THK

NEW

Compact Caged Ball Screw

SDA

Contributes to downsizing the equipment and lowering the center of gravity

Capable of operating at high speed 5000 min^{-1} (max DN value: 130,000)

Achieves a slim nut with a new circulation system

Low noise, long-term maintenance-free operation,
low torque fluctuation

For details, visit THK at **www.thk.com**

*Product information is updated regularly on the THK website.

THK CO., LTD.
TOKYO. JAPAN

CATALOG No.354-2E

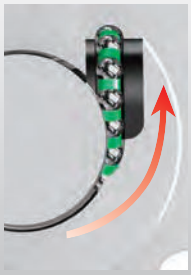
Compact Caged Ball Screw

Achieves Down-sizing and Higher-speed Operation

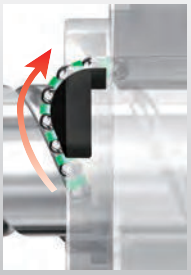
Use of a newly developed end cap and R piece achieves an ideal ball-circulation structure.

Ensures high-speed operation at 5000 min^{-1} (maximum DN value: 130,000) (approx. twice the previous model).
Use of a newly developed end cap and R piece achieves an ideal ball-circulation structure and significant downsizing of the product.
The nut dimensions are compliant with a DIN standard (DIN69051).*

* DIN standards refer to “Deutsche Industrie Normen” (German industrial standards) established by “Deutsches Institut für Normung e.V.” (DIN, German Institute for Standards in English), and are broadly used as standards in all industrial fields in many countries in Europe, Asia, etc.



Circulate in the tangential direction

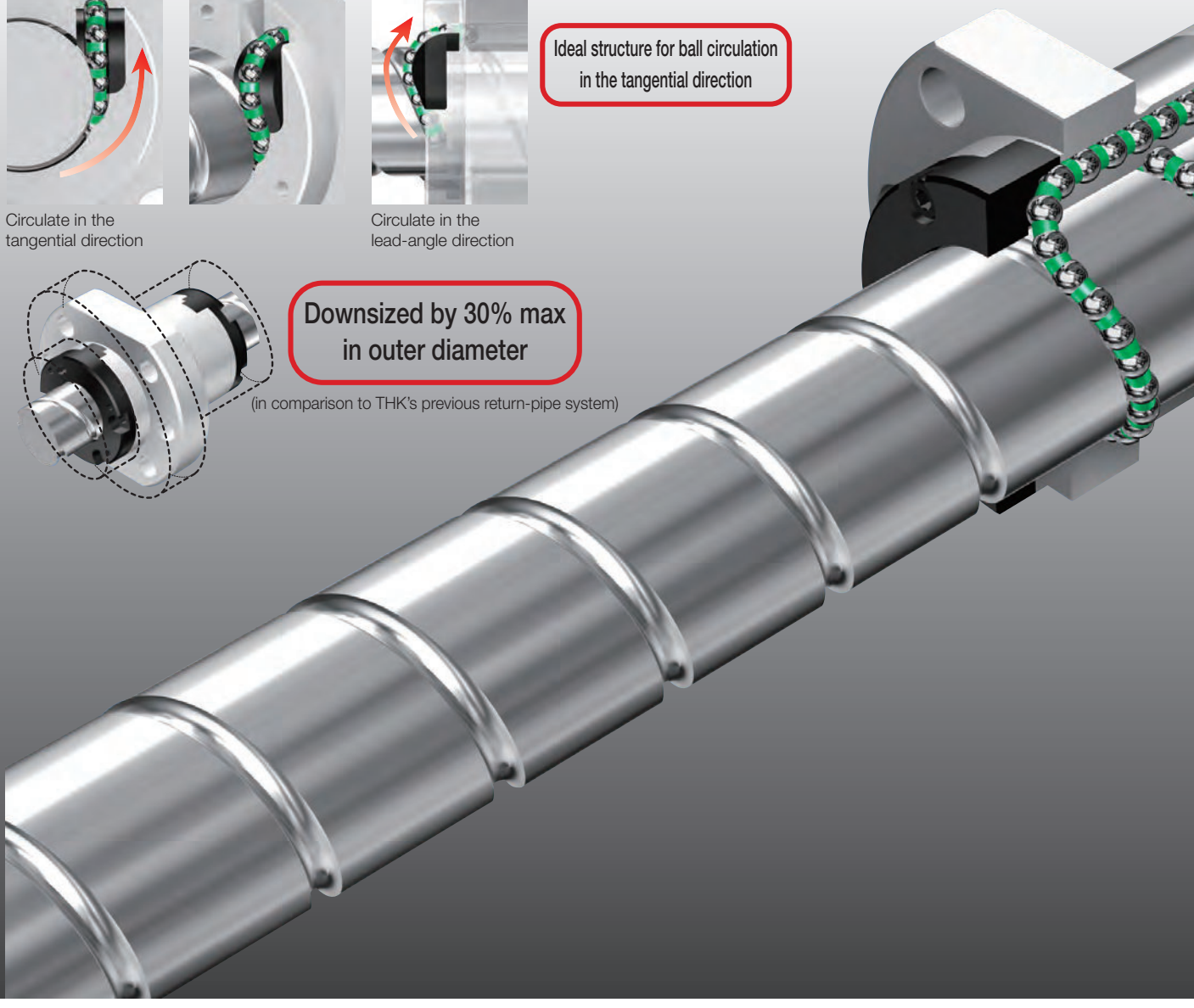


Circulate in the lead-angle direction

Ideal structure for ball circulation in the tangential direction

Downsized by 30% max in outer diameter

(in comparison to THK’s previous return-pipe system)



Use of a ball cage enables the formation of a grease pocket to increase grease retention, achieving long-term maintenance-free operation.

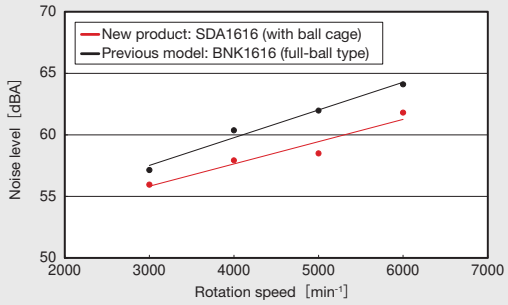
Use of an end cap integrated with a labyrinth seal minimizes the clearance with the screw shaft to improve the grease seal performance.

With no collision noise between balls, further noise reduction is achieved.

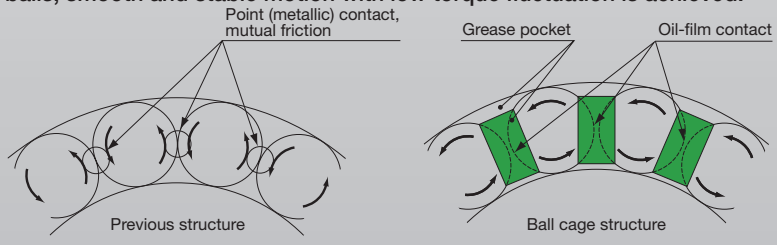
Noise level comparison

■Conditions

Shaft diameter/lead	ϕ16/16 mm
Measuring instrument	Sound level meter
Measurement distance	1 m



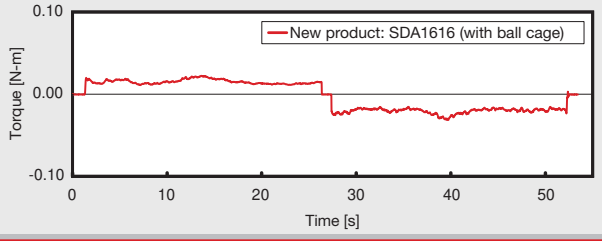
Since the use of a ball cage eliminates collision and mutual friction between balls, smooth and stable motion with low torque fluctuation is achieved.

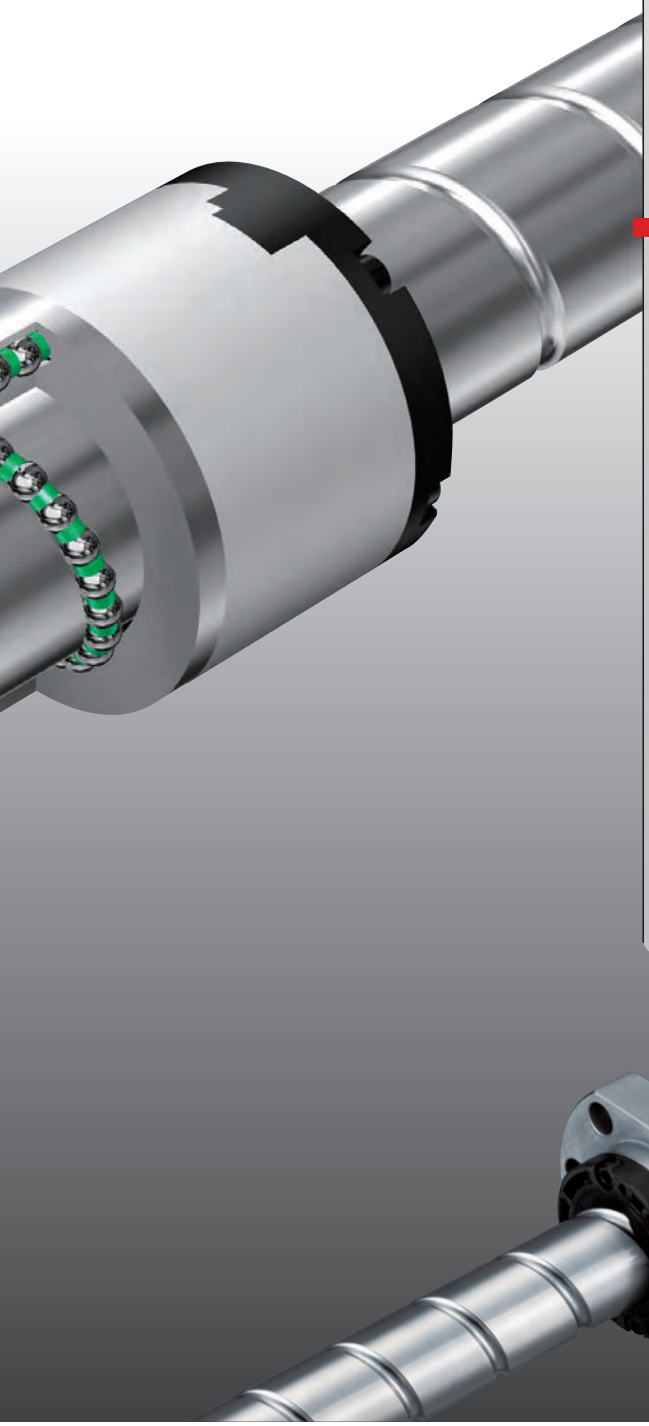


Smoothness comparison

■Conditions

Shaft diameter/lead	ϕ16/16 mm
Rotation speed	60 min-1
Stroke	550 mm
Lubricant	THK AFJ Grease





Diameter of the ball screw shaft	Ball screw lead [mm]							
	10	16	20	25	30	40	50	60
ϕ15	●		●		●			
ϕ16	●	●						
ϕ20			●	●		●		●
ϕ25			●	●	●		●	

Lead accuracy and axial clearance

[Lead accuracy]

Compliant with ISO (International Organization for Standardization) standards and DIN standards (Deutsche Industrie Normen), in addition to the formerly observed JIS (Japanese Industrial Standards).

Correspondence table of accuracy standards

		Lead accuracy					
Accuracy standard	JIS	C0	C1	C2*	C3	C5	C7
	ISO (DIN)	—	Cp1	—	Cp3	Cp5	—

* Represents lead accuracy under THK standards.

[Axial clearance]

Since model SDA adopts oversized ball preloading, G0 is the only available axial clearance.
If desiring an axial clearance other than G0, contact THK.

Static safety factor

[Basic static load rating C_{0a}]

Basic static load rating (C_{0a}) generally means the permissible axial load of a Ball Screw. Depending on the service conditions, it is necessary to consider the following static safety factor for the calculated load. Note that when a Ball Screw is stationary or in motion, an unexpected external force may be applied due to an inertial force generated through collision or start/stop action.

Static safety factor f_s

$$f_s \leqq \frac{C_{oa}}{F_a}$$

f_s : Static safety factor (Table 1)
C_{oa} : Basic static load rating*1 [kN]
F_a : Axial load [kN]

Table 1 Static safety factor (f_s)

Machine using the Ball Screw	Load conditions	Lower limit of f_s
General industrial machines	Without vibrations/impact	1.0 to 3.5
	With vibrations/impact	2.0 to 5.0
Machine tools	Without vibrations/impact	1.0 to 4.0
	With vibrations/impact	2.5 to 7.0

*1 Basic static load rating (C_{0a}) refers to the static load with a uniform direction and magnitude at which the sum of the permanent deformation of the rolling element and the permanent deformation of the raceway is 0.0001 times the diameter of the rolling element at a contact point to which the maximum stress is applied. The basic static load rating of a Ball Screw is defined on the basis of the axial load (specific value of each Ball Screw model is indicated in the dimensional table of the respective model).

Rated life and service life time

[Basic dynamic load rating C_a]

Basic dynamic load rating (C_a) is used to calculate the service life of a Ball Screw operating under a load. Basic dynamic load rating (C_a) refers to the load with constant direction and magnitude at which the rated life L is 10^6 [rev] when a group of identical Ball Screw units independently operate (basic dynamic load rating (C_a) is indicated in the dimensional table of the respective model).

Rated life L (total number of revolutions)

The service life of a Ball Screw is obtained from the following equation based on the basic dynamic load rating and the applied axial load.

$$L = \left(\frac{C_a}{f_w \cdot F_a}\right)^3 \times 10^6$$

L : Rated life (total number of revolutions) [rev]
C_a : Basic dynamic load rating*2 [kN]
F_a : Applied axial load [kN]
f_w : Load factor (Table 2)

Table 2 Load factor (f_w)

Vibrations/impact	Velocity (V)	f_w
Very Low	Very slow V ≦ 0.25 m/s	1.0 to 1.2
Low	Slow 0.25 m/s < V ≦ 1.0 m/s	1.2 to 1.5
Medium	Medium 1.0 m/s < V ≦ 2.0 m/s	1.5 to 2.0
High	High 2.0 m/s < V	2.0 to 3.5

*2 The rated life is calculated through load calculation assuming that favorable lubrication is secured and the product is assembled under ideal mounting conditions. The accuracy and deformation of the mounting member may affect the service life.

Service life time L_h

When the rated life (L) has been obtained, the service life time (L_h) is obtained from the following equation if the stroke length and the number of reciprocation are constant.

$$L_h = \frac{L \times Ph}{2 \times \ell_s \times n_1 \times 60}$$

L_h : Service life time [h]
ℓ_s : Stroke length [mm]
n_1 : Number of reciprocations per minute [min^{-1}]
Ph : Lead [mm]

Lubrication accessories

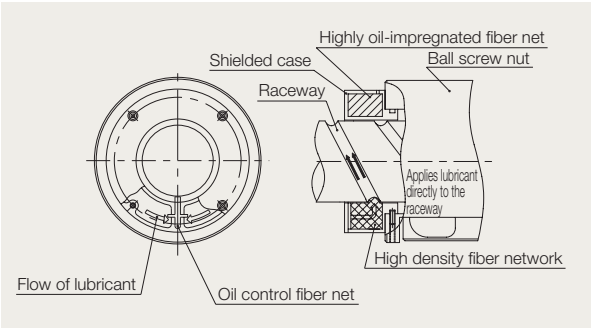
For model SDA, QZ Lubricators and Wiper Rings for Ball Screws are available as options. QZ Lubricators which contains a highly oil impregnated fiber net are designed for long term maintenance free operation. Contact type seal, Wiper Ring W, excels in foreign material removal.

[QZ Lubricator]

QZ Lubricator is a lubrication system that supplies the adequate amount of lubricant to the raceway of the ball screw shaft.

●Features

- Significantly extends maintenance interval
  With ordinary grease lubrication in Ball Screws, a slightly amount of oil is lost as the Ball Screw operates.
  Attaching QZ Lubricator will supplement the oil loss over a long period of time and significantly extend the maintenance interval.
- An eco-friendly lubrication system
  Since QZ Lubricator supplies the adequate amount of oil to the appropriate place through a high-density fiber net, it is an eco-friendly lubrication system that does not waste oil.



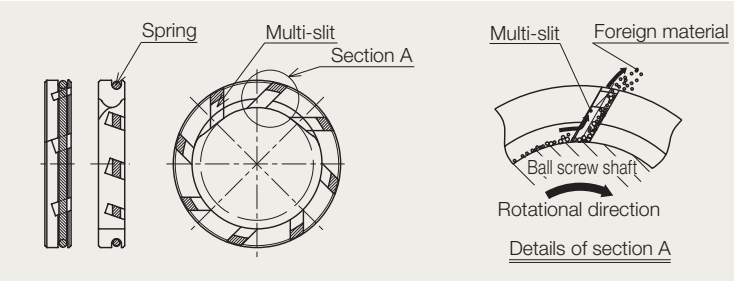
Dust control accessories

[Wiper ring W]

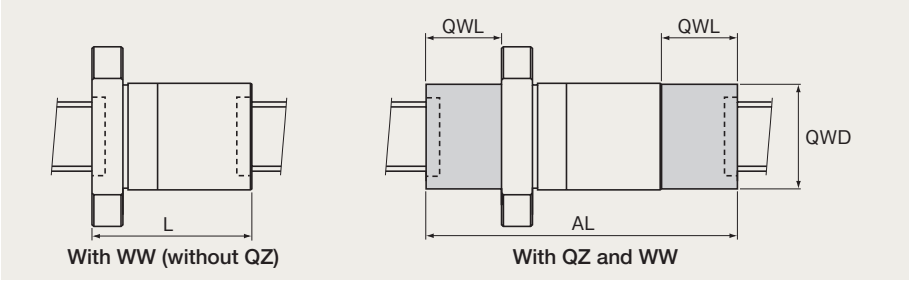
In wiper ring W, a highly wear resistant special resin elastically contacts the circumference and thread groove of the ball screw shaft, and removes foreign material from eight slits, preventing it from entering the ball screw nut.

●Features

- Prevents foreign material from entering the ball screw nut.
- Contacts the ball screw shaft at constant pressure to reduce heat generation.
- Excels in resistance to wear, impact and chemicals.
- Attaching QZ Lubricator for Ball Screws and wiper ring W would significantly extend the maintenance interval even in a harsh environment.



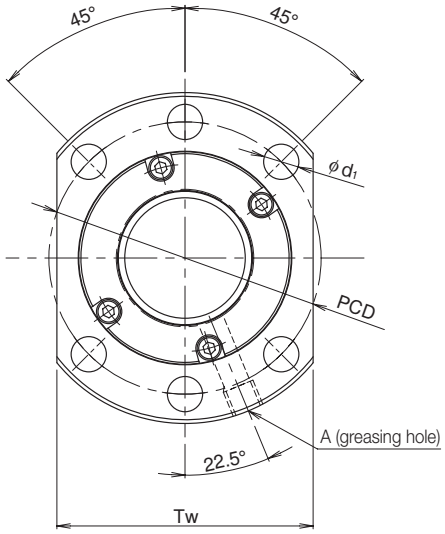
Dimensions of the ball screw nut attached with a labyrinth seal (RR), wiper ring (WW) and QZ Lubricator (QZ)



Unit : mm

Model No.	WW availability	QZ availability	Dimension with WW attached	Length of projection with QZ attached	Outer diameter of projection with QZ attached	Dimension with QZWW attached
			L	QWL	QWD	AL
SDA1510-2.8	○	○	43.3	28.5	27	92.3
SDA1520-3.6	△	○	—	28.5	27	101.6
SDA1530-3.6	×	○	—	28.5	27	121.9
SDA1610-2.8	○	○	43.4	28.5	27	92.4
SDA1616-2.8	○	○	59.9	28.5	27	108.9
SDA2020-2.8	○	○	76.8	28.5	35	122.8
SDA2030-1.8	×	○	—	28.5	35	122.2
SDA2040-1.8	×	○	—	28.5	35	142.5
SDA2060-1.6	×	○	—	28.5	35	123.3
SDA2520-2.8	○	○	77.4	28.5	39	123.4
SDA2525-2.8	○	○	91.2	28.5	39	137.2
SDA2530-1.8	×	○	—	28.5	39	122.1
SDA2550-1.8	×	○	—	28.5	39	162.4

Dimensional table of model SDA



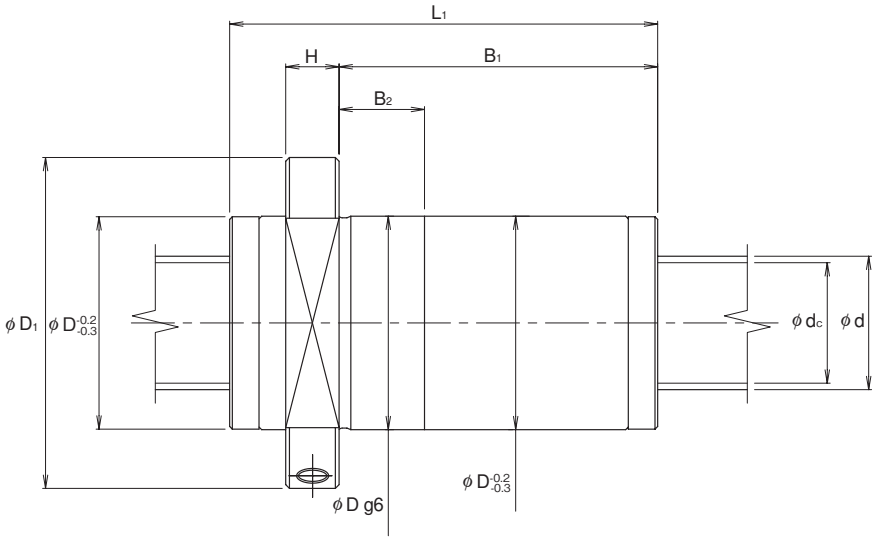
Model No.	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Screw shaft root diameter d_3	No. of loaded circuits Row × turns	Basic load rating		Rigidity K N/μm
						C_a kN	C_{oa} kN	
★☆SDA1510-2.8	15	10	15.5	13.1	1×2.8	5.5	7.8	144
SDA1520-3.6	15	20	15.5	13.1	2×1.8	6.4	10.3	183
SDA1530-3.6	15	30	15.5	13.1	2×1.8	6.1	8.9	190
SDA1610-2.8	16	10	16.5	14.1	1×2.8	5.6	8.2	150
SDA1616-2.8	16	16	16.5	14.1	1×2.8	5.5	8.4	152
☆SDA2020-2.8	20	20	20.75	17.1	1×2.8	10.9	17.6	207
SDA2030-1.8	20	30	20.75	17.1	1×1.8	7.0	11.5	135
☆SDA2040-1.8	20	40	20.75	17.1	1×1.8	6.8	9.9	141
☆SDA2060-1.6	20	60	20.75	17.1	2×0.8	5.4	9.7	128
SDA2520-2.8	25	20	25.75	22.1	1×2.8	12.1	21.6	245
SDA2525-2.8	25	25	25.75	22.1	1×2.8	12.0	22.0	246
SDA2530-1.8	25	30	25.75	22.1	1×1.8	8.2	14.5	164
SDA2550-1.8	25	25	25.75	22.1	1×1.8	7.6	12.6	170

★ : The outer diameter dimension is compliant with DIN standard 69051 (lead 5 or less).
☆ : A labyrinth seal is attached as standard (other models are without a labyrinth seal as standard).

Example of model number coding

SDA2520-2.8 QZ RR G0 +830L C3

- SDA2520-2.8: Model number
- QZ: With QZ Lubricator (no symbol for without QZ Lubricator)
- RR: Seal symbol (RR: labyrinth seal on both ends; WW: wiper ring on both ends)
- G0: Axial clearance (see P.3)
- +830L: Overall length of ball screw shaft (in mm)
- C3: Accuracy standard (see P.3)



Unit : mm

Nut dimensions										Screw shaft inertial moment/mm kg·cm^2/mm	Nut mass kg	Shaft mass kg/m	Max permissible rotation speed (min^{-1})
Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	d_1	Tw	Greasing hole A				
28	48	35.3	10	16.8	12.8	38	5.5	40	M6	3.9×10^{-4}	0.16	1.32	5000
28	48	44.6		25.1	10	38	5.5	40		3.9×10^{-4}	0.18	1.35	
28	48	64.9		43.4	10	38	5.5	40		3.9×10^{-4}	0.24	1.33	
28	48	35.4		16.9	12.9	38	5.5	40		5.05×10^{-4}	0.15	1.50	
28	48	51.9		33.4	10	38	5.5	40		5.05×10^{-4}	0.20	1.49	
36	58	65.8		45.3	12	47	6.6	44		1.23×10^{-3}	0.35	2.39	
36	58	65.2		43.7	12	47	6.6	44		1.23×10^{-3}	0.34	2.40	
36	58	85.5		62.5	12	47	6.6	44		1.23×10^{-3}	0.43	2.37	
36	58	66.3		40.3	12	47	6.6	44		1.23×10^{-3}	0.31	2.40	
40	62	66.4		45.9	16	51	6.6	48		3.01×10^{-3}	0.39	3.75	
40	62	80.2		59.7	16	51	6.6	48		3.01×10^{-3}	0.46	3.76	
40	62	65.1		44.1	16	51	6.6	48		3.01×10^{-3}	0.37	3.77	
40	62	105.4		81.9	16	51	6.6	48		3.01×10^{-3}	0.58	3.79	

Note 1: The maximum permissible rotation speed is calculated from the DN value. Calculate the critical speed, and then select the lower value.

Note 2: Each rigidity value (K) in the table indicates the spring constant obtained from the load and the elastic deformation when an axial load at 30% of the basic dynamic load rating (C_a) is applied.
This value does not include the rigidity of parts related to the ball screw nut mounting section. Normally, apply 80% of the rigidity value (K) in the table.
If the axial load (F_a) is not 0.3 C_a, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{F_a}{0.3C_a}\right)^{\frac{1}{3}}$$

K : Rigidity value in the dimensional table

●Precautions

If desiring to shape both ends of the screw shaft to have a larger diameter than the outer diameter of the screw shaft, contact THK.

⚠ Precautions on use

● Handling

- Do not disassemble the parts. Doing so may allow dust to enter the product and/or cause functional loss.
- Tilting the ball screw shaft and the ball screw nut may cause them to fall by its own weights.
- Do not drop or hit the Ball Screw. Doing so may cause personal injury and/or damage the product. Applying an impact to the product may cause functional loss even if the product looks intact.
- Do not remove the ball screw nut from the ball screw shaft. Doing so may cause balls or a ball cage to fall and make the product inoperable.
- Take care not to allow foreign material such as dust and cutting chips to enter the product. Failure to do so may damage the ball circulation part or cause functional loss.
- Some types of coolants may affect the functionality of the product. If using the product in an environment where a coolant could enter the ball screw nut, contact THK.
- Do not use the product at temperature exceeding 80°C. If the product is attached with QZ Lubricator, be sure to use it at temperature 50°C or below.
- If foreign material such as dust and cutting chips adheres to the product, replenish the lubricant after cleaning the product. For the type of the cleaning fluid, contact THK.
- If using the product for vertical application, take a measure to prevent it from falling such as adding a safety mechanism. Failure to do so may cause the ball screw nut to fall by its own weight.
- Do not use the product at speed exceeding the permissible rotation speed. Doing so may damage the product or cause an accident. Make sure that the service rotation speed is within the specification range designated by THK.
- Do not forcefully drive any component into the ball screw shaft or the ball screw nut. Doing so may cause an indentation on the raceway. Take care when mounting components.
- If misalignment or skewing occurs in the ball screw shaft support and the ball screw nut, it may substantially shorten the service life. Pay much attention to the components to be mounted and to the mounting accuracy.
- If using the product in a location constantly exposed to vibrations or in a special environment such as a clean room, vacuum, low temperature and high temperature, contact THK.
- Do not let the ball screw nut overshoot. Doing so may cause balls to fall or damage the ball circulation part.

● Lubrication

- Thoroughly wipe off anti-corrosion oil and feed lubricant before using the product.
- For use with high-speed rotation application, we have selected THK Grease AFJ for SDA Ball Screw. THK Grease AFJ provides superior performance in low-heat-generating characteristics.
- Do not mix lubricants with different physical properties.
- In locations constantly exposed to vibrations or in special environments such as a clean room, vacuum, low temperature and high temperature, normal lubricants may not be used. Contact THK for details.
- If planning to use a special lubricant, contact THK before using it.
- Lubrication interval varies according to the service conditions. Contact THK for details.
- In types attached with QZ Lubricator, the required minimum amount of lubricant is supplied to the raceway. Depending on the service conditions such as vertical application, the lubricant may drop from the ball screw shaft due to the nature of the lubricant.

● Storage

- When storing the Ball Screw, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding low temperature, high temperature and high humidity.

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