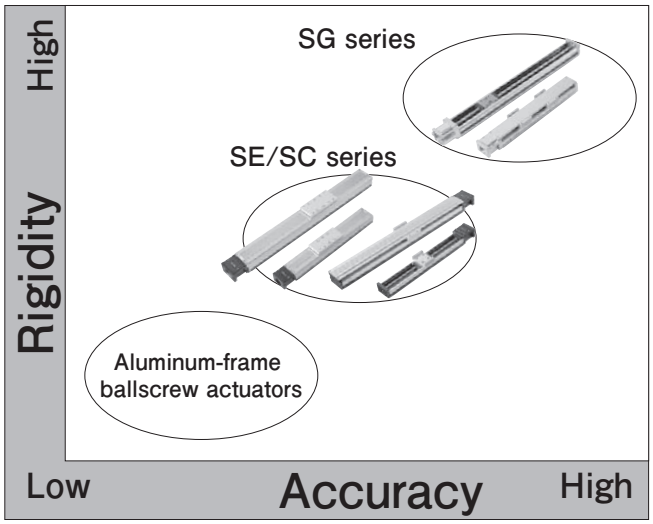
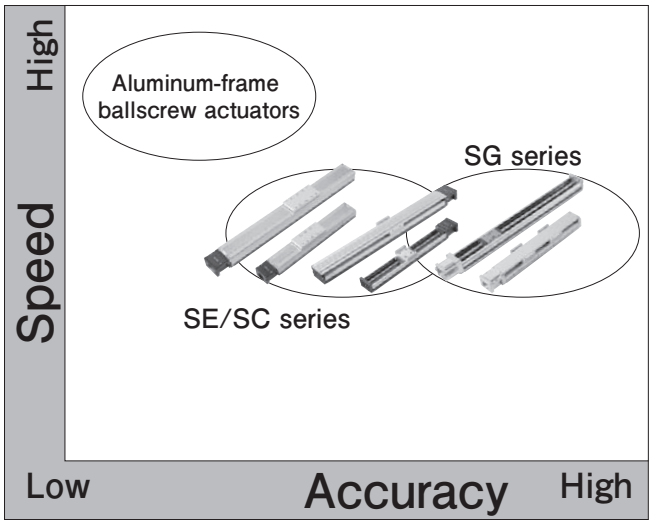
BALLSCREW ACTUATORS

A ballscrew actuator of KURODA is a compact single-axis unit consisting of a ball screw and a slide guide. With its slide block set in U-guide rail, the actuator has achieved low-profile design and compact shape, making it possible to considerably reduce necessary space as compared with the usual table type structure. Despite of its compact structure, the actuator with U-guide rail shows high rigidity against bending moment and deflection, and it can be applied to a structure supported by one end. The linear motion unit, which is gothic arched and in 4 points-contact structure, makes it possible to deliver high precision and high rigidity.

POSITIONS OF BALLSCREW ACTUATORS





WIDE VARIATIONS

Model No.		SG series						SE series				SC series (Note 2)		
		SG20	SG26	SG33	SG3320	SG46	SG55	SE15	SE23	SE30	SE45	SC23	SC30	SC45
Performance grade (Note 1)		P: Repeated positioning accuracy ±1μm H: Repeated positioning accuracy ±3μm						H: Repeated positioning accuracy ±3μm (Note 3) U: Repeated positioning accuracy ±5μm W: Repeated positioning accuracy ±10μm						
Screw shaft dia. (mm)		6	8	10	12	15	20	6	8	10	15	8	10	15
Lead (mm)	1	◎						◎						
	2		◎	●				◎	◎	●		◎	●	
	4								●	◎		●	◎	
	5	◎	◎	◎		●	●		◎	◎	◎	◎	◎	◎
	6									◎			◎	
	8								●			●		
	10			◎		◎	●			◎	◎		◎	◎
	20				◎	◎	◎			◎	◎		◎	◎

◎:In-stock items ●:Manufactured by order

(Note 1) The above table shows precision information on repeated positioning accuracy in particular, as an example. Performance of actuators may be different from the values shown above, depending on applied options and usage. For other precision information, refer to description pages for each series.

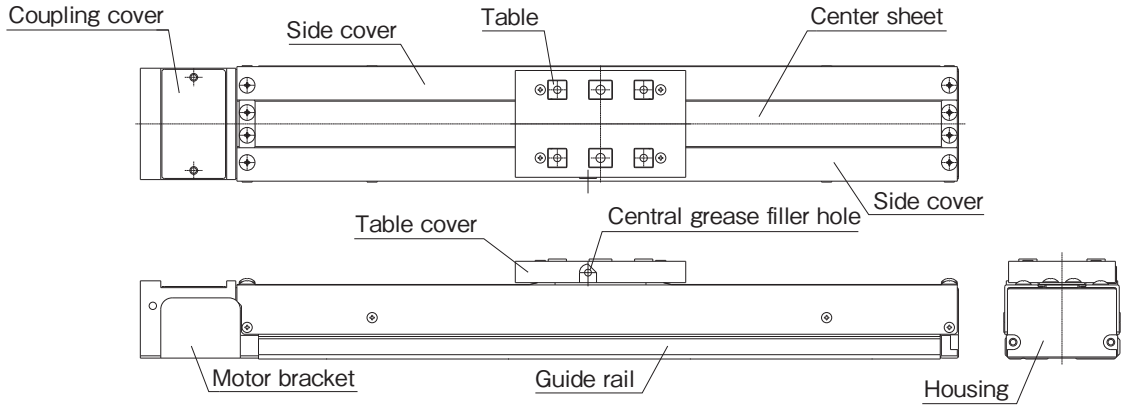
(Note 2) SC series is a full-cover version of SE series ballscrew actuators. For more information, refer to Front matters 5 to 6, and pages 99 to 121.

(Note 3) There is no Performance Grade H in SE30 and SC30 leads 6mm and 20mm.

FEATURES OF SC SERIES (FULL-COVER TYPE)

Full-cover type SC series, built on KURODA SE series, has remarkably improved its dust-preventive performance.

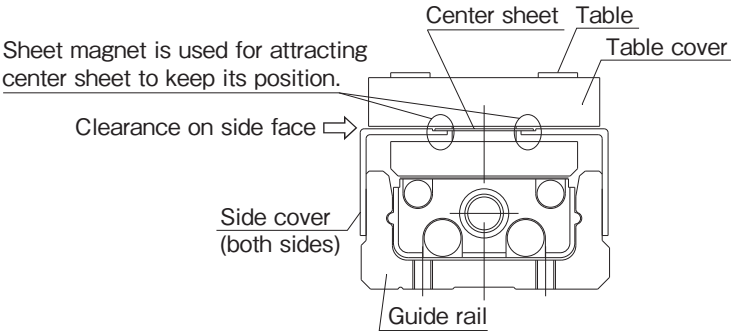
Structure



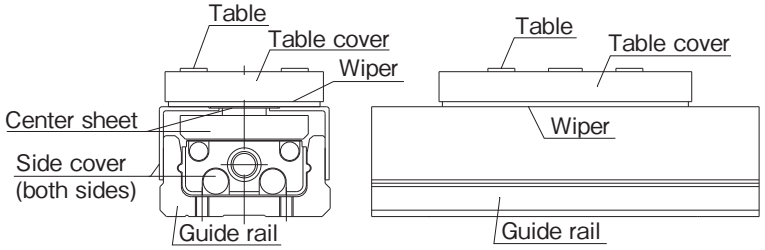
■ Remarkably improved dust prevention!

Compared to SE series with dustproof cover, dust prevention has been remarkably improved through making clearance on side face of actuator as narrow as it can be and effectively applying new center sheet designed to straddle the tables, so as to prevent entry of dust.

Center sheet is a flexible stainless sheet having a structure to keep its position and to prevent it from being lifted.



For further improved dust prevention, a wiper can be optionally equipped so that a gap between bottom of table cover and side cover/center sheet is filled.



■ Down-sized body meeting space-saving needs!

SC series has full-cover type body with the same width and dimensions as SE series' guide rail.
Replacing SE series with the full-cover type SC series requires just the same mounting space (width) as SE series (Note that mounting height is different).

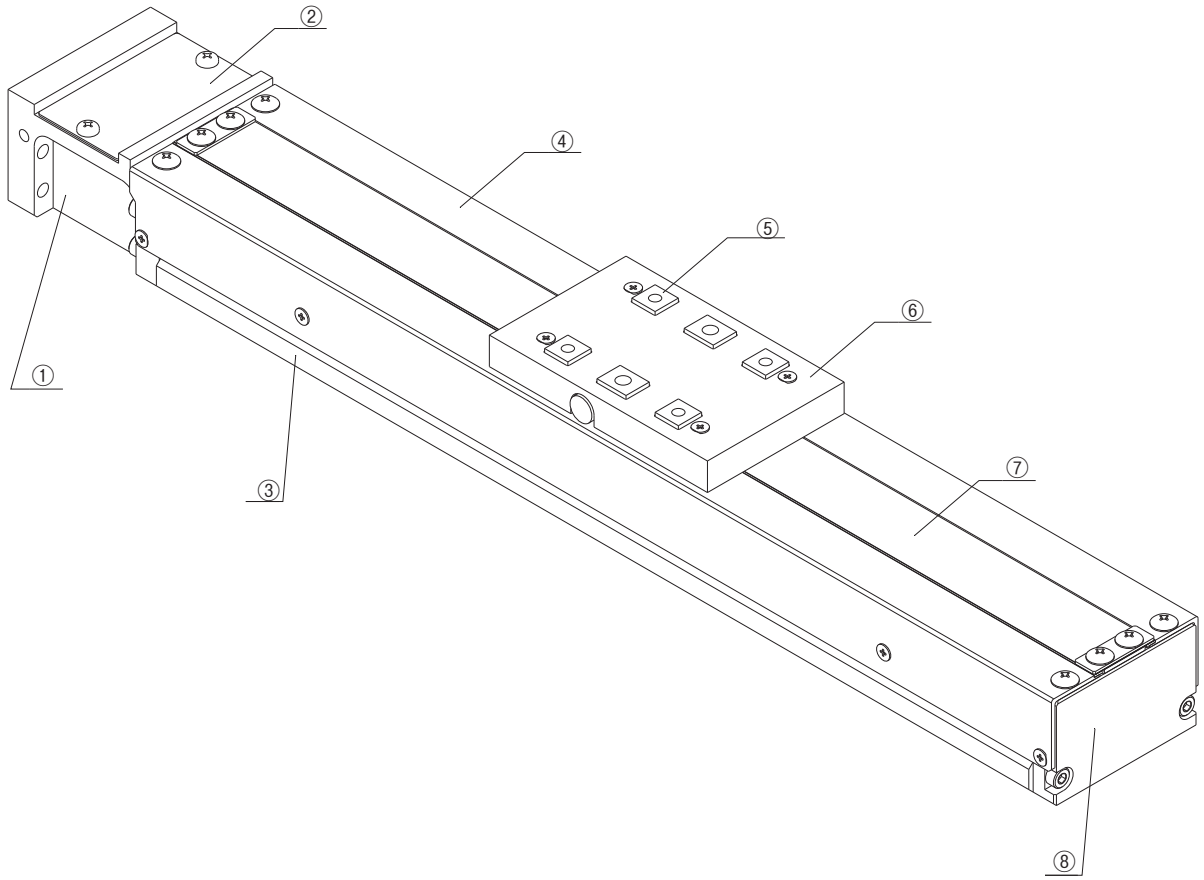
■ Easy maintenance!

In order for more efficient grease-up work, which is usually found cumbersome, a central grease filler hole is provided on the side face of the table, as standard equipment of SC series.
Supplying grease to ball screws and guide parts can be completed at a time through the central grease filler hole. (A plug is equipped with standard spec. model).
Grease nipple to be attached to grease filler hole is available as an option. (For more information, refer to pages 108, 114, and 120.)

■ Guide with remarkable rigidity!

Having steel U-guide rails similar to SG/SE series, SC series shows high rigidity despite of its compact structure, and it can be applied to a structure supported by one end. (For more information, refer to front matter 11.)

KEY COMPONENTS AND MATERIALS OF SC SERIES



No.	Part name	Material	Remarks
①	Motor bracket	Aluminum alloy	Anodized treatment
②	Coupling cover	Aluminum alloy	Anodized treatment
③	Guide rail	Carbon steel	Black coating
④	Side cover	Aluminum alloy	Anodized treatment
⑤	Table	Aluminum alloy	Anodized treatment
⑥	Table cover	Synthetic resin	
⑦	Center sheet	Stainless steel	
⑧	Housing	Aluminum alloy	Anodized treatment

(Note 1) Ball screws used for SC series have the same specifications as SE series.
(Note 2) Stainless steel is used for bolts and screws to joint components of actuator.

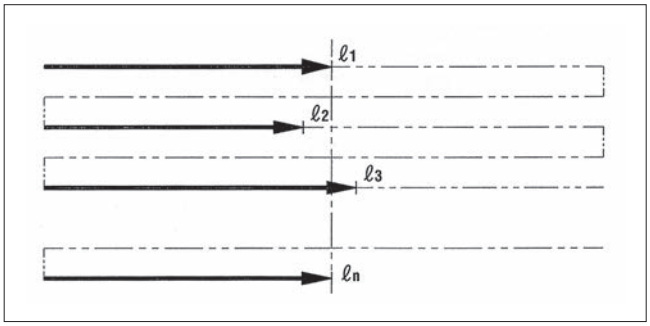
SUMMARY OF ACCURACY INDICATORS

Performance of ballscrew actuators are shown using various accuracy indicators described below.
For details in tolerance of the accuracy indicators, refer to table of performance (accuracy) information for each series.

● Repeated positioning accuracy

Repeat positioning of slide block in the same direction 7 times, measure stop position of slide block and halve maximum difference between obtained readings. Perform this measurement at the center and both ends of travel distance. Maximum value among obtained value is used as measured value.

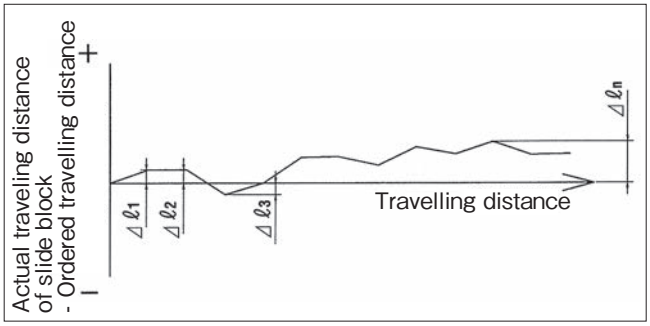
Repeated positioning accuracy
＝±1/2 ((maximum value of ℓn) - (minimum value of ℓn))



● Positioning accuracy

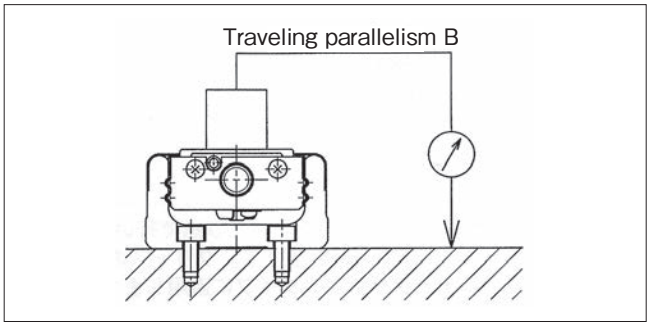
Position slide block properly in a fixed direction and use the obtained position as datum point. Perform positioning of slide block in the same direction and measure difference between actual traveling distance of slide block from datum point and distance ordered to be traveled from datum point. Perform this measurement throughout stroke range and use maximum value.

Positioning accuracy＝(Δ ℓn) max



● Traveling parallelism B

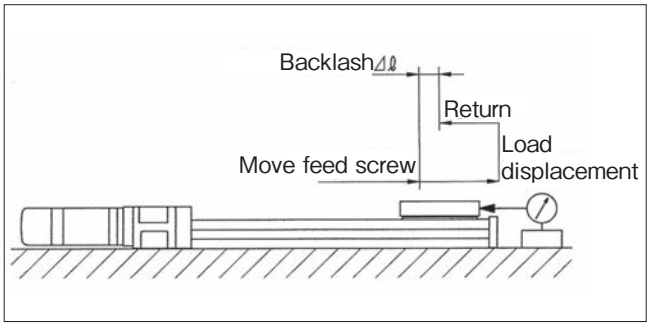
Fix indicator at the center of slide block and apply it to surface plate equipped with guide rail. Move slide block throughout traveling distance and use maximum distance among readings of test indicator as measured value.



● Backlash

Move slide block by rotating ball screw shaft and read test indicator when slide block is slightly moved and use its reading as reference value. Move slide block from this state in the same direction by pressuring prescribed load and measure difference between reading of test indicator with load removed and reference value. Perform this measurement at the center and both ends of traveling distance and use maximum value as a measured value.

Backlash＝Δ ℓ



⚠

・Firmly tighten the fixed part and connection of the ballscrew actuator.
Improper mounting of the body may adversely affect safety and accuracy depends on the circumstances.

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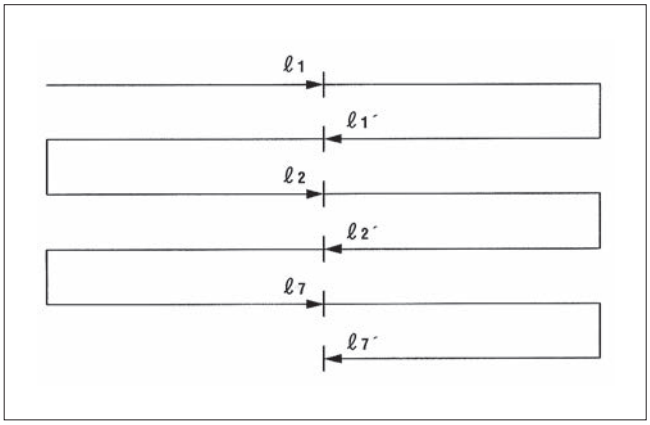
REFERENCE DATA ON ACCURACY

ACCURACY OF UNIT PRODUCT

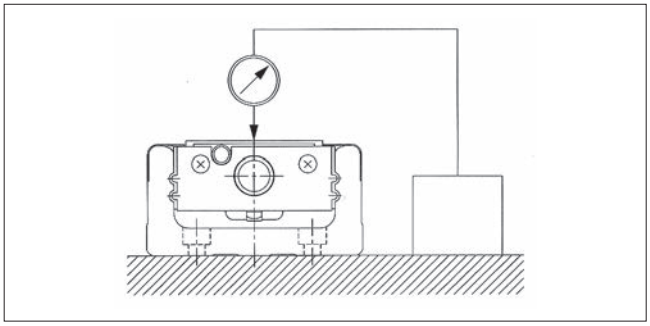
● Lost Motion

Perform positioning in a positive (or negative) direction and measure the position (ℓ_1). Move the slide block in the same direction and perform positioning in a negative (or positive) direction and measure the position (ℓ_1'). Move it further in the same direction and thereafter repeat the procedure in the positive and negative directions seven times each. Obtain the differences of the average values of the stop positions. Conduct this measurement for the entire moving range and use the obtained maximum value as a measured value.

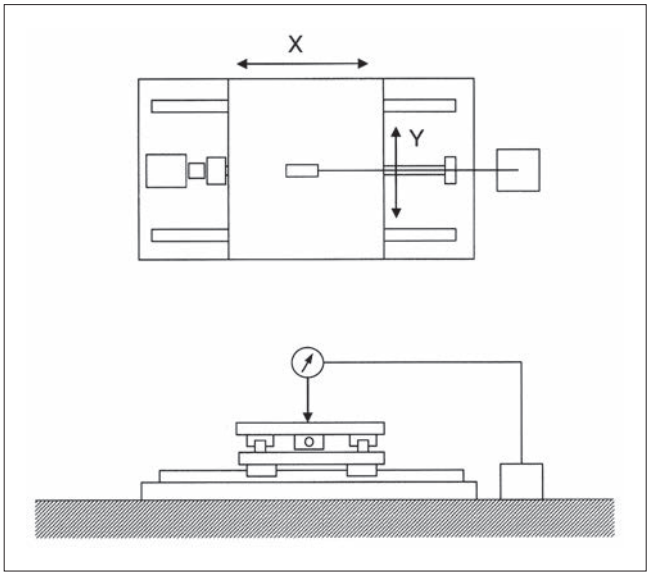


● Traveling Parallelism A

In the case of ballscrew actuators:
Set dial gauge on surface plate, fix indicator on top of slide block, obtain the maximum difference of dial gauge readings in measurable moving range in longitudinal direction of slide block. And use it as a measured value. Since the measurable range is small for ballscrew actuators, Traveling Parallelism B is used as the measurement method for all of the cases except for a few exceptions.



In the case of X-Y stages:
Set dial gauge on surface plate, fix indicator at the center of table, obtain the maximum difference of dial gauge readings in entire moving range in X-Y direction. The maximum difference is used as a measured value.

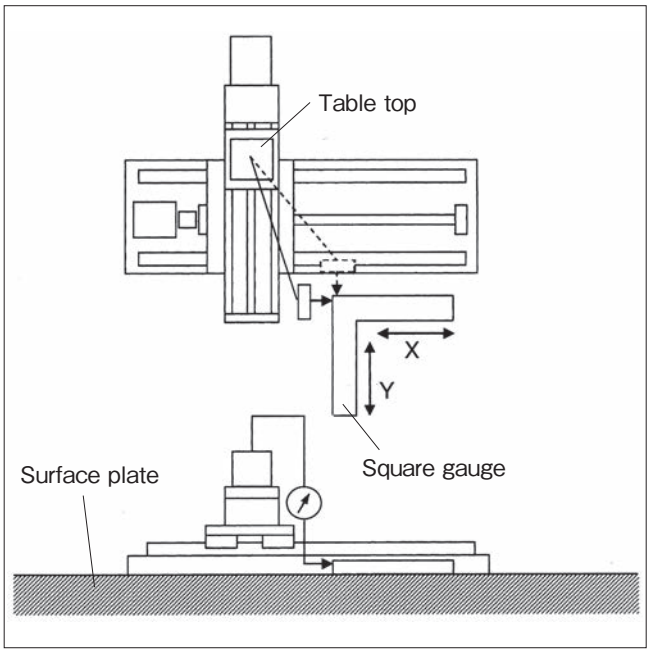


REFERENCE DATA ON ACCURACY

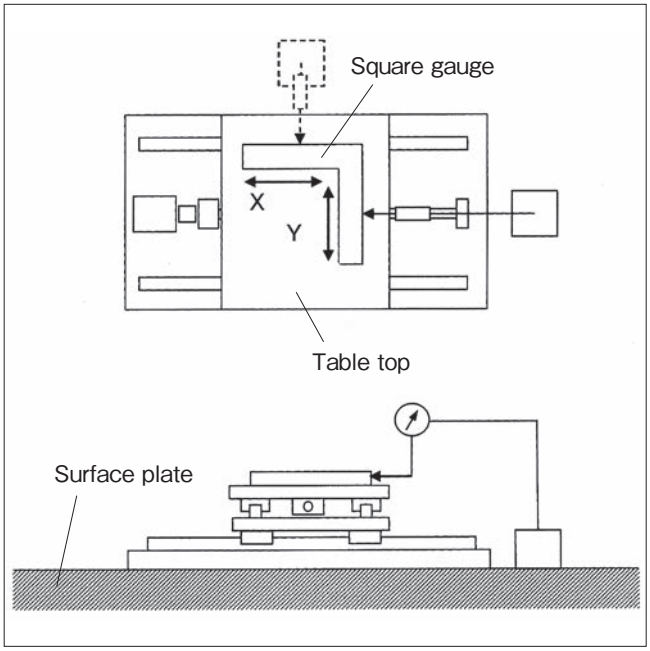
ACCURACY OF UNIT PRODUCT

● Squareness

In case squareness cannot be measured on the table top:
Set a dial gauge on the table top. On surface plate close to the table travel range, fix a square gauge in parallel to X (or Y) travel direction.
Place a fix indicator against the side of square gauge parallel to Y (or X) travel direction. The maximum reading value of the dial gauge in the entire travel range is a measured value of squareness.



In case squareness can be measured on the table top:
Set a dial gauge on surface plate. On the table top, fix a square gauge in parallel to X (or Y) travel direction.
Place a fix indicator against the side of square gauge parallel to Y (or X) travel direction. The maximum reading value of the dial gauge in the entire travel range is a measured value of squareness.



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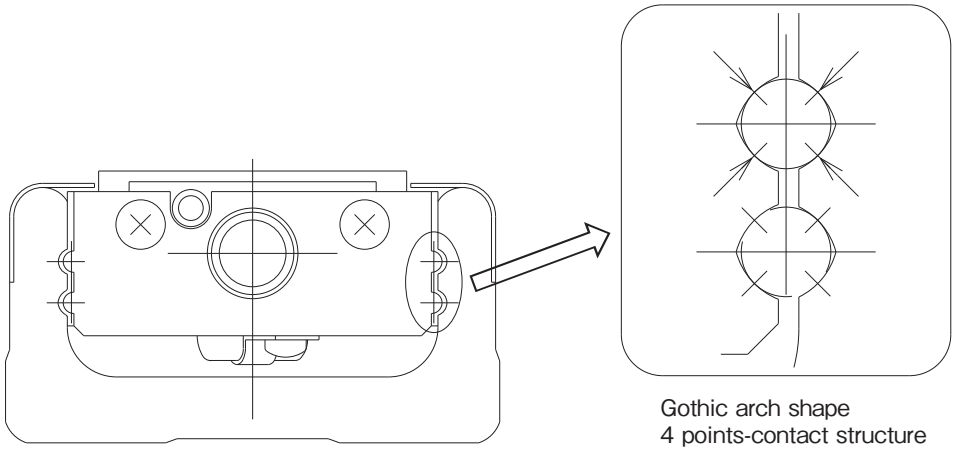
RIGIDITY

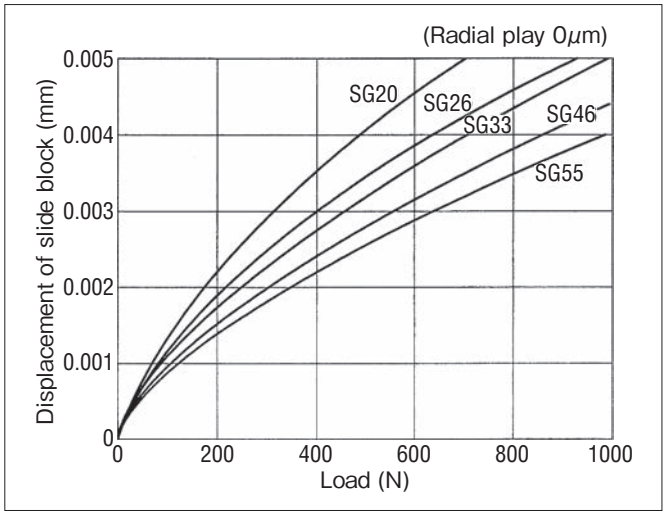
Linear motion units of SG, SE, and SC series, having gothic-arched grooves and 4 points-contact structure on guide rails and slide blocks, have attained high rigidity. Displacement by each radial load in each size with long block configuration is shown below as a reference.



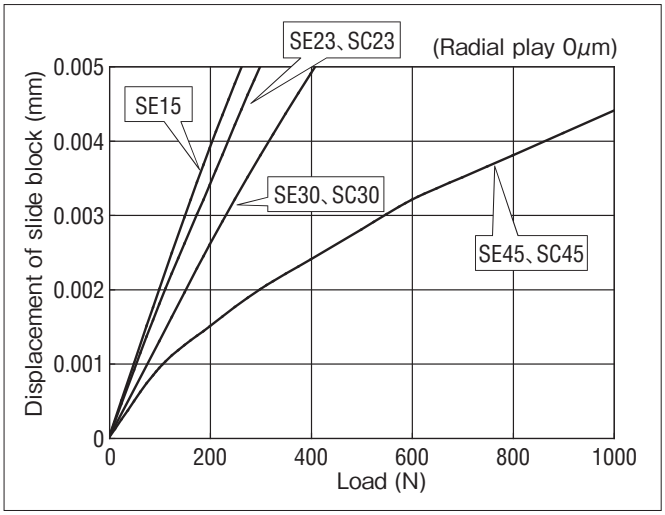
Gothic arch shape
4 points-contact structure

● Displacement of Slide block by Radial Load

SG series



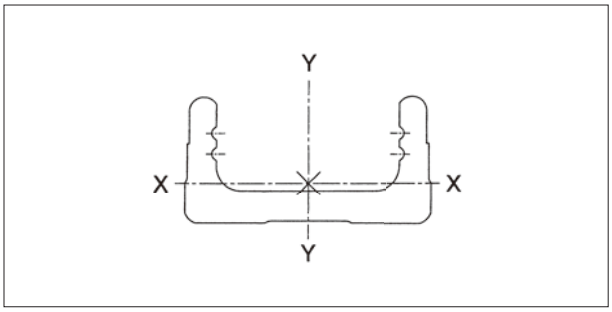
SE/SC series



● Sectional Secondary Moment of Guide Rail

The following table shows sectional secondary moments of guide rails in each size.

Model No.	Sectional secondary moments (mm^4)		Mass (kg/100mm)
	I_X (X axis)	I_Y (Y axis)	
SG20	6.50×10^3	6.00×10^4	0.250
SG26	1.69×10^4	1.47×10^5	0.380
SG33	5.11×10^4	3.42×10^5	0.600
SG46	2.42×10^5	1.49×10^6	1.240
SG55	2.29×10^5	2.28×10^6	1.500
SE15	2.71×10^3	2.36×10^4	0.147
SE23, SC23	1.44×10^4	1.37×10^5	0.410
SE30, SC30	3.88×10^4	3.14×10^5	0.560
SE45, SC45	1.45×10^5	1.26×10^6	1.110



OPTION AND MANUFACTURING BY ORDER

Category	Item		SG series					SE series				SC series		
			SG20	SG26	SG33	SG46	SG55	SE15	SE23	SE30	SE45	SC23	SC30	SC45
Option	Motor bracket configu-ration	Intermediate flange	○	○	○	○	○	○	○	○	○	○	○	○
		R0/RN type bracket (Note 1)	○	○	○	○	○	—	—	○	○	—	○	○
		Parallel motor mounting unit	—	—	○	○	—	—	—	○	○	—	○	○
	Type of cover	Dustproof cover	○	○	○	○	○	○	○	○	○	—	—	—
		Standard full-cover (Note 2)	—	—	—	—	—	—	—	—	—	○	○	○
		Full-cover with grease nipple (Note 2)	—	—	—	—	—	—	—	—	—	○	○	○
		Full-cover with wiper (Note 2)	—	—	—	—	—	—	—	—	—	○	○	○
		Full-cover with grease nipple and wiper (Note 2)	—	—	—	—	—	—	—	—	—	○	○	○
	Sensor	Photo-microsensor Ass'y	○	○	○	○	○	—	○	○	○	○	○	○
		Proximity sensor Ass'y	○	○	○	○	○	○	○	○	○	○	○	○
	Sensor rail Ass'y		○	○	○	○	○	○	○	○	○	○	○	○
	Surface treatment (Note 3)		○	○	○	○	○	○	○	○	○	○	○	○
	Dust preventive grease		○	○	○	○	○	○	○	○	○	○	○	○
	Dowel pin hole (slide block)		○	○	○	○	○	—	○	○	○	—	—	—
	Dowel pin hole (guide rail)		○	○	○	○	○	—	○	○	○	○	○	○
	Lubrication unit LUBSEAL™		—	—	—	—	—	—	○	○	○	○	○	○
	Reversed guide rail reference surface		—	—	—	—	—	○	○	○	○	○	○	○
	Sub guide rail		—	—	—	—	—	○	○	○	○	○	○	○
Manufactured by order (Note 8)	Intermediate stroke		●	●	●	●	●	●	●	●	●	●	●	●
	Oil hole (Note 4)		●	●	●	●	●	—	●	●	●	—	—	—
	XY bracket		●	●	●	●	●	●	●	●	●	●	●	●
	Motor assembling		●	●	●	●	●	●	●	●	●	●	●	●
	Long rail configuration		●	●	●	●	—	●	●	●	●	●	●	●
	Grease options (Note 5)		●	●	●	●	●	●	●	●	●	●	●	●
	Motor bracket configuration (Note 6)		●	●	●	●	●	●	●	●	●	●	●	●
	Sensor options (Note 7)		●	●	●	●	●	●	●	●	●	●	●	●

○: Option —: Not available ●: Manufactured by order

(Note 1) R0 type bracket is applied to SG series and RN type is applied to SE and SC series.

(Note 2) Full-cover type with wiper and with grease nipple is applied only to SC series.

(Note 3) Anti corrosive black coating (film thickness 1-2μm) is provided as surface treatment.

(Note 4) Oil hole for SG and SE series is applied to the configuration with sub-table.

(Note 5) Any grease application other than standard or option grease applications will be provided on a manufactured by order basis.

(Note 6) Ballscrew actuator with motor bracket or intermediate flange configuration other than standard or option configuration will be provided on a manufactured by order basis.

(Note 7) Ballscrew actuator requiring a sensor other than option configuration or two sensors attached on both ends will be provided on a manufactured by order basis.

(Note 8) For ballscrew actuators to be provided on a manufactured by order basis, specifications will be determined after consultation with customers. Please consult KURODA after completing the Specification Data Sheet attached at the end of this catalog.

HOW TO INTERPRET MODEL NO.

Model No.	Lead	Slide block		Guide rail length	Performance grade		Motor bracket configuration	Type of cover	Sensor		Surface treatment	Grease		Dowel pin hole
SG33	10	A	–	500	P	–	A1	C	C	–	N	N	–	PS
①	②	③		④	⑤		⑥	⑦	⑧		⑨	⑩		⑪

Model No. of Main Body

Model No. of Option

① Model of ballscrew actuator

The 2-digits number represents height of mounting surface, from the bottom face of guide rail to top face of slide block. (For SG/SE series with dustproof cover and SC series, Model No. of the unit used as base of the body is shown.)

SG series	SG20	SG26	SG33	SG46	SG55
SE series	SE15	SE23	SE30	SE45	
SC series	SC23	SC30	SC45		

② Lead of ball screw

Permissible speed varies depending on the lead. For more information, refer to dimensions of each series.

Lead	SG series					SE series				SC series		
	SG20	SG26	SG33	SG46	SG55	SE15	SE23	SE30	SE45	SC23	SC30	SC45
1mm	○					○						
2mm		○				○	○			○		
4mm								○			○	
5mm	○	○	○				○	○	○	○	○	○
6mm								○			○	
10mm			○	○				○	○		○	○
20mm			○	○	○			○	○		○	○

③ Variation of slide blocks and number of blocks to be mounted

For configuration with 2 slide blocks, a driving block and driven block in combination is mounted. For more information, refer to dimensions of each series.

④ Guide rail length

For more information, refer to dimensions of each series. Please note that the guide rail length is different from overall length or maximum stroke length of actuator.

Model No.	Standard guide rail length										
SE15	100	150	200								
SE23	150	200	250	300							
SE30	150	200	300	400	500	600	700	750(Note2)			
SE45	340	440	540	640	740	840	940				
SC23	150	200	250	300							
SC30	150	200	300	400	500	600	700	750(Note2)			
SC45	540	640	740	840	940						
SG20	100	150	200								
SG26	150	200	250	300							
SG33	150	200	300	400	500	600(Note1)					
SG46	340	440	540	640	740	840(Note1)	940(Note1)	1040(Note1)	1140(Note1)	1240(Note1)	
SG55	980	1080	1180	1280(Note1)	1380(Note1)						

(Note 1) Only available in Performance Grade H.
(Note 2) Guide rail length 750mm for SE30 and SC30 is only available in lead 10mm.

⑤ Performance of ballscrew actuators, including various positioning accuracy indicators and traveling parallelism

For more information on accuracy, refer to a table of accuracy information for each series.

⑥ Motor bracket configuration

Intermediate flange may be used in combination with basic configuration. For more information, refer to a table of motor bracket configurations and motor option for each series.

⑦ Type of cover

For more information, refer to dimensions of each series.

⑧ With or without sensor / type of sensor

For more information, refer to dimensions of each series.

⑨ With or without surface treatment applied on guide rails and ball screws

With standard specifications (Symbol N), only guide rails are treated with black coating (except for guide rails made from stainless steel).

⑩ Type of grease applied on slide blocks and ball screws of ballscrew actuators

With standard specifications, Multemp PS No.2 Grease (KYODO YUSHI CO., LTD.) is contained.

⑪ Additional options such as reversed reference surface and dowel pin holes

Left blank when additional options are not included.

BALLSCREW ACTUATOR LUBSEAL™

Lubrication Unit for Ballscrew Actuator

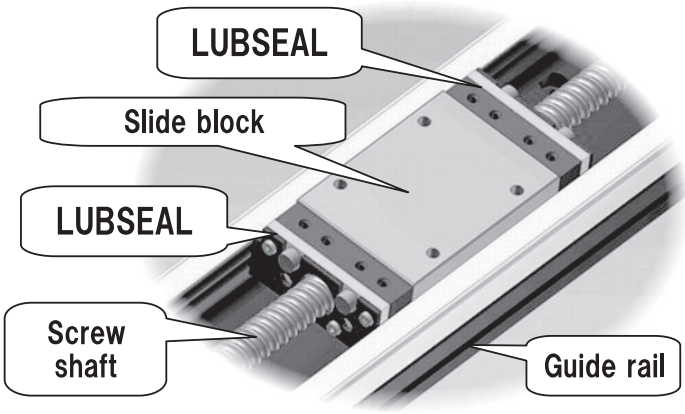
SE23 SE30 SE45 SC23 SC30 SC45

LUBSEAL is a lubrication unit which supplies a proper volume of grease to a ballscrew actuator. It contacts grooves on screw shaft and ball rolling point on guide rail. It also fits into both ends of a slide block in a ballscrew actuator compactly.
Suitable for semiconductor/liquid crystal manufacturing machines, machine tools and automobile production facilities.

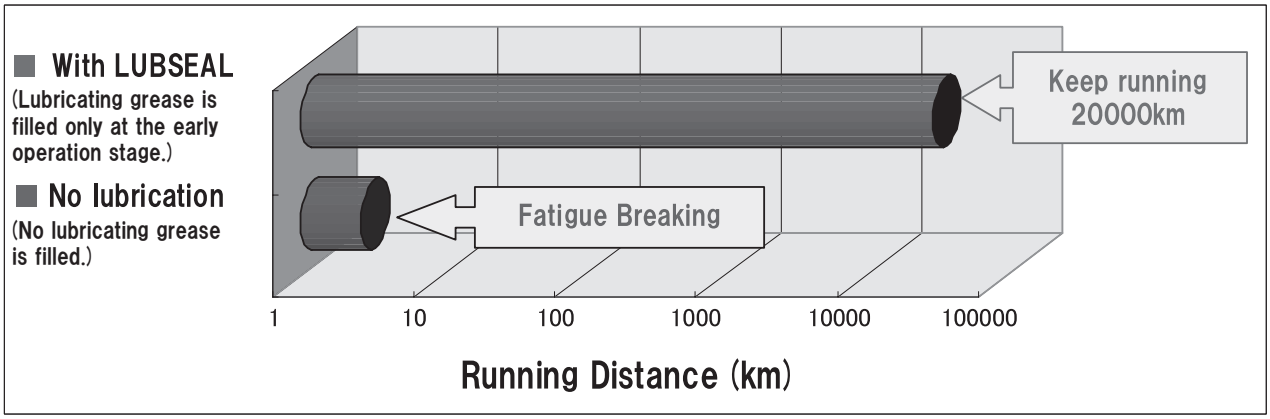
FEATURES

- Simple, neat, and compact
- Remarkably extends maintenance period
- Clean and gently for the environment

STRUCTURE



ENDURANCE TEST



Lineup

(Unit: mm)

Series	Model No.	Lead	Type of Slide Block	Applicable Guide Rail length (*)
SE	SE23	2, 5	Long Block	200-300
	SE30	4, 5, 10		200-750
	SE45	5, 10, 20	Long Block, Short Block	340-940
SC	SC23	2, 5	Long Block	200-300
	SC30	4, 5, 10		200-750
	SC45	5, 10, 20		540-940

* Because LUBSEAL are attached on both ends of a slide block, guide rail length is limited.

KURODA JENATEC

HOW TO INTERPRET MODEL NO.

SE series

Model NO.	Lead	Slide block		Guide rail length	Performance grade		Mortor bracket configuration	Type of cover	Sensor		Surface treatment	Grease		Dowel pin hole
SE30	10	E	–	500	W	–	A0	C	C	–	N	N	–	PS

↓

E: With 1 long block
F: With 2 long blocks
G: With 1 short block
H: With 2 short blocks

* To confirm variety of slide blocks, refer to the below-figure.

SC series

Model NO.	Lead	Slide block		Guide rail length	Performance grade		Mortor bracket configuration	Type of cover	Sensor		Surface treatment	Grease
SC30	10	E	–	500	W	–	A0	N	C	–	N	N

↓

E: With 1 long block

Maximum stroke and minimum stroke

(Unit: mm)

Model NO.	Guide rail length	Lubrication unit with LUBSEAL					
		Maximum stroke				Minimum stroke *2	
		Long slide block		Short slide block		Long slide block	Short slide block
		E: 1 pc	F: 2 pcs	G: 1 pc	H: 2 pcs	E: 1pc, F: 2pcs	G: 1pc, H: 2pcs
SE23	200	120	–	–	–	75	–
	250	170	95	–	–		
	300	220	145	–	–		
SE30 *1	200	104	–	–	–	91	–
	300	204	114	–	–		
	400	304	214	–	–		
	500	404	314	–	–		
	600	504	414	–	–		
	700	604	514	–	–		
	750	654	564	–	–		
SE45	340	211	–	241	148	123	93
	440	311	188	341	248		
	540	411	288	441	348		
	640	511	388	541	448		
	740	611	488	641	548		
	840	711	588	741	648		
	940	811	688	841	748		
SC23	200	110	–	–	–	75	–
	250	160	–	–	–		
	300	210	–	–	–		
SC30 *1	200	94	–	–	–	91	–
	300	194	–	–	–		
	400	294	–	–	–		
	500	394	–	–	–		
	600	494	–	–	–		
	700	594	–	–	–		
	750	644	–	–	–		
SC45	540	407	–	–	–	123	–
	640	507	–	–	–		
	740	607	–	–	–		
	840	707	–	–	–		
	940	807	–	–	–		

Dash (–) in the above table means the configuration is not available.
*1 Guide rail length 750mm for SE30 or SC30 is applied only to a 10mm lead-actuator.
*2 To use the length under minimum stroke, consult KURODA.

⚠ Operating Cautions

1. Operating temperature range is limited under 50 ℃. For operating temperature exceeding 50 ℃, consult KURODA.
2. Do not use organic solvent or kerosene.
3. In the case of anti-corrosive black coating specification, the coating film may be peeled off on the point of LUBSEAL contact.
4. Lubrication for SE series: To lubricate grooves on gide rail, pour grease for grease nipple. To lubricate screw shaft, apply grease to the shaft.
5. Lubrication for SC series: pour grease for central grease filler hole.

FOR SAFETY USE

Be sure to read the following instructions before use.
For common instructions, refer to the text of this catalog.

The following safety precautions recommend the correct usage of our products to prevent an injury and a damage.
These precautions are classified into 3 categories : "DANGER","WARNING" and "CAUTION" according to the degree of possible injury or damage and the degree of impendence of such injury or damage.
Be sure to follow all these precautions, as they include important contents regarding safety.

DANGER	WARNING	CAUTION
Indicates an impending hazardous situation that may arise due to improper handling or operation and could result in a serious injury or death.	Indicates a potentially hazardous situation that may arise due to improper handling or operation and could result in a serious injury or death.	Indicates a potentially hazardous situation that may arise due to improper handling or operation and could result in an injury or property damage only.

Be sure to obey "Labor Safety and Sanitation Law" and other safety rules and regulations in addition to these precautions.
There is some situation that may lead to a serious result according to circumstances, even if it is mentioned in the category of "CAUTION". Be sure to follow these precautions, as they contain important matters.

WARNING

- **Select a ballscrew actuator properly.**
  As operating conditions for products mentioned in this catalog are diversified, the applicability of ballscrew actuator to the intended system should be determined by the total system designer or the person who determined specifications for such system after conducting an analysis and testing as necessary.
  The person who determined the applicability of the system shall be responsible for assuring the intended system performance and safety. When configuring a system, the system designer should thoroughly examine all specifications for such a system by referring to the latest product catalog and data, and also take into consideration the possibility of equipment troubles.

- **The ballscrew actuator should be handled by persons who have sufficient knowledge and rich experience.**
  Thoroughly read this catalog and operation manual before use.
  · Never disassemble the ballscrew actuator. Dust can enter the inside, degrading the accuracy of the module and causing an accident. When the ballscrew actuator has been disassembled from necessity, return it to our company for repair and reassembling. (In this case, repairing charges are required.)
  · When mounting a ballscrew actuator to a machine and dismounting it from machine, check that a fall prevention means has been taken and the moving part of the machine has been fixed beforehand.

- **When using the ballscrew actuator in the following conditions or environments, take the proper safety measures and consult KURODA beforehand.**
  · Conditions and environments other than specified and outdoor use.
  · Applications to nuclear power equipment, railroads aircraft, vehicles, medical equipment, equipment connected with food and drink, and the likes.
  · Applications which require extreme safety and will also greatly affect men and property.

- **During operation, make sure to keep your hands away from either of stroke ends, where slide block moves, to prevent your finger from being caught.**

- **During operation, make sure to keep your hands away from screws and axis terminals of ball screw shaft, which are rotating parts, to prevent your hands from being caught.**

- **Pay adequate attention not to allow the actuators to be used for military purpose including for arms and weapons.**

BALLSCREW ACTUATOR/COMMON INSTRUCTIONS

Be sure to read the following instructions before use.
Also refer to "FOR SAFETY USE".

DESIGN

⚠ WARNING

- **Especially when there is the possibility that the ballscrew actuator is dangerous to the human body, provide it with a protective cover.**

  When there is the possibility that the load and the moving part of the ballscrew actuator are dangerous to the human body, design the structure to prevent the human body from touching such load and moving part directly.

- **Firmly tighten the fixed part and connection of the ballscrew actuator.Improper mounting of the body may adversely affect safety and accuracy according to circumstances.**

- **Take into consideration the behavior of the ballscrew actuator in an emergency.**

  When the machine is immediately stopped in an emergency by a person or by a safety device in case of power failure or system trouble, the motion of the module can injure the human body and can damage the machine. So design the machine to prevent an injury to the human body and a damage to the machine.

SELECTION

⚠ WARNING

- **Check specifications.**

  Be sure to use the ballscrew actuator within the given specifications.

- **When selecting a rigid type as coupling for connecting a motor, consult KURODA.**

MOUNTING

⚠ CAUTION

- **Be careful not to dent and flow the body and the mounting surface of the table, side cover, and center sheet.**

  Such dent or flaw will degrade parallelism of mounting surface, resulting in rattling of the guide and increased slide resistance. Note that, since the center sheet of SC series are very thin, such dent or flaw may ruin its dust preventive capability or lead to damage of the sheet function.

- **When connecting the ballscrew actuator to a load with an external support or guide, do so in accordance with a proper connecting method and perform centering satisfactorily.**

- **When mounting a load, do not apply an excessive shock or moment.**

  If the ballscrew actuator receives external force exceeding the permissible moment, the guide will loosen and sliding resistance will increase.

- **Do not start the system until it is confirmed that the ballscrew actuator works properly.**

  After mounting the ballscrew actuator, perform an appropriate functional test and make sure that it is correctly mounted and works safely without fail before starting the system.

- **Although corners of components, such as motor bracket, housing, side cover, and center sheet, are beveled, pay enough attention not to hurt yourself when handling them.**

OPERATING ENVIRONMENT

⚠ DANGER

- **Do not use the ballscrew actuator in a place where an explosive atmosphere exists.**

⚠ WARNING

- **Do not use the ballscrew actuator in an atmosphere containing corrosive gases, chemicals, seawater, water and vapor and in a place where it can be stained with such matters.**

- **When using the ballscrew actuator in a place where it is exposed to dust, cuttings, spatters, etc., fit a protective cover or other protector.**

- **Do not use the ballscrew actuator in a vibratory or shockable place ; otherwise causing a bad condition or breakdown.**

  When using the ballscrew actuator in such an environment, consult KURODA.

⚠ CAUTION

- **Since the SC series is equipped with sheet magnet on side covers for attracting center sheet to keep its position, be careful not to have the magnet contaminated with iron power or metallic fragments.**

LUBRICANTS

⚠ CAUTION

- **Unless otherwise specified, the nut contains Multemp PS No.2 Grease (KYODO YUSHI CO., LTD.) as a lubricant.**

- **Checking and supplying lubricant**

  Check the lubricant 2 to 3 months after the ball screw is used for the first time. If it is extremely dirty, wipe off old grease and apply new grease. Then, check and supply the lubricant once every year as a general rule. However, as the service life of lubricants varies according to operating conditions and environment, adjust the intervals properly.

  When feeding additional grease (lubricant), use the same brand of grease as initially contained.

  With SC series, a central grease filler hole (M3) is provided on side surface of table, making it possible for the grease to be supplied to ball screw and guide through the filler hole.

  Supply additional grease as necessary, preferably with the interval indicated above. When adding grease, 2 dispenses by grease gun (approx. 1 to 2 cc) should be supplied.

  After supplying additional grease, operate the table to the extent of full stroke to apply the grease over the component. Wipe off excess grease attached around the central grease filler hole.

- **Do not use at high temperature over 60 celsius degree.**

  As resin is used in ballscrew actuator, use at lower temperature than 60 celsius degree. For ballscrew actuator with sensor, use at lower temperature than 55 celsius degree.

CONTENTS

FULL-COVER TYPE BALLSCREW ACTUATORS/SC SERIES

VARIATIONS

Model No.		SC23	SC30	SC45
Performance grade		H: Repeated positioning accuracy ±3μm(Note 1) (Note 2) U: Repeated positioning accuracy ±5μm(Note 2) W: Repeated positioning accuracy ±10μm(Note 2)		
Screw shaft dia. (mm)		8	10	15
Lead (mm)	2	◎	●	
	4	●	◎	
	5	◎	◎	◎
	6		◎	
	8	●		
	10		◎	◎
	20		◎	◎

◎: In-stock items ●: Manufactured by order

(Note 1) There is no Performance Grade H in SC30 leads 6mm and 20mm.

(Note 2) Performance may be different from the values shown above, depending on applied options and usage.

HOW TO INTERPRET MODEL NO.

SC30	05	A	-	150	U	-	A1	N	N	-	N	N	-	PR
①	②	③		④	⑤		⑥	⑦	⑧		⑨	⑩		⑪

① Model ② Lead

① Model	② Lead	② Sub guide rail
SC23	2, 5	SB
SC30	4, 5, 6, 10, 20	SB
SC45	5, 10, 20	SB

③ Slide block

Model	Slide block
SC23 SC30 SC45	A: With 1 long block E: With 1 long block (LUBSEAL)

④ Guide rail length (Note 1) (Note 2)

Model	Guide rail length (mm)
SC23	150, 200, 250, 300
SC30	150, 200, 300, 400, 500, 600, 700*, 750*
SC45	540, 640, 740, 840, 940

⑤ Performance grade (Note 3)

H	Repeated positioning accuracy±3μm
U	Repeated positioning accuracy±5μm
W	Repeated positioning accuracy±10μm
L	Sub guide rail

⑥ Motor bracket configuration

Model	Motor bracket configuration	Sub guide rail
SC23	A0, A1, A2, A3, A5, A6, A7	NN
SC30	A0, A1, A2, A3, A4, A5, A7, B1, RN, E□, F□	NN
SC45	A0, A1, A2, A3, A4, A5, A6, RN, E□, F□, G□	NN

⑦ Type of cover

N	Standard cover
G	With grease nipple
S	With wiper
D	With grease nipple and wiper

⑧ Sensor

Model	Sensor
SC23	N: Without sensor S: Photo-microsensor K, E: Proximity sensor 1: For sensor rails only
SC30 SC45	N: Without sensor M, Y, C, P: Photo-microsensor K, E: Proximity sensor 1: For sensor rails only

⑨ Surface treatment (Note 4)

N	Standard treatment
L	Anti corrosive black coating

⑩ Grease (Note 5)

Model	Grease
SC23 SC30 SC45	N: Standard grease S: Dust preventive KURODA S grease

⑪ Additional options

Blank	No dowel pin hole
PR	For guide rail only
ML	For reversed guide rail reference surface
MPR	For both reversed guide rail reference surface and guide rail

(Note 1) For specifications of guide rail with long rails or intermediate stroke with non-standard length, consult KURODA.

(Note 2) The SC30 rail lengths marked with "*" are not available in Performance Grade H.

(Note 3) There is no Performance Grade H in SC30 leads 6mm and 20mm.

(Note 4) With standard specifications of surface treatment (Symbol: N), only guide rails are treated with black coating.

(Note 5) With standard grease (Symbol: N), Multemp PS No.2 Grease (KYODO YUSHI CO., LTD.) is contained in slide block and ball screw components.

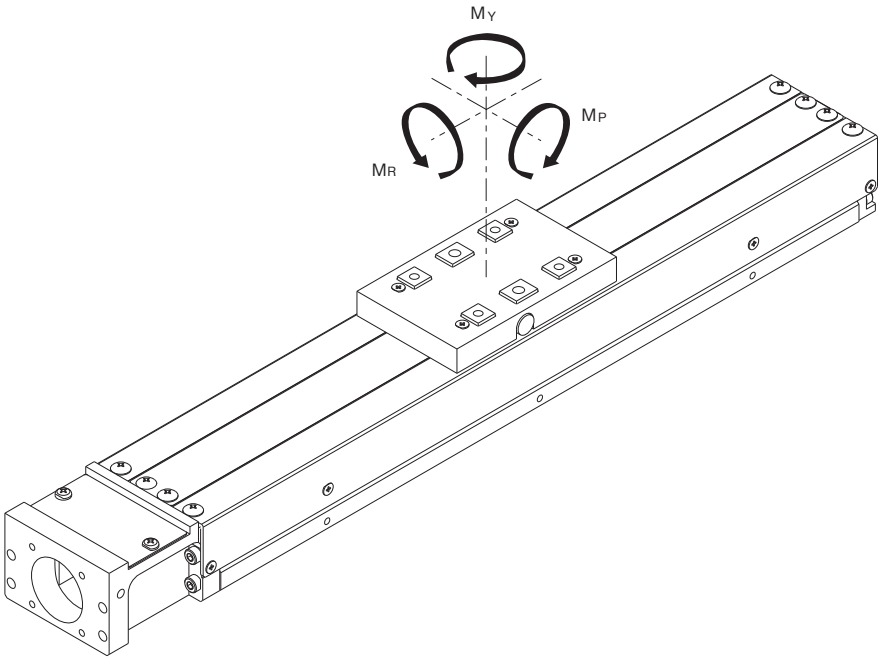
(Note 6) With Lubrication unit LUBSEAL specifications refer to Front matters 14 to 15.

SPECIFICATIONS

Model no.					SC2302		SC2305		SC3004		SC3005		SC3006		SC3010		SC3020		SC4505		SC4510		SC4520	
Performance grade					W	U	W	U	W	U	W	U	W	U	W	U	W	U	W	U	W	U	W	U
Guide	Radial clearance			μm	−3～0				−3～0										−5～0					
	Long block	Basic dynamic load rating	C	kN	4.3				7										27					
		Basic static load rating	C_0	kN	7.0				11.8										45.0					
		Static permissible moment	M_P	N·m	29				43										68					
			M_Y		51				107										194					
			M_R		61				84										250					
Ball screw	Shaft diameter			mm	8				10										15					
	Lead			mm	2		5		4		5		6		10		20		5		10		20	
	Basic dynamic load rating		C_a	kN	1.8		1.9		3.0		3.0		3.0		2.0		2.2		5.1		5.1		3.1	
	Basic static load rating		C_{0a}	kN	3.2		3.1		5.3		5.3		5.3		3.2		3.5		10.5		10.5		6.6	
Fixed side bearing	Model No. of bearing				AC6-16DF or equivalent				708DFP5 or equivalent										5201A or equivalent					
	Basic dynamic load rating		C_b	kN	1.79				4.40										5.90					
	Basic static load rating		C_{0b}	kN	1.76				4.36										3.20					

(Note 1) Static permissible moment shows rigidity value based on dimensions and material of table.
(Note 2) There is no Performance Grade H in SC30 leads 6mm and 20mm.

DIRECTION OF MOMENT



ACCURACY

Model No.	Guide rail length (mm)	Repeated positioning accuracy (μm)			Positioning accuracy (μm)			Travelling parallelism B (μm)			Backlash (μm)			Starting torque (Note 2) (N・m)		
		W	U	H	W	U	H	W	U	H	W	U	H	W	U	H
SC23	150	±10	±5	±3	70		60	15		15	20	5	5	0.03	0.06	0.06
	200				75											
	250				85											
	300				90											
SC30	150	±10	±5	±3 (±5)	70		60	15		15	20	5	5	0.07	0.15	0.15
	200				80											
	300				90											
	400				95											
	500				100		100	25		25						
	600				110											
	700			—	120		—			—			—			—
	750				130											
SC45	540	±10	±5	±3 (±5)	110		100	40		40	20	5	5	0.1	0.2	0.2
	640				120											
	740				130		120									
	840				150		150	50		50						
	940				170											

(Note 1) Measurement is to be performed with KURODA's specified motor mounted.

(Note 2) Above starting torque value is applied when the standard grease is used. The value may change depending on the properties of the grease.

(Note 3) For repeated positioning accuracy, the value in parentheses is for parallel motor mounted configurations.

INERTIA

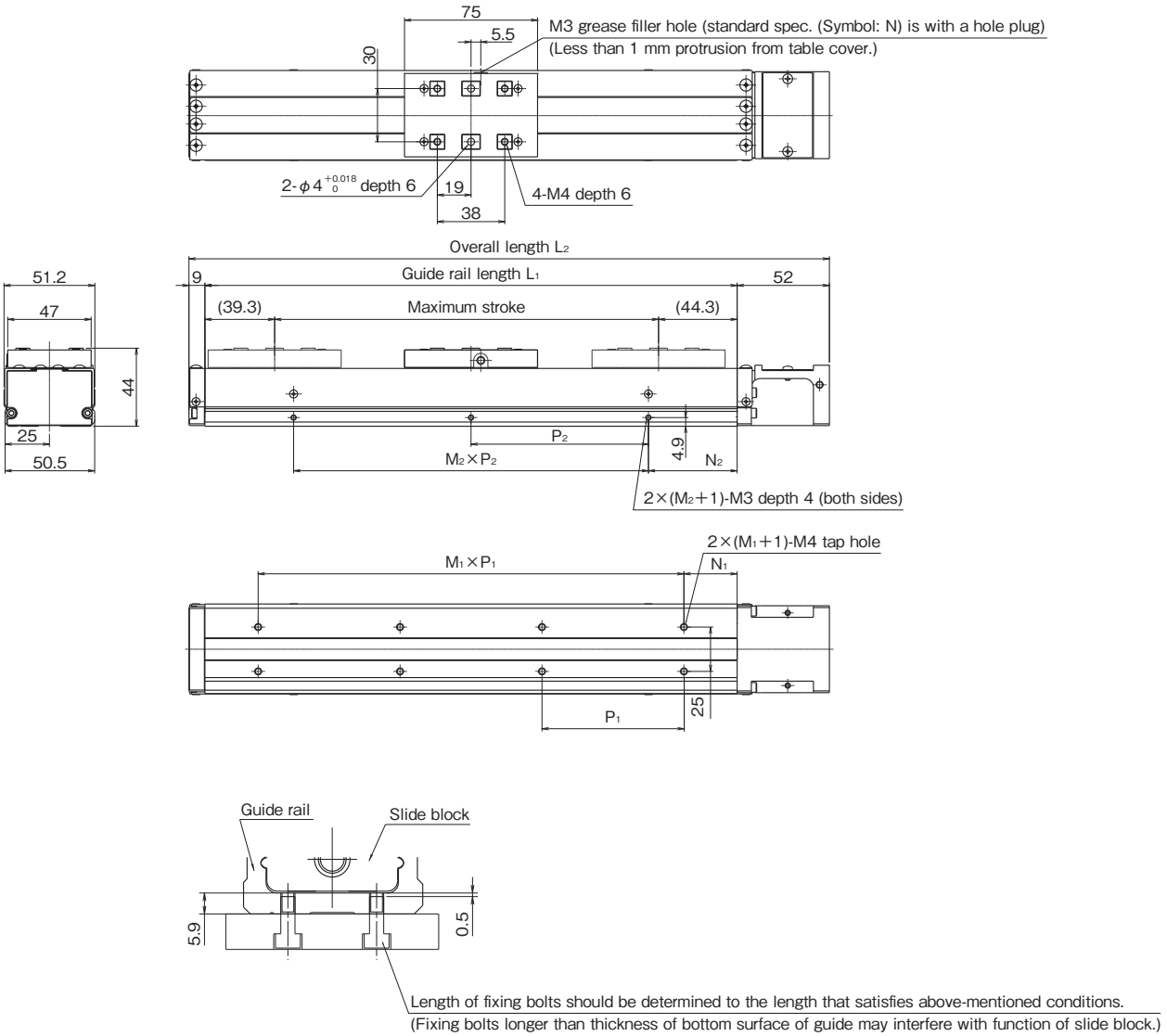
Inertia for slide block and ball screw of ballscrew actuator is shown in the following table.

(Unit : $\times 10^{-5}$kg·m^2)

Model No.	Guide rail length (mm)	Full-cover type Long block A: 1 block
SC2302	150	0.0616
	200	0.0773
	250	0.0930
	300	0.1090
SC2305	150	0.0756
	200	0.0913
	250	0.1070
	300	0.1230
SC3004	150	0.165
	200	0.204
	300	0.280
	400	0.357
	500	0.434
	600	0.510
	700	0.587
SC3005	150	0.176
	200	0.214
	300	0.291
	400	0.367
	500	0.444
	600	0.521
	700	0.597
SC3006	150	0.188
	200	0.227
	300	0.303
	400	0.380
	500	0.457
	600	0.533
	700	0.610
SC3010	150	0.261
	200	0.299
	300	0.376
	400	0.453
	500	0.529
	600	0.606
	700	0.683
	750	0.721
SC3020	150	0.602
	200	0.640
	300	0.717
	400	0.793
	500	0.870
	600	0.947
	700	1.023
SC4505	540	2.43
	640	2.81
	740	3.20
	840	3.59
	940	3.98
SC4510	540	2.68
	640	3.07
	740	3.46
	840	3.84
	940	4.23
SC4520	540	3.69
	640	4.08
	740	4.47
	840	4.86
	940	5.24

SC23

● FULL-COVER TYPE LONG BLOCK CONFIGURATIONS



● FULL-COVER TYPE LONG BLOCK DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
150	211	35	1×80	25	1×100	66	—
200	261	20	2×80	50		116	110
250	311	45		25	2×100	166	160
300	361	30	3×80	50		216	210

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)		Mass (kg)	
	Lead		Full-cover type	Mass of table (slide block + table + table cover parts)
	2mm	5mm	A: With 1 long block	
150	200	490	1.20	0.25
200			1.41	
250			1.63	
300			1.84	

(Note 1) Mass of full-cover type actuators in the above table includes mass of table.
(Note 2) For long rail configurations, please consult KURODA.

● MOTOR BRACKET CONFIGURATIONS

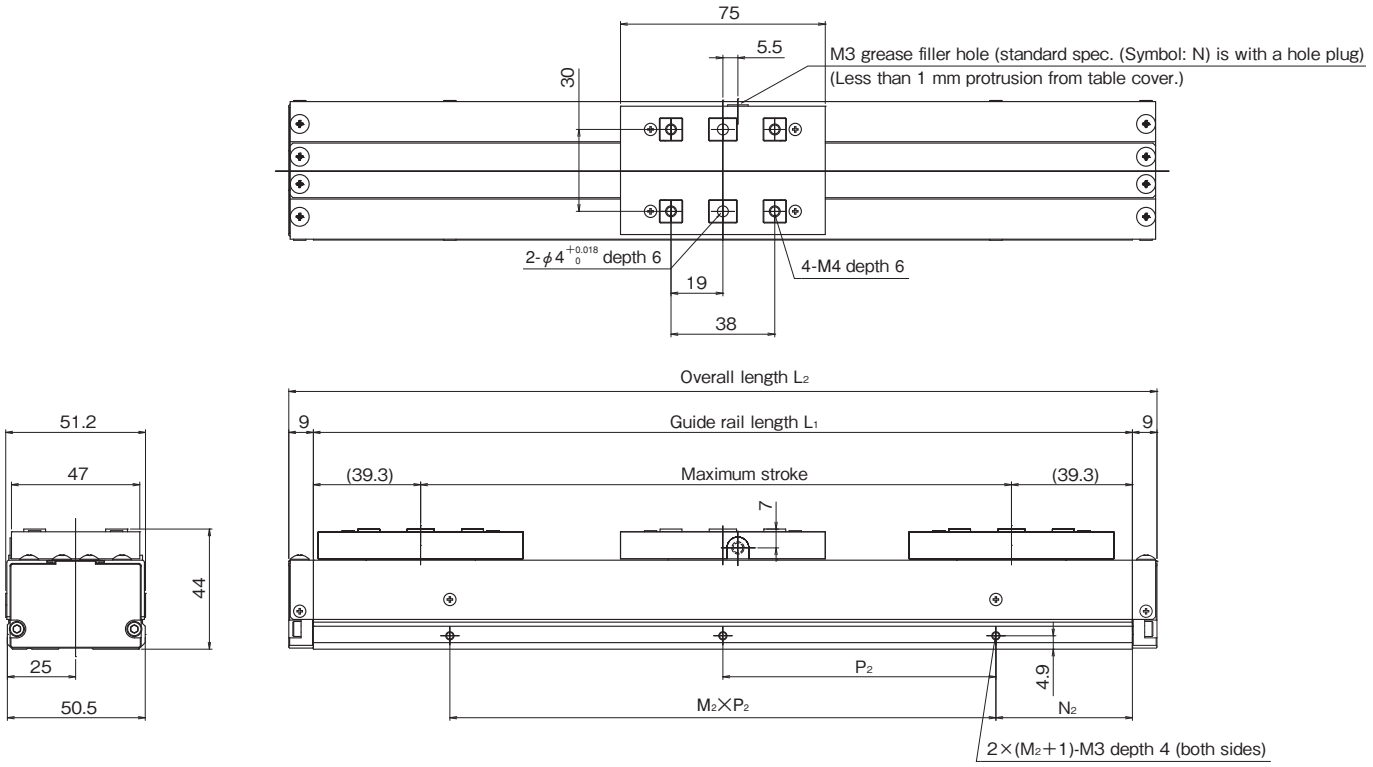
Please refer to Pages 68 to 71 of SE23 series regarding to motor bracket configurations.

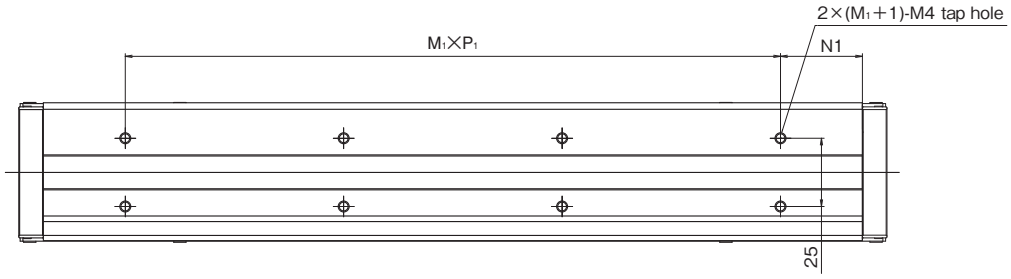
● DOWEL PIN HOLE (Guide rail only)

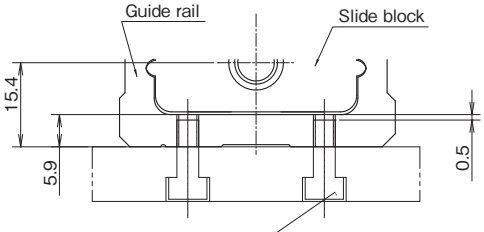
Please refer to Pages 73 of SE23 series regarding to guide rail positioning hole.

SC23

● FULL-COVER TYPE SUB GUIDE RAIL CONFIGURATIONS







Length of fixing bolts should be determined to the length that satisfies above-mentioned conditions.
(Fixing bolts longer than thickness of bottom surface of guide may interfere with function of slide block.)

KURODA JENATEC

● FULL-COVER TYPE SUB GUIDE RAIL DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
150	211	35	1×80	25	1×100	71	—
200	261	20	2×80	50		121	115
250	311	45		25	2×100	171	165
300	361	30	3×80	50		221	215

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)	Mass (kg)	
		Full-cover type	Mass of table (slide block + table + table cover parts)
	Lead	A: With 1 long block	
150	490	1.12	0.25
200		1.32	
250		1.51	
300		1.71	

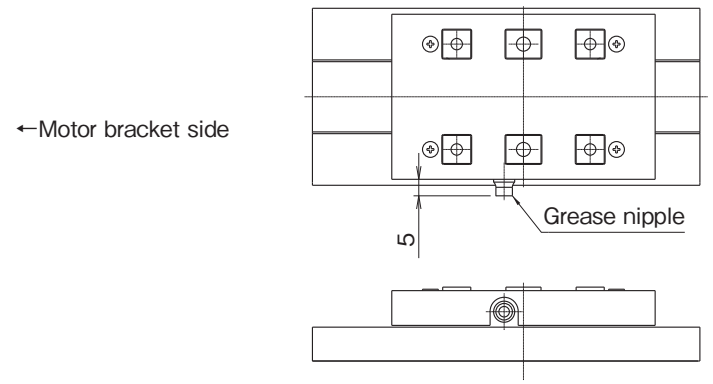
(Note 1) Mass of full-cover type actuators in the above table includes mass of table.
(Note 2) For long rail configurations, please consult KURODA.

SC23

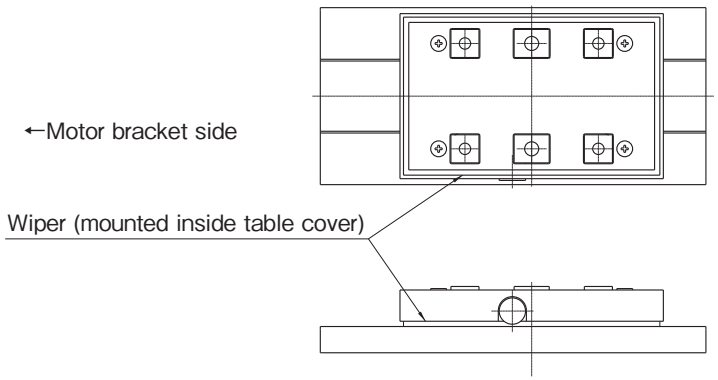
● COVER CONFIGURATION

The below-mentioned configurations with grease nipple and/or wiper are available for full-covered series. Standard specification (Symbol: N) has a plug equipped with grease filler hole.

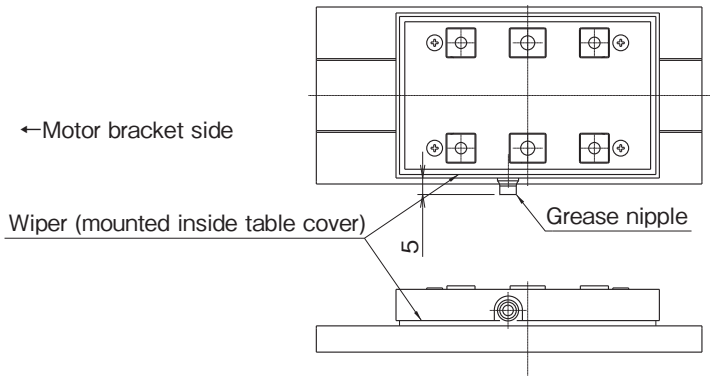
Full-cover type with grease nipple (Symbol: G)



Full-cover type with wiper (Symbol: S)



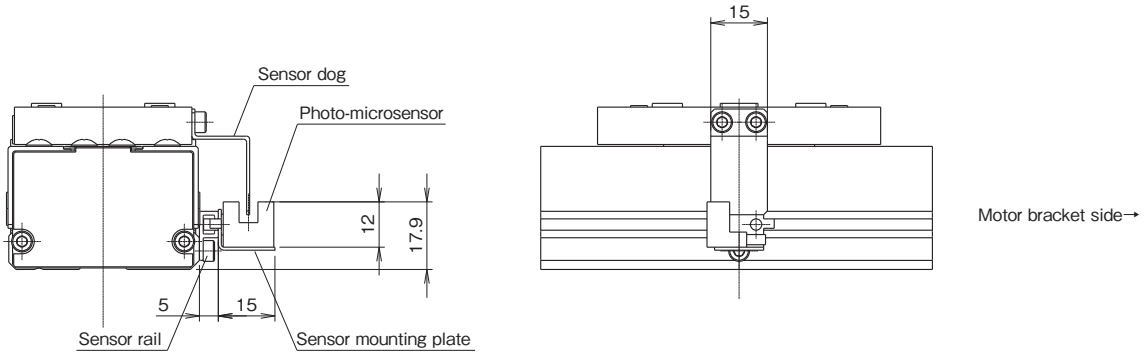
Full-cover type with grease nipple and wiper (Symbol: D)



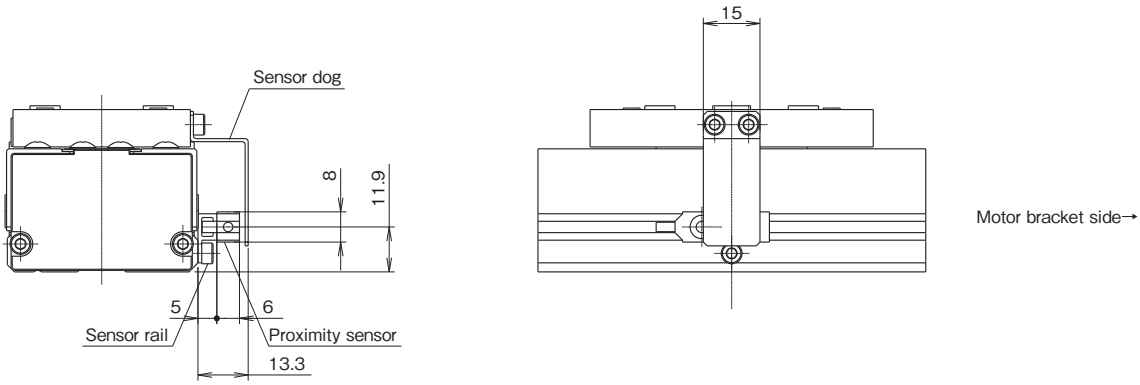
SC23

● SENSOR

Symbol S (NPN): Photo-microsensor (Panasonic Industrial Devices SUNX)



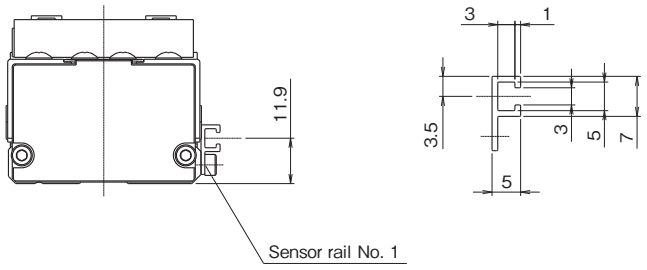
Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)



● SENSOR RAIL

Sensor rails only available with no sensors.

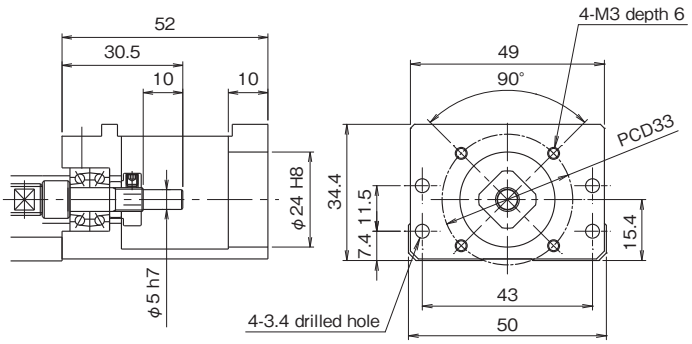
Sensor rail No. 1



SE23

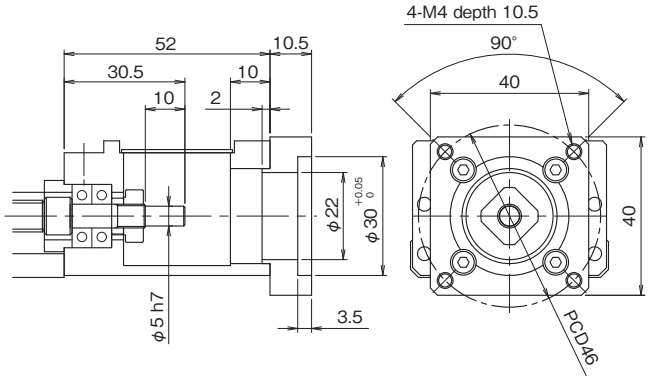
● MOTOR BRACKET CONFIGURATIONS

Motor bracket configuration: A0

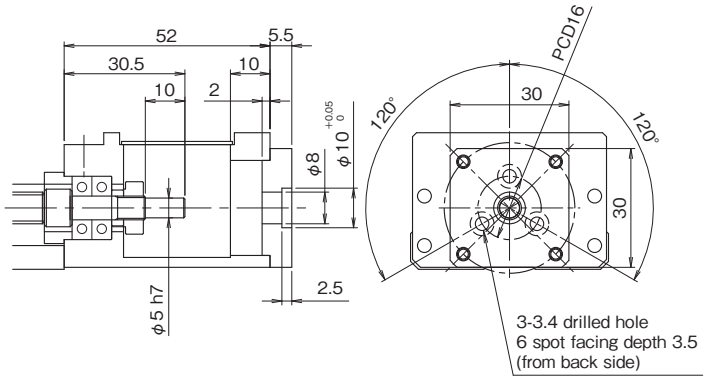


● MOTOR BRACKET CONFIGURATIONS (INTERMEDIATE FLANGE)

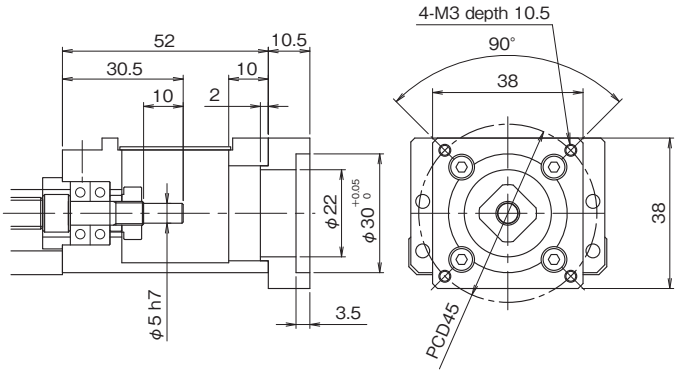
Motor bracket configuration: A1 (mass: 28g)



Motor bracket configuration: A2 (mass: 12g)



Motor bracket configuration: A3 (mass: 24g)

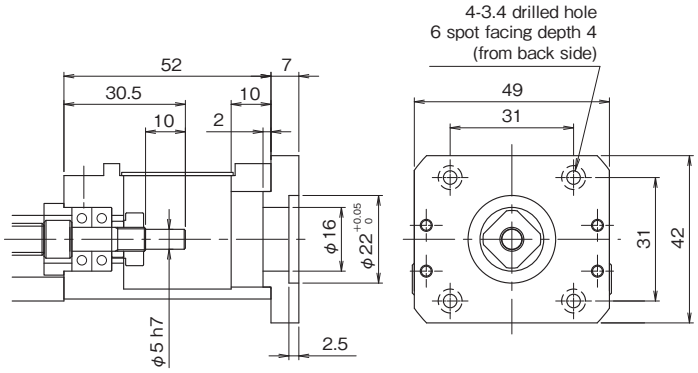


(Note) For A2 configuration, install the intermediate flange to motor before mounting it to actuator.

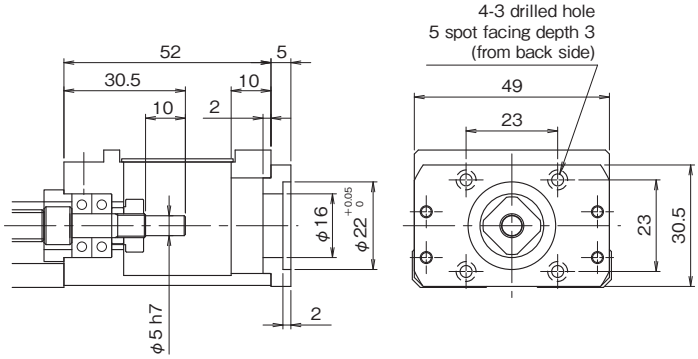
SE23

● MOTOR BRACKET CONFIGURATIONS (INTERMEDIATE FLANGE)

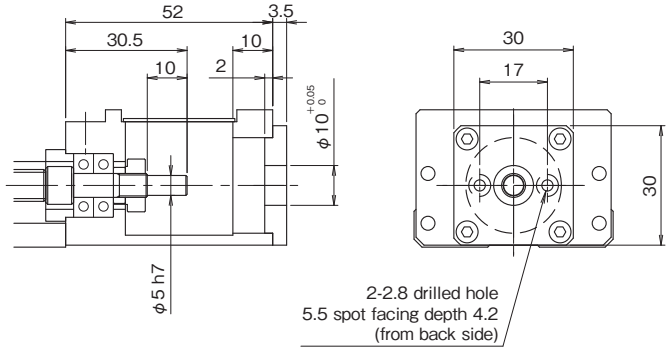
Motor bracket configuration: A5 (mass: 32g)



Motor bracket configuration: A6 (mass: 16g)



Motor bracket configuration: A7 (mass: 8g)



(Note) For A5, A6, and A7 configuration, install the intermediate flange to motor before mounting it to actuator.

● MOTOR BRACKET CONFIGURATIONS AND MOTOR OPTION

Motor option					Motor bracket configuration	Recommended coupling
Motor type	Maker	Series	Model No.	Output		
AC SERVO motor	PANASONIC	MINAS A5	MSME5A	50W	A3	SFC-010DA2 (MIKI PULLEY) ACD-19A (ISEL)
			MSME01	100W		
		MINAS A6	MSMF5A	50W		
			MSMF01	100W		
	MITSUBISHI ELECTRIC	MELSERVO J3	HF-KP (MP) 053	50W	A1	
			HF-KP (MP) 13	100W		
		MELSERVO J4	HG-KR (MR) 053	50W		
			HG-KR (MR) 13	100W		
	YASKAWA ELECTRIC	Σ-V	SGMJV, SGMAV-A5	50W	A1	
			SGMJV, SGMAV-01	100W		
			SGMJV, SGMAV-C2	150W		
		Σ-7	SGM7J, SGM7A-A5	50W		
			SGM7J, SGM7A-01	100W		
			SGM7J, SGM7A-C2	150W		
	SANYO ELECTRIC	SANMOTION R	R2AA04005	50W	A1	
			R2AA04010	100W		
Stepping motor	ORIENTAL MOTOR	α step	ARM2	□28mm	A6	
			ARM4	□42mm	A5	
		5-Phase	CRK52	□28mm	A6	
			CRK54	□42mm	A5	
			RKS54	□42mm		
		2-Phase	PKP22	□28mm	A6	
			PKP24	□42mm	A5	
	SANYO ELECTRIC	5-Phase	F series□42mm	□42mm	A5	

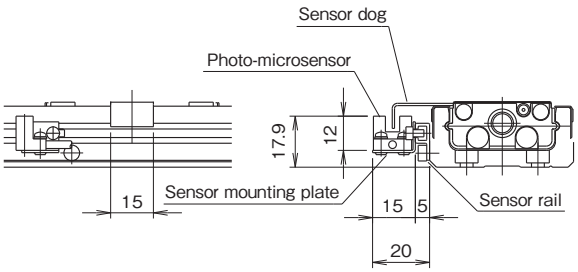
・For motors other than above-mentioned, consult KURODA.
・When selecting a rigid type of coupling for connecting a motor, consult KURODA.
・For detailed specifications of above-mentioned motors and couplings, refer to catalogs or websites provided by the makers.

SE23

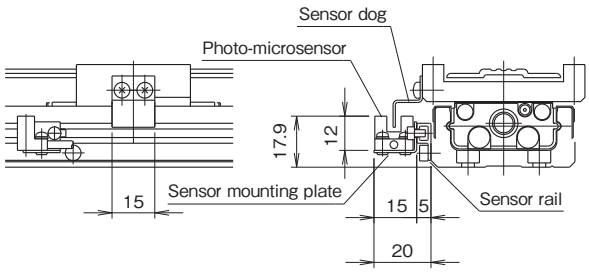
● SENSOR

Symbol S (NPN): Photo-microsensor (Panasonic Industrial Devices SUNX)

Without cover

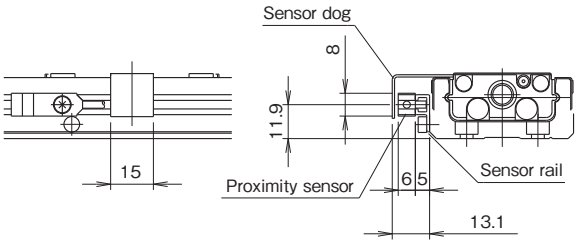


With dustproof cover

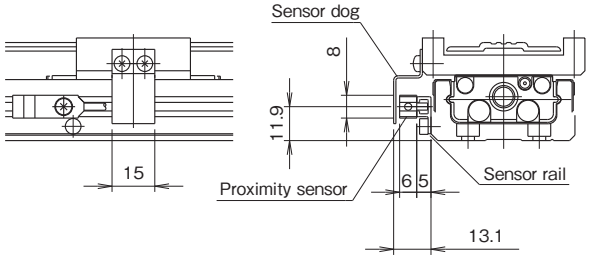


Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)

Without cover



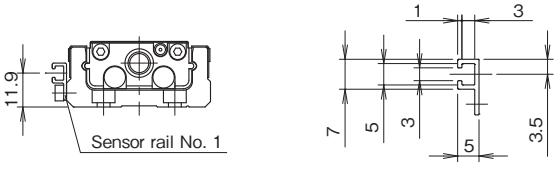
With dustproof cover



● SENSOR RAIL

Sensor rails only available with no sensors.

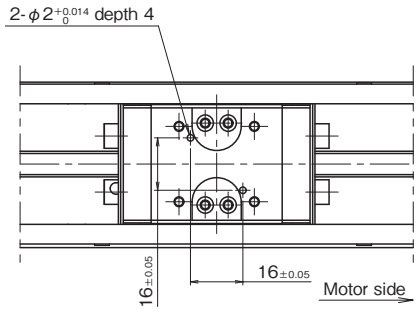
Sensor rail No. 1



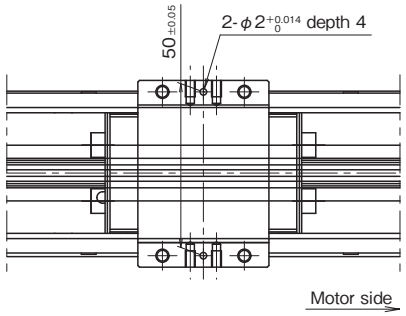
● DOWEL PIN HOLE

Dowel pin holes are applicable on the slide blocks with part number "PS", sub-tables "PR"or slide blocks and sub-tables "PSR". For an acutuator with 2 blocks, they are on both driving-side block and driven-side block. Please note that dowel pins are not equipped.

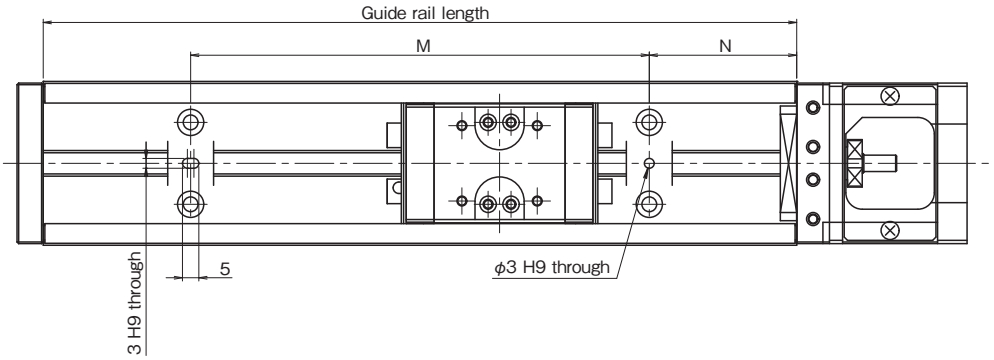
Long block without dustproof cover with "PS"



Long block with dustproof cover with "PS"



Guide rail with "PR"



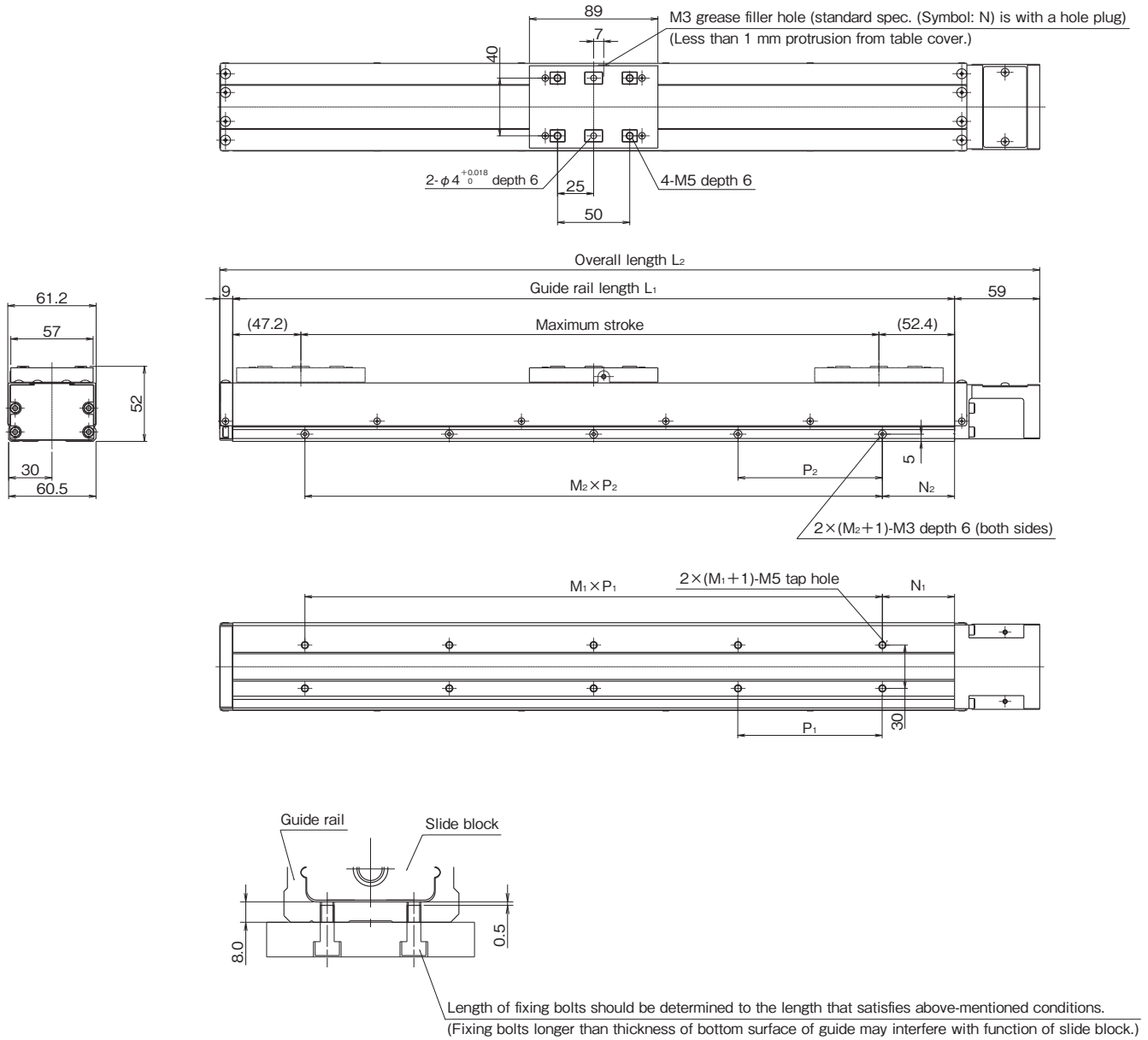
(Unit: mm)

Guide rail length	N	M	Dowel pin height
150	35	80	Less than 5.9
200	20	160	
250	45		
300	30	240	

Notice: In case dowel pin is stuck out from the U-guide rail, it may interfere with and break the slide block.

SC30

● FULL-COVER TYPE LONG BLOCK CONFIGURATIONS



● FULL-COVER TYPE LONG BLOCK DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
150	218	25	1×100	25	1×100	50	—
200	268	50		50		100	94
300	368		2×100		2×100	200	194
400	468		3×100		3×100	300	294
500	568		4×100		4×100	400	394
600	668		5×100		5×100	500	494
700	768		6×100		6×100	600	594
750	818	25	7×100	25	7×100	650	644

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)					Mass (kg)	
	Lead					Full-cover type	Mass of table (slide block + table + table cover parts)
	4mm	5mm	6mm	10mm	20mm	A: With 1 long block	
150	320	400	480	810	1200	1.9	0.43
200						2.2	
300						2.9	
400						3.5	
500						4.2	
600	240	300	360	600		4.9	
700	170	210	250	430	910	5.5	
750	—	—	—	380	790	5.8	

(Note 1) Guide rail length of 750 mm is available only for SC3010.

(Note 2) Mass of full-cover type actuators in the above table includes mass of table.

(Note 3) For long rail configurations, please consult KURODA.

● MOTOR BRACKET CONFIGURATIONS

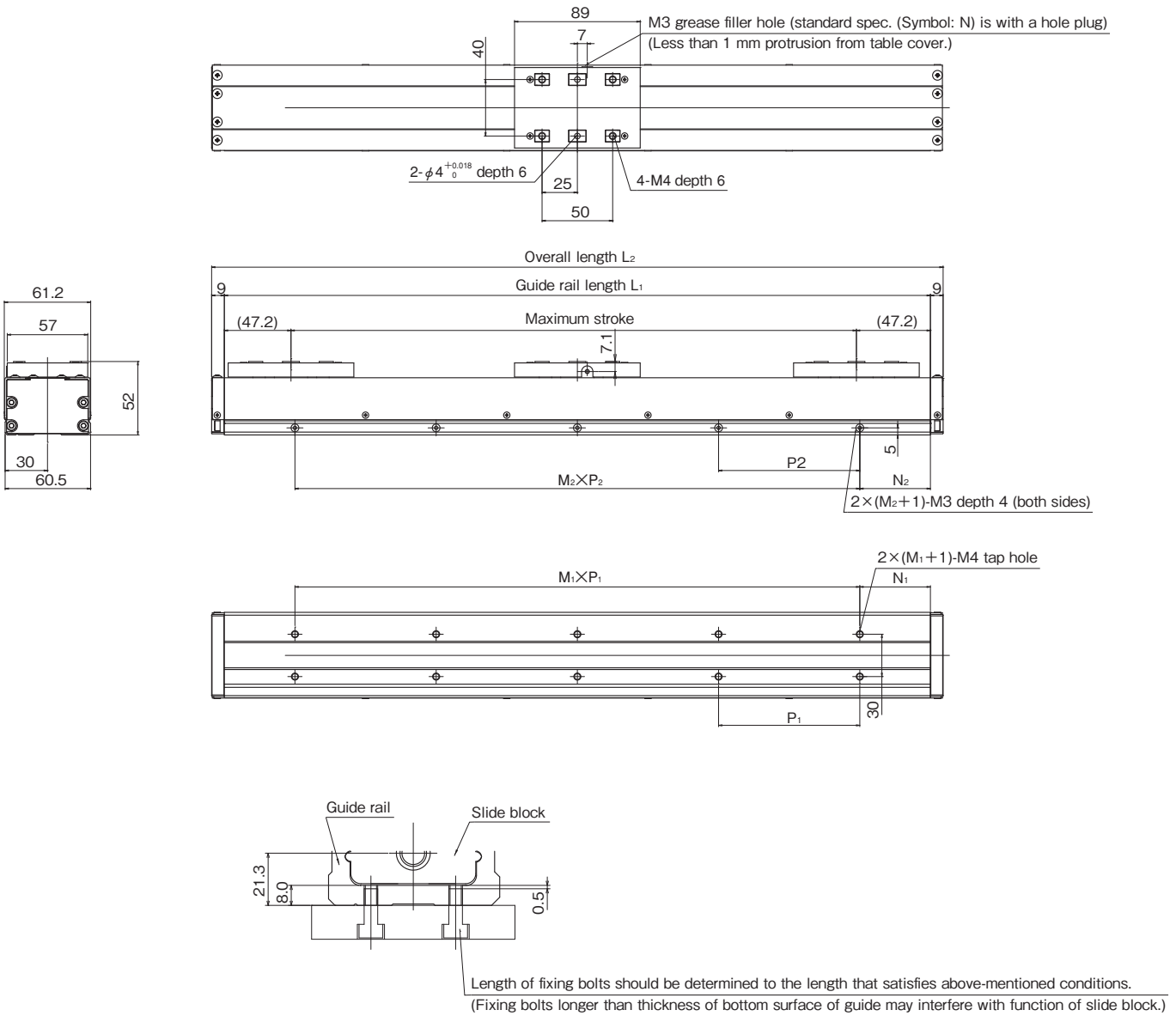
Please refer to Pages 78 to 81 of SE30 series regarding to motor bracket configurations and parallel motor mounting.

● DOWEL PIN HOLE (Guide rail only)

Please refer to Pages 83 of SE30 series regarding to guide rail positioning hole.

SC30

● FULL-COVER TYPE SUB GUIDE RAIL CONFIGURATIONS



● FULL-COVER TYPE SUB GUIDE RAIL DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
150	218	25	1×100	25	1×100	55	—
200	268	50		50		105	99
300	368		2×100		2×100	205	199
400	468		3×100		3×100	305	299
500	568		4×100		4×100	405	399
600	668		5×100		5×100	505	499
700	768		6×100		6×100	605	599
750	818	25	7×100	25	7×100	655	649

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)	Mass (kg)	
		Full-cover type	Mass of table (slide block + table + table cover parts)
	Lead	A: With 1 long block	
150	1200	1.80	0.43
200		2.09	
300		2.69	
400		3.28	
500		3.87	
600		4.46	
700		5.05	
750		5.35	

(Note 1) Guide rail length of 750 mm is available only for SC3010.

(Note 2) Mass of full-cover type actuators in the above table includes mass of table.

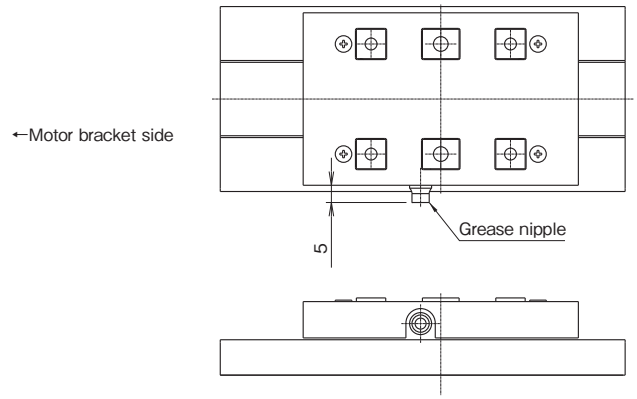
(Note 3) For long rail configurations, please consult KURODA.

SC30

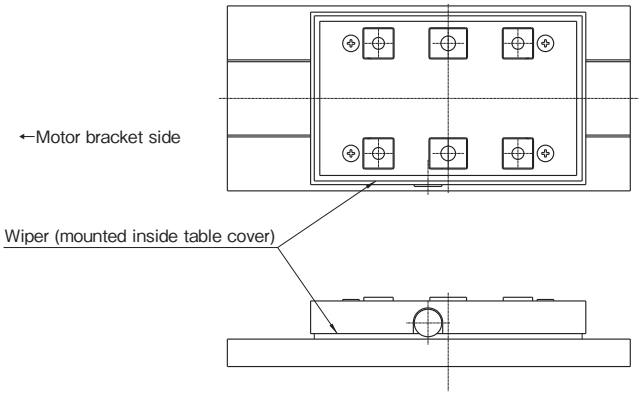
● COVER CONFIGURATION

The below-mentioned configurations with grease nipple and/or wiper are available for full-covered series. Standard specification (Symbol: N) has a plug equipped with grease filler hole.

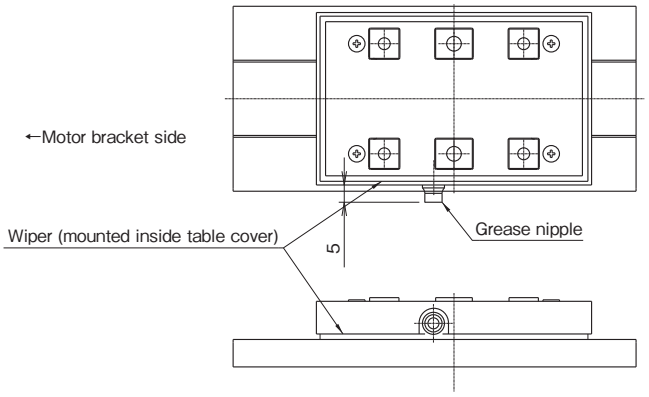
Full-cover type with grease nipple (Symbol: G)



Full-cover type with wiper (Symbol: S)



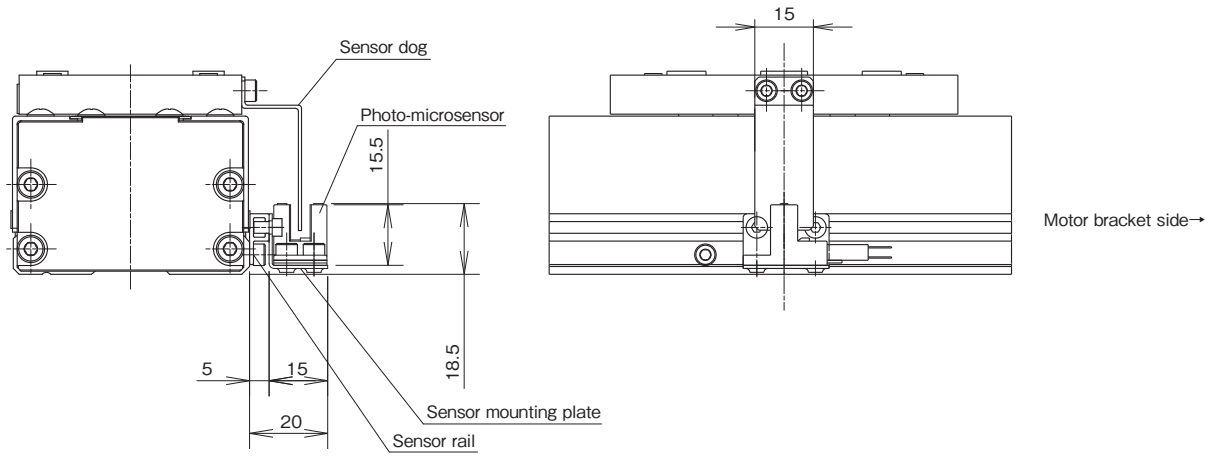
Full-cover type with grease nipple and wiper (Symbol: D)



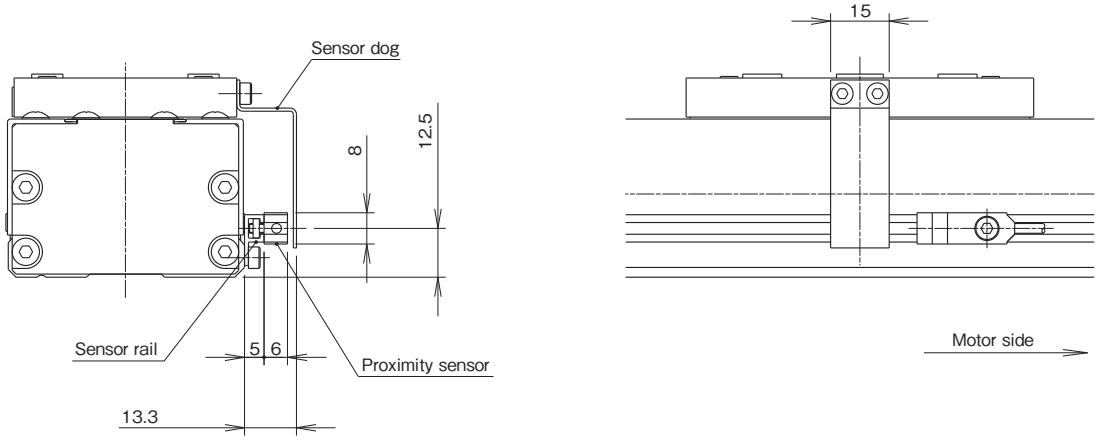
SC30

● SENSOR

Symbol C (NPN) / P (PNP), M (NPN) / Y (PNP): Photo-microsensor (OMRON, Panasonic Industrial Devices SUNX)



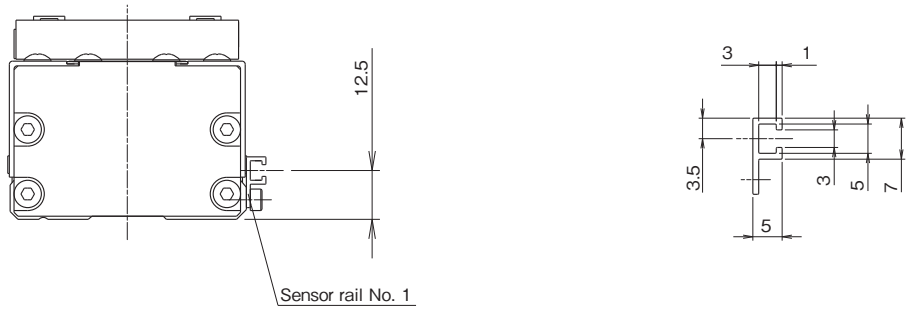
Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)



● SENSOR RAIL

Sensor rails only available with no sensors.

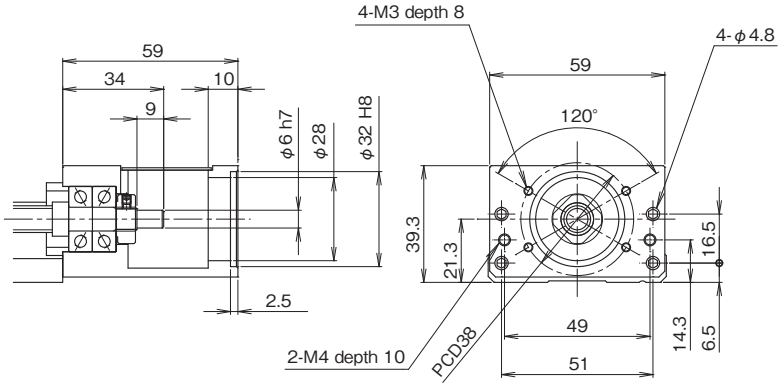
Sensor rail No. 1



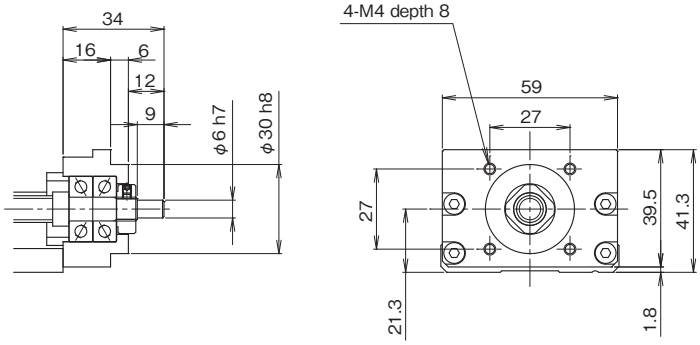
SE30

● MOTOR BRACKET CONFIGURATIONS

Motor bracket configuration: A0



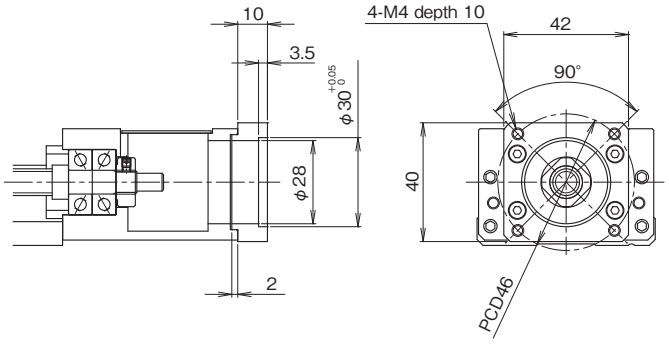
Motor bracket configuration: RN



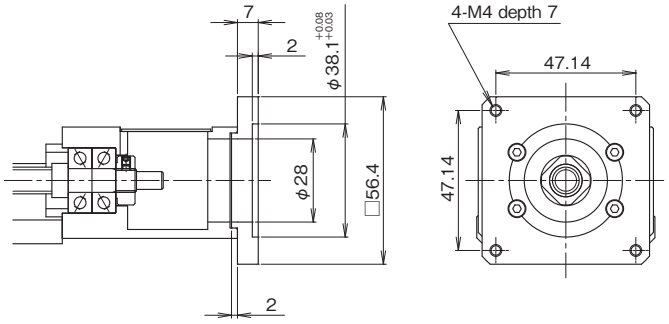
Mass of the RN configuration is 0.085 kg less than the value shown in the table on page 75.

● MOTOR BRACKET CONFIGURATIONS (INTERMEDIATE FLANGE)

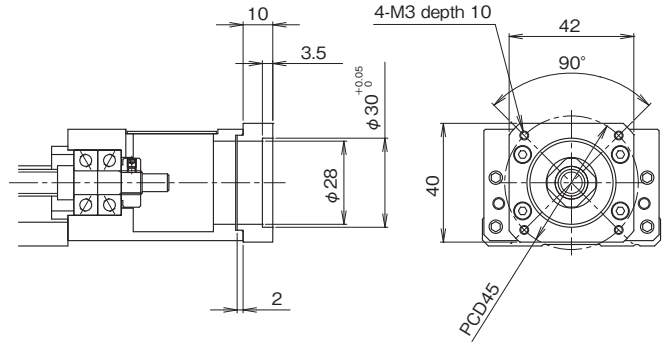
Motor bracket configuration: A1 (mass: 25g)



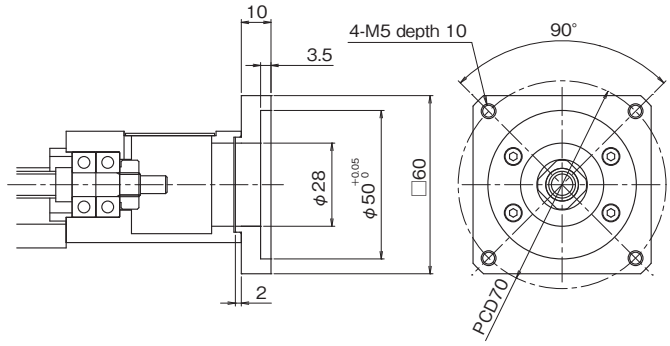
Motor bracket configuration: A5 (mass: 46g)



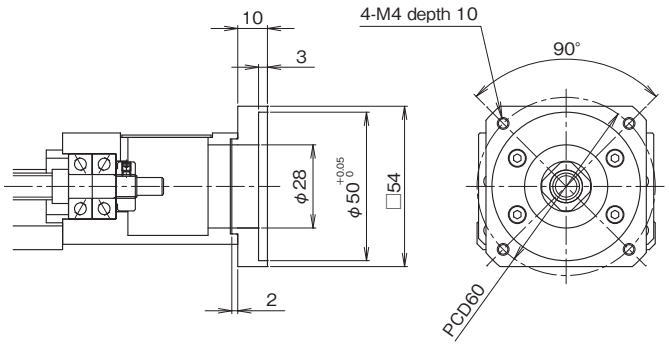
Motor bracket configuration: A2 (mass: 25g)



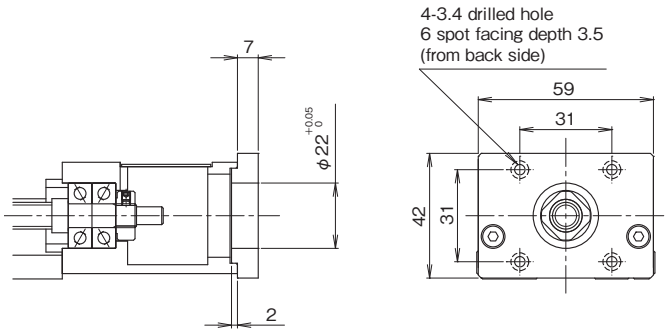
Motor bracket configuration: A7 (mass: 64g)



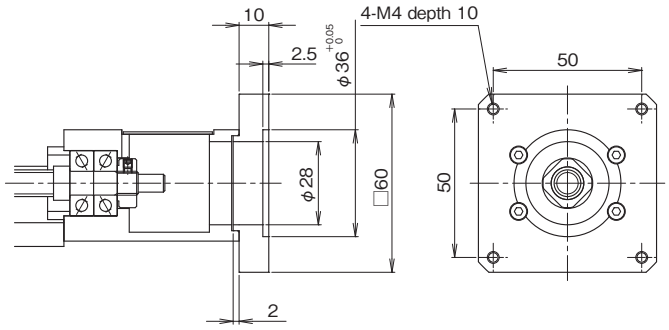
Motor bracket configuration: A3 (mass: 55g)



Motor bracket configuration: B1 (mass: 37g)



Motor bracket configuration: A4 (mass: 71g)



(Note) For B1 configuration, install the intermediate flange to motor before mounting it to actuator.

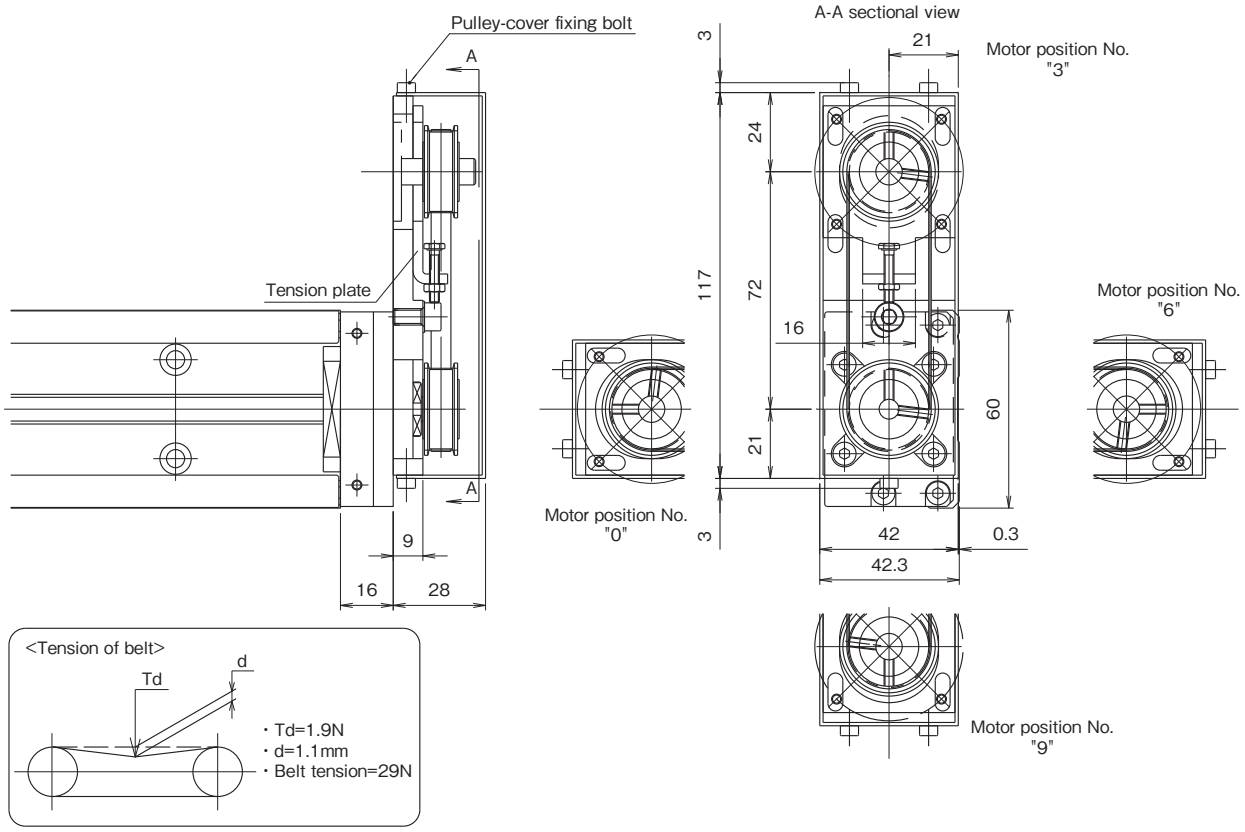
SE30

● MOTOR BRACKET CONFIGURATIONS AND MOTOR OPTION

Motor option					Motor bracket configuration	Recommended coupling
Motor type	Maker	Series	Model No.	Output		
AC SERVO motor	PANASONIC	MINAS A5	MSME5A	50W	A2	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			MSME01	100W		
		MINAS A6	MSMF5A	50W		
			MSMF01	100W		
	MITSUBISHI ELECTRIC	MELSERVO J3	HF-KP(MP)053	50W	A1	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			HF-KP(MP)13	100W		
			HF-KP(MP)23	200W	A7	XBW-27C2(NABEYA BI-TECH)
		MELSERVO J4	HG-KR(MR)053	50W	A1	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			HG-KR(MR)13	100W		
			HG-KR(MR)23	200W	A7	XBW-27C2(NABEYA BI-TECH)
	YASKAWA ELECTRIC	Σ-V	SGMJV, SGMAV-A5	50W	A1	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			SGMJV, SGMAV-01	100W		
			SGMJV, SGMAV-C2	150W		
			SGMJV, SGMAV-02	200W	A7	XBW-27C2(NABEYA BI-TECH)
		Σ-7	SGM7J, SGM7A-A5	50W	A1	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			SGM7J, SGM7A-01	100W		
			SGM7J, SGM7A-C2	150W		
			SGM7J, SGM7A-02	200W	A7	XBW-27C2(NABEYA BI-TECH)
	OMRON	G5	R88M-K05030	50W	A1	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			R88M-K10030	100W		
	SANYO ELECTRIC	SANMOTION R	R2AA04005	50W	A3	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)
			R2AA04010	100W		
			R2AA06020	200W	A7	XBW-27C2(NABEYA BI-TECH)
Stepping motor	ORIENTAL MOTOR	α step	ARM4	□42mm	B1	SFC-010DA2(MIKI PULLEY) ACD-19A(ISEL)
			ARM6	□60mm	A4	SFC-020D2(MIKI PULLEY) ACD-27A(ISEL)
		5-Phase	CRK54, RKS54	□42mm	B1	SFC-010DA2(MIKI PULLEY) ACD-19A(ISEL)
			CRK56, RKS56	□60mm	A4	SFC-020D2(MIKI PULLEY) ACD-27A(ISEL)
		2-Phase	PKP24	□42mm	B1	SFC-010DA2(MIKI PULLEY) ACD-19A(ISEL)
			PK26	□60mm	A5	SFC-020D2(MIKI PULLEY) ACD-27A(ISEL)
	SANYO ELECTRIC	5-Phase	F series□42mm	□42mm	B1	SFC-010DA2(MIKI PULLEY) ACD-19A(ISEL)
			F series□60mm	□60mm	A4	SFC-020DA2(MIKI PULLEY) ACD-27A(ISEL)

・For motors other than above-mentioned, consult KURODA.
・When selecting a rigid type of coupling for connecting a motor, consult KURODA.
・For detailed specifications of above-mentioned motors and couplings, refer to catalogs or websites provided by the makers.

● PARALLEL MOTOR MOUNTING



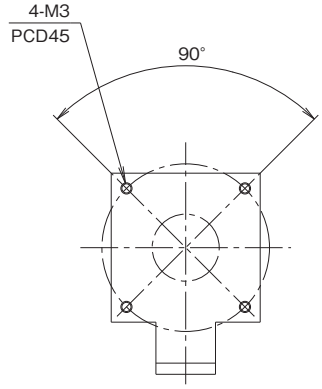
- Pulley unit position can be adjusted at every 90 degree.
- Motor parallel mounting can be equipped with dust-proof cover and sensor.
- Fill Motor position No. in □.
  If the pulley cover may not be removable due to restrictions arising from direction of the unit, consult KURODA for modifying positions of the pulley-cover fixing bolts (3 M3 hex socket bolts).

Mark	Pulley Inner dia.	Applicable motor	
E□	Inner dia. ϕ8	Panasonic	50 - 100W motor and so on
F□	Inner dia. ϕ8	Yaskawa	50 - 100W motor and so on
		Mitsubishi Electric	50 - 100W motor and so on
		Sanyo Electric	50 - 100W motor and so on

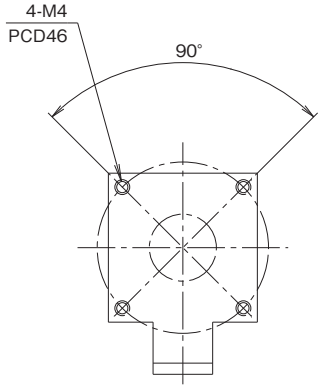
Fullfill the motor position No. in □.
Check the spec. if the motor can be assembled before using.

- Tension plate position can be built in pulley cover.
- Although tension plate is attached inside the cover with standard specifications, it can also be attached to outside the cover. Consult KURODA for such modification.
- The mass is 0.2kg larger than the values shown in table on page 75.
- Inertia moment is 2.22×10^{-6}kg・m^2 larger than the value shown in table on page 55.

Parallel motor mounting type E□
Tension plate dimension



Parallel motor mounting type F□
Tension plate dimension

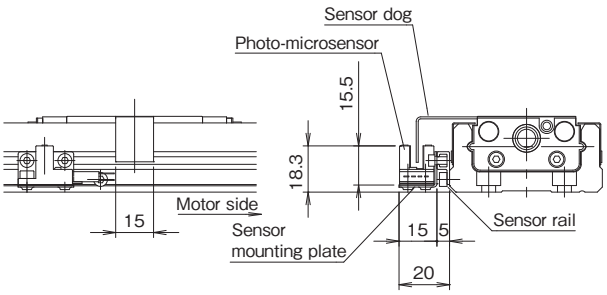


SE30

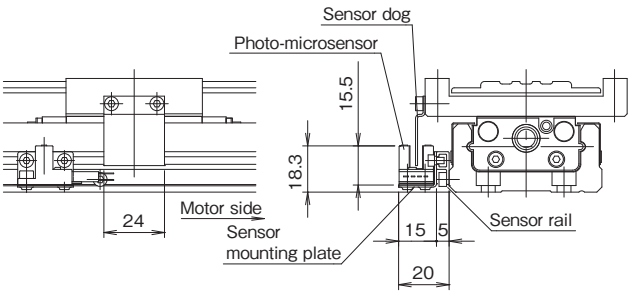
● SENSOR

Symbol C (NPN) / P (PNP), M / Y (PNP): Photo-microsensor (OMRON, Panasonic Industrial Devices SUNX)

Without dustproof cover

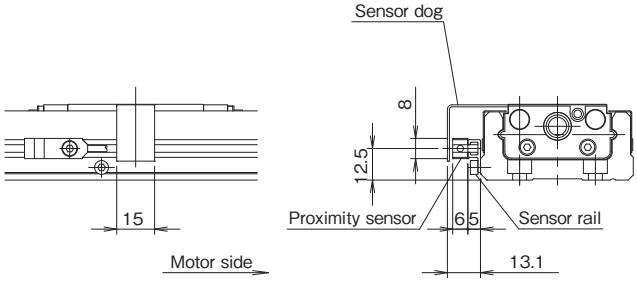


With dustproof cover

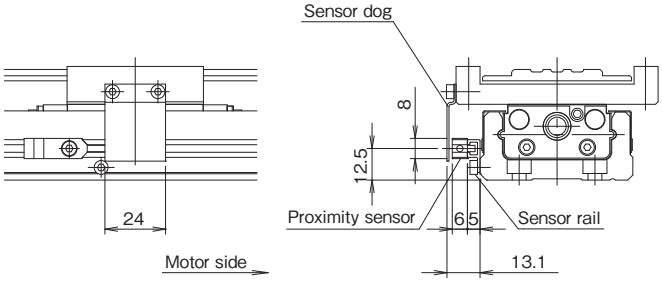


Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)

Without dustproof cover



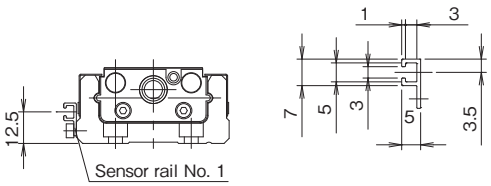
With dustproof cover



● SENSOR RAIL

Sensor rails only available with no sensors.

Sensor rail No. 1

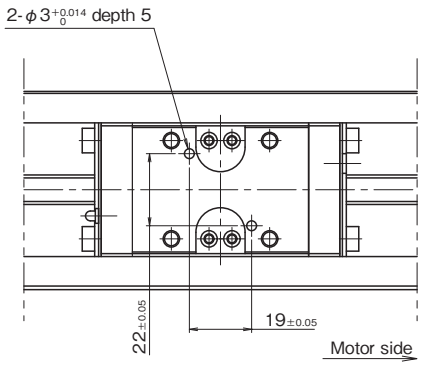


KURODA JENATEC

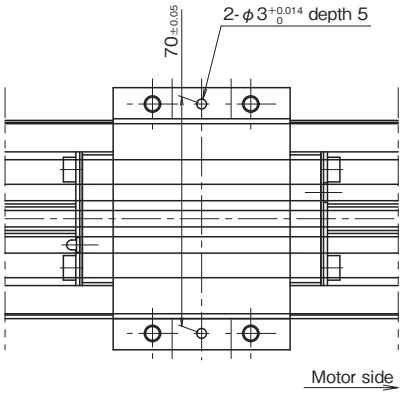
● DOWEL PIN HOLE

Dowel pin holes are applicable on the slide blocks with part number "PS", sub-tables "PR"or slide blocks and sub-tables "PSR". For actuators with 2 blocks, they are on both driving-side block and driven-side block. Please note that dowel pins are not equipped.

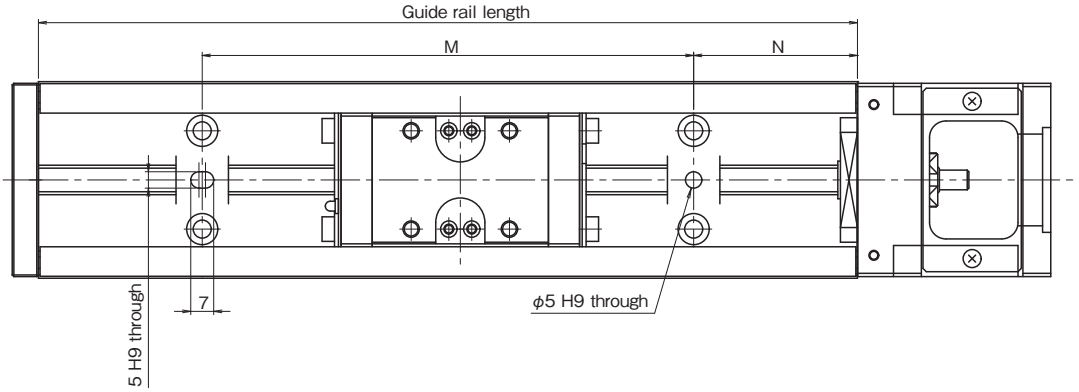
Long block without dustproof cover with "PS"



Long block with dustproof cover with "PS"



Guide rail with "PR"



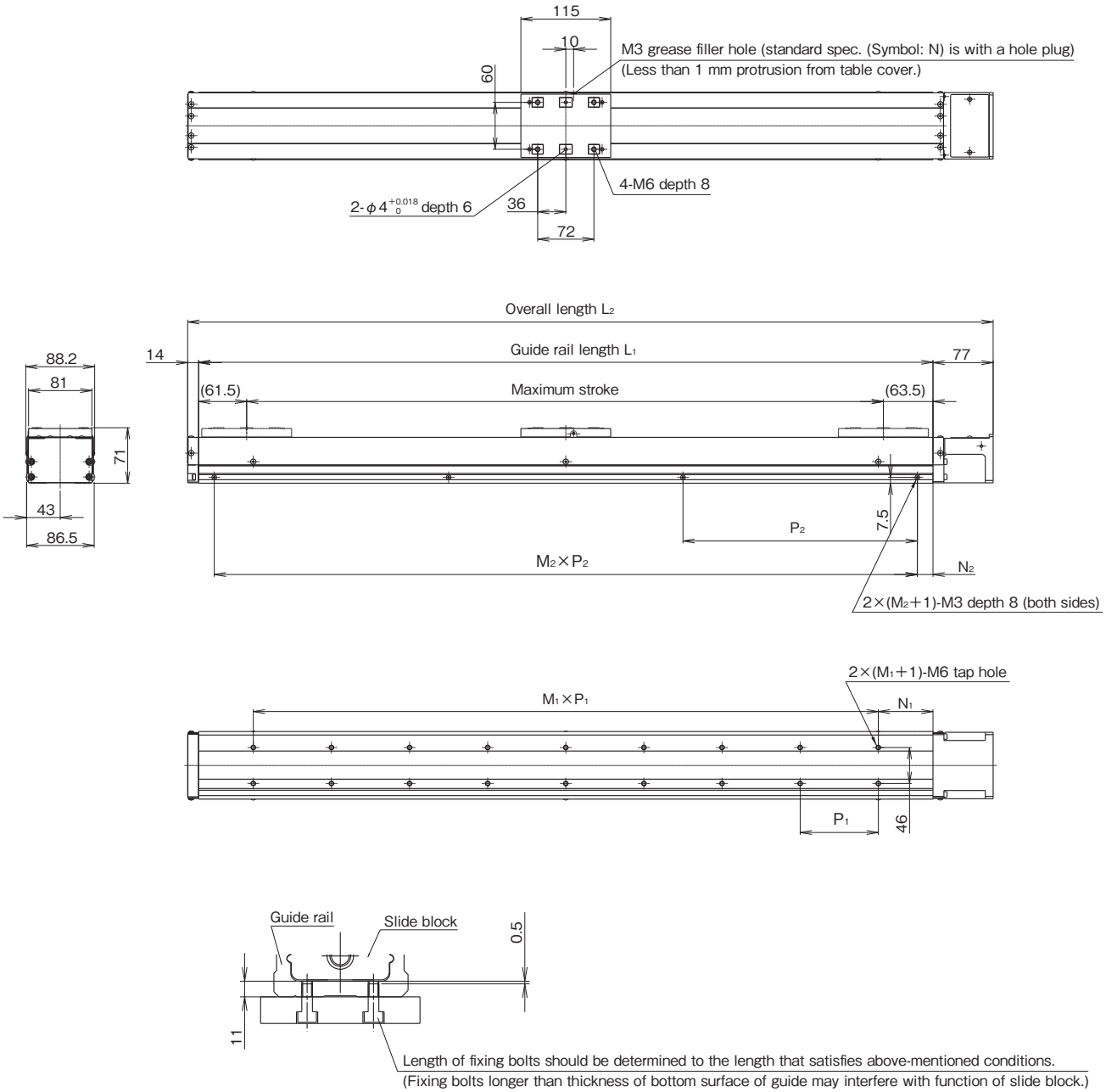
(Unit: mm)

Guide rail length	N	M	Dowel pin height
150	25	100	Less than 8
200	50	100	
300		200	
400		300	
500		400	
600		500	
700		600	
750	25	700	

Notice: In case dowel pin is stuck out from the U-guide rail, it may interfere with and break the slide block.

SC45

● FULL-COVER TYPE LONG BLOCK CONFIGURATIONS



KURODA JENATEC

● FULL-COVER TYPE LONG BLOCK DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
540	631	70	4×100	20	2×250	415	407
640	731		5×100		2×300	515	507
740	831		6×100		2×350	615	607
840	931		7×100		2×400	715	707
940	1031		8×100		3×300	815	807

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)			Mass (kg)	
	Lead			Full-cover type	Mass of table (slide block + table + table cover parts)
	5mm	10mm	20mm	A: With 1 long block	
540	260	520	1040	9.2	1.27
640				10.5	
740				11.8	
840				13.0	
940	200	410	830	14.3	

(Note 1) Mass of full-cover type actuators in the above table includes mass of table.
(Note 2) For long rail configurations, please consult KURODA.

● MOTOR BRACKET CONFIGURATIONS

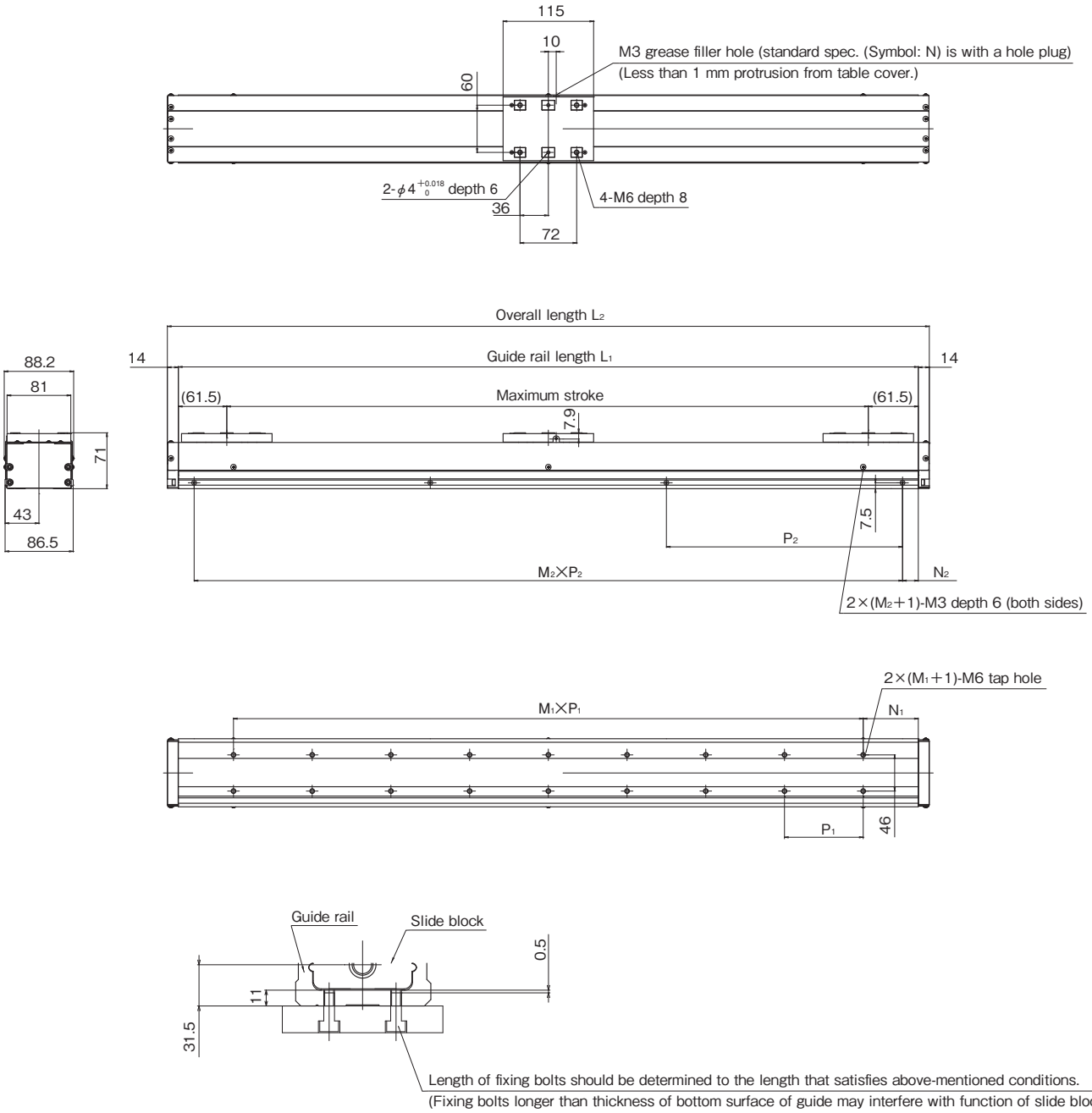
Please refer to Pages 92 to 95 of SE45 series regarding to motor bracket configurations and parallel motor mounting.

● DOWEL PIN HOLE (Guide rail only)

Please refer to Pages 97 of SE45 series regarding to guide rail positioning hole.

SC45

● FULL-COVER TYPE SUB GUIDE RAIL CONFIGURATIONS



● FULL-COVER TYPE SUB GUIDE RAIL DIMENSIONS

(Unit: mm)

Guide rail length L_1	Overall length L_2	N_1	$M_1 \times P_1$	N_2	$M_2 \times P_2$	Maximum stroke	
						Long block	Long block (with LUBSEAL)
						A: 1 block	E: 1 block
540	631	70	4×100	20	2×250	417	409
640	731		5×100		2×300	517	509
740	831		6×100		2×350	617	609
840	931		7×100		2×400	717	709
940	1031		8×100		3×300	817	809

● PERMISSIBLE SPEED / MASS

Guide rail length L_1 (mm)	Permissible speed (mm/s)	Mass (kg)	
		Full-cover type	Mass of table (slide block + table + table cover parts)
	Lead	A: With 1 long block	
540	2000	8.5	1.27
640		9.7	
740		10.8	
840		12.0	
940		13.1	

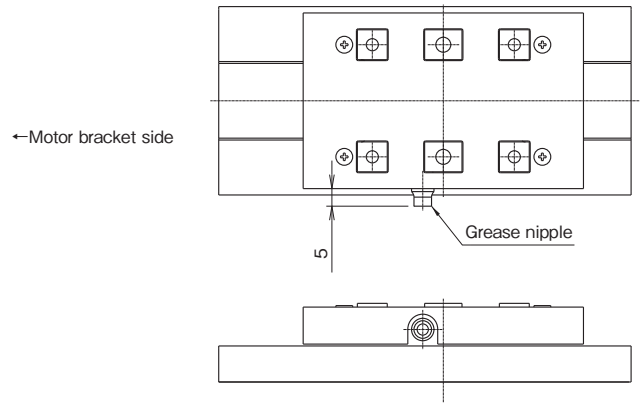
(Note 1) Mass of full-cover type actuators in the above table includes mass of table.
(Note 2) For long rail configurations, please consult KURODA.

SC45

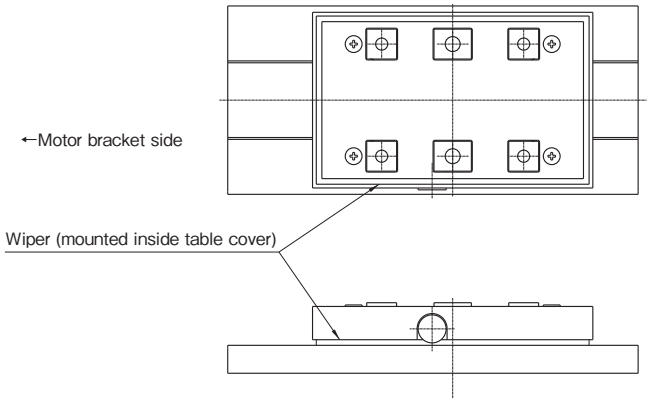
● COVER CONFIGURATION

The below-mentioned configurations with grease nipple and/or wiper are available for full-covered series. Standard specification (Symbol: N) has a plug equipped with grease filler hole.

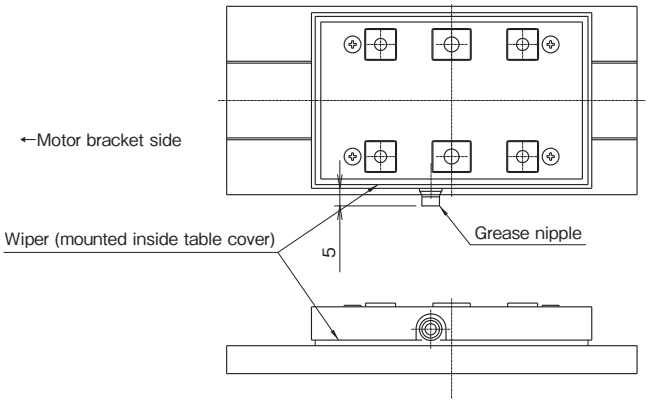
Full-cover type with grease nipple (Symbol: G)



Full-cover type with wiper (Symbol: S)



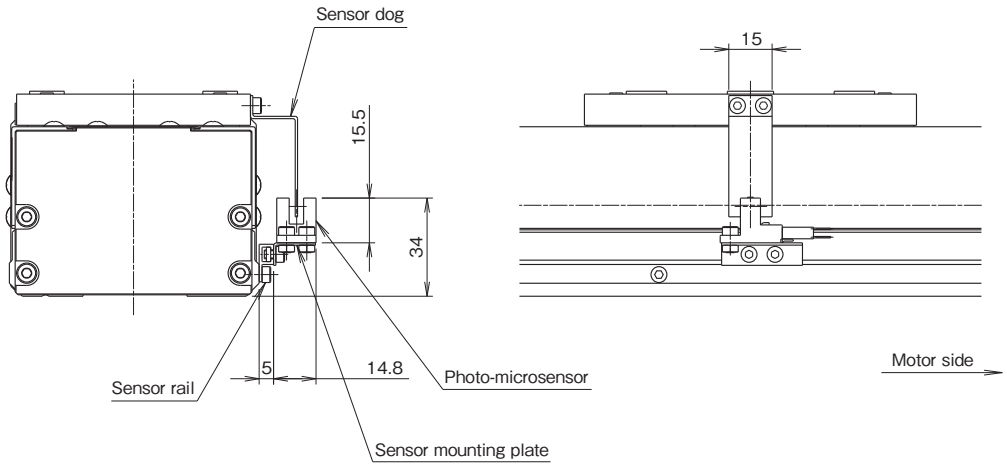
Full-cover type with grease nipple and wiper (Symbol: D)



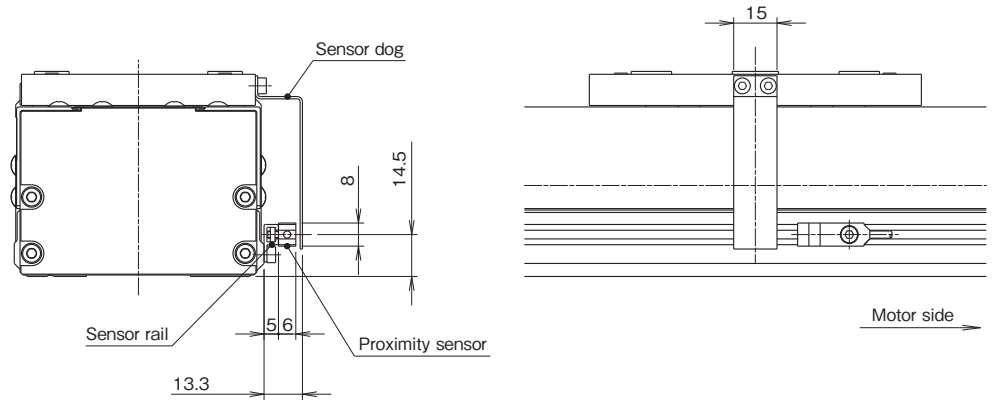
SC45

● SENSOR

Symbol C (NPN) / P (PNP), M (NPN) / Y (PNP): Photo-microsensor (OMRON, Panasonic Industrial Devices SUNX)



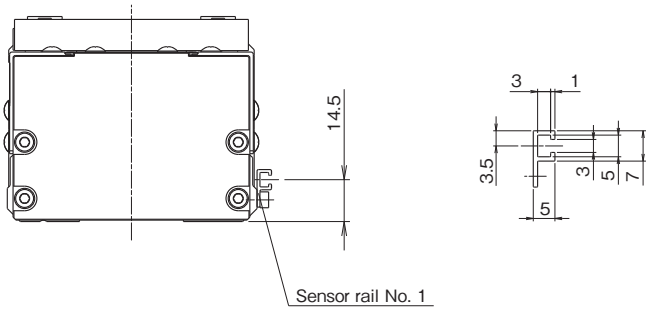
Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)



● SENSOR RAIL

Sensor rails only available with no sensors.

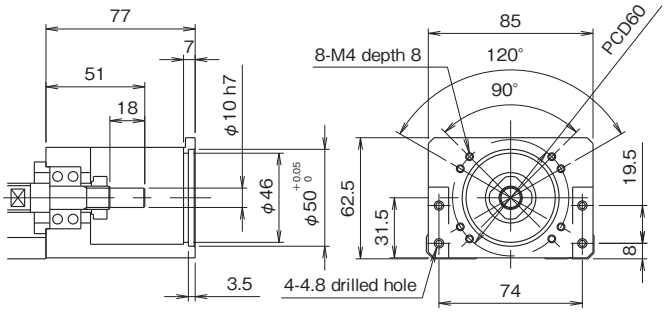
Sensor rail No. 1



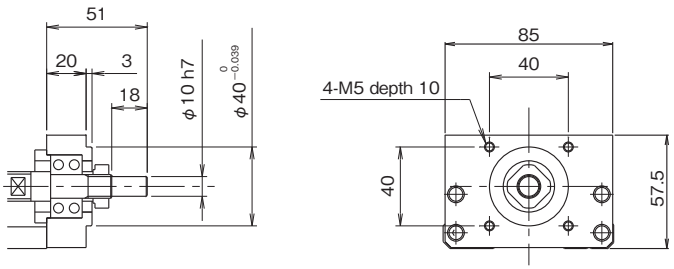
SE45

● MOTOR BRACKET CONFIGURATIONS

Motor bracket configuration: A0



Motor bracket configuration: RN

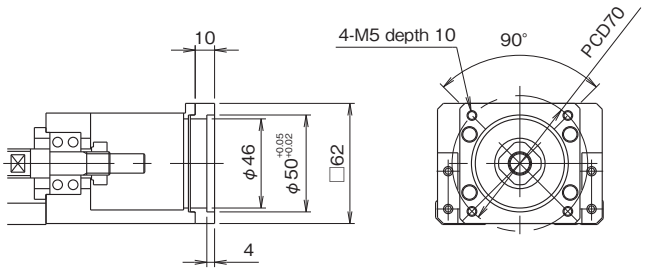


Mass of the RN configuration is 0.26 kg less than the values shown in the tables on pages 85 and 87.

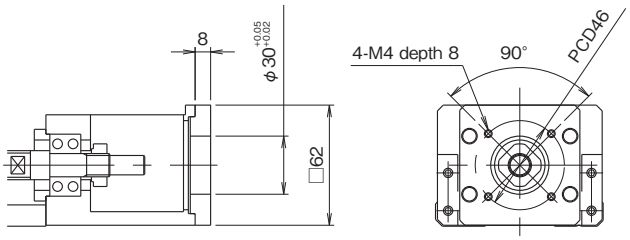
SE45

● MOTOR BRACKET CONFIGURATIONS (INTERMEDIATE FLANGE)

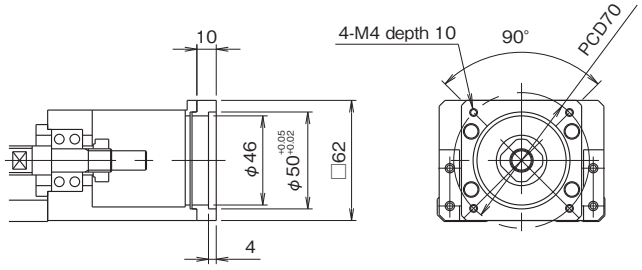
Motor bracket configuration: A1 (mass: 53g)



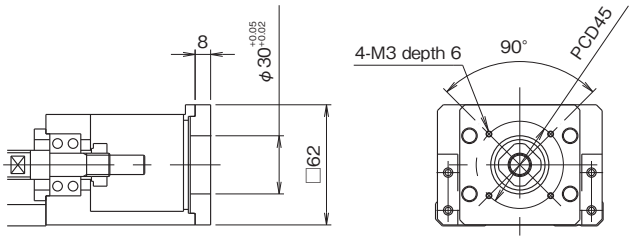
Motor bracket configuration: A4 (mass: 73g)



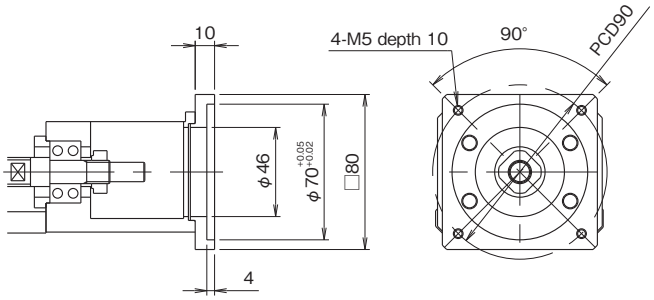
Motor bracket configuration: A2 (mass: 53g)



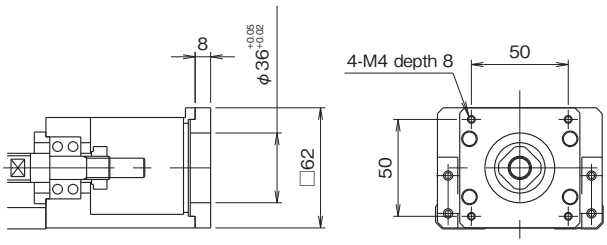
Motor bracket configuration: A5 (mass: 73g)



Motor bracket configuration: A3 (mass: 103g)



Motor bracket configuration: A6 (mass: 64g)



SE45

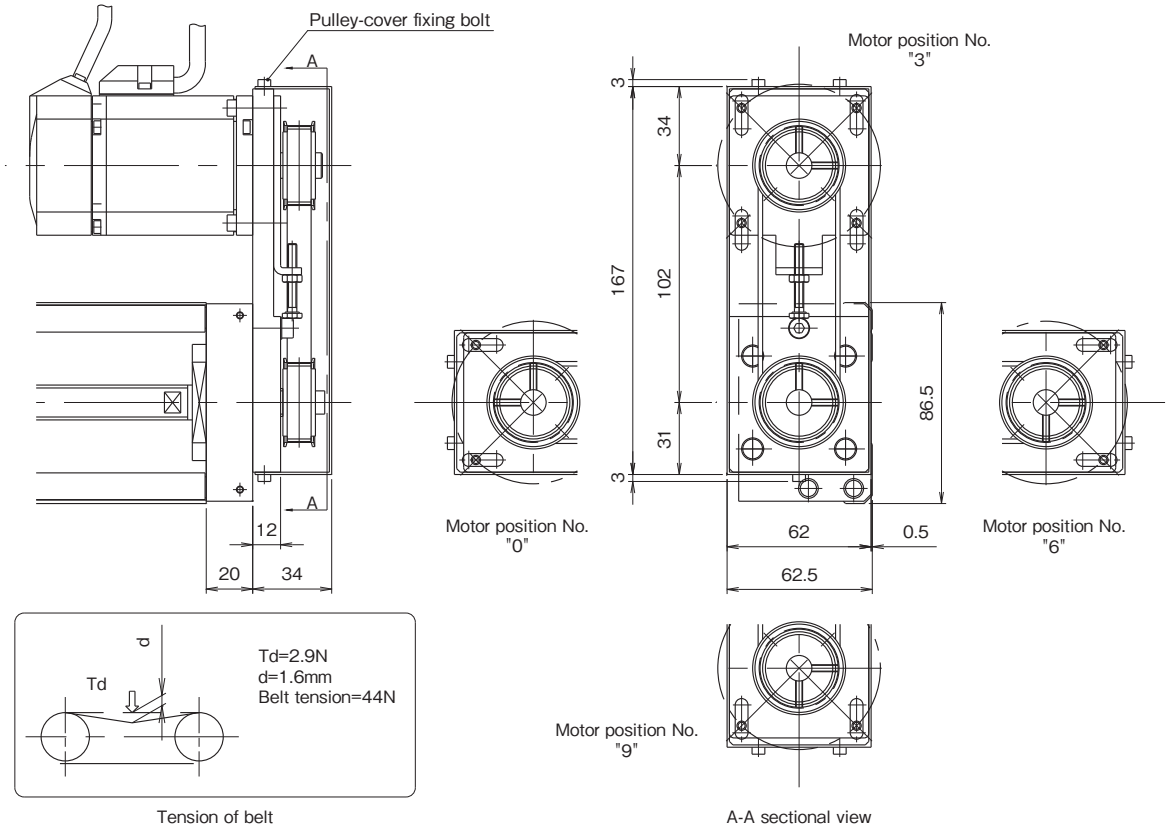
● MOTOR BRACKET CONFIGURATIONS AND MOTOR OPTION

Motor option					Motor bracket configuration	Recommended coupling
Motor type	Maker	Series	Model No.	Output		
AC SERVO motor	PANASONIC	MINAS E	MUMA02	200W	A2	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			MUMA04	400W		
		MINAS A5	MSME5A	50W	A5	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			MSME01	100W		
			MSME02	200W	A2	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			MSME04	400W		
			MSME08	750W	A3	SFC-040DA2 (MIKI PULLEY) ACD-44A (ISEL)
		MINAS A6	MSMF5A	50W	A5	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			MSMF01	100W		
			MSMF02	200W	A2	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			MSMF04	400W		
			MSMF08	750W	A3	SFC-040DA2 (MIKI PULLEY) ACD-44A (ISEL)
	MITSUBISHI ELECTRIC	MELSERVO J3	HF-KP (MP) 053	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			HF-KP (MP) 13	100W		
			HF-KP (MP) 23	200W	A1	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			HF-KP (MP) 43	400W		
		MELSERVO J4	HG-KR (MR) 053	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			HG-KR (MR) 13	100W		
			HG-KR (MR) 23	200W	A1	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			HG-KR (MR) 43	400W		
	YASKAWA ELECTRIC	Σ-V	SGMJV, SGMAV-A5	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			SGMJV, SGMAV-01	100W		
			SGMJV, SGMAV-C2	150W		
			SGMJV, SGMAV-02	200W	A1	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			SGMJV, SGMAV-04	400W		
			SGMJV, SGMAV-06	600, 550W		SFC-035DA2 (MIKI PULLEY) ACD-39A (ISEL)
		Σ-7	SGM7J, SGM7A-A5	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			SGM7J, SGM7A-01	100W		
			SGM7J, SGM7A-C2	150W		
			SGM7J, SGM7A-02	200W	A1	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			SGM7J, SGM7A-04	400W		
			SGM7J, SGM7A-06	600W		SFC-035DA2 (MIKI PULLEY) ACD-39A (ISEL)
	OMRON	G5	R88M-K05030	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			R88M-K10030	100W		
			R88M-K20030	200W	A2	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			R88M-K40030	400W		
	SANYO ELECTRIC	SANMOTION R	R2AA04005	50W	A4	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
			R2AA04010	100W		
			R2AA06020	200W	A1	SFC-030DA2 (MIKI PULLEY) ACD-34A (ISEL)
			R2AA06040	400W		
Stepping motor	ORIENTAL MOTOR	α step	ARM6	□60mm	A6	SFC-020DA2 (MIKI PULLEY) ACD-27A (ISEL)
	SANYO ELECTRIC	5-Phase	F series□60mm	□60mm	A6	

・For motors other than above-mentioned, consult KURODA.
・When selecting a rigid type of coupling for connecting a motor, consult KURODA.
・For detailed specifications of above-mentioned motors and couplings, refer to catalogs or websites provided by the makers.

SE45

● PARALLEL MOTOR MOUNTING

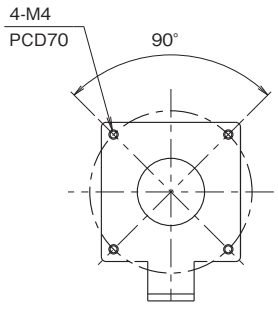


- Pulley unit position can be adjusted at every 90 degree.
- Fill motor position No. in □.
  If the pulley cover may not be removable due to restrictions arising from direction of the unit, consult KURODA for modifying positions of the pulley-cover fixing bolts (3 M3 cross recessed flat head machine screws).
- Motor parallel mounting can be equipped with dustproof cover and sensor.
- Although tension plate is attached inside the cover with standard specifications, it can also be attached to outside the cover. Consult KURODA for such modification.
- Tension plate position can be built in pulley cover.
- The mass is 0.7kg larger than the values shown in tables on pages 85 and 87.
- Inertia moment is 1.24×10^{-5}kg·m² larger than the value shown in table on page 55.

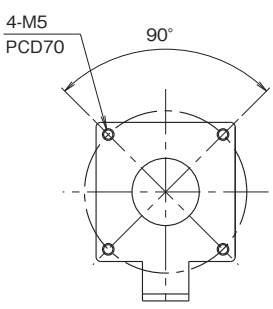
Mark	Pulley Inner dia.	Applicable motor	
E□	Inner dia. ϕ11	Panasonic	200W motor and so on
F□	Inner dia. ϕ14	Yaskawa	200W motor and so on
		Mitsubishi Electric	200W motor and so on
		Sanyo Electric	200W motor and so on
G□	Inner dia. ϕ8	Oriental Motor Stepping Motor □60 series and so on"	

Fullfill the motor position No. in □.
Check the spec. if the motor can be assembled before using.

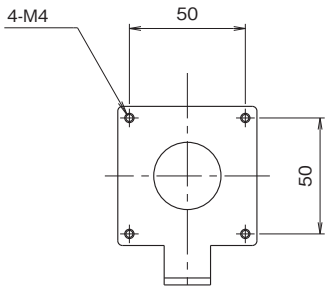
Parallel motor mounting type E□ Tension plate dimension



Parallel motor mounting type F□ Tension plate dimension



Parallel motor mounting type G□ Tension plate dimension

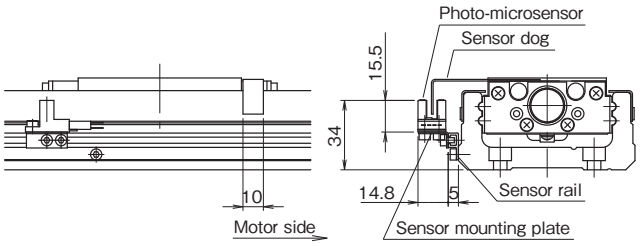


SE45

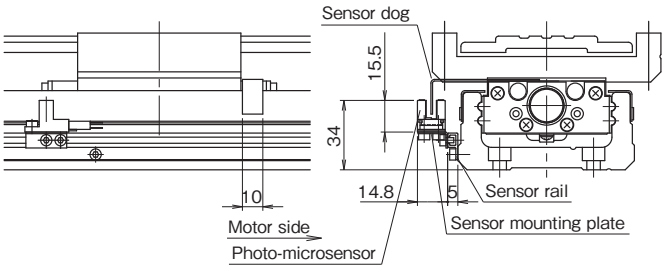
● SENSOR

Symbol C (NPN) / P (PNP), M (NPN) / Y (PNP): Photo-microsensor (OMRON, Panasonic Industrial Devices SUNX)

Without dustproof cover

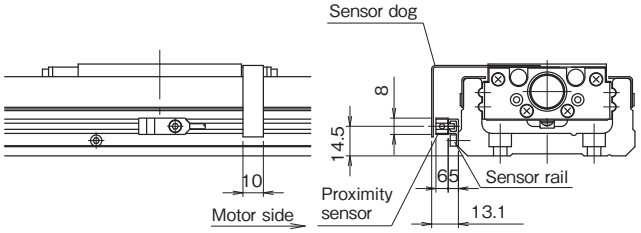


With dustproof cover

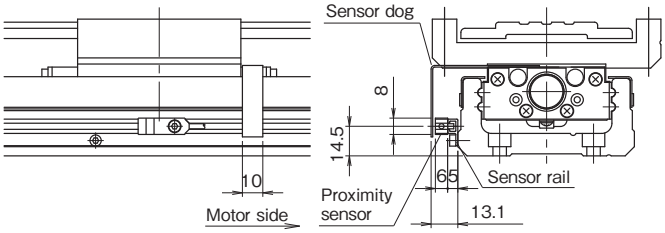


Symbol K (NPN) / E (PNP): Proximity sensor (Azbil)

Without dustproof cover



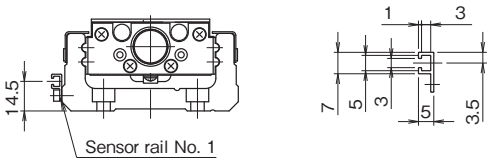
With dustproof cover



● SENSOR RAIL

Sensor rails only available with no sensors.

Sensor rail No. 1



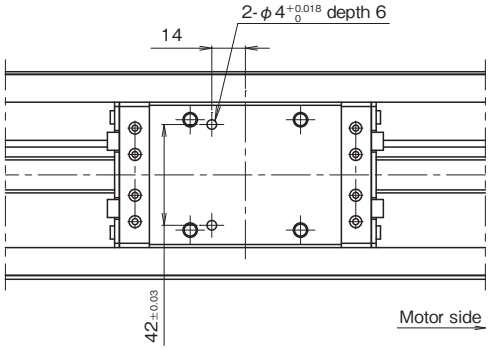
KURODA JENATEC

● DOWEL PIN HOLE

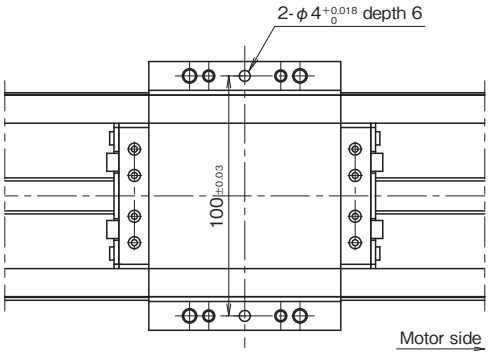
Dowel pin holes are applicable on the slide blocks with part number "PS", sub-tables "PR"or slide blocks and sub-tables "PSR". For an actuator with 2 blocks, they are on both driving-side block and driven-side block. Please note that dowel pins are not equipped.

Long block without dustproof cover with "PS"

For actuators with 2 blocks, the holes are on both blocks.

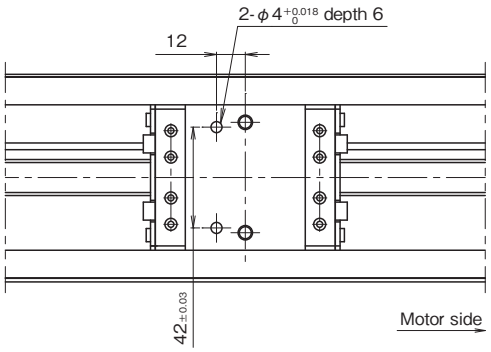


Long block with dustproof cover with "PS"

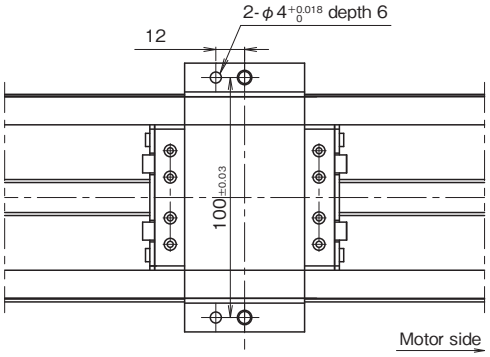


Short block without dustproof cover with "PS"

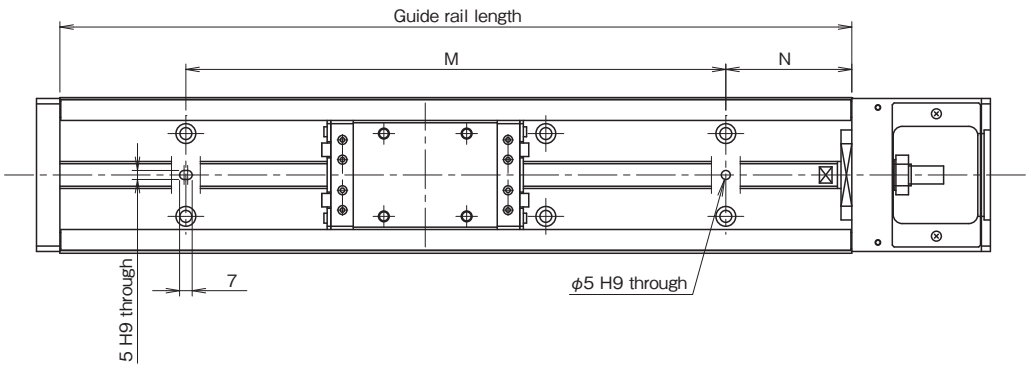
For actuators with 2 blocks, the holes are on both blocks.



Short block with dustproof cover with "PS"



Guide rail with "PR"



(Unit: mm)

Guide rail length	N	M	Dowel pin height
340	70	200	Less than 11
440		300	
540		400	
640		500	
740		600	
840		700	
940		800	

Notice: In case dowel pin is stuck out from the U-guide rail, it may interfere with and break the slide block.

● Specifications

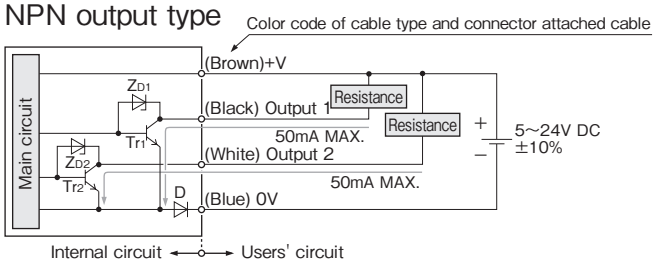
Model No.	NPN output type	PM-L25	PM-Y65
	PNP output type	-	PM-Y65P
Sensing range		6mm (fixed)	
Minimum sensing object		0.8X1.2mm opaque object	
Hysteresis		0.05mm or less	
Repeatability		0.01mm or less	
Supply voltage		5 to 24V DC ±10% Ripple P-P 10% or less	
Current consumption		15mA or less	
Output		NPN output type: NPN transistor open collector Maximum sink current : 50mA Applied voltage : 30V DC or less (between output and 0V) Residual voltage : 2V or less (at 50mA sink current) 1V or less (at 16mA sink current)	NPN output type: NPN transistor open collector Maximum sink current : 50mA Applied voltage : 30V DC or less (between output and 0V) Residual voltage : 2V or less (at 50mA sink current) 1V or less (at 16mA sink current) PNP output type: PNP transistor open collector Maximum sink current : 50mA Applied voltage : 30V DC or less (between output and +V) Residual voltage : 2V or less (at 50mA sink current) 1V or less (at 16mA sink current)
Output operation		Incorporated with 2 outputs : Light-ON/Dark-ON	
Short-circuit protection		Incorporated	
Response time		Under light received condition : 20μs or less Under light shielded condition : 80μs or less (Maximum response frequency 3kHz)	
Operation indicator		Orange LED (lights up under light received condition)	
Pollution degree		3	
Environmental resistance	Protection	IP64 (IEC)	IP40 (IEC)
	Ambient temperature	-25 to +55℃: (No dew condensation or icing allowed), Storage: -30 to +80℃:	
	Ambient humidity	5 to 85% RH, Storage: 5 to 95% RH	
	Ambient illuminance	Fluorescent light : 1000lx or less at the light-receiving face	
	Voltage withstandability	1000V AC for 1 min. between all supply terminals connected together and enclosure	
	Insulation resistance	20MΩ or more with 250V DC megger between all supply terminals connected together and enclosure	
	Vibration resistance	10 to 2000Hz frequency, 1.5mm amplitude (maximum acceleration 196m/s^2) in X, Y and Z directions for 2 hours each	
	Shock resistance	15000m/s^2 acceleration (1500G approx.) in X, Y and Z directions for 3 times each	
Emitting element		Infrared LED (Peak emission wavelength: 855nm (0.034mil), non-modulated)	
Material		Case: PBT Display: Polycarbonate	
Cable		0.09mm^2 4-core cabtyre cable, 1m long	-
Cable extension		Extension up to total 100m (328.084ft) is possible with 0.3mm^2, or more, cable.	Extension up to total 100m (328.084ft) is possible with 0.3mm^2, or more, cable.
Mass		Main body : 10g approx.	Main body : 3g approx.

Accessories	Specifications		
	S	M	Y
Sensor Model No.	PM-L25 (NPN) : 3	PM-Y65 (NPN) : 3	PM-Y65P (PNP) : 3
Sensor mounting plate (Note 1)	: 3	: 3	: 3
Sensor rail	: 1	: 1	: 1
Sensor dog (Note 2)	: 1	: 1	: 1
Connector for sensor	-	CN-14A : 3	CN-14A : 3

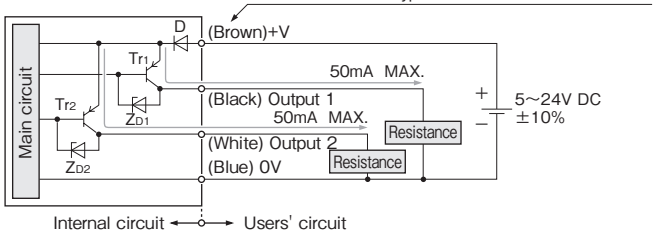
(Note 1) Sensor mounting plate is applied to SE and SC series.
(Note 2) 2 sensor dogs are used for SG33□D-150 sensor with Symbol "M" or "Y".

● I/O circuit diagram

NPN output type

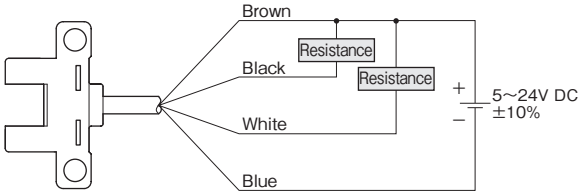


PNP output type

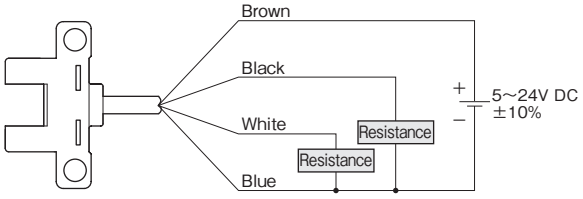


● Wiring diagram

NPN output type



PNP output type



(Note) For detailed information and operating precautions, refer to catalogs and operating instructions supplied by the sensor maker.

PROXIMITY SENSOR/Azbil

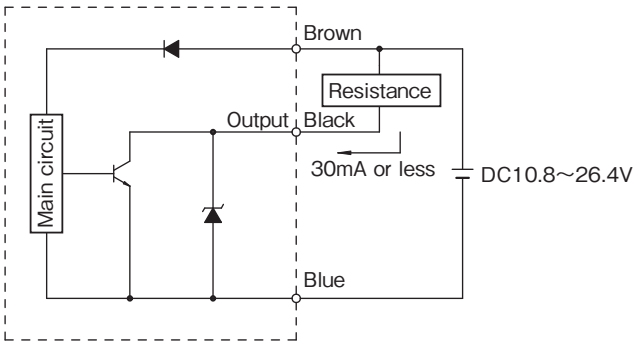
● Specifications

Model No.	NPN output type	APM-D3B1, APM-D3B1F (different-frequency type)
	PNP output type	APM-D3E1, APM-D3E1F (different-frequency type)
Sensing method		High-frequency oscillation type (unshielded type)
Rated supply voltage		DC 12/24V
Rated sensing distance		2.5mm ±15%
Usable sensing distance		0～1.8mm
Sensing object		15×15mm t=1mm Iron
Hysteresis		15% or less in sensing length
Operating voltage range		DC 10.8～26.4V(Ripple 10% or less)
Current consumption		10mA or less
Output type		NPN transistor open collector
		PNP transistor open collector
Operation mode		Normally closed (N.C.)
Control Output	Switching current	30mA or less (resistance load)
	Residual voltage	1V or less (switching current 30mA
	Output dielectric strength	26.4V
Response frequency		120Hz
Repeatability		0.05mm or less
Temperature characteristics		±15% max. for the range of -10 to +55℃ when +25℃ is taken as standard temperature in sensing distance
Supply voltage characteristics		±2% max. with 10% voltage fluctuation with rated supply voltage as standard voltage in sensing distance
Operation indicator		Lights up in orange under light received condition
Ambient temperature		−10～+55℃
Ambient temperature at storage		−25～+70℃
Ambient humidity		35～85%RH
Insulation resistance		50MΩ or more (measured by DC 500V insulation ohmmeter)
Voltage withstandability		1000V AC , 50/60Hz for 1 min. between all supply terminals connected together and enclosure
Vibration resistance		10 to 55Hz, 1.5mm amplitude in X, Y, and Z directions for 2 hours each
Shock resistance		500m/s² in X, Y, and Z directions for 3 times each
Protection		IP67 (IEC529)
Mass		10g approx.
Circuit protection		Surge absorption, reverse connection protection circuit (-S: load short protection)
Connection		Pre-leaded (oil-resistant cord: 2.5 mm O.D., 0.08 mm², 3-core, 1 m)
Case material		Polyarylate resin
Tightening torque		0.5N·m (M2.6 screw)

Accessories	Specifications	
	K	E
Sensor Model No.	APM-D3B1 (NPN) : 2	APM-D3E1 (PNP) : 2
	APM-D3B1F (NPN) : 1	APM-D3E1F (PNP) : 1
Sensor rail	: 1	: 1
Sensor dog	: 1	: 1

● Wiring diagram

NPN output type



PNP output type

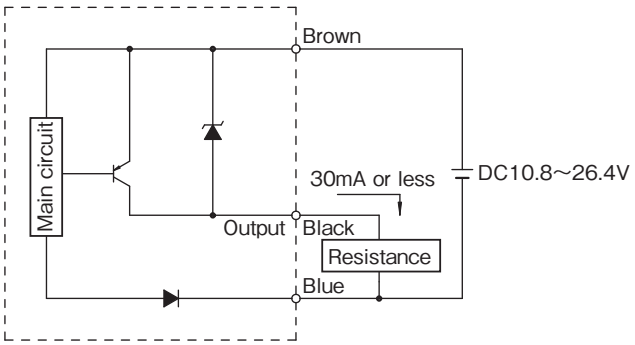


PHOTO-MICROSENSOR/OMRON

● Specifications

Model No.	NPN output type	EE-SX674	EE-SX671
	PNP output type	EE-SX674P	EE-SX671P
Sensing range		5mm (slot width)	
Sensing object		Opaque object 2 x 0.8mm or more	
Hysteresis		0.025mm or less	
Light source (peak emission wavelength)		GaAs IRED (940 nm)	
Operation indicator		Lights up at light-received (Red LED)	
Supply voltage		5 to 24V DC±10% Ripple P-P 10% or less	
Current consumption		12mA and less (connector type, when to open L connector)	
Output		NPN output type: NPN transistor open collector Output : 5 to 24V DC 100mA or less Residual voltage : 0.8V or less (at 100mA load current), 0.4V or less (at 40mA load current) OFF-state current 0.5mA or less	
		PNP output type : PNP transistor open collector Output : 5 to 24V DC 50mA or less Residual voltage : 1.3V or less (at 50mA load current) OFF-state current 0.5mA or less	
Response frequency		1kHz or above (3kHz in average)	
Ambient illuminance		Fluorescent light : 1000 lx at the light-receiving face	
Ambient temperature		Operation: -25 to +55℃, Storage: -30 to +80℃ (no dew condensation or icing allowed)	
Ambient humidity		Operation: 5 to 85% RH, Storage: 5 to 95% RH (no dew condensation or icing allowed)	
Vibration resistance		20 to 2000Hz (100m/s² peaked acceleration), 1.5mm amplitude in X, Y and Z directions for 2 hours each (4min. cycle)	
Shock resistance		500m/s² in X, Y and Z directions for 3 times each	
Protection		IP50 IEC60529	
Connection		Connector (available for direct soldering)	
Mass		3g approx.	
Material	Case	Poly Butylene Terephtalate (PBT)	
	Cover	Polycarbonate	
	Terminal		

Accessories	Specifications			
	C	P	H (Note 2)	J (Note 2)
Sensor Model No.	EE-SX674 (NPN) : 3	EE-SX674P (PNP) : 3	EE-SX671 (NPN) : 3	EE-SX671P (PNP) : 3
Connector for sensor	EE-1001: 3	EE-1001: 3	EE-1001: 3	EE-1001: 3
Sensor rail	: 1	: 1	: 1	: 1
Sensor dog (Note 3)	: 1	: 1	: 1	: 1
Sensor mounting plate (Note 1)	: 3	: 3		

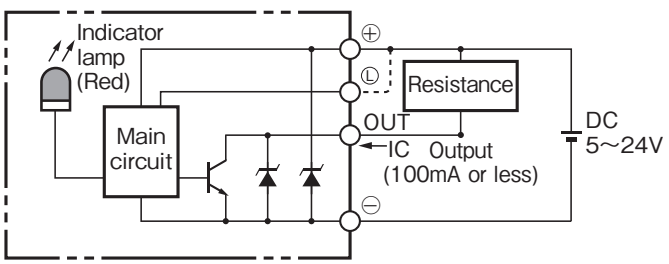
(Note 1) Sensor mounting plate is applied to SE and SC series.

(Note 2) If H or J configuration is used for the model without cover in SG33 series, a sensor mounting plate is attached in addition to the above-mentioned accessories.

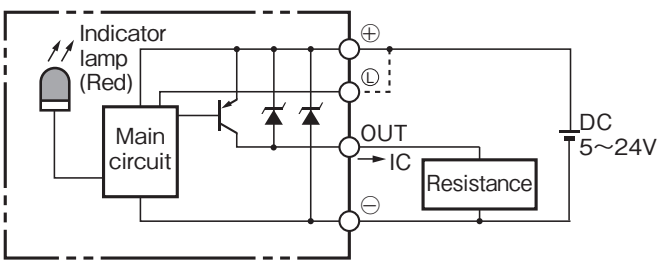
(Note 3) 2 sensor dogs are used for SG33□D-150 sensor with Symbol "M" or "Y".

● I/O circuit diagram

NPN output type



PNP output type



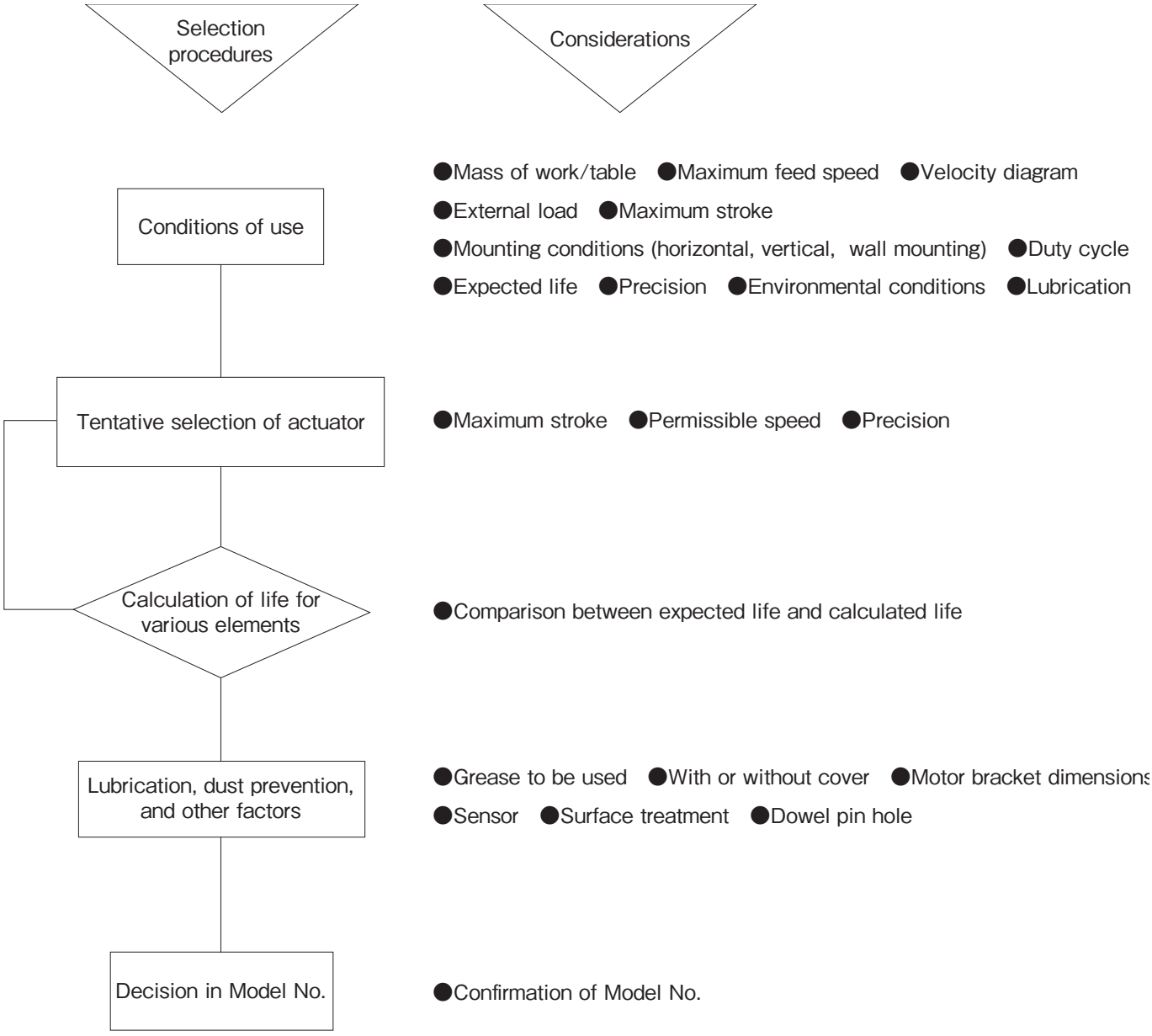
(Note) For detailed information and operating precautions, refer to catalogs and operating instructions supplied by the sensor maker.

CONTENTS

TECHNICAL DATA FOR BALLSCREW ACTUATORS

BALLSCREW ACTUATOR SELECTION GUIDE

Similar to ball screw selections, there is no instant way of selecting appropriate ballscrew actuators for various purposes. The following is an example of general procedures in actuator selection, with some considerations to be made on each step and pages to refer to.



LIFE EXPECTANCY

The shortest life expectancy of among guid-rail, ballscrew and support bearing can be defined as the life expectancy of ballscrew actuators, SE, SG, and SC series.
The following formula is used to calculate the life expectancy.

LIFE EXPECTANCY OF GUIDE

Calculate the life expectancy of guide using the following formula:

$$L_G = \left(\frac{f_C}{f_W} \cdot \frac{C}{P_T} \right)^3 \cdot 50 \quad \text{——— Formula (1)}$$

L_G : Life expectancy operational length (km)
f_C : Contact factor (see Table 1)
f_W : Load factor (see Table 2)
C : Basic dynamic load rating (N)
P_T : Calculated load per block (N)

Calculation of P_T

To calculate the life expectancy using Formula (1), you need to obtain the calculated load per block (P_T) in consideration of actual moment load.
If the acceleration is high or short-stroke operation is conducted, calculate P_T in consideration of acceleration. This acceleration calculation is made for a mass loaded on SG, SE, and SC.
Obtain the calculated load in uniform motion, accelerated motion, and decelerated motion, and its average figure is used as P_T.
For the calculation of P_T, select a calculation formula according to the installation conditions.
If acceleration needs not to be considered,
$P_T = P_{TC}$ (See Formula (2), (5) and (8)) can be used for calculation. However, you can calculate only the approximate value in this formula, therefore it is recommended that you calculate the life expectancy with an ample margin.

Table 1 Contact factor (f_C)

Number of blocks to be used in contact, when single axis module is used.	Contact factor (f_C)
1	1.0
2	0.81

Table 2 Load factor (f_W)

Operating condition		Load factor (f_W)
Vibration and shock	Speed	
Zero	250mm/s or less	1.0～1.5
Small	1000mm/s or less	1.0～2.0
Large	1000mm/s or more	2.0～3.5

Table 3 Moment equivalent factor

	Ep(E2p)	Ey(E2p)	Er(E2r)
SG20**A	2.25×10^{-1}	1.89×10^{-1}	7.84×10^{-2}
SG20**B	3.98×10^{-2}	3.34×10^{-2}	3.92×10^{-2}
SG26**A	1.51×10^{-1}	1.27×10^{-1}	5.88×10^{-2}
SG26**B	2.72×10^{-2}	2.28×10^{-2}	2.94×10^{-2}
SG33**A	1.26×10^{-1}	1.06×10^{-1}	4.55×10^{-2}
SG33**B	2.20×10^{-2}	1.84×10^{-2}	2.27×10^{-2}
SG33**C	2.31×10^{-1}	1.94×10^{-1}	4.55×10^{-2}
SG33**D	3.09×10^{-2}	2.59×10^{-2}	2.27×10^{-2}
SG46**A	8.39×10^{-2}	7.04×10^{-2}	3.17×10^{-2}
SG46**B	1.56×10^{-2}	1.31×10^{-2}	1.59×10^{-2}
SG46**C	1.39×10^{-1}	1.17×10^{-1}	3.17×10^{-2}
SG46**D	2.15×10^{-2}	1.18×10^{-2}	1.59×10^{-2}
SG55**A	6.80×10^{-2}	5.71×10^{-2}	2.74×10^{-2}
SG55**B	1.35×10^{-2}	1.14×10^{-2}	1.37×10^{-2}
SE15**A	2.70×10^{-1}	2.45×10^{-1}	9.64×10^{-2}
SE15**B	4.50×10^{-2}	3.80×10^{-2}	4.82×10^{-2}
SE23**A	1.52×10^{-1}	1.37×10^{-1}	5.22×10^{-2}
SE23**B	2.54×10^{-2}	2.29×10^{-2}	2.61×10^{-2}
SE30**A	1.17×10^{-1}	9.83×10^{-2}	4.54×10^{-2}
SE30**B	1.95×10^{-2}	1.64×10^{-2}	2.27×10^{-2}
SE45**A	8.39×10^{-2}	7.04×10^{-2}	3.17×10^{-2}
SE45**B	1.56×10^{-2}	1.31×10^{-2}	1.59×10^{-2}
SE45**C	1.26×10^{-1}	1.06×10^{-1}	3.17×10^{-2}
SE45**D	2.10×10^{-2}	1.76×10^{-2}	1.59×10^{-2}
SC23**A	1.52×10^{-1}	1.37×10^{-1}	5.22×10^{-2}
SC30**A	1.17×10^{-1}	9.83×10^{-2}	4.54×10^{-2}
SC45**A	8.39×10^{-2}	7.04×10^{-2}	3.17×10^{-2}

(Note) The specifications of a model with two blocks show factors when the two blocks are used in contact.

● P_T in the case of Horizontal Movement (Horizontal Installation)

① For uniform motion (P_{TC})

$$P_{TC}=\frac{1}{n}\cdot W+Ep\cdot M_{pL}+Ey\cdot M_{yL}+Er\cdot M_{rL} \quad \text{Formula (2)}$$

② For accelerated motion (P_{Ta})

$$P_{Ta}=\frac{1}{n}\cdot W+Ep\,(M_{pL}+m\cdot a_a\cdot Z)+Ey\,(M_{yL}+m\cdot a_a\cdot X)+Er\cdot M_{rL} \quad \text{Formula (3)}$$

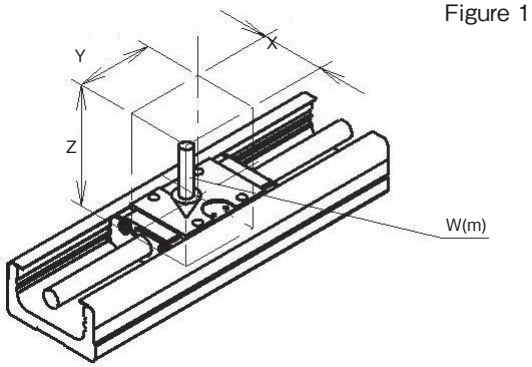
If item $(M_{pL}+m\cdot\alpha_a\cdot Z)$ or $(M_{yL}+m\cdot\alpha_a\cdot X)$ is a negative value, the value should be set to 0.

③ For decelerated motion (P_{Td})

$$P_{Td}=\frac{1}{n}\cdot W+Ep\,(M_{pL}+m\cdot\alpha_d\cdot Z)+Ey\,(M_{yL}+m\cdot\alpha_d\cdot X)+Er\cdot M_{rL} \quad \text{Formula (4)}$$

If item $(M_{pL}+m\cdot\alpha_d\cdot Z)$ or $(M_{yL}+m\cdot\alpha_d\cdot X)$ is a negative value, the value should be set to 0.

Figure 1



If a load is applied from a different direction other than W (m) in this figure, contact KURODA.

P_{TC} : Calculated load per block in uniform motion (N)
P_{Ta} : Calculated load per block in accelerated motion (N)
P_{Td} : Calculated load per block in decelerated motion (N)
n : Number of block of SG / SE / SC
W : Load (N)
m : Load mass (kg)
α_a : Acceleration in accelerated motion (m/sec²)
α_d : Acceleration in decelerated motion (m/sec²) (with a minus sign)
X : Distance from center of SG / SE / SC to center of gravity of loaded mass (mm)
Y : Distance from center of SG / SE / SC to center of gravity of loaded mass (mm)
Z : Distance from center of SG / SE / SC ballscrew to center of gravity of loaded mass (mm)

E_p : Moment equivalent factor in pitching direction (see Table 3)
E_y : Moment equivalent factor in yawing direction (see Table 3)
E_r : Moment equivalent factor in rolling direction (see Table 3)
M_{pL} : Load moment in pitching direction (N·mm)
$M_{pL} = W \cdot Y$
M_{yL} : Load moment in yawing direction (N·mm)
$M_{yL} = 0$ (The load moment is zero under this usage.)
M_{rL} : Load moment in rolling direction (N·mm)
$M_{rL} = W \cdot X$

(Note) For the moment directions, see Pages 3, 53 and 101.

● P_T in the Case of Horizontal Movement (Wall Installation)

① For uniform motion (P_{TC})

$$P_{TC}=\frac{1}{1.19\cdot n}\cdot W+Ep\cdot M_{pL}+Ey\cdot M_{yL}+Er\cdot M_{rL} \quad \text{Formula (5)}$$

② For accelerated motion (P_{Ta})

$$P_{Ta}=\frac{1}{1.19\cdot n}\cdot W+Ep\,(M_{pL}+m\cdot a_a\cdot Z)+Ey\,(M_{yL}+m\cdot a_a\cdot X)+Er\cdot M_{rL} \quad \text{Formula (6)}$$

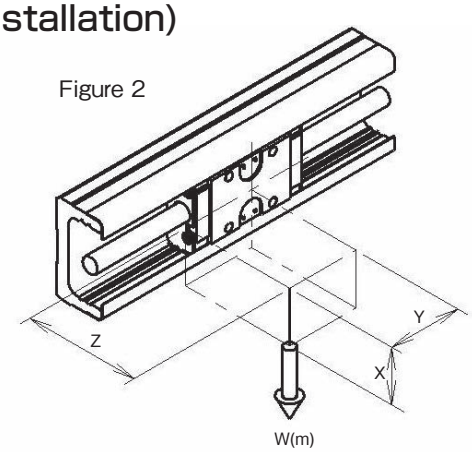
If item $(M_{pL}+m\cdot a_a\cdot Z)$ or $(M_{yL}+m\cdot a_a\cdot X)$ is a negative value, the value should be set to 0.

③ For decelerated motion (P_{Td})

$$P_{Td}=\frac{1}{1.19\cdot n}\cdot W+Ep\,(M_{pL}+m\cdot a_d\cdot Z)+Ey\,(M_{yL}+m\cdot a_d\cdot X)+Er\cdot M_{rL} \quad \text{Formula (7)}$$

If item $(M_{pL}+m\cdot\alpha_d\cdot Z)$ or $(M_{yL}+m\cdot\alpha_d\cdot X)$ is a negative value, the value should be set to 0.

Figure 2



If load is applied from a different direction other than W (m), contact KURODA.

P_{TC} : Calculated load per block in uniform motion (N)
P_{Ta} : Calculated load per block in accelerated motion (N)
P_{Td} : Calculated load per block in decelerated motion (N)
n : Number of block of SG / SE / SC
W : Load (N)
m : Load mass (kg)
α_a : Acceleration in accelerated motion (m/sec²)
α_d : Acceleration in decelerated motion (m/sec²) (with a minus sign)
X : Distance from center of SG / SE / SC to center of gravity of loaded mass (mm)
Y : Distance from center of SG / SE /SC to center of gravity of loaded mass (mm)
Z : Distance from center of SG / SE / SC ballscrew to center of gravity of loaded mass (mm)

E_p : Moment equivalent factor in pitching direction (see Table 3)
E_y : Moment equivalent factor in yawing direction (see Table 3)
E_r : Moment equivalent factor in rolling direction (see Table 3)
M_{pL} : Load moment in pitching direction (N·mm)
$M_{pL} = 0$ (The load moment is zero under this usage.)
M_{yL} : Load moment in yawing direction (N·mm)
$M_{yL} = W \cdot Y$
M_{rL} : Load moment in rolling direction (N·mm)
$M_{rL} = W \cdot Z$

(Note) For the moment directions, see Pages 3, 53 and 101.

● P_T in the Case of Vertical Movement

① For uniform motion (P_{TC})

$$P_{TC}=Ep\cdot M_{pL}+Ey\cdot M_{yL}+Er\cdot M_{rL}$$ ——— Formula (8)

② For accelerated motion (P_{Ta})

$$P_{Ta}=Ep\,(M_{pL}+m\cdot a_a\cdot Z)+Ey\,(M_{yL}+m\cdot a_a\cdot X)+Er\cdot M_{rL}$$ ——— Formula (9)

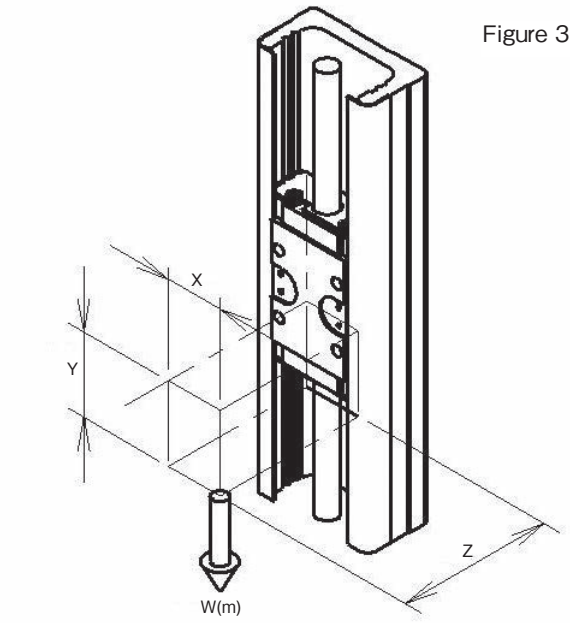
If item $(M_{pL}+m\cdot\alpha_a\cdot Z)$ or $(M_{yL}+m\cdot\alpha_a\cdot X)$ is a negative value, the value should be set to 0.

③ For decelerated motion (P_{Td})

$$P_{Td}=Ep\,(M_{pL}+m\cdot a_d\cdot Z)+Ey\,(M_{yL}+m\cdot a_d\cdot X)+Er\cdot M_{rL}$$ ——— Formula (10)

If item $(M_{pL}+m\cdot\alpha_d\cdot Z)$ or $(M_{yL}+m\cdot\alpha_d\cdot X)$ is a negative value, the value should be set to 0.

Figure 3



If load is applied from a different direction other than W (m) in this figure, contact KURODA.

P_{TC} : Calculated load per block in uniform motion (N)
P_{Ta} : Calculated load per block in accelerated motion (N)
P_{Td} : Calculated load per block in decelerated motion (N)
n : Number of block of SG / SE / SC
W : Load (N)
m : Load mass (kg)
α_a : Acceleration in accelerated motion (m/sec^2)
α_d : Acceleration in decelerated motion (m/sec^2) (with a minus sign)
X : Distance from center of SG / SE / SC to center of gravity of loaded mass (mm)
Y : Distance from center of SG / SE / SC to center of gravity of loaded mass (mm)
Z : Distance from center of SG / SE / SC ballscrew to center of gravity of loaded mass (mm)

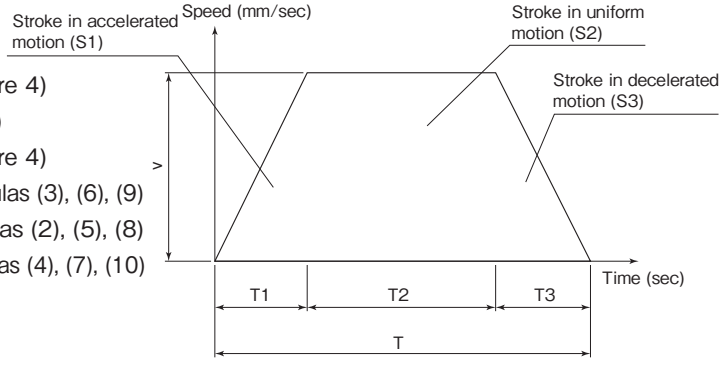
E_p : Moment equivalent factor in pitching direction (see Table 3)
E_y : Moment equivalent factor in yawing direction (see Table 3)
E_r : Moment equivalent factor in rolling direction (see Table 3)
M_{pL} : Load moment in pitching direction (N·mm)
$M_{pL} = W \cdot Z$
M_{yL} : Load moment in yawing direction (N·mm)
$M_{rL} = W \cdot X$
M_{rL} : Load moment in rolling direction (N·mm)
$M_{yL} = 0$ (The load moment is zero under this usage.)

(Note) For the moment directions, see Pages 3, 53 and 101.

● Using one of the above calculation formulas according to your usage, calculate average load in each motion to obtain calculated load per block (P_T).

$$P_T=\sqrt[3]{\frac{1}{(S1+S2+S3)}\left(P_{Ta}^{\,3}\cdot S1+P_{TC}^{\,3}\cdot S2+P_{Td}^{\,3}\cdot S3\right)}$$ ——— Formula (11)

Formula 4



P_T : Calculated load per block (N)
S1 : Traveling distance in accelerated motion (mm) (see Figure 4)
S2 : Traveling distance in uniform motion (mm) (see Figure 4)
S3 : Traveling distance in decelerated motion (mm) (see Figure 4)
P_{Ta} : Calculated load per block in accelerated motion (N) - Formulas (3), (6), (9)
P_{TC} : Calculated load per block in uniform motion (N) - Formulas (2), (5), (8)
P_{Td} : Calculated load per block in decelerated motion (N) - Formulas (4), (7), (10)

● LIFE EXPECTANCIES OF BALL SCREW AND SUPPORT BEARING

The life expectancies of the ball screw and the support bearing can be calculated using the following common calculation formula shown as below. Therefore, compare the dynamic load ratings of the ball screw and the support bearing and substitute a smaller value in the formula for calculation.

$$L_a = \left(\frac{1}{f_W} \cdot \frac{C_a \text{ or } C_b}{P_a} \right)^3 \cdot \ell \quad \text{——Formula (12)}$$

L_a : Life expectancy operational length (km)
f_W : Load factor (see Table 2)
C_a : Basic dynamic load rating of ball screw (N)
C_b : Basic dynamic load rating of support bearing (N)
P_a : Ave. Axial load (N)
ℓ : Ball screw lead (mm)

● Calculation of Pa

To calculate the life expectancy using Formula (6), calculate Pa in consideration of acceleration. Calculate the axial load in uniform, accelerated, and decelerated motions and its average figure is used as Pa.

● In the Case of Horizontal Movement

① For uniform motion (P_{ac})

$$P_{ac} = m \cdot W + F + F_b \cdot n \quad \text{——Formula (13)}$$

② For accelerated motion (P_{aa})

$$P_{aa} = m \cdot W + F + f_b \cdot n + (m + m_b \cdot n)\, \alpha_a \quad \text{——Formula (14)}$$

③ For decelerated motion (P_{ad})

$$P_{ad} = m \cdot W + F + f_b \cdot n - (m + m_b \cdot n)\, \alpha_d \quad \text{——Formula (15)}$$

P_{ac} : Axial load in uniform motion (N)
P_{aa} : Axial load in accelerated motion (N)
P_{ad} : Axial load in decelerated motion (N)
μ : Friction factor (0.006)
W : Load on block (N)
F : External force (load) in axial direction (N)
f_b : Slide resistance per block (N) (see Table 4)
n : Number of blocks of SG / SE
m : Load mass (kg)
m_b : Block mass of SG / SE (kg)
g : Gravitational acceleration (9.8 m / sec^2)
α_a : Acceleration in accelerated motion (m / sec^2)
α_d : Acceleration in decelerated motion (m / sec^2)

● In the Case of Vertical Movement

① For uniform motion (P_{ac})

$$P_{ac} = (m + m_b \cdot n)\, g + F + f_b \cdot n \quad \text{——Formula (16)}$$

② For accelerated motion (P_{aa})

$$P_{aa} = (m + m_b \cdot n) \cdot (g + \alpha_a) + F + f_b \cdot n_a \quad \text{——Formula (17)}$$

③ For decelerated motion (P_{ad})

$$P_{ad} = (m + m_b \cdot n) \cdot (g - \alpha_d) + F + f_b \cdot n_d \quad \text{——Formula (18)}$$

● Using one of the above calculation formulas according to your usage, calculate an average axial load (Pa).

$$P_a = \sqrt[3]{\frac{1}{(S1+S2+S3)} \left(P_{aa}^{\,3} \cdot S1 + P_{ac}^{\,3} \cdot S2 + P_{ad}^{\,3} \cdot S3 \right)} \quad \text{——Formula (19)}$$

P_a : Average axial load (N)
S1 : Traveling distance in accelerated motion (mm) (see Figure 4)
S2 : Traveling distance in uniform motion (mm) (see Figure 4)
S3 : Traveling distance in decelerated motion (mm) (see Figure 4)
P_{aa} : Axial load in accelerated motion (N) - Formulas (14), (17)
P_{ac} : Axial load in uniform motion (N) - Formulas (13), (16)
P_{ad} : Axial load in decelerated motion (N) - Formulas (15), (18)

Table 4 Slide resistance per block (f_b) (seal resistance)

(Unit: N)

Model No.	Accuracy grade	
	H	P
SG20	2.3	4.9
SG26	5.4	9.8
SG33	4.4	10.2
SG46	7.4	13.3
SG55	9	16

(Unit: N)

Model No.	Accuracy grade
	H/U/W
SE15	2.0
SE23, SC23	2.5
SE30, SC30	2.5
SE45, SC45	7.5

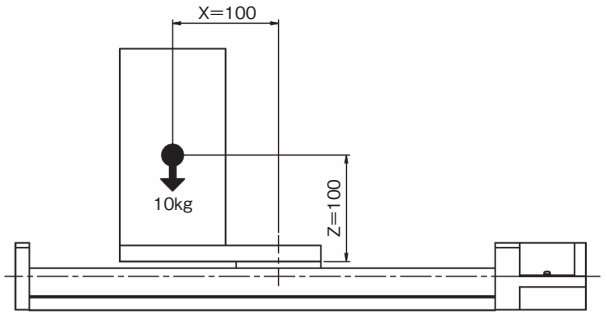
EXAMPLE OF BALLSCREW ACTUATOR SELECTION

● Linear motion robot - X-axis

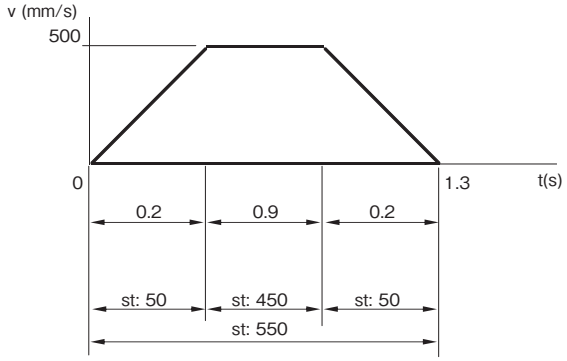
<Specifications>

Mass of work and table: M	10kg
Load distribution	See right side diagram.
Maximum stroke: st	550mm
Fast-feed speed: v	500mm/s
Acceleration/deceleration time constant: t	0.2 s
Maximum motor speed	6000min^{-1}
Orientating orientation	Horizontal
Repeated positioning accuracy	±0.01 mm or less
Expected life	30,000h

Load distribution diagram



Duty cycle model diagram



① Tentatively select SE4510A-740W-A1NN-NN in SE series, based on the conditions such as stroke and speed.

② Calculation of life expectancy

②-1. Calculating life expectancy of guide

Considering the usage with moment being loaded, average load and life expectancy were calculated in accordance with "LIFE EXPECTANCY OF GUIDE" on page 127, and they resulted in 1,274 N and 39,030 hours, respectively. The load coefficient for the above calculation was determined to be 2, based on the conditions of use.

②-2. Calculating expected life of ball screw and support bearings

Average axial load and life expectancy were calculated in accordance with "LIFE EXPECTANCIES OF BALL SCREW AND SUPPORT BEARING" on page 130, and the axial load resulted in 14.9 N and expected life of both ball screw and support bearing in over a million hours. The load coefficient for the above calculation was determined to be 2, based on the conditions of use.

③ Results of the selection

The above calculation results of life expectancies confirmed that the tentatively selected model would satisfy the required specifications. Since there is no other particular specification to be further considered, the model is selected officially.

Selected model of ballscrew actuator: SE4510A-740W-A1NN-NN

If longer life expectancy than the calculated life is preferred, make re-calculation after changing specifications, such as upgrading model size or adding extra slide block.

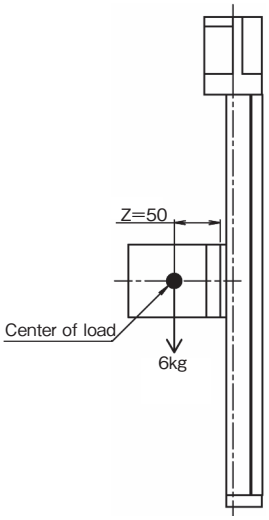
EXAMPLE OF BALLSCREW ACTUATOR SELECTION

● Lift - Z-axis

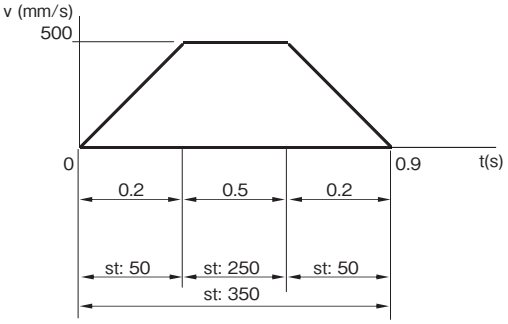
<Specifications>

Mass of work and table: M	6kg
Load distribution	See right side diagram.
Maximum stroke: st	350mm
Fast-feed speed: v	500mm/s
Acceleration/deceleration time constant: t	0.2 s
Maximum motor speed	6000min^{-1}
Orientating orientation	Vertical
Repeated positioning accuracy	±0.003 mm or less
Life expectancy	40,000h

Load distribution diagram



Duty cycle model diagram



① Tentative selection of ballscrew actuator

Tentatively select SG3310A-500H-A0NN-NN in SG series, based on the conditions such as strokes and speed.

② Calculation of life expectancy

②-1. Calculating life expectancy of guide

Considering the usage with moment being loaded, average load and life expectancy were calculated in accordance with "LIFE EXPECTANCY OF GUIDE" on page 127, and they resulted in 805 N and 17,166 hours, respectively. The load coefficient for the above calculation was determined to be 2, based on the conditions of use.

②-2. Calculating expected life of ball screw and support bearing

Average axial load and life expectancy were calculated in accordance with "LIFE EXPECTANCIES OF BALL SCREW AND SUPPORT BEARING "on page 130, and the axial load resulted in 60N and expected life of ball screw and support bearing in 44,202 and 353,620 house, respectively. The load coefficient for the above calculation was determined to be 2, based on the conditions of use.

③ Results of the selection

According to the above results of life expectancies, the life of the guide does not satisfy the life expectancy requirement. Since the ball screw and support bearing have satisfactory life expectancies, make re-calculation after changing the block on the guide. Leaving the guide rail length and required stroke as they are, change the model to SG3310D-500H-A0NN-NN.

④ Re-calculation of life

As in the previous step, average load and life expectancy were calculated in accordance with "LIFE EXPECTANCY OF GUIDE" on page 127, and they resulted in 198 N (load per block) and 146,740 hours, respectively.

⑤ Results of the re-selection

The results of re-calculation of life expectancy of the guide confirmed that the selected model would satisfy required hours of life expectancy.

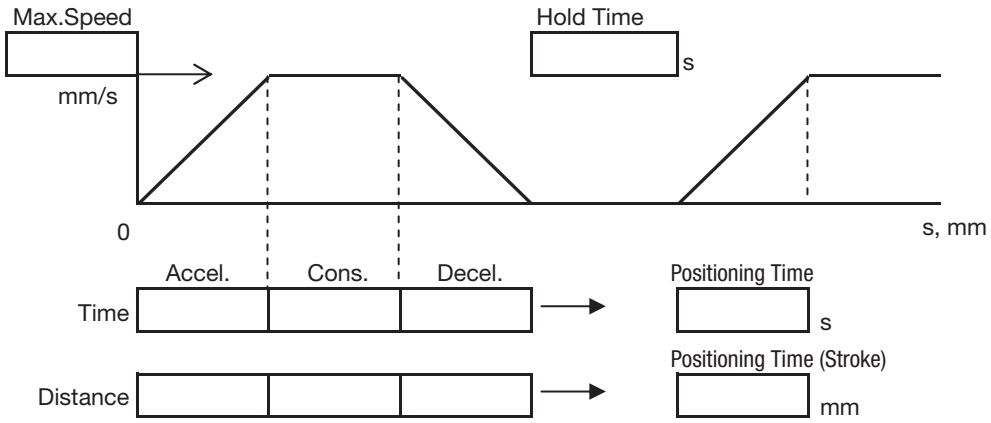
BALLSCREW ACTUATOR SPECIFICATION DATA SHEET

Company Name		Date	
Department		Contact personnel	
Adress		Tel / Fax	
Name of Equipment/machine used		Location of use	
Drawing/conceptual drawing attached?	☐Yes pieces of pages	☐No	

Conditions of Use (Either unit system may be used.)

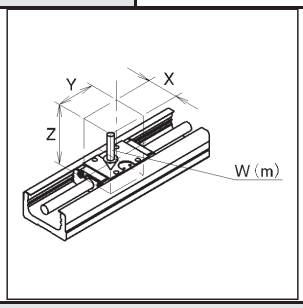
Mass of work and table (kg)			
Operating orientation	☐Horizontal ☐Vertical ☐Wall installation		
Maximum table speed (mm/s)		Maximum table stroke (mm)	
Expected life (h)			

Operating conditions

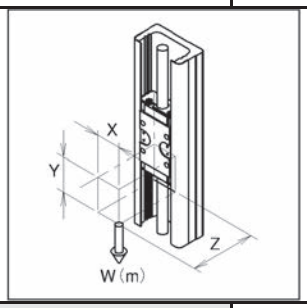


Load distribution (see below)	X = mm	Y = mm	Z = mm	

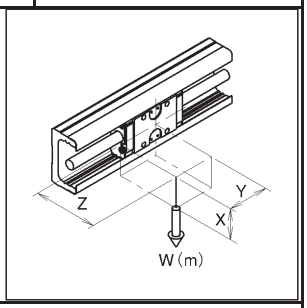
Horizontal



Vertical



Wall installation



Grease (brand) / Unless otherwise specified, Multemp PS No. 2 Grease (KYODO YUSHI CO.,LTD.) will be used as lubricant.								
Environmental conditions	Temp.	Dust	Humidity	Gas	Liquid	Clean room	Vacuum	Others
			%					
Name of motor					Parallel motor mounting		☐Required	☐Not required
Actuator quantity per a machine				Quantity for prototype				
Quantity of mass production			Change control		☐Yes		☐No	

Ballscrew actuator specifications

Size		Lead		Slide block		Guide rail length	Precision grade	
Dust-preventive cover		Sensor	Type:		Qty:		Surface treatment	

Additional description / request

*KURODA office		*Contact personnel	