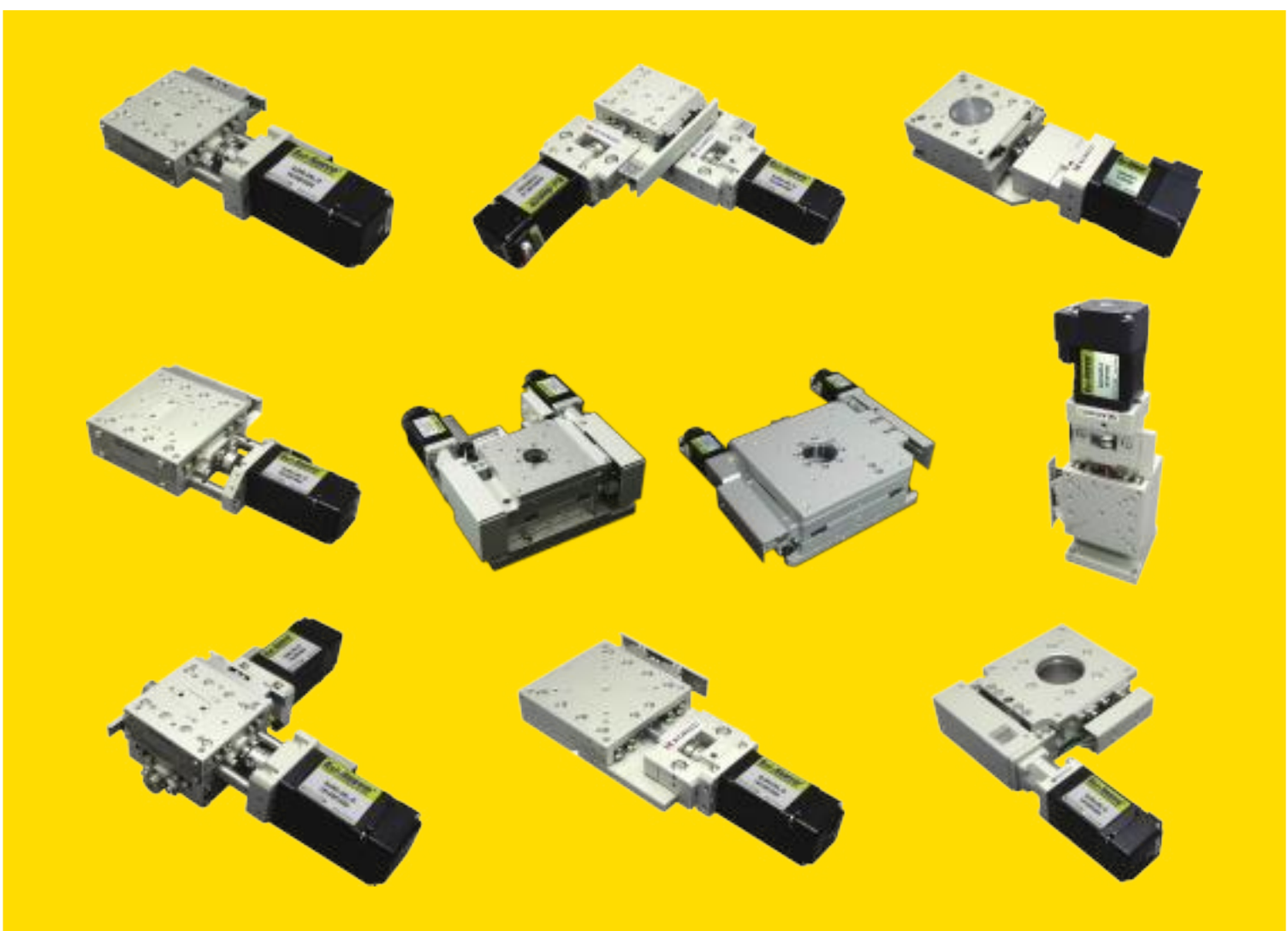
Ezi-Robo®

Actuator series Driven by Ezi-SERVO

- Unit solution of Ezi-SERVO + Precision Stage
- Ultra-precision XYθ alignment stage capable of high precision positioning
- Improved the position accuracy by using Ezi-SERVO
- EtherCAT, Ethernet, CC-Link Support

PMS



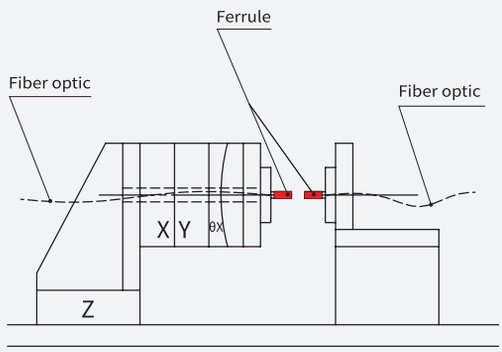
FASTECH
Fast, Accurate, Smooth Motion

KOHZU

Use of positioning stage

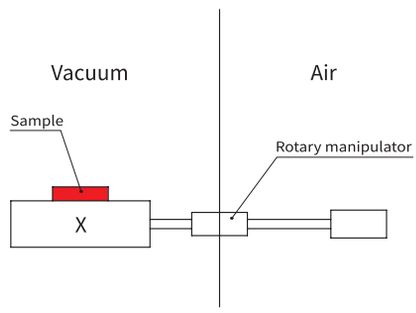
1. Assembly Application Fiber optic alignment

High precision positioning is required to connect fiber optics or optic and the core of optical devices accurately and send the optic without the loss. KOHZU stages can align the positioning from Nanometer scale. High precision alignments to XY direction or angle direction are needed according to the fiber optic types.



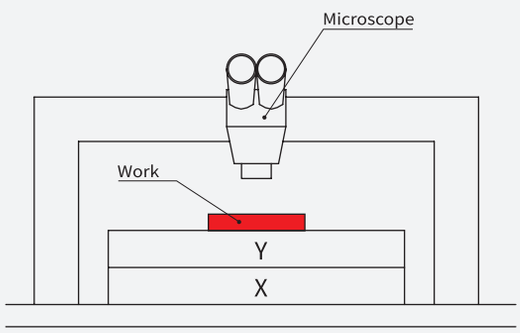
2. Inspection / Measurement Application Motion mechanism for vacuum stage

With the stage installed in the vacuum, connect it to the drive shaft of the stage through the flange using the rotary manipulator at the air side Sample mounted on the stage in vacuum can be aligned the positioning from air side



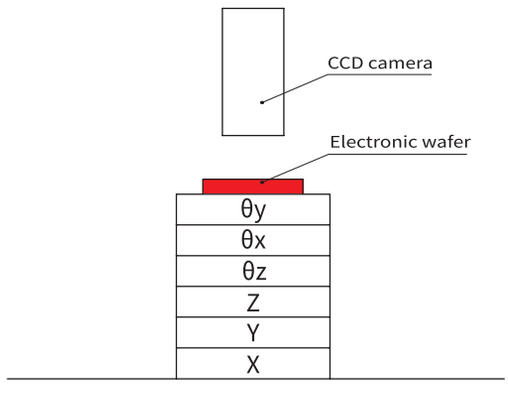
3. Inspection / Measurement Application Microscope observation and measurement

When measuring a workpiece with an optical system such as a microscope from the top, it is necessary to move the workpiece in the X and Y direc–tions. Depending on the degree of work and the optical system, it is necessary to limit the degree of XY distortion to several μm.
Our stage is mainly used for work observation and measurement requiring high precision of μm band and sub micrometer with stroke up to 300mm.



4. Inspection / Measurement Application Various application

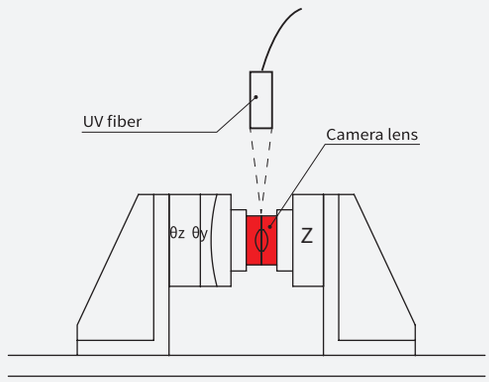
This is an automatic 6 axis stage for observing and inspecting electronic component boards with CCD camera in various directions.
From the bottom, it consists of X, Y, Z, θz, θx, θy. You can also change the motor to a sub motor in order to shorten the tact time.



● Use of positioning stage

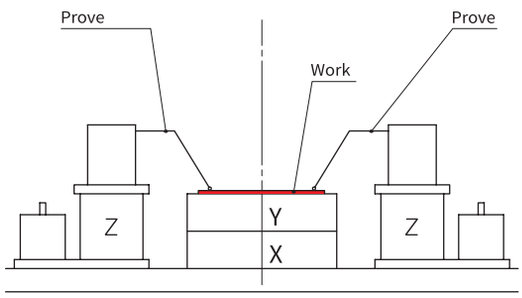
5. Assembly Adjustment Application Camera lens parts such as cellular phone

The Stages can be used for UV bonding of camera lens parts. Positioning is performed in three directions when the other lens part is bonded based on one lens part.



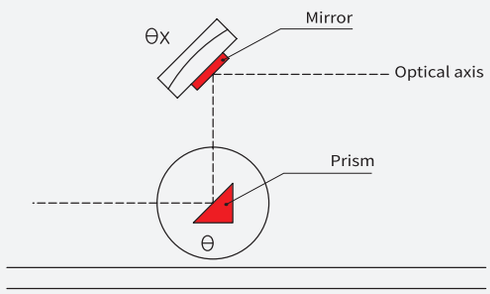
6. Inspection / Measurment Application Prove Tester

Electronic tests on the wafer for semiconductor and liquid crystal devices are measured with probes. XY stages need good accumulated lead error and straightness for touching the tip of probe to the terminal on work accurately and measuring all devices on wafer with same condition. And the repeatability of Z stage is also required for touching the tip of probe on same height every time when probe is up and down during the work positioning.



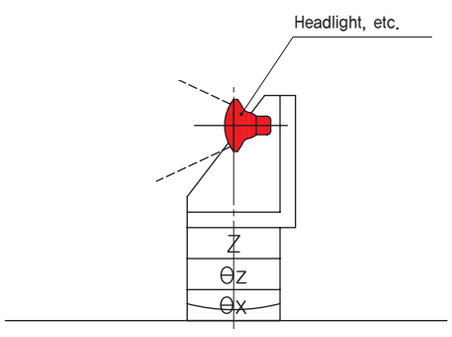
7. Inspection / Measurement Application Optical axis alignment for laser interferometer

Measurements with laser interferometer need the high precision positioning of optical devices(mirror, prism, etc.) on optical axis. And after positioning, they must keep the position stably. KOHZU manual stages which have the clamp mechanism for keeping the position can be used for this measurement.



8. Inspection / Measurement Application Lamp measurement

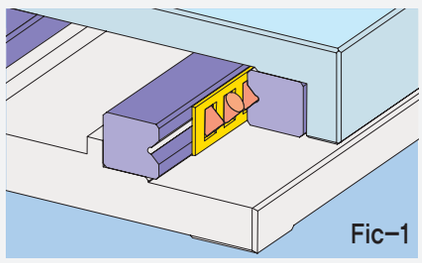
When measuring the light distribution of headlights, stage lights, and show-window lights in automobiles, tilt the lamp vertically and hori-zontally to measure the illuminance at the specified distance. In particular, automotive headlights require highly reliable measurements based on strict standards for safety. In addition, when the size of the workpiece changes, a Z stage is required at the top to align the center of the workpiece with the center of rotation. Stage requires high rigidity because it is mount relatively heavy weight



● Guide Mechanism Type

1. Cross -Roller Guide

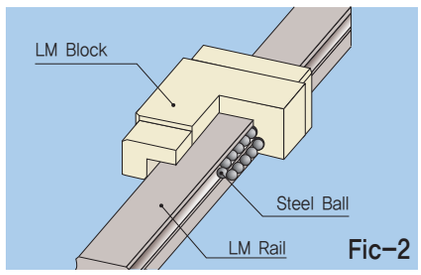
In cross-roller guides, quench hardened and precision ground bearing surfaces move upon loose hardened steel cylinders(rollers) with rotation axis oriented in alternating 90 degree angles(Ref. Fig.1). Having rollers arranged in an alternating cross pattern allows preloading and operation at any angle. The roller bearings are held apart from one another by a bearing cage, which prevents adjacent rollers from touching. Since cross roller bearings have little difference between static and dynamic friction they minimize start-to-stop slip-motion typical of other bearing types. The line contact of roller bearings along with precise roller-to-race gap management provide larger load-bearing surfaces, higher preloads and meet very tight runout and stiffness specifications.



Fic-1

2. Linear Guide

The linear guide system consists of a LM rail and steel ball(see Fig. 2). The ball rolls in the groove of the rail, is picked up by an end cap at the LM block, passes through the circulating hole in the LM block main body, and returns to the other end. Since the sliding surface is fabricated by quenching and abrasive finishing, the rail surface is precise, flat and hard. The ball is set in the pseudocylinder shaped groove formed by the sliding surface. Since the pseudo-cylinder surface and the bearing are in contact with each other at two points or four points, slipping does not easily occur.

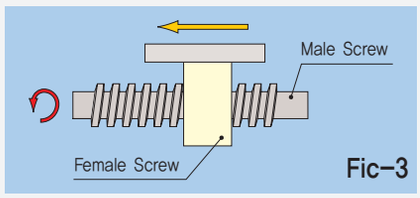


Fic-2

● Lead Mechanism Type

1. Ground Screw

The ground screw is ground at high precision and is held in place by a female screw(see Fig. 3). Since the ground screw and female screw are in contact with each other over a wide area, they do not move even if a horizontal load is applied to the stage. Also compared with the ball screw, the feed distance per rotation can be reduced to improve the resolution.



Fic-3

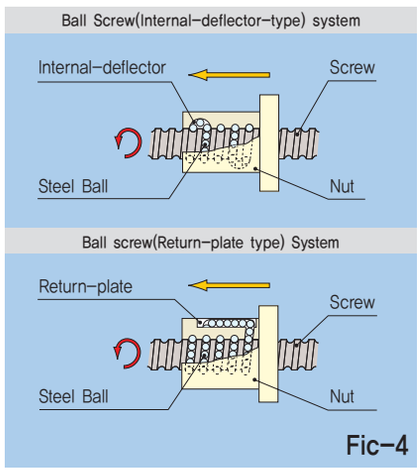
2. Ball screw

The ball screw consists of a screw spindle, a nut, and steel ball between them(Fig. 4). When the screw is rotated, the ball rolls and moves between the ball screw and the nut, and then returns to its original position. Since a ball is rolled, the friction is low, a high transmission efficiency is obtained, the difference between static friction and dynamic friction is small, and stick-slip does not easily occur

※ Resolution : The resolution of the stage can be obtained by the calculation below.

$$\Delta X = \left(\frac{p \cdot \Delta\theta}{360m} \right)$$

ΔX : Resolution(mm)
$\Delta\theta$: Basic step angle of motor(°)
p : Lead of sending screw(mm)
m : Number of micro-step interpolation



Fic-4

● Ezi-Robo PMS series Model List

Title	Standard Unit Paty No.	Motor Part No.	Imr
X	Ezi-Robo-PMS-□□-28M-D-XA05A-R201 / Ezi-Robo-PMS-□□-28M-D-XA07A-R201	EzM-28M-D	
XY	Ezi-Robo-PMS-□□-28M-D-YA05A-R201 / Ezi-Robo-PMS-□□-28M-D-YA07A-R201	EzM-28M-D	
Z	Ezi-Robo-PMS-□□-42M-□-ZA07A-W2C01	EzM-42M-■	
	Ezi-Robo-PMS-□□-42M-□-ZA07A-X102	EzM-42M-■	
θ	Ezi-Robo-PMS-□□-28M-D-RA07A-T01	EzM-28M-D	
Swivel (Gonio)	Ezi-Robo-PMS-□□-28M-D-SA05A-R2T / Ezi-Robo-PMS-□□-28M-D-SA05A-R2M	EzM-28M-D	
	Ezi-Robo-PMS-□□-28M-D-SA05A-R2S	EzM-28M-D	
	Ezi-Robo-PMS-□□-28M-D-SA07A-R2T / Ezi-Robo-PMS-□□-28M-D-SA07A-R2M	EzM-28M-D	
	Ezi-Robo-PMS-□□-28M-D-SA07A-R2S	EzM-28M-D	
XYθ	Ezi-Robo-PMS-□□-28M-D-YRA-071-KO	EzM-28M-D	
	Ezi-Robo-PMS-□□-28M-D-YRA-130-KO	EzM-28M-D	

※ □□ is Drive series.
■ is Drive resolution.

● Ezi-Robo PMS Part Numbering

Ezi-Robo-PMS-ST-28M-D-□

Product Name

Drive Type

EC : EtherCAT
EC-MI : EtherCAT Mini Type
EC-4X : EtherCAT 4 axis
PE : Plus Ethernet
PE-MI : Plus Ethernet Mini Type
CL : CC-Link
ST : Pulse Input
MI : Pulse Input Mini Type

Motor Flange Type

28 : 28mm
42 : 42mm

Motor Length

S : Small
M : Medium
L : Large
XL : Extra Large

Encoder Resolution

A : 10,000[ppr]
D : 16,000[ppr]

User Code

X : XA05A-R201
XA07A-R201

XY : YA05A-R201
YA07A-R201

Z : ZA07A-W2C01
ZA07A-X1

θ : RA07A-T01

Swivel(Gonio) :
SA05A-R2T
SA05A-R2M
SA05A-R2S
SA07A-R2T
SA07A-R2M
SA07A-R2S

XYθ : YRA-071-K0
YRA-130-K0

● Applicable Product Line-up

Product	Specification
Ezi-SERVO II EtherCAT	Embedded EtherCAT
Ezi-SERVO II EtherCAT MINI	Embedded EtherCAT Mini Type
Ezi-SERVO II EtherCAT 4X	Embedded EtherCAT 4 axis
Ezi-SERVO II Plus-E	Ethernet based controller integrated product
Ezi-SERVO II Plus-E MINI	Ethernet based controller integrated product Mini Type
Ezi-SERVO II CC-Link	Embedded CC-Link
Ezi-SERVO ST	Pulse Input Type
Ezi-SERVO MINI	Pulse Input Mini Type

Ezi-SERVO II EtherCAT
(EtherCAT)

Ezi-SERVO II EtherCAT MINI
(EtherCAT / Mini Type)

Ezi-SERVO II EtherCAT 4X
(EtherCAT)

Ezi-SERVO II Plus-E
(Ethernet)

Ezi-SERVO II Plus-E MINI
(Ethernet / Mini Type)

Ezi-SERVO II CC-Link
(CC-Link)

Ezi-SERVO ST
(Pulse Input)

Ezi-SERVO MINI
(Pulse Input / Mini Type)

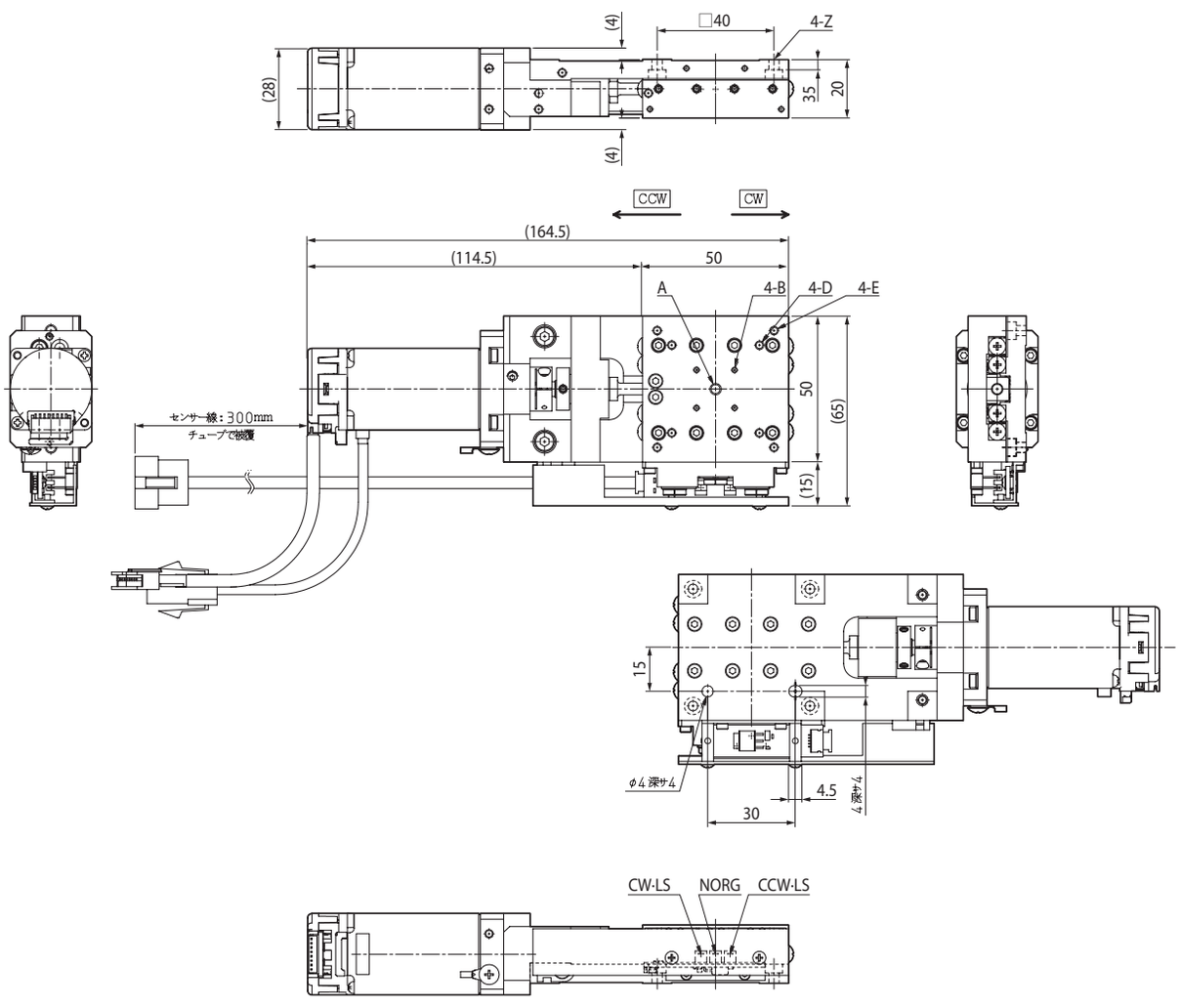
● Motor, Drive Combination

Unit Part Number	Motor Model Number	Drive							
		Ezi-SERVO ST	Ezi-SERVO MINI	Ezi-SERVO II EtherCAT	Ezi-SERVO II EtherCAT MINI	Ezi-SERVO II EtherCAT 4X	Ezi-SERVO II Plus-E	Ezi-SERVO II Plus-E MINI	Ezi-SERVO II CC-Link
XA05A-R201-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
XA07A-R201-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
YA05A-R201-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
YA07A-R201-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
ZA07A-W2C01-42M01	EzM-42M-A	O	O	O	O	O	O	O	O
ZA07A-X102-42M01	EzM-42M-A	O	O	O	O	O	O	O	O
RA07A-T01-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA05A-R2T-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA05A-R2M-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA05A-R2S-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA07A-R2T-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA07A-R2M-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
SA07A-R2S-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
YRA-071-28M01	EzM-28M-D	O	O	O	O	O	O	O	O
YRA-130-28M01	EzM-28M-D	O	O	O	O	O	O	O	O

※ The motor size can be changed among the same series.

● Slim High-Precision X Stage(XA05A-R201) Table Size: 50×50

◆ Ezi-Robo-PMS-□□-28M-D-XA05A-R201



Main Features

- High precision ultra-slim X Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-28M-D-XA05A-R201
	X Specification
Table Size	50×50mm
Motion Range	±7.5mm
Lead Mechanism	Ball screw, Lead 1.0mm
Hight	20mm
Guide	Cross Roller Guide
Resolution *1	1㎛
Max. Speed	5mm/sec
Repeatability(X)	Less ±0.2㎛
Lost Motion	Less 0.5㎛
Straightness	Less 1㎛ / 15mm
Backlash	Less 0.2㎛
Motor	EzM-28M(FASTECH)

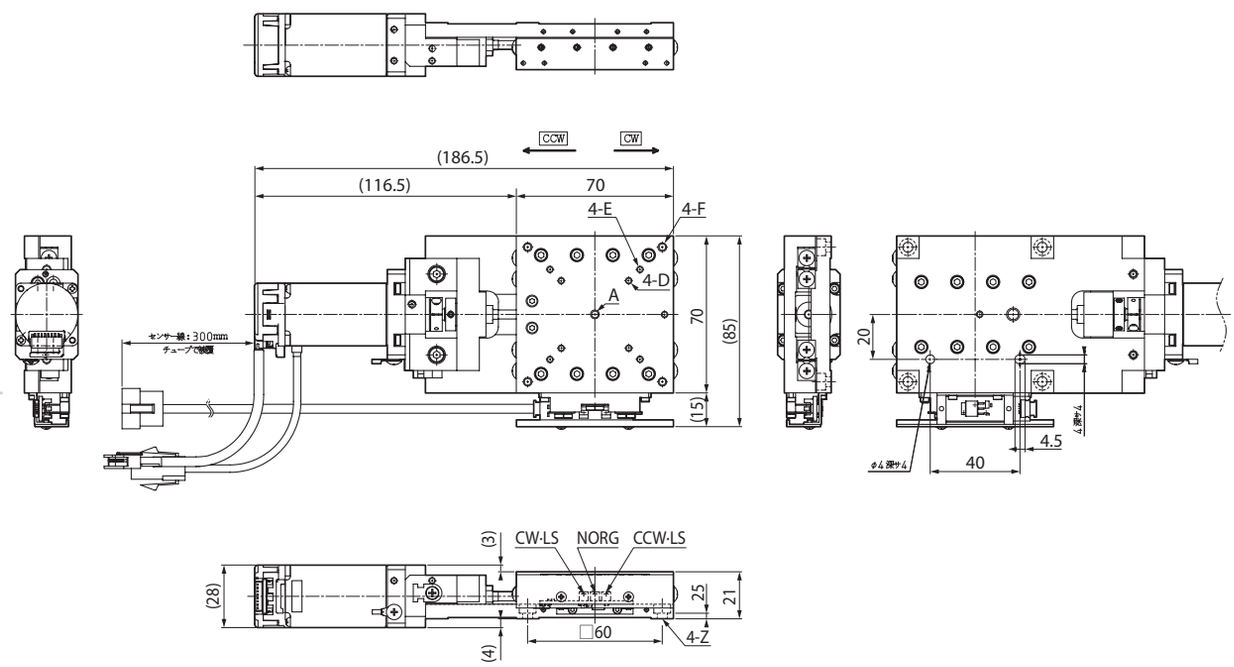
*1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

Application

- Alignment, measurement and bonding of small substrates such as LCD or OLED
- Mark alignment on screen printers
- Probe Inspection Equipment
- Round glass cutting process
- Alignment and evaluation of optical equipment, medical equipment and biotechnology equipment

● Slim High-Precision X Stage(XA07A-R201) Table Size: 70×70

◆ Ezi-Robo-PMS-□□-28M-D-XA07A-R201



Main Features

- High precision ultra-slim X Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number		Ezi-Robo-PMS-□□-28M-D-XA07A-R201
		X Specification
Table Size		70×70mm
Motion Range		±10mm
Lead Mechanism		Ball screw, Lead 1.0mm
Height		21mm
Guide		Cross Roller Guide
Resolution *1		1㎛
Max. Speed		5mm/sec
Repeatability		Less ±0.2㎛
Lost Motion		Less 0.5㎛
Straightness	Vertical	Less 1㎛ / 20mm
	Horizontal	Less 0.5㎛ / 20mm
Backlash		Less 0.2㎛
Motor		EzM-28M(FASTECH)

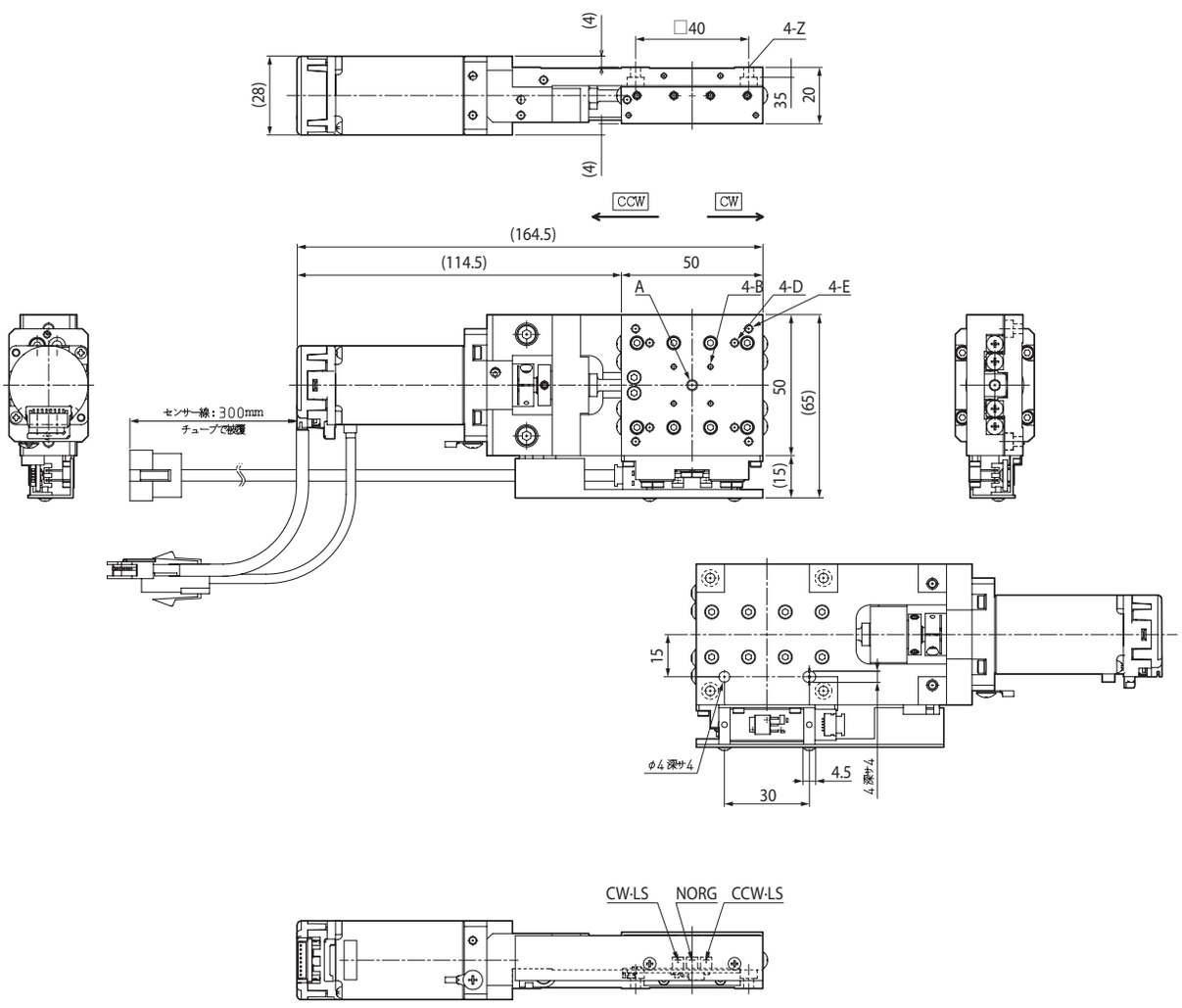
* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

Application

- Moving or focusing the CCD camera module
- Slide table for precision assembly
- Pick & Place movement axis
- Return of work(Horizontal, Vertical)
- Pallet positioning stopper on conveyor

● Slim High-Precision XY Stage(YA05A-R201) Table Size: 50×50

◆ Ezi-Robo-PMS-□□-28M-D-YA05A-R201



Main Features

- High precision ultra-slim XY Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-28M-D-YA05A-R201
	XY Specification
Table Size	50×50mm
Motion Range	±7.5mm
Lead Mechanism	Ball screw, Lead 1.0mm
Height	50mm
Guide	Cross Roller Guide
Resolution *1	1㎛
Max. Speed	5mm/sec
Repeatability(XY)	Less ±0.2㎛
Lost Motion	Less ±0.5㎛
Straightness	Less 1㎛ / 15mm
Backlash	Less 0.2㎛
Motor	EzM-28M(FASTECH)

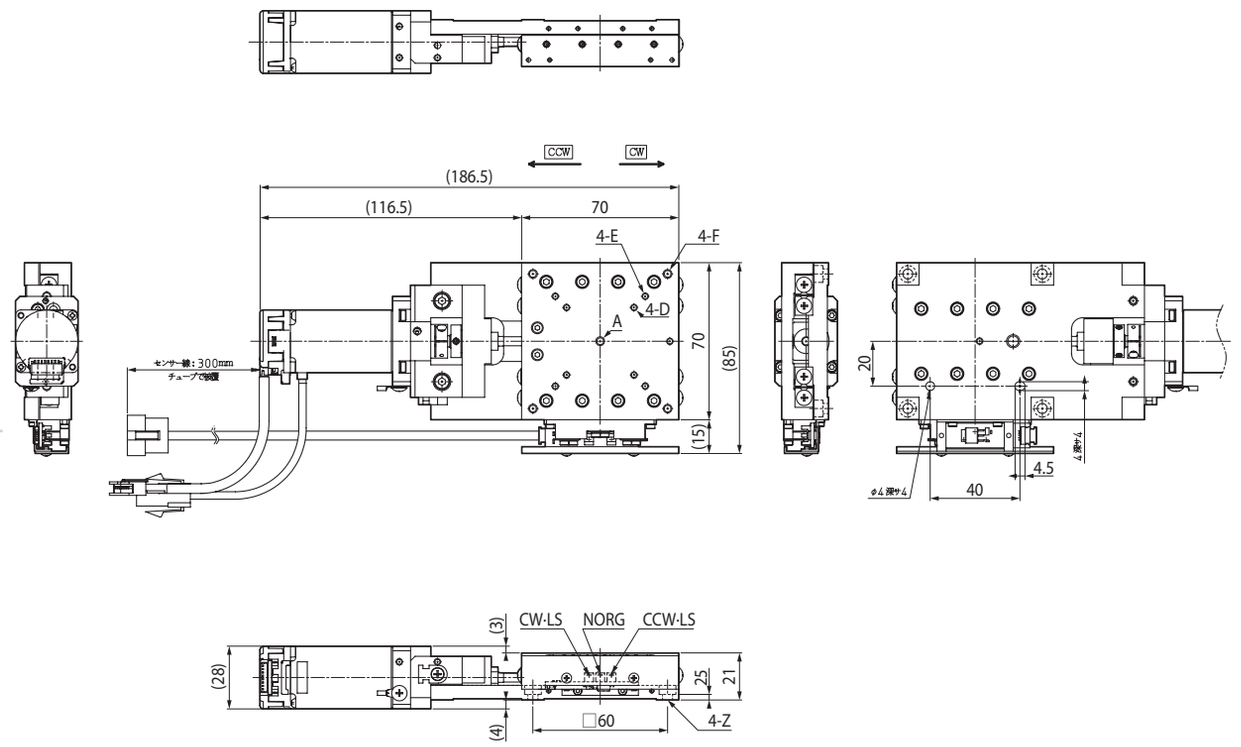
* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

Application

- Alignment and inspection of camera module
- Alignment measurement and bonding of small substrates such as LCD or OLED
- Mark alignment on screen printers
- Alignment and evaluation of optical equipment, medical equipment and biotechnology equipment

● Slim High-Precision XY Stage(YA07A-R201) Table Size: 70×70

◆ Ezi-Robo-PMS-□□-28M-D-YA07A-R201



Main Features

- High precision ultra-slim XY Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

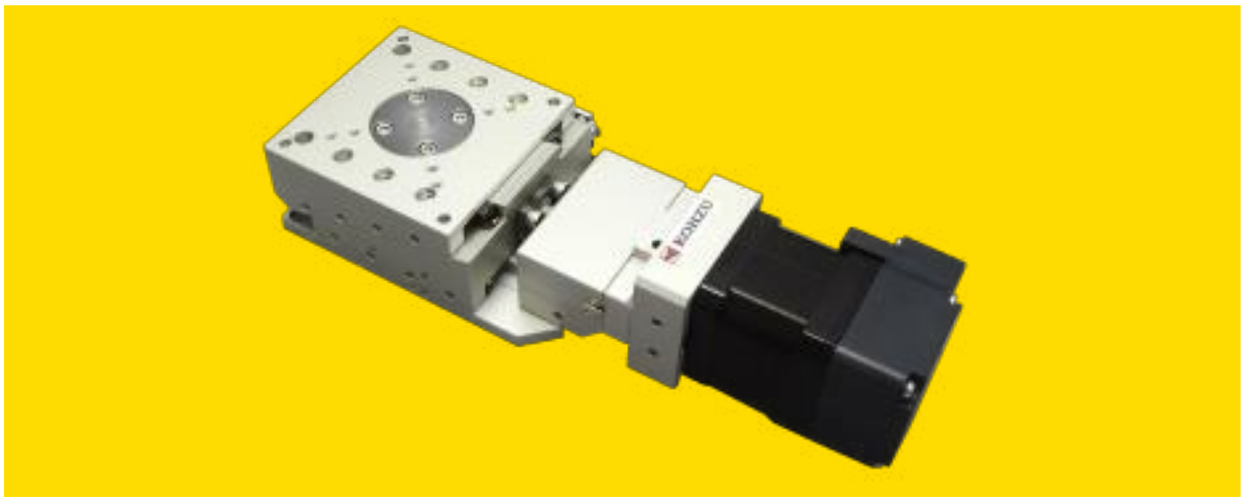
Model Number		Ezi-Robo-PMS-□□-28M-D-YA07A-R201
		XY Specification
Table Size		70×70mm
Travel Range		±10mm
Lead Mechanism		Ball screw, Lead 1.0mm
Height		50mm
Guide		Cross Roller Guide
Resolution *1		1㎛
Max. Speed		5mm/sec
Repeatability(XY)		Less ±0.2㎛
Lost Motion		Less 0.5㎛
Straightness	Vertical	Less 0.5㎛ / 20mm
	Horizontal	Less 1㎛ / 20mm
Backlash		Less 0.2㎛
Motor		EzM-28M(FASTECH)

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

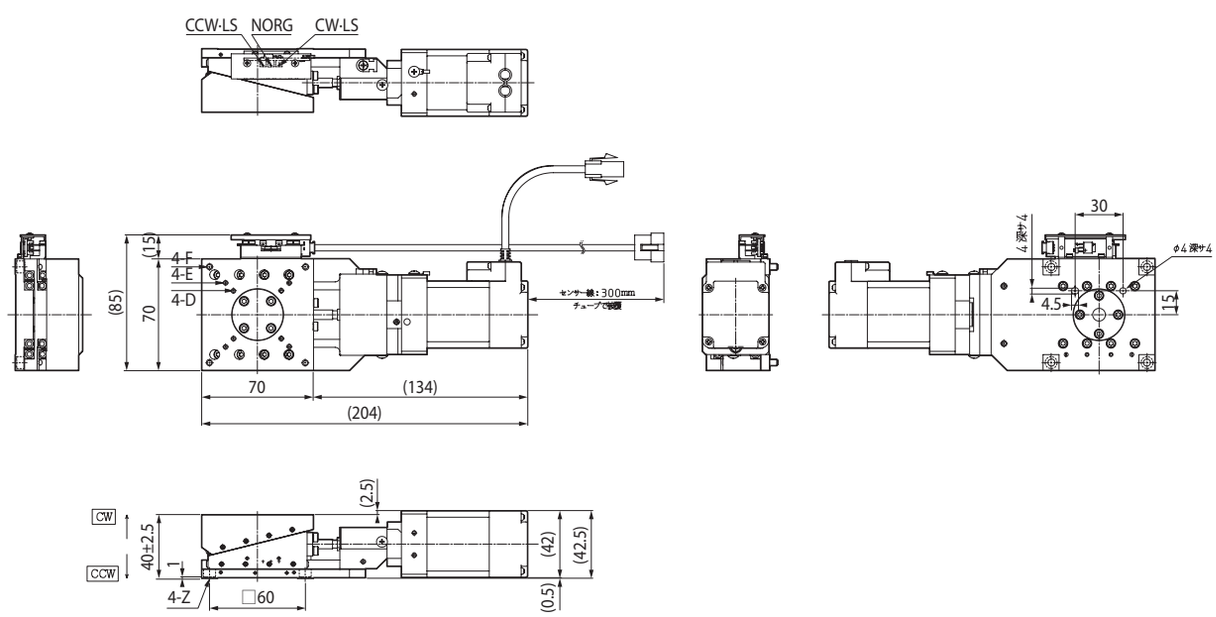
Application

- Alignment and inspection of camera module
- Alignment measurement and bonding of small substrates such as LCD or OLED
- Mark alignment on screen printers
- Alignment and evaluation of optical equipment, medical equipment and biotechnology equipment

● Slim High-Precision Vertical Stage(ZA07A-W2C01) Table Size: 70×70



◆ Ezi-Robo-PMS-□□-42M-□-ZA07A-W2C01



Main Features

- High precision ultra-slim Vertical Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-42M-□-ZA07A-W2C01
	Vertical Specification
Table Size	70×70mm
Travel Range	±2.5mm
Lead Mechanism	1/4 Wedge, Ball screw, Lead 1.0mm
Height	40mm
Guide	Cross Roller Guide
Resolution *1	0.25㎛
Max. Speed	1.25mm/sec
Repeatability(XY)	Less ±0.5㎛
Lost Motion	Less 0.3㎛
Straightness(Vertical)	Less 5㎛ / 5mm
Backlash	Less 1㎛
Motor	EzM-42M(FASTECH)

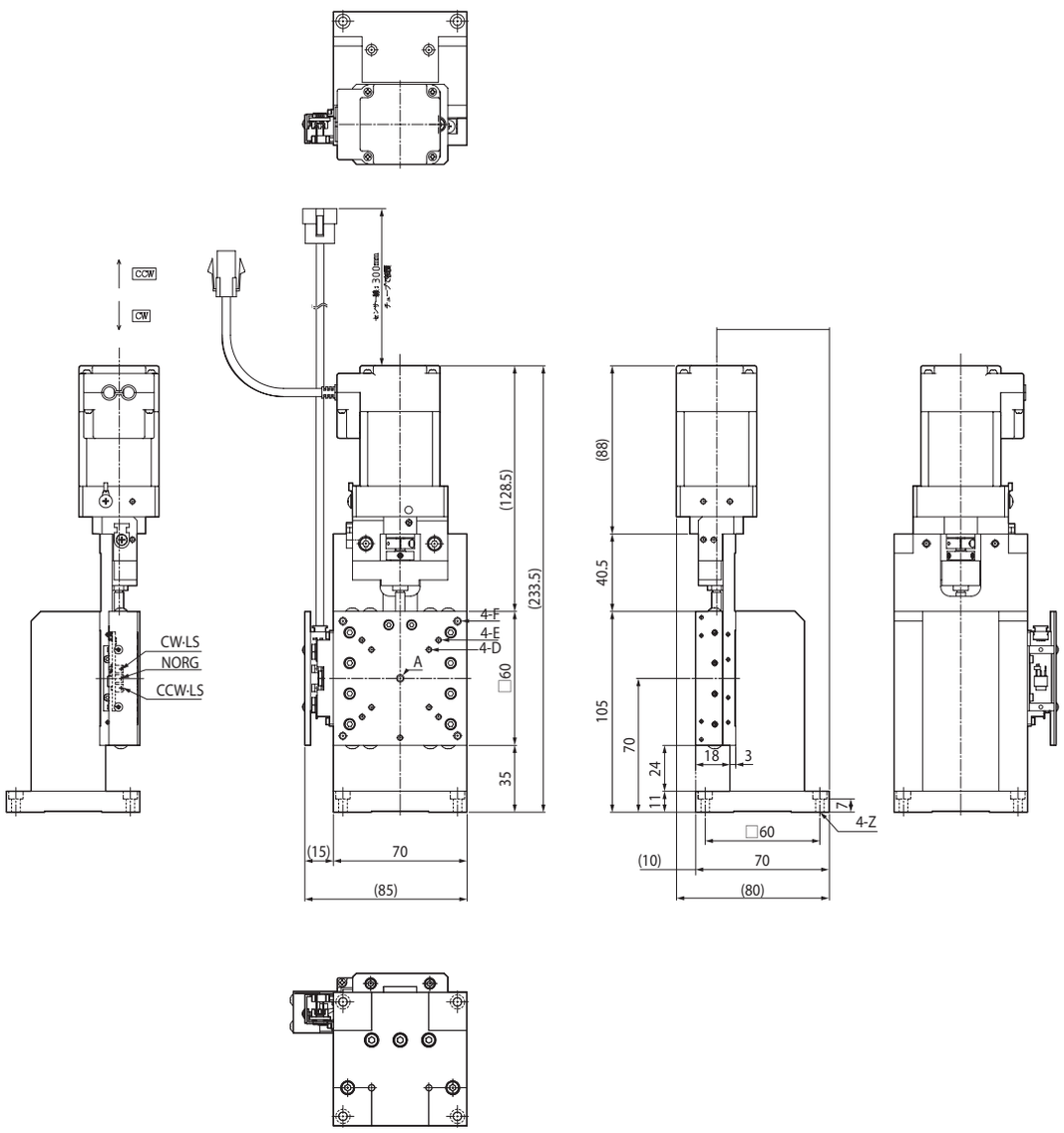
* 1 : Specification based on Ezi-SERVO 42M Motor resolution as 1,000 [Step/rev].

Application

- Moving or focusing the CCD camera module
- Slide table for precision assembly
- Pick & Place movement axis
- Return of work(Horizontal, Vertical)
- Pallet positioning stopper on conveyor

● Slim High-Precision Vertical Stage(ZA07A-X102) Table Size: 70×70

◆ Ezi-Robo-PMS-□□-42M-□-ZA07A-X102



Main Features

- High precision ultra-slim Vertical Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-42M-□-ZA07A-X102
	Vertical Specification
Table Size	70×70mm
Motion Range	±10mm
Lead Mechanism	Ground screw, Lead 0.5mm
Height	50mm
Guide	Cross Roller Guide
Resolution *1	0.5㎛
Max. Speed	2.5mm/sec
Repeatability(XY)	Less ±0.5㎛
Lost Motion	Less 1.5㎛
Straightness(Vertical)	Less 7㎛ / 20mm
Motor	EzM-42M(FASTECH)

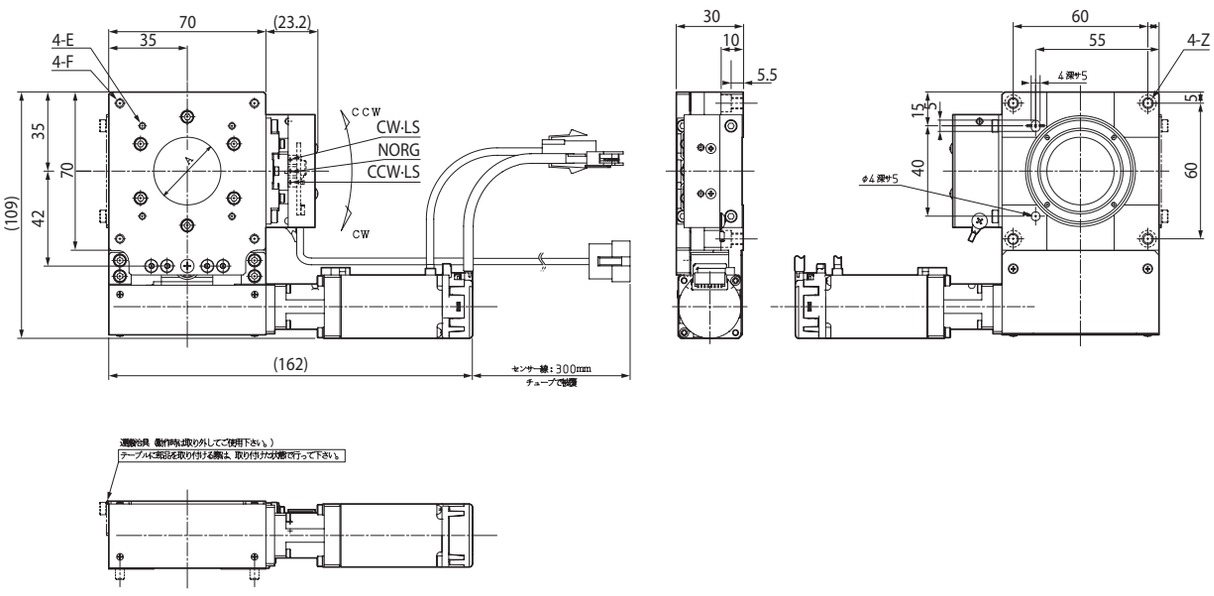
* 1 : Specification based on Ezi-SERVO 42M Motor resolution as 1,000 [Step/rev].

Application

- Moving or focusing the CCD camera module
- Slide table for precision assembly
- Pick & Place movement axis
- Return of work(Horizontal, Vertical)
- Pallet positioning stopper on conveyor

● Slim High-Precision Rotation Stage(RA07A-T01) Table Size: 70×70

◆ Ezi-Robo-PMS-□□-28M-D-RA07A-T01



Main Features

- High precision ultra-slim θ Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

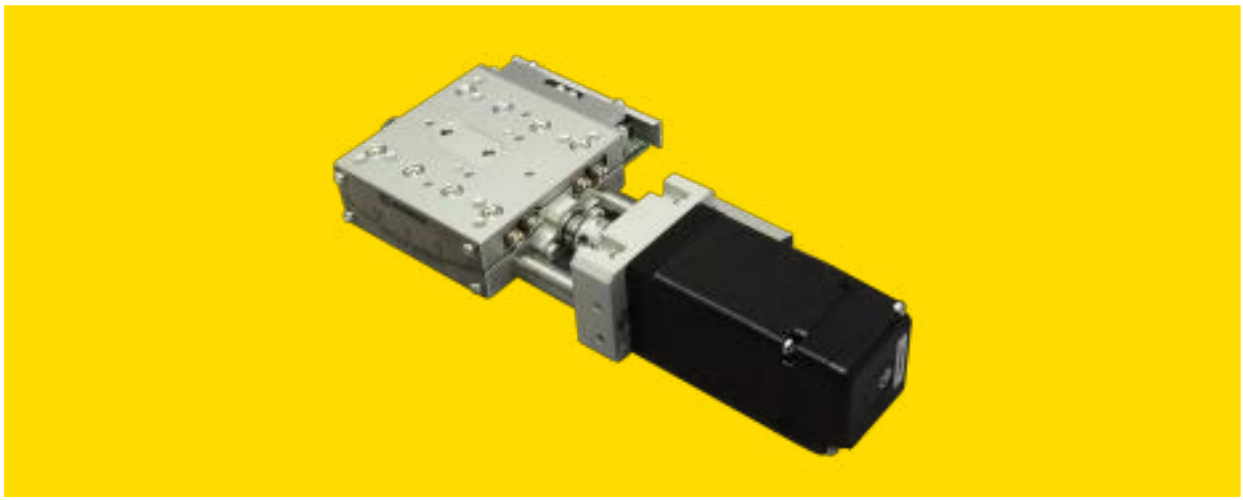
Model Number	Ezi-Robo-PMS-□□-28M-D-RA07A-T01
	θ Specification
Table Size	70×70mm
Motion Range	±5°
Lead Mechanism	Tangent-Bar System, Ball Screw
Height	30mm
Guide	Cross Roller Guide
Resolution *1	0.001364°
Max. Speed	13.64° /sec
Angular Repeatability(θ)	Less 0.002
Lost Motion	Less 0.005
Backlash	Less 0.005
Eccentricity	Less 5㎛ / ±5°
Motor	EzM-28M(FASTECH)

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

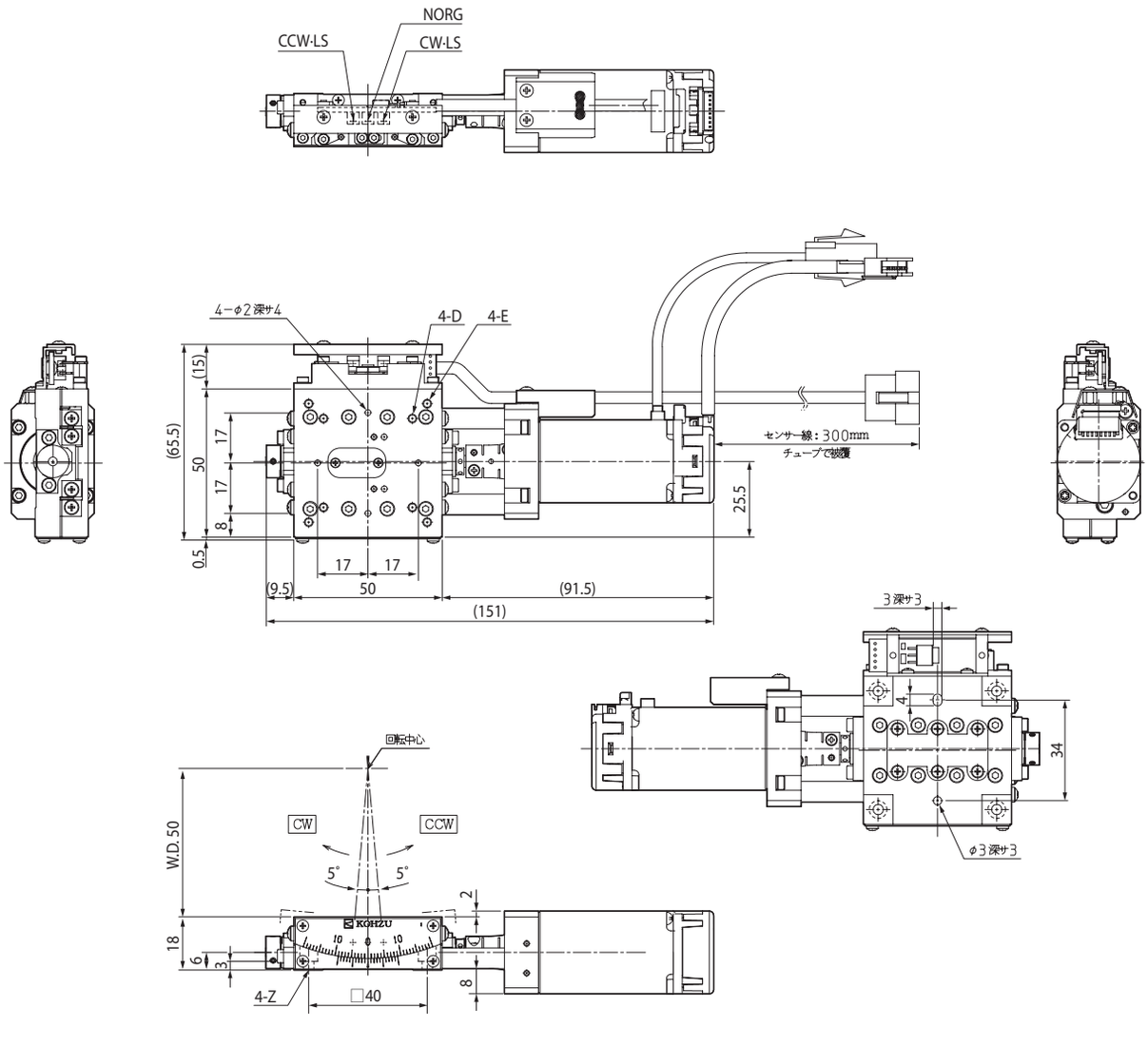
Application

- Rotation of Work
- Position correction in the θ direction of work
- Part Scanning, Laser Position Compensation
- θ direction alignment in combination with XY stage

● Slim High-Precision Swivel Stage(SA05A-R2T, SA05A-R2M) Table Size: 50×50



◆ Ezi-Robo-PMS-□□-28M-D-SA05A-R2T, SA05A-R2M



Main Features

- High precision ultra-slim Swivel Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

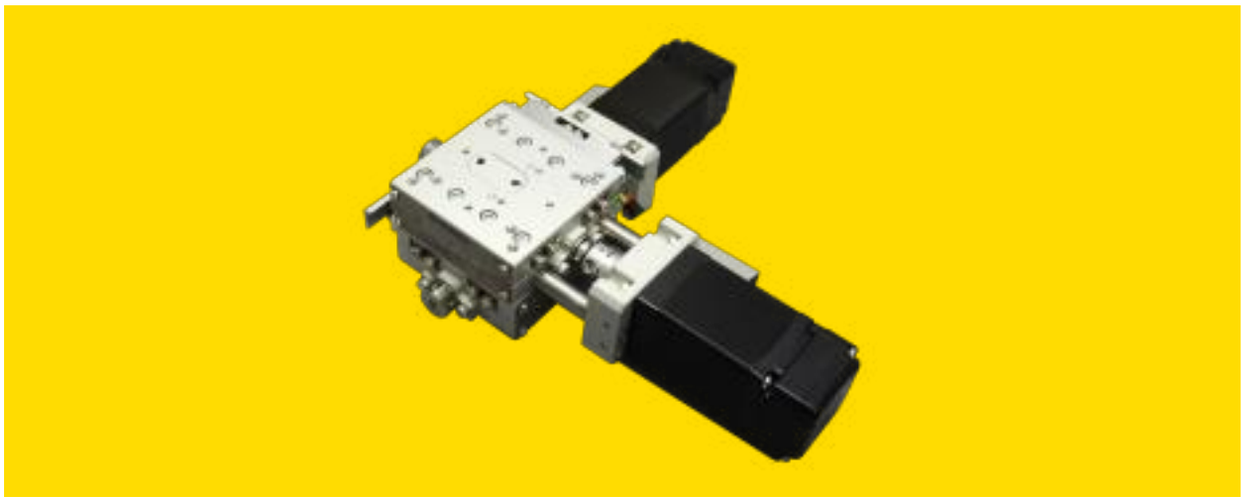
Model Number	Ezi-Robo-PMS-□□-28M-D-SA05A-R2T	Ezi-Robo-PMS-□□-28M-D-SA05A-R2M
	Swivel Sepcification	
Table Size	50×50mm	
Angular Range	±5°	±4.5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	18mm	
Guide	Cross Roller Guide	
Resolution *1	0.001063°	0.000797°
Max. Speed	16° /sec	12° /sec
Angular Repeatability(θ)	Less ±0.003°	
Lost Motion	Less 0.003°	
Backlash	Less 0.003°	
Motor	EzM-28M(FASTECH)	

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

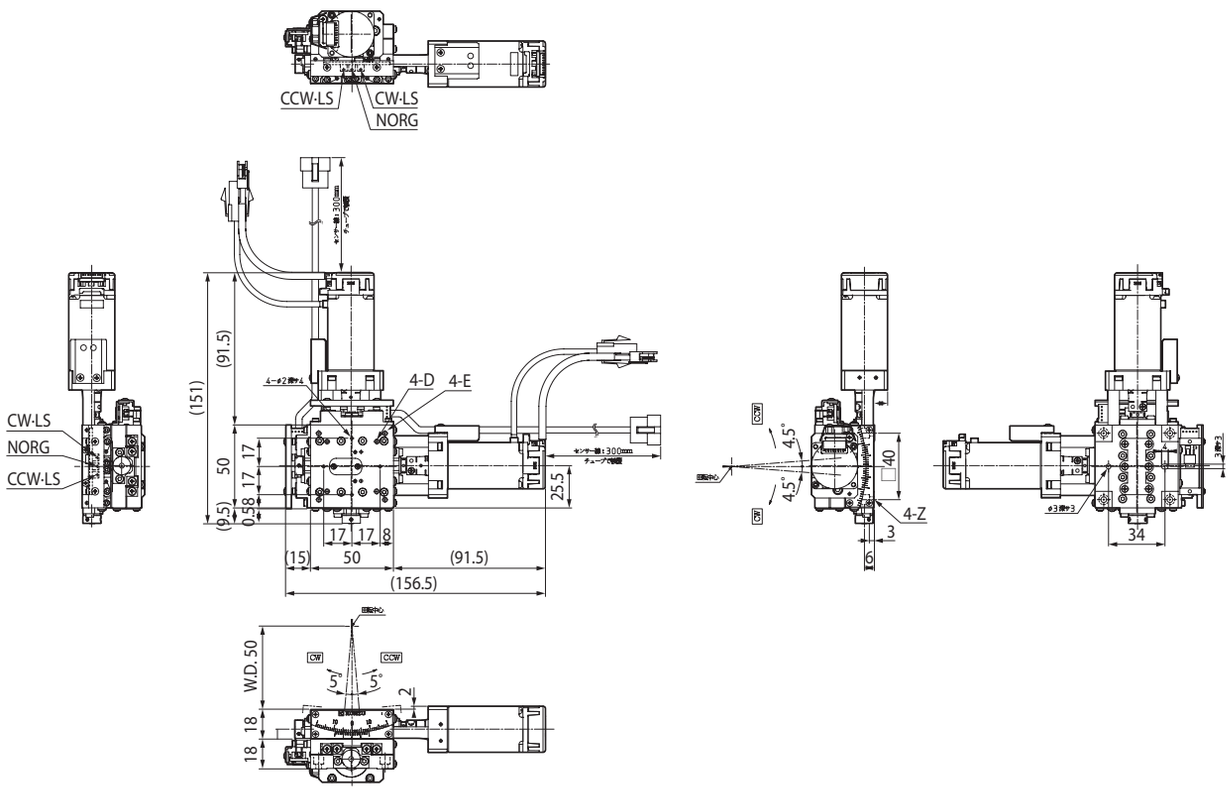
Application

- Camera and laser alignment
- Optical pick-up adjustment, fine angle positioning in the inspection system
- Angle alignment of work

● Slim High-Precision Swivel Stage(SA05A-R2S) Table Size: 50×50



◆ Ezi-Robo-PMS-□□-28M-D-SA05A-R2S



Main Features

- High precision ultra-slim Swivel Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

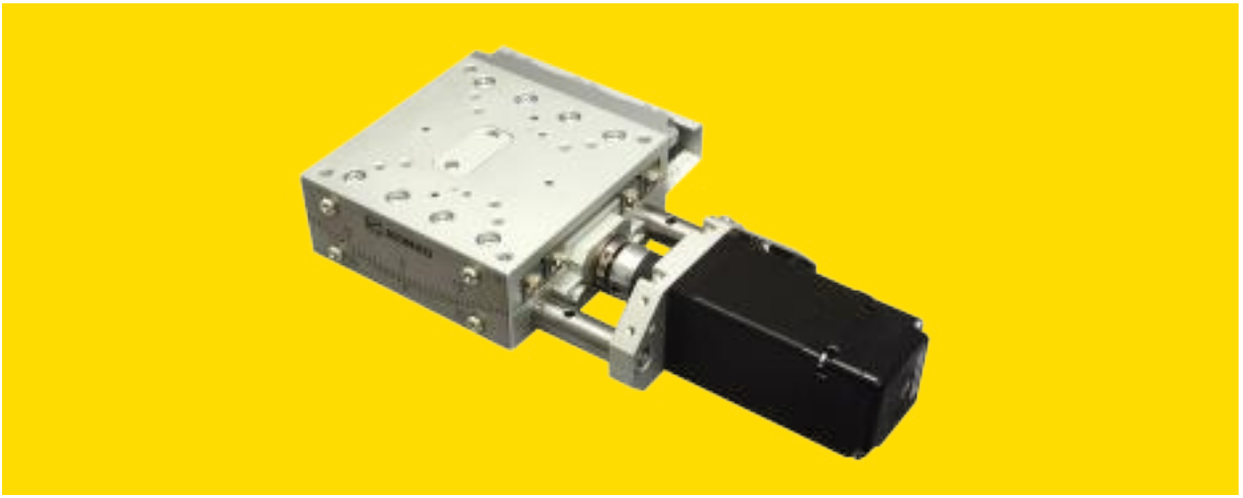
Model Number	Ezi-Robo-PMS-□□-28M-D-SA05A-R2S	
	R2T	R2M
	Swivel Sepcification	
Table Size	50×50mm	
Angular Range	±5°	±4.5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	40mm	
Guide	Cross Roller Guide	
Resolution *1	0.001063°	0.000797°
Max. Speed	16° /sec	12° /sec
Angular Repeatability(θ)	Less 0.003°	
Lost Motion	Less 0.003°	
Backlash	Less 0.003°	
Motor	EzM-28M(FASTECH)	

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

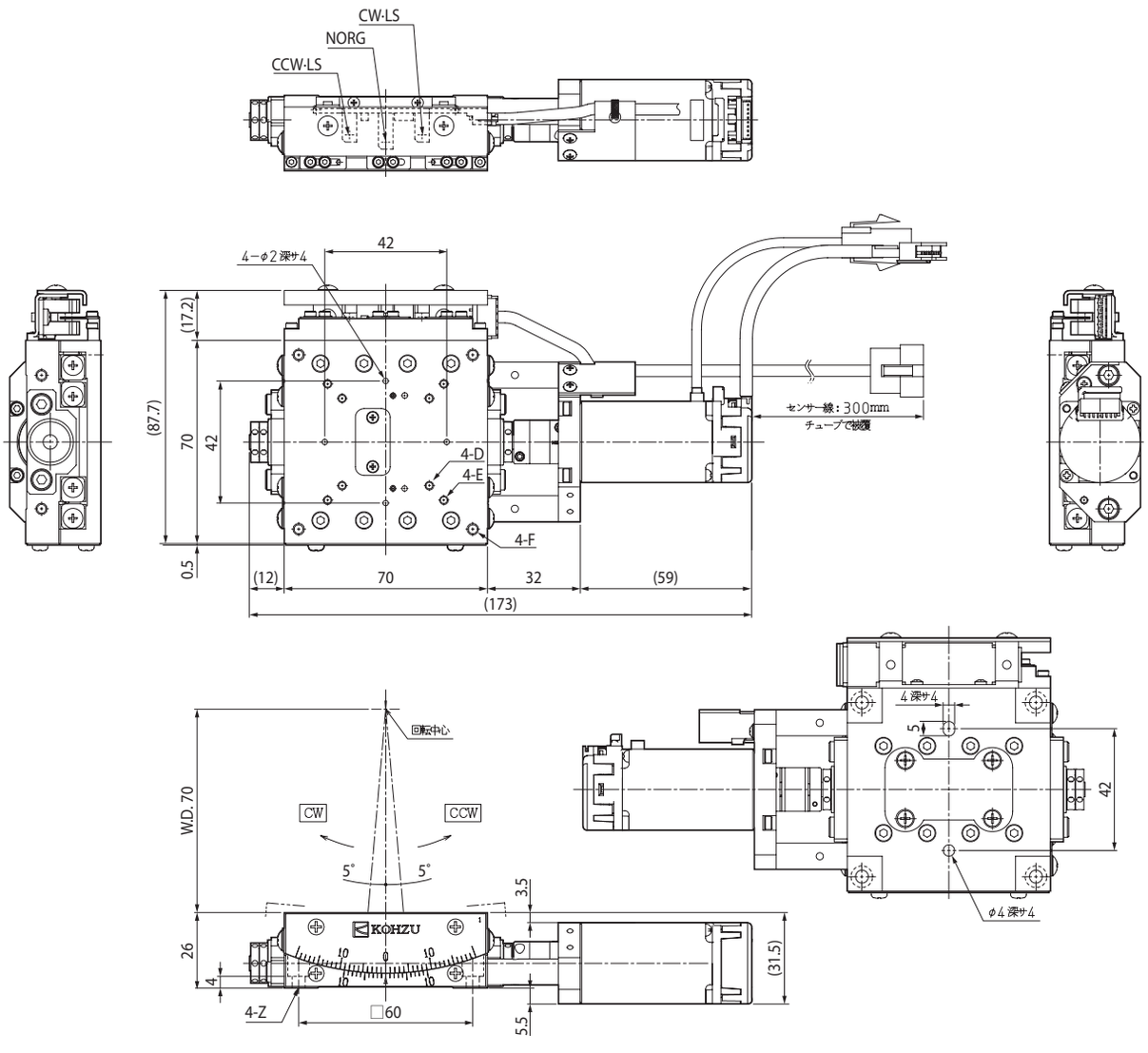
Application

- Camera and laser alignment
- Optical pick-up adjustment, fine angle positioning in the inspection system
- Angle alignment of work

● Slim High-Precision Swivel Stage(SA07A-R2T, SA07A-R2M) Table Size: 70×70



◆ Ezi-Robo-PMS-□□-28M-D-SA07A-R2T, SA07A-R2M



Main Features

- High precision ultra-slim Swivel Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertiona 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

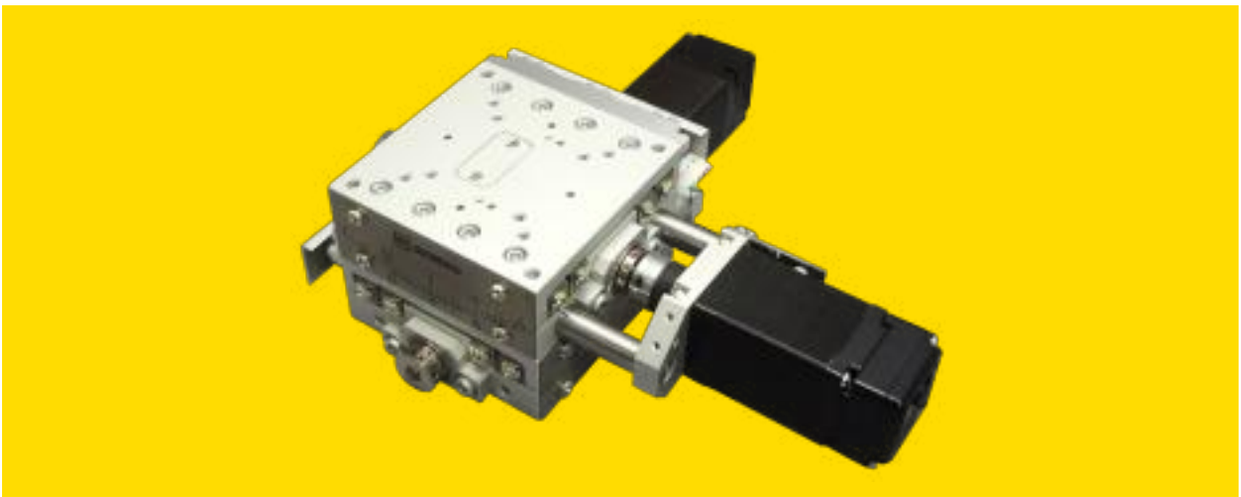
Model Number	Ezi-Robo-PMS-□□-28M-D-SA07A-R2T	Ezi-Robo-PMS-□□-28M-D-SA07A-R2M
	Swivel 사양	
Table Size	70×70mm	
Angular Range	±5°	±4.5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	26mm	
Guide	Cross Roller Guide	
Resolution *1	0.000756°	0.000564°
Max. Speed	11.3° /sec	8.5° /sec
Angular Repeatability(θ)	Less 0.001°	
Lost Motion	Less 0.003°	
Backlash	Less 0.003°	
Motor	EzM-28M(FASTECH)	

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

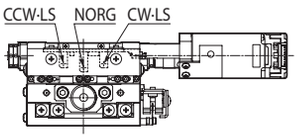
Application

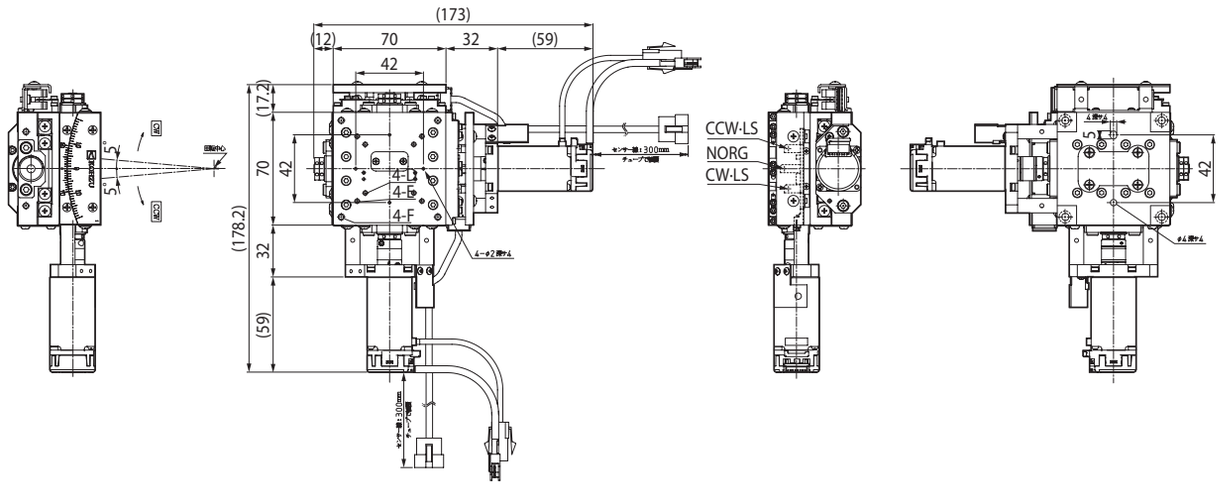
- Camera and laser alignment
- Optical pick-up adjustment, fine angle positioning in the inspection system
- Angle alignment of work

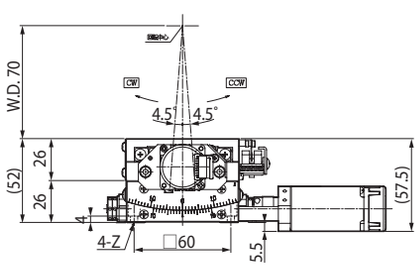
● Slim High-Precision Swivel Stage(SA07A-R2S) Table Size: 70×70



◆ Ezi-Robo-PMS-□□-28M-D-SA07A-R2S







Main Features

- High precision ultra-slim Swivel Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- High precision Ball Screw mechanism accomplished Long life
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-28M-D-SA07A-R2S	
	R2T	R2M
	Swivel Specification	
Table Size	70×70mm	
Angular Range	±5°	±4.5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	26mm	
Guide	Cross Roller Guide	
Resolution *1	0.000756°	0.000564°
Max. Speed	11.3° /sec	8.5° /sec
Angular Repeatability(θ)	Less 0.003°	
Lost Motion	Less 0.003°	
Backlash	Less 0.001°	
Motor	EzM-28M(FASTECH)	

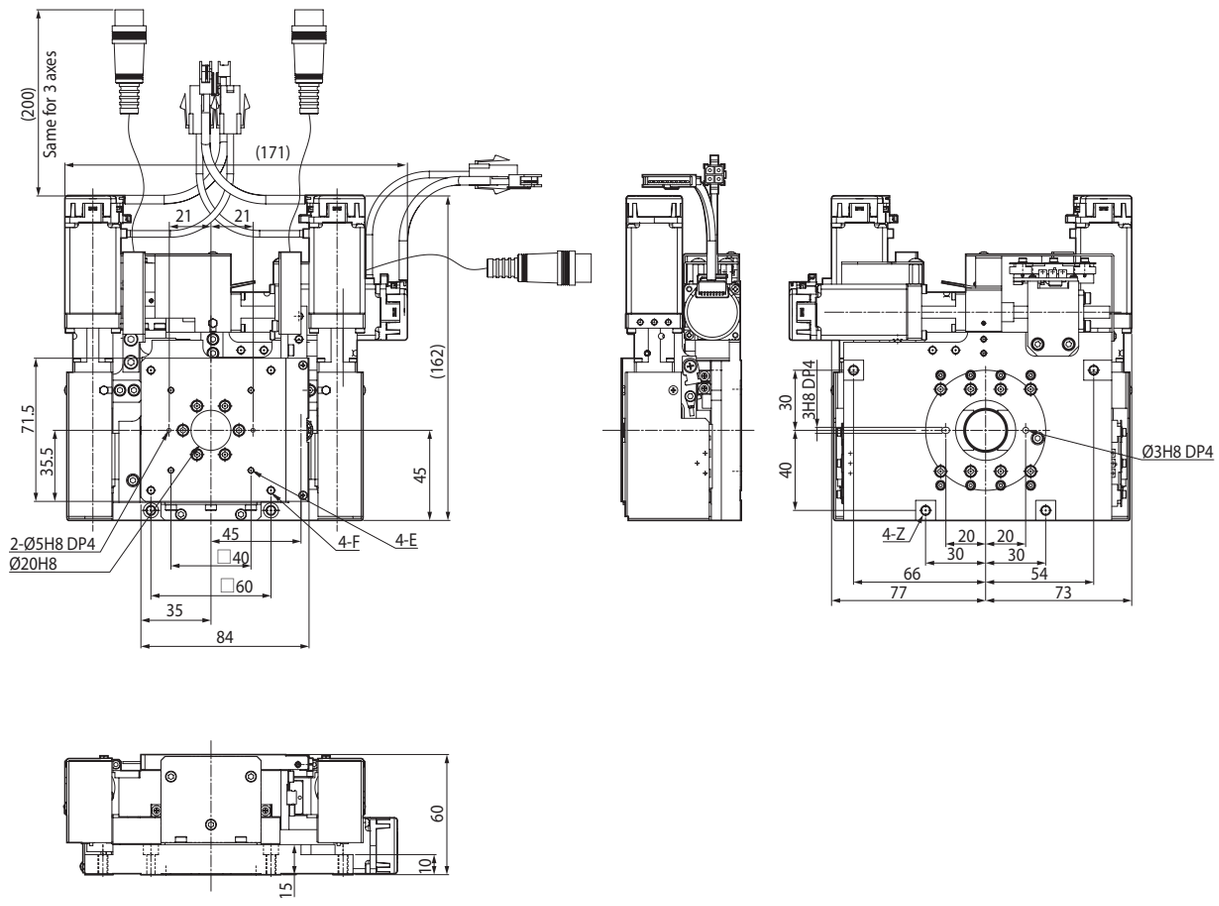
* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

Application

- Camera and laser alignment
- Optical pick-up adjustment, fine angle positioning in the inspection system
- Angle alignment of work

● Slim High-Precision XYθ Alignment Stage(YRA-071-KO) 1Table Size: 70×70

◆ Ezi-Robo-PMS-□□-28M-D-YRA-071-KO



Main Features

- High precision XYθ Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- Ultra-slim stage with integrated 3 axis structure
- High precision Ball Screw mechanism accomplished Long life
- Equipped with center hole opening while full stroke moving
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

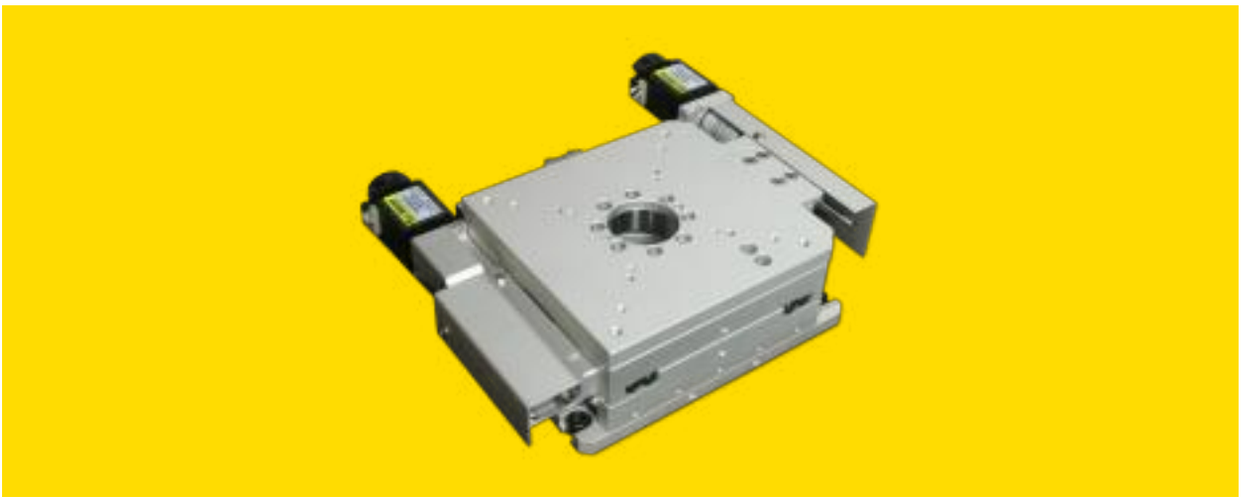
Model Number	Ezi-Robo-PMS-□□-28M-D-YRA-071-KO	
	XY Specification	θ Specification
Table Size	70×70mm	
Travel Range	±5mm	±5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	60mm	
Guide	Cross Roller Guide, Cross Roller Bearing	
Resolution *1	1㎛	0.0012732°
Max. Speed	5mm/sec	6.36° /sec
Repeatability(XY)	Less ±0.5㎛	-
Angular Repeatability(θ)	-	Less 0.001°
Lost Motion	Less 2㎛	Less 0.005°
Straightness	Less 1㎛ / 10mm	-
Backlash	Less 1㎛	Less 0.005°
Motor	EzM-28M(FASTECH)	

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

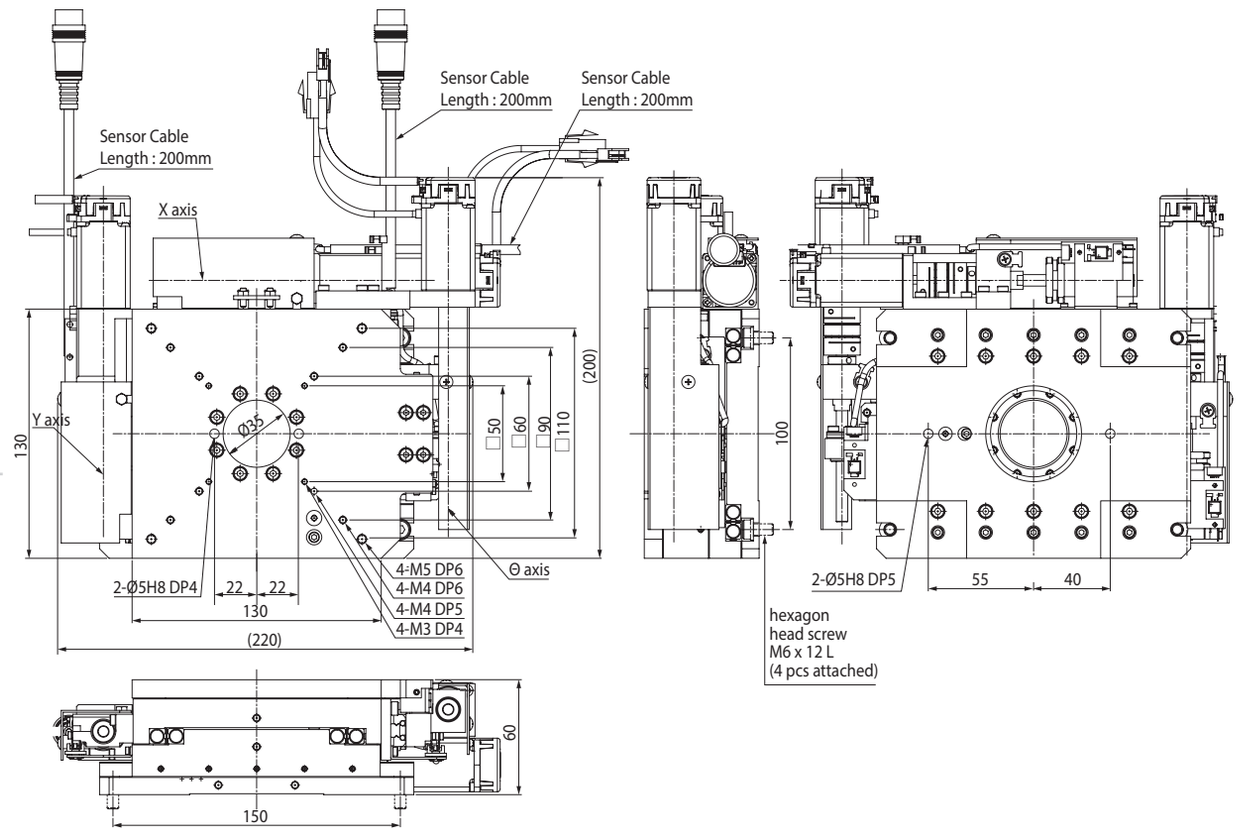
Application

- Camera and laser alignment
- Alignment measurement and bonding of small substrates such as LCD or OLED
- Mark alignment on screen printers
- Alignment and evaluation of optical equipment, medical equipment and biotechnology equipment

● Slim High-Precision XYθ Alignment Stage(YRA-130-KO) Table Size: 130×130



◆ Ezi-Robo-PMS-□□-28M-D-YRA-130-KO



Main Features

- High precision XYθ Stage for high accuracy of positioning
- Provide DLL Library for PC(Window) interface
- Ultra-slim stage with integrated 3 axis structure
- High precision Ball Screw mechanism accomplished Long life
- Equipped with center hole opening while full stroke moving
- Position Accuracy Improvement than convertional 5 phase stepping motor by combination with High Accuracy Optical Encoder of Ezi-SERVO

Specification

Model Number	Ezi-Robo-PMS-□□-28M-D-YRA-130-KO	
	XY Specification	θ Specification
Table Size	130×130mm	
Travel Range	±5mm	±5°
Lead Mechanism	Ball Screw, Lead 1.0mm	
Height	60mm	
Guide	Cross Roller Guide, Cross Roller Bearing	
Resolution *1	0.001mm	0.000674°
Max. Speed	5mm/sec	3.37° /sec
Repeatability(XY)	Less ±0.5㎛	-
Angular Repeatability(θ)	-	Less 0.001°
Lost Motion	Less 2㎛	Less 0.005°
Straightness	Less 1㎛ / 10mm	-
Backlash	Less 1㎛	Less 0.005°
Motor	EzM-28M(FASTECH)	

* 1 : Specification based on Ezi-SERVO 28M Motor resolution as 1,000 [Step/rev].

Application

- Camera and laser alignment
- Alignment measurement and bonding of small substrates such as LCD or OLED
- Mark alignment on screen printers
- Alignment and evaluation of optical equipment, medical equipment and biotechnology equipment

● Precision Comparison with 5-phase standard motor and Ezi-SERVO

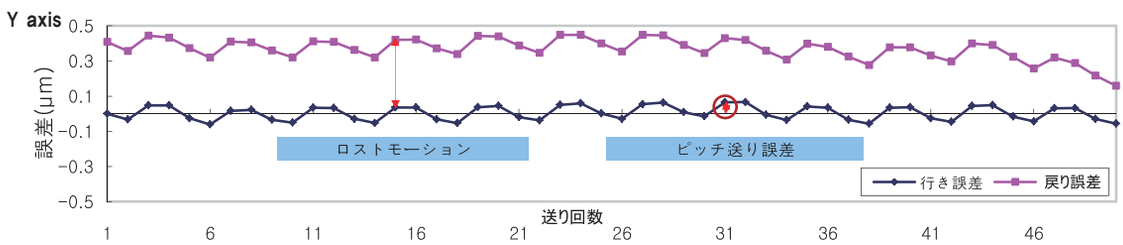
Ezi-Robo-PMS-□□-28M-D-YRA-071-KO

〈Measure Lost Motion and Pitch Movement Error〉

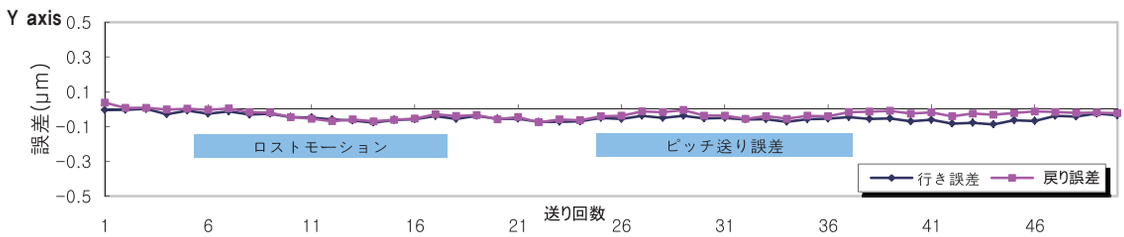
Below data describes measured data by Japan KOHZU company (www.kohzu.com) for Lost Motion and Pitch Movement Error with Ezi-SERVO 28M Motor equipped at PMS Automatic XYθ Series. X, Y axis to measure 50 times of movement under 1 step [0.5um] and θ Axis to measure 50 times of repeated positioning under 1 step 1.2133 [arcsec].
(Measurement Device : Laser Inteferometer)

- Tested Motor : EzM-28M-D
- Tested Drive : EzS-NDR-MI-28M-D
- Steps per 1 Revolution : 1,000 [Step/Revolution]
  (5Relevant to 5-phase motor of Half Step)

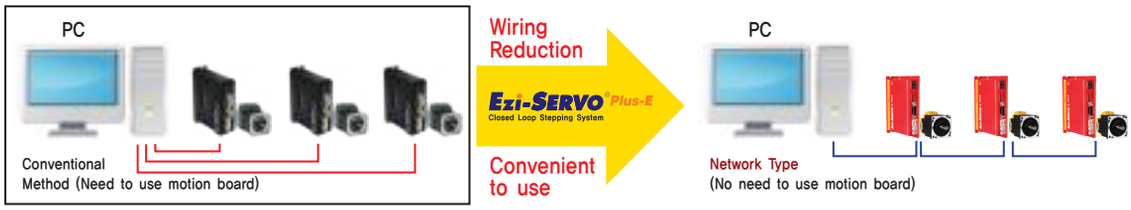
Lost motion and pitch movement error by standard motor



Lost motion and pitch movement error by Ezi-SERVO

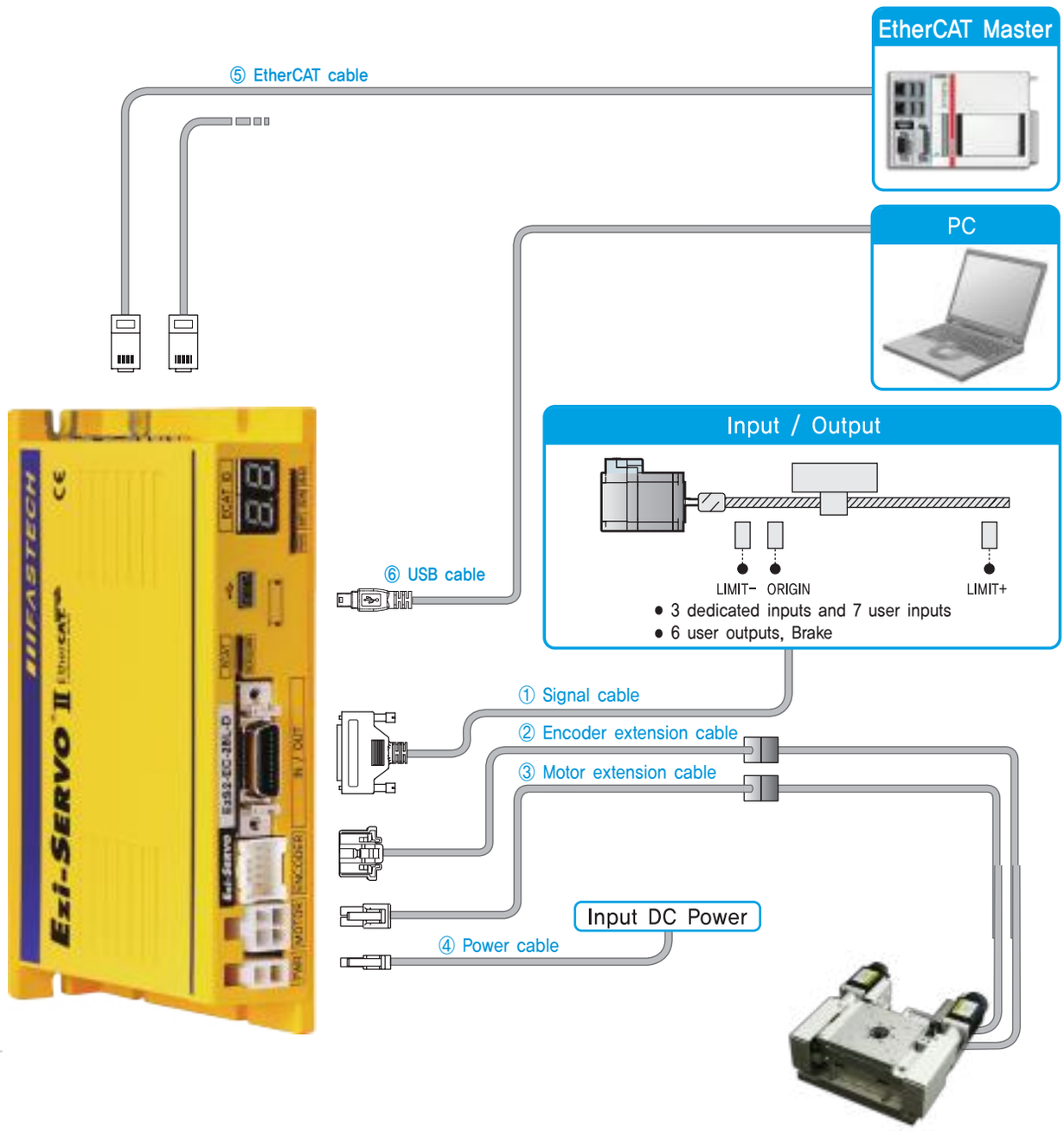


● Optimized Ezi-SERVO II Plus-E series for Network based Alignment System Structure



- Provide DLL Library for PC(Windows) Interface
- Positioning Control by EtherCAT, Ethernet, CC-Link Network(Controller embedded)
- Non-use of Motion Board reduce cost and wiring
- CW / CCW movement error(Lost Motion) minization enables more fast and accurate positioning
- Position accuracy improvement by precise fine pitch movement
  (Position accuracy is 3 times improved than current 5 phase motor)

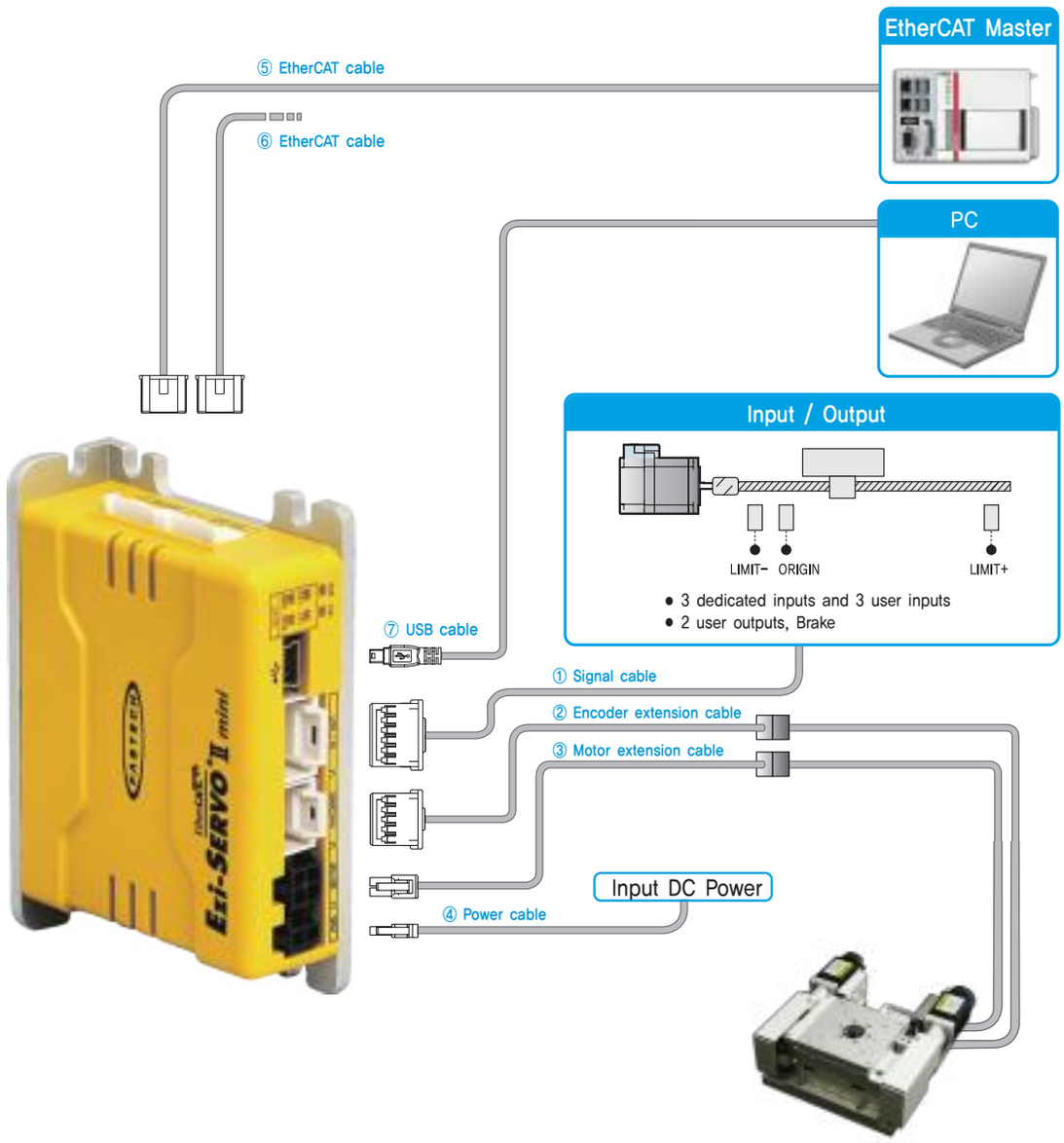
● System Configuration [EtherCAT (Ezi-SERVO II EtherCAT)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	EtherCAT Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

- Ezi-SERVO II EtherCAT is stepping motor control system using EtherCAT, high speed Ethernet(100Mbps full-duplex) based fieldbus.
  Ezi-SERVO II EtherCAT is EtherCAT slave module which support CAN application layer over EtherCAT(CoE). CiA 402 Drive profile implemented.
  Supported modes are Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode.
- Please refer to the Ezi-SERVO II EtherCAT catalog for optional cables, functions and operation.

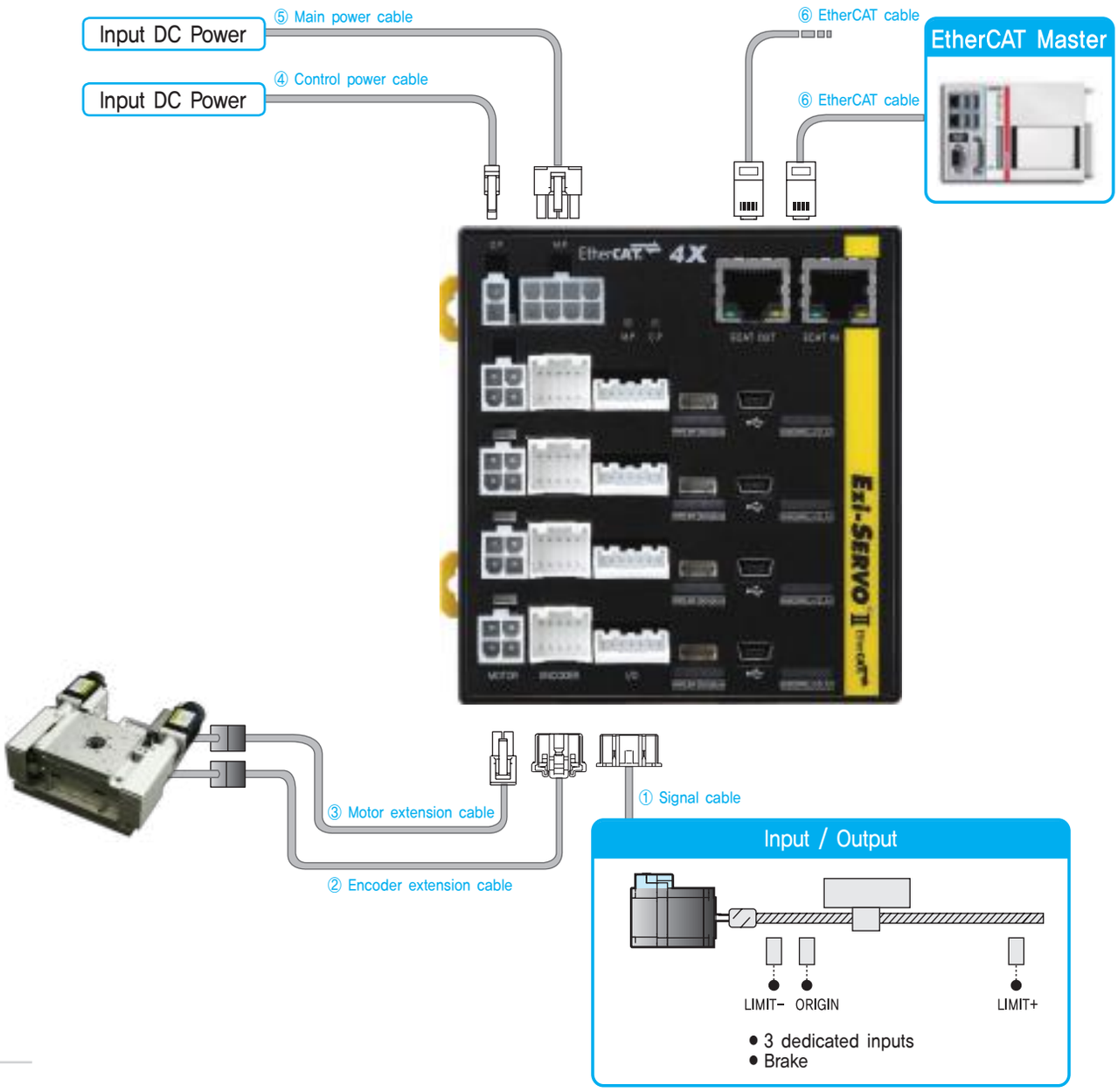
● System Configuration [EtherCAT (Ezi-SERVO II EtherCAT MINI)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	EtherCAT Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

- Ezi-SERVO II EtherCAT MINI is stepping motor control system using EtherCAT, high speed Ethernet(100Mbps full-duplex) based fieldbus. Ezi-SERVO II EtherCAT MINI is EtherCAT slave module which support CAN application layer over EtherCAT(CoE). CiA 402 Drive profile implemented. Supported modes are Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode.
- Please refer to the Ezi-SERVO II EtherCAT MINI catalog for optional cables, functions and operation.

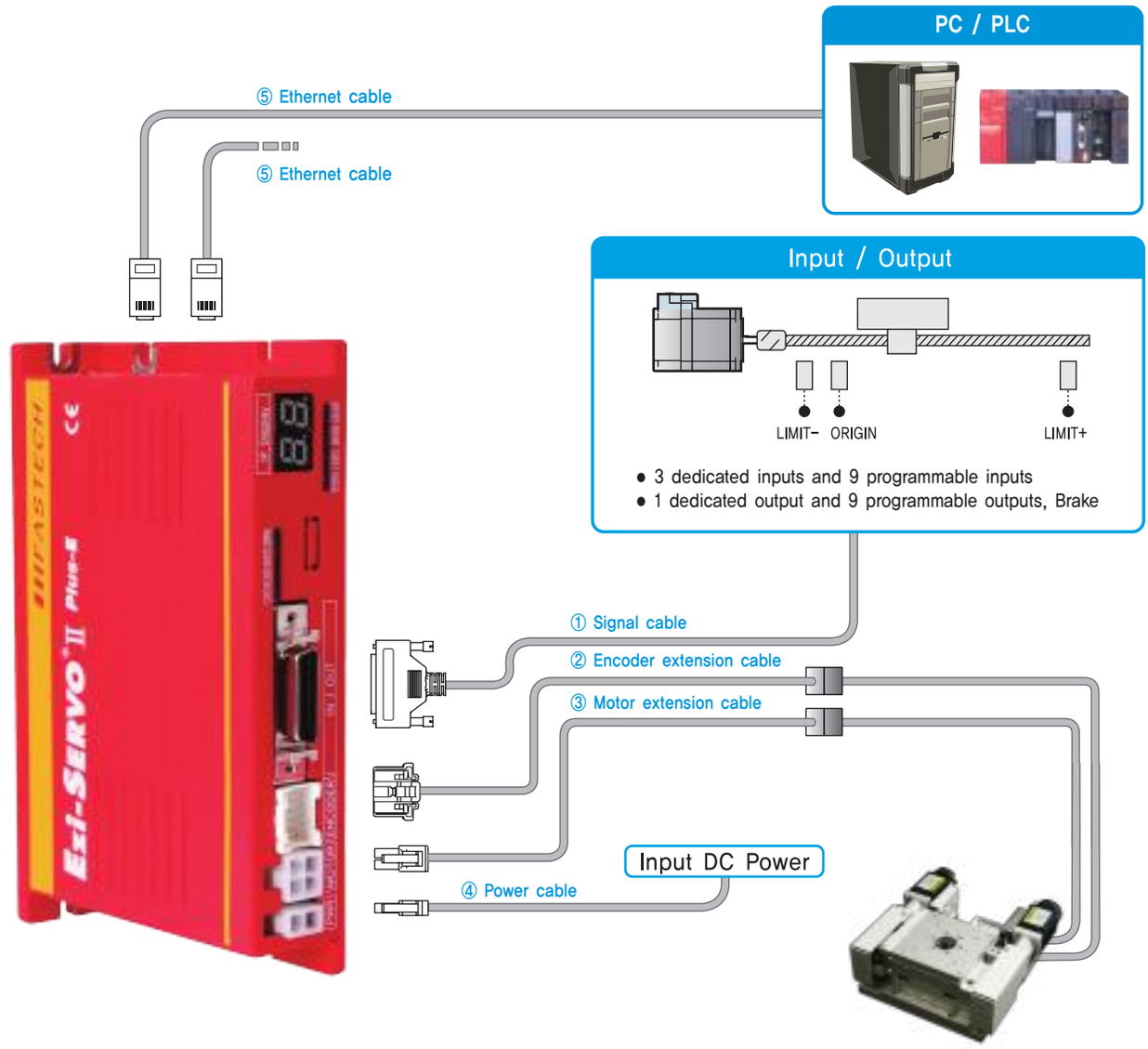
● System Configuration [EtherCAT 4X (Ezi-SERVO II EtherCAT 4X)]



Type	Signal Cable	Encoder Cable	Motor Cable	Control Power Cable	Main Power Cable	EtherCAT Cable
Length supplied	–	30cm	30cm	–	–	–
Max. Length	20m	20m	20m	2m	2m	100m

- Ezi-SERVO II EtherCAT 4X is 4 axis stepping motor control system using EtherCAT, high speed Ethernet(100Mbps full-duplex) based fieldbus. Ezi-SERVO II EtherCAT 4X is EtherCAT slave module which support CAN application layer over EtherCAT(CoE). CiA 402 Drive profile implemented. Supported modes are Profile Position Mode, Homing Mode, Cyclic Synchronous Position Mode.
- Please refer to the Ezi-SERVO II EtherCAT 4X catalog for optional cables, functions and operation.

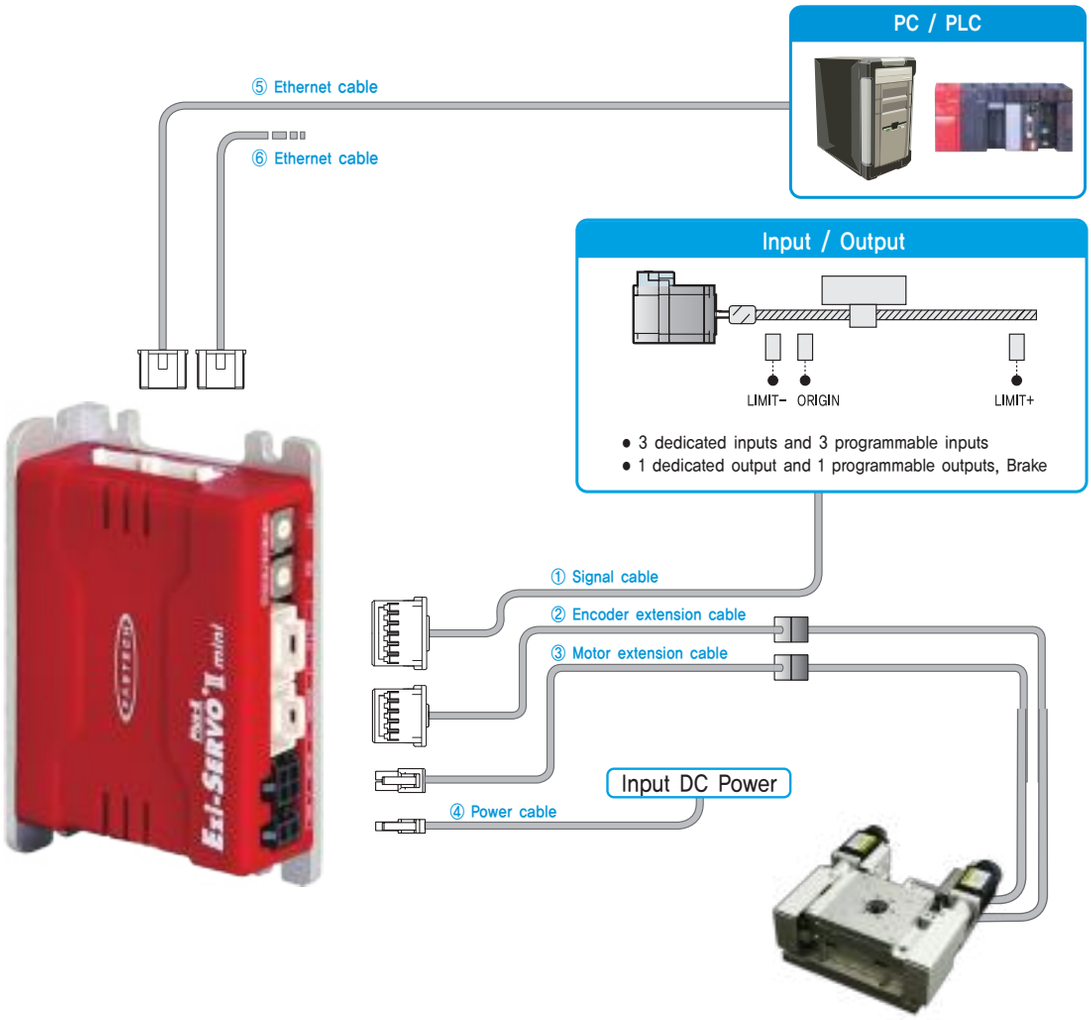
● System Configuration [Ethernet (Ezi-SERVO II Plus-E)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	Ethernet Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

- Ezi-SERVO II Plus-E drive can drive up to 254 axis through Ethernet communication with master controller such as PC. Ethernet HUB is built-in and can be connected in Daisy-chain form. All motion control functions can be controlled through network communication, and motion related conditions(eg. acceleration/deceleration time, etc.) are stored in the ROM as parameters. A motion library(DLL) is provided for programming under Windows 7/8/10.
- Please refer to the Ezi-SERVO II Plus-E catalog for optional cables, functions and operation.

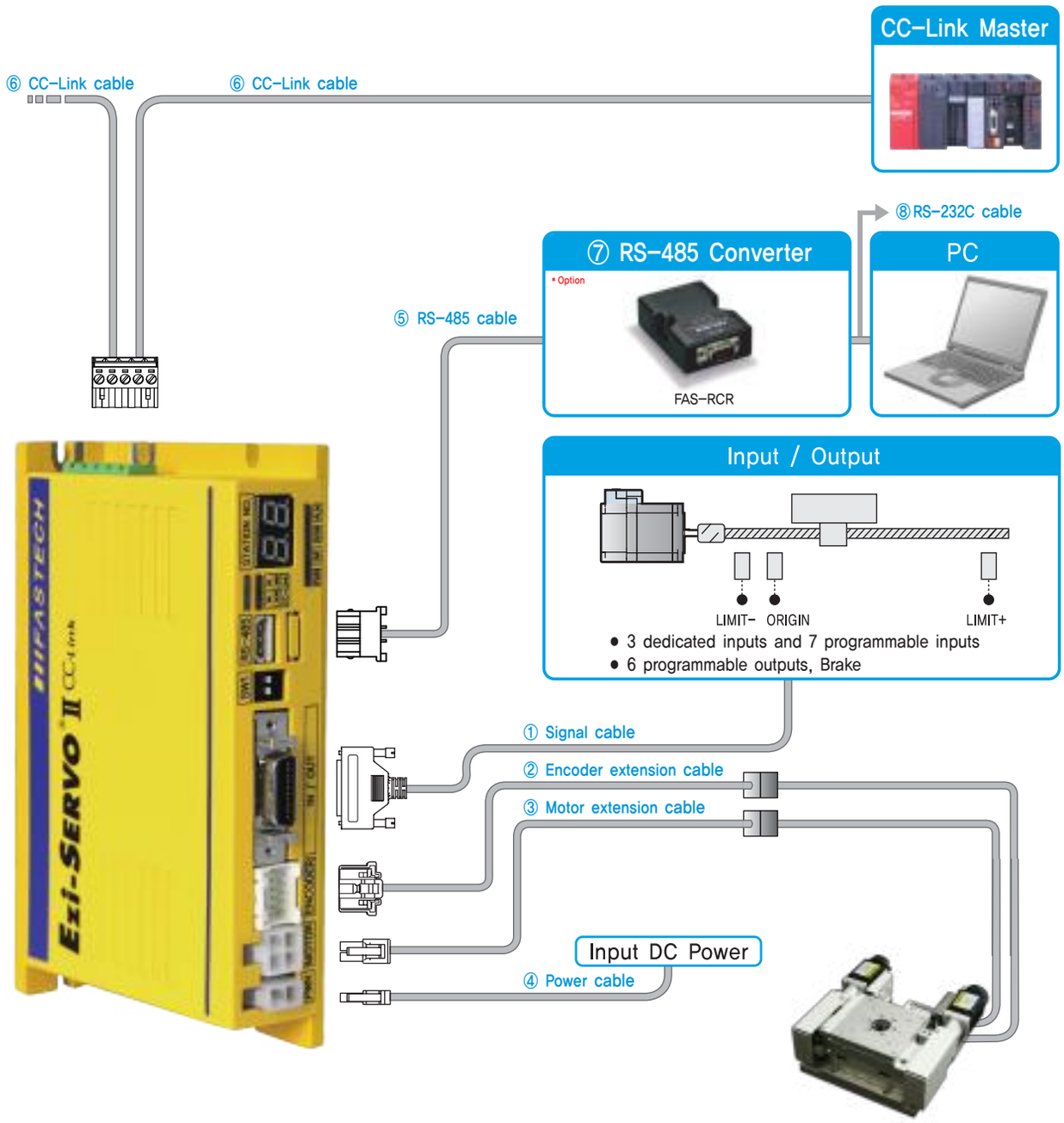
● System Configuration [Ethernet (Ezi-SERVO II Plus-E MINI)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	Ethernet Cable
Length supplied	–	30cm	30cm	–	–
Max. Length	20m	20m	20m	2m	100m

- Ezi-SERVO II Plus-E MINI drive can drive up to 254 axis through Ethernet communication with master controller such as PC. Ethernet HUB is built-in and can be connected in Daisy-chain form. All motion control functions can be controlled through network communication, and motion related conditions(eg. acceleration/deceleration time, etc.) are stored in the ROM as parameters. A motion library(DLL) is provided for programming under Windows 7/8/10.
- Please refer to the Ezi-SERVO II Plus-E MINI catalog for optional cables, functions and operation.

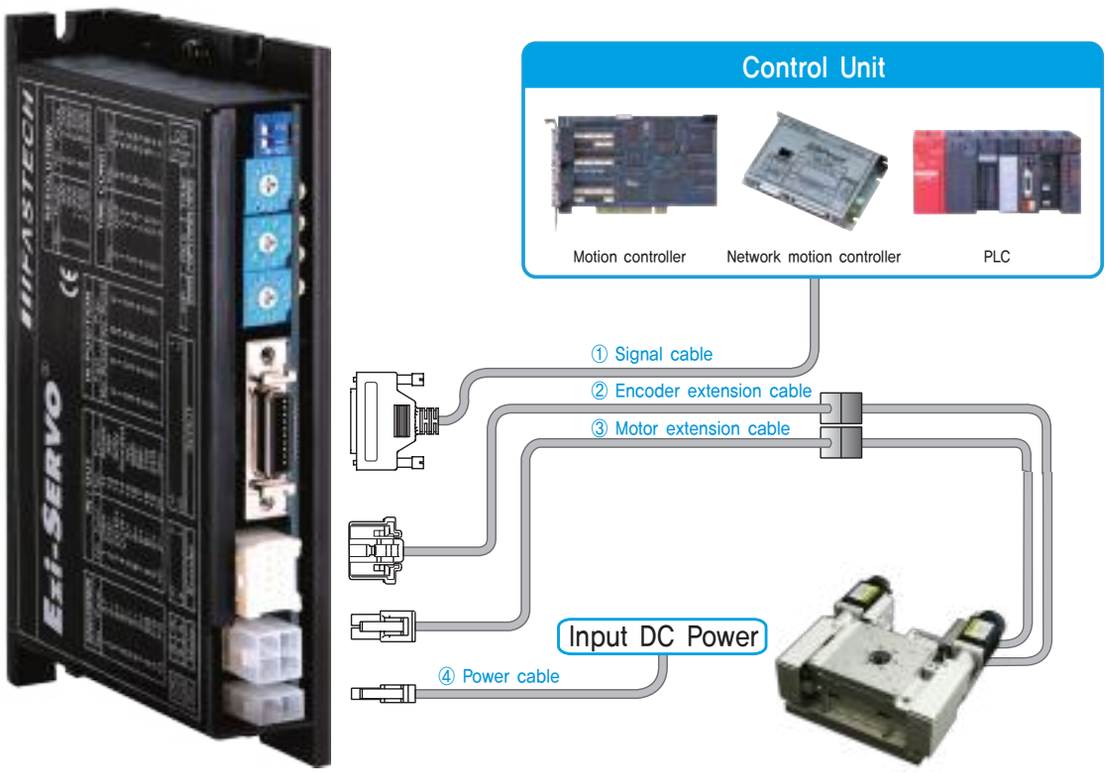
● System Configuration [CC-Link (Ezi-SERVO II CC-Link)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable	CC-Link Cable	RS-485 Cable
Length supplied	–	30cm	30cm	–	–	–
Max. Length	20m	20m	20m	2m	100m	2m

- Ezi-SERVO II CC-Link is a drive supporting CC-Link , a high speed fieldbus(max. 10Mbps). Ezi-SERVO II CC-Link is a Remote Device module supporting CC-Link network. Multi-function control is possible by occupying 1 station and 2 stations in CC-Link, and motion and monitoring functions are processed by device commands.
- Please refer to the Ezi-SERVO II CC-Link catalog for optional cables, functions and operation.

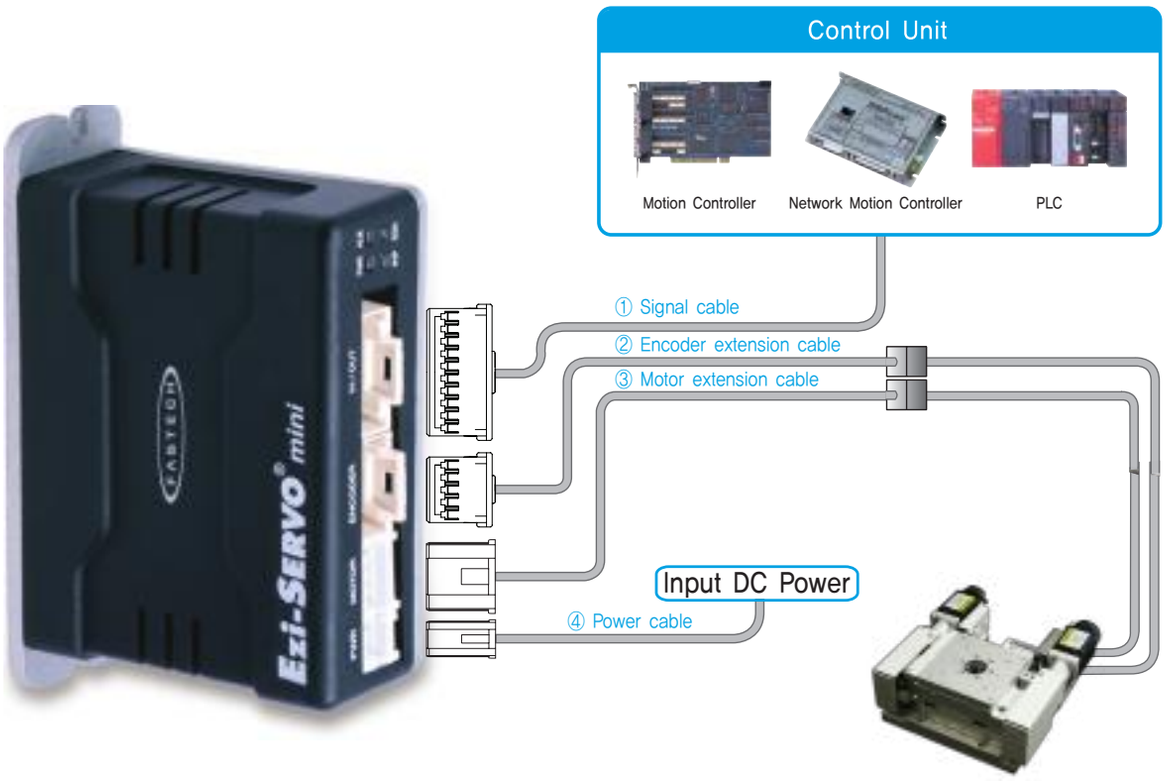
● System Configuration [Pulse Input Drive (Ezi-SERVO ST)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Length supplied	–	30cm	30cm	–
Max. Length	20m	20m	20m	2m

- Ezi-SERVO ST is a pulse input type drive. It is controlled by using of Motion controller, standalone controller or PLC (with positioning module).
- Please refer to the Ezi-SERVO ST catalog for optional cables, functions and operation.

● System Configuration [Pulse Input Mini Drive (Ezi-SERVO MINI)]



Type	Signal Cable	Encoder Cable	Motor Cable	Power Cable
Length supplied	–	30cm	30cm	–
Max. Length	20m	20m	20m	2m

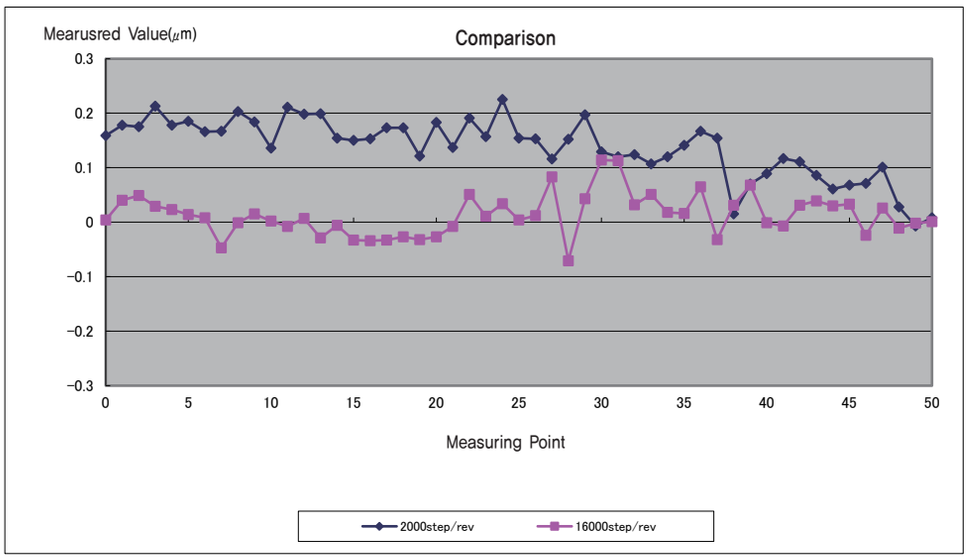
- Ezi-SERVO MINI is a pulse input type drive. It is controlled by using of Motion controller, standalone controller or PLC (with positioning module).
- Please refer to the Ezi-SERVO MINI catalog for optional cables, functions and operation.

● Motorized Linear Stage(XA05A-R201-28M01)

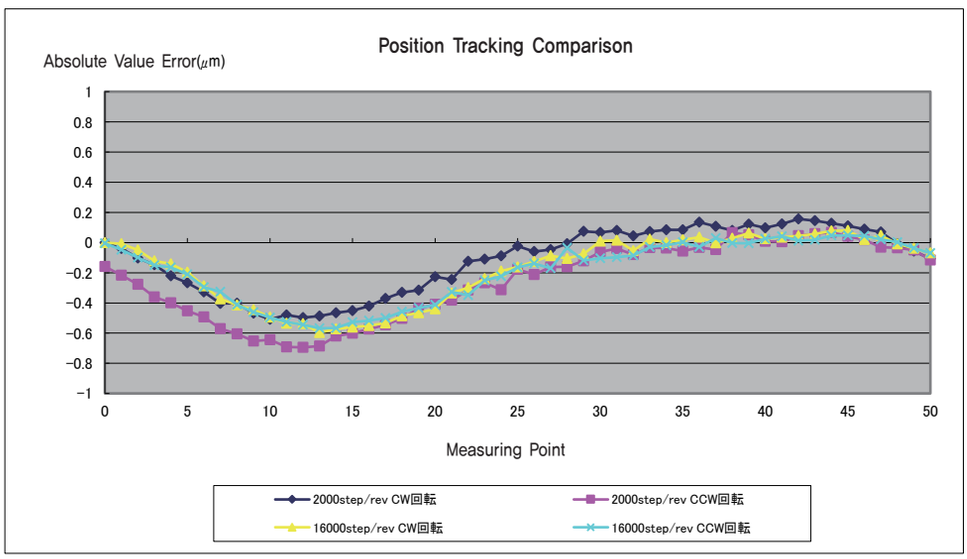
Test Item		Test Specification	Result
Accumulated lead error	[㎛/15mm]	5	2.3
Position repeatability	[±㎛]	0.2	0.04
Lost motion	[㎛]	0.5	0.2
Straightness : Vertical	[㎛/15mm]	1	0.3
Straightness : Horizontal	[㎛/15mm]	1	0.2
Backlash	[㎛]	0.2	0.1
Moment load stiffness	[arcsec/N-cm]	0.31	0.143

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : XA05A-R201-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

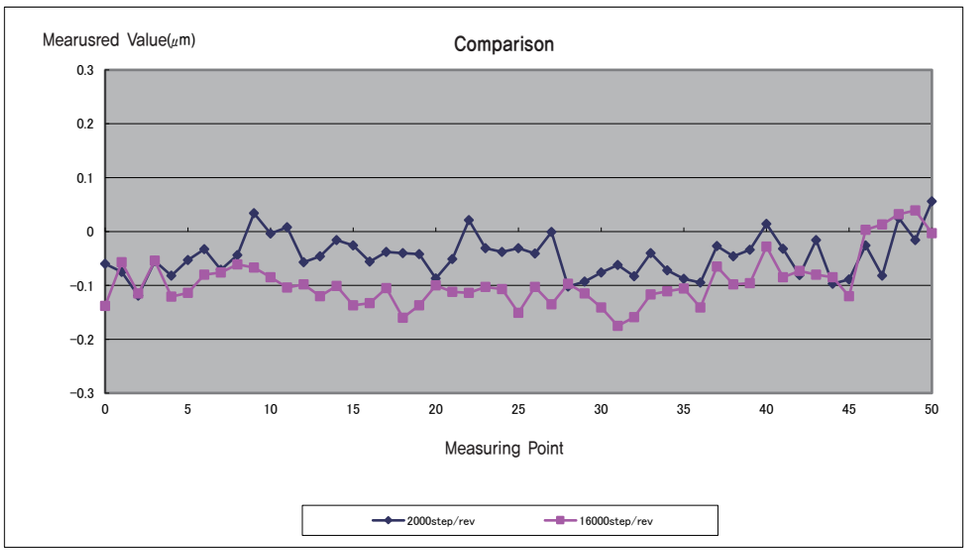


● Motorized Linear Stage(XA07A-R201-28M01)

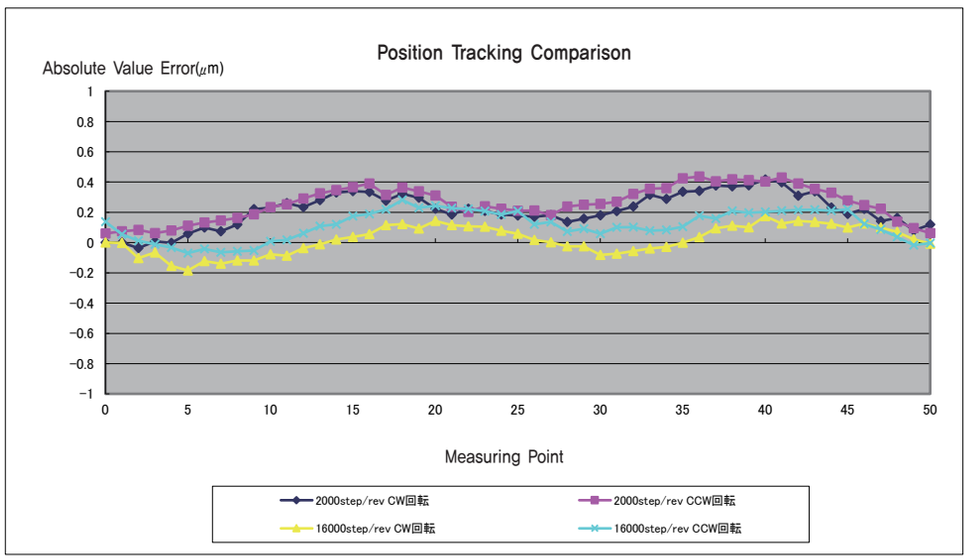
Test Item		Test Specification	Result
Accumulated lead error	[㎛/15mm]	5	2.3
Position repeatability	[±㎛]	0.2	0.04
Lost motion	[㎛]	0.5	0.1
Straightness : Vertical	[㎛/15mm]	1	0.3
Straightness : Horizontal	[㎛/15mm]	0.5	0.2
Backlash	[㎛]	0.2	0.1
Moment load stiffness	[arcsec/N-cm]	0.1	0.048

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : XA07A-R201-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

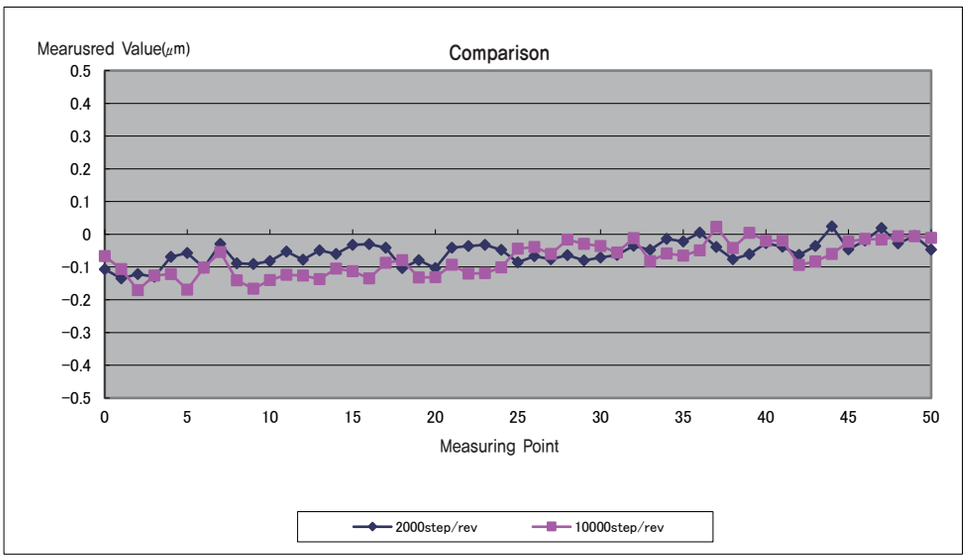


● Motorized Linear Stage(ZA07A-W2C01-42M01)

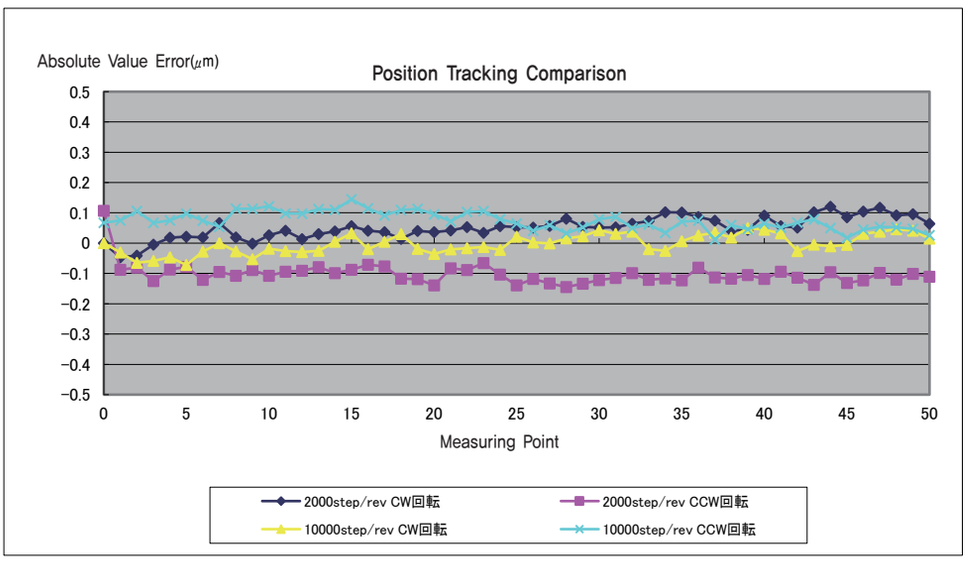
Test Item		Test Specification	Result
Position repeatability	[±㎛]	0.3	0.13
Lost motion	[㎛]	1.5	0.1
Straightness : Vertical	[㎛/20mm]	7	2
Straightness : Horizontal	[㎛/20mm]	7	2

◆ One step movement measurement result (Resolution 2,000 or 10,000 [ppr])
Stage : ZA07A-W2C01-42M01 / Motor : Ezi-SERVO-42M-D

Lost Motion



Position Accuracy

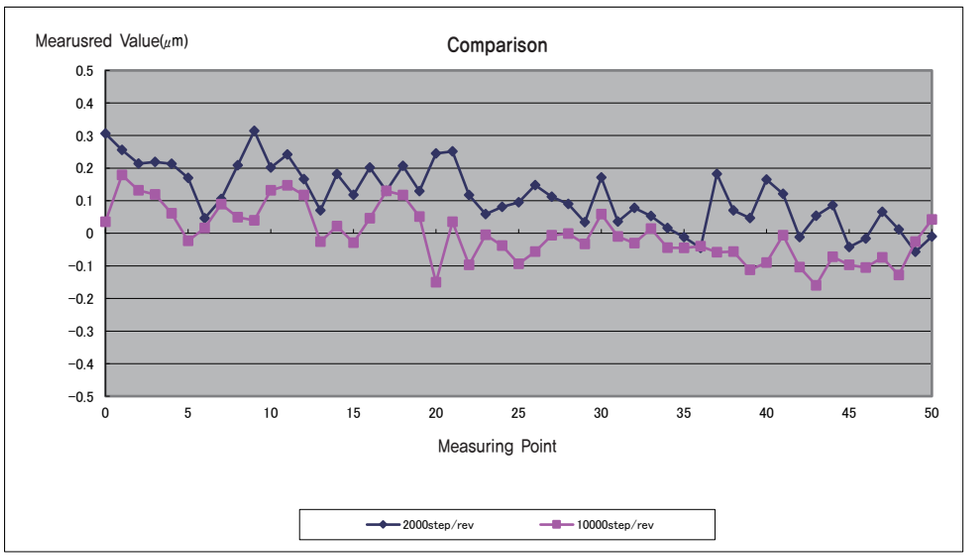


● Motorized Linear Stage(ZA07A-X102-42M01)

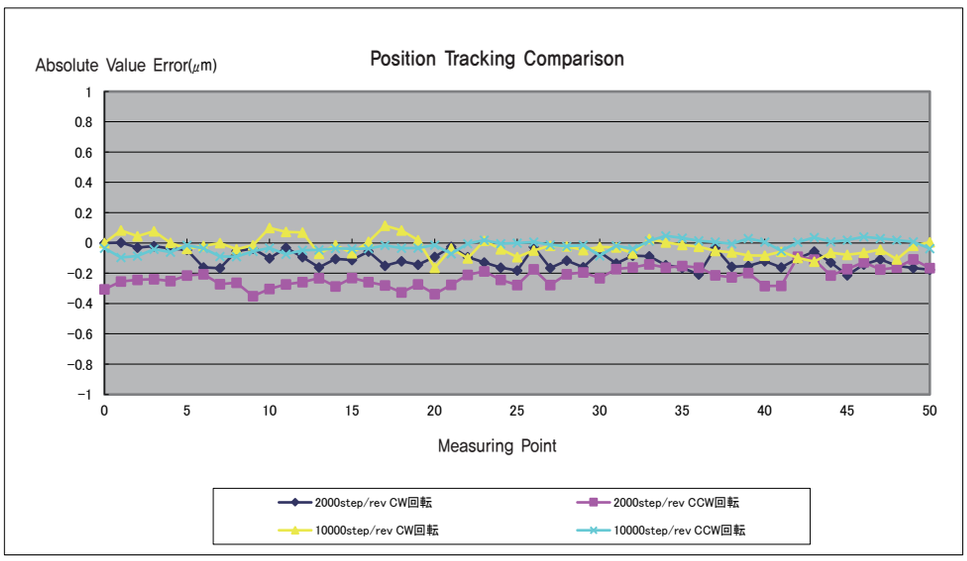
Test Item		Test Specification	Result
Accumulated lead error	[㎛/15mm]	5	2.3
Position repeatability	[±㎛]	0.2	0.04
Lost motion	[㎛]	0.5	0.1
Straightness : Vertical	[㎛/15mm]	1	0.3
Straightness : Horizontal	[㎛/15mm]	0.5	0.2
Backlash	[㎛]	0.2	0.1
Moment load stiffness	[arcsec/N-cm]	0.1	0.048

◆ One step movement measurement result (Resolution 2,000 or 10,000 [ppr])
Stage : ZA07A-X102-42M01 / Motor : Ezi-SERVO-42M-D

Lost Motion



Position Accuracy

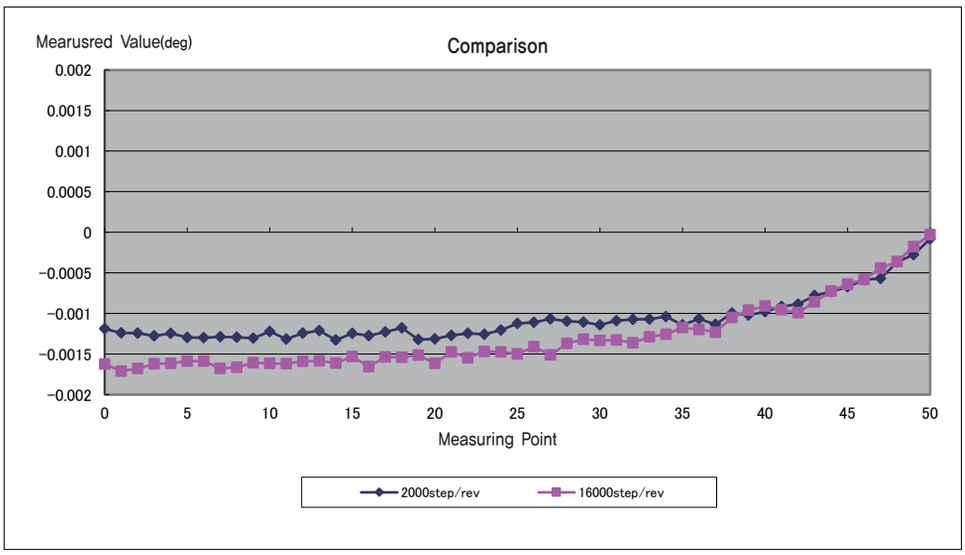


● Motorized Rotation Stage(RA07A-T01-28M01)

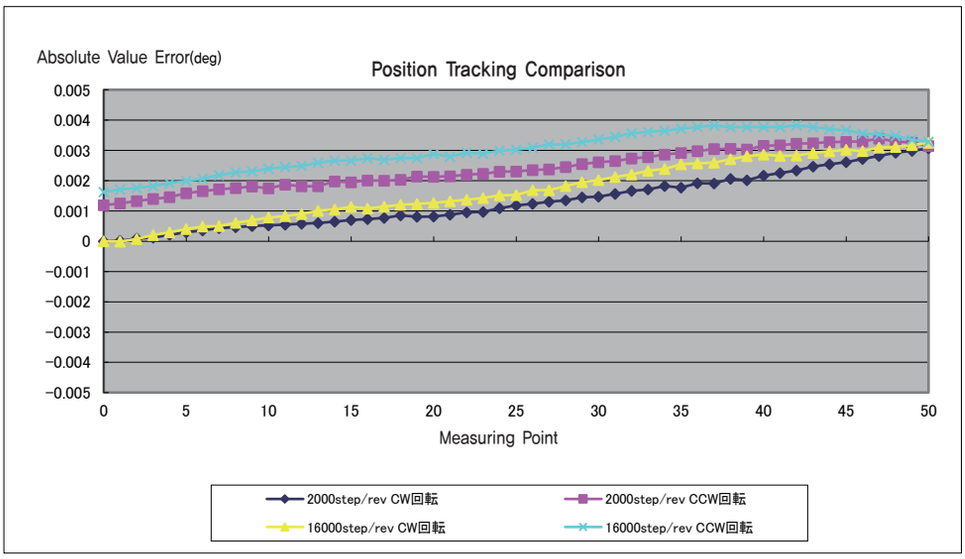
Test Item		Test Specification	Result
Lost motion	[deg]	0.005	0.0011
Angular repeata bility	[deg]	0.002	0.0002
Backlash	[deg]	0.005	0.0011
Surface runout	[㎛/±5deg]	5	0.7
Eccentricity	[㎛/±5deg]	5	0.1
Moment load stiffness	[arcsec/N-cm]	0.15	0.03

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : RA07A-T01-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

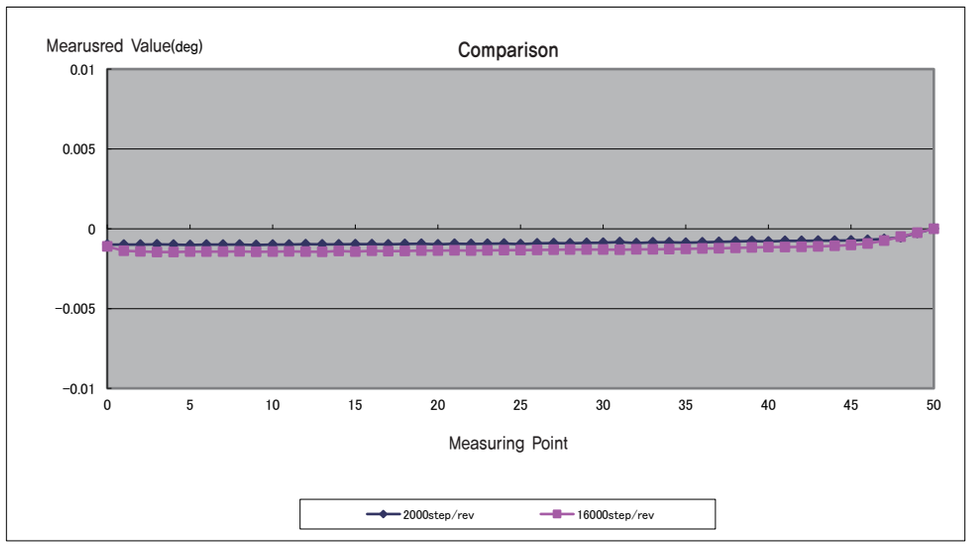


● Motorized Swivel Stage(SA05A-R2M-28M01)

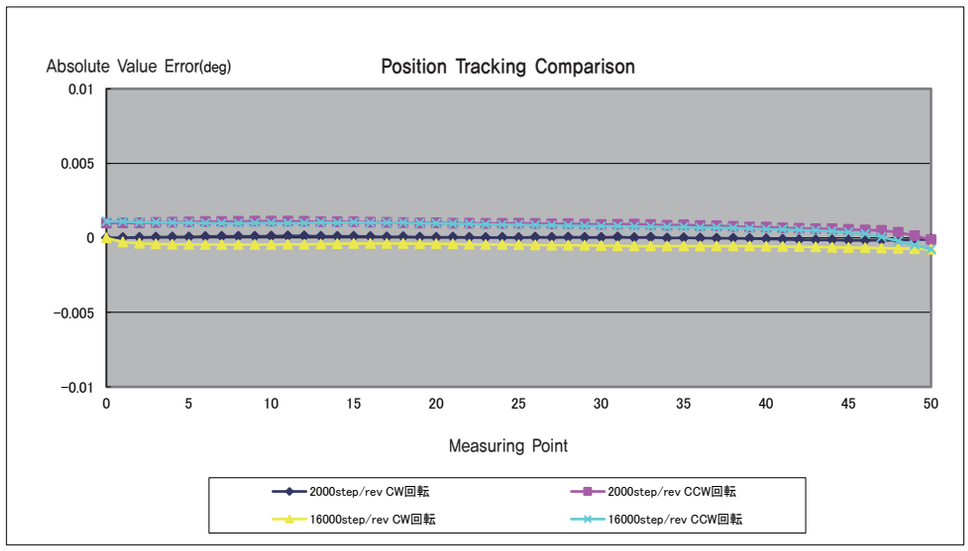
Test Item		Test Specification	Result
Position repeatability	[±deg]	0.003	0.0003
Lost motion	[deg]	0.003	0.0006
Backlash	[deg]	0.003	0.0017
Moment load stiffness	[arcsec/N-cm]	0.41	0.23

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : SA05A-R2M-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

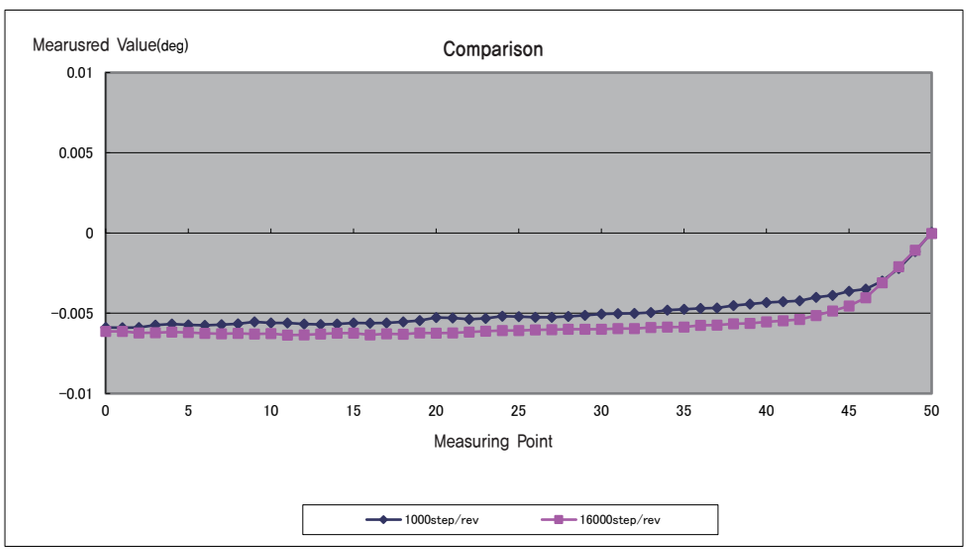


● Motorized Swivel Stage(SA05A-R2T-28M01)

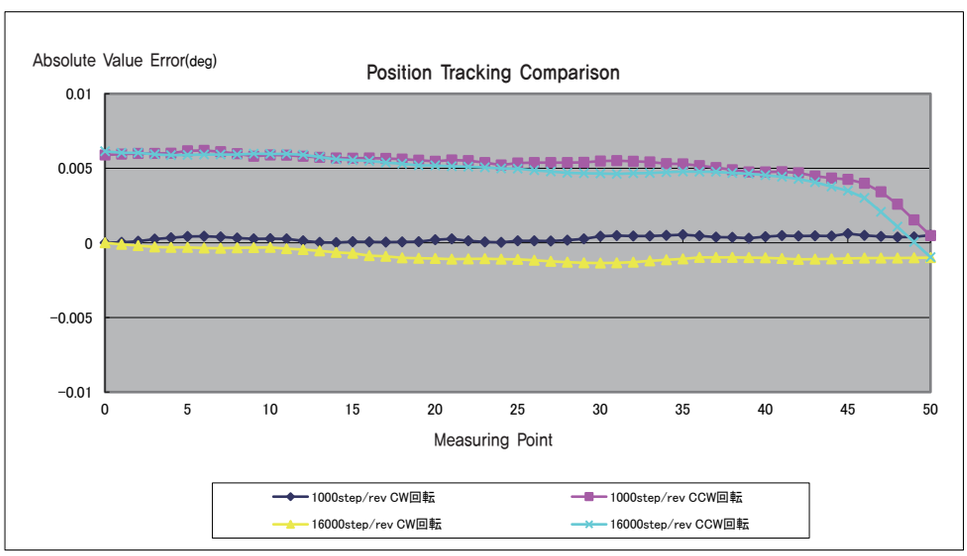
Test Item		Test Specification	Result
Position repeatability	[±deg]	0.003	0.0003
Lost motion	[deg]	0.003	0.0003
Backlash	[deg]	0.003	0.0017
Moment load stiffness	[arcsec/N-cm]	0.41	0.23

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : SA05A-R2T-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

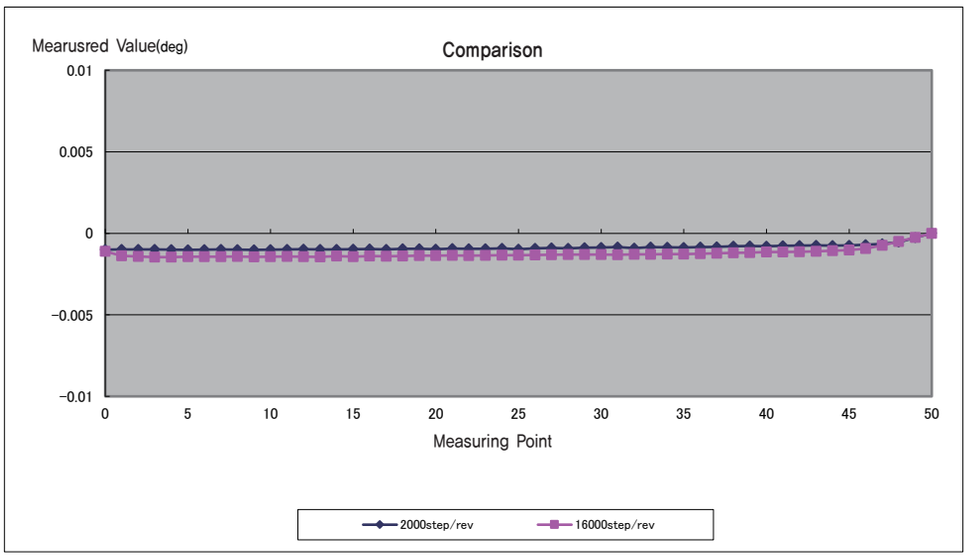


● Motorized Swivel Stage(SA07A-R2M-28M01)

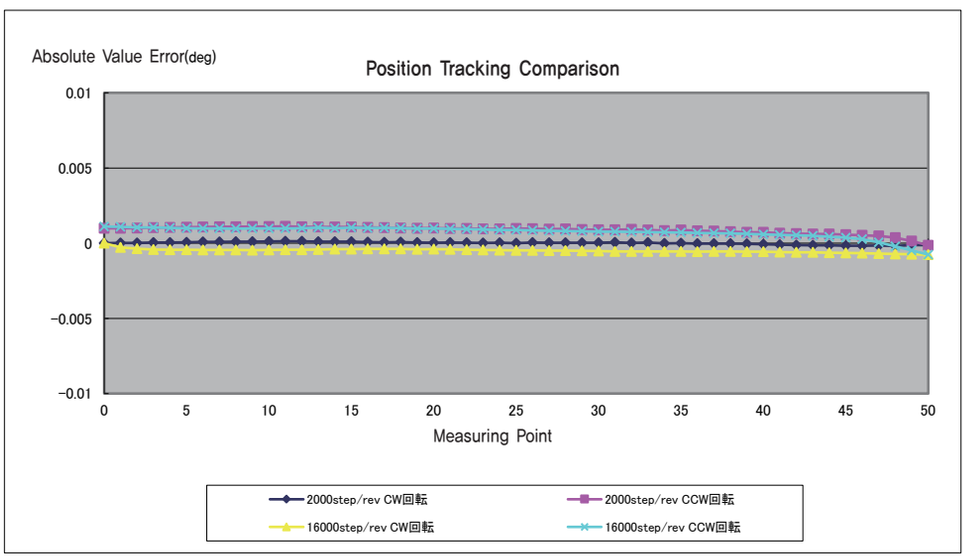
Test Item		Test Specification	Result
Position repeatability	[±deg]	0.001	0.0003
Lost motion	[deg]	0.003	0.0005
Backlash	[deg]	0.003	0.0004
Moment load stiffness	[arcsec/N-cm]	0.06	0.035

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : SA07A-R2M-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



Position Accuracy

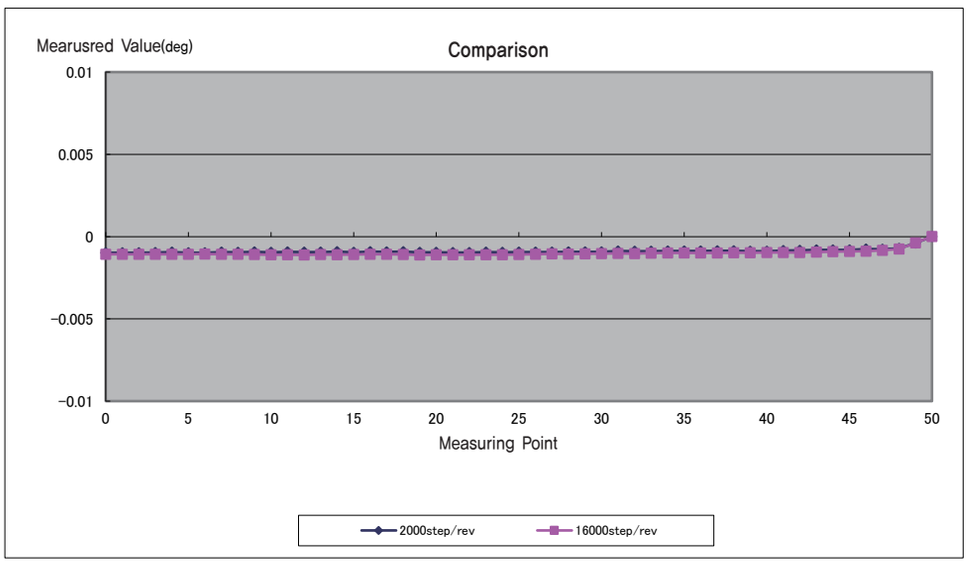


● Motorized Swivel Stage(SA07A-R2T-28M01)

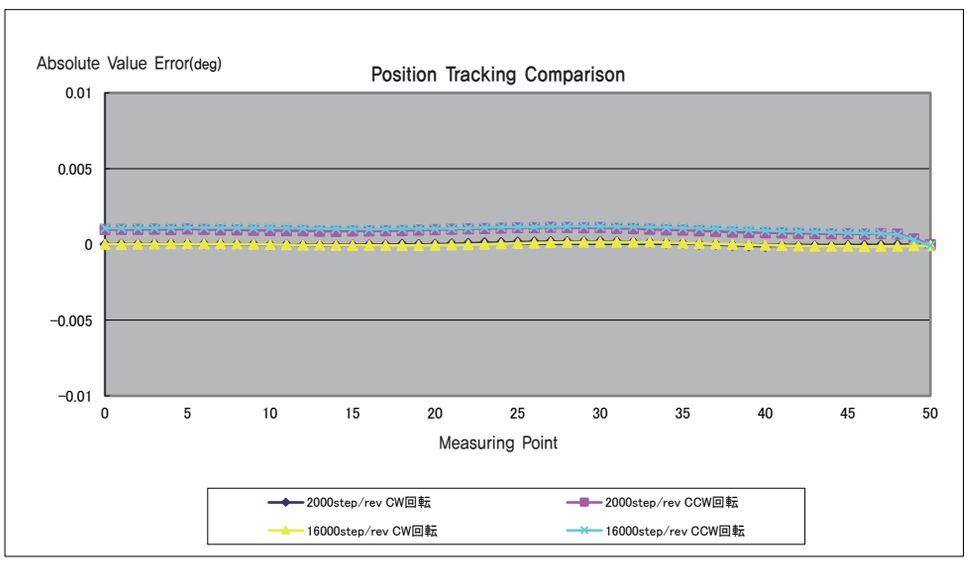
Test Item		Test Specification	Result
Position repeatability	[±deg]	0.001	0.0001
Lost motion	[deg]	0.003	0.0003
Backlash	[deg]	0.003	0.0003
Moment load stiffness	[arcsec/N-cm]	0.06	0.04

◆ One step movement measurement result (Resolution 2,000 or 16,000 [ppr])
Stage : SA07A-R2T-28M01 / Motor : Ezi-SERVO-28M-D

Lost Motion



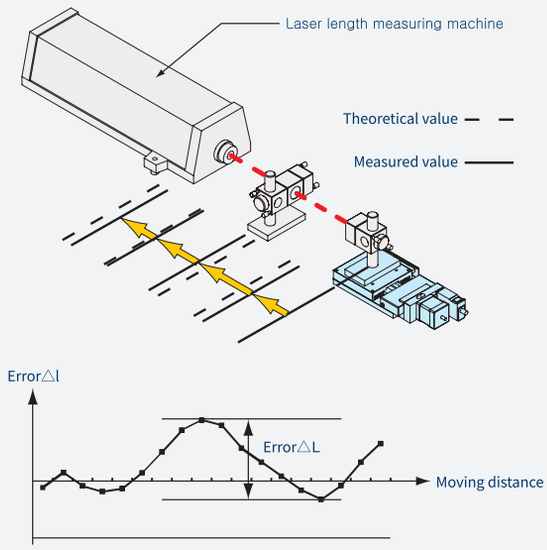
Position Accuracy



● Stage related terms and definitions

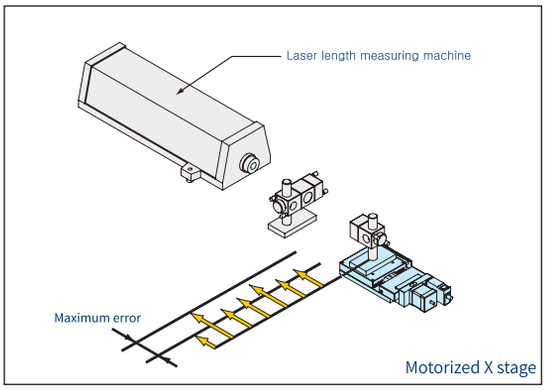
1. Accumulated Lead Error (Positioning Accuracy)

The positioning accuracy depends on errors in six degree of freedom. In a case of a linear positioning stage, the positioning accuracy is influenced by angular error(pitch, yaw, and roll), straightness(vertical and horizontal), and the lead error. Here is defined the positioning error is came from the lead error of screw as one of main reason and it is accumulated when the linear stage moves unidirectional within the full stroke. That' s why it is called as "Accumulated Lead Error." It is difference between a real output and ideal / calculated input. When the linear stage makes positioning in each position by each commanded values, there is an error between them. It is measured and calculated like following; (Actual displacement) –(Commanded displacement value).
The maximum deviation within the full stroke is defined as the Accumilated Lead Error.

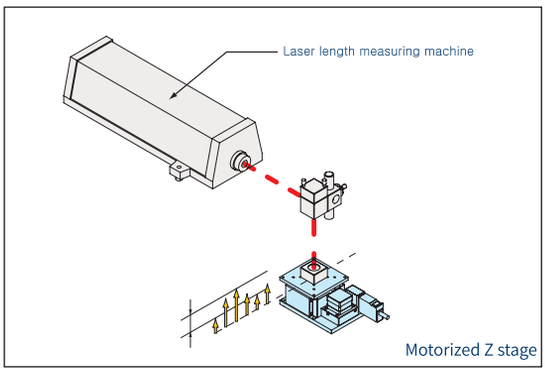


2. Repeatability

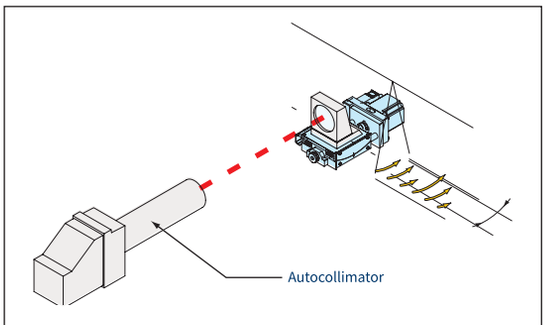
Positioning is repeated 7 times at an arbitrary point from the same direction, the stop position is measured. Perform this operation on three(3) points: at the center and at both ends. Then multiply the maximum deviation by 1/2. Repeatability is indicated by adding ± to one half of the maximum deviation. The load is only a corner cube placed on the center of the table.



Motorized X stage



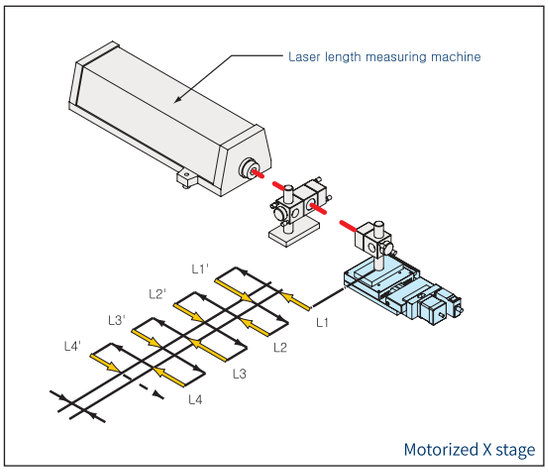
Motorized Z stage



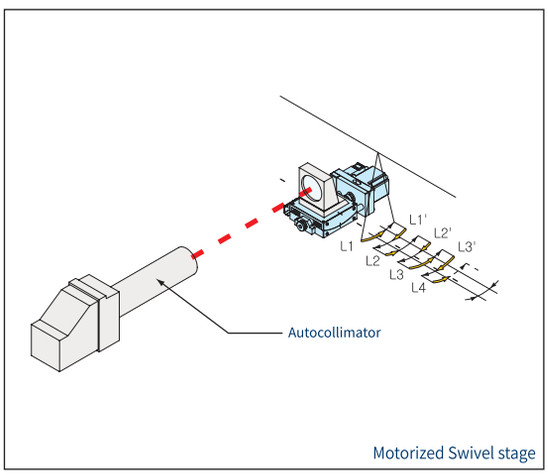
Motorized Swivel stage

3. Lost Motion

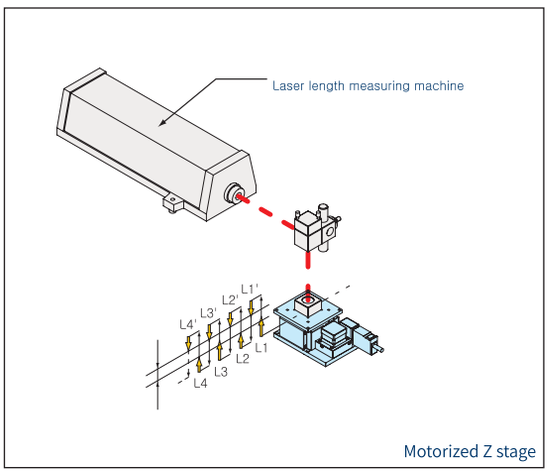
Positioning from a specified position(measurement position as a reference) from the positive direction and measuring its position.(L1) After moving in the forward direction, the same amount of command is given in the negative direction(motor rotation CCW direction) and Measuring this position.(L1') After moving in the negative direction, The same amount of command is given in the forward direction to move and determine the position. and Measuring that position.(L2) This positioning measurement is performed seven times in the forward and the negative directions, The maximum value within a given position obtained by calculating each difference and averaging the values is called a lost motion. However, the predetermined position means that the X stage has three points at the center and both ends, The swivel and Z stage are centered at one point.



Motorized X stage



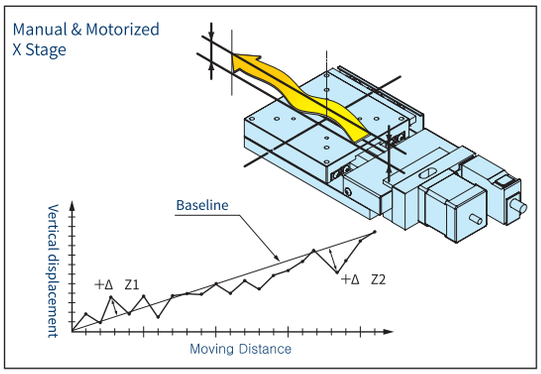
Motorized Swivel stage

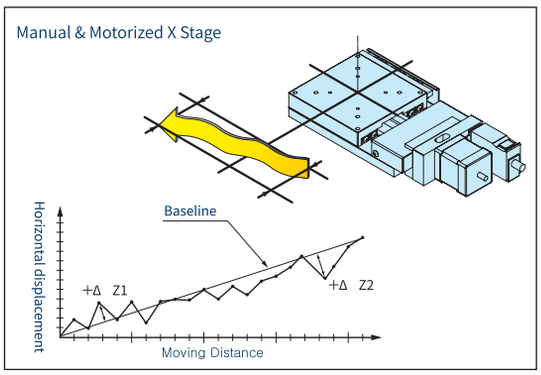


Motorized Z stage

4. Straightness(Within the vertical plane) / Straightness(Within the horizontal plane)

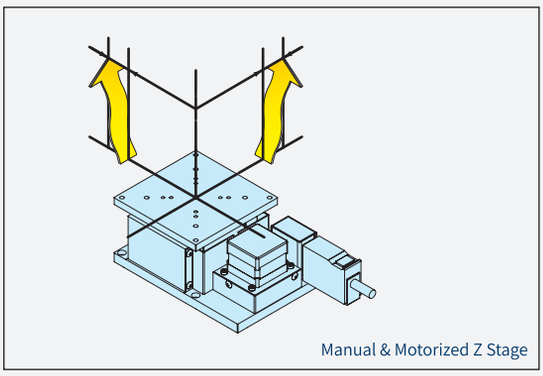
Place a reference plane(such as a straight edge) on the table top face, trace a displacement gauge in the table moving range, and obtain the maximum value of displacement from the straight line that connects the start point and the end point. This value is defined as straightness.
The straightness has a vertical component and a horizontal component. The maximum value of each component is defined as the stage straightness.

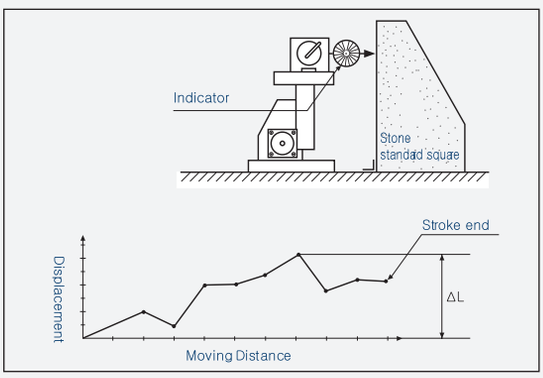




5. Verticality(Two directions)

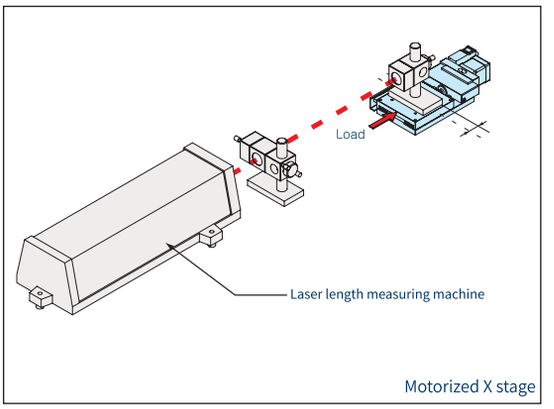
An indicator is set up at the table so that it touches the perpendicular surface of the standard square, and then it is raised while measuring the displacement.
Displacement when moving from the starting point of one stroke end(displacement 0) to the opposite stroke end is defined as verticality.



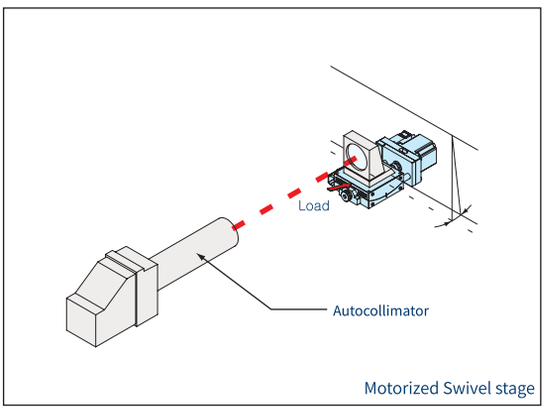


6. Backlash

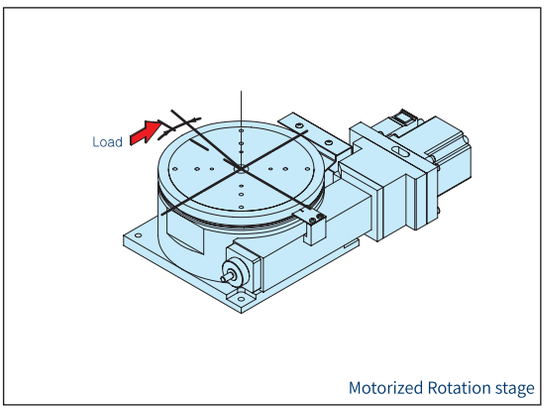
Let the table be the ORG position or the center of the movement range as the reference position, Loads the specified load in the same direction as the direction of travel when moving to the reference position, then releases the load. The difference between the reference position and the position after releasing the load is called backlash.
A predetermined position is set as a reference point, Apply the specified load in the same tangential direction as the sending direction and release the load. The difference between the reference position and the position after releasing the load is called backlash.



Motorized X stage



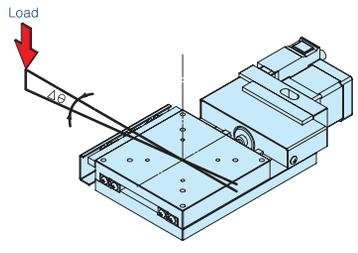
Motorized Swivel stage



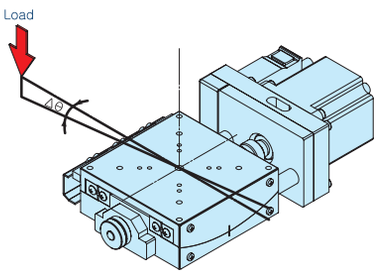
Motorized Rotation stage

7. Moment Load Stiffness (Roll Direction)

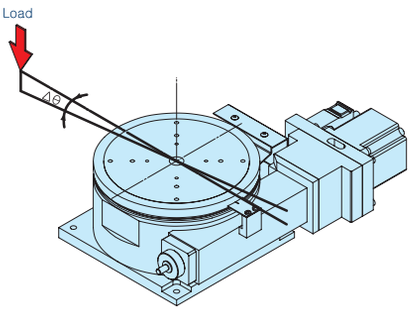
When an force in the roll direction is applied, the table tilts. Momentum Load is defined as the tilt angle of the table per momentum unit. Units are [arcsec / N · cm].



Manual & Motorized X Stage



Manual & Motorized Swivel Stage

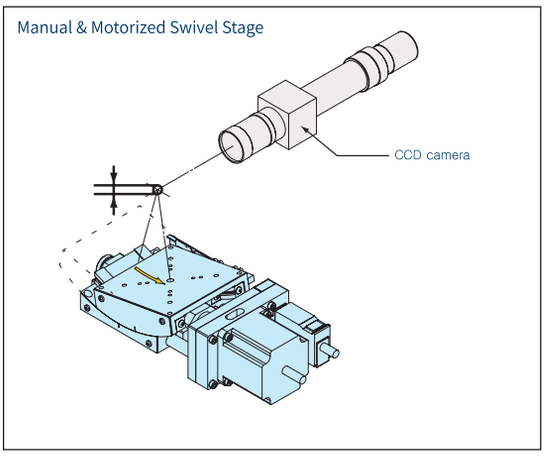


Manual & Motorized Rotation Stage

8. Rotational center displacement

When the reference point is installed on the actual rotation axis of the table, and the table is moved within the entire movement range, the shaking of the reference point is measured by the CCD camera, and the amount of shaking is called the rotation center displacement amount.

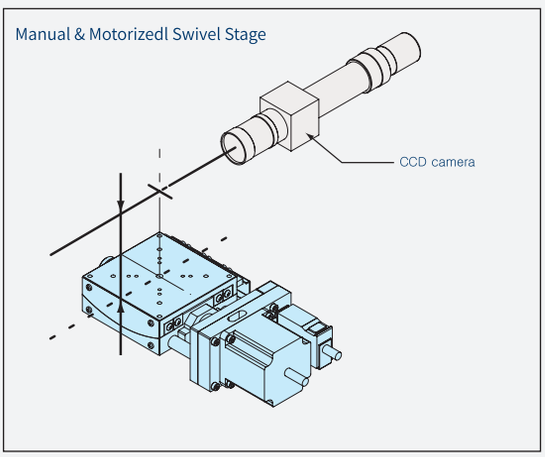
Manual & Motorized Swivel Stage



9. Work Distance

The distance from the reference point set for measuring the rotating center displacement to the table top face is defined as the working distance.

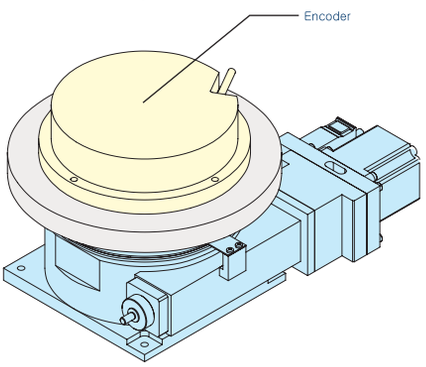
Manual & Motorizedl Swivel Stage



10. Horizontal withstand load

This is the limit load that can be applied to the table center when the stage is installed horizontally.(It is a limit load that can be guaranteed.) An encoder(shown in the below figure) is used for precision inspections of the accumulated lead error, lost motion, angle repeatability, and pitch error of motorized rotary stage(θ stage).

Motorized Rotation Stage



● Stage related terms and definitions

11. Accumulated Lead Error

A predetermined position is set as a reference point, Positioning is sequentially performed at regular intervals in one direction at a reference point, and then the difference between the measured value at each positioning point(the position actually moved from the reference point) and the command value(the position at which the command should actually be moved) is measured at 360° and the maximum difference is called the cumulative error.(⊿L in the below figure)

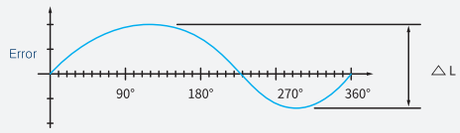


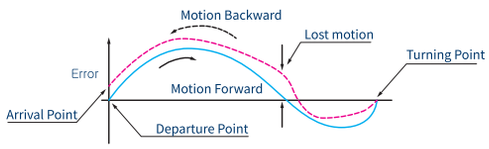
Table (Worm Wheel) rotation angle

Motorized Rotation Stage

12. Lost Motion

It is determined at a certain position as a reference point, and is sequentially measured at a certain interval in one direction at a reference point. After one rotation measurement, the measurement is performed in the opposite direction equally to the reference point. The maximum difference between the position of each locating point and the position of each locating point is called the lost motion.

※ Lost motion and definition of X stage are different.
※ The definition of the lost motion of the tangent bar type rotation stage is the same as that of the automatic swivel stage.

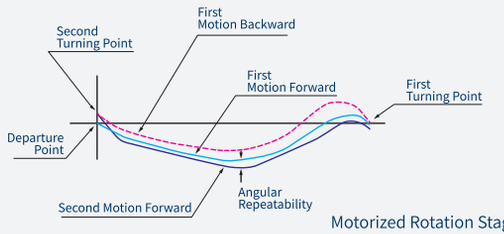


Motorized Rotation Stage

13. Angular Repeatability

The angular repeatability is defined as the maximum difference(regardless of the direction) when a rotation stage rotates twice of full turns of CW and CCW direction. The difference is calculated by comparing actual positioning in each angle from the first and second same directional rotation, and a bigger difference from CW and CCW rotations is defined as the maximum difference and same as the angular repeatability.

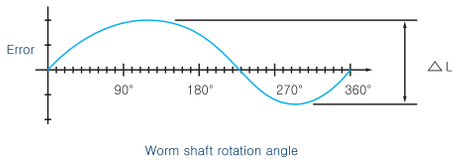
※ The definition of angular repeatability of tangent-bar lead mechanism motorized rotation stage is same as motorized swivel stage.



Motorized Rotation Stage

14. Pitch Error

A predetermined position is set as a reference point, the difference bet-ween the measured value(the position actually moved from the reference point) and the command value(the position at which the commanded actual movement is made) at each of the positioning points is set as a difference Measured in the range of 1 value(1 revolution of worm shaft), and the maximum difference(⊿L in the below figure) is called pitch error.

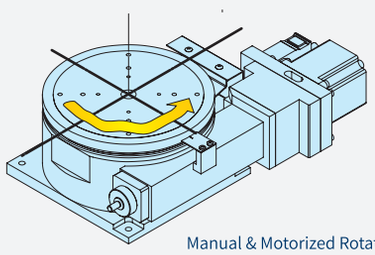


Motorized Rotation Stage

15. Surface Runout

An indicator is placed into contact in the vicinity of external periphery of the table, and a measurement is made at 36 points for every 10° . Maximum error(peak to peak) is obtained. This value is the sum of deviations resulting from surface runout errors and that derive from finished table surface irregularities.

※ The surface runout of tangent-bar lead mechanism rotation stage is measured in full stroke angular range.

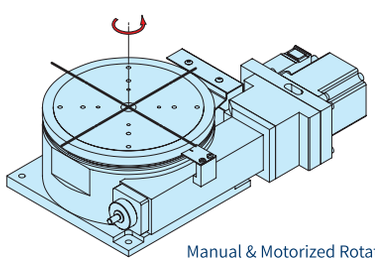


Manual & Motorized Rotation Stage

16. Eccentricity

The inner diameter as a reference is provided in the main shaft. During final assembly, displacement of this inner diameter is measured with an indicator. This value is the sum of roundness deviations of the inner diameter and eccentricity, and we define this value as eccentricity(only for Mont-Blanc series).

※ The eccentricity of tangent-bar lead mechanism rotation stage is measured in full stroke angular range.



Manual & Motorized Rotation Stage

MEMO

FASTECH

Fast, Accurate, Smooth Motion

FASTECH Co., Ltd.
Rm#1202, 401-dong, Bucheon Techno-Park,
655, Pyeongcheon-ro, Bucheon-si Gyeonggi-do,
Republic of Korea (Postal Code: 14502)
TEL : +82-32-234-6300 FAX : +82-32-234-6302
E-mail : sales@fastech-motions.com
Homepage : www.fastech-motions.com