

# **SIEMENS**

## **Induction Motors/ Generators**

---

### **Storage Recommendations**

## Table of Contents

---

	Page
Safety Procedures.....	2
Introduction.....	3
<b>Indoor Storage (Up to 5 Years)</b>	
Wholly Controlled Atmosphere.....	4
Partially Controlled Atmosphere.....	4
<b>Outdoor Storage (Up to 5 Years)</b>	
Inland Dry Climate.....	5
Inland Humid Climate.....	6
Salty and Industrial Atmosphere.....	7
Preparation For Storage.....	8
Maintenance During Storage.....	10
Preparation For Service.....	12

**Note** - These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the user's purposes, the matter should be referred to;

1. Your local Siemens Sales Office.

--Or--

2. Siemens Technical Support Communication Center:

    Inside the U.S.: 1-800-333-7421

    Outside the U.S.: +1 423-262-5710

    Online: [www.industry.usa.siemens.com/industry](http://www.industry.usa.siemens.com/industry) and click on Industry Services

The contents of this instruction manual shall not become part of or modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein do not create new warranties or modify the existing warranty.

Siemens machines are built in accordance with the latest applicable revision of the National Electric Code, Underwriters Laboratories Standards and Procedures, and NEMA (National Electrical Manufacturers Association) Standards. These publications and this instruction manual should be thoroughly read and understood prior to beginning any work on this equipment.

The information contained within is intended to assist operating personnel by providing information on the general characteristics of the purchased equipment. It does not relieve the user of the responsibility of using accepted engineering practices in the installation, operation and maintenance of this equipment.

Should a conflict arise between the general information in this manual and the contents of the drawings and supplementary material, the latter shall take precedence.

## Safety Procedures

This equipment contains hazardous voltages. Death, serious personal injury or property damage can result if safety instructions are not followed.

The successful and safe operation of motors and generators is dependent upon proper handling, installation, operation and maintenance, as well as upon proper design and manufacture. Failure to follow certain fundamental installation and maintenance requirements may lead to personal injury and the failure and loss of the motor as well as damage to other property.

Only qualified personnel should work on or around this equipment after becoming thoroughly familiar with all warnings, safety notices and maintenance procedures contained herein. Only qualified personnel should be involved in the inspection, maintenance and repair procedure and all plant safety procedures must be observed.

**Qualified Person:** For the purpose of this manual and product labels, a **Qualified** person is one who is familiar with the installation, construction and operation of the equipment, and the hazards involved. In addition, he or she has the following qualifications:

- a. Is trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety practices.
- b. Is trained in the proper care and use of protective equipment, such as rubber gloves, hard hat, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- c. Is trained in rendering first aid.



**Danger:** For the purpose of this manual and product labels, **Danger** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**Warning:** For the purpose of this manual and product labels, **Warning** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**Caution:** For the purpose of this manual and product labels, **Caution** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It is also used to alert against unsafe practices.

Motors should be installed and grounded per local and national codes.

Do not operate this equipment in excess of the values given on nameplate or contrary to the instructions contained in this manual. The equipment (or a prototype) has been factory tested and found satisfactory for the condition for which it was sold. Operating in excess of these conditions can cause stresses and strains beyond design limitations. Failure to heed this warning may result in equipment damage and possible personal injury.

	 <b>DANGER</b>
	<b>Hazardous voltage.</b> Will cause death, serious injury, electrocution or property damage. Disconnect all power before working on this equipment.

<b>NOTE</b>
Squirrel cage induction machines can be driven by various types of prime movers. These will act as induction generators. This instruction manual applies to both motors and induction generators. However, for clarity reasons, the machine will be referred to as a "motor".

## Introduction

---

The purpose of this booklet is to offer some short, easy to follow recommendations to our customers, users and distributors for the care of electric motors in storage.

For practical purposes, such equipment is considered to be in storage not only when it is in the storeroom but also when;

1. It has been delivered to the jobsite and has awaited installation for thirty (30) days or more, or
2. It has been installed but regular operation is delayed for thirty (30) days or more pending completion of plant construction, or
3. There are periods longer than thirty (30) days between operating cycles, or
4. The plant or department is shut down.

### NOTE

Squirrel cage induction machines can be driven by various types of prime movers. These will act as induction generators. This instruction manual applies to both motors and induction generators. However, for clarity reasons, the machine will be referred to as a "motor".

### NOTE

Recommended brand products have shown good performance. Siemens Industry, Inc. however, cannot assume responsibility or be liable for products other than those it warrants.

Manufacturers or distributors of products are:

Tectyl 502-C and 506 Valvoline Oil Co.  
Div. of Ashland Oil and Refining Co.  
150 Fourth Avenue  
Freedom, PA 15042

P.D. George  
Insulation Manufacturers Corp. 1231 Superior Avenue,  
N.E. Cleveland OH 44114

## Indoor Storage (Up to 5 Years)

---

### NOTE

Rodents and other animals in search of warm surroundings or food, like to house inside motors. Some of them attack the insulation materials. Their access to the motor should be prevented.

### Wholly Controlled Atmosphere

#### Requirements

Uniform temperature between 40°F (4.5°C) and 140°F (60°C) throughout the room maintained at least 10°F (5.5°C) above the dew point. Relative humidity of 50% or less. Dust accumulation should be minimal with no harmful fumes and no ambient vibration.

### Partially Controlled Atmosphere

#### Requirements

The room selected should be as clean and dry as possible with no ambient vibration.

If the ambient temperature exceeds 140 °F (60°C), the space or structure should be enclosed but ventilated. If the ambient temperature is below 40 °F (4.5 °C), the space heaters, if the motor is so equipped, should be energized. The enclosing structure should be designed to protect the motor from flying debris or other damage from high winds.

If the motor can be moved, it is suggested that the entire motor be encased in a strong, transparent plastic bag. Before sealing the bag, a moisture indicator should be attached to the side of the motor and several bags of silica gel desiccant placed inside the bag around the motor. When the moisture indicator shows that the desiccant has lost its effectiveness, as by a change in color, the bag should be opened and the desiccant replaced with fresh material. Take care in placing the bags of desiccant so that none is in contact with the heater element.

When a motor cannot be sealed for effective use of a desiccant, and the relative humidity is greater than 50% or where there are large daily swings in temperature, proper storage requires that the space heaters (anti-condensation heaters) be energized. Heaters supplied in the motor are sized to raise the windings temperature 10°F to 15°F (5.5°C to 8°C). This prevents moisture from condensing on the windings. If the motors are not equipped with space heaters, consult the factory for proper size of external heaters to be used.

## Outdoor Storage (Up to 5 Years)

---

### NOTE

Rodents and other animals in search of warm surroundings or food, like to house inside motors. Some of them attack the insulation materials. Their access to the motor should be prevented.

### Inland Dry Climate

#### Conditions Usually Encountered

Dust, sand, heat from the sun, and occasional rain or snow.

#### Requirements

If the ambient temperature exceeds 140°F (60°C), the space or structure should be enclosed but ventilated. If the ambient temperature is below 40°F (4.5°C), the space heaters, if the motor is so equipped, should be energized. Cover the motor completely to exclude dirt, dust, moisture and other foreign materials. At a bare minimum, a heavy waterproof cover should be slipped over the motor.

After the motor is covered as described, a shed of some sort should be erected to protect it from direct rain, snow and excessive direct sun heat. Proper wrapping will protect the motor from blown sand and dirt.

If the motor can be moved, it is suggested that the entire motor be encased in a strong, transparent plastic bag. Before sealing the bag, a moisture indicator should be attached to the side of the motor and several bags of silica-gel desiccant placed inside the bag around the motor. When the moisture indicator shows that the desiccant has lost its effectiveness, as by a change in color, the bag should be opened and the desiccant replaced with fresh material. Take care in placing the bags of desiccant so that none is in contact with the heater element.

When a motor cannot be sealed for effective use of a desiccant, and the relative humidity is greater than 50% or where there are large daily swings in temperature the space heaters (anti-condensation heaters) should be energized. Heaters supplied in the motor are sized to raise the temperature of the windings 10°F to 15°F (5.5 °C to 8 °C). This prevents moisture from condensing on the windings.

If the motors are not equipped with space heaters, consult the factory for proper size of external heaters to be used.

## Outdoor Storage (Up to 5 Years)

---

### NOTE

Rodents and other animals in search of warm surroundings or food, like to house inside motors. Some of them attack the insulation materials. Their access to the motor should be prevented.

### Inland Humid Climate: (Non Industrial Area)

#### Conditions Usually Encountered

Dust, rain, snow, organic growth (fungus).

#### Requirements

If the ambient temperature exceeds 140°F (60°C), the space or structure should be enclosed but ventilated. If the ambient temperature is below 40 °F (4.5 °C), the space heaters, if the motor is so equipped, should be energized.

Cover the motor completely to exclude dirt, dust, moisture and other foreign materials. At a bare minimum, a heavy waterproof cover should be slipped over the motor.

After the motor is covered as described, a shed of some sort should be erected to protect it from direct rain, snow and excessive direct sun heat. Proper wrapping will protect the motor from blown sand and dirt.

If the motor can be moved, it is suggested that the entire motor be encased in a strong, transparent plastic bag. Before sealing the bag, a moisture indicator should be attached to the side of the motor and several bags of silica gel desiccant placed inside the bag around the motor. When the moisture indicator shows that the desiccant has lost its effectiveness, as by a change in color, the bag should be opened and the desiccant replaced with fresh material. Take care in placing the bags of desiccant so that none is in contact with the heater element.

When a motor cannot be sealed for effective use of a desiccant, and the relative humidity is greater than 50% or where there are large daily swings in temperature the space heaters (anti-condensation heaters) should be energized. Heaters supplied in the motor are sized to raise the temperature of the windings 10°F to 15°F (5.5°C to 8°C). This prevents moisture from condensing on the windings. If the motors are not equipped with space heaters, consult the factory for proper size of external heater to use.

## Outdoor Storage (Up to 5 Years)

---

### NOTE

Rodents and other animals in search of warm surroundings or food, like to house inside motors. Some of them attack the insulation materials. Their access to the motor should be prevented.

## Salty and Industrial Atmospheres

### Conditions Usually Encountered

Moisture impregnated with salts or other chemicals, salty dust rain, snow, fungus growth, fumes, coal and chemical soot.

### Requirements

If the ambient temperature exceeds 140°F (60°C), the space or structure should be enclosed but ventilated. If the ambient temperature is below 40°F (45°C), the space heaters, if the motor is so equipped, should be energized.

Cover the motor completely to exclude dirt, dust, moisture and other foreign materials. At a bare minimum, a heavy waterproof cover should be slipped over the motor.

After the motor is covered as described, a shed of some sort should be erected to protect it from direct rain, snow and excessive direct sun heat. Proper wrapping will protect the motor from blown sand and dirt.

If the motor can be moved, it is suggested that the entire motor be encased in a strong transparent plastic bag. Before sealing the bag, a moisture indicator should be attached to the side of the motor and several bags of silica gel desiccant placed inside the bag - around the motor.

When the moisture indicator shows that the desiccant has lost its effectiveness as by a change in color, the bag should be opened and the desiccant replaced with fresh material. Take care in placing the bags of desiccant so that none is in contact with the heater element.

When a motor cannot be sealed for effective use of a desiccant and the relative humidity is greater than 50% or where there are large daily swings in temperature, the space heaters (anti-condensation heaters) should be energized.

Heaters supplied in the motor are sized to raise the temperature of the windings 10°F to 15°F (5.5°C to 8°C). This prevents moisture from condensing on the windings.

If the motors are not equipped with space heaters, consult the factory for proper size of external heater to be used.



## Preparation For Storage

---



### Sleeve and Tilting Pad Bearings

Motors with this type of bearing are shipped without lubricating oil. A film of rust-inhibiting oil from factory testing protects the bearing and shaft journals during shipment, but this protection does not last long enough for extended periods of storage for thirty (30) days or more. Therefore, before placing the motor in storage longer than thirty (30) days, fill the oil wells (sumps) to running level with a good grade of rust inhibiting turbine oil of the proper viscosity.

Remove the shaft blocking on motors with sleeve bearings to permit turning of the shaft. Do not remove the blocking on motors with tilting pad bearings unless an auxiliary oil flood lubricating system is available for use for storage maintenance.

### Oil Lubricated Antifriction and Kingsbury Type Bearings

No lubricating oil is shipped with any of these units.

Vertical motors with these types of bearings and for operation at 1800 rpm or slower are designed so the oil completely covers the bearings when properly lubricated. To protect the motor for storage, fill the oil wells (sumps) to the running level with a good grade of rust-inhibiting turbine oil of the proper viscosity.

Vertical motors with anti-friction bearings for operation at 3000 or 3600 rpm use oil sump lubrication requiring the bearings to be located above the normal oil level. A film of rust-inhibiting oil from factory testing protects the motor during shipment. If the motor will be run during storage, the motor should be prepared for future storage maintenance by filling the oil wells as described above. If the motor will not be run, arrange motor so it can be later disassembled for oil coating of internal parts.

### Grease Lubricated Anti-Friction Bearings

Grease lubricated ball or roller bearing motors are shipped from the factory with bearings properly packed with grease and if the elapsed time from the date of shipment is less than thirty (30) days, no further preparation is required.

If the elapsed time is over thirty (30) days, add grease to each bearing. Refer to the lubrication plate on the motor for the amount of grease and the identification of the grease installed at the factory. Use the same or compatible grease.

### Oil Mist Lubricated Anti-Friction Bearings

Motors with this type of lubrication system require special attention. Check for a tag attached to the motor and read and follow the caution statements on the tag.

If the tag states the motor was shipped with grease in the bearings, the motor should be treated same as Grease Lubricated Anti-Friction Bearings described above.

If the tag states that an oil mist lubrication system must be connected before the motor is started;

**INDOOR STORAGE:** The motor was shipped with no grease in the bearings and it cannot be stored for longer than two weeks unless an auxiliary oil-mist system is available.

**OUTDOOR STORAGE:** The motor should not be stored outdoors.

## **Preparation For Storage**

---

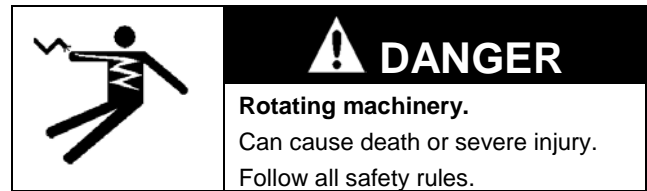
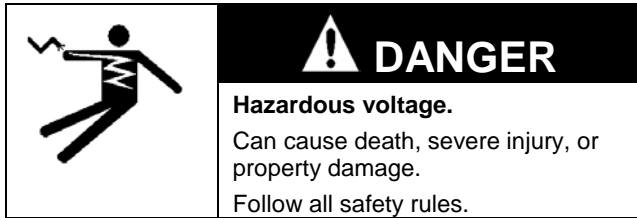
### **Shaft Extensions and Exposed Machined Surfaces**

Surfaces should be coated with an easily removable rust preventive such as Tectyl No. 502-C.

If the storage period will be nine months or longer and the risk of exposure to moisture is present, take the following precautions;

1. Before adding the lubricant described above, disassemble the motor taking care not to contaminate the existing lubricant or the bearing or shaft journal.
2. If any exposed machined surfaces are unpainted, coat these with a non-hardening protective film, such as Tectyl No. 506. This material can be later removed with petroleum solvents. Do not apply this material to bearings, shaft journals or other parts within the bearing cavity.
3. FOR INLAND HUMID CLIMATE or SALTY AND INDUSTRIAL ATMOSPHERE: Before reassembly of the motor, spray all internal surfaces of the stator (winding and iron) with one coat of an anti-fungus varnish such as PD. George No. 1137 protective sealer.

## Maintenance During Storage



### Sleeve Bearings

Per Chart 1, the motor shaft should be manually rotated by hand at about 30 rpm for 15 seconds or if power is available, the motor can be electrically bumped for 5 seconds;

Chart 1	
STORAGE ENVIRONMENT	Shaft Rotation Frequency
INDOOR – WHOLLY CONTROLLED ATMOSPHERE	Every two (2) months
INDOOR – PARTIALLY CONTROLLED ATMOSPHERE	Once per month
OUTDOOR – INLAND DRY CLIMATE	Once per month
OUTDOOR – INLAND HUMID CLIMATE	Once per week
OUTDOOR – SALTY AND INDUSTRIAL ATMOSPHERE	Once per week

### Tilting Pad Bearings

**INDOOR STORAGE:** Do not turn the shaft on motors with this type of bearing unless an external flood lubrication system is connected and in operation. If this system is not available, do not run the motor, but every three months, disassemble the motor for access to the bearings and coat the bearings and the shaft journal area with a rust-inhibiting turbine oil of the proper viscosity.

**OUTDOOR STORAGE:** The motor should not be stored outdoors.

### Oil Lubricated Antifriction and Kingsbury Type Bearings

Every three (3) months, 3000-3600 RPM vertical motors with anti-friction bearings should be run for two minutes to recoat the oil-lubricated bearings. If the motor cannot be run, it must be partially disassembled to reach the bearings. Manually cover the bearing with a fresh coat of oil. The oil itself need not be renewed.

On 1800 rpm and slower speed vertical motors, the shaft should be rotated by hand every two (2) months. Turn it by hand at about 30 rpm for 15 seconds or if power is available, the motor can be electrically bumped for 5 seconds.

### Grease Lubricated Anti-Friction Bearings

Per Chart 2, the motor shaft should be manually rotated by hand at about 30 rpm for 15 seconds or if power is available, the motor can be electrically bumped for 5 seconds;

Chart 2	
STORAGE ENVIRONMENT	Shaft Rotation Frequency
INDOOR – WHOLLY CONTROLLED ATMOSPHERE	Every two (2) months
INDOOR – PARTIALLY CONTROLLED ATMOSPHERE	Every two (2) months
OUTDOOR – INLAND DRY CLIMATE	Once per month
OUTDOOR – INLAND HUMID CLIMATE	Once per week
OUTDOOR – SALTY AND INDUSTRIAL ATMOSPHERE	Once per week

Bearings should be regreased at one (1) year intervals while in storage. Refer to the lubrication plate on the motor for the amount of grease and the identification of the grease installed at the factory. Use the same or compatible grease.

## **Maintenance During Storage**

---

### **Oil Mist Lubricated Anti-Friction Bearings**

If motor was shipped with grease in the bearing, follow instructions for grease lubricated anti-friction bearings described above.

If motor does not have grease in the bearing, start the oil mist system connected during the storage preparations, start the motor, and run it for two minutes. Repeat this process every two weeks.

### **Shaft Extensions, Exposed Machined Surfaces and Flanges**

Check the condition of the rust inhibitor used and recoat as recommended by the manufacturer. For example, Tectyl No. 502-C, heavily applied, may last about 2 years.

Desiccant bags and plugs must be checked periodically, even weekly, if the moisture is high (above 50% relative humidity) and the temperature drops often.

### **Other**

If heaters are used, check that they are operating properly. Perform this check every time the bearings are checked.

Check the condition of the desiccant weekly and replace as necessary.

Every two (2) years while in storage, the motor should be disassembled and prepared for storage again.

## Preparation For Service

---

### Cleaning

Both the interior and exterior of the motor should be free of spilled oil, water, dust, and dirt. The exterior should be wiped and the interior blown out with compressed air at a reduced pressure.

### CAUTION

#### Moisture.

Can damage windings.  
Protect motor from moisture.

Wipe off removable rust preventatives with a clean cloth soaked in petroleum solvent.

### WARNING

#### Solvent may explode.

Have no flames or spark.  
Dispose of rags in special container.

Make sure that the bearings and lubricant cavities are free of dust and dirt and that the (oil) plugs in the cavity are sealed and tight. Scratches or rust on the shaft journals must be carefully removed.

### Relubricate Bearings

Use the specified or compatible grease or the specified viscosity turbine oil as applicable. Refer to lubrication plates on the motor and to the instruction book.

### Remove Desiccant

### Check Winding Insulation Resistance

Regardless of the method or location of storage, the winding insulation should be measured prior to placing the motor in service. A low winding insulation resistance is an indication of excessive moisture in the winding and it should be dried before being energized.

Check the insulation resistance using a hand cranked or solid state insulation resistance tester and test with at least 500 volts but not greater than machine rated voltage. Use 500 volts on motors rated 600 volts or lower.

For machines with newer insulation systems, such as MiCLAD™ VPI, the insulation resistance after one (1) minute should be greater than 1000 megohms. (Values in excess of 5000 megohms are common.) Refer to the instruction book.

If the insulation resistance is less than satisfactory and the cause is excessive moisture in the winding, dry the windings by applying heat from:

1. A warm air oven.
2. Electric strip heaters.
3. Circulating currents through the coils.

Do not use radiant type heaters.

The heat should be applied slowly so the desired temperature will not be obtained in less than eight (8) hours. Heating faster may damage the winding. The insulation resistance should be measured before the heat is applied and every six to eight hours thereafter. For newer Class F insulation systems, such as MiCLAD™ VPI, a temperature of 245°F (118° C) is commonly used for this drying procedure.

Insulation resistance will decrease as the machine warms up but will begin to increase shortly as the dryout continues.

A uniform temperature must be maintained in the machine to obtain meaningful readings. When the insulation readings stop changing, the drying process is complete and may be discontinued. If the insulation resistance is still low, check for other causes.

To prevent damage to the bearings, the bearings and the bearing housings should be removed before starting any of the heating methods. The rotor should also be removed to allow more uniform heating of the winding. Temperature indicators or detectors should be connected to the winding and monitored to see that the recommended temperature is not exceeded. A fan can be helpful in getting more uniform winding temperatures and in carrying away the moisture when strip heaters are used as the heat source.

MiCLAD™ and Micalastic™ are Siemens trademarks.





# SIEMENS

Siemens Industry, Inc.

Norwood Motor Plant  
4620 Forest Avenue  
Norwood, OH 45212-3396  
(513) 841-3100