Advantages of Caged Ball Technology

Low Noise and Reduced Running Sound

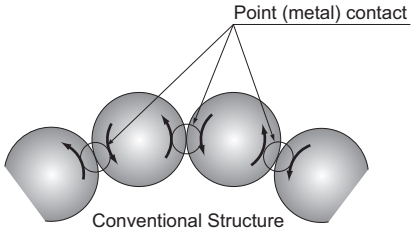
The use of the ball cage eliminates the sound of collision between the balls. Additionally, because balls are picked up in the tangential direction, the collision noise from ball circulation is also eliminated.

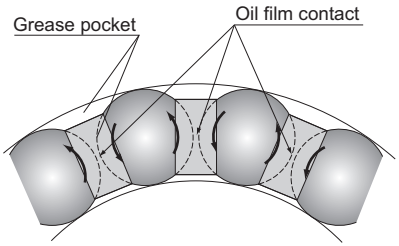
Long-Term Maintenance-Free Operation

The absence of friction between balls and the retention of lubrication in grease pockets enable long-term maintenance-free operation (i.e., lubrication is unnecessary over a long period).

Smooth Motion

Use of a ball cage eliminates friction between balls and minimizes torque fluctuation, allowing for smooth motion.





Structure of the Ball Screw with Ball Cage

Low Noise

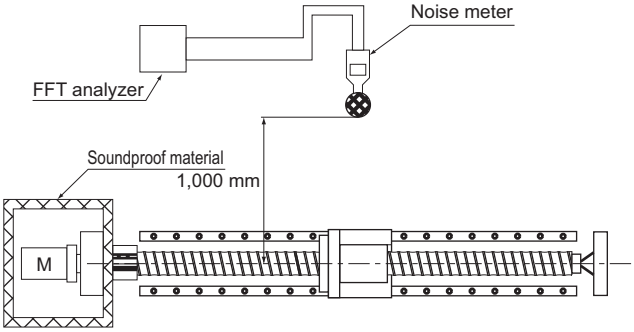
● Noise Level Data

Since the balls in a ball screw with a ball cage do not collide with each other, they do not produce a metallic sound and a low noise level is achieved.

■Noise Measurement

Conditions

Item	Description
Sample	Caged ball screw HBN3210-5 Conventional type: Model BNF3210-5
Stroke	600 mm
Lubrication	Grease lubrication (lithium-based grease containing extreme pressure agent)



Noise measurement instrument

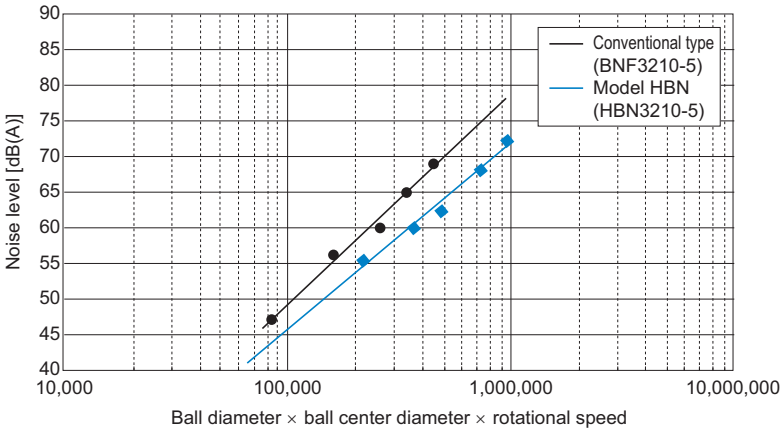


Fig. 14: Ball Screw Noise Level

Long-Term Maintenance-Free Operation

● High Speed, Load Durability

Thanks to high-speed ball circulation and the effects of Caged Ball technology, a ball screw with a ball cage excels in speed and durability while bearing a load.

■High Speed Durability Test

Test Conditions

Item	Description
Sample	High-speed ball screw with ball cage SDA3110V-5
Speed	5,000 min^{-1} (DN value*: 160,000)
Stroke	500 mm
Lubricant	THK AFJ Grease
Quantity	4 cm^3 (lubricated every 500 km)
Applied load	1.27 kN
Acceleration	0.5 G

* DN value: Ball center-to-center diameter x revolutions per minute

Test results

Shows no deviation after running 6,000 km.

■Load Durability Test

Test Conditions

Item	Description
Sample	High-speed ball screw with ball cage SBN5016V-5
Speed	1,500 min^{-1} (DN value*: 79,000)
Stroke	400 mm
Lubricant	THK AFG Grease
Quantity	57.7 cm^3 (Lubricated every 100 km)
Applied load	36.1 kN (0.38 Ca)
Acceleration	0.5 G

Test results

Shows no deviation after running for the calculated service life

Smooth Motion

● Low Torque Fluctuation

The Caged Ball technology allows smoother motion than the conventional type and reduces torque fluctuation.

Conditions

Item	Description
Shaft diameter/lead	25/5 mm
Shaft rotational speed	100 min^{-1}

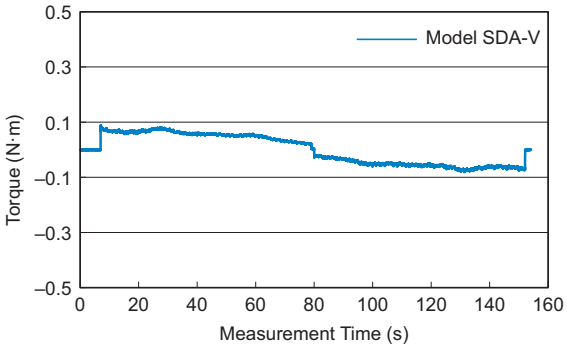


Fig. 15: Torque Fluctuation Data

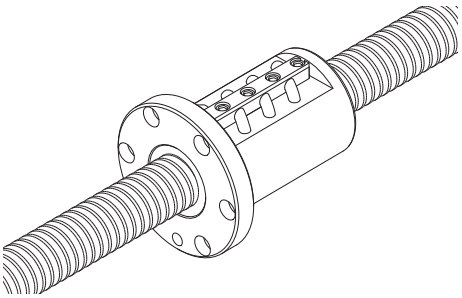
Types and Features

Preload Type

Model SBN-V

Dimensional Table⇒A15-112

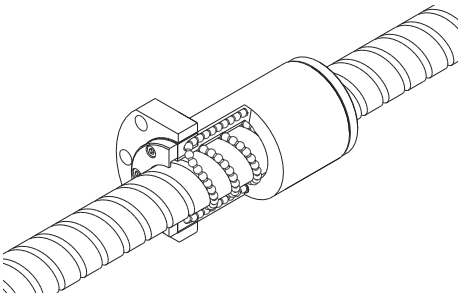
The circulation structure feature allows the balls to be picked up in a direction tangential to the shaft. The circulation components have been strengthened, increasing the DN value to 160,000 (small type: 130,000).



Model SBK

Dimensional Table⇒A15-116

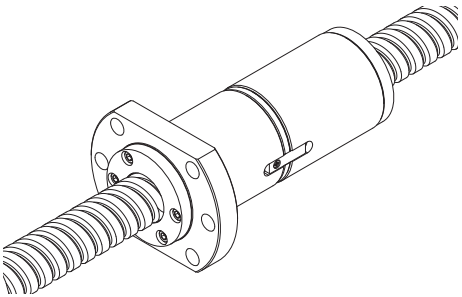
A compact structure is achieved by adopting the offset preload method, which shifts two rows of grooves of the ball screw nut.



Model SBKN

Dimensional Table⇒A15-120

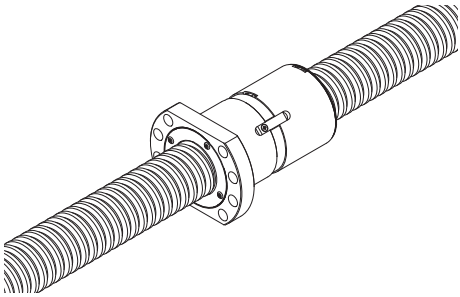
The preload method utilizes a combination of two ball screw nuts preloaded with spacers to eliminate backlash.
This type has improved load capacity in comparison with the Model SBK.



Model SDAN-V

Dimensional Table⇒A15-76

The preload method utilizes a combination of two ball screw nuts preloaded with spacers to eliminate backlash. The nut dimensions conform to ISO standards (ISO 3408). This type has improved axial rigidity in comparison with the Model SDA-V.



Model SDAN-VX

Dimensional Table⇒A15-76

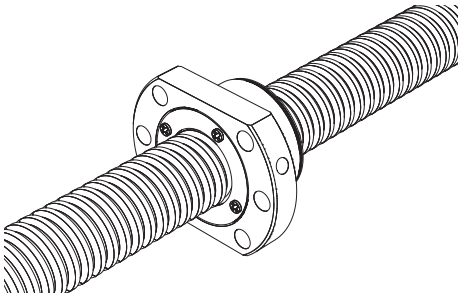
Full-Ball types are also available. (DN value: 130,000)

Preload/No Preload Type

Model SDA-V

Dimensional Table⇒A15-82

A ball screw with newly developed circulation components that give it an ideal ball circulation structure. (DN value: 160,000)
The nut dimensions conform to ISO standards (ISO 3408). Furthermore, the use of the newly developed thin film seal reduces the length of the nut, achieving a more compact design for the device.



Model SDA-VZ

Dimensional Table⇒A15-82

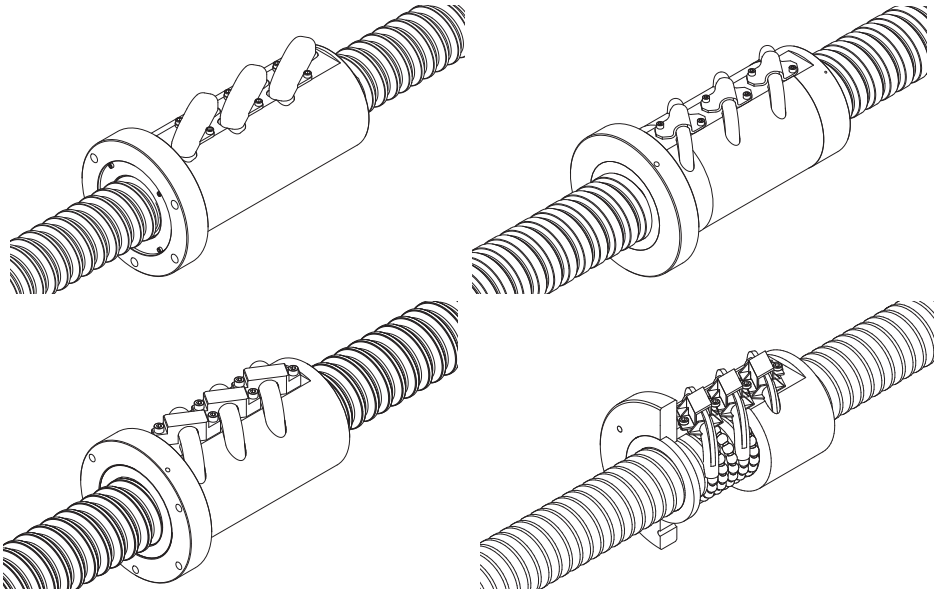
Full-Ball types are also available. (DN value: 130,000)

No Preload Type

Models HBN-V/HBN-K/HBN-KA/HBN

Dimensional Table⇒A15-244

With the optimal design for high loads, this ball screw model achieves a load rating more than twice the conventional type.



Model SBKH

Dimensional Table⇒A15-254

Model SBKH is a ball screw that achieves a high load carrying capacity and is capable of high-speed operation (92 m/min at a maximum).