

Axial mean effective load F_m

$$F_m = \sqrt[3]{\frac{1}{L} (Fe_1^3 \cdot L_1 + Fe_2^3 \cdot L_2 + Fe_3^3 \cdot L_3)}$$

$$= \sqrt[3]{\frac{1}{600} (196^3 \cdot 350 + 216^3 \cdot 125 + 176^3 \cdot 125)}$$

$$= 197 \text{ N}$$

$$L = \ell \times \left(\frac{C_a}{f_w \cdot F_m} \right)^3 \times 10^6$$

$$= 10 \times \left(\frac{7060}{1.2 \cdot 197} \right)^3 \times 10^6$$

$$= 2.66 \times 10^5 \text{ km}$$

3-2-2. Static safety factor; Divide the basic static load rating by the maximum axial load.

$$F_s = \frac{C_{0a}}{F_e} = \frac{C_{0a}}{F_{e2}} = \frac{12700}{216} = 58.7$$

C-1-5 Maintenance

C-1-5.1 Maintenance Method

- For standard Monocarrier, we pack grease in the slider, linear guides and ball screw.
- Monocarriers are equipped with NSK K1 Lubrication Unit as a standard feature, therefore, you may use it for 5 years or 10 000 km depending on your application, whichever comes first, without maintenance. However replenishment of preceded grease may extend its life substantially.
- The NSK K1 Lubrication Unit is ideal in environments where oily dust exists. However, the life may be shorter than described in Clause 2 above. In such a case, it requires increasing the frequency of replenishment.

3-3. Support unit

3-3-1. Fatigue life; Use the axial load $F_m = 197 \text{ N}$, that is the result of above calculation 3-2-1.

$$L = \ell \times \left(\frac{C_a}{f_w \cdot F_m} \right)^3 \times 10^6 = 10 \times \left(\frac{7100}{1.2 \cdot 197} \right)^3 \times 10^6$$

$$= 2.70 \times 10^5 \text{ km}$$

3-3-2. Static safety factor; Divide the limit load by the maximum axial load.

$$F_s = \frac{C_{0a}}{F_e} = \frac{C_{0a}}{F_{e2}} = \frac{3040}{216} = 14.0$$

3-4. Result

MCM08068H10D00	Linear guide	Ball screw	Support unit
Fatigue life	3.11 × 10 ⁶ km	2.66 × 10 ⁶ km	2.70 × 10 ⁶ km
Static safety factor	69.3	58.7	14.0

4. A Nozzle for the NSK grease gun for MCH Monocarriers is available as an option. NSK reference number: NSK HGP NZ8

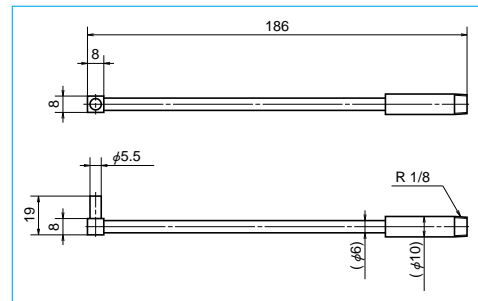


Fig. 5.1 NSK HGP NZ8

Precautions for handling

- Please consult with NSK when the motor is coupled to the ball screw using a pulley because there is a restriction on allowable load to the end of ball screw shaft.
- To extend high performance of NSK K1 lubrication unit, please observe the following.

- Temperature range Ambient temperature: 50°C
Max. instantaneous temperature: 80°C
- Use of chemicals Never leave a Monocarrier in close proximity of grease removing organic solvents such as hexane or thinner. Never immerse it in an antirust solvent that contains kerosene.

Note: Other oils, such as water-based and oil based cutting oil, and grease do not cause any problems.

C-1-5. 2 NSK K1™ Lubricant Unit

NSK K1 lubrication unit exhibits outstanding features, confirmed by abundant experimental data, along with proven performance of linear guides and ball screws that are equipped with NSK K1.

(1) High-Speed Durability Test of Linear Guides without Lubricant

Results of high-speed durability testing of a linear guide without lubricant are shown in Fig. 5.2. While the linear guide cannot be operated without lubricant for even short periods without damage, the installation of the NSK K1 permits the linear guide to run over 25 000 km without any problem.

Conditions	Test piece: LH30AN (Preload Z1)
	Speed: 3.3 m/s
	Stroke: 1800 mm
No lubricant	All grease removed
NSK K1	All grease removed + NSK K1

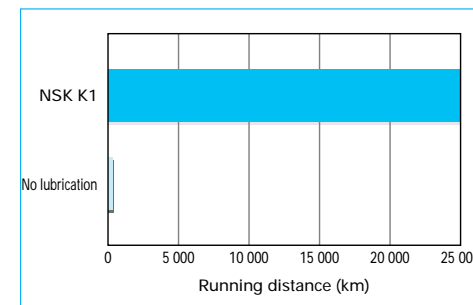


Fig. 5.2 Results of high-speed durability test of linear guides without lubricant

(2) High-Speed Durability Test of Ball Screws without Lubricant

Results of high-speed durability testing of ball screw without lubrication are shown in Fig.5.3. While the ball screw cannot be operated without a lubricant at 8.5 km without damage, the installation of the NSK K1 permits the ball screw to run over 21 000 km without any problem.

Conditions	Test piece: BS2020 (ball screw)
	Shaft diameter: 20 mm
	Lead: 20 mm
	Load: none
	Speed: 1.3 m/s (4 000 min ⁻¹)
No lubricant	All grease removed
	NSK K1

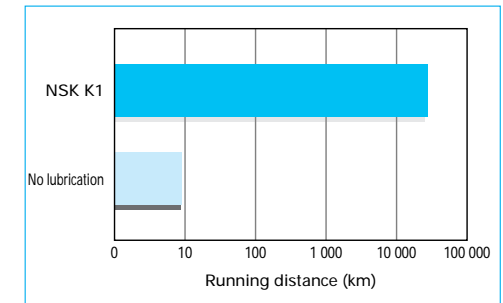


Fig. 5.3 Results of high-speed durability test of ball screws without lubricant

●NSK K1 Lubrication Units for food processing and medical devices are available.

For safety equipment of food processing and medical care, NSK provides the Monocarrier equipped with special NSK K1 Lubrication Unit that is made of materials approved by the FDA. Dimensions are the same as the standard NSK K1 Lubrication Unit, and special handling care is not required.