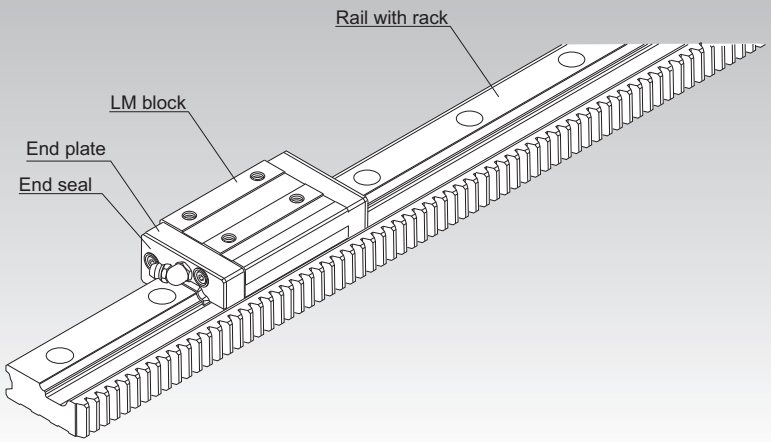
GSR-R

Separate Type (Radial) LM Guide Model GSR-R



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and end plates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they will not fall out.
Because the top face of the LM block is inclined, clearance is eliminated and an appropriate preload is applied simply by securing the LM block with mounting bolts.
Model GSR-R is based on model GSR, but has rack teeth on the LM rail. This facilitates the design and assembly of drive mechanisms.
Note: Model GSR-R cannot be used in single-axis applications.

Reduced Machining and Assembly Costs

Integrating the LM rail (linear guide) and rack (drive) into a single-piece structure reduces labor and time for machining the rack mounting surface, assembling, and adjusting the guide system, and thus significantly reduces costs.

Design with Ease

The travel distance per turn of the pinion is specified by the integer value. This makes it easy to calculate the travel distance per pulse when the LM Guide is used in combination with a stepping motor or servomotor.

Space Saving

Since a rack is included on the rail, machine size can be reduced.

Long Stroke

The end faces of the LM rail are machined for jointed use. To obtain a long stroke, simply joint LM rails of the standard length.

High Durability

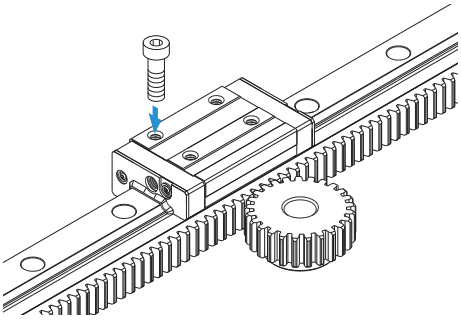
The rack teeth have a width equal to the LM rail height. The rack uses high-grade steel with proven performance and the tooth surface is heat-treated to ensure high durability.

Types and Features

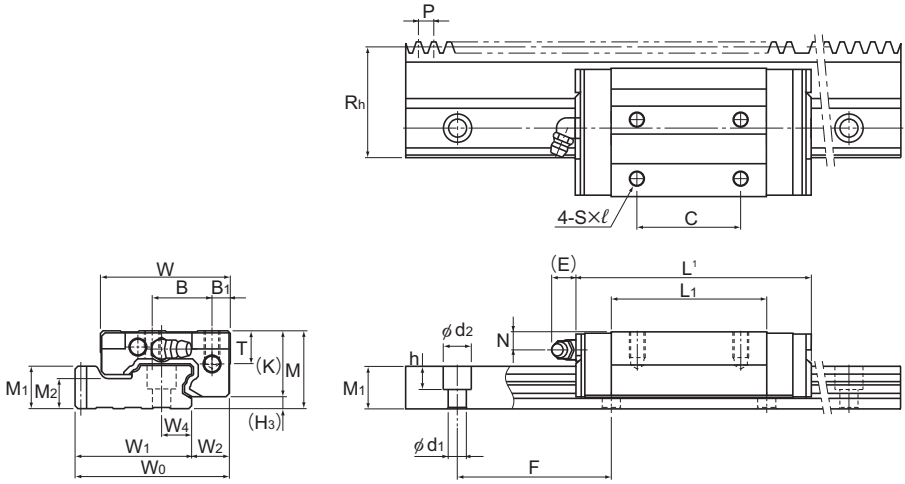
Model GSR-R (Rail with Rack)

Dimensional Table⇒A1-304

Since 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 so rigid.



Model GSR-R



Model GSR-T-R

Model No.	Rack			Outer dimensions				LM block dimensions										Grease nipple	H_3
	Reference pitch dimension P	Module	Pitch line height Rh	Height M	Width W	W_0	Length[1] L	B_1	B	C	S×ℓ	L_1	T	K	N	E		
GSR 25V-R GSR 25T-R	6	1.91	43	30	50	59.91	69 88	7	23	— 40	M6×10	41.2 60.2	12.7	25.4	7	12	B-M6F	4.6
GSR 30T-R	8	2.55	48	33	57	67.05	103	8	26	45	M8×12	70.3	14.6	28.5	7	12	B-M6F	4.5
GSR 35T-R	10	3.18	57	38	68	80.18	117	9	32	50	M8×15	80.3	15.6	32.5	8	12	B-M6F	5.5

Model number coding

Single-rail LM Guide

GSR25T 2 UU +2004L H R T

- GSR25T: Model number
- 2: No. of LM blocks
- UU: Contamination protection accessory symbol
- +2004L: LM rail length (in mm)
- H: Accuracy symbol — Normal grade (No Symbol)/High accuracy grade (H)
- R: Symbol for rail with rack type — R: Symbol for rail with rack type
- T: Symbol for LM rail jointed use

Notes: This model number indicates that a single-rail unit constitutes one set.
See **A1-547** for contamination protection accessories. See **A1-84** for accuracy symbol.

LM block

GSR25T UU

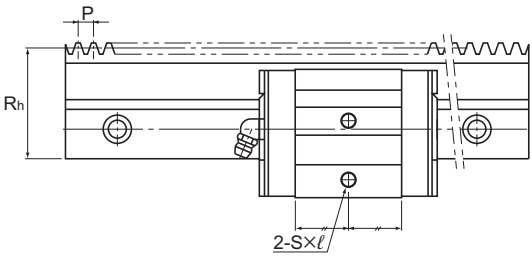
- GSR25T: Model number
- UU: Contamination protection accessory symbol

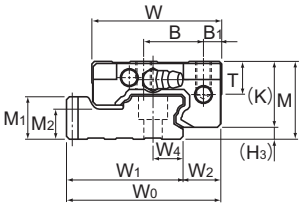
Rail with rack

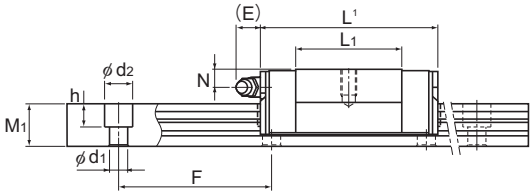
GSR25-2004L H R

- H: Accuracy symbol — Normal grade (No Symbol) / High accuracy grade (H)
- R: Symbol for rail with rack type

Notes: See **A1-547** for contamination protection accessories. See **A1-84** for accuracy symbol.







Model GSR25V-R

Unit: mm

	LM rail dimensions							Basic load rating[2]		Static permissible moment kN·m[3]				Mass	
	Width			Height	Pitch			C	C0	MA		MB		LM block	LM rail
	W1	W2	W4	M1	F	M2	d1×d2×h	kN	kN	1 block	2 blocks	1 block	2 blocks	kg	kg/m
	44.91	15	11.5	16.5	60	11.5	7×11×9	15.5 20	15.2 22	0.102 0.205	0.625 1.11	0.0891 0.176	0.541 0.961	0.29 0.5	4.7
	50.55	16.5	14	19	80	12	9×14×12	27.8	29.9	0.325	1.77	0.28	1.52	0.6	5.9
	60.18	20	17	22	80	14.5	11×17.5×14	37	39.1	0.485	2.63	0.419	2.27	1	8.1

[1] Length L shown in the table is the length with the contamination protection accessories, code UU or SS.
If other contamination protection accessories or lubricant equipment are installed, the total block length will increase. (See **A1-521** or **A1-543**)

[2] The basic load rating is for a load in the radial direction.
Use **A1-61** on Table 7 to calculate the load rating for loads in the reverse-radial direction or lateral direction.

[3] Static permissible moment 1 block: the static permissible moment with one LM block
2 blocks: the static permissible moment with two LM blocks in close contact with each other
A moment in the M_C direction can be received if two rails are used in parallel. However, since it depends on the distance between the two rails, it has been omitted.

Notes: For oil lubrication, be certain to let THK know the mounting orientation and where the LM block piping joint should be attached.
(Mounting orientation: see **A1-12**, Lubricant: see **A24-2**)
A special type with a module pitch is also available. Contact THK for details.
For checking the pinion strength, see **A1-308**.

Options⇒A1-507

Standard Lengths of LM Rails

Table 1 shows the standard LM rail lengths of model GSR-R variations.

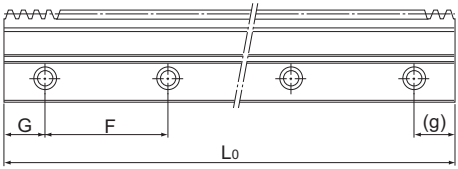


Table 1: Standard Lengths of LM Rails for Model GSR-R

Unit: mm

Model No.	GSR 25-R		GSR 30-R		GSR 35-R	
LM rail Standard lengths (L_0)	1500	2004	1504	2000	1500	2000
Standard pitch F	60	60	80	80	80	80
G, g	30	42	32	40	30	40

Rack and Pinion

Joining Two or More Rails

The end faces of rails with built-in racks are machined to facilitate jointed rail installation by leaving a clearance between rails after assembly.
Use of a special jig as shown in Fig. 1 will make the connection easier.
(THK also offers the rack-aligning jig.)

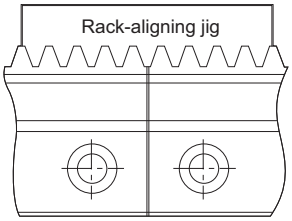


Fig. 1: Rack Connection Method

Reworking the Pinion Hole

Only the teeth of the type with a reworkable pinion hole (type C) are heat-treated. The hole and keyway can therefore be reworked by the user to the desired diameter and shape.
When reworking the pinion hole, be sure to take the following into account.
The material of the type with a reworkable hole diameter (type C): S45C

(1) When chucking the teeth of a type with a reworkable hole diameter, use a jaw scroll chuck or something like it to maintain the tooth profile.
(2) The pinion is produced using the center of the hole as a reference point. The center of the hole should therefore be used as a reference point when the pinion is aligned.
When checking the pinion runout, refer to the boss sides.
(3) Keep the reworked hole diameter within roughly 60 to 70% of the boss diameter.

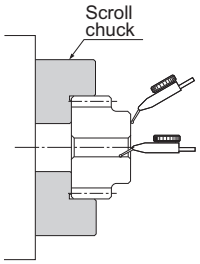


Fig. 2

Lubricating the Rack and Pinion

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

Notes: Use a lubricant of the same type of thickener as that contained in the LM Guide.
Unpredictable wear may occur in the rack and pinion according to load conditions and lubrication status. Contact THK when undertaking design.

Checking Strength

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

(1) Calculate the maximum thrust acting on the pinion.
(2) Divide the permissible power transmission capacity of the pinion to be used (Table 1) by an overload factor (Table 2).
(3) By comparing the thrust acting on the pinion obtained in step 1 with the pinion power transmission capacity obtained in step 2, make sure the applied thrust does not exceed the permissible power transmission capacity.

Example Calculation

When Model GSR-R is used in a horizontal conveyance system receiving a medium impact (assuming external load to be zero):

● Conditions

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

● Consideration

(1) Calculating the maximum thrust
Calculated the thrust during acceleration/deceleration.

$$Fmax = m \cdot \frac{v}{T_1} = 1\ kN$$

(2) Permissible power transmission capacity of the pinion

$$Pmax = \frac{\text{Permissible power transmission capacity (see Table 1)}}{\text{Overload factor (see Table 2)}} = \frac{2.33}{1.25} = 1.86\ kN$$

(3) Comparison between the maximum thrust and the permissible power transmission capacity of the pinion
Fmax < Pmax
Therefore, it is judged that the subject model number can be used.

Table 1: Permissible Power Transmission Capacity
Unit: kN

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

Table 2: Overload Factor

Impact from the motor	Impact from the driven machine		
	Uniform load	Medium impact	Large impact
Uniform load (electric motor, turbine, hydraulic motor, etc.)	1.0	1.25	1.75

(Excerpt from JGMA401-01)

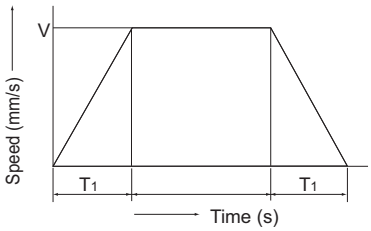
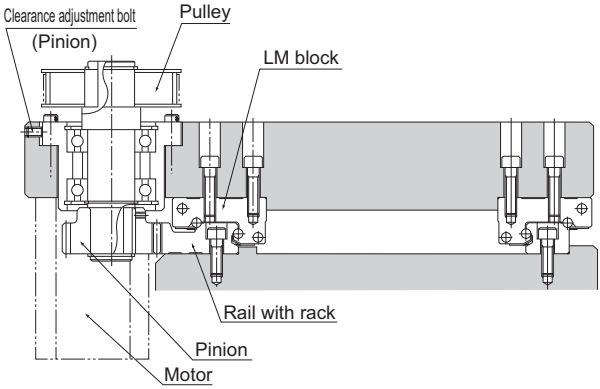
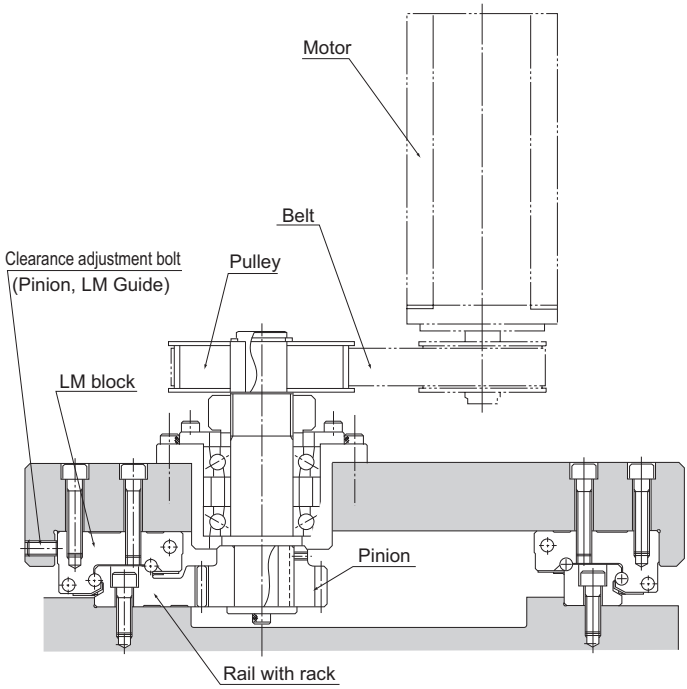


Fig. 3

Example of Installing Model GSR-R with a Table

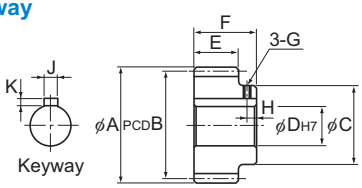




Rack and Pinion Dimensional Drawing

Pinion for rack - type A

Type with a worked keyway



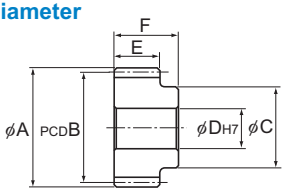
Unit: mm

Model No.	Pitch	Number of teeth	Tip circle diameter A	Meshing PCD B	Boss diameter C	Hole diameter D	Tooth width E	Overall length F	G	H	Keyway J×K	Supported model numbers
GP6-20A	6	20	42.9	39	30	18	16.5	24.5	M3	4	6×2.8	GSR 25-R
GP6-25A		25	51.9	48	35	18						
GP8-20A	8	20	57.1	52	40	20	19	26	M3	5	8×3.3	GSR 30-R
GP8-25A		25	69.1	64	40	20			M4			
GP10-20A	10	20	70.4	64	45	25	22	30	M4	5	8×3.3	GSR 35-R
GP10-25A		25	86.4	80	60	25					10×3.3	

Notes: When placing an order, specify the model number from the table.
Non-standard pinions with different numbers of teeth are also available upon request. Contact THK for details.

Pinion for rack - type C

Type with a reworkable hole diameter

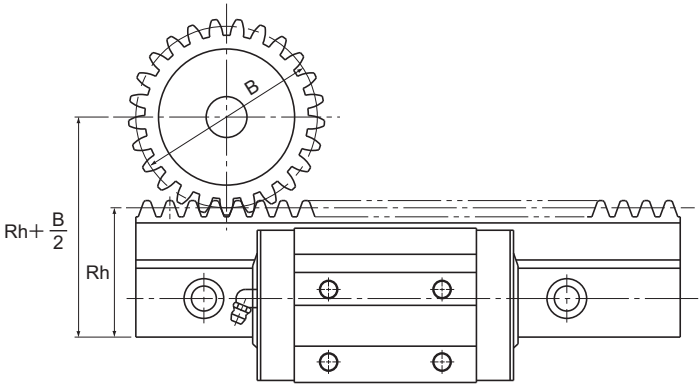


Unit: mm

Model No.	Pitch	Number of teeth	Tip circle diameter A	Meshing PCD B	Boss diameter C	Hole diameter D	Tooth width E	Overall length F	Supported model numbers
GP 6-20C	6	20	42.9	39	30	12	16.5	24.5	GSR 25-R
GP 6-25C		25	51.9	48	35	15			
GP 8-20C	8	20	57.1	52	40	18	19	26	GSR 30-R
GP 8-25C		25	69.1	64	40	18			
GP10-20C	10	20	70.4	64	45	18	22	30	GSR 35-R
GP10-25C		25	86.4	80	60	18			

Notes: When placing an order, specify the model number from the table.
Non-standard pinions with different numbers of teeth are also available upon request. Contact THK for details.

Dimensions when the LM rail is used in combination with a pinion



Unit: mm

Model GSR model No.	Pinion model No.	LM rail pitch line height Rh	Pinion meshing PCD B	Rh+B/2
GSR 25-R	GP 6-20A	43	39	62.5
	GP 6-20C			
	GP 6-25A		48	67
	GP 6-25C			
GSR 30-R	GP 8-20A	48	52	74
	GP 8-20C			
	GP 8-25A		64	80
	GP 8-25C			
GSR 35-R	GP 10-20A	57	64	89
	GP 10-20C			
	GP 10-25A		80	97
	GP 10-25C			