1.3. Rated Load and Rated Life

Rated Loads in All Directions

The basic load ratings (C_Z and C_{OZ}) in the dimensional table in the "THK General Catalog - Product Specifications," provided separately, indicate the values per rolling element in the directions shown in Fig. 2. When obtaining the rated life, calculate the basic load ratings (C and C_O) of the actually used rolling elements from the equation below.

●For Cross Roller Guide Model VR

$$C = C_L = \left(\frac{Z}{2}\right)^{\frac{3}{4}} \times C_Z, \quad C_T = 2C$$

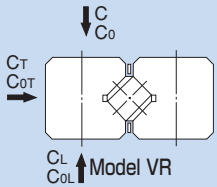
$$C_O = C_{OL} = \frac{Z}{2} \times C_{OZ}, \quad C_{OT} = 2C_O$$

$\left(\text{For } \frac{Z}{2}\text{, truncate the decimals.}\right)$

●For Ball Guide Model VB

$$C = C_L = Z^{\frac{2}{3}} \times C_Z, \quad C_T = 2C$$

$$C_O = C_{OL} = Z \times C_{OZ}, \quad C_{OT} = 2C_O$$



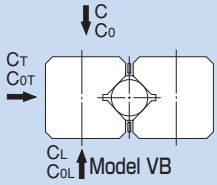


Fig. 2

C : Basic dynamic load rating (kN)
C_O : Basic static load rating (kN)
C_Z : Basic dynamic load rating in the dimensional table in the "THK General Catalog - Product Specifications," provided separately (kN)
C_{OZ} : Basic static load rating in the dimensional table in the "THK General Catalog - Product Specifications," provided separately (kN)
Z : Number of rolling elements used
(Number of rolling elements within the effective load range)

Static Safety Factor f_S

Models VR and VB may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start-up and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{C_O}{P_C}$$

f_S : Static safety factor (table 1)
C_O : Basic static load rating (kN)
P_C : Calculated load (kN)

Table 1 Reference Values of Static Safety Factors (f_S)

Machine using the LM system	Service conditions	Lower limit of f_S
General industrial machinery	Without vibrations or impact	1 to 1.3
	With vibrations or impact	2 to 3

Rated Life

When the basic dynamic load ratings have been obtained, the rated lives of Cross Roller Guide model VR and Ball Guide model VB are obtained using the following equations.

●For Model VR

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P_C} \right)^{\frac{10}{3}} \times 100$$

●For Model VB

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P_C} \right)^{3} \times 50$$

L : Rated life (km)
(The total number of revolutions that 90% of a group of identical VR (VB) units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (kN)
P_C : Calculated load (kN)
f_T : Temperature factor (see Fig 3 on page F-8)
f_W : Load factor (see table 2 on page F-8)

Calculating the Service Life Time

When the rated life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_s \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

f_T : Temperature factor

If the temperature of the atmosphere surrounding the operating model VR or VB exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig. 3.

Note: If the ambient temperature exceeds 100℃, contact THK.

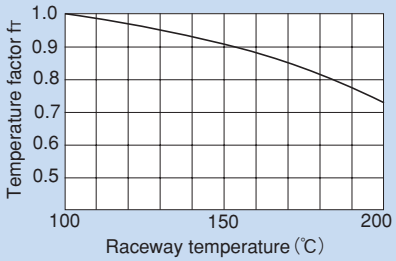


Fig. 3 Temperature Factor (f_T)

f_W : Load factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start-up and stop. Therefore, when the actual load applied on model VR or VB cannot be obtained, or when speed and vibrations have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in table 2 of empirically obtained data.

Table 2 Load Factor (f_W)

Vibrations/impact	Speed (V)	f_W
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5