1. Stainless steel

NSK linear guide is available in stainless steel.

› Stainless steel standard series

PU Series **PE Series**

LE Series **Miniature LH Series** **LL Series**

› Available in stainless steel

NH Series

NS Series

LU Series

Select from the above when using in the environments which invite rust.

2. Surface treatment

(1) Recommended surface treatment

We recommend "low temperature chrome plating" and "fluoride low temperature chrome plating" for rust prevention because of the result of the humidity chamber test for antirust characteristics and their cost-effectiveness.

However, never apply any organic solvent to those treatments for degreasing because it has adverse effect on antirust characteristics.

Refer to the next page for the results of humidity chamber test.

Please consult NSK for other surface treatment.

Low temperature chrome plating (Electrolytic rust prevention black treatment)

› Used to prevent corrosion, light reflection, and for cosmetic purpose.

Fluoride low temperature chrome plating

› Fluoroplastic coating is provided following the low temperature chrome plating.

› Resistance to corrosion is higher than electrolytic rust prevention film treatment.

(2) Rust prevention of fluoride low temperature chrome plating

The use environment of NSK linear guides is expanding from general industrial machines, semiconductor and liquid crystal manufacturing systems to aerospace equipment.

Among all measures to cope with environment, rust prevention is the most challenging. Such environment includes:

› Moisture for washing machines and other equipment

› Chemicals used in the wet processing of semiconductor and liquid crystal display manufacturing equipment

NSK has developed electrolytic rust prevention black film treatment (black chrome plating) which is added by fluororesin impregnating treatment. (Hereinafter referred as "Fluoride low temperature chrome plating") This surface treatment methods has proved its superiority as the rust prevention of linear guides which are used in the above equipment.

› What is "Fluoride low temperature chrome plating?"

This is a type of black chrome plating which forms a black film (1 to 2 µm in thickness) on the metal surface. Fluoroplastic coating is added to the film to increase corrosion resistance.

› Accuracy control is easily manageable due to low temperature treatment and to the absence of hydrogen embrittlement.

› Product accuracy is less affected due to the thin film which has high-corrosion resistance.

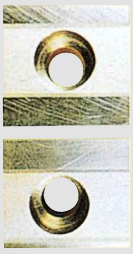
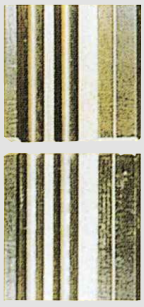
› This method is superior to other surface treatments in durability on the rolling surface.

› Inexpensive compared with products with other surface treatment and stainless steel products.

However, do not use organic solvent because it adversely affects antirust property of the plating.

› Humidity chamber test

Table 8.1 Results of the humidity test

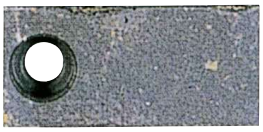
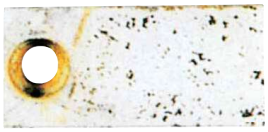
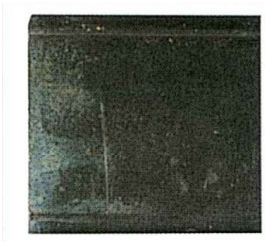
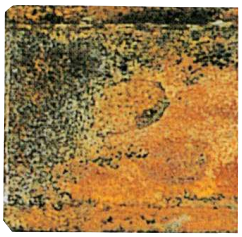
Characteristic / Test sample		Fluoride low temperature chrome plating (Recommended)	Hard chrome plating (Reference)	Electroless nickel plating (Reference)	Equivalent to SUS440C material	Standard steel
Corrosion-resistant property — Rusting	Top	(Ground) B	(Ground) B	(Ground) A	(Ground) C	(Ground) D
	Side	(Ground) A	(Ground) A	(Ground) A	(Ground) C	(Ground) E
	Bottom	(Ground) A	(Ground) A	(Ground) A	(Ground) C	(Ground) E
	End	(Machined) A	(Machined) C	(Machined) A	(Machined) C	(Machined) E
	Chamfer/grinding recess	(Drawn) A	(Drawn) D	(Drawn) A	(Drawn) C	(Drawn) E
	<Test conditions> › Testing chamber: High temperature, highly moist chamber (made by DABAI ESPEC) › Temperature: 70°C › Relative humidity: 95% › Testing time: 96 h Time to "ramp-up" and "ramp-down" conditions of the temperature and the humidity Ramp-up: 5 h Ramp-down: 2 h	 	 	 	 	 
	Film thickness	5 µm	0.5 – 7 µm	10 µm	—	—

Rusting
A: No rust
B: Not rusted, but slightly discolored
C: Spotty rust
D: Slightly rusted
E: Completely rusted

› Chemical corrosion resistance test

Table 8.2 Results of the corrosion resistance test

Test conditions: Rail base material: Equivalent to SUS440C
Chemical density: 1 mol/ℓ

Fluoride low temperature chrome plating		Hard chrome plating (reference)	None surface treatment
	Immersed in solution for 24 hrs Nitric acid		
	Immersed in solution for 24 hrs Fluoride		
	Immersed in solution for 72 hrs Hydrochloric acid type washing solution $HC\ell : H_2O_2 : H_2O$ = 1 : 1 : 8		
○	Hydrochloric acid (immersed)	○	▲
○	Sulfuric acid (immersed)	○	×
○	Ammonia or sodium hydroxide	○	△

○: Normal △: Partial surface damage ▲: Overall surface damage ×: Corroded

› Surface treatment durability test

Peeling resistance of surface treatment

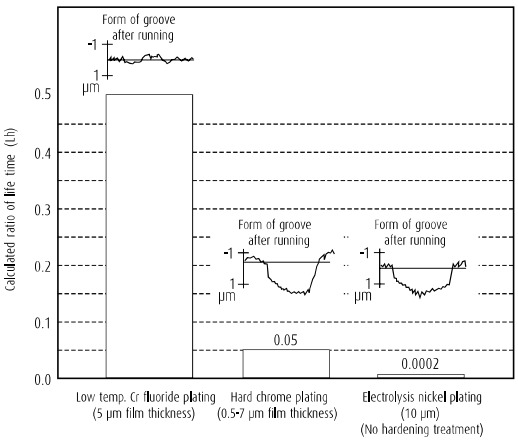


Fig. 8.1 Result of durability test

› Total evaluation

Table 8.3 Evaluation

	Rust prevention ability	Quality stability	Durability	Cost
Fluoride low temperature chrome plating (recommended)	◎	○	◎	◎
Hard chrome plating (reference)	○	×	△	△
Electroless nickel plating (reference)	◎	△	×	△
Material equivalent to SUS440C	○	◎	◎	△

◎: Excellent ○: Suitable in use △: Not so good for use ×: Problem in use