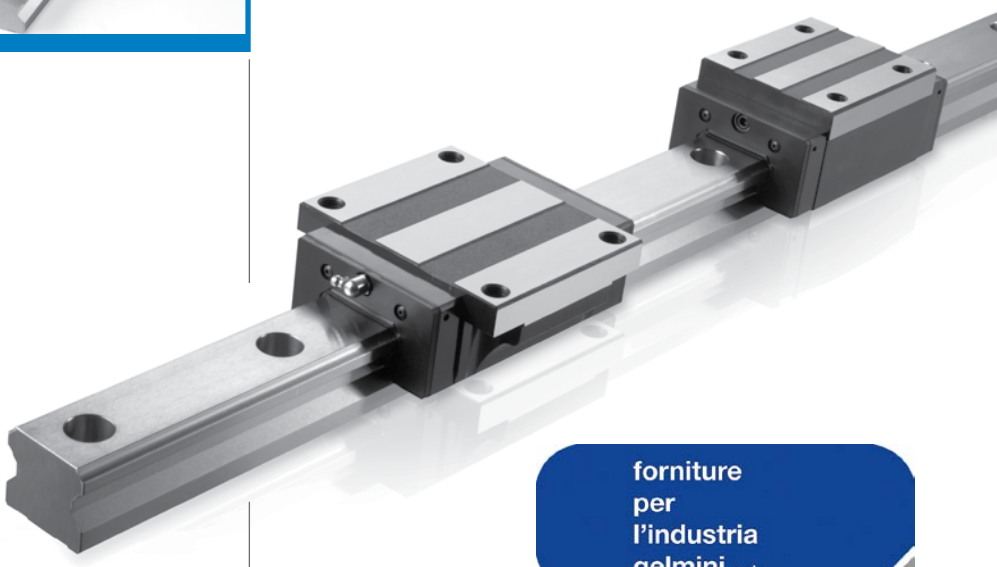
PMI

PMI Linear Motion Systems

Linear Guideway



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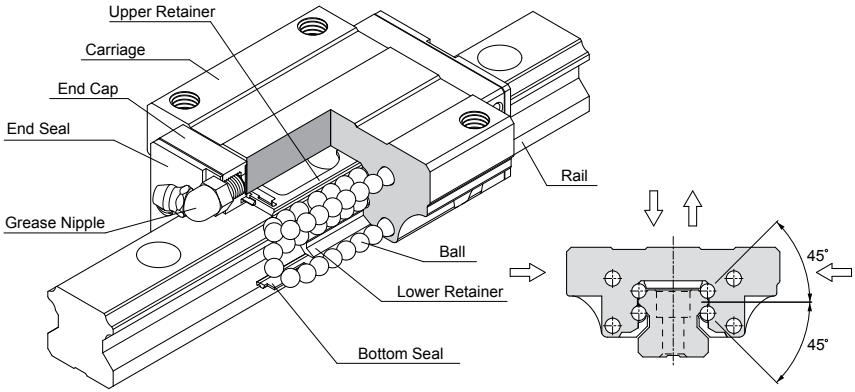
11.1 The Selection of Preload

Selecting proper preload from table below to adapt the specific application and condition.

Preload grade	Fitted condition	Application examples
Clearance (FZ)	• The loading direction is fixed, vibration and impact are light, and two axes are applied in parallel. • High precision is not required, and the low frictional resistance is need.	Semiconductor facilities, medical equipment, stage systems, press machine, welding machine, industrial roboJt, and other small sliding systems.
Light preload (FC)	• The loading direction is fixed, vibration and impact are light, and two axes are applied in parallel. • High precision is not required, and the low frictional resistance is needed.	Welding machine, binding machine, auto packing machine, XY axis of ordinary industrial machine, material handling equipments.
Medium preload (F0)	• Overhang application with a moment load. • Applied in one-axis configuration • The need of light preload and high precision.	Z axis of industrial machines, EDM, precision XY table, PC board drilling machine, industrial robot, NC lathe, measuring equipment, grinding machine, auto painting machine.
Heavy preload (F1)	• Machine is subjected to vibration and impact, and high rigidity required. • Application of heavy load or heavy cutting.	Machine center, NC lathe, grinding machine, milling machine, Z axis of boring machine and machine tools.
Ultra heavy preload (F2)	• Machine is subjected to vibration and impact, and high rigidity required. • Application of heavy load or heavy cutting.	Machine center, NC lathe, grinding machine, milling machine, Z axis of boring machine and machine tools.

12.1 Heavy Load Type, MSA Series

A. Construction



B. Characteristics

The trains of balls are designed to a contact angle of 45° which enables it to bear an equal load in radial, reversed radial and lateral directions. Therefore, it can be applied in any installation direction. Furthermore, MSA series can achieve a well balanced preload for increasing rigidity in four directions while keeping a low frictional resistance. This is especially suit to high precision and high rigidity required motion.

The patent design of lubrication route makes the lubricant evenly distribute in each circulation loop. Therefore, the optimum lubrication can be achieved in any installation direction, and this promotes the performance in running accuracy, service life, and reliability.

High Rigidity, Four-way Equal Load

The four trains of balls are allocated to a circular contact angle at 45°, thus each train of balls can take up an equal rated load in all four directions. Moreover, a sufficient preload can be achieved to increase rigidity, and this makes it suitable for any kind of installation.

Smooth Movement with Low Noise

The simplified design of circulating system with strengthened synthetic resin accessories makes the movement smooth and quiet.

Self Alignment Capability

The self adjustment is performed spontaneously as the design of face-to-face (DF) circular arc groove. Therefore, the installation error could be compensated even under a preload, and which results in precise and smooth linear motion.

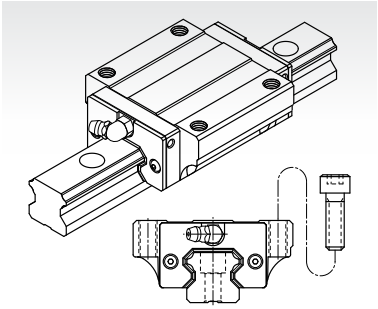
Interchangeability

For interchangeable type of linear guideway, the dimensional tolerances are strictly maintained within a reasonable range, and this has made the random matching of the same size of rails and carriages possible. Therefore, the similar preload and accuracy can be obtained even under the random matching condition. As a result of this advantage, the linear guideway can be stocked as standard parts, the installation and maintenance become more convenient. Moreover, this is also beneficial for shortening the delivery time.

C. Carriage Type

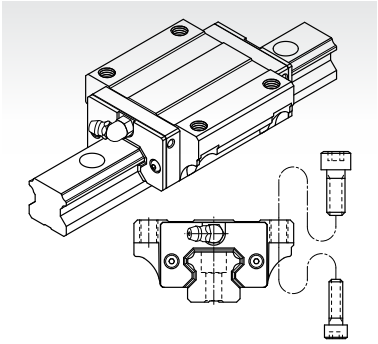
Heavy Load

MSA-A Type



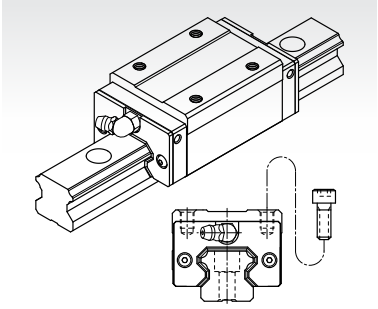
Installed from top side of carriage with the thread length longer than MSA-E type.

MSA-E Type



This type offers the installation either from top or bottom side of carriage.

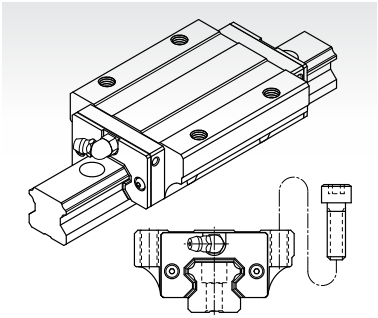
MSA-S Type



Square type with smaller width and can be installed from top side of carriage.

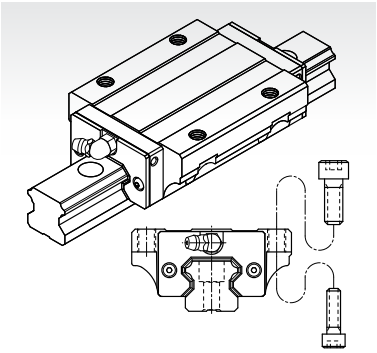
Ultra Heavy Load

MSA-LA Type



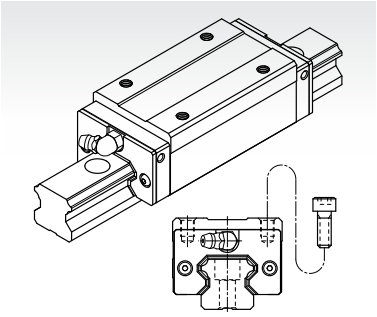
All dimensions are same as MSA-A except the length is longer, which makes it more rigid.

MSA-LE Type



All dimensions are same as MSA-E except the length is longer, which makes it more rigid.

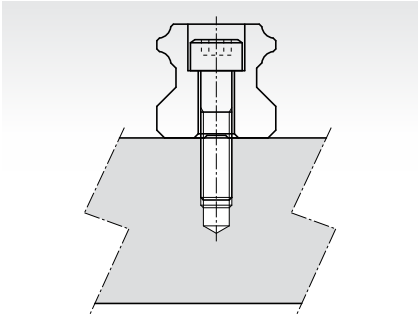
MSA-LS Type



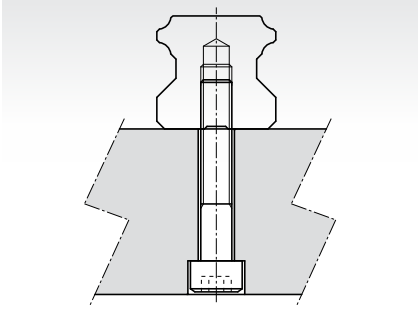
All dimensions are same as MSA-S except the length is longer, which makes it more rigid.

D. Rail Type

Counter bore (R type)



Tapped Hole (T type)



E. Description of Specification

(1) Non-Interchangeable Type

MSA 25 A 2 SS F0

Series：**MSA**

Size：**15, 20, 25, 30, 35, 45, 55, 65**

Carriage type：(1) Heavy load
A : Flange type, mounting from top
E : Flange type, mounting either from top or bottom
S : Square type

(2) Ultra heavy load
LA : Flange type, mounting from top
LE : Flange type, mounting either from top or bottom
LS : Square type

Number of carriages per rail：**1, 2, 3 ...**

Dust protection option of carriage：
No symbol, **UU, SS, ZZ, DD, KK, LL, RR** (refer to chapter 15.1 Dust Proof)

Preload：**FC** (Light preload) , **F0** (Medium preload) , **F1** (Heavy preload)

Code of special carriage：**No symbol, A, B, C, D ...**

Rail type：**R** (Counter-bore type), **T** (Tapped hole type)

Rail length (mm)

Rail hole pitch from start side (**E1**, see Fig.12.1)

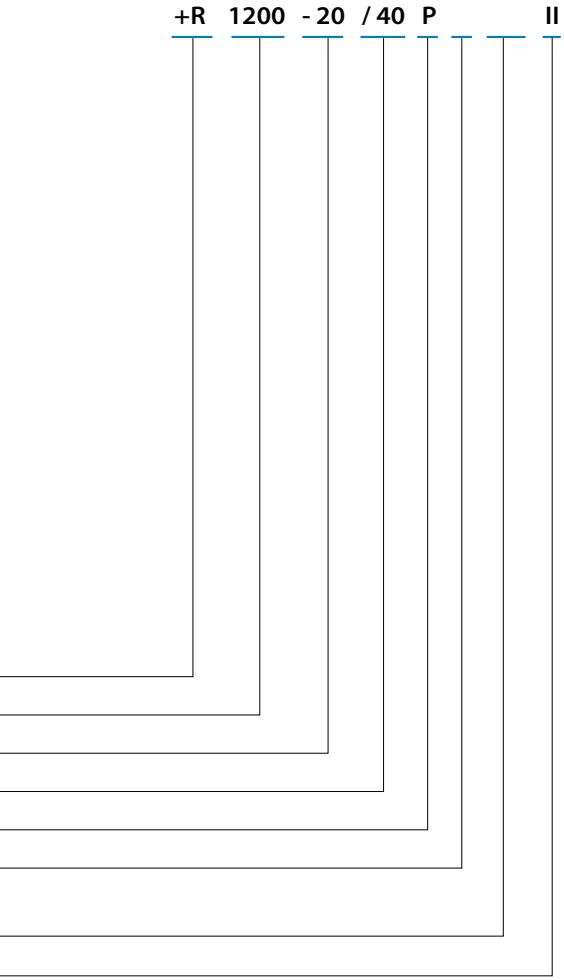
Rail hole pitch to the end side (**E2**, see Fig.12.1)

Accuracy grade：**N, H, P, SP, UP**

Code of special rail：**No symbol, A, B ...**

Dust protection option of rail：**No symbol, /CC, /MC, /MD**
(refer to chapter 15.1 Code of contamination fro Rail)

Number of rails per axis：**No symbol, II, III, IV ...**


+R 1200 - 20 / 40 P II

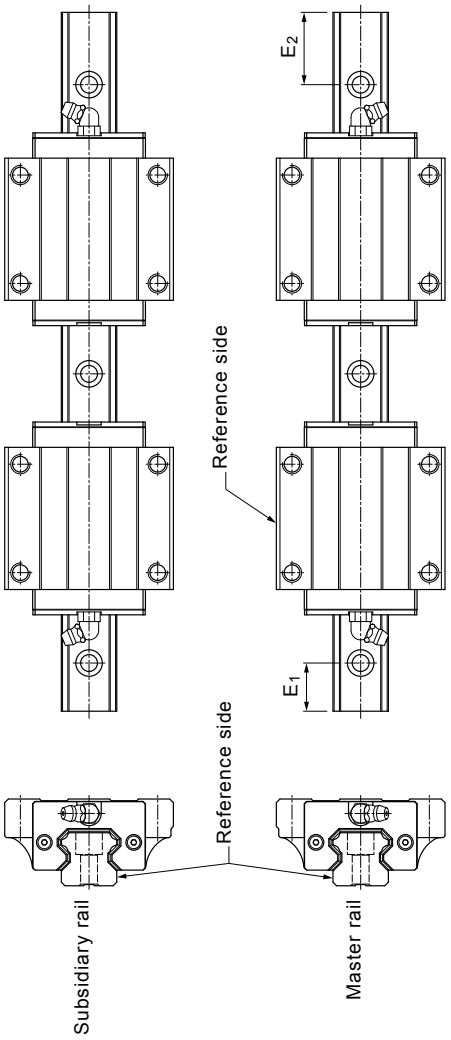

E2
Reference side
E1
Reference side
Subsidiary rail
Master rail

Fig12.1

(2) Interchangeable Type

Code of Carriage

MSA 25 A SS FC N

Series：**MSA**

Size：**15, 20, 25, 30, 35, 45, 55, 65**

Carriage type：(1) Heavy load
A : Flange type, mounting from top
E : Flange type, mounting either from top or bottom
S : Square type
(2) Ultra heavy load
LA : Flange type, mounting from top
LE : Flange type, mounting either from top or bottom
LS : Square type

Dust protection option of carriage：**No symbol, UU, SS, ZZ, DD, KK, LL, RR**
(refer to chapter 15.1 Dust Proof)

Preload：**FC** (Light preload)**, F0** (Medium preload)

Accuracy grade：**N, H, P**

Code of special carriage：**No symbol, A, B, C, D ...**

Code of Rail

MSA 25 R 1200 - 20 / 40 N

Series：**MSA**

Size：**15, 20, 25, 30, 35, 45, 55, 65**

Rail type：**R** (Counter-bore type), **T** (Tapped hole type)

Rail length (mm)

Rail hole pitch from start side (**E1**, see Fig.12.1)

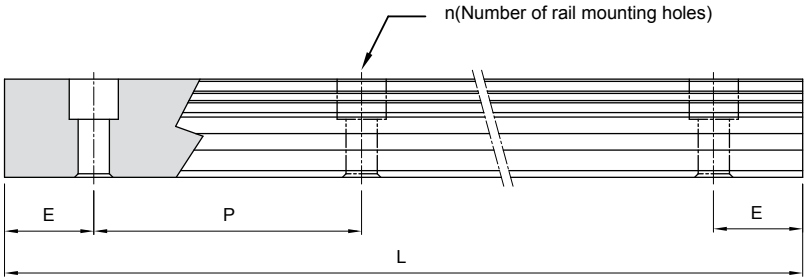
Rail hole pitch to the end side (**E2**, see Fig.12.1)

Accuracy grade：**N, H, P**

Code of special rail：**No symbol, A, B ...**

Dust protection option of rail：**No symbol, /CC, /MC**
(refer to chapter 15.1 Code of contamination fro Rail)

J. Rail Maximum Length and Standrad



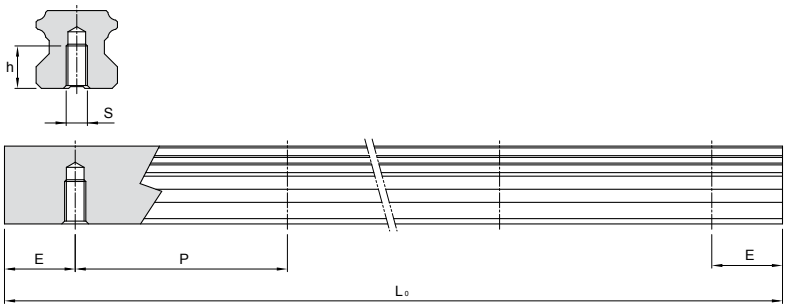
$$L=(n-1)\times P+2\times E$$

L: Total Length of rail *(mm)*
n: Nuber of mounting holes
P: Distance between any two holes *(mm)*
E: Distance from the center of the last hole to the edge *(mm)*

Unit: mm

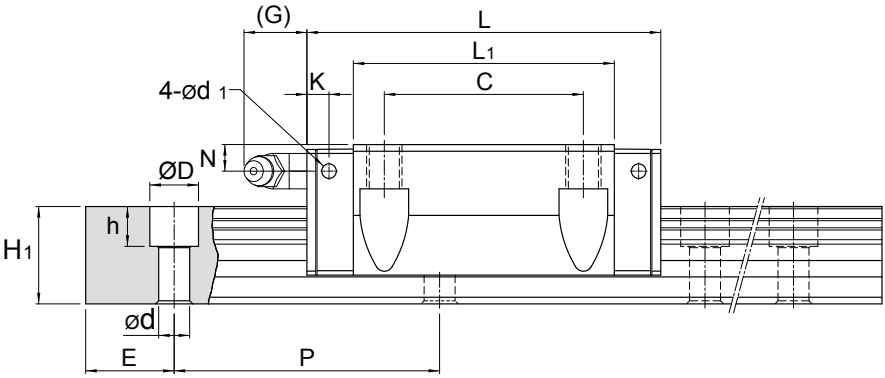
Model No.	Standard Pitch (P)	Standard ($E_{std.}$)	Minimum ($E_{min.}$)	Max (L_0 max.)
MSA 15	60	20	5	2000
MSA 20	60	20	6	4000
MSA 25	60	20	7	4000
MSA 30	80	20	8	4000
MSA 35	80	20	8	4000
MSA 45	105	22.5	11	4000
MSA 55	120	30	13	4000
MSA 65	150	35	14	4000

K. Tapped-hole Rail Dimensions



Rail Model	S	h(mm)
MSA 15 T	M5	8
MSA 20 T	M6	10
MSA 25 T	M6	12
MSA 30 T	M8	15
MSA 35 T	M8	17
MSA 45 T	M12	24
MSA 55 T	M14	24
MSA 65 T	M20	30

Dimensions of MSA-E / MSA-LE

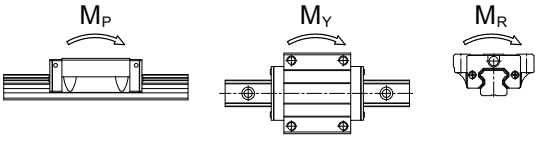


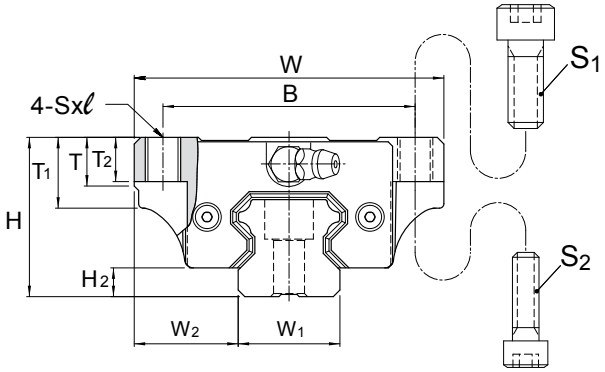
Unit: mm

Model No.	External dimension					Carriage dimension											Grease Nipple
	Height H	Width W	Length L	W_2	H_2	B	C	S×ℓ	L_1	T	T_1	T_2	N	G	K	d_1	
MSA 15 E	24	47	56.3	16	4.2	38	30	M5×7	39.3	7	11	7	4.3	7	3.2	3.3	G-M4
MSA 20 E **MSA 20 LE**	30	63	72.9 88.8	21.5	5	53	40	M6×10	51.3 67.2	7	10	10	5	12	5.8	3.3	G-M6
MSA 25 E **MSA 25 LE**	36	70	81.6 100.6	23.5	6.5	57	45	M8×10	59 78	11	16	10	6	12	5.8	3.3	G-M6
MSA 30 E **MSA 30 LE**	42	90	97 119.2	31	8	72	52	M10×10	71.4 93.6	11	18	10	7	12	6.5	3.3	G-M6
MSA 35 E **MSA 35 LE**	48	100	111.2 136.6	33	9.5	82	62	M10×13	81 106.4	13	21	13	8	11.5	8.6	3.3	G-M6
MSA 45 E **MSA 45 LE**	60	120	137.7 169.5	37.5	10	100	80	M12×15	102.5 134.3	13	25	15	10	13.5	10.6	3.3	G-PT 1/8
MSA 55 E **MSA 55 LE**	70	140	161.5 199.5	43.5	13	116	95	M14×17	119.5 157.5	19	32	17	11	13.5	8.6	3.3	G-PT 1/8
MSA 65 E **MSA 65 LE**	90	170	199 253	53.5	15	142	110	M16×23	149 203	21.5	37	23	19	13.5	8.6	3.3	G-PT 1/8

Note: The basic dynamic load rating C of ball type is based on the 50 km for nomonal life. The conversion between C for 50 km and C_{100} for 100 km is C=1.26 x C_{100}.

Note*: Single: Single carriage/ Double: Double carriages closely contacting with each other.



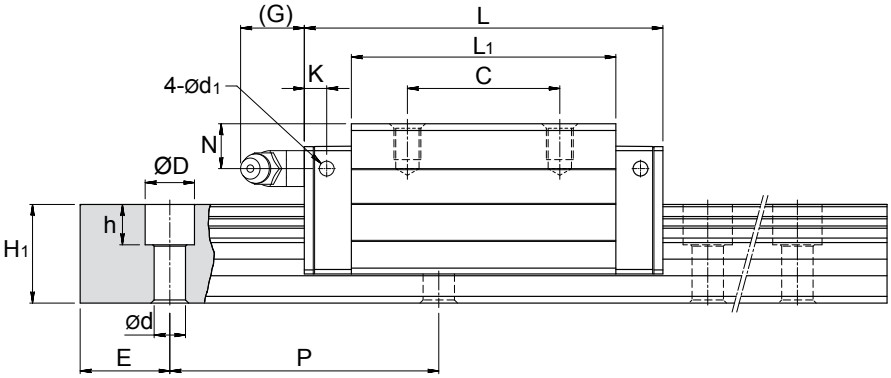


Model No.	Bolt Size	
	S_1	S_2
MSA 15	M5	M4
MSA 20	M6	M5
MSA 25	M8	M6
MSA 30	M10	M8
MSA 35	M10	M8
MSA 45	M12	M10
MSA 55	M14	M12
MSA 65	M16	M14

Unit: mm

Model No.	Rail dimension					Basic load rating		Static moment rating					Weight	
	Width W_1	Height H_1	Pitch P	E std.	D × h × d	Dynamic C kN	Static C_o kN	M_P kN-m		M_Y kN-m		M_R kN-m	Carriage kg	Rail kg/m
								Single*	Double*	Single*	Double*			
MSA 15 E	15	15	60	20	7.5×5.3×4.5	11.8	18.9	0.12	0.68	0.12	0.68	0.14	0.18	1.5
MSA 20 E	20	18	60	20	9.5×8.5×6	19.2	29.5	0.23	1.42	0.23	1.42	0.29	0.4	2.4
MSA 20 LE						23.3	39.3	0.39	2.23	0.39	2.23	0.38	0.52	
MSA 25 E	23	22	60	20	11×9×7	28.1	42.4	0.39	2.20	0.39	2.20	0.48	0.62	3.4
MSA 25 LE						34.4	56.6	0.67	3.52	0.67	3.52	0.63	0.82	
MSA 30 E	28	26	80	20	14×12×9	39.2	57.8	0.62	3.67	0.62	3.67	0.79	1.09	4.8
MSA 30 LE						47.9	77.0	1.07	5.81	1.07	5.81	1.05	1.43	
MSA 35 E	34	29	80	20	14×12×9	52.0	75.5	0.93	5.47	0.93	5.47	1.25	1.61	6.6
MSA 35 LE						63.6	100.6	1.60	8.67	1.60	8.67	1.67	2.11	
MSA 45 E	45	38	105	22.5	20×17×14	83.8	117.9	1.81	10.67	1.81	10.67	2.57	2.98	11.5
MSA 45 LE						102.4	157.3	3.13	16.95	3.13	16.95	3.43	3.9	
MSA 55 E	53	44	120	30	23×20×16	123.6	169.8	3.13	17.57	3.13	17.57	4.50	4.17	15.5
MSA 55 LE						151.1	226.4	5.40	28.11	5.40	28.11	6.00	5.49	
MSA 65 E	63	53	150	35	26×22×18	198.8	265.3	6.11	33.71	6.11	33.71	8.36	8.73	21.9
MSA 65 LE						253.5	375.9	11.84	57.32	11.84	57.32	11.84	11.89	

Dimensions of MSA-S / MSA-LS

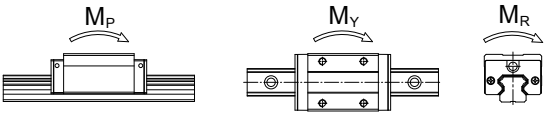


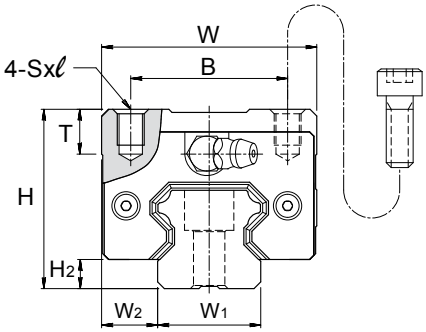
Unit: mm

Model No.	External dimension					Carriage dimension									
	Height H	Width W	Length L	W_2	H_2	B	C	S×ℓ	L_1	T	N	G	K	d_1	Grease Nipple
MSA 15 S	28	34	56.3	9.5	4.2	26	26	M4×5	39.3	7.2	8.3	7	3.2	3.3	G-M4
MSA 20 S **MSA 20 LS**	30	44	72.9 88.8	12	5	32	36 50	M5×6	51.3 67.2	8	5	12	5.8	3.3	G-M6
MSA 25 S **MSA 25 LS**	40	48	81.6 100.6	12.5	6.5	35	35 50	M6×8	59 78	10	10	12	5.8	3.3	G-M6
MSA 30 S **MSA 30 LS**	45	60	97 119.2	16	8	40	40 60	M8×10	71.4 93.6	11.7	10	12	6.5	3.3	G-M6
MSA 35 S **MSA 35 LS**	55	70	111.2 136.6	18	9.5	50	50 72	M8×12	81 106.4	12.7	15	11.5	8.6	3.3	G-M6
MSA 45 S **MSA 45 LS**	70	86	137.7 169.5	20.5	10	60	60 80	M10×17	102.5 134.3	16	20	13.5	10.6	3.3	G-PT 1/8
MSA 55 S **MSA 55 LS**	80	100	161.5 199.5	23.5	13	75	75 95	M12×18	119.5 157.5	18	21	13.5	8.6	3.3	G-PT 1/8
MSA 65 S **MSA 65 LS**	90	126	199 253	31.5	15	76	70 120	M16×20	149 203	23	19	13.5	8.6	3.3	G-PT 1/8

Note: The basic dynamic load rating C of ball type is based on the 50 km for nomonal life. The conversion between C for 50 km and C_{100} for 100 km is $C=1.26 \times C_{100}$.

Note*: Single: Single carriage/ Double: Double carriages closely contacting with each other.





Unit: mm

Model No.	Rail dimension					Basic load rating		Static moment rating					Weight	
	Width W_1	Height H_1	Pitch P	E std.	D × h × d	Dynamic C kN	Static C_o kN	M_P kN-m		M_Y kN-m		M_R kN-m	Carriage kg	Rail kg/m
								Single*	Double*	Single*	Double*			
MSA 15 S	15	15	60	20	7.5×5.3×4.5	11.8	18.9	0.12	0.68	0.12	0.68	0.14	0.18	1.5
MSA 20 S	20	18	60	20	9.5×8.5×6	19.2	29.5	0.23	1.42	0.23	1.42	0.29	0.3	2.4
MSA 20 LS						23.3	39.3	0.39	2.23	0.39	2.23	0.38	0.39	
MSA 25 S	23	22	60	20	11×9×7	28.1	42.4	0.39	2.20	0.39	2.20	0.48	0.52	3.4
MSA 25 LS						34.4	56.6	0.67	3.52	0.67	3.52	0.63	0.68	
MSA 30 S	28	26	80	20	14×12×9	39.2	57.8	0.62	3.67	0.62	3.67	0.79	0.86	4.8
MSA 30 LS						47.9	77.0	1.07	5.81	1.07	5.81	1.05	1.12	
MSA 35 S	34	29	80	20	14×12×9	52.0	75.5	0.93	5.47	0.93	5.47	1.25	1.45	6.6
MSA 35 LS						63.6	100.6	1.60	8.67	1.60	8.67	1.67	1.9	
MSA 45 S	45	38	105	22.5	20×17×14	83.8	117.9	1.81	10.67	1.81	10.67	2.57	2.83	11.5
MSA 45 LS						102.4	157.3	3.13	16.95	3.13	16.95	3.43	3.7	
MSA 55 S	53	44	120	30	23×20×16	123.6	169.8	3.13	17.57	3.13	17.57	4.50	4.12	15.5
MSA 55 LS						151.1	226.4	5.40	28.11	5.40	28.11	6.00	4.91	
MSA 65 S	63	53	150	35	26×22×18	198.8	265.3	6.11	33.71	6.11	33.71	8.36	6.43	21.9
MSA 65 LS						253.5	375.9	11.84	57.32	11.84	57.32	11.84	8.76	

PMI

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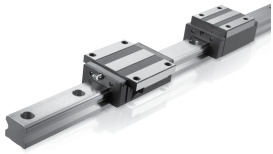

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