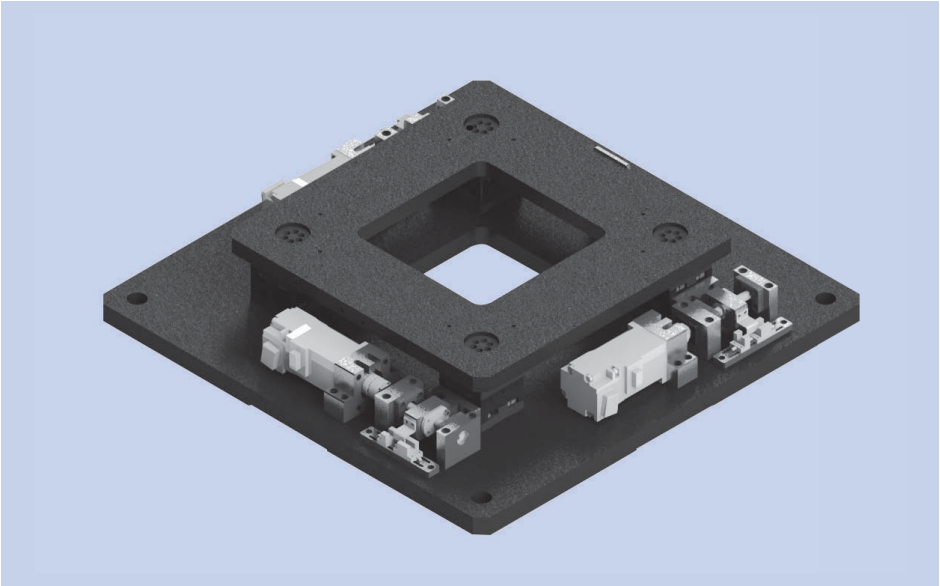
Motorized Alignment Stage JMA



C

Structure

MENTOR's motorized alignment stage module type JMA is a low-section and large-sized precision positioning stage in which alignment module having an angle adjustment mechanism is arranged on the same plane, and can perform XYθ Motion.

Features

Realization of diversified operations

Not only linear motion in the XY direction but also swing motion can be performed. In the case of swing motion, especially, an optional desired position can be set as the center of swing. This can achieve diversified operation.

High accuracy, rigidity, and reliability

Alignment module is designed on a basic of precision position table, high-rigidity crossed roller bearing, and linear way to obtain high accuracy, high rigidity, and high reliability.

Optimally applicable to large equipment

A combination of alignment module with an aluminum alloy stage and base can configure a large stage. Alignment module can be easily applicable to a larger than the dimensions described in the catalog. Consult MENTOR about it if necessary.

Hollow structure

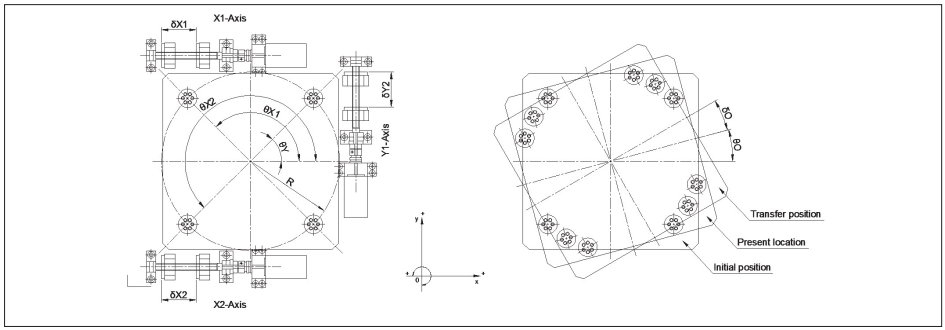
The stage and base have a hollow structure with a large diameter. This is useful for the measurement of transmitted light from the bottom side, cord wiring of machines and equipment, etc.

Example of motion specification

Achievement of diversified movements : To achieve XY motion and θ motion (swing motion) at the same moment, a combination of XY positioning table and θ stage is normally required. However, MENTOR motorized alignment stage module type adopting alignment module enables these movements with a low profile single stage.

C

Motorized 3Axis Alignment Stage – Feed formula



Feed formula

As expression below to find the relative feed rate of each axis to obtain the arbitrary rotation angle δΘ table.

X_1축 : $\delta X_1 = R\cos(\delta\theta + \theta X_1 + \theta O) - R\cos(\theta X_1 + \theta O)$ — 식(1)
X_2축 : $\delta X_2 = R\cos(\delta\theta + \theta X_2 + \theta O) - R\cos(\theta X_2 + \theta O)$ — 식(2)
Y축 : $\delta Y = R\sin(\delta\theta + \theta Y + \theta O) - R\sin(\theta Y + \theta O)$ — 식(3)

δX_1 : X_1 relative feed amount of axis (mm)
δX_2 : X_2 relative feed amount of axis (mm)
δY : Y relative feed amount of axis (mm)
θX_1 : Angle of Cross Roller Bearing center, which is connected to the X_1 axis (°) = 135 °
θX_2 : Angle of Cross Roller Bearing center, which is connected to the X_2 axis (°) = 225 °
θY : Angle of Cross Roller Bearing center that is connected to the Y-axis (°) = 45 °
θo : Initial position angle (°)
$\delta\theta$: Request rotation angle (°)
R : Connected to each axis the Cross Roller Bearing central radius (mm)
(See Product Parameter table)

Product parameter table

Type	R	θY	θX1	θX2
JMA-200	90	45°	135°	225°
JMA-300	155			
JMA-400	207.5			

Final calculation value

(Unit : mm)

구동축	상대 이송량			
	Case (a)		Case (b)	Case ©
	X-방향 +1mm	Y-방향 + 0.5mm	θ-방향 +2°	θ-방향 -0.3°
X_1	1	0	-3.7583	0.5550
	(+1)	(0)	(-2.7583)	(2.2033)
X_2	1	0	3.8918	-0.5921
	(+1)	(0)	(+4.8918)	(+4.2997)
Y	0	0.5	3.7583	-0.5550
	(0)	(-0.5)	(+4.2583)	(+3.9733)

Feed formula

⊙ **Motor**

AC Servo Motor : SGMAH-A5A (Yaskawa, 50W)
Encoder : 2048 Pulse/Revolution

⊙ **Ball Screw**

Ø10 , Lead 2

⊙**Resolution**

$$\text{Resolution} = \frac{\text{Ball Screw Lead}}{\text{Encoder Line}} = \frac{2}{2048} = 0{,}0009765\text{mm}$$

① **Motion Profile**

When operating as follows Carriage Plate in the origin initial position on the figure left page is to determine the feed rate of each axis

(a) X-axis + 1mm, Y-axis + 0.5mm move parallel
(b) Carriage Plate In central rotation center is rotated + 2 °
(c) Rotate -0.3 ° from the state of (b)

② **Examples of feed rate calculation**

(a) X-axis + 1mm, Y-axis + 0.5mm move parallel

ⓐ Feed X-axis

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{1}{2} \text{ X } 2048 = 1024$$

▶ Therefore X_1, sending only 1024 Pulse in the same direction by X_2 axis synchronization.

ⓑ Feed Y-axis

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{0.5}{2} \text{ X } 2048 = 512$$

▶ Therefore, I will send only 512 Pulse in the Y-axis + direction.

(b) Carriage Plate In central rotation center is rotated + 2 °

$\theta X_1 = 135°$ $\theta X_2 = 225°$
$\theta Y = 45°$ $R = 155$

In addition, depending on the initial conditions of Motion

$\theta O = 0°$ $\delta\theta = 2°$

Equation 1 above conditions, Equation 2, and substituting in equation 3,

$\delta X_1 = 155\text{Cos}(2+135+0)-155\text{Cos}(135+0)=-3.7583\text{mm}$

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{-3.7583}{2} \text{ X } 2048 = -3{,}848.50$$

▶ Therefore, X_1 axis - direction to send only 3848.50 Pulse.

$\delta X_2 = 155\text{Cos}(2+225+0)-155\text{Cos}(225+0)= 3.8918\text{mm}$

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{3.8918}{2} \text{ X } 2048 = 3{,}985.20$$

▶ Therefore, send only 3985.20 Pulse to X_2 axis + direction.

$\delta Y = 155\text{Sin}(2+45+0)-155\text{Sin}(45+0)= 3.7583\text{mm}$

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{3.7583}{2} \text{ X } 2048 = 3{,}848.50$$

▶ Therefore, send only 3848.50 Pulse in the Y-axis + direction.

ⓒ Rotate -0.3 ° in the state of ⓑ

The condition (b)

$\theta O = 2°$
$\delta\theta = -0.3°$

Equation 1 above conditions, Equation 2, and substituting in equation 3,

$\delta X_1 = 155\text{Cos}(-0.3+135+2)-155\text{Cos}(135+2)=0.5550\text{mm}$

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{0.5550}{2} \text{ X } 2048 = 568.32$$

▶ Therefore, send only 568.32 Pulse to X_1 axis + direction.

$\delta X_2 = 155\text{Cos}(-0.3+225+2)-155\text{Cos}(225+2)= -0.5921\text{mm}$

$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{-0.5921}{2} \text{ X } 2048 = -606.31$$

▶ Therefore, X_2 axis - direction to send only 606.31 Pulse.

$\delta Y = 155\text{Sin}(-0.3+45+2)-155\text{Sin}(45+2)= -0.5550\text{mm}$

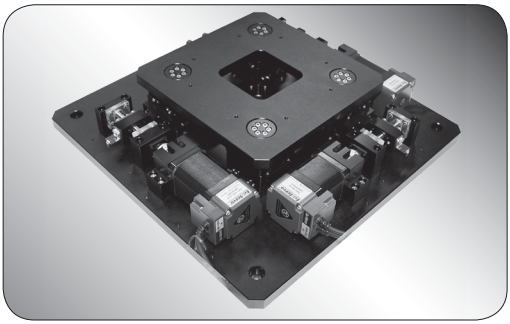
$$\text{Pulse} = \frac{\text{Request Feed}}{\text{Ball Screw Lead}} \text{ X } \text{Encoder\_Line} = \frac{-0.5550}{2} \text{ X } 2048 = -568.32$$

▶ Therefore, Y-axis - direction to send only 568.32 Pulse.

C

JMA-Series / Motorized Stage

JMA



Model Selection

1) 2) 3) 4)

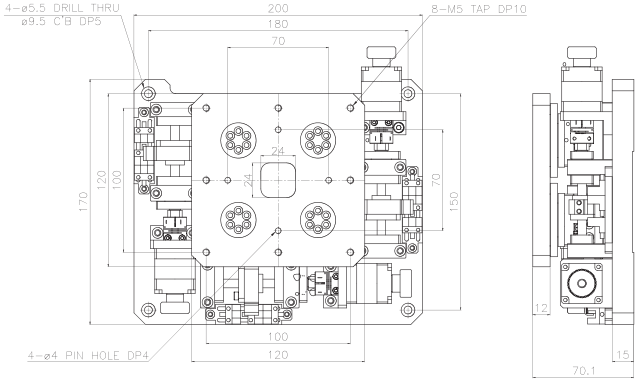
JMA-200-B5-O

1) Axis	2) Table Size	3) Grade of Ball Screw	4) Motor
JMA : UVW- stage	120 : 120x120mm 180 : 180x180mm 200 : 200x200mm 300 : 300x300mm OP : Make to Order	B5 : C5 Grade Ball Screw B7 : C7 Grade Ball Screw	O 42 : Oriental Motor (5Phase) S 42 : Sanyo (2Phase) E 42 : Ezi-Servo Y 40 : Yaskawa Servo M 40 : Mitsubish Servo X 40 : Without Motor & Bracket

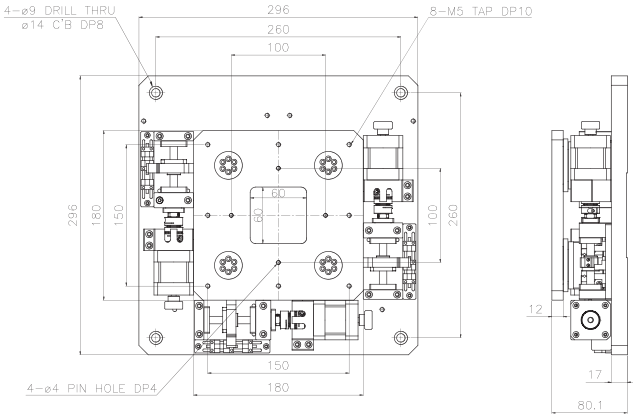
C

Model	JMA-120	JMA-180
Surface Size	120 x 120mm	180 x 180mm
Travel Range	±5/ ±5/ ±5°	±10/ ±10/ ±5°
Travel Guide	Crossed-Roller guide , Cross Roller ring	
Resolution	2㎛ (Full step)	
Max. Speed	10mm/sec (based on 5phase motor)	
Applicable Ball Screw	Ø8, lead 1(C5/C7)	Ø8, lead 1(C5/C7)
Accuracy	7㎛(C5) / 12㎛(C7)	7㎛(C5) / 12㎛(C7)
Bi-Repeatability	± 2㎛(C5) / ± 3㎛(C7)	± 2㎛(C5) / ± 3㎛(C7)
Load Capacity	15 Kgf	30 Kgf
Parallelism	30㎛	30㎛
Driving Parallelism	20㎛	20㎛
Staightness	10㎛	10㎛
Weight	5Kg	13Kg
Material	Aluminum	
Finish Treatment	Black Anodizing	

JMA



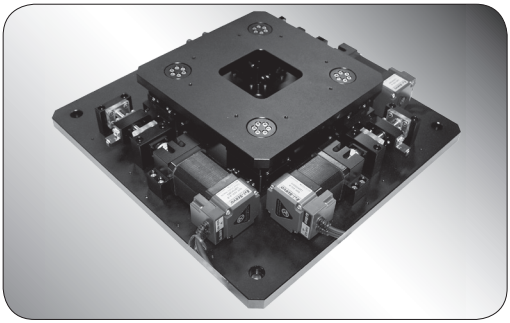
JMA-120



JMA-180

JMA-Series / Motorized Stage

JMA



Model Selection

1) 2) 3) 4)

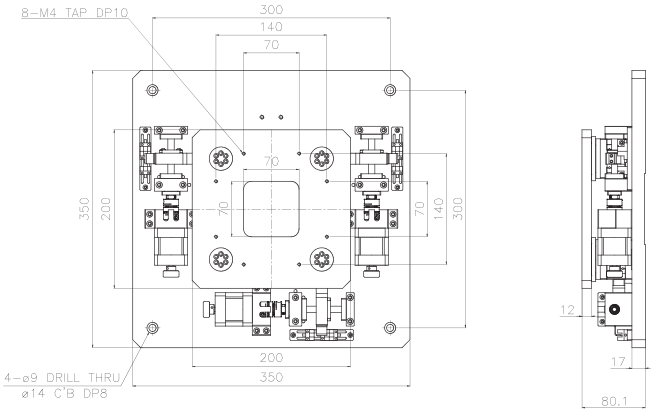
JMA-200-B5-O

1) Axis	2) Table Size	3) Grade of Ball Screw	4) Motor
JMA : UVW-stage	120 : 120x120mm 180 : 180x180mm 200 : 200x200mm 300 : 300x300mm OP : Make to Order	B5 : C5 Grade Ball Screw B7 : C7 Grade Ball Screw	O 42 : Oriental Motor (5Phase) S 42 : Sanyo (2Phase) E 42 : Ezi-Servo Y 40 : Yaskawa Servo M 40 : Mitsubish Servo X 40 : Without Motor & Bracket

C

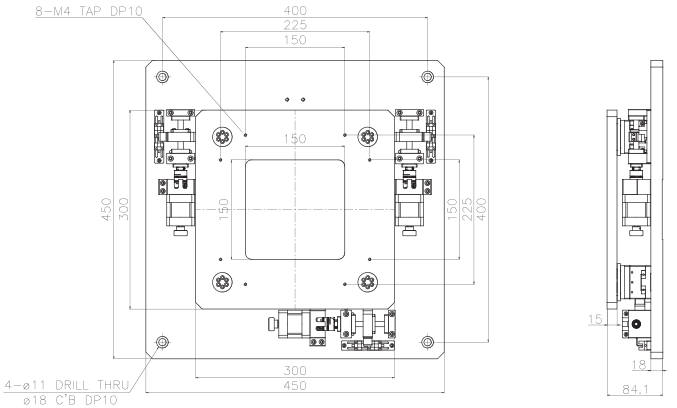
Model	JMA-200	JMA-300
Surface Size	200 x 200mm	300 x 300mm
Travel Range	±5/ ±5/ ±2.5°	±5/ ±5/ ±2.5°
Travel Guide	Crossed-Roller guide , Cross Roller ring	
Resolution	2㎛ (Full step)	
Max. Speed	10mm/sec (based on 5phase motor)	
Applicable Ball Screw	Ø8, lead 1(C5/C7)	Ø8, lead 1(C5/C7)
Accuracy	7㎛(C5) / 12㎛(C7)	7㎛(C5) / 12㎛(C7)
Bi-Repeatability	± 2㎛(C5) / ± 3㎛(C7)	± 2㎛(C5) / ± 3㎛(C7)
Load Capacity	30 Kgf	40 Kgf
Parallelism	30㎛	30㎛
Driving Parallelism	20㎛	20㎛
Staightness	10㎛	10㎛
Weight	15Kg	20Kg
Material	Aluminum	
Finish Treatment	Black Anodizing	

JMA



JMA-200

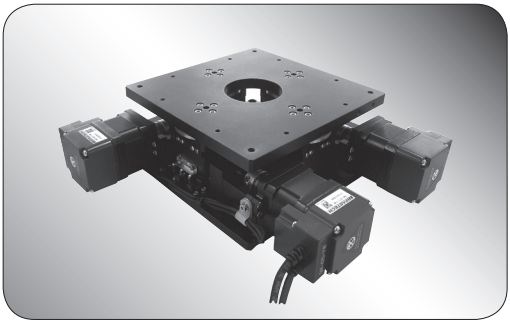
C



JMA-300

JMA-Series / Motorized Stage

JMAS



Model Selection

1) 2) 3) 4)

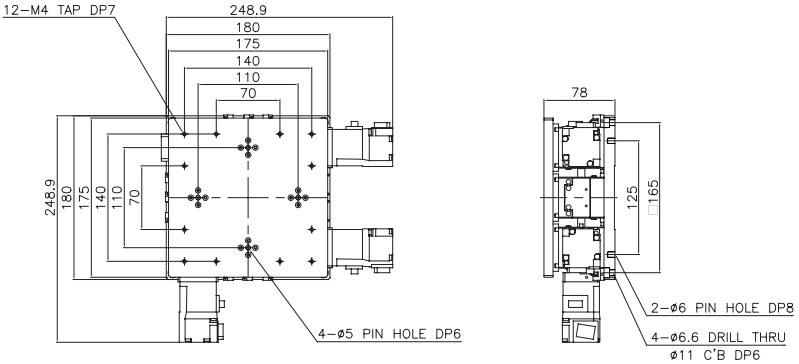
JMAS-200-B5-O

1) Axis	2) Table Size	3) Grade of Ball Screw	4) Motor
JMAS : UVW-stage	175 : 175x175mm 200 : 200x200mm OP : Make to Order	B5 : C5 Grade Ball Screw B7 : C7 Grade Ball Screw	O 42 : Oriental Motor (5Phase) S 42 : Sanyo (2Phase) E 42 : Ezi-Servo Y 40 : Yaskawa Servo M 40 : Mitsubish Servo X 40 : Without Motor & Bracket

C

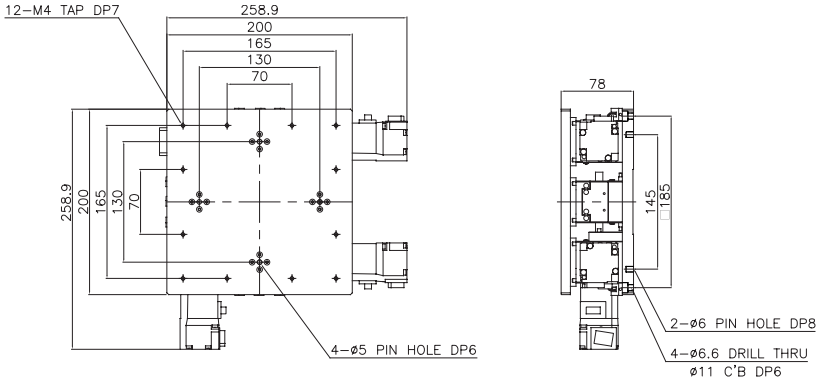
Model	JMAS-175	JMAS-200
Surface Size	175 x 175mm	200 x 200mm
Travel Range	±7/ ±7/ ±7°	±7/ ±7/ ±6°
Travel Guide	Crossed-Roller guide , Cross Roller ring	
Resolution	2㎛ (Full step)	
Max. Speed	10mm/sec (based on 5phase motor)	
Applicable Ball Screw	Ø8, lead 1(C5/C7)	Ø8, lead 1(C5/C7)
Accuracy	7㎛(C5) / 12㎛(C7)	7㎛(C5) / 12㎛(C7)
Bi-Repeatability	± 2㎛(C5) / ± 3㎛(C7)	± 2㎛(C5) / ± 3㎛(C7)
Load Capacity	50 Kgf	50 Kgf
Parallelism	30㎛	30㎛
Driving Parallelism	20㎛	20㎛
Staightness	10㎛	10㎛
Weight	9Kg	10Kg
Material	Aluminum	
Finish Treatment	Black Anodizing	

JMAS



JMAS-175

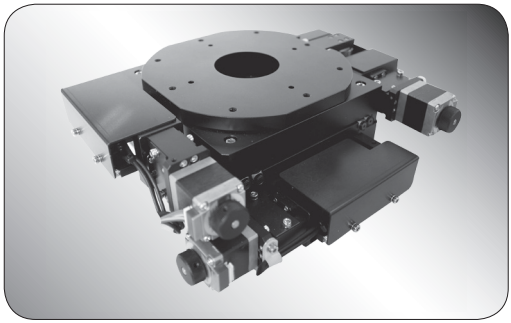
C



JMAS-200

JMU-Series / Motorized Stage

JMU



Model Selection

1) 2) 3) 4)

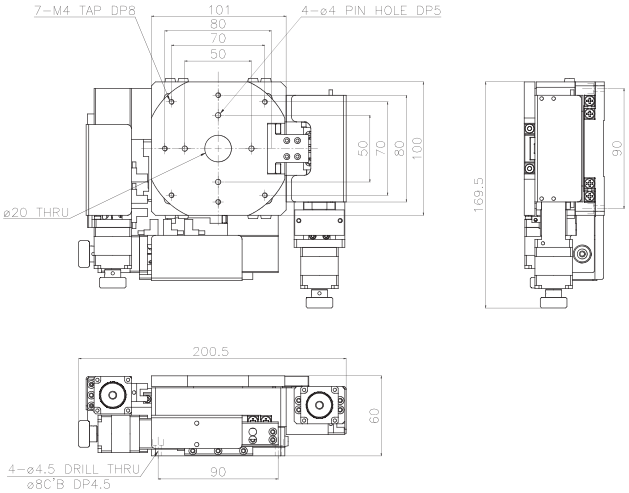
JMU-200-B5-O

1) Axis	2) Table Size	3) Grade of Ball Screw	4) Motor
JMU : XYR- stage	100 : 100x100mm 120 : 120x120mm 150 : 150x150mm 200 : 200x200mm	B5 : C5 Grade Ball Screw B7 : C7 Grade Ball Screw	O : Oriental Motor (5Phase) S : Sanyo (2Phase) E : Ezi-Servo Y : Yaskawa Servo E 42 : Ezi-Servo X: Without Motor & Bracket

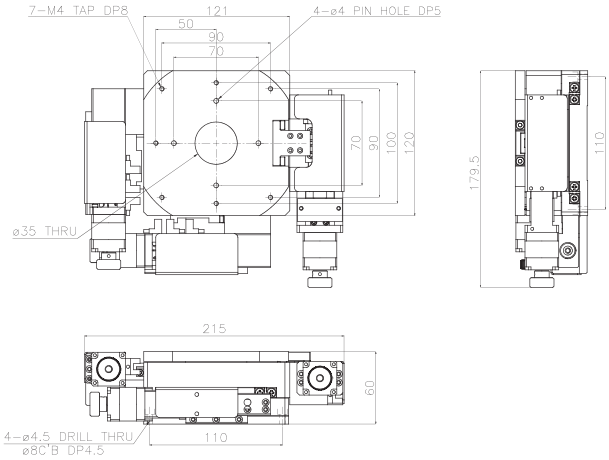
C

Model	JMU-100	JMU-120
Surface Size	100 x 100mm	120 x 120mm
Travel Range	±10/ ±10/ ±5°	±10/ ±10/ ±5°
Travel Guide	Crossed-Roller guide , Cross Roller ring	
Resolution	2㎛ (Full step)	
Max. Speed	10mm/sec (based on 5phase motor)	
Applicable Ball Screw	Ø8, lead 1(C5/C7)	Ø8, lead 1(C5/C7)
Accuracy	7㎛(C5) / 12㎛(C7)	7㎛(C5) / 12㎛(C7)
Bi-Repeatability	± 2㎛(C5) / ± 3㎛(C7)	± 2㎛(C5) / ± 3㎛(C7)
Load Capacity	10 Kgf	12 Kgf
Parallelism	40㎛	40㎛
Driving Parallelism	20㎛	20㎛
Staightness	10㎛	10㎛
Weight	3.5Kg	4Kg
Material	Aluminum	
Finish Treatment	Black Anodizing	

JMU



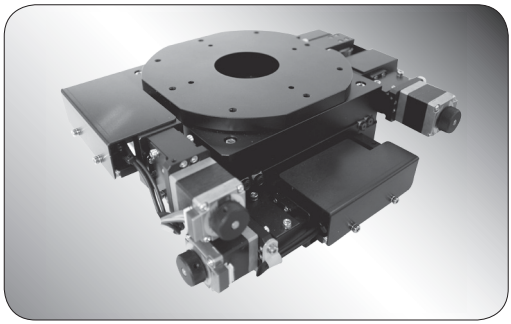
JMU-100



JMU-120

JMU-Series / Motorized Stage

JMU



Model Selection

1) 2) 3) 4)

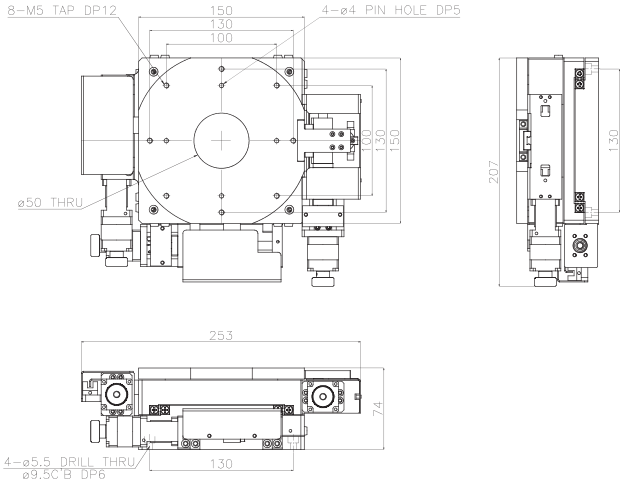
JMU-200-B5-O

1) Axis	2) Table Size	3) Grade of Ball Screw	4) Motor
JMU : XYR- stage	100 : 100x100mm 120 : 120x120mm 150 : 150x150mm 200 : 200x200mm	B5 : C5 Grade Ball Screw B7 : C7 Grade Ball Screw	O : Oriental Motor (5Phase) S : Sanyo (2Phase) E : Ezi-Servo Y : Yaskawa Servo E 42 : Ezi-Servo X: Without Motor & Bracket

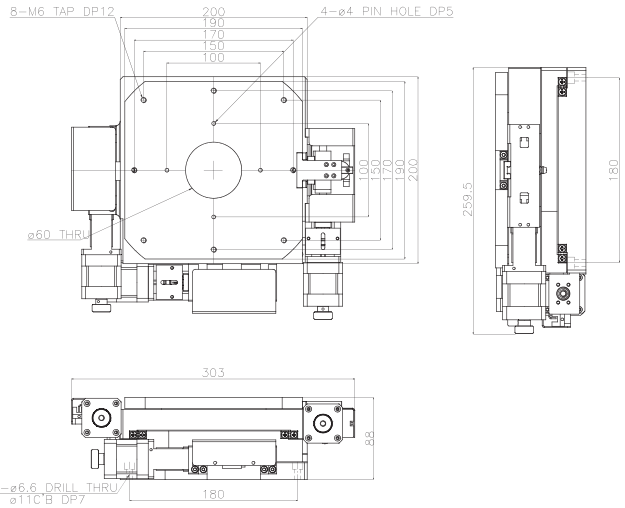
C

Model	JMU-150	JMU-200
Surface Size	150 x 150mm	200 x 200mm
Travel Range	±20/ ±20/ ±5 °	±20/ ±20/ ±5 °
Travel Guide	Crossed-Roller guide , Cross Roller ring	
Resolution	2㎛ (Full step)	
Max. Speed	10mm/sec (based on 5phase motor)	
Applicable Ball Screw	Ø8, lead 1(C5/C7)	Ø8, lead 1(C5/C7)
Accuracy	7㎛(C5) / 12㎛(C7)	7㎛(C5) / 12㎛(C7)
Bi-Repeatability	± 2㎛(C5) / ± 3㎛(C7)	± 2㎛(C5) / ± 3㎛(C7)
Load Capacity	15 Kgf	25 Kgf
Parallelism	40㎛	50㎛
Driving Parallelism	20㎛	20㎛
Staightness	10㎛	10㎛
Weight	5.2Kg	7Kg
Material	Aluminum	
Finish Treatment	Black Anodizing	

JMU



JMU-150



JMU-200

C