Static Safety Factor f_s

The Flat Roller 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.

$$f_s = \frac{f_c \cdot C_0}{P_c}$$

where

f_s : Static safety factor
f_c : Contact factor (see "Rated Load" and "Rated Life" on page J-7)
C_0 : Basic static load rating (kN)
P_c : Calculated radial load (kN)

■Reference value of static safety factor

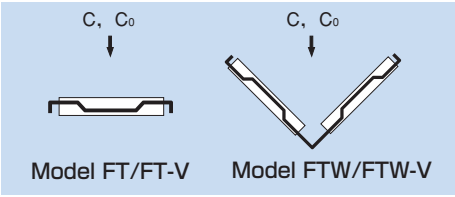
The static safety factors indicated in table 1 are the lower limits of reference values in the respective service conditions.

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
Machine tools	Without vibrations or impact	1 to 1.5
	With vibrations or impact	2.5 to 7

Rated Load

The rated loads shown in the dimensional tables in the "THK General Catalog - Product Specifications," provided separately, represent the rated loads with a unit length (ℓ) in the directions indicated in the figure below.



If the length of the Flat Roller in the effective load range differs from the unit length (ℓ), approximate rated loads (C_ℓ and $C_{0\ell}$) can be obtained using the following equation.

$$C_\ell = \left(\frac{\ell_0}{\ell}\right)^{\frac{3}{4}} \times C$$

$$C_{0\ell} = \frac{\ell_0}{\ell} \cdot C_0$$

where

C_ℓ : Basic dynamic load rating in the effective load range (kN)
ℓ_0 : Length in effective load range (mm)
ℓ : Unit length (length indicated in dimensional table in the "THK General Catalog - Product Specifications," provided separately) (mm)
$C_{0\ell}$: Basic static load rating in the effective load range (kN)
C : Basic dynamic load rating (kN)
C_0 : Basic static load rating (kN)

Note that if the hardness of the raceway is lower than 58 HRC, the rated loads will be decreased (see Fig. 3 on page J-8).

Rated Life

When the basic dynamic load rating (C_ℓ) of the Flat Roller in the effective load range has been obtained from the equation above, the rated life is obtained using the following equation.

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

where

L : Rated life (km)
(The total number of revolutions that 90% of a group of identical Flat Roller units independently operating under the same conditions can achieve without showing flaking)
C_ℓ : Basic dynamic load rating (kN)
P_C : Calculated radial load (kN)
f_H : Hardness factor (see Fig. 3 on page J-8)
f_T : Temperature factor (see Fig. 2 on page J-8)
f_W : Load factor (see table 2 on page J-8)
f_C : Contact factor *

* Note: Contact factor is determined according to the contact state of the two planes between which the rollers travel. If the contact ratio between the two planes is 50%, set the contact factor as $f_C = 0.5$ for safety's sake.

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.

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

where

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 Linear Bush 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. 2.

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

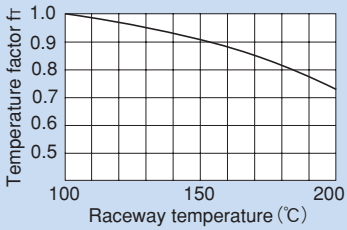


Fig. 2 Temperature factor (f_T)

■f_H : Hardness factor

To maximize the load capacity of the LM system, the hardness of the raceways needs to be between 58 to 64 HRC. If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

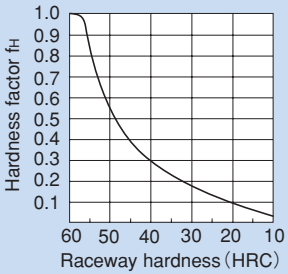


Fig. 3 Hardness factor (f_H)

■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 cannot be obtained, or when speed and impact 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
Medium	Medium 1<V≦2m/s	1.5 to 2
Strong	High V>2m/s	2 to 3.5