



Precision Linear Pack

THK General Catalog

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* Please see the separate "B Product Specifications".

Features of the Precision Linear Pack

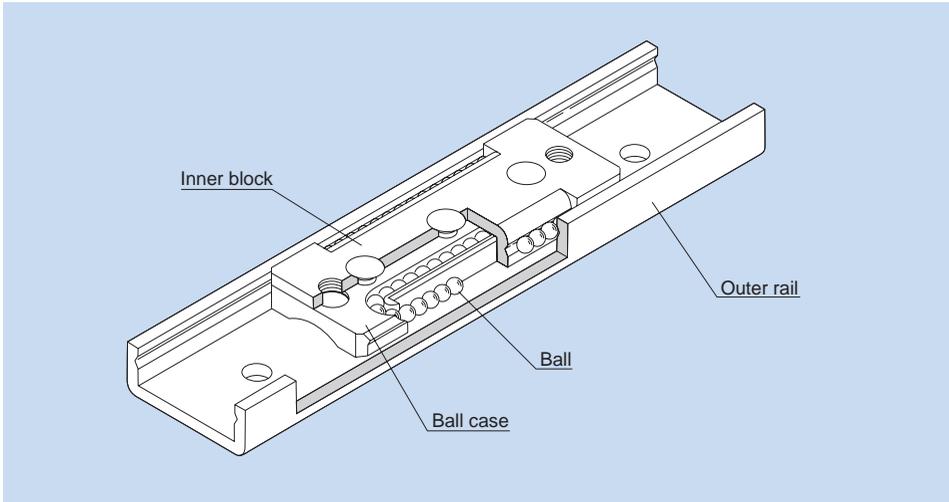


Fig.1 Structure of Precision Linear Pack Model ER

Structure and Features

Model ER is a slide unit using a stainless steel plate that is precision formed, heat-treated and then ground. It has a structure where balls roll between the V-shaped grooves machined on the outer rail and the inner block to allow the system to slide. It is an ultra-thin, lightweight unit in which the balls circulate in a ball case incorporated in the inner block to perform infinite straight motion.

This model is used in extensive applications such as magnetic disc devices, electronic equipment, semiconductor manufacturing equipment, medical equipment, measuring equipment, plotting machines and photocopiers.

[Reduced Design and Assembly Costs]

It provides a highly accurate linear guide system with lower design cost and fewer assembly man-hours than the conventional miniature ball bearings used in precision machines and other equipment.

[Maintains Long-term Stability]

It is a ball-circulating type slide unit with an extremely small friction coefficient. This slide unit maintains stable performance over a long period of time.

[Lightweight, Compact Design and High-speed Response]

The outer rail and the inner block are composed of very thin stainless steel plates.

Since the linear pack is light, it has a small inertial moment and demonstrates superb high-speed response.

Rated Load and Nominal Life

[Rated Loads in All Directions]

The basic load rating in the specification table indicates the rated load in the radial direction as shown in Fig.2. The rated loads in the reverse radial and lateral directions are obtained from Table1 below.

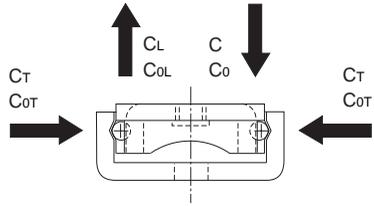


Fig.2 Rated Loads in All Directions

Table1 Rated Loads in All Directions

	Basic dynamic load rating	Basic static load rating
Radial direction	C (indicated in the specification table)	C ₀ (indicated in the specification table)
Reverse radial direction	C _L =C	C _{oL} =C ₀
Lateral directions	C _T =1.47C	C _{oT} =1.73C ₀

[Static Safety Factor f_s]

Model ER 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.

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

f_s : Static safety factor (see Table2)

f_c : Contact factor
(see Table3 on A-568)

C₀ : Basic static load rating (N)

P_c : Calculated load (N)

● Reference Value of Static Safety Factor

The static safety factors indicated in Table2 are the lower limits of reference values in the respective conditions.

Table2 Reference Value of Static Safety Factors (f_s)

Machine using the LM system	Condition	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 nominal life of model ER is obtained using the following equation.

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

- L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical ER units independently operating under the same conditions can achieve without showing flaking)
- C : Basic dynamic load rating (N)
- P_c : Calculated load (N)
- f_c : Contact factor (see Table3)
- f_w : Load factor (see Table4 on A-569)

[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.

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

- L_h : Service life time (h)
- l_s : Stroke length (mm)
- n₁ : Number of reciprocations per minute (min⁻¹)

● f_c: Contact Factor

When multiple inner blocks are used in close contact with each other, their linear motion is affected by a moment load and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C₀) by the corresponding contact factor in Table3.

Table3 Contact Factor (f_c)

Number of inner blocks in close contact with each other	Contact factor f _c
2	0.81
3	0.72
Normal use 1	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 ER cannot be obtained, or when speed and vibrations have a significant influence, divide the basic dynamic load rating (C) by the corresponding load factor in Table4 of empirically obtained data.

Table4 Load Factor (f_w)

Vibrations/impact	Speed(V)	f_w
Faint	Very low $V \leq 0.25\text{m/s}$	1 to 1.2
Weak	Slow $0.25 < V \leq 1\text{m/s}$	1.2 to 1.5

Accuracy Standards

The running straightness of model ER is indicated in Table5. (See Fig.3.)

Table5 Running Straightness Unit: mm

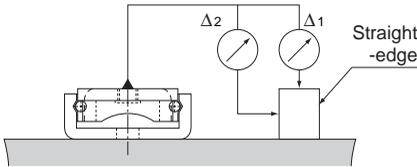


Fig.3 Method for Measuring Running Straightness

Stroke length		Running straightness of inner block in vertical directions $\Delta 1$	Running straightness of inner block in horizontal directions $\Delta 2$
Above	Or less		
—	20	0.002	0.004
20	40	0.003	0.006
40	60	0.004	0.008
60	80	0.005	0.010
80	100	0.006	0.012
100	120	0.008	0.016

Radial Clearance

The radial clearance of model ER means the value for the motion of the central part of the inner block when the inner block is slightly moved with a vertically constant force in the middle of the outer rail in the longitudinal direction. The negative values in table 6 indicate that the respective models are provided with a pre-load when assembled and have no clearance between their inner blocks and the outer rails.

Table6 Radial Clearance Unit: μm

Model No.	Radial clearance	
	Normal	C1
ER 513	± 2	-2 to 0
ER 616	± 2	-3 to 0
ER 920	± 2	-4 to 0
ER 1025	± 3	-6 to 0

Note) When desiring normal clearance, add no symbol; when desiring C1 clearance, indicate "C1" in the model number.
(see "Model number coding" on B-476)

[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 Precision Linear Pack may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.
- (3) Removing the inner block of the Precision Linear Pack from the outer rail or letting it overshoot will cause balls to fall off.

[Lubrication]

- (1) Thoroughly remove anti-rust oil with a cleaning detergent and apply lubricant before using the product. As the most suitable grease, we recommend THK AFC Grease, which maintains lubricity over a long period of time. For lubrication in a clean room, low dust generation THK AFE-CA Grease and THK AFF Grease are recommended.
- (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.

[Installation]

The mounting surface of Precision Linear Pack model ER must be finished to the maximum accuracy.

For securing the outer rail of models ER513 and ER613, also purchase and use No. 0 screws for precision equipment (see Table1). (If using ordinary screws, the inner block may hit the screw head.)

Table1 Outer Rail Fixing Screws for Models ER513 and ER616

Model No.	Type	Nominal name of screw × pitch
ER 513	No. 0 pan-head screw (class 1)	M2×0.4
ER 616		M2.6×0.45

Japan Camera Industry Association Standard JCIS 10-70
Cross-recessed screw for precision equipment (No. 0 screw)

[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 or 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°C 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.

[Storage]

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