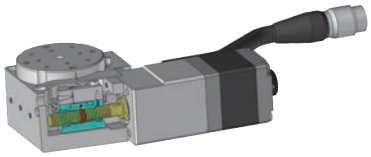
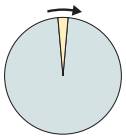
Motorized Rotary Stage Guidance

Impressive lineup of attractive products including the newest model.
Can be found the optimum stages.

Choosing an appropriate stage

Original



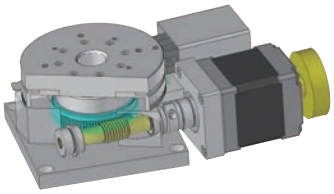


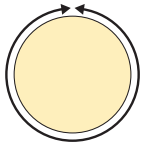
Make sure it is driven repeatedly within plus or minus 10 degree. P.1-169～

Sinemotion rotary stage: KRB04/KRB06

High durability and high speed driving with ball screws.
The optimum repeatability driving of the minute angle.

Table size	ϕ40mm	ϕ60mm



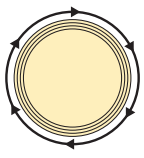


Make sure to use 360 degree rotated. P.1-177～

Worm gear type rotary stage: KRW04360C/KRW06360C-Z/KS402/KRE

The optimum positiong on the wide angle accuracy or continuous operation in 360 degree.
Transmission type would be suitable for rotating polarizing elements and organization cables.
KRE series: Thin type・Light weight・Low price P.1-025～

Table size	ϕ40mm	ϕ60mm	ϕ75mm	ϕ100mm	ϕ180mm



Make sure to use 360 degree high speed rotated.:KS451 P.1-189～

Direct drive type

Table size	ϕ39mm

The optimum rotation stages for use to rotate 360 degree with high speed.

High speed

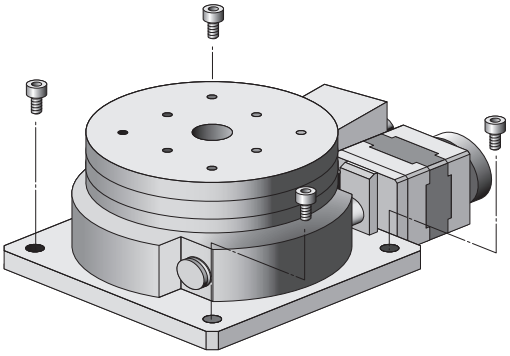
Worm gear type (～40°/sec)
Direct drive (72°/sec)
Ball bearing type (102°/sec)

How to use correetly

▽Mounting

Fix corner position with supplied screw.

* KRB04、KRB06、KRW04360、KRW06360
  KRE04360、KRE06360 are fixed in 3 position



▽About the object that mounted on upper/bottom of stage

When a stage is mounted on uneven or an object that is uneven, the stage table may deformed, and may also affeted the accuracy. [Approximate flatness: up to 10μm]

▽Position of stage mounting

All products SPEC shows must be shown flat setting condition.
Pay attention to mount such as up side down, vertical on the side and horizontal on the side.
Load capacity and accuracy might be changed by the posioning.

Load capacity or accuracy might be changed due to the mount position. Please check below table for using.
Please feel free to ask us how to best use.

▼Each positioning characteristics

Products series	Inverted and reversed	Side horizontal	Side vertical use
Sinmotion rotation stage	○	○	○
Worm gear type rotation stage	○	○	○
Direct drive type	×	×	×
KRE04360、KRE06360	×	×	×

○ : Available under limit of load or moment
× : Not available

Center of rotation

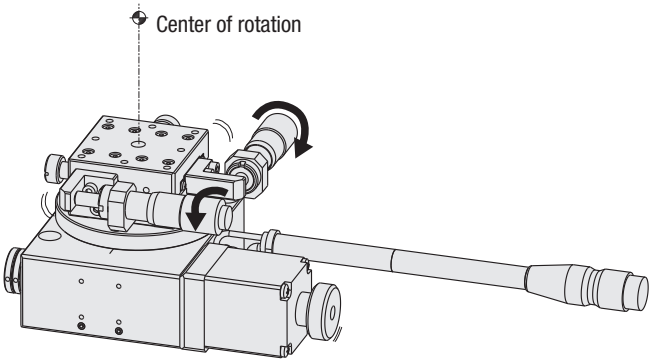
▽How to align the center of rotation

Use the full power of stages by aligned each center when mount to the other equipments.

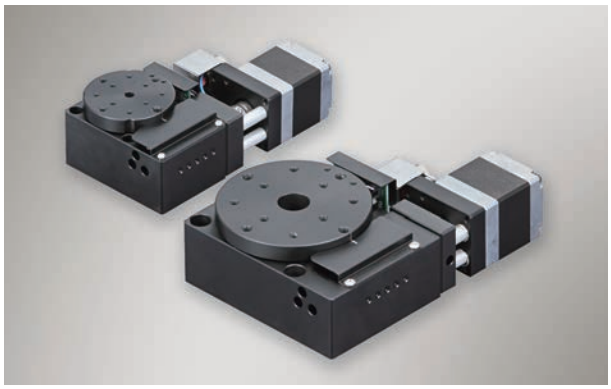
Align the center as belows.:

- Position the minimum point of eccentricity rotating the stage by using dial gauge, and then fix the work.
- Can be issued to fine tune the center with XY stages.

* There is no surface based on mounting.



Sinemotion Rotary Stage Guidance



Rotation stage with ball bearing.
It is ideal for fine angle stepping repeatability.

■Usage

- For posture controlled
- For lens or LD panel bonding

Sinmotion rotary stage guidance

■High durability type

Backlash by the abrasion was concerned about by the worm gear type when continued being driven at a microangle repeatedly.
We have succeeded in making travel mechanism a ball screw from a worm gear.

■Improvement acceleration/deceleration

Can be smooth starting and acceleration because of low friction.

■Reduce the backlash

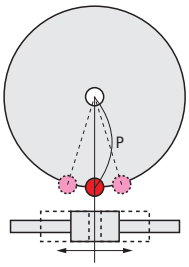
Reduce the backlash with preload mechanism.

■Travel distance and constant speed

The linear movement of a ball screw is converted into rotational movement by bearings in the stage.
(The travel distance of ball screw is not the same as the travel angle of the stage because linear movement is converted into rotational ovement).
As a result, the resolution per pulse is different between the stroke center and the end.
The rotation speed is not stable even when sending pulse signals at a constant speed.

■Equipment for calculating the travel distance

*An equation on the basis of the stroke center.
(1) Travel angle=Arcsin((Input pulse*X)/P)
(2) Input pulse=P*sin(travel distance)/X



P=Distance between supporting points
(The distance between center rotation and bearing)

■Definition

Definition	Value	Unit
Distance between supporting points P	17	mm
Ball screw lead	1	mm
Motor basic step angle	0.72	Degree
Ball screw travel length per pulse X	0.002	mm

* Distance between supporting points are different from the stage.

■Basic specification

Model	Motor basic step angle	Distance between supporting points P
KRB04017	0.72°	17mm
KRB06011	0.72°	27mm

Contact us for details of the equation.

For proper operation

▽Mounting

KRB04017: Fix 3 position with supplied screw.
KRB06011: Fix with supplied screws to 3 position of lower plate.

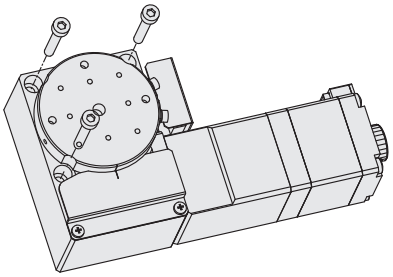
▽About the object that mounted on upper/bottom of stage.

When a stage is mounted on uneven or an object that is uneven,
the stage table may deformed, and may also affeted the accuracy.
[Approximate flatness: up to 10μm]

▽Position of stage mounting

All products SPEC shows must be shown flat setting condition.
Pay attention to mount such as up side down, vertical on the side and horizontal on the side.
Load capacity and accuracy might be changed by the posioning.
Please feel free to ask us for more information.

・KRB04017:Fit the hole of the upper table with the installation hole



Sinemotion Rotary Stage ϕ40/ϕ60: KRB04/KRB06

Rotation stage with ball bearing. It is ideal for fine angle stepping repeatability.

Freely customize the motor | Original | RoHS | CAD 2D·3D

See page P.009

Model: **KRB04017C-□**

Selection code: 1 2 | Option code: 3

1 Table size

04	ϕ40mm
06	ϕ60mm

2 Travel length

017	±8.5°
011	±5.5°

* Cannot choose 04011 and 06017.

3 Cable option

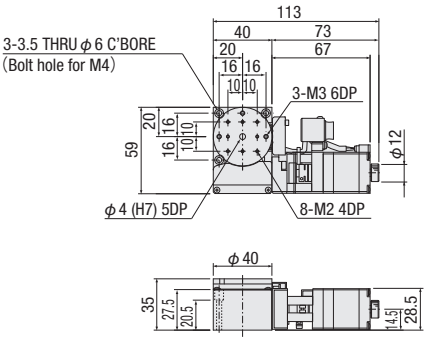
Code	Specification	Cable type
A	2m	D214-2-2E
B	2m One end loose	D214-2-2EK
C	4m	D214-2-4E
D	4m One end loose	D214-2-4EK
E	Only connector (Cable is not included)	—
F	Robot cable 2m	D214-2-2R
G	Robot cable 2m one end loose	D214-2-2RK
H	Robot cable 4m	D214-2-4R
J	Robot cable 4m one end loose	D214-2-4RK
Blank	Cable is not included(Standard)	—

* If you choose the option specification, please add the difference to standard price. Need a purchase of additional for set of axis
* One end loose position to only stage opposite side.
* See page P.1-207, 209～ for details of cable.
* Please select "Code A, C, F or H" when connect with stepping motor controller(DS102/112).

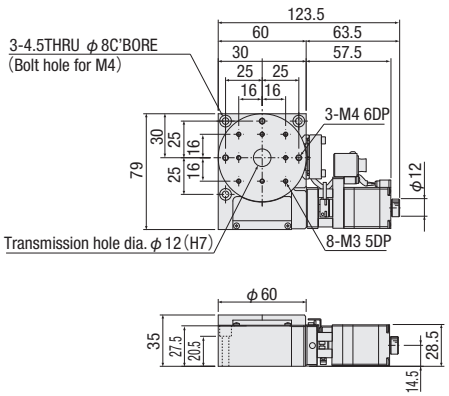
Cable P.1-207～
Electrical specification P.1-171～

Dimensional outline drawings

KRB04017C



KRB06011C



SPEC

Model		KRB04017C	KRB06011C
Mechanical specification	Travel length	±8.5°	±5.5°
	Table size	ϕ40mm	ϕ60mm
	Travel mechanism	Ball screw ϕ6 lead 1	
	Guide	Combination angular ball bearing	
	Main materials-Finishing	Aluminum—Black almite finishing	
	Weight	0.5kg	0.7kg
Accuracy specification	Resolution/Pulse	≒0.0067″(Full)	≒0.0042″(Full)
	MAX speed※	102°/sec[15kHz]	64°/sec[15kHz]
	Repeatability positioning accuracy	Within ±0.003°	
	Load capacity	4.0kgf [39.2N]	6.0kgf [58.8N]
	Moment stiffness	0.52″/N・cm	0.25″/N・cm
	Lost motion	0.003°	
	Backlash	0.01°	
	Parallelism	Within 50μm	
Sensor	Limit sensor	Installed	
	Origin sensor	—	
	Slit origin sensor	—	
Provided screw (Hexagon-headed bolt)		3 of M3—25	3 of M4—25

*See page P.1-169 if you require exact calculations.
* The MAX speed becomes the theory speed at the time of the 15kHz drive for the traveling pulse of the full stroke.

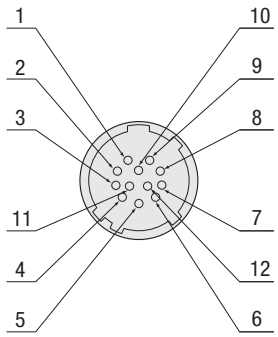
Electrical Specification: KRB04/KRB06

Electrical specification

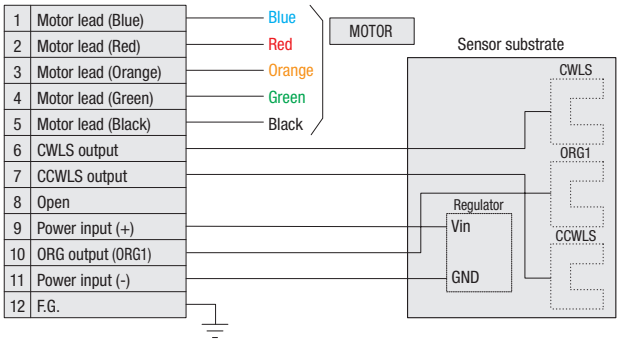
Models		KRB04017C	KRB06011C
Motor (*1)	Type	5 phase stepping motor 0.75A/Phase (Oriental Motor Co.,Ltd.)	
	Model (*2)	C005C-90215P	
	Step angle	0.72°	
Connector	Model	HR10A-10R-12P (73) (Hirose Electric Co.,Ltd.)	
	applicable connector on acceptance side	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)	
Sensor	Limit sensor	Installed	
	Origin sensor	Installed	
	Slit origin sensor	—	
	Model	Photo microsensor EE-SX4320 (Omron Co.,Ltd.)	
	Power voltage	DC5～24V±10%	
	Consumption current	30mA or less (15mA or less per 1 sensor)	
	Control output	NPN open collector output DC30V or less50mA or less Residual voltage 0.7V or less when the load current is 50mA Residual voltage 0.4V or less when the load current is 16mA	
	Output logic	On detection (light shield condition): Output transistor OFF (Non-continuity)	

*1 See page P.1-213~ for details of single motor specification.
*2 Model is our own management model.

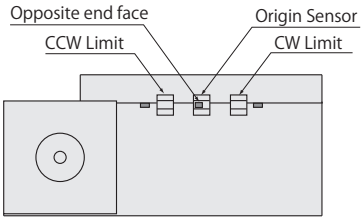
Pin allocation

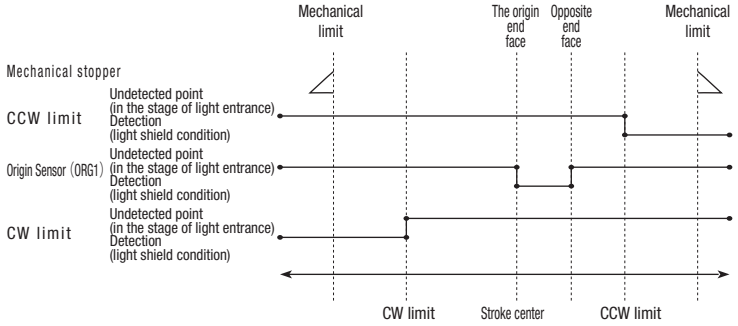


Connection diagram



Timing chart





Unit [deg.] Direction of CW ◄——————————► Direction of CCW

	Reference coordinate	CW Limit	Stroke center	Opposite end face	CCW Limit
KRB04017C	Stroke center	9.0	0	4.5	9.0
KRB06011C	Stroke center	6.0	0	2.5	6.0

* The coordinate is a basis of design value.
* Please note ±0.5 [deg.] difference.

Note: The timing chart shows only timing of sensor, it is not for output signal logic.
Refer to ON/OFF display of output transistor that shows on electrical specifications-sensor-output logic for output signal logic.
Output signal logic will be different depends on your controller.

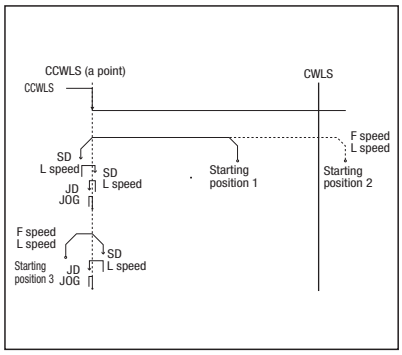
Method for return to origin

Suruga's motorized stages are different from the specification depending on the models. Therefore return to origin method other than recommendation may not be work correctly.
Set to the way of recommendation return origin when using our controller.

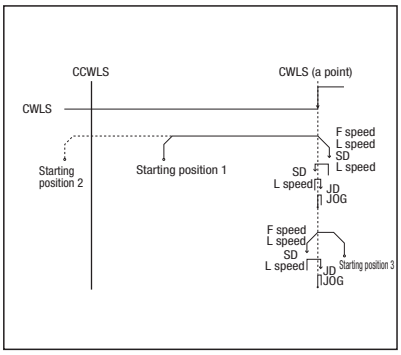
■KRB04017/KRB06011 recommended return to origin　Return to origin sequence ▶P.1-201～

Type 5: Detect in the direction of CCW and perform detected process for CW edge of CWLS signal.
Type 6: Detect in the direction of CW and perform detected process for CCW edge of CWLS signal.
Type 11: After finished type5, perform detected process for CCW edge of TIMING signal.
Type 12: After finished type6, perform detected process for CW edge of TIMING signal.

[Type3]
Detect in the direction of CCW and perform detected process for CCW edge(a point) of ORG signal.



[Type6]
Detect in the direction of CW and perform detected process for CCW edge of CWLS signal.



Adaptive driver

■ Driver ▶P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

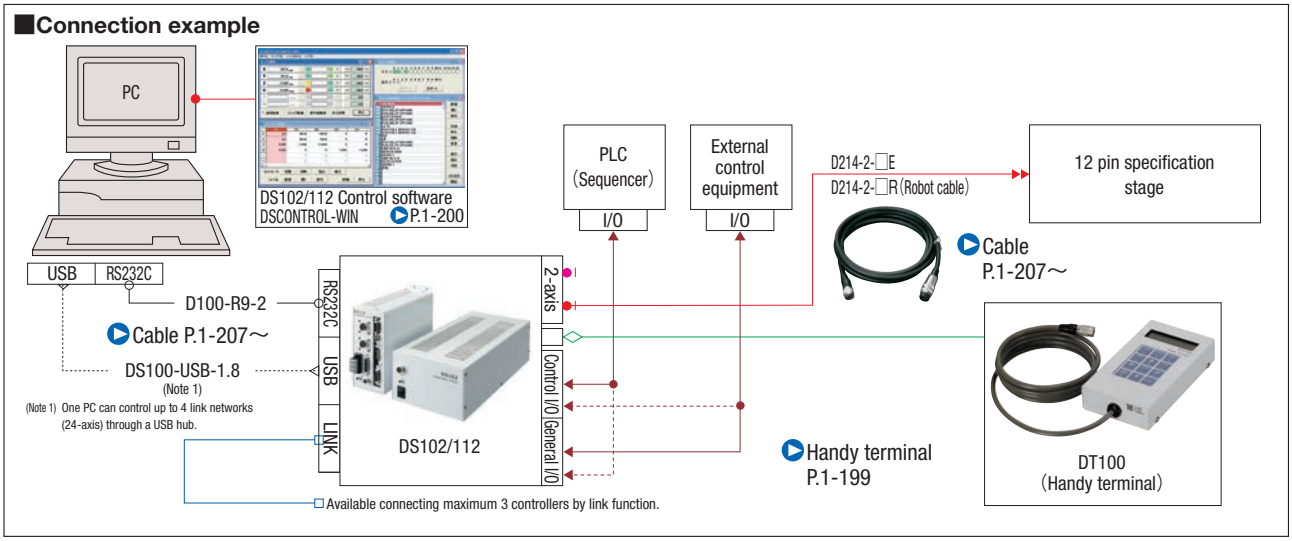
Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ Controller ▶P.1-197～

Input power	General-purpose input/ output port	Driver type	
		Full/Half	1～1/250 (16 steps)
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO

■Connection example

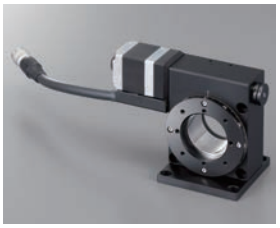


Rotary Stage ϕ39/ϕ59: KRW04/KRW06

KRW04360

KRW06360C

KRW06360C-Z



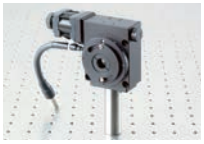
Freely customize the motor

See page P.009

RoHS

■Good for accuracy positioning at wide angle and 360°continuously rotation.
■Vertical type can be used as a cable organization and polarizing elements rotation.

■Available for motorized polarizer with adaptor.
FPW06360C P.3-103



■Low price motorized rotation stage KRE series line up
P.1-177～

Model: **KRW** | Selection code: **04360-** | Option code: □□ (1 2 3 4)

Cable P.1-207～
Electrical specification P.1-175～

1 Table size

04	ϕ40mm
06	ϕ60mm

2 Travel length

360	360°

※Table size code 06: 360C

3 Mounting

Code	Specification
Blank	Horizon
Z	Vertical

* Z is only for KRW06.

4 Cable option

Code	Specification	Cable type
A	2m	D214-2-2E
B	2m One end loose	D214-2-2EK
C	4m	D214-2-4E
D	4m One end loose	D214-2-4EK
E	Only connector (Cable is not included)	—
F	Robot cable 2m	D214-2-2R
G	Robot cable 2m one end loose	D214-2-2RK
H	Robot cable 4m	D214-2-4R
J	Robot cable 4m one end loose	D214-2-4RK
Blank	Cable is not included (Standard)	—

* One end loose position to only stage opposite side.
* If you choose the option specification, please add the difference to standard price.
* See page P.1-207, 209～ for details of cable.
* Please select "Code A, C, F or H" when connect with stepping motor controller(DS102/112).

Selection Example

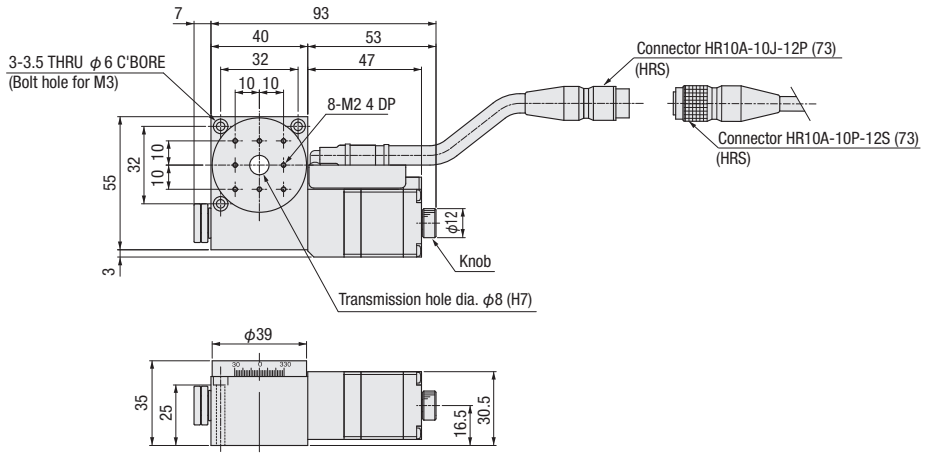
Your spec	Table size	+	Attached cable	▷
	ϕ59mm		4m one end loose	**KRW06360-D**

SPEC

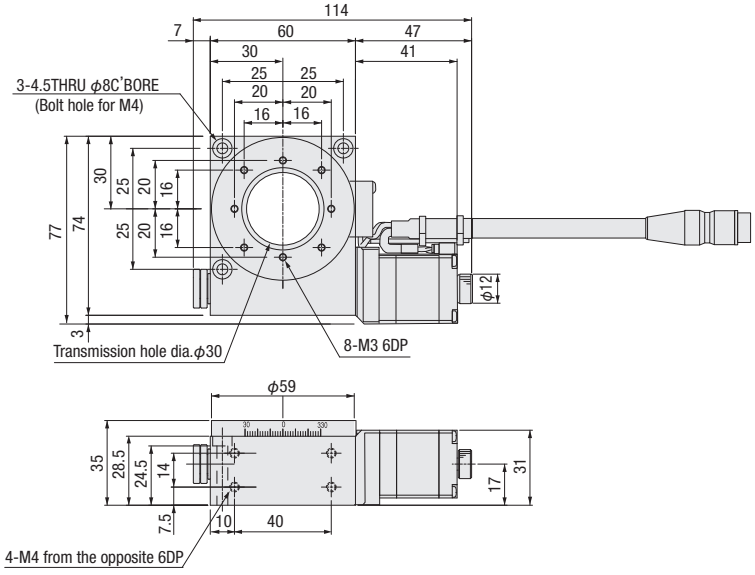
Model		KRW04360	KRW06360C	KRW06360C-Z
Mechanical specification	Travel length	360°		
	Table size	ϕ39mm	ϕ59mm	
	Travel mechanism (Reduction ratio)	Worm gear (Reduction ratio 1/120)	Worm gear (Reduction ratio 1/180)	
	Guide	Deep groove ball bearing		
	Main materials-Finishing	Aluminum—Black almite finishing		
	Weight	0.4kg	0.6kg	0.7kg
Accuracy specification	Resolution/Pulse	0.006° (Full)	0.004° (Full)	
	MAX speed	30°/sec [5kHz]	20°/sec [5kHz]	
	Positioning accuracy	Within 0.05°		
	Repeatability positioning accuracy	Within ±0.01°		
	Load capacity	3.0kgf [29.4N]		1.0kgf [9.8N]
	Moment stiffness	0.74″/N・cm	0.84″/N・cm	
	Lost motion	Within 0.05°		
	Backlash	Within 0.1degree	Within 0.05°	
	Parallelism	Within 50μm		
	Eccentricity	Within 5μm		
	Runout	Within 30μm		
Sensor	Limit sensor	—		
	Origin sensor	Installed		
	Slit origin sensor	—		
Provided screw (Hexagon-headed bolt)		3 of M3—30	3 of M4—30	4 of M4—6

Dimensional outline drawings

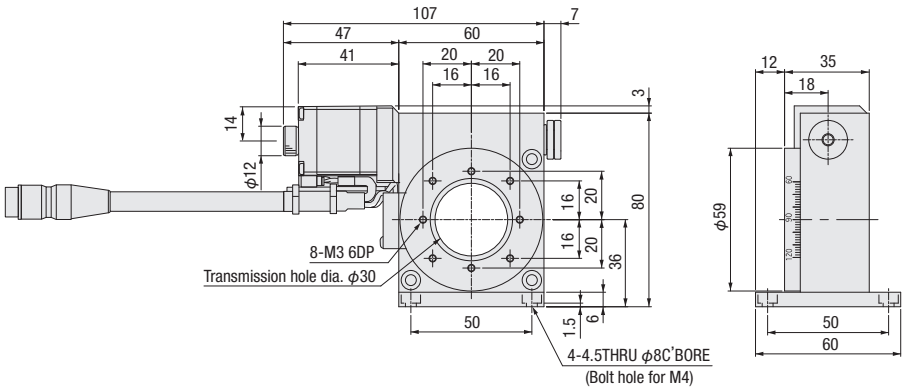
KRW04360



KRW06360C



KRW06360C-Z



Electrical Specification: KRW04/KRW06

Electrical specification

Models		KRW04360	KRW06360C	KRW06360C-Z
Motor (*1)	Type	5 phase stepping motor 0.75A/Phase (Oriental Motor Co.,Ltd.)		
	Model (*2)	C005C-90215P		
	Step angle	0.72°		
Connector	Model	HR10A-10J-12P (73) (Hirose Electric Co.,Ltd.)		
	applicable connector on acceptance side	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)		
Sensor	Limit sensor	—		
	Origin sensor	Installed		
	Slit origin sensor	—		
	Model	Photo microsensor EE-SX4320 (Omuron Co.,Ltd.)		
	Power voltage	DC5～24V ±10%		
	Consumption current	35mA or less		
	Control output	NPN open collector output DC5～24V 8mA or less Residual voltage 0.3V or less when the load current is 2mA		
	Output logic	On detection (light shield condition): Output transistor OFF (Non-continuity)		

*1 See page P.1-213～ for details of single motor specification. *2 Model is our own management model.

Available sensor DC5V~24V.

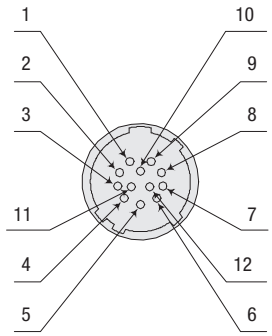
This stages have DC5V~24V correspondence sensor. 24V correspondence sensor amplifier substrateK-PCBA24 is not necessary.

It used to require the K-PCBA24 when the former products are drived by use of a motion control board or programable logic controller (PLC) without our controller.

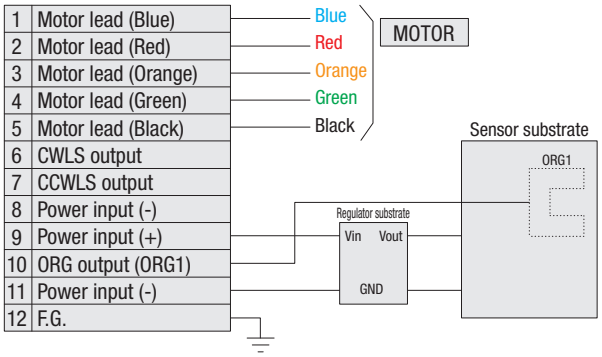
Note

Must be wired without sensor amplifier substrate when our customer who uses the former stages KS401-40, -60, KS431-60 and amplifier substrates will be replaced with KRW stages.
We have avariety of harness that can be jumped between input and output connector of sensor amplifier substrate for taking advantage of existing cables that using sensor amplifier substrate.

Pin allocation



Connection diagram



Timing chart

KRW04360/KRW06360C

Origin・・・Detect in scale 0 (Dark)
(Return to origin is performed type 4 of returning origin by use of DS102/DS112 controller)

	Origin detected scale position [°]
KRW04360	0 (The end face of the origin: The end face of the origin:CCW side edge of shield plate) 11 (Opposite end face : Opposite side of the end face: CW side edge of shield plate)
KRW06360C	0 (The end face of the origin: The end face of the origin:CCW side edge of shield plate) 9 (Opposite end face : Opposite side of the end face: CW side edge of shield plate)

Note: The direction of CW/CCW in timing chart shows motor rotation. Upper plate rotation in CW as below.
KRW04360: CW KRW06360: CW

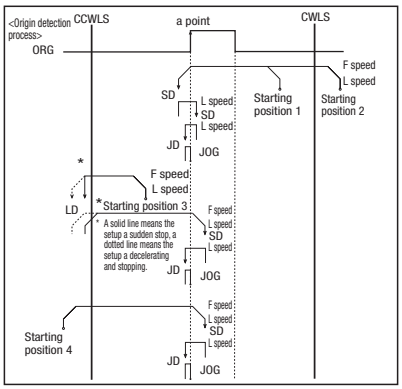
Method for return to origin

Suruga's motorized stages are different from the specification depending on the models.
Therefore return to origin method other than recommendation may not be work correctly.
Set to the way of recommendation return origin when using our controller.

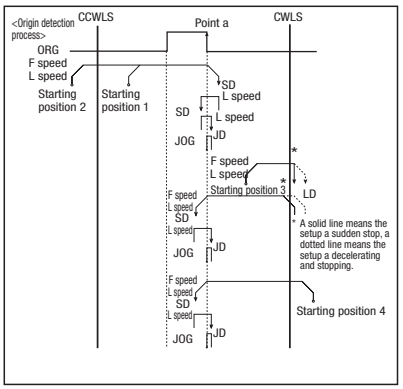
■KRW04360/KRW06360C recommended return to origin　Return to origin sequence ▶P.1-201～

Type 3: Detect in the direction of CCW and perform detected process for CCW edge(a point) of ORG signal.
Type 4: Detect in the direction of CW and perform detected process for CW edge of ORG signal.
Type 9: After finished Type3, perform detected process for CCW edge of TIMING signal.
Type 10: After finished Type4, perform detected process for CW edge of TIMING signal.

[Type3] Detect in the direction of CCW and perform detected process for CCW edge (a point) of ORG signal.



[Type4] Detect in the direction of CW and perform detected process for CW edge of ORG signal.



Adaptive driver

■ Driver ▶P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

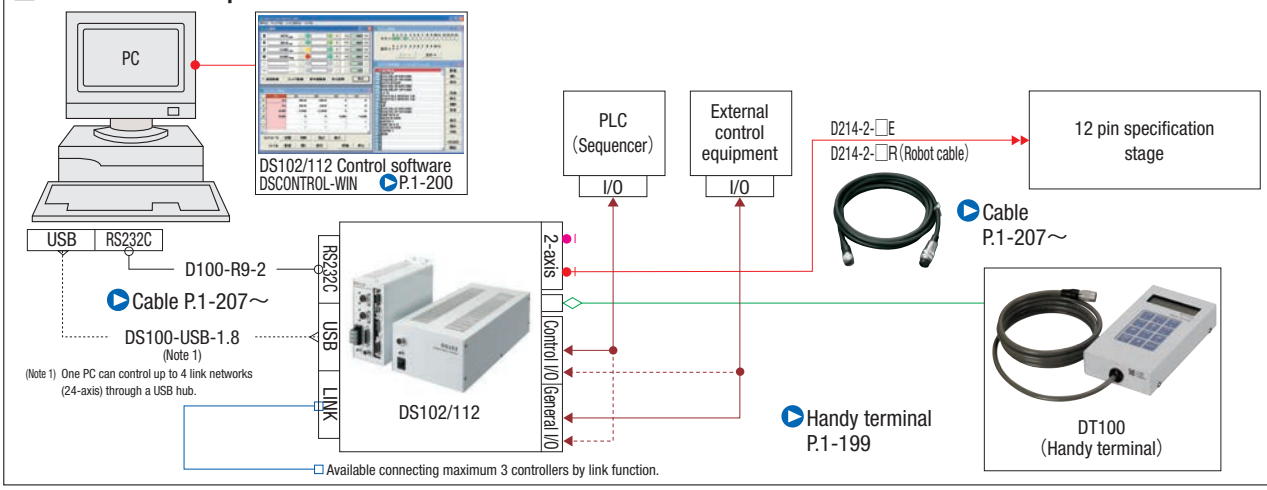
Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ Controller ▶P.1-197～

Input power	General-purpose input/ output port	Driver type	
		Full/Half	1～1/250 (16 steps)
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO

■Connection example



Rotary Stage: KRE04360/KRE06360

KRE04360

KRE06360

RoHS

* The photo shows an image.
The holes and the shape may differ in certain respects from the actual product.

Model: KRE04360-C□

Selection code: 1 — Option code: 2

Cable P.1-207～
Electrical specification P.1-179～

1 Table size

04	ϕ39mm
06	ϕ60mm

2 Cable option

Code	Specification	Cable type
F	Robot cable 2m	D214-2-2R
G	Robot cable 2m one end loose	D214-2-2RK
H	Robot cable 4m	D214-2-4R
J	Robot cable 4m one end loose	D214-2-4RK
Blank	Cable is not included (Standard)	—

* If you choose the option specification, please add the difference to standard price.
Electrical specification P.1-179～
* See page P.1-207, 209～ for details of cable.
* Please select "Code F or H" when connect with stepping motor controller(DS102/112).

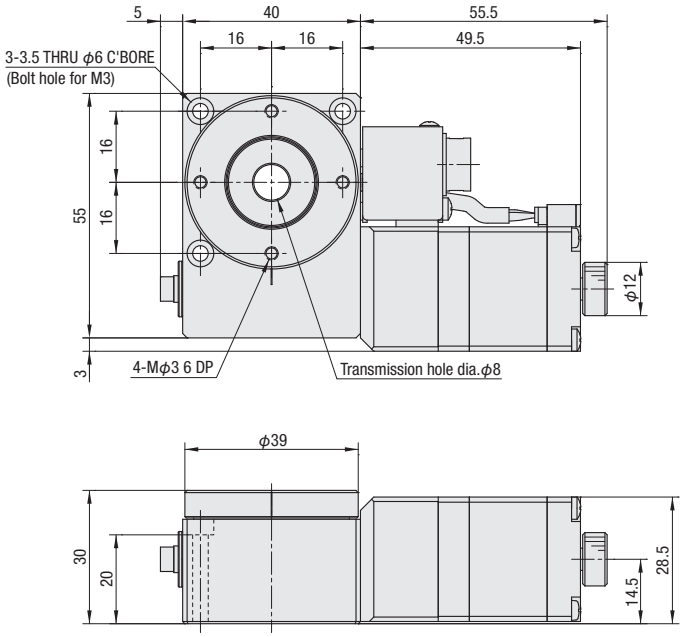
SPEC

Model		KRE04360-C	KRE06360-C
Mechanical specification	Travel length	360°	
	Table size	ϕ39mm	ϕ60mm
	Travel mechanism (Reduction ratio)	Worm gear (Reduction ratio 1/90)	Worm gear (Reduction ratio 1/120)
	Guide	Deep groove ball bearing	
	Main materials-Finishing	Aluminum—Black almite finishing	
	Weight	0.36kg	0.50kg
Accuracy specification	Resolution (Pulse)	0.008°(Full)	0.006°(Full)
	MAX speed	40°/sec	30°/sec
	Positioning accuracy	Within 0.1degree	
	Repeatability positioning accuracy	Within ±0.05°	
	Load capacity	3kgf [29.4N]	
	Lost motion	Within 0.1degree	
	Parallelism	Within 50μm	
Sensor	Limit sensor	—	
	Origin sensor	Installed	
Provided screw (Hexagon-headed bolt)		3 of M3—25	3 of M4—12

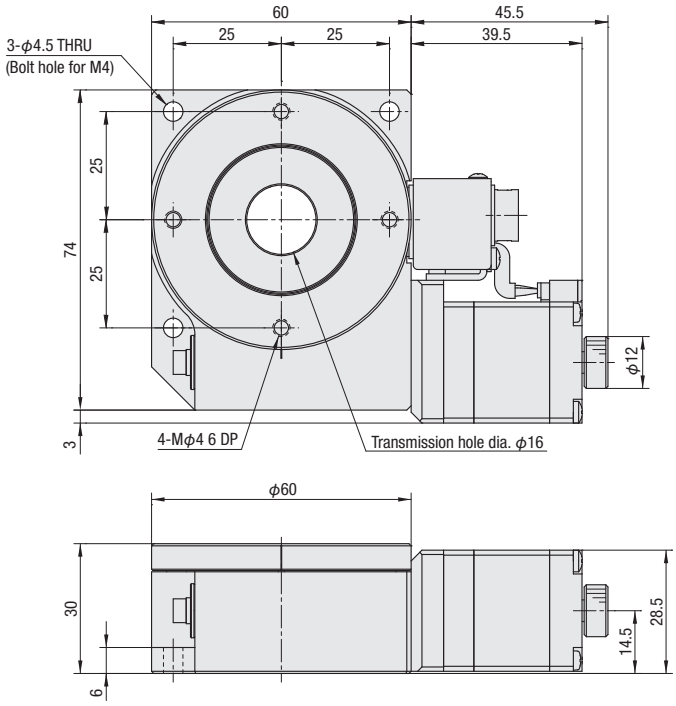
SURUGA SEIKI CAD 3D·2D

Dimensional outline drawings

KRE04360



KRE06360



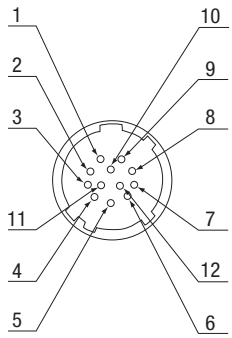
Electrical Specification: KRE04360/KRE06360

Electrical specification

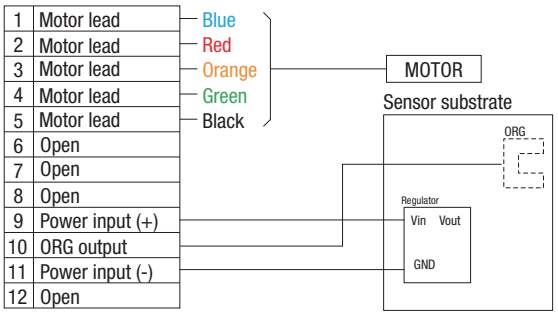
Models		KRE04360-C	KRE06360-C
Motor (*1)	Type	5 phase stepping motor 0.75A/Phase	
	Maker	Oriental Motor Co.,Ltd.	
	Model (*2)	C005C-90215P	
	Step angle	0.72°	
Connector	Model	HR10A-10R-12PC (71) (Hirose Electric Co.,Ltd.)	
	Receiving connector	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)	
Sensor	Origin sensor	Installed	
	Model	Photo microsensor EE-SX4320 (Omuron Co.,Ltd.)	
	Power voltage	DC5～24V ±10%	
	Consumption current	35mA or less	
	Control output	NPN open collector output DC5~24V 8mA or less Residual voltage 0.3V or less when the load current is 2mA	
	Output logic	On detection (light shield condition): Output transistor OFF (Non-continuity)	

*1 See page ▶P.1-213~ for details of single motor specification.
*2 Model is our own management model.

Pin allocation



Connection diagram



* When use DS102/DS112 controller, setup the sensor logic as below.
• Limit sensor logic: A (N.O.)
• Origin sensor logic: B (N.C.)

Timing chart

Unit [°]

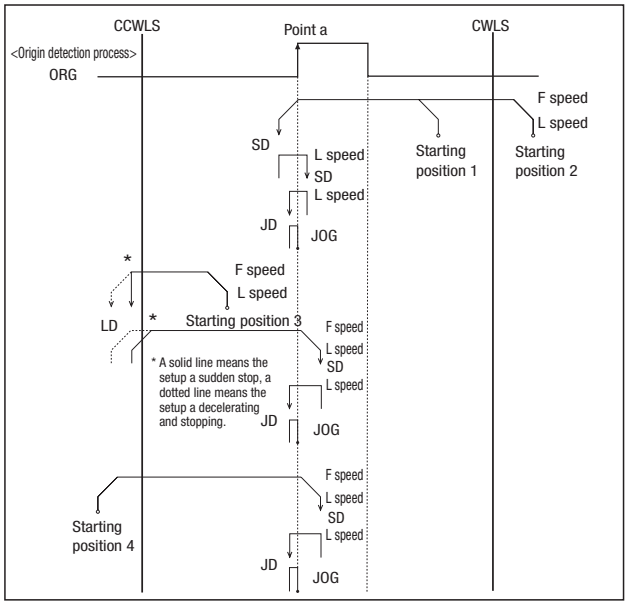
	Origin detected scale position [°]
KRE04360	0 (The end face of the origin: CCW side edge of the douser.) 6 (Opposite side of the end face: CW side edge of the douser.)
KRE06360	0 (The end face of the origin: CCW side edge of the douser.) 4 (Opposite side of the end face: CW side edge of the douser.)

* Return to origin means that is performed return to origin type 4 using DS102/DS112 series.
* The coordinate value should be on the design. Dimension error may occur about plus or minus 0.5 deg.

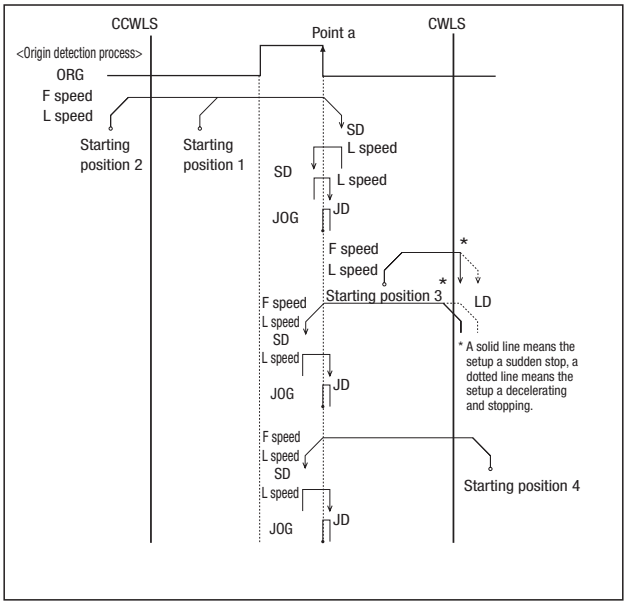
KRE series recommendation return to origin method

Suruga's motorized stages are different from the specification depending on the models. Therefore return to origin method other than recommendation may not be work correctly. Set to the way of recommendation return origin when using our controller.

[Type3] Detect in the direction of CCW and perform detected process for CCW edge (a point) of ORG signal.



[Type4] Detect in the direction of CW and perform detected process for CW edge of ORG signal.



[Type9] After finished Type3, perform detected process for CCW edge of TIMING signal.

[Typ10] After finished Type4, perform detected process for CW edge of TIMING signal.

Return to origin sequence P.1-201～

Adaptive driver

■ **Driver** P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ **Controller** P.1-197～

Input power	General-purpose input/output port	Driver type (Divisions)	
		Normal (Full/Half)	Micro step (1~1/250 [16 steps])
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO

DS112/102

Rotary Stage φ75/φ100/φ180: KS402

RoHS

■Good for accuracy possitioning at wide angle and 360°continuously rotation.

■Transmission type would be suitable for rotating polarizing elements and organization cables.

Model

KS402-□-5

(□: Selection code 1, 5: Option code 2)

Cable P.1-207～
Electrical specification P.1-183～

1 Table size

75	φ75mm
100	φ100mm
180	φ180mm

2 Cable option

Code	Specification	Cable type
Blank	2m	D214-2-2E
1	2m One end loose	D214-2-2EK
2	4m	D214-2-4E
3	4m One end loose	D214-2-4EK
4	Only connector (Cable is not included)	—
5	Cable is not included (Standard)	—
6	Robot cable 2m	D214-2-2R
7	Robot cable 4m	D214-2-4R
8	Robot cable 4m one end loose	D214-2-4RK
9	Robot cable 2m one end loose	D214-2-2RK

* If you choose the option specification, please add the difference to standard price.
* See page P.1-207, 209～ for details of cable.
* Please select "blank, 2, 6 and 7" when connect with stepping motor controller(DS102/112).

Selection Example

Your spec	Table size	+	Attached cable	▷ KS402-100-5
	φ100mm		2m	

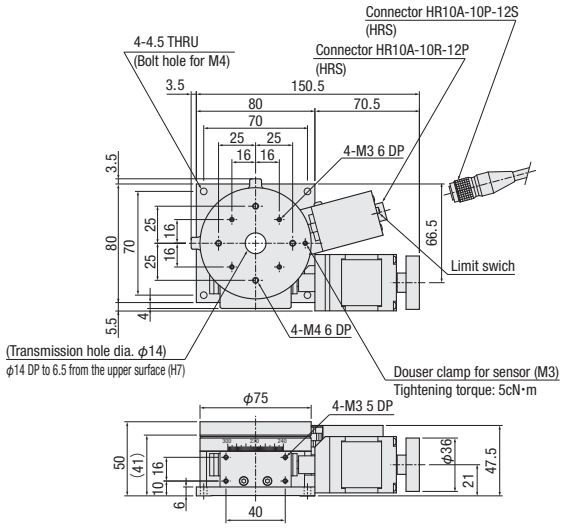
SPEC

Model		KS402-75-5	KS402-100-5	KS402-180-5
Mechanical specification	Travel length	360°		360°
	Table size	φ75mm	φ100mm	φ180mm
	Travel mechanism (Reduction ratio)	Worm gear (1/144)	Worm gear (1/180)	Worm gear (1/180)
	Guide	Receiving cross roller axis	Combination angular ball bearing	Combination angular ball bearing
	Main materials-Finishing	Aluminum—Black almite finishing		
	Weight	1.1kg	2.5kg	9.7kg
Accuracy specification	Resolution	0.0025°/Pulse (Full)	0.004°/Pulse (Full)	0.004°/Pulse (Full)
	MAX speed	25°/sec[10kHz]	20°/sec[5kHz]	20°/sec[5kHz]
	Positioning accuracy	Within 0.03°		Within 0.05°
	Repeatability positioning accuracy	Within ±0.005°		Within ±0.005°
	Load capacity	10kgf [98N]	15kgf [147N]	30kgf [294N]
	Moment stiffness	0.15″/N・cm	0.07″/N・cm	0.02″/N・cm
	Lost motion	Within 0.005°	Within 0.004°	Within 0.01°
	Backlash	Within 0.005°	Within 0.004°	Within 0.01°
	Parallelism	Within 120μm		Within 100μm
	Eccentricity	Within 5μm		
	Runout	Within 20μm		Within 60μm
Sensor	Limit sensor	Installed (Switch)		Installed (Switch)
	Origin sensor	Installed		
	Proximity origin sensor	—		
Provided screw (Hexagon-headed bolt)		4 of M4—10	4 of M6—16	4 of M6—12

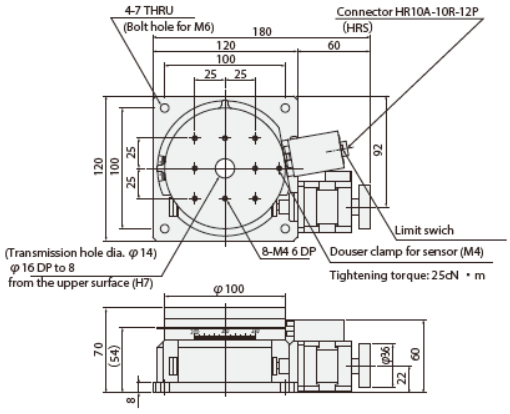
* Model □ an unsupported RoHS.

Dimensional outline drawings

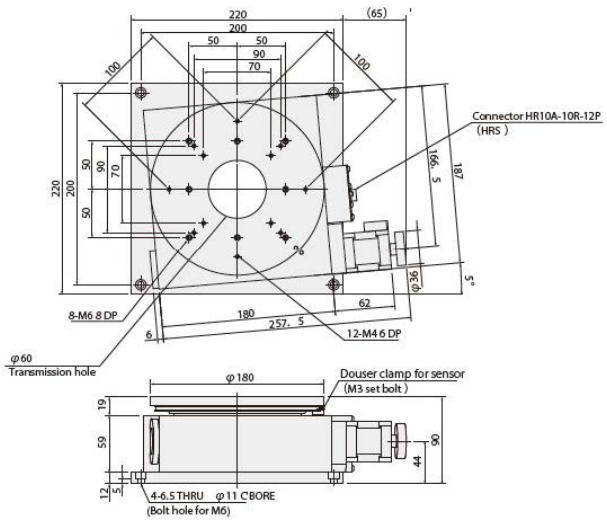
KS402-75



KS402-100C



KS402-180C



Electrical Specification・Option: KS402

Electrical specification

Models		KS402-75	KS402-100	KS402-180
Motor (*1)	Type	5 phase stepping motor 0.75A/Phase (Oriental Motor Co.,Ltd.)		
	Model (*2)	C7214-9015-1	PK544PB-C18	
	Step angle	0.36°	0.72°	
Connector	Model	HR10A-10R-12P (73) (Hirose Electric Co.,Ltd.)		
	applicable connector on acceptance side	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)		
Sensor	Limit sensor	Installed (PM-F25)		Installed (PM-F25,R25)
	Origin sensor	Installed (PM-F25)		Installed (PM-L25)
	Slit origin sensor	–		
	Model	Photo microsensor PM-□25 (Panasonic Industrial Devices SUNX)		
	Power voltage	DC5～24V ±10%		
	Consumption current	45mA or less (Per 1 sensor 15mA)		
	Control output	NPN open collector output DC30V or less50mA or less Residual voltage 2V or less when the load current is 50mA Residual voltage 1V or less when the load current is 16mA		
	Output logic	CWLS,CCWLS On detection (light shield condition): Output transistor OFF (Non-continuity) ORG Light on: Output transistor becomes OFF (Non-continuity)		On detection (light shield condition): Output transistor OFF (Non-continuity)

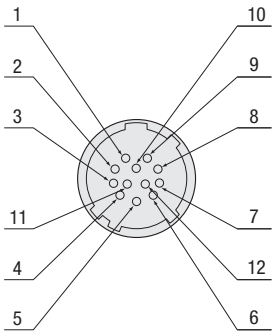
*1 See page ▶ P.1-213～ for details of single motor specification.

*2 Model is our own management model.

◯Can be reset the limit function in KS402-75, 100, 180 by the switch.

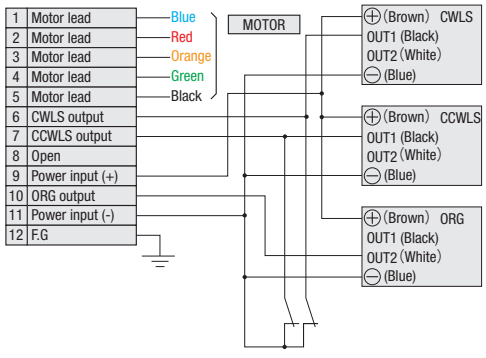
◯Can be set any traveling angle because of changeable shield plate position

Pin allocation

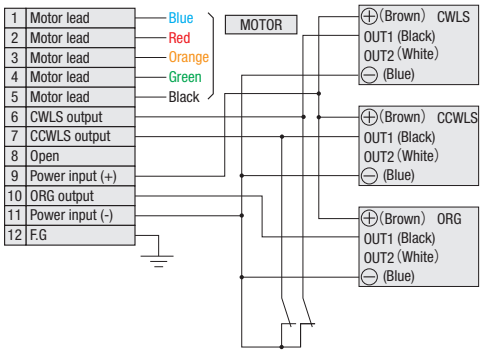


Connection diagram

KS402-75/KS402-100



KS402-180



Timing chart

KS402-75, KS402-100, KS402-180 (Detect only KS402-180 (dark))

Origin・・・Detect in scale 0 (Ligth on)

(Return to origin is performed type 4 of returning origin by use of DS102/DS112 controller)

CW and CCW limit・・・Any changeable position

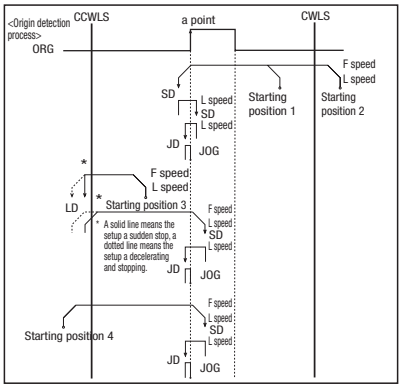
Method for return to origin

Suruga's motorized stages are different from the specification depending on the models.
Therefore return to origin method other than recommendation may not be work correctly.
Set to the way of recommendation return origin when using our controller.

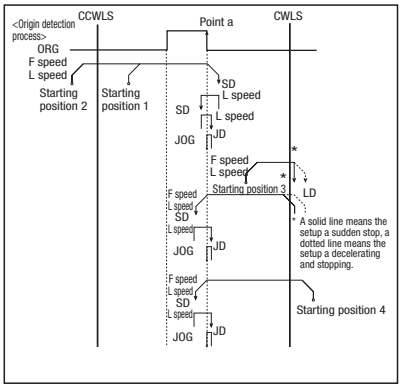
■KS402 series recommended return to origin　Return to origin sequence ▶ P.1-201～

Type 3: Detect in the direction of CCW and perform detected process for CCW edge(a point) of ORG signal.
Type 4: Detect in the direction of CW and perform detected process for CW edge of ORG signal.
Type 9: After finished Type3, perform detected process for CCW edge of TIMING signal.
Type 10: After finished Type4, perform detected process for CW edge of TIMING signal

[Type3] Detect in the direction of CCW and perform detected process for CCW edge (a point) of ORG signal.



[Type4] Detect in the direction of CW and perform detected process for CW edge of ORG signal.



Adaptive driver

■ Driver ▶P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

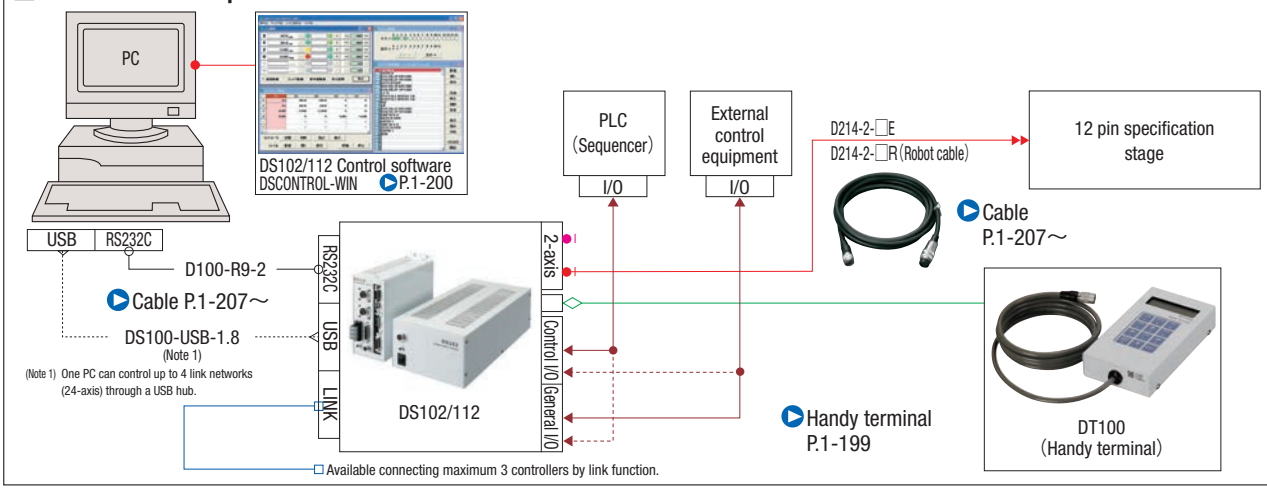
Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ Controller ▶P.1-197～

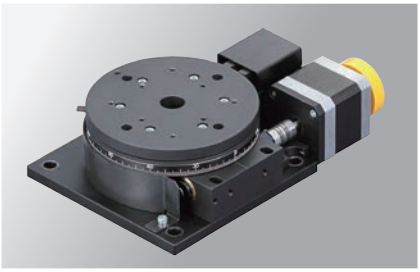
Input power	General-purpose input/ output port	Driver type	
		Full/Half	1～1/250 (16 steps)
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO

■Connection example



MotorizedRotary Stage：KRE10360

KRE10360



RoHS

* This photos shows a cover psition is an image. The holes and the shape may differ in certain respects from the actual product.

Model **KRE10360-** Selection code 1 Option code 2

Cable P.1-207～
Electrical specificationP.1-179～

1 Table size

10	φ100mm

2 Cable option

Code	Specification	Cable type
A	2m	D214-2-2E
B	2m One end loose	D214-2-2EK
C	4m	D214-2-4E
D	4m One end loose	D214-2-4EK
E	Only connector (Cable is not included)	—
F	Cable is not included (Standard)	D214-2-2R
G	Robot cable 2m one end loose	D214-2-2RK
H	Robot cable 4m	D214-2-4R
J	Robot cable 4m one end loose	D214-2-4RK
Blank	Cable is not included (Standard)	—

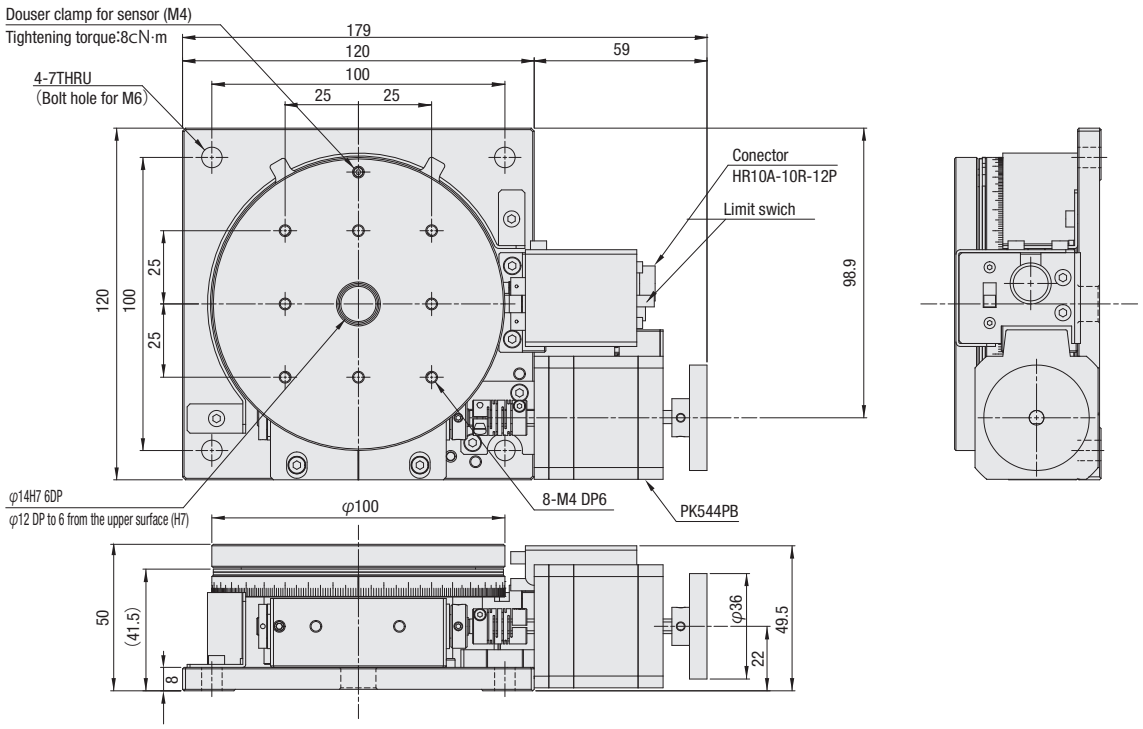
* The one end loose side might be on an opposite side of stage.
* If you choose the option specification, please add the difference to standard price.
See page Page▶P.1-207、209～for more cable details.
* Please select "blank, A, C , F, H" when connect with stepping motor controller(DS102/ 112).

SPEC		
Model		**KRE10360**
Mechanical specification	Travel legth	360°
	Table size	φ100mm
	Travel mechanism (Reduction ratio)	Worm gear(1/ 90)
	Guide	Deep groove ball bearing
	Material of stage	Aluminum—Al-Bronze
	Mass	1.8kg
Accuracy specification	Resolution	0.008°/ Pulse(Full)
	MAX speed	40°/ sec[5kHz]
	Positioning accuracy	Within 0.05°
	Repeatability positioning accuracy	Within ± 0.01°
	Load capacity	15kgf【147N】
	Moment stiffness	0.08″/ N・cm
	Lost motion	Within 0.02°
	Back lash	Within 0.02°
	Paralleism	Within 120 μm
	Eccentricity	Within 5 μm
	Runout	Within 35 μm
Provided screw (Hexagon-headed bolt)		4 of M6—16
Sensor	Limit sensor	Installed (Switch)
	Origin sensor	Installed

SURUGA SEIKI CAD 3D・2D

Dimensional outline awings

KRE10360



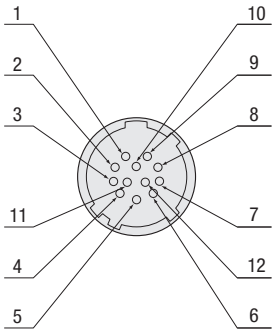
Electrical Specification・Option : KRE10360

Electrical specification

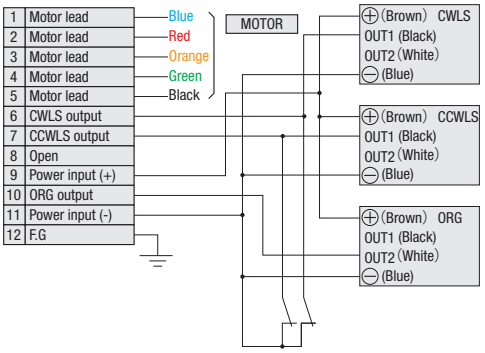
Model		KRE10360
Motor (*1)	Type	5 phase stepping motor 0.75A/Phase (Oriental Motor Co.,Ltd.)
	Model (*2)	PK544PB
	Step angle	0.72°
Connector	Model	HR10A-10J-12P (73) (Hirose Electric Co.,Ltd.)
	Applicable connector on acceptance side	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)
Sensor	Limit sensor	Installed（PM-R25）
	Origin sensor	Installed（PM-F25）
	Slit origin sensor	—
	Model	Photo microsensor PM-□25 (Panasonic Industrial Devices SUNX)
	Power voltage	DC5～24V ±10%
	Consumption current	45mA or less (Per 1 sensor 15mA)
	Control output	NPN open collector output DC30V or less50mA or less Residual voltage 2V or less when the load current is 50mA Residual voltage 1V or less when the load current is 16mA
	Output logic	CWLS,CCWLS On detection (light shield condition): Output transistor OFF (Non-continuity) ORG Light on: Output transistor becomes OFF (Non-continuity)

*1 See page 1-213~ for details of single motor specification
*2 Model is our own management model.
◯Can be reset the limit function in KS402-75, 100, 180 by the switch.
◯Can be set any traveling angle because of changeable shield plate position

Pin allocation



Connection diagram



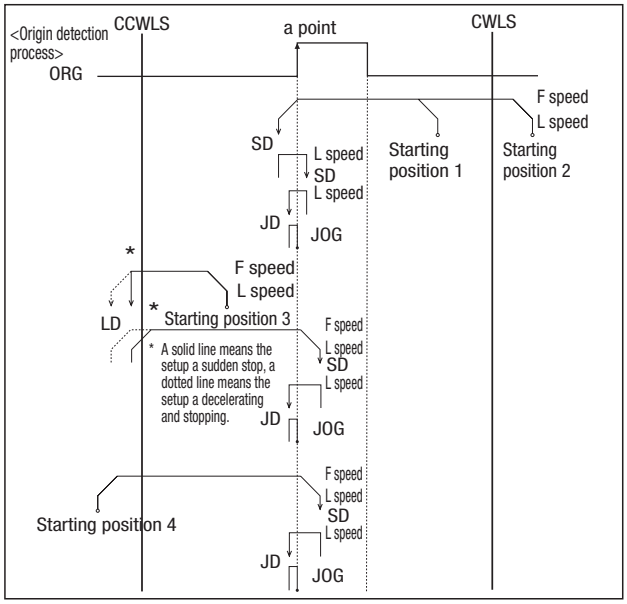
Timing chart

Origin・・・Detect in scale 0 (Ligth on)
(Return to origin is performed type 4 of returning origin by use of DS102/DS112 controller)
CW and CCW limit・・・Any changeable position

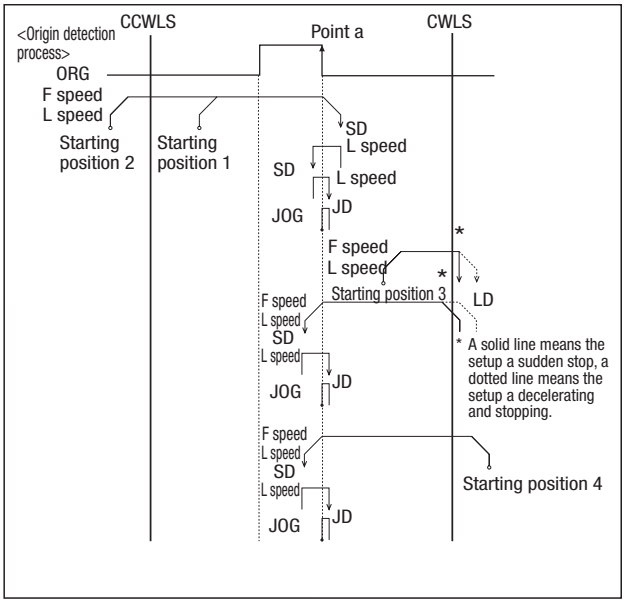
Method for return to origin

Suruga's motorized stages are different from the specification depending on the models.
Therefore return to origin method other than recommendation may not be work correctly.
Set to the way of recommendation return origin when using our controller.

【Type 3】 Detect in the direction of CCW and perform detected process for CCW edge (a point) of ORG signal.



【Type 4】 Detect in the direction of CW and perform detected process for CW edge of ORG signal.



【Type 9】 After finished Type3, perform detected process for CCW edge of TIMING signal.

【Type 10】 After finished Type4, perform detected process for CW edge of TIMING signal.

Adaptive driver

■ **Driver** P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ **Controller** P.1-197～

Input power	General-purpose input/ output port	Driver type	
		Full/Half	1～1/250[16 steps]
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO


DS112/102

Rotary Stage ϕ39: KS451

KS451-40

RoHS

■Good for accuracy possitioning
360°continuously rotation.

Model: **KS451-40-** Option code: **5** (1) (2)

Cable P.1-207～
Electrical specification P.1-191～

1 Cable option

Code	Specification	Cable type
Blank	2m	D214-2-2E
1	2m One end loose	D214-2-2EK
2	4m	D214-2-4E
3	4m One end loose	D214-2-4EK
4	Only connector (Cable is not included)	—
5	Cable is not included (Standard)	—
6	Robot cable 2m	D214-2-2R
7	Robot cable 4m	D214-2-4R
8	Robot cable 4m one end loose	D214-2-4RK
9	Robot cable 2m one end loose	D214-2-2RK

* If you choose the option specification, please add the difference to standard price.
* See page P.1-207, 209～ for details of cable.
* Please select "blank, 2, 6 and 7" when connect with stepping motor controller(DS102/112).

2 Attached substrate specification

Code	Specification
Blank	Not available 24V supported substrate
V	Substrate for 24V Included K-PCBA24

※KS451: Sensor voltage 5V
Consider to use sensor amprifier substrate when you control without our controller.

Selection Example

Your spec	Table size	+	Attached cable	+	Attached substrate specification	▷
	ϕ39mm		2m		With substrate for 24V	**KS451-40-V**

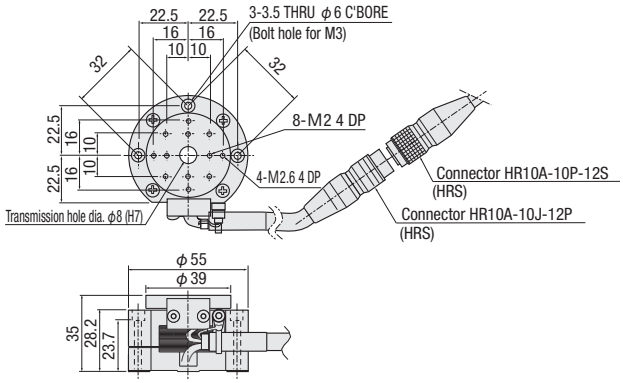
SPEC

Model		KS451-40-5
Mechanical specification	Travel length	360°
	Table size	ϕ39mm
	Travel mechanism	Direct drive motor
	Guide	Ball bearing (Deep groove ball bearing)
	Main materials-Finishing	Aluminum—Black almite finishing , stainless steel
	Weight	0.3kg
Accuracy specification	Resolution	0.72°/Pulse (Full) 0.36°/Pulse (Half)
	MAX speed	72°/sec [100Hz]
	Positioning accuracy	—
	Repeatability positioning accuracy	—
	Load capacity	1.0kgf [9.8N]
	Moment stiffness	2.50″/N・cm
	Lost motion	Within 0.05°
	Backlash	—
	Parallelism	Within 100μm
	Runout	Within 50μm
Sensor	Limit sensor	—
	Origin sensor	Installed
	Proximity origin sensor	—
Provided screw (Hexagon-headed bolt)		3 of M3—28

SURUGA SEIKI CAD 3D·2D

Dimensional outline drawings

KS451-40

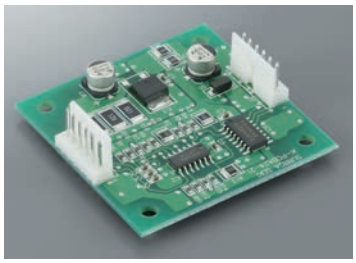


Sensor amplifier substrate for 24V: K-PCBA24

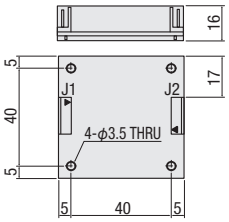
Instruction Manual RoHS

K-PCBA is needed to drive a motorized stage with EE-SX1101 sensor when using PC or sequencer's motion control module and not using our controller. EE-SX11 sensor is operated with 5V input voltage and there is only about 1mA of output current. When using controlling equipment such as PC and sequencer, it is common to use photo coupler for sensor input-terminal and often needs about 10mA of terminal current. Therefore a motorized stage with EE-SX1101 sensor cannot be direvtly connected. In this case, K-PCBA is effective in being assembled as sensor amplifier so that input voltage becomes 24V and max. Output current is available up to 500mA.

K-PCBA24

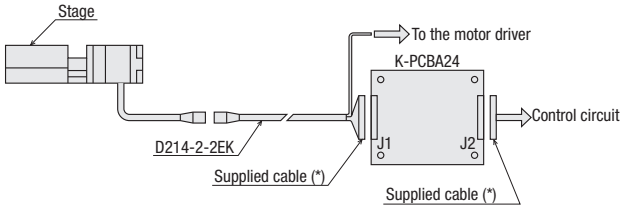


Dimensional outline drawings



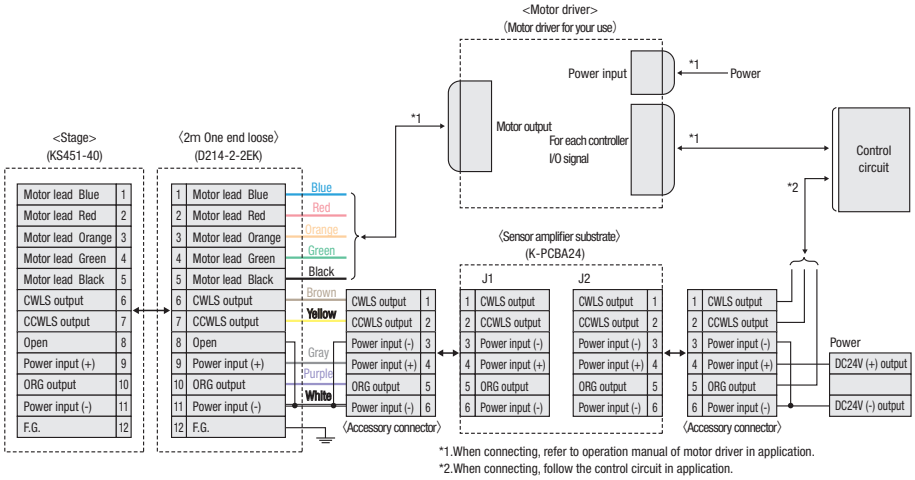
▼mark indicates the position of connector 1 pin.

Full diagram



* Crimping connection of accessory connector needs to be done by a customer

Connection sensor amplifier and driver example



*1.When connecting, refer to operation manual of motor driver in application.
*2.When connecting, follow the control circuit in application.

Note that sensor damage

***See sensor specification for the exclude and include this substrate.**
***There are stages that no need this substrate.**

SPEC	
Model	**K-PCBA24**
Dimension	50 (W) ×50 (D) ×16 (H) mm
Connector type	171825-6 (Tyco Electronics Japan G.K.6)
Compatible connector	171822-6 (Accessories)
Power voltage	DC24V±10%
Consumption current	30mA or less
Control output	NPN open collector output DC24V 500mA or less
Specification environment	0～40℃,20～80%RH (non-dew)
Accessories	2 of connector 171822-6 (Tyco Electronics Japan G.K.)
	12 of contact terminal 170204-1 (Tyco Electronics Japan G.K.)

*Connector processing needs to be done by customer. Please use electric wire of which diameter is more than 0.2mm for wire arrangement.

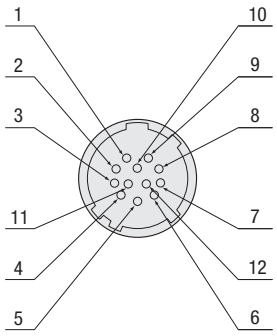
Electrical Specification • Option: KS451

Electrical specification

Model		KS451-40
Motor	Type	5 phase stepping motor 0.75A/Phase
	Model	Special specification
	Step angle	0.72°
Connector	Model	HR10A-10J-12P (73) (Hirose Electric Co.,Ltd.)
	applicable connector on acceptance side	HR10A-10P-12S (73) (Hirose Electric Co.,Ltd.)
Sensor	Limit sensor	—
	Origin sensor	Installed
	Slit origin sensor	—
	Model	Photo microsensor EE-SX1103 (Omuron Co.,Ltd.)
	Power voltage	DC5V
	Consumption current	25mA or less
	Control output	NPN open collector output DC5V or less1.2mA or less Residual voltage 0.4V or less when the load current is 0.3mA
	Output logic	On detection (light shield condition): Output transistor OFF (Non-continuity)

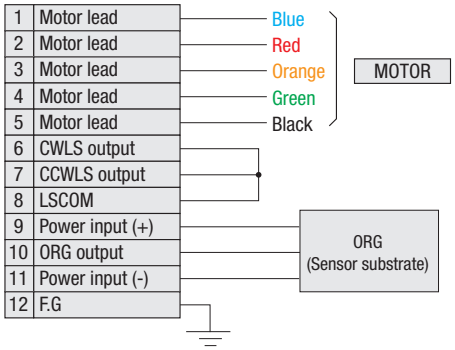
* Please use microstep when reduce the vibration or return to origin. (Driver: CRD5107P P.1-187〜)

Pin allocation



Connection diagram

KS451-40



Timing chart

KS451-40

	Range of origin detection [°]
KS451-40	0〜11°

Note: The direction of CW/CCW in timing chart shows motor rotation.
Upper plate rotation in CW as below.
KS451-40: CW

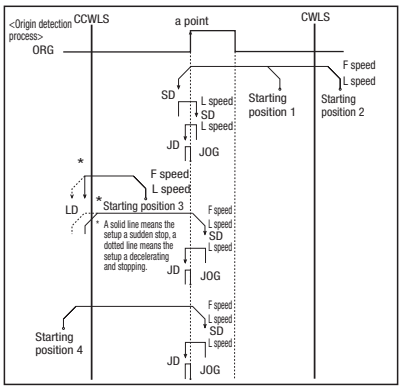
Method for return to origin

Suruga's motorized stages are different from the specification depending on the models.
Therefore return to origin method other than recommendation may not be work correctly.
Set to the way of recommendation return origin when using our controller.

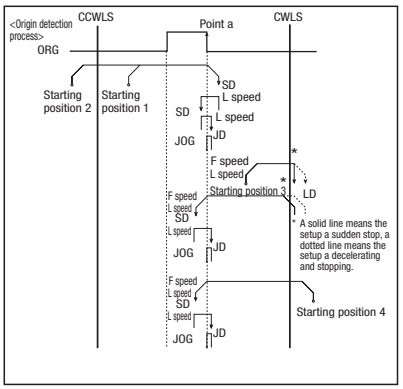
■KS451 recommended return to origin　Return to origin sequence ▶P.1-201～

Type 3: Detect in the direction of CCW and perform detected process for CCW edge(a point) of ORG signal.
Type 4: Detect in the direction of CW and perform detected process for CW edge of ORG signal.
Type 9: After finished Type3, perform detected process for CCW edge of TIMING signal.
Type 10: After finished Type4, perform detected process for CW edge of TIMING signal.

[Type3] Detect in the direction of CCW and perform detected process for CCW edge (a point) of ORG signal.



[Type4] Detect in the direction of CW and perform detected process for CW edge of ORG signal.



Adaptive driver

■ Driver ▶P.1-205～

DC24 type input

Model	CRD5107P	SD5107P3-A22
Divisions	1～1/250 (16 steps)	Full/Half

AC100V input

Model	RKD507-A
Divisions	1～1/250 (16 steps)

Adaptive stepping motor controller

■ Controller ▶P.1-197～

Input power	General-purpose input/ output port	Driver type	
		Full/Half	1～1/250 (16 steps)
AC100-240V	Without	DS102NR	DS102MS
	With	DS102NR-IO	DS102MS-IO
DC24V	Without	DS112NR	DS112MS
	With	DS112NR-IO	DS112MS-IO

■Connection example