

Selecting a Nut

Types of Nuts

The nuts of ball screws are categorized by ball circulation method into the return-pipe type, the deflector type, and the end-cap type. These three nut types are described as follows.

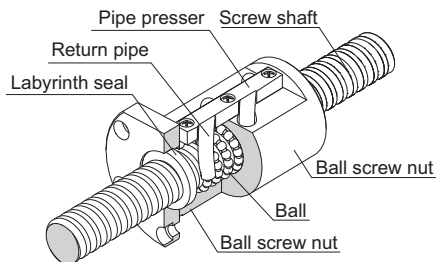
In addition to the circulation methods, the ball screws are also categorized by the preloading method.

Types by Ball Circulation Method

● Return-Pipe Type

(Models SBN-V (Medium), BIF-V (Medium), BIF, BNF-V (Medium), BNF, BNFN-V (Medium), BNFN, BNT, BTK-V),
Return-Piece Type
(Models SBN-V (Small), HBN, BIF-V (Small), BNF-V (Small), BNFN-V (Small))

These are the most common types of nuts, which use a return pipe for ball circulation. The return pipe allows balls to be picked up, pass through the pipe and return piece, and return to their original positions to circulate endlessly.

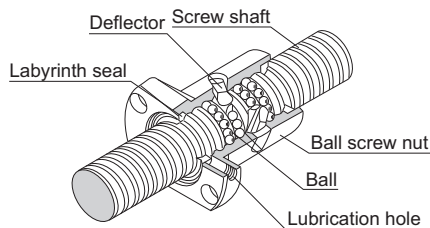


Example of Return-Pipe Nut Structure

● Deflector Type

(Models EBB-V, EPB-V, DK, DKN, DIK, JPF, DIR, and MDK)

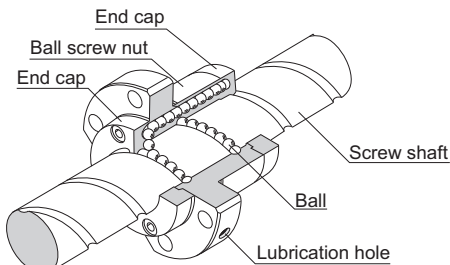
These are the most compact type of nut. The balls change their travel direction with a deflector, pass over the circumference of the screw shaft, and return to their original positions to circulate endlessly.



Example of Simple Nut Structure

● End-Cap Type: Large Lead Nut (Models SBK, SBKN, SBKH, WHF, BLK, WGF, BLW, WTF, CNF, and BLR)

These nuts are the most suitable for fast feed. The balls are picked up with an end cap, pass through a hole in the nut, and return to their original positions to circulate endlessly.



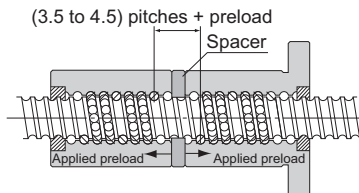
Example Large-Lead Nut Structure

Types by Preloading Method

● Fixed-Point Preloading

■ Double-Nut Preload (Models SBKN, SDAN-V, BNFN-V, BNFN, DKN, and BLW)

A spacer is inserted between two nuts to provide a preload.



Model SBKN



Model SDAN-V



Models BNFN-V and BNFN



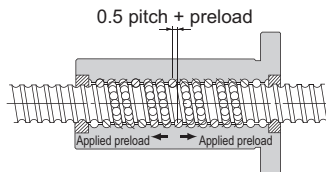
Model DKN



Model BLW

■ Offset Preload (Models SBK, SBN-V, BIF-V, BIF, EPB-V, DIK, and DIR)

More compact than the double-nut method, offset preloading provides a preload by changing the groove pitch of the nut without using a spacer.



Model SBK (two rows between phases)



Model SBN-V



Models BIF-V and BIF



Model EPB-V



Model DIK



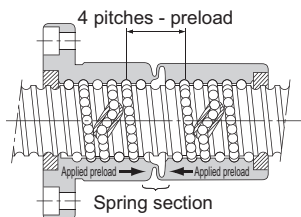
Model DIR

Selection Criteria

Selecting a Nut

● Constant Pressure Preloading (Model JPF)

With this method, a spring structure is installed almost in the middle of the nut, and it provides a preload by changing the groove pitch in the middle of the nut.



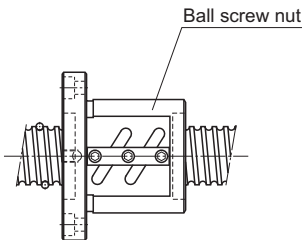
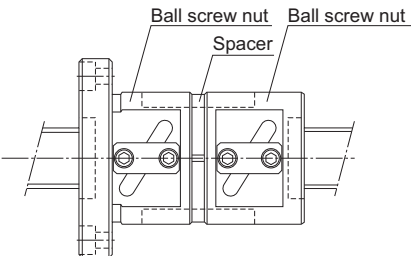
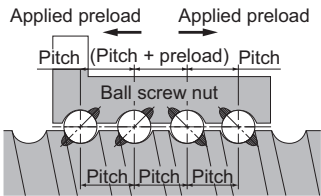
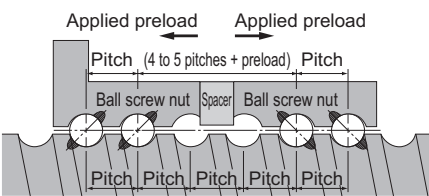
Model JPF

Structure and Features of Offset-Preload Simple-Nut Ball Screws

The simple-nut ball screw is an offset-preload type in which a phase is provided in the middle of a single ball screw nut, and an axial clearance is set at a below-zero value (under a preload).

The simple-nut ball screw has a more compact structure and allows smoother motion than the conventional double-nut type (spacer inserted between two nuts).

Comparison between the Simple Nut and the Double Nut

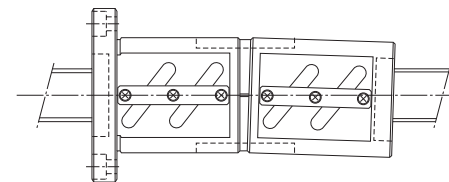
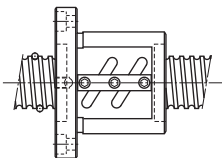
Simple-nut ball screw	Conventional double-nut ball screw
	
Preload structure	
	

Simple-nut ball screw

Conventional double-nut ball screw

Rotational performance

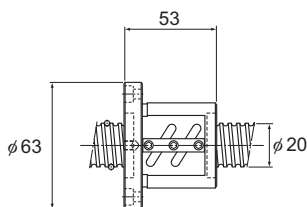
The offset preload of simple-nut ball screws is adjusted by changing the ball diameter. This eliminates the inconsistency in the contact angle, which is the most important factor in ball screw performance. It also ensures high rigidity, smooth motion, and high wobbling accuracy.



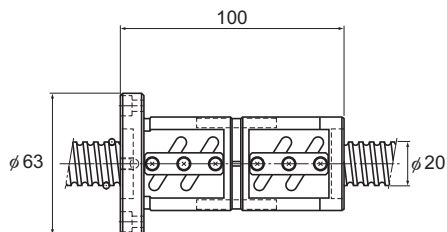
In double-nut ball screws, poor flatness in the spacer surface and inaccurate perpendicularity in the nut can cause inconsistency in the contact angle. This results in a non-uniform ball contact, inferior rotational performance, and low wobbling accuracy.

Dimensions

Since simple-nut ball screws are based on a preloading mechanism that does not require a spacer, the overall nut length can be kept short. As a result, the whole nut can be designed to be light and compact.

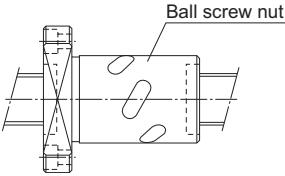
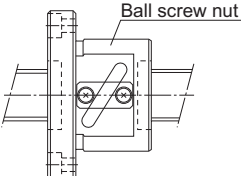
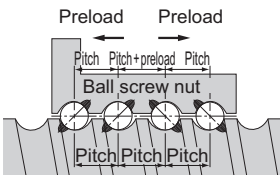
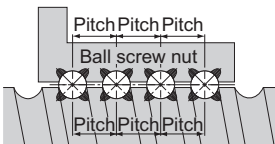
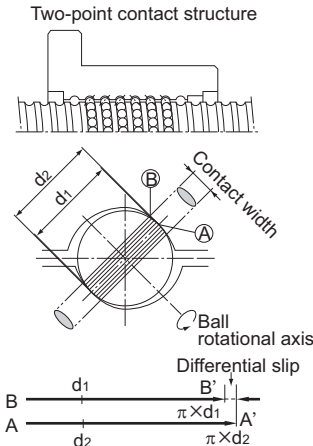


Simple-Nut



Double-Nut

Comparison between Simple-Nut Offset Preload and Oversized-Ball Preload

Simple-nut ball screw Model DIK	Conventional oversized-ball-preload-nut ball screw Model BNF
	
Preload structure	
	
Accuracy life	
<p>Simple-nut ball screw Model DIK has a similar preloading structure to that of the double-nut type although the former only has one ball screw nut. As a result, no differential slip or spin occurs, thus minimizing the increase in the rotational torque and the generation of heat. Accordingly, a high level of accuracy can be maintained over a long period.</p> <p>Two-point contact structure</p> 	<p>With an oversized-ball-preload nut, preload is provided through each of the balls in contact with the raceway at four points. This causes differential slip and spin which increase the rotational torque, resulting in accelerated wear and heat generation. Therefore, the accuracy deteriorates in a short period.</p> <p>Four-point contact structure</p> 