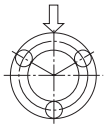
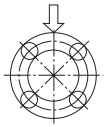
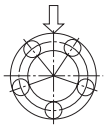
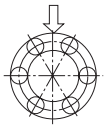
1.3. Rated Load and Rated Life

Rated Load

The rated load of the Linear Bush varies according to the position of balls in relation to the load direction. The basic load ratings indicated in the dimensional tables of the "THK General Catalog - Product Specifications," provided separately, each indicate the value when one row of balls receiving a load are directly under the load.
If the Linear Bush is mounted so that two rows of balls evenly receive the load in the load direction, the rated load changes as shown in table 1.

Table 1

Number of rows of balls	Ball position	Rated load
3 rows		1×C
4 rows		1.41×C
5 rows		1.46×C
6 rows		1.28×C

Note: For specific values for "C" above, see the respective dimensional table in the "THK General Catalog - Product Specifications," provided separately.

Calculating the Rated Life

The rated life of the Linear Bush is obtained using the following equation.

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

L	: Rated life	(km)
C	: Basic dynamic load rating	(N)
P_C	: Calculated load	(N)
f_T	: Temperature factor	(see Fig. 3)
f_C	: Contact factor	(see table 2 on page C-12)
f_W	: Load factor	(see table 3 on page C-12)
f_H	: Hardness factor	(see Fig. 2)

●When a Moment Load is Applied to a Single Nut or Two Nuts in Close Contact with Each Other

When a moment load is applied to a single nut or two nuts in close contact with each other, calculate the equivalent radial load at the time the moment is applied.

$$P_u = K \cdot M$$

P_u : Equivalent radial load (as moment applied) (N)

K : Equivalent factor (see tables 4 to 6 on page C-13)

M : Applied moment (N·mm)

However, "P_u" is assumed to be within the basic static load rating (C_0).

●When a Moment and a Radial Load are Applied Simultaneously

When a moment and a radial load are applied simultaneously, calculated the service life based on the sum of the radial load and the equivalent radial load.

■f_H : Hardness factor

To maximize the load capacity of the Linear Bush, 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).

Normally, f_H=1.0 since the Linear Bush has sufficient hardness.

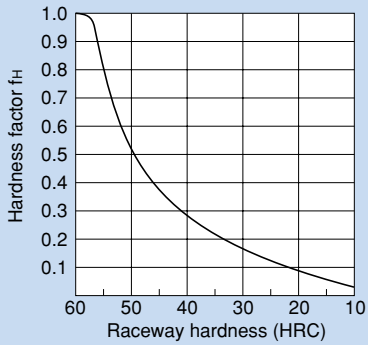


Fig. 2 Hardness factor (f_H)

■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 the figure on the right.

Also note that the Linear Bush itself must be of high-temperature type.

Note: If the ambient temperature exceeds 80℃, use a Linear Bush type equipped with metal retainer plates.

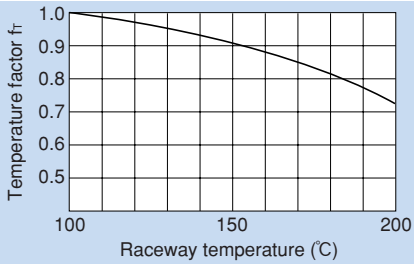


Fig. 3 Temperature factor (f_T)

■f_C : Contact factor

When multiple nuts are used in close contact with each other, their linear motion is affected by moments and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in the table on the right.

Note: If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in the table on the right.

Table 2 Contact Factor (f_C)

Number of nuts in close contact with each other	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
Normal use	1

■f_W : Load factor

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

Table 3 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

Calculating the Service Life Time

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

$$L_h = \frac{L \times 10^3}{2 \times \ell_s \times n_1 \times 60}$$

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