

# **$\tau$ Linear Stage NST Series**

## **Instruction Manual Ver. 1.0**

**Nikki Denso Co., Ltd.**

## Preface

Thank you for adopting our NST Stage Series products.

### [Check Points]

#### 1. Receiving check of our products

Please check the following points when you receive our products.

- (1) If the products are exactly the ones you ordered. (Type, Rated output, Driver combination, External view, Accessories, etc.)
- (2) If baggage are not damaged during transporting. (Package damage, Abnormal outlook)
- (3) If accessories are packed together with the main products.

\* If packages as carton boxes are broken, please do not unpack them and inform our sales man. And if above points are unclear or damage, etc. is found, please immediately contact our sales man.

#### 2. Precautions before installation (in handling)

\* When transporting the products, please handle with care so as not to damage them.

### **Caution**

Pay attention not to pile up the products or not to put anything on the products.

Pay attention not to give a shock to the products.

Do not hold a cable during transporting the products so as to protect the cable from disconnection.

#### 3. Cautions in storage

If the products are not used immediately after receiving, store them under the following conditions in order to prevent deterioration of insulation and rust formation. However, unpack the packages, soon after receiving and check any damage and other non-conformances incurred during transportation.

Table 1: Storage conditions of the products

Item		Description
Ambient conditions	Temp.	-10°C to +60°C
	Humidity	85% or less (non-condensing)
	Storage location	Store in a clean place free from dust and dirt. Do not store in harmful atmosphere such as corrosive gas, grinding power, metal powder, oil, etc.
Vibration		Store in a place free from vibration.
Others		Rust prevention effective period is within 3 months after the shipment from our factory under the above described environmental conditions. If the storage period is planned for long time, please make rust prevention to the products and inspect them periodically.

#### 4. Precautions in transportation

If you transport the products after receiving, please satisfy following conditions.

Table 2: Transporting conditions of the products

Item		Description
Ambient conditions	Temp.	-10°C to + 60°C
	Humidity	80% or less (no-condensing)
	Storage location	Do not transport the products in a harmful atmosphere such as corrosive gas, grinding power, metal powder, oil, etc.
Vibration		0.5G or less

### **Caution**

Recommended storing or transporting condition is in humidity of 65% RH or less.  
If the humidity exceeds 65% RH, contact us.

#### [About this manual]

This manual explains specifications, installation, and precautions in use of the products. In order to use this product properly, please deeply understand the contents of this manual. At the time of installation, operation, and in other works, please comply with the conditions and procedures of this manual.

This product brings the NST Stage instruction manual and other instruction manuals of the composition products (liner motor, encoder, etc.) that are used in this product. Points overlapped in the instruction manuals for between the stage and the linear motor, encoder, etc., are subject to follow this manual having priority. When you use the custom-made product, please refer to this manual together with the specifications of that custom-made product. If there are points overlapped in descriptions and items, follow this manual having priority.

#### [Warranty period]

Warranty period of the products is either one-year from our factory shipment or 3000 hours of the device operation time, and the earlier incident is effective. However, please note that any failure or abnormality resulting from the following causes is not covered by the warranty.

- (1) Modification by other parties other than us.
- (2) Non standard operation different from rules and regulations stipulated in this manual.
- (3) Natural disaster or act of gods.
- (4) Connection with an other maker's unit which is not approved by us.

Range of our warranty only covers repair of our products. Damages induced by the failure in the delivered products, opportunity loss at the side of the client, secondary damages, and accident compensation are excluded.

Regardless the warranty period, please inform our sales man whenever you find any failure or abnormality.

## **Caution**

- Our products have been designed and manufactured for the aim of the general purpose applications in the general industry and the products are not intended to be used in any equipment and system that may involve human life.  
For this reason, we are free from any responsibility if the products are used in any other applications than we intended.  
(Examples: Applications in the equipment and system for the purpose of atomic, aerospace, medical, and passenger vehicles that may greatly involve the human-life and assets.
- When installing the product to the facility that may involve serious accidents and loss by excessive exterior noises or failure on the motor, install the back-up and fail-safe functions systematically.  
If used under the conditions where sulfur or sulfide gas is produced, splitting due to corrosion on the tip resistors or poor connection on the contacts can occur.

\* NIKKI DENSO retains the right to revise this document on matter how it is altered.  
Although the information from NIKKI DENSO is reliable, NIKKI DENSO will not assume responsibility whatever results may arise from the use of this information unless specially guaranteed by NIKKI DENSO.

# Cautions for Safety

Before installation, wiring, operation, maintenance and inspection, abnormal diagnosis, and countermeasures, absolutely and carefully read this manual and other related instruction manuals and documents thoroughly and use the product correctly.

Use this device only after getting the proper knowledge of this device and understanding the safety information and precautions.

In this manual cautions for safety are ranked as “Danger” and “Caution”.


And cautions for handling are divided into “Prohibition”, “Compulsion” which are defined (action not to be done) and (action to be done).

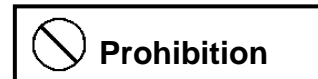


: If mis-handling is made, dangerous situation as death or serious injury of a worker could occur.



: If mis-handling is made, dangerous situation as medium or light injury and only damage of goods could occur.

However, since a  **Caution** marked item could also cause serious results depending on the actual condition, please comply with the important instruction.



: **Action not to be done**

If this caution is ignored, the unit does not perform, properly.



: **Action to be done**

If this caution is ignored, the unit does not perform, properly.

**[Cautions when using unit]**



## **Danger**

\*Since electric shock and injury may occur, please be sure to comply with the following suggestions.

- (1) Make sure to ground (connection with the driver) the earth terminal or the earth cable of the motor.  
Use larger earth cables as much as possible for JIS Class 3 or better grounding.  
**[Electric shock may occur]**
- (2) Do not damage, force cables excessively, put any heavy thing on cables and nip cables.  
**[Electric shock may occur]**
- (3) Never touch the rotating section of running motor.  
**[Injury may occur]**
- (4) After the withstand voltage test and insulation-resistance test (Megger test), do not touch the terminal for five minutes.  
**[Electric shock may occur]**



## **Caution**

- (1) Use a specified motor and driver and controller.  
**[Fire or failure may occur]**
- (2) Never use in the atmosphere such as water splash, corrosive or low plashing point gas nor place close to flammable goods.  
**[Fire or failure may occur]**
- (3) Since temperature of a motor, driver and controller and peripherals raises quite high, do not touch them.  
**[Burn may occur]**
- (4) In supplying power or for a while after shutting power off, since a motor could be very hot, do not touch them.  
**[Burn may occur]**

**[Receiving and checking of packages]**



## **Caution**

- (1) When you receive ordered units, please check the contents. If wrong thing is found or quantity is wrong, please do not use them and inform the status to our sales man.  
**[Electric shock, injury, damage, fire or failure may occur]**
- (2) If packages of our products are broken, do not unpack them and inform the fact to our sales man.  
**[Electric shock, injury, damage, fire or failure may occur]**

[Storage]

 **Prohibition**

Do not store units in a place of raining, water dripping, and harmful gas/ liquid.  
**[failure may occur]**

[Storage]

 **Compulsion**

- (1) Store the product in a place of no direct sunlight or under the controlled temperature/humidity environment within the range specified in this manual.  
**[failure may occur]**
- (2) When the storage period after purchase exceeds three years, contact our salesman.  
**[failure may occur]**

[Transportation]

 **Caution**

Do not hold a cable and a motor shaft during transporting units.  
**[Injury or failure may occur]**

 **Compulsion**

Complying with the suggestion, do not transport excessive amount break whole packages.  
**[Injury or failure may occur]**

[Installation]

 **Caution**

- (1) Do not climb or put any heavy thing on this unit.  
**[Injury or failure may occur]**
- (2) Prevent foreign particles entering the device.  
**[Fire may occur]**
- (3) Be sure to install this unit to the specified direction.  
**[Fire or failure may occur]**
- (4) Never apply heavy shock to this unit.  
**[This unit may be damaged]**
- (5) Conduct proper attachment suitable for output or weight of this unit.  
**[This unit may be damaged]**
- (6) Attach this unit to a non-flammable thing as metal.  
**[Fire may occur]**
- (7) Use the product in the environment where no dust particles exist.
- (8) Firmly fix the product on to the installation area where enough hardness is secured.  
Duly protect the installed motor from hitting by other articles such as dropping items.

**[Wiring]**

 **Caution**

- (1) Be sure to conduct correct wiring.  
**[Running away, burning of a motor, injury or fire-failure may occur]**
- (2) In order to avoid influences by noises, use specific cables (shielded, twisted, and other measures) designated by the driver/controller instruction manual. Further, follow the length specified in this manual.  
**[Running away of a motor, injury or machine damage may occur]**
- (3) To avoid electric shock and noise influence, be sure to make proper grounding (earth).  
**[Running away of a motor, injury or machine damage may occur]**

**[Operation and Run]**

 **Caution**

- (1) For safety, employ an excessive current protection device, leak-current breaker, excessive high-temperature prevention device, emergency stop device, and others for protection.  
**[Injury or fire may occur]**
- (2) Make sure the proper combination of driver and controller.  
**[Injury , fire or machine damage may occur]**
- (3) Before conduct test run, separate a motor from its machine system and fix it to a adequate place and confirm the motion, then connect the motor to the machine.  
**[Injury or machine damage may occur]**
- (4) Since excess adjustment may cause this unit unstable, avoid this situation.  
**[Injury or machine damage may occur]**
- (5) When an alarm occurs, be sure to eliminate the cause, reset the alarm and resume this unit.  
**[Injury or machine damage may occur]**
- (6) When power recovers from black out status, since sudden re-start may occur, do not approach the machine.  
(Machine system design shall be considered to maintain safety of workers against re-start.)  
**[Injury may occur]**
- (7) When any hazardous situation can be imperiled in the stop and breakdown of the product, install an external braking function to maintain the product and to avoid such risks.  
**[Injury or machine damage may occur]**

 **Prohibition**


Do not switch on the power supply while the product is in operation or in vibration.  
**[Running away of a motor, injury or machine damage may occur]**

 **Compulsion**

Stop the operations immediately and set emergency stop circuit outside in order to stop the power supply.  
**[Injury or machine damage may occur]**



[Maintenance and inspection]

 <b>Prohibition</b>
Overhaul/ repair shall be conducted only by us or suggested shop by us. <b>[failure may occur]</b>

## Contents

---

Chapter 1: Stage.....	1-1
1-1 Outline.....	1-1
1-2 Stage type .....	1-2
1-3 Transportation, Unpacking, Installation .....	1-3
1-3-1 Transportation and unpacking .....	1-3
1-3-2 Installation .....	1-4
1-4 Wiring.....	1-4
1-5 Test run .....	1-5
1-5-1 Encoder count check.....	1-5
1-5-2 About magnetic pole detection .....	1-5
1-5-3 Zero return run .....	1-6
1-5-4 Parameter setting of drivers .....	1-8
1-6 Maintenance and inspection .....	1-8
1-6-1 Daily inspection.....	1-8
1-6-2 Periodic inspection .....	1-9
1-7 Maintenance parts .....	1-9

# Chapter 1: Stage

## 1-1 Outline

This chapter explains the stage.

In order to correctly use this product, duly understand the contents in this chapter.

In your verifications, verify in order of the specifications of the made-to-order product, this instruction manual (herein after called, this document), and the instruction manual of each constructive products ( $\tau$  linear motor,  $\tau$  DISK motor, encoder and other options).

The specifications and each instruction manual can give different descriptions; however, please refer them giving the priority in the above order.

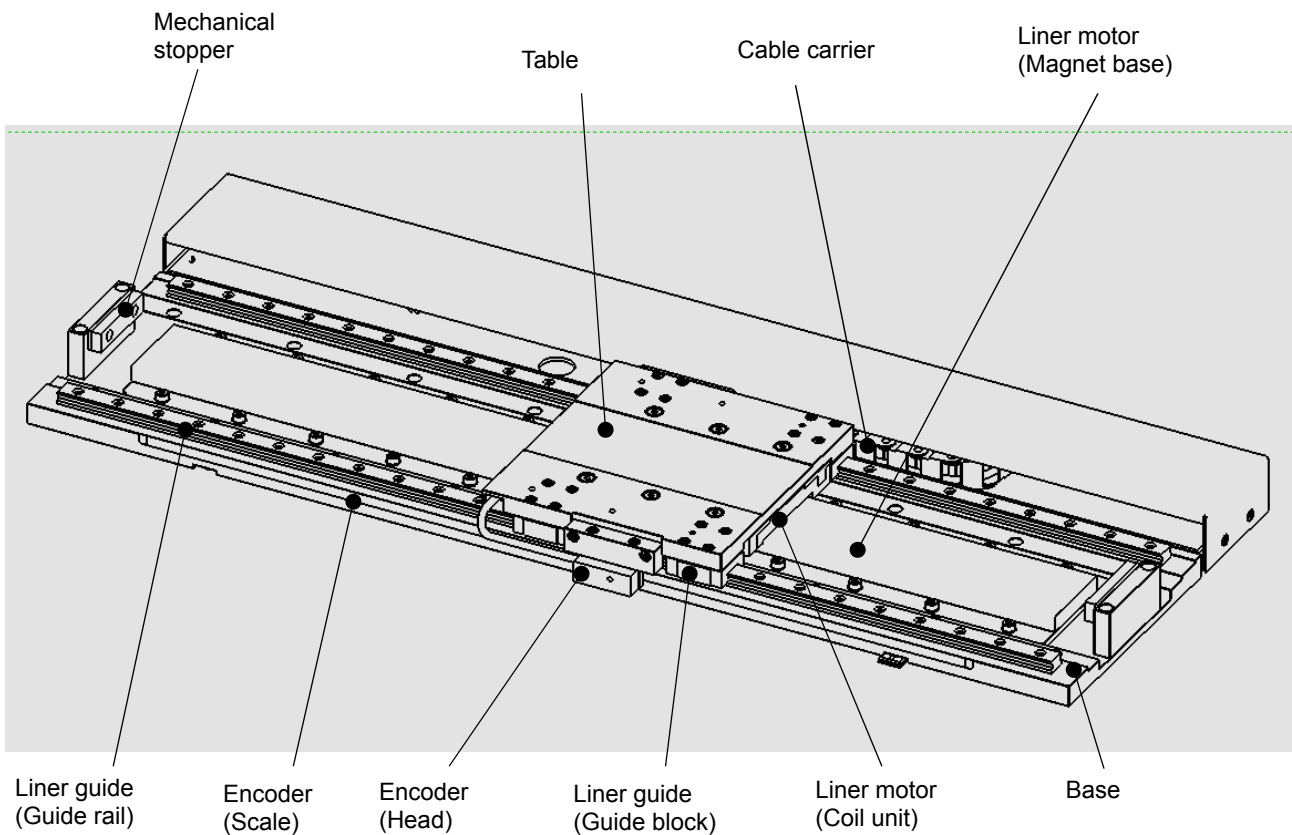


Figure 1-1-1 Sketch of stage system

1-2 Stage type

NST- \* △ □ ☆ ◇ ▲ ■ ★ ◆ \*\* ◇ ◆ -S##

Example: NST-L H G A G L G M E A2 B P -S99

Table 1-2 Stage type

*	Construction axis *1	A	B	C	D	E	F	G	H	J	K	L								Z			
		X	Z	θ	XY	XZ	Xθ	Zθ	XYZ	XYθ	XZθ	XYZθ	M	N	P	Q	R	S	T	U			
△	X axis effective stroke mm		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	Z	
		Exceeding	0	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	Stroke NIL (construction axis NIL)	
		Lower than	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	5000		
□	Y axis effective stroke mm		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	Z	
		Exceeding	0	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	Stroke NIL (construction axis NIL)	
		Lower than	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	5000		
☆	Z axis effective stroke mm		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	Z	
		Exceeding	0	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	Stroke NIL (construction axis NIL)	
		Lower than	10	50	100	200	300	400	500	600	700	800	900	1000	1250	1500	2000	2500	3000	4000	5000		
◇	*3 θ axis effective stroke		A	B	C	D	E	F	G														Z
		Exceeding	0	10	45	90	180	270	360 or more (multi-rotation)														Stroke NIL (construction axis NIL)
		Lower than	10	45	90	180	270	360															
▲	X axis rated thrust N		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T		Z	
		Exceeding	0	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500		Axis construction NIL	
		Lower than	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500	3000			
■	Y axis rated thrust		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T		Z	
		Exceeding	0	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500		Axis construction NIL	
		Lower than	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500	3000			
★	Z axis rated thrust		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T		Z	
		Exceeding	0	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500		Axis construction NIL	
		Lower than	10	25	50	70	90	100	135	150	200	250	300	500	750	1000	1500	2000	2500	3000			
◆	θ axis rated torque N·m		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R					Z
		Exceeding	1	2	3	4	5	7.5	10	15	20	50	100	200	500	1000	1500	2000					Stroke NIL (construction axis NIL)
		Lower than	2	3	4	5	7.5	10	15	20	50	100	200	500	1000	1500	2000	2500					
**	Power voltage spec.	A1		A2							D1	D2	D3										
		AC100/110V		AC200/220V							DC5V	DC12V	DC24V										
◇	Designing order	A	B	C	D	E	.....														Z		
◆	Accuracy spec. *4	P			N																		
		Specified High precision			Non-specified																		
S##	Exclusive machine code																						

- \*1. Horizontal bottom axis: X axis, Horizontal upper axis: Y axis, Vertical axis: Z axis, Rotation axis θ axis
- \*2. Thrust and torque are rated specifications.
- \*3. Even when the θaxis is a multi-rotation motor, this has a priority when the rotation range is restricted electrically and mechanically.
- \*4. Accuracy specifications refer to mechanical accuracy and electrical accuracy.  
 Mechanical accuracy: Parallelism, perpendicularity, yawing, pitching, rolling, absolute positioning accuracy (before compensation), etc.  
 Electrical accuracy: Constant speed stability, absolute value decision accuracy compensation, etc.
- \*5. As for the encoder type being used, refer to the instruction manual of options.
- \*6. For linear, the longest stroke is applied to the type when the multi-head drive in 1 truck.

## 1-3 Transportation, Unpacking, Installation

### 1-3-1 Transportation and unpacking

Please check the following points when you receive our products.

- (1) If the products are exactly the ones you ordered. (Type, Rated output, Driver combination, External view, Accessories, etc.)
- (2) If baggage are not damaged during transporting. (Package damage, Abnormal outlook)
- (3) If accessories are packed together with the main products.

\* If there exist remarkable differences in temperature and humidity between the open-air and the unpacking location, leave the package for about 24 hours before unpacking to accustom it to the environment.

\* If packages as carton boxes are broken, please do not unpack them and inform our sales man.

Furthermore, if above points are unclear or damage, etc. is found, please immediately contact our sales man.

#### Precautions before installation (in handling)

\* When transporting the products, please handle with care so as not to damage them.

### **Danger**

A motor in this product uses a powerful magnet. If a person who implanted a cardiac pacemaker approaches this product, serious accident can happen. Thus, pay enough attention.

### **Prohibition**

When transporting this product, ensure each axis has been fixed with the axis fixation metal furniture, then, lift it up using the eyebolt as an accessory.

**[Product breakdown, deterioration in accuracy may occur.]**

### **Caution**

A motor in this product uses a powerful magnet. When the magnetic item (iron, tool, etc.) approaches the product during the work, pay enough attention not to induce a pinching accident or a breakdown problem due to the magnetic pulling power.

Do not pile up the product and never put anything on it.

Do not give a shock to the product.

Do not move the product handling its cable. It may cause a cable disconnection.

### 1-3-2 Installation

- For accuracy protection and heat radiation, firmly install the product to the hard floor which reserves the radiation area, keeping the bottom of the product entirely flat and adhesive to the floor. (No tremor or shudder is allowed.)
- Secure the enough installation area wider than the product basement setting area.
- Keep the flatness of the installation area at 0.01 mm/500 mm or less.
- The basement fixation bolt must be tightened at the proper tightening torque adequate to the footstool material, keeping the enough screwing depth. Use all holes for the basement fixation bolts.
- (Use portions that were covered by the table, by removing the axis fixation metal fittings and eyebolts and moving the table.)
- When the product has been fixed completely, remove the axis fixation metal fittings and eyebolts. Then, slowly move each axis with your hand and check for no abnormal sliding resistances and interferences and no absorbed foreign substances to the magnet base.

### 1-4 Wiring

- In the wire connection, pay attention not to make a wrong connection in the axis driver combination that copes with the stage wiring, referring to the specifications, inspection report, and other related documents. Particularly, in the multi-stage, your special attention is required. Breakdown and deterioration in accuracy may occur.
- Be sure to ground the product.
- Fix the product cable between the stage and driver at the proper length.
- Be sure to ground the product installation footstool. Particularly, install an additional grounding to the product when the product and the product installation plate are isolated. (Example: when installing the product onto the stone molding board.)
- For other details, refer to the instruction manual for the driver.

## **Caution**

Wrong wiring can cause fire due to an abnormal run or excessive heating of the product.  
Carry out the wiring work after switching off the main power of the device.

## 1-5 Test run

Before using the device for the practical application, ensure the following points.  
If failed to confirm, the device can run abnormally involving injury, breakdown, and other phenomena.

### 1-5-1 Encoder count check

- Supply the main power to the device and push forward the slide table with your hand, and make sure that positive count direction of the encoder harmonizes with the positive direction of the motor.

Positive direction of the encoder: unless otherwise no remarks, movement from the encoder head to the cable drawing direction is positive.

For details, refer to the instruction manual for options.

Positive direction of the motor: unless otherwise no remarks, movement from the coil unit to the cable drawing direction is positive.

For details, refer to the instruction manual for linear motor.

\* If the direction of the encoder and motor is not matched, the device can run abnormally.

### 1-5-2 About magnetic pole detection

- The magnetic pole detection sensor is attached to this product as the standard accessory.
- When using the magnetic pole detection sensor, pay attention to the following points.

#### 1) Acceleration limit in the magnetic pole detection

This magnetic pole sensor roughly detects magnetic pole at the time of power on, and after a micro distance\* (compensation distance) movement, compensation is applied. Here, if the rapid acceleration is in operation during the compensation, deviation in the magnetic pole detection can be generated that may possibly reduce the thrust.

Therefore, keep the acceleration operation under 5G from the power on until the moving distance mentioned in the [Table 1-1 Compensation distance and angle, with each motor type] is achieved.

Table 1-1 Compensation distance and angle, with each motor type

Motor type	Compensation distance, angle
NVA-A/BM/D	6mm
NVA-BL	12mm
NVA-C(R850)	0.43°

2) Magnetic pole sensor unit position at the power on

This magnetic pole sensor detects the magnetic pole with the magnetic flux, and the magnetic pole detection is impossible in the position where the magnetic pole sensor is outside of the MG base.

Furthermore, at the edge of the MG base, deviation in the magnetic pole detection may occur. Therefore, be sure to keep the distance L between the edge of the MG base and the coil unit at the power on, as shown in [Figure 1-5-1 Magnetic pole sensor position with each motor].

Here, after the magnetic pole detection compensation (refer to 1) Acceleration limit in the magnetic pole detection), deviation of the magnetic pole sensor from the MG base gives no problems.

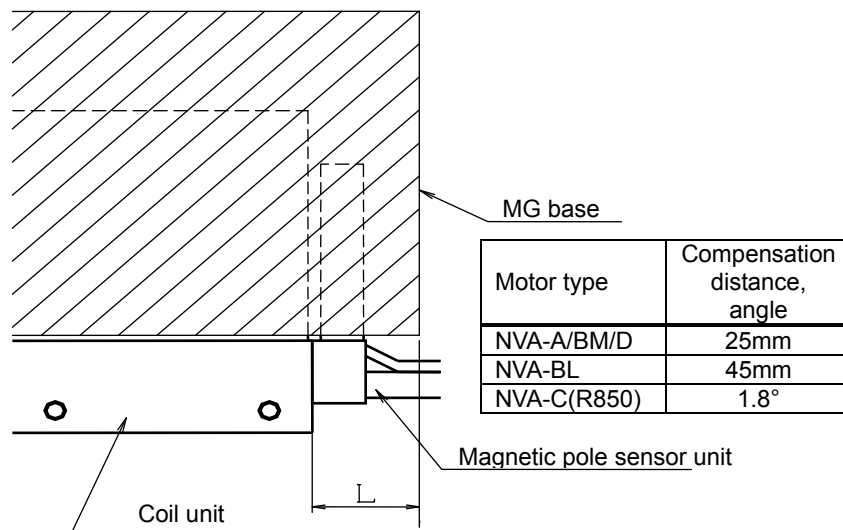


Figure 1-5-1 Magnetic pole sensor position, with each motor

1-5-3 Zero return run

In the zero return run, pay attention to the following precautions of 1) - 3).  
(Repeatability of the zero-point position is assured under the constant temperature.)

1) Zero return direction (Open type INC, Assembly type INC)

The zero-point signal has the width of position; thus, the zero return direction must always be the one-way direction.

Note that there is an error of about some 10μm to 500μm depending on the setting in the case where the zero return direction is both directions.

2) Zero return speed (Open type INC, Assembly type INC)

Perform the zero return speed at the speed listed on the below table [Table Zero return speed]. If exceeds the speed listed, the zero-point signal does not come out, to which pay attention.

Table Zero return speed

	Open type INC	Assembly type INC
Zero return speed	250 mm/sec or less	20 mm/sec or less



- 3) Zero return when standing close to the zero-point (Renishaw encoder only)
- A) Zero-point signal sometimes comes out at the wrong position (False zero-point signal)  
 The zero-point signal can be produced even when the zero-point is not at the normal position if the power is turned on in the range of  $\pm 5$  mm from the zero-point position.  
As a remedy against this phenomenon, move it for  $40\mu\text{m}$  or more in the jog mode before the zero return run and output the false zero-point signal once, then, perform the zero return run. With this operation, the zero return can be implemented to the normal position.
- B) Zero-point signal does not come out  
 If performed the zero return run in the range of  $\pm 0.5$  mm from the zero-point position, the zero-point signal does not come out and the zero return is not performed.  
As a remedy against this phenomenon, move it to the position more than  $\pm 0.5$  mm from the zero-point position once, then, perform the zero return run. With this operation, the zero return can be implemented to the normal position.
- C) Recommendable zero return run and environment  
 As shown in figure, by setting the  $\pm\text{OT}$  and ZLS sensors, recommended is the zero return run which uses the [OT return zero return] function of our driver having the position detection function. In the following explanation, the zero-point position is considered to be the normal providing the movement of the positive direction. (Positive direction zero return) In the case of reverse direction, reverse positive and negative. (Reverse direction zero return)  
 A driver that has no positioning function does not cope with the OT return zero return function. In this case, perform the similar sequence with the upper controller. \* For details, refer to the instruction manual for each driver.

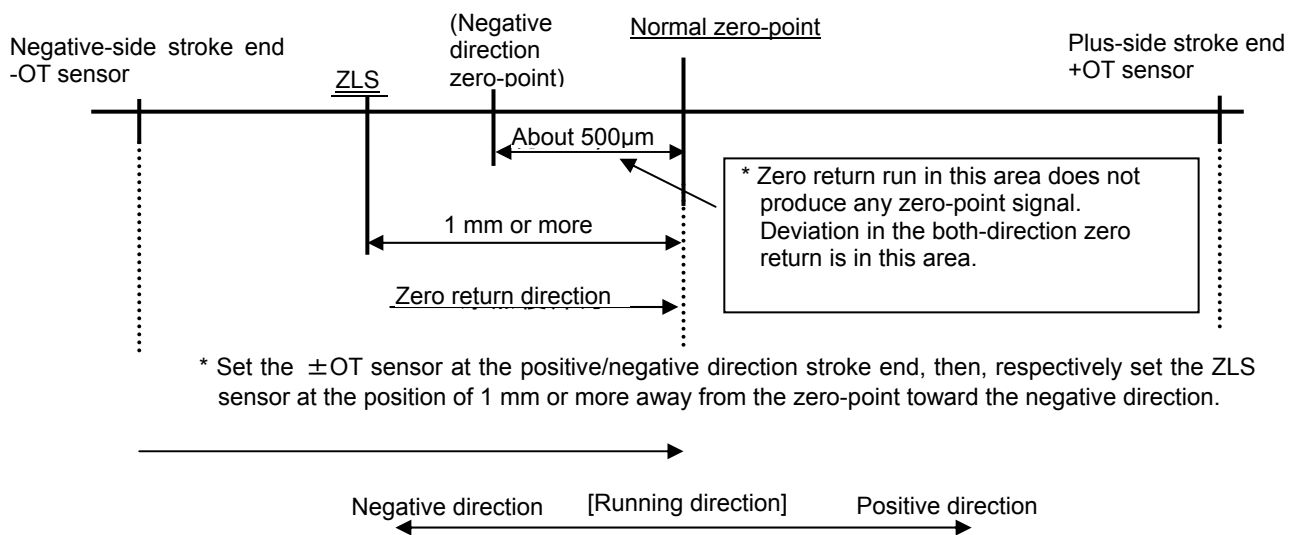


Figure 1-5-2 Sketch of recommendable zero return run

#### 1-5-4 Parameter setting of drivers

Parameter setting of the driver is necessary to fully extract the performance of this product. For the detail of the parameter setting, refer to the instruction manual for drivers.

### **Caution**

To prevent an accident, always ready to push the emergency stop when performing the initial setting. In the initial stage of the parameter setting, unexpected movement or operation occurs; thus, duly pay attention.

#### 1-6 Maintenance and inspection

This section mainly explains maintenance and inspection of the NST stage. For other products ( $\tau$  linear,  $\tau$  DISC, and options) that are used in this device, refer to the instruction manual for them respectively.

##### 1-6-1 Daily inspection

For the below items, conduct the daily inspection before and after operation.

Inspection items	Inspection contents	Remarks
External view	Check the product for stains and scratches	Remove stains with towels and air not scratching the product.
Linear scale	Stains and scratches on the surface	For heavy dirt, use IPA. * Do not use strong pungency solvent. Contact us when found scratches on the product.
Motor	Check abnormal sound, vibration, temperature change	
Magnet	Check magnet for adhered foreign substances	Remove the foreign substances paying attention not to scratch the magnet with the scraper, etc.
Setting place environment	Check power, temperature, humidity, dirt, etc.	Remove the dirt from the cooling block, etc.
Connector, cable	Scratches, excessive bending, loosening of connectors	

### 1-6-2 Periodic inspection

For the below items, conduct the 6-month inspection.

Inspection items	Inspection contents	Remarks
Bolt tightening at main portions	Check bolts for loosening.	If loosening on bolt, re-tighten it.
Mechanical stopper	Check cushion for wearing and damage	Contact us if found wearing, breakage, etc.
Wearing of linear guide	Check if no loosening and wearing	Contact us when found abnormal.
Greasing on linear guide	Greasing on linear guide	For standard stage, use AFF grease (Low dust emission type) made by THK. For special products, contact us.
Connector, cable	Scratches and excessive bending on cable Loosening on connector	Repair or replace if cable is disconnected. If connector is loosened, fasten it.

The above-mentioned intervals for inspection are references only. Shorten the inspection interval depending on the necessity of the operating conditions of devices.

### 1-7 Maintenance parts

This section mainly explains maintenance parts for the NST stage. For other products ( $\tau$  linear,  $\tau$  DISC, and options) that are used in this device, refer to the instruction manual for them respectively.

Maintenance parts	Remarks
Grease for linear guide	AFF grease (Low dust emission type) made by THK. For special products, contact us.
Mechanical stopper cushion	Replace in case of wearing or breakage. When replacement, contact us.
Linear guide	When replacement is necessary due to wearing caused by frequent operation, consult us.
Connector, cable	When replacement is necessary due to wearing caused by frequent operation, consult us.
Cable carrier	When replacement is necessary due to wearing caused by frequent operation, consult us.