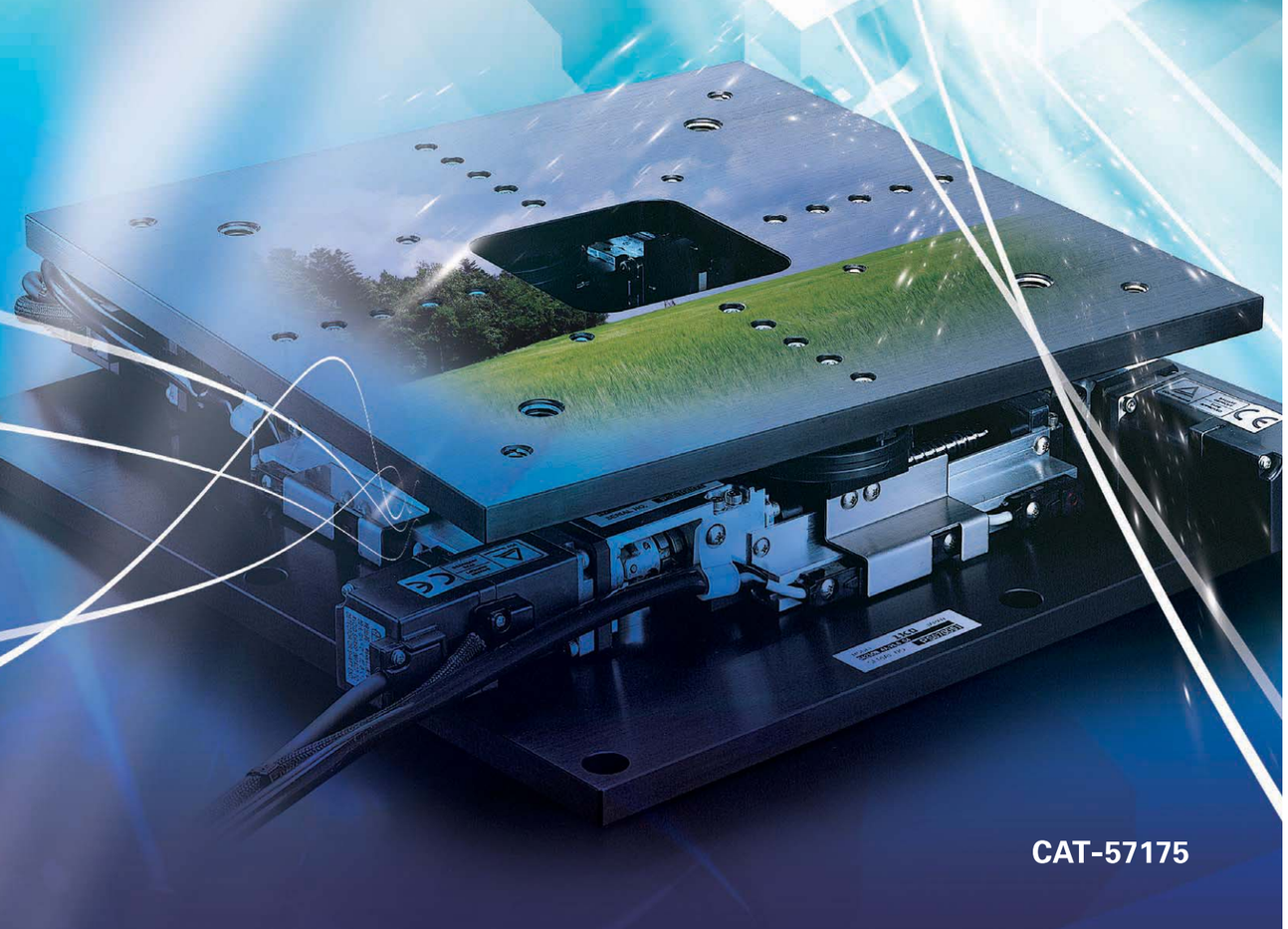
U.S. PATENTED

IKO

Alignment Stage Module Type

SA···M



CAT-57175

See you again at

IKO Website

http://www.ikont.co.jp/eg/

June 2010 IKO Overseas Dept.

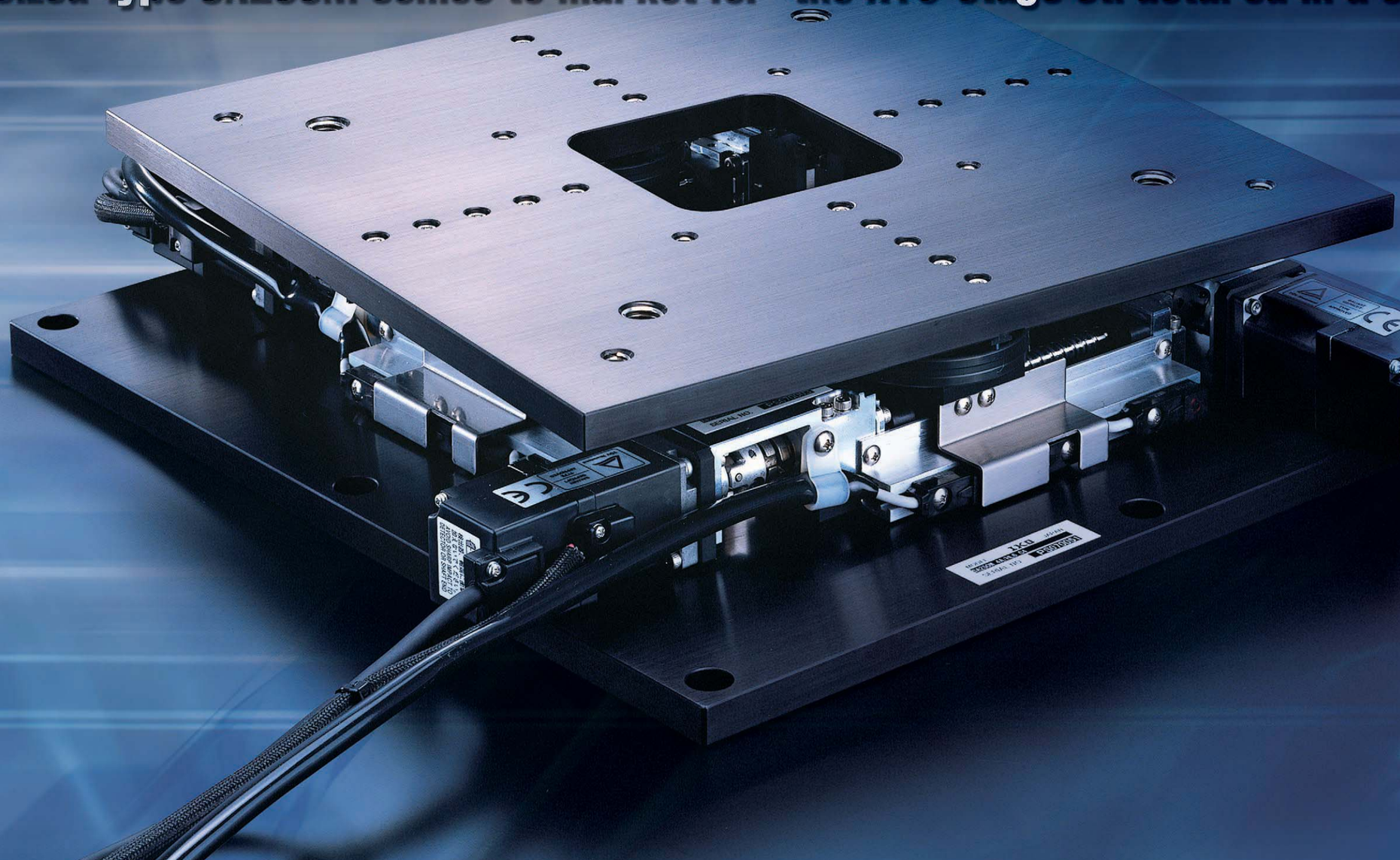
IKO Alignment Stage Module Type

SA···M

U.S. PATENT
7223018B2

IKO strives to be a leader in Technology. Our primary source for development is listening to the customer wants and needs. Our performance and work separate us from others by utilizing our creative thinking and original technologies. IKO is constantly developing and implementing new and advanced technologies in pursuit of excellent motion performance and service for your cost savings.

Small-sized Type SA250M comes to market for the XYθ stage structured in a single layer!



IKO Alignment Stage Module Type SA···M

IKO Alignment Stage SA···M is an XYθ stage structured in a single layer with the extremely low section height where multiple units of Alignment Module AM, which has an angle adjustment mechanism, are arranged on a same plane.
In addition to the outer dimension of stage 420 mm × 420 mm and 800 mm × 800 mm, where a large diameter hollow is incorporated, the stage of 250 mm × 250 mm has been lined up for small size applications, totaling the number of the SA···M series to three. The SA···M series is best suited for an alignment mechanism of production and inspection equipment for semiconductors and flat panel displays.

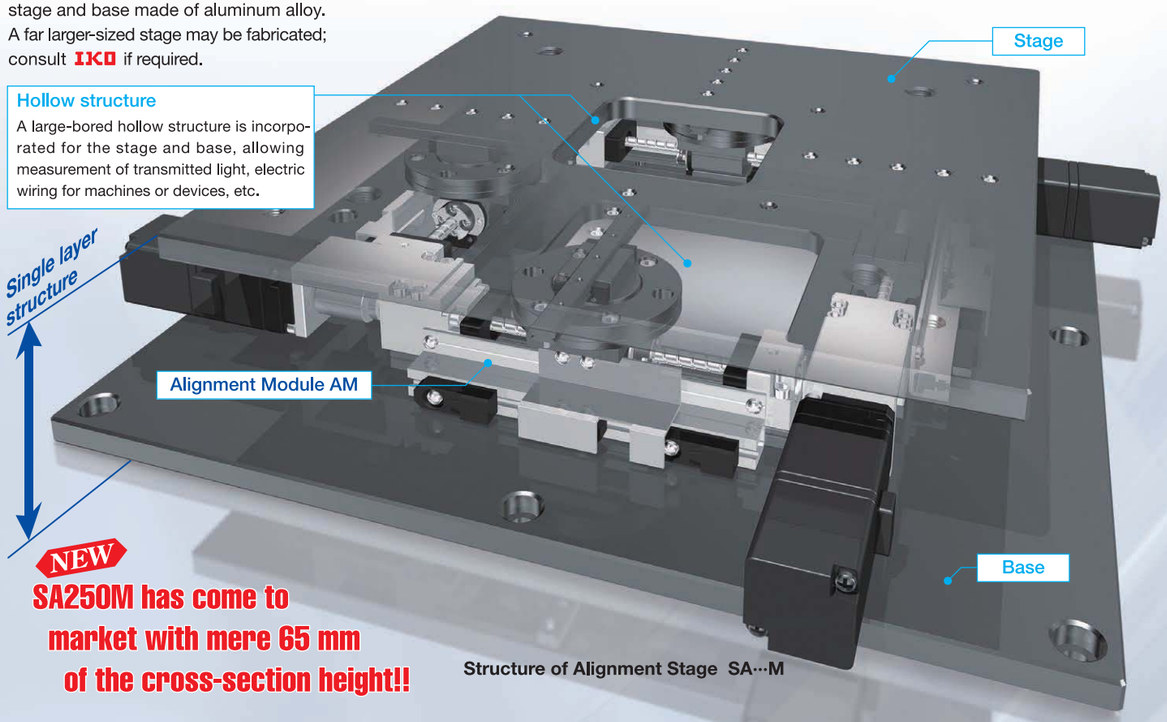
Alignment Stage Module Type SA···M

Small cross-section and large-sized alignment stage

A single layer, low cross-section height and large-sized stage has been realized by integrating Alignment Module AM with the stage and base made of aluminum alloy.
A far larger-sized stage may be fabricated; consult IKO if required.

High accuracy, high rigidity and high reliability

The SA···M series has high reliability due to combination with Alignment Module AM, of which accuracy and rigidity are high.



NEW
SA250M has come to market with mere 65 mm of the cross-section height!!

Structure of Alignment Stage SA···M

A wide variety of movements realized

In addition to the linear motion in the X and Y directions, an alignment motion around an arbitrarily located center is possible, resulting in high degree of freedom in motion and a wide variety of movements.

Specification of four-shaft driving added

The four-shaft driving specification, which offers enhanced alignment accuracy compared with three-shaft driving, has been set as standard, providing best suitability for an alignment mechanism of production equipment for flat panel displays, which has been evolving toward a large size.
Consult IKO for details of the four-shaft driving stage controller.

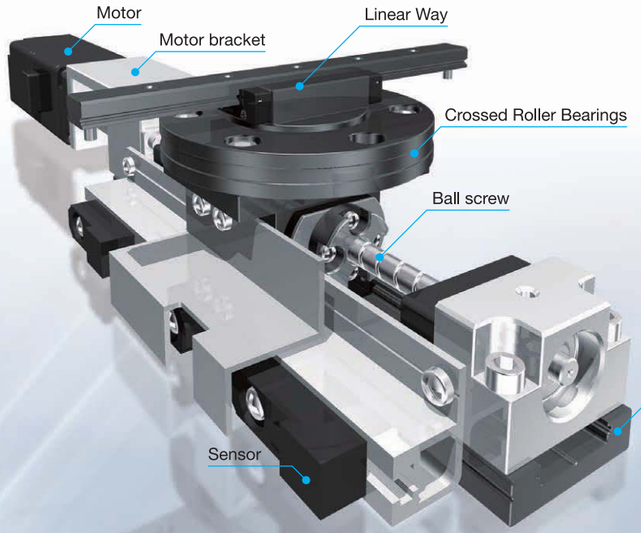
Alignment Module AM

Alignment Module AM with the angle adjustment function

The AM series is a positioning module developed for the alignment stage by combining high rigidity type Crossed Roller Bearings and Linear Way on IKO Precision Positioning Table TU as a base. The AM series is standardized for specifications in two types: with a ball screw and motor for a driving mechanism and without a ball screw for a driven mechanism.
The customer may purchase Alignment Module AM as a single unit and freely construct an alignment stage.

No adjustment required

The tolerance of the height dimension is precisely controlled within ±10 μm.
The customer needs not adjust the height of each alignment module during construction of the alignment stage.



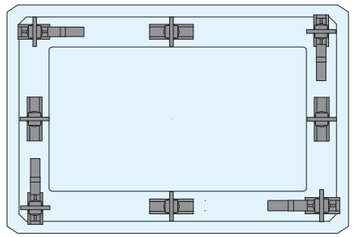
Structure of Alignment Module AM
(Specification with a ball screw and motor)

NEW
Small-sized Alignment Module AM25 added to the lineup

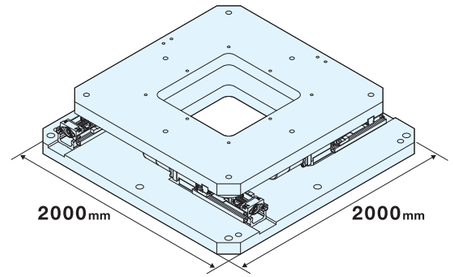
Alignment Module AM realizes a variety of configurations for the alignment stage.
The type AM25 for small size applications with the height of 47 mm and width of 86 mm has been added to the lineup of the alignment module, expanding the variation in size to four up to the type AM86.

Freely combination

An alignment stage can freely be designed according to application by selectively combining Alignment Module AM with various types of stages and bases.



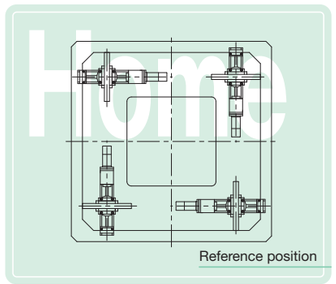
Realizes free designing of an alignment stage in accordance with application!

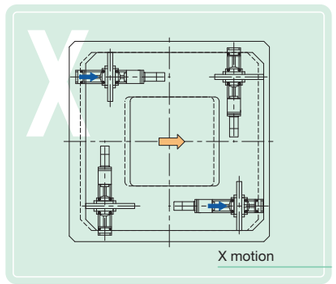


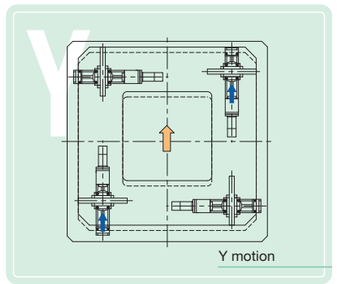
Accommodated for large-sized alignment stages of 2000 mm class!

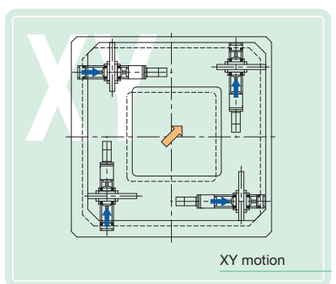
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

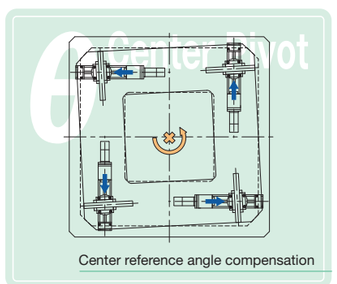
Principle of operation

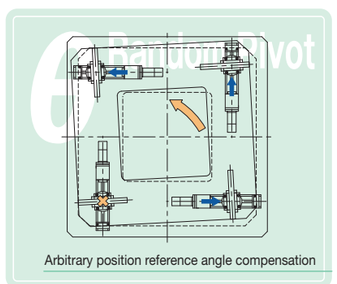






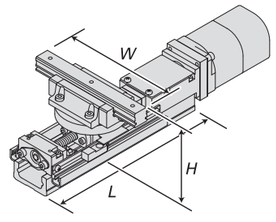




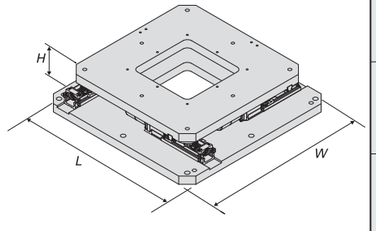


Variation

Alignment Module AM

Shape	Type	Size W×L×H (mm)	Stroke (mm)	Repeatability (mm)
	AM25	86×130×47	30	±0.002
	AM40	120×180×78	30	±0.002
	AM60	220×290×110	90	±0.002
	AM86	350×390×148	120	±0.002

Alignment Stage SA···M

Shape	Type	Size W×L×H (mm)	Max. range of movement XY motion (mm)	Max. range of movement Angle compensation motion (Degree)	Repeatability XY motion (mm)	Repeatability Angle compensation motion (sec)
	SA250M	250×250×65	±15	±10	±0.002	±6
	SA420M	500×500×120	±15	±5	±0.002	±3
	SA800M	900×900×170	±45	±8	±0.002	±1.5

Identification Number

Example of identification number for Alignment Stage Module Type SA···M

SA 420 M 4 A / Y027 G 4

① Type
SA···M : Alignment stage module type

② Size
250 : Outer dimension of the stage □ 250 mm
420 : Outer dimension of the stage □ 420 mm
800 : Outer dimension of the stage □ 800 mm

③ Specification of the drive shaft
3 : Two-shaft driving for X-axis; one-shaft driving for Y-axis
4 : Two-shaft driving for X-axis; two-shaft driving for Y-axis

④ With or without motor
A : With motor

⑤ Motor type
For applicable motors, see Page 8.

⑥ Type of the ball screw
G : Ground ball screw

⑦ Ball screw lead
4 : Lead of 4 mm (applicable for SA250M and SA420M)
5 : Lead of 5 mm (applicable for SA800M)

Example of identification number for Alignment Module AM

AM 40-30 A / Y027 G 4 A

① Type
AM : Alignment module

② Size
25- 30 : Width of 25 mm; stroke length of 30 mm; height of 47 mm
40- 30 : Width of 40 mm; stroke length of 30 mm; height of 78 mm
60- 90 : Width of 60 mm; stroke length of 90 mm; height of 110 mm
86-120 : Width of 86 mm; stroke length of 120 mm; height of 148 mm

③ With / or without motor
No symbol : Without motor A : With motor

④ Motor type
For applicable motors, see Page 8.

If Without motor (no symbol) is specified for Item 3 With or without motor :
・If a motor code is selected, the motor is delivered together with a motor attachment and coupling.
・For no symbol, the motor is delivered without a motor attachment nor coupling.

⑤ Type of the ball screw
G : Ground ball screw N : No ball screw

⑥ Ball screw lead
4 : Lead of 4 mm (applicable for AM25 and AM40)
5 : Lead of 5 mm (applicable for AM60 and AM86)

⑦ Wiring direction of the motor sensor leads
A : Located left, viewing from the motor
B : Located right, viewing from the motor
Only B is applicable for AM25.

Characteristics

Table 1.1 Accuracy of the SA···M series

Type and size	Max. range of movement		Repeatability	
	XY motion (1) mm	Angle compensation motion (2) Degree	XY motion (1) mm	Angle compensation motion (2) sec
SA250M	±15	±10	±0.002	±6
SA420M	±15	± 5		±3
SA800M	±45	± 8		±1.5

Note (1) Indicates a value when the stage is located at the reference position.
(2) Indicates a value when the stage is located at the reference position and the rotation center at the stage center.

Table 1.2 Accuracy of the AM series

unit mm

Type and size	Stroke length	Track rail length	Repeatability	Positioning accuracy	Parallelism in operation B	Backlash
AM25	30	130	±0.002	0.020	0.008	0.003
AM40	30	180				
AM60	90	290				
AM86	120	390				

Note (1) Not applicable for the specification without a ball screw

Table 1.3 Height dimension of the AM series

unit mm

Type and size	Module height dimension	Tolerance of the height dimension
AM25	47	±0.010
AM40	78	
AM60	110	
AM86	148	

Remark : Indicates a value from the mounting surface to the center of the module upper surface when the upper and lower axes bisect at right angle and the linear motion rolling guides of each shaft is located at the middle of its stroke.

Table 2 Maximum speed

Type and size	Lead mm	Motor revolution r/min	Max. speed mm/sec
SA250M	4	3000	200
SA420M			
SA800M	5		250
AM25	4	3000	200
AM40			
AM60	5		250
AM86			

Table 3 Allowable load

Type and size	Allowable load N
SA250M	98(1)
SA420M	470(1)
SA800M	680(1)
AM25	100(2)
AM40	500(2)
AM60	790(2)
AM86	3040(2)

Note (1) Indicates a load applicable to the stage at the arbitrary location.
(2) Indicates a load applicable to a unit of the module. Calculate a load to a unit of the module by using the loading location when constructing a stage.

Table 4 Table inertia and starting torque

Type and size	Table inertia J_T $\times 10^{-5}$kg・m^2	Starting torque T_0 N・m
SA250M	0.102	0.02(1)
SA420M	0.48	0.07(1)
SA800M	3.50	0.12(1)
AM25	0.028	0.02
AM40	0.08	0.07
AM60	0.59	0.12
AM86	4.97	0.17

Note (1) Indicates a value for reference.

Sensor Specifications

Table 5.1 Specifications of sensor

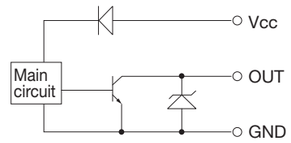
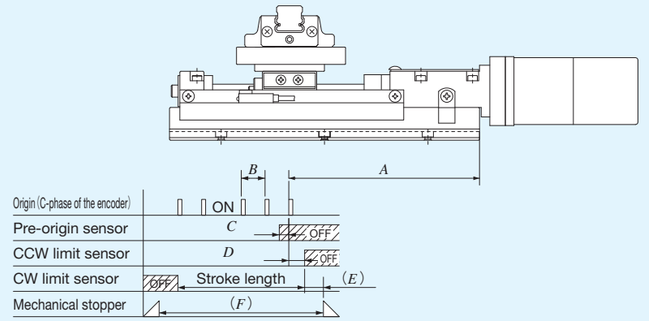
Sensor type	Proximately sensor
Power voltage	12 to 24 VDC ±10%
Power supply voltage	10 mA or less
Current consumption	Open corrector ・Max. switching current : 100 mA ・Applied voltage : 30 VDC or less ・Residual voltage : Less than 1.0 V at 100 mA of switching current Less than 0.4 V at 16 mA
Output operation	When approaching : OFF
Operation indicator	LED (Orange) (turned off at detection)
Circuit diagram	

Table 5.2 Specifications of connector

Pin. No.	Signal name	Connectors (Tyco Electronics AMP K.K.)	
		Sensor side	Opposite side
1	—	Cap housing 172160-1	Plug housing 172168-1
2	Pre-origin		
3	CW limit		
4	CCW limit	Connector 170365-1	Connector 170363-1
5	Power input		
6	GND		

Remark : Prepare applicable connector

Table 6 Sensor timing chart



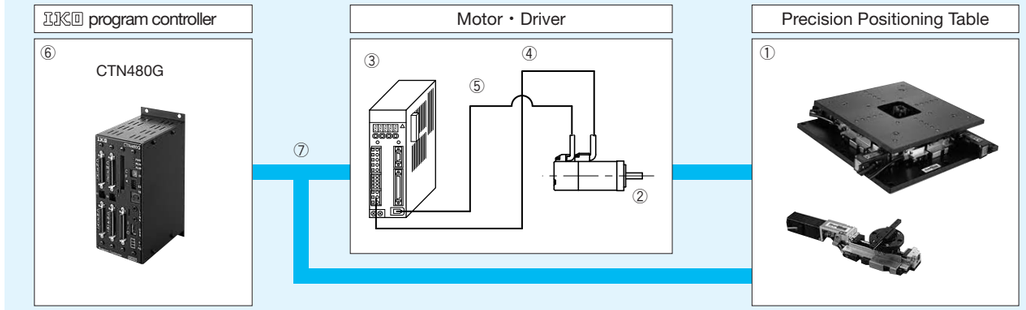
unit mm

Size	A	B	C	D	E	F
SA250M	−(1)	4	2	15	8	46
SA420M	−(1)	4	2	15	8	48
SA800M	−(1)	5	3	45	16	117
AM25	90	4	2	15	8	46
AM40	90	4	2	15	8	48
AM60	133	5	3	45	16	117
AM86	155	5	3	60	8	136

Note (1) The origin point coincides with the stroke center.

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

System Configuration



System configuration

■ Combination of Motor・Driver・Controller

Table 7 System configuration of Alignment Stage SA···M

① Type and size	Without brake		⑤ Encoder cord	③ Driver	⑥ Controller CTN480G
	② Motor code	④ Motor cord			⑦ Pulse・Limit cord
SA250M	AL6	TAE20J6-AM□□ (TAE20J5-AM□□) ×3 Max. length of 5 m	TAE20K0-EC□□ (TAE20J9-EC□□) ×3 Max. length of 5 m	SGDF-A2CP×3	TAE10P3-LD□□ (TAE10P4-LD□□) ×3
SA420M	Y027	TAE20G2-AM□□ (TAE20G1-AM□□) ×3	TAE20G6-EC□□ (TAE20G5-EC□□) ×3	SGDH-A5AE-E×3	TAE10M7-LD□□ (TAE10M8-LD□□) ×3
SA800M	Y028			SGDH-01AE-E×3	
SA420M	P001	TAE20G8-AM□□ (TAE20G7-AM□□) ×3	TAE20H2-EC□□ (TAE20H1-EC□□) ×3	MSDA5A5A1A×3	TAE10M9-LD□□ (TAE10P0-LD□□) ×3
SA800M	P002			MSDA015A1A×3	
SA250M	HL6	TAE20K2-AME□□ (TAE20K1-AME□□) ×3	—	MR-J2-03A5×3	TAE10P5-LD□□ (TAE10P6-LD□□) ×3
SA420M	J001	TAE20H4-AM□□ (TAE20H3-AM□□) ×3	TAE20H8-EC□□ (TAE20H7-EC□□) ×3	MR-J2S-10A×3	TAE10P1-LD□□ (TAE10P2-LD□□) ×3
SA800M	J002				

Remarks：1. The cord in ( ) have high bending resistance.
2. The lengths of cord can be specified by □□ in the end of supplemental code. Selectable length is up to 20m in increments of 1m.
※The length under 10m is also selected by two digits.（Example of 3m : TAE20G2-AM03）
3. The length of the pulse cord portion of the pulse limit cord is 1.5 m.
4. Use of an image processing positioning controller is recommended for 4-shaft driving stage. For details of its system configuration, consult IKO.

Table 8 System configuration of Alignment Module AM

① Type and size	Without brake		⑤ Encoder cord	③ Driver	⑥ Controller CTN480G
	② Motor code	④ Motor cord			⑦ Pulse・Limit cord
AM25	AL6	TAE20J6-AM□□ (TAE20J5-AM□□) Max. length of 5 m	TAE20K0-EC□□ (TAE20J9-EC□□) Max. length of 5 m	SGDF-A2CP	TAE10P3-LD□□ (TAE10P4-LD□□)
AM40	Y027	TAE20G2-AM□□ (TAE20G1-AM□□)	TAE20G6-EC□□ (TAE20G5-EC□□)	SGDH-A5AE-E	TAE10M7-LD□□ (TAE10M8-LD□□)
AM60	Y028			SGDH-01AE-E	
AM86	Y029			SGDH-02AE-E	
AM40	P001	TAE20G8-AM□□ (TAE20G7-AM□□)	TAE20H2-EC□□ (TAE20H1-EC□□)	MSDA5A5A1A	TAE10M9-LD□□ (TAE10P0-LD□□)
AM60	P002			MSDA015A1A	
AM86	P003			MSDA023A1A	
AM25	HL6	TAE20K2-AME□□ (TAE20K1-AME□□)	—	MR-J2-03A5	TAE10P5-LD□□ (TAE10P6-LD□□)
AM40	J001	TAE20H4-AM□□ (TAE20H3-AM□□)	TAE20H8-EC□□ (TAE20H7-EC□□)	MR-J2S-10A	TAE10P1-LD□□ (TAE10P2-LD□□)
AM60	J002				
AM86	J003			MR-J2S-20A	

Remarks：1. The cord in ( ) have high bending resistance.
2. The lengths of cord can be specified by □□ in the end of supplemental code. Selectable length is up to 20m in increments of 1m.
※The length under 10m is also selected by two digits.（Example of 3m : TAE20G2-AM03）
3. The length of the pulse cord portion of the pulse limit cord is 1.5 m.

Motor Specifications

Table 9 Motor applications

Type and size		Applicable motors (AC servomotor・Without brake)	
Alignment stage SA···M	Alignment module AM	Motor code	Model
SA250M	AM25	AL6	SGMM-A2C312
		HL6	HC-AQ0235D
SA420M	AM40	Y027	SGMAH-A5AAA21-E
		P001	MSMA5AZA1A
		J001	HC-KFS053
SA800M	AM60	Y028	SGMAH-01AAA21-E
		P002	MSMA012A1A
		J002	HC-KFS13
—	AM86	Y029	SGMAH-02AAA21-E
		P003	MSMA022A1A
		J003	HC-KFS23

Remark：The motor codes of AL6 and Y□□□ are from YASKAWA Electric Corp., P□□□ from Matsushita Electric Industrial Co., Ltd., and HL6 and J□□□ from Mitsubishi Electric Corp.

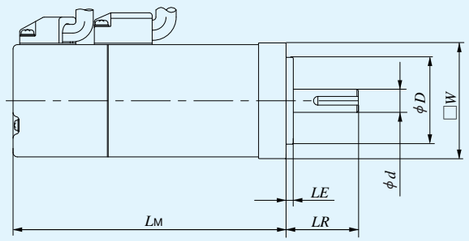
Table 10 Motor specifications

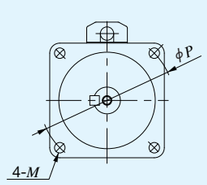
Motor code	Model	Power voltage	Rated voltage	Rated torque	Max. momentary torque	Rated number of revolution	Motor inertia	Encoder type	Mass
AL6	SGMM-A2C312	DC24	20	0.0637	0.191	3000	0.00548	Incremental 2048pulse/rev	0.16
Y027	SGMAH-A5AAA21-E	AC200	50	0.159	0.477		0.0220	Incremental 13 bits (8192pulse/rev)	0.4
Y028	SGMAH-01AAA21-E		100	0.318	0.955		0.0364		0.5
Y029	SGMAH-02AAA21-E		200	0.637	1.91		0.106		1.1
P001	MSMA5AZA1A	AC200	50	0.16	0.48	3000	0.025	Incremental 2500P/R	0.34
P002	MSMA012A1A		100	0.32	0.95		0.062		0.56
P003	MSMA022A1A		200	0.64	1.91		0.17		1.0
HL6	HC-AQ0235D	DC24	20	0.0637	0.191	3000	0.0072	Incremental 2048pulse/rev	0.22
J001	HC-KFS053	AC200	50	0.16	0.48		0.053	Absolute or incremental 17 bits	0.4
J002	HC-KFS13		100	0.32	0.95		0.084		0.53
J003	HC-KFS23		200	0.64	1.9		0.42		0.99

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

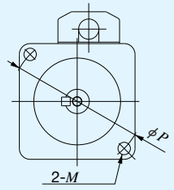
Specifications of Motor

Table 11 Dimensions of motor





Y029
P001、P002、P003
J003



AL6、HL6
Y027、Y028
J001、J002

unit mm

Motor code	□W × LM	LR	LE	d	D	P	M
AL6	25 × 64	16	2.5	5	20	28	M3 depth 5
Y027	40 × 77	25	2.5	6	30	46	φ4.3
Y028	40 × 94.5	25	2.5	8	30	46	φ4.3
Y029	60 × 96.5	30	3	14	50	70	φ5.5
P001	38 × 73	25	3	8	30	45	φ3.4
P002	38 ×103	25	3	8	30	45	φ3.4
P003	60 × 94	30	3	11	50	70	φ4.5
HL6	28 × 61	16	2.5	6	20	33	φ2.9
J001	40 × 81.5	25	2.5	8	30	46	φ4.5
J002	40 × 96.5	25	2.5	8	30	46	φ4.5
J003	60 × 99.5	30	3	14	50	70	φ5.8

Specifications of Driver

Table 12 Driver by YASKAWA Electric Corp.

Driver type	SGDF-A2CP	SGDH-A5AE-E	SGDH-01AE-E	SGDH-02AE-E
Applicable motor code	AL6	Y027	Y028	Y029
Rated output of applicable motor	20	50	100	200
Signal feedback	Incremental encoder	Serial encoder		
Type of command pulse input	To be selected among code + pulse line, 90° 2-phase pulse, and CCW + CW pulse			
System of command pulse input	Line driver, Open collector			
Main circuit power voltage	DC24V±10%	Single phase/3-phase, 200 to 230 VAC, −15 to 10%, 50/60 Hz		
Control circuit power supply	—	Single phase, 200 to 230 VAC, −15 to 10%, 50/60 Hz		
Continuously output current	2.0	0.64	0.91	2.1
Max. output current	5.7	2.0	2.8	6.5
Ambient temperature in operation	0 to 50℃			
Ambient temperature in storage	−20 to 85℃			
Ambient humidity (use and storage)	Less than 90%RH (Keep dewdrop free)			
Mass	0.3	0.8	0.8	0.8

Table 13 Driver by Matsushita Electric Industrial Co., Ltd.

Driver type	MSDA5A5A1A	MSDA015A1A	MSDA023A1A
Applicable motor code	P001	P002	P003
Rated output of applicable motor	50	100	200
Signal feedback	Incremental encoder		
Type of command pulse input	CCW/CCW pulse signal, pulse signal/rotational direction signal, 90° phase difference signal		
System of command pulse input	Line driver, Open collector		
Main circuit power voltage	3-phase, 200 to 230 VAC, −15 to 10%, 50/60 Hz		
Control circuit power supply	3-phase, 200 to 230 VAC, −15 to 10%, 50/60 Hz		
Power supply capacity	0.3	0.3	0.5
Ambient temperature in operation	0 to 55℃ (No freezing)		
Ambient temperature in storage	−20 to 65℃ (No freezing)		
Ambient humidity (use and storage)	Less than 90%RH (No condensation)		
Mass	1.0	1.0	1.0

Table 14 Driver by Mitsubishi Electric Corp.

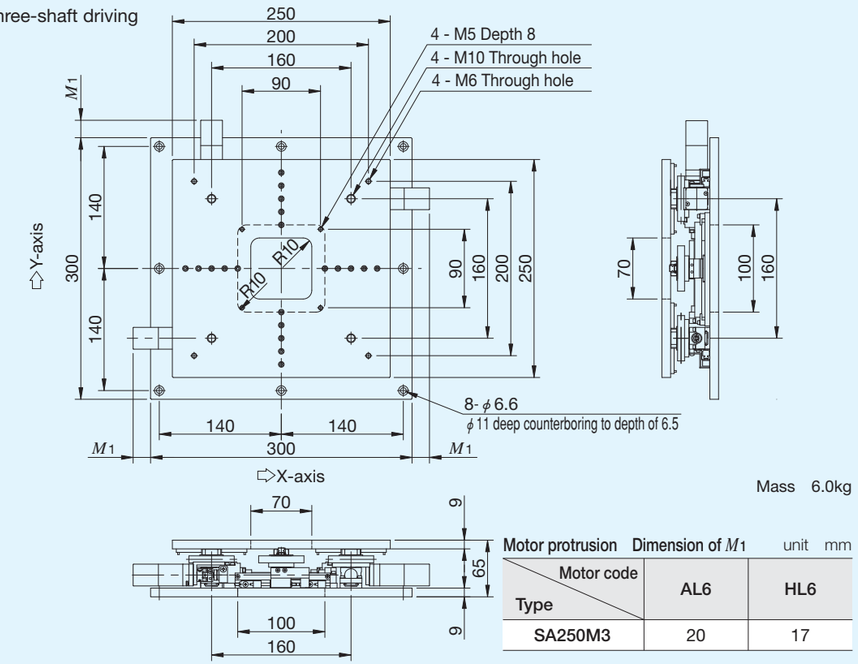
Driver type	MR-J2-03A5	MR-J2S-10A		MR-J2S-20A
Applicable motor code	HL6	J001	J002	J003
Rated output of applicable motor	20	50	100	200
Signal feedback	Incremental encoder	Absolute/Incremental sharing 17bit encoder		
Type of command pulse input	To be selected among code + pulse line, 90° 2-phase pulse, and CCW + CW pulse			
System of command pulse input	Line driver, Open collector			
Main circuit power voltage	DC21.6~30V	3-phase, 200 to 230 VAC, 50/60 Hz or single phase, 230 VAC, 50/60 Hz		
Control circuit power supply	DC24V±10%	Single phase, 200 to 230 VAC, 50/60 Hz		
Rated output current	1.6	0.83	0.71	1.1
Max. output current	4.8	2.5	2.2	3.4
Ambient temperature in operation	0 to 55℃ (No freezing)			
Ambient temperature in storage	−20 to 65℃ (No freezing)			
Ambient humidity (use and storage)	Less than 90%RH (No condensation)			
Mass	0.2	0.7		0.7

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Alignment Stage SA···M

SA250M

Specifications of three-shaft driving

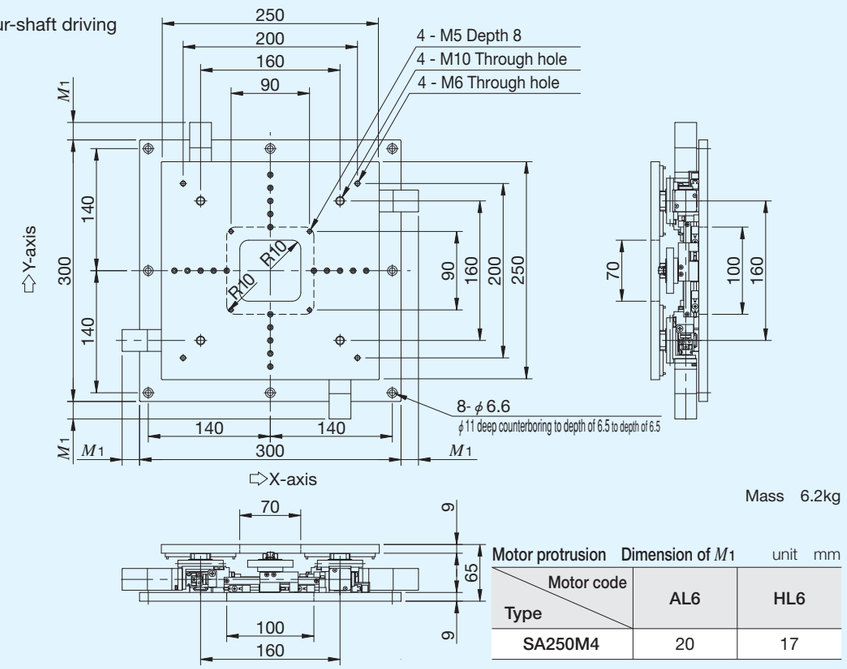


Mass 6.0kg

Motor protrusion Dimension of M_1 unit mm

Type \ Motor code	AL6	HL6
SA250M3	20	17

Specifications of four-shaft driving



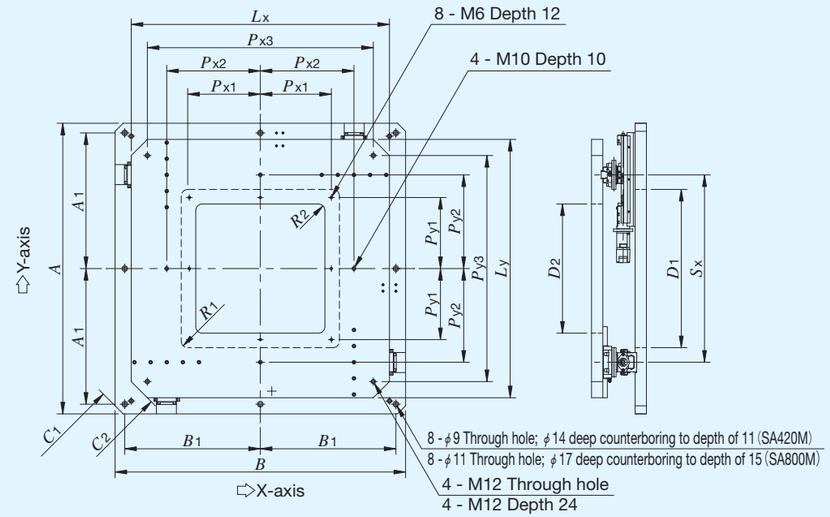
Mass 6.2kg

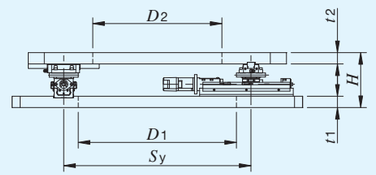
Motor protrusion Dimension of M_1 unit mm

Type \ Motor code	AL6	HL6
SA250M4	20	17

Alignment Stage SA···M

SA420M、SA800M





Mass unit kg

Size	Specification	
	3-shaft driving	4-shaft driving
SA420M	29.7	30.0
SA800M	118.5	119.4

unit mm

Size	A	B	L_x	L_y	H	t_1	t_2	D_1	D_2	C_1	C_2	R_1	R_2	S_x	S_y
SA420M	500	500	420	420	120	25	25	230	190	30	30	15	15	300	300
SA800M	900	900	800	800	170	35	35	490	400	50	25	20	20	580	580

unit mm

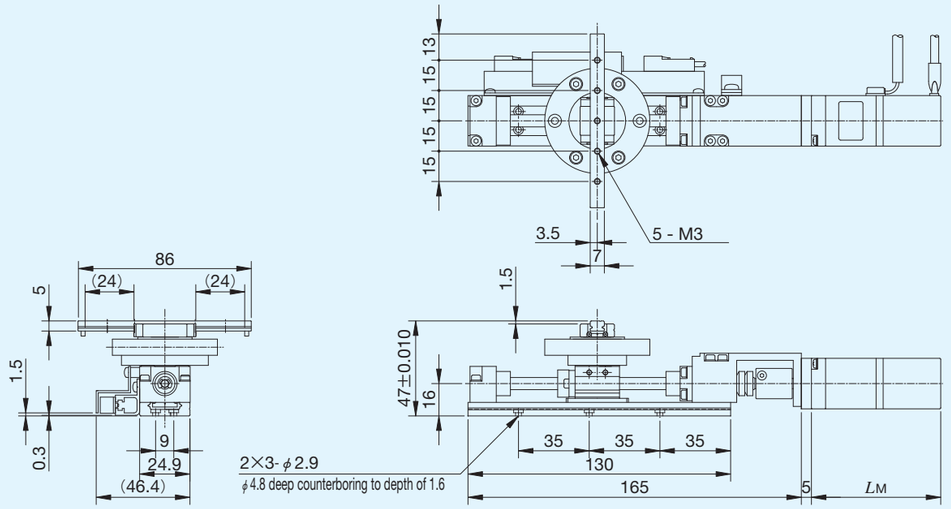
Size	A_1	B_1	P_{x1}	P_{y1}	P_{x2}	P_{y2}	P_{x3}	P_{y3}
SA420M	225	225	105	105	160	160	360	360
SA800M	420	420	220	220	300	300	700	700

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

Alignment Module AM

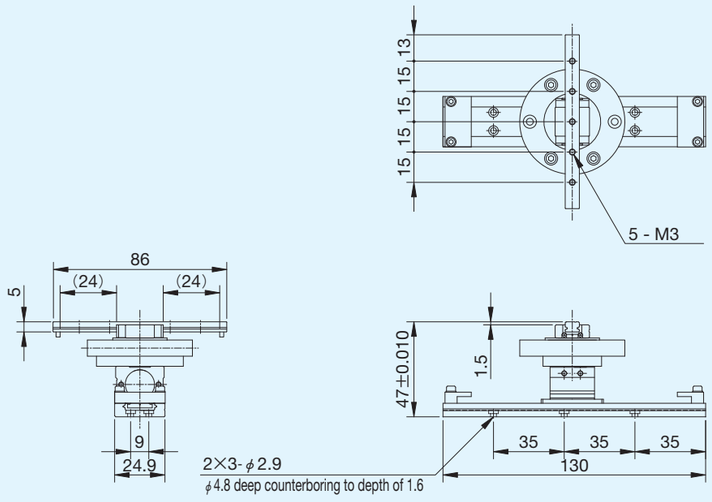
AM25

With motor and ball screw



Mass 0.6kg

Without motor nor ball screw

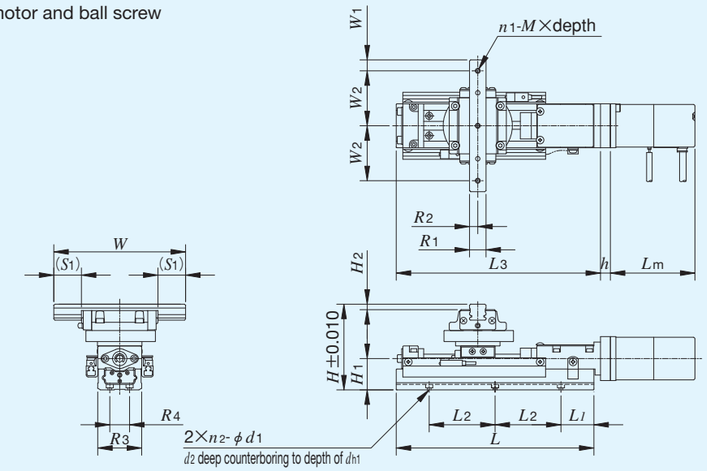


Mass 0.4kg

Alignment Module AM

AM40、AM60、AM86

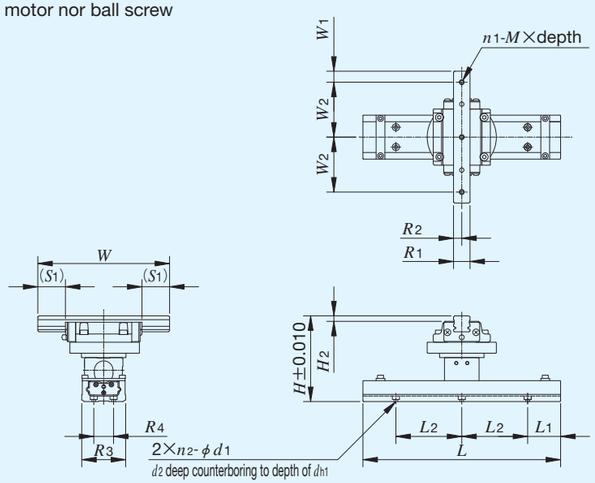
With motor and ball screw



Mass unit kg

Size	Mass
AM40	1.7
AM60	5.5
AM86	16.9

Without motor nor ball screw



Mass unit kg

Size	Mass
AM40	4.4
AM60	4.6
AM86	14.3

unit mm

Size	W	W1	W2	S1	L	L1	L2	L3	h	H	H1	H2
AM40	120	10	50	25	180	30	60	186	9	78	28.5	5
AM60	220	10	50	59	290	35	100	298	8	110	42	6
AM86	350	35	70	99	390	35	100	398	13	148	49.5	8

unit mm

Size	R1	R2	R3	R4	n1	M × depth	n2	d1	d2 deep counterboring to depth of dh1
AM40	15	7.5	40	18	3	M4 Depth 8	3	3.4	6.5 deep counterboring to depth of 3.1
AM60	23	11.5	60	28	5	M6 Depth 12	3	5.5	9.5 deep counterboring to depth of 5.4
AM86	34	17	86	46	5	M8 Depth 16	4	7	11 deep counterboring to depth of 7

1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

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