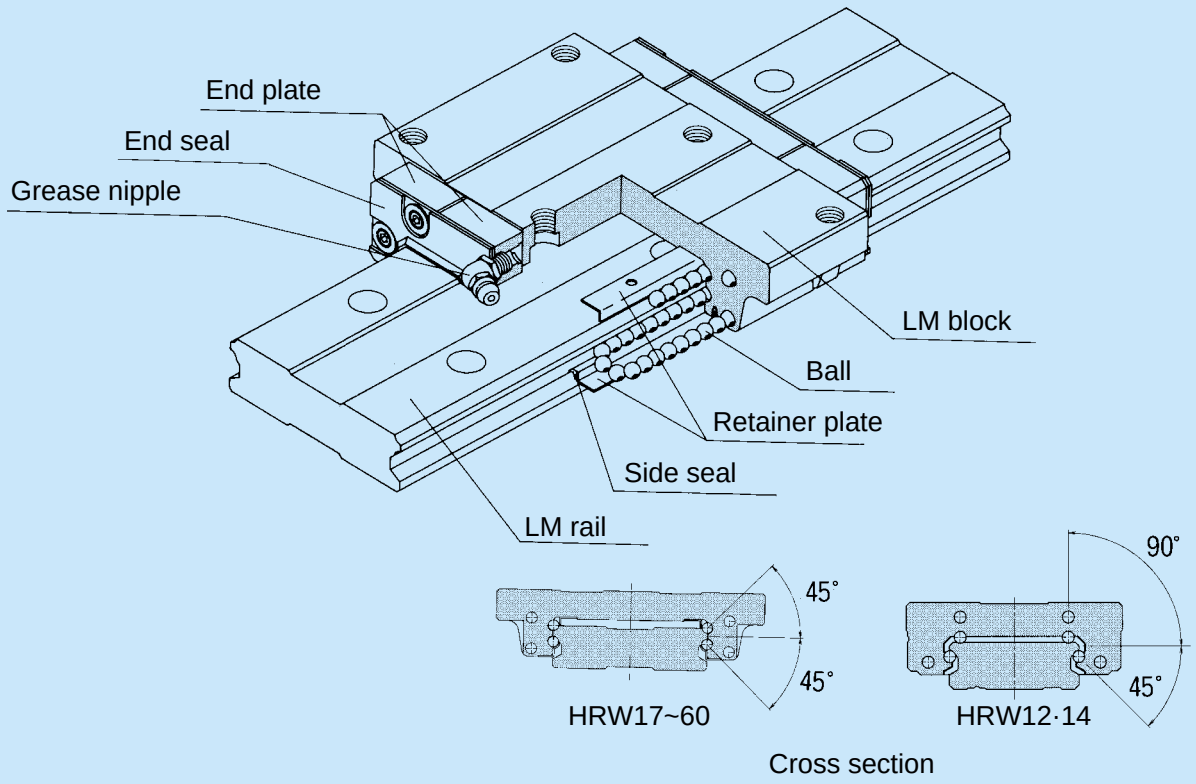


Fig. 1 Construction of Model HRW

Construction and Features

Balls roll in four rows of precision-ground raceway on an LM rail and an LM block. The end plate attached to the LM block causes the trains of balls to circulate.

As the balls are held in place by the retainer plate, they do not fall off if the LM block is removed from the rail (except for types HRW 12 and 14LR).

The four trains of balls are arranged so that the contact angle is 45°, allowing each train of balls to bear an equal load rating in all four directions: radial, reverse-radial, and the two lateral directions. This type can therefore be used in any installation direction. Moreover, type HRW permits the application of a well-balanced preload, making it possible to increase rigidity in the four directions while keeping the friction coefficient low. The overall height is designed to be as low as possible. The LM block is made as thick as possible and is designed to be solidly fastened with six bolts (excluding types HRW12, 14LR, 17, and 21CR).

Type HRW can be used with only one rail where space-saving is a necessity, moments act on the system, and high rigidity is required.

Compact and high load-carrying capability

Because a large number of balls is effective in carrying heavy loads, type HRW maintains excellent rigidity in all directions. The great rail width allows all moments involved to be properly borne by a single rail.

The rail cross section provides a large geometrical moment of inertia, ensuring high rigidity in the lateral direction and thereby eliminating the need for a brace or similar reinforcement.

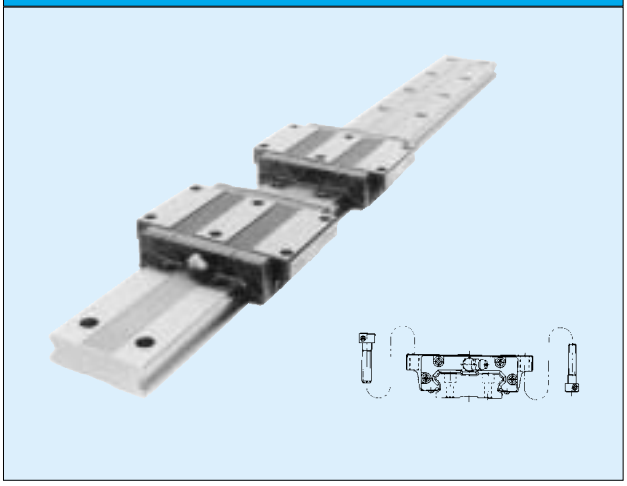
Low noise

The turning corners of ball trains are provided with synthetic-resin end plates, to ensure that the balls circulate smoothly. This results in low noise and stable linear motion.

Type HRW27 has achieved 50 dB at a running speed of 50 m/min.

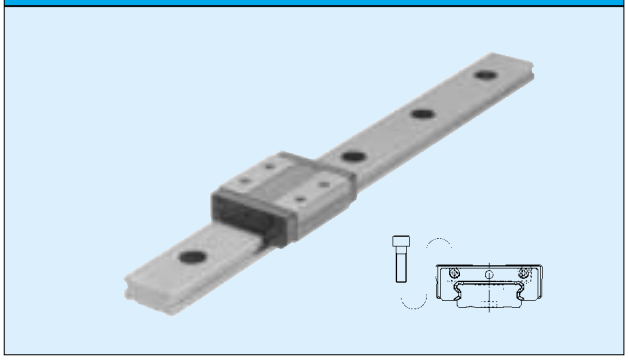
Types and Features

Type HRW-CA



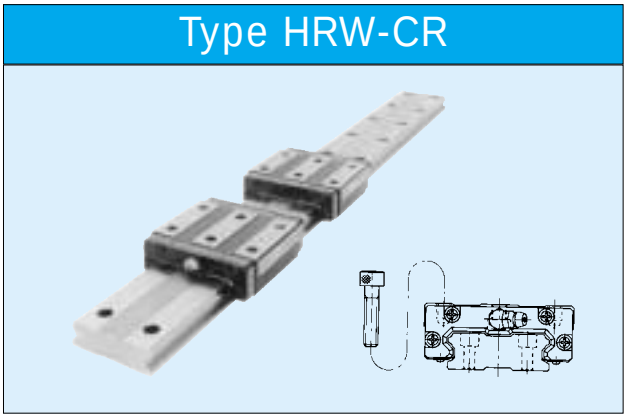
Low-profile, wide, four-way equal-load type. LM-block mounting holes are tapped, and the flange bottom surface is spot-faced. An LM block can therefore be mounted from either above or below.

Miniature type HRW-LR



Low-profile, wide, and radial-load-resistant. LM blocks are to be mounted using the tapped holes provided on their top surfaces.

Type HRW-CR



Low-profile, wide, four-way equal-load type. LM blocks are to be mounted using the tapped holes provided on their top surfaces.

Load rating

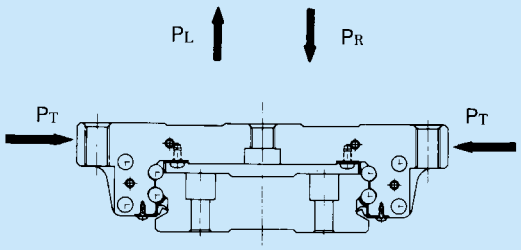


Fig. 2

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

The basic load ratings of types HRW17 through 60 in all four directions (radial, reverse-radial and the two lateral directions) are equivalent to one another. The values are given in the corresponding dimension tables.

The basic load ratings of types HRW12 and 14 are those for the radial direction in the diagram. The values are given in the corresponding dimension tables. Values for the reverse-radial and lateral directions can be obtained from Table 1.

Table 1 Type HRW12, 14 Basic Load Ratings in Various Directions

Direction	Basic dynamic-load rating	Basic static-load rating
Radial direction	C	C_O
Reverse-radial direction	$C_L = 0.78C$	$C_{OL} = 0.71C_O$
Lateral directions	$C_T = 0.48C$	$C_{OT} = 0.35C_O$

Equivalent load

The equivalent load for types HRW17 through 60 when loads are applied in all four directions to their LM blocks simultaneously can be obtained using the following equation:

$P_E = P_R (P_L) + P_T$

where

P_E	:	equivalent load - In the radial direction - In the reverse-radial direction - In the lateral direction	(N)
P_R	:	radial load	(N)
P_L	:	reverse-radial load	(N)
P_T	:	lateral load	(N)

An equivalent load for types HRW 12, 14 when reverse-radial and lateral loads are exerted on its LM block simultaneously can be obtained using the following equation:

$P_E = X \cdot P_L + Y \cdot P_T$

where

P_E	:	equivalent load - In the reverse-radial direction - In the lateral directions	(N)
P_L	:	reverse-radial load	(N)
P_T	:	lateral load	(N)
X and Y	:	equivalent factor	(see Table 2)

Table 2 Type-HRW12, 14 Equivalent Factor

P_E	X	Y
Equivalent load in the reverse-radial direction	1	2
Equivalent load in the lateral directions	0.5	1

Permissible moment

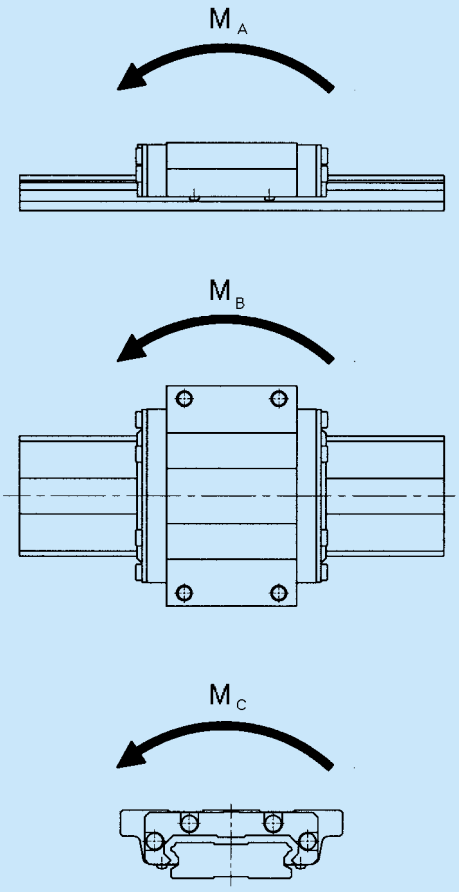


Fig. 3

In type HRW, a single LM block can bear moments in all directions. Table 3 gives the permissible moments in directions M_A, M_B, and M_C for a single LM block.

Table 1 Type HRW Static Permissible Moment

Unit : kNm

Model No.	M_A	M_B	M_c
HRW 12	0.022	0.010	0.034
HRW 14	0.030	0.020	0.077
HRW 17	0.03	0.03	0.13
HRW 21	0.06	0.06	0.21
HRW 27	0.14	0.14	0.42
HRW 35	0.46	0.46	1.58
HRW 50	1.09	1.09	3.65
HRW 60	1.54	1.54	6.10

Accuracy standards

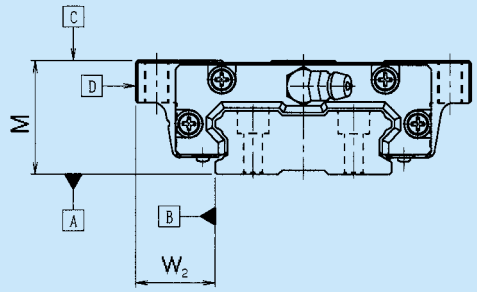


Fig. 4

The accurancy of type HRW is divided into five grades, normal, high, precision, super-precision.

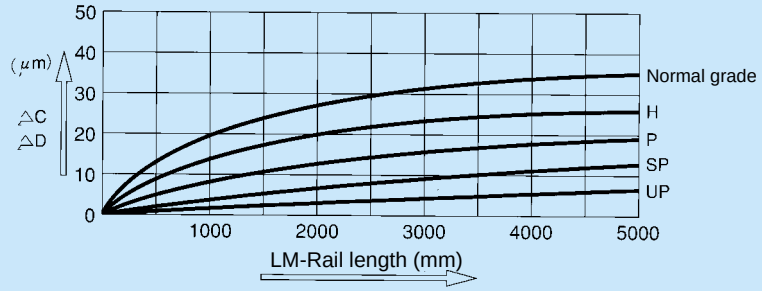


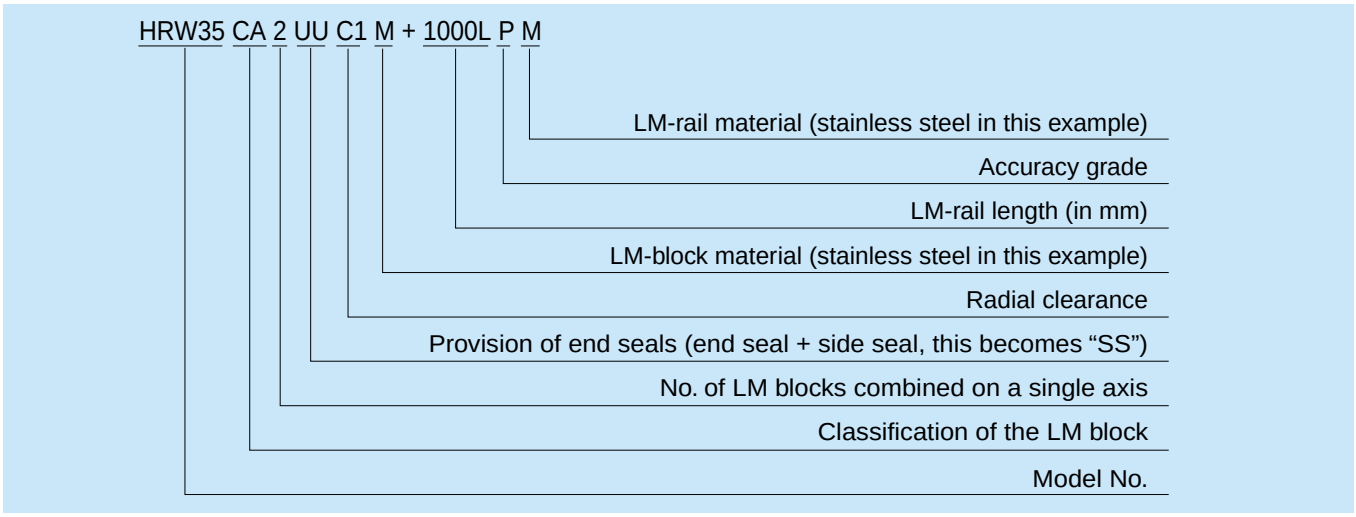
Fig. 5 Relationship Between LM-Rail Length and Running Parallelism

Table 4 Type HRW Accuracy Standard

Unit : mm

Model No.	Accuracy standard	Normal	High	Precision	Super-precision	Ultra-precision
	Item	No symbol	H	P	SP	UP
HRW 12 HRW 14	Tolerance for height M	±0.08	±0.04	±0.02	±0.01	———
	Tolerance for the height M difference among LM blocks	0.015	0.007	0.005	0.003	———
	Tolerance for rail-to-block lateral distance W_2	±0.05	±0.025	±0.015	±0.010	———
	Tolerance for rail-to-block lateral distance W_2 difference among LM blocks	0.02	0.01	0.007	0.005	———
	Running Parallelism of LM block surface C with surface A	C (as per Fig. 5)				
	Running parallelism of LM block surface D with surface B	D (as per Fig. 5)				
HRW 17 HRW 21	Tolerance for height M	±0.1	±0.03	0 -0.03	0 -0.015	0 -0.008
	Tolerance for the height M difference among LM blocks	0.02	0.01	0.006	0.004	0.003
	Tolerance for rail-to-block lateral distance W_2	±0.1	±0.03	0 -0.03	0 -0.015	0 -0.008
	Tolerance for rail-to-block lateral distance W_2 difference among LM blocks	0.02	0.01	0.006	0.004	0.003
	Running Parallelism of LM block surface C with surface A	C (as per Fig. 5)				
	Running parallelism of LM block surface D with surface B	D (as per Fig. 5)				
HRW 27 HRW 35	Tolerance for height M	±0.1	±0.04	0 -0.04	0 -0.02	0 -0.01
	Tolerance for the height M difference among LM blocks	0.02	0.015	0.007	0.005	0.003
	Tolerance for rail-to-block lateral distance W_2	±0.1	±0.04	0 -0.04	0 -0.02	0 -0.01
	Tolerance for rail-to-block lateral distance W_2 difference among LM blocks	0.03	0.015	0.007	0.005	0.003
	Running Parallelism of LM block surface C with surface A	C (as per Fig. 5)				
	Running parallelism of LM block surface D with surface B	D (as per Fig. 5)				
HRW 50 HRW 60	Tolerance for height M	±0.1	±0.05	0 -0.05	0 -0.03	0 -0.02
	Tolerance for the height M difference among LM blocks	0.03	0.015	0.007	0.005	0.003
	Tolerance for rail-to-block lateral distance W_2	±0.1	±0.05	0 -0.05	0 -0.03	0 -0.02
	Tolerance for rail-to-block lateral distance W_2 difference among LM blocks	0.03	0.02	0.01	0.007	0.005
	Running Parallelism of LM block surface C with surface A	C (as per Fig. 5)				
	Running parallelism of LM block surface D with surface B	D (as per Fig. 5)				

Model-number coding



Radial clearance

Table 5 presents the radial clearances of types HRW.

Table 5 Type-HRW Radial Clearances

Unit : μm

Clearance symbol / Model No.	Nomal	Under a light preload	Medium preload
	No symbol	C1	C0
HRW 12	±1.5	– 4 ~ – 1	——
HRW 14	±2	– 5 ~ – 1	——
HRW 17	– 3 ~ + 2	– 7 ~ – 3	——
HRW 21	– 4 ~ + 2	– 8 ~ – 4	——
HRW 27	– 5 ~ + 2	– 11 ~ – 5	——
HRW 35	– 8 ~ + 4	– 18 ~ – 8	– 28 ~ – 18
HRW 50	– 10 ~ + 5	– 24 ~ – 10	– 38 ~ – 24
HRW 60	– 12 ~ + 5	– 27 ~ – 12	– 42 ~ – 27

Contamination Protection

From our wide variety of products for type HRW, you can select the best one for your situation. (For details on seals, see “Contamination Protection” for type HSR on page A-249.)

Seal resistance value

For the maximum value of seal resistance of Seals Type HRW...UU per LM block in which grease is applied, see Table 6.

Table 6 Type HRW Seal resistance

Unit: N

Model No.	Resistance
HRW 12	0.2
HRW 14	0.3
HRW 17	2.9
HRW 21	4.9
HRW 27	4.9
HRW 35	9.8
HRW 50	14.7
HRW 60	19.6

Side seal for type HRW

Prevents contaminants from entering an LM block from below

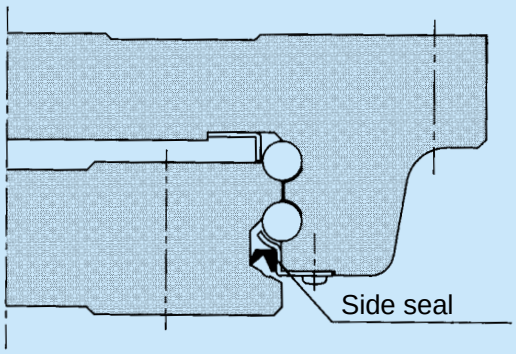


Fig. 6

Scraper for type HRW

Removes spatters and similar large foreign matter

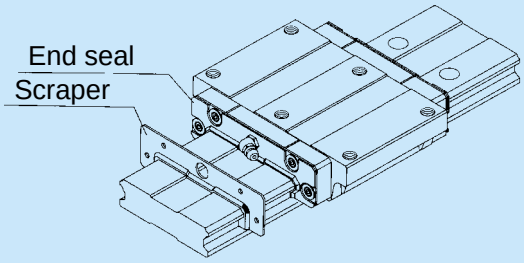


Fig. 7

Not all LM Guide models accept all contamination-protection accessories. Please check Table 7.

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

Table 4 Type HRW: LM Block Overall Length with a Contamination-protection Accessory Attached

Unit: mm

Model. No.	No symbol		UU		SS		DD		ZZ		KK	
HRW12LRM	O	36.1	O	37	O	37	×	-	×	-	×	-
HRW14LRM	O	44.6	O	45.5	O	45.5	×	-	×	-	×	-
HRW17CA/CAM HRW17CR/CRM	O	49.2	O	51	×	-	Δ	54	Δ	53.6	Δ	58.6
HRW21CA/CAM HRW21CR/CRM	O	57.2	O	59	×	-	Δ	64.2	Δ	62.8	Δ	69
HRW27CA/CAM HRW27CR/CRM	O	66.8	O	73	O	73	O	79	O	75.6	O	81.8
HRW35CA/CAM HRW35CR/CRM	O	100.1	O	107.5	O	107.5	O	114.3	O	112.5	O	119.7
HRW50CA HRW50CR	O	134.1	O	141.5	O	141.5	O	148.2	O	143.8	O	151
HRW60CA	O	149.5	O	159	O	159	O	169.7	O	165.1	O	175.9

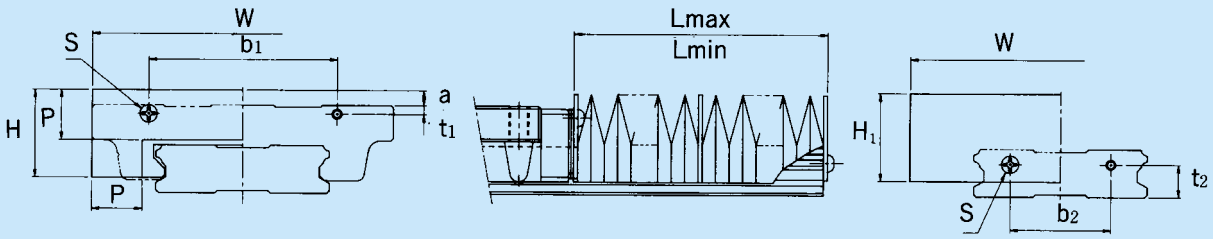
Note: O = Applicable

× = Not applicable

Δ = Applicable, but does not allow a side seal to be attached

Dedicated Bellows JHRW for Type HRW

Shown below are the dimensions of dedicated bellows JHRW for type HRW. When ordering the bellows, specify the relevant model number shown in the table below.



Unit : mm

Model No.	Boundary dimensions											A (Lmax / Lmin)	Applicable LM-Guide model
	W	H	H_1	P	b_1	t_1	b_2	t_2	Mounting bolt S	a	b		
JHRW 17	68	22	23	15	43	3	18	6	*M3 × 0.5 × 6*l*	8	4	5	HRW 17
JHRW 21	75	25	26	17	48	3	22	7	M3 × 0.5 × 6*l*	8	3.5	6	HRW 21
JHRW 27	85	33.5	33.5	20	48	3	20	10	M3 × 0.5 × 6*l*	10	2.5	7	HRW 27
JHRW 35	120	35	35	20	75	3.5	40	13	M3 × 0.5 × 6*l*	6	-	7	HRW 35
JHRW 50	164	42	42	20	100	9	50	16	M4 × 0.7 × 8*l*	-	1	7	HRW 50
JHRW 60	180	51	51	25	120	8	60	24	M5 × 0.8 × 10*l*	-	-	9	HRW 60

Note 1: Mounting bolts marked with a "**" for type JHRW17 should be used for LM rails only. Use tapping screws of designation 2.5x8 for LM blocks.

Note 2: The expansion ratios in installation directions other than horizontal, e.g., vertical and wall-hung, differ from those specified in this table (guidelines: A – 1.5). When ordering bellows, please specify your installation direction.

Note 3: If bellows are attached to both ends of an LM block, a grease nipple cannot be installed there. In such a case, contact us.

Model-number coding

JHRW21 - 60/360

- JHRW21: Model No. (bellows for type HRW21 in this example)
- 60/360: Bellows dimensions (length when compressed / length when expanded)

Note: A bellows length can be calculated as shown below.

$$Lmin = \frac{S}{(A - 1)}$$ S: stroke length in (mm)

$$Lmax = Lmin \times A$$ A: expansion ratio

Mounting-Surface Height and Corner Profile

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

For the reference-surface shoulder height, see Table 8.

Furthermore, provide enough space to the corner profile of a mounting surface so that the corner does not interfere with chamfers made on the LM blocks or rails, or provide the corner with a radius smaller than corner radius r specified in Table 8.

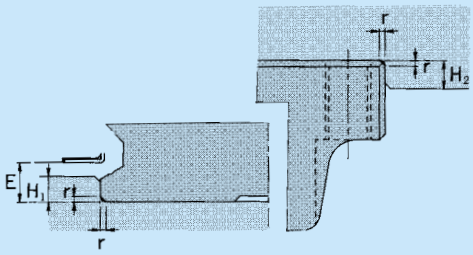


Fig. 8

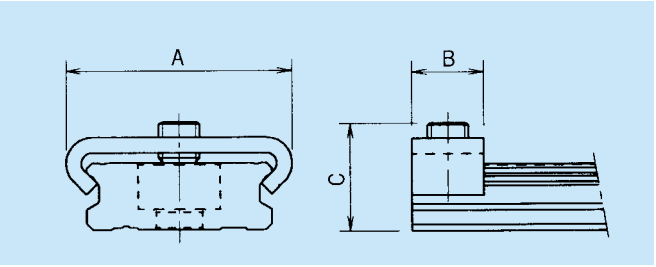
Table 8 Mounting Surface Shoulder Height and Corner Radius

Unit : mm

Model No.	Corner radius r (max.)	LM rail shoulder height H_1	LM block shoulder max. height H_2	E
HRW 12	0.5	1.5	4	2
HRW 14	0.5	1.5	5	2
HRW 17	0.4	2	4	2.5
HRW 21	0.4	2.5	5	3
HRW 27	0.4	2.5	5	3
HRW 35	0.8	3.5	5	4
HRW 50	0.8	3	6	3.4
HRW 60	1.0	5	8	6.5

Stopper

In types HRW 12 and 14, removing the LM block from the rail causes the balls to fall off. To prevent this, the LM block is delivered with stoppers installed. If the LM Guide is used without the stoppers, be careful not to allow the LM block to overrun.



Model No.	A	B	C
HRW 12	22	7	10.5
HRW 14	28.6	7.6	11.2

LM-Rail Standard and Maximum Lengths

Table 9 presents the standard and maximum lengths of LM rails for type HRW. If your maximum length is not within the range of this table, we offer special LM rails intended for connected use.

For dimension G when a special length is specified, we recommend those listed in Table 9. A large dimension G tends to reduce stability at the rail ends, which may degrade accuracy.

For connected use, we offer LM rails that ensure the elimination of level differences at joints. Therefore, when placing an order, please specify the overall length of the LM rails you require.

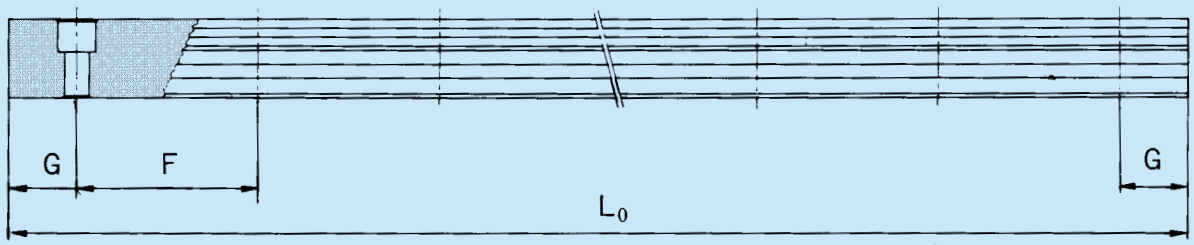


Table 9 Type HRW LM rail Standard and Maximum Lengths

Unit: mm

Model No.	HRW 12	HRW 14	HRW 17	HRW 21	HRW 27	HRW 35	HRW 50	HRW 60
LM-rail standard length (L_0)	70 110 150 190 230 270 310 390 470	70 110 150 190 230 270 310 390 470 550 670	110 190 310 470 550	130 230 380 480 580 780	160 280 340 460 640 820	280 440 760 1000 1240 1560	280 440 760 1000 1240 1640 2040	570 885 1200 1620 2040 2460
Standard pitch F	40	40	40	50	60	80	80	105
G	15	15	15	15	20	20	20	22.5
Max. length	(1000)	(1430)	1900 (800)	1900 (1000)	3000 (1200)	3000	3000	3000

Note 1: In special cases in which connected use is impossible but one of the maximum lengths specified here is required, contact us.

Note 2: Numbers in parentheses indicate the maximum lengths of stainless steel types.

HRW-CA Type

Standard type

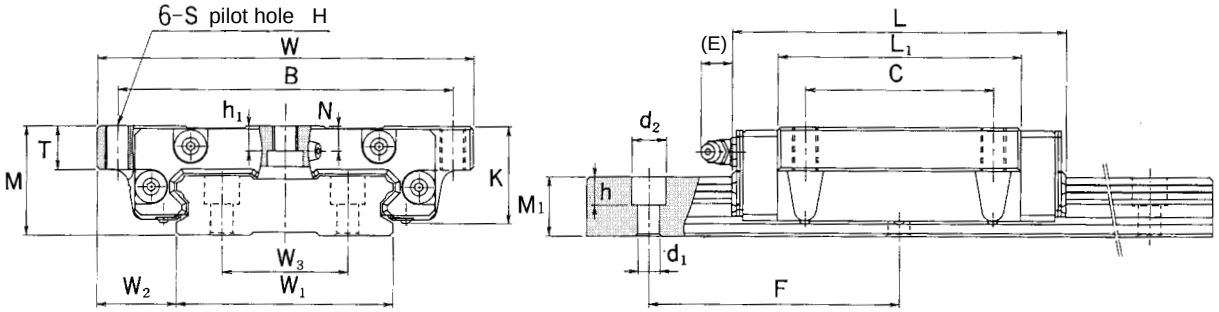
HRW-CAM Type

Stainless-steel type

Model No.	External dimensions			LM block dimensions									
	Height M	Width W	Length L	B	C	S	H	h_1	L_1	T	K	N	E
HRW 17 CA HRW 17 CAM	17	60	51	53	26	M4	3.3	3.2	33.6	6	14.5	4	2
HRW 21 CA HRW 21 CAM	21	68	59	60	29	M5	4.4	3.7	40	8	18	4.5	12
HRW 27 CA HRW 27 CAM	27	80	73	70	40	M6	5.3	6	51.8	10	24	6	12
HRW 35 CA HRW 35 CAM	35	120	107.5	107	60	M8	6.8	8	77.6	14	31	8	12
HRW 50 CA	50	162	141.5	144	80	M10	8.6	14	103.5	18	46.6	14	16
HRW 60 CA	60	200	159	180	80	M12	10.5	15.5	117.5	25	53.5	15	16

Notes:

- An “M” in a model number indicates that the corresponding LM blocks, rails, and balls are made of stainless steel and are therefore corrosion- and environment-resistant.
- For permissible static moments M_A, M_B, and M_C, see page A-299.



Unit : mm

Grease nipple	LM-rail dimensions						Basic load rating		Mass	
	Width W_1 ±0.05	W_2	W_3	Height M_1	Pitch F	$d_1 \times d_2 \times h$	C kN	C_0 kN	LM block kg	LM rail kg/m
PB107	33	13.5	18	9	40	4.5 × 7.5 × 5.3	4.31	8.14	0.15	2.1
B-M6F	37	15.5	22	11	50	4.5 × 7.5 × 5.3	6.18	11.5	0.25	2.9
B-M6F	42	19	24	15	60	4.5 × 7.5 × 5.3	11.5	20.4	0.5	4.3
B-M6F	69	25.5	40	19	80	7 × 11 × 9	27.2	45.9	1.4	9.9
B-PT1/8	90	36	60	24	80	9 × 14 × 12	50.2	81.5	4.0	14.6
B-PT1/8	120	40	80	31	105	11 × 17.5 × 14	63.8	102	5.7	27.8

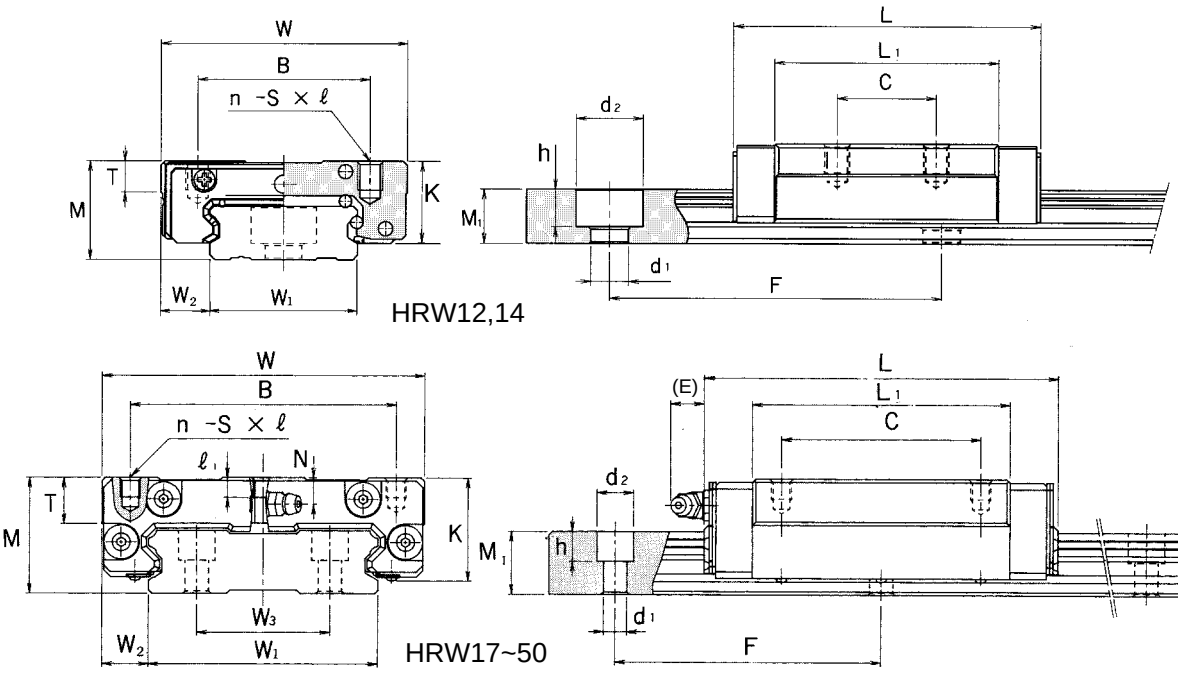
- For standard LM-rail lengths, see page A-305.
- For model-number coding, see page A-301.

HRW-CR Type
Standard type

HRW-CRM Type
HRW-LRMType
Stainless-steel type

Model No.	External dimensions			LM-block dimensions								
	Height M	Width W	Length L	B	C	S × *l* (*l*)	n	L_1	T	K	N	E
HRW 12 LRM	12	30	37	21	12	M3 × 0.5 × 3.5 (-)	4	27	4	10	2.8	-
HRW 14 LRM	14	40	45.5	28	15	M3 × 0.5 × 4 (-)	4	32.9	5	12	3.3	-
HRW 17 CR HRW 17 CRM	17	50	51	29	15	M4 × 0.7 × 5 (-)	4	33.6	6	14.5	4	2
HRW 21 CR HRW 21 CRM	21	54	59	31	19	M5 × 0.8 × 6 (-)	4	40	8	18	4.5	12
HRW 27 CR HRW 27 CRM	27	62	73	46	32	M6 × 6 (6)	6	51.8	10	24	6	12
HRW 35 CR HRW 35 CRM	35	100	107.5	76	50	M8 × 8 (8)	6	77.6	14	31	8	12
HRW 50 CR	50	130	141.5	100	65	M10 × 15 (15)	6	103.5	18	46.6	14	16

Notes:
- An “M” in a model number indicates that the corresponding LM blocks, rails, and balls are made of stainless steel and are therefore corrosion- and environment-resistant.
- For permissible static moments M_A, M_B, and M_C, see page A-299.



Unit : mm

Grease nipple	LM rail dimensions						Basic load rating		Mass	
	Width W_1 ±0.05	W_2	W_3	Height M_1	Pitch F	$d_1 \times d_2 \times h$	C kN	C_0 kN	LM block kg	LM rail kg/m
Oil hole Ø2.2 drilled hole	18	6	-	6.5	40	4.5 × 8 × 4.5	3.29	7.16	0.045	0.79
Oil hole Ø2.2 drilled hole	24	8	-	7.2	40	4.5 × 7.5 × 5.3	5.38	11.4	0.080	1.20
PB107	33	8.5	18	9	40	4.5 × 7.5 × 5.3	4.31	8.14	0.12	2.1
B-M6F	37	8.5	22	11	50	4.5 × 7.5 × 5.3	6.18	11.5	0.19	2.9
B-M6F	42	10	24	15	60	4.5 × 7.5 × 5.3	11.5	20.4	0.37	4.3
B-M6F	69	15.5	40	19	80	7 × 11 × 9	27.2	45.9	1.2	9.9
B-PT1/8	90	20	60	24	80	9 × 14 × 12	50.2	81.5	3.2	14.6

- For standard LM-rail lengths, see page A-305.
- For model-number coding, see page A-301.