes are listed.
For intermediate bearing sizes, use the grease volume for the next larger size bearing.
Caution: To avoid damage to motor bearings, grease must be kept free of dirt. For an extremely dirty
environment, consult your Baldor distributor or an authorized Baldor Service Center for additional information.

Relubrication Procedure

1. Stop the motor, clean all grease fittings with a clean cloth.
2. Remove the grease outlet plug.
3. Add the recommended amount of grease to the bearing and bearing cavity. (Bearing should be about 1/3
full of grease and outboard bearing cavity should be about 1/2 full of grease.)
4. Operate the motor for 15 minutes with grease plug removed. This allows excess grease to purge.
5. Re-install grease outlet plug.

Without Grease Provisions

Note: Only a Baldor authorized and UL or CSA certified service center can disassemble a UL/CSA
listed explosion proof motor to maintain its UL/CSA listing.

1. Disassemble the motor.
2. Add the recommended amount of grease to the bearing and bearing cavity. (Bearing should be about 1/3
full of grease and outboard bearing cavity should be about 1/2 full of grease.)
3. Assemble the motor.

Sample Relubrication Determination

Assume - NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of
43°C and the atmosphere is moderately corrosive.

1. Table 3-2 shows 9500 hours for standard conditions.
2. Table 3-3 classifies severity of service as "Severe".
3. Table 3-5 shows that 1.2 in 3 or 3.9 teaspoon of grease is to be added.

Note: Smaller bearings in size category may require reduced amounts of grease.

Caution: Do not exceed motor load limit may cause premature bearing failure.
**Table 3-6 Troubleshooting Chart**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible Causes</th>
<th>Possible Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor will not start</td>
<td>Usually caused by line trouble, such as, single phasing at the starter.</td>
<td>Check source of power. Check overloads, fuses, controls, etc.</td>
</tr>
<tr>
<td>Excessive humming</td>
<td>High Voltage.</td>
<td>Check input line connections.</td>
</tr>
<tr>
<td>Eccentric air gap.</td>
<td></td>
<td>Have motor serviced at local Baldor Service Center.</td>
</tr>
<tr>
<td>Motor Over Heating</td>
<td>Overload. Compare actual amps (measured) with nameplate rating.</td>
<td>Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.</td>
</tr>
<tr>
<td>Single Phasing.</td>
<td>Check current at all phases (should be approximately equal) to isolate and correct the problem.</td>
<td></td>
</tr>
<tr>
<td>Improper ventilation.</td>
<td>Check external cooling fan to be sure air is moving properly across cooling fins.</td>
<td></td>
</tr>
<tr>
<td>Excessive dirt build-up on motor.</td>
<td>Clean motor.</td>
<td></td>
</tr>
<tr>
<td>Unbalanced voltage.</td>
<td>Check voltage at all phases (should be approximately equal) to isolate and correct the problem.</td>
<td></td>
</tr>
<tr>
<td>Rotor rubbing on stator.</td>
<td>Check air gap clearance and bearings.</td>
<td>Check air gap clearance and bearings.</td>
</tr>
<tr>
<td>Over voltage or under voltage.</td>
<td>Check input voltage at each phase to motor.</td>
<td></td>
</tr>
<tr>
<td>Open stator winding.</td>
<td>Check stator resistance at all three phases for balance.</td>
<td></td>
</tr>
<tr>
<td>Grounded winding.</td>
<td>Perform dielectric test and repair as required.</td>
<td></td>
</tr>
<tr>
<td>Improper connections.</td>
<td>Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.</td>
<td></td>
</tr>
<tr>
<td><strong>Bearing Over Heating</strong></td>
<td>Misalignment.</td>
<td>Check and align motor and driven equipment.</td>
</tr>
<tr>
<td>Excessive belt tension.</td>
<td>Reduce belt tension to proper point for load.</td>
<td></td>
</tr>
<tr>
<td>Excessive end thrust.</td>
<td>Reduce the end thrust from driven machine.</td>
<td></td>
</tr>
<tr>
<td>Excessive grease in bearing.</td>
<td>Remove grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Insufficient grease in bearing.</td>
<td>Add grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Dirt in bearing.</td>
<td>Clean bearing cavity and bearing seal(s) approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Insufficient grease in bearing.</td>
<td>Add grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Excessive grease in bearing.</td>
<td>Remove grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Excessive end thrust.</td>
<td>Reduce the end thrust from driven machine.</td>
<td></td>
</tr>
<tr>
<td>Rotor out of balance.</td>
<td>Have rotor balanced at your local Baldor Service Center.</td>
<td></td>
</tr>
<tr>
<td>Resonance.</td>
<td>Tune system or contact your local Baldor Service Center for assistance.</td>
<td></td>
</tr>
<tr>
<td>Misalignment.</td>
<td>Check and align motor and driven equipment.</td>
<td></td>
</tr>
<tr>
<td>Rubbing between rotating parts and stator.</td>
<td>Isolate and eliminate cause of rubbing.</td>
<td></td>
</tr>
<tr>
<td>Rotor out of balance.</td>
<td>Have rotor balanced at your local Baldor Service Center.</td>
<td></td>
</tr>
<tr>
<td>Resonance.</td>
<td>Tune system or contact your local Baldor Service Center for assistance.</td>
<td></td>
</tr>
<tr>
<td>Motor Over Heating</td>
<td>misalignment.</td>
<td>Check and align motor and driven equipment.</td>
</tr>
<tr>
<td>Excessive belt tension.</td>
<td>Reduce belt tension to proper point for load.</td>
<td></td>
</tr>
<tr>
<td>Excessive end thrust.</td>
<td>Reduce the end thrust from driven machine.</td>
<td></td>
</tr>
<tr>
<td>Excessive grease in bearing.</td>
<td>Remove grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Insufficient grease in bearing.</td>
<td>Add grease until cavity is approximately 1/4 filled.</td>
<td></td>
</tr>
<tr>
<td>Dirt in bearing.</td>
<td>Clean bearing cavity and bearing seal(s) approximately 1/4 filled.</td>
<td></td>
</tr>
</tbody>
</table>


Suggested bearing and winding RTD setting guidelines for Non-Hazardous Locations ONLY

Most large frame AC Baldor motors with a 1.15 service factor are designed to operate below a Class B (80°C) temperature rise at rated load and are built with a Class H winding insulation system. Based on this low temperature rise, RTDs (Resistance Temperature Detectors) settings for Class B rise should be used as a starting point. Some motors with a 1.0 service factor have Class F temperature rise.

The following tables show the suggested alarm and trip settings for RTDs. Proper bearing and winding RTD alarm and trip settings should be selected based on these tables unless otherwise specified for specific applications.

If the driven load is found to operate well below the initial temperature settings under normal conditions, the alarm and trip settings may be reduced so that an abnormal machine load will be identified.

The temperature limits are based on the installation of the winding RTDs imbedded in the winding as specified by NEMA. Bearing RTDs should be installed so they are in contact with the outer race on ball or roller bearings or in direct contact with the sleeve bearing shell.

### Winding RTDs

<table>
<thead>
<tr>
<th>Temperature Limit In °C (40°C Maximum Ambient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
</tr>
<tr>
<td>Rated Load</td>
</tr>
<tr>
<td>Rated Load to 1.15 S.F.</td>
</tr>
</tbody>
</table>

#### Note:
Winding RTDs are factory production installed, not from ModExpress. When Class H temperatures are used, consider bearing temperatures and relubrication requirements. Greases that may be substituted that are compatible with Polyrex EM (but considered as standard lubricants) include the following:
- Texaco Polystar
- Rykon Premium #2
- Chevron SRI #2
- Mobilith SHC
- 100
- Pennzoil Pennzlube EM
- Chevron Black Pearl
- Darmex 707
- PetroCanada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation. Contact Baldor application engineering for special lubricants or further clarifications.

### Bearing RTDs

<table>
<thead>
<tr>
<th>Temperature Limit In °C (40°C Maximum Ambient)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm</td>
</tr>
<tr>
<td>Standard</td>
</tr>
<tr>
<td>High Temperature</td>
</tr>
</tbody>
</table>

#### Note:
Bearing temperature limits are for standard design motors operating at Class B temperature rise.

- Oil or Grease Anti-Friction Sleeve

- Standard* 95 100 85 95
- High Temperature** 110 115 105 110

#### Note:
* Bearing temperature limits are for standard design motors operating at Class B temperature rise.
** High temperature lubricants include some special synthetic oils and greases.

Greases that may be substituted that are compatible with Polyrex EM (but considered as standard lubricants) include the following:
- Texaco Polystar
- Rykon Premium #2
- Chevron SRI #2
- Mobilith SHC
- 100
- Pennzoil Pennzlube EM
- Chevron Black Pearl
- Darmex 707
- Darmex 711
- PetroCanada Peerless LLG

See the motor nameplate for replacement grease or oil recommendation. Contact Baldor application engineering for special lubricants or further clarifications.
WARNING: Do not touch electrical connections before applying power. Electric shock can cause serious or fatal injury.

AC & DC Motor Installation & Maintenance

MOTOR ENCLOSURE

The motor is marked to NEMA MG-1, Part 7 standard. It is essential to ensure that the motor is properly oriented and seated. The motor should rotate freely without binding. If the motor has been in storage for an extensive period, it should be rechecked for proper operation. This motor is balanced to NEMA MG1, Part 7 standard. The motor should be inspected and run smoothly. If not, stop the motor immediately and determine the cause. Possible causes are: low voltage at the motor, motor connections are not correct or the load is too heavy. Check the motor current after a few minutes of operation and compare the readings with the nameplate rating. If the motor is overheating, it is possible that the motor cannot cope with the load. If the motor is not overheating, it is possible that the motor is not aligned properly. In this case, the motor should be realigned.

GROUNDING

Connect the motor as shown in the connection diagrams. If you have any doubts about the grounding of the motor, consult your local Baldor representative.

VIBRATION

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**WARNING:** Guards must be installed for rotating parts such as couplings, pulleys, external fans, and unused shaft extensions, should be permanently guarded to prevent accidental contact by personnel. Accidental contact with any moving parts of the motor or drive may result in serious or fatal injury. Injury or death may result from contact with any moving parts of the motor or drive.

**MOUNTING**

Mount the motor on a foundation sufficiently rigid to prevent excessive vibration. Grease lubricated ball bearing motors should be relubricated. Lubrication is also recommended at these intervals.

**LUBRICATION**

Lubrication Information

- New motors that have been stored for a year or more should be relubricated.
- Lubricant inlet and outlet plugs must be removed before operation.
- If the motor has been stored for a year or more, it should be relubricated.
- Lubrication is also recommended at these intervals.
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### Table 1  Service Conditions

<table>
<thead>
<tr>
<th>Severity of Service</th>
<th>Ambient Temperature</th>
<th>Atmospheric Contamination</th>
<th>Type of Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>40°C (104°F)</td>
<td>Clean, Little Corrosion</td>
<td>Deep Groove Ball Bearing</td>
</tr>
<tr>
<td>Severe</td>
<td>50°C (122°F)</td>
<td>Moderate dirt, Corrosion</td>
<td>Deep Groove Ball Bearing</td>
</tr>
<tr>
<td>Extreme</td>
<td>&gt;50°C (122°F)</td>
<td>Severe dirt, Abrasive dust, Corrosion</td>
<td>Deep Groove Ball Bearing</td>
</tr>
</tbody>
</table>

* Special high temperature grease is recommended. ** Special low temperature grease is recommended.

---

### Table 2  Lubrication Frequency (Ball Bearings)

<table>
<thead>
<tr>
<th>NEMA / (IEC) Frame Size</th>
<th>Rated Speed ‐ RPM</th>
<th>Up to 210 incl. (132)</th>
<th>**</th>
<th>2700 Hrs.</th>
<th>5500 Hrs.</th>
<th>12000 Hrs.</th>
<th>18000 Hrs.</th>
<th>22000 Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 280 to 360 incl. (225)</td>
<td>**</td>
<td>3600 Hrs.</td>
<td>9500 Hrs.</td>
<td>15000 Hrs.</td>
<td>18000 Hrs.</td>
<td>22000 Hrs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 360 to 500 incl. (300)</td>
<td>**</td>
<td>2200 Hrs.</td>
<td>3500 Hrs.</td>
<td>7400 Hrs.</td>
<td>10500 Hrs.</td>
<td>15000 Hrs.</td>
<td>18000 Hrs.</td>
<td>22000 Hrs.</td>
</tr>
</tbody>
</table>

* Relubrication intervals are for ball bearings. For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

** For motors operating at speeds greater than 3600 RPM, contact Baldor for relubrication recommendations.

---

### Table 3  Lubrication Interval Multiplier

<table>
<thead>
<tr>
<th>Severity of Service</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1.0</td>
</tr>
<tr>
<td>Severe</td>
<td>0.5</td>
</tr>
<tr>
<td>Extreme</td>
<td>0.1</td>
</tr>
</tbody>
</table>

---

### Table 4  Amount of Grease to Add

<table>
<thead>
<tr>
<th>Frame Size (NEMA / (IEC))</th>
<th>Bearing Description (Largest bearing in each frame size)</th>
<th>Bearing OD</th>
<th>D mm</th>
<th>Width</th>
<th>B mm</th>
<th>Weight of grease to add</th>
<th>Volume of grease to add</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 210 incl. (132)</td>
<td>6307</td>
<td>80</td>
<td>21</td>
<td>0.30 (8.4)</td>
<td>0.6 (2.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 210 to 280 incl. (180)</td>
<td>6311</td>
<td>120</td>
<td>29</td>
<td>0.61 (17.4)</td>
<td>1.2 (4.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 280 to 360 incl. (225)</td>
<td>6313</td>
<td>140</td>
<td>33</td>
<td>0.81 (23.1)</td>
<td>1.5 (5.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Over 360 to 500 incl. (300)</td>
<td>NU322</td>
<td>240</td>
<td>50</td>
<td>2.12 (60.0)</td>
<td>4.1 (13.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Weight in grams = 0.005 DB
Typical IEC vs. NEMA Lead Marking

Single Phase Non-Reversible
Refer to the connection diagram provided on the Baldor motor.

Main Winding
U1(T1)  U2(T4)

Auxiliary Winding
Z1(T8)  Z2(T5)

Single Phase Reversible

Main Winding
U1(T1)  U2(T4)

Auxiliary Winding
Z1(T8)  Z2(T5)

Dual Voltage Reversible

Main Winding
U1(T1)  U2(T2)

Auxiliary Winding
Z1(T8)  Z2(T5)

U3(T3)  U4(T4)

Three Phase
For single winding 3 phase motors, lead markings can be directly translated between IEC and NEMA designations.

For these motors, the lead markings are:

U1=T1  U2=T4  U3=T7  U4=T10
V1=T2  V2=T5  V3=T8  V4=T11
W1=T3  W2=T6  W3=T9  W4=T12

Refer to the connection diagram provided on the Baldor motor.

Some examples are as follows:

Three Leads

WYE Connection
U(T1)  W(T3)  V(T2)

DELTA Connection
U(T1)  Line 1  V(T2)  Line 2  W(T3)  Line 3

Six Leads

DELTA-WYE Connection
U1(T1)  V2(T5)  V1(T2)  W1(T3)  U2(T4)  V2(T5)  W2(T6)  V3(T9)  W3(T9)  V4(T12)

WYE-DELTA Connection
W1(T3)  U2(T4)  W2(T6)  V3(T9)  W3(T9)  V4(T12)  U1(T1)  V1(T2)  W1(T3)  U2(T4)

Low Volts/Run High Volts/Start

DC Motors
Lead markings can be translated between IEC and NEMA designations as follows:

Armature
Series Field
Shunt Field
A1, A2
S2, S2
F1, F2

NEMA
A1, A2
D1, D2
E1, E2

IEC
A1, A2

Refer to the connection diagram provided on the Baldor motor.

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