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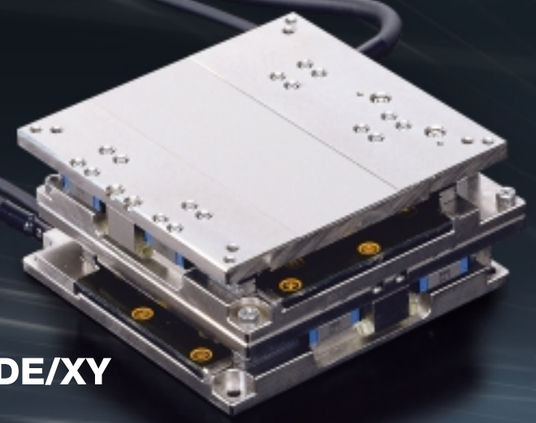
Absolute compactness and Ultra precision

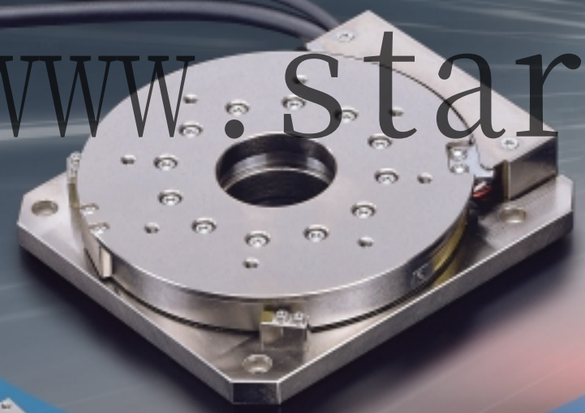
IKO Alignment Stage Direct Drive

SA···DE

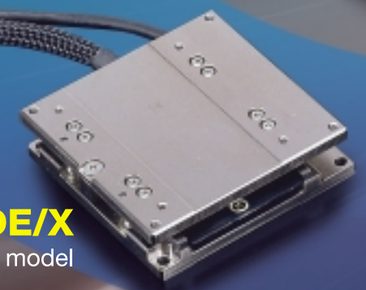


SA120DE/XY

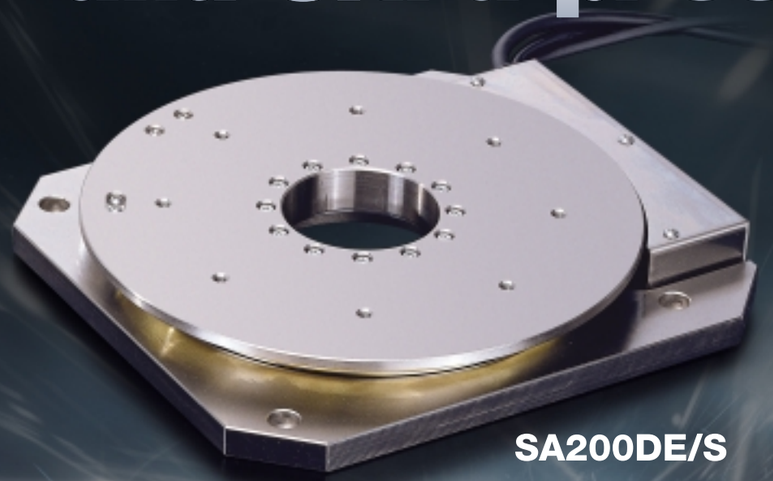
SA120DE/S



NEW
SA65DE/XS
X-θ model



NEW
SA65DE/X
X axis model



SA200DE/S

- Ultra compact size contributes space saving of your machine
- High resolution and response by full closed loop controlling with optical scale
- Flexible combination of X-Y-θ for your design

NEW
SA65DE/XYS
X-Y-θ model

X-Y-θ motion

We aim to be a Technology-Developing company taking customer-needs as primary source for development. With our original technologies and creativities, our function and performance differ from others.
We develop and implement new and high technical skills, which pursue excellent motion performances and service for your cost saving.

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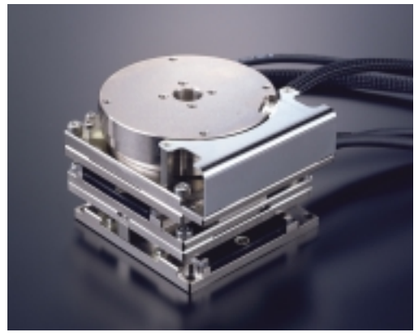
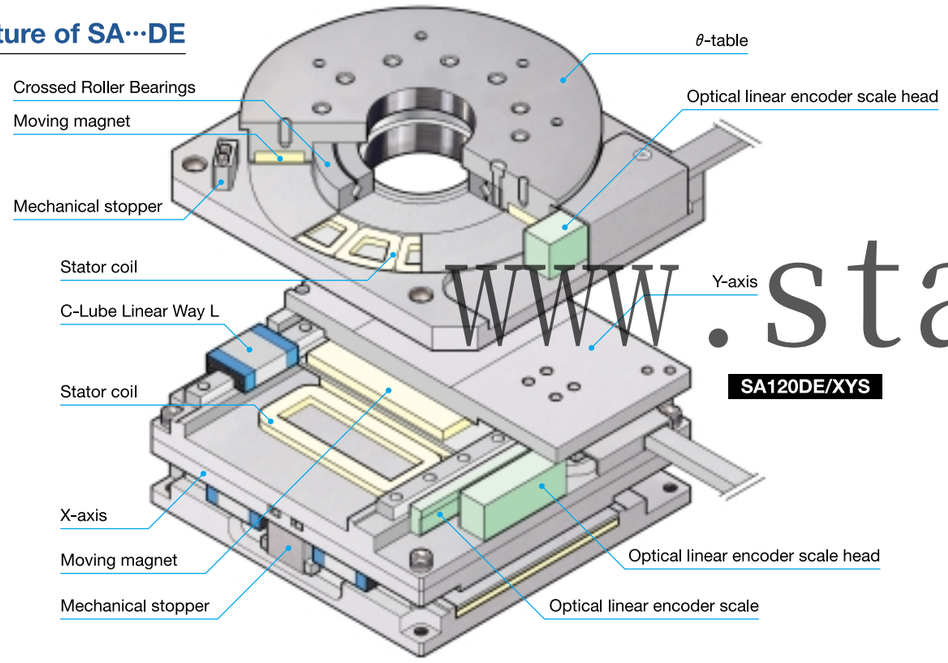
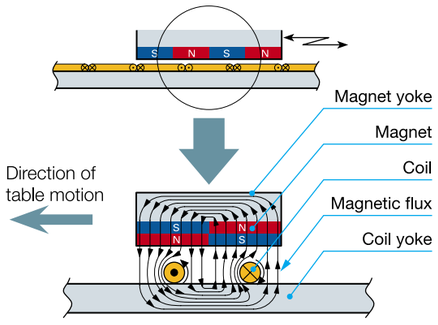
IKO Alignment Stage Direct Drive SA···DE

IKO Alignment Stage Direct Drive SA···DE is low height and ultra compact stage performing precise X-Y-θ motion.
Two sets of linear motors and miniature linear motion rolling guides are assembled perpendicularly for X-Y axis and Direct drive system together with crossed roller bearing are mounted as θ table.
High resolution and high positioning accuracy can be obtained by full closed loop controlled with optical linear scale. Single X-axis stage and θ table are specified as standard, yet other combinations are possible according to customer's application.
This is suitable for the semiconductor manufacturing process / flat panel display, alignment system by image processing control and measuring / inspection system requiring cleanliness.



Structure of SA···DE





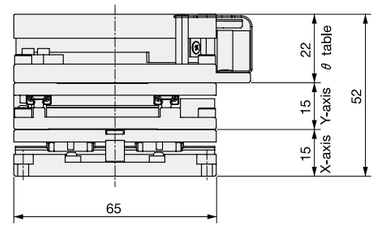
Principle of operation of SA···DE

Alignment Stage SA···DE incorporates field coils and optical linear scale sensor in the moving table, and a C-shaped yoke with a set of magnets facing to each other and an optical linear scale in the stator. As shown in the figure, a magnetic flux in the vertical direction is generated by the set of magnets facing each other. When a rotating magnetic flux is generated around the coil due to coil current, a force is applied to the coil in the horizontal direction. (Fleming's left -hand rule)
A unidirectional thrust can be continuously obtained by switching the coil current according to the vertical flux direction, so that the moving part can keep moving in one direction. Acceleration is control by current level and position is control by opposition signal from the optical linear scale for traveling and accurate positioning.

Feature of SA···DE

Ultra compact size, low height

SA65DE/1XYS



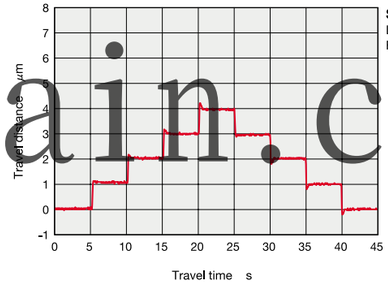
unit: mm

Due to the assembly of direct drive systems, the product provides lower height compare to that of ball screw models. Especially the height of SA65DE is the lowest with only 52mm.

High resolution and quick response

Direct drive system together with high-resolution linear encoder and full closed loop control achieves high resolution and quick response.

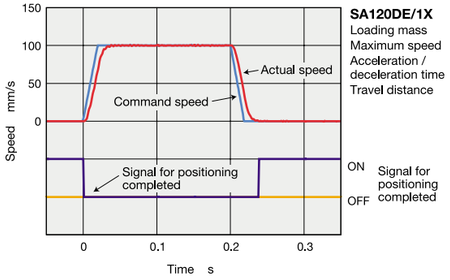
Test result for micro step feeding



SA120DE/1X
Loading mass : 1 kg
Feeding command : 1 μm

The graph shows actual traveled distance against 1 μm of feeding command.
Model: SA120DE/1X

Positioning time



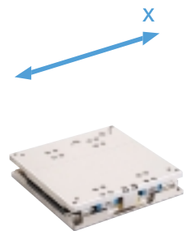
SA120DE/1X
Loading mass : 250 g
Maximum speed : 100 mm/s
Acceleration / deceleration time : 20 ms
Travel distance : 20 mm

The graph shows actual positioning time against command.
Model: SA120DE/1X

Freely combination

In SA···DE, single X-axis and θ table are lined up as standard.
Combine them and make your complex stage as you like.

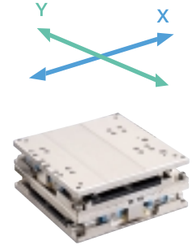
Standard



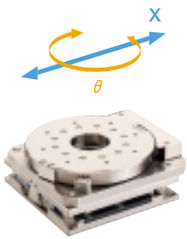
X-axis

θ table

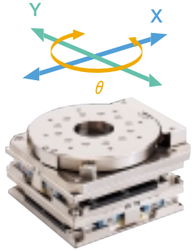
Combination



X-Y stage



X-θ stage



X-Y-θ stage

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Identification Number

Example of identification number

SA 120 DE / 5 XYS R

- ❶ Type
- ❷ Size
- ❸ Encoder interface specification
- ❹ Table structure
- ❺ Surface treatment

❶ Type	SA···DE : Alignment Stage Direct Drive	
❷ Size	65 : □ 65, φ 65 120 : □120, φ 120 200 : φ 200	
❸ Encoder interface specification	1 : 0.1 μm 5 : 0.5 μm	Resolution of encoder for X or X-Y axis is chosen.
Note : Only theta axis is required in ❹, indicating this specification is not necessary.		
❹ Table structure	X : X-axis Y : Y-axis Z : θ-table	In combination of axes, refer Table 1.

Table 1 Combination of axes

Combination		SA65DE	SA120DE	SA200DE
X	: X-axis only	○	○	—
S	: Theta axis only	○	○	○
XY	: Two axes in X and Y	○	○	—
XS	: Two axes in X and θ	○	○	
XYS	: Three axes in X, Y and θ	○	○	

❺ Surface treatment	No symbol : Electroless nickel plating R : Black chrome surface treatment	Whole surface of table and bed are treated in both specitications.

Specification and Performance

Table 2.1 Specification and performance

Item	Type	SA65DE/1X	SA65DE/5X	SA120DE/1X	SA120DE/5X
Maximum thrust(1)	N	25		70	
Rated thrust(2)	N	3.5		15	
Operative stroke length	mm	10		20	
Maximum load mass	kg	2.4		5.9	
Resolution	μm	0.1	0.5	0.1	0.5
Maximum speed(3)	m/s	0.27	0.5	0.4	0.8
Repeatability(4)	μm	±0.5			
Mass of moving part	kg	0.17		1.2	
Total mass(5)	kg	0.35		2.5	
Ambient temperature and humidity		0 to 40℃, 20 to 80%RH (No condensation)			

Note (1) The maximum holding time for the maximum thrust is 1sec.
(2) Values are applicable when table is mounted on steel made solid mounting base and ambient temperature at 20℃.
(3) If higher speed is necessary, consult IKO.
(4) The value is applicable when the temperature of table becomes stable.
(5) The mass of cord is not included.

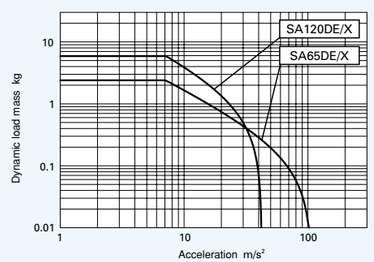
Table 2.2 Specification and performance

Item	Type	SA65DE/S	SA120DE/S	SA200DE/S
Maximum torque(1)	N・m	0.5	2.0	3.5
Rated torque(2)	N・m	0.06	0.4	1.2
Maximum load mass	kg	2.2	6.8	12.3
Operative angle	Degree	50	60	280
Resolution	Second	0.64	0.36	0.25
	Pulse/degree	5625	10000	14400
Maximum speed(3)	Degree/sec	720	400	270
Repeatability(4)	Second	±1.3	±0.8	±0.5
Inertia of moving mass	kg・m²	0.00012	0.002	0.013
Total mass(5)	kg	0.5	2	6
Ambient temperature and humidity		0 to 40℃, 20 to 80%RH (No condensation)		

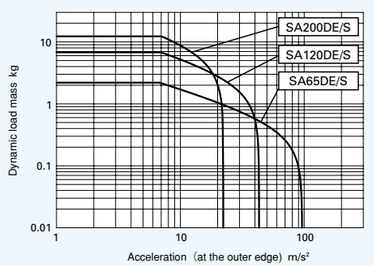
Note (1) The maximum holding time for the maximum torque is 1sec.
(2) Values are applicable when table is mounted on steel made solid mounting base and ambient temperature at 20℃.
(3) If higher speed is necessary, consult IKO.
(4) The value is applicable when the temperature of table becomes stable.
(5) The mass of cord is not included.

●Dynamic load mass

〈X (or Y) axis〉



〈θ-table〉



Remark : Dynamic load mass for θ-table is calculated as steel-made carrying cube. Acceleration is given at the outer edge of stage.

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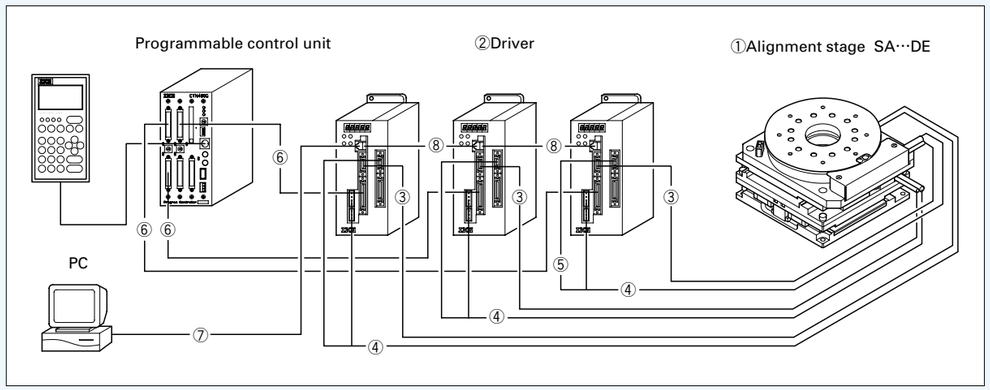
System Configuration



①Type and size	②Driver	③Encoder cord	④Motor relay cord	⑤Limit relay cord	Programmable control unit ⑥Pulse cord and limit cord	⑦RS232C connecting cord
SA 65DE/X	TDL1-1600/06L	TAE20Q4-EC	—	—	TAE10R6-LD	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9)
SA 65DE/S	TDL1-1600/06S	TAE2088-EC	—	—	TAE10R6-LD	
SA 65DE/XY	TDL1-1600/06L×2	TAE20Q4-EC×2	—	—	TAE10R6-LD×2	
SA 65DE/XS	TDL1-1600/06L + TDL1-1600/06S	TAE20Q4-EC + TAE2088-EC	—	—	TAE10R6-LD×2	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9) ×2
SA 65DE/XYS	TDL1-1600/06L×2 + TDL1-1600/06S	TAE20Q4-EC×2 + TAE2088-EC	—	—	TAE10R6-LD×3	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9) ×3
SA120DE/X	TDL1-1600/12L	TAE2088-EC	—	—	TAE10R6-LD	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9)
SA120DE/S	TDL1-1600/12S	TAE2088-EC	—	—	TAE10R6-LD	
SA120DE/XY	TDL1-1600/12L×2	TAE2088-EC×2	—	—	TAE10R6-LD×2	
SA120DE/XS	TDL1-1600/12L + TDL1-1600/12S	TAE2088-EC×2	—	—	TAE10R6-LD×2	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9) ×2
SA120DE/XYS	TDL1-1600/12L×2 + TDL1-1600/12S	TAE2088-EC×3	—	—	TAE10R6-LD×3	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9) ×3
SA200DE/S	TDL1-1600/20S	TAE2088-EC	TAE20K5-MC03	TAE10G4-LC03	TAE10R6-LD	TAE2089-RSP(Dsub25) TAE2090-RSD(Dsub 9)

Remarks : 1. Length of motor relay cord and limit relay cord is 3m.
2. Length of pulse cord and limit cord is 1.5m.
3. Length of RS232C communication code is 2m.
4. When multiple sets of SA···DE are operated simultaneously, specific cords that connect drivers are required. Consult IKO.

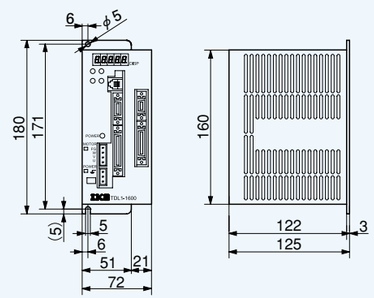
Driver

Table 3 Driver

Item \ Model	TDL1-1600(1)
Positioning command type	Pulse line input operation, RS232C communication
Pulse line input	Line driver input Maximum pulse frequency : 10MHz max (2.5MHz max for AB phases) Pulse input type: + direction/ - direction, pulse/direction, A-phase / B-phase
Sequence input	Servo ON, +direction movement disabled, - direction movement disabled, gain LOW, reset, and operation.
Sensor output	Origin, Pre-origin, + direction limit, - direction limit
Sequence output	Servo ready, completion of positioning, alarm code 0, alarm code 1, alarm code 2
Output limitation	Current feed back, overheating (motor and driver), thrust control, servo OFF, +direction movement disabled, - direction movement disabled
Main power supply	AC90～110V 50／60Hz
Instantaneous maximum current	4A
Control source	———
PWM Carrier frequency	40kHz
Parameter key	4 keys (digit selection, increment, data/parameter, and write)
Data display	LED 7-segments, output current/parameter/error code, etc.
Parameter items (non-volatile memory)	Current value, resolution, control mode, electronic gear, gain, completion of positioning, electric origin, acceleration filter, etc.
Analog monitor	2 channels (current speed and output current)
Mass	1.2kg
Ambient temperature	0～40℃
Cooling fin temperature	70℃ max(Overheat interruption type)
Vibration and shock	Vibration 0.5G, impact 5G, once

Dimension

TDL1-1600



Note(1) Economy and compact model TDL1-1601 is also available. Consult IKO if required.

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1mm=0.03937inch

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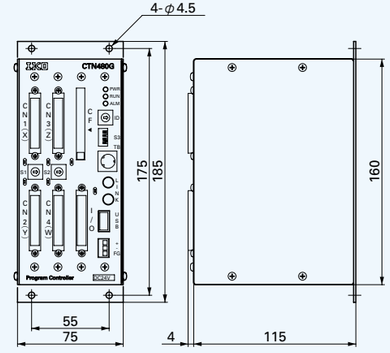
Programmable Controller CTN480G (RoHS compliance)



1. *Super-high-function that permits program inputs up to 10000 steps*
2. *High-speed pulse output up to 6M pps*
3. *4-axis linear interpolation/2-aixs circular interpolation function provided as standard.*
4. *Positional correction by linear encoder.*
5. *Program storage and transfer can be performed by CompactFlash*
6. *A system can be easily configured by incorporated I/O sequence function, timer, counter, and arithmetic function without sequencers.*
7. *USB interface is provided as standard. This permits data editing, controller operation and direct execution by PC.*
8. *Return-to-origin is not required because of prvided absolute encoder.*
9. *Simultaneous execution/stop of optional axes can be performed by the synchronous control function.*
10. *Up to 5 programs can be simultaneously executed by the multi-task function.*
11. *Positioning accuracy correction can be performed by positioning correction data previously input.*
12. *Wiring with the driver can be easily performed by the input/output function for axes.*
13. *Up to 4 controllers (16-axis control) can be connected by link connection.*

Table 4 Functions and performance

Item			CTN480G
Program specifications / Command pulse output specifications	Number of control axes		4 axes (Simultaneous execution can be performed.)
	Maximum command value		±2147483648 pulses (signed 32-bit length)
	Maximum output frequency		6Mpps
	Acceleration/Deceleration time		0 to 65.533 sec (straight line, cycloid, S-shaped acceleration/deceleration)
	Output method		CW/CCW direction pulse, direction command/normal/reverse pulse, 90° phase difference pulse
Program specifications	Input method		MDI, teaching, PC input by USB
	Command input method		Absolute command or incremental command
	Program capacity		10000 steps
	Functions		Jump, call, repetition, four operations, logical operations, speed setting, acceleration/deceleration setting, timer control, I/O control, input condition branch, various editing functions (create, erase, delete, insert, copy, etc.)
Input/output specifications	Input	Number of input points	LS input General-purpose input 16 points 20 points (The number can be extended up to 80 points.)
		Operation input	Start, stop, emergency stop, normal/reverse manual operation, return-to-origin, current position resetting, interrupt, completion of positioning, driver alarm input, etc. (Selection and allocation using parameters by general-purpose input)
		Input method	Photo coupler input (for no-voltage contact or open collector)
	Output	Number of output points	General-purpose input 20 points (The number can be extended up to 80 points.)
		Operation output	Auto operation status, limit sensor detection, emergency stop, pulse output status, completion of return-to-origin, servo ON, driver alarm resetting, proportional control, deviation counter clearing (Selection and allocation using parameters by general-purpose output)
		Output method	Open collector output (DC30V 100mA MAX)
	Power supply for inputs/outputs		For I/O DC24V 4A For limit DC24V 100mA
Other main functions			USB (data read, write, direct execution, etc.), program storage/transfer by compact flash, positional correction by linear scale, backlash correction, software limit, LS logical correction, check function (trace, I/O, LS, stop condition, etc.), 4-axis linear interpolation, 2-axis circular interpolation

Remarks : 1. The model number of the dedicated teaching box (separately available) is TAE10M5-TB.
2. Cable for USB connection shall be prepared by customer. Connector A-A type is necessary. (Refer to Fig.1)
3. Compact Flash (Type Ⅰ) shall be prepared by customer. (Refer Fig.2)
4. CompactFlash is a registered trademark of SanDisk Corporation.

Table 5 General specifications

Item	CTN480G
Supply voltage	DC24V±10%
Maximum current consumption	4.5A
Ambient temperature Ambient humidity	0 to 50℃ Storage : -10 to 60℃ 20 to 85%RH (Keep dewdrop free)
Counter measure for outage	Flash memory
Mass (Ref.)	1.2kg

Table 6 Accessories

Type	Model	Remark
I/O connector	10150-3000PE (plug)	Sumitomo 3M
	10350-52Y0-008 (cover)	
Power connector	XW4B-03B1-H1	Omron Corp. (Two pieces)
Link connector	4832.1310 (2 pieces)	Schurter AG
	CFS1/4C101J	KOA Corporation
DIN rail mounting part	DRT-1	Takachi Electric Industrial Co., Ltd.

Fig.1 USB cable (A-A type connector)

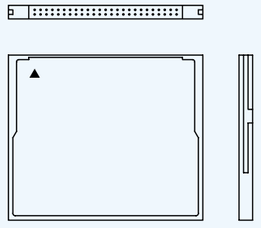


Fig.2 CompactFlash (Type Ⅰ)

Thrust and Dynamic Load Mass

■What is Effective thrust (Effective torque)?

Effective thrust is the effective value of the thrust required in a given operation pattern.
When this value exceeds the rated thrust of Nano Linear NT, the motor may overheat or seize. When using this model, calculate the effective thrust and operate within it. However, the operation limit may vary according to the operating conditions, etc.
In general, the effective thrust (F_{rms}) is obtained as follows. (For a calculation example, see page 11.)

$$F_{rms}=\sqrt{\frac{F_P^2\times t_a+(F_P-2\times F_L)^2\times t_a+F_L^2\times t_c}{t}}$$

Where, F_P is the force required for acceleration.
F_L is the force due to running resistance.
The running resistance consists of the friction of the linear motion rolling guide incorporated in Alignment stage.

■What is Dynamic load mass?

The dynamic load mass is the maximum weight that permits obtaining the required acceleration and deceleration. The acceleration and deceleration of Alignment stage becomes smaller as the weight on the stage increases.
Similarly, the acceleration and deceleration of rotation becomes smaller as the weight on the stage increases.

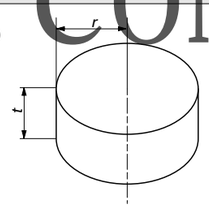
Therefore, when using this model, examine the operation pattern taking the relationship between the weight and acceleration/deceleration into consideration.

Inertia moment can be given by following formulae.

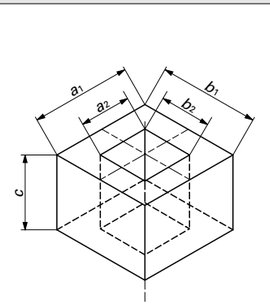
ρ : Consistency m : Mass

Cylinder

$$J_L=\frac{1}{2}\cdot\pi\cdot\rho\cdot t\cdot r^4=\frac{1}{2}\cdot m\cdot r^2$$



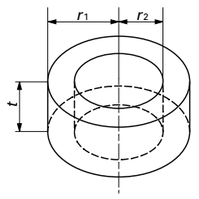
Midair square pillar



$$J_L=\frac{1}{12}\cdot\rho\cdot c\cdot(a_1^3\cdot b_1+a_1\cdot b_1^3-a_2^3\cdot b_2-a_2\cdot b_2^3)=\frac{1}{12}\cdot m\cdot\frac{(a_1^3\cdot b_1+a_1\cdot b_1^3-a_2^3\cdot b_2-a_2\cdot b_2^3)}{a_1\cdot b_1-a_2\cdot b_2}$$

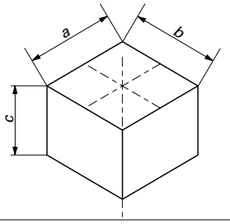
Hollow cylinder

$$J_L=\frac{1}{2}\cdot\pi\cdot\rho\cdot t\cdot(r_1^4-r_2^4)=\frac{1}{2}\cdot m\cdot(r_1^2+r_2^2)$$



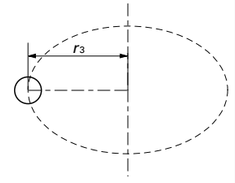
Square pillar

$$J_L=\frac{1}{12}\cdot\rho\cdot a\cdot b\cdot c\cdot(a^2+b^2)=\frac{1}{12}\cdot m\cdot(a^2+b^2)$$



Offset rotation

$J_L'=J_L+m\cdot r_3^2$
J_L' : Inertia from the rotation center
J_L : Inertia moment by rotation around the center of gravity



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Examination Example of Operation Pattern

■Calculation of acceleration/deceleration time

The thrust required for driving Alignment Stage SA···D (X or Y-axis) reaches its peak during acceleration.
The thrust required during acceleration is limited by the thrust of Alignment Stage SA···D (X or Y-axis). The limit acceleration time is therefore calculated by the following formula.

・Friction resistance of the rolling guide F_f
Use below values in each calculation
SA65DE/X：0.5N
SA120DE/X：3.0N

・Force due to running resistance F_L

$$F_L=F_f+F_c \quad [N]$$

・Force due to acceleration F_a

$$F_a=(W_L+W_T)\frac{V}{t_a} \quad [N]$$

・Thrust required for acceleration F_P

$$F_P=F_a+F_L \quad [N]$$

・Limit acceleration time t_a

$$t_a=\frac{(W_L+W_T)\cdot V\cdot k}{F_M-F_L} \quad [s]$$

where,

W_L ：Load mass kg
W_T ：Mass of the moving part kg
F_c ：Pulling resistance of the electrical cord N
F_M ：Thrust of Alignment stage N
t_a ：Acceleration time s
V ：Travel speed m/s
k ：Safety factor (1.3)

Code pulling resistance differs depending on the cord mass and pulling method. Assume an appropriate resistance value for calculation.

Similarly, required torque for θ table shall be considered in cluding the inertia by loaded mass.
Required torque becomes maximum during acceleration and it should not exceed the maximum torque of SA···D.

・Friction resistance of the rolling guide M_f
Use below values in each calculation
SA65DE/S：0.03N・m
SA120DE/S：0.1N・m
SA200DE/S：0.2N・m

・Torque due to rotation resistance M_L

$$M_L=M_f+M_c \quad [N\cdot m]$$

・Torque due to acceleration M_a

$$M_a=(J_L+J_T)\frac{R}{t_a} \quad [N\cdot m]$$

・Torque required for acceleration M_P

$$M_P=M_a+M_L \quad [N\cdot m]$$

・Limit acceleration time t_a

$$t_a=\frac{(J_L+J_T)\cdot R\cdot k}{M_M-M_L} \quad [s]$$

where,

J_L ：Inertia moment by loading mass kg·m²
J_T ：Inertia moment by moving mass kg·m²
M_c ：Pulling resistance of the electrical cord N·m
M_M ：Torque of Alignment Stage N·m
t_a ：Acceleration time s
R ：Travel speed rad/s
k ：Safety factor (1.3)

θ table does not have cord and there is no pulling resistance.
Inertia moment of loading mass can be given by the formulae on page 10.

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■Calculation example

Depending on operating ratio, the effective thrust can exceeds the rated thrust value and motor may overheated, failure and could cause injury. Calculate the effective thrust of the operation pattern in order to examine whether the desired operation can be safely performed or not.

As an examination example, operating pattern using SA120DE/XYS is shown below.
Below example of operation pattern is estimated considering limit acceleration time.

Setting items

Model			SA120DE/XYS
Loading mass		W_L	5.0kg
Inertia moment by loading mass		J_L	1.0×10^{-2}kg・m²
X-axis	Mass of moving part	W_T	5.9kg
	Travel distance	L	0.01m
	Maximum speed	V	0.1m/s
	Acceleration/deceleration time	t_a	0.05s
	Time for constant travel speed	t_c	0.05s
	Cycle time	t	0.4s
	Pulling resistance of the cord	F_c	1.0N
Y-axis	Mass of moving part	W_T	3.4kg
	Travel distance	L	0.01m
	Maximum speed	V	0.1m/s
	Acceleration/deceleration time	t_a	0.05s
	Time for constant travel speed	t_c	0.05s
	Cycle time	t	0.4s
	Pulling resistance of the cord	F_c	1.0N
θ table	Inertia moment by moving mass	J_T	2.0×10^{-3}kg・m²
	Required rotting angle	L	0.1 π rad
			18°
	Maximum speed	R	π rad/s
			180°/s
	Acceleration/ deceleration time	t_a	0.05s
	Time for constant speed	t_c	0.05s
	Cycle time	t	0.4s
	Pulling resistance of the cord	M_c	0.0N・m
Safety factor		k	1.3

STEP1 Calculation of the thrust required for X-axis acceleration

①Friction resistance of the rolling guide F_L

$$F_L=F_f+F_c$$
$$=3.0+1.0=4.0 \quad [N]$$

②Force due to acceleration F_a

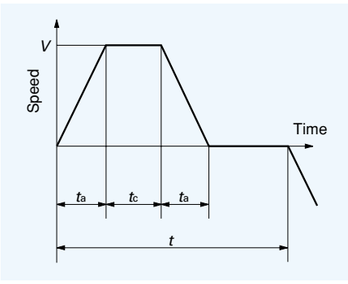
$$F_a=(W_L+W_T)\frac{V}{t_a}$$
$$=(5.0+5.9)\times\frac{0.1}{0.05}\fallingdotseq21.8 \quad [N]$$

③Thrust required for acceleration F_P

$$F_P=F_a+F_L$$
$$=21.8+4.0=25.8 \quad [N]$$

Make sure that $F_P\times1.3$ (safety factor) does not exceed the maximum thrust on page 6. If this values exceeds, re-examine the maximum speed, acceleration / deceleration time and other factors of the operation pattern. In this example, required thrust is smaller than maximum thrust as below.

Maximum thrust of SA120DE/X $F_M=70$ [N]
$F_P\times1.3$(Safety factor)$=25.8\times1.3=33.54$ [N] < F_M



STEP2 Calculation of the effective thrust for X-axis

Effective thrust F_{rms} can be determined as follows.

$$F_{rms}=\sqrt{\frac{F_P^2\times t_a+(F_P-2\times F_L)^2\times t_a+F_L^2\times t_c}{t}}$$
$$=\sqrt{\frac{25.8^2\times0.05+(25.8-2\times4.0)^2\times0.05+4.0^2\times0.05}{0.4}}$$
$$\fallingdotseq11.17 \quad [N]$$

Make sure that F_{rms} does not exceed the rated thrust. If F_{rms} exceeds rated thrust, re-examine the maximum speed, acceleration / deceleration time and other factors of the operation pattern. In this example, continuously operation is judged possible.

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

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STEP3 Calculation of the thrust and effective thrust for Y-axis acceleration

Same calculation to X-axis is needed. In case operation pattern of the Y-axis is the same as X-axis, safer condition is estimated due to light value of moving mass. (Omitted)

STEP4 Calculation of the torque for θ table acceleration

①Torque due to rotation resistance M_L

$M_L = M_f + M_c$

$= 0.1 + 0.0 = 0.1$ [N·m]

②Torque due to acceleration M_a

$$M_a = (J_L + J_T)\frac{R}{t_a}$$

$$= (0.01 + 0.002) \times \frac{\pi}{0.05} \fallingdotseq 0.754 \text{ [N·m]}$$

③Torque required for acceleration M_P

$M_P = M_a + M_L$

$= 0.754 + 0.1 = 0.854$ [N·m]

Make sure that $M_P \times 1.3$ (safety factor) does not exceed the maximum thrust on page 6. If this values exceeds, re-examine the maximum speed, acceleration / deceleration time and other factors of the operation pattern. In this example, required thrust is smaller than maximum thrust as below.

Maximum torque of SA120DE/S $M_M = 2.0$ [N·m]

$M_P \times 1.3$ (Safety factor) $= 0.854 \times 1.3 \fallingdotseq 1.11$ [N·m] < M_M

STEP5 Calculation of effective torque

Effective torque M_{rms} can be determined as follows

$$M_{rms} = \sqrt{\frac{M_P^2 \times t_a + (M_P - 2 \times M_L)^2 \times t_a + M_L^2 \times t_c}{t}}$$

$$= \sqrt{\frac{0.854^2 \times 0.05 + (0.854 - 2 \times 0.1)^2 \times 0.05 + 0.1^2 \times 0.05}{0.4}}$$

$\fallingdotseq 0.38$ [N·m]

Make sure that M_{rms} does not exceed the rated torque. If M_{rms} exceeds rated torque, re-examine the maximum speed, acceleration / deceleration time and other factors of the operation pattern. In this example, continuously operation is judged possible.

※When the position of loading mass offsets against rotating center, special attention is necessary because acceleration and deceleration of X-Y axis may become additional load to θ table operating torque.

Cautions

- ☐ Alignment Stage SA···DE is a precision device. Therefore, handle it with great care and do not apply any excessive load or strong impact on it.
- ☐ Design the system that does not apply excessive force to cables.
- ☐ Use this product in a clean environment free from water, oil, dust and other foreign matters.
- ☐ Make sure that the mounting base is free from dirt and harmful protuberances.
- ☐ The flatness of the mounting base for Alignment Stage SA···DE will affect the positioning accuracy. It must be less than 10μm.
- ☐ Alignment Stage SA···DE contains strong magnets. If a ferromagnetic body is placed close to Alignment Stage SA···DE, it may be attracted.
- ☐ The magnetic circuit inside Alignment Stage SA···DE is a closed circuit. However, a slight magnetic flux leak exists and may affect devices sensitive to magnetism located in the neighborhood. In such instances, please contact IKO.
- ☐ The linear motion rolling guide assembled in Alignment Stage SA···DE is lubricated with grease. So take extreme care not to allow dirt or any foreign matters to enter into the unit.
- ☐ Alignment Stage SA···DE is machined, assembled and adjusted with high accuracy. Accordingly, never disassemble or remodel it in any case.
- ☐ If considering to use Alignment Stage SA···DE vertically, consult IKO before designing.

◎ The appearance, specifications and other details of the products are subject to change without prior notice for improvement.

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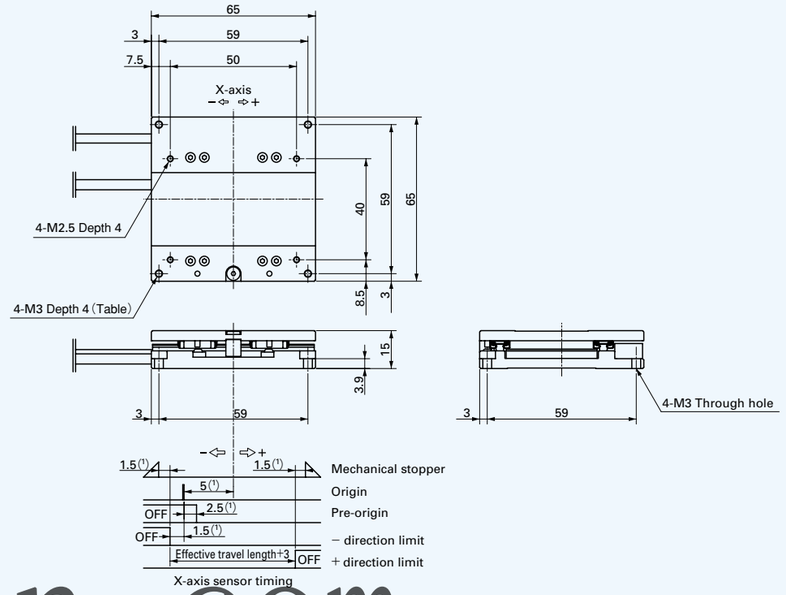
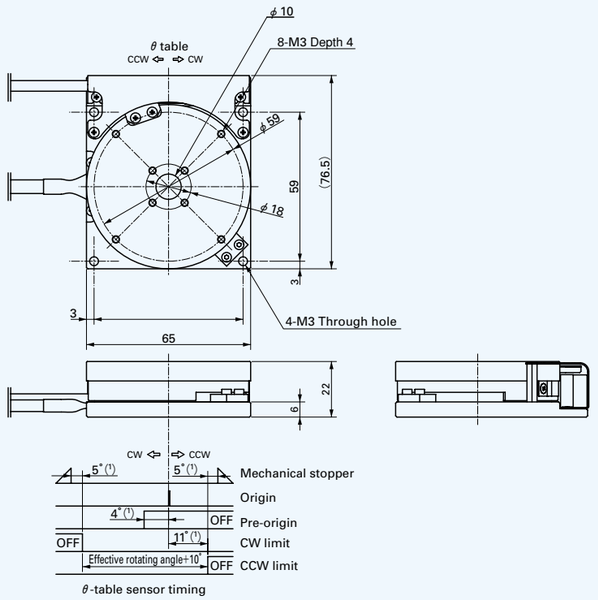
●SA65DE/X



Note(1) Values are for reference only. For detailed information, consult IKO.

●SA65DE/S



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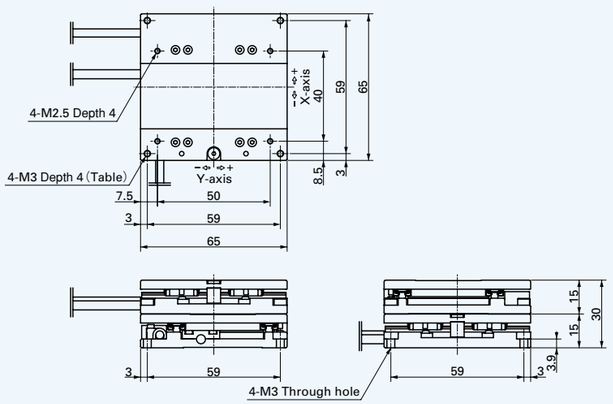
Alignment Stage SA65DE<Assembled set>

●SA65DE/XY



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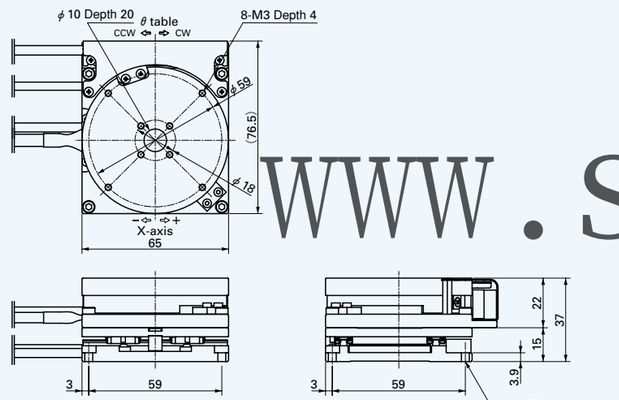

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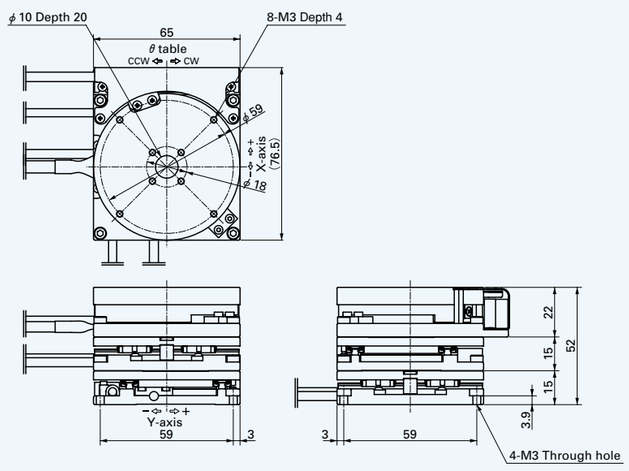
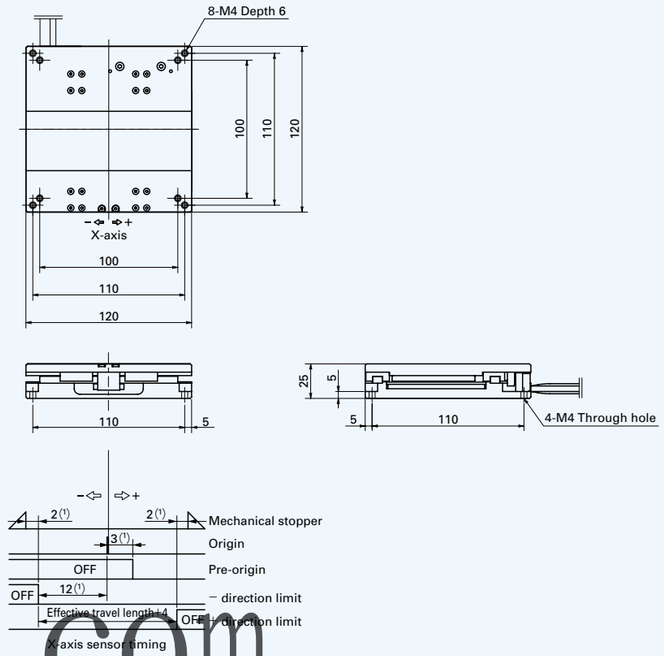


Alignment Stage SA120DE<XX-axis・θ table>

●SA120DE/X



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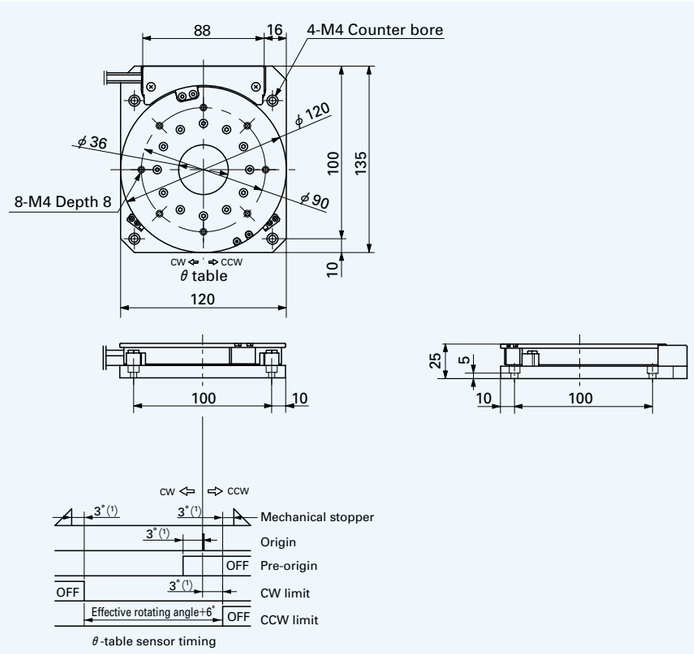
●SA120DE/S



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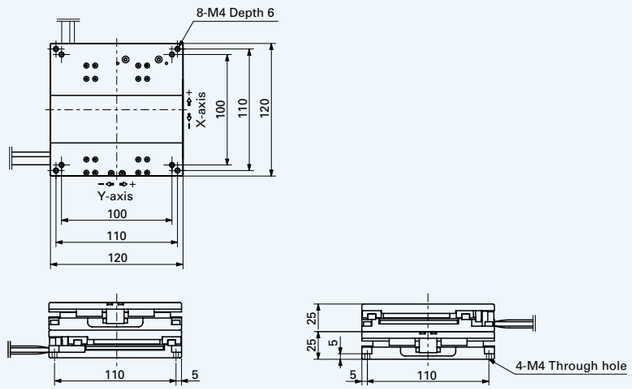
●SA120DE/XY



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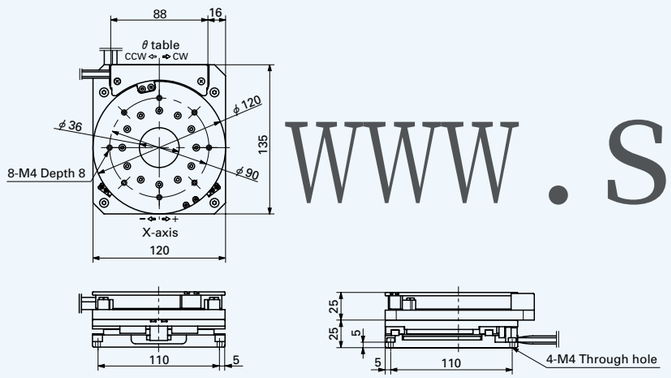

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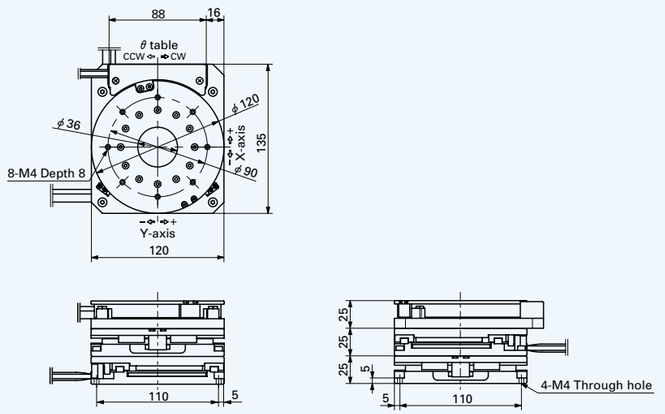
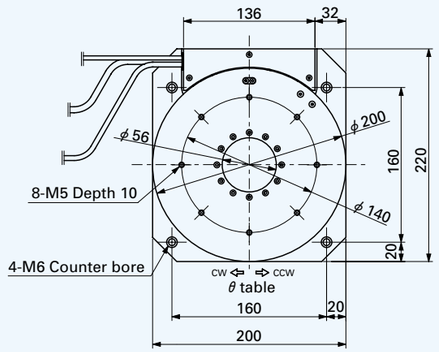
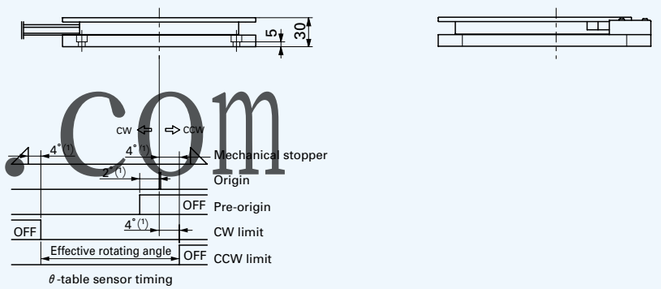


Alignment Stage　SA200DE＜θ table＞

●SA200DE/S





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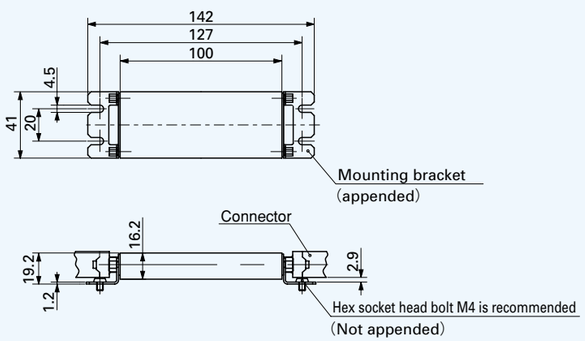
●Encoder interface



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