

⚠ WARNING

- Read and follow all instructions carefully.
- Indicates a hazardous situation which if not avoided, could result in death or serious injury.
- Disconnect and lock out power before installation and maintenance. Working on or near energized equipment can result in severe injury or death.
- Do not operate equipment without guards in place. Exposed equipment can result in severe injury or death.

⚠ CAUTION

- Periodic inspections should be performed. Failure to perform proper maintenance can result in premature product failure and personal injury.

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE

OWNER: READ AND SAVE THESE INSTRUCTIONS

Safety Instructions

Before installing, using, or servicing this product, carefully read and fully understand the instructions including all warnings, cautions, and safety notice statements. To reduce risk of personal injury, death and/or property damage, follow all instructions for proper motor installation, operation and maintenance.

Although you should read and follow these instructions, they are not intended as a complete listing of all details for installation, operation, and maintenance. If you have any questions concerning any of the procedures, or if you have a safety concern not covered by the instructions, STOP, and contact the motor manufacturer.

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1. Safety Information

1.1 Safety Overview

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood. Contact Regal with any questions or concerns before proceeding if you are uncertain about any details in either safety precautions or operation instructions.

1.2 Electrical Safety

WARNING! High voltage can be generated even when power is disconnected.

Due to the nature of the permanent magnet used in NovaMAX™ motors, high voltage can be generated whenever the motor is rotating, even if the power is off. It is extremely important to make sure the motor cannot be rotated during servicing by the drive or any auxiliary equipment. If the load can rotate the motor without power being applied, install a manual disconnect to open the motor leads before servicing. Install an interlock to connect the manual disconnect to the control circuits of the drive. Failure to observe these recommendations will lead to serious or fatal injury or property damage.

WARNING! Electrical shock hazard.

All electrical connections should be made only by qualified electrical personnel and in accordance with all applicable codes, ordinances and sound practices. Be sure you are familiar with NEMA safety standards for selection, installation, and operation of electrical motors, as well as the National Electrical Code. Unsafe installation or use will lead to serious injury, property damage, and/or death.

WARNING! Electrical grounding hazard.

Do not apply power to the motor until it has been properly grounded per the National Electrical Code Article 430, as well as any applicable local codes and ordinances. Failure to properly ground motors will cause serious or fatal injury and/or property damage.

WARNING! Automatic reset protector hazard.

Do not use automatic reset protectors if restarting the motor automatically would pose a hazard to personnel or equipment. If unsure, avoid automatic reset devices. Failure to follow this warning could cause serious or fatal injury and/or property damage.

WARNING! Magnetic field hazard.

Pacemaker Danger- Permanent magnet motors can generate a magnetic field in the vicinity of the motor location and can pose a serious health risk to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk of injury, such persons should stay away from the vicinity of the motor.

1.3 Mechanical Safety

CAUTION: Motor handling

Follow recommended Regal® procedures for lifting, moving, storing, installing, and connecting motor to external components with belts. Avoid over-tensioning drive belts or lifting connected devices with the drive shaft. Motor mounts are intended to hold the weight of the motor only. Failure to follow this recommendation could result in motor damage.

CAUTION: Prevent lifting injury

Use care when lifting heavy equipment to prevent injury. For heavy equipment over 50 lbs (22 kg), use a team lift and proper lifting technique.

WARNING! Possible high temperature.

Surfaces in motor enclosures or accessory equipment may reach harmful temperatures. Take steps to avoid coming into contact

with hot surfaces while installing, operating, or maintaining equipment. Failure to do so could result in death or personal injury.

WARNING! Rotating parts hazard.

This motor may be connected to other machinery with exposed rotating parts. Keep extremities, hair, clothing, and tools secured a safe distance from any moving parts. Only qualified personnel should install, operate, or maintain the motor and accessory equipment. Failure to follow this warning could result in death or serious personal injury, death and/or property damage.

WARNING! Protective safeguards must remain in place.

Do not bypass safety interlocks or other safeguards. Safety devices will only provide protection if used in the manufacturer's recommended fashion.

WARNING! Loose parts hazard.

Ensure all devices are properly connected and remove any unused shaft pins before applying power to the motor. Rotation can cause loose parts to be ejected and cause injury. Improper coupling can cause harm to personnel or equipment if the load decouples unexpectedly.

WARNING! Disconnect auxiliary devices prior to motor maintenance.

Before maintaining the motor, disconnect any connected devices that could cause the motor to turn. Failure to do so could result in physical injury or death or damage to the motor.

WARNING! Possible noise hazard.

While the NovaMAX motor operates quietly, other components in the system may have significant noise levels when in operation. Wear adequate ear protection to reduce harmful effects to hearing.

2. Receiving and Inspection

Each NovaMAX motor meets rigorous standards at the factory prior to shipment. Upon receipt of your new motor, perform the following inspections immediately.

2.1 Initial Inspection

- Inspect packaging for any shipping damage. Report any damage immediately to your shipping carrier and Regal customer support.
- Check contents against packing list, verifying nameplate for conformance with your purchase order.
- Allow the motor to come to room temperature before unpacking it, in order to prevent possible condensation.

2.2 Motor Handling

CAUTION: Prevent lifting injury

Use care when lifting heavy equipment to prevent injury. For heavy equipment over 50 lbs (22 kg), use a team lift and proper lifting technique.

CAUTION: Motor handling

Follow Regal recommended procedures for lifting, moving, storing, installing, and connecting motor to external components with belts. Avoid over-tensioning drive belts or lifting connected devices with the drive shaft. Motor mounts are intended to hold the weight of the motor only. Failure to follow this recommendation could result in motor damage.

2.3 Storage

- Motors that are not put into service immediately should be stored in a clean, dry environment indoors. Protect motors from dust and vibration, and avoid large temperature swings.

- NovaMAX™ motors are permanently lubricated, and require no additional lubrication.
- For motors in storage, rotate motor shaft 5-10 times by hand every three months.
- When motor is readied for use after storage, follow above precautions for lifting and handling motor. Inspect motor visually and rotate shaft, ensuring the motor has not suffered any corrosion in storage.

3. Installation

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood. Contact Regal with any questions or concerns before proceeding if you are uncertain about any details in either safety precautions or operation instructions.

WARNING! Electrical shock hazard.

All electrical connections should be made only by qualified electrical personnel and in accordance with all applicable codes, ordinances and sound practices. Be sure you are familiar with NEMA safety standards for selection, installation, and operation of electrical motors, as well as the National Electrical Code. Unsafe installation or use will lead to serious injury, property damage, and/or death.

WARNING! Electrical live circuit hazard.

Electrical shock can cause serious or fatal injury. Do not touch any electrical connections until the power to the motor and all accessory devices has been disconnected and locked out.

3.1 Safety Conventions

Select the mounting location for the motor carefully. Consider the following when choosing the location: Motors should be protected from dust, vibration, moisture, corrosive liquids or vapors and direct sunlight, and there should be good ventilation and accessibility for inspection and maintenance.

The ambient temperature for the motor location should be between -25 and 40°C (-13–104°F).

3.2 Mounting

The motor should be securely attached to a firm, rigid surface with minimum vibration to establish good alignment with the driven load and the motor shaft. Failure to secure to a proper mounting location can cause damage to the motor. Depending on the model NovaMAX motors are mounted via a Foot mount, or a C-Face mount.

For details on mounting the variable frequency drive (VFD) that is required to operate the motor, please refer to the installation section of the VFD manual.

3.3 Alignment

Proper alignment of the pulley, sprocket, or gear with the motor shaft is critical. Good alignment minimizes vibration and maximizes equipment life. Misalignment could cause damage to the motor and/or shorten the life of the motor. Whichever connector is chosen, it should be located as close to the shoulder shaft as possible.

3.4 Coupling

CAUTION: Do not force components onto the shaft. Hammering or prying components onto the motor shaft can damage the motor.

Direct coupling: Whenever possible, use flexible couplings to secure the motor shaft to the load. Use dial indicators to check alignment. Mechanical vibration or roughness during operation may indicate misalignment; consult equipment manufacturer for assistance.

NOTE: Contact Regal® technical support if assistance with motor mounting or coupling is required.

3.6 Guarding

WARNING! Before proceeding, read section 1.3 Electrical safety on electrical safety guidelines. Failure to follow recommendations will result in serious personal injury or damage to equipment.

WARNING! Setup personnel are responsible for proper connection and tuning of the motor with the selected variable frequency drive (VFD). Contact the VFD manufacturer or Regal with any questions or to clarify proper installation procedures.

3.7 Variable Frequency Drive and Motor Connection

WARNING! Electrical connection hazard.

The NovaMAX motor is a permanent magnet motor and therefore requires an electronic variable frequency drive to operate. The motor must not be operated from line supply voltage -- damage to the motor and/or tripping of supply circuit breakers will result.

NovaMAX motors operate from the three-phase output of variable frequency drives. Not all VFDs support permanent magnet motor operation, but most vendors have models that do. Contact a NovaMAX motor Application Engineer for a list of VFDs that have been tested with the NovaMAX motor. Any VFD selected must be compliant with UL Standard 508C. The VFD output voltage and output current (Amps) ratings must correspond to the motor nameplate rating.

WARNING! Motor leads between the variable frequency drive and motor must be properly connected and insulated. Improper connection could lead to shorts and arcing, thereby causing equipment damage or personal injury. Take steps to make sure all electrical connections are properly secured.

The motor three-phase leads are color coded:

U Phase - Violet

V Phase - Orange

W Phase - Yellow

Consult the wiring guidance in the manual for the selected Variable Frequency Drive and follow National Electrical Code practices for the installation. Ensure the motor is properly grounded, securing a grounding wire from the ground stud in the motor terminal housing to earth ground.

3.8 Power Cabling to Variable Frequency Drive

Refer to variable frequency drive manual for connection instructions.

4. Operation

4.1 Startup Operation

WARNING! Review all safety information in section 1. Safety Information before proceeding. Review VFD Operator's Manual for an overview of drive control panel / keypad operation. Before beginning the initial operational checkout, review the entire procedure to make sure all steps are understood. Contact Regal with any questions before proceeding.

4.2 Initial Operational Checkout

The initial operational checkout assumes the following:

- The motor and drive have been mounted and properly cabled. See VFD operator's manual for specific instructions regarding installation of the motor VFD.
- The motor is not yet connected to the load or any auxiliary devices.

Check installation:

- Mechanical checks: Check mounting bolts for tightness. Rotate motor shaft to make sure it rotates freely.
- Electrical checks: Make sure all electrical connections are well made, properly insulated, and have electrical continuity with a multimeter. Replace any panels or covers that were removed in the installation process before energizing the VFD or motor.
- Apply power to the motor-VFD system. Inspect the VFD to see that the control panel or keypad is illuminated.
- Start the motor at a low speed to confirm that the motor shaft is turning

NOTE: If the motor rotates in the opposite to expected direction, any two leads can be reversed to change the direction. Disconnect and lock out power to the motor and VFD system, then reverse two of the three power leads into the motor. Repeat the installation operational checkout procedure to verify the motor is turning in the desired direction.

4.3 Coupled Startup

After the motor has successfully been started with the initial operational checkout, follow this procedure to start up the motor with the coupling installed.

- Install the motor coupling. Check the motor coupling is properly aligned and not binding.
- Ensure all safety shields and guards are in place.
- The first coupled rotation should be performed unloaded. Rotate the motor and check that the coupling is rotating smoothly and is not translating excessive vibration back to the motor.
- Attach the load and rotate the motor. The motor can now be fully operated within specified limits.

5. Maintenance

5.1 Safety Overview

Only qualified personnel should attempt installation, operation or maintenance of this equipment. Do not install, operate or perform maintenance until all warnings and cautions have been reviewed and are understood.

WARNING! Electrical live circuit hazard.

Electrical shock will cause serious or fatal injury. Do not touch any electrical connections until the power to the motor and all accessory devices has been disconnected and locked out.

5.2 General Inspection

Inspect motors regularly, every three months or after 500 hours of operation, whichever occurs first. Keeping motors clean and ventilation openings clean prolongs the life of the equipment. Perform the following checks during inspection:

- Check motor exterior for oily residue, lint, water, or dirt. Residue on the motor surface can interfere with ventilation.
- Check mechanical and electrical connections for tightness

5.3 Lubrication

NovaMAX™ motors equipped with grease fittings (Zerks) require scheduled relubrication. Motors without grease fittings contain permanently lubricated bearings, which do not require maintenance.

Following are relubrication instructions for motors with grease fittings

Relubrication of Bearings

Bearings must be relubricated periodically for smooth operation. Bearing grease will lose its lubricating ability over time. Depending on operating conditions, type of grease, operating conditions, operation speed and size of bearing, bearing grease may lose its lubricating ability over time. Follow these recommendations for proper bearing relubrication.

Type of Grease

Exxon Mobil® Polyrex® EM

Relubrication Interval

The relubrication interval can be calculated by following steps below. (Reminder, if no grease fittings are provided, the motor has permanently lubricated bearings that do not require maintenance.)

1. Use the following table to determine interval based on motor frame size and average operating speed.

Relubrication Interval (Hours of Operation)

NEMA Frame Size	Operating Speed (RPM)					
	600	1200	1800	2400	3000	3600
182T/184T	33,000	20,000	12,000	8,500	6,800	5,700
213T/215T	31,000	18,000	11,000	7,300	5,800	4,900
254T/256T	28,000	17,000	10,000	6,700	5,300	4,400

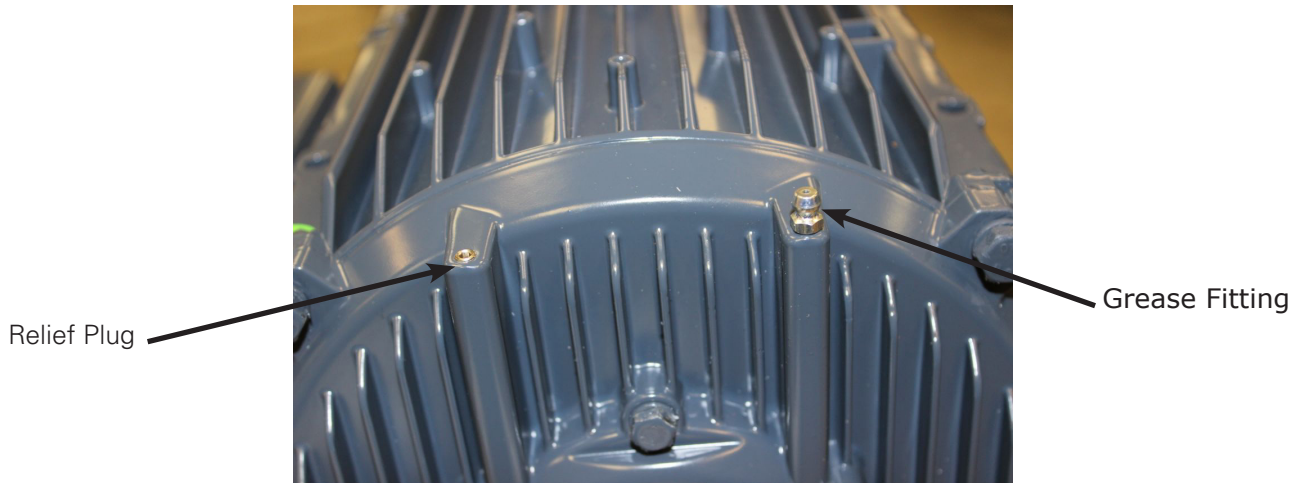
NOTE: For vertically mounted motors divide the relubrication interval from Table 1 by 2. Use the following table as a guide to the proper amount of grease to add at each service interval.

Relubrication Amount

NEMA Frame Size	Weight of Grease		Volume	
	Ounce	Grams	in ³	Teaspoon
182T/184T	0.26	7.2	0.5	1.7
213T/215T	0.31	8.7	0.6	2.0
254T/256T	0.41	11.6	0.8	2.7

Procedure

1. Thoroughly clean grease fitting (zerk), relief plug and surrounding areas. (Does not apply to motors without grease fittings which contain permanently lubricated bearings, and do not require maintenance.)
2. Remove relief plug if provided.
3. Pump recommended amount of grease into zerk. Make sure to pump the correct amount as both over and under lubrication can damage bearings and cause motor failure.
4. Replace relief plug.



6. Troubleshooting

Problem	Cause	Resolution
Motor fails to start	No power to VFD, or VFD is in fault condition	Check that VFD is powered and is not in a fault condition. Refer to Motor Operation section of VFD manual as necessary. If the VFD fault re-occurs after clearing, contact Regal® technical support.
	Motor is wired incorrectly	Check wiring against nameplate
	Driven load exceeds motor capacity	Match motor to driven load
	Motor coupling or load is bound up or jammed	Test motor unbound, and realign or replace coupling
Motor rotates in wrong direction	Motor is wired incorrectly	Switch two of the three supply inputs to the motor, and perform unloaded installation test per Initial operational checkout on page 4.
Motor has been running, then stalls or fails to restart	No power to VFD, or VFD is in fault condition	Check that VFD is powered and is not in a fault condition. Refer to Motor Operation section of VFD manual as necessary. If the VFD fault re-occurs after clearing, contact Regal technical support
	Motor is overloaded or load has seized	Check load and coupling for free movement. Check motor torque rating against load requirements.
	Over-temperature shut-off has occurred and does not automatically reset	Check VFD fault status and reset or re-configure as necessary.

6. Troubleshooting continued

Problem	Cause	Resolution
Excessive vibration	Motor is misaligned to load	Realign connection to load.
	Loose or weak mounting support	Check mounting support for tightness and rigidity
	Unbalanced load (especially in directly connected loads)	Make sure load is balanced. Check motor by itself. If vibration persists contact Regal® technical support
	Improper belt tension on multiple belts	Check all belts for deflection. Make sure all belts are replaced at the same time; avoid mixing old and new belts.
	Motor is resonating	Tune system to eliminate resonance- contact Regal technical support.
Motor has been running, then stalls or fails to restart	No power to VFD, or VFD is in fault condition	Check that VFD is powered and is not in a fault condition. Refer to Motor Operation section of VFD manual is necessary. If the VFD fault re-occurs after clearing, contact Regal technical support
	Motor is overloaded or load has seized	Check load and coupling for free movement. Check motor torque rating against load requirements.
	Over-temperature shut-off has occurred and does not automatically reset	Check VFD over-temperature shut off switch and reset or re-configure as necessary.
Unusual motor noise - rubbing, grinding or squealing	Motor is not wired properly	Check motor wiring against nameplate diagram.
	Contact between stationary and rotating parts	Inspect system for any areas which rubbing could be occurring, re-configure system to eliminate contact. Check motor by itself if necessary, rotating first by hand to make sure the shaft spins freely, then rotate unloaded. If the source of the trouble can't be located, contact Regal technical support.
	Loose belt	Check belt for proper tension.
Motor overheats or repeated over-temperature shutdown by VFD	Driven load exceeds motor specifications	Check VFD for fault condition. If over-current fault is occurring the loading may be exceeding the motor specification. Ensure that the load is not being increased due to binding.
	Ambient temperatures are too high	Motor can be installed in environments up to 40°C.
	Motor is not properly ventilated or ventilation openings are blocked.	Check ventilation path and air flow. Inspect motor for conditions that could restrict ventilation.