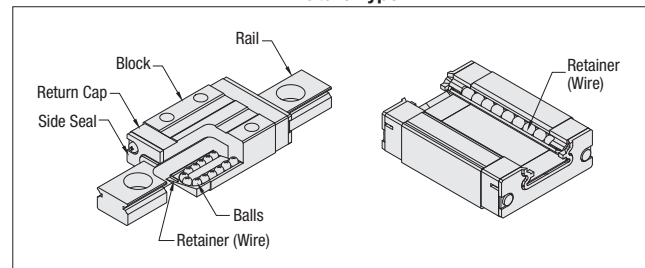


Linear Guide Structure and Features

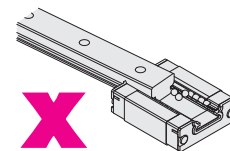
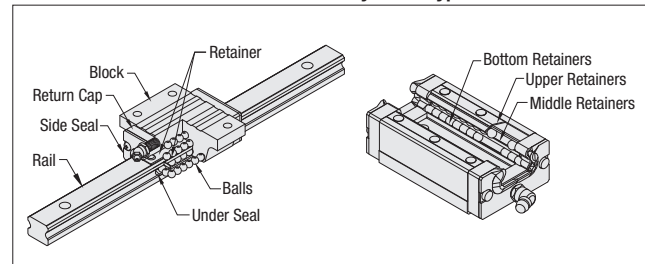
Miniature Type



-Linear guides utilize steel balls rolling on precisely ground raceways, and the balls are recirculated by plastic return caps.
 - End seals prevent foreign objects from intruding into the blocks.
 -Miniature Type has two rows of contacting steel balls in a 4-point raceway contact design.
 -Medium and Heavy Load Types have four rows of contacting steel balls in a 2-point raceway contact design.
 -Load ratings are the same for all four directions (radial, reverse-radial, and lateral directions). Can be used in any orientation.
 -Cautions

Balls do not fall out of MISUMI linear guides when removed from rails as the blocks are equipped with ball-retainers. However, the balls may fall out by rapidly removing blocks from the rail or inserting the rail into the block at a slant. Remove and install the blocks with caution.

Medium and Heavy Load Type



Precision

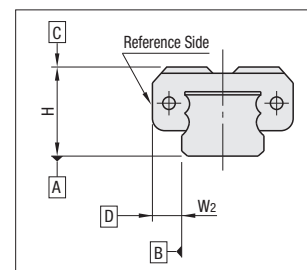
- Dimensional Accuracies

Unit: μm

| Type | Grades | Precision Grade | High Grade | Standard Grade | |
|----------------------------|-------------------------------------|-----------------|------------|-----------------|----------------|
| Miniature Type | Height H Tolerance | ± 10 | ± 20 | ± 20 | |
| | Height H Pair Variation | 7 | 15 | 40 | |
| | Width W ₂ Tolerance | ± 15 | ± 25 | $\pm 25(20)$ | |
| | Width W ₂ Pair Variation | 10 | 20 | 40 | |
| Medium and Heavy Load Type | Accuracy Standards | | High Grade | Interchangeable | Standard Grade |
| | Height H Tolerance | ± 40 | ± 20 | ± 100 | |
| | Height H Pair Variation | 15 | 15 | 20 | |
| | Width W ₂ Tolerance | ± 20 | ± 30 | ± 100 | |
| | Width W ₂ Pair Variation | 24, 28 | 15 | 25 | 20 |
| | | 33, 42 | 15 | 25 | 30 |
| | 30, 36, 40, 42 | - | 25 | - | |

[Pair Variation of Height H]
 Difference between the min./max. values of Height (H) Dimension for a number of blocks combined on one rail

[Pair Variation of Width W₂]
 Difference between the min./max. values of Width (W) Dimension for a number of blocks combined on one rail
 - Pair variation value shown in table () is for the products on P545



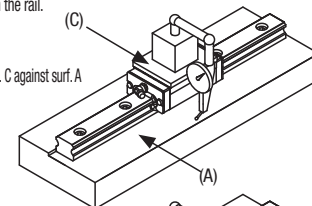
- Running Parallelism

Unit: μm

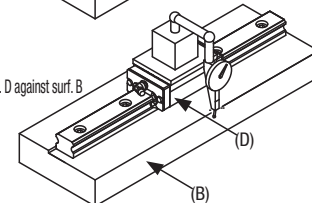
| Rail Length (mm) | Over | Or Less | Miniature | | | Medium and Heavy Load | | |
|------------------|------|---------|-----------------|------------|----------------|-----------------------|-----------------|----------------|
| | | | Precision Grade | High Grade | Standard Grade | High Grade | Interchangeable | Standard Grade |
| 50 | 50 | 2 | 3 | 13 | 7 | 6 | 7 | |
| 50 | 80 | 2 | 3 | 13 | 7 | 6 | 7 | |
| 80 | 125 | 3 | 7 | 15 | 7 | 6.5 | 7 | |
| 125 | 200 | 3 | 7 | 15 | 7 | 7 | 7 | |
| 200 | 250 | 3.5 | 9 | 17 | 7 | 8 | 7 | |
| 250 | 315 | 4 | 11 | 18 | 8 | 9 | 12 | |
| 315 | 400 | 5 | 11 | 18 | 8 | 11 | 12 | |
| 400 | 500 | 5 | 12 | 19 | 9 | 12 | 14 | |
| 500 | 630 | 6 | 13.5 | 21 | 11 | 14 | 18 | |
| 630 | 800 | 6 | 14 | 21.5 | 13 | 16 | 21 | |
| 800 | 1000 | - | - | - | 14.5 | 18 | 23 | |
| 1000 | 1250 | - | - | - | 16 | 20 | 25 | |
| 1250 | 1600 | - | - | - | 19 | 23 | 27 | |
| 1600 | 2000 | - | - | - | 21 | 26 | 28.5 | |

[Running Parallelism]
 Measured while the rail is bolted firmly to a standard reference surface base.
 A relative variation of block's top surface C against the rail's bottom surface A, and a relative variation of block's datum surface D against the rail's datum surface B are measured, as the block is run from end to end on the rail.

-Running parallelism of surf. C against surf. A



-Running parallelism of surf. D against surf. B



Selection of Radial Clearance (Preload)

| Type | Preload | Sizes (Height H Dimension) | Radial Clearance (μm) |
|-----------------------|----------------------------------|----------------------------|------------------------------------|
| Miniature | Light Preload | 6~20 | -3~0 |
| | Interchangeable-Slight Clearance | | 0~15 |
| Medium and Heavy Load | Normal Clearance | 24 | -4~+2 |
| | | 28 | -5~+2 |
| | | 33 | -6~+3 |
| | Interchangeable, Light Preload | 24, 28 | -4~0 |
| | | 30, 36, 40, 42 | -5~0 |
| | *42 | -7~0 | |

*marked size is for Extra Heavy Load and Extra Super Heavy Load.

- Clearance and preload of MISUMI Linear Guides are controlled with minute ball size adjustments.
 - Increased rigidity and reduced elastic deformation will result by preloading (negative clearance).
 - Generally, selecting some preloads would cause favorable effects on accuracy and life of Linear Guides.

Friction Force (Required Thrust Force)

Linear Guide friction force (required thrust) varies depending on load, speed and lubricant property. Especially when moment load is applied, Preload Type friction force increases.

Although seal resistance varies according to seal lip press-fit allowance and lubrication conditions, it is not proportionate to load and keeps a constant value.

Friction force is obtained by the following formula.

$$F = \mu \cdot W + f$$

F : Friction (N)

μ : Dynamic Friction Coefficient

W : Applied Load

f : Seal Resistance (2N ~ 5N)

Table-1 Dynamic Friction Coefficient

| Types | Dynamic Friction Coefficient (μ) |
|---------------------------|--|
| Miniature Linear Guides | 0.004~0.006 |
| Medium Load Linear Guides | 0.002~0.003 |

Allowable Load

-Basic Dynamic Load Rating (C)

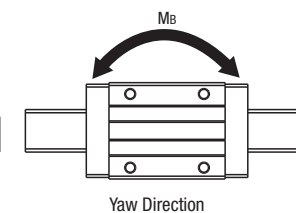
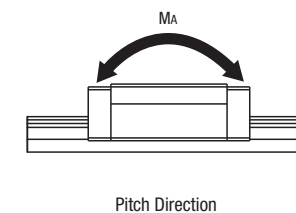
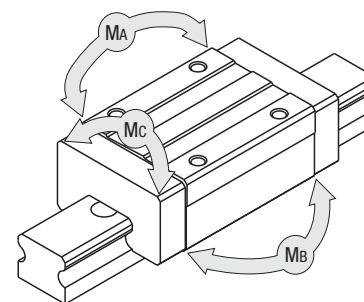
Basic dynamic load rating is defined as: A constant load applied in a constant direction and ran under equal condition on a group of linear guide specimen where 90% of specimen will reach 50 x 103m without experiencing any damages due to rolling fatigues.

-Basic Static Load Rating (Co)

Basic static load rating is defined as: A load applied on non-moving linear guides where a sum of rolling element plastic deformation amount and rolling surface plastic deformation amount becomes equal to 0.001 times that of the diameter of the rolling element (balls).

-Allowable Static Moment (M_A / M_B / M_C)

Allowable static moment is a critical static moment load defined by permanent deformation value similar to basic static load rating Co.



-Static Safety Factor (fs)

Basic Static Load Rating Co, in the static state or in low speed, is divided by Static Safety Factor fs in Table-2 depending on operating conditions.

$$\text{Allowable Load (N)} \leq C_o / f_s$$

$$\text{Allowable Moment (N} \cdot \text{m)} \leq (M_A, M_B, M_C) / f_s$$

f_s: Statistic Safety Factor C_o: Basic Static Load Rating (N)

M_A, M_B, M_C: Static Allowable Moment (N · m)

Table-2 Static Safety Factor (fs lower limit)

| Condition of Use | Lower Limits of fs |
|---|--------------------|
| For normal operating condition | 1~2 |
| When smooth running performance is required | 2~4 |
| When vibrations and impacts exist | 3~5 |