

B-3-3.7 TW Series for Twin-Drive Systems

(1) Features

Variations in the lead accuracy and preload torque between two ball screws, which consist of a unit of TW Series, are controlled, resulting improved travel accuracy and ball screw operating lifetime.

Fig. 1 shows measured variation in lead accuracy while Fig. 2 displays an example of variation in thermal expansion between the two ball screws.

Fig. 3 is a schematic diagram comparing the travel accuracy between the TW Series and conventional model.

- High rigidity and long lifetime

Twin-drive systems are superior to single-drive systems in system rigidity, supporting the design of long-life feeding mechanism even if they make the shaft diameter one size smaller.

- High responsiveness to positioning commands

Twin-drive systems permit the use of screw shaft diameters that are one size smaller, thereby reducing screw shaft inertia by up to 50%, offering high responsiveness to positioning commands.

- Improved high-speed capability and noise level

Twin-drive systems allow the use of smaller screw diameters, resulting in no increase in the level of noise. The end-deflector recirculation system significantly improves high-speed capability and noise level compared with the existing return tube recirculation system, offering high-speed feeding of up to 1 200 mm/min (shaft dia. 40 mm, lead 30 mm, rotational speed 4 000 min⁻¹).

(2) Specifications

Table 1 Specifications of twin-drive systems

Recirculation systems	End-deflector recirculation system, Return tube system, Deflector(bridge type) system
Shaft dia.	32 – 63 mm
Lead	10 – 30 mm
Accuracy grade	C5
Screw shaft length	3 m or less

(3) Optional specifications

- Hollow shaft ball screw and nut cooling ball screw
- Provides high accuracy through the use of forced cooling. Please refer to ball screws for high precision machine tools (page B542 to B550) for more details.

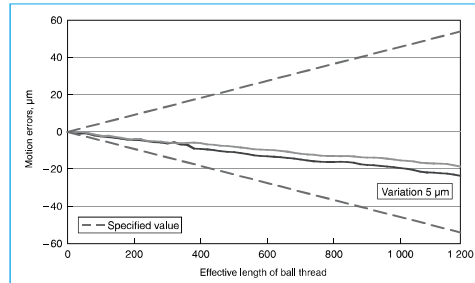


Fig. 1 Example of measured variation in lead accuracy

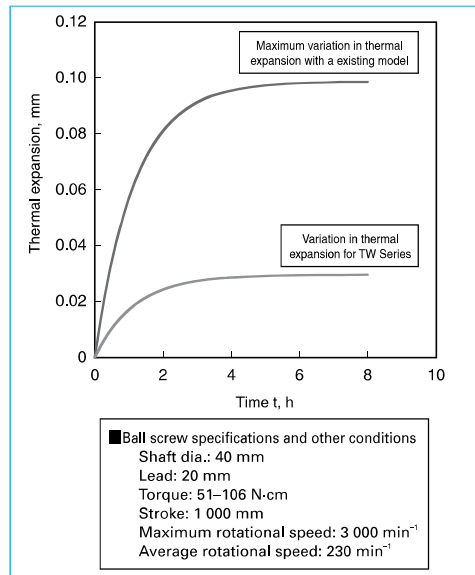


Fig. 2 Calculation example of the variation of thermal expansion

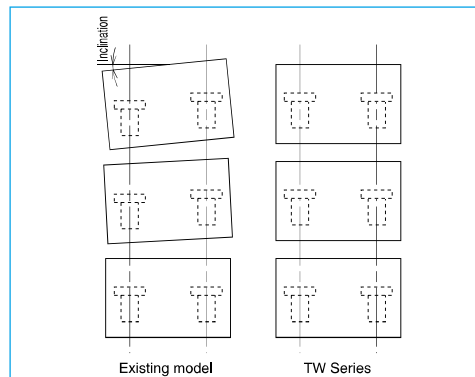


Fig. 3 Schematic diagram of travel accuracy

B-3-3.8.1 Hollow Shaft Ball Screw for High Precision Machine Tools

The increase in speed of the feeding mechanism for highly accurate positioning may require some measures against thermal expansion of the ball screw (forced cooling using hollow ball screw). NSK standardized hollowed screw shafts and shaft ends configuration (sealing section and support bearing seat). NSK recommends this as the most effective measure against thermal expansion.

1. Features

- Stable positioning accuracy

Suppresses expansion of the ball screw shaft by rising temperature, and provides stable, precise positioning.

- Prevents displacement of various sections

Minimizes deformation of the ball screw support bearings as well as of the machine base which is caused by thermal expansion of ball screw. Forced cooling keeps the heat from spreading to other sections, and prevents the processing table from deforming due to heat.

- Reduces warm-up time

Temperature does not rise high, therefore cuts machine warm-up period.

- Maintains lubricant's effect

Removes heat from the ball screw, deterring lubricant deterioration.

- Easy designing for installation

Use support bearing unit exclusive for NSK ball screws (high speed and high load capacity for machine tools, see page B405) and seal unit (page B545) to standardized shaft end. This makes designing of mounting ball screw easy. NSK also provides nut cooling ball screws. The level of temperature rise for nut cooling ball

screw is equal to the hollow shaft ball screw thanks to the optimized nut internal design for cooling. Please refer to nut cooling ball screws (page B547) for more details.

2. Design precautions

Refer to HMC type, end-deflector recirculation system, return tube recirculation system, and deflector(bridge type) recirculation system for ball screw specifications. If the overall ball screw length exceeds 3 000 mm, contact NSK. For general precautions regarding ball screw, refer to "Design Precautions" (page B83) and "Handling precautions" (page B103).

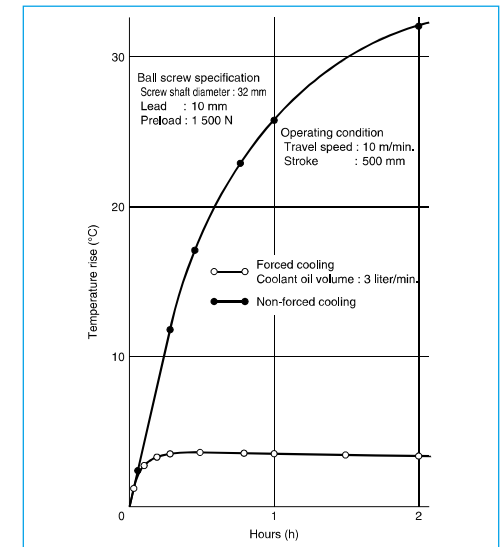
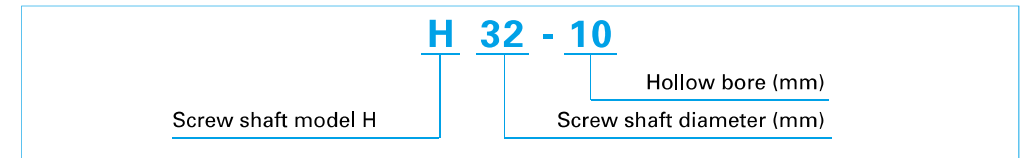


Fig. 1 Effect of forced cooling by hollow shaft ball screw

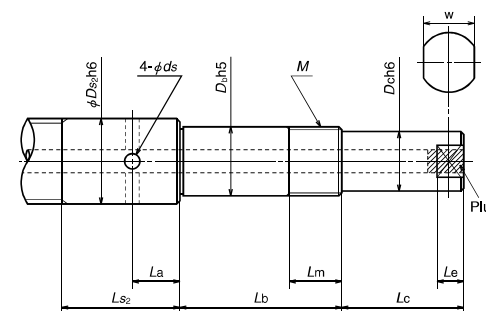
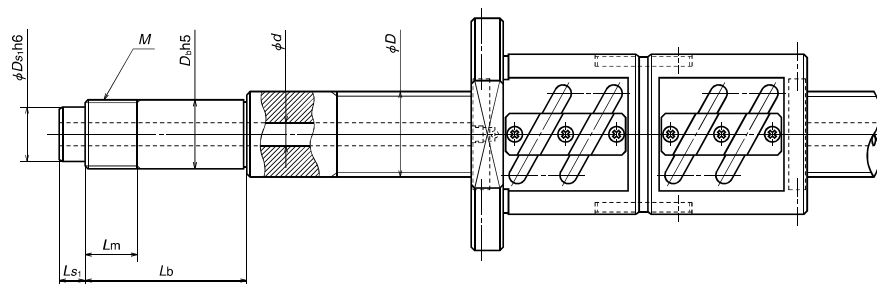
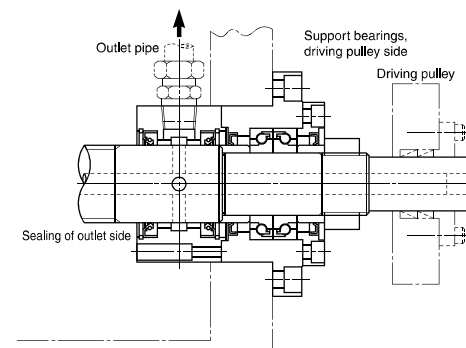
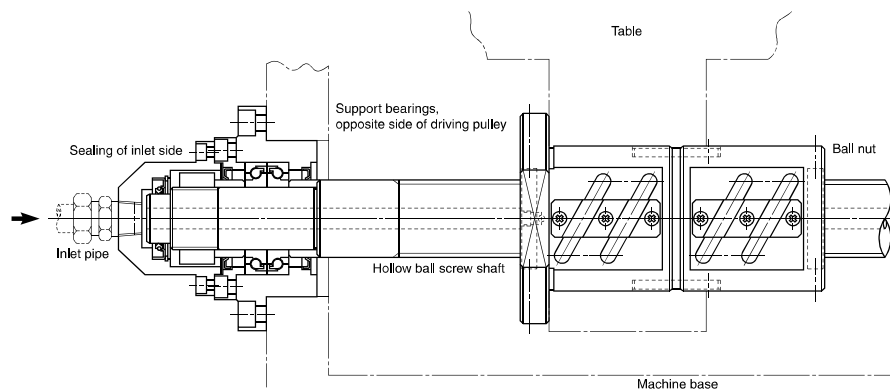
3. Model example of dimension table

A model number that indicates specification factors is structured as shown below.

◇Example of model



4. Installation example and standard dimensions



Model No.	Screw shaft		Bearing seat				Sealing					
	Diameter D	Hollow d	Diameter D_b	Lock nut			Inlet		Outlet			
				M	L_m	L_b	D_{s1}	L_{s1}	D_{s2}	L_{s2}	L_a	ds
H32-10	32	10	25	M25×1.5	26	104	20	15	32	60	25	6
H40-12	40	12	30	M30×1.5	26	89	25	15	40	60	25	7
						104						
H50-15	50	15	40	M40×1.5	30	92	32	15	50	65	27	8
						107						
						122						

Notes: 1. Please consult NSK for other models.
2. See B420 for bearing combination symbols.

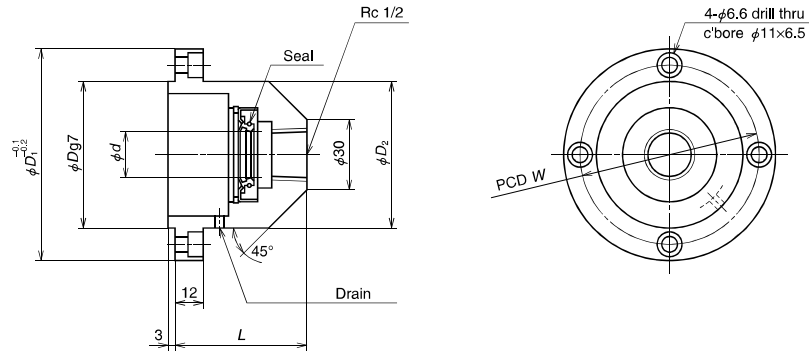
Drive side		Spanner flats		Applicable support unit	Used bearing	Equipped seal unit	
D_c	L_c	w	L_e			Shaft end	Shaft outer surface
20	40	17	8	WBK25DF-31H WBK25DFD-31H	25TAC62CSUHPN7C DF combination 25TAC62CSUHPN7C DFD combination (25TAC62CSUHPN7C DFF combination)	WSK20A-01	WSK32B-01
25	50	22	10	WBK30DF-31H WBK30DFD-31H	30TAC62CSUHPN7C DF combination 30TAC62CSUHPN7C DFD combination (30TAC62CSUHPN7C DFF combination)	WSK25A-01	WSK40B-01
35	70	30	13	WBK40DF-31H WBK40DFD-31H WBK40DFD-31H	40TAC72CSUHPN7C DF combination 40TAC72CSUHPN7C DFD combination 40TAC72CSUHPN7C DFF combination	WSK32A-01	WSK50B-01

Unit: mm

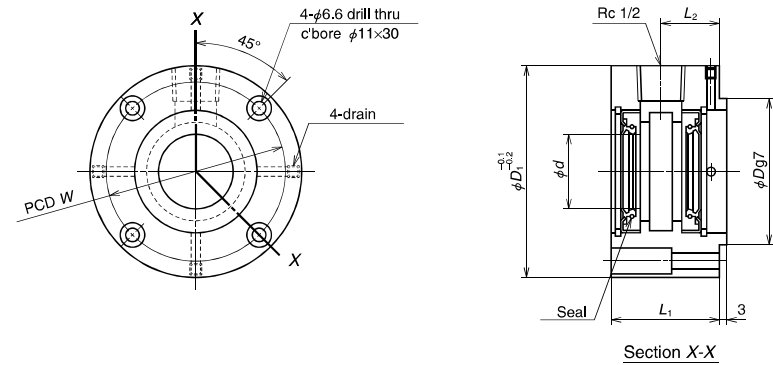
5. Seal units for hollow ball screw shaft (available by order)

This is an exclusive joint for coolant of the hollow ball screw shaft.

**A Type
(for shaft end)**



**B Type
(for shaft outer surface)**



Unit: mm

Reference No.	d	D	D_1	D_2	L	W	Fixing bolt
WSK20A-01	20	57	85	57	56	70	M6
WSK25A-01	25	57	85	57	56	70	M6
WSK32A-01	32	69	95	67	61	80	M6

Unit: mm

Reference No.	d	D	D_1	L_1	L_2	W	Fixing bolt
WSK32B-01	32	57	85	46	25	70	M6
WSK40B-01	40	57	85	46	25	70	M6
WSK50B-01	50	69	95	49	27	80	M6

◇ **Handling precautions**

- Use NSK support unit (high speed and high load capacity for machine tools on page B405) for installation in order to maintain the eccentricity between screw shaft and seal unit.

- Apply grease to the lip section for protection at the time of installation to the ball screw.
- Make certain that the drain holes (one for A Type, four for B Type) of the seal unit directly face downward when the unit is installed.