BALDOR • RELIANCE

Inverter Duty AC Motors

5200 Frames Vertical Footless Mounting
Water Cooled Increased Safety
ATEX Category 2G, Exe Gas Group IIC T3
Temperature Code Motor

04/16 Installation & Operating Manual MN441

Any trademarks used in this manual are the property of their respective owners.

Table of Contents

Section 1
General Information 1–1
Overview 1–1
Safety Notice 1–1
Receiving 1–2
Handling. 1–2
Storage 1–2
Removal From Storage 1–3
Section 2
Installation & Operation 2-1
Overview 2-1
Location 2-1
Pre Installation Checks 2-1
Vertical Mounted Motor 2-1
Lubrication 2-2
Electrical Connection. 2-2
Grounding 2-2
Pre–Operation Check 2-3
First Time Uncoupled Start–Up. 2-4
Coupled Start–up 2-4
Jogging and Repeated Starts 2-4
Section 3
Maintenance 3-1
Maintenance General 3-1
Periodic Maintenance 3-1
Bearing Lubrication 3-1
Renewal Parts 3-2
Troubleshooting Guide. 3-3
Section 4
Accessories 4-1
Appendix A
AC Motor Performance A-1

Section 1

General Information

Overview This manual contains general procedures that apply to Baldor Motor products. Be sure to read and understand the Safety Notice statements in this manual. For your protection, do not install, operate or attempt to perform maintenance procedures until you understand the Warning and Caution statements.
A Warning statement indicates a possible unsafe condition that can cause harm to personnel.
A Caution statement indicates a condition that can cause damage to equipment.
Baldor Electric motors are sold to OEM (Original Equipment Manufacturers) companies who provide motors and equipment containing these motors as their product offerings. Be sure to consult the OEM documents for safety and regulatory information that is important to the application of these products.

Important: This instruction manual is not intended to include a comprehensive listing of all details for all procedures required for installation, operation and maintenance. This manual describes general guidelines that apply to most of the motor products shipped by Baldor Electric Company. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact Baldor Electric Company for more information or clarification.
Before you install, operate or perform maintenance, become familiar with the following:

- IEC 34–1 Electrical and IEC72–1 Mechanical specifications.

Safety Notice: This equipment contains high voltage! Electrical shock can cause serious or fatal injury.
Only qualified personnel should attempt installation, operation and maintenance of electrical equipment.

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

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

WARNING: **Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury.**

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

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

WARNING: **Guards must be installed for rotating parts to prevent accidental contact by personnel. Accidental contact with body parts or clothing can cause serious or fatal injury.**

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

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

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

WARNING: **Use proper care and procedures that are safe during handling, lifting, installing, operating and maintaining operations. Improper methods may cause muscle strain or other harm.**

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

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

WARNING: **Adjustable speed controls may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify the controller is incapable of delivering hazardous voltages and that the voltage at the motor leads is zero before proceeding. Failure to observe this precaution may result is severe bodily injury or death.**

WARNING: **Thermostat contacts automatically reset when the motor has slightly cooled down. To prevent injury or damage, the control circuit should be designed so that automatic starting of the motor is not possible when the thermostat resets.**

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

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

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

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

Caution: **Do not use the coupling to compensate for poor alignment. This can result in vibration, noise, coupling wear, overloaded bearings and early failure.**

Safety Notice Continued

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

Caution: **If a Motor Insulation test (High Potential Insulation test) must be performed, disconnect the motor from any Speed Control or drive to avoid damage to connected equipment.**

If you have any questions or are uncertain about any statement or procedure, or if you require additional information please contact your OEM.

Receiving

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

1. Observe the condition of the shipping container and report any damage immediately to the commercial carrier that delivered your motor.
2. Verify that the part number of the motor you received is the same as the part number listed on your purchase order.

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

Handling

The motor should be lifted using the lifting lugs or eye bolts provided.

1. Use the lugs or eye bolts provided to lift the motor. Never attempt to lift the motor and additional equipment connected to the motor by this method. The lugs or eye bolts provided are designed to lift only the motor. Never lift the motor by the motor shaft or hood.
2. If the motor must be mounted to a plate with the driven equipment such as pump, compressor etc., it may not be possible to lift the motor alone. For this case, the assembly should be lifted by a sling around the mounting base. The entire assembly can be lifted as an assembly for installation. If the load is unbalanced (as with couplings or additional attachments) additional slings or other means must be used to prevent tipping. In any event, the load must be secure before lifting.

Storage

Storage requirements for motors and generators that will not be placed in service for at least six months from date of shipment.
Improper motor storage will result in seriously reduced reliability and failure. An electric motor that does not experience regular usage while being exposed to normally humid atmospheric conditions is likely to develop rust in the bearings or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.
A wooden crate “shell” should be constructed to secure the motor during storage. This is similar to an export box but the sides & top must be secured to the wooden base with lag bolts (not nailed as export boxes are) to allow opening and closing many times without damage to the “shell”.
Minimum resistance of motor winding insulation is 5 Meg ohms or the calculated minimum, which ever is greater. Minimum resistance is calculated as follows: **Rm = kV + 1**

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

Example: For a 480VAC rated motor Rm =1.48 Meg–ohms (use 5 MΩ).
For a 4160VAC rated motor Rm = 5.16 Meg–ohms.

Preparation for Storage

1. Some motors have a shipping brace attached to the shaft to prevent damage during transportation. The shipping brace, if provided, must be removed and stored for future use. The brace must be reinstalled to hold the shaft firmly in place against the bearing before the motor is moved.
2. Store in a clean, dry, protected warehouse where control is maintained as follows:
   a. Shock or vibration must not exceed 2 mils maximum at 60 hertz, to prevent the bearings from brinelling. If shock or vibration exceeds this limit vibration isolation pads must be used.
   b. Storage temperatures of 10 °C (50 °F) to 49 °C (120 °F) must be maintained.
   c. Relative humidity must not exceed 60%.
   d. Motor space heaters (when present) are to be connected and energized whenever there is a possibility that the storage ambient conditions will reach the dew point. Space heaters are optional.
   Note: Remove motor from containers when heaters are energized, reprotect if necessary.
3. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
   a. If motor insulation resistance decreases below the minimum resistance, contact your OEM.
   b. Place new desiccant inside the vapor bag and re–seal by taping it closed.
   c. If a zipper–closing type bag is used instead of the heat–sealed type bag, zip the bag closed instead of taping it. Be sure to place new desiccant inside bag after each monthly inspection.
   d. Place the shell over the motor and secure with lag bolts.
4. Where motors are mounted to machinery, the mounting must be such that the drains and breathers are fully operable and are at the lowest point of the motor. Vertical motors must be stored in the vertical position. Storage environment must be maintained as stated in step 2.
5. 5200 motors with anti–friction bearings are greased at the factory. During storage, motor shafts are to be rotated manually every 30 days and greased every 6 months in accordance with the Maintenance section of this manual.
6. Coat all external machined surfaces with a rust preventing material. An acceptable product for this purpose is Exxon Rust Ban # 392.

Removal From Storage

1. Remove all packing material.
2. Measure and record the electrical resistance of the winding insulation resistance meter at the time of removal from storage. The insulation resistance must not be less than 50% from the initial reading recorded when the motor was placed into storage. A decrease in resistance indicates moisture in the windings and necessitates electrical or mechanical drying before the motor can be placed into service. If resistance is low, contact your OEM.
3. Regrease the bearings as instructed in Section 3 of this manual.
4. Reinstall the original shipping brace if motor is to be moved. This will hold the shaft firmly against the bearing and prevent damage during movement.

EX Equipment Marking and Acceptance Instructions

ATEX:

If the motor is marked as shown in Figure 1-1, it is designed to comply with all European Directives in effect at the time of manufacture, including ATEX Directive 94/9/EC. It is assumed that the installation of these motors by the OE Machinery manufacturer complies with this Directive and the standard
EN 60204--1: Safety of Machinery -- Electrical Equipment of Machines.

Any repairs by the end user, unless expressly approved by Baldor•Reliance, release Baldor•Reliance from responsibility to conformity. Authorized and qualified personnel only must perform repairs. These motors are designed in accordance with appropriate governmental regulatory agencies. They meet the technical requirements of the appropriate agencies at completion of manufacturing and have been issued approval numbers and nameplates. Any changes to these motors, may void these approvals and render these motors non--conforming and dangerous for use.
These motors are suitable for the ATEX Group and Category marked on the equipment nameplate. These motors are designed for normal mining applications and are in compliance with the above safety directives when operated within the parameters identified on the motor nameplate.
Specific motor type, frame designation, model number, date code, electrical specifications, and serial number are marked on a separate nameplate.
Special Conditions are indicated on the motor nameplate as a suffix “X” on the certificate number.
Details of this condition can be found on the motor approval certificate.

IEC, IECEx, ATEX CERTIFICATION:

If the motors are marked as Indicated below, the motors are certified to IEC60079--0 and EX/IEC60079--7 standard series. It is assumed that the installation of these motors by the OE Machinery manufacturer will be carried out in accordance with any national requirements for the intended market. Any Repairs by the end user, unless expressly approved by Baldor•Reliance, release Baldor•Reliance from responsibility to conformity. Authorized and qualified personnel only must perform repairs.
These motors are designed in accordance with appropriate governmental regulatory agencies. They meet the technical requirements of the appropriate agencies at completion of manufacturing and have been issued approval numbers and nameplates. Any changes to these motors, without the consent of Baldor•Reliance and the regulatory agencies may void these approvals and render these motors non--conforming and dangerous for use.
These motors are suitable for Group IIC with a maximum surface temperature of 200° C (T3 temperature code).
Specific motor type, frame designation, model number, date code electrical specifications, and serial number are marked on a separate nameplate. The certificate number provides additional information for example certificate numbers such as IECEx are in the form “IECExCCC. YY.nnnnX”, where CCC is the Certification Body, YY the year the certificate is issued, nnnn the certificate number and “X” is present if there are special conditions. Refer to the certificate for details on marking code and conditions of certification.

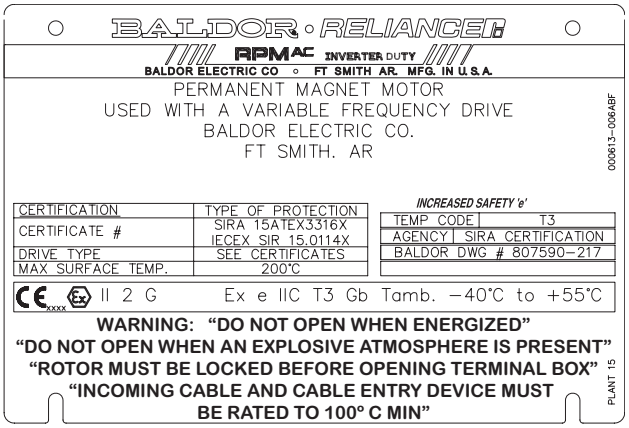
Specific Conditions of Use:

Conditions common to “Ex e” Certificates
If the motor certificate number is followed by the symbol “X”, this indicates that the motor has specific conditions of use which are indicated on the certificate. It is necessary to review the product certification certificate in conjunction with this instruction manual.

1. The motor cooling arrangement shall be supplied continuously water at a flow rate of 22 GPM at a maximum inlet temperature of 50°C.
2. The RPM-AC IPM WC5233 Permanent Magnet Motor is equipped with RTDs and these devices shall be connected to a control circuit that removes power from the motor at a Trip level of 190°C. These RTDs shall be connected to a control circuit that falls within the scope of a safety, controlling, and regulating device.
3. The installer shall ensure that the cable entries are suitably certified and dimensioned cable entry devices and maintain the type of protection afforded to the motor. All unused entries must be fitted with an appropriate blanking element.
4. The anti-condensation heater shall not be energized when the motor is running or when the internal ambient temperature of the motor >40°C.
5. The anti-condensation heater must be operated in accordance with its installation, operating and maintenance instructions.
6. Terminal combs shall not be used for linking terminals on the auxiliary terminal strips.
7. The auxiliary terminals shall only be wired with cable in an ambient temperature of -10°C to +80°C.

8. Not more than one single or multiple strand lead shall be connected into either side of any auxiliary terminal, unless multiple conductors have been joined in a suitable manner, e.g. two conductors into a single insulated crimped boot lace ferrule.
9. Leads connected to the auxiliary terminals shall be insulated for the appropriate voltage and this insulation shall extend to within 1 mm of the metal of the terminal throat.
10. All auxiliary terminal screws, used and unused, shall be tightened down to between 0.5 Nm and 0.7 Nm.

Figure 1-1 Typical AC Hazardous Duty Motor Markings



11. The motor shall only be used with the following variable speed drives.

Table 1-1 Variable Speed Drive Models

Manufacturer	Model Number
ABB	ACS800-104-0580-7 ACS880-07-2300A-7 ACS880-104-0530A-7 ACS880-104-0600A-7
Siemens	S120

Acceptance Inspection

All motors should be inspected for damage prior to connecting the motor to an electrical supply. All covers should be in place and access cover bolts torqued to their proper levels. On motors received with the shaft blocked by the factory, remove blocking before operating the motor. If motor is to be reshipped, alone or installed to another piece of equipment, the shaft must again be blocked against axial movement to prevent brinelling of the bearings during shipment.

EMC Compliance Statement for European Union

The motors described in this instruction manual are designed to comply 2004/108/EC . These motors are commercial in design and not intended for residential use. When used with converters, please consult converter manufacturers literature regarding recommendations on cable types, cable shielding, cable shielding termination, connection recommendations and any filters which may be recommended for EMC compliance. For additional information, consult Baldor MN1383.

Section 2

Installation & Operation

Overview

Before installing the motor, be sure you read Section 1 and become familiar with the Warnings and Cautions to prevent damage to the motor and prevent injury to personnel. This is extremely important for a good installation and to ensure trouble free operation.

Installation should conform to the National Electrical Code as well as local codes and practices. When other devices are coupled to the motor shaft, be sure to install protective devices to prevent future accidents. Some protective devices include, coupling, belt guard, chain guard, shaft covers etc. These protect against accidental contact with moving parts. Machinery that is accessible to personnel should provide further protection in the form of guard rails, screening, warning signs etc.

1. If the motor has been in storage for an extended period or had been subjected to adverse moisture conditions, check the insulation resistance of the stator winding (see Checking Insulation Resistance in section 3).
2. Examine the motor nameplate data to make sure it agrees with the power circuit to which it will be connected. The motor is guaranteed to operate successfully at line frequency not more than 5%, and line voltage not more than 10%, above or below the nameplate ratings, or a combined variation of voltage and frequency of not more than 10% above or below nameplate ratings. Efficiency, power factor and current may vary from nameplate data.
3. Check to make sure that direction of motor rotation is correct for the intended application.

Location

It is important that motors be installed in locations that are compatible with motor enclosure and ambient conditions. Improper selection of the motor enclosure and ambient conditions can lead to reduced operating life of the motor. The motor must be located in an environment that satisfies local codes and National Board of Fire and Underwriter's regulations. For locations outside the USA., compliance with IEC requirements and other regulatory agencies are required. The following additional considerations should also govern its location:

For open and protected motors the installation should be in a location that provides adequate space for air circulation of the external cooling fan. Exposure to high ambient temperatures, humidity and atmospheric contamination should be avoided. Acids, alkalis and gases also have detrimental effects on electrical machinery. The location of installation should be accessible for routine maintenance and inspection.

If the room is not large enough to have natural ventilation, some external source of forced and filtered air will be necessary. The room should be such that the heat developed during operation can escape and will not be recirculated over the equipment.

Permanent handling equipment to facilitate major service and repair without complete disassembly of the individual units should be considered.

If the motor must be moved or additional handling or shipment of motor be required, be certain to block the shaft as it was blocked for shipment by the factory. Blocking the shaft, limits the rotor movement both axially and radially which prevents damage to the bearings.

Pre Installation Checks

The assurance of successful start–up depends upon the use of good handling, inspection, and installation practices.

Before shipment, every motor is given a running test to check operation. Although complete factory tests have been made, motors should be checked for any change resulting from improper handling during shipment, storage, installation or by an unsatisfactory foundation. Failure to check or do the necessary work as mentioned above, could cause misalignment resulting in vibration and premature bearing failure.

Before the motor is checked for alignment, remove all shipping blocks and supports installed at the factory. The shaft should turn over freely. The degree of accuracy required in the alignment depends on the rated speed of the machine. The greater the speed, the greater the care and accuracy necessary in the alignment. The motor must be level to maintain the proper oil level. Check the driven equipment to make sure that the motor will be coupled to a level shaft. If necessary, level it up before coupling.

Caution: **Do not use the coupling to compensate for poor alignment. This can result in vibration, noise, coupling wear, overloaded bearings and early failure.**

Vertical Mounted Motor

These procedures are for Vertical mounting of motors only.

1. Carefully lower the motor on to the pump flange. Position the motor to obtain the best possible alignment.
2. Motors are shipped with shaft extensions protected with a coating of slushing compound. This compound should be removed by washing with a petroleum solvent such as Stoddard Solvent or similar solvents available under various trade names.
3. After the motor is properly positioned for axial end play – and with the hold down bolts snug but not tightened up – the motor must be checked for angular misalignment. The coupling hub should be mounted by customer, but the coupling should not be engaged.
4. Clamp a dial indicator to the motor coupling hub, placing the probe against the end of the connecting shaft. Mark the shaft at the point where the probe touches it, and turn both shafts, taking care to keep the probe on the reference mark.
5. Note the dial indicator reading at 0 deg (starting point), 90 deg, 180 deg and 270 deg. Total angular misalignment must not exceed .3 mil (0.0003") per inch of coupling hub radius Maximum Permissible Angular Misalignment = (Coupling Hub Radius) X (.0003)
6. Next, check for excessive shaft run out by using the accurately ground or machined diameter provided on most coupling hubs. Set up dial indicator with the probe on the machined diameter. Mark the shaft at the point where the probe touches it and turn both shafts taking care to keep the probe on the reference mark.

7. Note the dial indicator reading at 0 deg (starting point), 90 deg, 180 deg, and 270 deg. Maximum permissible run out between the two coupling hubs is 0.002”.
8. Tighten the motor and driven equipment hold–down bolts, and recheck alignment. If within limits, assemble the coupling and lubricate with the manufacturer’s recommended lubricant.
9. After alignment, insert the dowel pins through the motor base into the pump flange to maintain the position of the motor.

Lubrication The lubrication system should be checked in preparation for rotating the shaft during the alignment operation.

Anti Friction Bearings (Grease Lubricated)

Bearing chambers are packed with grease during assembly, and do not normally need additional grease at time of installation, unless the unit has been in storage and installation for 6 months or longer. Lubricant must be added per Section 3, Maintenance.

Electrical Connection

WARNING: **Adjustable speed controls may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify the controller is incapable of delivering hazardous voltages and that the voltage at the motor leads is zero before proceeding. Failure to observe this precaution may result is severe bodily injury or death.**

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

Note: Conductors entering main power junction box must have a minimum of 100 °C cable jacket insulation rating.

Use only a shielded motor power cable with complete circumferential braided or copper film / tape ground jacket around the power leads. This ground should be secured to the motor frame from within the motor terminal box and must return without interruption to the drive ground. In addition, if the motor and coupled equipment ground are not on a single common metal base plate, it is important to equalize the equipment ground potentials by bonding the motor frame to the coupled equipment using a high frequency conductor such as a braided strap.

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

A conduit box may be provided for the power lines to the stator and other conduit boxes for all other electrical connections. Tapped holes are provided for grounding.

Grounding

WARNING: **Failure to properly ground the motor may cause electrical shock hazard to personnel. Do not attach ground lead to motor mounting bolt.**

All large motors should be grounded with the grounding conductor equipped with a brazed copper terminal, or with a suitable solderless terminal fastened to the motor. Soldered terminals should not be used. A washer should be used between bolt head and terminal lug. The other end should be fastened with suitable clamps or terminals to rigid metallic conduit or to the nearest available ground.

Ground conductor size should be in accordance with the National Electrical Code Table 250–95 or Table 16 Part 1 of Canadian Electrical Code. (Table 2–1 in this section).

Attachment to the motor should not be made under a flange mounting bolt.

Be sure that the motor leads are connected as shown on the connection nameplate (when supplied on the motor) and that the power supply corresponds with the motor nameplate data (voltage, frequency and number of phases). The motor will operate, but with modified characteristics when the line voltage is within plus or minus 10%; the frequency within plus or minus 5% of the nameplate value; or combination of voltage and frequency within +10% of nameplate.

Table 2-1 Size of Equipment Ground Conductor

Rating or Setting of Automatic Overcurrent Device in Circuit Ahead of Equipment, Conduit, etc., Not Exceeding (Amperes)	Size	
	Copper Wire No.	Aluminum or Copper Clad Aluminum Wire No.*
15	14	12
20	12	10
30	10	8
40	10	8
60	10	8
100	8	6
200	6	4
300	4	2
400	3	1
500	2	1/0
600	1	2/0
800	0	3/0
1000	2/0	4/0
1200	3/0	250MCM
1600	4/0	350MCM
2000	250MCM	400MCM
2500	350MCM	600MCM
3000	400MCM	600MCM
4000	500MCM	800MCM
5000	700MCM	1200MCM
6000	800MCM	1200MCM

* See installation restrictions in NEC Section 250–92(a).

WARNING: **This equipment is at line voltage when AC power is connected. Disconnect and lockout all ungrounded conductors of the ac power line before proceeding. Failure to observe these precautions could result in severe bodily injury or loss of life.**

Pre–Operation Check

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

1. Verify that Hold Down bolts are tightened to the proper torque.
2. If the motor has been idle for a long period of time after installation, check insulation resistance.
3. Check the incoming power to be sure that line voltage, frequency and phase are correct for the motor (refer to the motor nameplate).
4. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
5. Be sure all shipping materials and braces (if used) are removed from motor shaft.
6. Ensure alignment is correct and motor is properly lubricated.
7. Manually rotate the motor shaft to ensure that it rotates freely.

Caution: **When driven equipment may be damaged by incorrect rotation direction, uncouple the motor from the load and check motor rotation direction during initial start and be sure rotation is correct.**

8. When the driven machine is likely to be damaged by the wrong direction of rotation, it is best to uncouple the motor from its load during the check for rotation and/or during the initial start.
   Some motors are designed for a single direction of rotation as indicated by nameplates. Running those units in the wrong direction will reduce airflow causing overheating. Check to see that both the motor and driven equipment are operating in the correct direction of rotation. If it is necessary to change rotation, disconnect and lockout all input power and interchange any two input power phases.
9. Replace all panels and covers.
10. Check to see that coupling guards and other protective enclosures are not blocking the ventilating air into the motor and exhaust openings.

First Time Uncoupled Start–Up

Read each of the steps in the following procedure over thoroughly, so that each is fully understood, before attempting to start the motor.

1. Make the initial start by following the regular sequence of starting operations in the control instructions. The coupling should be uncoupled and a solo plate should be installed if required.
2. After starting, check that the motor is running smoothly. If the motor has excessive vibration, shut down immediately and investigate. Check for coupling and key unbalance, rusty bearing, lack of lubrication, foot planarity, structural resonance (see Table 2–2).
3. Check bearing temperatures frequently. At initial start, the bearing temperature rate of rise will be high. This rate of rise should decrease within 60 minutes. If this rate of rise does not decrease or the temperature exceeds 120 °C, stop the motor (see Table 2–3).
4. Ensure that the protective controls are functioning properly before any prolonged operation.
5. Run the motor for at least two hours.

Coupled Start–up

This procedure assumes a coupled start up. Also, that the first time start up procedure was successful. Read and fully understand each of the steps in the following procedure before attempting to start the motor.

1. Disconnect and lockout the power source. Ensure no power is applied to the motor.
2. After a successful uncoupled start, assemble the coupling and lubricate with the manufacturer's recommended lubricant. Check to see that the coupling is not binding.
3. Verify the motor shaft is on its magnetic center.
4. Verify coupling axial movement is within the bearing float limit.
5. Check to see that coupling guards and other protective enclosures are not blocking the ventilating air over the motor and exhaust openings.
6. Try no load coupled start–up, repeating steps 1 to 5 of the "First Time Uncoupled Start–up" procedure.
7. Verify the driven equipment is not transmitting vibration back to the motor through the coupling or base.
8. Inspect the motor carefully. Make the initial start by following the regular sequence of starting operations in the control instructions.
9. After starting, check that the motor is running smoothly. If the motor shows excessive vibration, shut down immediately and investigate. Check for coupling and key unbalance, lack of lubrication, foot planarity and structural resonance.
10. Check vibration at the bearing housing. Motor vibration must not exceed the limits given in Table 2–2. Vibration severity and conversion of the above limits to velocity or acceleration can be determined by using the vibration nomograph in Figure 2-2. Nomograph shows accepted industry vibration levels.
11. Verify all panels and covers are securely in place.
12. Verify that coupling guards are properly installed and protective enclosures are not blocking the ventilating air into the motor and exhaust openings.

Jogging and Repeated Starts

Caution: **Repeated starts and/or jogs can greatly reduce the life of an induction motor.**

Repeated starts and/or jogs can greatly reduce the life of an induction motor. If it is necessary to repeatedly start or jog a motor, check the application with Baldor Electric.

At ambient temperature, the motor is normally capable of making two starts in succession and coasting to rest between starts.

The motor is also capable of making one start at its rated load operation temperature. For cooling time required before additional starts can be made consult Baldor Electric or the motor starting nameplate if one is provided.

If more starts than defined above are attempted in shorter period of time, severe damage to the motor electrical windings and rotor may result.

The starting conditions listed above apply only if the inertia of the connected load, the load torque during acceleration, the applied voltage, and the starting method are those for which the motor was designed.

For starting situations not covered here, consult Baldor Electric before proceeding.

Refer also to the motor nameplate which may list starting conditions.

Table 2-2 Maximum Vibration Limits

Condition	Amplitude on Bracket (in / second)
Warning	0.2
Shutdown	0.3

Figure 2-1 Vibration Nomograph

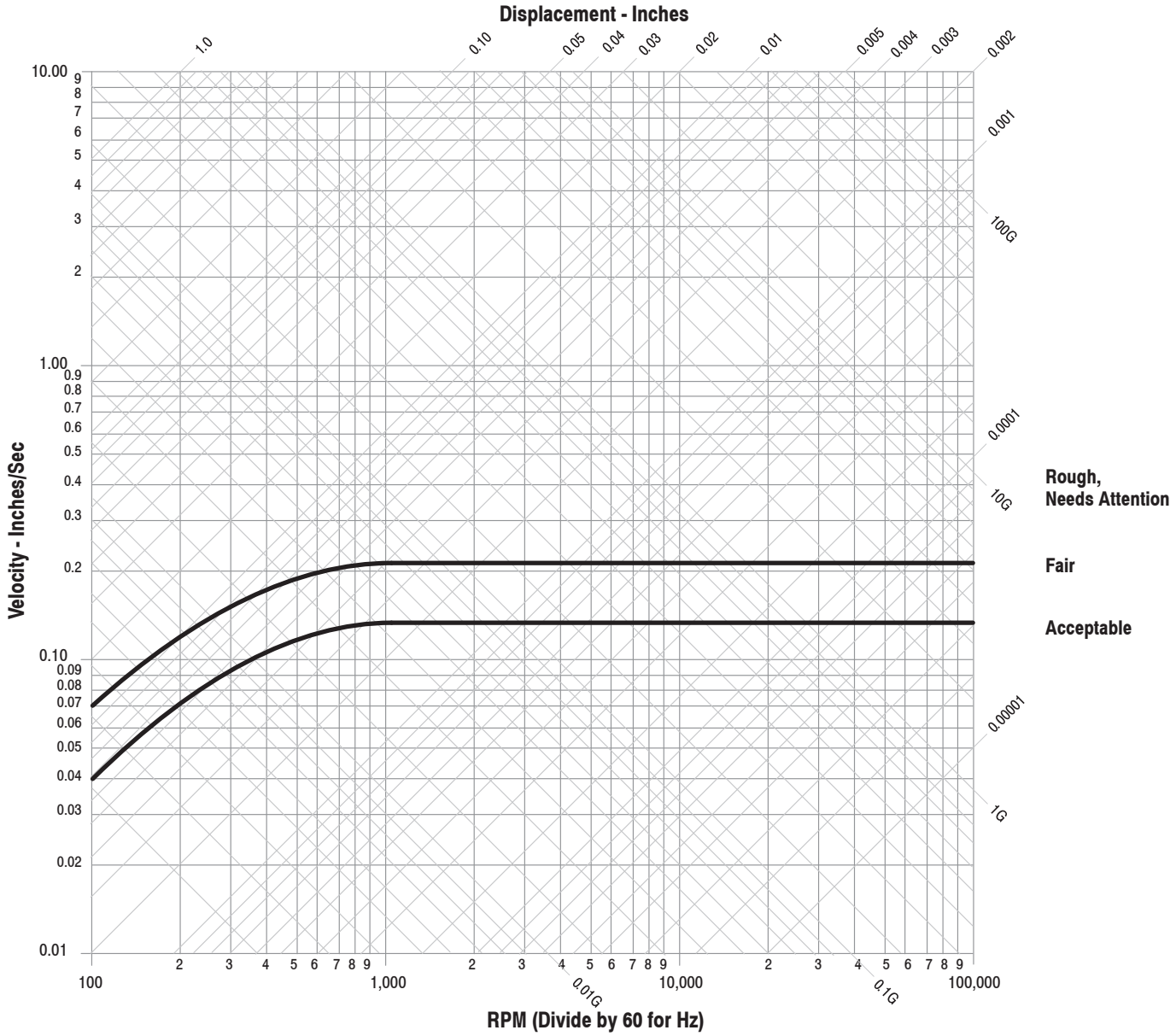


Table 2-3 Maximum Temperature Limits

Condition	Bearing RTD (°C)	Winding RTD (°C)
Warning	110	180
Shutdown	120	190

Section 3

Maintenance & Troubleshooting - Vertical Shaft

WARNING: **High Voltage may be present even when the machine is not rotating. Ensure that power has been disconnected before touching the motor or any of its components. Electrical shock can cause serious or fatal injury.**

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

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

WARNING: **Solvents can be toxic and/or flammable. Follow manufacturer's safety procedures and directions. Failure to observe this precaution could result in bodily injury.**

Caution: **Do not use solvents containing trichloroethane to clean interior or exterior of motor. Damage may occur to paint and insulation systems.**

Maintenance General

Prior to maintenance, the motor should be removed from service.
The motor should be inspected periodically for the build up of foreign material.
Any build-up of foreign material should be removed prior to energizing the motor.
If unusual bearing noise or vibration is experienced, the bearings should be replaced.
Inspections which are important to the proper motor operation and maintenance. Maintenance should be performed every 3 months or 500 operating hours, whichever comes first.
In addition, the following should always be observed.

Provide adequate ventilation
Avoid sharp blows and excessive axial thrust loads on the output shaft.
Maintain proper lubricant level.

When properly applied, 5200 Frame motors require minimal routine maintenance. Since clearances and fits are precisely machined, no periodic mechanical adjustments are required. Like any precision machine, periodic inspection and simple routine maintenance will prolong your motor's life and help detect potentially damaging conditions.
The minimal time spent performing simple maintenance cannot begin to compare with the cost of lost productivity and time consuming major repairs incurred through neglect or routine inspection and maintenance.

Periodic Mantenance

Every 3 months or 500 operating hours, whichever comes first:

1. Listen for any abnormal noises and check cause immediately.
2. Check for excessive vibration.
3. Check to see that all covers are in place and secure.
4. Check for proper lubrication.
5. Check bearing temperature rise.
6. Check voltage and frequency variations. Unbalanced voltage or single-phase operation of polyphase motors will cause excessive heating and ultimately failure. Even a slight unbalance of voltage applied to a polyphase motor will cause large unbalance currents and result in over-heating.
7. Check power supply total harmonic distortion to avoid overheating. Periodic checks of phase, voltage, frequency, and power consumption of an operating motor are recommended.

These checks can also provide an excellent indication of the load from the driven equipment.
Comparisons of this data with previous no load and full load power demands will give an indication of the performance of the driven machine.

Bearing Lubrication

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 areas of the motor prior to lubricating to prevent grease contamination.

Recommended Lubricant

Refer to motor nameplate for recommended lubricant. If none is shown, the recommended lubricant is Mobil Polyrex EM. The following is a list of alternate lubricants.
Operating TEMP. –25 °C (–15 °F) to 50 °C (120 °F)

Mobil POLYREX EM

Use only clean, fresh grease from clean containers.
Do not mix greases unless compatibility has been checked and verified.

Grease Lubrication Procedure

Anti-friction bearings may be lubricated stationary with the motor preferably warm.

1. Locate the grease inlet, remove all caked grease and dirt from the fitting. There is one grease inlet per bearing.
2. Add the recommended volume of the recommended lubricant per the motor Lubrication Nameplate using a hand operated grease gun.
3. Start the motor and run with the relief plug open for several minutes. Some grease should be purged from the grease drain pipe.

Renewal Parts

The high productivity expected in industry today demands a well planned maintenance program. The success of which often can depend on the number and type of spare parts on hand. Serious consideration should be given to having all vital replacement components on hand to protect the units against costly down time.
A detailed parts list, which gives Baldor Electric Company recommendations for spare parts that should be stocked for your motor, can be ordered.
Be sure to include complete nameplate data, purchase order number, serial number, model number, rating, etc., for your motor when ordering the spare parts list.
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.

Table 3-1 Troubleshooting Guide

Symptom	Possible Causes	Corrective Action
Motor will not start	Motor improperly connected Incorrect Line Voltage Overload relay tripped Fuses blown or defective Open circuit in stator or rotor Short circuit in stator Grounded Winding	Check motor connection and control connections Check nameplate for required voltage Correct and reset Replace fuses Check for open circuit Check for short circuit Check for ground
Motor noisy	Winding single phased Loose mounting Noisy bearing Coupling halves loose Vibration Uneven air gap	If winding is single phased, unit will not start. Stop unit and try to reset Check and correct Check and replace Inspect alignment and tighten Check alignment with driver connected Check feet planarity Correct balance of motor if necessary Check key unbalance on coupling. Check gap, correct problem.
Excessive Bearing Temperature (anti-friction bearing)	Inadequate lubrication Coupling misalignment Inadequate ventilation	Add lubricant per nameplate instructions Realign unit Clean filters, check to see if louvers are blocked
Excessive Bearing Temperature (sleeve bearing) (Vertical Shaft)	Excess lubricant Inadequate oil supply Excessive end thrust Contaminated oil Tight clearance Oil rings not functioning Bearing material torn Rough shaft or corrosion Bearing Misalignment Coupling misalignment Shaft current Oil level too high or low Insufficient water flow (cooling coil) Excessive water temperature to cooling coil	Clean grease reservoir & add correct lubricant volume Refer to nameplate requirements and correct Check for proper lubrication, oil level, leaks Check alignment and coupling float Drain and refill, change filters in flood lube system Inspect for source of contamination Check bearing bore and shaft O.D for proper clearance. Check for damage, check roundness and for burrs - repair or replace if necessary Dress, scrape and refit. Dress and polish shaft Realign bearing or reseat bearing Realign motor Insulate bearing and isolate shaft from ground Reduce or add to proper level (sight gauge) Increase water flow Decrease inlet water temperature
Excessive Temperature	Overload Restricted ventilation Electrical	Reduce load to nameplate rating or replace with larger unit Check openings and duct work for obstructions and correct Check for grounded or shorted coils and unbalanced voltages between phases
Oil Leak (sleeve bearing units)	Overfilled Seals not secured properly Pipe fittings loose Bearing air pressure equalizer vent clogged Wrong sealing compound on bearing cap surface	Drain to proper level or adjust oiler elevation Tighten Tighten or replace worn threaded parts Clear out passage Use Permatex Aviation type No. 3 or other non-hardening gasket sealer
Oil Leak (Flood Lubrication System)	To much oil flow in pressure lube system Air pressure unbalanced	Reduce flow to recommended level on nameplate Clean venting pipes
Excessive Vibration	Coupling misalignment Coupling , Coupling key or Rotor Unbalance Foundation resonance structure improper Worn bearing Coupled equipment Shaft Straightness	Realign to operating condition Rebalance Make adjustments to foundation Replace bearing if oversize Check motor vibration uncoupled, if necessary rebalance equipment Straighten without residual stress to avoid springback or replace shaft
Water in Sump oil (Vertical Shaft)	Cooling coil leak Water leak at dome cover or non-reverse ratchet	Test cooling coil & repair as required Replace dome gasket and or seal with silicone gasket sealer
Oil Leak or excess oil usage (Vertical Shaft)	High oil level Moisture in oil	Use non-foaming oil. Reduce or add to proper level (sight gauge) Clean & replace oil
Excess oil foaming (Vertical Shaft)	Improper oil High oil level Moisture in oil	Use non-foaming oil. Reduce or add to proper level (sight gauge) Clean & replace oil

The owner is responsible for conformance to national electric code and all other applicable local codes and practices. Refer to Safety Notice in Section 1 of this manual.

Note: Motor is equipped with the following accessories only if ordered with the motor.

Internal Motor Sensors

Winding Temperatures (two per phase) 100 ohm RTDs (6 total).
A working seventh spare RTD may also be installed on some units.
Bearing Temperatures (two per bearing) 100 ohm RTDs (4 total)

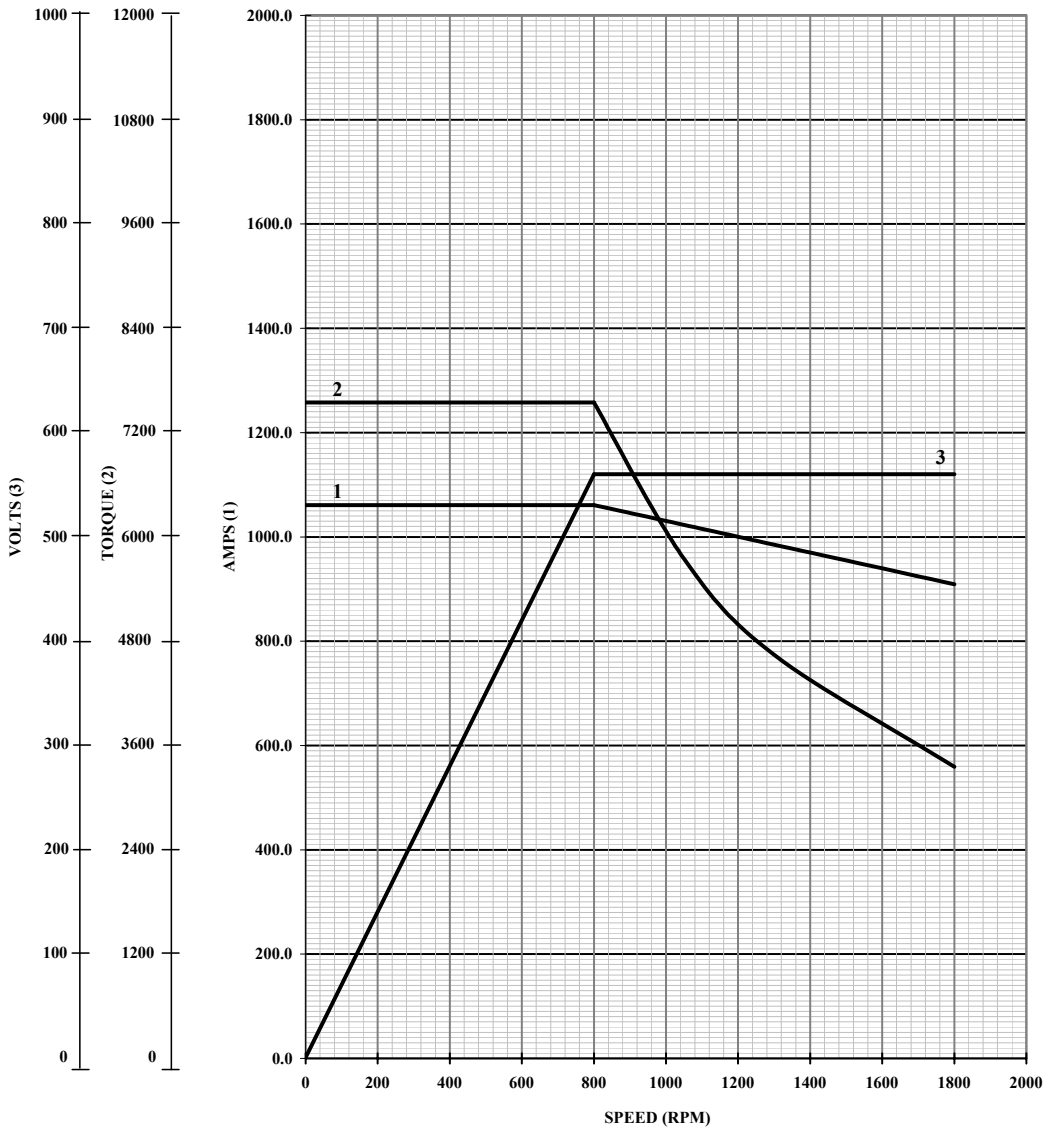
Basic Troubleshooting

RTDs

1. If values displayed are exceptionally high (greater than 185 °C winding or 145 °C bearing temperatures) a loose wire could be the culprit. All RTDs terminate on the terminal blocks within the auxiliary terminal box. Confirm placement and secure leads.
   No external surface temperature readings should ever exceed 200 °C or motor must be de-energized and allowed to cool. Confirm proper water flow is going through motor.
2. Disconnect RTD from the terminal block and check resistance with an ohmmeter. Values of the RTD should be less than 250 ohms. If resistance values show infinity then the RTD has failed or the wires between the element and terminals are broken. Replace wires or RTD if possible. If resistance values show close to zero or less than 100 ohms then check the leads you are measuring. Measure between the red and white leads (or black and white leads on water RTDs).
   Confirm that no external motor surface temperatures ever exceeds 200 °C.

AC Motor Performance

REL S.O.		HERTZ	80.0	AMB°C	-20-55°C Air / 50°C Coolant	CODE LETTER	N/A
FRAME	5233	RPM	800	INSUL	H	ENCLOSURE	TEWC
HP	1150	VOLTS	560	S.F.	1.00	STATOR RES.@25°C	0.00684
TYPE	IPM	AMPS	1061	NEMA DESIGN	--		OHMS (BETWEEN LINES)
PHASE	3	DUTY	CONT	ROTOR WK^2 (lb-ft^2)	680	TYPICAL DATA	



AMPERES SHOWN FOR **560** VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE VOLTAGE.

REVISION 9

BALDOR · DODGE · RELIANCE

DR. BY CD
CK. BY ---
APP. BY R. McElveen
DATE 5/5/2010

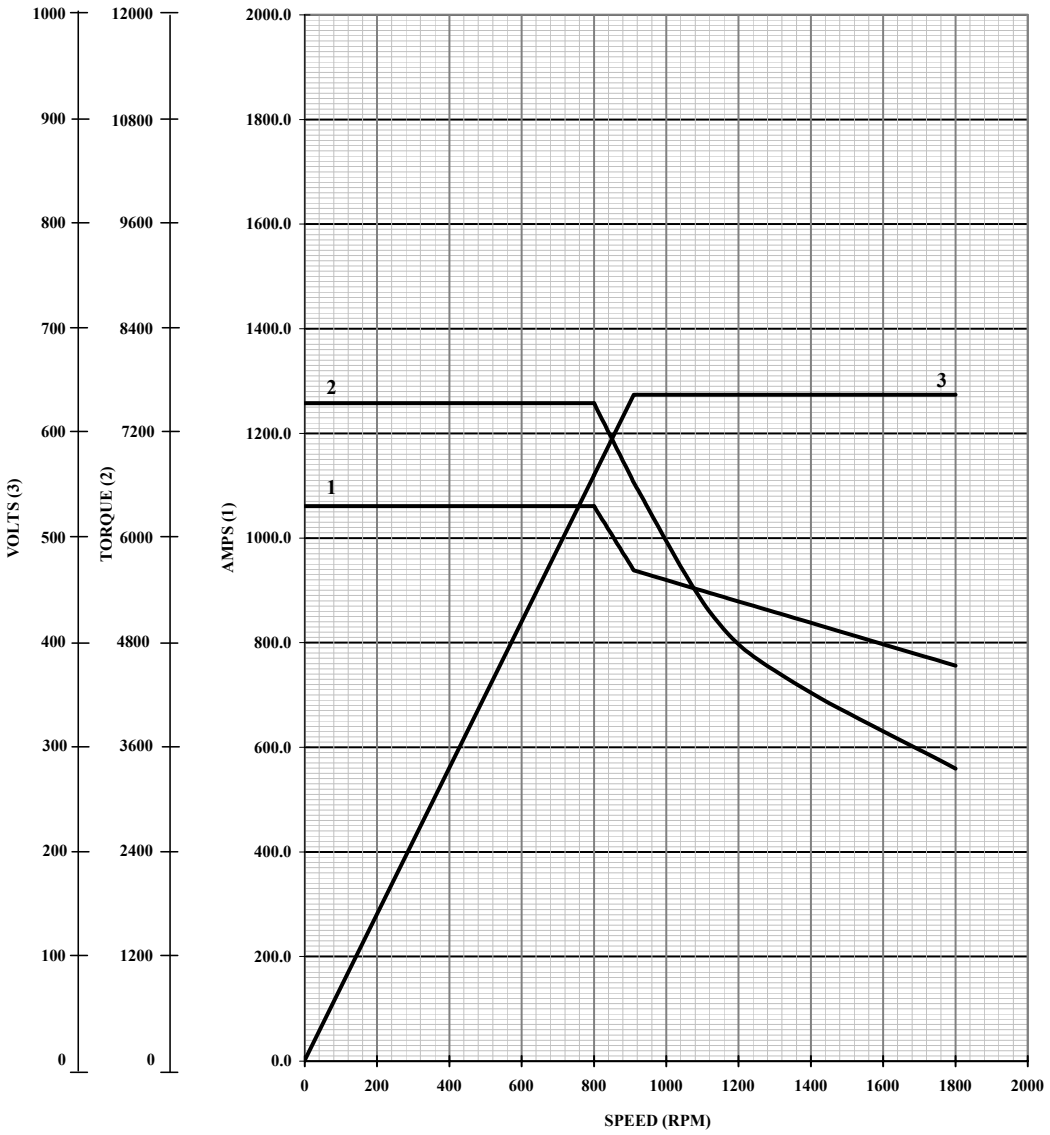
A-C MOTOR PERFORMANCE CURVES

PM4529A

SH 2 OF 4

ISSUE DATE: 5/5/2010

REL S.O.		HERTZ	80 / 91	AMB°C	-20-55°C Air / 50°C Coolant	CODE LETTER	N/A
FRAME	5233	RPM	800 / 910	INSUL	H	ENCLOSURE	TEWC
HP	1150	VOLTS	560 / 637	S.F.	1.00	STATOR RES.@25°C	0.00684
TYPE	IPM	AMPS	1061 / 938	NEMA DESIGN	--	OHMS (BETWEEN LINES)	
PHASE	3	DUTY	CONT	ROTOR WK^2 (lb-ft^2)	680	TYPICAL DATA	



AMPERES SHOWN FOR **637** VOLT CONNECTION, IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE VOLTAGE.

REVISION 9

BALDOR · DODGE · RELIANCE

DR. BY CD
CK. BY ---
APP. BY R. McElveen
DATE 5/5/2010

A-C MOTOR PERFORMANCE CURVES

PM4529A

SH 4 OF 4

ISSUE DATE: 5/5/2010

MN441-0116

BALDOR®

A MEMBER OF THE ABB GROUP

Baldor Electric Company
P.O. Box 2400, Fort Smith, AR 72902-2400 U.S.A., Ph: (1) 479.646.4711, Fax (1) 479.648.5792, International Fax (1) 479.648.5895
www.baldor.com

© Baldor Electric Company
All Rights Reserved. Printed in USA.
MN441
4/16 Printshop 50