

High Performance NEMA Variable-Speed AC Motors

**Bulletin 1329R High Performance,
.33 - 450 HP**



Product Overview

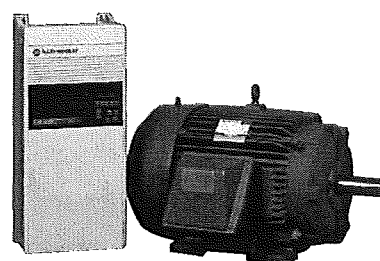
The **Bulletin 1329R** high performance NEMA frame AC motors are specifically suited for applications requiring full torque to zero speed and precise speed regulation. These motors meet or exceed the insulation requirements described in NEMA MG1-1998, Part 31, Section IV. Many modifications, including encoders, are available to help meet your application requirements.

Product Highlights

- Cast iron frame and end brackets
- NEMA Design A
- Class F insulation
- Constant torque from zero to base speed
- 1.5:1 constant HP range
- Available in TENV and TEFC enclosures
- Range of available feedback devices
- 3 normally closed thermostats included
- Regreaseable bearings

Application Highlights

- Paper Machines
- Machine Tools
- Paper Converting
- Metals Process Lines

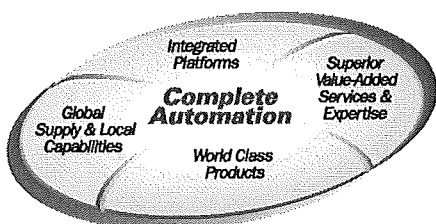


Bulletin 1329R high performance AC motors provide wide speed range operation in NEMA frame sizes.



Bringing Together Leading Brands in Industrial Automation

Ratings	<ul style="list-style-type: none"> • 230 and 460 VAC • .33 through 450 HP • Full torque zero to base speed • 1.0 service factor 	<ul style="list-style-type: none"> • 1200 and 1800 RPM base speeds • 40° C ambient • Altitude of 3300 feet above sea level
Enclosures	• Available in totally enclosed non-ventilated and fan-cooled configurations	
Options	<ul style="list-style-type: none"> • Shielded bearings • Low temperature grease • C-Face with or without feet • Vertical or horizontal mounting 	<ul style="list-style-type: none"> • Oversized conduit box • Lead lugs • Space heaters • Variety of hollow shaft encoders available
Standards	• CE	• CSA Certified



A Complete Automation™ Solution for Variable-Speed Performance

You can depend on Allen-Bradley products and services as your single source for a Complete Automation solution. These products are designed to deliver integrated performance and are backed by comprehensive support services. This total capability from a single source offers you savings and flexibility to ensure optimum value from your investment.



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Wherever you need us, Rockwell Automation brings together leading brands in industrial automation including Allen-Bradley controls, Reliance Electric power transmission products, Dodge mechanical power transmission components, and Rockwell Software. Rockwell Automation's unique, flexible approach to helping customers achieve a competitive advantage is supported by thousands of authorized partners, distributors and system integrators around the world.

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General Purpose Variable-Speed Large AC Motors

**Bulletin 1329R AC Motors,
500 to 1250 HP**



Product Overview

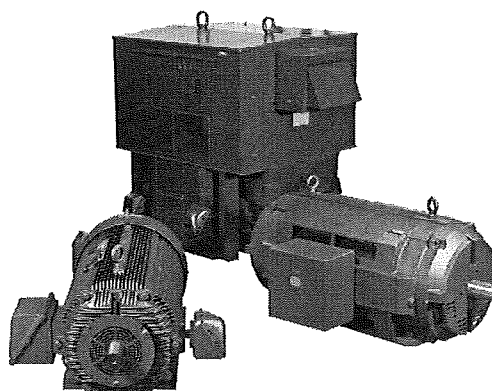
The **Bulletin 1329R** Large AC motor products are available from 500 to 1250 horsepower, 460 to 4160 volts and have a wide range of options available. Industrial enclosures that are Open Drip-Proof, Weather Protected II, Totally Enclosed Fan-Cooled, and Totally Enclosed Blower-Cooled are available for a variety of industrial applications.

Product Highlights

- Constructed for use on variable-speed applications
- NEMA Design B
- Class F insulation
- Solid cure VPI insulation process
- Available from 460 to 4160 Volts
- Includes two insulated bearings and shaft grounding brush as standard
- Cast iron frame and end brackets
- Oversized conduit box
- Epoxy paint
- Meets NEMA MG1 specifications

Application Highlights

- Fans and Pumps
- Material Handling
- Compressors

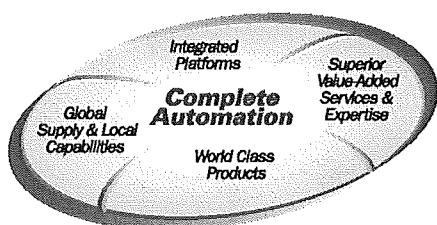


Bulletin 1329R Large AC motors are available through 1250 HP in multiple enclosure configurations to meet a wide range of industrial applications.



Bringing Together Leading Brands in Industrial Automation

Ratings	<ul style="list-style-type: none"> • Available Voltages: 460, 575, 2300 and 4160 VAC • 500 through 1250 HP • Speed ranges: 10:1 VT, 2:1 CT and 1000:1 CT 	<ul style="list-style-type: none"> • 1.2: 1 constant HP range • 1200, 1800 or 3600 RPM base speeds • 40° C ambient • Altitude of 3300 feet above sea level
Enclosures	<ul style="list-style-type: none"> • Range of industrial enclosed available: 	<ul style="list-style-type: none"> • Open drip-proof, weather protected II, totally enclosed fan-cooled, and totally enclosed, blower-cooled
Options	<ul style="list-style-type: none"> • EZLINK™ Plus motor monitoring system • Filters on WP-II motors • Encoders • Air pressure switch on WP-II 	<ul style="list-style-type: none"> • Winding and bearing RTD's • Space heaters • Division II Class 1 group C & D classification
Standards	<ul style="list-style-type: none"> • NEMA MG1 	<ul style="list-style-type: none"> • API 541



A Complete Automation™ Solution for Variable-Speed Performance

You can depend on Allen-Bradley products and services as your single source for a Complete Automation solution. These products are designed to deliver integrated performance and are backed by comprehensive support services. This total capability from a single source offers you savings and flexibility to ensure optimum value from your investment.

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Washdown Duty Variable-Speed AC Motors

Bulletin 1329R, 0.5 to 2 HP



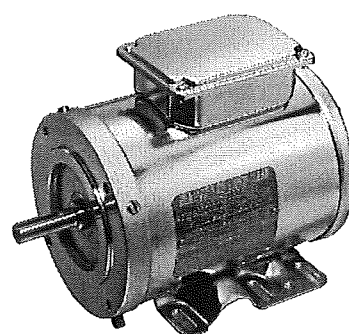
Two Choices to Meet Your Washdown Duty Needs

Two motor styles are provided as solutions to help meet your needs for in-place cleaning procedures with steam, high-pressure water, detergents or sanitizing foams. The **Bulletin 1329R Super Clean™** motors, which are stainless steel, or the **Bulletin 1329R Easy Clean™** motors, which are epoxy-coated, are available for corrosive washdown environments. Allen-Bradley Washdown Duty AC variable-speed motors offer solutions you can trust.

Specifications

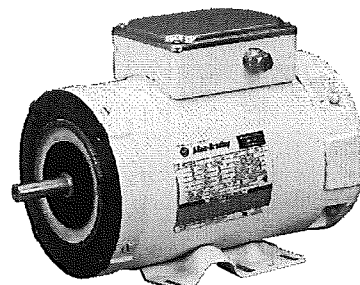
Horsepower	0.5 to 2 HP
Base Speed	3600, 1800, 1200 RPM
Enclosure	Totally Enclosed Fan Cooled or Totally Enclosed Non-vent
Frame	56 and 140T
Mounting	Foot mounted, C-face with feet and C-face without feet
NEMA Design	B
Power Supply	Three-phase, 60 Hz, 230/460 V
Insulation System	Inverter Grade Class F
Insulation System Rating	Minimum 1600 V CIV at rated operating temperature
Duty	Continuous
Ambient	40°C
Service Factor	1.15 SF on Sine Wave, 1.0 SF on Inverter
Speed Range	10:1 CT & VT for TENV and 4:1 CT & VT for TEFC
Availability	Available from stock for Quick Ship Delivery

Note: Installation in washdown environments requires proper installation of motor drains and in some cases may require the addition of motor space heaters.



Bulletin 1329R Super Clean™ Motors

This stainless steel motor design eliminates worries about rust or paint contamination. It's designed to provide exceptional performance for most washdown duty applications. Available 0.5 to 2 HP.



Bulletin 1329R Easy Clean™ Plus Motors

For general purpose washdown applications, this U.S.D.A. accepted, epoxy-coated and energy-efficient motor provides exceptional service life and value.



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Construction Features

Feature	Easy-Clean Plus	Super-Clean
Frame	Full seam weld. Heavy gauge steel. Frame-to-end shield fit extra long and sealed with Permatex®.	Paint-free, 300 series stainless steel, electro-polished.
End Shields	Cast iron with epoxy finish. Provisions for "T" drain every 90 degrees.	Cast stainless CF-8M (equivalent to 316 stainless steel) with provisions for "T" drains every 90 degrees.
Base	Heavy duty steel welded to frame.	Heavy duty, stamped, 300 series stainless steel welded to frame.
Rotor	Cast aluminum with integrally cast fins. Keyless design, heat shrunk to shaft, turned for proper air gap, and dynamically balanced. Coated with epoxy polyamide primer.	
Stator	Specially treated class "F" and "H" wire used with full slot liner material. Laced coil heads. Phase Insulation. Non-hygroscopic polyester resin.	
Hardware	Plated, hex headed.	300 series stainless steel, hex headed with neoprene washers.
Bearings	Double sealed, permanently lubricated with moisture-resistant grease.	
Conduit Box	Oversized, top mounted, F1/F2 conduit connection, grounding lug provided. Conduit box and cover are gasketed. Stainless steel conduit box cover eliminates paint.	Oversized, top mounted, 300 series stainless steel. F1 conduit connection, grounding lug provided. Conduit box and cover are gasketed.
Shaft	High strength, 303 series stainless steel with lip seal and V-ring slinger.	High strength, 316 series passivated stainless steel with Teflon® coated, stainless steel, double lip Viton® seal.
Nameplate	300 series stainless steel.	Paint-free, 300 series stainless steel.
Connection Diagram	Permanently attached to motor.	
Fan	Antistatic, bi-directional, corrosion resistant polypropylene. Steel fan shroud coated with U.S.D.A. accepted gloss white epoxy paint.	Antistatic, bi-directional, corrosion resistant polypropylene. Steel fan shroud is 300 series stainless steel.
Finish	All exterior surfaces painted with U.S.D.A. accepted gloss white epoxy.	All exterior surfaces are paint-free. All stainless steel.
Leads	Permanently marked. "Easy-Clean Plus" neoprene gasket between conduit box and frame.	Permanently marked. "Super-Clean" neoprene lead gasket.
Efficiency Design	Energy Efficient	
Certification	UL® component recognition and CSA approved.	

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Installation, Operation and Maintenance Manual

Standard Industrial AC Induction Motors

- 180-449 Frames (NEMA)
- 112-280 Frames (IEC)



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ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this motor. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

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Cross Sectional and Parts Identification Drawing

Receiving and Handling

Acceptance

Thoroughly inspect this equipment before accepting shipment from the transportation company. If any of the goods called for in the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight or express agent at once and request him to make an inspection. We are willing to assist you in collecting claims for loss or damage in shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material. Claims for loss or damage in shipment must not be deducted from the invoice, nor should payment of the invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery.

If considerable damage has been incurred and the situation is urgent, contact the nearest Allen-Bradley Sales Office for assistance. Please keep a written record of all such communications.

Storage Conditions - Short Term

Following are requirements for storage:

1. Motors must be kept in their original containers (or with equivalent protection). In addition, they must be stored in a warehouse free from extremes in temperature, humidity and corrosive atmosphere.
2. If unusual vibrations exist at the storage location, the motor should be protected with isolation pads.
3. All breathers and drains are to be operable while in storage and/or the moisture drain plugs should be removed. The motors must be stored so the drain is at the lowest point.

Storage Preparation

Improper storage of electric machines will result in seriously reduced reliability of that equipment.

For example, the following items can occur to an electric motor that does not experience regular usage while exposed to normally humid atmospheric conditions:

- Bearings may rust.
- Rust particles from surrounding surfaces may contaminate the bearings.
- The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failing to ground.

The following preparations should be followed:

1. Minimize condensation in and around the motor by use of desiccants or other humidity control methods.
2. Motor space heaters, when specified, must be energized when there is a possibility that the ambient storage conditions will reach the dew point. Space heaters are an option.
3. Coat all external machined surfaces with a material to prevent corrosion. An acceptable product for this purpose is Exxon Rust Ban #392 (or equivalent).
4. Measure and record the electrical resistance of the winding insulation with a megger or insulation resistance meter. Minimum accepted megohm level is the *insulation kv rating + 1 megohm*. If levels fall below this value, contact your Allen-Bradley Sales Office. The recorded data will be needed when the motor is removed from storage.
5. 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. Before the motor is moved, the brace must be reinstalled to hold the shaft firmly in place against the bearing.
6. When placing the motor into extended storage (greater than 3 months), the motors with regreasable bearings must be greased per [Table A](#). The motor shaft must then be rotated a minimum of 15 times after greasing. Non-regreasable motors with a "Do Not Lubricate" nameplate should also be rotated 15 times to redistribute grease within the bearing.
7. Before lubricating the motor, remove the grease drain plug (opposite the grease fitting) on the bottom of each end bracket. Replace the plug after greasing.

Table A

Lubrication Volume (Storage)

NEMA (IEC) Frame Size	Volume in Cubic Inches (cm ³)
182-215 (112-132)	0.5 (8)
254-286 (160-180)	1.0 (16)
324-365 (200-225)	1.5 (24)
404-449 (250-280)	2.5 (40)

8. When the motor is placed into extended storage, regreasable bearings must be greased (see [Table A](#)). Motor shafts are to be rotated 15 revolutions manually every 3 months and additional grease added every nine months to each bearing (see [Table A](#)). Bearings must be greased at the time of removal from storage. Shafts on non-regreasable motors should be rotated 15 revolutions every 3 months.
9. All breather drains should be fully operable while in storage. The motors must be stored so the drain is at the lowest point. All breathers and automatic "T" drains must be operable to allow breathing at points other than through the bearing fits.

10. Space heaters, when specified, are to be connected and operable while in storage.
11. Windings must be meggered at the time equipment is put in storage (refer to step 4 on page 4). When the motor is removed from storage, the insulation resistance must not have dropped more than 50% from the initial reading. Any drop below this point necessitates electrical or mechanical drying.
12. When motors are not stored in the original containers, but are removed and mounted on other pieces of machinery, the mounting must be such that the drains/breathers and space heaters are fully operable. In this respect, the drains must be kept at the lowest point in the motor so that all condensation can automatically drain out.

Storage for Extended Periods (greater than 18 months)

All of the preceding requirements described in this document apply, with the following additional requirements.

1. Motor must be crated in a box similar to Export Boxing, but the "shell" (sides and top of box) will be lag-bolted to the wooden base (not nailed). This design will allow the box to be opened and closed many times without destroying the "shell."
2. The motor will be sealed in an airtight vapor barrier bag with desiccant inside. This airtight bag will give added protection during shipment of motor to the permanent storage area.
3. After the first "inspection" (for megger reading, turning the shaft, etc.) it is recommended that the vapor bag be re-sealed with masking tape (or similar method). New desiccant should also be added inside the bag before closing. Once closed, place the shell over the motor and replace the lap bolts.
4. If a "zipper" type of bag is used (instead of a "heat-sealed" bag), then close the bag with the zipper (instead of taping).
5. New desiccant must be added inside the bag after each periodic inspection.
6. Minimize the accumulation of condensed water in and around the machine.

Unpacking

After unpacking and inspecting, turn the motor shaft by hand to assure that there are no obstructions to free rotation.

Equipment which has been in storage for some time should be tested and relubricated (regreasable type) prior to being put into service. Refer to "Test General Condition" and "Lubrication" for procedure to be performed after extended storage.

Equipment with roller bearings is shipped with a shaft block. After removing the shaft block, be sure to replace any bolts that are required in service and that were used to hold the shaft block in place during shipment.

Installation

Inspection

After the motor is unpacked, examine the nameplate data to see that it agrees with the power circuit to which it is to be connected. The motor will operate with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data. Performance within these voltage and frequency variations will not necessarily be in accordance with the standards established for operation at rated voltage and frequency.

Location

The motor should be installed in a location compatible with the motor enclosure and specific ambient.

To allow adequate air flow, the following clearances must be maintained between the motor and any obstruction:

TEFC (IC0141) Enclosures

Fan Cover Air Intake	180-210T Frame	25.4 mm (1.00 in.)
	250-449T Frame	101.6 mm (4.00 in.)
	IEC 112 - 132	25.0 mm (0.98 in.)
	IEC 160 - 280	100.0 mm (3.94)

Exhaust Envelope equal to the "P" dimension on the motor dimension sheet

Protected Enclosures

Bracket Intake Same as TEFC

Frame Exhaust Exhaust out the sides-envelope a minimum of the "P" dimension plus 50.0 mm (1.97 in.). Exhaust out the end-same as intake.

Table B

General Effect of Voltage & Frequency Variation on Induction-motor Characteristics

Variation	Starting & Maximum Running Torque	Sync Speed	Slip %	Full Load Speed	Efficiency			Power Factor/COS			Full Load Current	Starting Current	Temperature Rise (full load)	Maximum Overload Capacity	Magnetic Noise (no-load in particular)
					Full-Load	3/4 Load	1/2 Load	Full Load	3/4 Load	1/2 Load					
Voltage Variation:															
120% voltage	Increase 44%	No change	Decrease 30%	Increase 1.5%	6-0% Decrease (1-75 HP) 0-3% Increase (100-200 HP)	Decrease 1/2-2 points	Decrease 7-20 points	Decrease 5-15 points	Decrease 10-30 points	Decrease 15-40 points	Increase 12%	Increase 20%	Increase 5-6 degrees C. (1-75 HP) Decrease 3-4 degrees C. (100-200 HP)	Increase 44%	Noticeable increase
110% voltage	Increase 21%	No change	Decrease 17%	Increase 1%	Slight decrease	Practically no change	Decrease 1-2 points	Decrease 5-10 points	Decrease 5 points	Decrease 5-6 points	Increase 2-4%	Increase 10-12%	Increase 3-4 degrees C.	Increase 21%	Increase slightly
Functions of Voltage	(voltage) ²	Constant	$\frac{1}{(\text{voltage})^2}$	(sync speed slip)								voltage		(voltage) ²	
90% Voltage	Decrease 19%	No change	Increase 23%	Decrease 1-1/2%	Decrease 2 points	Practically no change	Increase 1-2 points	Increase 5 points	Increase 2-3 points	Increase 4-5 points	Increase 11%	Decrease 10-12%	Increase 6-7 degrees C.	Decrease 19%	Slight decrease
Frequency Variation:															
105% frequency	Decrease 10%	Increase 5%	Practically no change	Increase 5%	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase	Slight decrease	Decrease 5-6%	Slight decrease	Slight decrease	Slight decrease
Function of frequency	$\frac{1}{(\text{frequency})^2}$	Frequency		(sync speed slip)								$\frac{1}{\text{frequency}}$			
95% frequency	Increase 11%	Decrease 5%	Practically no change	Decrease 5%	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight increase	Increase 5-6%	Increase slightly	Increase slightly	Increase slightly
1% phase unbalance	Slight decrease	Slight decrease		Slight decrease	2% decrease			5-6% decrease			1-1/2% increase	Slight decrease	2% increase		
2% phase unbalance	Slight decrease	Slight decrease		Slight decrease	8% decrease			7% decrease			3% increase	Slight decrease	8% increase		

NOTE: This table shows general effects, which will vary somewhat for specific ratings.

Lifting Means



ATTENTION: When lifting means are provided for handling the motor, it should not be used to lift the motor plus additional equipment such as gears, pumps, compressors or other driven equipment. Failure to observe this precaution could result in bodily injury.

In the case of assemblies on a common base, any lifting means provided on the motor or generator should not be used to lift the assembly and base. The assembly should be lifted by a sling around the base or by other lifting means provided on the base. In all cases, care should be taken to assure lifting in the direction intended in the design of the lifting means. Precautions should be taken to prevent hazardous overloads due to deceleration, acceleration or shock forces.

Mounting

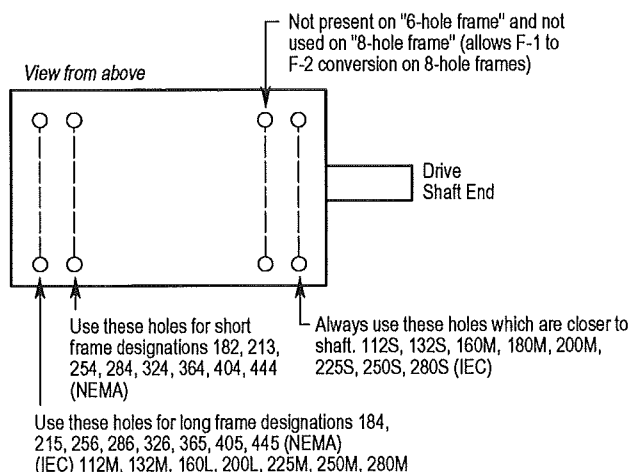
Mount the motor on a foundation sufficiently rigid to prevent excessive vibration. Roller bearing and ball-bearing motors may be mounted with the shaft at any angle. Roller bearing motors are not suitable for coupled duty applications. After carefully aligning the motor with the driven unit, bolt securely in place.

When motors, which are normally mounted with the shaft in a horizontal position, are mounted vertically, it may be necessary to provide additional guards to prevent foreign objects from falling into the motor openings and striking rotating parts. Such guards may be obtained at the time of purchase or from a local service repair center.

Explosion proof motors are shipped from the factory with the conduit box mounted. If the conduit box is removed or rotated, a minimum of five (5) full threads of engagement on the motor pipe nipple must be maintained for explosion proof integrity of the conduit box.

Some motors have standardized frames containing 6 or 8 mounting holes. 6 hole frames are not suitable for field reversal of mounting from F-1 to F-2, etc. Figure 1 indicates the proper mounting holes to use.

Figure 1
Mounting of 6 & 8 Hole Motor Frames



Drive

The pulley, sprocket, or gear used in the drive should be located on the shaft as close to the shaft shoulder as possible. Heat to install. Driving a unit on the shaft will damage the bearings.

Belt Drive – Align the pulleys so that the belt will run true. Tighten the belt just enough to prevent slippage, any tighter will cause premature bearing failure. If possible, the lower side of the belt should be the driving side.

Chain Drive – Mount the sprocket on the shaft as close to the bracket as possible. Align the sprockets so that the chain will run true. Avoid excessive chain tension.

Gear Drive and Direct Connection – Accurate alignment is essential. Secure the motor and driven unit rigidly to the base.

Rotating Parts



ATTENTION: Rotating parts such as couplings, pulleys, external fans and unused shaft extensions must be permanently guarded against accidental contact with hands or clothing. This is particularly important where the parts have surface irregularities such as keys, keyways or set screws. Failure to observe this precaution could result in personal injury.

Some Satisfactory Methods Of Guarding Are:

- Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
- Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding in normal service.



ATTENTION: The user is responsible for conforming with the National Electrical code and other applicable local codes. Wiring practices, grounding disconnects and overcurrent protection are of particular importance. Failure to observe these precautions could result in personal injury or loss of life.

Wiring



ATTENTION: The following steps require rotating parts and/or electrical circuits to be exposed. Stay clear if unit must be running or disconnect and lockout power source if contact must be made.

Connect the motor to the power supply according to the diagram on the motor nameplate. For most 230/460 volt motors, nine leads are brought out from the stator windings so that the motor may be connected for either 230 or 460 volts.

Important: When motors are provided with thermal protection (typically thermostats), it is important to properly connect and apply the devices. This will ensure that the motor is properly protected from being operated if thermal limits are reached and/or exceeded. The control system must be configured to reduce the motor load and/or shut down the motor control system to allow the motor to cool to a level within acceptable operating ranges. If the motor is operated with the thermal protective devices tripped (indicating an over temperature condition), the motor insulation could be damaged and complete failure of the motor insulation is possible. In the event of motor failure due to an over temperature condition, Rockwell Automation requires that motor thermal protective devices (when supplied) be adequately monitored and incorporated into the motor control system to maintain warranty. Failure on the part of the individual installing this equipment to take these steps will result in the factory warranty being voided.

Grounding

In the USA consult the *National Electrical Code*, Article 430 for information on grounding of motors, Article 445 for grounding of 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 other 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 making ground connections. When motors with bonded cushion rings are used in multimotor installations employing group fusing or group protection, the bonding of the cushion ring should be checked to determine that it is adequate for the rating of the branch circuit overcurrent protective device being used.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical parts of other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security.

The user must select a motor starter and overcurrent 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.



ATTENTION: When careful consideration of the hazards involved in a particular application indicate the machine frames should not be grounded or when unusual operating conditions dictate that a grounded frame cannot be used, the installer should make sure the machine is permanently and effectively insulated from ground. In those installations where the machine frame is insulated from ground, it is recommended that appropriate warning labels or signs be placed on or in the area of the equipment by the installer. Failure to observe these precautions could result in severe bodily injury or loss of life.

Starting



ATTENTION: Before starting the motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off. Failure to observe this precaution could result in bodily injury.



ATTENTION: Check direction of motor rotation before coupling motor to load. Failure to observe this precaution could result in damage to or destruction of the equipment.

Before starting the motor, check the following items:

- The rotor should turn freely when disconnected from the load.
- Driven machine should be unloaded when first starting the motor.

The motor should run smoothly with little noise. If the motor fails to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shutdown immediately and investigate for trouble.

Drain Plugs

If motor is totally enclosed fan-cooled or non-ventilated, it is recommended that condensation drain plugs, if present, be removed. These are located in the lower portion of the end-shields. Totally enclosed fan-cooled "XT" motors are normally equipped with automatic drains which may be left in place as received.

Rotation

To reverse the direction of rotation, disconnect from power source and interchange any two of the three line leads for the three-phase motors.

Test for General Condition

If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megohmmeter.

If the resistance is lower than one megohm the windings should be dried in one of the two following ways:

1. Bake in an oven at a temperature not exceeding 90 degrees C (200 degrees F) until insulation resistance becomes constant.
2. With rotor locked, apply low voltage and gradually increase current through windings until temperature (measured with a thermometer) reaches 90 degrees C (200 degrees F). Do not exceed this temperature.

Initial Lubrication

Allen-Bradley motors are shipped from the factory with the bearings properly packed with grease and ready to operate. Where the unit has been subjected to extended storage (6 months or more) the bearings should be relubricated (regreasable type) prior to starting.

Operation



ATTENTION: Surface temperatures of the motor enclosure may reach temperatures which can cause discomfort or injury if contact is made with hot surfaces. When installing, protection must be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in personal injury.

Due to the inherent characteristics of insulating materials, abnormally high temperatures shorten the operating life of electrical apparatus. The total temperature, not the temperature rise, should be the measure of safe operation. The class of insulation determines the maximum safe operating temperature. Aging of insulation occurs at an accelerated rate at abnormally high temperatures. A general rule for gauging the effect of excessive heat is that for each 10 degrees C (50 degrees F) rise in temperature above the maximum limit for the insulation, the life of the insulation is halved.

Unbalanced voltage or single-phase operation of polyphase machines may cause excessive heating and ultimate failure. It requires only a slight unbalance of voltage applied to a polyphase motor to cause large unbalance currents and resultant overheating.

Periodic checks of phase voltage, frequency and power consumption of a motor while in operation are recommended. Such checks assure the correctness of frequency and voltage applied to the motor and yield an indication of the load offered by the apparatus which the motor drives.

Comparisons of this data with previous no-load and full-load power demands will give an indication of the performance of the complete machine. Any serious deviations should be investigated and corrected.

Stator problems can usually be traced to one of the following causes:

- Worn bearings
- Operating single-phase
- Moisture
- Poor insulation
- Overloading
- Oil and dirt

Dust and dirt are usually contributing factors. Some forms of dust are highly conductive and contribute materially to insulation breakdown. The effect of dust on the motor temperature through restriction of ventilation is a principal reason for keeping the windings clean.

Squirrel-cage rotors are rugged and in general give little trouble. The first symptom of a defective rotor is lack of torque. This may cause a slowing down in speed accompanied by a growling noise or perhaps failure to start the load. This is caused by an open or high resistance joint in the rotor bar circuit. Such a condition can generally be detected by looking for evidence of localized heating.

Motors with maximum surface temperatures listed on the nameplates.



ATTENTION: The motor is designed to operate at or below the maximum surface temperature stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a Division 2 or Zone 2 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor under any of the following conditions can cause the marked temperature to be exceeded.

- Motor load exceeding service factor value.
 - Ambient temperatures above nameplate value.
 - Voltages above or below nameplate value.
 - Unbalanced voltages.
 - Loss of proper ventilation.
 - Variable frequency operation.
 - Altitude above 1000 meters (3000 feet).
 - Severe duty cycles, repeated starts.
 - Motor stall.
 - Motor reversing.
 - Single-phase operation.
-

Maintenance and Repair

The fundamental principle of electrical maintenance is keep the apparatus clean and dry. This requires periodic inspection of the motor, the frequency depending upon the type of motor and the service.



ATTENTION: To ensure that the driven equipment is not unexpectedly started, remove all power before proceeding. Failure to observe this precaution could result in personal injury or death.

The following should be checked at regular intervals:

- Windings should be dry and free of dust, grease, oil and dirt. Windings may be cleaned by suction cleaners or by wiping. Nozzles on suction type cleaners should be nonmetallic. Gummy deposits of dirt and grease may be removed by using a commercially available low volatile solvent.
- Terminal connections, assembly screws, bolts and nuts should be tight. They may loosen if motor is not securely mounted and tend to vibrate.
- Insulation resistance of motors in service should be checked periodically at approximately the same temperature and humidity conditions to determine possible deterioration of the insulation. When such measurements at regular intervals indicate a wide variation, the cause should be determined. Motor should be reconditioned if the motor has been subjected to excessive moisture by re-winding or re-insulating if necessary. Enclosed motors require very little attention. Ensure that the external air chamber of fan-cooled motors does not become clogged with foreign material which will restrict passage of air.

Disassembly

If it becomes necessary to disassemble the motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling. Precautions to keep bearings clean should also be exercised. Before removing either end shield:

1. Disconnect motor from power source. Label the leads to assure proper reconnection.
2. Remove motor from mounting base. Remove fan cover and fan if present.
3. Mark end brackets relative to position on frame so they can be easily replaced.

Removing Brackets and Rotor

1. Remove bearing cartridge nuts or screws (if used).
2. Remove opposite drive end bracket bolts.
3. Pull bracket.
4. Remove drive end bracket in same manner.
5. Remove rotor.

Removing and Replacing Ball Bearings

Bearings should not be removed unless they are to be replaced. When removal is necessary, use a bearing puller. A bearing puller may be rigged by using a metal plate with holes drilled to match the tapped holes in the inner cap. Use care to keep the pressure equal to prevent breaking the cap.

To install a bearing, heat the bearing in an oven at 121 degrees C (250 degrees F). This will expand the inner race, allowing it to slip over the bearing seat. All bearings must be replaced with the identical part. In many cases special bearings are used which cannot be identified by markings on the bearing. In all cases, when replacing bearings, use markings on bearings and motor identification number to obtain correct replacement bearing. The majority of bearings used now have a C3 internal fit.

Reassembly

Follow reverse procedure as outlined above. Having marked the brackets in the original position, replace as marked.

Lubrication of Bearings

Motors covered by this Instruction Manual are equipped with several types of bearings. This description covers regreasable anti-friction bearings only. Non-regreasable ball bearings require no periodic maintenance.

Grease Lubricated Bearings

This motor has been properly lubricated at the time of manufacture. It is not necessary to lubricate at time of installation unless the motor has been in storage for a period of six months or more.

Lubrication of anti-friction bearings should be done as a part of a planned maintenance schedule. The Recommended Lubrication Interval should be used as a guide to establish this schedule.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarly, care should be taken to properly clean the grease inlet area of the motor to prevent grease contamination.

Recommended Lubricant

For motors operating in ambient temperatures shown below, use the following lubricants or their equivalent:

Ball Bearing Motors

Operating Temperature: -25 to 50 degrees C (-15 to 120 degrees F)	Chevron Oil – SRI No. 2 Exxon – Unirex N2 Shell Oil Co. – Dolum R Texaco, Inc. – Premium RB
Minimum Starting Temperature -60 degrees C (-76 degrees F)	Shell Oil Co. – Aeroshell 7

Roller Bearing Motors

Operating Temperature: -25 to 50 degrees C (-15 to 120 degrees F)	Chevron Oil – Black Pearl EP No. 2 Texaco, Inc. – Premium RB
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Lubrication Procedure

Anti-friction bearings may be lubricated with the motor running or stationary. However, stationary with the motor warm is preferred.

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting (if the motor is not equipped with grease fittings).
2. If motor is equipped with grease drain plug, remove plug and loosen any hardened grease that may block drain.
3. Add the recommended volume of the lubricant using a hand operated grease gun.
4. Run the motor for two hours.
5. Replace the pipe plug in grease drain plug.
6. Grease may not relieve from drain. Use only volume shown in Table E.

Lubrication Instructions

1. Select Service Condition from Table C.
2. Select Lubrication Frequency from Table D.
3. Select Lubrication Volume from Table E.
4. Lubricate the motor at the required frequency with the required lubricant volume in accordance with *Lubrication Procedure* above.



ATTENTION: Mixing lubricants is not recommended due to possible incompatibility. If changing lubricant without motor disassembly is desired, follow lubrication instructions and repeat lubrication after 100 hours of service. Care must be taken to look for signs of lubricant incompatibility, such as extreme “soupiness” visible from the grease relief area. Failure to observe this precaution could result in damage to or destruction of the equipment.

Table C
Service Conditions

Standard Conditions:	Eight hours per day; normal or light loading, clean, 40 degree C (100 degrees F) maximum ambient.
Severe Conditions:	Twenty-four hour per day operation or shock loading, vibration, or in dirt or dust at 40-50 degrees C (100-120 degrees F) ambient.
Extreme Conditions:	Heavy shock or vibration, or dust.

Table D
Lubrication Frequency for Ball Bearings

Speed	NEMA (IEC) Frame	Condition		
		Standard	Severe	Extreme
1800 RPM & slower	182- 215 (112-132)	3 Years	1 Year	6 Months
	254-365 (160-200)	2 Years	6-12 Months	3 Months
	404-449 (225-280)	1 Year	6 Months	1-3 Months
3600 RPM	All	6 Months	3 Months	1 Month

Lubrication Frequency for Roller Bearings

For Roller Bearings – divide the above times by 2.

Table E
Recommended Volume

NEMA (IEC) Frame	Volume in Cubic Inches (cm ³)
182- 215 (112-132)	0.5 (8)
254-286 (160-180)	1.0 (16)
324-365 (200-225)	1.5 (24)
404-449 (250-280)	2.5 (40)

Replacement Bearings

Your maintenance program will not be complete without including spare bearings. It must be remembered that the bearing is a wearable component and therefore must eventually be replaced. To ensure that you are able to maintain original operation, we recommend the purchase of spare parts directly from Allen-Bradley.

All bearings are subject to exact specifications and tests necessary to satisfy performance requirements. In this manner, it is possible to duplicate your present bearing. Markings on the bearing do not indicate complete specifications.

Total Service Programs

Allen-Bradley can provide a wide range of maintenance programs to help you reduce downtime, improve productivity and increase profits. Capabilities include:

- Motor Start-up Service
- Motor Electrical and Mechanical Preventive Maintenance
- Vibration Analysis
- Mobile Van Repair Service
- Balancing and Alignment Service
- Maintenance Service
- 24-Hour Technical Support
- Modernization Service

For more information contact your local Allen-Bradley Sales Office.

Renewal Parts

Parts can be obtained from your nearest Allen-Bradley parts distributor, or directly from the factory. When ordering parts for which a part number is not available, give complete description of part and purchase order number, serial number, model number, etc., of the equipment on which the part is used.

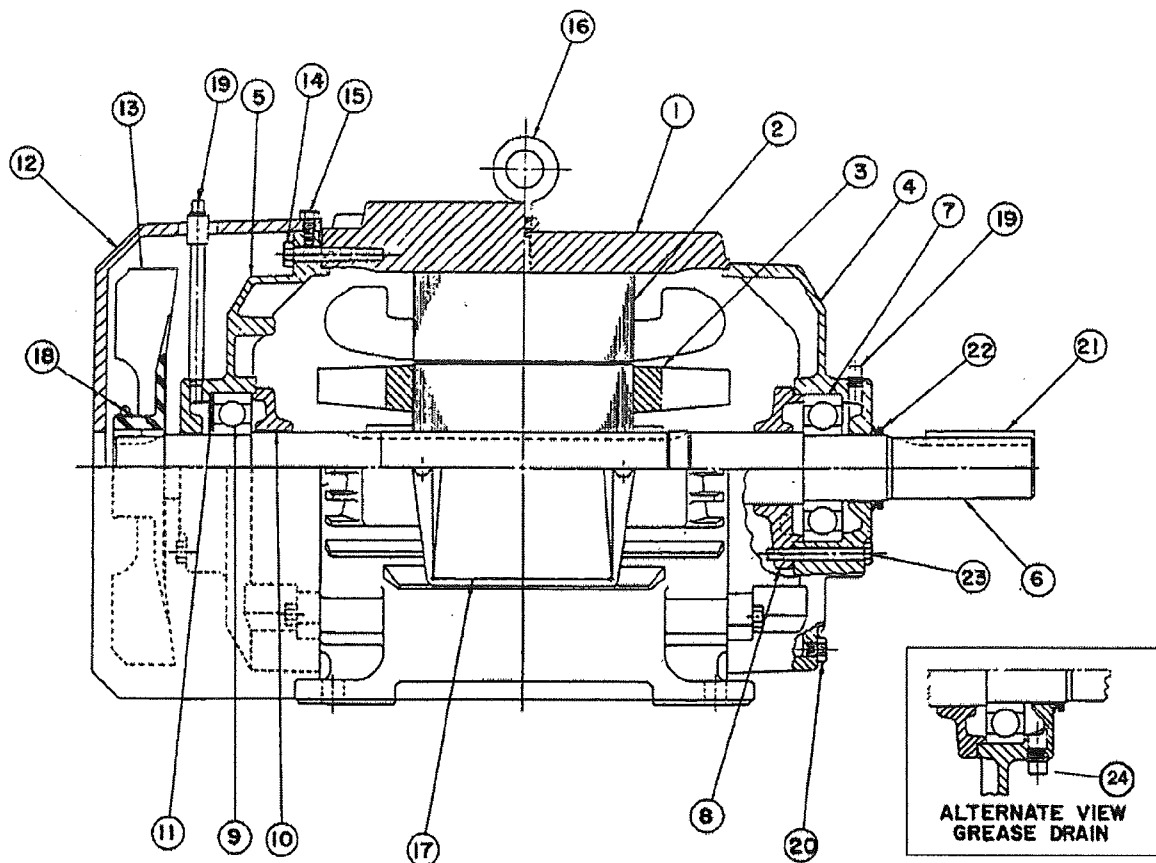
A detailed parts list, which gives recommendations for spare parts that should be stocked for your equipment, can also be ordered.

Cross Sectional and Parts Identification Drawing

Find No.	Part Description
1	Frame
2	Stator
3	Rotor/internal Cooling Fan
4	Backend Bracket
5	Frontend Bracket
6	Shaft
7	Backend Ball Bearing
8	Backend Inner Cap

Find No.	Part Description
9	Frontend Ball Bearing
10	Frontend Inner Cap
11	Wave Washer, Frontend
12	Fan Cover
13	Outer Cooling Fan
14	Front End Bracket Bolts
15	Fan Cover Bolts
16	Eyebolt

Find No.	Part Description
17	Terminal Box
18	Fan Clamp
19	Grease Entry
20	Condensation Drain
21	Key
22	Slinger
23	Backend Cap Bolts
24	Grease Drain



NOTE: Bearings shown are regreasable type. Not all items shown may be present on motor. Not all items on motor may be shown on drawing. Drawing is for general reference purposes only.

Online Documentation

The latest motor information can be obtained from the Allen-Bradley Drives & Motors home page on the World Wide Web at:

<http://www.ab.com/drives/motors>

www.rockwellautomation.com

Corporate Headquarters

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Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe: Rockwell Automation SA/NV, Vorsilaan/Boulevard du Souverain 36-BP 3A/B, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products

Americas: Rockwell Automation, 6040 Ponders Court, Greenville, SC 29615-4617 USA, Tel: (1) 864.297.4800, Fax: (1) 864.281.2433

Europe: Rockwell Automation, Brühlstraße 22, D-74834 Elztal-Dallau, Germany, Tel: (49) 6261 9410, Fax: (49) 6261 17741

Asia Pacific: Rockwell Automation, 55 Newton Road, #11-01/02 Revenue House, Singapore 307987, Tel: (65) 351 6723, Fax: (65) 355 1733

U.S. Allen-Bradley Drives Technical Support

Tel: (1) 262.512.8176, Fax: (1) 262.512.2222, Email: support@drives.ra.rockwell.com, Online: www.ab.com/support/abdrives



Installation, Operation and Maintenance Manual

Vertical Solid Shaft Normal Thrust and In-Line AC Motors

- Vertical Mount
- Solid Shaft
- Normal/Medium/Extended Thrust
- In-Line Coupled
- API 610 Style (P-Base)
- 180-449 Frames



ATTENTION: Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, and/or service this motor. Read and understand this manual in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or loss of life.

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Receiving and Handling

Acceptance

Thoroughly inspect this equipment before accepting shipment from the transportation company. If any of the goods called for in the bill of lading or express receipt are damaged or the quantity is short, do not accept them until the freight or express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight or express agent at once and request him to make an inspection. We are willing to assist you in collecting claims for loss or damage in shipment; however, this willingness on our part does not remove the transportation company's responsibility in reimbursing you for collection of claims or replacement of material. Claims for loss or damage in shipment must not be deducted from the invoice, nor should payment of the invoice be withheld awaiting adjustment of such claims, as the carrier guarantees safe delivery.

If considerable damage has been incurred and the situation is urgent, contact the nearest Allen-Bradley Sales Office for assistance. Please keep a written record of all such communications.

Unpacking

If facilities for the shelter of equipment are not available, do not unpack until ready for use. If this equipment is to be stored for any period of time prior to installation, the area should be dry and protected and not subject to severe humidity changes, extreme oil, dirt and similar adverse conditions.

After unpacking and inspecting, turn the motor shaft by hand to assure that there are no obstructions to free rotation.

Storage

Motors or generators must be stored in a clean, dry area protected from extremes of temperature, moisture, shock and vibration. Storage temperatures of 10 to 49 degrees C (50 to 120 degrees F) with a maximum relative humidity of 60% must be observed. In addition, motors subjected to extended storage must be handled and treated per the requirements specified in publication “**Motors-5.0.**” This publication is available from your Allen-Bradley Sales Office or online at: <http://www.ab.com/drives/motors>.

- Bearings – Ball & Roller (anti-friction). The bearings are to be fully greased at the time of going into extended storage. Motor shafts are to be rotated manually every 6 months and additional grease added purging some of that in cavity. Grease in the bearings is to be purged at the time of removal from storage, making sure that an ample supply of fresh grease is in each grease cavity.
- All condensate drains to be fully operable while in storage, and/or the drain plugs removed. The motors must be stored so that the drain is at the lowest point. All breathers and automatic “T,” drains must be operable to allow breathing at points other than through the bearing fits.
- All units equipped with heaters are to have the heaters connected if storage conditions in any way simulate or approach atmospheric conditions experienced in operation.
- Windings to be megged at the time equipment is put in storage. At the time of removal from storage, the resistance reading must not have dropped more than 50% from the initial reading. Any drop below this point necessitates electrical or mechanical drying. Where a large quantity of motors are stored, an inspection or sampling should be made by removing the end brackets. Visually inspect for the presence of water in the grease or rust on the bearing. If present, replace the bearings and relubricate.
- All external parts and motors subjected to corrosion should be protected by corrosion resistant coating proven adequate for prevailing conditions.

- Where motors are not stored in the original containers, but are removed and mounted on other pieces of machinery, the mounting must be such that the drains and breathers are fully operable. In this respect, the drains must be kept at the lowest point in the motor and/or the drain plugs removed so that all condensation can automatically drain out.
- All other storage conditions apply, including rotation of motor shafts. Where such conditions cannot be met, the equipment must be treated the same as if it were mounted in its normal position, and all protective devices such as heaters, breathers, and drains must be fully operable.

Installation

Inspection

After the motor is unpacked, examine the nameplate data to see that it agrees with the power circuit to which it will be connected. The motor is guaranteed to operate successfully with frequency not more than 5% and voltage not more than 10% above or below the nameplate data, or combined variation of voltage and frequency of not more than 10% above or below nameplate data. Efficiency, power factor and current may vary from nameplate data.

If the motor is totally-enclosed, fan-cooled and equipped with condensate drain plugs. The plugs must be removed to permit escape of moisture. The drain plug is located on the flange bracket. Certain motors are furnished with hex-head "T-Drains," which should be left in place. Some explosion-proof motors are equipped with explosion-proof drains which must remain in place.

As shipped, the motor is ready for immediate service. If the motor has been in storage for an extended period or has been subjected to adverse moisture conditions, it is best to check the insulation resistance of the stator winding with a megger or an insulation resistance meter before initial starting.

If the insulation resistance is lower than that calculated from the formula in the Maintenance section (see page 8), the winding should be dried out in one of two ways:

1. Bake in an oven at a temperature not exceeding 90 degrees C (200 degrees F) until insulation resistance becomes constant. If this is done, motor should be relubricated before reinstallation.
2. With rotor locked, apply low voltage and gradually increase current through windings until temperature (measured with a thermometer) reaches 90 degrees C (200 degrees F). Do not exceed this temperature.

Table A
General Effect of Voltage & Frequency Variation on Induction-motor Characteristics

Variation	Starting & Maximum Running Torque	Sync Speed	Slip %	Full Load Speed	Efficiency			Power Factor/COS			Full Load Current	Starting Current	Temperature Rise (full load)	Maximum Overload Capacity	Magnetic Noise (no-load in particular)
					Full-Load	3/4 Load	1/2 Load	Full Load	3/4 Load	1/2 Load					
Voltage Variation:															
120% voltage	Increase 44%	No change	Decrease 30%	Increase 1.5%	6-0% Decrease (1-75 HP) 0-3% Increase (100-200 HP)	Decrease 1/2-2 points	Decrease 7-20 points	Decrease 5-15 points	Decrease 10-30 points	Decrease 15-40 points	Increase 12%	Increase 20%	Increase 5-6 degrees C.	Increase 44%	Noticeable increase
110% voltage	Increase 21%	No change	Decrease 17%	Increase 1%	Slight decrease	Practically no change	Decrease 1-2 points	Decrease 5-10 points	Decrease 5 points	Decrease 5-6 points	Increase 2-4%	Increase 10-12%	Increase 3-4 degrees C.	Increase 21%	Increase slightly
Functions of Voltage	(voltage) ²	Constant	$\frac{1}{(\text{voltage})^2}$	(sync speed slip)							voltage			(voltage) ²	
90% Voltage	Decrease 19%	No change	Increase 23%	Decrease 1-1/2%	Decrease 2 points	Practically no change	Increase 1-2 points	Increase 5 points	Increase 2-3 points	Increase 4-5 points	Increase 11%	Decrease 10-12%	Increase 6-7 degrees C.	Decrease 19%	Slight decrease
Frequency Variation:															
105% frequency	Decrease 10%	Increase 5%	Practically no change	Increase 5%	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase	Slight increase	Slight decrease	Decrease 5-6%	Slight decrease	Slight decrease	Slight decrease
Function of frequency	$\frac{1}{(\text{frequency})^2}$	Frequency		(sync speed slip)								$\frac{1}{\text{frequency}}$			
95% frequency	Increase 11%	Decrease 5%	Practically no change	Decrease 5%	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight decrease	Slight increase	Increase 5-6%	Increase slightly	Increase slightly	Increase slightly

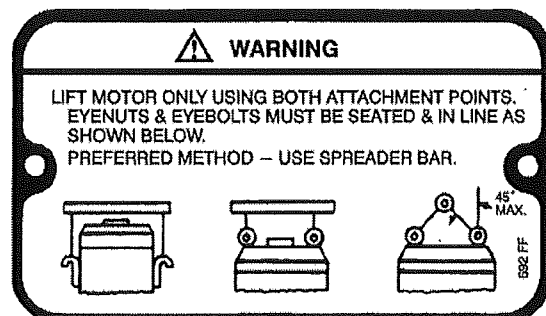
NOTE: This table shows general effects, which will vary somewhat for specific ratings.

Lifting Means



ATTENTION: When lifting means are provided for handling the motor, it should not be used to lift the motor plus additional equipment such as gears, pumps, compressors or other driven equipment. Failure to observe this precaution could result in bodily injury.

Lifting means are provided for handling the motor only and should not be used to lift the motor plus the driven equipment without consulting the local Allen-Bradley Sales Office. In all cases, care should be taken to assure lifting in the direction intended in the design of the lifting means. Likewise, precautions should be taken to prevent hazardous overloads due to deceleration, acceleration or shock forces. Refer to Lifting Nameplate to assure correct lifting procedure. (See below).



When mounting the motor it is essential that motor and drive unit be rigidly supported in correct alignment. This also applies when mounting In-line NEMA LP motors.

Allowances should be made for shaft growth (due to thermal expansion) to avoid potential problems with seals and/or bearings. All motors with the thrust bearings located in the top will have some degree of shaft growth. The following chart lists the expected amount of growth for Allen-Bradley LP motors.

Shaft Growth

Frame Size	Growth mm (inches)	Frame Size	Growth mm (inches)
180	0.05 (0.002)	360	0.43 (0.017)
210	0.13 (0.005)	400	0.46 (0.018)
250	0.25 (0.010)	444/445	0.51 (0.020)
280	0.30 (0.012)	447/449	0.56 (0.022)
320	0.38 (0.015)		

National Electrical Code



ATTENTION: The user is responsible for conforming with the National Electrical Code and all other applicable local codes. Wiring practices, grounding, disconnects and overcurrent protection are of particular importance. Failure to observe these precautions could result in severe bodily injury or loss of life

All motors & generators covered by this document should be installed and protected in accordance with the National Electrical Code.

The user must select a motor starter and overcurrent 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.

Important: When motors are provided with thermal protection (typically thermostats), it is important to properly connect and apply the devices. This will ensure that the motor is properly protected from being operated if thermal limits are reached and/or exceeded. The control system must be configured to reduce the motor load and/or shut down the motor control system to allow the motor to cool to a level within acceptable operating ranges. If the motor is operated with the thermal protective devices tripped (indicating an over temperature condition), the motor insulation could be damaged and complete failure of the motor insulation is possible. In the event of motor failure due to an over temperature condition, Rockwell Automation requires that motor thermal protective devices (when supplied) be adequately monitored and incorporated into the motor control system to maintain warranty. Failure on the part of the individual installing this equipment to take these steps will result in the factory warranty being voided.

Grounding

Motors should be grounded to limit their potential to ground in the event of accidental connection or contact between live electrical parts and the metal exteriors. See the *National Electrical Code*, Article 430 for information on grounding of motors, Article 445 for grounding of generators, and Article 250 for general information on grounding. In compliance with NEC the terminal housing has grounding provisions which have been approved by the Underwriters Laboratory, UL, and Canadian Standards Association, CSA. In making the ground connection, the installer should make certain there is a solid and permanent metallic connection between the ground point and the motor or generator terminal housing. External grounds should not be used on motors located in hazardous environments.

There are applications where grounding the exterior parts of a motor or generator may result in greater hazard by increasing the possibility of a person in the area simultaneously contacting ground and some other nearby live electrical part or other ungrounded electrical equipment. In portable equipment it is difficult to be sure that a positive ground connection is maintained as the equipment is moved, and providing a grounding conductor may lead to a false sense of security. When careful consideration of the hazards involved in a particular application indicate the machine frames should not be grounded or when unusual operating conditions dictate that a grounded frame cannot be used, the installer should make sure the machine is permanently and effectively insulated from ground. In those installations where the machine frame is insulated from ground, it is recommended that appropriate warning labels or signs be placed on or in the area of the equipment by the installer.

Starting



ATTENTION: Before starting the motor, remove all unused shaft keys and loose rotating parts to prevent them from flying off.

The rotor should rotate freely when the shaft is turned by hand.

The motor should run smoothly with little noise. If the motor should fail to start and produces a decided hum, it may be that the load is too great for the motor or that it has been connected improperly. Shut down immediately and investigate for trouble.

Operate at normal load for an initial period to check for any unusual noise, heating or excessive current.

To reverse the direction of rotation, interchange any two of the power leads.

Maintenance

The fundamental principle of electrical maintenance is to keep the motor clean and dry. This requires periodic inspection of the motor, the frequency (depending upon the type of motor) and the service.

Important: In order to retain UL listing, UL listed motors must be returned to an Allen-Bradley service facility for repairs or maintenance which requires opening the motor enclosure.

The following items should be checked at regular intervals:

- Windings should be dry and free of dust. Windings may be cleaned by suction cleaners or by wiping. Nozzles on suction type cleaners should be non-metallic. Gummy deposits of dirt and grease may be removed by using mineral spirits. Do not use gasoline or other inflammable solvents.
- Terminal connections, assembly screws, bolts and nuts should be tight. They may loosen if motor is not securely mounted and tend to vibrate.
- Long storage or unusual operating conditions may cause motor insulation to absorb moisture. Therefore a megger should be used to check insulation resistance of the motor to ground. Periodic megger readings should be taken at approximately the same temperature and humidity conditions to determine possible deterioration of the insulation. Standards of the IEEE recommend that the insulation of stator windings of clean dry machines at room temperature (approximately 25 degrees C or 77 degrees F) should not be less than:

$$\text{Insulation Resistance (meg-ohms)} = \frac{\text{Motor Rated Voltage} + 1000}{1000}$$

If the resistance is below this value, follow the corrective procedure outlined in the *Installation* section.

- Totally-enclosed, fan-cooled motors require very little attention. Be sure that the external air chamber of this motor does not become clogged with foreign material which will restrict the passage of air.
- Squirrel cage rotors are rugged and in general, give little trouble. The first symptom of a defective rotor is lack of torque. This may cause a slowing down in speed accompanied by a growling noise or perhaps failure to start the load.

This is caused by an open or high resistance joint in the rotor bar circuit. Such a condition can generally be detected by looking for evidence of localized heating.

Repairing end rings should be done only by a competent person. It is recommended that a factory representative be consulted before attempting to do this work.

Disassembly

If it becomes necessary to disassemble this motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling. Precautions to keep bearings clean should be exercised.

Remove bearing cartridge screws before removing end shield screws. Marking end shields relative to position on frame will make reassembly easier.

Bearings should not be removed unless they are to be replaced. When removal is necessary, it is recommended that an authorized Allen-Bradley Repair Facility be utilized.

The thrust bearing systems used may be one of several types depending on the application requirements. Your authorized repair facility is best equipped to service these bearing systems.

Lubrication

This motor has been properly lubricated at the time of manufacture – it is not necessary to lubricate it at the time of installation. If motor has been in storage for a period of six months or more, lubricate before starting.

Lubrication of anti-friction bearings should be done as a part of a planned maintenance schedule. The recommended lubrication interval should be used as a guide to establish this schedule.

Cleanliness is important in lubrication. Any grease used to lubricate anti-friction bearings should be fresh and free from contamination. Similarly, care should be taken to properly clean the grease inlet area of the motor to prevent grease contamination.

Recommended Lubricant

For motors operating in ambient temperatures shown below, use the following lubricants or their equivalent:

Operating Temperature: -25 to 50 degrees C (-15 to 120 degrees F)	Chevron Oil – SRI No. 2* Shell Oil Co. – Dolum R
Minimum Starting Temperature -75 degrees C (-100 degrees F)	Shell Oil Co. – Aeroshell #7

* Standard lubricant

Special Applications

Silicone grease may be required in special high temperature applications. Consult your local Allen-Bradley Representative.



ATTENTION: Mixing lubricants is not recommended due to possible incompatibility. If changing lubricant without motor disassembly is desired, follow lubrication instructions and repeat lubrication after 100 hours of service. Care must be taken to look for signs of lubricant incompatibility, such as extreme “soupiness” visible from the grease relief area. Failure to observe this precaution could result in damage to or destruction of the equipment.

Lubrication Frequency

Standard Conditions:	Eight hours per day; normal or light loading, clean, 40 degree C (100 degrees F) maximum ambient.
Severe Conditions:	Twenty-four hour per day operation or shock loading, vibration, or in dirt or dust at 40-50 degrees C (100-120 degrees F) ambient.
Extreme Conditions:	Heavy shock or vibration, or dust.

Ball Bearings

Horsepower	Condition		
	Standard	Severe	Extreme
1 through 7-1/2 HP, 1800 RPM & slower	2 Years	6 Months	1 Month
10 through 75 HP, 1800 RPM and slower	1 Year	3 Months	1 Month
100 HP & greater, 1800 RPM and slower	1 Year	3 Months	1 Month
All over 1800 RPM	6 Months	2 Months	1 Month

Roller Bearings

For Roller Bearings – divide the above times by 2.

Recommended Volume

Frame Size	1800 RPM & Slower	3600 RPM
182 through 215	0.5 Cu. In.	0.5 Cu. In.
254 through 286	1.0 Cu. In.	1.0 Cu. In.
324 through 365	1.5 Cu. In.	1.5 Cu. In.
404 through 449	2.5 Cu. In.	1.0 Cu. In.

Lubrication Procedure

Anti-friction bearings may be lubricated with the motor running or stationary. However, stationary with the motor warm is preferred.

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting (if the motor is not equipped with grease fittings).
2. Add the recommended volume of the lubricant using a hand operated grease gun.
3. Run the motor for two hours.
4. Replace the pipe plug in grease inlet.

Total Maintenance Program

Allen-Bradley can provide a wide range of maintenance programs to help you reduce downtime, improve productivity and increase profits. Capabilities include:

- Electrical and Mechanical Start-Up Service
- Electrical Preventive Maintenance
- Mechanical Preventive Maintenance
- Vibration Analysis
- Mobile Van Repair Service
- Balancing and Alignment Service
- Maintenance Service
- 24-Hour Technical Support
- Modernization Service

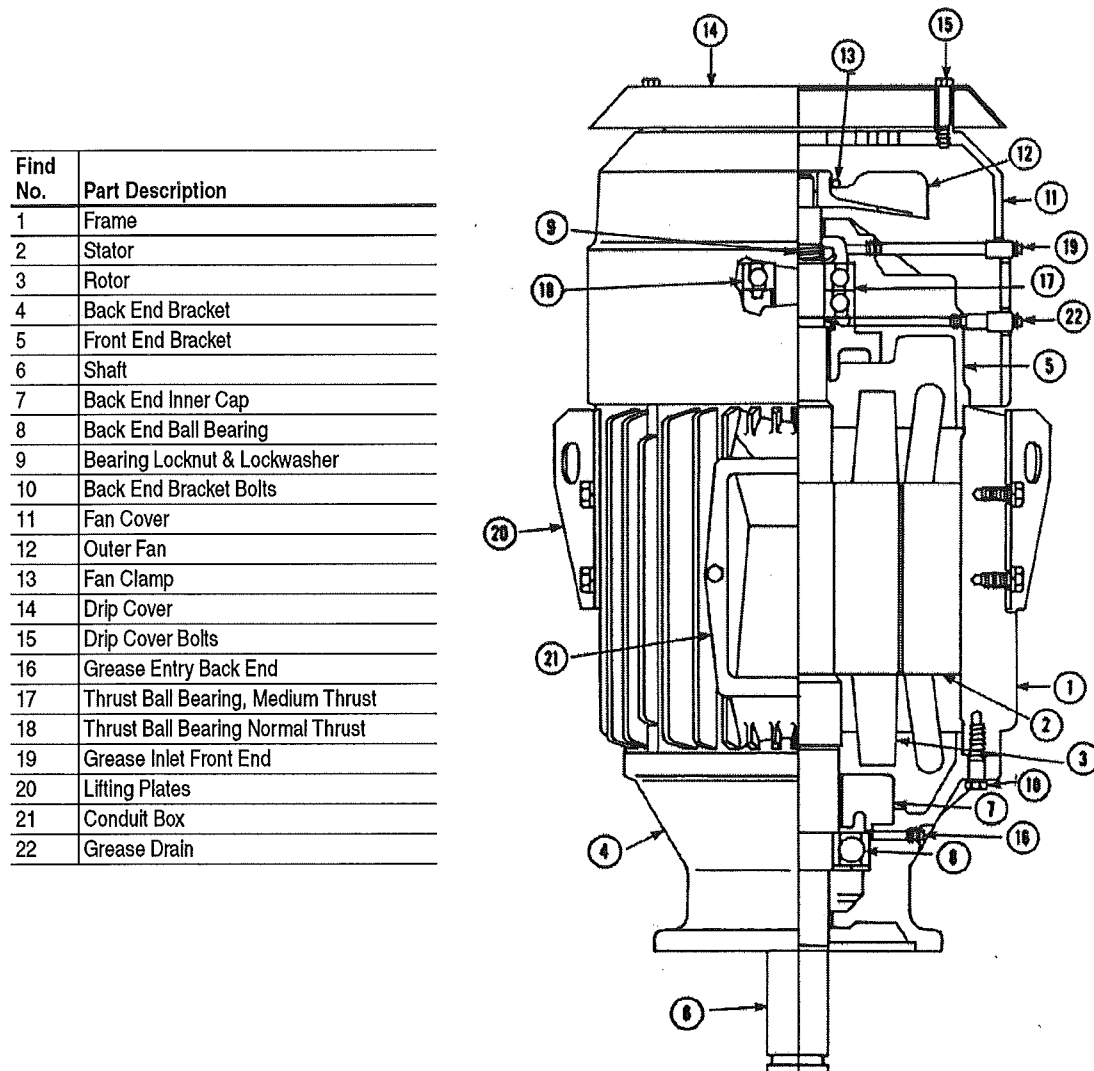
For more information contact your local Allen-Bradley Sales Office.

Renewal Parts

Parts can be obtained from your nearest Allen-Bradley parts distributor, or directly from the factory. When ordering parts for which a part number is not available, give complete description of part and purchase order number, serial number, model number, etc., of the equipment on which the part is used.

A detailed parts list, which gives recommendations for spare parts that should be stocked for your equipment, can also be ordered.

Figure 1
General Cross Section & Parts Identification



Online Documentation

The latest motor information can be obtained from the Allen-Bradley Drives & Motors home page on the World Wide Web at:

<http://www.ab.com/drives/motors>

www.rockwellautomation.com

Corporate Headquarters

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Asia Pacific: Rockwell Automation, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Headquarters for Dodge and Reliance Electric Products

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Installation and Operation Manual

1329R Small AC Motors

- 1/3 through 3 HP
- 56-W180T

Installation and Operation

Unpacking

Unpack motor carefully and inspect for possible damage during shipment. Check packing materials and save any instruction tags or wiring diagrams found in the carton. Report any damages or shortages immediately to the local transportation agent.

Before connecting motor to the electrical supply, inspect for any damage resulting from shipment. Turn shaft by hand to assure free rotation. If the motor has been in storage or subjected to adverse moisture conditions, have it dried thoroughly before operating. After drying, run motor (not connected to load) for a short time to assist drying and as a bearing check.



ATTENTION: High voltage and rotating parts can cause serious or fatal injury. The use of electric machinery, like all other utilization of concentrated power and rotating equipment, can be hazardous. Installation, operation, and maintenance of electric machinery should be performed by qualified personnel. Familiarization with NEMA safety standards, national electrical code and sound local practices is recommended.

Mounting

Mount the motor on a foundation sufficiently rigid to prevent vibration. After careful alignment, bolt motor securely in place.

Mounting Instructions for 56C & 140TC Face Mounted Motors

Before mounting a “C” face motor to a mating flange, be sure both surfaces and all mounting holes are smooth and free of debris.

When mounting into a quill type reducer, make sure the input and output shafts are coated with an anti-seize compound suitable for the application.

When mounting through a flexible coupling, verify that there is adequate clearance between the driven equipment shaft, the coupling interface and the motor shaft. Lack of clearance may result in binding of the shafting and premature bearing failure.

Always slide the motor tenon into the mating flange to its full depth before tightening the mounting bolts. Do not allow the motor to hang by the shaft extension while assembling it to the driven equipment (i.e. quill input gear case). This may bend or crease the shaft and damage any seals that are present.

Only use the proper mounting bolts. These should be 3/8”-16 threads per inch and sized for length such that engagement into the motor flange does not exceed 9/16”. For example, a gear case with a 3/8” flange thickness requires a bolt that is:
 $3/8" + 9/16" = 15/16" = \text{Maximum Bolt Length.}$

Since 15/16" is not a standard bolt length, a 7/8" bolt or a 1" bolt with a lockwasher can be used.



ATTENTION: To guard against motor damage such as premature failure and/or a loose assembly, use only mounting bolts that are the correct length. A bolt that is too long may cause damage to the motor.

Wiring

Check nameplate data on motor before installing to assure correct rating and that the available power supply agrees with the motor power supply. If in doubt, check local power company. Fuses, wires, thermal cutouts and other protective devices should be the proper size and rating to safely carry the load and to interrupt the circuit on overloads. Built in thermals, when installed, are of proper size to provide the required protection



ATTENTION: Ground the machine properly to avoid serious injury to personnel. Grounding should be in accordance with the National Electrical Code and consistent with sound local practices.

All motors contain wiring instructions either as a label on the inside of the conduit box cover or by separate sheet or tag. All motors should be installed in accordance with the National Electric Code and local requirements. Check leads or terminals with connection diagrams or label so the proper connections to the incoming power leads are made.

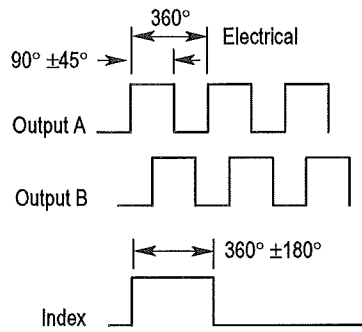
Important: When motors are provided with thermal protection (typically thermostats), it is important to properly connect and apply the devices. This will ensure that the motor is properly protected from being operated if thermal limits are reached and/or exceeded. The control system must be configured to reduce the motor load and/or shut down the motor control system to allow the motor to cool to a level within acceptable operating ranges. If the motor is operated with the thermal protective devices tripped (indicating an over temperature condition), the motor insulation could be damaged and complete failure of the motor insulation is possible. In the event of motor failure due to an over temperature condition, Rockwell Automation requires that motor thermal protective devices (when supplied) be adequately monitored and incorporated into the motor control system to maintain warranty. Failure on the part of the individual installing this equipment to take these steps will result in the factory warranty being voided.

Blower Motor Connection

Vector Duty W180T frame motors may incorporate the use of a blower motor for cooling. In these cases a single-phase, 115V, 60 Hz blower motor is used.

Encoder Connection Diagrams

Dynapar H20 – 10 pin M/S Connector



Output Terminations

Signal	Pin
Output A	A
Output B	B
Output Z	C
Vcc	D
Common	F
Case	G
No Connection	E
Output A (NOT)	H
Output B (NOT)	I
Output Z (NOT)	J

Lakeshore – Epic Connector

The following table is a universal wiring guide for the latching Epic connector.

Epic Connector or Plain Cable Connections

Pin	Signal	Color
1	Common	Black
2	B	Green
3	A	Blue
4	Z	Violet
5	No Connection	–

Pin	Signal	Color
6	5-15V	Red
7	B (NOT)	Yellow
8	A (NOT)	Gray
9	Z (NOT)	Orange
10	Shield	Braid

Starting



ATTENTION: Check direction of motor rotation before coupling motor to load.

The motor should start quickly and run smoothly. If the motor fails to start, it may be that the load is too great, the applied voltage low or the motor improperly connected. In any case, immediately shut motor off, disconnect from power supply, and investigate the cause.

Rotation

Refer to notation on wiring diagram for method of changing rotation.

Ambient Temperature

Each motor nameplate carries a maximum ambient temperature rating. Motors should not be operated at ambients above this rating.

Maintenance



ATTENTION: High Voltage. Electric shock may cause serious or fatal injury. Disconnect power before touching any internal part.

The fundamental principle of electrical maintenance is – **Keep The Apparatus Clean And Dry.** This requires periodic inspection of the motor, the frequency depending upon the type of motor and service.

The following should be checked at regular intervals.

1. Windings should be dry and free of dust, grease, oil, and dirt. Windings may be cleaned by suction cleaners or by wiping. Nozzles on suction type cleaners should be non-metallic. Gummy deposits of dirt and grease may be removed by using a commercially available mineral solvent. Do not use gasoline or other inflammable solvents.
2. Terminal connections, assembly screws, bolts and nuts should be tight. They may loosen if motor is not securely bolted and tends to vibrate.
3. Insulation resistance of motors in service should be checked periodically at approximately the same temperature and humidity conditions to determine possible deterioration of the insulation. When such measurements at regular intervals indicate a wide variation, the cause should be determined. Motor should be reconditioned if it has been subjected to excessive moisture, or by re-winding or re-insulating if necessary. Enclosed motors require very little attention. Be sure that external air chamber of fan cooled motors does not become clogged with foreign material which will restrict passage of air.



ATTENTION: Mineral solvents are flammable and moderately toxic. The usual precautions for handling chemicals of this type should be observed. These include:

1. Avoid excessive contact with skin.
2. Use in well ventilated areas.
3. Take necessary precautions to prevent fire or explosion hazards.

Lubrication

Ball Bearings

The ball bearing has deep grooved, double shielded bearings with sufficient lubricant packed into the bearings by the manufacturer for “life Lubrication.” The initial lubricant is supplemented by a supply packed into larger reservoirs in the end shield at time of assembly. No grease fittings are provided as the initial lubrication is adequate for up to 10 years of operation under normal conditions.

Sleeve Bearings

The bearing sleeve is steel on the outside for strength with a tin base babbitt lining on the inside for low friction and long wear. A storage space around the bearing is filled with Permawick, a commercial composition of special cellulose fiber highly saturated with oil. The initial factory lubrication is normally adequate for approximately one year under normal operation. Thereafter, lubricate about every six (6) months. This requires about 3 to 4 squirts from a 4 in. oil can. Use only LIGHT grade mineral oil (similar to SAE 10W) having viscosity of 210 sec. at 100°F. If the motor has been subjected to storage prior to operation, it is advisable to lubricate in accordance with the above.

Overload Protection

Motors supplied with thermal protectors are furnished with either a manual or automatic reset type to protect against destructive overheating. If the protector trips, proceed as follows:

Manual Reset Type

1. Wait two minutes.
2. Push in reset plunger until it catches.

Automatic Reset Type

This type will reset itself when the motor cools sufficiently.

If the thermal protector continues to trip, an abnormal condition exists. This condition must be corrected before motor will operate normally.



ATTENTION: Motors with automatic reset thermal protectors should be used in applications where an unexpected restart would not be hazardous. If a motor using an automatic reset thermal protector has tripped “off” make sure to disconnect motor from line before working near the motor or any equipment driven by it. Serious injuries could occur otherwise due to an unexpected “reset” and motor start up.

Troubleshooting

If trouble develops in operation of motor, be sure that:

1. The bearings are in normal condition and have been properly lubricated with a high grade, ball bearing lubricant, free of dirt or grit. (If dirt enters bearing, flush and relubricate.)
2. There is no mechanical misadjustment to prevent free rotation of moving parts of motor and drive.
3. All bolts and nuts are properly tightened.
4. Motor instructions have been carefully carried out.
5. That rated voltage is available in all phases at the motor terminals.

6. That the line voltage, frequency and phase correspond to the values stamped on the nameplate.
7. That all connections and contacts are properly made in all circuits between motor and line, and between motor and control.

Warranty

Allen-Bradley warrants workmanship and materials on each Fractional Horsepower AC Motor for one year from date of shipment. This warranty does not extend to failures induced by misuse, abuse or misapplication. For warranty service, contact your nearest sales office.

Repair Procedures

Important: Allen-Bradley cannot be held responsible for expense incurred in any repairs performed by other than the Company's Engineers or Authorized Service stations unless authorization has been granted by Allen-Bradley Field Representatives or the factory.



ATTENTION: Internal parts of this motor may be at line voltage even when motor is not rotating. Disconnect all AC line connections before contacting any internal part.

Disassembly

If it becomes necessary to disassemble the motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling. Precautions to keep bearings clean should be exercised.

Before removing either end shield:

1. Disconnect motor from power source. Tag the leads to insure proper re-connection.
2. Remove motor from mounting base.
3. Mark end shields relative to position on frame so they can be easily replaced.

Removing End Shields And Rotor

1. Remove any bearing cartridge nuts or screws.
2. Remove end shield through bolts.
3. Pull end shields by tapping lightly on screw driver in slot between end shield and frame with fiber mallet.
4. Remove rotor.

Removing and Replacing Ball Bearings

Should it become necessary to replace bearings, the bearing bore and cavity should be thoroughly cleaned and repacked with approximately 1/2 teaspoonful of recommended grease (Chevron SRI #2 or equivalent).

Bearings should be removed with bearing pullers using a center insert in the end of the shaft to protect the shaft center. If a puller is not available, use a fiber hammer and transmit blows through a hard wood block.

To re-install ball bearings, either in a press or on the bench, pressure should be applied to the inner race by using a square faced sleeve or piece of pipe that will fit over the shaft, to avoid damaging the bearing. If a press is not available and a hammer is used, the blows should be transmitted against the sleeve by a block of wood or fiber.

Reassembly

Follow reverse procedure as outlined for Disassembly. Having marked the brackets in the original position, replace as marked.



ATTENTION: The use of electrical equipment in hazardous locations is restricted by the national electrical code, article 500. Original equipment manufacturers and user customers must read, understand and apply these rules for installation and use of all equipment in such locations and consult local code inspection and enforcement agencies as necessary to insure compliance. Motors listed by Underwriters Laboratories, Inc., for use in specific locations have been designed, tested, and approved for use in such locations only.

Online Documentation

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