

Product Service Bulletin

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ASK THE Experts

Have a question for the experts?
Contact us at motorhelp@nidec-motor.com



If we suspect that a motor failed as result of water damage, what installation advice can we give our customers to help them protect the motor from future water damage?



If they are going to use the motor outdoors, it is going to be subjected to humidity and moist environments. They can take appropriate precautions by using space heaters or trickle voltage heating schemes to keep the winding above the dew point and prevent moisture from collecting and causing problems.

Storage

Tips to storing a motor, short or long term.

When to put a motor in storage:

If a motor is not put into immediate service (one month or less), or if it is taken out of service for a prolonged period, special storage precautions should be taken to prevent damage. The following schedule is recommended as a guide to determine storage needs.

A. Out of service or in storage less than one month - no special precautions except that space heaters, if supplied, must be energized at any time the motor is not running.

B. Out of service or in storage for more than one month but less than six months-store per items 2A, B, C, D, E (2), F, and items #A, B, and C, and item 4.

C. Out of service or in storage for six months or more - all recommendations.

Storage Preparation

- A. Where possible, motors should be stored indoors in a clean, dry area.
- B. When indoor storage is not possible, the motors must be covered with a tarpaulin. This cover should extend to the ground; however, it should not tightly wrap the motor. This will allow the captive air space to breathe, minimizing formation of condensation. Care must also be taken to protect the motor from flooding or from harmful chemical vapors.
- C. Whether indoors or out, the area of storage should be free from excessive ambient vibration which can cause bearing damage.
- D. Inspect the rust preventative coating on all external machined surfaces, including shaft extensions. If necessary, re-coat the surfaces with a rust preventative material, such as Rust Veto^{®†} No. 342 (manufactured by E.F. Houghton Co.) or an equivalent. The condition of the coating should be checked periodically and surfaces re-coated as needed.

E. Bearings:

- 1) When storage time is 6 months or more, grease lubricated cavities must be completely filled with lubricant. Remove the drain plug and fill cavity with grease until grease begins to purge from drain opening. Refer to section IX. **“LUBRICATION” of the Installation, Operation and Maintenance Manual** and/or review motor’s lubrication nameplate for correct lubricant.
- 2) Oil lubricated motors are shipped without oil. When storage time exceeds one (1) month, the oil sumps must be filled to the maximum capacity as indicated on the oil chamber sight gauge window. Refer to motor lubrication nameplate or Section IX “Lubrication” for proper oil.

NOTE: Motor must not be moved with oil in reservoir. Drain oil before moving to prevent sloshing and possible damage.

With a clean cloth, wipe any excess oil from the threads of the drain plug and the inside of the drain hole. Apply Gas-oila^{®†} P/N SS08 or equivalent thread sealant to the threads of the drain plug and replace the plug in the oil drain hole. Refill oil when motor has been moved to the new location.

- F. To prevent moisture accumulation, some form of heating must be utilized. This heating should maintain the winding temperature at a minimum of 5° above ambient. If space heaters are supplied, they should be energized. If none are available, single phase or “trickle” heating may be utilized by energizing one phase of the motor’s winding with a low voltage. Request the required voltage and transformer capacity from Nidec Motor Corporation. A third option is to use an auxiliary heat source and keep the winding warm by either convection or blowing filtered warm air into the motor.

Periodic Maintenance

- A.** Oil should be inspected monthly for evidence of moisture or oxidation. The oil must be replaced whenever contamination is noted or every twelve months, whichever occurs first. It is important to wipe excess oil from the threads of the drain plug and the drain hole and to coat the plug threads with Gasoila^{®†} P/N SS08 or equivalent thread sealant before replacing the drain plugs.
- B.** Grease lubricated bearings must be inspected once a month for moisture and oxidation by purging a small quantity of grease through the drain. If any contamination is present, the grease must be completely removed and replaced.
- C.** All motors must have the shaft rotated once a month to maintain a lubricant film on the bearing races and journals.
- D.** Insulation Testing:

Two tests are used to evaluate the condition of the winding insulation. The first of these is the one minute insulation resistance test (IR1) and the second is the polarization index test (PI), which can also be referred to as a dielectric absorption test. The results of either of these tests can be skewed by factors such as the winding temperature and its relation to the dew point temperature at the time the test was conducted. The PI test is less sensitive to these factors than the IR1 test, but its results can still be affected significantly. Due to these factors, the most reliable method for evaluating the condition of the winding insulation is to maintain a record of periodic measurements, accumulated over months or years of service, for one or both of these tests. It is important that these tests be conducted under similar conditions of the winding insulation is to maintain a record of periodic measurements, accumulated over months or years of service, for one or both of these tests. It is important that these tests be conducted under similar conditions of winding temperature, dew point temperature, voltage magnitude and duration, and relative humidity. If a downward trend develops in the historical data for either test, or if the readings from both tests drop below a minimum acceptable value, have an authorized electrical apparatus service shop thoroughly clean and dry the winding, and retreat, if necessary.

The recommended procedure for the IR1 test is as follows:

- (1)** Disconnect all external accessories or equipment that have leads connected to the winding and connect them to a common ground. Connect all other accessories that are in contact with the winding to a common ground.
- (2)** Using a megohmmeter, apply DC voltage at the level noted below for 1 minute and take a reading of the insulation resistance between the motor leads and ground.

Rated Motor Voltage	Recommended DC Test Voltage
Up to 1000 (inclusive)	500 VDC
1001 to 2500 (inclusive)	500 to 1000 VDC
2501 to 5000 (inclusive)	500 to 2500 VDC
5001 and up	500 to 5000 VDC

- (3)** The reading should be corrected to a 40°C base temperature by utilizing the formula:

$$R_{40C} = K_T R_T$$

Where:

R_{40C} = insulation resistance (in megohms) corrected to 40°C

K_T = insulation resistance temperature coefficient at temperature $T^{\circ}C$

R_T = measured insulation resistance (in megohms) at temperature $T^{\circ}C$

The value of K_T can be approximated by using the formula:

$$K_T = (0.5)^{(40-T) / 10}$$

Where: T = the winding temperature in $^{\circ}C$ that the insulation resistance was measured at.

Storage *continued*

The recommended procedure for the PI test is as follows:

- (1) Perform steps 1 and 2 from the IR1 test procedure. Heed the safety warnings given in the IR1 test procedure.
- (2) With DC voltage, still being applied by the megohmmeter, taken an additional reading of insulation resistance between the motor leads and ground 10 minutes after the DC voltage was initially applied. To minimize measurement errors, the variation in winding temperature between the 1 minute and 10 minute readings should be kept to a minimum.
- (3) Obtain the polarization index by taking the ratio of the 10-minute resistance reading to the 1 minute resistance reading.

The recommended minimum value for the 1 minute insulation resistance reading corrected to 40°C is:

Rated Motor Voltage	Minimum Insulation Resistance
Up to 999 (inclusive)	5 Megohms
1000 and up	100 Megohms

If historical data from previous IR1 and / or PI tests is available, then a comparison of the present test result to previous tests can be used to evaluate the condition of the insulation. To minimize error, all readings that are compared should be taken at test voltages, winding temperatures, and relative humidities that are similar as possible. If a downward trend in the readings develops over time, have an authorized electrical apparatus service shop thoroughly clean and dry the winding and, if necessary, retreat the winding. Then, repeat the test and re-check results before returning the motor service.

If historical data from previous IR1 or PI tests is not available, then compare readings from the present test to the recommended minimum values listed below. If the readings from both tests fall below the minimum, have an authorized electrical apparatus service shop thoroughly clean and dry the winding and, if necessary, retreat the winding. Then, repeat the tests and re-check results before turning the motor to service.

The recommended minimum value for the polarization index is 2.0 if the 1 minute insulation resistance reading corrected to 40°C is above 5000 megohms, however, the polarization index may not be meaningful. In such cases, the polarization index may be disregarded as a measure of insulation condition.

Refer any question to the Nidec Motor Corporation Product Service Department.

For more information, refer to the IEEE 43™ Standard.



Start-up Preparations After Storage:

- A. Motor should be thoroughly inspected and cleaned to restore to an 'As Shipped' condition.
- B. Motors that have been subjected to vibration must be disassembled and each bearing inspected for damage.
- C. When storage time has been six (6) months or more, oil and/or grease must be completely changed using lubricants and methods recommended on the motor's lubrication plate, or in Section 7.5 of the Installation, Operation and Maintenance Manual.
- D. The winding must be tested to obtain insulation resistance and dielectric absorption ratio as described in Section 3.3, item D of the Installation, Operation and Maintenance Manual.
- E. Contact Nidec Motor Corporation Product Service Department prior to start-up if storage time has exceeded one year.

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