

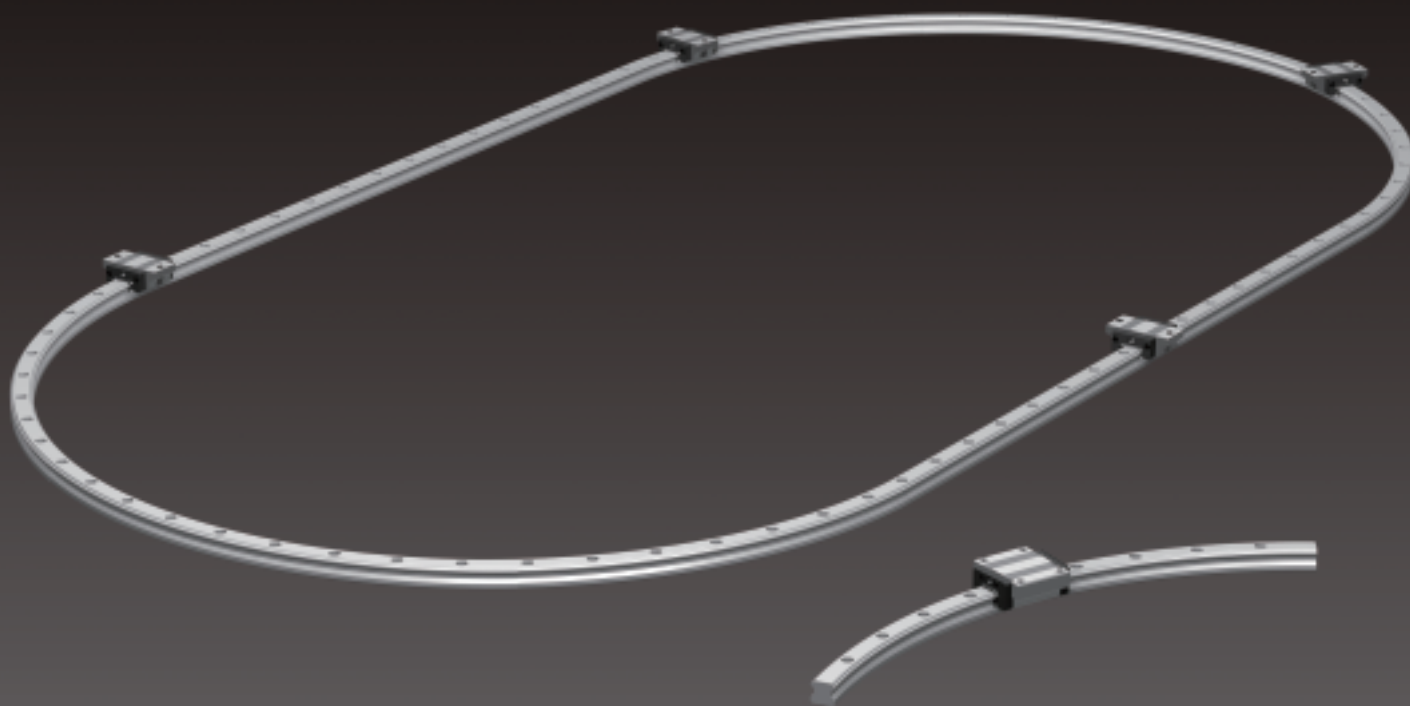


Compliant with
New Accuracy Standards

LM Guide

R Guide / Straight-Curved Guide
Achieving a Simplified Mechanism

HCR/HMG



THK CO., LTD.
TOKYO, JAPAN

CATALOG No.306-5E

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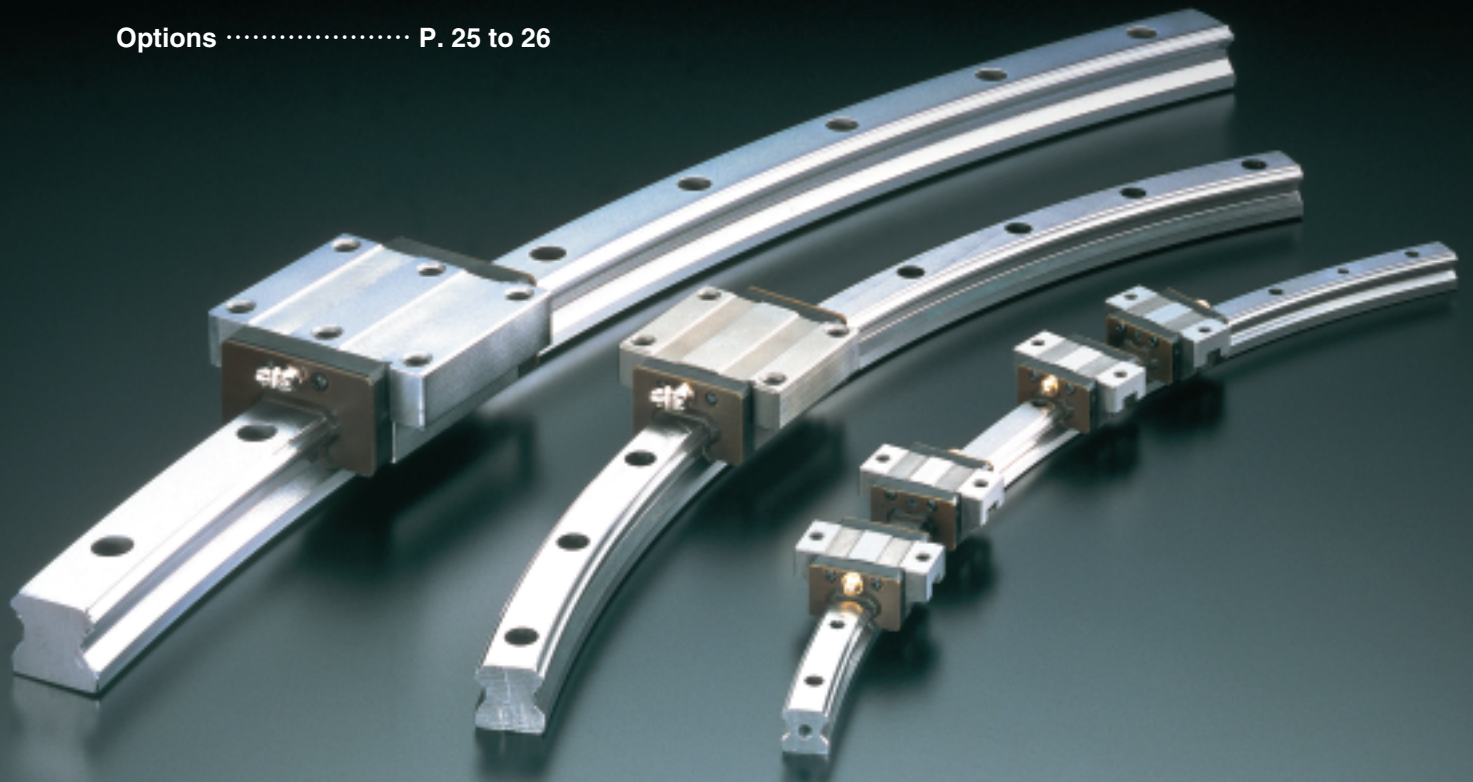
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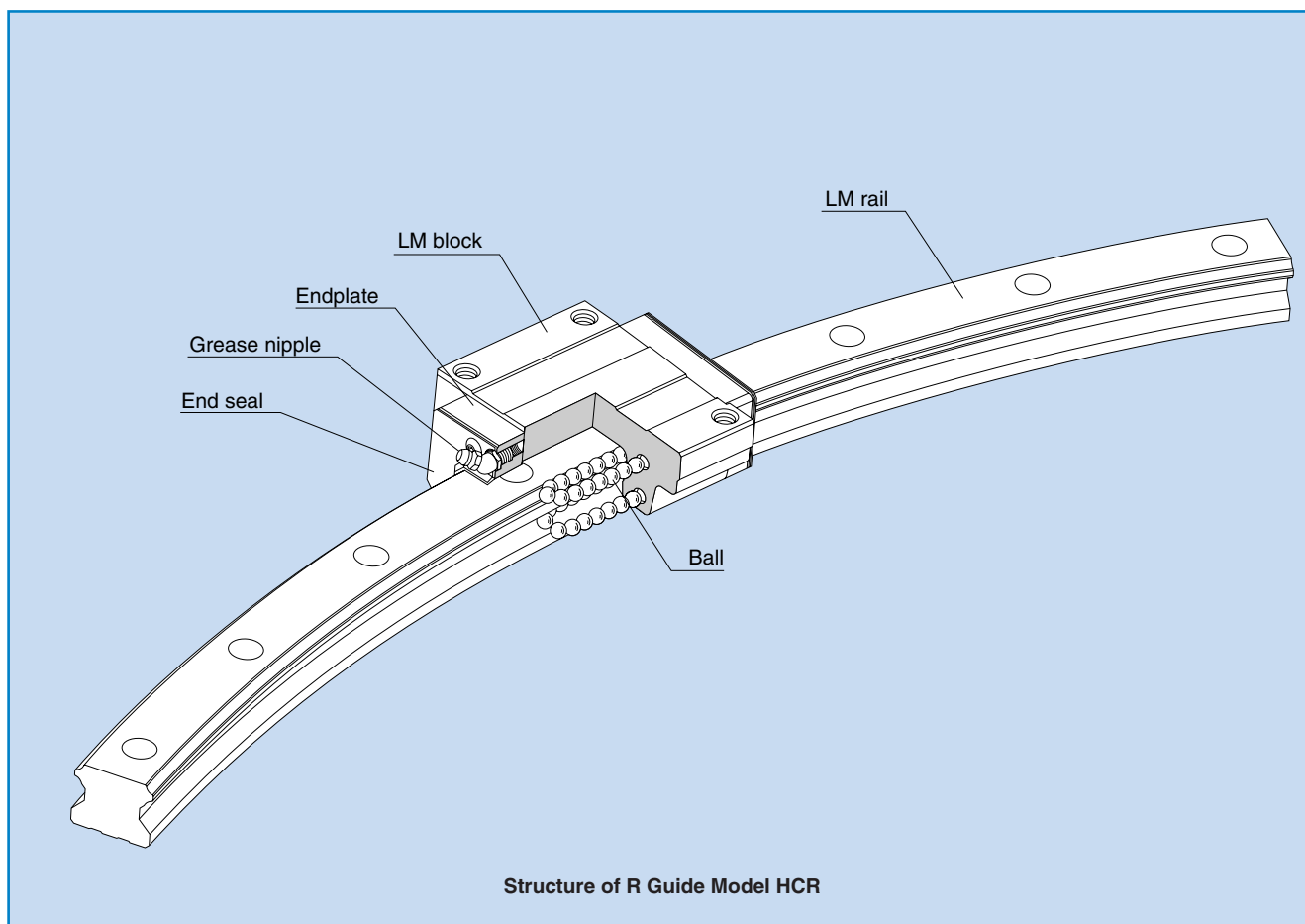
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HCR

R Guide



Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.

With a structure that is basically the same as four-way equal load type LM Guide model HSR, which has a proven track record, this R Guide is a new concept product that allows highly accurate circular-arc motion.

● Freedom of design

Multiple LM blocks can individually move on the same rail. By arranging LM blocks at the load points, efficient structural design is achieved.

● Shortened assembly time

This model allows clearance-free, highly accurate circular motion as opposed to sliding guides or cam followers. You can easily assemble this model simply by mounting the LM rail and LM blocks with bolts.

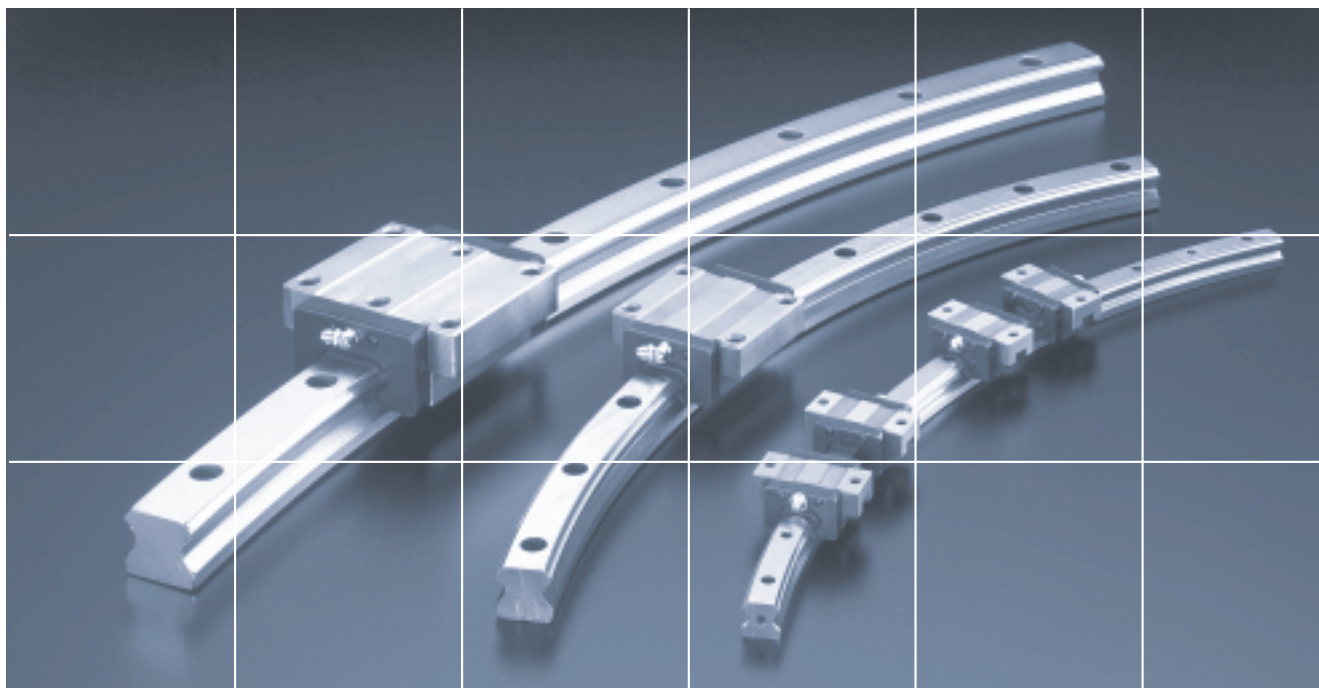
● Allows circular motion of 5 m or greater

It allows circular motion of 5 m or greater, which is impossible with swivel bearings.

In addition, the use of this model makes it easy to assemble, disassemble and reassemble equipment that circularly moves.

● Capable of receiving loads in all directions

This model is capable of receiving loads in all directions since it has a structure that is basically the same as model HSR.



HCR Outline

Model HCR - Product Overview

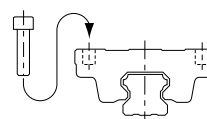
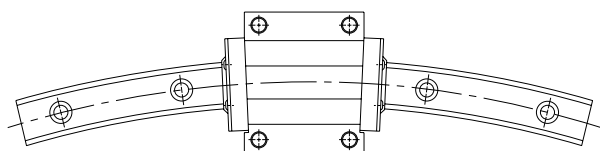
A circular motion guide of 4-way equal-load type, this model ensures backlash-free, highly accurate circular motion. Since it allows efficient design where LM blocks are arranged at the load points, large circular motion can easily be achieved.

Major applications Large swivel base / pendulum vehicle for railroad / pantagraph / control unit / optical measuring machine / tool grinding machine / X-ray machine / CT scanner / medical equipment / stage setting / multistory garage / amusement machine / turntable / tool changer

Model HCR

The flange of its LM block has tapped holes.

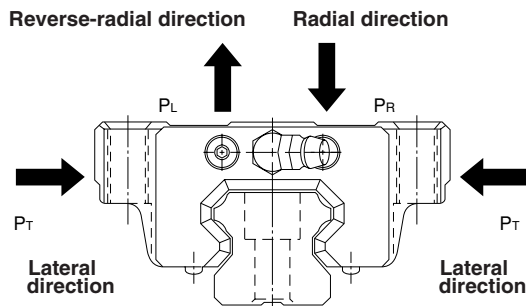
- HCR 12A ● HCR 35A
- HCR 15A ● HCR 45A
- HCR 25A ● HCR 65A



Rated Loads in All Directions

Model HCR is capable of receiving loads in all four directions: radial, reverse-radial and lateral directions.

The basic load ratings are uniform in the four directions (radial, reverse-radial and lateral directions), and their actual values are provided in the dimensional table*1 for HCR.



*1: Dimensional table for model HCR

Model HCR → pages 9-10

Equivalent Load

When the LM block of model HCR receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R (P_L) + P_T$$

where

P_E : Equivalent load	[N]	P_R : Radial load	[N]
· Radial direction		P_L : Reverse-radial load	[N]
· Reverse-radial direction		P_T : Lateral load	[N]
· Lateral direction			

***1: Basic dynamic load rating (C)**

It refers to a load with a constant magnitude and direction under which the rated life (L) of a group of identical LM Guide units independently operating is 50 km.

Service life

The service life of an LM Guide is subject to variations even under the same operational conditions. Therefore, it is necessary to use the rated life defined below as a reference value for obtaining the service life of the LM Guide.

Rated life

The rated life means the total travel distance that 90% of a group of units of the same LM Guide model can achieve without flaking (scale-like exfoliation on the metal surface) after individually running under the same conditions.

Service life time

Once the rated life (L) has been obtained, the service life time can be obtained using the equation on the right if the stroke length and the number of reciprocations are constant.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3 \times 50$$

- L : Rated life [km]
- C : Basic dynamic load rating** [N]
- P_C : Calculated load [N]
- f_H : Hardness factor (see Fig. 1)
- f_T : Temperature factor (see Fig. 2)
- f_C : Contact factor (see Table 1)
- f_W : Load factor (see Table 2)

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

- L_h : Service life time [h]
- l_s : Stroke length [mm]
- n₁ : No. of reciprocations per min [min⁻¹]

f_H : Hardness factor

To ensure the achievement of the optimum load capacity of the LM Guide, the raceway hardness must be between 58 and 64 HRC. At hardness below this range, the basic dynamic and static load ratings decrease. Therefore, the rating values must be multiplied by the respective hardness factors (f_H). Since the LM Guide has sufficient hardness, the f_H value for the LM Guide is normally 1.0 unless otherwise specified.

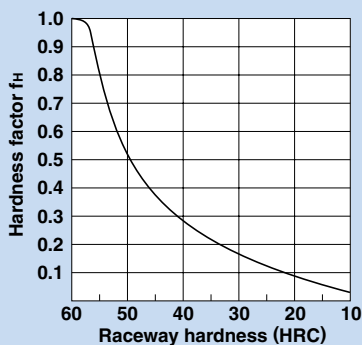


Fig. 1

f_C : Contact factor

When multiple LM blocks are used in close contact with each other, it is difficult to achieve uniform load distribution due to moment loads and mounting-surface accuracy. When using multiple blocks in close contact with each other, multiply the basic load rating (C or C_s) by the corresponding contact factor indicated in Table 1.

Note: When uneven load distribution is expected in a large machine, consider using a contact factor from Table 1.

Table 1 Contact Factor (f_C)

Number of blocks used in close contact	Contact factor f _C
2	0.81
3	0.72
4	0.66
5	0.61
6 or more	0.6
Normal use	1

f_T : Temperature factor

Since the service temperature of Caged Ball LM Guides is normally 80°C or below, the f_T value is 1.0.

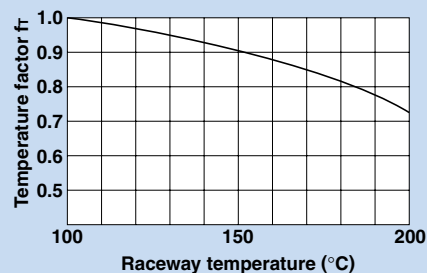


Fig. 2

f_W : Load factor

In general, reciprocating machines tend to produce vibrations or impact during operation. It is especially difficult to accurately determine all vibrations generated during high-speed operation and impacts produced each time the machine starts and stops. Therefore, where the effects of speed and vibration are estimated to be significant, divide the basic dynamic load rating (C) by a load factor selected from Table 2, which contains empirically obtained data.

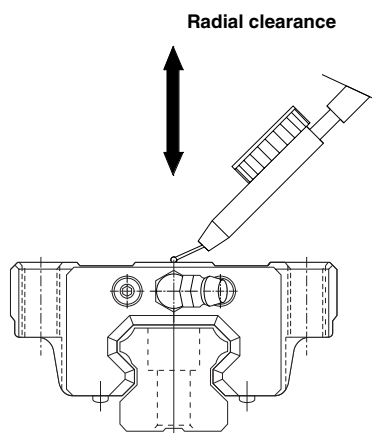
Table 2 Load Factor (f_W)

Vibration/impact	Speed [V]	f _W
Faint	Very slow V ≤ 0.25m/s	1 to 1.2
Weak	Slow 0.25 < V ≤ 1m/s	1.2 to 1.5
Moderate	Medium 1 < V ≤ 2m/s	1.5 to 2
Strong	Fast V > 2m/s	2 to 3.5

Radial Clearance Standard

Since the radial clearance of an LM Guide greatly affects the running accuracy, load carrying capacity and rigidity of the LM Guide, it is important to select an appropriate clearance according to the application.

In general, selecting a negative clearance (i.e., a preload*1 is applied) while taking into account possible vibrations and impact generated from reciprocating motion favorably affects the service life and the accuracy.



***1: Preload**

Preload is an internal load applied to the rolling elements (balls) of an LM block in advance in order to increase its rigidity.

The clearance of all model HCR units is adjusted to the designated value before being shipped. Therefore, it is unnecessary to adjust the preload.

Unit: μm

Model No.	Indication symbol	Normal	Light load
		No symbol	C1
12		- 3 to +3	- 6 to - 2
15		- 4 to +2	- 12 to - 4
25		- 6 to +3	- 16 to - 6
35		- 8 to +4	- 22 to - 8
45		-10 to +5	- 25 to -10
65		-14 to +7	- 32 to -14

***1: Running parallelism**

It refers to the parallelism error between the LM block and the LM rail datum plane when the LM block travels the whole length of the LM rail with the LM rail secured on the reference datum plane using bolts.

***2: Difference in height M**

It indicates the difference between the minimum and maximum values of height (M) of each of the LM blocks used on the same plane in combination.

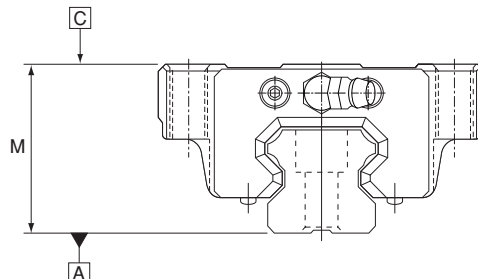
***3: Difference in width W_z**

It indicates the difference between the minimum and maximum values of the width (W_z) between each of the LM blocks, mounted on one LM rail in combination, and the LM rail.

Accuracy Standard

The accuracy of model HCR is specified in terms of running parallelism (*1), dimensional tolerance for height and width, and height and width difference between a pair (*2,*3) when two or more LM blocks are used on one rail or when two or more rails are mounted on the same plane.

The accuracy of model HCR is categorized into Normal grade and High-accuracy grade by model numbers, as indicated in the table below.



Unit: mm

Model No.	Accuracy standard	Normal grade	High-accuracy grade
	Item	No symbol	H
12 15 25 35	Dimensional tolerance for height M	± 0.2	± 0.2
	Difference in height M	0.05	0.03
	Running parallelism of surface C against surface A	as shown in the table below	
45 65	Dimensional tolerance for height M	± 0.2	± 0.2
	Difference in height M	0.06	0.04
	Running parallelism of surface C against surface A	as shown in the table below	

LM Rail Length and Running Parallelism for Models HCR

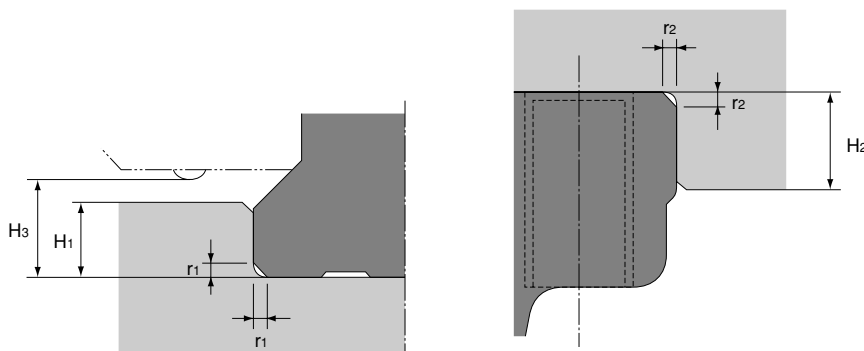
Unit: μm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	High-accuracy grade
		No symbol	H
—	125	30	15
125	200	37	18
200	250	40	20
250	315	44	22
315	400	49	24
400	500	53	26
500	630	58	29
630	800	64	32
800	1000	70	35
1000	1250	77	38
1250	1600	84	42
1600	2000	92	46

Shoulder Height of the Mounting Base and the Corner Radius

Normally, the mounting base for the LM rail and the LM block has a datum plane on the side face of the shoulder of the base in order to allow easy installation and highly accurate positioning.

The corner of the mounting shoulder must be machined to have a recess, or machined to be smaller than the corner radius "r," to prevent interference with the chamfer of the LM rail or the LM block.



Shoulder for the LM rail

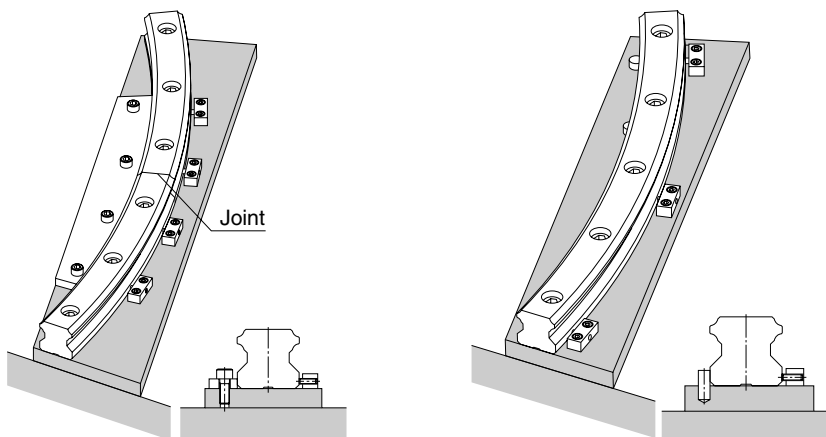
Shoulder for the LM block

Unit: mm

Model No.	Corner radius for the LM rail r_1 (max)	Corner radius for the LM block r_2 (max)	Shoulder height for the LM rail H_1	Maximum shoulder height for the LM block H_2	H_3
12	0.8	0.5	2.6	6	3.1
15	0.5	0.5	3	4	3.5
25	1	1	5	5	5.5
35	1	1	6	6	7.5
45	1	1	8	8	10
65	1.5	1.5	10	10	14

Procedure for Assembling Model HCR

To install the LM rails of R Guide model HCR, we recommend having any form of datum point (such as a pin) on the reference side (inside) of the LM rail, and pressing the LM rail to the datum point then stopping the LM rail with a presser plate from the counter-reference surface.

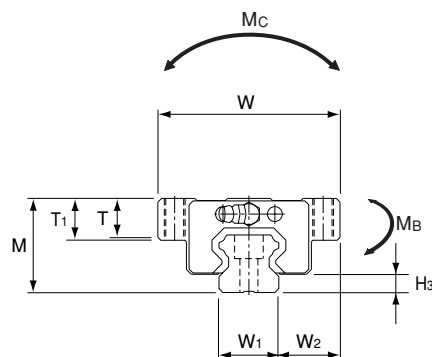


Method for Securing the LM Rails at the Joint

Method for Securing the LM Rail Using a Pin as a Datum Point

R Guide Model HCR

Dimensional Table for Model HCR



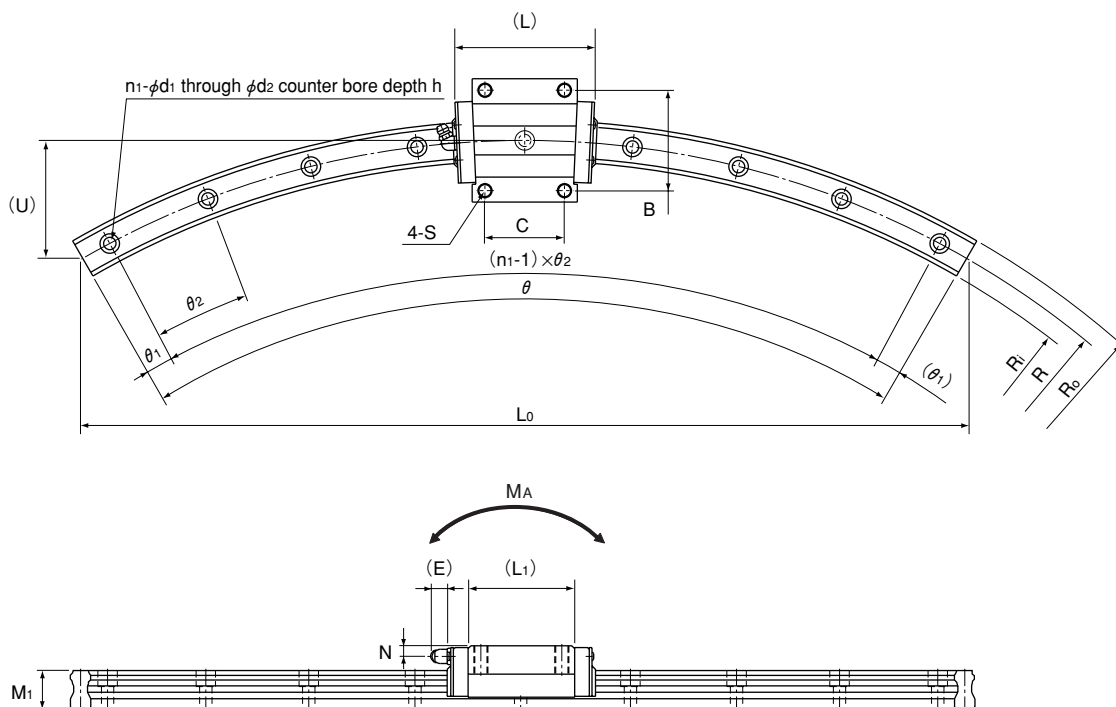
Model No.	Outer dimensions			LM block dimensions								
	Height M	Width W	Length L	B	C	S	L _i	T	T _i	N	E	Grease nipple
HCR 12A+60/100R	18	39	44.6	32	18	M 4	30.5	4.5	5	3.4	3.5	PB1021B
HCR 15A+60/150R	24	47	54.5	38	28	M 5	38.8	10.3	11	4.5	5.5	PB1021B
HCR 15A+60/300R			55.5									
HCR 15A+60/400R			55.8									
HCR 25A+60/500R	36	70	81.6	57	45	M 8	59.5	14.9	16	6	12	B-M6F
HCR 25A+60/750R			82.3									
HCR 25A+60/1000R			82.5									
HCR 35A+60/600R	48	100	107.2	82	58	M10	80.4	19.9	21	8	12	B-M6F
HCR 35A+60/800R			107.5									
HCR 35A+60/1000R			108.2									
HCR 35A+60/1300R			108.5									
HCR 45A+60/800R	60	120	136.7	100	70	M12	98	23.9	25	10	16	B-PT1/8
HCR 45A+60/1000R			137.3									
HCR 45A+60/1200R			137.3									
HCR 45A+60/1600R			138									
HCR 65A+60/1000R	90	170	193.8	142	106	M16	147	34.9	37	19	16	B-PT1/8
HCR 65A+60/1500R			195.4									
HCR 65A+45/2000R			195.9									
HCR 65A+45/2500R			196.5									
HCR 65A+30/3000R			196.5									

■ Example of model number coding

HCR25A 2 UU C1+60/1000R H T

1 2 3 4 5 6 7 8

- 1 Model number
- 2 No. of LM blocks used on the same rail
- 3 Dust prevention accessory symbol (see page 12)
- 4 Radial clearance symbol (see page 6)
- 5 R-Guide center angle
- 6 LM rail radius (in mm)
- 7 Accuracy symbol (see page 7)
- 8 Symbol for connected LM rail type



Unit: mm

LM rail dimensions													Basic load rating		Static permissible moment kN-m*					Mass	
R	Ro	Ri	Lo	U	Width		Height	d1×d2×h	n1	θ°	θ1°	θ2°	C	Co	MA	MB	MC	LM block	LM rail		
					W1	W2	M1						[kN]	[kN]	1 block	2 blocks in close contact	1 block	2 blocks in close contact	1 block	[kg]	[kg/m]
100	106	94	100	13.4	12	13.5	11	3.5×6×5	3	60	7	23	4.7	8.53	0.0409	0.228	0.0409	0.228	0.0445	0.08	0.83
150	157.5	142.5	150	20.1					3	7	23		6.66	10.8							
300	307.5	292.5	300	40	15	16	15	4.5×7.5×5.3	5	60	6	12	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
400	407.5	392.5	400	54					7	3	9		8.33	13.5							
500	511.5	488.5	500	67					9	2	7										
750	761.5	738.5	750	100	23	23.5	22	7×11×9	12	60	2.5	5	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
1000	1011.5	988.5	1000	134					15	2	4										
600	617	583	600	80					7	3	9										
800	817	783	800	107	34	33	29	9×14×12	11	60	2.5	5.5	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6
1000	1017	983	1000	134					12	2.5	5										
1300	1317	1283	1300	174					17	2	3.5										
800	822.5	777.5	800	107					8	2	8										
1000	1022.5	977.5	1000	134	45	37.5	38	14×20×17	10	60	3	6	60	95.6	1.42	7.92	1.42	7.92	1.83	2.8	11.0
1200	1222.5	1177.5	1200	161					12	2.5	5										
1600	1622.5	1577.5	1600	214					15	2	4										
1000	1031.5	968.5	1000	134					8	60	2	8									
1500	1531.5	1468.5	1500	201					10	60	3	6									
2000	2031.5	1968.5	1531	152	63	53.5	53	18×26×22	12	45	0.5	4	141	215	4.8	23.5	4.8	23.5	5.82	8.5	22.5
2500	2531.5	2468.5	1913	190					13	45	1.5	3.5									
3000	3031.5	2968.5	1553	102					10	30	1.5	3									

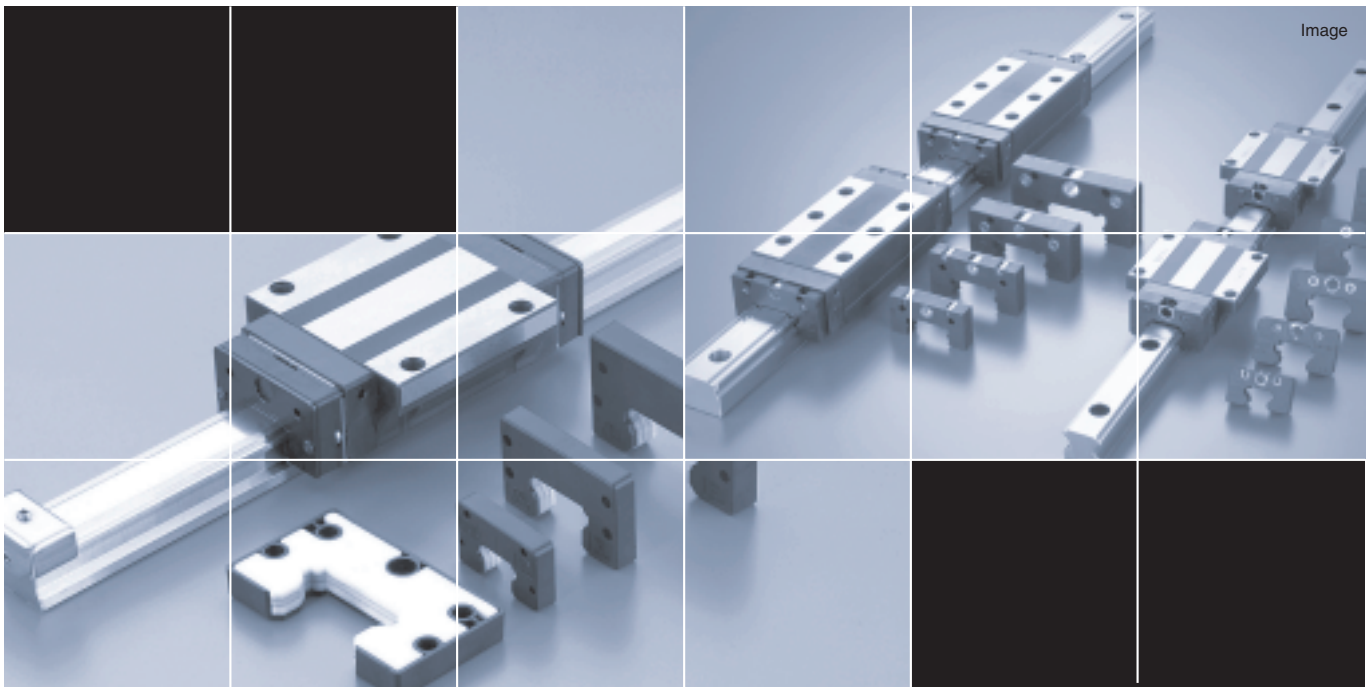
Note

LM rail radiuses other than the radiuses in the above table are also available. Contact THK for details.

The R-Guide center angles in the table are maximum manufacturing angles. To obtain angles greater than them, rails must additionally be connected. Contact THK for details.

Static permissible moment*: 1 block: static permissible moment value with 1 LM block

2 blocks: static permissible moment value with 2 blocks closely contacting with each other

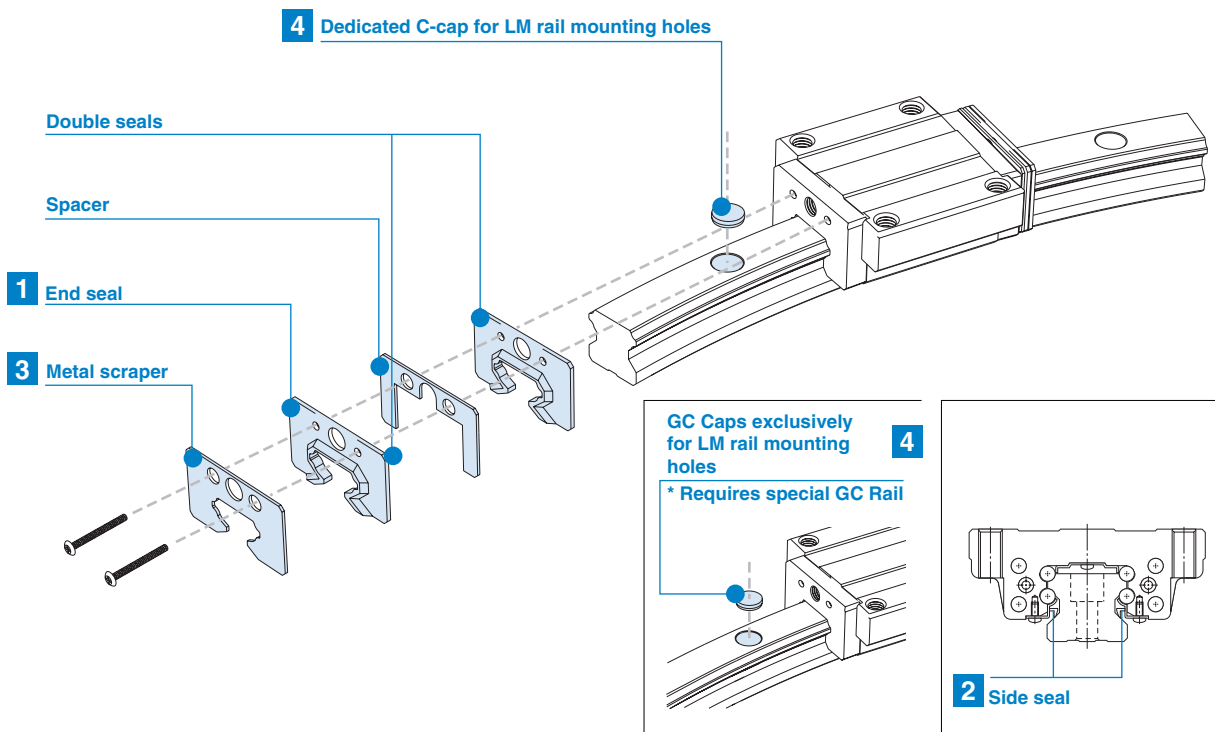


HCR OPTIONS

Options

For model HCR, dust-prevention accessories are available. Make a selection according to the application and the installation site.

When foreign matter enters an LM system, it will cause abnormal wear or shorten the service life, and it is necessary to prevent foreign matter from entering the system. Therefore, when possible entrance of foreign matter is predicted, it is important to select an effective sealing device or dust-prevention device that meets the atmospheric conditions.



1 to 3 Seals and a Scraper

Highly wear-resistant end seals made of special resin rubber and side seals for increased dust-prevention effect are available.

If desiring a dust-prevention accessory, specify it with the corresponding symbol indicated in table 2. For the supported model numbers for dust-prevention accessories and the overall LM block length with a dust-prevention accessory attached (dimension L), see table 3.

Seal resistance value

For the maximum seal resistance value per LM block when a lubricant is applied on seals HCR···UU, refer to the corresponding value provided in table 1.

Table 1 Maximum Seal Resistance Value of Seals HCR···UU Unit: N

Model No.	Seal resistance value
12	1.2
15	2.0
25	3.9
35	11.8
45	19.6
65	34.3

Table 2 Symbols of Dust Prevention Accessories for Model HCR

Symbol	Dust prevention accessory
UU	With end seal
SS	With end seal + side seal
DD	With double seals + side seal
ZZ	With end seal + side seal + metal scraper
KK	With double seals + side seal + metal scraper
LL	With low-resistance seal
RR	With LL seal + side seal

Table 3 Overall LM Block Length (Dimension L) of Model HCR with a Dust Prevention Accessory Attached Unit: mm

Model No.	UU	SS	DD	ZZ	KK	LL	RR
12A+60/ 100R	44.6	—	—	—	—	—	—
15A+60/ 150R	54.5	54.5	59.7	—	—	54.5	54.5
15A+60/ 300R	55.5	55.5	60.7	57.1	62.3	55.5	55.5
15A+60/ 400R	55.8	55.8	61	57.3	62.5	55.8	55.8
25A+60/ 500R	81.6	81.6	89.2	85.5	93.1	81.6	81.6
25A+60/ 750R	82.3	82.3	89.9	86	93.6	82.3	82.3
25A+60/1000R	82.5	82.5	90.1	86.2	93.8	82.5	82.5
35A+60/ 600R	107.2	107.2	114.8	111.2	118.8	107.2	107.2
35A+60/ 800R	107.5	107.5	115.1	111.5	119.1	107.5	107.5
35A+60/1000R	108.2	108.2	115.8	112	119.6	108.2	108.2
35A+60/1300R	108.5	108.5	116.1	112.3	119.8	108.5	108.5
45A+60/ 800R	136.7	136.7	143.9	142.1	149.2	136.7	136.7
45A+60/1000R	137.3	137.3	144.5	142.7	149.9	137.3	137.3
45A+60/1200R	137.3	137.3	144.5	142.7	149.9	137.3	137.3
45A+60/1600R	138	138	145.2	143.3	150.5	138	138
65A+60/1000R	193.8	193.8	201	199.4	206.6	193.8	193.8
65A+60/1500R	195.4	195.4	202.6	200.8	208	195.4	195.4
65A+60/2000R	195.9	195.9	203.1	201.3	208.5	195.9	195.9
65A+60/2500R	196.5	196.5	203.7	201.8	209	196.5	196.5
65A+60/3000R	196.5	196.5	203.7	201.8	209	196.5	196.5

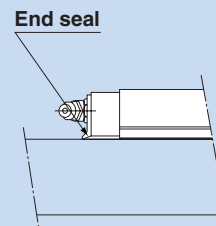
Note: "—" indicates not available.

Applicability of DD, ZZ and KK depends on the LM rail radius. Contact THK for details.

End seal

1

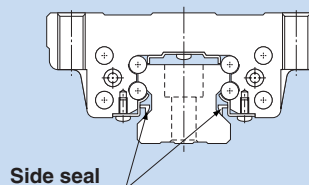
Used in locations exposed to dust.



Side seal

2

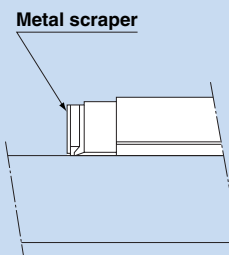
Used in locations where dust may enter the LM block from the side or bottom surface, such as vertical, horizontal and inverted mounts.



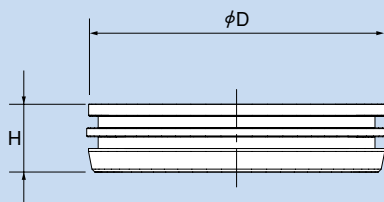
Metal scraper

3

Used in locations where welding spatter may adhere to the LM rail.



4 GC Cap



4 Metal Cap Dedicated for LM Rail Mounting Holes GC Cap

GC cap is a metallic cap that plugs the LM rail mounting hole (article compliant with the RoHS Directives). It prevents the entrance of foreign material and coolant from the LM rail top face (mounting hole) under harsh environments, and significantly increases the dust control performance of the LM Guide if used with a dust control seal.

Unit: mm

Model No.	Outer diameter D	Thickness H	Model No.	Outer diameter D	Thickness H
GC5	9.86	2.5	GC14	23.36	5.0
GC6	11.36	2.5	GC16	26.36	5.0
GC8	14.36	3.5	GC22	35.36	5.0
GC10	17.86	3.5	GC24	39.36	5.0
GC12	20.36	4.6			

If designating an LM Guide model attached with GC cap, observe the following example of model number coding.

Example of model number coding

HCR25A 2 UU C1 + 60 / 1000R H T GC

Model number	Dust control option symbol	R-Guide	LM rail length center angle (in mm)	Accuracy symbol	With GC cap Symbol for connected LM rail type
Number of LM blocks per rail		Radial clearance symbol			

Note 1: The LM rail of an LM Guide model attached with GC cap is of special type.

Note 2: GC cap cannot be mounted on an LM rail made of stainless steel or provided with surface treatment.

Note 3: If using the product in a special environment such as vacuum, low temperature or high temperature, contact THK.

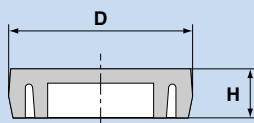
Note 4: GC cap is not sold alone. It is always provided in combination with LM Guide.

Note 5: The mouth of the LM rail mounting hole is not chamfered. Take care not to hurt your hand when attaching GC cap.

Note 6: After attaching GC cap, be sure to level and clean (wipe off) the top face of the LM rail.

5 Dedicated C-cap

It prevents cutting chips from entering the LM rail mounting holes.



5 Dedicated C-cap for LM Rail Mounting Holes

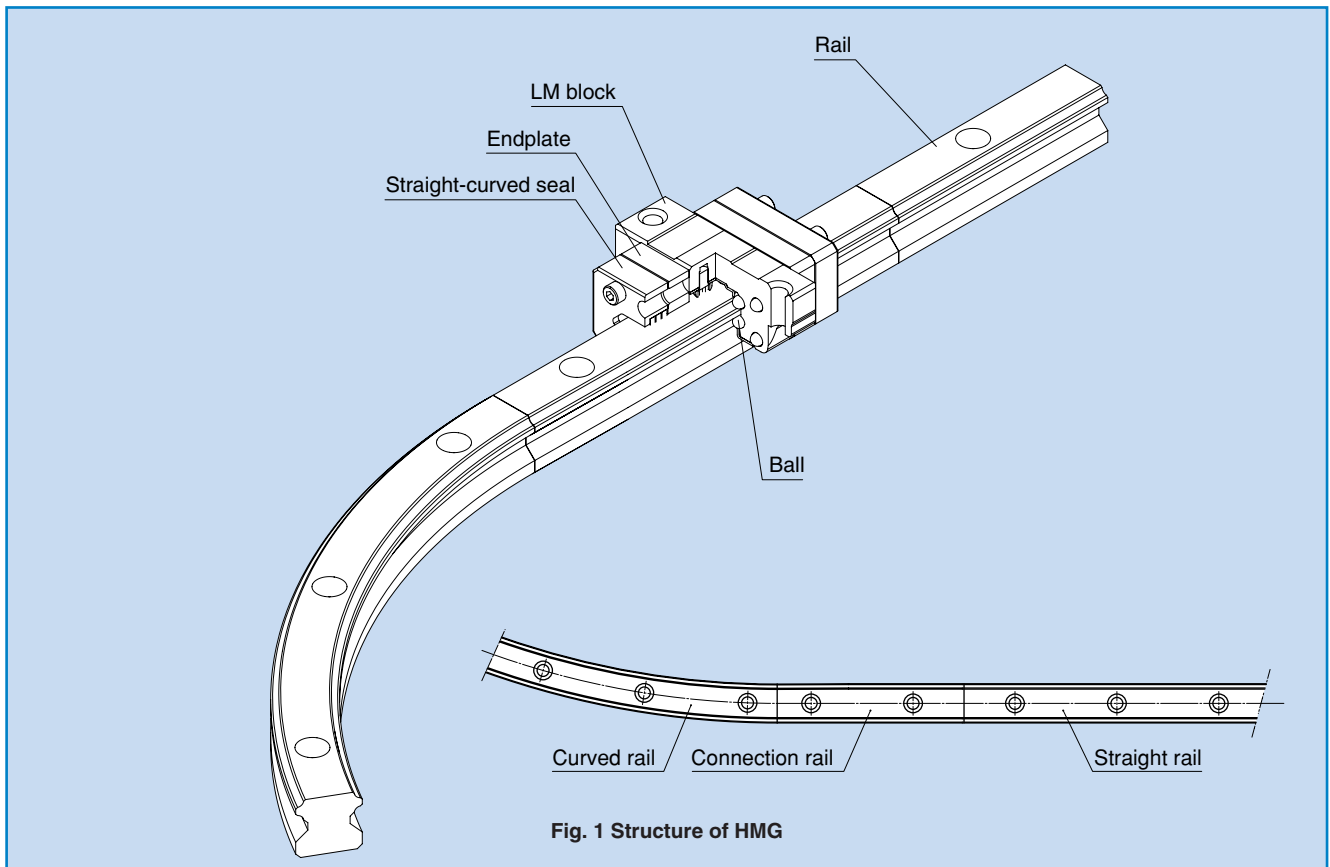
If any of the LM rail mounting holes of an LM Guide is filled with cutting chips or foreign matter, they may enter the LM block structure. Entrance of such foreign matter can be prevented by covering each LM rail mounting hole with the dedicated cap so that the top of the mounting holes is on the same level as the LM rail top face.

The dedicated C-cap for LM rail mounting holes uses a special synthetic resin with high oil resistance and high wear resistance, it is highly durable. When placing an order, specify the desired cap type with the corresponding cap number indicated in the table on the right.

Model No.	C-cap model No.	Bolt used	Major dimensions mm	
			D	H
12	C 3	M 3	6.3	1.2
15	C 4	M 4	7.8	1.0
25	C 6	M 6	11.4	2.7
35	C 8	M 8	14.4	3.7
45	C12	M12	20.5	4.7
65	C16	M16	26.5	5.7

HMG

Straight-Curved Guide

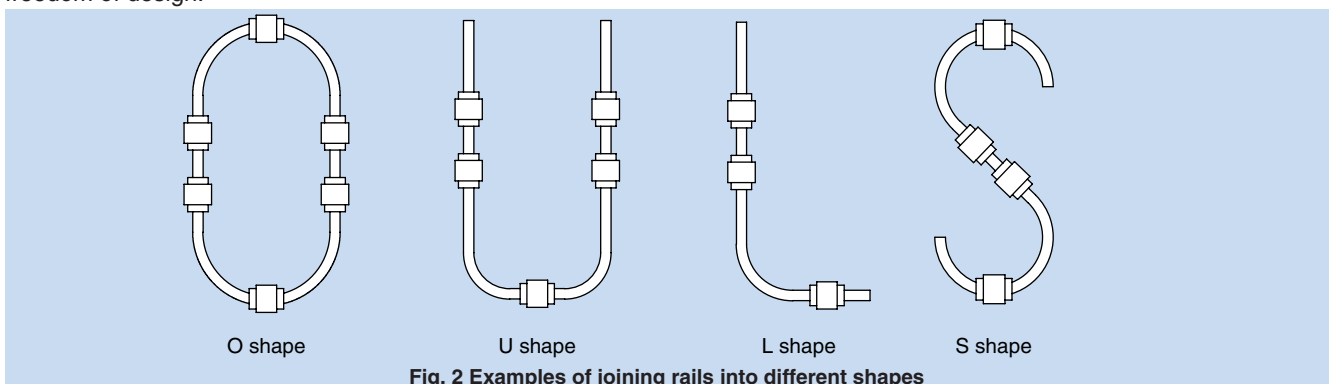


The Straight-Curved Guide HMG is a new straight-curved guide that allows the same type of LM blocks to continuously move on straight and curved rails by combining the technologies of the LM Guide HSR and the R Guide HCR. It achieves drastic cost reduction through improvement of work efficiency at the assembly and conveyance lines and the inspection equipment and simplification of the structure by eliminating a lift and a table.

● Free design

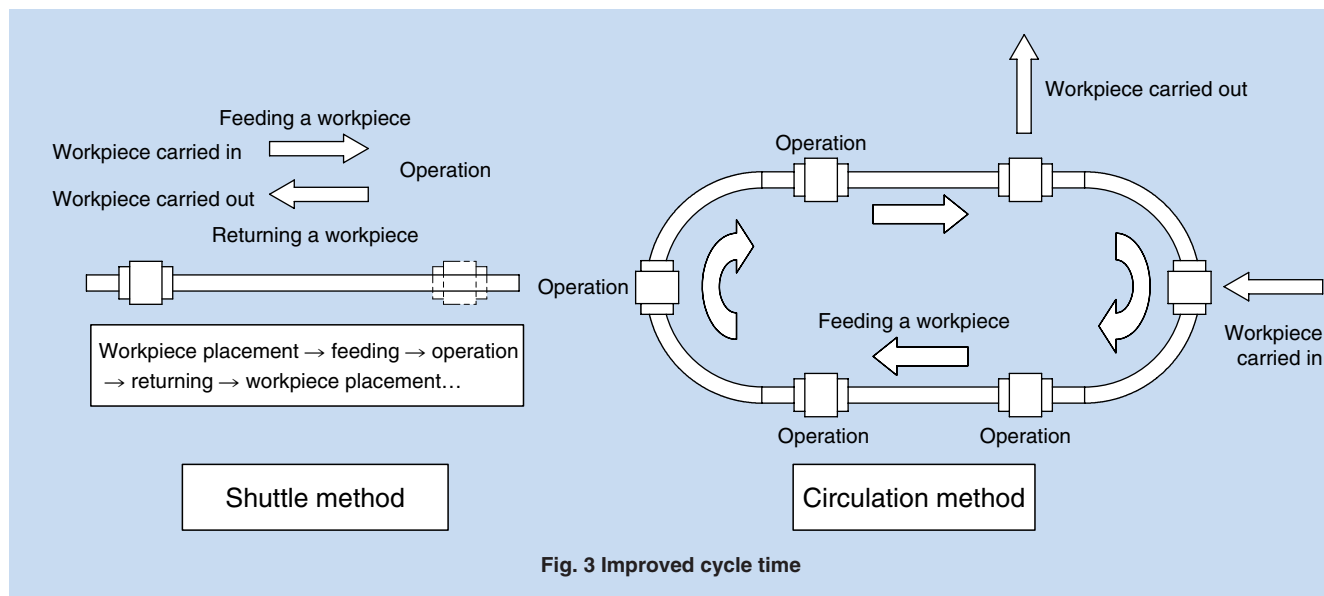
It allows free combinations of straight and curved shapes.

Since LM blocks can smoothly transit between the straight and curved sections, various combinations of straight and curved rails can be joined into various shapes such as O, U, L and S shapes. In addition, HMG allows a large table to be mounted and a heavy object to be carried through combinations of multiple blocks on a single shaft or 2 or more LM rails. Thus, it provides great freedom of design.



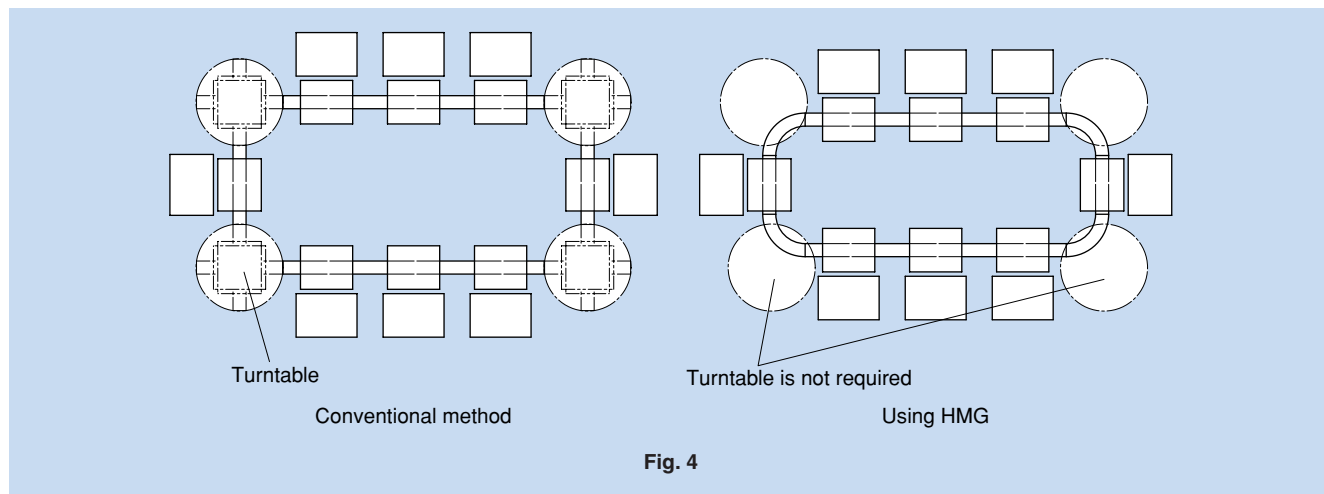
● Shortened transportation time

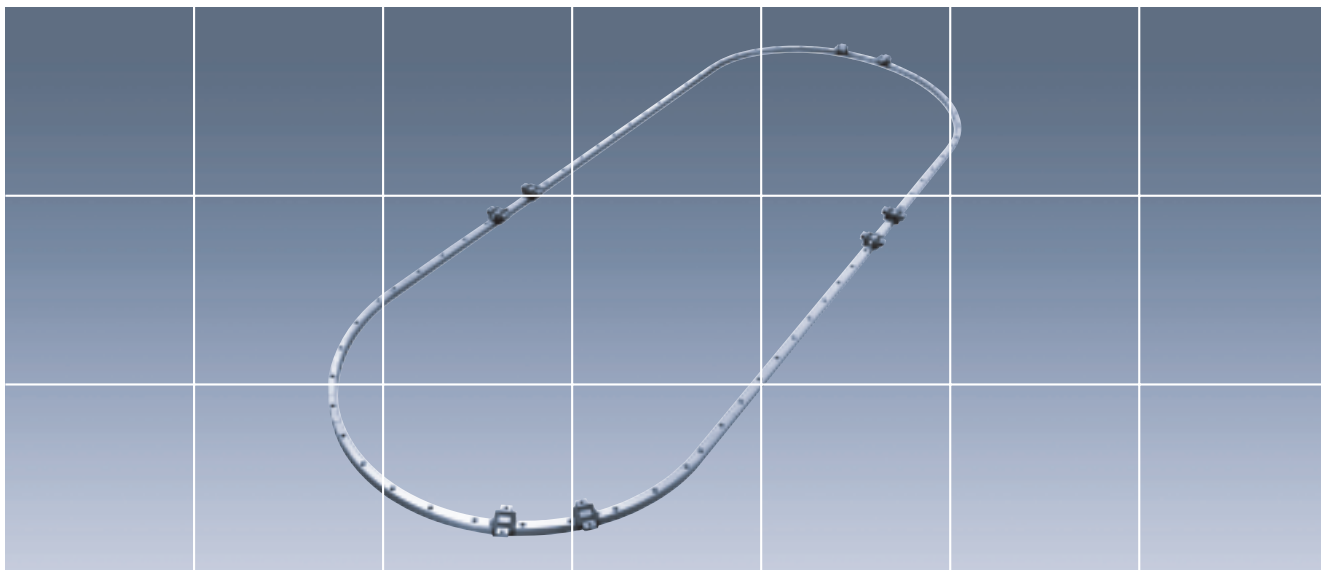
Unlike the shuttle method, using HMG units in a circulating system allows workpieces to be placed while other workpieces are being inspected or mounted, thus significantly improving cycle time. Increasing the number of tables can further shorten cycle time.



● Cost reduction through a simplified mechanism

Combination of straight and curved rails eliminates a lift and a turntable conventionally used for changing directions in the conveyance and production lines. Therefore, use of HMG simplifies the mechanism and eliminates a large number of parts, allowing the cost to be reduced. Additionally, man-hours in designing can also be reduced.





HMG Outline

Model HMG - Product Overview

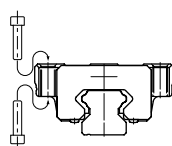
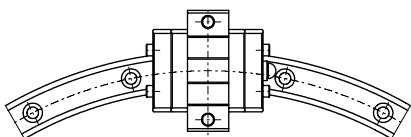
Having a special structure that enables LM blocks to continuously move on straight and curved rails, this model allows free combinations of straight and curved shapes.

Major applications Assembly line / conveyance line / inspection machine / large swivel base / amusement machine

Model HMG

The flange of the LM block has tapped holes. This model can be mounted from the top and the bottom.

- HMG 15
- HMG 25
- HMG 35
- HMG 45
- HMG 65



Rated Loads in All Directions

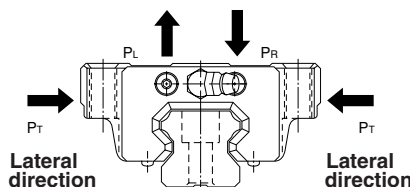
*1: Dimensional table for model HMG

Model HMG → pages 21-22

Model HMG is capable of receiving loads in all four directions: radial, reverse-radial and lateral directions.

The basic load ratings are uniform in the four directions (radial, reverse-radial and lateral directions), and their actual values are provided in the dimensional table*1 for HMG.

Reverse-radial direction Radial direction



Equivalent Load

When the LM block of model HMG receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R (P_L) + P_T$$

where

- | | | | |
|----------------------------|-----|-----------------------------|-----|
| P_E : Equivalent load | [N] | P_R : Radial load | [N] |
| · Radial direction | | P_L : Reverse-radial load | [N] |
| · Reverse-radial direction | | P_T : Lateral load | [N] |
| · Lateral direction | | | |

***1: Basic dynamic load rating (C)**

It refers to a load with a constant magnitude and direction under which the rated life (L) of a group of identical LM Guide units independently operating is 50 km.

Service life

The service life of an LM Guide is subject to variations even under the same operational conditions. Therefore, it is necessary to use the rated life defined below as a reference value for obtaining the service life of the LM Guide.

Rated life

The rated life means the total travel distance that 90% of a group of units of the same LM Guide model can achieve without flaking (scale-like exfoliation on the metal surface) after individually running under the same conditions.

Service life time

Once the rated life (L) has been obtained, the service life time can be obtained using the equation on the right if the stroke length and the number of reciprocations are constant.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3 \times 50$$

- L : Rated life [km]
- C : Basic dynamic load rating** [N]
- P_C : Calculated load [N]
- f_H : Hardness factor (see Fig. 1)
- f_T : Temperature factor (see Fig. 2)
- f_C : Contact factor (see Table 1)
- f_W : Load factor (see Table 2)

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

- L_h : Service life time [h]
- ℓ_s : Stroke length [mm]
- n₁ : No. of reciprocations per min [min⁻¹]

f_H : Hardness factor

To ensure the achievement of the optimum load capacity of the LM Guide, the raceway hardness must be between 58 and 64 HRC. At hardness below this range, the basic dynamic and static load ratings decrease. Therefore, the rating values must be multiplied by the respective hardness factors (f_H). Since the LM Guide has sufficient hardness, the f_H value for the LM Guide is normally 1.0 unless otherwise specified.

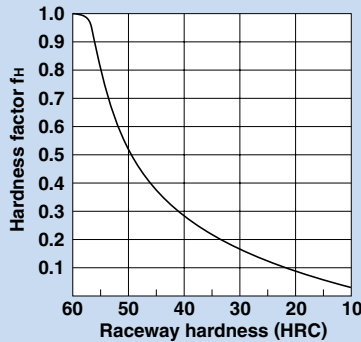


Fig. 1

f_C : Contact factor

When multiple LM blocks are used in close contact with each other, it is difficult to achieve uniform load distribution due to moment loads and mounting-surface accuracy. When using multiple blocks in close contact with each other, multiply the basic load rating (C or C_s) by the corresponding contact factor indicated in Table 1.

Note: When uneven load distribution is expected in a large machine, consider using a contact factor from Table 1.

Table 1 Contact Factor (f_C)

Number of blocks used in close contact	Contact factor f _C
2	0.81
3	0.72
4	0.66
5	0.61
6 or more	0.6
Normal use	1

f_T : Temperature factor

Since the service temperature of Caged Ball LM Guides is normally 80°C or below, the f_T value is 1.0.

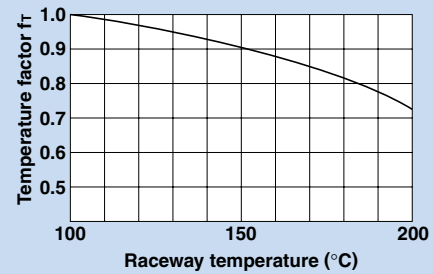


Fig. 2

f_W : Load factor

In general, reciprocating machines tend to produce vibrations or impact during operation. It is especially difficult to accurately determine all vibrations generated during high-speed operation and impacts produced each time the machine starts and stops. Therefore, where the effects of speed and vibration are estimated to be significant, divide the basic dynamic load rating (C) by a load factor selected from Table 2, which contains empirically obtained data.

Table 2 Load Factor (f_W)

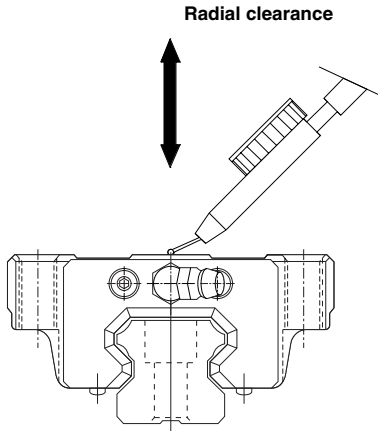
Vibration/impact	Speed [V]	f _W
Faint	Very slow V ≤ 0.25m/s	1 to 1.2
Weak	Slow 0.25 < V ≤ 1m/s	1.2 to 1.5
Moderate	Medium 1 < V ≤ 2m/s	1.5 to 2
Strong	Fast V > 2m/s	2 to 3.5

HMG OUTLINE

Model HMG - Product Overview

Radial Clearance Standard

Since the radial clearance of an LM Guide greatly affects the running accuracy, load carrying capacity and rigidity of the LM Guide, it is important to select an appropriate clearance according to the application.



In general, selecting a negative clearance (i.e., a preload*1 is applied) while taking into account possible vibrations and impact generated from reciprocating motion favorably affects the service life and the accuracy.

Unit: μm

Model No.	Indication symbol	Normal	Light load
	No symbol		C1
15	- 4 to +2	-12 to - 4	
25	- 6 to +3	-16 to - 6	
35	- 8 to +4	-22 to - 8	
45	-10 to +5	-25 to -10	
65	-14 to +7	-32 to -14	

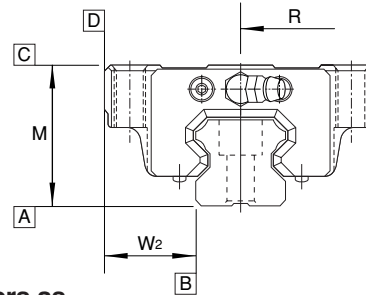
***1: Preload**

Preload is an internal load applied to the rolling elements (balls) of an LM block in advance in order to increase its rigidity. The clearance of all model HMG units is adjusted to the designated value before being shipped. Therefore, it is unnecessary to adjust the preload.

Accuracy Standard

The accuracy of Straight-Curved Guide HMG is specified in terms of running parallelism (*2), dimensional tolerance for height and width, and height and width difference between a pair (*3, *4) when two or more LM blocks are used on one rail or when two or more rails are mounted on the same plane. (A clearance occurs in the curved area.)

The accuracy of model HMG is defined model numbers as indicated in the table below.



***2: Running parallelism**

It refers to the parallelism error between the LM block and the LM rail datum plane when the LM block travels the whole length of the LM rail with the LM rail secured on the reference datum plane using bolts.

***3: Difference in height M**

It indicates the difference between the minimum and maximum values of height (M) of each of the LM blocks used on the same plane in combination.

***4: Difference in width W2**

It indicates the difference between the minimum and maximum values of the width (W2) between each of the LM blocks, mounted on one LM rail in combination, and the LM rail.

Unit: mm

Model No.	Accuracy standard	Normal grade
	Item	No symbol
15	Dimensional tolerance for height M	± 0.1
	Difference in height M	0.02
	Dimensional tolerance for width W ₂	± 0.1
	Difference in width W ₂	0.02
	Running parallelism of surface C against surface A	as shown in the table below
	Running parallelism of surface D against surface B	as shown in the table below
25 35	Dimensional tolerance for height M	± 0.1
	Difference in height M	0.02
	Dimensional tolerance for width W ₂	± 0.1
	Difference in width W ₂	0.03
	Running parallelism of surface C against surface A	as shown in the table below
	Running parallelism of surface D against surface B	as shown in the table below
45 65	Dimensional tolerance for height M	± 0.1
	Difference in height M	0.03
	Dimensional tolerance for width W ₂	± 0.1
	Difference in width W ₂	0.03
	Running parallelism of surface C against surface A	as shown in the table below
	Running parallelism of surface D against surface B	as shown in the table below

LM Rail Length and Running Parallelism for Models HMG

Unit: μm

LM rail length [mm]		Running Parallelism Values
Above	Or less	Normal grade
		No symbol
—	125	30
125	200	37
200	250	40
250	315	44
315	400	49
400	500	53

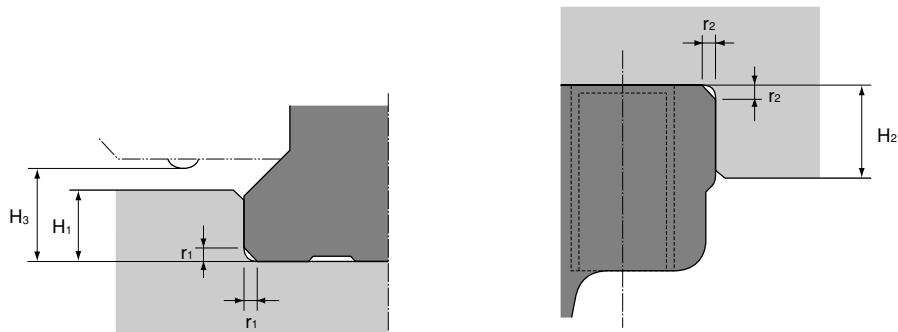
Unit: μm

LM rail length [mm]		Running Parallelism Values
Above	Or less	Normal grade
		No symbol
500	630	58
630	800	64
800	1000	70
1000	1250	77
1250	1600	84
1600	2000	92

Shoulder Height of the Mounting Base and the Corner Radius

Normally, the mounting base for the LM rail and the LM block has a datum plane on the side face of the shoulder of the base in order to allow easy installation and highly accurate positioning.

The corner of the mounting shoulder must be machined to have a recess, or machined to be smaller than the corner radius "r," to prevent interference with the chamfer of the LM rail or the LM block.



Shoulder for the LM rail

Shoulder for the LM block

Unit: mm

Model No.	Corner radius for the LM rail r_1 (max)	Corner radius for the LM block r_2 (max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	H_3
15	0.5	0.5	3	4	3.5
25	1	1	5	5	5.5
35	1	1	6	6	7.5
45	1	1	8	8	10
65	1.5	1.5	10	10	14

Examples of Table Mechanisms

The Straight-Curved Guide HMG requires a rotating mechanism and a slide mechanism for the table to rotate through the curved sections when 2 or more rails are used or when 2 or more LM blocks are connected on a single rail. Refer to Fig. 1 for examples of such mechanisms.

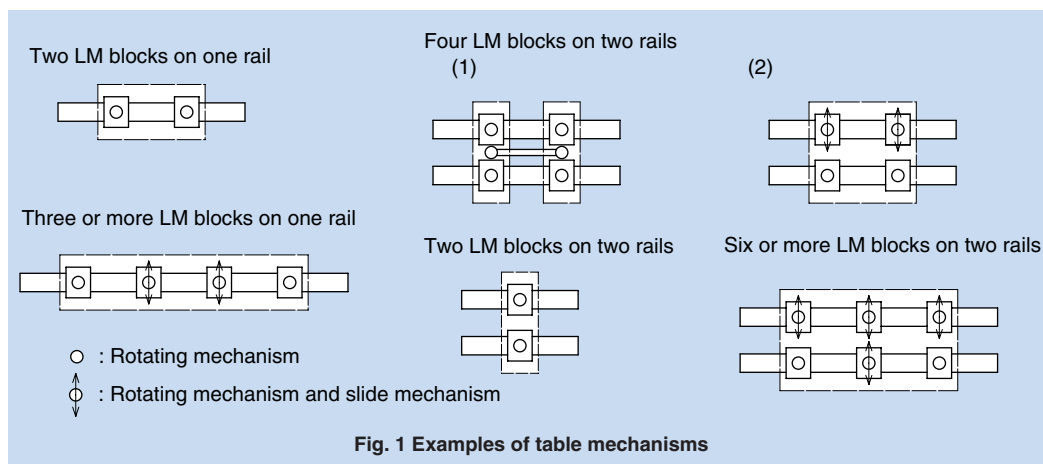
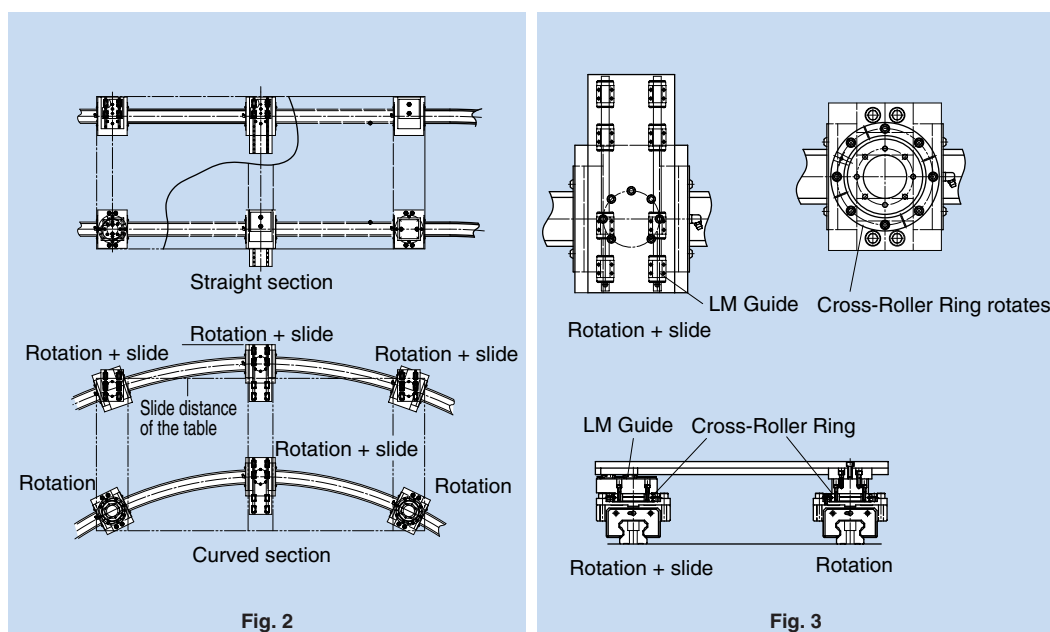


Fig. 2 shows examples of designing a table when HMG units are used on multiple rails. A Straight-Curved Guide requires a rotating mechanism and a slide mechanism since the table is decentered when an LM block transits from a straight section to a curved section. The amount of eccentricity differs according to the radius of the curved section and the LM block span. Therefore, it is necessary to design the system in accordance with the corresponding specifications.

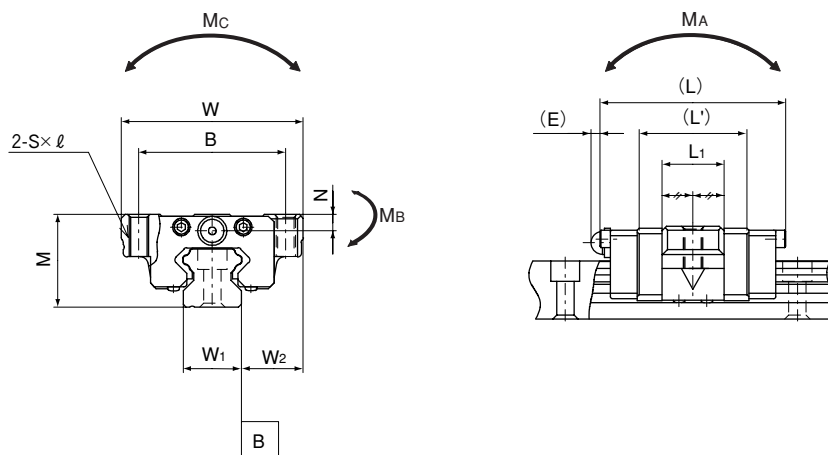
Fig. 3 shows detail drawings of the slide and rotating mechanisms. In Fig. 3, LM Guides are used in the slide mechanism and Cross-Roller Rings in the rotating mechanism to achieve smooth sliding and rotating motions.

For driving the Straight-Curved Guide, belt drives and chain drives are available.

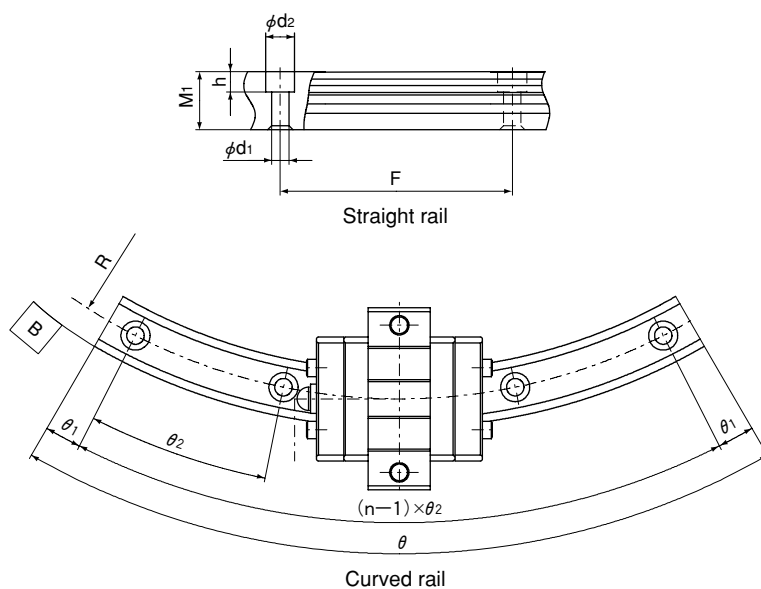


Model HMG

Dimensional Table for Model HMG



Model No.	Outer dimensions				LM block dimensions					LM rail dimensions			
	M	W	L	L'	B	S×l	L ₁	N	E	Straight rail			Height
										W ₁	W ₂	F	M ₁
HMG15A	24	47	48	28.8	38	M5×11	16	4.3	5.5	15	16	60	15
HMG25A	36	70	62.2	42.2	57	M8×16	25.6	6	12	23	23.5	60	22
HMG35A	48	100	80.6	54.6	82	M10×21	32.6	8	12	34	33	80	29
HMG45A	60	120	107.6	76.6	100	M12×25	42.6	10	16	45	37.5	105	38
HMG65A	90	170	144.4	107.4	142	M16×37	63.4	19	16	63	53.5	150	53



Unit: mm

LM rail dimensions						Basic dynamic load rating(C)	Basic static load rating(Co)	
Mounting hole	Curved rail						Resultant load(C)[kN]	Straight section(Cost)[kN]
$d_1 \times d_2 \times h$	R	n	θ°	θ_1°	θ_2°			
4.5×7.5×5.3	150	3	60	7	23	2.56	4.23	0.44
	300	5	60	6	12			
	400	7	60	3	9			
7×11×9	500	9	60	2	7	9.41	10.8	6.7
	750	12	60	2.5	5			
	1000	15	60	2	4			
9×14×12	600	7	60	3	9	17.7	19	11.5
	800	11	60	2.5	5.5			
	1000	12	60	2.5	5			
	1300	17	60	2	3.5			
14×20×17	800	8	60	2	8	28.1	29.7	18.2
	1000	10	60	3	6			
	1200	12	60	2.5	5			
	1600	15	60	2	4			
18×26×22	1000	8	60	2	8	66.2	66.7	36.2
	1500	10	60	3	6			
	2000	12	45	0.5	4			
	2500	13	45	1.5	3.5			
	3000	10	30	1.5	3			

In an application design with one LM block used on one rail, if a moment is applied, its operation may be affected.

If a moment is applied, we recommend using multiple LM blocks on one rail.

Table 1 shows the static permissible moment value per LM block in the M_A , M_B and M_C directions.

Table 1 Static permissible moment of HMG

Unit: kN-m

Model No.	M_A		M_B		M_C	
	Straight section	Curved section	Straight section	Curved section	Straight section	Curved section
HMG15	0.008	0.007	0.008	0.01	0.027	0.003
HMG25	0.1	0.04	0.1	0.05	0.11	0.07
HMG35	0.22	0.11	0.22	0.12	0.29	0.17
HMG45	0.48	0.2	0.48	0.22	0.58	0.34
HMG65	1.47	0.66	1.47	0.73	1.83	0.94

HMG TYPE

Joint LM rails

● Specifications of unevenness of the joint

Since accuracy tolerance in LM rail installation affects the product's service life, mount LM rails so that the unevenness of each joint is within the specification shown in Table 1. For a joint between curved rails, and a joint between curved and joint rails, we recommend using pins as shown in Fig. 1. When joining those rails, place the pins on the outside, press the rails toward the pins, and then adjust the joint to eliminate or minimize the unevenness using adjusting screws from the inside.

Table 1 Specifications for unevenness of the joint Unit: mm

Model No.	Ball raceway, side face	Top face	Max clearance of the joint
	a	b	c
15	0.01	0.02	0.6
25	0.01	0.02	0.7
35	0.01	0.02	1
45	0.01	0.02	1.3
65	0.01	0.02	1.3

Note: Place the pins on the outside and the presser bolts on the inside.

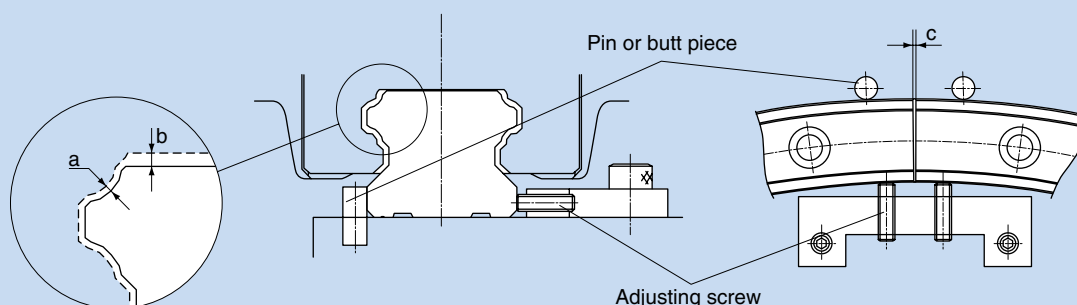


Fig. 1 Use of butt pieces

● Curved sections

With HMG, there is a clearance in each curved section for a structural reason. Therefore, HMG may not be used where highly accurate feed is required. In addition, the curved section cannot receive a large moment. If a large moment is applied, it is necessary to increase the number of LM blocks or LM rails. For specific values of permissible moments, see Table 1 on page 22.

LM rail Joints

HMG requires connection rails when LM blocks move from straight to curved sections or where R is inverted such as rails connected in an S shape. Take this into account when designing a system in such applications.

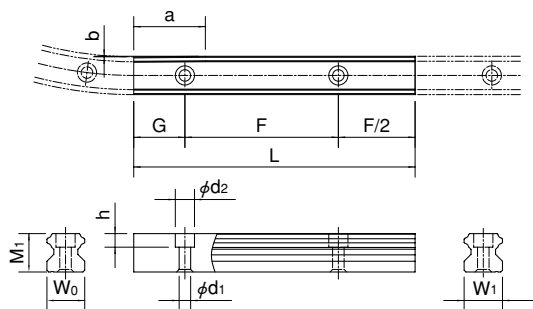


Table 2 Dimensions of rail joints

Unit: mm

Model No.	Dimensions of a joint rail							
	Height M ₁	Pitch F	Mounting hole d ₁ ×d ₂ ×h	Width W ₁ W ₀		Taper length a	Taper depth b	Radius R
15A	15	60	4.5×7.5×5.3	15	14.78	28	0.22	150
					14.89		0.11	300
					14.92		0.08	400
25A	22	60	7×11×9	23	22.83	42	0.17	500
					22.89		0.11	750
					22.92		0.08	1000
35A	29	80	9×14×12	34	33.77	54	0.23	600
					33.83		0.17	800
					33.86		0.14	1000
					33.9		0.1	1300
45A	38	105	14×20×17	45	44.71	76	0.29	800
					44.77		0.23	1000
					44.81		0.19	1200
					44.86		0.14	1600
65A	53	150	18×26×22	63	62.48	107	0.52	1000
					62.66		0.34	1500
					62.74		0.26	2000
					62.8		0.2	2500
					62.83		0.17	3000

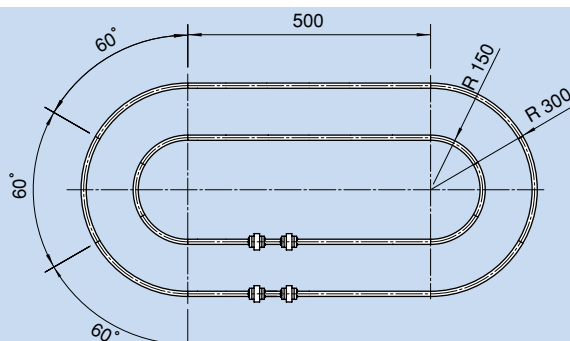


Fig.2 Example of model number

Example of model number coding

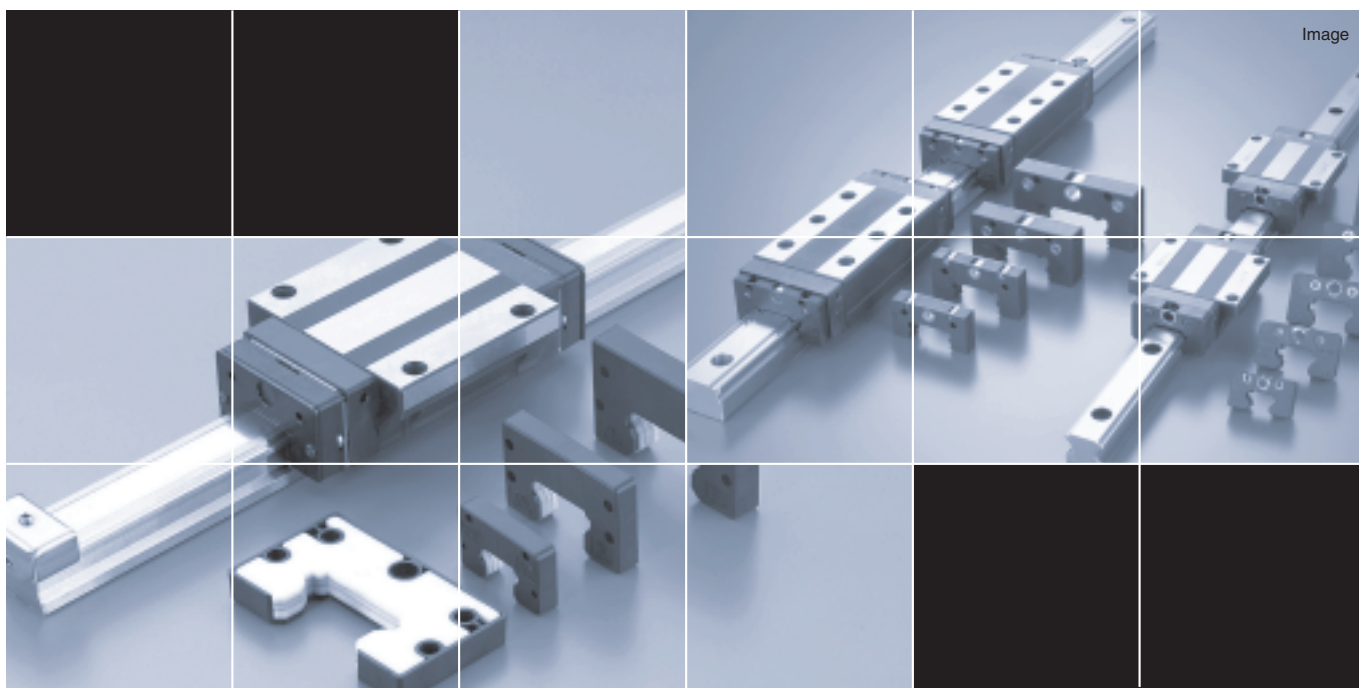
When 2 axes are used

HMG15A 2 UU C1+1000L T+60/150R 6T+60/300R 6T- II

- 1 Model number
- 2 Number of LM blocks per axis
- 3 Seal symbol
- 4 Clearance symbol
- 5 Overall straight LM rail length per axis
- 6 Straight LM rail joint symbol
- 7 Center angle of an inward curved LM rail
- 8 Radius of an inward curved LM rail
- 9 Number of inward curved LM rails connected
- 10 Center angle of an outward curved LM rail
- 11 Radius of an outward curved LM rail
- 12 Number of outward curved LM rails connected
- 13 Number of axes

Note - This model number indicates that an LM block and an LM rail constitute one set (i.e., the required number of sets when 2 rails are used in parallel is 2).
 - HMG does not have a seal as standard.
 Fig. 2 represents the above example of model number coding.

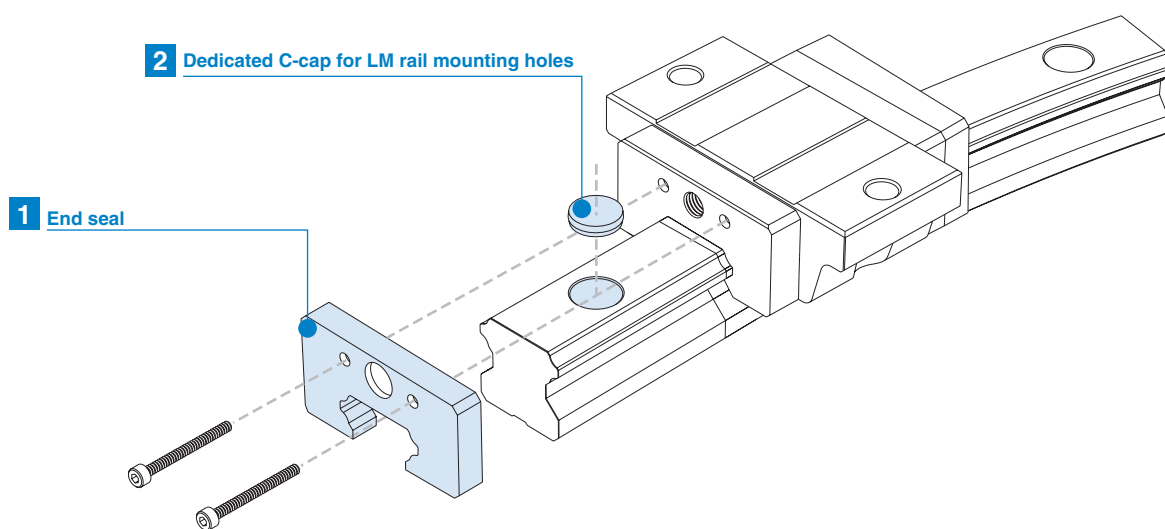




HMG OPTIONS

Options

For model HMG, dust-prevention accessories are available. Make a selection according to the application and the installation site.



Dust Prevention Accessories

When foreign matter enters an LM system, it will cause abnormal wear or shorten the service life. It is necessary to prevent foreign matter from entering the system. Therefore, when possible entrance of foreign matter is predicted, it is important to select an effective sealing device or dust-prevention device that meets the working conditions.

1 Seal

As a standard, high wear-resistant end seals are used.

If desiring a dust-prevention accessory, specify it with the corresponding symbol indicated in table 2. For the supported model numbers for dust-prevention accessories and the overall LM block length with a dust-prevention accessory attached (dimension L), see table 3.

Seal resistance value

For the maximum seal resistance value per LM block when a lubricant is applied on seal HMG ... UU, refer to the corresponding value provided in table 1.

Table 1 Maximum Seal Resistance
Value of Seal HMG ... UU
Unit: N

Model No.	Seal resistance value
15	3
25	6
35	8
45	12
65	40

Note: These specification values represent values of one block (2 seals).

Table 2 Symbol of Dust Prevention Accessory for Model HMG

Symbol	Dust prevention accessory
UU	With end seal

Table 3 Overall LM Block Length (Dimension L) of Model HM
with a Dust Prevention Accessory Attached
Unit: mm

Model No.	UU
15	48
25	62.2
35	80.6
45	107.6
65	144.4

2 Dedicated C-cap for LM Rail Mounting Holes

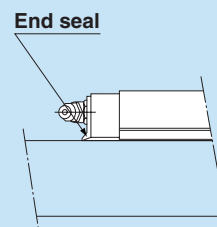
If any of the LM rail mounting holes of an LM Guide is filled with cutting chips or foreign matter, they may enter the LM block structure. Entrance of such foreign matter can be prevented by covering each LM rail mounting hole with the dedicated cap so that the top of the mounting holes are on the same level as the LM rail top face.

The dedicated C-cap for LM rail mounting holes is highly durable since it uses a special synthetic resin with high oil resistance and high wear resistance. When placing an order, specify the desired cap type with the corresponding cap number indicated in the table on the right.

Model No.	C-Cap model No.	Bolt used	Major dimensions mm	
			D	H
15	C 4	M 4	7.8	1
25	C 6	M 6	11.4	2.7
35	C 8	M 8	14.4	3.7
45	C12	M12	20.5	4.7
65	C16	M16	26.5	5.7

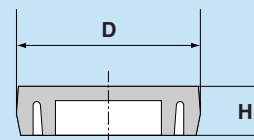
End seal

Used in locations exposed to dust.



Dedicated C-cap

It prevents cutting chips from entering the LM rail mounting holes.



THK R Guide Model HCR / Straight-Curved Guide Model HMG

Precautions on use

● Handling

- Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
- Tilting an LM block or LM rail may cause them to fall by their own weight.
- Dropping or hitting the LM Guide may damage it. Giving an impact to the LM Guide could also cause damage to its function even if the guide looks intact.

● Lubrication

- Thoroughly remove anti-corrosion oil and feed lubricant before using the product.
- Do not mix lubricants of different physical properties.
- 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.
- When planning to use a special lubricant, contact THK before using it.
- When adopting oil lubrication, the lubricant may not be distributed throughout the LM system depending on the mounting orientation of the system. Contact THK for details.
- Lubrication interval varies according to the service conditions. Contact THK for details.

● Precautions on Use

- Entrance of foreign matter may cause damage to the ball circulating path or functional loss. Prevent foreign matter, such as dust or cutting chips, from entering the system.
- When planning to use the LM system in an environment where coolant penetrates the LM block, it may cause trouble to product functions depending on the type of coolant. Contact THK for details.
- Do not use the LM system at temperature of 80°C or higher. When desiring to use the system at temperature of 80°C or higher, contact THK in advance.
- If foreign matter adheres to the LM system, replenish the lubricant after cleaning the product. For available types of detergent, contact THK.
- When using the LM Guide with an inverted mount, breakage of the endplate due to an accident or the like may cause balls to fall out and the LM block to come off from the LM rail and fall. In these cases, take preventive measures such as adding a safety mechanism for preventing such falls.
- When using the LM system in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
- When removing the LM block from the LM rail and then replacing the block, an LM block mounting/removing jig that facilitates such installation is available. Contact THK for details.

● Storage

- When storing the LM Guide, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

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LM Guide **HSV**

GLOBAL STANDARD MODEL

LM rails and LM Blocks are individually stocked.



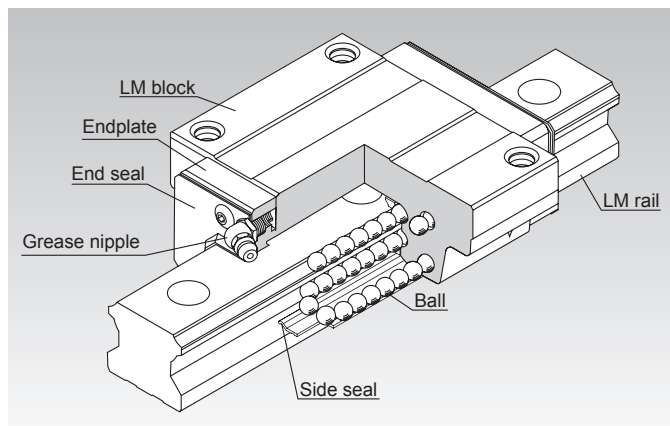
THK CO., LTD.
TOKYO, JAPAN

CATALOG No.411E

LM Guide HSV

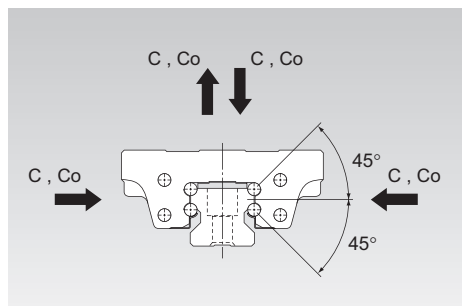
■ Structure and Features

- 4-way Equal Load
- Heavy load, high rigidity
- Practically a global standard size
- Superb capability of absorbing mounting error



MODEL HSV - C	MODEL HSV - R
The flange of its LM block has tapped holes. Can be mounted from the top or the bottom.	Having a smaller LM block width (W) and tapped holes, this model is optimal for compact design.

■ Basic Load Rating



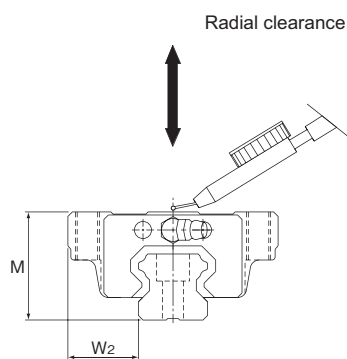
Model No.	Basic load rating		Static permissible moment kN-m *				
	C kN	C ₀ kN	M _A		M _B		M _C
			1 block	Double blocks	1 block	Double blocks	1 block
HSV15	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844
HSV20	13.8	23.8	0.19	1.04	0.19	1.04	0.201
HSV25	19.9	34.4	0.307	1.71	0.307	1.71	0.344
HSV30	28	46.8	0.524	2.7	0.524	2.7	0.562
HSV35	37.3	61.1	0.782	3.93	0.782	3.93	0.905
HSV45	60	95.6	1.42	7.92	1.42	7.92	1.83

Note) Static permissible moment *

1 block: static permissible moment value with 1 LM block

Double blocks: static permissible moment value with 2 blocks closely contacting with each other

■ Radial Clearance and Accuracy Standards



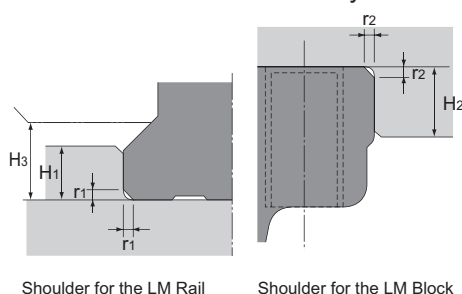
Radial clearance and Accuracy standards for model HSV

Unit:mm

Model No.	Radial clearance (μm)	Height M			Width W ₂		Running parallelism of surface C(D) against surface A(B)	
		Dimensional tolerance	Difference	Difference (Many rail use)	Dimensional tolerance	Difference	3000L ~3090L	4520L ~4560L
							0.021	0.024
HSV15	-4 to +2	±0.07	0.02	0.04	±0.06	0.02	0.021	0.024
HSV20	-5 to +2	±0.07	0.02	0.04	±0.06	0.02		
HSV25	-6 to +3	±0.08	0.02	0.04	±0.07	0.025		
HSV30	-7 to +4	±0.08	0.02	0.04	±0.07	0.025		
HSV35	-8 to +4	±0.08	0.02	0.04	±0.07	0.025		
HSV45	-10 to +5	±0.08	0.025	0.05	±0.07	0.03		

■ Shoulder Height of the Mounting Base and the Corner Radius

Normally, the mounting base for the LM rail and the LM block has a reference-surface on the side face of the shoulder of the base in order to allow easy installation and highly accurate positioning.

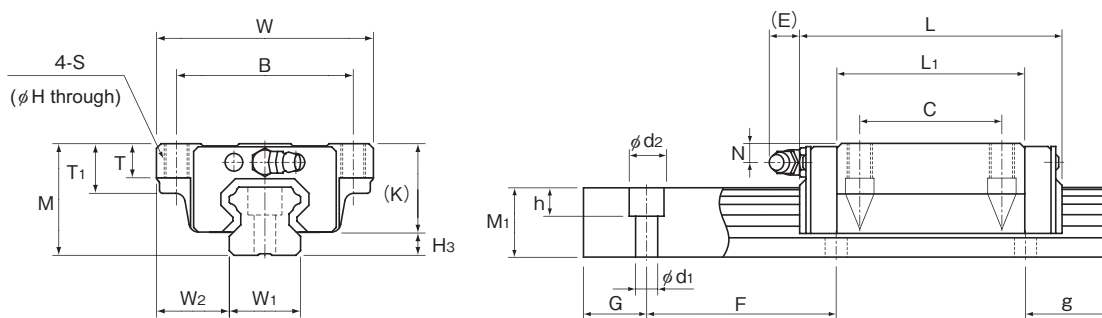


Unit:mm

Model No.	Corner radius for the LM rail r ₁ (max)	Corner radius for the LM block r ₂ (max)	Shoulder height for the LM rail H ₁	Shoulder height for the LM block H ₂	H ₃
HSV15	0.5	0.5	3	4	4.2
HSV20	0.5	0.5	3.5	5	5
HSV25	1	1	5	5	6.5
HSV30	1	1	5	5	8
HSV35	1	1	6	6	9.4
HSV45	1	1	8	8	11.5

Global Standard Model

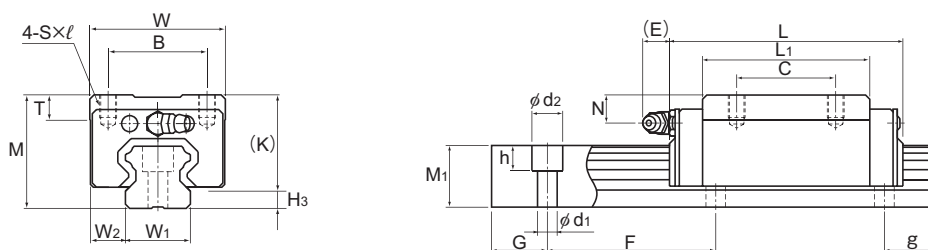
Model HSV-C



Unit:mm

Model No.	Outer dimensions			LM block dimensions												H ₃	Mass kg
	Height M	Width W	Length L	W ₂	B	C	S	H	L ₁	T	T ₁	K	N	E	Grease nipple		
HSV15C	24	47	56.6	16	38	30	M5	4.4	38.8	6.9	11	19.8	4.3	5.5	PB1021B	4.2	0.2
HSV20C	30	63	74	21.5	53	40	M6	5.4	50.8	10	10	25	5	12	B-M6F	5	0.35
HSV25C	36	70	83.1	23.5	57	45	M8	6.8	59.5	10	16	29.5	6	12	B-M6F	6.5	0.59
HSV30C	42	90	98	31	72	52	M10	8.5	70.4	10	18	34	7	12	B-M6F	8	1.1
HSV35C	48	100	109.4	33	82	62	M10	8.5	80.4	13	21	38.6	8	12	B-M6F	9.4	1.6
HSV45C	60	120	139	37.5	100	80	M12	10.5	98	15	25	48.5	10	16	B-R1/8	11.5	2.8

Model HSV-R



Unit:mm

Model No.	Outer dimensions			LM block dimensions												H ₃	Mass kg
	Height M	Width W	Length L	W ₂	B	C	S × l	L ₁	T	K	N	E	Grease nipple				
HSV15R	28	34	56.6	9.5	26	26	M4 × 5	38.8	6	23.8	8.3	5.5	PB1021B	4.2	0.18		
HSV20R	30	44	74	12	32	36	M5 × 6	50.8	8	25	5	12	B-M6F	5	0.25		
HSV25R	40	48	83.1	12.5	35	35	M6 × 8	59.5	9	33.5	10	12	B-M6F	6.5	0.54		
HSV30R	45	60	98	16	40	40	M8 × 10	70.4	9	37	10	12	B-M6F	8	0.9		
HSV35R	55	70	109.4	18	50	50	M8 × 12	80.4	12	45.6	15	12	B-M6F	9.4	1.5		
HSV45R	70	86	139	20.5	60	60	M10 × 17	98	15	58.5	20	16	B-R1/8	11.5	2.6		

LM RAIL Dimensions

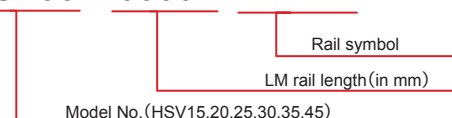
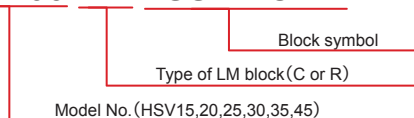
Unit:mm

Model No.	Width W ₁ ⁰ _{-0.05}	Height M ₁	Pitch F	d ₁ × d ₂ × h	LM rail length (G,g)		Mass kg/m
HSV15	15	15	60	4.5 × 7.5 × 5.3	3000(20,40)	—	1.5
HSV20	20	18	60	6 × 9.5 × 8.5	3000(20,40)	4540(20,20)	2.3
HSV25	23	22	60	7 × 11 × 9	3000(20,40)	4540(20,20)	3.3
HSV30	28	26	80	9 × 14 × 12	3000(20,20)	4520(20,20)	4.8
HSV35	34	29	80	9 × 14 × 12	3000(20,20)	4520(20,20)	6.6
HSV45	45	38	105	14 × 20 × 17	3000(20,40)	4560(22.5,22.5)	11

Model Number Coding

Block: **HSV35 C 1SS BLOCK**

Rail : **HSV35 - 3000L RAIL**



Please contact the LM rail length you need to your dealer.

THK LM Guide Model HSV



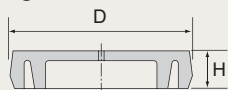
For the precautions on Using the LM Guide, see General Catalog or THK WEB SITE, respectively.

CAP C (Option)

The correspondence of the options, please contact your dealer.

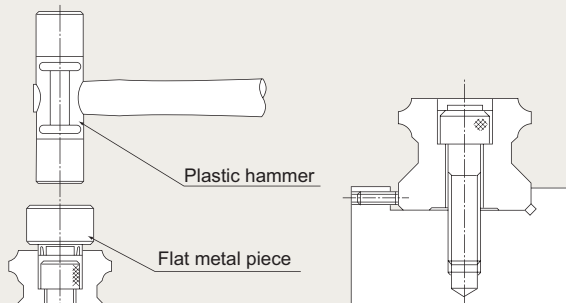
If any of the LM rail mounting holes of an LM Guide is filled with cutting chips or foreign material, they may enter the LM block structure.

Entrance of such foreign material can be prevented by covering watch LM rail mounting hole with the dedicated cap.



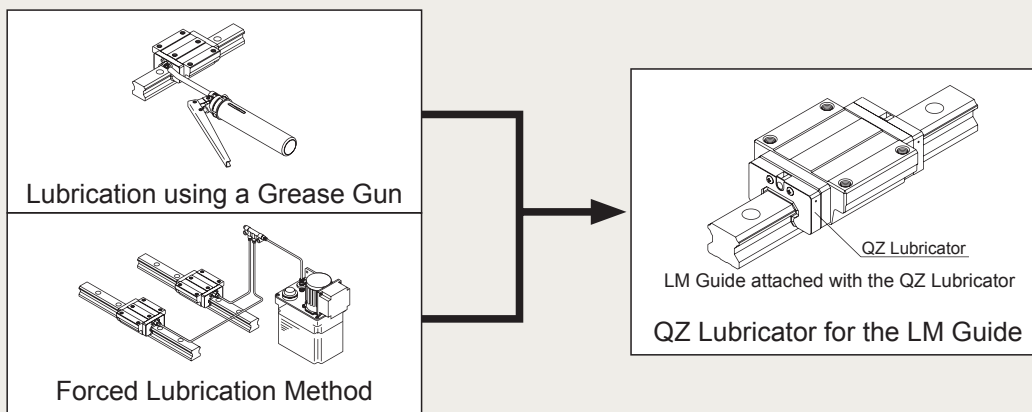
The Dedicated Cap C for LM Rail Mounting Holes

Model No.	Bolt used	Main dimensions (mm)		Supported model number
		D	H	
C4	M4	7.8	1.0	HSV15
C5	M5	9.8	2.4	HSV20
C6	M6	11.4	2.7	HSV25
C8	M8	14.4	3.7	HSV30
C8	M8	14.4	3.7	HSV35
C12	M12	20.5	4.7	HSV45



QZ Lubricator (Option)

QZ Lubricator feeds the right amount of lubricant to the raceway on the LM rail. This allows an oil film to continuously be formed between the rolling element and the raceway, and drastically extends the lubrication and maintenance intervals.



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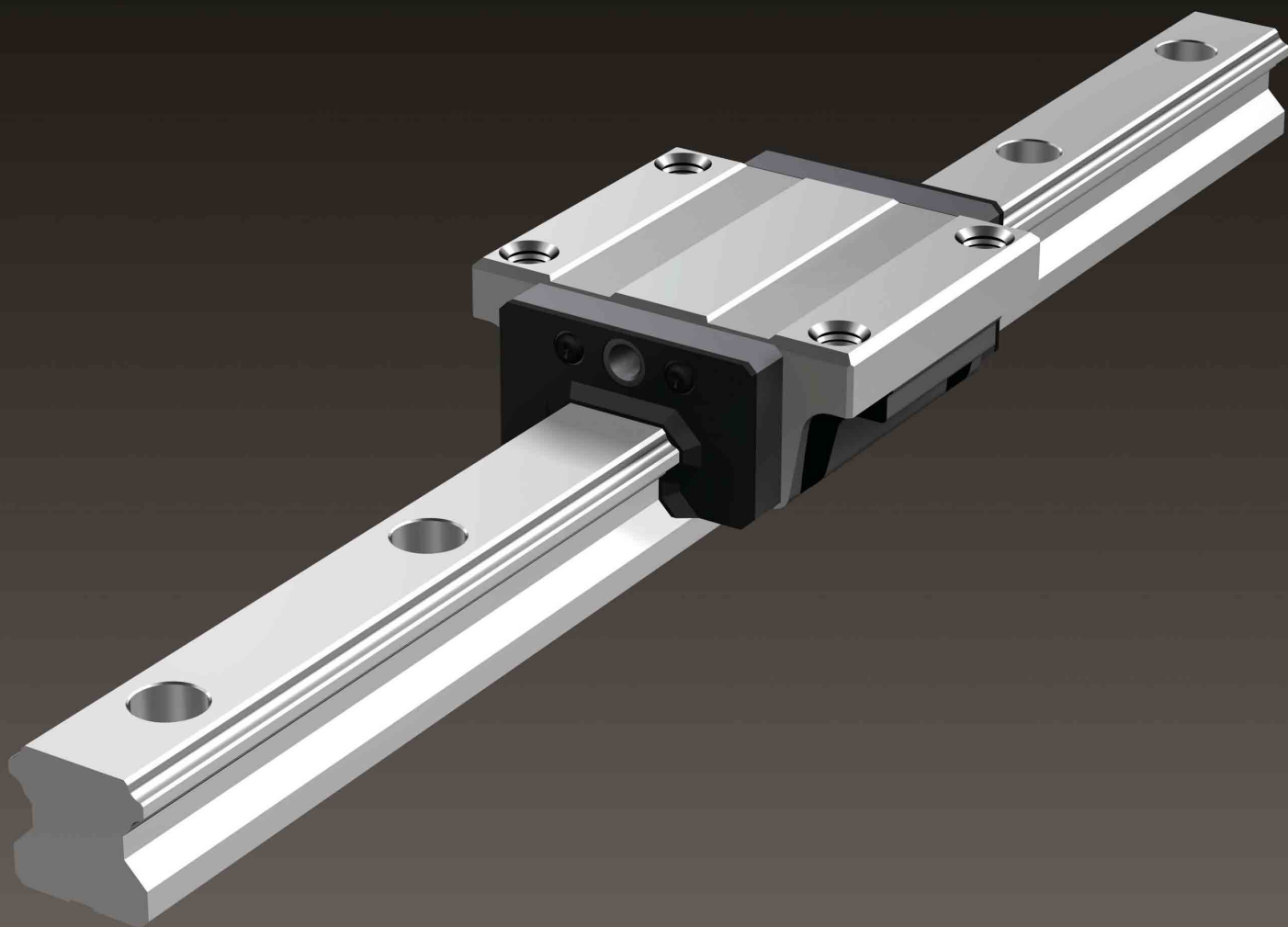
Dealer



Новый экономичный тип (класс Ct) направляющих LM

К линейке моделей HSR, хорошо зарекомендовавших себя на рынке, добавлена новая, экономичная серия. Данная серия оптимально подходит для рынка линейных направляющих общего назначения, таких как системы транспортировки!

HSR (Класс Ct)

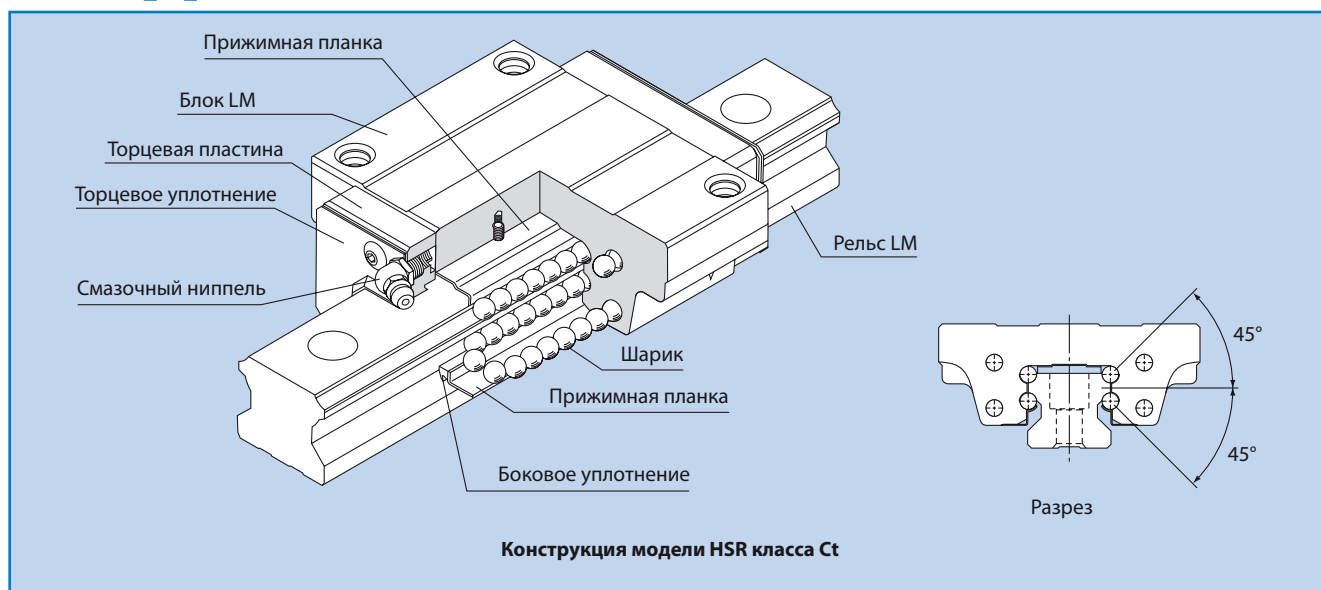


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TOKYO, JAPAN

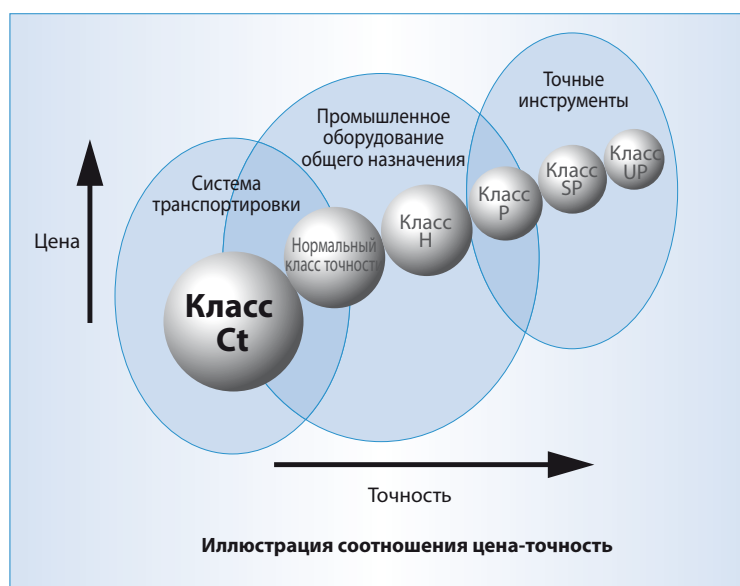
CATALOG No. 317R

Наша компания предлагает новую серию направляющих - LM, которая объединяет в себе уникальные производственные технологии компании ТНК и разумный ценовой подход и удовлетворяет ценовым требованиям рынка в сегменте систем транспортировки общего назначения.

Модель HSR класса точности Ct



Четырехнаправленная модель с равномерной нагрузкой и размерами, соответствующими мировым стандартам, что обеспечивает простоту конструкции



● Экономичность

- Экономичность продукции обеспечивается без ухудшения всех необходимых характеристик.
- Экономичность - один из факторов снижения цены продукции.

● Универсальность

- Четырехнаправленная модель с равномерной нагрузкой и размерами, соответствующими мировым стандартам, что обеспечивает простоту конструкции.
- Модель подходит для установки на стандартных линейных направляющих - системах транспортировки общего назначения, для которых не требуется высокая точность.
- Высокая устойчивость к погрешностям технических параметров.

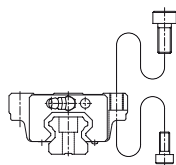
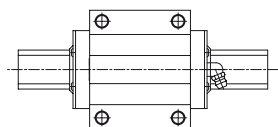
● Быстрая доставка

- Так как рельсы и блоки серии LM хранятся на складе в отдельных упаковках, их доставка выполняется в более быстрые сроки, по сравнению с собранными агрегатами.
- Такой подход удобен при необходимости срочной доставки и замены блока LM.

Модель HSR-C класса Ct

Фланец блока LM имеет резьбовые отверстия. Монтаж может выполняться как сверху, так и снизу. Это удобно, когда в опоре отсутствуют сквозные отверстия для установки болтов.

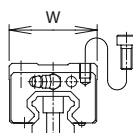
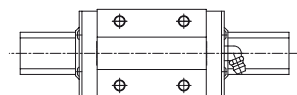
- HSR 15C
- HSR 20C
- HSR 25C
- HSR 30C
- HSR 35C



Модель HSR-R класса Ct

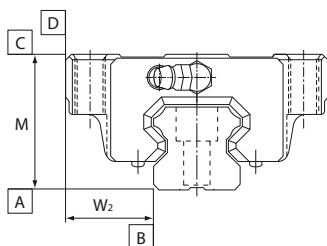
Блок LM имеет меньшую ширину (W), в месте установки имеются резьбовые отверстия. Данная модель оптимальна для рабочих мест с ограничением свободного пространства.

- HSR 15R
- HSR 20R
- HSR 25R
- HSR 30R
- HSR 35R



Стандарт точности

В следующей таблице и на рисунке справа показаны стандарты точности для динамического параллелизма и допуски по ширине и высоте для модели направляющей LM HSR класса Ct.



Деталь: мм

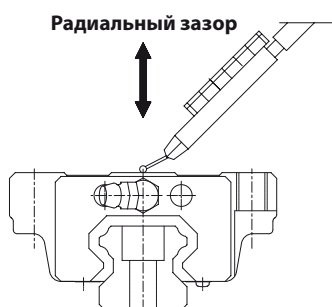
Номер модели	Стандарт точности	Класс Ct
	Деталь	
15 20	Допуск по высоте, M	$\pm 0,12$
	Перепад по высоте, M	0,025
	Допуск по ширине, W2	$\pm 0,12$
	Перепад по ширине, W2	0,025
25 30 35	Допуск по высоте, M	$\pm 0,12$
	Перепад по высоте, M	0,025
	Допуск по ширине, W2	$\pm 0,12$
	Перепад по ширине, W2	0,035

Примечание: Перепад по величине M обозначает величину, при которой переход на следующую линию не разделяет каретки, установленные на одном рельсе LM.

Единица измерения: мкм

Длина рельса LM (мм)		Величина динамического параллелизма	
Выше	Или ниже	Класс Ct 7	Класс Ct 5
—	50	6	6
50	80	6	6
80	125	6	6
125	200	7	6
200	250	9,5	6,5
250	315	11	7,5
315	400	13	8,5
400	500	16	11
500	630	18	13
630	800	20	15
800	1000	23	16
1000	1250	26	18
1250	1600	28	20
1600	2000	31	23
2000	2500	34	25
2500	3150	36	27
3150	4000	40	29
4000	5000	41	30

Радиальный зазор



В следующей таблице показан радиальный зазор модели направляющей LM HSR класса Ct.

Деталь: мкм

Номер модели	Радиальный зазор
15	от -8 до +2
20	от -14 до +2
25	от -16 до +2
30	от -18 до +4
35	от -20 до +4

Ресурс оборудования

Номинальный ресурс

Номинальный (L) ресурс соответствует общей длине хода, которую 90% группы устройств той же модели могут пройти без отслоения покрытия (видимого отслоения металлического покрытия) при работе в одинаковых условиях.

Номинальный ресурс моделей HSR класса Ct определяется по уравнению (1).

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3 \times 50 \dots\dots\dots(1)$$

Примечание: Динамическая грузоподъемность (C) обозначает нагрузку неизменной величины и направления, при которой номинальный запас хода (L) составляет L = 50 км для группы одинаковых направляющих LM, работающих независимо и в одинаковых условиях.

- L: Номинальный запас хода (км)
- C: Динамическая грузоподъемность (H)
- P_C: Расчетная нагрузка (H)
- f_H: Коэффициент твердости (см. в Общем каталоге)
- f_T: Температурный коэффициент (см. в Общем каталоге)
- f_C: Контактный коэффициент (см. в Общем каталоге)
- f_W: Коэффициент нагрузки (см. в Общем каталоге)

Ресурс оборудования

После определения номинального ресурса (L) ресурс оборудования можно рассчитать по уравнению (2) при постоянной длине хода и числу возвратно-поступательных движений.

$$L_h = \frac{L \times 10^6}{2 \times \ell_s \times n_1 \times 60} \dots\dots\dots(2)$$

- L_h: Ресурс оборудования (ч)
- ℓ_s: Длина хода (мм)
- n₁: Число возвратно-поступательных движений в минуту (мин⁻¹)

ДОПОЛНИТЕЛЬНЫЕ ДЕТАЛИ

Для моделей HSR класса Ct могут быть заказаны средства защиты от пыли. Для заказа необходимо указать маркировку соответствующей детали из таблицы ниже (описание маркировки средств защиты от пыли см. на страницах а-24 - а-25 Общего каталога No.401E).

Для номеров моделей, имеющих техническую поддержку, и общей длины блока LM (параметр L) с установленными средствами защиты от пыли подходят соответствующие параметр моделей HSR. Также могут быть заказаны пробки и крышки для монтажных отверстий рельс LM.

См. перечень дополнительных деталей в Общем каталоге.

Защита от пыли

Средства защиты от пыли для модели HSR класса Ct

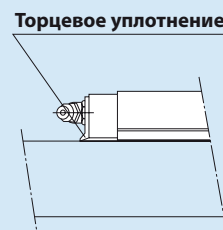
Средства защиты от пыли	принцип действия/установка
Торцевое уплотнение	Установленное на обоих концах блока LM, уплотнение защищает вертикальную и боковую поверхность рельса LM от попадания воды и отложения пыли, а также предотвращает их попадание в блок LM. Кроме того, в устройстве стандартной комплектации уплотнение защищает блок LM от утечки смазки.
Боковое уплотнение	Применяется в случаях, когда в блок LM может попасть пыль сбоку или снизу.

Обозначение средств защиты от пыли для модели HSR класса Ct

Обозначение	средства защиты от пыли
SS	Торцевое + боковое уплотнение (стандартное исполнение)

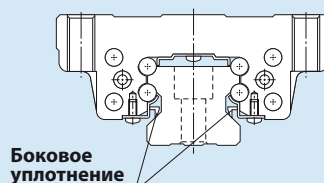
Торцевое уплотнение

Применяется при эксплуатации в помещениях с сильной запыленностью



Боковое уплотнение

Применяется в случаях, когда в блок LM может попасть пыль с бокового или нижнего направления, например при установке в вертикальном или перевернутом положении.



Крышки для монтажных отверстий рельс LM

Если монтажные отверстия рельса LM направляющей LM заполнены стружками или другими инородными частицами, последние могут попасть в блок LM. Можно предотвратить проникновение подобных инородных частиц, закрыв каждое монтажное отверстие рельса LM крышкой, чтобы верхняя часть монтажных отверстий находилась на одном уровне с верхней поверхностью рельса LM.

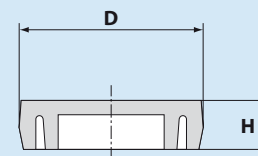
Изготовленные из специальной маслостойкой и противоизносной синтетической резины, крышки для монтажных отверстий рельса LM являются чрезвычайно долговечными.

Основные размеры крышки

Номер модели	Крышка номер модели	Болт	Основные размеры (мм)	
			D	H
15	C4	M4	7,8	1,0
20	C5	M5	9,8	2,4
25	C6	M6	11,4	2,7
30	C8	M8	14,4	3,7
35	C8	M8	14,4	3,7

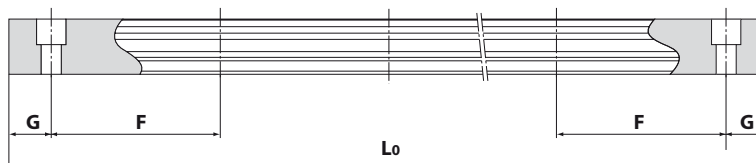
Крышка для монтажных отверстий рельс LM

Защищает монтажные отверстия рельса LM от попадания стружек.



Стандартная и максимальная длина рельса LM

В следующей таблице приведены значения стандартной и максимальной длины направляющей LM модели HSR класса Ct. Чем больше параметр G, тем менее устойчивой может быть область G после установки, это негативно отражается на точности устройства. Каждая модель HSR класса Ct оборудована отрезком рельса LM достаточной длины. При размещении заказа укажите общую длину рельса LM, а также параметры "G" и "g". Если максимальная длина рельса LM нужного типа превышает значение, указанное в таблице, используются скрепленные рельсы. В этом случае не забудьте указать общую длину направляющей.

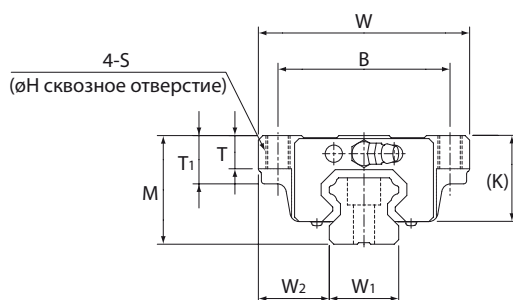


Стандартная и максимальная длина рельса LM для модели HSR класса Ct

Деталь: мм

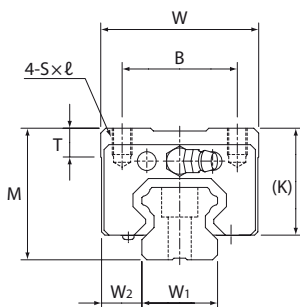
Номер модели	HSR15	HSR20	HSR25	HSR30	HSR35
Стандартная длина рельса LM (L0)	160	160	220	280	280
	220	220	280	360	360
	280	280	340	440	440
	340	340	400	520	520
	400	400	460	600	600
	460	460	520	680	680
	520	520	580	760	760
	640	580	640	840	840
	760	640	700	920	920
	820	700	760	1000	1000
	1000	820	820	1160	1080
	1240	1000	1000	1240	1160
	1600	1240	1240	1640	1240
		1600	1600	1880	1640
		1840	1960	2520	2040
	2080	2440	3000	2520	
	3000	3000		3000	
Стандартный шаг F	60	60	60	80	80
G	20	20	20	20	20
Максимальная длина	3000	3000	3000	3000	3000

Таблица размеров для модели HSR-C класса Ct



Номер модели	Внешние размеры			Размеры блока LM										
	Высота М	Ширина W	Длина L	B	C	S	H	L ₁	T	T ₁	K	N	E	Смазочный ниппель
HSR15C	24	47	56,6	38	30	M5	4,4	38,8	7	11	19,3	4,3	5,5	PB1021B
HSR20C	30	63	74	53	40	M6	5,4	50,8	10	9,5	26	5	12	B-M6F
HSR25C	36	70	83,1	57	45	M8	6,8	59,5	11	16	30,5	6	12	B-M6F
HSR30C	42	90	98	72	52	M10	8,5	70,4	9	18	35	7	12	B-M6F
HSR35C	48	100	109,4	82	62	M10	8,5	80,4	12	21	40,5	8	12	B-M6F

Таблица размеров для модели HSR-R класса Ct



Номер модели	Внешние размеры			Размеры блока LM									
	Высота М	Ширина W	Длина L	B	C	S x l	L ₁	T	K	N	E	Смазочный ниппель	
HSR15R	28	34	56,6	26	26	M4 x 5	38,8	6	23,3	8,3	5,5	PB1021B	
HSR20R	30	44	74	32	36	M5 x 6	50,8	8	26	5	12	B-M6F	
HSR25R	40	48	83,1	35	35	M6 x 8	59,5	9	34,5	10	12	B-M6F	
HSR30R	45	60	98	40	40	M8 x 10	70,4	9	38	10	12	B-M6F	
HSR35R	55	70	109,4	50	50	M8 x 12	80,4	11,7	47,5	15	12	B-M6F	

■ Номер модели

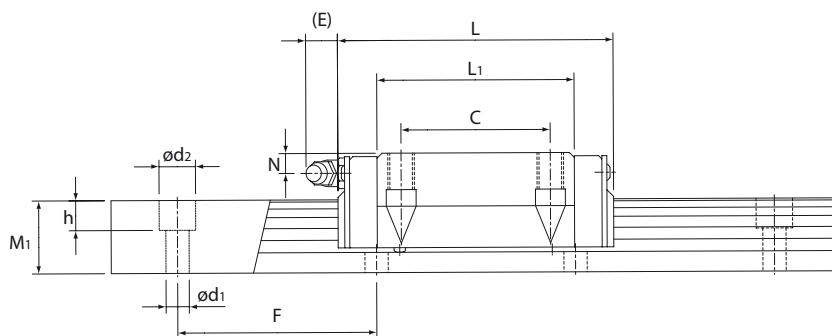
Блок: **HSR25 C 1 SS Ct BLOCK**

1 2 3 4 5 6

Рельс: **HSR25 - 3000L Ct7 RAIL**

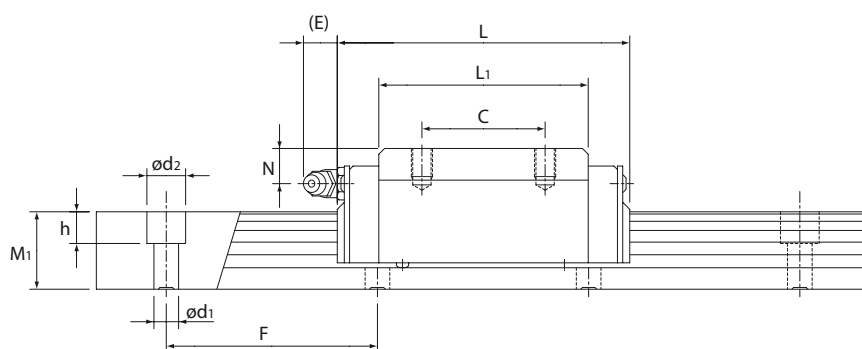
7 8 9

- 1 Номер модели
- 2 Тип блока LM (C, R)
- 3 Количество блоков (в данном примере - 1)
- 4 Обозначение средств защиты от пыли*1: (см. страницу 3)
- 5 Обозначение "Класс Ct"
- 6 Обозначение блока
- 7 Длина рельса LM (мм)
- 8 Обозначение "Класс Ct" (класс Ct5, класс Ct7)
- 9 Обозначение рельса



Деталь: мм

Размеры рельса LM					Динамическая грузоподъемность		Допустимый статический момент кН·м ^{*2}			Масса	
Ширина W _{1-0,05} ⁰	W ₂	Высота M ₁	Шаг F	d ₁ × d ₂ × h	C кН	C ₀ кН	M _A 	M _B 	M _C 	Блок LM кг	Рельс LM кг/м
15	16	15	60	4,5×7,5×5,3	8,33	13,5	0,0805	0,0805	0,0844	0,2	1,5
20	21,5	18	60	6×9,5×8,5	13,8	23,8	0,19	0,19	0,201	0,35	2,3
23	23,5	22	60	7×11×9	19,9	34,4	0,307	0,307	0,344	0,59	3,3
28	31	26	80	9×14×12	28	46,8	0,524	0,524	0,562	1,1	4,8
34	33	29	80	9×14×12	37,3	61,1	0,782	0,782	0,905	1,6	6,6



Деталь: мм

Размеры рельса LM					Динамическая грузоподъемность		Допустимый статический момент кН·м ^{*2}			Масса	
Ширина W _{1-0,05} ⁰	W ₂	Высота M ₁	Шаг F	d ₁ × d ₂ × h	C кН	C ₀ кН	M _A 	M _B 	M _C 	Блок LM кг	Рельс LM кг/м
15	9,5	15	60	4,5×7,5×5,3	8,33	13,5	0,0805	0,0805	0,0844	0,18	1,5
20	12	18	60	6×9,5×8,5	13,8	23,8	0,19	0,19	0,201	0,25	2,3
23	12,5	22	60	7×11×9	19,9	34,4	0,307	0,307	0,344	0,54	3,3
28	16	26	80	9×14×12	28	46,8	0,524	0,524	0,562	0,9	4,8
34	18	29	80	9×14×12	37,3	61,1	0,782	0,782	0,905	1,5	6,6

Примечание

*1: Для модели HSR класса Ст "SS" является стандартной комбинацией.
 *2: Обозначает допустимый статический момент для одного блока LM.

ТНК Модель HSR класса точности Ct



Техника безопасности в процессе эксплуатации

● Правильное обращение

- Разборка устройства может привести к попаданию пыли внутрь конструкции или уменьшению точности подгонки деталей. Не разбирайте устройство.
- Наклон блока LM или рельса LM может привести к их падению под действием собственного веса.
- Падение направляющей LM или удар могут привести к ее повреждению. Механический удар по направляющей LM может негативно отразиться на ее работе, даже если после удара на ней отсутствуют внешние повреждения.

● Смазка

- Перед началом эксплуатации тщательно удалите антикоррозионную смазку и смажьте устройство.
- Не смешивайте смазочные материалы с различными свойствами.
- В местах, подверженных постоянной вибрации или в специфических условиях эксплуатации: в помещениях с повышенными санитарными требованиями, в условиях вакуума, высоких и низких температур нельзя применять смазочные материалы общего назначения. Для получения более подробной информации обратитесь в компанию ТНК.
- Перед использованием смазочных материалов специального назначения обратитесь в компанию ТНК.
- При смазке маслом возможно неравномерное распределение смазочного материала по системе LM. Это зависит от монтажной ориентации системы. Для получения более подробной информации обратитесь в компанию ТНК.
- Интервал смазки зависит от условий эксплуатации. Для получения более подробной информации обратитесь в компанию ТНК.

● В процессе эксплуатации

- Попадание инородных тел внутрь устройства может привести к повреждению шаровой части или выходу направляющей из строя. Не допускайте попадания инородных тел, таких как пыль и стружки, внутрь системы
- При эксплуатации линейной направляющей с использованием определенных типов хладагена и возможностью попадания хладагена внутрь каретки не исключено ухудшение работы устройства. Для получения более подробной информации обратитесь в компанию ТНК.
- Система LM не предназначена для эксплуатации при температуре 80°C и выше. Если подразумевается эксплуатация системы LM при температуре 80°C или выше, предварительно обратитесь в компанию ТНК.
- При отложении загрязнений в системе LM, очистите устройство и замените смазку. Для получения информации по типам моющих средств обратитесь в компанию ТНК.
- При эксплуатации направляющей LM, установленной в перевернутом виде, возможен разлом торцевой пластины при возникновении аварийной ситуации, а также выпадение шариков, соскальзывание и падение блока LM с рельса. В таких случаях необходимо принять меры по профилактике падения, например, установить предохранительное устройство.
- В местах, подверженных постоянной вибрации или в специфических условиях эксплуатации: в помещениях с повышенными санитарными требованиями, в условиях вакуума, высоких и низких температур нельзя применять смазочные материалы общего назначения.
- При снятии блока LM с рельса для замены можно применять зажим для установки/снятия блока LM, который упрощает данный процесс. Для получения более подробной информации обратитесь в компанию ТНК.

● Хранение

- Хранение направляющей LM необходимо производить в горизонтальном положении и в упаковке, рекомендованной компанией ТНК, а также предохранять устройство от воздействия высоких и низких температур и высокой влажности.

● "LM Guide," ("Направляющая LM"), "Ball Cage," ("Шаровая обойма") " , " и "QZ" являются зарегистрированными торговыми марками компании ТНК СО., LTD.

- Вид продукции на фотографиях может немного отличаться от реального вида.
 - Внешний вид и спецификации продукции могут быть изменены без предварительного уведомления. Перед размещением заказа проконсультируйтесь с компанией ТНК.
 - Несмотря на то, что данный каталог был составлен с особой тщательностью, компания ТНК не несет ответственность за урон, возникший по причине типографских ошибок или упущенной информации.
 - При экспорте продукции и технологий, а также продаже на экспорт компания ТНК принципиально соблюдает законы международной торговли и обмена валюты, законы регулирования внешней торговли, а также другие законы, имеющие силу в данной области.
- Перед экспортом продукции компании ТНК в форме отдельных торговых продуктов, предварительно обратитесь в компанию ТНК.

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