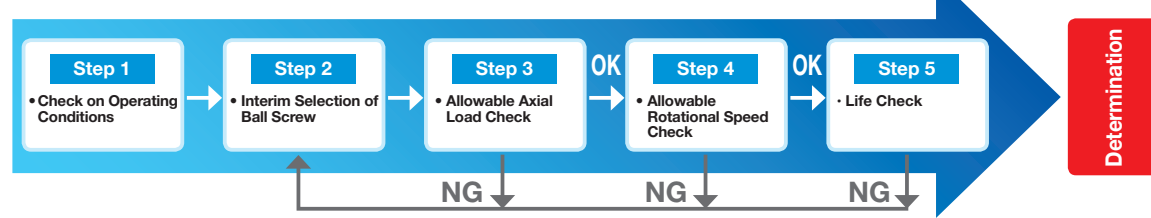


Use the following steps to select a ball screw suited to the usage criteria.



Step 1 Check on Operating Conditions

Refer to Operating Conditions below.

NO	Item	Unit
①	Positioning Accuracy	mm
②	Stroke	mm
③	Travel Speeds	mm/s
④	Drive Motor Speed	min ⁻¹
⑤	Weight of Workpiece and Table	Kg
⑥	Mounting Orientation (horizontal or vertical)	-
⑦	Life Hours	Time
⑧	Motion pattern (Duty Cycle Line Diagram) (See Figure 1)	-

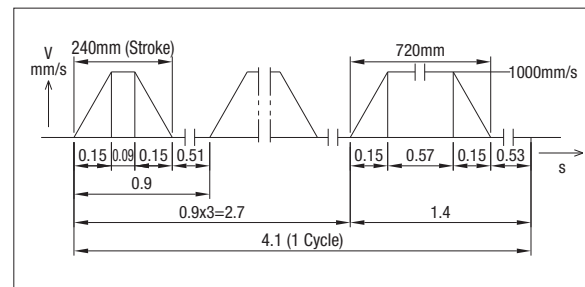


Figure 1 (Ex.) Duty Cycle Line Diagram

Step 2 Interim Selection of Ball Screw

Consider the applicability of the following items to the conditions confirmed in step 1 and provisionally decide the ball screw.

- Selection of Lead Accuracy of Ball Screws**
 - ① Select the ball screw that satisfies the positioning precision. Check the following two points.
Lead Accuracy: For details, see P.2223 on the catalog.
Axial Clearance: For details, see P.2224 on the catalog.
- Selection of Ball Screw Shaft Length**
 - Generally, the shaft length should be ② stroke + shaft end of 50~150 mm + allowance.
The allowance is to prevent detachment, and one end should be (lead x 1.5~2) mm or more.
- Provisional positioning of lead**
 - ③ Travel speeds, and ④ speed of the drive motor should be used to select the lead.
- Temporary selection of the shaft diameter**
 - ⑤ Weight of work and table, and ⑥ mounting position, and provisionally decided lead should be used to select the shaft diameter.

Step 3 Allowable Axial Load Check

The max. axial load to the ball screw must be equal to or less than the allowable axial load value. If a load exceeding the allowable axial loading is applied, it is possible that the ball screw's screw shaft will buckle. (Figure 2)

Allowable Axial Load

The allowable axial load represents an allowed maximum load, including a safety margin, to prevent shaft buckling from occurrence. The finer the shaft diameter or the longer the shaft the easier it is for buckling to occur.

For details, see P.2225 on the catalog.

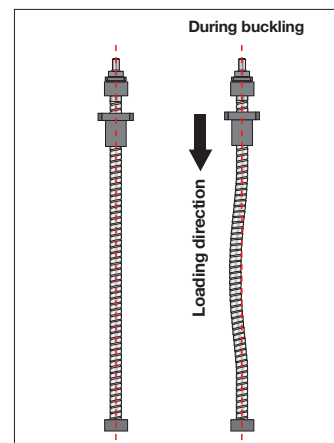
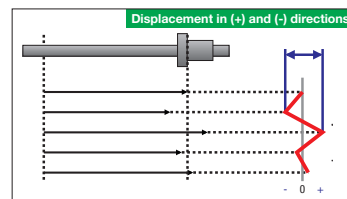


Figure 2 Buckled Ball Screw

<Impact on Positioning Precision of Axial Clearance>

If the ball screw has axial clearance, when positioning operation is performed from the positive direction, because the work does not move even when the screw shaft rotates, a difference occurs in the clearance interval between the theoretical movement amount obtained from the revolution speed of the screw shaft and the actual movement amount.



Step 4 Allowable Rotational Speed Check

The rotational speed of the ball screw must be less than the allowable rotational speed. If it exceeds the allowed rotational speed, the thread and the nut will be affected in the following way.

- Screw Shaft:** When the allowable rotational speed is exceeded, resonance will begin at a unique oscillating frequency and this might disable operation. (Figure 3)
- Nut:** If the orbital speed of the steel balls inside the nut becomes large, it is possible that the circulation components will be damaged by the impact force. (Figure 4)

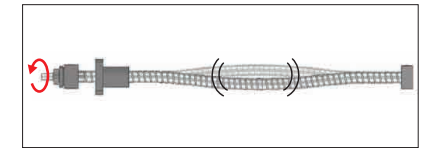


Figure 3 Resonating Ball Screw

Allowable Rotational Speed

Refers to the allowable rotational speed that is 80% or less of the critical speed that matches the rotational speed of a ball screw at which there is a unique oscillation possessed by the screw shaft. The ball screw rotational speed is decided by the necessary travel speed and ball screw lead.

To decide the allowable rotational speed, it is necessary to consider the following two elements.

- Critical speed for the rotating shaft
- Limit rotational speed of the balls circulating inside the nut

For details, see P.2226 on the catalog.

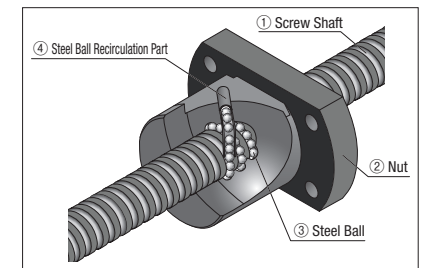


Figure 4 Ball Screw Circulation Structure (Tube Style)

Step 5 Life Check

In order to use the equipment beyond the expected life, life calculations are required.

Operating Hours of Ball Screws

This refers to the total revolutions, time, or distance up until chipping begins to occur due to fatigue causes by some kind of repetitive stress on the ball rolling surface or balls. The lifespan of the ball screw is calculated from the basic dynamic load rating. See Figures 5 and 6 for expired parts that have chips.

When a certain group of the same ball screws are operated with a certain axial load and 90% of the screws achieve 1 million rotations (10⁶) without flaking in its operating life, such axial load is defined as a basic dynamic load rating.

For details, see P.2227 on the catalog.



Figure 5 Thread Inside Nut

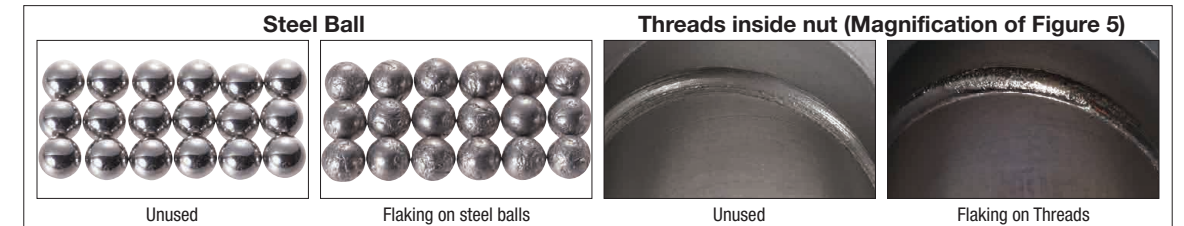


Figure 6 Flaking on Ball Screw Components

When choosing, it is necessary to ensure the temperature impact and rigidity is suitable for the usage environment and selection criteria. For details, see P.2223~2230 of the catalog technical pages and choose a ball screw that is suitable for the purpose of use.

Overview of MISUMI Technical Calculation Software

Ball screw's Life calculations and safety margin check can be performed just by entering some operation conditions. (http://download.misumi.jp/mol/fa_soft.html)

