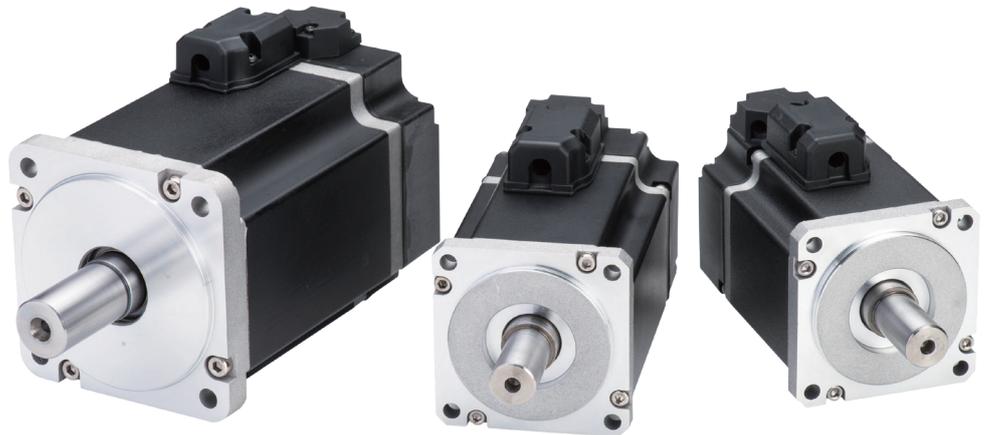


**HIWIN®**



# AC Servo Motor

User Manual

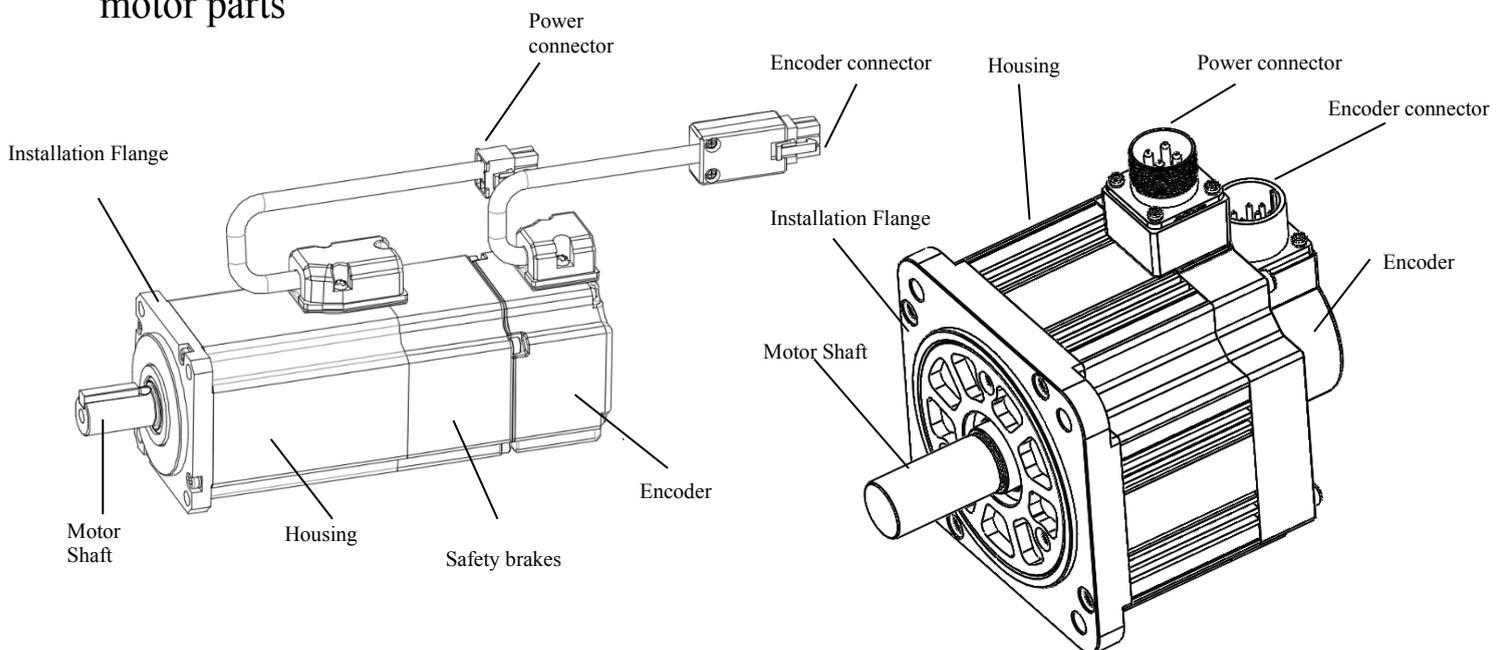
# Operation Instruction

Thank you for purchasing this company's AC servo motors and drivers.

Before you operate the motor, you must sufficiently understand the motor's specifications and operating manual. Please carefully read the safety precautions and operation instruction.

- Before using, please check the specifications and model name on the-label to make sure that you have received the correct servo motor.
- If you have received a motor with the wrong specifications or if the motor is damaged or missing parts, please contact your dealer, the retailer or this company's sales representatives.

## Description of motor parts



## Precautions before use

1. Before using this product, please read this user's operation instruction carefully. This company will not be responsible for any damage, accidents or injuries caused by products that have not been properly installed according to this operation instructions.
2. Before installing or using this product, check the package to see if it has been damaged or broken. If there is any damage, please contact this company's sales, retailer or dealer.
3. Please check whether or not the cables have been damaged and can be used for connection.
4. Please do not disassemble or modify this product on your own. This company's products have been designed with structural calculations, computer simulations, and physical testing. Do not disassemble or modify this product on your own without getting approval from professionals.
5. Children will not allowed to operate this product.
6. Persons who have physical or mental disease or who do not have experience with the use of related products should not be allowed to use this product unless they are accompanied by supervisors or personnel familiar with the product to ensure their safety.

\* If any of the above registration information does not match with your purchasing information or if there are any problems with the product, please contact your dealer, retailer or sales representative of this company.

## ■ Description of safety-related symbols

The safety-related content of this instruction uses the following marks. Description of the safety signs is important content, please read carefully and comply.



**Danger:** indicates that incorrect use will cause danger that can result in personnel injury or death.



**Caution:** incorrect use will cause danger, which can possibly result in personnel harm and light injury or damage to the product.

- Before installation, operation, maintenance and inspection, please read carefully and be familiar with this instructions, operation manual and other attached documents.
- Be familiar with mechanical knowledge, safety information, and precautionary items related to the product before use.
- This instructions divides safety precautionary items into “**Danger**” and “**Caution**”, please comply and implement.
- After reading this instruction, please keep this instruction where the user can access at any time.

## • Description of safety instructions

### Operation danger

1. If an abnormality occurs with this product, do not attempt to repair it yourself. This product should only be repaired by this company's qualified technical personnel or the product should be sent back to this company for repairs.
2. Do not use the servo motor for loads that exceed its specification standards.
3. Do not touch wires or operate the equipment with wet hands.
4. Do not change servo motor parts or remove motor screws on your own because this can damage the servo motor. This company will not be responsible for any damage, accidents, or injuries caused by products that have been improperly tampered with.
5. The surface of servo motor, regenerative resistor and driver will be hot when operation. Do not touch.
6. Do not touch the keyway of keyway motor with hands.
7. Never touch the rotating parts of the motor when the motor is operating.

### Fire danger

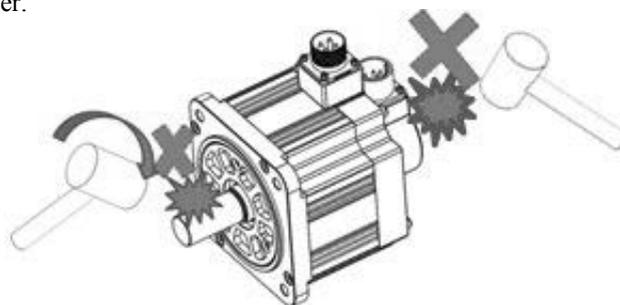
1. Do not place flammable materials around the motor, driver or regenerative resistor.
2. Do not use in environment with corrosive, flammable gases or flammable materials.
3. Do not connect the motor directly to commercial power.

### Electric Shock danger

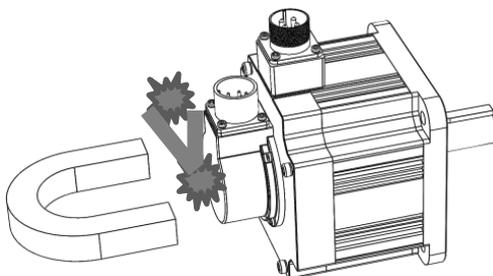
1. To prevent risk of electric shock, do not use damage cables with ~~exert~~ excessive pressure or press and clamp the wire overly.
2. Do not use when wires are in contact with oil or water.

### Caution:

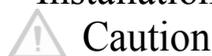
1. Read this instruction first before using the product.
2. If the product is used for excessive load will cause the motor ~~easing~~ housing high surface temperature.
3. There may be electromagnetic compatibility (EMC) problems in other environments.
4. Do not use this product in an environment where it may be shocked. Do not directly strike the shaft or encoder; as hitting or pounding). This company will not be responsible for product damage, accidents or injuries caused by products treated in this manner.



5. Do not pick up or place the motor, by cable or shaft-
6. Because the servo motor contains a precision encoder, please take sufficient measures to prevent electromagnetic noise interference or abnormal temperature changes when using.
7. The absolute encoder has an attached magnetic sensor. Do not operate magnetic equipment on the top of encoder cover or around the encoder.



## ■ Installation Instruction



### Caution

#### General precautionary items

1. Please follow the requirements of operation instruction.
2. Follow the technical instruction and install servo motor at a location with bearable load.
3. When installing, do not impact or strike the motor.
4. When installing, prevent foreign objects from entering the product.
5. The spacing for installing the servo motor, driver, controller and other machines should follow specifications.
6. When installing, please set up an external emergency stop loop that can immediately stop the product and cut off power.

#### Installation environment

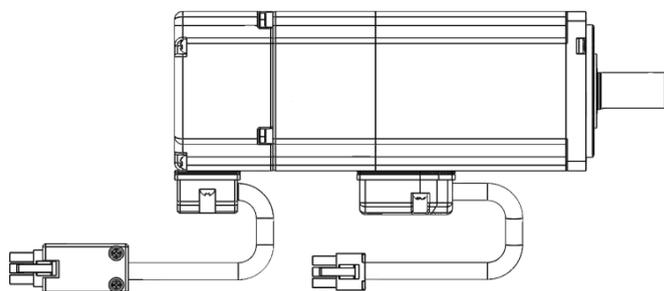
Items		Environment conditions
Environment temperature	Operations	0°C-40°C(avoid condensation and icing)
	Storage	-15°C-70°C(avoid condensation and icing)
Environmental humidity	Operations	Below 80% RH (avoid condensation and icing)
	Storage	
Storage environment		Indoors out of direct sunlight, away from corrosive or flammable gases, oil/grease and dirty conditions.
Elevation		Less than 1000 meters
Vibration		Less than 49m/s <sup>2</sup>

#### Description of installation site

1. Please install this product indoors, out of direct sunlight.
2. Please install this product in a site with no humidity, dust or hazardous/corrosive gases or liquids.
3. The servo motor's shaft is not water or oil proof. Thus, do not install or use this servo motor in an environment with water or oil droplets, excessively high humidity or corrosive/flammable gases.
4. Do not store this product in a site with vibration that exceeds the quantity stated in the specification document.
5. The servo motor's shaft material is not rust-resistant. Although grease has been applied to prevent rust before the products shipped, if the storage time exceeds six months, inspect the shaft every three months to make sure that it is not rusted. Apply an appropriate amount of rust-prevention grease when needed.

## Installation method

1. Install in a horizontal direction: cable lead must face downward to prevent oil or water penetration.



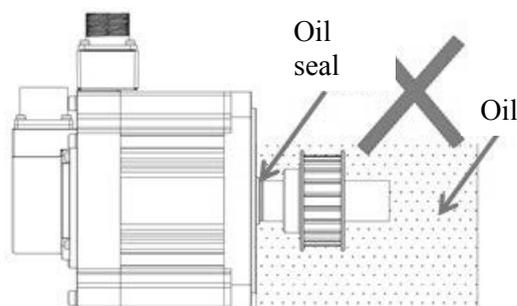
2. Install in a vertical direction: when the motor shaft mounted with reducer is installed facing upwards, oil seal must be used to prevent the reducer oil from flowing into the inside of the motor.

## ■ Installation precautions for other parts

### ⚠ Caution

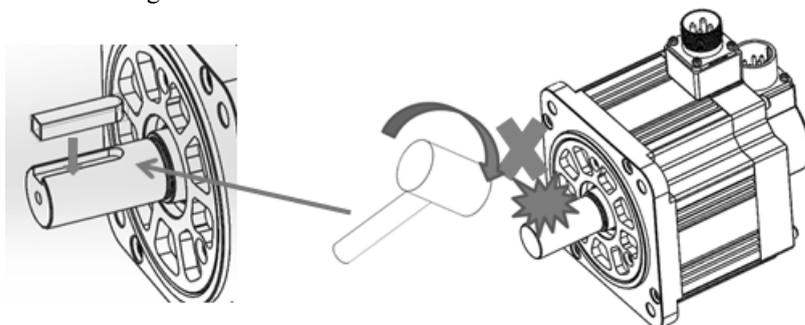
#### Installation and use of oil seals

1. If the servo motor shaft and flange opening is easily affected by oil spray in the operation environment, use a motor with an oil seal.
2. Check the operation environment to make sure that the oil seal material is appropriate.
3. The oil seal should not be used in a location lower than the oil surface or the oil can leak in through the opening of motor flange to damage the servo motor.



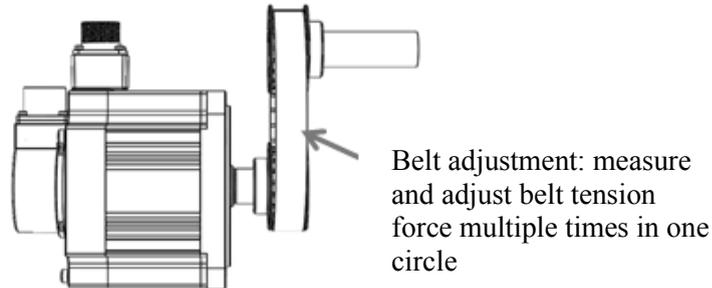
#### Key installation and use

1. When putting the key that comes with the product or a key designated by the manual into the keyway, do not directly strike the shaft, which can cause damage.



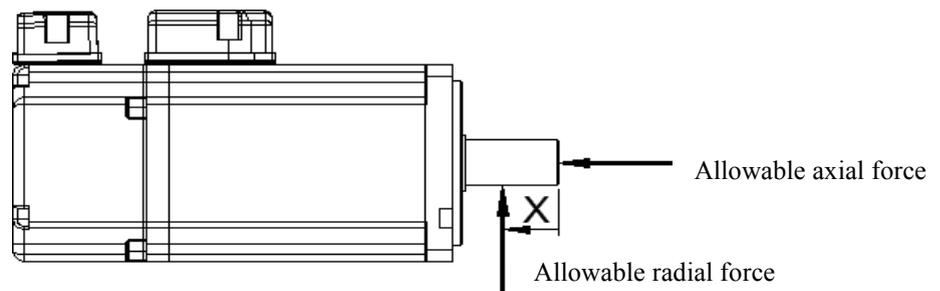
## Belt installation and use

1. Choose a belt that is suitable for the servo motor's allowable radial load and output power.
2. When the motor accelerates or decelerates, the reaction force to the acceleration/deceleration will increase the initial belt tension. Thus, when choosing a belt, please consider the ~~action~~ load of motion and the belt's safety coefficient.
3. When installing the belt, suitably adjust the belt tension force and consider the allowable radial load stated in the motor operation instruction. Please reference the following Attachment 1.



## Attachment 1

### Allowable radial / Axial force for the 50W-2KW series



#### Allowable axial force

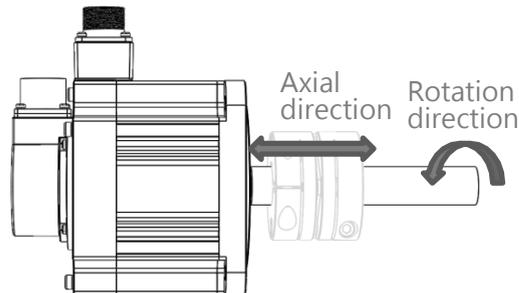
Motor Output Power	Frame Size	Allowable axial force (unit: Newton)
50W, 100W	40mm	74
200W, 400W	60mm	107
750W	80mm	170
1KW, 2KW	130mm	390

#### Allowable radial force:

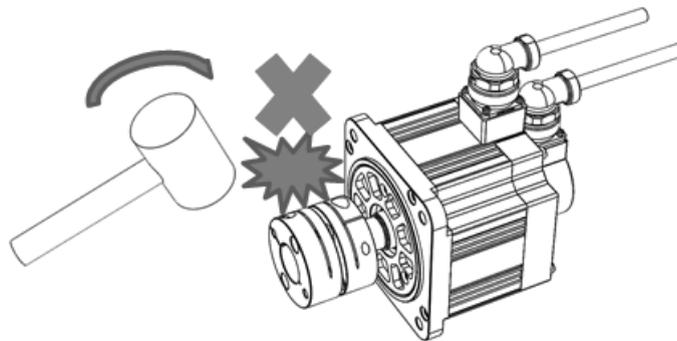
Motor output Power	Frame Size	Allowable axial force (unit: Newton), X unit mm										
		X=0	X=5	X=10	X=15	X=20	X=25	X=30	X=35	X=40	X=45	X=50
50W, 100W	40mm	68	74	80	88	98	-	-	-	-	-	-
200W, 400W	60mm	190	200	215	230	245	270	-	-	-	-	-
750W	80mm	340	350	365	380	395	415	435	-	-	-	-
1KW, 2KW	130mm	640	660	685	715	745	775	810	850	890	940	990

## Coupling Installation and Use

1. Before installation, please clean and remove the rust spots, dust and oil on the outer surface of the motor shaft and inner surface of coupling, especially molybdenum, silicon and fluorine type lubricant or esters. These lubricants and ester affect the friction coefficient and should never be on the motor shaft and coupling.
2. According to load conditions, choose suitable coupling. Excessively large or small coupling can cause coupling damage.
3. When the two clamping screw bolts on coupling are loose, check whether or not the coupling can slightly move along the axial direction and rotating direction. If the coupling cannot be smoothly moved, re-adjust the concentricity of both axis of motor shaft and coupling. This is an easy way to check the concentricity between both ways. If this method cannot be used to check, then use machine part precision management or other methods to check installation concentricity.

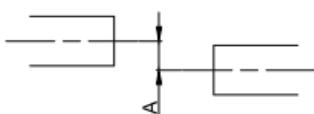


4. When installing the coupling on motor shaft, do not apply too much compressive or tensile force. Do not impact the motor shaft or it can affect the installation precision.

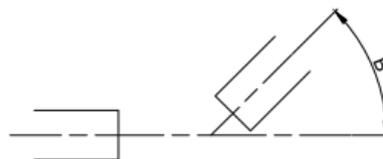


5. Before coupling installing with the motor shaft, do not fasten the screw bolt.
6. When choosing the coupling, do not exceed the maximum torque limit of the transmission. Choose the model according to the allowable eccentricity, declination, and axial direction deviation stated in the instructions.
7. If an abnormal coupling noise (metallic noise) is discovered during operations, stop operations immediately and check if the eccentricity of shaft are affected or if screws are loose.
8. Do not change the screws that match the coupling, or change screws referencing its use specifications.
9. Do not touch coupling while operating. To prevent danger, install a protective outer cover and other safety measures.
10. Conduct installation only when the main power is shutoff.
11. When installing the motor, pay attention to the following three types of basic deviation. Illustrations are shown below:

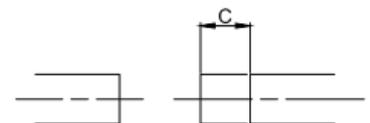
1. Eccentricity (A):



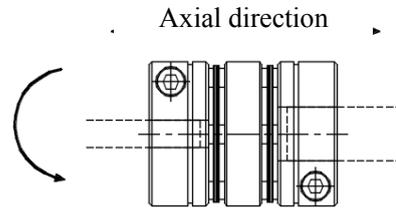
2. Declination (B):



3. Axial direction displacement (C):



12. To check the center line of the two axis of motor shaft and coupling for easy calibration, loosen the coupling screws on the motor shaft and load-end axis shoulder. Rotate the coupling and see if the coupling can easily rotated along the axial direction- To check the concentricity of both axis. Illustrations are shown below:



13. Motor Flange circle size and the PCD hole position of the flange. Please check concentricity when installing. The size of the recommended flange installation holes is shown in the following table.

Motor output power	Flange circle size	Tolerance
50W, 100W	30mm	H7
200W, 400W	50mm	H7
750W	70mm	H7
1KW, 2KW	110mm	H7

14. When installing the motor flange, please make sure that the deviation between the motor flange position hole and the load-end axis needs to be within the coupling's related allowable deviation.
15. If the deviation between the motor shaft and the load-end axis shoulder is too high, and the coupling is forcefully installed, it can cause the motor shaft, coupling, or load-end axis shoulder to break. So make sure that the deviation between the two axis is within the coupling's allowable deviation.
16. When choosing a coupling, we recommend choosing a flexible coupling that can absorb the eccentricity, declination and axial direction displacement.

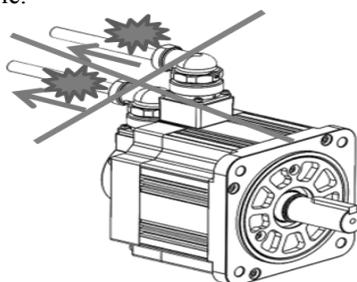
## ■ Wiring precautions

### Caution

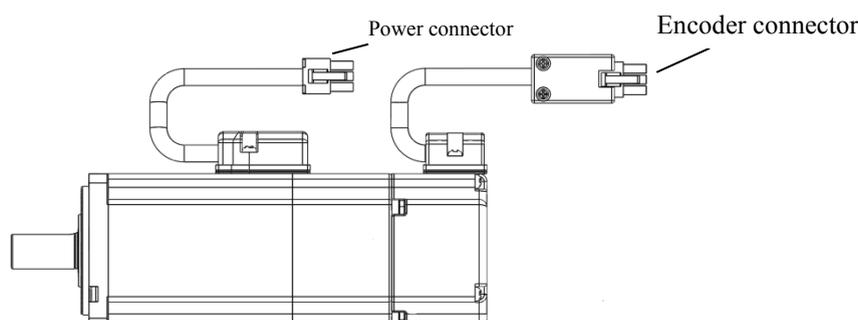
1. Before using this product, please read the operation voltage marked in the specification labels and make sure that the supplied power meets product requirements.
2. Have professional electricians distributed the wiring.
3. Make sure the wires distributions execute properly or the servo motor will experience unexpected reactions.
4. Please connect the power terminal and motor terminal securely.
5. When distribute the wiring, the AC servo motor grounding terminal must be installed properly.
6. Please check if the motor input, driver input and brake input voltage is correct. It is especially important to check if the power and signal wires connected to the encoder are correct. Incorrectly distributed wires can cause abnormal motor operation and cause damage or malfunction in motors and drivers.
7. Try to separate the motor power cables and the encoder power cable and signal cables. This is to prevent electrical signal coupling and noise (do not install the power and signal on the same circuit).
8. Do not conduct voltage resistance test on the encoder. This can damage the encoder.
9. Do not connect the servo motor U, V, W directly to the input power.
10. Install an external emergency stop circuit to ensure that power can be shut off in an emergency situation.
11. Even when the power is shut off, the connector will still have residual high voltage. Do not touch the terminal in 5 minutes after power off.

## Precautions for using power cables

1. When connecting motors, do not drag the cable.



2. The cable's minimum bending radius (R) should be over 10 times of the cable's outer diameter.
3. The wire should be installed so that it is not repeatedly moved or bent.
4. When using cable tie or other methods to fix the cables, put insulation and buffer material between the cable tie and the cable to prevent the tie from breaking because of over-tying.
5. When connecting the servo motor connector, first connect the servo motor's power connector, then connect the encoder connector.



6. Use HIWIN designated connectors and make the correct connections. For connector specifications, reference the HIWIN user manual.

## ■ Operation precautions

### Caution

1. Before operating, check and confirm the parameters. Unexpected actions may occur depending on the machine.
2. First operated motor without load (machine end connected to the motor shaft) to prevent accidents.
3. Do not operate this product overload
4. If the current exceeds the allowable maximum current stated in the manual when operating, the motor's internal magnetic components can become demagnetized. If this situation occurs, contact your dealer or this company's sales representatives.
5. When the servo motor is operating, use a designated driver for operating. Do not connect commercial power (AC100V/200V, 50/60Hz) directly to the servo motor. This can result in improper operations or permanent damage of the servo motor.
6. When operating, make sure that the motor and driver temperature is within the specification. Please reference the operation instructions and environmental requirements.
7. During the servo motor's operating period, apply anti-rust grease on the shaft to prolong usable life.
8. If any abnormal smell, noise, smoke, hot gas, or vibration is detected when the servo motor is operating, stop motor immediately and shut off the power.
9. When operation on machine with load, pre-set the parameters related to the machine to prevent the machine from losing control.
10. Do not execute extreme parameter adjustments. Extreme parameter adjustments can easily make the servo system unstable and cause unexpected damage or personnel injuries.
11. Do not frequently switch on and off the machine.
12. When the product is power on or off, the motor casing, driver casing, and regenerative resistor can still be hot. Do not touch to prevent from burns.
13. Servo motor should be operated with HIWIN designated driver.
14. The brake is used to keep the motor stop or holding. Do not use the brake for dynamic braking.

### Precautions for using safety brakes

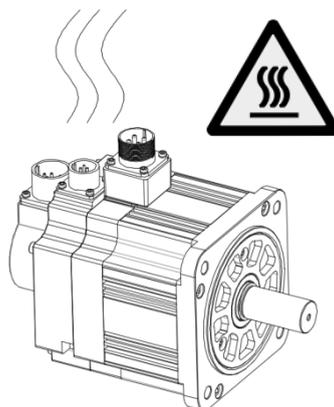
1. The brake is used to keep the motor at a stop for long periods holding or for emergency stop in case of power shortage. Do not use for dynamic braking if used for motor emergency stop, the brake can be damaged from improper use
2. Before operating the motor, check brake supply power and check ~~release~~ the brake function. For other detailed information, reference the manual time sequence figure.
3. The brake voltage is DC 24 V. Check the input voltage before use.
4. Before operating the servo motor, check the brake's armature attraction and release time.
5. Brake's operation environment: if the brake friction surface has water or oil, it will decrease the braking torque. The cable is not oil-resistant. Thus, in an environment with oil or grease, an outer protective cover must be used.

The following conditions are often

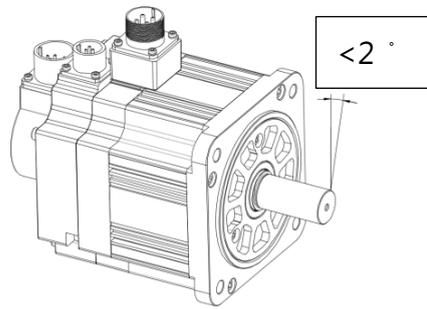
mistaken for brake damage.

### Caution

1. Heat: even if the servo motor is shut off, the power that maintains the brake holding will heat up the servo motor.



1. Rotation backlash: when the brake holding, there will still have backlash. The maximum rotational backlash is within 2 degrees.



2. Noise: when the motor is operating at a low rotation, accelerating, stopping or changing directions, the friction plate sometimes will produce a friction noise. This is the safety brake structural noise and not a malfunction noise. This will not affect motor function.

## Brake maintenance and inspection

Regularly inspecting the brakes can prolong its function. Regularly maintain and inspect brakes according to use.

1. Check ON/OFF function
2. Check if there are any noises
3. Check If there is abnormal heating
4. Check release time
5. Check the input voltage

## Maintenance, transportation and storage precautions



Caution

### Storage environment

Please store in the following environment

Items		Environment conditions
Environment temperature	Operations	0°C~40°C(avoid condensation and icing)
	Storage	-15°C~70°C(avoid condensation and icing)
Environmental humidity	Operations	Below 80% RH (avoid condensation and icing)
	Storage	
Storage environment		Indoors out of direct sunlight, away from corrosive or flammable gases, oil/grease and dirty conditions.
Elevation		Less than 1000 meters
Vibration		Less than 49m/s <sup>2</sup>
Protective structure		IPXX indicates water and dust resistance level (not including the shaft rotation part, motor power connector, and encoder connector) If the work environment has oil, coolant or other high-penetration liquid, add an oil seal or protective cover so that liquids will not come in directly contact with the servo motor.

1. Do not stand on or place heavy objects on this product.
2. Use the correct transportation method based on the product weight. Follow directions and do not stack them.
3. When moving the servo motor, do not directly grab the cable or the motor shaft-
4. Use the correct transportation method according to the product weight.
5. Servo motor is precision machine. Do not drop or impact the product.
6. The servo motor shaft is not waterproof or oil proof. Thus, do not install the servo motor in a condition with water droplets, oil-based liquid, excessive humidity, or corrosive/flammable gases.
7. Do not store this product in a site with vibration that exceeds the quantity stated in the specification document.
8. This product's cleaning method: use alcohol to clean (70%).
9. The servo motor's shaft is not rust-proof. The shaft has been applied with grease for rust protection before shipped from the factory. However, if the storage period exceeds six months, the shaft should be checked every three months and grease should be applied to extend its usable life and prevent rust.
10. If motor with a brake has not been used for a long time, please operate with no load condition for at least 10 minutes before use and installation.
11. Deal with products that have been damaged: recycle according to local regulations.

## Conform to RoHS standards

This product conforms to RoHS requirements (from the raw materials to the finished product). This ensures that the product's quality complies with the related regulations.



# RoHS

The limit for the six types of hazardous materials in RoHS are:

The maximum allowable content for lead (Pb), mercury (Hg), hexavalent chromium (Cr6+), polybrominated biphenyls (PBB), and polybrominated diphenyl (PBDE) is 0.1% (1000ppm). For cadmium (Cd) is 0.01% (100ppm).

## Safety certification

### Conform to CE & UL requirement

		Driver	Motor
CE requirement  	EMC requirement	EMC: EN61800-3 EN55011 EN61000-6-2 EN61000-6-4 EN61000-2-4 IEC60146-1-1 IEC61000-2-1	EN55011 EN61000-6-2 EN61000-6-4
	Low voltage requirement	LVDS:EN61800-5-1	EN60034-1 EN60034-5
UL requirement		UL: E348161	UL1004-1 UL1004-6

Servo motor regular inspection. The optimal inspection period should be set to application conditions and environment.

1. Before conducting any maintenance or inspection work, shut down the power supply. Make sure that the power indicator for the servo unit is off, then use a test instrument to check the voltage between the positive voltage and the negative terminal on the servo unit before starting inspection work.
2. All inspection and maintenance work must be conducted by qualified engineers.
3. If parts are damaged during the inspection process, please contact the dealer or HIWIN sales for maintenance and exchange.

Caution: even if the main circuit voltage remains, there is a danger of electrocution. Do not touch the servo motor or any connecting wires. This is because there is still a risk of electrocution.

## Please reference the following method for maintenance and inspection

1. Check if the terminal platform's screws are secure regularly. If the screws are loose, tighten the screws.
2. Check vibration and noise: use touch or sound to check if there is more vibration or noise than normal.
3. Check if the cable has been damaged. If the servo motor is movable, implement regular checks according to its use conditions.
4. Check the exterior for damage. Clean and maintain servo motor regularly. Check if the cable has loosened from the connectors and whether or not the driver is connected.
5. At least once a year: cut off the connection between the servo motor and the servo unit and measure the insulation resistance. Use the insulation resistance meter to measure the isolation resistance at 500V. (Measuring method: measure the resistance between the U, V, or W on the FG phase of the servo motor power cable. ) If the resistance value is 10MΩ or higher, this is normal.

## Exchange of consumable parts

The usable life of the parts is as shown below. However, as the method of use and environmental conditions change, the parts must be changed if abnormalities are discovered. The dealer or HIWIN sales can be commissioned to purchase and exchange parts.

Part name	Standard usable life	Check remarks
Bearing	20,000HR	Check bearing for abnormal noise or vibration
Oil seal	5,000HR	Check flange opening for oil leak
Brake	20,000HR	Check for abnormal noise and vibration. Test the suction release time to see if it is normal and check power changes when in operation.

This product has a one-year warranty starting from the factory manufacturing date. This company is not responsible for the parts and repair of the product if the product was damaged by natural disaster or improper use during the warranty period (reference the precautions and installation portion of this manual).