

MINIATURE LINEAR GUIDES



ROLLCO

SPECIALIZED
ON LINEAR MOTION



Index

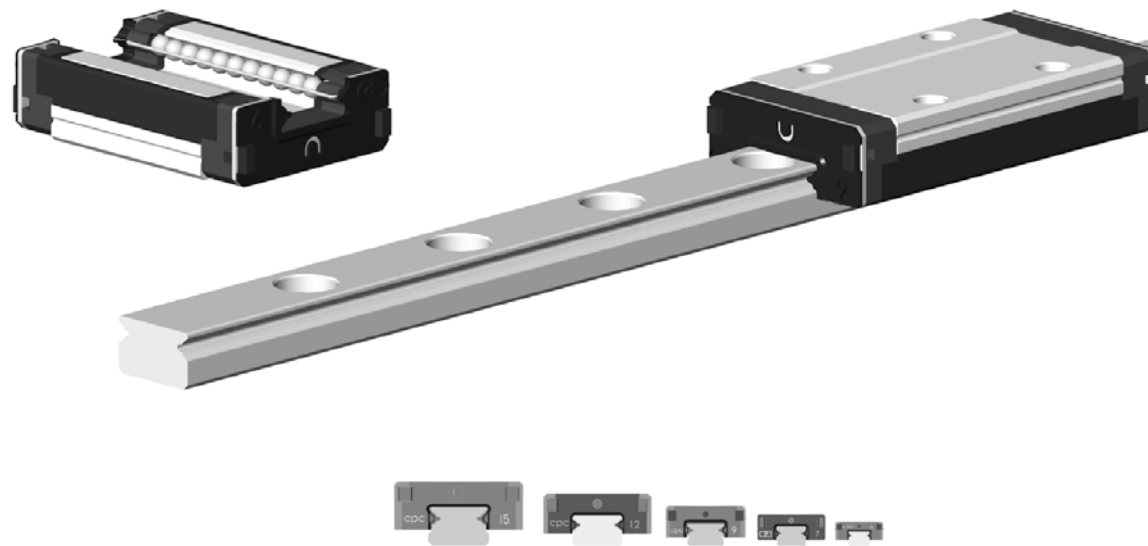
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High Load and High Moment Capacity

MR Miniature Linear Guide series incorporate the design of two rows of ball recirculation, the ball track has gothic profile design with 45° contact angle to attain the effect of equal load capacity in all directions. Under the restriction of limited space, larger steel balls are used to enhance the load and torque capacity.

Insetting Design

The steel body frame end cap and seal are all nested together creating a rigid coupled assembly that doesn't require any screws, making for a simpler less expensive bearing assembly. Such design saves space and provides an easy coupling way.



Accuracy

MR Miniature Linear Guide series have three accuracy classes P,H,N for your choice.

Dust-Proof Design

Standard end seals constitute a completely a completely dust-proof seal design.

Ball-Return Path

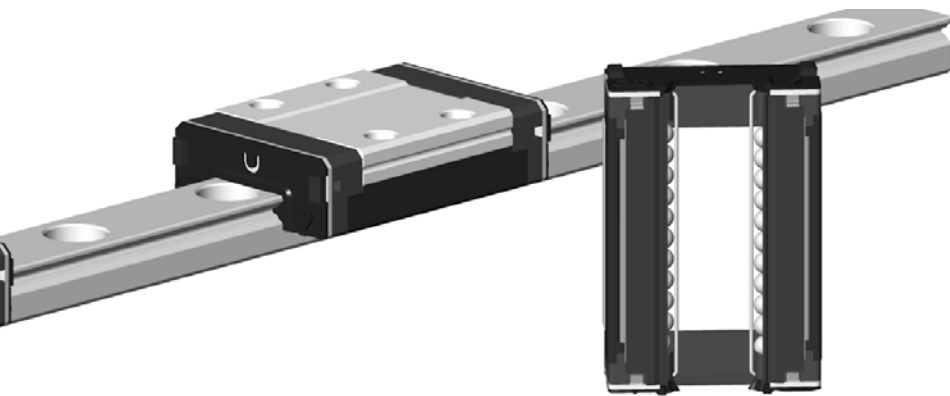
Plastic frames and end caps constitute the complete return circuit. This design makes the re circulation smoother and quieter.

Lubrication

The blocks can be lubricated from either end whose plug can be unfolded by lubricant-injection.

Ball-Retainer

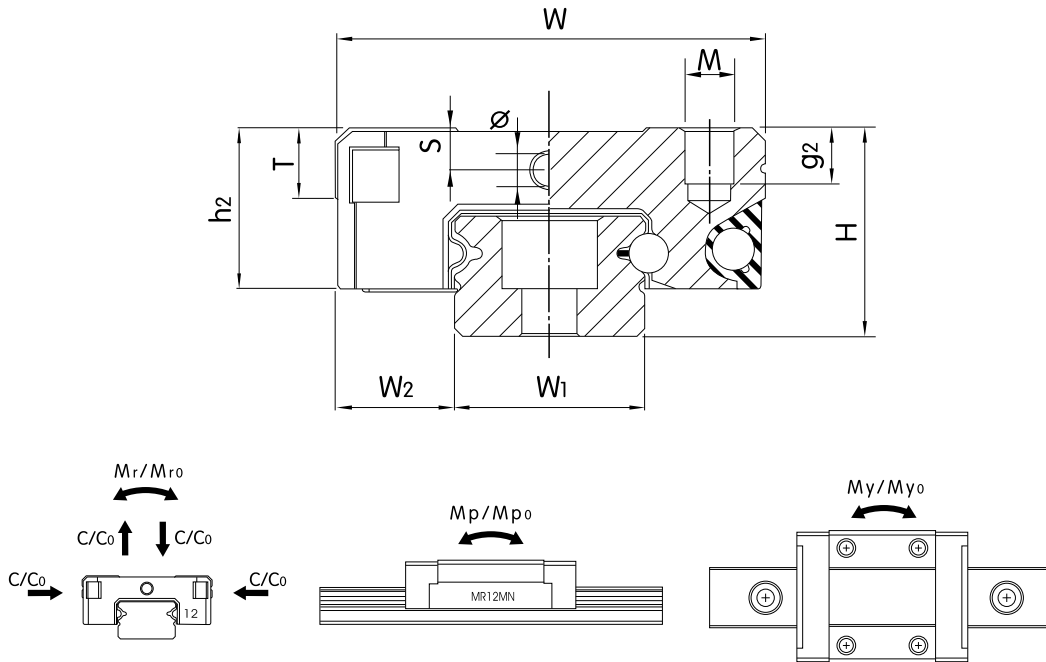
The runner block is equipped with a rigid ball-retainer. This keeps the steel balls in place during handling and installation.



Material

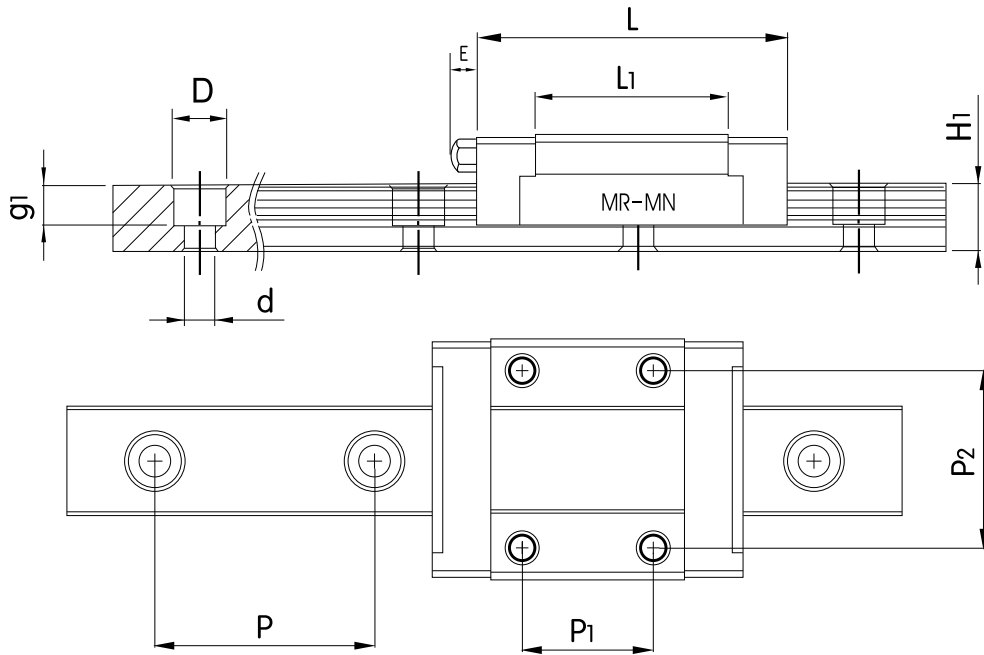
The MR Miniature Linear Guide series uses through hardened stainless steel for the rail, runner block and balls.

STANDARD NARROW RAIL TYPE



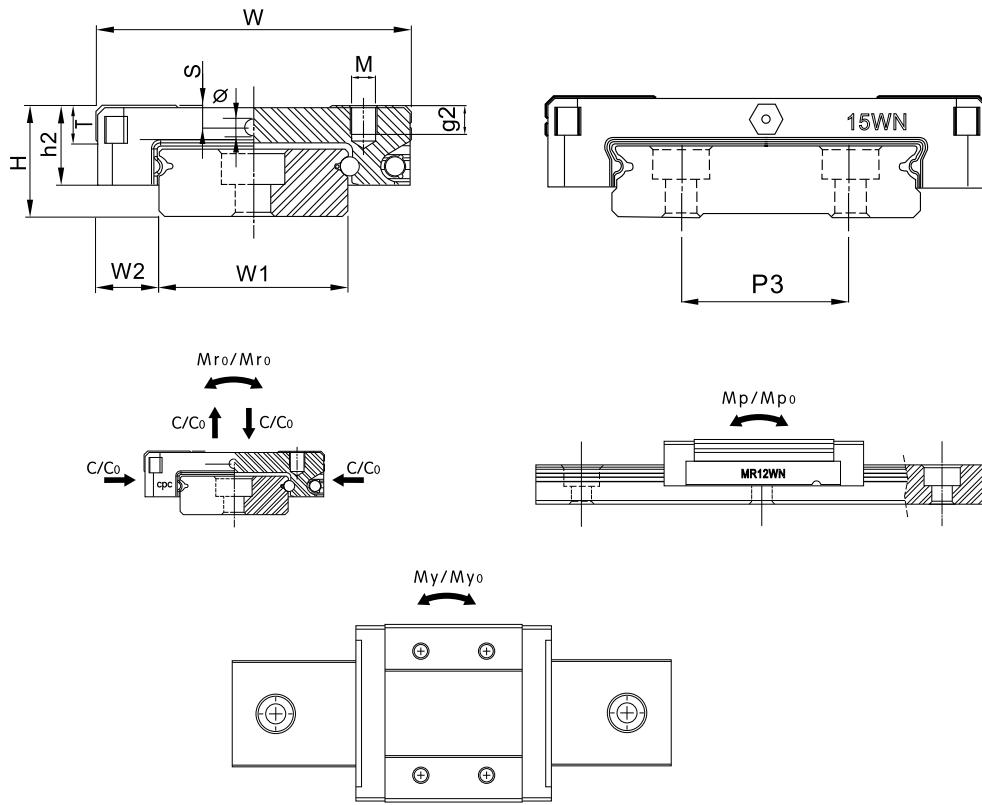
Size	Ass. dimensions		Rail Dimensions(mm)				Block dimensions (mm)						
	H	W ₂	C	H ₁	P	D x d x g ₁	W	L	L ₁	P ₁	P ₂	E	Ø
MR 3 MN	4	2.5	3	2.6	10	M1.6	8	11.7	6.7	3,5	-	-	-
MR 3 ML	4	2.5	3	2.6	10	M1.6	8	16	11	5,5	-	-	-
MR 5 MN	6	3.5	5	3.5	15	3.5 x 2.4 x 1	12	16	10	-	8	-	0.8
MR 5 ML	6	3.5	5	3.5	15	3.5 x 2.4 x 1	12	19.5	13.5	-	7	-	0.8
MR 7 MN	8	5	7	4.7	15	4.2 x 2.4 x 2.3	17	23.7	14.3	8	12	-	1.2
MR 7 ML	8	5	7	4.7	15	4.2 x 2.4 x 2.3	17	30.4	23	13	12	-	1.2
MR 9 MN	10	5.5	9	5.5	20	6 x 3.5 x 3.3	20	30.5	19.5	10	15	-	1.5
MR 9 ML	10	5.5	9	5.5	20	6 x 3.5 x 3.3	20	39.5	29.5	16	15	-	1.5
MR 12 MN	13	7.5	12	7.5	25	6 x 3.5 x 4.5	27	35.4	22	15	20	-	2.0
MR 12 ML	13	7.5	12	7.5	25	6 x 3.5 x 4.5	27	47.4	34	20	20	-	2.0
MR 15 MN	16	8.5	15	9.5	40	6 x 3.5 x 4.5	32	43	27	20	25	3.6	2.5
MR 15 ML	16	8.5	15	9.5	40	6 x 3.5 x 4.5	32	60	44	25	25	3.6	2.5

STANDARD NARROW RAIL TYPE



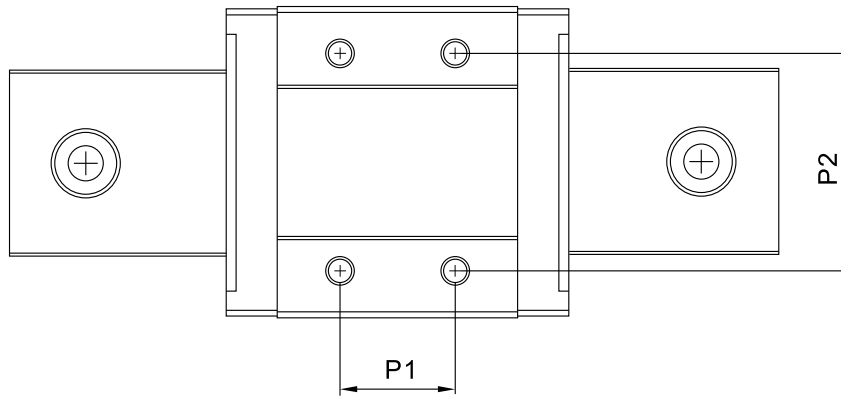
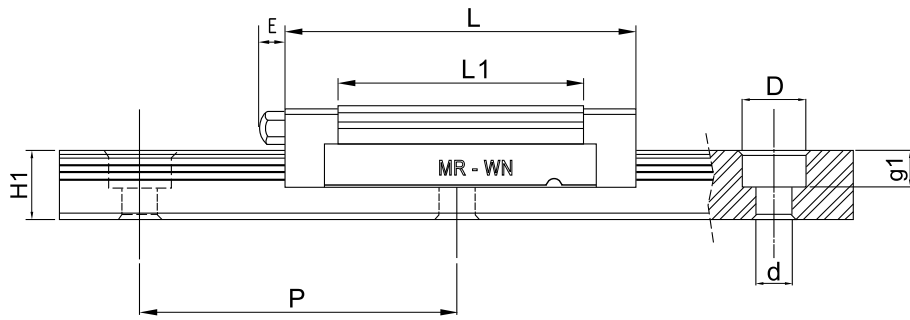
Block dimensions (mm)				Load Capacity		Static Moment (Nm)			Weight		Size
h2	M x g ₂	S	T	Dynamic C(N)	Static Co(N)	M _{ro}	M _{po}	M _{yo}	Block g	Rail g/m	
3.3	M1.6 x 1.1	-	1.5	190	310	0.6	0.4	0.4	0.9	53	MR 3 MN
3.3	M2 x 1.1	-	1.5	295	575	0.9	1.1	1.1	1.2	53	MR 3 ML
4.5	M2 x 1.5	1.1	2	335	550	1.7	1.0	1.0	3	120	MR 5 MN
4.5	M2.6 x 2.0	1.1	2	470	900	2.4	2.1	2.1	3.3	120	MR 5 ML
6.5	M2 x 2.5	1.7	2.8	890	1400	5.2	3.3	3.3	9	230	MR 7 MN
6.5	M2 x 2.5	1.7	2.8	1310	2440	9.0	7.7	7.7	16	230	MR 7 ML
7.8	M3 x 2.8	2.2	3.3	1570	2495	11.7	6.4	6.4	17	330	MR 9 MN
7.8	M3 x 2.8	2.2	3.3	2135	3880	18.2	12.4	12.4	25	330	MR 9 ML
10	M3 x 3.5	2.6	4.3	2308	3465	21.5	9.5	9.5	34	600	MR 12 MN
10	M3 x 3.5	2.6	4.3	3240	5630	34.9	16.0	16.0	51	600	MR 12 ML
12	M3 x 5.5	2.8	4.3	3810	5590	43.6	10.9	10.9	53	1010	MR 15 MN
12	M3 x 5.5	2.8	4.3	5350	9080	70	26.9	26.9	90	1010	MR 15 ML

WIDE RAIL TYPE



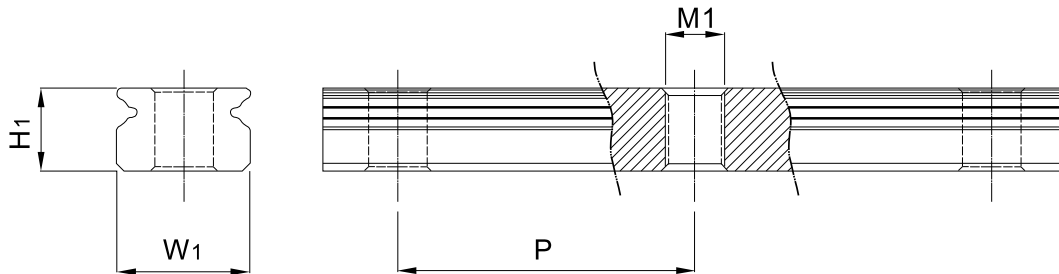
Size	Ass. dimensions		Rail dimensions (mm)								Block dimensions (mm)							
	H	W_2	W_1	H_1	P	P ₃	D	x	d	x	g_1	W	L	L_1	P ₁	P ₂	E	Ø
MR 3 WN	4.5	3	6	2.6	15	-	4	x	2.4	x	1.5	12	15	10	4.5	-	-	-
MR 3 WL	4.5	3	6	2.6	15	-	4	x	2.4	x	1.5	12	21	15	8	-	-	-
MR 5 WN	6.5	3.5	10	4	20	-	5.5	x	3	x	1.6	17	21.1	15.1	6.5	13	-	0.8
MR 5 WL	6.5	3.5	10	4	20	-	5.5	x	3	x	1.6	17	27.2	21.2	11	13	-	0.8
MR 7 WN	9	5.5	14	5.2	30	-	6	x	3.5	x	3.5	25	31.6	21.2	10	19	-	1.2
MR 7 WL	9	5.5	14	5.2	30	-	6	x	3.5	x	3.5	25	40.4	30.1	19	19	-	1.2
MR 9 WN	12	6	18	7.5	30	-	6	x	3.5	x	3.5	30	38.2	27.4	12	21	-	1.5
MR 9 WL	12	6	18	7.5	30	-	6	x	3.5	x	3.5	30	50.7	39.5	24	23	-	1.5
MR 12 WN	14	8	24	8.5	40	-	8	x	4.5	x	4.5	40	44.4	31	15	28	-	2.0
MR 12 WL	14	8	24	8.5	40	-	8	x	4.5	x	4.5	40	59.4	46	28	28	-	2.0
MR 15 WN	16	9	42	9.5	40	23	8	x	4.5	x	4.5	60	55.5	39.5	20	45	3.6	2.5
MR 15 WL	16	9	42	9.5	40	23	8	x	4.5	x	4.5	60	74.5	58.5	35	45	3.6	2.5

WIDE RAIL TYPE



Block dimensions (mm)				Load Capacity		Static Moment (Nm)			Weight		Size
h2	M x g ₂	S	T	Dynamic C(N)	Static Co(N)	M _{ro}	M _{po}	M _{yo}	Block g	Rail g/m	
3.5	M2 x 1.6	0.8	1.8	280	530	1.6	0.9	0.9	2.4	130	MR 3 WN
3.5	M2 x 1.6	0.8	1.8	280	530	1.6	0.9	0.9	2.4	130	MR 3 WL
5	M3 x 1.5	1.1	2.3	475	900	4.6	2.2	2.2	5.9	280	MR 5 WN
5	M3 x 1.5	1.1	2.3	615	1315	6.8	4.1	4.1	7.5	280	MR 5 WL
7	M3 x 3	1.6	3.2	1180	2095	7.8	7.3	7.3	17	460	MR 7 WN
7	M3 x 3	1.6	3.2	1570	3140	22.65	14.9	14.9	31	460	MR 7 WL
7.8	M3 x 3	2	4	2030	3605	33.2	13.7	13.7	33	660	MR 9 WN
7.8	M3 x 3	2	4	2550	4990	45.9	26.7	26.7	47	660	MR 9 WL
10	M3 x 3.5	3	4.5	3065	5200	63.7	26.3	26.3	63	1200	MR 12 WN
10	M3 x 3.5	3	4.5	4070	7800	95.6	56.4	56.4	94	1200	MR 12 WL
12	M4 x 4.5	3.5	4.5	5065	8385	127.9	45.7	45.7	128	2828	MR 15 WN
12	M4 x 4.5	3.5	4.5	6725	12580	191.9	93.1	93.1	210	2828	MR 15 WL

RAILS FOR BOTTOM MOUNTING



Dimension Specification - MRU-M Series

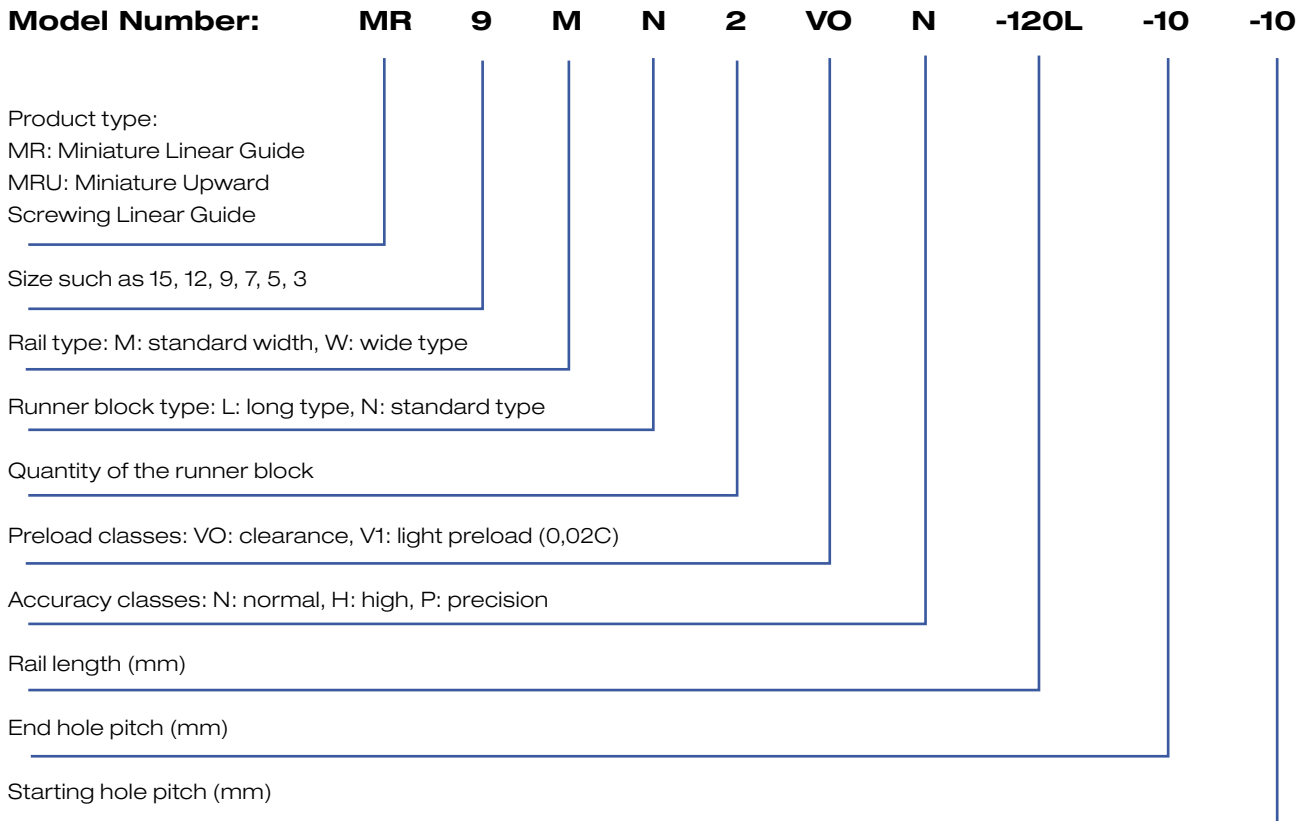
Size	Rail Dimensions (mm)			
	H1	W1	P	M1
MRU 5 M	3.5	5	15	M3 x 0.5
MRU 7 M	4.7	7	15	M3 x 0.5
MRU 9 M	5.5	9	20	M4 x 0.7
MRU 12 M	7.5	12	25	M4 x 0.7
MRU 15 M	9.5	15	40	M4 x 0.7

Dimension Specification - MRU-W Series

Size	Rail Dimensions (mm)			
	H1	W1	P	M1
MRU 5 W	4	10	20	M3 x 0.5
MRU 7 W	5.2	14	30	M4 x 0.7
MRU 9 W	7.5	18	30	M4 x 0.7
MRU 12 W	8.5	24	40	M5 x 0.8
MRU 15 W	9.5	42	40	M5 x 0.8

Order Code

An example of the miniature linear guide series part numbering systems is shown in the following example.



Rail Length

When the required length exceeds Lmax, two or more connected pieces are provided. Please contact Rollco for more information.

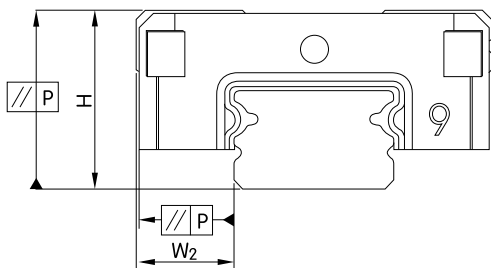
Rail length standard type	Hole pitch (mm)	Lmax
3M	10	300
5M	15	930
7M	15	930
9M	20	920
12M	25	930
15M	40	930

Rail length wide type	Hole pitch (mm)	Lmax
3W	15	940
5W	20	940
7W	30	940
9W	30	940
12W	40	940
15W	40	940

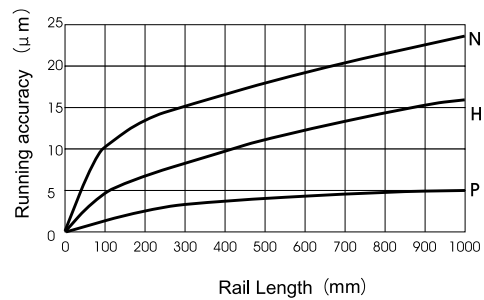
Precision

Accuracy

The MR miniature Linear Guide series has 3 options for accuracy. These are Precision (P), High (H), Normal (N).



Accuracy of the running parallelism



Accuracy classes (µm)	Precision	High	Normal	
	P	H	N	
Tolerance of dimension height H	H	±10	±20	±40
Variation of height for different runner block on the same position of rail	ΔH	7	15	25
Tolerance of dimension width W	W2	±15	±25	±40
Variation of width for different runner block on same position of rail	ΔW2	10	20	30

Speed

The maximum speed for the MR guides is: $V_{max} = +3m/s$
 and the maximum acceleration: $a_{max} = 250 m/s^2$

Preload

Preload Classes

The MR miniature Linear Guide series has two classes of preload, V0 and V1 as described in the preload table below.

Preload can enhance stiffness, precision, and torque resistance, but will affect life and friction.

Preload classes	Preload	Clearance (μm)					
		3	5	7	9	12	15
Standard V0	Small clearance	+1	+1.5	+2	+2	+3	+5
	to light preload	0	0	-2	-2	-3	-5
Preload V1	Light preload	0	0	0	0	0	0
	0.02C	-0.5	-1	-3	-4	-6	-10

Permissible operating Temperature

The MR Miniature linear guide can operate in a range of temperatures from -40°C ~ $+80^{\circ}\text{C}$. For short term operation it can reach $+100^{\circ}\text{C}$.

Lubrication

Lubrication Cautions

The MR miniature Linear Guide must be lubricated.

- The re lubricaton interval must be shortened if the travel stroke is <2 or >15 times the length of the steel body of the runner block.
- When grease lubrication is used, we recommend mineral oil based lithium soap grease with a viscosity between ISO VG32-100.
- When oil lubrication is used we recommend the mineral oil CLP or CGLP based on DIN 51517 or HLP based on DIN 51524 and the viscosity ranges between ISO VG 32-100 by the working temperature between 0°C ~ +70°C are recommended. (We recommend VG 10 for use in lower temperature environment.)

Friction

Friction

The MR miniature Linear Guides have low friction characteristics, with a stable and consistent operation friction and a slight starting friction.

Sealing

The MR miniature Linear Guides are sealed by end seals or both ends of the runner block. Optional side seals build an all-around closed sealing system.

Friction

$$F_{rn} = \mu \cdot F \quad \text{_(1)}$$

F Load (N)

F_{rn} Friction (N)

(1) MR Miniature Linear Guide series friction factor is about $\mu=0.002-0.003$

Friction with endseals under lubrication

MR Size	Friction with endseals (N _{max}) (under lubrication)	
	M	W
3	0.08	0.2
5	0.08	0.2
7	0.1	0.4
9	0.1	0.8
12	0.4	1.0
15	1.0	1.0

Load-carrying Capacity and Rating Life

Dynamic load rating C

When the dynamic loads are applied normal to the load zones with constant magnitude and direction, the rated life of a linear bearing can theoretically reach 10^5 m of travel. (The above is according to DIN 636 Part 2).

$$C_{(50)} = 1.26 \cdot C_{(100)} \quad \text{_(2)}$$

$$C_{(100)} = 0.79 \cdot C_{(50)} \quad \text{_(3)}$$

$$L = \left(\frac{C}{P}\right)^3 \cdot 10^5 \quad \text{_(4)}$$

$$L_h = \frac{L}{2 \cdot s \cdot n \cdot 60} = \frac{L}{v_m} \cdot \left(\frac{C}{P}\right)^3 \quad \text{_(5)}$$

L	= rating life in meter	(m)
L_h	= rating life in hour	(h)
C	= dynamic load rating	(N)
P	= equivalent load	(N)
s	= length of stroke	(m)
n	= stroke repetition	(min ⁻¹)
v_m	= average speed	(m/min)

Static Load Rating C_0

The static load along the acting direction; under this loading, the maximum calculated stress at the centre of the highest loaded contact position between the rolling elements and the race way by a curvature radius ≤ 0.52 is 4200 MPa and by a curvature radius ≥ 0.6 is 4600 MPa.

Note: at this contact point under such stress, a permanent total deformation is generated corresponding to about 0.0001 times of the rolling element diameter. (The above is according to DIN636 Part 2).

$$S_0 = C_0/P_0 \quad \text{_(6)}$$

$$S_0 = M_0/M \quad \text{_(7)}$$

Operation condition	S_0
Normal operating condition	1~2

$$P_0 = F_{\max} \quad \text{_(8)}$$

$$M_0 = M_{\max} \quad \text{_(9)}$$

Load with vibration or impact	2~3
High accuracy and smooth running	≥ 3

Static Load P_0 and Moment M_0

Permissible static load.

The applying static load of the miniature linear guide is limited as follows:

- Static load of the linear guide
- Permissible load of fixing screws.
- The permissible load of the related parts of the whole mechanism.
- The static load safety factor required for the application.

The equivalent static load and static moment are the largest load and moment, referred to formula (8) and (9).

Static Load Safety Factor S_0

Under the static load safety factor, the linear guide system demonstrates a reliable operation and running accuracy as required in application. The static load safety factor S_0 is calculated by the formula (6) and (7).

S_0	=	static load safety factor	
C_0	=	basic static load in action direction	(N)
P_0	=	equivalent static load in action direction	(N)
M_0	=	basic static moment in action direction	(Nm)
M	=	equivalent static moment in action direction	(Nm)

Height and Fillet of the Fitting Edge

To avoid any interference, the corner of the fitting edge with a recess is recommended. If not so, please refer to the following table for the fillet of the fitting edge corner and the height of the fitting edge.

Screw Tightening Moment (Nm)

Screw grade

12.9	Steel	Cast Iron	Non Iron metal
M2	0.6	0.4	0.3
M3	1.8	1.3	1.0
M4	4.0	2.5	2.0

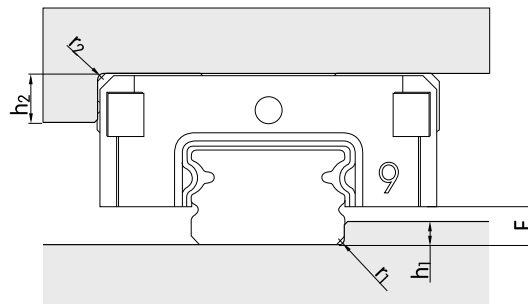
Dimensions of the fitting edge

Dimension	h1	r1max	h2	r2max	E	Dimension	h1	f1max	h2	r2max	E
3M	0.5	0.2	1.5	0.3	0.7	3W	0.7	0.2	1.7	0.3	1
5M	1.2	0.2	1.9	0.3	1.5	5W	1.2	0.2	2	0.3	1.5
7M	1.2	0.3	2.8	0.3	1.5	7W	1.2	0.3	2.8	0.3	2
9M	1.5	0.3	3	0.3	2.2	9W	1.5	0.3	3	0.3	4.2
12M	2.5	0.5	4	0.5	3	12W	2.5	0.5	4	0.5	4
15M	2.5	0.5	4.5	0.5	4	15W	2.5	0.5	4.5	0.5	4

The Mounting Surface

Surface roughness

The mounting surface should be ground or fine milled to reach a surface roughness Ra 1.6.



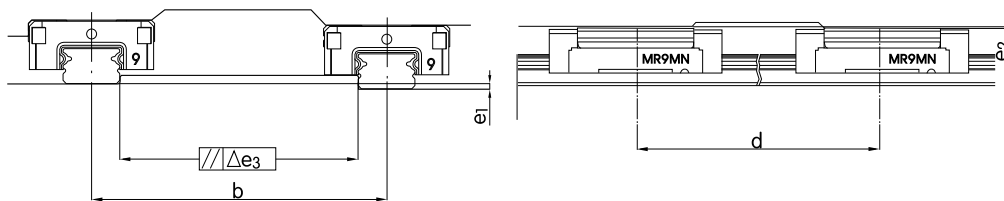
Geometric and Position Accuracy of the Mounting Surface

The inaccuracy of the mounting surfaces will affect the running accuracy and reduce the operating lifetime of the MR miniature linear guide. If the inaccuracies of the mounting surfaces exceed the values calculated by formulas (10), (11), and (12), the lifetime will become shortened, as calculated by formulas (4) and (5).

$$e_1 \text{ (mm)} = b \text{ (mm)} \cdot f_1 \cdot 10^{-4} \quad (10)$$

$$e_2 \text{ (mm)} = d \text{ (mm)} \cdot f_2 \cdot 10^{-5} \quad (11)$$

$$e_3 \text{ (mm)} = f_3 \cdot 10^{-3} \quad (12)$$



Size	Standard V0			Preload V1		
	f ₁	f ₂	f ₃	f ₁	f ₂	f ₃
3 MN	4	9	2	3	9	1
5 MN	4	8	2	2	8	2
7 MN	5	11	4	3	10	3
9 MN	5	11	6	4	10	3
12 MN	6	13	8	4	12	6
15 MN	7	11	12	5	10	8
3 ML	4	5	2	3	5	1
5 ML	3	5	2	2	5	1
7 ML	4	6	4	3	6	3
9 ML	5	7	5	3	7	4
12 ML	5	8	8	3	7	5
15 ML	7	8	11	4	8	7

Size	Standard V0			Preload V1		
	f ₁	f ₂	f ₃	f ₁	f ₂	f ₃
3 WN	2	5	2	4	3	1
5 WN	2	5	2	1	3	1
7 WN	2	6	4	2	4	3
9 WN	2	7	6	2	5	4
12 WN	3	8	8	2	5	5
15 WN	2	9	11	1	6	7
3 WL	2	3	1	1	2	1
5 WL	2	3	2	1	2	1
7 WL	2	4	4	1	3	3
9 WL	2	5	5	2	3	3
12 WL	2	5	7	2	3	5
15 WL	2	5	10	1	4	7

One Partner for Linear Components:



BELT DRIVEN LINEAR UNITS
Complete units - easy to mount.



BALL SCREWS
Cylindrical and flange-nut.



UNI LINE
Complete unit saves time and money.



QUADRO TABLE
Complete linear drive unit. Can be supplied with protection bellow.



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The strong solution for short strokes.



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Linear ball bearings and hardened steel shaft.



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Telescopic systems for smooth movement. Steel and aluminium.



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The strongest solution for extraction.



COMPACT RAIL
No more problems with parallelism. Low noise guiding with lifetime lubricated bearings.



CURVI LINE
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