



U.S. Electrical Motors Installation and Maintenance Manual

SAFETY FIRST

High voltage and rotating parts can cause serious or fatal injury. Safe installation, operation, and maintenance must be performed by qualified personnel. Familiarization with and adherence to NEMA MG2, the National Electrical Code (NEC) and local codes is required. It is important to observe safety precautions to protect personnel from possible injury. Personnel should be instructed to:

1. Be familiar with the equipment and read all instructions thoroughly before installing or working on equipment.
2. Avoid contact with energized circuits or rotating parts.
3. Disconnect all power sources before initiating any maintenance or repair.
4. Act with care in accordance with prescribed procedures in handling and lifting this equipment.
5. Be sure unit is electrically grounded in accordance with code requirements.
6. Be sure equipment is properly enclosed or protected to prevent access by children or other unauthorized personnel in order to prevent possible accidents.
7. Be sure shaft key is fully captive before unit is energized.
8. Avoid contact with capacitors until safe discharge procedures have been completed.
9. Provide proper guarding for personnel against rotating parts and applications involving high inertia loads which can cause overspeed.
10. Avoid extended exposure to equipment with high noise levels.

INSPECTION AND HANDLING

Inspect unit to make sure no damage has occurred during shipment. Check nameplate for correct speed, horsepower, voltage, Hertz, and phase for conformance with power supply and equipment. **WARNING:** Units should be lifted using all eyebolts or lugs if provided. These eyebolts or lugs are provided for lifting this unit only and must not be used to lift any additional weight. Lifting angle, from shank of eyebolt, must not exceed 30° for machines with single and 45° for machines with multiple lifting means. Replacement eyebolts must be per ASTM A489 or equivalent. All eyebolts must be securely tightened. Be careful not to touch overhead power lines with lifting equipment. Failure to observe this warning may result in serious personal injury.

STORAGE

Units should be stored indoors, in a clean, dry location & winding should be protected from excessive moisture absorption. **NOTE:** If motors are to be stored for more than one year, refer to U.S. Electrical Motors. If gear and belt transmission units are to be stored for more than six months, refer to U.S. Electrical Motors.

LOCATION

WARNING: Use only UL Listed Hazardous Location Motors for service in Hazardous Locations as defined in Article 500 of the NEC. Units should be located in a clean, well-ventilated area. **WARNING:** Units should be located in a suitable enclosure to prevent access by children or other unauthorized personnel to prevent possible accidents.

INSTALLATION / MOUNTING

Mount units on a firm, flat surface sufficiently rigid to prevent vibration. Drive belts and chains should be tensioned in accordance with supplier recommendations. Couplings should be properly aligned and balanced. For belt, chain and gear drive selection refer to the drive or equipment manufacturer. For application of drive equipment refer to applicable information in NEMA MG1.

Motors have been dynamically balanced using a half key the same length as the full key shipped with the motor. If pulley keyway length is less than this length, rework long key by removing one-half of excess length between pulley and end of key to maintain balance.

Do not restrict motor ventilation. Unless otherwise specified on nameplate, motor is designed for operation in accordance with NEMA MG1 "Usual Service Conditions" which states an ambient temperature range of -15°C to 40°C (5°F to 104°F). Standard grease lubricated units are suitable for operation within this temperature range, special lubricants may be required for ambient temperatures outside of the range.

NOTE: Motors operating under rated load and allowable ambient conditions may feel hot when touched; this is normal and should not be cause for concern. When in doubt, measure frame surface temperature and confer with nearest office. Enclosed motors normally have condensation drain openings. Insure that drain openings are properly located and open (plugs removed) for the motor mounting position. Drain openings should be at the lowest point of end brackets, frame housing and terminal housing when the motor is installed. This may require modification of motor to accomplish. If unit appears wet, and/or has been stored in a damp location, dry out thoroughly and check for adequate insulation resistance to ground before operating.

WARNING: Guards should be provided for all exposed rotating parts to prevent possible personal injury. Keep fingers and foreign objects away from ventilation and other openings. Applications involving *high inertia loads* may damage equipment due to motor overspeed during coast shutdown. Such applications should be referred to U.S. Electrical Motors.

CAUTION: Do not force drive coupling or other equipment onto shaft, as bearing damage may result

POWER SUPPLY AND CONNECTIONS

The power supply must agree with values on nameplate. Terminal voltage should not vary more than $\pm 10\%$ of nameplate voltage at rated frequency. Unbalanced line voltage, greater than one percent, can cause overheating. Do not exceed the continuous rated load amperes on the nameplate. Starting controls and overload protection should be properly sized in accordance with the NEC and the control manufacturer's recommendations.

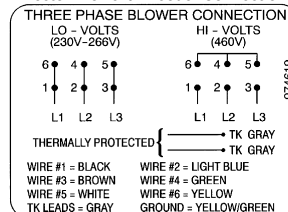
Motor connections should be made by following instructions on connection diagram. Determine direction of rotation before connecting driven equipment. If direction of rotation label is supplied, operate only in specified direction. Rotation may be reversed on three phase motors by interchanging any two line connections. On single phase motors, interchange leads per connection diagram on motor. Wiring of units, controls and grounding shall be in accordance with local and NEC requirements. **WARNING:** Failure to properly ground unit may cause serious injury to personnel. Where unexpected starting could be hazardous to personnel, do not use automatic reset starting devices.

USE OF VARIABLE FREQUENCY DRIVES

Electric motors can be detrimentally affected when applied with variable frequency drives (VFD's). The non-sinusoidal waveforms of VFD's have harmonic content which causes additional motor heating; and high voltage peaks and short rise times, which result in increased insulation stress, especially when long power cable lengths are used. Other effects of VFD's on motor performance include reduced efficiency, increased load current, vibration and noise. Standard motors utilized with VFD's must be limited to those application considerations defined in NEMA MG-1 Part 30.

NEMA MG-1 Part 31 defines performance and application considerations for Definite Purpose Inverter fed motors. To insure satisfactory performance and reliability, U.S. Electrical Motors offers and recommends nameplated inverter duty motor products which meet the requirements of NEMA MG-1 Part 31. The use of non-inverter duty motors may result in unsatisfactory performance or premature failure, which may not be warrantable under the Terms and Conditions of Sale. Contact your U.S. Electrical Motors Field Sales Engineer for technical assistance for motor selection, applications and warranty details.

Vector Blower / Encoder Connection



10 Pin Bendix Wiring

Pin #	Function
D	+VDC
F	COM
A	A
B	B
C	Z
H	A'
J	B'
K	Z'
E	N/C

9 Pin Sub-D Wiring

Pin #	Function
1	+VDC
2	A
3	A'
4	B
5	B'
6	Z
7	Z'
8	N/C
9	COM



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OIL LUBRICATION

Most oil lubricated units are shipped without oil. Refer to instruction manual with unit for specific type and grade of oil to be used, change interval and level. If lubrication instructions specify synthetic oil, do not substitute. **WARNING:** For applications in the food and drug industry (including animal food), consult the petroleum supplier for lubricants that are acceptable to the Food & Drug Administration and other governing bodies.

MAINTENANCE

Inspect units at regular intervals. Keep units clean and ventilation openings clear of dust, dirt or other debris. Lubricate units per this operating instruction sheet and instruction plate on unit. Excessive lubrication may damage the unit. Do not over-grease. **WARNING:** Disconnect all power sources to the unit and discharge all parts which may retain an electrical charge before attempting any maintenance or repair. Screen and covers must be maintained in place when unit is in operation. Failure to observe this warning may result in personal injury.

U.L. Listed Motors For Use in Hazardous Locations: Repair of these motors must be made by the manufacturer or manufacturer's authorized service station approved to repair U.L. Listed motors. The U.L. listing applies to the electric motor only and not to the belt or gear transmissions or other devices that may be connected to the motor.

GREASE LUBRICATION INSTRUCTIONS

Units are prelubricated at the factory and do not require initial lubrication. Relubricating interval depends upon speed, type of bearing and service. Refer to Table 1 for suggested regreasing intervals. Operating conditions may dictate more frequent lubrications. Motor must be at rest and electrical controls should be locked open to prevent energizing while motor is being serviced. (refer to section on Safety). If motor is removed from storage, refer to storage procedures.

To relubricate bearings, remove the drain plug. Inspect grease drain and remove any blockage with a mechanical probe taking care not to damage bearing. **CAUTION:** Under no circumstances should a mechanical probe be used while the motor is in operation. Add new grease at the grease inlet, refer to Table 1 for replenishment quantities. New grease must be compatible with grease in the motor (See Caution Note). Run the motor for 15 to 30 minutes with the drain plug removed to allow purging of any excess grease. Shut off unit and replace the drain plug. Return motor to service. **CAUTION: Overgreasing can cause excessive bearing temperatures, premature lubricant breakdown and bearing failure. Care should be exercised against overgreasing.**

TABLE 1
Recommended Grease Replenishment Quantities & Intervals
(For Lubrication of Units in Service)

Bearing Number - Common		Bearing Number - AFBMAX		Grease Fl. Oz.	Lubrication Interval		
62XX	63XX	XXBC02	XXBC03		3600 RPM	1800 RPM	1200 RPM
6203 - 6207	6303 - 6306	17 - 35	17 - 30	0.2	2 years	3 years	3 years
6208 - 6212	6307 - 6309	40 - 60	35 - 45	0.4	1 year	2 years	2 years
6213 - 6215	6310 - 6311	65 - 75	50 - 55	0.6	1 year	2 years	2 years
6216 - 6220	6312 - 6315	80 - 100	60 - 75	1.0	6 months	1 year	2 years
6221 - 6228	6316 - 6320	105 - 140	80 - 100	1.8	6 months	1 year	1 year

For motors mounted vertically or in hostile environments, reduce intervals shown by 50 percent.

Refer to motor nameplate for bearings provided on a specific motor. For bearings not listed in the table above, the amount of grease required may be calculated by the formula:

$$G = 0.11 \times D \times B$$

where: G = Qty of grease in fluid ounces; D = Outside diameter of bearing (inches); B = Width of bearing (inches)

TABLE 2
Recommended Greases

THE FOLLOWING GREASES ARE INTERCHANGEABLE WITH THE GREASE AS PROVIDED IN UNITS SUPPLIED FROM FACTORY (unless stated otherwise on a lubrication nameplate provided on motor).

Manufacturer	Grease (NLGI No. 2)
Exxon Mobil	Polyrex EM
Chevron USA Inc.	SRI No. 2

CAUTION: Greases of different bases (lithium, polyurea, clay, etc.) may not be compatible when mixed. Mixing such greases can result in reduced lubricant life and premature bearing failure. When necessary, prevent such intermixing by disassembling the motor, removing all old grease from bearings and housings (including all grease fill and drain holes). Inspect and replace damaged bearings. Fill bearing housings and bearings approximately 30% full of new grease. Remove any excess grease extending beyond the edges of the bearing races and retainers. Refer to Table 2 for recommended greases.

RENEWAL PARTS & WARRANTY SERVICE

When inquiring for renewal parts, call the U.S. Electrical Motors **Parts Department** (Memphis, Tennessee) or a Parts Stocking Distributor. For warranty service call the nearest U.S. Motors Authorized Service Station. Give them complete nameplate data including ID number, etc. Request installation & maintenance manuals by product name.

REGIONAL OFFICES

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(888) 637-7333
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