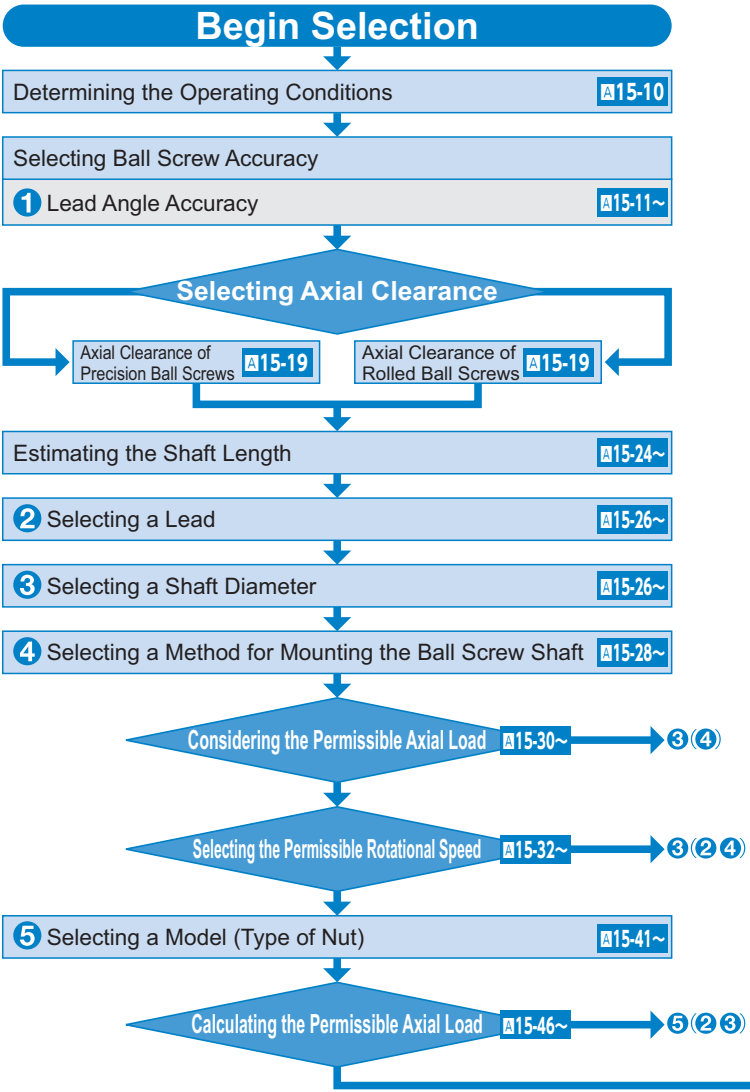
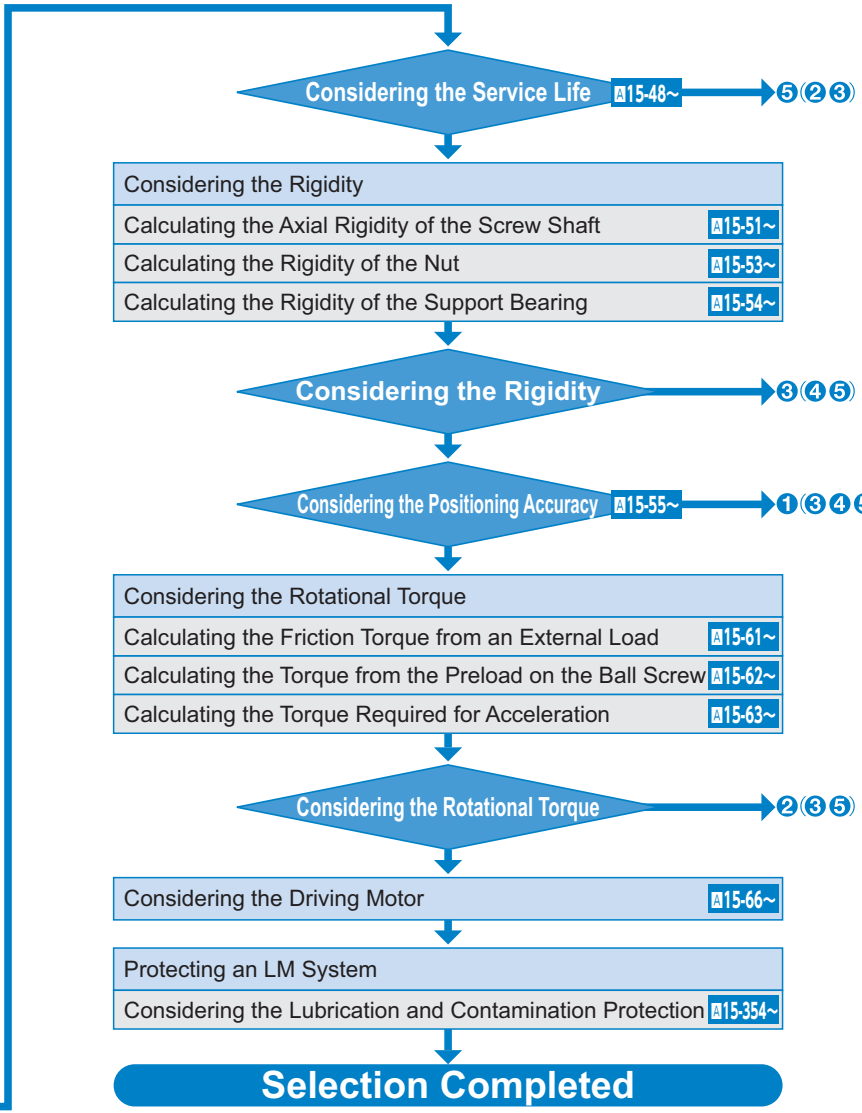
Flowchart for Selecting a Ball Screw

Ball Screw Selection Procedure

When selecting a ball screw, it is necessary to consider various parameters that depend on the operating conditions. The following is a flowchart for selecting a ball screw.




Considering the Service Life A15-48~
⑤②③
Considering the Rigidity
Calculating the Axial Rigidity of the Screw Shaft A15-51~
Calculating the Rigidity of the Nut A15-53~
Calculating the Rigidity of the Support Bearing A15-54~
Considering the Rigidity
③④⑤
Considering the Positioning Accuracy A15-55~
①③④⑤
Considering the Rotational Torque
Calculating the Friction Torque from an External Load A15-61~
Calculating the Torque from the Preload on the Ball Screw A15-62~
Calculating the Torque Required for Acceleration A15-63~
Considering the Rotational Torque
②③⑤
Considering the Driving Motor A15-66~
Protecting an LM System
Considering the Lubrication and Contamination Protection A15-354~
Selection Completed

Operating Conditions of the Ball Screw

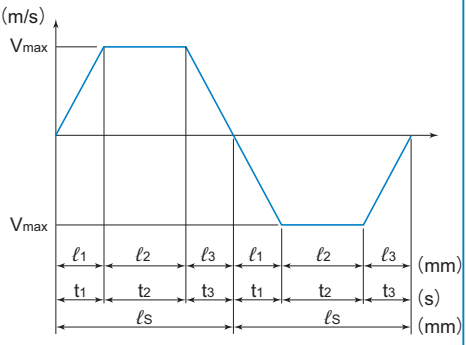
The following operating conditions need to be considered when selecting a ball screw.

Transfer orientation (horizontal, vertical, etc.)
Transferred mass m (kg)
Table guide method (sliding, rolling)
Frictional coefficient of the guide surface μ (—)
Guide surface resistance f (N)
External load in the axial direction F (N)
Desired service life time L_h (h)

Stroke length ℓ_S (mm)
Operating speed V_{max} (m/s)
Acceleration time t_1 (s)
Uniform speed time t_2 (s)
Deceleration time t_3 (s)

Acceleration $\alpha = \dfrac{V_{max}}{t_1}$ (m/s²)

Acceleration distance $\ell_1 = V_{max} \times t_1 \times 1{,}000/2$ (mm)
Uniform speed distance $\ell_2 = V_{max} \times t_2 \times 1{,}000$ (mm)
Deceleration distance $\ell_3 = V_{max} \times t_3 \times 1{,}000/2$ (mm)
Number of reciprocations per minute n (min^{-1})



Velocity Diagram

Positioning accuracy (mm)
Positioning accuracy repeatability (mm)
Backlash (mm)
Minimum feed amount s (mm/pulse)

Driving motor (AC servomotor, stepping motor, etc.)
The rated rotation speed of the motor N_{MO} (min^{-1})
Inertial moment of the motor J_M ($kg \cdot m^2$)
Motor resolution (pulse/rev)
Reduction ratio A (—)