Linear Ball Slide

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Linear Ball Slide

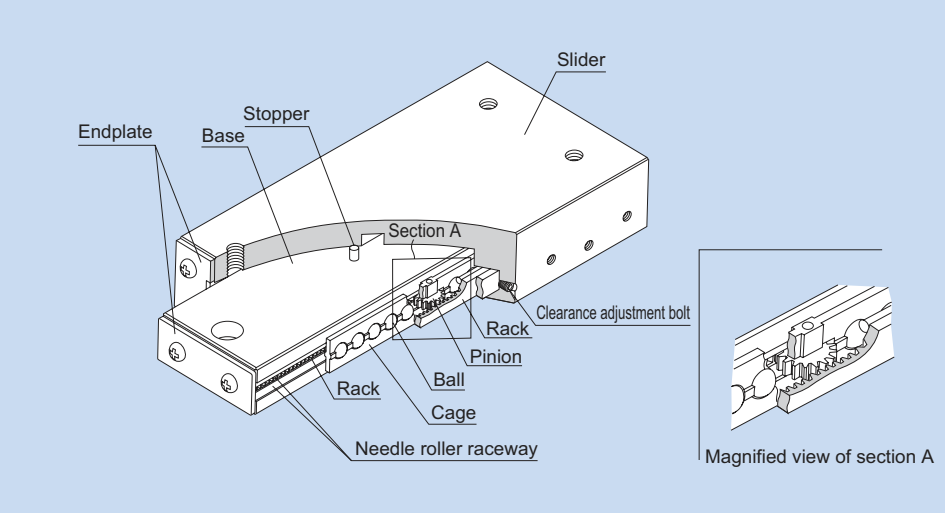


Fig.1 Structure of Linear Ball Slide Model LSP

Structure and Features

The Linear Ball Slide is a highly corrosion resistant slide unit that has an extremely low friction coefficient because stainless steel balls roll on four stainless steel needle roller raceways that are hardened and ground.
In addition, model LSP has a pinion gear in the center and a rack on the base to prevent the cage from slipping.
A ball slide equipped with a cylinder model LSC has a cylinder for drive in the base to downsize the system and reduce the space and the weight.
Its components are all made of stainless steel, which is highly corrosion resistant. Furthermore, since its inertia is small, the slide system is highly responsive to high speed. By simply securing the Linear Ball Slide on the mounting surface, the user can easily achieve a linear guide mechanism. Thus, this slide system is optimal for locations requiring high accuracy, such as optic measuring machines, automatic recorders, small electronic-parts assembling machines, OA equipment and its peripherals.

[A Unit Type That Allows Easy Installation]
The clearance and motion of the slider is adjusted to the best state. Therefore, a highly accurate slide mechanism can be gained by simply mounting the unit on the flat-finished mounting surface.

[Lightweight and Compact]
A light aluminum alloy is used in the base and the slider to reduce the weight.

[Smooth Motion]
The balls and the raceway (needle roller raceway) are in point contact, which causes the smallest rolling loss, and the balls are evenly retained in the ball cage. This allows the slide system to perform rolling motion at a minimal coefficient of friction (μ = 0.0006 to 0.0012).

[Highly Corrosion Resistant]
The base and the slider are made of an aluminum alloy and their surfaces are treated with alumite (anodization processing), which is highly resistant to corrosion and wear.
The balls, needle roller raceways and screws are made of stainless steel, making the system highly corrosion resistant.

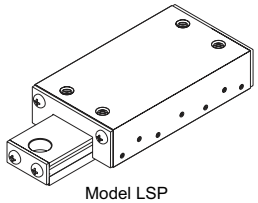
Types of the Linear Ball Slide

Types and Features

Linear Ball Slide with a Rack Model LSP

Specification Table⇒B-514

With model LSP, the cage has a rack and pinion mechanism, thus to prevent the cage from slipping.
Also, since the cage does not slip even in vertical mount, this model is used in an even broader range of applications.
Note) Do not use the stopper as a mechanical stopper.

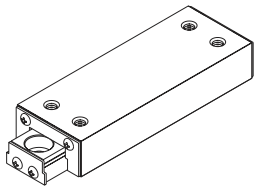


Model LSP

Linear Ball Slide Model LS

Specification Table⇒B-516

Model LS is a unit-type linear system for finite motion that has a structure where balls are arranged between the base and the slider via a needle roller raceway.
It is incorporated with a stopper mechanism, thus to prevent damage deformation caused by collision between the cage and the endplate.
Note) Do not use the stopper as a mechanical stopper.

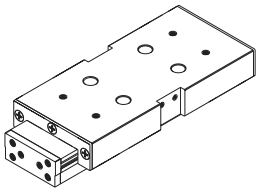


Model LS

Linear Ball Slide with a Cylinder Model LSC

Specification Table⇒B-518

Model LSC contains an air cylinder for drive inside the base. Feeding air from the two ports on the side face of the base allows the slide to perform reciprocating motion. Since the cylinder is of double-acting type, horizontal traveling speed can be adjusted using the speed controller. The cylinder and the piston are made of a corrosion resistant aluminum alloy, and their surfaces are specially treated to increase wear resistance and durability. Additionally, the cage has a rack and pinion mechanism, thus enabling the cage to operate without slipping.
Air-feeding ports for piping are provided on one side face, ensuring a certain degree of operability and easy assembly even if the installation site has a limited space and is complex.
The table on the right shows the specifications of the air cylinder incorporated in model LSC.
Note) Do not use the stopper as a mechanical stopper.



Model LSC

<Cylinder specifications>

Type of action	Double-acting
Fluid used	air (no lubrication)
Working pressure	100 kPa to 700 kPa (1 kgf/cm^2 to 7 kgf/cm^2)
Stroke velocity	50 to 300mm/s

[Speed Controller]

Fig.2 shows the shape of the speed controller.

Note) The speed controller is optional.
(control method: meter out)

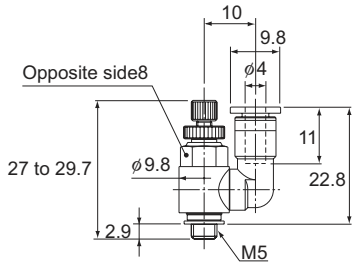


Fig.2 Shape of the Speed Controller (common to all model numbers)

[Dedicated Unit Base Model B]

With Linear Ball Slide model LSC, a limit switch for detecting the stroke end can be mounted using a dedicated unit base (Fig.3). When fine positioning is required, a dedicated stopper can be mounted on the unit base to adjust the position. (excluding model LSC1015)

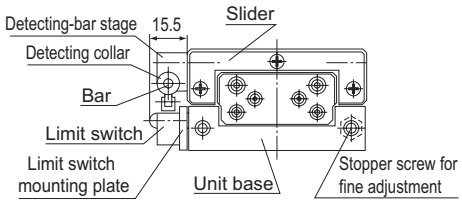
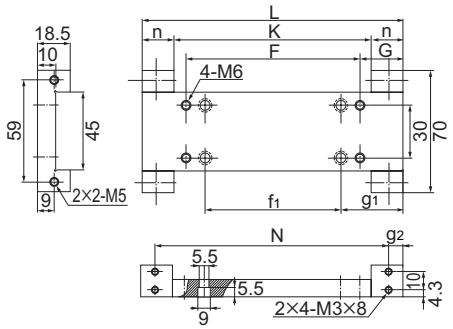
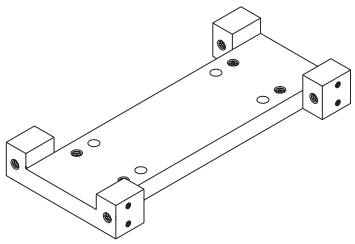


Fig.3 Unit Base and Limit Switch Installation





Unit: mm

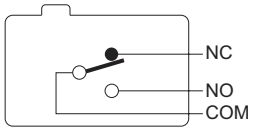
Unit base Model B	Unit base dimensions									Mass
	Length L	F	G	f_1	g_1	K	n	N	g_2	kg
LSC1515	80	40	21	23	29.5	56	12	68	6	0.12
LSC1530	110	60	25	40	35	74	18	94	8	0.16
LSC1550	150	100	25	78	36	114	18	134	8	0.21

[Limit Switch]

The specifications of the limit switch are as follows.

<Limit switch specifications>

Type	D2VW-5L2A-1 (Omron)
Contact type	contact (1C contact)



<Rated Specifications>

Type	Rated voltage (V)		Non-inductive load (A)				Inductive load (A)	
			Resistance load		Ramp load		Inductive load	
			Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open
D2VW-5	AC	125	5		0.5		4	
		250	5		0.5		4	
	DC	30	5		3		4	
		125	0.4		0.1		0.4	

Note1) The above figures indicate the constant current.
Note2) Inductive load refers to power factor of 0.7 or greater (alternate current) and time constant of 7 ms or less (direct current).
Note3) Ramp load implies a rush current 10 times greater.
Note4) The above rated values apply when a test is conducted with the following conditions in accordance with JIS C 4505.
(1) Ambient temperature: 20°C± 2°C
(2) Ambient humidity: 65% ± 5% RH
(3) Operating frequency: 30 times/min

Note) For applications under a minute load (5 to 24 VDC), a minute-load type is available. Contact THK for details.

Rated Load and Nominal Life

[Rated Loads in All Directions]

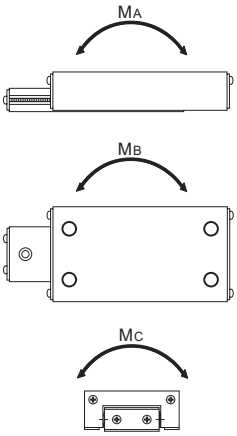
The rated loads of models LS, LSP and LSC are identical in the vertical and horizontal directions.

[Static Safety Factor f_s]

Linear Ball Slide models LS, LSP or LSC 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 and stop. It is necessary to consider a static safety factor against such a working load.

$$f_s = \frac{C_0}{P_c} \quad \text{or} \quad f_s = \frac{M_0}{M}$$

f_s	: Static safety factor	
C_0	: Basic static load rating	(N)
M_0	: Static permissible moment (M_A, M_B and M_C)	(N-m)
P_C	: Calculated load	(N)
M	: Calculated moment	(N-m)



● **Reference Value of Static Safety Factor**

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Value of Static Safety Factors (f_s)

Machine using the LM system	Load conditions	Lower limit of f_s
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 7

[Nominal Life]

The service life of the Linear Ball Slide is obtained using the following equation.

$$L = \left(\frac{1}{f_w} \cdot \frac{C}{P_c}\right)^3 \times 50$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical Linear Ball Slide units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (N)
P_c : Calculated load (N)
f_w : Load factor (see Table2)

[Calculating the Service Life Time]

When the nominal 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_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 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 Table2 of empirically obtained data.

Table2 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

Accuracy Standards

The accuracies of Linear Ball Slide models LS, LSP and LSC are defined as follows.

Running parallelism of the top face of the slide
: 0.010mm MAX/10mm
Positioning repeatability of the top face of the slide
: 0.0015mm MAX

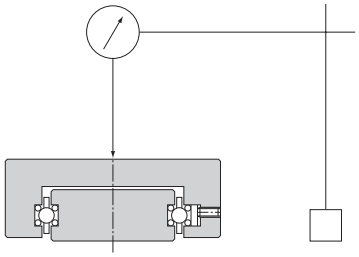


Fig.1 Accuracy Standards

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Dropping or hitting the Linear Ball Slide may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Apply lubricant before using the product.
(2) Do not mix lubricants of different physical properties.
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(4) When planning to use a special lubricant, contact THK before using it.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) If foreign material such as dust of cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene.
(3) Contact THK if you desire to use the product at a temperature of 80℃ or higher.
(4) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
(5) The Linear Ball Slide is incorporated with a stopper mechanism that prevents the slider from coming off. If impact is given, the stopper may be damaged. Do not use this stopper as a mechanical stopper.

[Storage]

When storing the Linear Ball Slide, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.