MANUAL

Direct Drive Cooling Tower Motor Inverter Duty PM Motors

(FL210, FL250, FL280, FL320, FL360, FL400, FL440, and FL580)

(Specifically designed for operation with ACS880+N5350 Cooling Tower Drive)

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Section 1
General Information

Overview
This manual contains general procedures that apply to Baldor-Reliance 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-Reliance mining 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 ABB. If you have a question about a procedure or are uncertain about any detail, Do Not Proceed. Please contact your OEM for more information or clarification. Before you install, operate or perform maintenance, become familiar with the following:

- NEMA Publication MG-2, Safety Standard for Construction and guide for Selection, Installation and Use of Electric Motors and Generators
- IEC 60034–1 Electrical and IEC60072–1 Mechanical specifications
- NFPA 70® National Electrical Code (NEC) and local codes and practices.

Safety Notice
This equipment contains high voltage! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt installation, operation and maintenance of electrical equipment. Be sure that you are completely familiar with MSHA (Mine Safety and Health Administration), safety standards for selection, installation and use of electric motors and generators and local codes and practices. Unsafe installation or use can cause conditions that lead to serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

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

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

WARNING
The Adjustable Speed Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that 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 in 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.

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

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.

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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
Mechanically lock or tie down the fan to prevent rotation as voltage will be produced even when the PM motor is totally disconnected from the power source.

WARNING
Incorrect motor rotation direction can cause serious or fatal injury or equipment damage. Be sure to verify motor rotation direction before coupling the load to the motor shaft.

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

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

WARNING
RPM AC permanent magnet motors can induce voltage and current in the motor leads by rotating the motor shaft. Electrical shock can cause serious or fatal injury. Therefore, do not couple the load to the motor shaft until all motor connections have been made. During any maintenance inspections, be sure the motor shaft will not rotate.

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

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

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

Caution
Use only a shielded motor power cable with a 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 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.

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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
Do not lift the motor by the shaft. The motor is designed to drive a load but it is not intended to have lifting forces and stresses applied to the motor shaft. Damage to the motor may result.

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

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

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

Caution
Do not use an induction oven to heat noise tested bearings. Arcing between the balls and races may damage the bearing. Failure to observe this precaution may result in equipment damage.

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

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

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

Handling
The motor should be 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 the hood of a WPII motor. 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. Excessive lifting angles can cause motor damage.
2. To avoid condensation inside the motor, do not unpack until the motor has reached room temperature. (Room temperature is the temperature of the room in which it will be installed). The packing provides insulation from temperature changes during transportation.

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.

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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.
   e. Measure and record the resistance of the winding insulation (dielectric withstand) every 30 days of storage.
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. Motors with anti-friction bearings are to be greased at the time of going into extended storage with periodic service as follows:
   a. Motors marked “Do Not Lubricate” on the nameplate do not need to be greased before or during storage.
   b. Ball and roller bearing (anti-friction) motor shafts are to be rotated manually every 3 months and greased every 6 months in accordance with the Maintenance section of this manual
6. All breather drains are to be fully operable while in storage (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 and draining at points other than through the bearings around the shaft.
   Vertical motors should be stored in a safe stable vertical position.
7. Coat all external machined surfaces with a rust preventing material. An acceptable product for this purpose is Exxon Rust Ban # 392.

Non-Regreaseable Motors

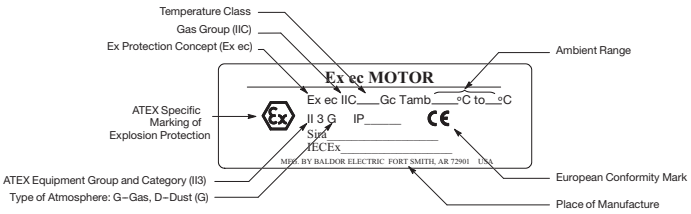
Non-regreaseable motors with “Do Not Lubricate” on the nameplate should have the motor shaft rotated 15 times to redistribute the grease within the bearing every 3 months or more often.

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.

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Equipment Marking for IEC Certified Product
IEC certified products have special markings that identify the protection concept and environment requirements. An example is shown in Figure 1-1.



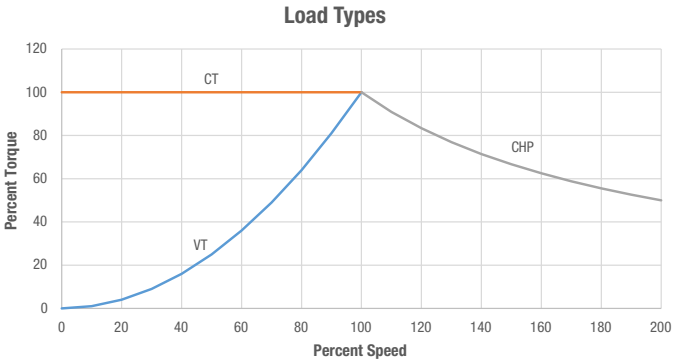
Specific Conditions of Use:
If the motor certificate number is followed by the symbol “X”, this indicates that the motor has specific conditions of use which are indicated on the certificate. It is necessary to review the product certification certificate in conjunction with this instruction manual.

Operation On Frequency Converters:
If the motor is evaluated for operation with an adjustable speed drive, the type of converter (for example PWM for Pulse Width Modulated) and safe speed ranges (for example 0-120Hz) will be specified in the certification documents or on motor nameplates. It is necessary to consult the adjustable speed drive manual for proper set up. IECEx Certificates are available online at www.iecex.com

Unit Conversions	
Inches to Millimeters	Inches x 25.4 = mm
Millimeters to Inches	mm x .03937 = Inches
Horsepower to Kilowatts	Hp x .746 = Kw
Kilowatts to Horsepower	Kw x 1.341 = Hp
Pounds to Kilograms	Lbs x .454 = Kg
Kilograms to Pounds	Kg x 2.205 = Lbs

Typical Speed versus Torque Curves are shown in Figure 1-2. For values relative to your specific motor, consult the motor nameplate marking.

Figure 1-2 Typical Speed vs Torque Curves



Specific Conditions of Use:
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.

Section 2
Installation & Operation

Overview
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.
Baldor-Reliance Cooling Tower PM motors are high performance motors specifically designed for use with adjustable frequency controllers. The basic design includes Class H insulation, 1.0 service factor, 40°C ambient, continuous duty. Standard enclosure is totally enclosed air over (TEAO) with minimum recommended air flow velocities provided by the application fan. Many modifications, and accessories are available. Motors are permanent magnet rotor construction. Refer to the motor nameplate or the performance data sheet for the rated air velocity.
Motors are designed exclusively for outdoor cooling tower environments. Rated air flow is required for proper operation. Motors are designed to mount inside the cooling tower with the fan mounted directly to the motor shaft.

Mechanical Installation
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 fan from the motor shaft before lifting the motor.

Caution
Do not lift the motor by the shaft. The motor is designed to drive a load but it is not intended to have lifting forces and stresses applied to the motor shaft. Damage to the motor may result.

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.
After storage or after unpacking and inspection to see that all parts are in good condition, do the following:
1. Rotate the motor shaft by hand to be sure there are no obstructions to free rotation.
2. A motor that has been in storage for some time should be tested for moisture (dielectric withstand insulation test) and relubricated (regreasable type) prior to being put into service.
3. A motor with roller bearings is shipped with a shaft block. After removing the shaft block, be sure to replace any bolts used to hold the shaft block in place during shipment that are required in service.

Table 2-1 Tightening Torque

NEMA Frame	Hole Dia. (Inch)	Bolt Size & Thread	Torque lb–ft for Bolt Grade	
			SAE 5	SAE 8
FL210Y	0.69 (18)	5/8-11	155-176	200-249
FL250Y	0.69 (18)	5/8-11	155-176	200-249
FL280Y	0.69 (18)	5/8-11	155-176	200-249
FL320Y	0.81(21)	3/4-10	274-310	389-440
FL360Y	0.81(21)	3/4-10	274-310	389-440
FL400Y	0.81(21)	3/4-10	274-310	389-440
FL440Y	0.81(21)	3/4-10	274-310	389-440
FL5800Y	1.06(27)	7/8-9	434-486	616-689

Mounting Location
All Baldor-Reliance Direct Drive Cooling Tower Motors may be mounted vertical, shaft up, supported by the opposite drive end bracket. Use appropriate hardware (not furnished). The motor should be installed in a location compatible with the motor enclosure required air flow and specific ambient.
The motor must be securely installed to a rigid foundation or mounting surface to minimize vibration and maintain alignment between the motor and fan blades within the cooling tower walls. Failure to provide a proper mounting surface may cause vibration, misalignment and bearing damage. All hold down bolts must be the correct grade for the type of mounting and must be torqued to their recommended value.
Foundation caps and sole plates are designed to act as spacers for the equipment they support. If these devices are used, be sure that they are evenly supported by the foundation or mounting surface.
When installation is complete and accurate alignment of the motor and fan is accomplished, the base should be grouted to the foundation to maintain this alignment.
The standard motor base is designed for vertical mounting.
Installation Procedure:
1. Verify that the motor shaft is compatible with fan hub design and that the planned mounting surface is compatible with the opposite drive end flange mounting hole configuration.
2. Verify that the fan is properly balanced prior to lowering down onto the motor shaft.
3. Follow all safety lock out and tag out procedures for confined space installation.
4. Ensure that the Direct Drive Cooling Tower Motor

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Installation Procedure: Continued
mounting surface is flat and mechanically suitable for the Direct Drive Cooling Tower Motor flange mounting.
5. Lower the motor in place using the four motor eye bolts.
6. Level the motor with respect to the base. Use a dial indicator on top of the motor feet and verify that foot deflection does not exceed 0.005 in (0.125 mm) as the mounting bolts are tightened.
7. Shims should be used under motor feet to prevent excessive deflection that causes permanent deformation of the motor feet.
8. Secure the motor to the cooling tower structure with flange mounting bolts, not provided.
9. Tighten the flange mounting bolts to the proper torque specification.
10. Lower and mount the fan hub directly onto the motor shaft making sure that the proper blade tip clearance and proper fan blade height is maintained for the specific tower requirements.
    Make sure the fan is tightened securely to prevent parts from flying off during fan rotation.

WARNING
Mechanically lock or tie down the fan to prevent rotation as voltage will be produced even when the PM motor is totally disconnected from the power source.

Alignment
Accurate alignment of the motor within the cooling tower structure is extremely important.
Mechanical vibration and roughness during operation may indicate poor alignment. Use dial indicators to check alignment. The space between fan hub and motor should be checked and maintained as recommended by the fan manufacturer.

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

Guards must be installed for rotating parts such as external fans, and unused shaft extensions. This is particularly important where the parts have surface irregularities such as keys, key ways or set screws.
Some satisfactory methods of guarding are:
1. Covering the machine and associated rotating parts with structural or decorative parts of the driven equipment.
2. Providing covers for the rotating parts. Covers should be sufficiently rigid to maintain adequate guarding during normal service.

Electrical Installation
Flyng Leads
For ExnA hazardous location motors, it is a specific condition of use that all terminations in a conduit box be fully insulated. Fully insulated and lugged terminations must be bolted and provided with lock washer to prevent rotation. Flying leads must be insulated with two full wraps of electrical grade insulating tape or heat shrink tubing.

Bypass Mode – Not Available
All Baldor Reliance Direct Drive Cooling Tower Motors are inverter duty motors using optimum pole design with permanent magnet rotor construction. They are not intended to be used in bypass mode (across the line). These motors cannot be run in bypass mode.

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
The Adjustable Speed Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that 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 in severe bodily injury or death.

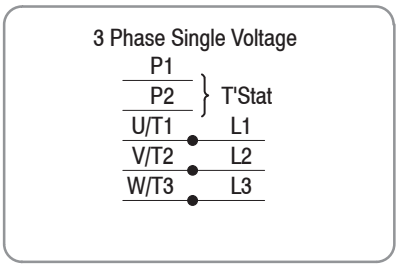
Caution
Use only a shielded motor power cable with a complete circumferential braided or copper film/tape ground jacket around the power leads. This ground should be secured to the motor frame from within the motor terminal box and must return without interruption to the drive ground.
In addition, if the motor and coupled equipment 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.

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Note: Main power leads for CE Marked Motors may be marked U,V,W – for standard configurations
(see Figure 2-1).

1. Refer to manual MN799UG. Connect all motor leads, thermostat leads and vibration switch leads to the ACS880+5350 Cooling Tower Drive as described in Chapters 5 & 6.
2. Be sure all connections are secure and proper tightening torque values (MN799UG, Chapter 4) are used.

Figure 2-1 Connection Diagram
Thermostat Leads Connection



Baldor-Reliance Direct Drive Cooling Tower Motors may three (3) normally closed thermostats (one per phase) connected in series, with leads P1 and P2 terminated in the main conduit box. To protect against motor overheating, thermostats must be connected to the appropriate controller circuit (function loss).
Failure to connect the thermostats will void the motor warranty.
Refer to the ACS880 Cooling Tower Drive manual (3AXD50000011888) Chapter 6 for correct thermostat lead connections.

Grounding
In Europe, the customer is responsible to ensure ground method conforms to IEC and applicable local codes. Grounding provisions are inside the motor conduit box for European CE compliance and a ground hole is provided in the opposite drive end bracket as standard features.
In the USA consult the National Electrical Code (NEC), Article 430 for information on grounding of motors and generators, and Article 250 for general information on grounding. In making the ground connection, the installer should make certain that there is a solid and permanent metallic connection between the ground point, the motor terminal housing, and the motor frame. A ground hole is provided in the opposite drive end bracket as standard features.
There are applications where grounding the exterior parts of a motor 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. Select an ACS880+5350 Cooling Tower Drive suitable for this motor and its application.

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

Crosssectional area of phase conductors, S	Minimum crosssectional area of the corresponding protective conductor, S_p
mm2	mm2
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	70

Equipotential bonding connection shall made using a conductor with a cross-sectional area of at least 4 mm2.

Caution
Use only a symmetrical shielded motor power cable with a 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, it is important to equalize the equipment ground potential by bonding the motor to the earth ground and also bonding the exterior ground bolt on the motor conduit box and ground bolt at motor foot using a high frequency, low impedance conductor such as a braided strap or highly stranded cable.

Due to the high switching frequencies of inverter controls, the ground connection/path must be low impedance, not only low resistance. The NEC grounding instructions are intended to protect from low frequency, high current considerations and are not adequate for grounding of high frequency circuits. Baldor-Reliance cooling tower PM motors are designed to operate with the ACS880+5350 Cooling Tower Drive.
To avoid damage to the motor due to bearing currents, the motor must be grounded and bonded properly.
A low impedance ground conductor should be used to ground

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all motors.
Failure to ground the motor properly for high frequency transients (1MHz to 10MHz) may result in electric discharge damage to the motor bearings.
For the motor power a shielded motor power cable that includes a complete circumferential braided or copper film/ tape ground is recommended. This ground should be secured to the motor frame from within the motor terminal box and must return without interruption to the drive PE ground connection.
Refer to manual MN799UG Chapter 5.

Conduit Box
All Incoming Leads must be supplied with a Water Tight Lead Connection.

Condensation Drain
All Baldor-Reliance Direct Drive Cooling Tower Motors are provided with a stainless steel Drain at the lowest point of the bottom bracket.

Fan Mounting
Baldor-Reliance Direct Drive Cooling Tower Motors are supplied with a shaft suitable for mounting the fan hub directly to the motor shaft. The motor must be ordered with the appropriate shaft dimensions to match the fan hub. Fan should be balanced to ISO G6.3 Balance Grade or Better.

Bearing Axial Thrust Limits
Baldor-Reliance Direct Drive Cooling Tower Motors are designed for direct couple fan applications with the fan mounted directly to the motor shaft. Both the drive end (DE) and opposite drive end (ODE) use regreasable ball bearing construction. Bearings are sized for minimum 100,000 hours L–10 life. See Table 2–2 for maximum allowable load limits. Fan should be balanced to ISO G6.3 Balance Grade or Better.

Table 2-2 Axial Load Capacity

			ODE Axial Thrust Max lbs			
Frame	**DE Bearing Size**	**ODE Bearing Size**	**150 RPM**	**300 RPM**	**500 RPM**	**750 RPM**
FL210Y	6209	6310	845	570	420	325
FL250Y	6211	6313	1250	935	685	535
FL280Y	6313	6314	1265	985	810	610
FL320Y	6313	6316	1705	300	855	-
FL360Y	6316	6222	1855	300	855	-
FL400Y	6222	6222	1460	300	510	-
FL400Y	6222	*7222	5320	4050	3285	-
FL440Y	6222	6322	1445	645	-	-
FL440Y	6222	*7322	7620	5750	4620	-
FL5800Y	6228	*7228 Tandem Set	8755	6310	4835	-

* Bearing design can handle down thrust only. Do not lift with the Shaft

HEATERS

H1 —∿∿— H2

H1 —∿∿— H2

ACS880+N5350 Trickle Current Heating
Space heaters are generally not required as the ACS880+5350 Cooling Tower Drive has a trickle current heating feature. For extreme applications that require space heaters, one heater is installed in each end of motor. Leads for each heater are labeled H1 & H2. (Like numbers should be tied together). Heaters should be connected such that they are not energized when motor is operating.

When ACS880+N5350 Trickle Current Heating is used, it must be enabled in the drive and the correct Wattage set in the drive. Please set the Wattage Trickle Current Heating Parameter by Frame Size as follows:

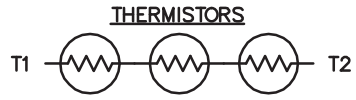
Motor Frame Size	Wattage
FL210	75
FL250	75
FL280	100
FL320	125
FL360	150
FL400	175
FL440	225
FL5800	400

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Installation & Operation

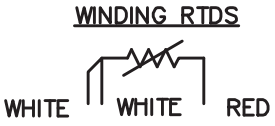
The ACS880+N5350 also provides a Rotational Trickle Current Function. The Rotational Trickle Current should be configured as follows:

- Rotate continuously at 1/10 rated speed if the external vibrations are equal to or above 0.43 ips pk,
- Rotate for 3 minutes every 15 minutes for external vibrations equal to or greater than 0.36 ips pk, but less than 0.43 ips pk
- Includes 1 minute of ramp up, 1 minute of operation at 1/10 rated speed and 1 minute of ramp down
- Rotate for 3 minutes every 30 minutes for external vibrations equal to or greater than 0.25 ips pk, but less than 0.36 ips pk
- Rotate for 3 minutes every 60 minutes for external vibrations up to 0.25 ips pk
- Refer to ACS880 Cooling Tower Drive manual (3AXD50000011888) for correct configuration of the ACS880+N5350 CTDD Drive.

Caution
Failure to configure the rotational trickle current feature correctly in high vibration situations (as described above) will void warranty in the case of bearing spalling.



Three thermistors are installed in windings.
Leads are labeled TD1 — TD6 for shutdown and TD7 — TD12 for warning.



RTD CONNECTIONS

One Per Phase

Leads	Phase1	Phase2	Phase3
Red (or Marked)	1TD1	2TD1	3TD1
White	1TD2	2TD2	3TD2
White	1TD3	2TD3	3TD3

Two Per Phase

	Phase1		Phase2		Phase3	
Leads	#1	#2	#3	#4	#5	#6
Red(or Marked)	1TD1	2TD1	3TD1	4TD1	5TD1	6TD1
White	1TD2	2TD2	3TD2	4TD2	5TD2	6TD2
White	1TD3	2TD3	3TD3	4TD3	5TD3	6TD3

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- One bearing RTD is installed in Drive end plate (PUEP), leads are labeled RTDDE.
- One bearing RTD is installed in Opposite Drive end plate (FREP), leads labeled RTDODE.
- Note RTD may have 2 — Red/1 — White leads; or 2 — White/1 — Red Lead.

Optional Accessories
WARNING
Incorrect motor rotation direction can cause serious or fatal injury or equipment damage. Be sure to verify motor rotation direction.

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

First Time Start Up and Operation
WARNING
Mechanically lock or tie down the fan during servicing to prevent rotation as voltage will be produced even when the PM motor is totally disconnected from the power source.

1. Be sure that all power to motor and accessories is off.
2. Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity.
3. Install the motor conduit box cover and all covers and panels that were removed during installation.
4. Remove the mechanical lock or tie down from the fan to allow the fan to turn freely.
5. Refer to MN799UG Chapter 7 and follow the procedures to complete the installation and start up.

During operation observe the motors' performance. It should run smoothly with little noise. The bearings should not overheat and should reach a normal operating temperature. Any undue noise, overheating, or erratic performance should be investigated and corrective action taken immediately to prevent serious damage. All RPM AC motors are lubricated before shipment and will operate for a long period before regreasing is required. The period will vary depending on environmental and service conditions. Refer to Maintenance section of this manual.

Section 2
Installation & Operation

Air Flow Cooling
Baldor-Reliance AC Direct Drive Cooling Tower Motors are rated based upon cooling tower air flow over the motor and ambient air temperature as shown on the motor nameplate. Motors are TEAO (totally enclosed air over) with air flow generated from the fan mounted to the motor shaft.

Maximum Safe Speed
The maximum safe operating speed of the motor is listed on the motor nameplate. Do not exceed this speed. When the maximum speed of the motor control can exceed the maximum safe motor speed (motor nameplate value), the speed characteristics of the control must be set so the speed is limited to this maximum. For cooling tower applications, the motor base speed is the maximum speed.

Balance
Motors are dynamically balanced to meet the dynamic balance limits of NEMA MG1 Part 7 second for peak value of the unfiltered velocity in inches per second unless ordered differently. Balance is done with a full length 1/2 height shaft key. A full shaft key is shipped with motor.

Table 2-3 Dynamic Balance

Condition	RPM	NEMA Velocity Peak (in/sec)	IEC Velocity Peak (mm/sec RMS)
Normal Operation	0-750	0.15	2.7
Warning - Alarm		0.35	6.3
Trip - Shutdown		0.45	8.1

Hazardous Locations
Hazardous locations are those where there is a risk of ignition or explosion due to the presence of combustible gases, vapors, dust, fibers or flyings.

Selection
Facilities requiring special equipment for hazardous locations are typically classified in accordance with local requirements. In the US market, guidance is provided by the National Electric Code. In international hazardous location areas, guidance for gas / vapor / mist classification is given in IEC60079–14. This classification process lets the installer know what equipment is suitable for installation in that environment, and identifies what the maximum safe temperature or temperature class is required.
It is the customer or users responsibility to determine the area classification and select proper equipment.
Areas are classified with respect to risk and exposure to the hazard. In the US market, areas are typically classified as follows Class, Division, Group and Temperature Class. In some newer installations in the US and in most international markets, areas are classified in Zones.
Class I Division 2 / Zone 2 Ex nA, [Equipment Protection Level (EPL) Gc]
This protection concept relies on having no sources of ignition present such as arcing parts or hot surfaces. For this protection concept, internal temperatures as well as external temperatures are considered. In many cases, the internal temperatures are higher than the external temperatures and therefore become the limiting factor in determination of temperature code designation. In these applications, it is very important to use a motor that has been evaluated thermally for use with an inverter or converter, if variable speed operation is desired. Thermostats used for Class I Division 2 and Ex nA motors are used to protect the motor only. For motors using flying lead construction, it is important to use connection lugs and insulate with heat shrink tubing or a double wrap of insulation grade electrical tape to avoid the risk of spark or ignition.
Class II Division 2 / Zone 22 [Equipment Group III, Equipment Protection Level (EPL) Dc]
This area classification is one where the risk of exposure to ignitable concentrations of dust are not likely to occur under normal operating conditions and relies heavily on the housekeeping practices within the installation.
Sine Wave Power Operation for Division 2 and Zone 1 or 2 and Zone 21 or 22 Hazardous Location.
These motors are designed to operate at or below the maximum surface temperature (or T–Code) stated on the nameplate. Failure to operate the motor properly can cause this maximum surface temperature to be exceeded. If applied in a Division 1 or 2 / Zone 1 or 2 and Zone 21 or 22 environment, this excessive temperature may cause ignition of hazardous materials. Operating the motor at any of the following conditions can cause the marked surface temperature to be exceeded.

- Motor load exceeding service factor nameplate value
- Ambient temperatures above nameplate value
- Voltages above or below nameplate value
- Unbalanced voltages
- Loss of proper ventilation
- Altitude above 3300 feet / 1000 meters
- Severe duty cycles of repeated starts
- Motor stall
- Motor reversing
- Single phase operation of polyphase equipment

Section 2
Installation & Operation

- Variable frequency operation

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

1. Motor load exceeding service factor nameplate value
2. Ambient temperature above nameplate value
3. Voltage (at each operating frequency) above or below rated nameplate value
4. Unbalanced voltages
5. Loss of proper ventilation
6. Operation outside of the nameplate speed / frequency range
7. Altitudes above 3300 feet / 1000 meters
8. Single phase operation of polyphase equipment
9. Unstable current wave forms
10. Lower than name plate minimum carrier frequency

Thermal Limiting
Thermal limiting devices are temperature sensing control components installed inside the motor to limit the internal temperature of the motor frame by interrupting the circuit of the holding coil of the magnetic switch or contactor. They are required for most Division 1 and Zone 1 applications. For Division 2 or Zone 2 applications, motors should be selected that preclude running temperatures from exceeding the ignition temperatures for the designated hazardous material. In Division 2 or Zone 2 classified locations, thermal limiting devices should only be used for winding protection and not considered for limiting all internal motor temperatures to specific ignition temperatures.

Specific Conditions of Use" for Ex Equipment or "Schedule of Limitations" for Ex Components:
See Certificate supplied with the motor for the Specific "Conditions of Use" for Ex Equipment or "Schedule of Limitations" for Ex Components.

Baldor-Reliance Direct Drive Permanent Magnet Motors
This series of direct drive permanent magnet motors are designed for high power dense, slower speed high torque applications such as cooling tower fan or mixers, etc. The can only be used in conjunction with a converter. They cannot be operated directly across the line. The motors are optimized for the nameplate rating. The optimum Volts and Current are provided on the nameplate for the optimum rating. When optimum voltage and current is not supplied to the motor optimum rating may not be obtained.

When sizing the motor for use with a converter the voltage drop of all components such as filters, long cables, etc. may prevent optimum operating conditions and have to be taken into account. The motor nameplate identifies the optimum voltage into the motor and a set up voltage for the converter. This set up voltage should be used when operation in scalar mode. The nameplate also shows the open circuit voltage which may also be used if required by the inverter. The allowable voltage variation for these motors is +/- 5 %.

When programing the converter and motor system the motor parameters such as; motor set up voltage, motor current, motor frequency, open circuit voltage, etc. should be taken from the motor nameplates and the converter output current limit should be set at the motor full load current shown on the nameplate. Setting the converter current limit should prevent a converter with additional current capability from supplying damaging current to the motor.

Section 3
Maintenance & Troubleshooting

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

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:
Baldor-Reliance permanent magnet motors can induce voltage and current in the motor leads by rotating the motor shaft. Electrical shock can cause serious or fatal injury. Therefore, do not couple the load to the motor shaft until all motor connections have been made. During any maintenance inspections, be sure the motor shaft will not rotate.

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:
The Adjustable Speed Controller may apply hazardous voltages to the motor leads after power to the controller has been turned off. Verify that 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 in severe bodily injury or death.

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

General Inspection
Inspect the motor at regular intervals, approximately every 8000 hours of operation or every 12 months, whichever occurs first. Keep the motor clean and the ventilation openings clear.
The following steps should be performed at each inspection:

1. Check that the motor is clean. Check that the exterior fins of the motor are free of dirt, oil, grease, etc.
   If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Perform a dielectric with stand test periodically to ensure that the integrity of the winding insulation has been maintained. Record the readings. Immediately investigate any significant decrease in insulation resistance.
3. Check all electrical connectors to be sure that they are tight and supplied with a Water Tight Connector.
4. Check the Conduit Box and Cover to ensure all Bolts and Connections are Tight and properly Sealed.
5. Inspect the Condensation Drains supplied on the bottom bracket to ensure they are free of debris.

Relubrication & Bearings
Bearing grease will lose its lubricating ability over time, not suddenly.
The lubricating ability of a grease (over time) depends primarily on the type of grease, the size of the bearing, the speed at which the bearing operates and the severity of the operating conditions.
Good results can be obtained if the following recommendations are used in your maintenance program. Relubrication with the shaft stationary and a warm motor is recommended.

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

1. Relubrication with the shaft stationary and a warm motor is recommended.
2. Wipe all dirt from the outside of the grease fills and drains.
3. Locate the grease inlet at the top of the bearing hub, clean the area and replace the 1/8–inch pipe plug with a grease fitting if the motor is not equipped with grease fitting.
4. Remove grease drain plug located opposite the grease inlet.
5. Using a manual grease gun, pump in the recommended grease in the amount shown in Table 3-1.
   This amount will provide an ample supply of lubricant

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Maintenance & Troubleshooting

between lubrication intervals. Use only clean, fresh grease from clean containers and handle so as to keep it clean. In general, mixing of greases is not recommended. If an incompatible grease is used, the lube system must be repacked completely with the new grease.

6. Replace drain plugs.
7. It is not uncommon that grease may not appear at the grease drain even though the recommended amount of grease has been added. This condition should not cause concern. It is not required to use more than the recommended amount of grease.
8. Rubbing Seals need to be periodically greased.
9. Non-rubbing Seals or Labyrinth type seals have a clearance between stationary and rotating parts of not less than .05mm.

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Maintenance & Troubleshooting

Interval and Type of Grease

Amount of grease to be added to Baldor-Reliance motors.

Table 3-1 Relubrication Amount& Intervals

Frame Size	Grease Type	Vol. in Cubic in^3 (cm^3)	Weight oz (gram)	Relubrication Interval (months)	
				Standard Service	Severe Service
FL210Y	Mobil Mobilith SHC 460	2 (32	1 (28)	12	6
FL250Y	Mobil Mobilith SHC 460	2 (32)	1 (28)	12	6
FL280Y	Mobil Mobilith SHC 460	3 (48)	1.5 (42)	12	6
FL320Y	Mobil Mobilith SHC 460	4 (62)	2 (56)	12	6
FL360Y	Mobil Mobilith SHC 460	5 (80)	2.5 (70)	12	6
FL400Y	Mobil Mobilith SHC 460	5 (80)	2.5 (70)	12	6
FL440Y	Mobil Mobilith SHC 460	10 (96)	5 (140)	12	6
*FL5800Y	Mobil SHC Polyrex 462	18 (296)	9 (255)	12	6

*FL5800 Motors Shipped prior to 10/2020 were supplied with Klubersynth BH72-422

Service Condition	Ambient
Standard	40 C or less
Severe	Above 40 C

The relubrication interval is given in Table 3-1 unless otherwise specified on the motor lubrication nameplate.
The relubrication interval is based on calender time and not hours of operation.
Motors are shipped from the factory with full grease cavities and ready for operation.

Connection Box Maintenance

For motors certified as Ex nA and Ex ec, in order to maintain the protection level, it is necessary to periodically inspect and tighten covers and gland plates. The torque values shown below can be used for guidance:

Table 3-2 Torque Values

INCH-THREADED			
BOLT SIZE	THREAD PITCH	STANDARD DRY TORQUE	
		FT. POUND FORCE TOLERANCE +/- 5%	NEWTON METER TOLERANCE +/- 5%
1/4	20	8.45	11.5
5/16	18	17.4	23.6
3/8	16	30.9	41.9
METRIC THREADED			
BOLT SIZE	THREAD PITCH	STANDARD DRY TORQUE	
		FT. POUND FORCE TOLERANCE +/- 5%	NEWTON METER TOLERANCE +/- 5%
6	1.00	9.972	13.52
8	1.25	24.19	32.80
10	1.50	47.90	64.94

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Maintenance & Troubleshooting

Table 3-3 Troubleshooting Chart

Symptom	Possible Causes	Possible Solutions
Motor will not start	Usually caused by line trouble, such as, single phasing at the starter.	Check source of power. Check overloads, fuses, controls, etc.
Excessive humming	High Voltage.	Check input line connections.
	Eccentric air gap.	Have motor serviced at local authorized ABB service center.
Motor Over Heating	Overload. Compare actual amps (measured) with nameplate rating.	Locate and remove source of excessive friction in motor or load. Reduce load or replace with motor of greater capacity.
	Single Phasing.	Check current at all phases (should be approximately equal) to isolate and correct the problem.
	Improper ventilation.	Check external cooling fan to be sure air is moving properly across cooling fins. Excessive dirt build-up on motor. Clean motor.
	Unbalanced voltage.	Check voltage at all phases (should be approximately equal) to isolate and correct the problem.
	Rotor rubbing on stator.	Check air gap clearance and bearings.
		Tighten Thru Bolts.
	Over voltage or under voltage.	Check input voltage at each phase to motor.
	Open stator winding.	Check stator resistance at all three phases for balance.
	Grounded winding.	Perform dielectric test and repair as required.
	Improper connections.	Inspect all electrical connections for proper termination, clearance, mechanical strength and electrical continuity. Refer to motor lead connection diagram.
Bearing Over Heating	Misalignment.	Check and align motor and driven equipment.
	Excessive belt tension.	Reduce belt tension to proper point for load.
	Excessive end thrust.	Reduce the end thrust from driven machine.
	Excessive grease in bearing.	Remove grease until cavity is approximately 3/4 filled.
	Insufficient grease in bearing.	Add grease until cavity is approximately 3/4 filled.
	Dirt in bearing.	Clean bearing cavity and bearing. Repack with correct grease until cavity is approximately 3/4 filled.
Vibration	Misalignment.	Check and align motor and driven equipment.
	Rubbing between rotating parts and stationary parts.	Isolate and eliminate cause of rubbing.
	Rotor out of balance.	Have rotor balance checked are repaired at your authorized ABB Service Center.
	Resonance.	Tune system or contact your authorized ABB Service Center for assistance.
Noise	Foreign material in air gap or ventilation openings.	Remove rotor and foreign material. Reinstall rotor. Check insulation integrity. Clean ventilation openings.
Growling or whining	Bad bearing.	Replace bearing. Clean all grease from cavity and new bearing. Repack with correct grease until cavity is approximately 3/4 filled.

Section 3
Maintenance & Troubleshooting

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

Baldor-Reliance Direct Drive Cooling Tower Motors are built with a Class H winding insulation system.

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

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

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

Winding RTDs -- Temperature Limit In °C (40°C Maximum Ambient)

Motor Load	Alarm	Trip
≤ Rated Load	165 °C	175 °C

Note: * Winding RTDs are factory production installed, not from Mod-Express.

*** When Class H temperatures are used, consider bearing temperatures and relubrication requirements.**

Bearing RTDs -- Temperature Limit In °C (40°C Maximum Ambient)

Bearing Type Grease	Anti- Friction	
	Alarm	Trip
Standard	100 °C	110 °C

Reference MN433 for Repair Guidelines of Baldor-Reliance Synchronous PM Motors.

Section 4
IEC 60079 Series

INFORMATION REQUIRED PER IEC 60079-0:2017 Ed7

All **bold** information below is quoted from the standard, clause 30.

Clause 30 (instructions) – Instructions are provided with each motor, the most recent version of this manual can be download at baldor.com.

Instructions for purposes of this standard consists of the following that are shipped with your motor in the literature package:
- Instruction Manual MN427
- Ex Certificates applicable for your motor
- Nameplate marking photos for your motor

Clause 30.1 (general)
The instructions prepared by the manufacturer shall include the following particulars as a minimum.

Marking
A recapitulation of the information with which the equipment is marked, except for the serial number (see Clause 29), together with any appropriate additional information to facilitate maintenance (for example, address of the importer, repairer, etc.)

A copy of the nameplates is included in the literature package and is shipped with each motor. These instructions are used for a range of motors. An example of typical certification marking is shown in Section 1. For motor specific information, please refer to the certification nameplate photos, electrical rating information and any specific conditions conveyed in the motor marking such as but not limited to ambient range, water flow, converter set up parameters and refer to the data package shipped with the product.

on-site assembling:
Not typically required.

adjustment and parameter setting
If operated on a converter, refer to nameplate marking for set-up parameters.

Use and setting-up;
Ratings such as electrical values, ambient temperatures and pressures, maximum surface temperatures and other limit values related to a designated use are included on the product nameplate photos and in the product data package.

- putting into service- of the equipment / of the whole installation:
- **Information about verifications / tests prior to first use**

Refer to Section 2, Installation and Operation
- **detailed information about any special installation requirements for the Type of Protection(s) employed**

i) information about verifications / tests prior to (first) use
Refer to Section 2, Installation and Operation
ii) detailed information about any special installation requirements for the Type of Protection(s) employed

- maintenance;
- **Information such as cleaning, oil level check or recalibration requirements;**

Cleaning- The enclosure is non-conducting and may generate an ignition capable level of electrostatic charge under extreme conditions. The user should ensure that the equipment is not installed in a location in a location where it might be subjected to external conditions which might cause a build-up of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
Additional information on maintenance such as Information on bearing inspection is in the Maintenance Section 3
- **Requirements for the maintenance of the explosion protection.**

For Ex e machines, consult manufacturer for winding details

For permanent magnet motors, the voltage that may be present at the motor terminals, when the supply is disconnected, when the motor is rotating. Open circuit vs. speed data is normally supplied.
For motors using permanent magnet rotors, consult warning marking, which is provided with the Instructions.
Information on any maintenance required to ensure continued compliance with the rubbing seal requirements of 5.2.12 Inspect Seal during the bearing lubrication process to ensure the integrity of the seal.

- repair
- **Repair should be conducted in accordance with the requirements given in IEC 60079-19**
  Refer to Repair of Motors used in Hazardous Locations Information related to the fitting or removal of parts / components; As each motor design is unique, it is necessary to Contact the manufacture for additional repair details. Use only original manufacturer's parts.

Section 4
IEC 60079 Series

- **information related to the fitting or removal of parts / components**
  Contact ABB regarding any spare parts.

- **Information about spare parts**
  Contact ABB regarding any spare parts.

- **Requirements for a documentation of such repairs.**
  As any repair is undertaken after consultation with IEC60079-19, the documentation requirements for the repair in this standard apply.

- taking out of service and dismantling

- **Use appropriate lock out tag out procedures to prevent restart and prior to making or breaking any electrical connection.**

where applicable, Specific Conditions of Use according to 29.3 e)
As Specific Conditions of Use may vary with each certificate, if Specific Conditions are applied, the certificate is shipped with each motor forming part of the Instructions. Refer to Marking and Acceptance section for an explanation of the “X” suffix to certificate numbers.

Clause 30.3 (electrical machines)

In addition to the information required according to 30.1, the following additional information shall be prepared for electrical machines, as applicable:

machines intended to be supplied by a converter
For speed torque information on motors intended to be supplied by converter, consult motor nameplate.

bearing lubrication requirements for both commissioning and maintaining;
Instructions for lubrication are included in the Bearing Maintenance Section. Only use ABB recommended grease or contact ABB Motors and Mechanical Inc., product support team for guidance on equivalents suitable for hazardous locations.

the permitted axial and radial loading of the shaft;
Please refer to Table 2-2 in this manual for information.

the thermal expansion of the shaft and housing under rated conditions
Maintain minimum clearances necessary to accommodate thermal growth of up to 3mm of the frame and up to 5mm (8mm for Furnace Fan Motor Designs) of the shaft during design operating conditions. Consult engineering for application specific solutions where these minimum clearances are not permissible.

any necessary maintenance of the protection provided by the manufacturer against stray circulating currents in the bearings or shafts.
Ensure that the motor is properly earthed and bonded. For motors operated by converter, consult converter manufacturers instructions relative to cable recommendations.

any necessary protection of the bearings from vibration, including during transportation, storage, or standby service;
Protection of bearings from vibration during storage and transportation are addressed in General. Bearings requiring blocking are blocked during shipment.

guidance on maintenance and replacement intervals for bearings based on the operating conditions.
Instructions for lubrication are included in the Bearing Maintenance Section

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