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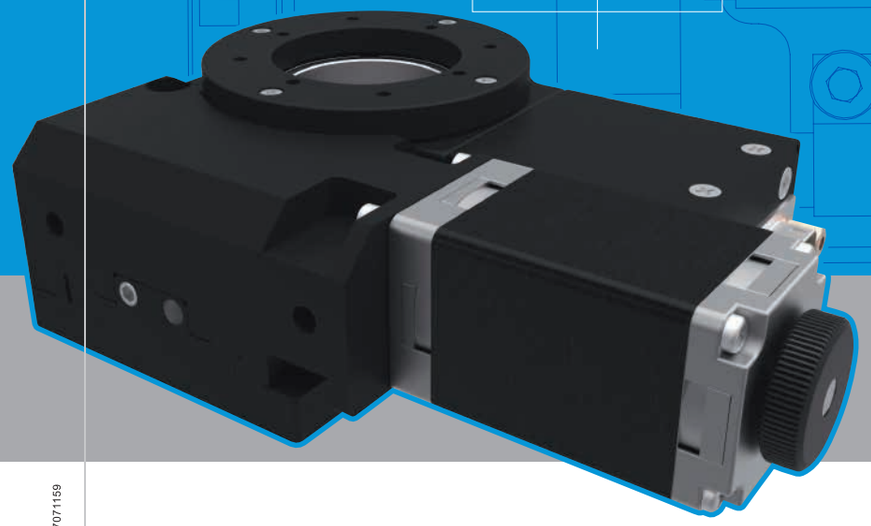
www.gmtglobalinc.com

GMT GLOBAL INC.

PRECISION ROTARY STAGES



Precision Rotary Stages

【Precision】Zero backlash-Motorized Precision Stage

【Precision】Worm & Worm Gear-Thin type-Motorized Precision Stage

【Precision】XYθ-axis-in-one Motorized Precision Stage

This is a precision product. For operating properly, please be familiar with the following precautions before using it.

Unpacking Precautions

Before unpacking, please check the appearance for damage, loose crews or components. If there are concerns about structure and appearance, please take photographs as evidence and e-mail to the responsible unit.

When the packages arrive, please make sure that the specifications and contents are consistent with the order, and check whether any peripheral parts are missing.

For any questions, please contact the responsible unit.

Safety Precautions

Before placement and use, please make sure that there is sufficient working space around to prevent the possibility of falling and rolling.
→ CAUTION：A violation may result in personal injuries or product.

For safe installations and operations, please follow the electrical safety instructions. Do not use in any explosive, flammable, corrosive, humid environments or wet conditions nor near to such materials. Otherwise, there would be risks of fire and electric shocks.
→ CAUTION：A violation may result in serious personal injuries or product damage.

Please always check that whether the movement space of the motors and mechanisms is enough in operations, and avoid any body parts or clothing accessories being close of / entering into the working areas of the stages. It otherwise will cause dangers as rolling, pinching, and pulling.
→ CAUTION：A violation may result in personal injuries or product damage.

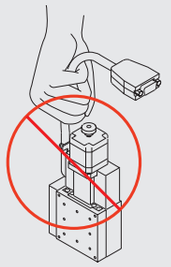
Please turn off the power before starting maintenance to prevent the danger as an electric shock.
→ CAUTION：A violation may result in serious personal injuries or product damage.

If the product is used in a vertical direction as Z-axis, please use safety devices to prevent slides or power interruptions are caused due to an overload.
→ CAUTION：A violation may result in personal injuries or product damage.

Installation Precautions

If any unusual situations arise in operations (such as unusual sounds and vibrations), please immediately stop the machine.
→ CAUTION：A violation may result in personal injuries or product damage.

Do not forcibly pull or bend any electric wires and follow the wiring diagram for correct wiring.
→ CAUTION：A violation may result in personal injuries or product damage.



For tightening screws, please use a torque wrench corresponds to specifications of the screws.
→ CAUTION：A violation may cause loosening.

Please do not allow the setting of machine speed to excess the maximum default speed, and avoid extreme changes of the setting and parameters.
→ CAUTION：A violation may result in personal injuries or product damage.

If any malfunctions or damage arise, please do not continue the use.
→ CAUTION：A violation may result in personal injuries or product.

Please make sure the wiring and connections of electric equipment are secured and the parameters are set correctly.
→ CAUTION：A violation may cause fire, electric shocks, personal injuries or product damage.

Environment Precaution

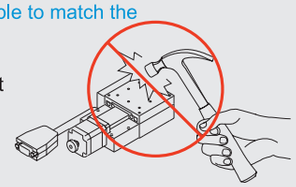
If any foreign objects such as dust or metal powder that enters into the screws or slide rails, it may reduce the product life and cause abnormal wears of products.
→ CAUTION：If any concerns exist, please implement the dust control measures.

Once the product is used as a mechanical processing standard, it may affect the life, performances and precision.
→ CAUTION：For this case, please have the installation be on a reliably rigid base.

The product is designed and planned to operate in the specified directions mentioned in the catalog. Please check with GMT if other directions will be applied.
→ CAUTION：If the product is used beyond the usage of horizontal directions, it will reduce the life and increase the probability of malfunctions.

Before installing our products, please make sure there are no unnecessary objects in the area, and use alcohol for cleaning to prevent for losing precision of the installation.
→ CAUTION：A violation may cause the product precision unable to match the specifications marked on the catalog.

Do not apply any inappropriate forces on or strike the product to prevent damage and the loss of precision and warranties.
→ CAUTION：A violation may cause the product precision unable to match the specifications marked on the catalog.



Installation Precautions

Please do not turn off the travel stroke limitation sensors during the operation, it otherwise will cause the deactivations of the sensors, and do not overuse the travel strokes while turning the knob on the back of the motors.

→ CAUTION：A violation may result in personal injuries or product damage.

While installing the peripheral mechanisms on the upper / lower board of the stage, please have the stage horizontally fixed and then make sure the flatness and the inclination angle of the mounting surface is within 0.01mm and 1° respectively to prevent for the arising of poor precision due to the deformations of the stage.

→ CAUTION：A violation may result in personal injuries or product damage.

Do not remove any parts of the precision motorized stage arbitrarily to prevent the loss of precision and warranties. If a service is needed, please contact our salespersons.

→ CAUTION：A violation may cause damage on product and the precision unable to match the specifications marked on the catalog.

If any screw holes do not fit or need additional screw holes, please contact our salespersons and do not handle it by self to guarantee the precision and warranties.

→ CAUTION：A violation may cause damage on product and the precision unable to match the specifications marked on the catalog.

All of the accessories and parts of the product are not water-proof or dust-proof; please do not directly use in oil misty, dusty or humid environments.

→ CAUTION：A violation may cause damage on product and the precision unable to match the specifications marked on the catalog.

Installation Procedures：

1. Please make sure there is no flash, dust, or dent on the installation surface.
2. Please put the product on the installation surface.
3. The screw holes should be aligned with the ones located on the installation surface.
4. It is suggested to use the screws according to the compliances of the standard specifications.
5. Use a torque wrench to tighten screws.

Precautions for product use environments：

Transporting temperature	-10℃ ~ 70℃
Transporting humidity	below 90%RH (non-condensing)
Installation temperature	0℃ ~ 40℃
Installation humidity	below 20% ~ 80%RH (non-condensing)
Environmental gases	It must not contain any corrosive, flammable gas, oil mist or dust indoors.

Warranty Instructions

→ Within a warranty period, if any following failures occur, our company will be responsible for the repair.

→ The product is warranted for one year, and is started from when the product is delivered to the designated place.

→ If any mention below occurs, it will not be covered under warranty：

1. The damage caused by using the product in any unspecified environments or methods.
2. The damage caused by unauthorized modifications or repairs.
3. The damage caused by natural disasters or misuses.
4. The damage caused after the purchase due to the careless uses or motions.
5. The malfunctions or damage caused by unauthorized connections with the other machines.
6. The malfunctions or damage caused by the violations of precautions and instructions.

Trouble Shooting Suggestions

→ If the motors or mechanisms are hit by the external forces, please check whether the properties of screws are in normal.

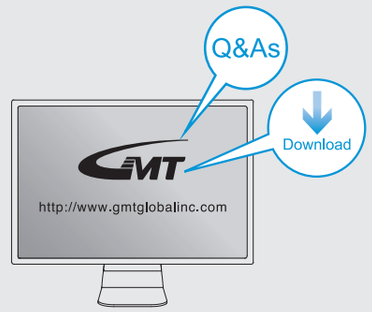
→ Please do not arbitrarily adjust the positions of the origin and both left and right limits to prevent the collisions of machines and the loss of warranties.

→ The wires and receptacles of limit switches must be secured to prevent loosening.

→ Do not arbitrarily loosen the couplings and transmission structures to guarantee the precision and warranties.

→ If any unusual noises or vibrations of the machines occur in operations, for safety, please turn off the power first.

→ To see Q&As regarding to the product, please visit our GMT website.



ARH Series

Model Description

Material	Drive Type	Accuracy Level	Wiring Method	Drive (Optional)
A Aluminum Alloy	2 Ball Screw	P Precision	N GMT Standard	X Not equipped C Standard specified by GMT

ARH 40 - A 2 P N - C D - 2 C

Axis & Serial Numbers	Table Size	Motor Type	Connector Type	Connecting Cable (Optional)
ARH θ-Axis	40 Ø40mm 60 Ø60mm 80 Ø80mm 120 Ø120mm	C 5-phase stepper X Not equipped	D D-SUB15 (VGA)	X Not equipped 2 2mm cable 4 4mm cable 6 6mm cable

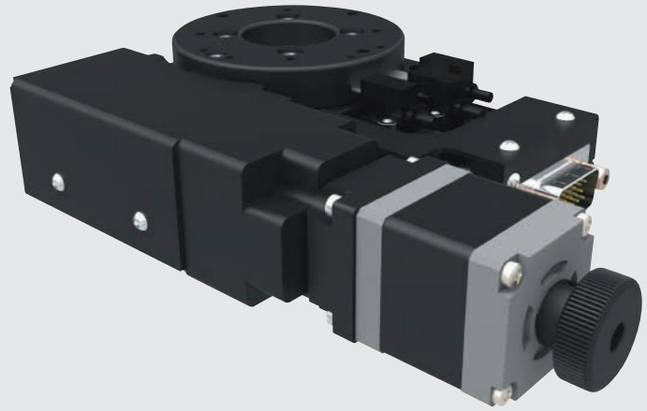
Model No.			ARH40-A2PN-CD	ARH60-A2PN-CD	ARH80-A2PN-CD	ARH120-A2PN-CD
Mechanical Specifications	Table Size		Ø40 mm	Ø60 mm	Ø80 mm	Ø120 mm
	Travel Stroke		±13°	±7.5°	±10°	±12.5°
	Drive Type		Ball Screw			
	Rail		Assembled ball bearing			
	Stage Material / Surface Treatment		Aluminum Alloy / Black Anodized			
	Main Unit Weight		0.6 Kg	0.8 Kg	1.3 Kg	2.3 Kg
	Coupling		FAMMS12-5 x 5		FAMC13A-5 x 5	
	Accuracy Level		P：Precision			
	Wiring Method		N：GMT Standard			
Precision Specifications	Resolutioin (Pulse)	Full / Half	0.0038° / 0.0019°	0.0021° / 0.0011°	0.0018° / 0.0009°	0.0013° / 0.0006°
	Maximum Precision (Full Step)		18° / sec	10.5° / sec	11° / sec	8° / sec
	Positioning Precision		0.03°			
	Repeatability Precision		±0.003°			
	Load Capacity		3 Kgf	8 Kgf	10 Kgf	15 Kgf
	Missed Step		0.003°			
	Parallelism		30 μm			
	Dynamic Strairgtness		30 μm			
	Dynamic Parallelism		10 μm			
Electrical Specifications	Motor	Type / Shaft Numbers	5-phase stepper / □28 double shafts			
		Brand / Model	SANYO / SH5281 - 7211		SANYO / SH5285 - 7211	
	Driver Brand / Model		GMT / GTR515B			
	Connector	Stage Side Connector	15-pin male end connector D-SUB			
		Controller Side Connector	15-pin female end connector D-SUB (Optional)			
	Sensor	Power Voltage	24V±10%			
		Control Output	NPN open collector output under 24V 8mA			
		Output Control	Testing (sensing)：output transistor OFF (closed)			

◎GMT Standard wiring is defined as the product photo, and not optional available.
◎GMT Standard Motorized Stage series is equipped with D-SUB connector as the standard one which is available to be changed to HRS or NJC on request as per reference stated on P.28.
◎In case HRS connection cable is required, please consult to your regional sales.

Motorized Positioners ▶ Standard Motorized Stages
ARH Series
GMT GLOBAL INC.
Product Specification

ARH Series Calculation

ARH series



◎Photo is ARH60

Calculation formula：

Feeding Screw Guiding：$L' = \tan^{-1} \times R$

θ-Axis rotation angle = $\tan\left(\frac{L'}{R}\right)$

R = θ-Axis Guiding

θ = θ-Axis rotation angle

L' = Feeding Screw Guiding

Code	Model No.	ARH40	ARH60	ARH80	ARH120
	R	30.5	54.5	65	85
	θ	26°	15°	20°	25°

Example：ARH60 rotation angle

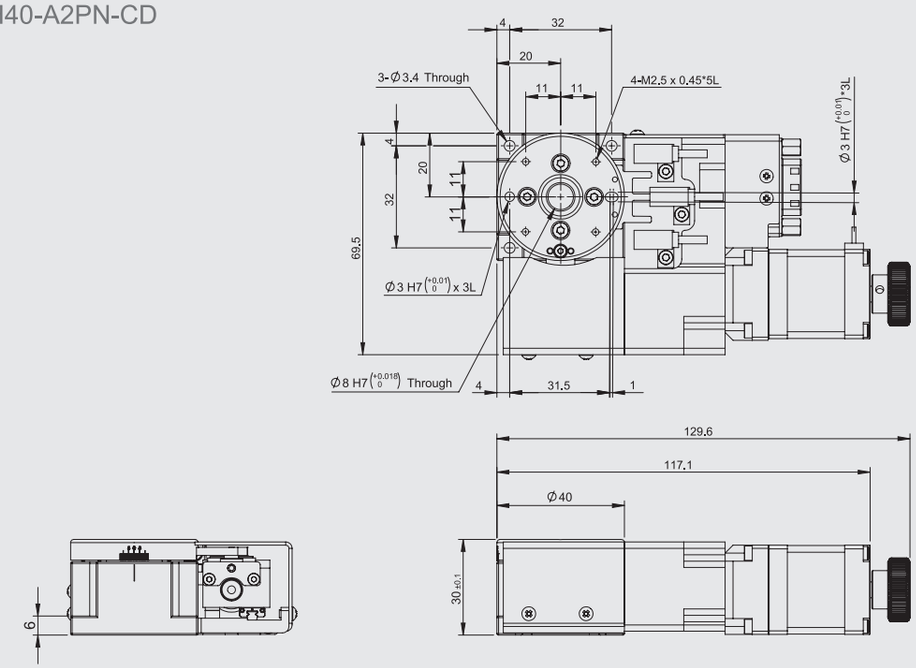
$\theta = \tan^{-1}\left(\left(\frac{1}{54.5}\right)\right) = 1.0512°$

Example：ARH60 Feeding Screw Guiding

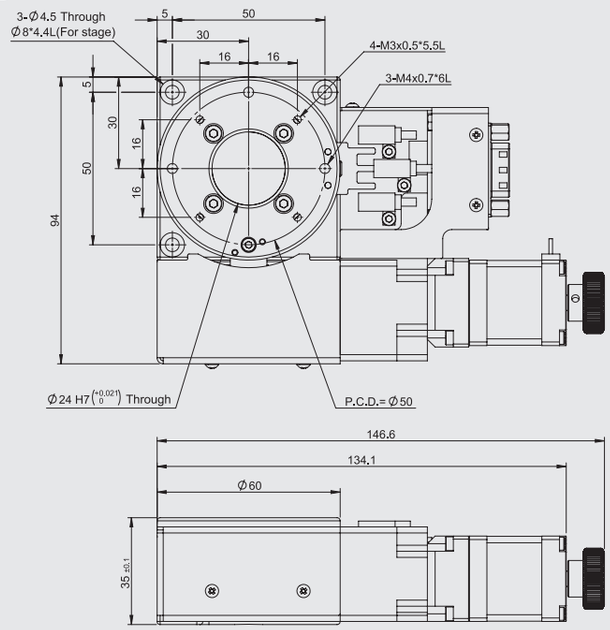
$L' = \tan(1.0512°) \times 54.5 = 1$

ARH Series

ARH40-A2PN-CD

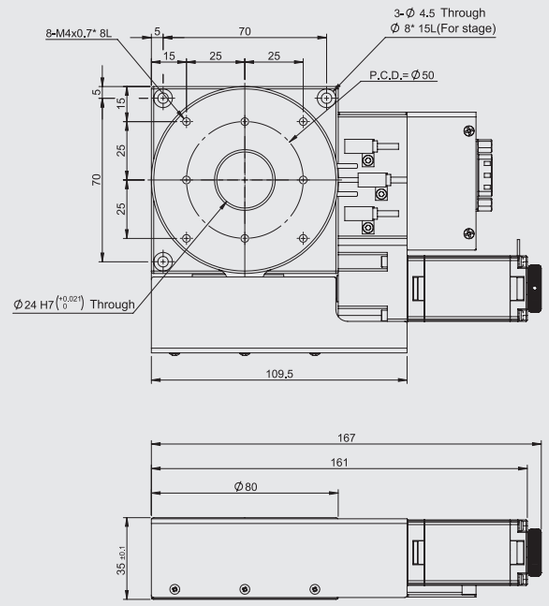


ARH60-A2PN-CD

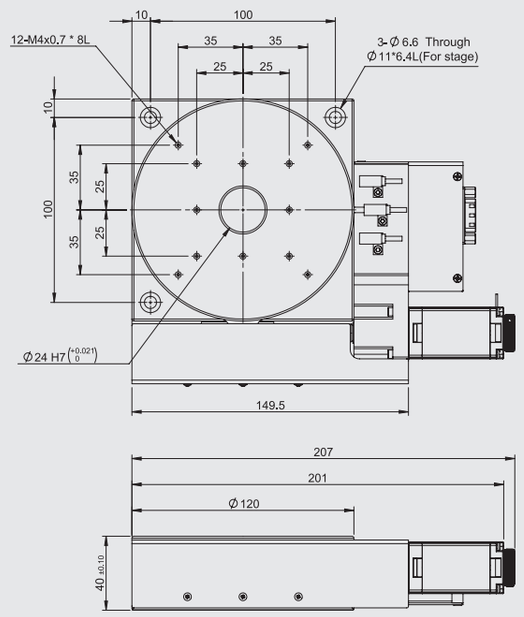


Motorized Positioners ▶ Standard Motorized Stages
ARH Series
GMT GLOBAL INC.
Product Specification

ARH80-A2PN-CD



ARH120-A2PN-CD



ARS Series

Model Description

Material	Drive Type	Accuracy Level	Wiring Method	Motor Model	Connector Type
A Aluminum Alloy	3 Worm & Worm Gear+Guiding Gear	P Precision	N GMT Standard	C 5-phase stepper X Not equipped	D D-SUB15 (VGA)

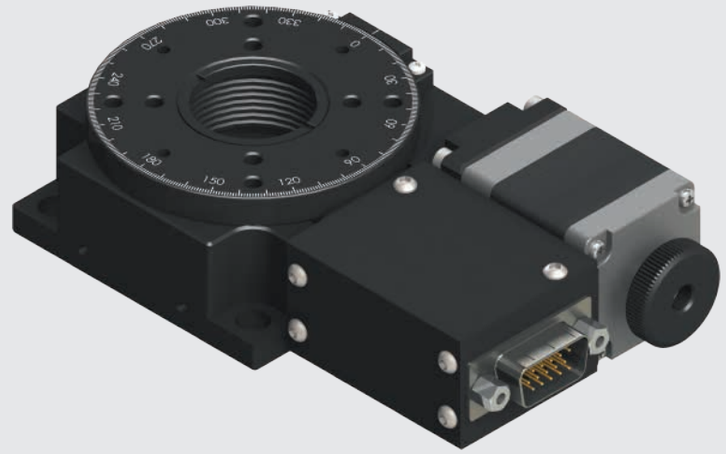
ARS 60 - 23 - A 3 P N - C D - 2 C

Axis & Serial Numbers	Table Size	Aperture	Connecting Cable (Optional)	Drive (Optional)
ARS Thin type θ-Axis	60 Ø60mm	23 Ø23mm	X Not equipped 2 2mm cable 4 4mm cable 6 6mm cable	X Not equipped C Standard specified by GMT

	Model No.	ARS60-23-A3PN-CD	ARS60-30-A3PN-CD	ARS60-I-23-A3PN-CD	ARS60-I-30-A3PN-CD
Mechanical Specifications	Table Size	Ø60 mm			
	Travel Stroke	360°			
	Drive Type	Worm & Worm Gear (ratio 1/150)			
	Rail	Crossed-roller guiding			
	Stage Material / Surface Treatment	Aluminum Alloy / Black Anodized			
	Aperture	Ø23 mm	Ø30 mm	Ø0.91"	Ø1.18"
	Main Unit Weight	0.57 Kg			
	Coupling	FAMMS12-3*5			
	Accuracy Level	P：Precision			
	Wiring Method	N：GMT Standard			
Precision Specifications	Resolutioin (Pulse) Full / Half	0.005° / 0.0025°			
	Maximum Precision (Full Step)	24° / sec			
	Positioning Precision	0.05°			
	Repeatability Precision	±0.01°			
	Load Capacity	6 Kgf			
	Missed Step	0.05°			
	Parallelism	30 μm			
	Dynamic Straigrtness	30 μm			
	Dynamic Parallelism	20 μm			
Electrical Specifications	Motor: Type / Shaft Numbers	5-phase stepper / □28 double shafts			
	Motor: Brand / Model	SANYO / SH5281-7211			
	Driver Brand / Model	GMT / GTR-515B			
	Connector: Stage Side Connector	15-pin male end connector D-SUB			
	Connector: Controller Side Connector	15-pin female end connector D-SUB (Optional)			
	Sensor: Origin Sensor / Limit Sensor	Photoelectric sensor EE-SX4134			
	Sensor: Origin Approximation Sensor	N / A			
	Sensor: Power Voltage	24V±10%			
	Sensor: Control Output	NPN open collector output under 24V 8mA			
	Sensor: Output Control	Testing (sensing)：output transistor OFF (closed)			

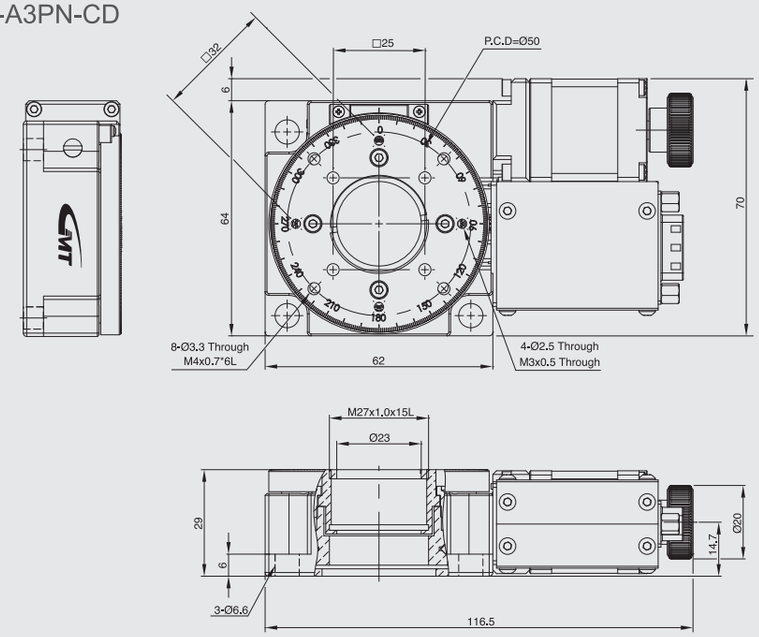
◎ GMT Standard wiring is defined as the product photo, and not optional available.
◎ GMT Standard Motorized Stage series is equipped with D-SUB connector as the standard one which is available to be changed to HRS or NJC on request as per reference stated on P.28.
◎ In case HRS connection cable is required, please consult to your regional sales.

ARS Series

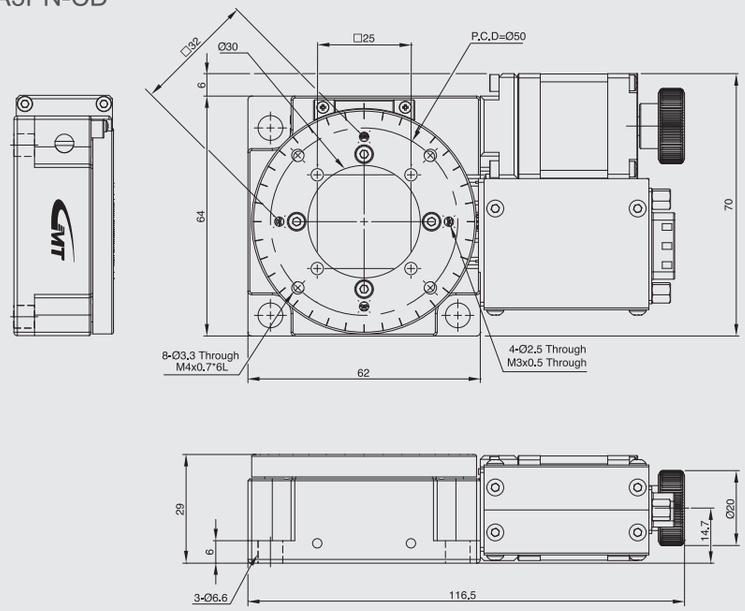


◎Photo is ARS60-23-A3PN-CD

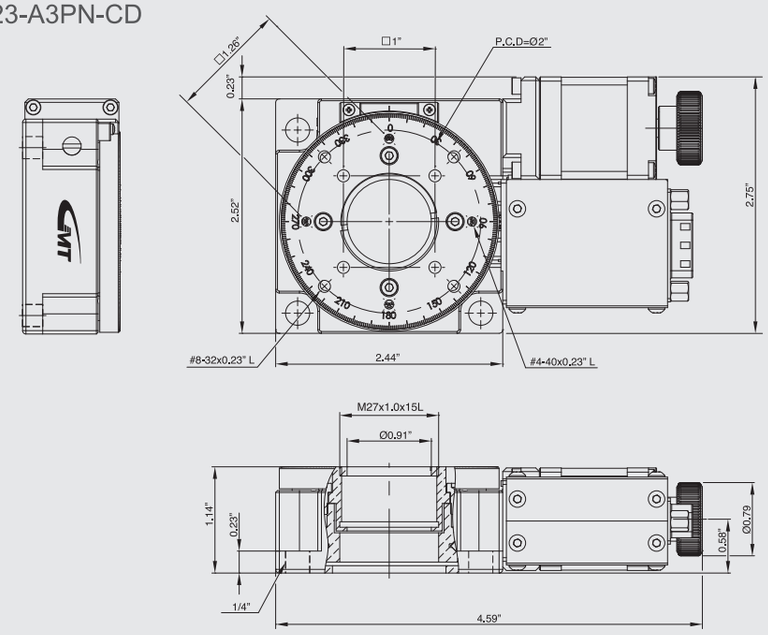
ARS60-23-A3PN-CD



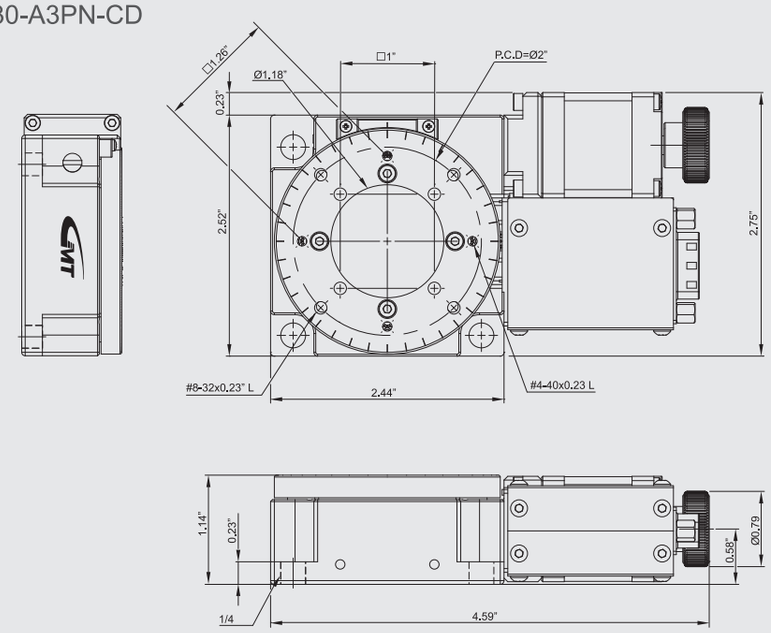
ARS60-30-A3PN-CD



ARS60-I-23-A3PN-CD



ARS60-I-30-A3PN-CD



AXYR Series

Model Description

Material		Drive Type		Accuracy Level		Wiring Method		Motor Type		Connector Type	
A	Aluminum Alloy	2	Ball Screw	UP	Ultra Precision	R	Right side	C	5-phase stepper	D	D-SUB
				P	Precision	L	Left side	N	2-phase stepper		
								M	2-phase closed stepper		
								X	Not equipped		

AXYR 60 - A 2 UP R - C D - 2 C

Model No.	
XY +θ-Axis	

Table Size	
60	60*60 mm
80	80*80 mm
120	120*120 mm

Connecting Cable (Optional)	
2	2 mm
4	4 mm
6	6 mm

Driver (Optional)	
C	Standard specified by GMT
E	Ezi-Servo
X	Not equipped

AXYR Series Calculation

Calculation formula：

Feeding Screw Guiding：$L' = \tan^{-1}\theta \times R$

θ-Axis Rotation Angle = $\tan\left(\frac{L'}{R}\right)$

R = θ-Axis Guiding

θ = θ-Axis Rotation Angle

L' = Feeding Screw Guiding

Code	Model No.	AXYR60	AXYR80	AXYR120
	R	51	61	85
	θ	17°	20°	20°

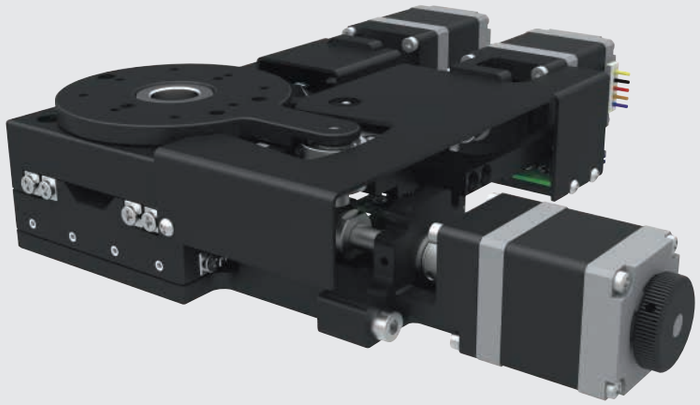
Example：AXYR60 Rotation Angle

$\theta = \tan^{-1}\left(\left(\frac{1}{51}\right)\right) = 1.1233°$

Example：AXYR60 Feeding Screw Guiding

$L' = \tan(1.233°) \times 51 = 1$

AXYR□-A2P□-ND



◎Photo is AXYR60-A2PR-ND

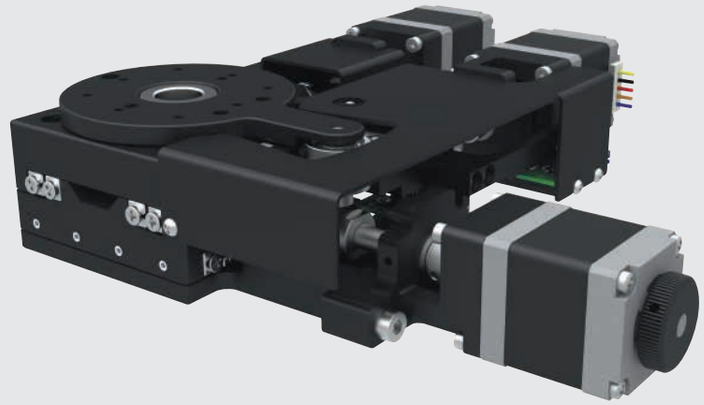
Model No.			AXYR60-A2PR-ND AXYR60-A2PL-ND	AXYR80-A2PR-ND AXYR80-A2PL-ND	AXYR120-A2PR-ND AXYR120-A2PL-ND
Mechanical Specifications	Table Size		Ø60 mm	Ø80 mm	Ø120 mm
	Travel Stroke-X Axis		±7.5 mm	±12 mm	±15 mm
	Travel Stroke-Y Axis		±7.5 mm	±12 mm	±15 mm
	Travel Stroke-θ Axis		±8.5°	±10°	
	Drive Type		Ball Screw		
	Rail-XY Axis		Crossed-roller guiding		
	Rail-θ Axis		Circular ball bearing		
	Stage Material / Surface Treatment		Aluminum Alloy / Black Anodized		
	Accuracy Level		P：Precision		
	Wiring Method		R：Right side / L：Left side		
Precision Specifications	XY Axis Resolutioin (Pulse) Full / Half		5 μm / 2.5 μm		
	θAxis Resolutioin (Pulse) Full / Half		0.0056° / 0.0028°	0.0047° / 0.0023°	0.0034° / 0.0017°
	XY Axis Maximum Precision (Full Step)		10 mm / sec		
	θAxis Maximum Precision (Full Step)		8° / sec		
	XY Axis Positioning Precision		10 μm		
	XY Axis Repeatability Precision		±1 μm		
	θ Axis Positioning Precision		0.05°		
	θ Axis Repeatability Precision		±0.01°		
	Load Capacity (Kgf)		6	10	25
	XY Axis Missed Step		2 μm		
	θ Axis Missed Step		0.01°		
	Parallelism		20 μm	30 μm	
	Dynamic Straigrtness		20 μm		
	Dynamic Parallelism		10 μm	15 μm	
Electrical Specifications	Motor	Type / Shaft Numbers	2MS-N28D32A	2MS-N28D45A	2MS-N28D45A
		Brand / Model	GMT		
	Connector	Stage Side Connector	15-pin male end connector D-SUB		
		Controller Side Connector	15-pin female end connector D-SUB (Optional)		
	Sensor	Power Voltage	24V±10%		
		Control Output	NPN open collector output under 24V 8mA		
		Output Control	Testing (sensing)：output transistor OFF (closed)		

◎GMT Standard wiring is defined as the product photo, and not optional available.

◎GMT Standard Motorized Stage series is equipped with D-SUB connector as the standard one which is available to be changed to HRS or NJC on request as per reference stated on P.28.

◎In case HRS connection cable is required, please consult to your regional sales.

AXYR□-A2UP□-CD



◎Photo is AXYR60-A2UPR-CD

Model No.			AXYR60-A2UPR-CD AXYR60-A2UPL-CD	AXYR80-A2UPR-CD AXYR80-A2UPL-CD	AXYR120-A2UPR-CD AXYR120-A2UPL-CD
Mechanical Specifications	Table Size		Ø60 mm	Ø80 mm	Ø120 mm
	Travel Stroke-X Axis		±7.5 mm	±12 mm	±15 mm
	Travel Stroke-Y Axis		±7.5 mm	±12 mm	±15 mm
	Travel Stroke-θ Axis		±8.5°	±10°	
	Drive Type		Ball Screw		
	Rail-XY Axis		Crossed-roller guiding		
	Rail-θ Axis		Circular ball bearing		
	Stage Material / Surface Treatment		Aluminum Alloy / Black Anodized		
	Accuracy Level		UP：Ultra Precision Grand		
	Wiring Method		R：Right side / L：Left side		
Precision Specifications	XY Axis Resolutioin (Pulse) Full / Half		2 μm / 1 μm		
	θAxis Resolutioin (Pulse) Full / Half		0.0022° / 0.0011°	0.0019° / 0.0009°	0.0013° / 0.0007°
	XY Axis Maximum Precision (Full Step)		5 mm / sec		
	θAxis Maximum Precision (Full Step)		8° / sec		
	XY Axis Positioning Precision		5 μm		
	XY Axis Repeatability Precision		±0.5 μm		
	θ Axis Positioning Precision		0.03°		
	θ Axis Repeatability Precision		±0.003°		
	Load Capacity (Kgf)		6	10	25
	XY Axis Missed Step		1 μm		
	θ Axis Missed Step		0.003°		
	Parallelism		20 μm	30 μm	
	Dynamic Straigrtness		20 μm		
	Dynamic Parallelism		10 μm	15 μm	
Electrical Specifications	Motor	Type / Shaft Numbers	SH5281-7211	SH5285-7211	SH5285-7211
		Brand / Model	SANYO		
	Connector	Stage Side Connector	15-pin male end connector D-SUB		
		Controller Side Connector	15-pin female end connector D-SUB (Optional)		
	Sensor	Power Voltage	24V±10%		
		Control Output	NPN open collector output under 24V 8mA		
		Output Control	Testing (sensing)：output transistor OFF (closed)		

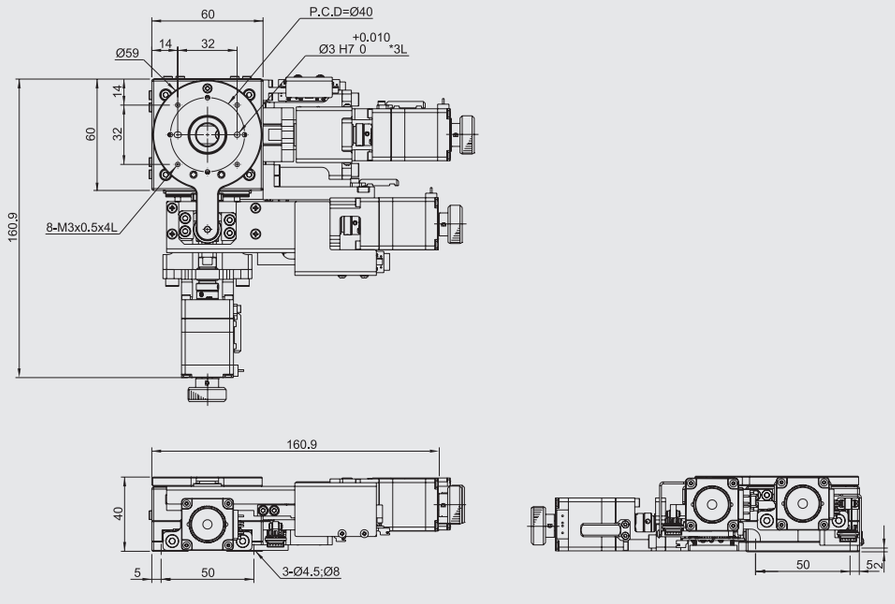
◎GMT Standard wiring is defined as the product photo, and not optional available.

◎GMT Standard Motorized Stage series is equipped with D-SUB connector as the standard one which is available to be changed to HRS or NJC on request as per reference stated on P.28.

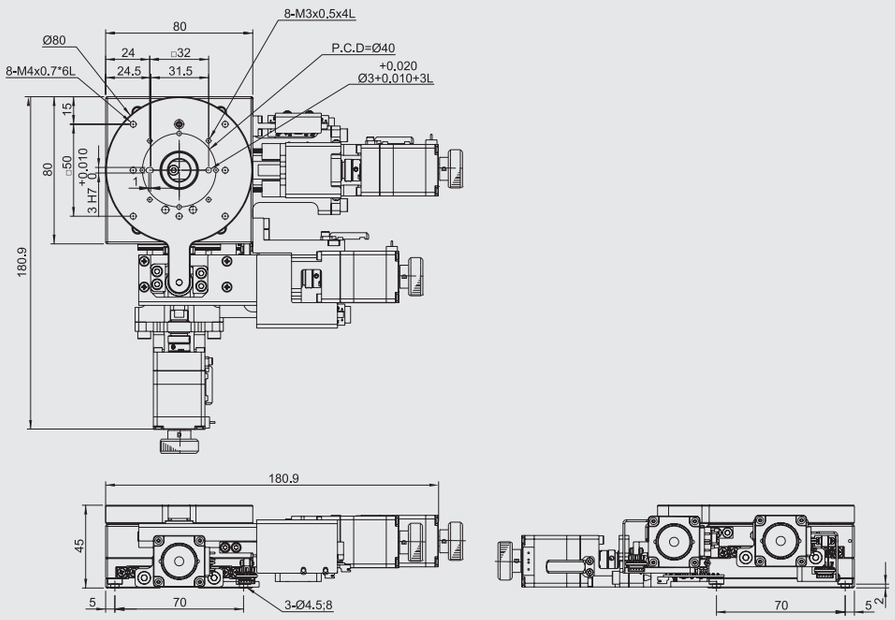
◎In case HRS connection cable is required, please consult to your regional sales.

AXYR□-A2PR-ND

AXYR60-A2PR-ND

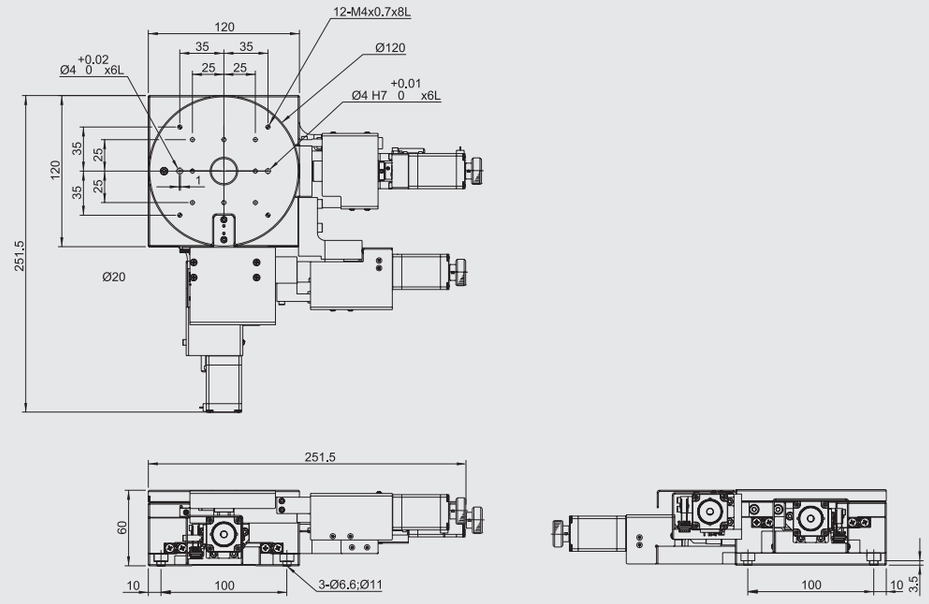


AXYR80-A2PR-ND



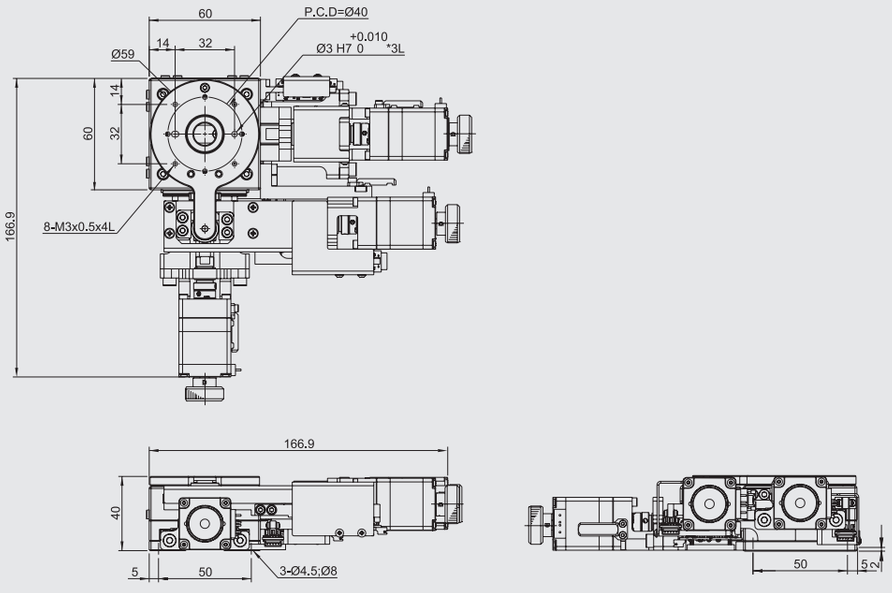
XYθ-axis-in-one Motorized Precision Stage
AXYR□-A2PR-ND
GMT GLOBAL INC.
Product Specification

AXYR120-A2PR-ND



AXYR□-A2UPR-CD

AXYR60-A2UPR-CD



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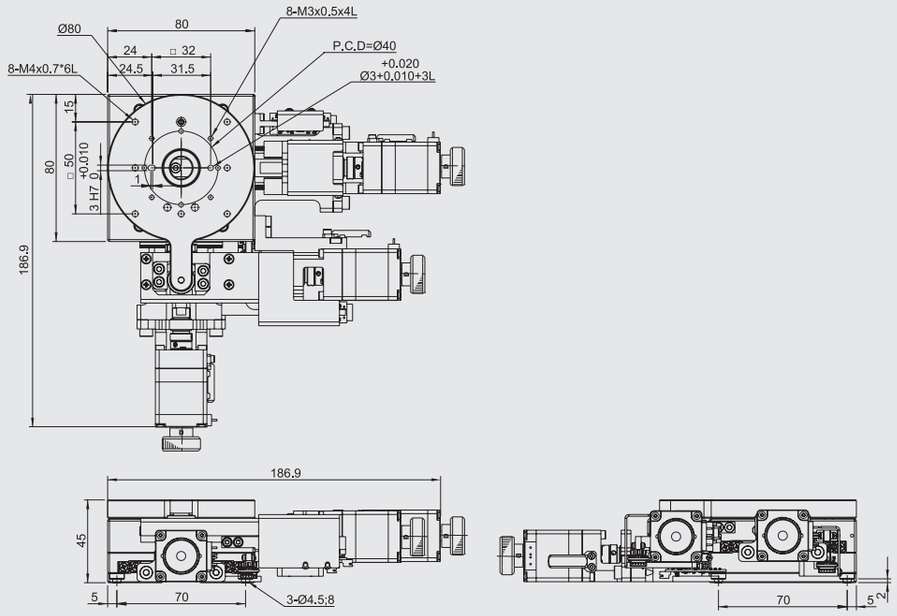

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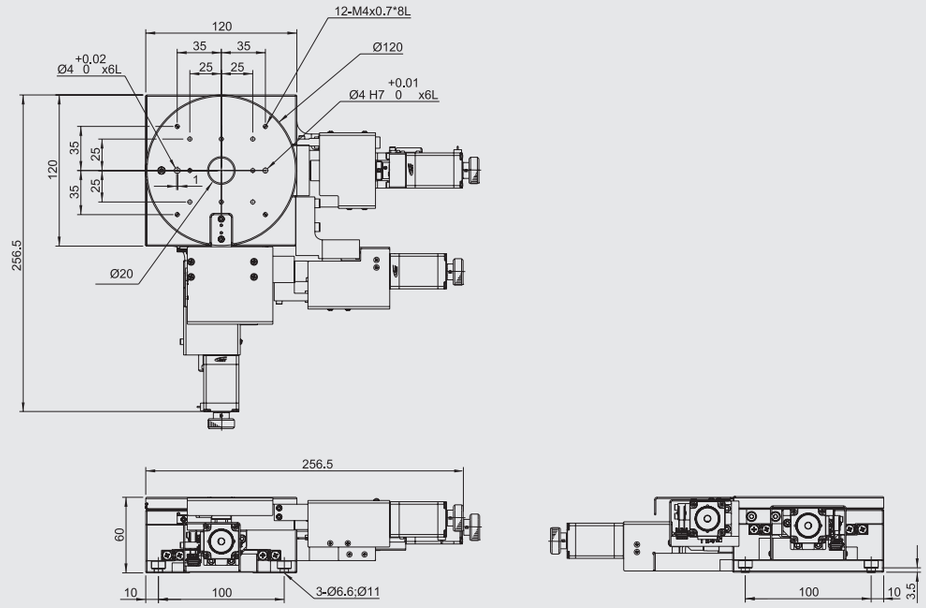
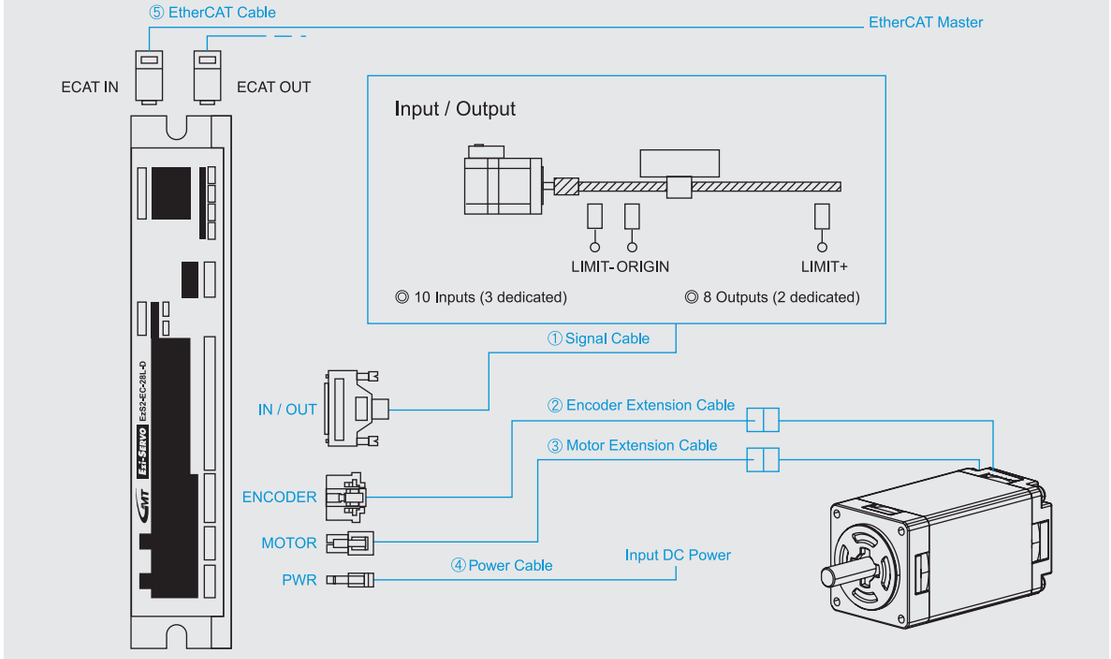


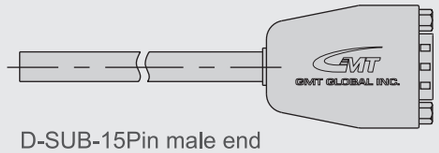
Motor Driver Introduction

Standard Equipped	Equipped Motor / Shaft Type	5-Phase Stepper Motor / Double Shaft		
	Motor Manufacturer	SANYO		
	Motor Models	SH5281-7211	SH5285-7211	
	Rated Current	0.75 A		
	Size	□28x32	□28x51.5	
	Step Angle	0.72°		
	Magnetizing Maximum Static Torque	0.041 N·m	0.078 N·m	
	Rotor Inertia (kg·m²)	$0.01x10^{-4}$	$0.022x10^{-4}$	
	Driver Manufacture	GMT		
	Driver Model	GTR515B		
	Applicable Platform	AXYR60-A2UP	AXYR80-A2UP	AXYR120-A2UP
	Equipped Motor / Shaft Type	2-Phase Stepper Motor / Double Shaft		
	Motor Manufacturer	GMT		
	Motor Models	2MS-N28D32A	2MS-N28D45A	
	Rated Current	0.67 A		
	Size	□28x31.3	□28x45	
	Step Angle	1.8°		
	Magnetizing Maximum Static Torque	0.06 N·m	0.09 N·m	
	Rotor Inertia (kg·m)	$0.9x10^{-4}$	$0.12x10^{-4}$	
	Driver Manufacture	GMT		
	Driver Model	GTR22G-D		
	Applicable Platform	AXYR60-A2P	AXYR80-A2P	AXYR120-A2P
Recommened	Equipped Motor / Shaft Type	Closed Stepper Motor / Double Shaft		
	Motor Manufacturer	Minebea		
	Motor Models	TM-28M-G		
	Size	□28x50.5		
	Maximum Torque (mN·m)	140		
	Rotor Inertia (kg·m²)	$4x10^{-7}$		
	Driver Manufacture	FASTECH		
	Driver Model	EzS2-EC-28M-GM		



Model No.			Length (m)
Signal Cable	Nornal Cable	EZI-SERVO-IOR-CABLE-1M	1 m
		EZI-SERVO-IOR-CABLE-2M	2 m
		EZI-SERVO-IOR-CABLE-3M	3 m
		EZI-SERVO-IOR-CABLE-5M	5 m
	Resistant Bend Cable	EZI-SERVO-IOR-CABLE-BEN-1M	1 m
		EZI-SERVO-IOR-CABLE-BEN-2M	2 m
		EZI-SERVO-IOR-CABLE-BEN-3M	3 m
		EZI-SERVO-IOR-CABLE-BEN-5M	5 m
Encoder Cable	Nornal Cable	EZI-SERVO-ENC-CABLE-1M	1 m
		EZI-SERVO-ENC-CABLE-2M	2 m
		EZI-SERVO-ENC-CABLE-3M	3 m
		EZI-SERVO-ENC-CABLE-5M	5 m
	Resistant Bend Cable	EZI-SERVO-ENC-CABLE-BEN-1M	1 m
		EZI-SERVO-IOR-CABLE-BEN-2M	2 m
		EZI-SERVO-IOR-CABLE-BEN-3M	3 m
		EZI-SERVO-IOR-CABLE-BEN-5M	5 m
Motor Cable	Nornal Cable	EZI-SERVO-MOTER-CABLE-1M	1 m
		EZI-SERVO-MOTER-CABLE-2M	2 m
		EZI-SERVO-MOTER-CABLE-3M	3 m
		EZI-SERVO-MOTER-CABLE-5M	5 m
	Resistant Bend Cable	EZI-SERVO-MOTER-CABLE-BEN-1M	1 m
		EZI-SERVO-MOTER-CABLE-BEN-2M	2 m
		EZI-SERVO-MOTER-CABLE-BEN-3M	3 m
		EZI-SERVO-MOTER-CABLE-BEN-5M	5 m
EtherCAT Cable	Resistant Bend Cable	EZI-SERVO-2-EC-ETHER-CABLE-1M	1 m
		EZI-SERVO-2-EC-ETHER-CABLE-2M	2 m
		EZI-SERVO-2-EC-ETHER-CABLE-3M	3 m
Power Cable	Cable	EZI-SERVO-POWER-CABLE-1M	1 m

Designated Stage Connector

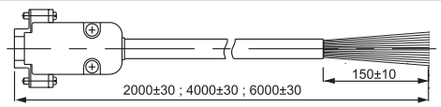


D-SUB-15Pin male end

- For **GMT** full-series of the motorized stage, the D-sub connectors have been used as the default designated connectors.
- The standard of the connecting cables (male end) should be corresponded to the connection type on the side of the stage (female end). A standard cable is including a single-ended connector with a combination of 15 connecting wires stocked.
- The standard D-SUB connecting cables, the D-SUB TO HRS converting cables, and the D-SUB TO NJC converting cables are optional accessories (sold separately).
- If you use HRS / NJC previously, you can choose the D-SUB TO HRS / D-SUB TO NJC converting cables for conversions.
- When a standard connecting cable is in use, please take the insulation treatments on any ends of the unused discrete wires.
- Abnormal operations may be caused if the length of a connecting cable is over 6m.
- The minimum bendable radius of a connecting cable is 5 times the cable diameter.

Connecting Cable

D-SUB Standard connecting cable

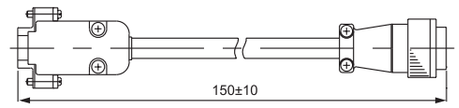


Model : AW1C2A2-2 ; AW1C2A2-4 ; AW1C2A2-6 Unit : mm

Stage side is D-SUB female end			Control side single-sided discrete wire 15 wires
Motor leadA	1	Green line / black spot	1
Motor leadB	2	Green line / red spot	2
Motor leadC	3	Pink line / black spot	3
Motor leadD	4	Pink line / red spot	4
Motor leadE	5	Blue line / black spot	5
CWLS output	6	Blue line / red spot	6
CCWLS output	7	White line / black spot	7
Motor rotary ORG2 output	8	White line / red spot	8
Power input (+)	9	Gray line / black spot	9
Stage travel stroke ORG1 output	10	Gray line / red spot	10
Power input (-)	11	Yellow line / black spot	11
Ground ⏚	12	Yellow line / red spot	12
Not used	13	Not used	13
Not used	14	Not used	14
Not used	15	Not used	15
			Control side corresponding connection points

Connecting Cable

D-SUB TO NJC converting cable

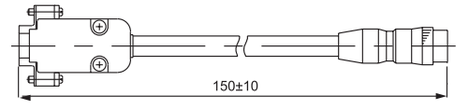


Model : AW2C2L4-0.15 Unit : mm

Stage side D-SUB female end			Control side NJC male end
Motor leadA	1	Green line / black spot	1 Motor leadA
Motor leadB	2	Green line / red spot	2 Motor leadB
Motor leadC	3	Pink line / black spot	3 Motor leadC
Motor leadD	4	Pink line / red spot	4 Motor leadD
Motor leadE	5	Blue line / black spot	5 Motor leadE
CWLS output	6	Blue line / red spot	6 CWLS output
CCWLS output	7	White line / black spot	8 CCWLS output
Motor rotary ORG2 output	8	White line / red spot	11 Motor rotary ORG2 output
Power input (+)	9	Gray line / black spot	10 Power input (+)
Stage travel stroke ORG1 output	10	Gray line / red spot	14 Stage travel stroke ORG1 output
Power input (-)	11	Yellow line / black spot	15 Power input (-)
Ground ⏚	12	Yellow line / red spot	16 Ground ⏚
Not used	13	Not used	9 Not used
Not used	14	Not used	12 Not used
Not used	15	Not used	13 Not used
			7 Not used

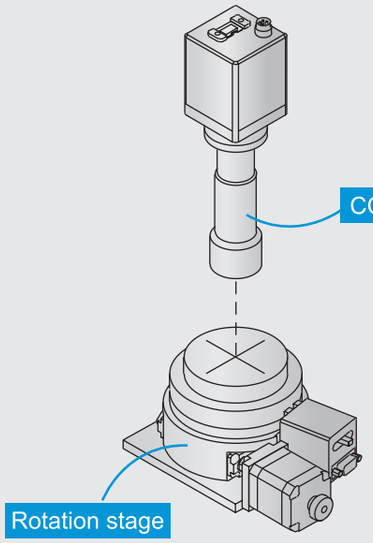
Connecting Cable

D-SUB TO HRS converting cable



Model : AW2C2G0-0.15 Unit : mm

Stage side D-SUB female end			Control side NJC male end
Motor leadA	1	Green line / black spot	1 Motor leadA
Motor leadB	2	Green line / red spot	2 Motor leadB
Motor leadC	3	Pink line / black spot	3 Motor leadC
Motor leadD	4	Pink line / red spot	4 Motor leadD
Motor leadE	5	Blue line / black spot	5 Motor leadE
CWLS output	6	Blue line / red spot	6 CWLS output
CCWLS output	7	White line / black spot	7 CCWLS output
Motor rotary ORG2 output	8	White line / red spot	8 Motor rotary ORG2 output
Power input (+)	9	Gray line / black spot	9 Power input (+)
Stage travel stroke ORG1 output	10	Gray line / red spot	10 Stage travel stroke ORG1 output
Power input (-)	11	Yellow line / black spot	11 Power input (-)
Ground ⏚	12	Yellow line / red spot	12 Ground ⏚
Not used	13		
Not used	14		
Not used	15		



Testing equipment : a CCD image detection system.
The foundation of the stage should be fixed during the operation, while only the upper stage is working at the same time.

One-Way Remove Positioning Precision (Unit : °)

Within a predetermined testing range, start working a homing rotation stage to move to an unspecified position in a fixed direction (CW or CCW). As the motion is done, record the difference has occurred between the actual and target movement values. The difference is referred to as a One-Way Remove Positioning Precision.

Repeatability Positioning Precision (Unit : ±°)

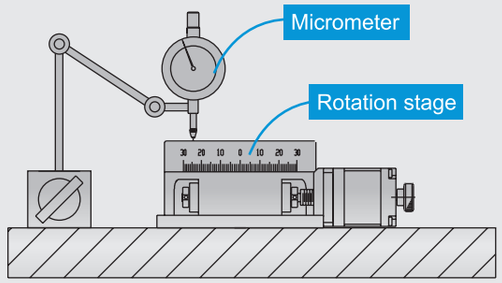
Firstly, set a standard angle aligned with the baseline, and then repeat the measurement for seven repetitions including both clockwise as well as counterclockwise directions and record each difference for obtaining a maximum value and the path including it.
With half value of the difference, test for the other differences at midpoint / both ends of the previous path and thence record the maximum, which is referred to as a repeatability positioning precision.

Missed Step (Lost Stroke at Reverse Rotation) (Unit : °)

Select clockwise rotation for angle positioning and set a position x1. Continue counterclockwise rotation for angle positioning and set a position y1. Set a custom position for testing seven repetitions. Then record the maximum difference and the path including it, both are used to perform the next step that, test the other differences at midpoint / both ends of the previous path and thence record the maximum, which is referred to as a missed step.

Missed Step calculation :

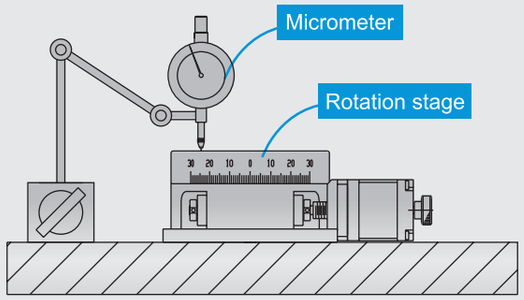
$$\max \left| \frac{(x1+x2+x3\ldots\ldots+x7)}{7} - \frac{(y1+y2+y3\ldots\ldots+y7)}{7} \right|$$



Testing equipment : a micrometer.
The foundation of the stage should be fixed during the operation, while only the meter is moving at the same time.

Parallelism (Unit : μm)

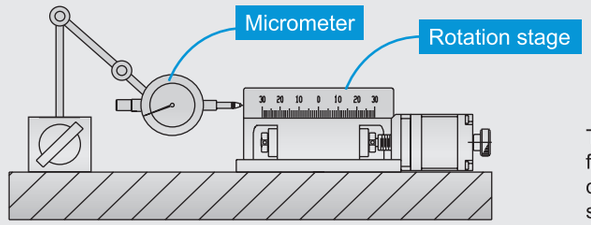
Place a homing elevator stage onto granite workbench and set a micrometer to measure the maximum level difference at middle area of the stage (or use Zeiss coordinate measuring machines), and to be referred to as a parallelism.



Testing equipment : a micrometer.
The foundation of the stage should be fixed during the operation, while only the upper stage is working at the same time.

Dynamic Parallelism (Unit : μm)

Place a homing elevator stage onto granite workbench and set four micrometers to measure the level difference at four angles of the stage (or use Zeiss coordinate measuring machines), and record the maximum value to as a dynamic parallelism.



Testing equipment : a micrometer. The foundation of the stage should be fixed during the operation, while only the upper stage is working at the same time.

Dynamic Concentricity (Unit : °)

Within a predetermined position, set a micrometer to measure the concentricity of circumference of a homing rotation stage rotating in specified / fixed directions (CW and CCW), and record the maximum of the concentric difference to be referred to as a dynamic concentricity.

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