

10.3. Torque Required for Acceleration

$$T_3 = J \times \omega' \times 10^3 \quad \dots\dots\dots (45)$$

where

T_3 : Torque required for acceleration (N-mm)

J : Inertial moment (kg-m²)

ω' : Angular acceleration (rad/sec²)

$$J = m \left(\frac{\ell}{2\pi} \right)^2 \cdot A^2 \cdot 10^{-6} + J_s \cdot A^2 + J_A \cdot A^2 + J_B$$

m : Transferred mass (kg)

ℓ : Ball screw lead (mm)

J_s : Inertial moment of the screw shaft (kg-m²)

(indicated in the dimensional table of the respective model number in the "THK General Catalog - Product Specifications," provided separately)

A : Reduction ratio

J_A : Inertial moment of gears, etc. attached to the screw shaft side (kg-m²)

J_B : Inertial moment of gears, etc. attached to the motor side (kg-m²)

$$\omega' = \frac{2\pi \cdot Nm}{60t}$$

Nm : Motor rotation speed per minute (min⁻¹)

t : Acceleration time (sec)

[Ref.] Inertial moment of a round object

$$J = \frac{m \cdot D^2}{8 \cdot 10^6}$$

J : Inertial moment (kg-m²)

m : Mass of a round object (kg)

D : Screw shaft outer diameter (mm)