**Japanese patent Nos.: 1388133, 1405187, and 1613980**
**Overseas patents registered in the U.S., Germany, U.K., France, Italy, and South Korea**

# LM Guide GSR - Interchangeable self-adjusting type
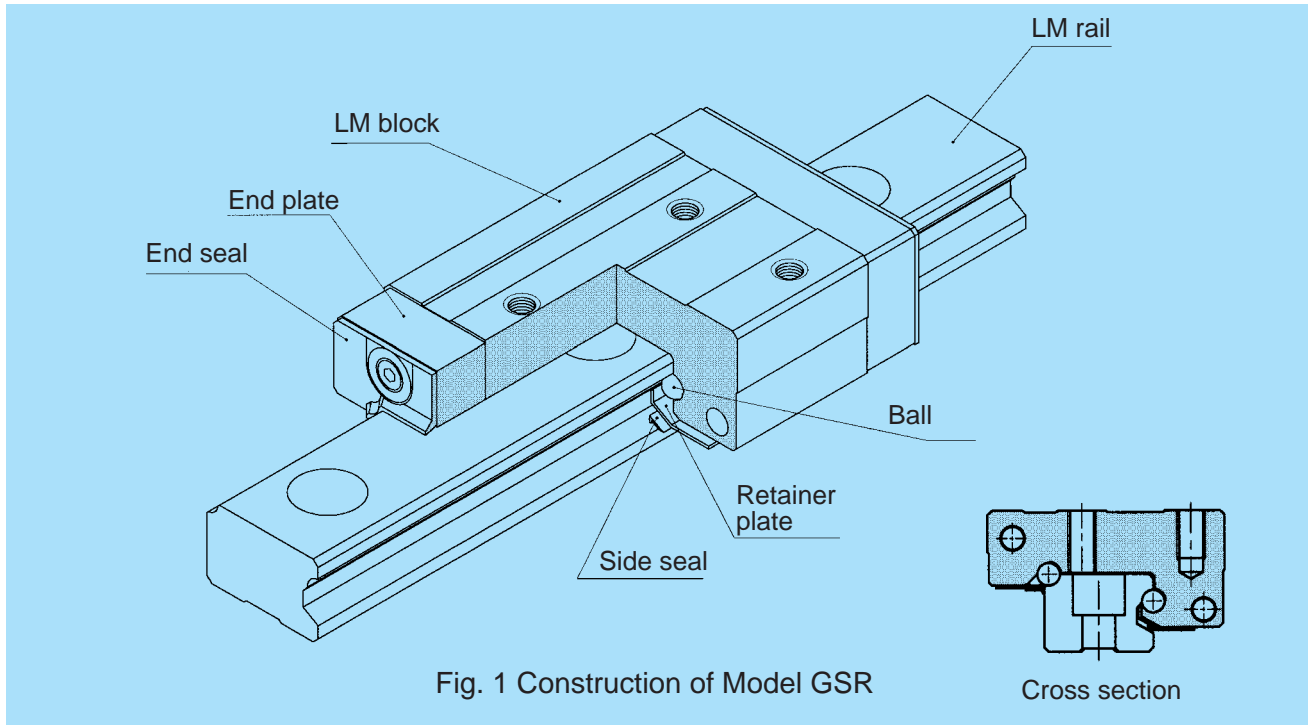


Fig. 1 Construction of Model GSR

Cross section

## Construction and Features

Balls roll in two rows of precision-ground raceway on an LM rail and an LM block. The end plate attached to the LM block causes the trains of balls to circulate. As the balls are held in place by the retainer plate, they do not fall off if the LM block is removed from the rail.

As the LM-block top surface is tilted, by simply fastening the mounting bolts, clearances can be eliminated and an appropriate preload can be applied.

As type GSR has a special contact design employing a circular-arc groove, even if levelness and rail parallelism are not fully established, it can provide smooth linear motion with no affect on service life. With its high self-adjusting capability, type GSR is best suited for uses in which high installation accuracy is difficult to achieve, and in industrial machines in general.

### Interchangeability

The LM rail and block of this type are interchangeable with one another. As a result, rails and blocks can be stored separately. It is even possible to cut a long LM rail to a desired length and couple it with any LM block.

### Bears loads in all directions

The ball-contact angle is designed to bear loads in all directions. Type GSR is therefore applicable where moments can act in any direction, including reverse-radial and lateral.

### Compact

Type GSR is designed to be as low-profile as possible. This enables it to provide stable linear motion and keep the center of gravity low, making it possible to construct compact machine systems.
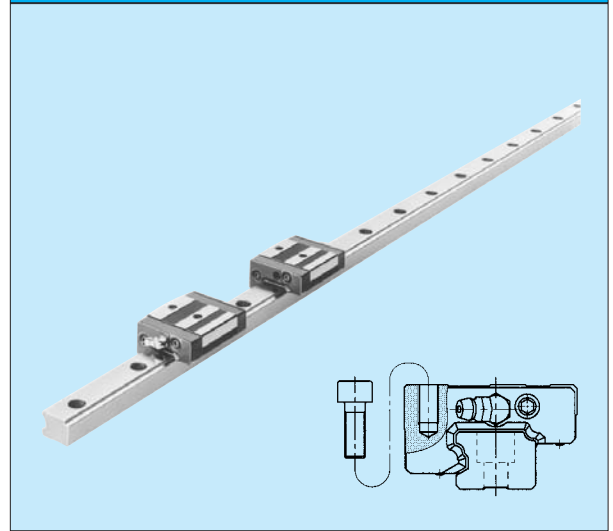
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## Types and Features

A-IV

### Type GSR-T (with a standard block)
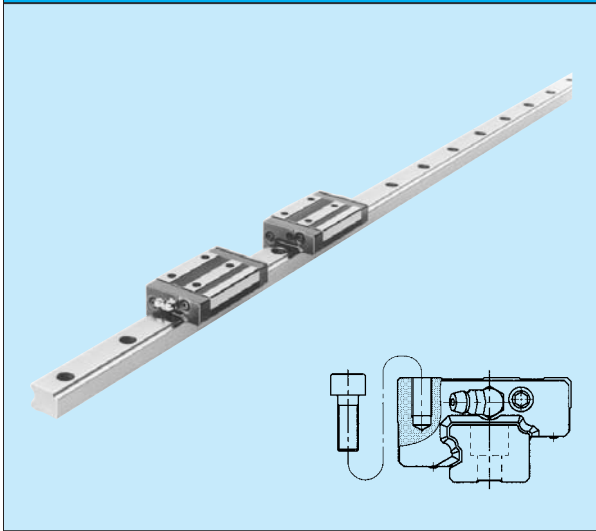


With large-diameter balls arranged in two rows of circular-arc grooves. Features an excellent self-adjusting capability, enabling it to compensate for mounting-surface errors, thereby ensuring smooth linear motion.

### Type GSR-V (with short block)



Type GSR-T modified by shortening the LM block; therefore space-saving

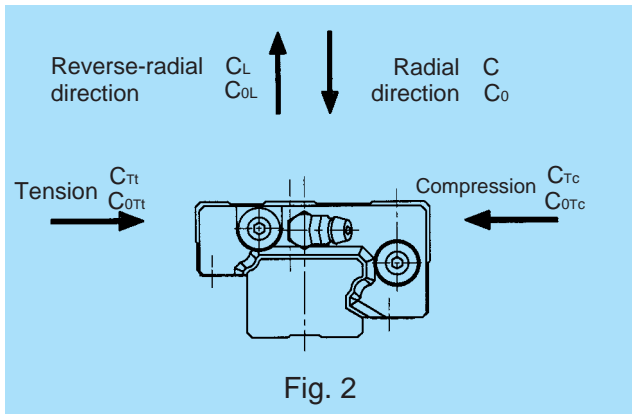## Load Rating and Permissible Moment in Various Directions

## Load rating



Fig. 2

Type GSR can bear loads in all four directions: radial, reverse-radial, and the two lateral directions.

The basic load rating is for a load in the radial direction on one LM block in the diagram shown above. The values are given in the corresponding dimension tables. Values for the reverse-radial, tensile, and compressive lateral directions are given in Table 1.

## Equivalent load

The equivalent load for type GSR when loads in the radial, tensile lateral, reverse-radial, and compressive lateral directions are exerted on its LM block simultaneously can be obtained using the following equation:

$$P_E = X \cdot P_R + Y \cdot P_{Tt}$$
$$P_E = P_L + P_{TC}$$

where

| | | | |
|---|---|---|---|
| $P_E$ | : | equivalent load | (N) |

- In the radial direction
- In the reverse-radial direction
- In the tensile lateral direction
- In the compressive lateral direction

| | | | |
|---|---|---|---|
| $P_R$ | : | radial load | (N) |
| $P_L$ | : | reverse-radial load | (N) |
| $P_{Tt}$ | : | tensile lateral load | (N) |
| $P_{TC}$ | : | compressive lateral load | (N) |

X and Y : equivalent factor

### Table 1 Type-GSR Load Ratings in Various Directions

| Direction | Basic dynamic load rating | Basic static load rating |
|---|---|---|
| Radial | $C$ | $C_0$ |
| Reverse-radial | $C_L = 0.93C$ | $C_{0L} = 0.90C_0$ |
| Tensile lateral | $C_{Tt} = 0.84C$ | $C_{0Tt} = 0.78C_0$ |
| Compressive lateral | $C_{Tc} = 0.93C$ | $C_{0Tc} = 0.90C_0$ |

### Table 2 Type-GSR Equivalent Factor (under radial and tensile lateral loads)

| $P_E$ | X | Y |
|---|---|---|
| Equivalent load in the radial direction | 1 | 1.280 |
| Equivalent load in the tensile lateral direction | 0.781 | 1 |

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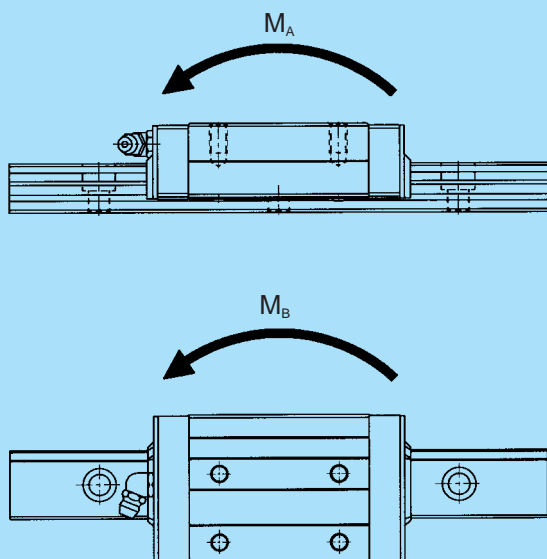
A-IV

## Permissible moment



Fig. 3

In type GSR, a single LM block can bear moments in directions $M_A$ and $M_B$. The moment in direction $M_C$ can be applied if the LM Guide system uses two LM rails in parallel. Table 3 gives the permissible moments in directions $M_A$ and $M_B$ for a single LM block. The data on permissible moments in direction $M_C$ is omitted here, as the moment depends on the distance between two rails.

Table 3 Type-GSR Static Permissible Moment

Unit : N•m

| Model No. | $M_A$ | $M_B$ |
|-----------|-------|-------|
| GSR 15T | 38.9 | 33.7 |
| GSR 15V | 18.2 | 15.7 |
| GSR 20T | 76.2 | 66.0 |
| GSR 20V | 35.8 | 31.0 |
| GSR 25T | 132 | 114 |
| GSR 25V | 61.5 | 53.3 |
| GSR 30T | 208 | 180 |
| GSR 35T | 311 | 270 |

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## Accuracy Standards



Fig 4
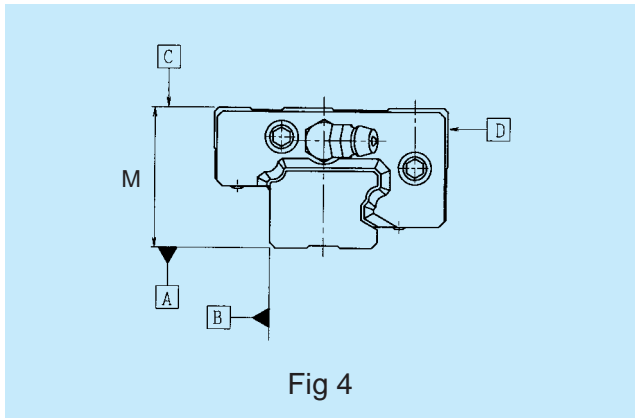
The accuracy of type GSR is shown in Table 2 for each model number, classified into the normal, high, and precision grades.

### Table 4 Type GSR Accuracy Standard

Unit : mm

| Model No. | Accuracy standard | Normal | High | Precision |
|---|---|---|---|---|
| | Item | No symbol | H | P |
| GSR 15<br>GSR 20 | Tolerance for height M | ±0.02 | | |
| | Running Parallelism of surface C with surface A | C (as per Fig. 5) | | |
| | Running parallelism of surface D with surface B | D (as per Fig. 5) | | |
| GSR 25<br>GSR 30<br>GSR 35 | Tolerance for height M | ±0.03 | | |
| | Running Parallelism of surface C with surface A | C (as per Fig. 5) | | |
| | Running parallelism of surface D with surface B | D (as per Fig. 5) | | |
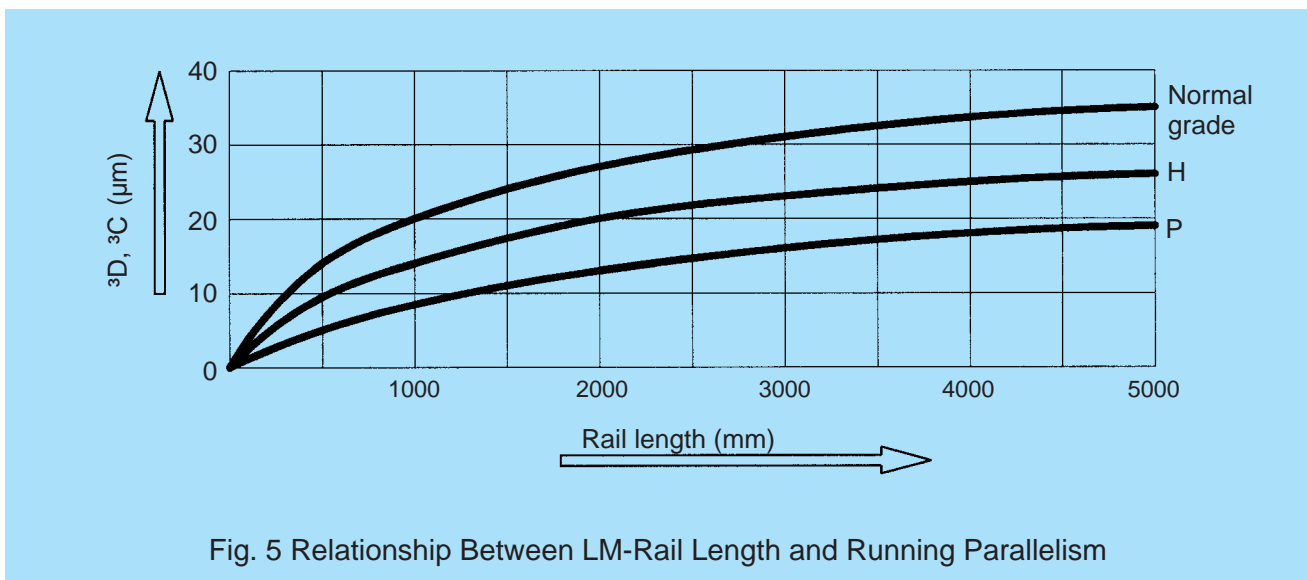

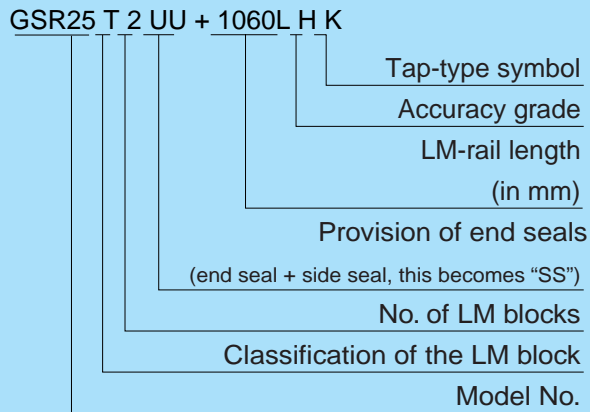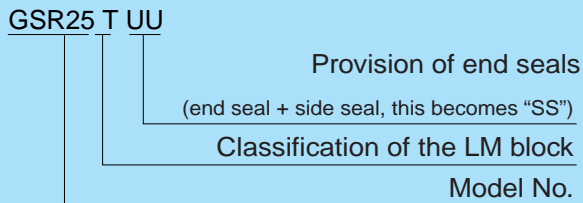
Fig. 5 Relationship Between LM-Rail Length and Running Parallelism

## Model-number coding

LM-rail/block combination model number

GSR25 T 2 UU + 1060L H K

Tap-type symbol
Accuracy grade
LM-rail length
(in mm)
Provision of end seals
(end seal + side seal, this becomes "SS")
No. of LM blocks
Classification of the LM block
Model No.

LM-block model number

GSR25 T UU

Provision of end seals
(end seal + side seal, this becomes "SS")
Classification of the LM block
Model No.

LM-rail model number

GSR25 - 1060L H K

Tap-type symbol
Accuracy grade
LM-rail length (in mm)
LM-rail model number

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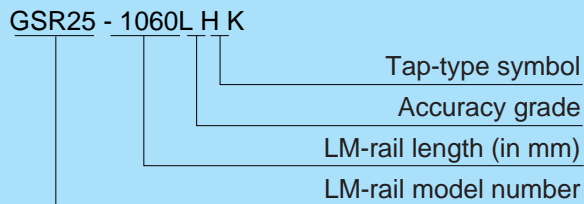
## Contamination Protection

From our wide array of products for type GSR, you can select the one best suited for your situation.  (For details on seals, see "Contamination Protection" for type HSR on page A-223.)

If your choice is applicable to your system, please note that in some models, attaching a contamination-protection accessory to an LM block changes the block's overall length.  Add the increment specified in the corresponding dimension table to dimension L.

### Table 5 Applicability of Seals to Type GSR, and the Increment to Be Added to the Block Overall Length

Unit : mm

| Model No. | No symbol | | UU | | SS | | DD | | ZZ | | KK | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GSR  15 | O | -4.8 | O | - | O | - | O | 5.0 | O | 6.8 | O | 11.8 |
| GSR  20 | O | -6.0 | O | - | O | - | O | 6.6 | O | 3.6 | O | 10.2 |
| GSR  25 | O | -7.0 | O | - | O | - | O | 7.0 | O | 3.6 | O | 10.6 |
| GSR  30 | O | -7.0 | O | - | O | - | O | 7.6 | O | 4.2 | O | 11.8 |
| GSR  35 | O | -7.0 | O | - | O | - | O | 7.6 | O | 4.2 | O | 11.8 |

Note: O = Applicable

## Seal resistance

The maximum values for seal resistance per LM block in type GSR...UU with a lubricant applied are given in Table 6.

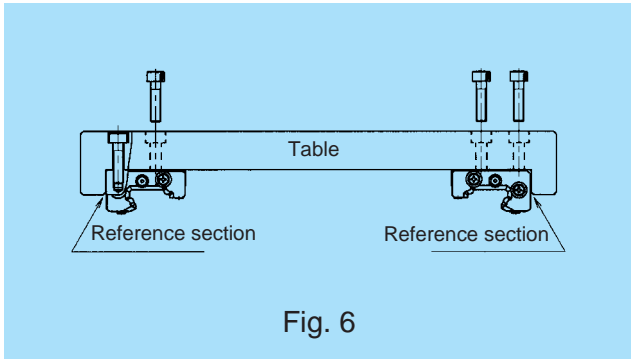### Table 6 Maximum Resistance Value of seals to Type GSR

Unit : N

| Model No. | Seal resistance value |
|---|---|
| GSR  15 | 2.5 |
| GSR  20 | 3.1 |
| GSR  25 | 4.4 |
| GSR  30 | 6.3 |
| GSR  35 | 7.6 |

## Mounting Procedures

LM Guide type GSR can be mounted by the procedure specified below.

1. Hold the table against the LM-block reference surface.  Fully fasten bolts.  The table must have a reference section on both sides.

**Fig. 6**

2. Position LM rail A on the base along a straight edge. Using a torque wrench, fully fasten the rail.

**Fig. 7**
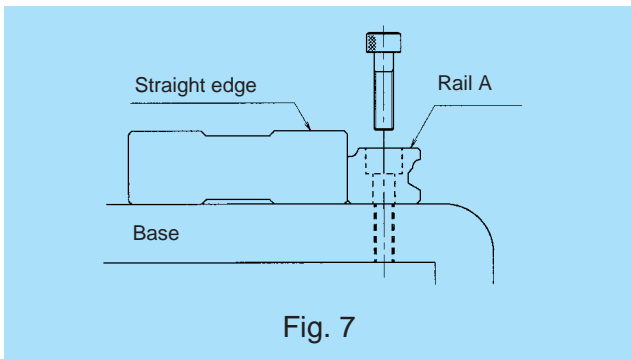
3. Temporarily fasten LM rail B to the base.  Insert a block into the rail.
With pressing LM rail B against the block, temporarily fasten the bolts.

**Fig. 8**
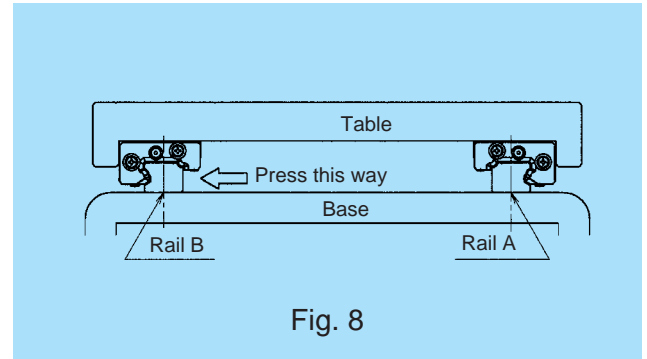
4. Move the table a couple of strokes.  Break in the LM block on the rails.  Using a torque wrench, fully fasten LM rail B.
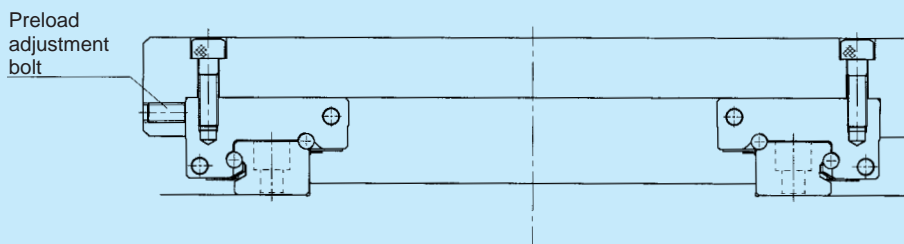
**Fig. 9**
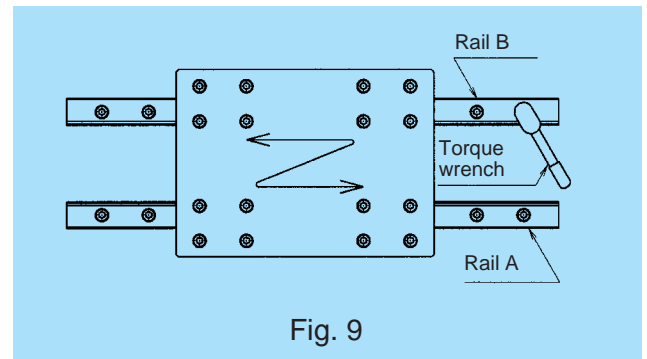
If multiple sets are to be mounted, prepare a jig as shown.  The jig facilitates the establishment of parallelism between LM rails.

**Fig. 10**

A-IV
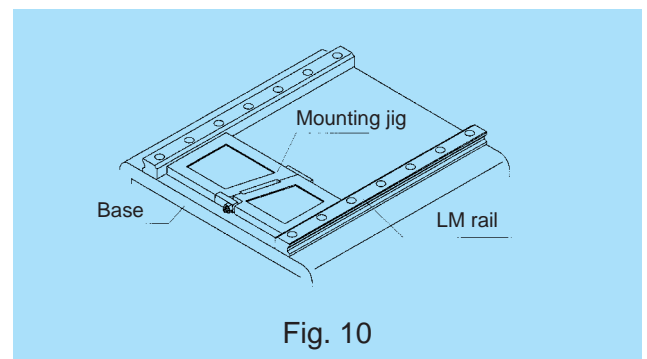
## Sample adjustment of clearance



To increase rigidity, a reference section can be installed on the outer side of each LM block.
By pressing the blocks sideways with set screws, a preload is exerted on the guideway, thereby increasing rigidity.

Fig. 11 Sample Preload Adjustment Using Set Screws

## Precautions on Use

### Mounting-Surface Height and Corner Profile

Normally, mounting surfaces for LM blocks and rails have lateral reference surfaces to aid in positioning rails and blocks with a high degree of accuracy.

For the reference-surface shoulder height, see Table 7.

Furthermore, provide enough space to the corner profile of a mounting surface so that the corner does not interfere with chamfers made on the LM blocks or rails, or provide the corner with a radius smaller than corner radius r specified in Table 7.



Fig. 12
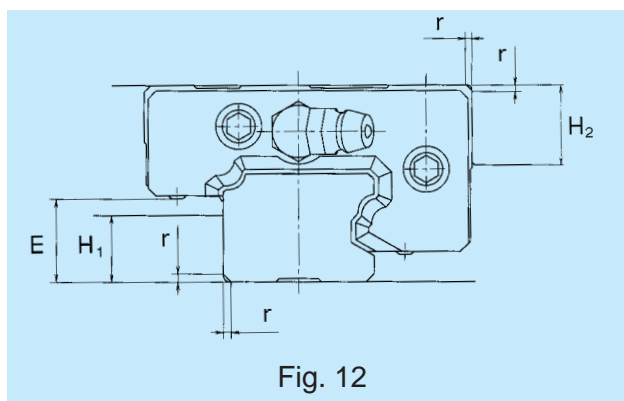
Table 7 Mounting-Surface Shoulder Height and Corner Radius

Unit : mm

| Model No. | Corner radius r (max.) | LM-rail shoulder height $H_1$ | LM-block shoulder max. height $H_2$ | E |
|---|---|---|---|---|
| GSR 15 | 0.6 | 7 | 7 | 8 |
| GSR 20 | 0.8 | 9 | 8 | 10.4 |
| GSR 25 | 0.8 | 11 | 11 | 13.2 |
| GSR 30 | 1.2 | 11 | 13 | 15 |
| GSR 35 | 1.2 | 13 | 14 | 17.5 |

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## LM-Rail Standard and Maximum Lengths

Table 8 gives the standard and maximum LM-rail lengths for type GSR.

If many rails of different lengths are used, it is economical to stock LM rails of the maximum length, as they can be cut to the desired lengths in accordance with the necessary number of strokes.

A-IV
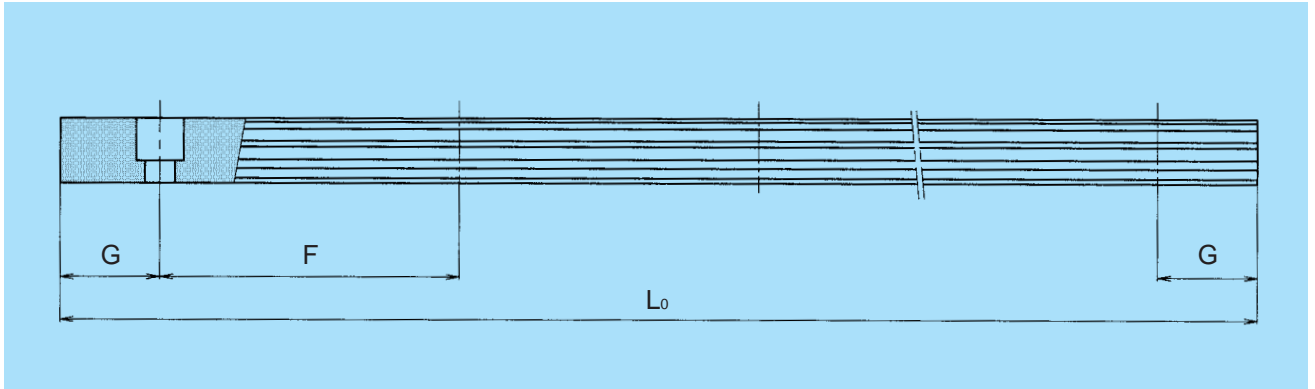
Table 8 Type-GSR LM-Rail Standard and Maximum Lengths

Unit : mm

| Model No. | GSR 15 | GSR 20 | GSR 25 | GSR 30 | GSR 35 |
|---|---|---|---|---|---|
| LM-rail standard length ($L_0$) | 460 | 460 | 460 | 1240 | 1240 |
| | 820 | 820 | 820 | 1720 | 1720 |
| | 1060 | 1060 | 1060 | 2200 | 2200 |
| | 1600 | 1600 | 1600 | 3000 | 3000 |
| Standard pitch F | 60 | 60 | 60 | 80 | 80 |
| G | 20 | 20 | 20 | 20 | 20 |
| Max. length | 2000 | 3000 | 3000 | 3000 | 3000 |

### Tapped-hole LM rail type GSR-K

- The LM-rail bottom surface is provided with tapped holes, whereby H-shapes, channels, and similar steel materials can easily be attached.
- Because there are no mounting holes on the LM-rail surface, no foreign matter (e.g., cutting chips) can enter the system, resulting in improved sealability.

1. Set a bolt length that will ensure a clearance of 2 to 3 mm at the tip of each bolt when the bolt is tightened over the full length of the effective tapped thread.
2. We can also provide tapered washers that can be attached to steel shapes as shown in Fig. 13.
3. For the model-number coding, see page A-289.
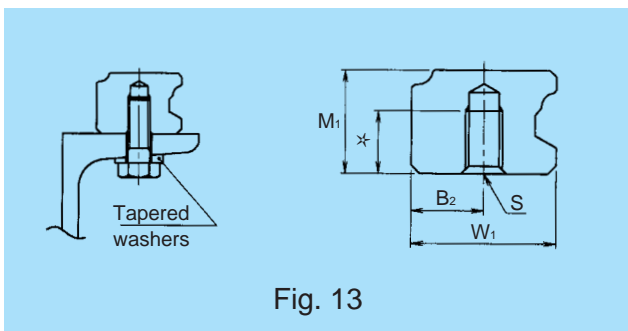
Fig. 13

Table 9 Tapped-Hole Position and Depth

| Model No. | $W_1$ | $B_2$ | $M_1$ | $S \times \ell$ |
|---|---|---|---|---|
| GSR 15 | 15 | 7.5 | 11.5 | M4 × 0.7 × 7 |
| GSR 20 | 20 | 10 | 13 | M5 × 0.8 × 8 |
| GSR 25 | 23 | 11.5 | 16.5 | M6 × 10 |
| GSR 30 | 28 | 14 | 19 | M8 × 12 |
| GSR 35 | 34 | 17 | 22 | M10 × 14 |

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# Type GSR-T (long type)
# Type GSR-V (short type)
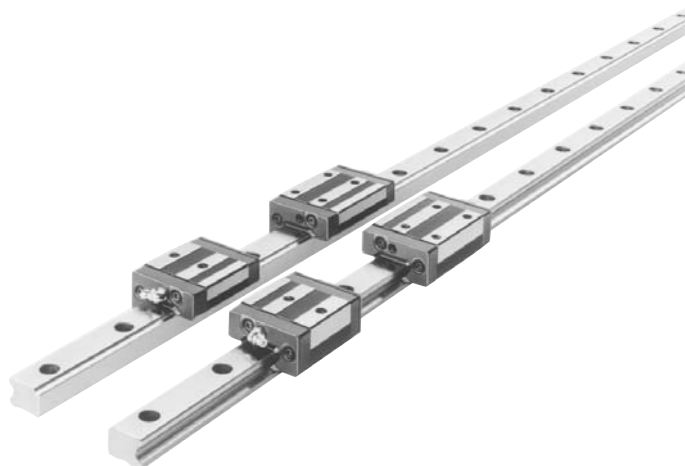


| Model No. | External dimensions | | | LM-block dimensions | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Height M | Width W | Length L | B | B₁ | C | N-S × ℓ | K₁ | K₂ | L₁ | N₁ | N₂ | E |
| GSR 15 T<br>GSR 15 V | 20 | 32 | 60<br>47.1 | 15 | 5 | 26<br>- | 4-M4 × 0.7 × 7<br>2-M4 × 0.7 × 7 | 12 | 17.5 | 40.2<br>27.5 | 4.5 | 3 | 5.5 |
| GSR 20 T<br>GSR 20 V | 24 | 43 | 74<br>58.1 | 20 | 7 | 30<br>- | 4-M5 × 0.8 × 8<br>2-M5 × 0.8 × 8 | 13.6 | 20.6 | 50.2<br>34.3 | 5 | - | 12 |
| GSR 25 T<br>GSR 25 V | 30 | 50 | 88<br>69 | 23 | 7 | 40<br>- | 4-M6 × 10<br>2-M6 × 10 | 16.8 | 25.5 | 60.2<br>41.2 | 7 | - | 12 |
| GSR 30T | 33 | 57 | 103 | 26 | 8 | 45 | 4-M8 × 12 | 18 | 28.5 | 70.3 | 7 | - | 12 |
| GSR 35T | 38 | 68 | 117 | 32 | 9 | 50 | 4-M8 × 15 | 20.5 | 32.5 | 80.3 | 8 | - | 12 |

Notes:
- For model-number coding, see page A-289.
- For permissible static moments $M_A$ and $M_B$, see page A-287.

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A-IV
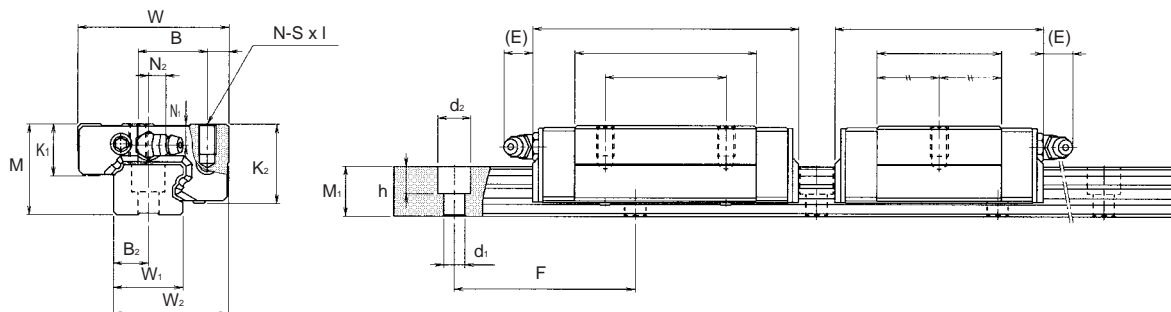
Unit : mm

| Grease nipple | LM-rail dimensions | | | | | | Basic load rating | | Mass | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Width $W_1$ | $W_2$ | $B_2$ | Height $M_1$ | Pitch F | $d_1 \times d_2 \times h$ | C kN | $C_0$ kN | LM block kg | LM rail kg/m |
| PB-107 | 15 | 25 | 7.5 | 11.5 | 60 | $4.5 \times 7.5 \times 5.3$ | 5.69 4.31 | 8.43 5.59 | 0.13 0.08 | 1.2 |
| B-M6F | 20 | 33 | 10 | 13 | 60 | $6 \times 9.5 \times 8.5$ | 9.22 7.01 | 13.2 8.82 | 0.25 0.17 | 1.8 |
| B-M6F | 23 | 38 | 11.5 | 16.5 | 60 | $7 \times 11 \times 9$ | 13.5 10.29 | 19.0 12.65 | 0.5 0.29 | 2.6 |
| B-M6F | 28 | 44.5 | 14 | 19 | 80 | $9 \times 14 \times 12$ | 18.8 | 25.9 | 0.6 | 3.6 |
| B-M6F | 34 | 54 | 17 | 22 | 80 | $11 \times 17.5 \times 14$ | 25.1 | 33.8 | 1.0 | 5.0 |

- For standard LM-rail lengths, see page A-293.

# Rack-toothed LM Guide Type GSR-R
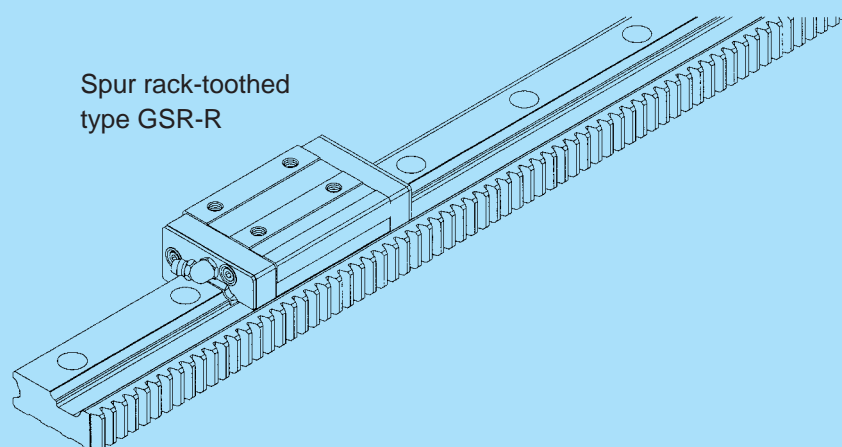
Spur rack-toothed
type GSR-R

Fig. 1 Construction of type GSR-R

## Construction and Features

Balls roll in two rows of precision-ground raceway on an LM rail and an LM block. The end plate attached to the LM block causes the trains of balls to circulate. As the balls are held in place by the retainer plate, they do not fall off if the LM block is removed from the rail.

As the LM-block top surface is tilted, by simply fastening the mounting bolts, clearances can be eliminated and an appropriate preload can be applied.

Type GSR-R is a modification of type GRS, with the rack teeth cut on the LM rail. This aids in the design and assembly of drive mechanisms.

### Reduces working and assembly costs
The one-piece structure integrating the LM rail (linear guide) and rack (drive) reduces the man-hours required to work the mounting surface for receiving a rack, and to attach it to the rail. This substantially reduces overall costs.

### Facilitates design
The displacement per turn of the pinion is in increments of integral multiples. This makes it easy to calculate the displacement per pulse when the LM Guide is used in combination with a stepping or servo motor.

### Space-saving
The rack and the LM rail are formed into one unit. As a result, a system using this type of LM Guide can be made compact in size.

### Free stroke
The LM-rail end faces are finished for connected use. To obtain a rail for use with long strokes, simply connect LM rails of the standard length.

### High durability
The rack-tooth width is equal to the LM-rail height. The material is high-grade steel with proven high performance, and the rack teeth are heat-treated, thereby ensuring the high durability of type GSR-R.

## Types and Features
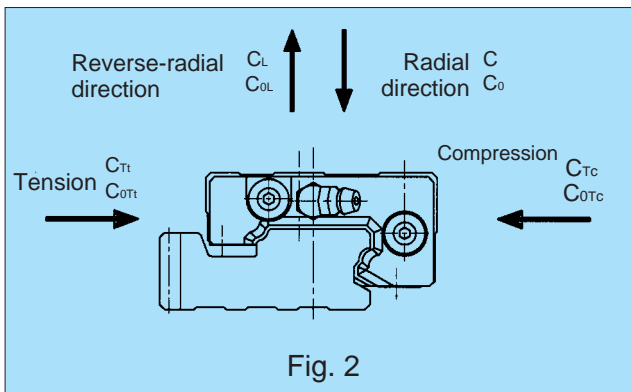
### Type GSR-R (with a rack-toothed LM rail)
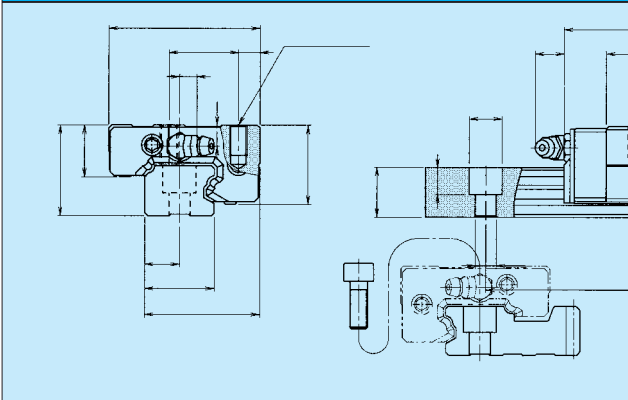


■ **Can be used if the pinion mounting part does not have high rigidity**

As the thrust load on the pinion shaft can be kept low due to rack-pinion meshing, it is easy to design systems with pinion shaft bearings and tables that are not high in rigidity.

### Load Rating and Permissible Moment in Various Directions

#### Load rating



Fig. 2

Type GSR-R can bear loads in all four directions: radial, reverse-radial, and the two lateral directions.

The basic load rating is for a load in the radial direction on one LM block in the diagram shown above. The values are given in the corresponding dimension tables. Values for the reverse-radial, tensile, and compressive lateral directions are given in Table 1.

Table 1 Type-GSR-R Load Ratings in Various Directions

| Direction | Basic dynamic load rating | Basic static load rating |
|---|---|---|
| Radial | $C$ | $C_O$ |
| Reverse-radial | $C_L = 0.93C$ | $C_{OL} = 0.90C_O$ |
| Tensile lateral | $C_{Tt} = 0.84C$ | $C_{OTt} = 0.78C_O$ |
| Compressive lateral | $C_{TC} = 0.93C$ | $C_{OTc} = 0.90C_O$ |

## Equivalent load

The equivalent load for type GSR-R when loads in the radial, tensile lateral, reverse-radial, and compressive lateral directions are exerted on its LM block simultaneously can be obtained using the following equation:

$$P_E = X \cdot P_R + Y \cdot P_{Tt}$$
$$P_E = P_L + P_{TC}$$

where

| | | | |
|---|---|---|---|
| $P_E$ | : | equivalent load | (N) |

- In the radial direction
- In the reverse-radial direction
- In the tensile lateral direction
- In the compressive lateral direction

| | | | |
|---|---|---|---|
| $P_R$ | : | radial load | (N) |
| $P_L$ | : | reverse-radial load | (N) |
| $P_{Tt}$ | : | tensile lateral load | (N) |
| $P_{TC}$ | : | compressive lateral load | (N) |

X and Y : equivalent factor



Fig. 3
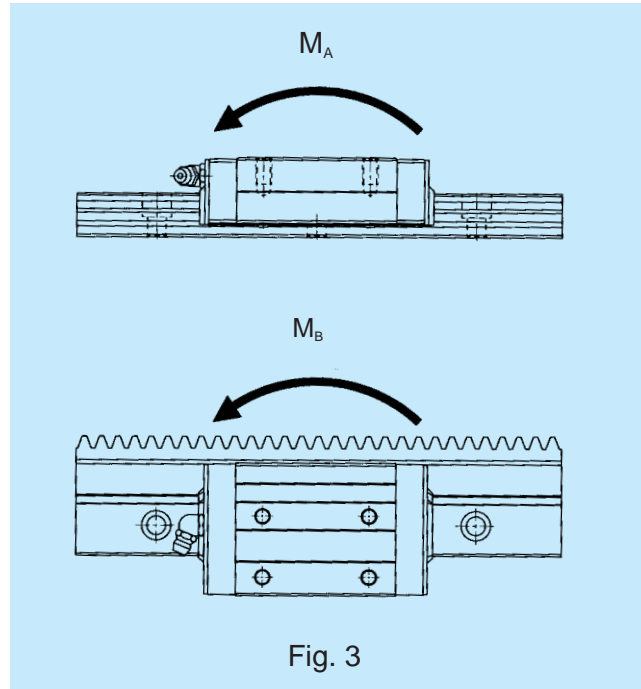
### Table 2 Type-GSR-R Equivalent Factor (under radial and tensile lateral loads)

| $P_E$ | X | Y |
|---|---|---|
| Equivalent load in the radial direction | 1 | 1.280 |
| Equivalent load in the tensile lateral direction | 0.781 | 1 |

In type GSR-R, a single LM block can bear moments in directions $M_A$ and $M_B$. The moment in direction $M_C$ can be applied if the LM Guide system uses two LM rails in parallel. Table 3 gives the permissible moments in directions $M_A$ and $M_B$ for a single LM block. The data on permissible moments in direction $M_C$ is omitted here, as the moment depends on the distance between two rails.

### Table 3 Type-GSR-R Static Permissible Moment

Unit : N•m

| Model No. | $M_A$ | $M_B$ |
|---|---|---|
| GSR 25 T-R | 132 | 114 |
| GSR 25 V-R | 61.5 | 53.3 |
| GSR 30 T-R | 208 | 180 |
| GSR 35 T-R | 311 | 270 |

## Accuracy Standards
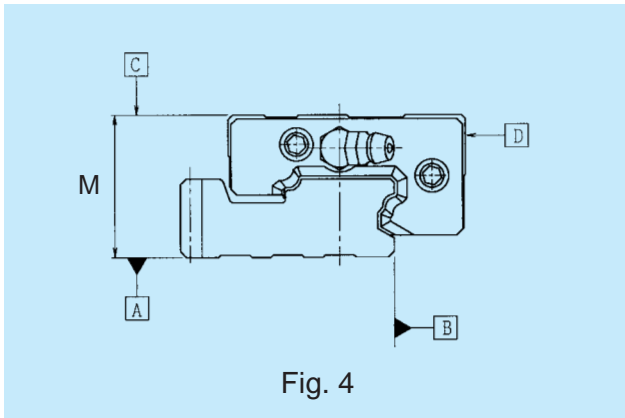
The accuracy of type GSR-R is shown in Table 4 for each model number, classified into the normal and high grades.

Fig. 4

### Table 4 Type GSR-R Accuracy Standard

Unit : mm

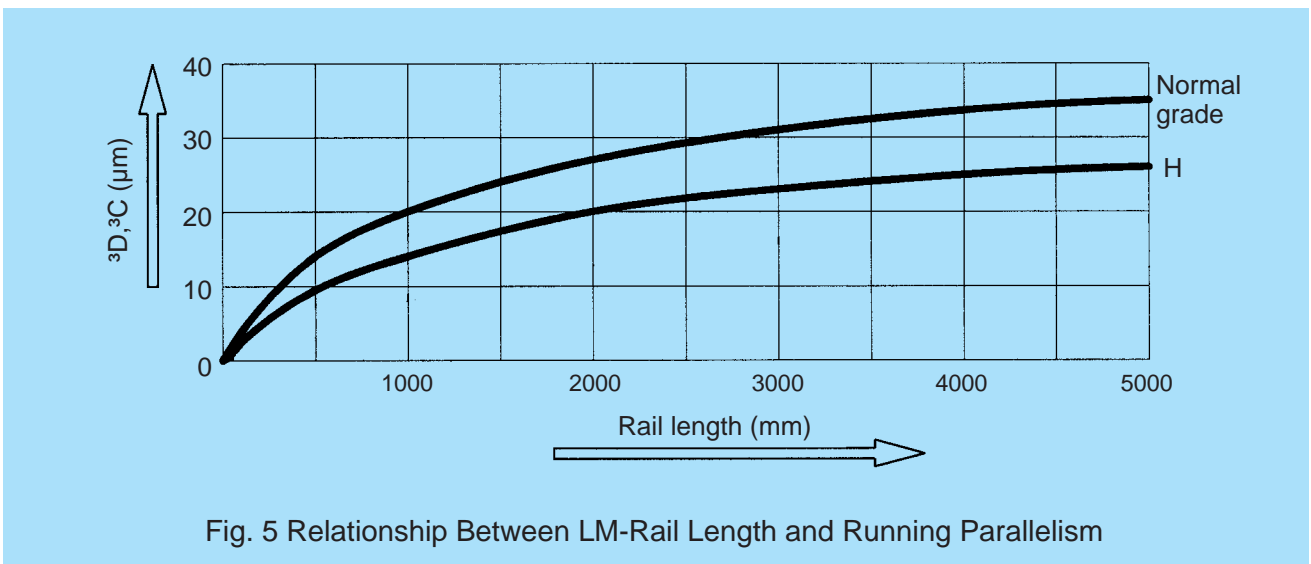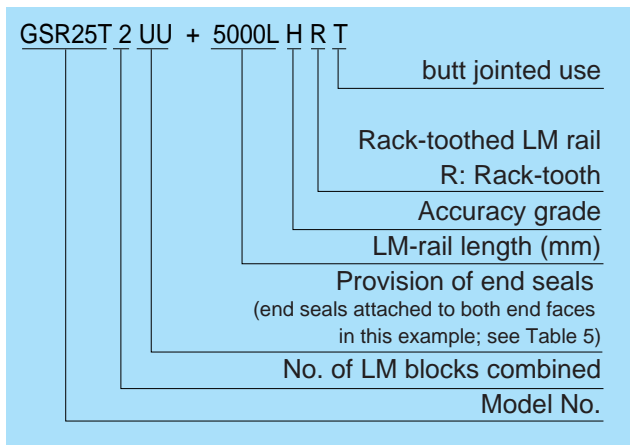| Model No. | Accuracy standard | Normal | High |
|---|---|---|---|
| | Item | No symbol | H |
| GSR 25 GSR 30 GSR 35 | Tolerance for height M | ±0.03 | |
| | Running Parallelism of surface C with surface A | C (as per Fig. 5) | |
| | Running parallelism of surface D with surface B | D (as per Fig. 5) | |

Fig. 5 Relationship Between LM-Rail Length and Running Parallelism

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## Model-number coding

### One-Axis LM Guide

```
GSR25T 2 UU + 5000L H R T
                          butt jointed use

                     Rack-toothed LM rail
                     R: Rack-tooth
                  Accuracy grade
               LM-rail length (mm)
            Provision of end seals
            (end seals attached to both end faces
             in this example; see Table 5)
         No. of LM blocks combined
      Model No.
```
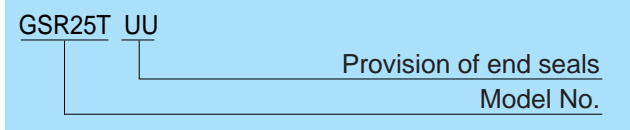
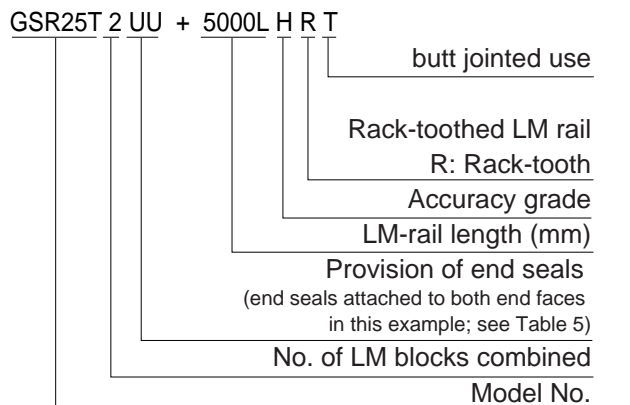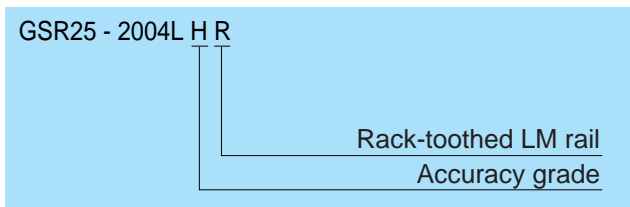\* If LM rails of various lengths are to be put to butt jointed use, contact us.

Note: One model number in this example is required for one LM Guide in a one-axis configuration.

### Separate-part model number
● **LM block model number**

```
GSR25T  UU
              Provision of end seals
           Model No.
```

● **Rack-toothed-LM-rail model number**

```
GSR25 - 2004L H R
                  Rack-toothed LM rail
               Accuracy grade
```

```
GSR25T 2 UU + 5000L H R T
                          butt jointed use

                     Rack-toothed LM rail
                     R: Rack-tooth
                  Accuracy grade
               LM-rail length (mm)
            Provision of end seals
            (end seals attached to both end faces
             in this example; see Table 5)
         No. of LM blocks combined
      Model No.
```

## Contamination Protection

### Seal resistance value

The maximum values for seal resistance per LM block in type G with a lubricant applied are given in Table 5.

Table 5 Maximum Resistance Value of seals to Type GSR-R

Unit : N

| Model No. | Seal resistance value |
|---|---|
| GSR 25R | 4.4 |
| GSR 30R | 6.3 |
| GSR 35R | 7.6 |

From our wide array of products for type GSR-R, you can select the one best suited for your situation. (For details on seals, see "Contamination Protection" for type HSR on page A-223.)

Some models do not acept contamination-protection accessories. Confirm which parts are applicable by refferring to Table 6.

If your choice is applicable to your system, please note that in some models, attaching a contamination-protection accessory to an LM block changes the block's overall length. Add the increment specified in the corresponding dimension table to dimension L.

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## Precautions on Use

### Mounting-Surface Height and Corner Profile

See Table 7, as the reference section is placed on the opposite side of the rail compared to its position in the standard type GSR.
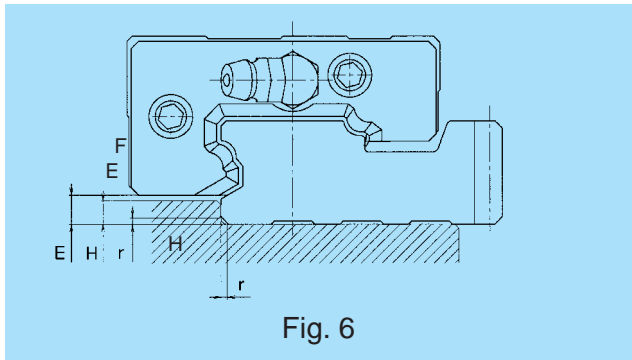


Fig. 6

Table 7 Mounting-Surface Shoulder Height and Corner Radius

Unit : mm

| Model No. | Corner radius r (max.) | LM-rail shoulder height H | E |
|---|---|---|---|
| GSR 25 | 0.8 | 4 | 4.5 |
| GSR 30 | 1.2 | 4 | 4.5 |
| GSR 35 | 1.2 | 4.5 | 5.5 |

### Joint between rack teeth

The end faces of rack-toothed LM rails are finished so as to ensure a clearance that will aid in their connection.

Use of the special jig shown in Fig. 7 will make connection even easier. (We also offer a special jig for aligning rack teeth.)
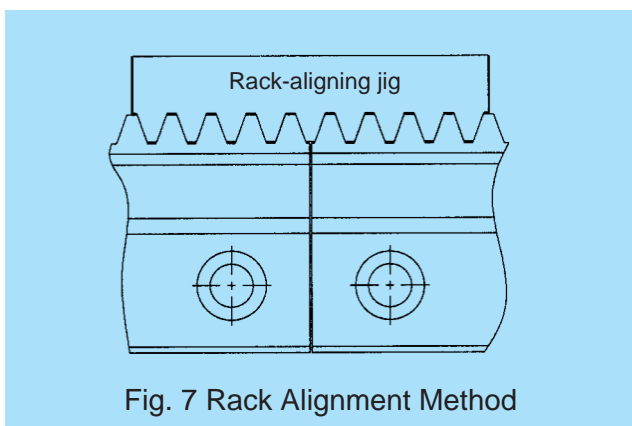


Fig. 7 Rack Alignment Method

### Reeworking the pinion hole

Only the teeth of the pinion-hole-diameter reworking type (type C) are heat-treated. The hole and keyway can therefore be reworked by the user to the desired diameter and shape.

When carrying out reworking, be sure to take the following into consideration.

Material of the hole-diameter reworking type (type C): S45C

1. When chucking the teeth of a hole-diameter reworking-type pinion, use a jaw scroll chuck or similar tool so as to maintain the tooth profile.
2. The pinion is produced using the hole center as a reference point. The hole center should therefore be used as a reference point when the pinion is aligned. When checking the pinion run-out, refer to the boss sides.
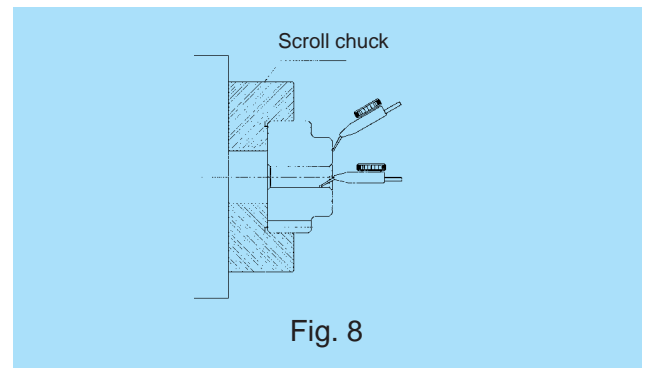3. Keep the reworked hole diameter within 60% to 70% of the boss diameter.



Fig. 8

### Lubricating the rack and pinion

To ensure smooth sliding on tooth surfaces and prevent wear, the teeth should be provided with a lubricant.

* Use a lubricant of the same type as that sealed in the LM Guide.

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## Checking strength

The strength of the assembled rack and pinion must be checked in advance.

1. Calculate the maximum thrust exerted on the pinion.
2. Divide the permissible power-transmission capacity of the pinion to be used (Table 8) by an overload factor (Table 9).
3. By comparing the thrust exerted on the pinion obtained in step 1 with the pinion power-transmission capacity obtained in step 2, make sure the loaded thrust is not greater than the permissible power-transmission capacity.

[Calculation example]

Type GSR-R is used in a horizontal conveyance system subjected to medium impact (assume external loads to be zero).

Conditions

| | |
|---|---|
| Subject model No. (pinion) | GP6-20A |
| Mass (table + work) | m = 100 kg |
| Velocity | v = 1 m/s |
| Acceleration/deceleration time | $T_1$ = 0.1 s |

Consideration

1. Obtain the maximum thrust
   Calculate the thrust during acceleration and deceleration

$$Fmax = m \cdot \frac{v}{T_1} = 1.00kN$$

2. Compare the maximum thrust with the pinion power-transmission capacity

$$Pmax = \frac{\text{Obtain the pinion power-transmission capacity}}{\text{Compare the maximum thrust with the pinion power-transmission capacity}} = \frac{2.33}{1.25}$$

$$= 1.86kN$$

3. In this way, the applicability of the subject model number can be judged.

$$Fmax < Pmax$$

Table 8 Permissible Power-Transmission Capacity

Unit : kN

| Model No. | Permissible power-transmission capacity | Applicable model No. |
|---|---|---|
| GP 6 - 20A | 2.33 | GSR 25 - R Type |
| GP 6 - 20C | 2.05 | |
| GP 6 - 25A | 2.73 | |
| GP 6 - 25C | 2.23 | |
| GP 8 - 20A | 3.58 | GSR 30 - R Type |
| GP 8 - 20C | 3.15 | |
| GP 8 - 25A | 4.19 | |
| GP 8 - 25C | 3.42 | |
| GP10 - 20A | 5.19 | GSR 35 - R Type |
| GP10 - 20C | 4.57 | |
| GP10 - 25A | 6.06 | |
| GP10 - 25C | 4.96 | |

Table 9 Overload Factor

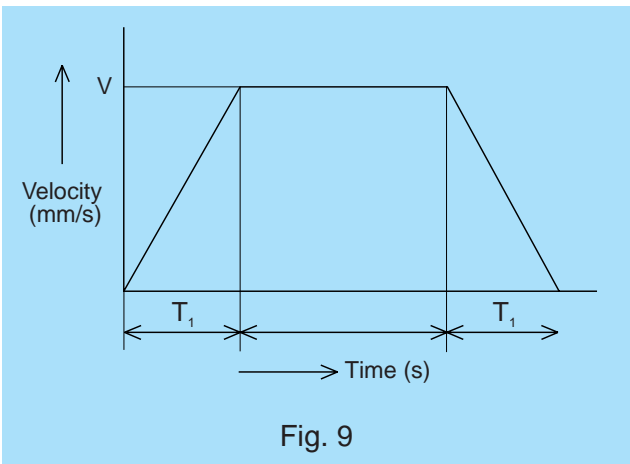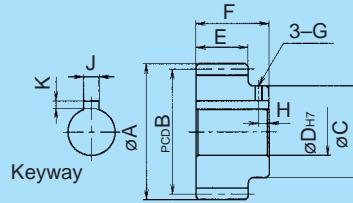| Impact from the driving side | Impact from the driven side | | |
|---|---|---|---|
| | Uniform load | Medium impact | Heavy impact |
| Uniform load (motors, turbines, hydraulic motors, etc.) | 1.0 | 1.25 | 1.75 |

(JGMA401-01)



Fig. 9

## Pinion
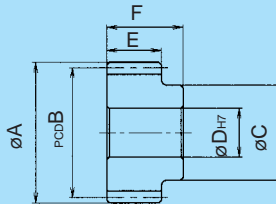● **Pinion for racks (type A)**
  **Keyway working type**



Keyway

Unit : mm

| Model No. | Pitch | No. of teeth | Tip circle diameter A | Meshing PCD B | Boss diameter C | Hole diameter D | Face width E | Overall length F | G | H | Keyway J × K | Applicable LM-Guide Model No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GP 6-20A | 6 | 20 | 42.9 | 39.0 | 30 | 18 | 16.5 | 24.5 | M3 | 4 | 6 × 2.8 | GSR25 R |
| GP 6-25A | | 25 | 51.9 | 48.0 | 35 | 18 | | | | | | |
| GP 8-20A | 8 | 20 | 57.1 | 52.0 | 40 | 20 | 19 | 26 | M3 | 5 | 8 × 3.3 | GSR30 R |
| GP 8-25A | | 25 | 69.1 | 64.0 | 40 | 20 | | | M4 | | | |
| GP10-20A | 10 | 20 | 70.4 | 64.0 | 45 | 25 | 22 | 30 | M4 | 5 | 8 × 3.3 | GSR35 R |
| GP10-25A | | 25 | 86.4 | 80.0 | 60 | 25 | | | | | 10 × 3.3 | |

1) When placing an order, specify the model numbers given in this table.
2) We can provide non-standard pinions with a different number of teeth. If you require them, contact us.

● **Pinion for racks (type C)**
  **Hole-diameter reworking type**



Unit : mm

| Model No. | Pitch | No. of teeth | Tip circle diameter A | Meshing PCD B | Boss diameter C | Hole diameter D | Face width E | Overall length F | Applicable LM-Guide Model No. |
|---|---|---|---|---|---|---|---|---|---|
| GP 6-20C | 6 | 20 | 42.9 | 39.0 | 30 | 12 | 16.5 | 24.5 | GSR25 R |
| GP 6-25C | | 25 | 51.9 | 48.0 | 35 | 15 | | 24.5 | |
| GP 8-20C | 8 | 20 | 57.1 | 52.0 | 40 | 18 | 19 | 26 | GSR30 R |
| GP 8-25C | | 25 | 69.1 | 64.0 | 40 | 18 | | 26 | |
| GP10-20C | 10 | 20 | 70.4 | 64.0 | 45 | 18 | 22 | 30 | GSR35 R |
| GP10-25C | | 25 | 86.4 | 80.0 | 60 | 18 | | 30 | |

1) When placing an order, specify the model numbers given in this table.
2) We can provide non-standard pinions with a different number of teeth. If you require them, contact us.

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## LM-Rail Standard and Maximum Lengths

The LM-rail standard lengths of rack-toothed LM Guide type GSR-R are shown in Table 10

As LM rails of type GSR-R are provided with a special end-face finish, they can be connected without further working.
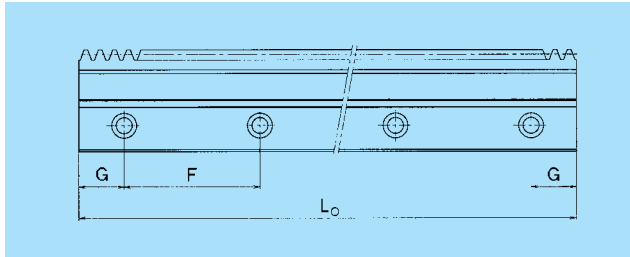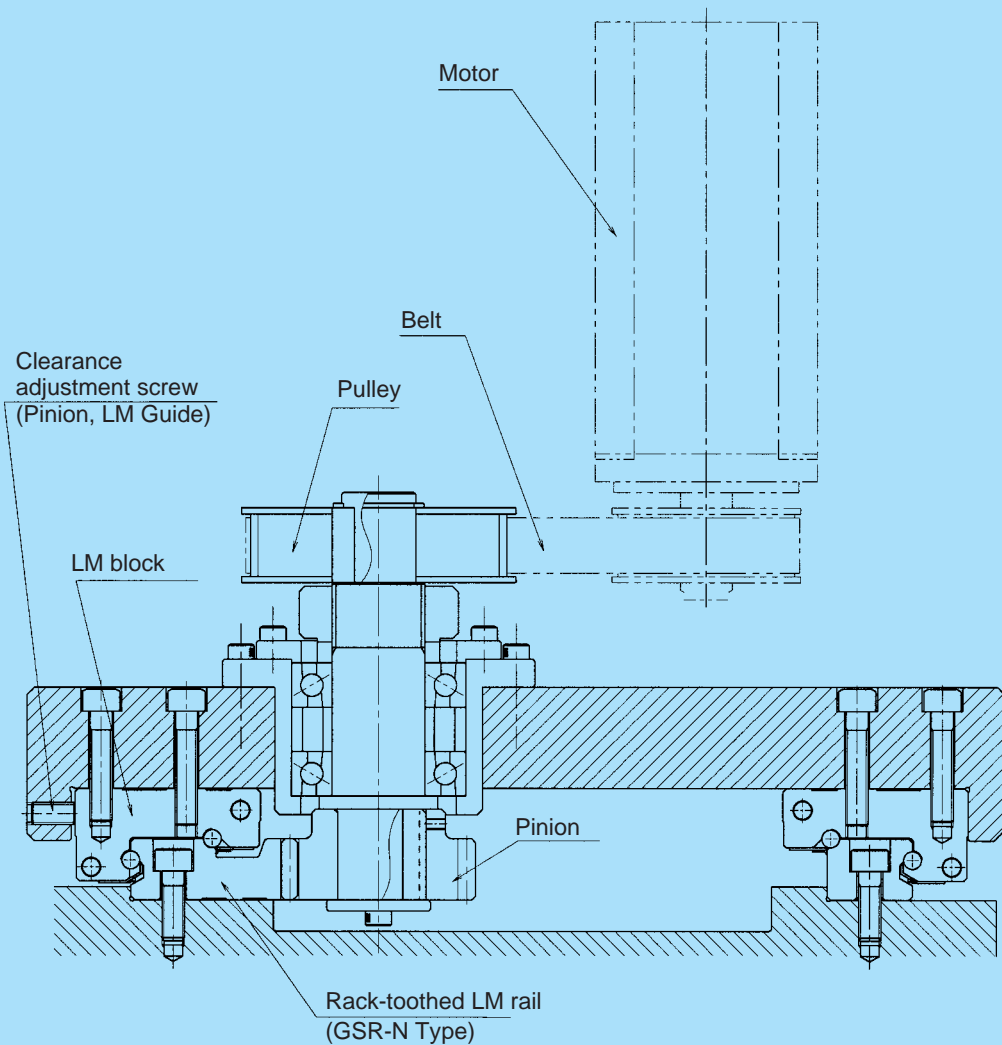


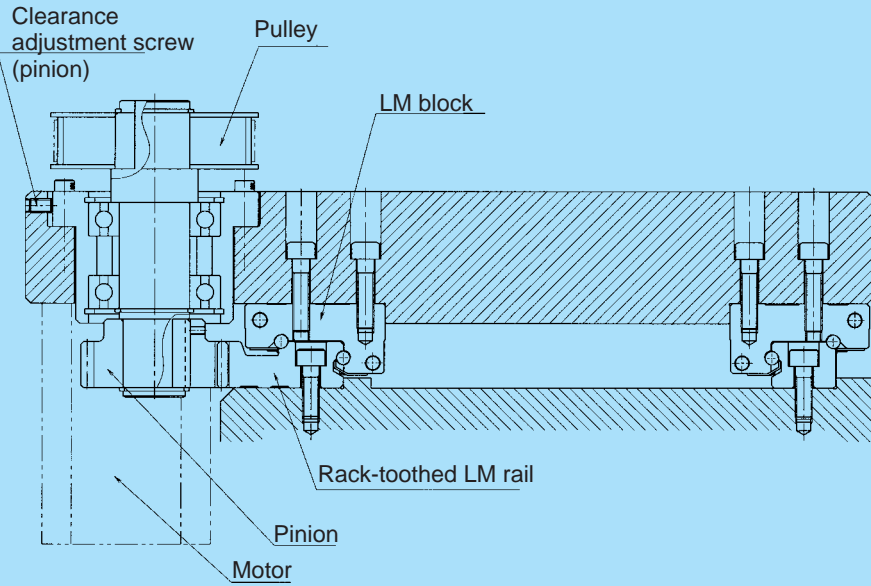Table 10 Type-GSR-R LM-Rail Standard and Maximum Lengths

Unit : mm

| Model No. | LM-rail standard length (L$_0$) | Standard pitch F | G |
|---|---|---|---|
| GSR 25 - R | 1500 | 60 | 30 |
| | 2004 | | 42 |
| GSR 30 - R | 1504 | 80 | 32 |
| | 2000 | | 40 |
| GSR 35 - R | 1500 | 80 | 30 |
| | 2000 | | 40 |

## Sample table assembly

Clearance adjustment screw (pinion)
Pulley
LM block
Rack-toothed LM rail
Pinion
Motor

Motor
Belt
Clearance adjustment screw (Pinion, LM Guide)
Pulley
LM block
Pinion
Rack-toothed LM rail (GSR-N Type)

# Rack-Toothed LM Guide Type GSR-R



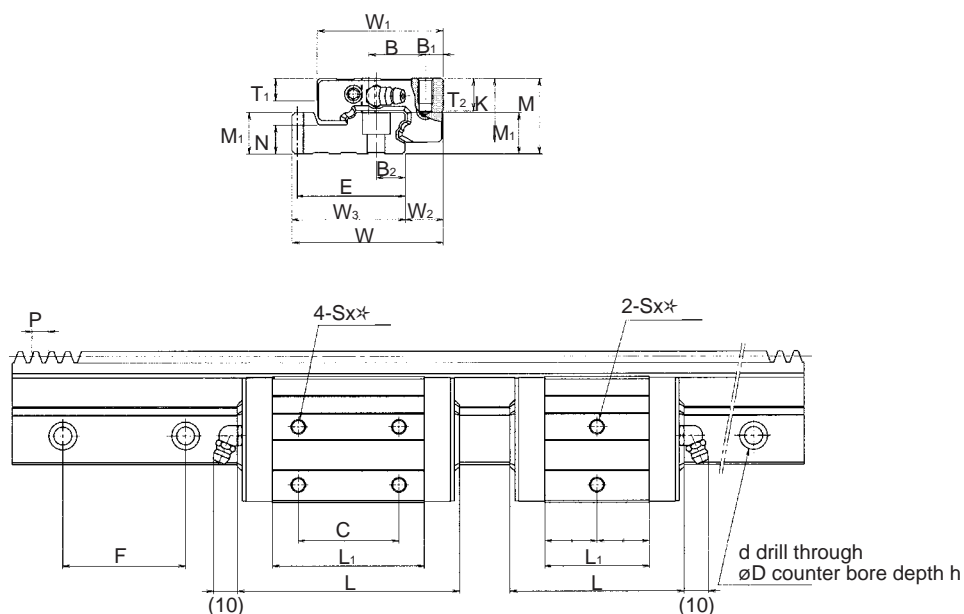| Model No. | Reference pitch | Module | Pitch line height | External dimensions | | | LM-block dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Height | Width | Length | B | C | $B_1$ | $S \times \ell$ | $W_1$ | $L_1$ | K | $T_1$ | $T_2$ |
| | P | | E | M | W | L | | | | | | | | | |
| GSR 25T - R GSR 25V - R | 6 | 1.91 | 43 | 30 | 59.91 | 88 69 | 23 | 40 | 7 | M6 × 10 | 50 | 60.2 41.2 | 25.5 | 9 | 13 |
| GSR 30T - R | 8 | 2.55 | 48 | 33 | 67.05 | 103 | 26 | 45 | 8 | M8 × 12 | 57 | 70.3 | 28.5 | 10 | 15 |
| GSR 35T - R | 10 | 3.18 | 57 | 38 | 80.18 | 117 | 32 | 50 | 9 | M8 × 15 | 68 | 80.3 | 32.5 | 12 | 16 |

Notes:

- LM Guides with special modules and pitches can be manufactured.  Please contact THK for further information.
- For model-number coding, see page A-300.
- For the procedure for checking pinion strength, see page A-302.

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A-IV

Unit : mm

| Grease nipple | LM-rail dimensions | | | | | | | Basic load rating | | Mass | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Width $M_1$ | $W_2$ | $W_3$ | $B_2$ | N | $d \times D \times h$ | F | C kN | $C_0$ kN | LM block kg | LM rail kg/m |
| B-M6F | 16.5 | 15 | 44.91 | 11.5 | 11.5 | $7 \times 11 \times 9$ | 60 | 13.5 | 19.0 | 0.5 | 4.7 |
| | | | | | | | | 10.29 | 12.65 | 0.29 | |
| B-M6F | 19 | 16.5 | 50.55 | 14 | 12 | $9 \times 14 \times 12$ | 80 | 18.8 | 25.9 | 0.6 | 5.9 |
| B-M6F | 22 | 20 | 60.18 | 17 | 14.5 | $11 \times 17.5 \times 14$ | 80 | 25.1 | 33.8 | 1.0 | 8.1 |

- For LM-rail standard lengths, see page A-304.
- For static permissible moments $M_A$ and $M_B$, see page A-298.