

B-3-1.5 VSS Type for Contaminated Environments

1. Features

● **High dust-resistance**
Specially profiled screw shaft grooves and high performance seals prevent the entry of fine contaminants. Reduces particle penetration rate to less than 1/15 of existing standard products.

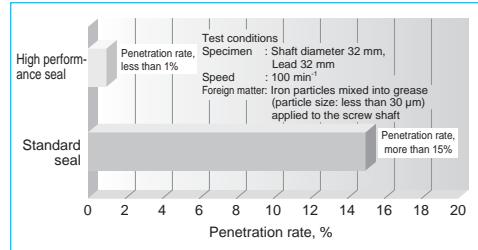


Fig. 1 Particle penetration rate

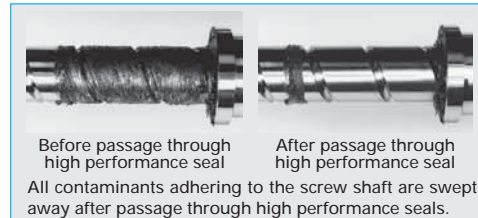


Fig. 2 Contamination before and after particle penetration test

● **Long life**
High performance seals extend ball screw durability under severely contaminated environments with iron powder. Extreme durability tests under contaminated environments show the durability of the VSS type extends more than four times longer than our existing type with a standard seal.

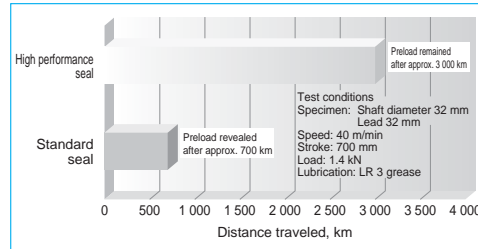


Fig. 3 Extreme durability test results using iron particles

● **High speed**
For ultimate smoothness of ball recirculation, the internal ball recirculation system enables high-speed operation at a maximum of d·n

150 000. Large lead specifications allow high-speeds of 150 m/min.

● **Low-noise**
Reduces noise level by more than 6 dB compared with our conventional tube-type ball screws, thereby providing low-noise and good noise tone features.

● **Compact size**
Ball nut external diameter is up to 25% smaller than our conventional models.

2. Specifications

(1) Recirculation system
End-deflector recirculation system has features of high-speed operation with low-noise, and compact ball nut. The structure of recirculation system is shown in Fig.4.

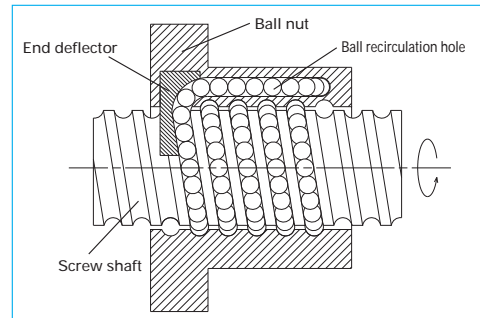


Fig. 4 Structure of end deflector recirculation system

(2) Accuracy grade and axial play
The available standard accuracy grade and axial play are as follows. Please consult NSK for other grades.

Table 1 Accuracy grade and axial play

Accuracy grade	C5
Axial play	Z, 0 mm (Preloaded) T, 0.005 mm or less; S, 0.020 mm or less

(3) Allowable d·n value and the criterion of maximum rotational speed

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.
Allowable d·n value: 150000 or less
Criterion of maximum rotational speed: 3000 min⁻¹
Note: Please also review critical speed. See

"Technical Description: Permissible rotational speed" (Page B51) for details.

(4) High performance seal
High performance seal (Japan patents: 3646452, 3692203) with special lip that contacts screw shaft cross-section and prevents entry of fine contaminants.

(5) Lubrication unit
Incorporates NSK K1 lubrication unit to sufficiently lubricate the high performance seal lip, reduce friction, and improve durability.

(6) optional
Non-contact metal protector that traces the ball screw grooves and safeguards the seal against high-temperature foreign matter.

3. Design precaution

When designing the screw shaft end, one end of

the screw must meet either one of the following conditions. If not, we cannot install the ball nut on the screw shaft.

- Cut the ball groove through to the shaft end.
- The diameters of bearing journals and the gear or pulley seat must be less than the root diameter of ball groove "dr" specified on the dimension table.


High performance seals may increase torque, which may in turn increase temperature. Please consult with NSK prior to usage under severe service conditions.

For general precautions regarding ball screws, refer to "Design Precautions" (Page B84) and "Handling Precautions" (Page B103).

4. Product categories

VSS Type has the model as follows.

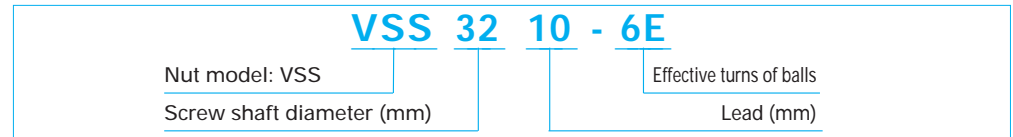
Table 2 VSS type product categories

Nut model	Shape	Flange shape	Preload system
VSS		Circular II	Non-preload, Slight axial play P preload (light preload)

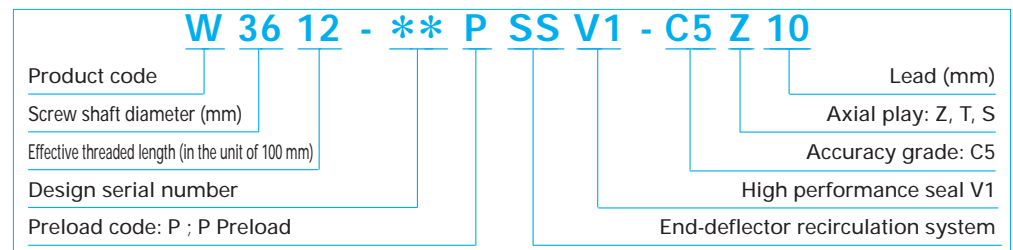
5. Example of model number in dimension table

A structure of "Model number" and "Reference number for ball screw" are as follows.

◇Model number



◇Reference number for ball screw

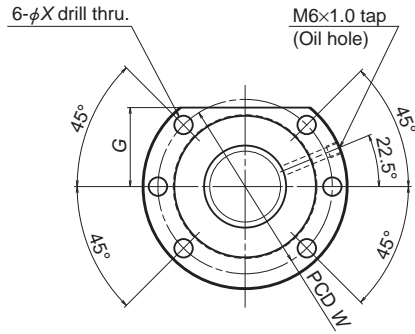


6. Handling Precautions

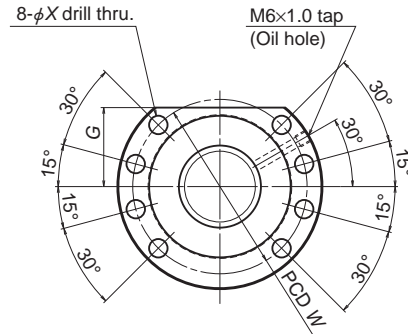
Maximum operating temperature: 50°C
Maximum momentary operating temperature: 80°C

Chemical precautions: Never expose the ball screw to grease-removing organic solvents such as hexane or thinner. Never immerse the ball screw in kerosene or rust preventive oils which contain kerosene.

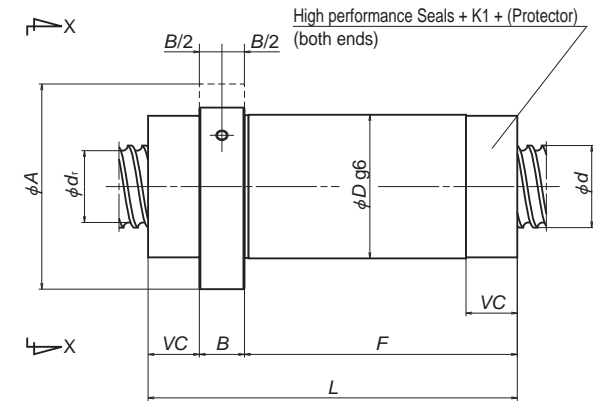
View X-X



Flange TYPE I



Flange TYPE II



Model No.	Shaft dia. <i>d</i>	Lead <i>l</i>	Ball dia. <i>D_w</i>	Ball circle dia. <i>d_m</i>	Root dia. <i>d_r</i>	Effective turns of balls Turns	Flange shape	Basic load rating (N)		Axial rigidity <i>K</i> (N/μm)
								Dynamic <i>C_a</i>	Static <i>C_{0a}</i>	
VSS3210-6E		10				6	I	43300	111000	682
VSS3216-5E	32	16	5.5563	33	27.5	5		36700	90800	563
VSS3220-5E		20				5		36700	90800	561
VSS3232-4E		32				4		25000	58300	387
VSS4040-4E	40	40	6.35	41	34.4	4	II	33600	83900	472
VSS5050-4E	50	50	6.35	51	44.4	4		37300	105000	559

- Remarks
1. The right hand screw is the standard. For specifications on left hand screws, contact NSK.
 2. Rigidity in the Table is theoretical value obtained from the elastic deformation between screw groove and ball when the preload is 1.5% of the basic dynamic load rating, and axial load is applied to it. Refer to "Technical Description" (Page B41) if axial load and preload differs from the conditions above, or when considering change in the deformation of the ball nut itself.
 3. Products with axial play may have a partially negative play (preloaded condition) depending on screw length. Refer to "Manufacturing range of effective screw length in combination of accuracy grade and axial play. (Page B20)"

Unit: mm

Ball nut dimensions									Maximum shaft length
Nut entire length <i>L</i>	Nut outside diameter <i>D</i>	Flange outside diameter <i>A</i>	Flange width <i>B</i>	Nut length <i>F</i>	Notch size <i>G</i>	Seal installation dimensions <i>VC</i>	Bolt hole PCD <i>W</i>	Bolt hole dimensions <i>X</i>	
132				89.5					2800
150				107.5	34				
169	56	86	18	126.5		24.5	71	9	
122				79.5					
144	70	100	22	94	38.5	27.5	85	9	
164	82	118	22	114.5	46	27.5	100	11	5000