



STR-Series

Instruction manual

Read carefully this instruction manual before use

NIDEC DRIVE TECHNOLOGY CORPORATION

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1. Safety precautions


General

- This instruction manual describes about installation and operation of **STR-Series**.
- The product must be dealt by a person with applicable skill and knowledge.
- Read this instruction manual carefully to understand the product in detail.
- In case of a need for maintenance or repair work, please contact the sales office.
- Keep this instruction manual in a proper place to refer to.
- This instruction manual must be delivered to a final customer who operates the product.
- For servo motor operation, refer to its instruction manual.

Pictograph descriptions

Pictograph	Meaning
 Warning	This indicates that improper use may lead to serious injury or death.
 Caution	This indicates that improper use poses a strong risk of injury or damage to property.

 Warning
<ul style="list-style-type: none"> • Do not touch moving parts of the product while in operation. It can lead to injuries. • Do not perform maintenance work while electric power is supplied. Unexpected movement by interference may cause injuries. • Transport, installation, operation, or maintenance must be carried out by a person with skill and knowledge. Improper handling may cause injury or damage to the product. • Do not hang the product by a crane after installing. The product may fall and resulted in injury • Do not use the product for applications which has significant effects to human life, serious risk of death, pollution or environmental destruction such as following: <ul style="list-style-type: none"> •Medical instruments •Nuclear power devices •Aerospace devices •Devices dealing with hazardous materials etc.

 Caution
<ul style="list-style-type: none"> • Check the product has correct specification for an application before use. Improper application may cause malfunction or resulted injury. • Do not remove serial plate. • Stop operation immediately if there is unusual vibration, noise, temperature rise, or unable to obtain expected performance. • If moving parts of the product interfere or is being constrained improperly, unexpected load acts on servo motor, which leads to overheating, stop operation immediately if the product does not rotate properly. • Do not touch a motor. • Turn off the main power switch of a servo motor in the case of electric power down. Avoid risk of sudden start after electric power recovery which can cause injury. • Do not disassemble the product. It can lead to malfunction. • Tighten screws with proper tightening torque by using torque wrench. Apply LOCTITE 242 (recommended) or equivalent agent when tightening screws to avoid being loosened during operation. Improper tightening can cause failure and resulted injury. • Use the product with right orientation. Operation with improper orientation can cause failure or oil leak.

2. Preparation

2-1 Checking the product

- Open the package and check contained items as listed below:
- STR main unit + servo motor 1 set
 - Motor driver 1
 - Motor driver cable 1
 - Encoder cable 1
 - Motor fitting parts (motor base, sleeve, guide) 1 set (for customer fitting case)
 - Instruction manual 1
 - Certification of guarantee 1

2-2 Checking specifications

Read a product code on serial plate to check if a specification is correct.

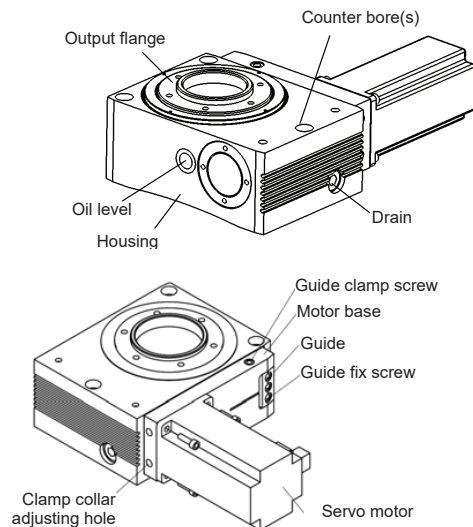
【Product code example】

STR	1 0 0	0 8 0	E	R	1 4 B K 1 2	0 0

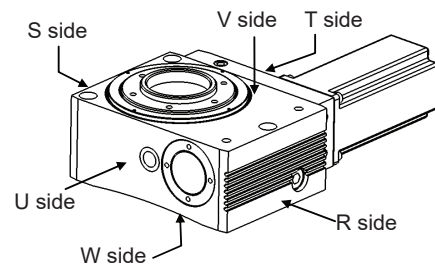
Orientation code: Proper orientation determined at time of order.

1	2	3	4	5	6	0
						Orientation varies
W side grounded	V side grounded	U side grounded	T side grounded	R side grounded	S side grounded	

2-3 Name of parts



Surface names



3. Installation

3-1 Packaging

The product is shipped after quality inspection.

Servo motor is assembled when shipped.
Servo driver and cables are not connected.

3-2 Installing place

The product should be installed in a place satisfying following conditions:

Environment temperature from +5 to +40 °C
Humidity under 85% (no condensation)
Non vacuum or extreme pressure
No exposure for water, oil, chemicals, dusts, and so on.
No existence of explosive gas, other hazardous gas, or radioactive materials.
No direct sunlight.
Excessive shock or force does not act
Grounded from electric current.
Minimum electromagnetic noise (beware for welding machines).
Easy to carry out maintenance and checking oil level and drain.

3-3 Installing

Put the product with proper orientation on a flat and rigid surface.

Fix a rotating table or a component on the output flange.

Tighten screws with proper tightening torque by using torque wrench. Apply LOCTITE 242 (recommended) or equivalent agent when tightening screws to avoid being loosened during operation. Tightening torque should follow tables show in below.

Tightening torque table A Housing screws (Aluminum alloy)

Screw size	Tightening torque (DIN6.8)
M4	2.1 N·m
M5	4.4 N·m
M6	7.5 N·m
M8	18.5 N·m
M10	36.0 N·m
M12	63.0 N·m
M16	158.0 N·m

Tightening torque table B Output flange (Steel alloy)

Screw size	Tightening torque (DIN10.9)
M4	4.1 N·m
M5	8.5 N·m
M6	14.0 N·m
M8	35.0 N·m
M10	69.0 N·m
M12	120.0 N·m

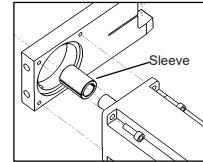
3-4 Servo motor assembling process

In the case of assembling servo motor into STR at customer's site, please follow this assembling process.

- Improper assembling servo motor cannot make a performance with a high capability.
- Apply **LOCTITE 242 (recommended)** or equivalent agent when tightening screws to avoid being loosened during operation. Improper tightening can cause failure and resulted injury.

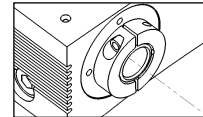
1. Fix the motor onto the motor base

Fix the motor and the motor base. Also, fit a sleeve on the motor shaft with a little bit of turbine oil. **(Never apply molybdenum grease or other grease which contains extreme pressure additive.)** Side of the sleeve and the motor shaft should be aligned. (If the diameter of the motor shaft and the inside diameter of the input shaft are same size, it is unnecessary a sleeve.)



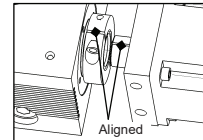
2. Put a clamp collar onto the input shaft

Fix the clamp collar by tightening screws loosely. **(Do not tighten screws too much.)** Side of the clamp collar and the input shaft should be aligned. Screws should face R side of the housing.



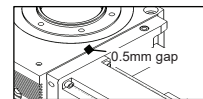
3. Insert the motor shaft

When insert the motor shaft, slit of the sleeve and clamp collar should be aligned as shown in the figure.



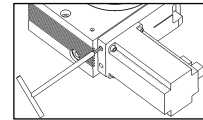
4. Make 0.5 mm gap between housing and motor base

Use filler gauge or substitution to measure 0.5 mm gap. Keep the gap until tighten clamp collar screws. Using 0.5 mm shims required.



5. Tighten the clamp collar screws

Tighten clamp collar screws evenly. Tightening torque must follow the tightening torque table on previous page.



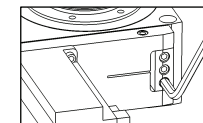
6. Clamp the guide with motor base

Insert the guide into a slit of motor base. Guide should contact to the housing surface. After that, tighten the guide clamp screw to hold the guide. Adjust the screw to allow guide be able to slide.



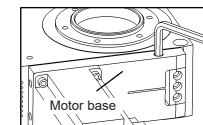
7. Fix the guide to the housing

Tighten screws to fix the guide.



8. Fix the motor base to the housing

Tighten screws much more to fix the motor base. Apply **LOCTITE 242 (recommended)** or equivalent agent and tighten their screws again.



NOTE: IF INSTALLING SHIMPO REDUCER WITH THE STR, DISREGARD THIS SECTION AND FOLLOW STANDARD ASSEMBLY INSTRUCTIONS FOR OUR SERVO GRADE PLANETARY PRODUCTS.

4. Connection and operation

4-1 Connection and servo parameter set up

Connection of a servo motor, an amplifier, and a controller must follow the instruction manual of each component. After connection, set servo parameters depending on conditions of operation, i.e. speed, inertia, pattern of motion, etc. Parameter set up and programming must follow the instruction manual of a servo motor, an amplifier, or a controller.

4-2 Checking out motion

After setting up a servo motor, run a motor at low speed to check its motion. Interference, excessive inertia, or other improper condition can lead to overheat and malfunction of a motor. If expected motion is not obtained, stop operation immediately, and check an operation condition.

4-3 Normal operation

Start and stop is operated by a programmable controller, PC, or other control units. Refer to instruction manual of a controller for detailed control method.

Do not start and stop by switching main power.

4-4 Output flange position with servo motor off

Because of STR high efficiency, it does not have "self-lock" property. If it is required to ensure the output flange position with servo motor power off, it is necessary to use brake type servo motor, or other brake, clamping system on output axis for safety.

To ensure the output flange position with servo motor power off, it is necessary to use brake or clamping system for safety.

4-5 Adjusting servo motor gain

Adjustment a speed loop gain, a speed loop integral time constant and a position loop gain must follow the procedure. (See the instruction manual of servo motor in detail.)

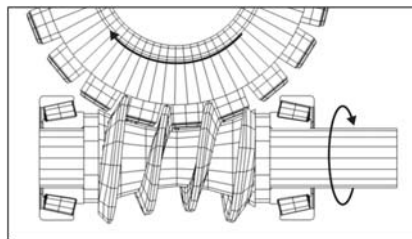
Step	Description
1	Adjust a moment of inertia for load.
2	Decrease a position loop gain and increase a speed loop integral time constant.
3	Increase a speed loop gain until the mechanical system does not vibrate and noise.
4	Decrease a speed loop integral time constant until the mechanical system does not vibrate and noise.
5	Adjust a torque command filter time constant so that no vibration occurs.
6	Repeat the steps 2, 3 and 4, then reduce the value for 10 to 20%
7	In case of the position control, increase a position loop gain until the mechanical system does not vibrate and noise.

4-6 Operation under cold temperature

Under cold temperature, motor speed can be affected by increased lubricant viscosity. In such a case, warm up operation is recommended until STR reaches about 15 °C.

4-7 Directional relation of input and output rotation

For standard STR, relation of rotation is as shown in below figure. For clockwise input rotation with looking from T side, output shaft produces clock wise rotation looking from V side.



Input and output rotation

4-8 General operating conditions

The product must not exceed the operating conditions, such as rated torque, revolution speed, and so on, which specified in catalogue or specification drawings. Improper operating condition can lead to failure of the product.

5. Maintenance

5-1 Regular check up

For safety, following should be checked regularly

- Loosened screws
- Noise, excessive heat
- Oil seal conditions (wearing, cracks)
- Oil leak

5-2 Lubricants

- Although high quality and long life lubricant is used for STR-Series, it should be refilled every 3,000 hours of operation.
- Condition of a lubricant can be checked from oil level gauge. Checking should be carried out when the product is stopped. Check color and amount, and if there are significant changes, refill the lubricant no matter what operation hours.
- Small bubbles, which can appear in oil during operation, does not affect its lubrication property.

Use the following lubricant for refill.

Standard lubricant: Mobil SHC629 (VG150)

Use of different oil can cause wearing or other troubles.

For grease lubrication (special requirement)

Type of grease is specified in a specification drawing.

Generally, no refilling is required for grease lubrication. If there is a need for refilling grease, please contact to NIDEC-SHIMPO.

It is not possible to replace oil with grease or vice versa.

6. Troubleshoot

Check the following first in the case of trouble.

Conditions	Check points
STR does not run with starting operation	Motor, amplifier, and controller are connected properly? (→ 4-1) Servo parameters are correct? (→ 4-1, 4-4) No malfunction of motor, amplifier, or controller? No interference of an output? (→ 4-2) Is clamp collar tightened properly? (→ 3-4)
Speed is slow. Servo error appears.	Isn't temperature low? (→ 4-6) Servo parameters are correct? (→ 4-4) No interference of an output? (→ 4-2) No excessive load or inertia? Is clamp collar tightened properly? (→ 3-4)
Over shoot	Servo parameters for inertia correct? (→ 4-1, 4-4) No excessive load or inertia? Is clamp collar tightened properly? (→ 3-4)
Output vibration. Long settling time. Motor noise.	Is servo gain adjusted properly? (→ 4-4) Tightening pressure of guide clamp screw proper? (→ 3-4)
Irregular motion	Strong electric, magnetic noise existence (→ 3-2) No malfunction of motor, amplifier, or controller?

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