4. Handling and Transport

For any direct, special, incidental or consequential damages to the motor or any characteristics arising from operations not mentioned in this document. Thus, damages due to improper storage, incorrect installation of the motor, or malfunction of the load equipment, any damage caused by the negligence of third parties are not guaranteed. Refer to section '12. Warranty' for items excluded from the warranty agreed upon with the customer.

4.1 Incoming inspection

We conduct basic tests on the product before shipment and only ship those that pass these tests. Upon receipt, please inspect the product for any damage that may have occurred during transportation. Check the ratings on the nameplate, especially kilowatt output, voltage, speed, frequency and protection and make sure that they are identical with the ordered item.

Hand-turn the shaft to see that it turns smoothly and also check the basic parts such as making sure there is no excessive play in the shaft. If there are any issues at all, immediately contact the distributor or Hyosung Heavy Industries.

4.2. Transportation

Motors with lifting lugs or eyebolts should always be lifted using lifting devices. Always use a suitable lifting device when lifting the motor. The eyebolt is designed to lift only the motor's weight, as specified on the nameplate.

The motor placed on the pallet must be lifted onto the pallet base, ensuring that the lifting device fully supports its weight. Do not drop the packaging, and handle the motor with care to prevent bearing damage.

⚠ WARNING

- The supplied eyebolts are designed to lift motors only. Do not use this eyebolt to lift the motor along with its base, pulley, pump, reducer, or any other attached components.
- Do not use a damaged, bent, or cracked eyebolt. Always check the condition of the eyebolts before lifting the motor.

If the contract does not specify the packaging method, the motor will be packaged based on its size, weight, and transportation method. Possible packaging options include cartons, pallets, skids, semi-enclosed, or fully enclosed packaging. Ensure compliance with the requirements for images displayed on the surface of the packaging for transportation.

4.3 Lifting

Before lifting, ensure that the eyebolts are fully tightened and securely fastened, and that the eyebolt face of the motor is in full contact with the frame. (Please refer to Figure 4.1 - 2)

Figure 4.1 - Correctly tightened

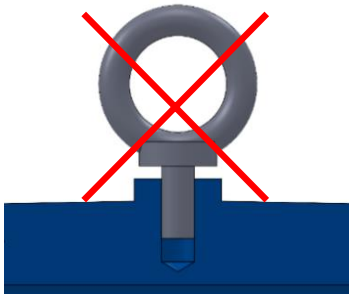

Figure 4.2 - Incorrectly tightened

⚠ WARNING

- Always use the designated eyebolt to lift the motor. Do not attempt to lift the motor using the shaft or carton box. It is crucial to use the proper eyebolt, as it is specifically designed for lifting the motor safely.
- Do not move the motor above the operator's head. When transporting it, ensure that it is kept close to the floor.

4.3.1 Horizontal type motor with one eyebolt

For lifting horizontal motors with only one eyebolt, the inclination angle must not exceed 30º from the vertical axis. (Please refer to Figure 4.3)

Figure 4.3 - Maximum allowable inclination angle for a motor with only one eyebolt

4.3.2 Horizontal motor with two eyebolts

If the motor has more than two eyebolts, all eyebolts must be used simultaneously when lifting the motor. The lifting chain or rope must remain vertical, and a spreader beam is recommended to protect the motor's surface. The maximum inclination angle of an electric motor equipped with two or more vertical lifting eyebolts according to Figure 4.4 shall not exceed 45° from the vertical axis.

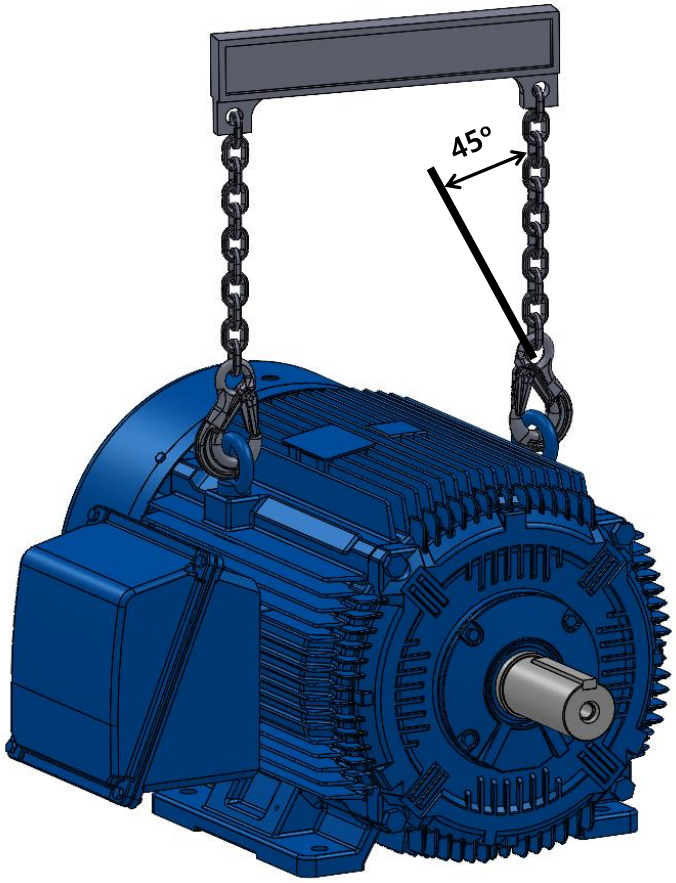

Figure 4.4 - Maximum allowable inclination angle for a motor equipped with two or more eyebolts

4.3.3 Vertical type motor

Vertical motors must be lifted using two lifting hooks simultaneously, and the lifting chain or rope must remain vertical. A spreader beam is recommended to protect the motor surface. If the motor is equipped with more than two eyebolts, all eyebolts must be used at the same time during lifting.

Figure 4.5 - Lifting a vertical type motor

⚠ WARNING

- The safe lifting of motors requires the use of a lifting device with adequate capacity to handle the weight and length of the motor.
- If the motor is lifted in any way other than as described in this manual, we cannot guarantee its safe lifting. We also cannot be held responsible for any issues that may occur.

5. Storage

The motor should be stored in a clean, dry, and well-ventilated area with minimal indoor vibration and little temperature variation (the ambient temperature should be between 50°F and 104°F, with humidity levels below 60%). Unless the motor is installed vertically, store it horizontally and do not place other objects on top of the motor.

If the motor is stored for an extended period, there is a possibility of rust forming on the machined surfaces, grease loss due to oil separation, or insulation degradation of the stator windings from moisture absorption. To prevent this from happening, make sure you do the following

- If you won't be using the motor for more than a month, or if it will be stored in a high-humidity area or a place where moisture and debris might get in, store the motor on a pedestal that's at least 4 inches high. Cover the motor with a waterproof cover, place a desiccant inside, and seal it. Make sure to change the desiccant regularly.
- The rust preventive coating is applied to help prevent rust. However, depending on the storage conditions, rust may still occur. To maintain protection, please reapply the rust inhibitor periodically (at least once a month).
- To prevent rust from forming on the bearings, rotate the shaft by hand for at least 10 full turns every two weeks after receiving the motor.
- When storing the motor for more than 6 months, rotate the shaft every 6 months to re-lubricate the grease. (Regrease the bearing after removing the grease outlet plug)
- If stored for more than two years, disassemble, clean, inspect, and then regrease the bearings. (Sealed bearings are recommended for change)
- Measure the insulation resistance every three months using a DC 500V class insulation resistance tester and properly maintain the insulation condition. (Please refer to Section '5.1.Insulation Resistance,' for instructions on measuring insulation resistance)
- When the motor is stopped, condensation may form inside and outside due to temperature differences between the interior and exterior. To prevent this, operate a space heater to keep the motor at least 9°F(5°C) warmer than the surrounding air. If a space heater is not available, regularly check the insulation resistance. If it falls below the specified value, use a secondary heater or another method to maintain the temperature.
- Do not stack more than two tiers high of motors packaged in cartons or wood, as this may damage the packaging. If your storage space is limited and you need to stack more than two tiers, use a storage rack to keep the weight off the motors.
- We are not responsible for any defects caused by improper storage due to failure to follow the instructions in this manual.

5.1 Insulation resistance

When storing or not in use, you must regularly measure the insulation resistance of the windings and record the measurement data. If the insulation resistance value falls below the reference value, take measures such as drying the motor windings or adjusting the storage conditions to restore the insulation resistance to the reference value or higher.

5.1.1 Measuring Insulation Resistance

Follow the procedure below to measure the insulation resistance.

(1) Prepare an insulation resistance tester
(2) Open the motor's terminal box. Using the insulation resistance tester, connect the red clip to the motor's lead wire and the black clip to the ground terminal or an unpainted area of the motor. Then, begin the measurement. (It is recommended to measure each phase separately, with each phase isolated. While measuring one phase, ensure that the other phases are grounded)
(3) Apply a direct current test voltage of DC 500V to the winding, wait for 1 minute, and then measure the insulation resistance. (If the OL indication appears on the insulation resistance tester before 1 minute, this is normal, as it indicates an infinite resistance greater than 1000 MΩ.)

Power supply cables and other external devices connected to the motor can influence the insulation resistance measurement. Therefore, they must be disconnected and grounded during the measurement.

When measuring insulation resistance, ensure that the power cable is disconnected and conduct the measurement in a safe environment.

5.1.2 Determining Insulation Resistance

The insulation resistance of the low-voltage motor stator windings must meet or exceed the reference value when measured with a DC 500V insulation resistance tester. Typically, a resistance of 5 MΩ or more at a winding temperature of 104°F is sufficient for safe use. Since the insulation resistance value decreases exponentially as the winding temperature increases, you can use the following equation to adjust the insulation resistance value according to the winding temperature. (Applied standards: IEEE Std 43)

$$R_C = K_T \times R_T$$

R_C: Insulation resistance (MΩ) at 104°F

K_T: Correlation coefficient of insulation resistance at

temperature T°F $[(0.5)^{(104-T)/18}]$

R_T: Insulation resistance at the measured temperature (MΩ)

T: Winding temperature at the time of measurement (°F)

To assist with the calculation, temperature-specific correlation coefficient values are provided in Table 5.1.

Table 5.1 - Insulation Resistance Correlation Factor (KT) for Different Winding Temperatures

Winding Temperature (°F)	Correlation coefficient K_T	Winding Temperature (°F)	Correlation coefficient K_T	Winding Temperature (°F)	Correlation coefficient K_T
33.8	0.067	69.8	0.268	105.8	1.072
35.6	0.072	71.6	0.287	107.6	1.149
37.4	0.077	73.4	0.308	109.4	1.231
39.2	0.082	75.2	0.330	111.2	1.320
41.0	0.088	77.0	0.354	113.0	1.414
42.8	0.095	78.8	0.379	114.8	1.516
44.6	0.102	80.6	0.406	116.6	1.625
46.4	0.109	82.4	0.435	118.4	1.741
48.2	0.117	84.2	0.467	120.2	1.866
50.0	0.125	86.0	0.500	122.0	2.000
51.8	0.134	87.8	0.536	123.8	2.144
53.6	0.144	89.6	0.574	125.6	2.297
55.4	0.154	91.4	0.616	127.4	2.462
57.2	0.165	93.2	0.660	129.2	2.639
59.0	0.177	95.0	0.707	131.0	2.828
60.8	0.189	96.8	0.758	132.8	3.031
62.6	0.203	98.6	0.812	134.6	3.249
64.4	0.218	100.4	0.871	136.4	3.482
66.2	0.233	102.2	0.933	138.2	3.732
68.0	0.250	104.0	1.000	140.0	4.000

The insulation resistance of the low-voltage motor should be assessed by comparing the corrected value at 104°F with the values in Table 5.2.

Table 5.2 - Evaluating Insulation Resistance

Insulation resistance(MΩ)	Acceptance
< 5	Dissatisfied
5 ~ 100	Insulation is degrading. Currently, the performance is satisfactory, but periodic checks should still be conducted.
> 100	Satisfied

If the insulation resistance is low, it could indicate the presence of moisture in the stator windings. In such cases, the product should be sent to a Hyosung Heavy Industries service center for proper inspection and repair. To improve insulation resistance by drying the motor, refer to section ‘8.4.3 Cleaning and Drying.’