

### 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<sup>-1</sup>).

#### (2) Specifications

Table 1 Specifications of twin-drive systems

Recirculation systems	End-deflector recirculation system, Return tube system, Deflector(bridge type) system
Shaft dia.	φ 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 B540 to B548) for more details.

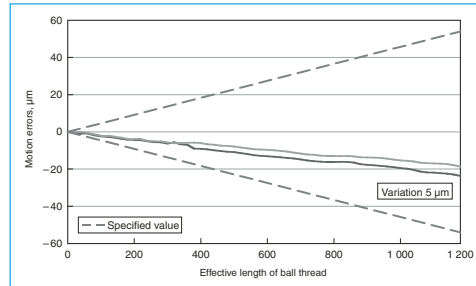


Fig. 1 Example of measured variation in lead accuracy

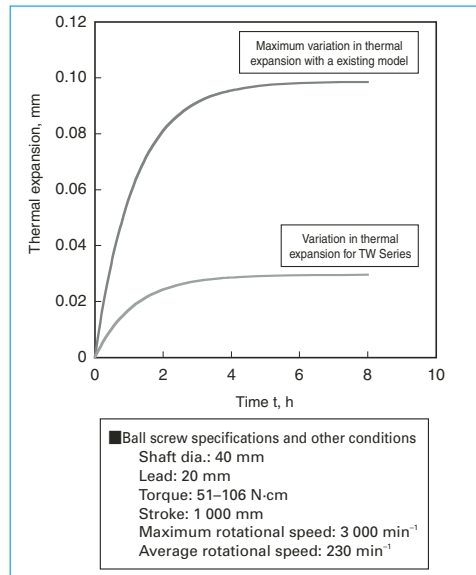


Fig. 2 Calculation example of the variation of thermal expansion

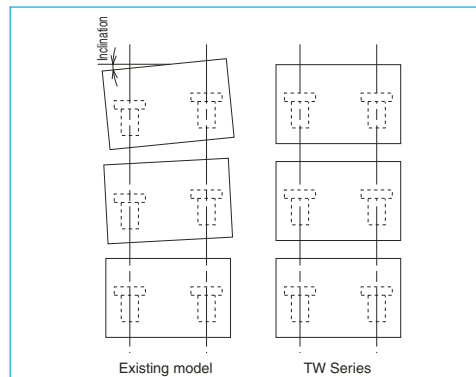


Fig. 3 Schematic diagram of travel accuracy

### 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 B543) 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 B545) 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).

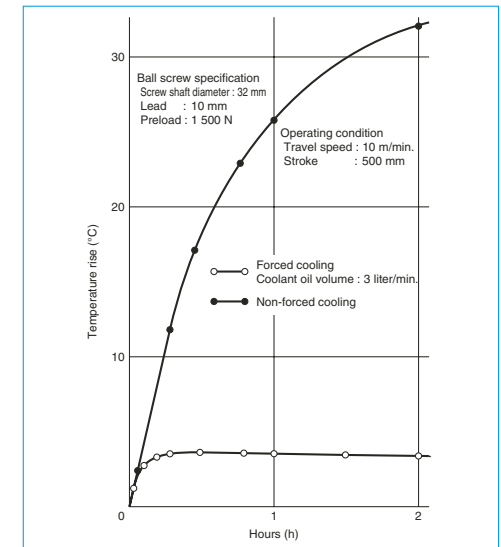


Fig. 1 Effect of forced cooling by hollow shaft ball screw

#### 3. Model example of dimension table

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

◇Example of model

