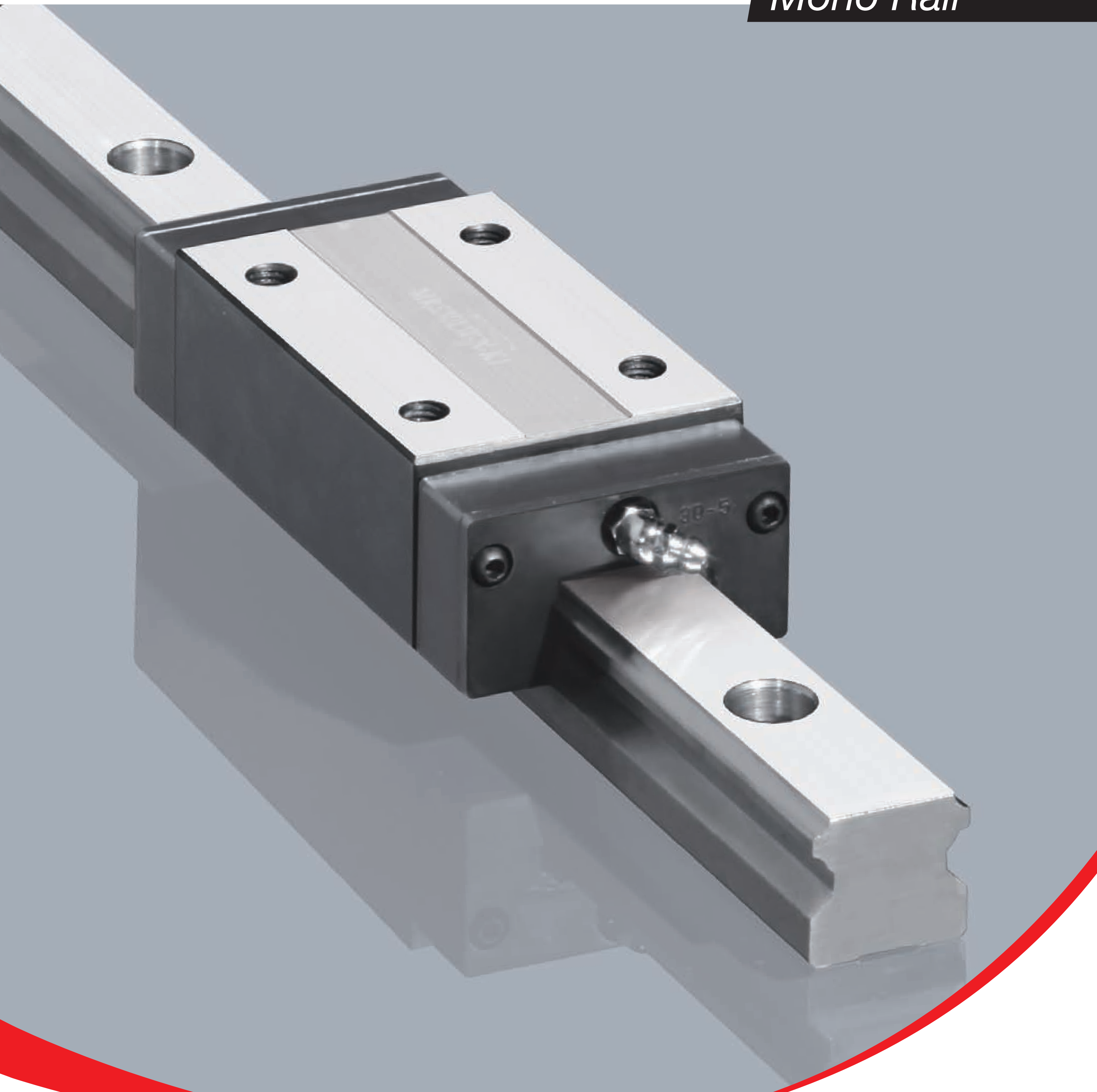
ROLLON®

LinearEvolution

Mono Rail

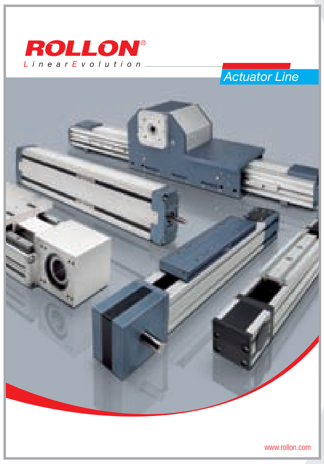


www.rollon.com

When you move. We move

Rollon S.p.A. was founded in 1975 as a manufacturer of linear motion components. Today Rollon group is a leading name in the design, production and sale of linear rails, telescopic rails and actuators, with headquarters based in Italy and offices and distributors located throughout the world. Rollon products are used in many industries with creative and efficient solutions in a wide range of applications used on a daily basis.

Solutions for linear motion



Linear Rails

Rails with roller bearings
Rails with caged ball bearings
Rails with recirculating ball bearing

Telescopic Rails

Rails with partial/total extension
Heavy duty rails
Rails for and automated/manual applications

Actuators

Belt driven actuators
Ball screw driven actuators
Rack and pinion actuators

Core Competencies

- Full range of linear rails, telescopic rails and actuators
- Worldwide presence with branches and distributors
- Fast delivery all over the world
- Large technical know-how for applications

Standard solutions

Wide range of products and sizes
Linear rails with roller and caged ball bearings
Heavy duty telescopic rails
Belt or ball screw driven linear actuators
Multi-axis systems

Collaboration

International know-how in several industries
Project consultancy
Maximizing performance and cost optimization

Customization

Special products
Research and development of new solutions
Technologies dedicated to different sectors
Optimal surface treatment

Applications


Aerospace

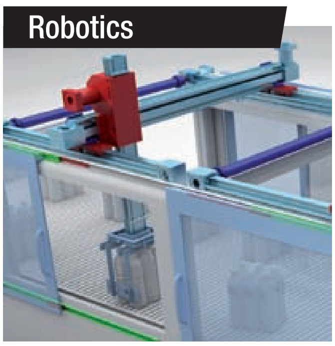

Railway

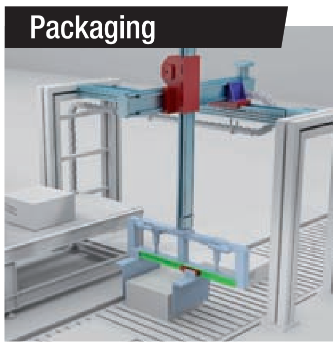

Logistics


Industrial Machines


Medical


Specialty Vehicles


Robotics


Packaging

Content

Mono Rail

Technical features overview

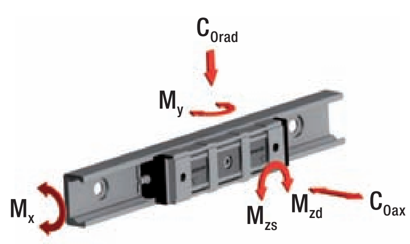
Ordering key

Technical features overview

Family		Product	Section	Shape of rail	Hardened raceways	Self-alignment	Slider: Balls	Slider: Rollers	Anticorrosion
Compact Rail		TLC KLC ULC			√	+++			****
X-Rail		TEX TES UEX UES				+++			*Available in stainless steel*
Easyslide		SN			√	++			****
Easyslide		SNK			√	+			****
Mono Rail		MR			√	-			
Mono Rail		MMR			√	-			****
Curviline		CKR CVR CKRH CVRH CKRX CVRX			√	+			**** *Available in stainless steel*
Sys		SYS1				++			****
Sys		SYS2				++			****
Prismatic Rail		P			√	+++			

The information shown must be verified for the specific application.
For a complete view of technical data, please consult our catalogs on www.rollon.com
* The maximum value is defined by the application.
** A longer stroke is available for jointed versions.
*** C 50
**** For more information, please contact Rollon.

Size	Max. load capacity per slider [N]		Max. dynamic load capacity [N] C 100	Massimo momento [Nm]			Max. rail length [mm]	Max. running speed* [m/s]	Max. acceleration [m/s²]	Operating temperature
	C_0 rad	C_0 ax		M_x	M_y	M_z				
18-28-35 -43-63	15000	10000	36600	350	689	1830	4080**	9	20	-20°C/+120°C
20-30-45	1740	935	****				3120	1.5	2	-20°C/+100°C TEX-UEX -20°C/+120°C TES-UES
22-28-35 -43-63	122000	85400	122000	1120,7	8682	12403	1970	0,8		-20°C/+130°C
43	10858	7600	10858	105	182	261	2000**	1,5		-20°C/+70°C
15-20-25-30-35-45-55	249000		155000***	5800	6000	6000	4000**	3,5	20	-10°C/+60°C
7-9-12-15	8385		5065	171,7	45,7	45,7	1000**	3	250	-20°C/+80°C
16,5-23	2475	1459	****				3240	1,5	2	-20°C/+80°C
50-100-130-180	3960	6317	-	548	950	668	7500**	5	20	0°C/+60°C
200	6320	6320	-	700	820	705	7500**	5	20	0°C/+60°C
28-35-55	15000	15000	-	-	-	-	7500**	7	20	-10°C/+80°C



Product explanation

Mono Rails are profile rails for the highest degree of precision

Fig. 1

The running grooves are ground in semicircular profile and have a contact angle of 45° in X-arrangement so that the same load capacity is guaranteed in all principle directions. Use of large steel balls enables high load and moment capacities. All carriages in size 55 are equipped with ball chains.

The most important characteristics:

- X-arrangement with 2-point contact of the raceways
- Uniform loading capacity in all main directions
- High ability for self-regulating
- Small differential slip in comparison to 4-point contact
- Very quiet running and low operating noise
- Low maintenance due to advanced lubrication chamber
- Small displacement force in preload compared to 4-point contact
- Mono Rail profile rails meet the market standard and can replace linear rails of the same design from other manufacturers while maintaining the main dimensions
- Miniature Mono Rails available in a standard or large version
- Miniature Mono Rail available in Martensite stainless steel.

Preferred areas of application:

- Construction and machine technology (safety doors, feeding)
- Packaging machines
- Special purpose machinery
- Logistics (e.g., handling units)
- Medical technology (e.g., X-ray equipment, hospital gurneys)
- Semiconductors and electronics industry

MRS

Standard carriage with flange.

Fig. 2

MRS...W / MRT...W

Carriage without flange, also called block. Available in two different heights. MRT is the lower version.

Fig.3

MRS...L

Carriage in long version for holding larger loads. MRS...L is the version with flange.

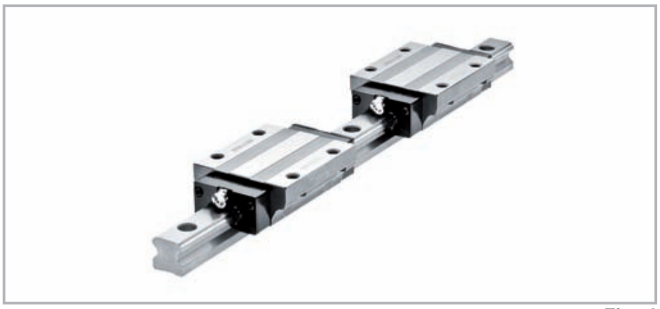


Fig. 4

MRS...LW

Carriage in long version without flange.

Fig. 5

MRT...SW

Carriage without flange in short version for lower loads with equally high precision.

Fig. 6

MRR...F

Guide rail MRR...F for bolting from below with threaded holes. Design with smooth surface without bevels.

Fig. 7

Standard width

Compact technology and high performance in its smallest structural shape.

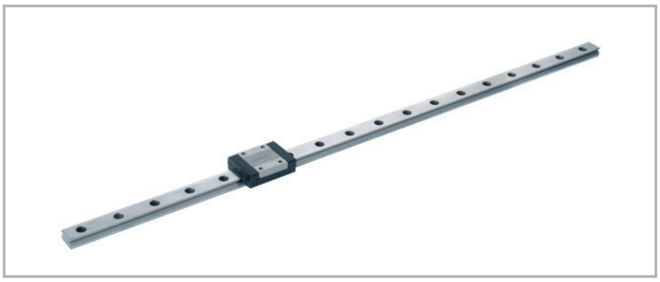


Fig. 8

Large width

Wide miniature profile rails, with a compact size, allow the acceptance of higher forces and moments. Especially suited for single rail applications.

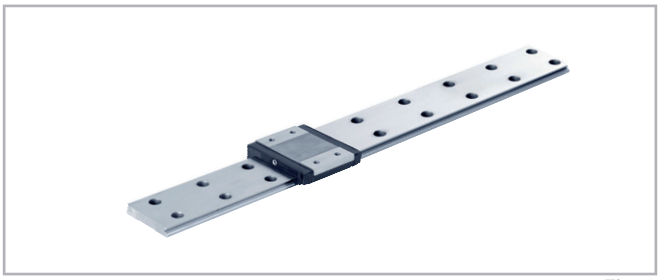


Fig. 9

Technical data

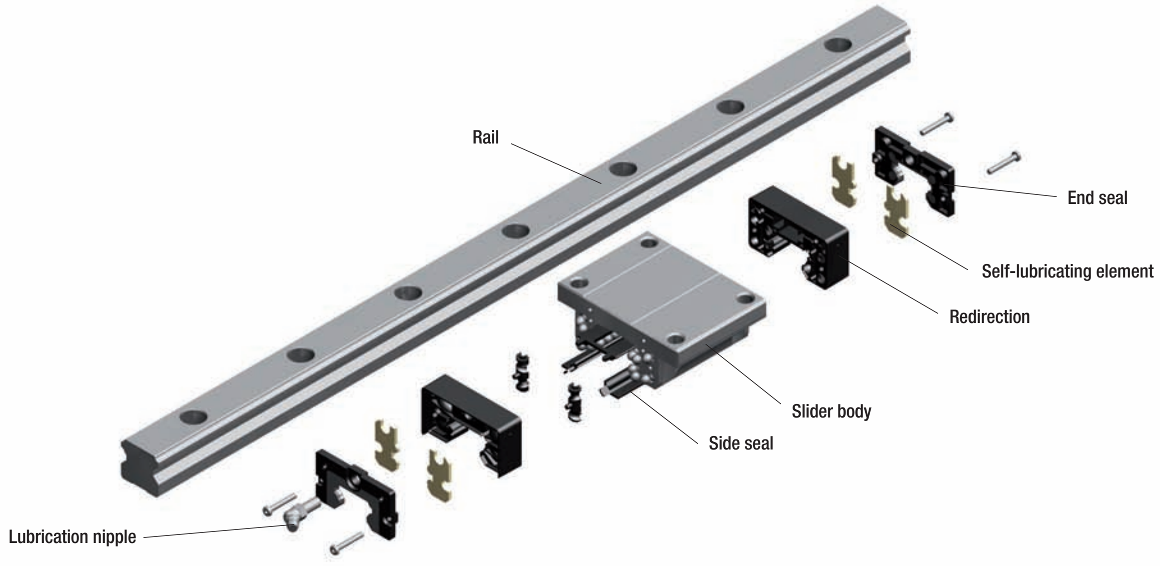


Fig. 10

Performance characteristics:

- Mono Rail available sizes: 15, 20, 25, 30, 35, 45, 55
- Standard version Miniature Mono Rail available sizes: 7, 9, 12, 15
- Large version Miniature Mono Rail available sizes: 9, 12, 15
- Max. operating speed: 3.5 m/s (137.79 in/s) (depending on application)
- Max. operating temperature: +80 °C (+176 °F) (depending on application)
- Available rail lengths up to approx. 4,000 mm (157.5 in) for Mono Rail (see Ordering key, Table 45)
- Four preload classes for Mono Rail: G1, K0, K1, K2
- Three precision classes: N, H, P
- Three preload classes for the Miniature Mono Rails: V0, VS, V1
- Lengths for single rails are available up to 1,000mm (39.37 in) for the Miniature Mono Rail

Remarks:

- Combining rails is possible (joining)
- The fixing holes on the carriages with flange can also be used as through holes for fastening from below. Here, the reduction in size of the screw diameter must be observed
- Various surface coatings on request
- Manual and pneumatic clamping elements available as accessories. Depending on the height of the carriage, additional adapter plates must be used
- Dimensions H_2 and L of the carriage change when using metal deflectors and other seals. Refer to Sec. 4 Accessories, pg. MR-15f
- The carriages in size 55 are equipped with ball chains
- Primary lubricated systems have an increased displacement resistance

Mono Rail load capacities

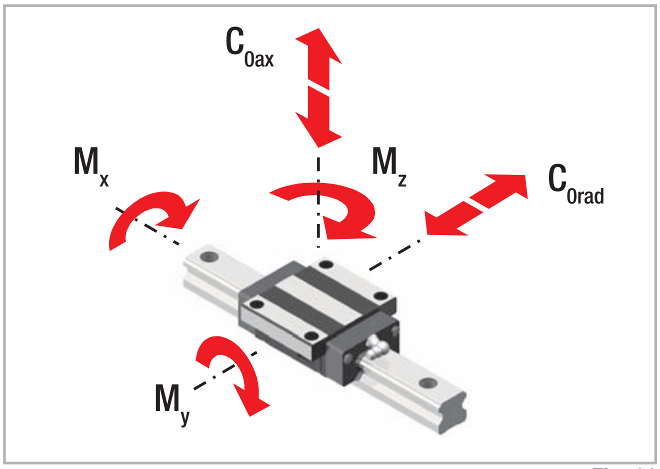


Fig. 11

Type	Load capacities [N]		Static moments [Nm]		
	dyn. C	stat. C_{0rad} stat. C_{0ax}	M_x	M_y	M_z
MRS15 MRS15W MRT15W	8500	13500	100	68	68
MRT15SW	5200	6800	51	18	18
MRS20 MRS20W MRT20W	14000	24000	240	146	146
MRT20SW	9500	14000	70	49	49
MRS20L MRS20LW	16500	30000	300	238	238
MRS25 MRS25W MRT25W	19500	32000	368	228	228
MRT25SW	12500	17500	175	69	69
MRS25L MRS25LW	26000	46000	529	455	455

Tab. 1

Type	Load capacities [N]		Static moments [Nm]		
	dyn. C	stat. C_{0rad} stat. C_{0ax}	M_x	M_y	M_z
MRS30 MRS30W MRT30W	28500	48000	672	432	432
MRT30SW	17500	24000	336	116	116
MRS30L MRS30LW	36000	64000	896	754	754
MRS35 MRS35W MRT35W	38500	62000	1054	620	620
MRT35SW	25000	36500	621	209	209
MRS35L MRS35LW	48000	83000	1411	1098	1098
MRS45 MRS45W MRT45W	65000	105000	2363	1378	1378
MRS45L MRS45LW	77000	130000	2925	2109	2109
MCS55 MCS55W	123500	190000	4460	3550	3550
MCS55L	155000	249000	5800	6000	6000

Tab. 2

Miniature Mono Rail load capacities

Standard width

Fig. 12

Type	Load capacities [N]		Static moments [Nm]		
	dyn. C_{100}	stat. C_0	M_x	M_y	M_z
MR07MN	890	1400	5.2	3.3	3.3
MR09MN	1570	2495	11.7	6.4	6.4
MR12MN	2308	3465	21.5	12.9	12. 9
MR15MN	3810	5590	43.6	27	27

Tab. 3

Large width

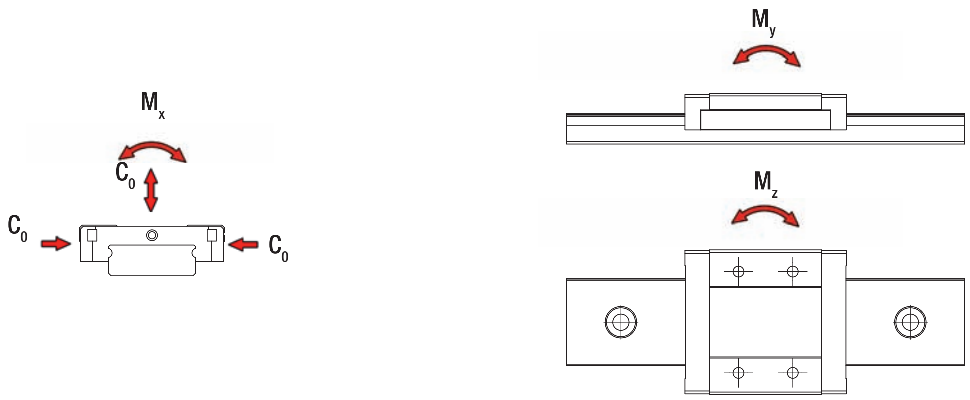


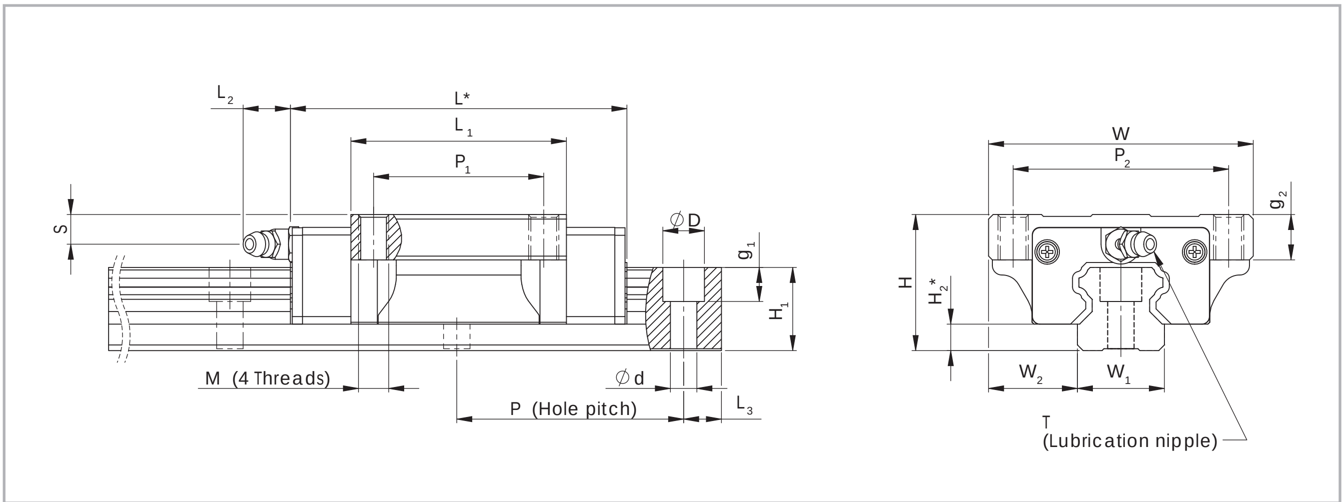
Fig. 13

Type	Load capacities [N]		Static moments [Nm]		
	dyn. C_{100}	stat. C_0	M_x	M_y	M_z
MR09WN	2030	3605	33.2	13.7	13.7
MR12WN	3065	5200	63.7	26.3	26.3
MR15WN	5065	8385	171.7	45.7	45.7

Tab. 4

Product dimensions

MRS – carriage with flange



* Dimensions H_2 and L change when using end and side seals (see pg. MR-15, Tab. 15).

Fig. 14

Type	System [mm]				Slider MRS [mm]									Weight [kg]	Rail MRR [mm]							Weight [kg/m]
	H	W	W_2	H_2	L	P_2	P_1	M	g_2	L_1	L_2	T	S		W_1	H_1	P	d	D	g_1	L_3*	
MRS15	24	47	16	4,6	69	38	30	M5	8	40	5	∅3	4,3	0.19	15	14	60	4.5	7.5	5.8	20	1.4
MRS20	30	63	21.5	5	81.2	53	40	M6	9	48.8	12	M6 x 1	7	0.4	20	18		6	9.5	9		2.6
MRS20L					95.7					63.4				0.52								
MRS25	36	70	23.5	7	91	57	45	M8	12	57			7.8	0.57	23	22		7	11	9.5		3.6
MRS25L					113					79.1				0.72								
MRS30	42	90	31	9	114	72	52	M10		72			7	1.1	28	26	80	9	14	12.5		5.2
MRS30L					135.3					94.3				1.4								
MRS35	48	100	33	9,5	114	82	62		13	80			8	1.6	34	29						7.2
MRS35L					139.6					105.8				2								
MRS45	60	120	37.5	14	142.5	100	80	M12	15	105	17	M8 x 1	8.5	2.7	45	38	105	14	20	17.5	22.5	12.3
MRS45L					167					129.8				3.6								

* Only applies when using max. rail lengths (see Ordering key)

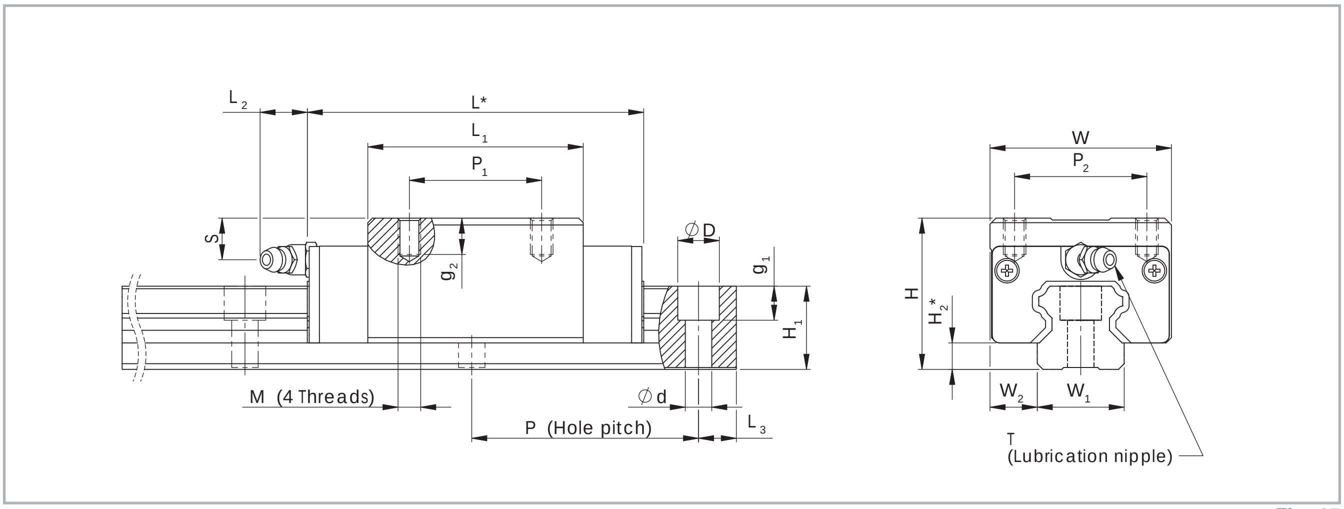
Tab. 5

Type	System [mm]				Slider MCS [mm]									Weight [kg]	Rail MRC [mm]							Weight [kg/m]
	H	W	W_2	H_2	L	P_2	P_1	M	g_2	L_1	L_2	T	S		W_1	H_1	P	d	D	g_1	L_3*	
MCS55	70	140	43,5	12,7	181.5	116	95	M14	21	131	12	M8 x 1	20	5.4	53	38	120	16	23	20	30	14.5
MCS55L					223.7					173				7.1								

* Only applies when using max. rail lengths (see Ordering key)

Tab. 6

MRS…W – carriage without flange



* Dimensions H_2 and L change when using end and side seals (see pg. MR-15, Tab. 15).

Fig. 15

Type	System [mm]				Slider MRS [mm]									Weight [kg]	Rail MRR [mm]							Weight [kg/m]
	H	W	W_2	H_2	L	P_2	P_1	M	g_2	L_1	L_2	T	S		W_1	H_1	P	d	D	g_1	L_3*	
MRS15W	28	34	9.5	4,6	69	26	26	M4	6.4	40	5	∅3	8,3	0.21	15	14	60	4.5	7.5	5.8	20	1.4
MRS20W	30	44	12	5	81.2	32	36	M5	8	48.8	12	M6 x 1	7	0.31	20	18		6	9.5	9		2.6
MRS20LW					95.7		50			63.4				0.47								
MRS25W	40	48	12.5	7	91	35	35	M6	9.6	57			11.8	0.45	23	22		7	11	9.5		3.6
MRS25LW					113		50			79.1				0.56								
MRS30W	45	60	16	9	114	40	40	M8	12.8	72			10	0.91	28	26	80	9	14	12.5		5.2
MRS30LW					135.3		60			94.3				1.2								
MRS35W	55	70	18	9,5	114	50	50			80			15	1.5	34	29						7.2
MRS35LW					139.6		72			105.8				1.9								
MRS45W	70	86	20.5	14	142.5	60	60	M10	16	105	17	M8 x 1	18.5	2.3	45	38	105	14	20	17.5	22.5	12.3
MRS45LW					167		80			129.8				2.8								

* Only applies when using max. rail lengths (see Ordering key)

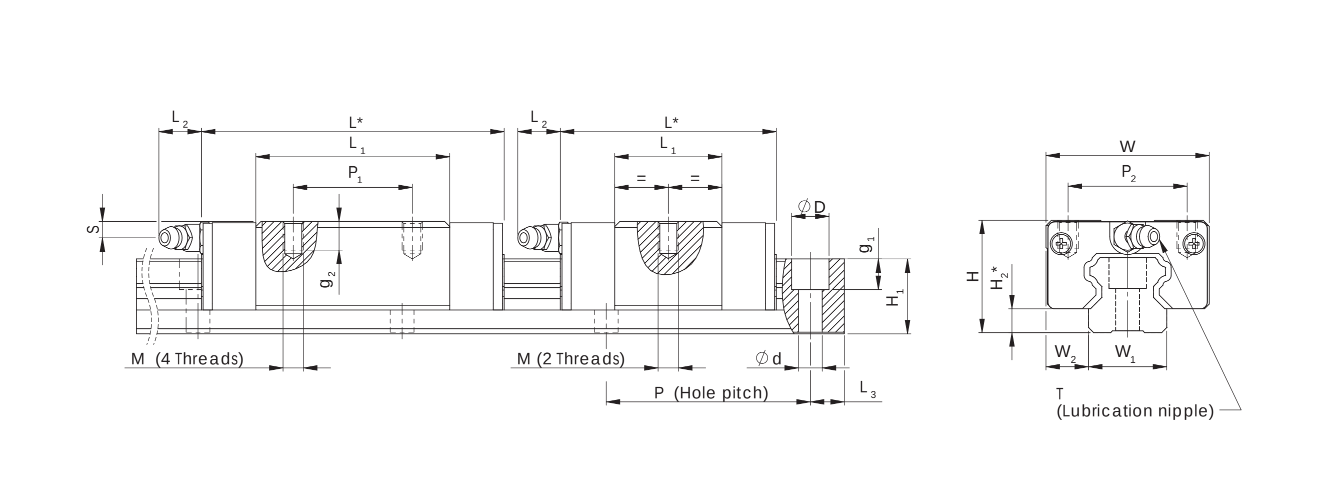
Tab. 7

Type	System [mm]				Slider MCS [mm]									Weight [kg]	Rail MRC [mm]							Weight [kg/m]
	H	W	W_2	H_2	L	P_2	P_1	M	g_2	L_1	L_2	T	S		W_1	H_1	P	d	D	g_1	L_3*	
MCS55W	80	100	23.5	12.7	181.5	75	75	M12	19	131	12	M8 x 1	30	5.2	53	38	120	16	23	20	30	14.5

* Only applies when using max. rail lengths (see Ordering key)

Tab. 8

MRT…W – carriage without flange



* Dimensions H_2 and L change when using end and side seals (see pg. MR-15, Tab. 15).

Fig. 16

Type	System [mm]				Slider MRT [mm]									Weight [kg]	Rail MRR [mm]							Weight [kg/m]
	H	W	W_2	H_2	L	P_2	P_1	M	g_2	L_1	L_2	T	S		W_1	H_1	P	d	D	g_1	L_3*	
MRT15W	24	34	9.5	4.6	69	26	26	M4	5.6	40	5	∅3	4.3	0.17	15	14	60	4.5	7.5	5.8	20	1.4
MRT15SW					50.6		-			21.6				0.1								
MRT20W	28	42	11	5	81.2	32	32	M5	7	48.8	12	M6 x 1	5	0.26	20	18		6	9.5	9		2.6
MRT20SW					60.3		-			28				0.17								
MRT25W	33	48	12.5	7	91	35	35	M6	8.4	57			4.8	0.38	23	22		7	11	9.5		3.6
MRT25SW					65.5		-			31.5				0.21								
MRT30W	42	60	16	9	114	40	40	M8	11.2	72			7	0.81	28	26	80	9	14	12.5		5.2
MRT30SW					80		-			38.6				0.48								
MRT35W	48	70	18	9.5	114	50	50			80			8	1.2	34	29						7.2
MRT35SW					79.7		-			45.7				0.8								
MRT45W	60	86	20.5	14	142.5	60	60	M10	14	105	17	M8 x 1	8.5	2.1	45	38	105	14	20	17.5	22.5	12.3

* Only applies when using max. rail lengths (see Ordering key)

Tab. 9

MRR...F – rails mounted from below

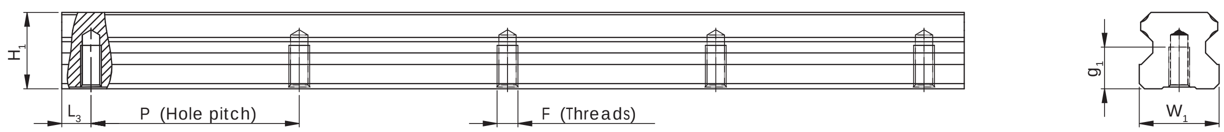


Fig. 17

<table>
<tr><th>Rail type</th><th>W_1 [mm]</th><th>H_1 [mm]</th><th>L_3* [mm]</th><th>P [mm]</th><th>F</th><th>g_1 [mm]</th></tr>
<tr><td>MRR15...F</td><td>15</td><td>14</td><td rowspan="5">20</td><td rowspan="3">60</td><td>M5</td><td>8</td></tr>
<tr><td>MRR20...F</td><td>20</td><td>18</td><td rowspan="2">M6</td><td>10</td></tr>
<tr><td>MRR25...F</td><td>23</td><td>22</td><td>12</td></tr>
<tr><td>MRR30...F</td><td>28</td><td>26</td><td rowspan="2">80</td><td rowspan="2">M8</td><td>15</td></tr>
<tr><td>MRR35...F</td><td>34</td><td>29</td><td>17</td></tr>
<tr><td>MRR45...F</td><td>45</td><td>38</td><td>22.5</td><td>105</td><td>M12</td><td>24</td></tr>
</table>

* Only applies when using max. rail lengths (see Ordering key)

Tab. 10

Miniature Mono Rail standard width

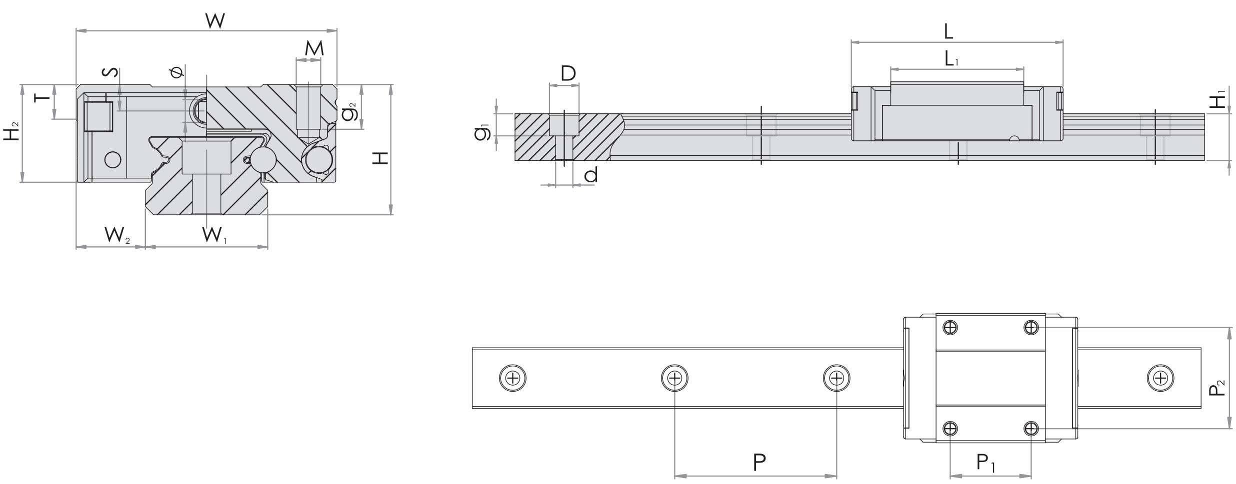


Fig. 18

Type	System [mm]			
	H	W	W_2	H_2
MR07MN	8	17	5	6.5
MR09MN	10	20	5.5	7.8
MR12MN	13	27	7.5	10
MR15MN	16	32	8.5	12

Tab. 11

Type	Slider [mm]										Rail [mm]						
	L	P_2	P_1	M	g_2	L_1	T	S	Ø	Weight [kg]	W_1	H_1	P	d	D	g_1	Weight [kg/m]
MR07MN	23.7	12	8	M2	2.5	14.3	2.8	1.6	1.1	0.008	7	4.7	15	2.4	4.2	2.3	0.215
MR09MN	30.6	15	10	M3	3.0	20.5	3.3	2.2	1.3	0.018	9	5.5	20	3.5	6	3.5	0.301
MR12MN	35.4	20	15	M3	3.5	22.0	4.3	3.2	1.3	0.034	12	7.5	25	3.5	6	4.5	0.602
MR15MN	43.0	25	20	M3	5.5	27.0	4.3	3.3	1.8	0.061	15	9.5	40	3.5	6	4.5	0.93

Tab. 12

Miniature Mono Rail large width

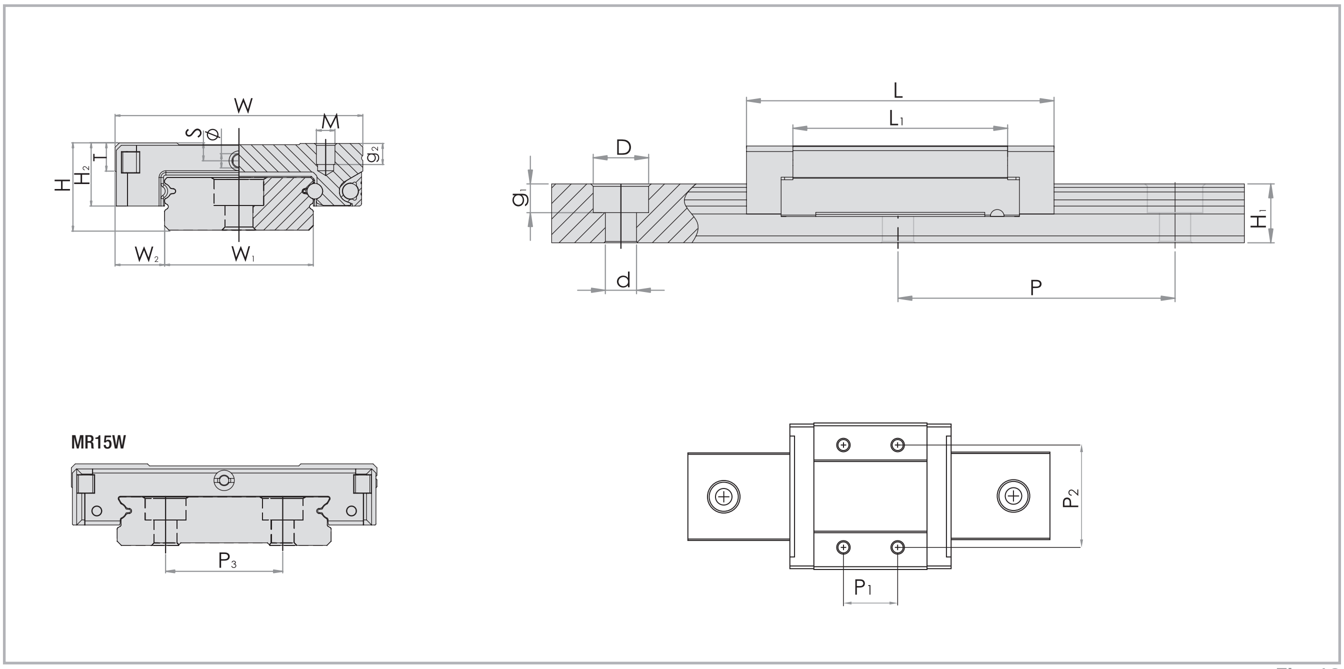


Fig. 19

Type	System [mm]			
	H	W	W_2	H_2
MR09WN	12	30	6	8.6
MR12WN	14	40	8	10.1
MR15WN	16	60	9	12

Tab. 13

Type	Slider [mm]										Rail [mm]							
	L	P_2	P_1	M	g_2	L_1	T	S	Ø	Weight [kg]	W_1	H_1	P	P_3	d	D	g_1	Weight [kg/m]
MR09WN	39.1	21	12	M3	3	27.9	4	2.6	1.3	0.037	18	7.3	30	-	3.5	6		0.94
MR12WN	44.4	28	15	M3	3.5	31.0	4.5	3.1	1.3	0.065	24	8.5	40	-	4.5	8	4.5	1.472
MR15WN	55.3	45	20	M4	4.5	38.5	4.5	3.3	1.8	0.137	42	9.5	40	23	4.5	8		2.818

Tab. 14

Accessories

Safety equipment and covers

End seal

Carriages of Mono Rail profile rails are equipped with end seals for contamination protection as standard.

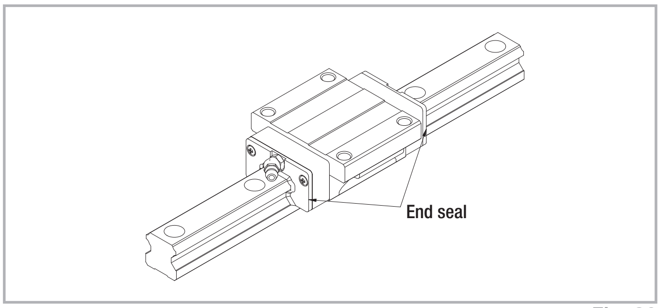


Fig. 20

Side seal

Carriages are equipped with side seals to prevent permeation of contaminates.

No side seals are available for carriages in long or short version (...SW/...L/...LW).

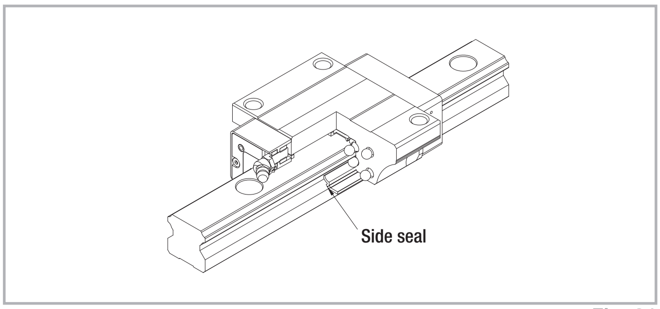


Fig. 21

Seal variants:

A: Carriage with end and side seal

Changes in floor clearance and length of sliders by corresponding seal variant

Seal variant		A	A
Slider type[1]	Size	Changed dimension H_2* [mm]	Changed length L* [mm]
MRS MRS...W MRT...W	15	2.5	73
	20	2.9	85
	25	4.9	94.7
	30	6.9	117
	35	7.6	118
	45	12.05	146.7
MCS MCS...W	55	-	-
MRS...L MRS...LW	20	-	-
	25	-	-
	30	-	-
	35	-	-
	45	-	-
MCS...L	55	-	-
MRT...SW	15	-	-
	20	-	-
	25	-	-
	30	-	-
	35	-	-

Tab. 15

[1] No side seals are available for carriages in long or short version (...SW/...L/...LW)

* For comparison see Chapter 3 Product dimensions, pg. MR-8ff

Metal cover strip

A rail cover strip made of corrosion resistant steel is available to improve the seal after guide rail installation. The metal cover strip is 0.3 mm wide and can have a maximum length of 50 m.

Size	Width [mm]
15	10
20	13
25	15
30	20
35	24
45	32
55	38

Tab. 16

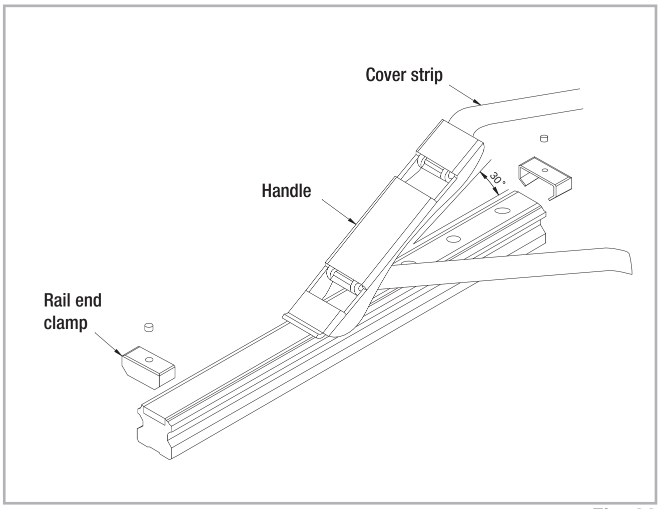


Fig. 22

Flush cap

Metal debris and other foreign substance can collect in the fixing holes of the rails and thus end up the carriage.
To prevent penetration of contamination in the carriage, the fixing holes should be capped with perforated caps flush with the rail surface.
Flush caps are made of wear and oil resistant synthetic resin. Various sizes of perforated caps for the counter sunk holes for hexagon socket bolts M3 to M22 are included as standard in the scope of supply.
Flush caps are driven in flush with the rail surface with light hammer taps using a flat piece of metal (see fig. 23).

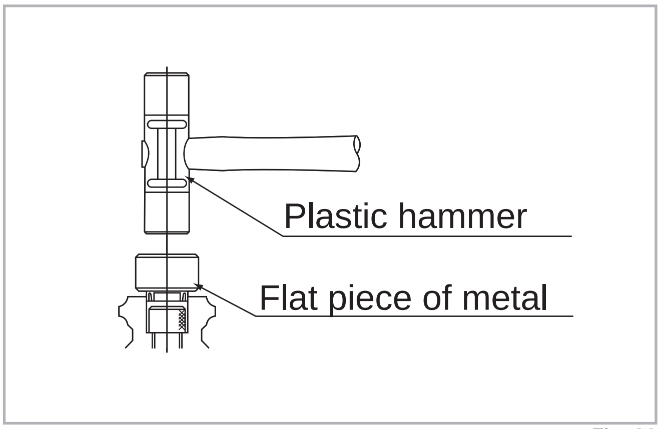


Fig. 23

Clamping elements

Mono Rail profile rails can be secured with manual or pneumatic clamping elements. Areas of application are:

- Table cross beams and sliding beds
- Width adjustment, stops
- Positioning of optical equipment and measuring tables

Manual clamp elements HK

The HK series is a manually activated clamping element.
Contact profiles press synchronously on the free surfaces of the profile rail by using the freely adjustable clamping lever.
The floating mounted contact profiles guarantee symmetrical introduction of force on the guide rail.
Special characteristics of the clamping elements HK:

- Simple and safe design
- Floating contact profile
- Precise positioning
- Holding force up to 2,000 N

Variants:
An additional adapter plate must be used depending on the height of the carriage (see pg. MR-20, tab. 19).
Activation:
Standard with hand lever, further activation options, e.g. using DIN 912 screw, possible on request.

Pneumatic clamp elements MK / MKS

The patented wedge slide gear puts into effect high holding forces. The pressurised medium moves the wedge slide gear in the longitudinal direction.
Contact profiles press with high force on the free surfaces of the profile rail by the resulting cross movement. MK is an element that closes with pneumatic pressure. The custom design MKS closes with spring energy storage and is opened via air impingement.

Special characteristics of clamp elements MK / MKS:

- Short shape
- High clamp forces
- Precise positioning
- High axial and horizontal rigidity

Areas of application of MK:

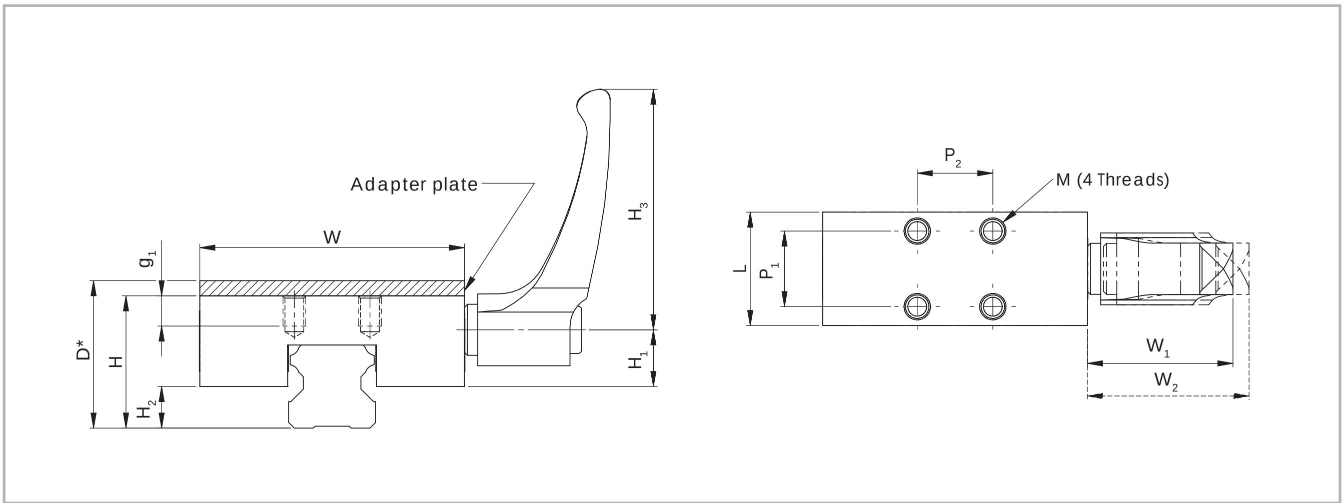
- Positioning axes
- Setting vertical axes
- Positioning lifting gear
- Clamping machine tables

Variants:
An additional adapter plate must be used depending on the height of the carriage (see pg. MR-20, tab. 20).
Connection options:
The basic MK / MKS series versions are equipped with air connections on both sides, i.e. the factory default settings air connections and the ventilation filter can be exchanged to the opposite side surfaces.
Custom design MKS opens with impingement of an air pressure of > 5.5 bar.

Areas of application of MKS:

- Clamping with drop in pressure (Normally Open)
- Clamping without power required (Normally Closed)

Manual clamp HK



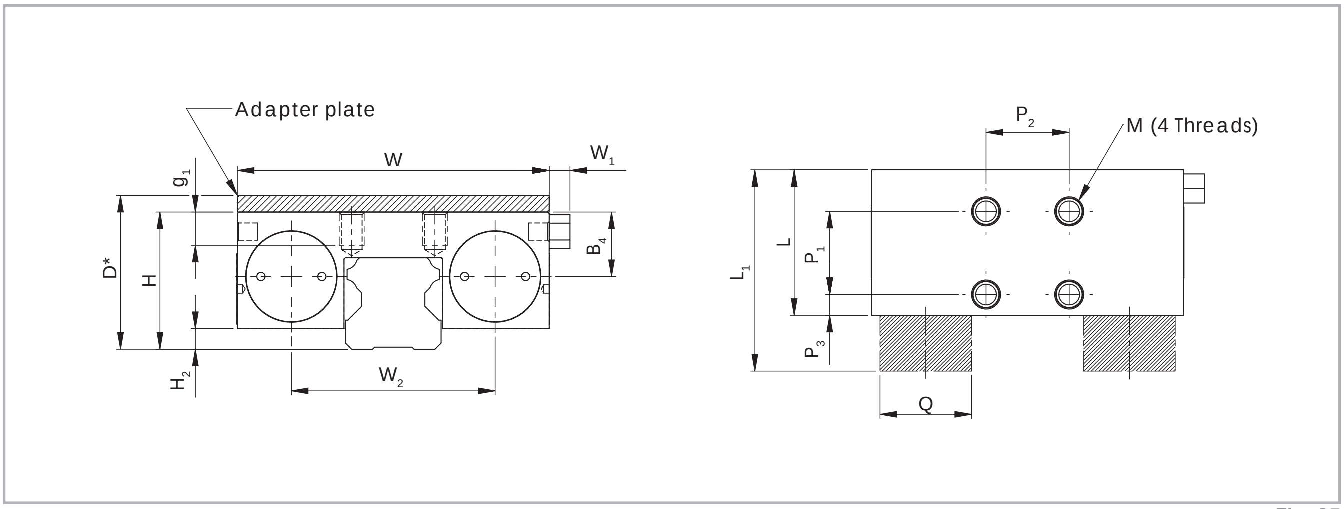
* Changed dimensions when using the adapter plate, see pg. MR-20, tab. 19

Fig. 24

Type	Size	Holding force [N]	Tightening torque [Nm]	Dimensions [mm]											M
				H	H_1	H_2	H_3	W	W_1	W_2	L	P_1	P_2	g_1	
HK1501A	15	1200	5	24	12.5	6.5	44	47	30.5	33.5	25	17	17	5	M4
HK2006A	20			28	17.5	5		60			24	15	15	6	M5
HK2501A	25		7	36	15	12	63	70	38.5	41.5	30	20	20	8	M6
HK2514A				33		11.5									
HK3001A	30	2000	15	42	21.5	12	78	90	46.5	50.5	39	22	22		
HK3501A	35			48		16		100				24	24	10	M8
HK4501A	45			60	26.5	18		120			44	26	26	14	M10
HK5501A	55		22	70	31	21	95	140	56.5	61.5	49	30	30	16	M14

Tab. 17

Pneumatic clamp MK / MKS



* Changed dimensions when using the adapter plate, see pg. MR-20, tab. 20

Fig. 25

<table>
<tr><th rowspan="2">Type</th><th rowspan="2">Size</th><th rowspan="2">MK holding force
[N]</th><th rowspan="2">MKS holding force
[N]</th><th colspan="13">Dimensions
[mm]</th><th rowspan="2">M</th></tr>
<tr><th>H</th><th>H_2</th><th>W</th><th>W_1</th><th>W_2</th><th>B_4</th><th>L_1*</th><th>L</th><th>P_1</th><th>P_2</th><th>P_3</th><th>Q
[∅]</th><th>g_1</th></tr>
<tr><td>MK / MKS 1501A</td><td>15</td><td>650</td><td>400</td><td>24</td><td rowspan="2">2.5</td><td>55</td><td rowspan="2">6</td><td>34</td><td>12</td><td>58</td><td rowspan="2">39</td><td>15</td><td>15</td><td>15.5</td><td>16</td><td>4.5</td><td>M4</td></tr>
<tr><td>MK / MKS 2001A</td><td>20</td><td>1000</td><td>600</td><td>28</td><td>66</td><td>43</td><td>14.4</td><td>61</td><td rowspan="2">20</td><td rowspan="2">20</td><td rowspan="2">5</td><td>20</td><td>5</td><td>M5</td></tr>
<tr><td>MK / MKS 2501A</td><td>25</td><td>1200</td><td>750</td><td>36</td><td>8</td><td>75</td><td rowspan="5">5</td><td>49</td><td>15.5</td><td>56</td><td>35</td><td>22</td><td>8</td><td>M6</td></tr>
<tr><td>MK / MKS 3001A</td><td>30</td><td>1750</td><td>1050</td><td>42</td><td>7</td><td>90</td><td>58</td><td rowspan="2">20.5</td><td>68</td><td rowspan="2">39</td><td>22</td><td>22</td><td>8.5</td><td>25</td><td rowspan="2">10</td><td rowspan="2">M8</td></tr>
<tr><td>MK / MKS 3501A</td><td>35</td><td>2000</td><td>1250</td><td>48</td><td>11.5</td><td>100</td><td>68</td><td>67</td><td>24</td><td>24</td><td>7.5</td><td>28</td></tr>
<tr><td>MK / MKS 4501A</td><td>45</td><td rowspan="2">2250</td><td rowspan="2">1450</td><td>60</td><td>16.5</td><td>120</td><td>78.8</td><td>26.8</td><td rowspan="2">82</td><td rowspan="2">49</td><td>26</td><td>26</td><td>11.5</td><td rowspan="2">30</td><td>15</td><td rowspan="2">M10</td></tr>
<tr><td>MK / MKS 5501A</td><td>55</td><td>70</td><td>21.5</td><td>128</td><td>87</td><td>30.5</td><td>30</td><td>30</td><td>9.5</td><td>18</td></tr>
</table>

* Only for model MKS

Tab. 18

Adapter plate

For HK clamps

Clamp	Size	Slider type	Adapter plate	D
HK1501A	15	MRS, MRT...W, MRT...SW	-	24
		MRS...W	PHK 15-4	28
HK2006A	20	MRT...W, MRT...SW	-	28
		MRS, MRS...L, MRS...W, MRS...LW	PHK 20-2	30
HK2514A	25	MRT...W, MRT...SW	-	33
HK2501A		MRS, MRS...L,	-	36
		MRS...W, MRS...LW	PHK 25-4	40
HK3001A	30	MRS, MRS...L, MRT...W, MRT...SW	-	42
		MRS...W, MRS...LW	PHK 30-3	45
HK3501A	35	MRS, MRS...L, MRT...W, MRT...SW	-	48
		MRS...W, MRS...LW	PMK 35-7	55
HK4501A	45	MRS, MRS...L, MRT...W	-	60
		MRS...W, MRS...LW	PHK 45-10	70
On request	55		-	68
HK5501A		MCS, MCS...L	-	70
		MCS...W	PHK 55-10	80

Tab. 19

For MK / MKS clamps

Clamp	Size	Slider type	Adapter plate	D
MK / MKS 1501A	15	MRS, MRT...W, MRT...SW	-	24
		MRS...W	PMK 15-4	28
MK / MKS 2001A	20	MRT...W, MRT...SW	-	28
		MRS, MRS...L, MRS...W, MRS...LW	PMK 20-2	30
On request	25	MRT...W, MRT...SW	-	33
MK / MKS 2501A		MRS, MRS...L, MRZ	-	36
		MRS...W, MRS...LW	PMK 25-4	40
MK / MKS 3001A	30	MRS, MRS...L, MRT...W, MRT...SW	-	42
		MRS...W, MRS...LW	PMK 30-3	45
MK / MKS 3501A	35	MRS, MRS...L, MRT...W, MRT...SW	-	48
		MRS...W, MRS...LW	PMK 35-7	55
MK / MKS 4501A	45	MRS, MRS...L, MRT...W	-	60
		MRS...W, MRS...LW	PMK 45-10	70
On request	55		-	68
MK / MKS 5501A		MCS, MCS...L	-	70
		MCS...W	PMK 55-10	80

Tab. 20

Technical instructions

Mono Rail precision

Precision means the guide accuracy or the maximal deviation of the carriage based on the side and support surfaces during the movement along the rails.

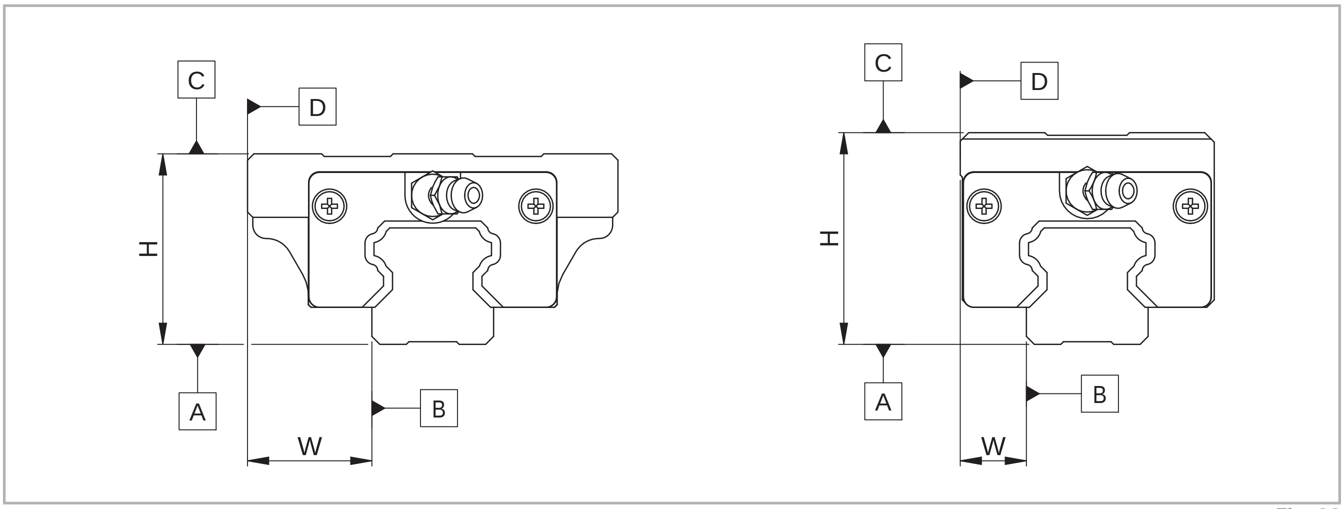


Fig. 26

	Precision class [mm]		
	Normal [N]	High [H]	Precise [P]
Height tolerance H	± 0.1	± 0.04	0 to -0.04
Side tolerance W			
Height difference (Δ H)	0,03	0,02	0,01
Width difference (Δ W)			
Guide accuracy of raceway C based on surface A	ΔC see graph in fig. 27		
Guide accuracy of raceway D based on surface B	ΔD see graph in fig. 27		

Tab. 21

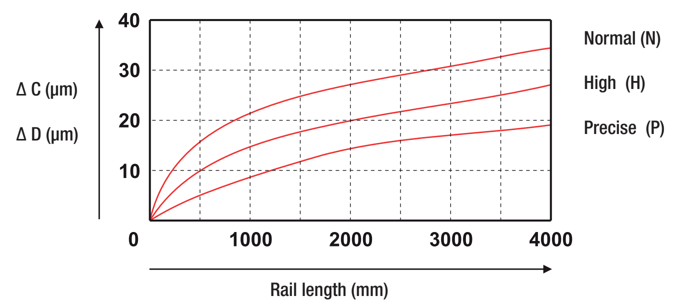


Fig. 27

Miniature Mono Rail precision

There are three precision classes to choose from for the Mono Rail Miniature profile rails: Classes P, H, and N are manufactured.

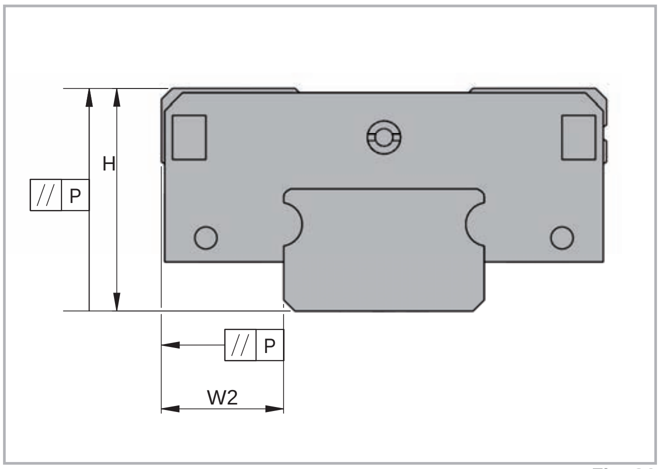


Fig. 28

	Precision classes	Precision P [µm]	High H [µm]	Normal N [µm]
H	Tolerance of height H	± 10	± 20	± 40
ΔH	Permissible height difference of different carriages at the same position on the rail	7	15	25
W_2	Tolerance of width W_2	± 15	± 25	± 40
ΔW_2	Permissible width difference of different carriages at the same position on the rail	10	20	30

Tab. 22

Running accuracy

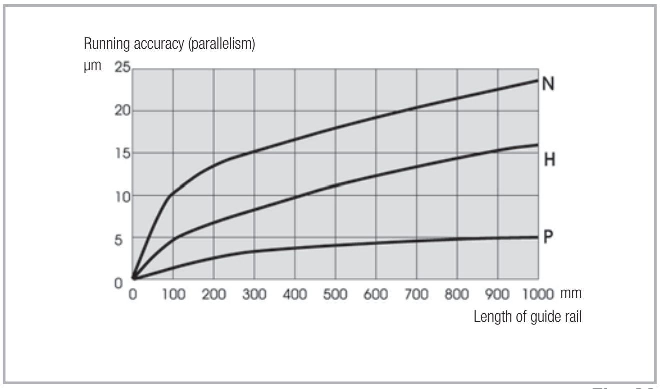


Fig. 29

Mono Rail Radial clearance / preload

Radial clearance describes the value for the radial movement of the carriage at a constant vertical load, while the carriage moves in longitudinal direction.

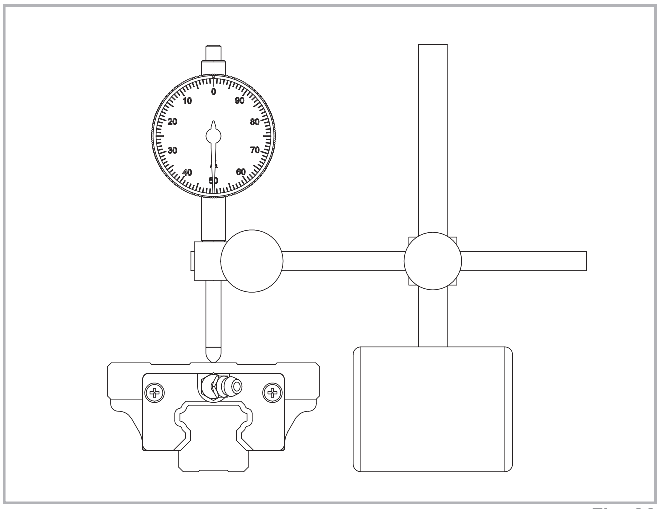


Fig. 30

Preload is defined as an effective load on the rolling element in the interior of the carriage in order to remove an existing clearance or to increase the rigidity.
The Mono Rail profile rails are available in the four different preload classes G1, K0, K1 and K2 (see tab. 23). The preload influences the rigidity, precision and torque resistance and also affects the service life and displacement force.

The radial clearance for the respective preload classes are listed in table 24.

Degree of preload	Preload class	Preload
With clearance	G1	0
No clearance	K0	0
Small preload	K1	0,02 x C*
Average preload	K2	0,05 x C*

* C is the dynamic load capacity, see pg. MR-9, tab. 1f

Tab. 23

Size	Radial clearance of the preload classes [μm]			
	G1 Impact free movement, compensation of assembly tolerances	K0 Impact free and easy movement	K1 Small moments, one rail application, low vibrations	K2 Average vibrations and moments, light impacts
15	+4 to +14	-4 to +4	-12 to -4	-20 to -12
20	+5 to +15	-5 to +5	-14 to -5	-23 to -14
25	+6 to +16	-6 to +6	-16 to -6	-26 to -16
30	+7 to +17	-7 to +7	-19 to -7	-31 to -19
35	+8 to +18	-8 to +8	-22 to -8	-35 to -22
45	+10 to +20	-10 to +10	-25 to -10	-40 to -25
55	+12 to +22	-12 to +12	-29 to -12	-46 to -29

Tab. 24

Miniature Mono Rail Preload

The Mono Rail Miniature profile rails are available in the three different preload classes V_0, V_S and V_1 (see table 25). The preload influences the rigidity, precision and torque resistance and also affects the product service life and displacement force.

Type	Preload classes		
	Small clearance Very quiet running V_0 [µm]	**Standard** Very quiet and precise running V_S [µm]	**Small preload** High rigidity, vibration reduced, high precision, good load balance V_1 [µm]
MR07	from +5 to +2	from +1 to -2	from -2 to -4
MR09	from +5 to +2	from +2 to -2	from -2 to -5
MR12	from +6 to +2	from +2 to -2	from -2 to -5
MR15	from +7 to +2	from +2 to -3	from -2 to -6

Tab. 25

Anticorrosive protection

There are numerous application-specific surface treatments available for profile rails of the Mono Rail product family.

For more information please contact Rollon technical support. All linear rails of the Miniature Mono Rail series are made of stainless steel.

Mono Rail lubrication

Profile rails must generally be lubricated before commissioning. They can be lubricated with oil or grease.
The correct lubricant selection has a large influence on the service life and the function of the profile rail, insufficient lubrication and tribocorrosion can ultimately lead to total failure.

As well as reducing friction and wear, lubricants also serve as sealant, noise damper and corrosion protection for the linear guide. Different lubricants for special applications are available upon request.
For more information please contact Rollon technical support.

Important instructions for lubrication

- Mono Rail profile rails must be lubricated for operation.
- The carriage must be moved back and forth during lubrication.
- The lubricant is inserted through a lubrication nipple.
- There should be a thin film of lubricant on the rail surface at all times.
- Please inform us in advance if the guides are to be used in acid or base containing environments or in clean rooms.
- Primary lubricated systems have an increased displacement resistance.
- Please contact Rollon technical support if the rail will be oriented vertically.
- If the stroke is <2 or >15 times the carriage length, the lubrication intervals should be shortened.

Grease lubrication

We recommend the use of a lithium emulsified lubricant NLGI Class 2 for lubrication.

Oil lubrication

We recommend a synthetic oil for operating temperatures between 0 °C and +70 °C. For application-specific custom lubrication, please contact Rollon technical support.

Relubrication

- Relubrication of the system must be done before the lubricant used is dirty or shows discolouration.
- Relubrication is performed at operating temperature. The carriage must be moved back and forth during relubrication.
- If the stroke is <2 or >15 times the carriage length, the lubrication intervals should be more often.

Lubrication intervals

Operating speed, stroke length and ambient conditions influence the selection of time between lubrication intervals. Establishing a safe lubrication interval is based exclusively on the experienced practiced values determined on site. However, a lubrication interval should not be longer than one year in any case.

Miniature Mono Rail lubrication

Function

The contact points between ball and track are separated from each other by a microscopically thin oil film. The lubrication effects:

- Reduction of friction
- Reduction of wear
- Corrosion protection
- Better thermal distribution and therefore increased of service life

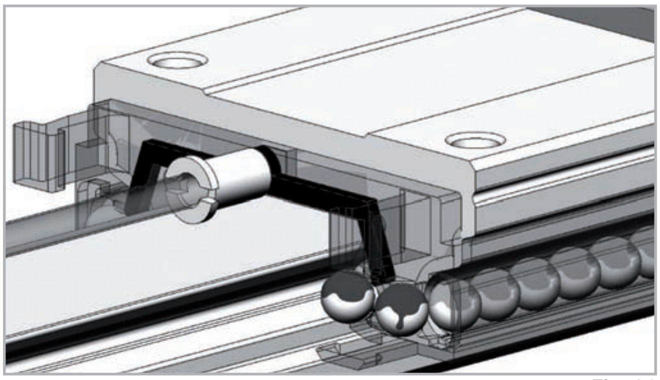


Fig. 31

Important instructions for lubrication

- Mono Rail Miniature profile rails must be lubricated for operation.
- The carriage must be moved back and forth during lubrication.
- The lubricant can also be applied to the tracks.
- The lubricant can be injected into the lubrication holes on both sides of the carriage.
- There should be a thin film of lubricant on the rail surface at all times.
- Please inform us in advance if the guides are to be used in acid or base containing environments or in clean rooms.
- Please contact the sales department if the oil lubrication should be used for vertical use of the guide.
- If the stroke is < 2 or > 15 times the carriage length, the lubrication intervals should be more often.

Type	First lubrication [cm³]
MR07MN	0.12
MR09MN	0.23
MR12MN	0.41
MR15MN	0.78

Tab. 26

Type	First lubrication [cm³]
MR09WN	0.30
MR12WN	0.52
MR15WN	0.87

Tab. 27

Grease lubrication

When using grease lubrication, we recommend synthetic-oil based lithium grease with a viscosity according to ISO VG 32 to ISO VG 100.

Oil lubrication

We recommend CLP or CGLP synthetic oil conforming to DIN 51517 or HLP to DIN 51524 and a viscosity range conforming to ISO VG 32 to ISO VG 100 for operating temperatures between 0 °C and +70 °C. We recommend a viscosity according to ISO VG 10 for use at low temperatures. For application-specific special lubrication please contact Rollon technical support.

$$\text{ISO VG 10} \;\hat{=}\; \text{Viscosity of } 10\ \frac{mm^2}{s} \text{ at } 40\ °C$$

$$\text{ISO VG 32} \;\hat{=}\; \text{Viscosity of } 32\ \frac{mm^2}{s} \text{ at } 40\ °C$$

$$\text{ISO VG 100} \;\hat{=}\; \text{Viscosity of } 100\ \frac{mm^2}{s} \text{ at } 40\ °C$$

Fig. 32

Lubrication intervals

Operating speed, stroke length and ambient conditions influence the selection of time between lubrication intervals. Establishing a safe lubrication interval is based exclusively on the experienced practiced values determined on site. However, a lubrication interval should not be longer than one year in any case.

Relubrication

- Relubrication of the system must be done before the lubricant used is dirty or shows discolouration.
- An application of approx. 50 % of the quantity used for first lubrication is sufficient for relubrication (see tab. 28).
- Relubrication is performed at operating temperature. During relubrication, the carriage should be moved back and forth.
- If the stroke is < 2 or > 15 times the carriage length, the lubrication intervals should be more often.

Initial lubrication and relubrication

Self-lubricating

The carriages of the following sizes have a self-lubrication element to extend lubrication intervals.

Size	Initial lubrication grease [cm³]	Relubrication [cm³]	Initial lubrication oil [cm³]
15	1.3	1.1	1.5
20	2.3	2	2.5
25	2.8	2.5	3.5
30	3.5	3	4.5
55	5.5	4	5.5

The given lubrication quantities apply to preload K1 and speeds ≤ 1 m/s

Tab. 28

Not self-lubricating

The carriages of sizes 35 and 45 are not self-lubricating due to the design.

Size	Initial lubrication grease [cm³]	Relubrication [cm³]	Initial lubrication oil [cm³]
35	3.5	3	3.5
45	4.5	3.5	4.5

The given lubrication quantities apply to preload K1 and speeds ≤ 1 m/s

Tab. 29

Mono Rail lubrication nipple

The following lubrication nipples are part of the standard delivery:

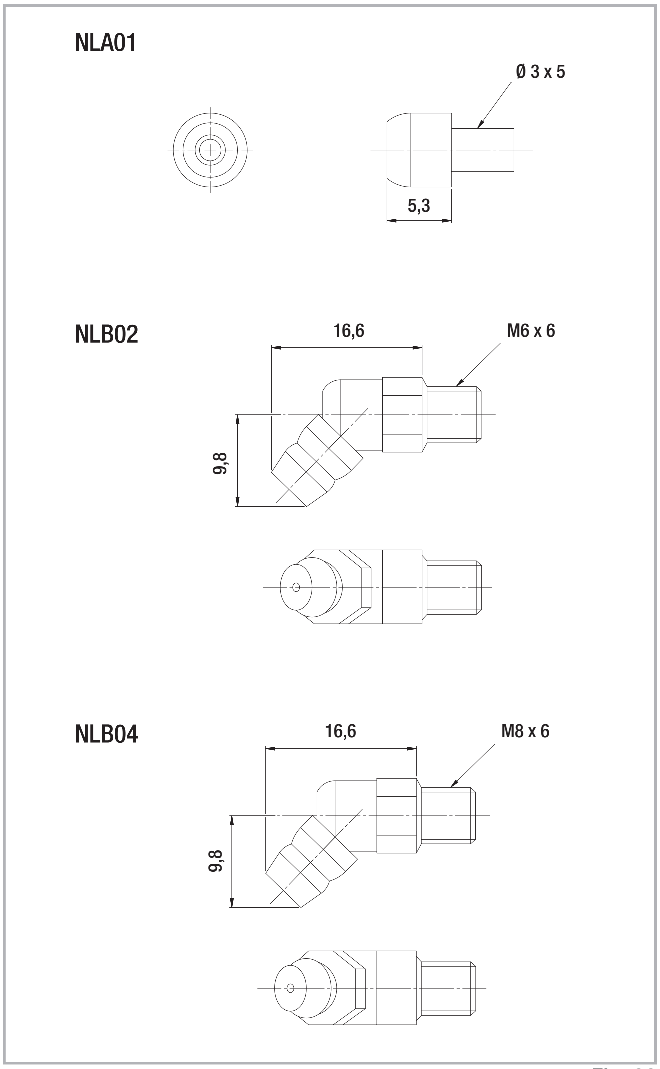


Fig. 33

Lubrication nipple	Size
NLA01	15
NLB02	20
	25
	30
	35
NLB04	45
	55

Tab. 30

Other lubrication nipples, such as lubrication adapters with hose inlet or with quick-coupling, are available on request. Please observe that the thread lengths (see fig. 33) can be changed when using additional deflectors and end seals. For more information please contact Rollon technical support.

Friction / displacement resistance

Mono Rail profile rails have a low friction characteristic and thus low displacement resistance. The low start-up friction (breakaway force) is almost identical to the moving friction (running resistance).

The displacement resistance is dependent upon several factors:

- Friction of the sealing system
- Friction of the balls with each other
- Friction between balls and redirection
- Rolling resistance of the balls in the running grooves
- Resistance of lubricant in the carriage
- Resistance by contamination in the lubricant
- Preload for increase of rigidity
- Moment load

Resistance of the seals

Type	f [N]
MRS15	0.15
MRS20	0.2
MRS25	0.35
MRS30	0.7
MRS35	0.8
MRS45	0.9
MCS55	1.0

Tab. 31

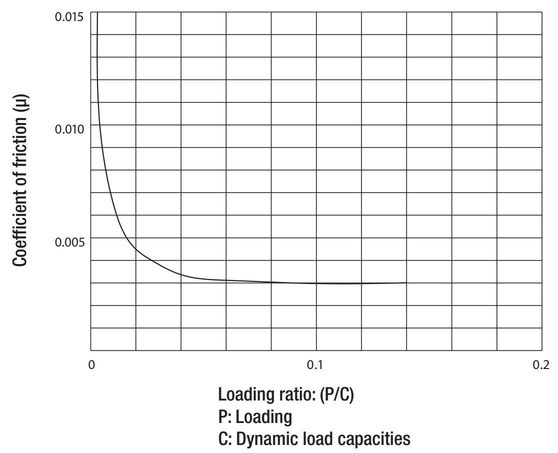


Fig. 34

Displacement resistance

The following formula is used for general approximate calculation of the displacement resistance. Please note that the level of preload or the viscosity of the lubricant used can also influence the displacement resistance.

$F_m = \mu \cdot F + f$	F_m = Displacement resistance (N) F = Load (N) μ = Coefficient of friction f = Resistance of the seals (N)

Fig. 35

Mono Rail profile rails have a coefficient of friction of approx.
μ = 0.002 - 0.003.

Mono Rail loading

The given static load capacity for each carriage represents the maximum permissible load value, which if exceeded causes permanent deformations of the raceways and adverse effects of the running properties.
Checking the load must be done as follows:

- through determination of the simultaneously occurring forces and moments for each carriage
- by comparison of these values with the corresponding load capacities.

The ratio of the actual load to maximum permissible load may be as large as the reciprocal of the accepted safety factor, S_0, at the most.

$$\frac{P_{0rad}}{C_{0rad}} \leq \frac{1}{S_0} \qquad \frac{P_{0ax}}{C_{0ax}} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 36

The above formulas are valid for a single load case.
If two or more forces are acting simultaneously, please check the following formula:

$$\frac{P_{0rad}}{C_{0rad}} + \frac{P_{0ax}}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

P_{0rad} = effective radial load (N)
C_{0rad} = permissible radial load (N)
P_{0ax} = effective axial load (N)
C_{0ax} = permissible axial load (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum permissible moments in the different loading directions (Nm)

Fig. 37

Safety factor

Operating conditions	S_0
Normal operation	1 ~ 2
Loading with vibration or shock effect	2 ~ 3
Loading with strong vibration or impacts	≥ 3

Tab. 32

The safety factor S_0 can lie on the lower given limit if the occurring forces can be determined with sufficient precision. If shock and vibration are present, the higher value should be selected. For dynamic applications higher safety is required. Please contact Rollon technical support.

Miniature Mono Rail loading

Static load (P_0) and static moment (M_0)

Permissible static load

The permissible static load of the Mono Rail Miniature profile rail is limited by:

- Static load of each linear guide
- Permissible load of the fixing screws
- Permissible load of all components used in the surrounding construction
- Static safety factor, which is required by the corresponding application

The equivalent static load and the static moment are the largest load, or the largest moment, which are calculated based on formulas 3 and 4.

Static safety factor S_0

When observing the static safety factor S_0 the Mono Rail Miniature profile rails allow a permissible operation and high running precision as is required for each application. Calculation of the static safety factor S_0: see fig. 38

S_0 static safety factor

C_0 static load capacity in loading direction (N)

P_0 equivalent static load (N)

M_0 static moment in loading direction (Nm)

M equivalent static moment in loading direction (Nm)

Static load capacity C_0

The static load capacity C_0 of ball recirculating guides is defined according to DIN 636, Part 2 as the only load which gives a Hertzian stress of 4,200 MPa with the existing lubrication between track and balls in the center of the highest loaded contact surface.

Note: In the loading center, there is a permanent deformation of approx 0.01 % of the ball diameter under this load (according to DIN 636, Part 2).

$S_0 = C_0 / P_0$	Formula 1	Operating conditions	S_0
$S_0 = M_0 / M$	Formula 2	Normal operation	1 ~ 2
$P_0 = F_{max}$	Formula 3	Loading with vibration or shock effect	2 ~ 3
$M_0 = M_{max}$	Formula 4	High precision and smooth running	≥ 3

Fig. 38

Dynamic load capacity C

If the dynamic loads work vertically on the last zones with equal size and direction, the calculated service life of the linear guide can theoretically reach 100 km piston travel (as per DIN 636, Part 2).

Combined loads in combination with moments

If both loads and moments work on the profile rails, the equivalent dynamic load is calculated with formula 9. According to DIN 636, Part 1, the equivalent load should not exceed ½ C.

Equivalent dynamic load and speed

With changing load and speed, these must be considered individually since each parameter helps determine the service life.

Equivalent dynamic load

If only the load changes, the equivalent dynamic load can be calculated with formula 5.

Equivalent speed

If only the speed changes, the equivalent speed is calculated with formula 6. If speed and load change, the equivalent dynamic load is calculated with formula 7.

Combined dynamic load

With combined exterior load in an arbitrary angle, the equivalent dynamic load is calculated with formula 8.

$$P = \sqrt[3]{\frac{q_1 \cdot F_1^3 + q_2 \cdot F_2^3 + \cdots q_n \cdot F_n^3}{100}} \qquad \text{Formula 5}$$

$$\bar{v} = \frac{q_1 \cdot v_1 + q_2 \cdot v_2 + \cdots q_n \cdot v_n}{100} \qquad \text{Formula 6}$$

$$P = \sqrt[3]{\frac{q_1 \cdot v_1 \cdot F_1^3 + q_2 \cdot v_2 \cdot F_2^3 + \cdots q_n \cdot v_n \cdot F_n^3}{100}} \qquad \text{Formula 7}$$

$$P = |F_X| + |F_Y| \qquad \text{Formula 8}$$

$$P = |F_X| + |F_Y| + \left(\frac{|M_1|}{M_x} + \frac{|M_2|}{M_y} + \frac{|M_3|}{M_z}\right) \cdot C_0 \qquad \text{Formula 9}$$

P	= equivalent dynamic load (N)
q	= stroke (in %)
F_1	= individual load levels (N)
v	= average speed (m/min)
$\bar{v}$	= individual speed levels (m/min)
F	= external dynamic load (N)
F_Y	= external dynamic load – vertical (N)
F_X	= external dynamic load – horizontal (N)
C_0	= static load capacity (N)
M_1, M_2, M_3	= external moments (Nm)
M_x, M_y, M_z	= maximum permissible moments in the different loading directions (Nm)

Fig. 39

Mono Rail service life

Calculation of service life:

The dynamic load capacity C is a conventional variable used for calculating the service life. This load corresponds to a nominal service life of 50 km. The relationship between calculated service life L_{km} (in km), dynamic load capacity C (in N) and equivalent load P (in N) is given in the formula to the right:

$$L_{km} = \left(\frac{C}{P} \cdot \frac{f_c}{f_i}\right)^3 \cdot 50\ \text{km}$$

f_c = contact factor
f_i = application coefficient

Fig. 40

The equivalent load P corresponds in its effects to the sum of the forces and moments working simultaneously on a slider. If these different load components are known, P results from the equation to the right:

$$P = |P_{0ax}| + |P_{0rad}| + \left(\frac{|M_1|}{M_x} + \frac{|M_2|}{M_y} + \frac{|M_3|}{M_z}\right) \cdot C_{0rad}$$

Fig. 41

Contact factor f_c

The contact factor f_c refers to applications in which several carriages pass the same rail section. If two or more carriages are moved over the same point on a rail, the static and dynamic loading values must be multiplied with the numbers from the table below:

Number of carriages	1	2	3	4	5
f_c	1	0.81	0.72	0.66	0.61

Tab. 33

Application coefficient f_i

The application coefficient f_i can be understood as the dynamic safety factor. Refer to the table below for the values:

Operational conditions	Speed	f_i
Neither external impacts nor vibrations	Low speed V ≤ 15 m/min.	1 - 1.5
Light impacts or vibrations	Average speed 15 < V ≤ 60 m/min.	1.5 - 2
Average and high external impacts or vibrations	High speed V > 60 m/min.	2 - 3.5

Tab. 34

Miniature Mono Rail service life

An example of a profile rail or a lot of identical profile rails under the same running conditions, which use ordinary materials with normal manufacturer's quality and operating conditions, can reach 90 % of the calculated service life (as per DIN 636 Part 2). By taking 50 km traverse as a basis, the dynamic load capacity is usually 20 % over the values as per DIN. The relationship between the two load capacities can be seen from formulas 10 and 11.

Calculation of service life

Formulas 12 and 13 are used for calculating the service life, if equivalent dynamic load and average speed are constant.

$C_{(50)} = 1{,}26 \cdot C_{(100)}$	Formula 10	L = service life based on 100,000 (m)
$C_{(100)} = 0{,}79 \cdot C_{(50)}$	Formula 11	L_h = service life (h)
$L = \left(\frac{C_{100}}{P}\right)^3 \cdot 10^5$	Formula 12	C = dynamic load capacity (N)
$L_h = \frac{L}{2 \cdot s \cdot n \cdot 60} = \frac{L}{V_m} \cdot \left(\frac{C_{100}}{P}\right)^3$	Formula 13	P = equivalent dynamic load (N)
		S = stroke length (m)
		n = stroke frequency (min^{-1})
		V_m = average speed (m/min)

Fig. 42

Mono Rail installation instructions

The given radii and shoulder heights in the table must be observed when assembling rails and carriages on the stop edges to ensure perfect seating of carriages or raceways.

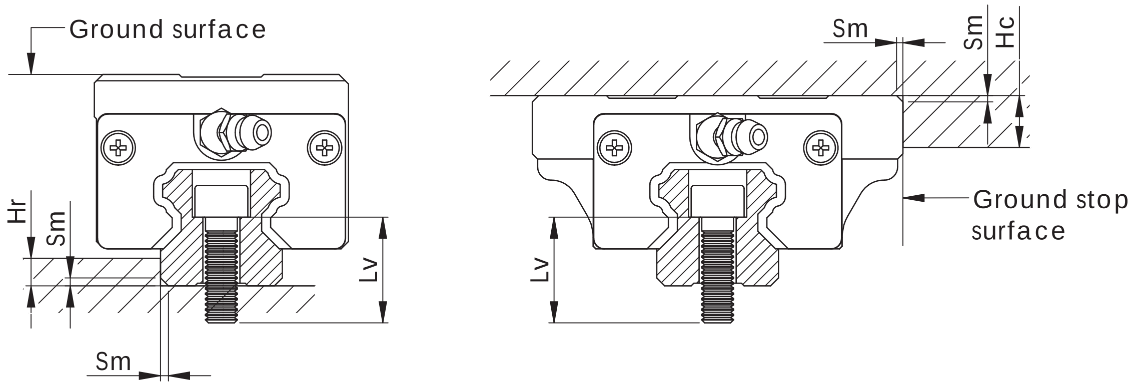


Fig. 43

Size	Maximum level of incline Sm [mm]	Maximum height of rail shoulder Hr [mm]	Maximum height of rail shoulder when using the side seal Hr* [mm]	Maximum height of slider shoulder Hc [mm]	Required bolt lengths (rails) Lv [mm]
15	0.8	4	1.9	5	M4 x 16
20		4.5	2.4	6	M5 x 20
25	1.2	6	3.9	7	M6 x 25
30		8	5.9	8	M8 x 30
35		8.5	6.6	9	
45	1.6	12	10.5	11	M12 x 40
55		13	-	12	M14 x 45

* For use of various seals, see pg. MR-14, fig. 21ff

Tab. 35

Assembly precision

The maximum permissible deviations of the rail surfaces for assembly are given in the following drawing (see fig. 44) and the table below (see tab. 36):

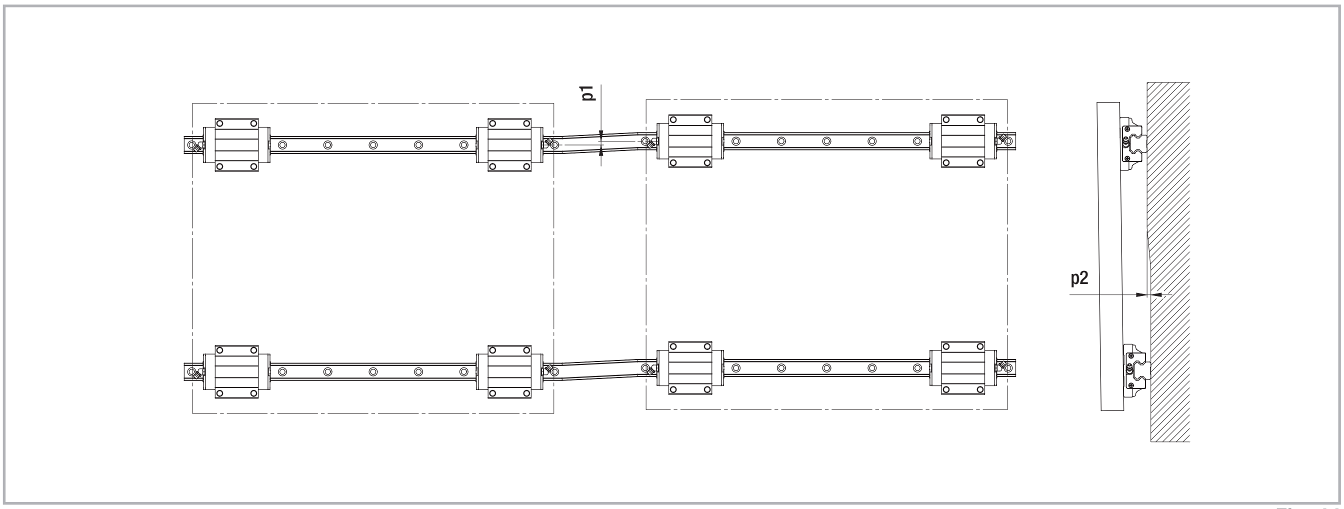


Fig. 44

Size	Permissible tolerance for parallelism p1 [µm]				Permissible tolerance for parallelism p2 [µm]			
	K2	K1	K0	G1	K2	K1	K0	G1
15	-	18	25	35	-	85	130	190
20	18	20			50			
25	20	22	30	42	70			195
30	27	30	40	55	90	110	170	250
35	30	35	50	68	120	150	210	290
45	35	40	60	85	140	170	250	350
55	45	50	70	95	170	210	300	420

Tab. 36

The bolt sizes to be used and optimum tightening torques for rail assembly are listed in the table below (see tab. 37).

Bolt	Tightening torque M_t [Nm]		
	Steel	Cast iron	Aluminium
M4	4	3	2
M5	9	6	4
M6	14	9	7
M8	30	20	15
M12	118	78	59
M14	157	105	78

Tab. 37

Miniature Mono Rail installation instructions

Shoulder heights and radius of stop edges

Rounding of the stop edges of the surrounding construction should be made so as to avoid contact with the edges of the carriage and the rail. Please observe the following table with the information on the radius and height of the stop surfaces.

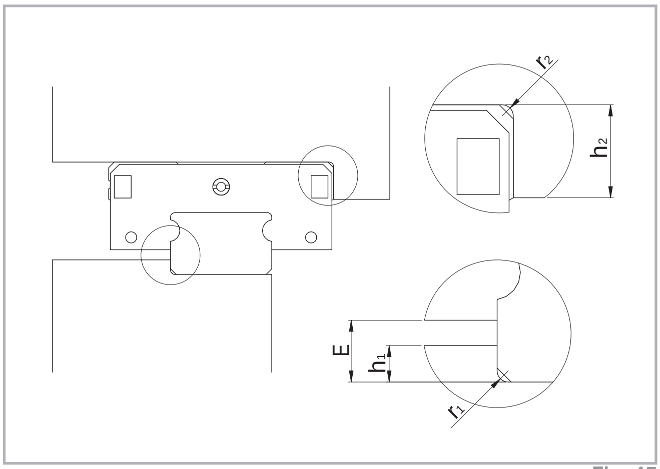


Fig. 45

Dimensions of the stop edges

Type	h_1 [mm]	r_{1max} [mm]	h_2 [mm]	r_{2max} [mm]	E [mm]
MR07M	1.2	0.3	2.8	0.3	1.5
MR09M	1.5	0.3	3	0.3	2.2
MR12M	2.5	0.5	4	0.5	3
MR15M	2.5	0.5	4.5	0.5	4

Tab. 38

Type	h_1 [mm]	r_{1max} [mm]	h_2 [mm]	r_{2max} [mm]	E [mm]
MR09W	2.5	0.3	3	0.3	3.4
MR12W	2.5	0.5	4	0.5	3.9
MR15W	2.5	0.5	4.5	0.5	4

Tab. 39

Geometric and positional accuracy of the mounting surfaces

Inaccuracies of the mounting surface negatively influence the running accuracy and reduce the service life of the Mono Rail Miniature profile rails. If the inaccuracies of the mounting surfaces exceed the values calculated using formulas 14, 15 and 16, the service life is shortened according to formulas 12 und 13.

Mounting surface

The mounting surface should be ground or milled very finely and have a surface roughness of R_a 1.6.

Reference surface

Rail: Both sides of the rails can be used as a reference surface without further marks.

Slider: The reference surface is located across from the running side identified with a notch mark.

Calculation of the positional accuracy

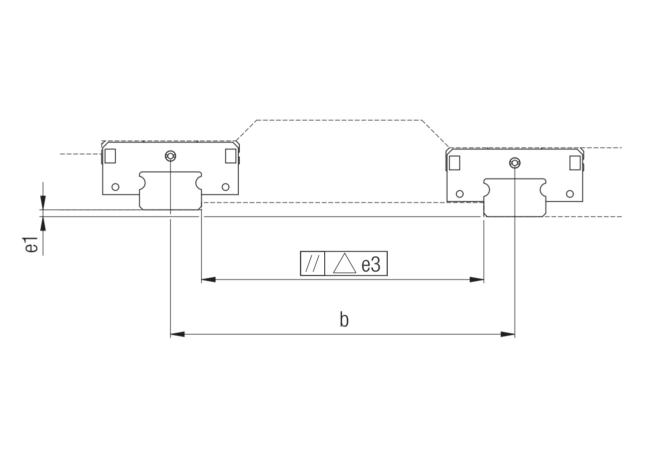


Fig. 46

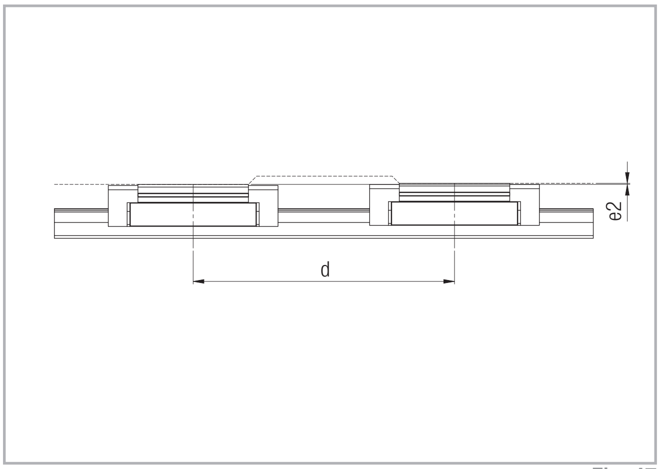


Fig. 47

e1 (mm) = b (mm) · f1 · 10^{-4}	Formula 14
e2 (mm) = d (mm) · f2 · 10^{-5}	Formula 15
e3 (mm) = f3 · 10^{-3}	Formula 16

Fig. 48

Type	V_0, V_S			V_1		
	f1	f2	f3	f1	f2	f3
MR07MN	5	11	4	3	10	3
MR09MN	5	11	6	4	10	4
MR12MN	6	13	8	4	12	6
MR15MN	7	11	12	5	10	8

Tab. 40

Type	V_0, V_S			V_1		
	f1	f2	f3	f1	f2	f3
MR09WN	2	7	6	2	5	4
MR12WN	3	8	8	2	5	5
MR15WN	2	9	11	1	6	7

Tab. 41

Tightening torque for fixing screws (Nm)

Screw quality 12.9	Steel	Cast iron	Non-ferrous metal
M2	0.6	0.4	0.3
M3	1.8	1.3	1
M4	4	2.5	2

Tab. 42

Composite rails

Guide rails longer than the one part maximum length (see Ordering key), are put together from two or more rails.
When putting guide rails together, be sure that the register marks shown in fig. 49 are positioning correctly.
These are fabricated axisymmetric for parallel application of composite guide rails, unless otherwise specified.

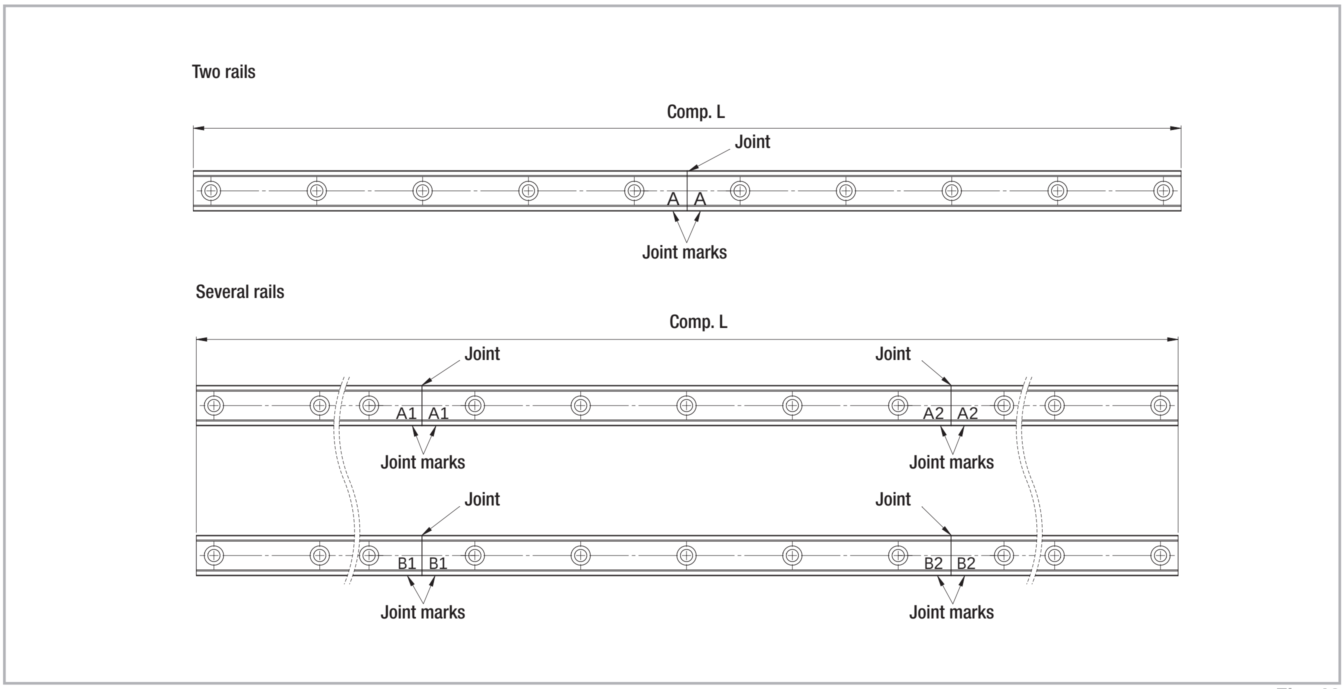


Fig. 49

Assembly process

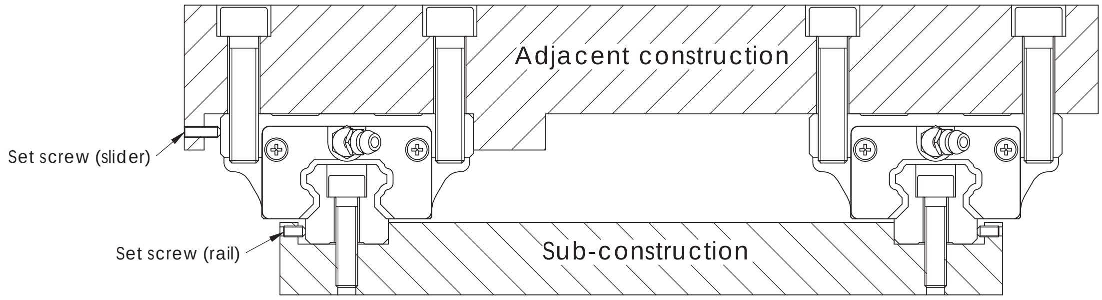


Fig. 50

Fixing guide rails:

(1) Whet the assembly surface with a whetstone and also remove burrs, unevenness and dirt (see fig. 51).
Note: All linear guides are preserved with anticorrosion oil at the factory. This protection must be removed before installation.
In doing so, please ensure that the surfaces are coated with low-viscosity oil for the purpose of further protection against corrosion.

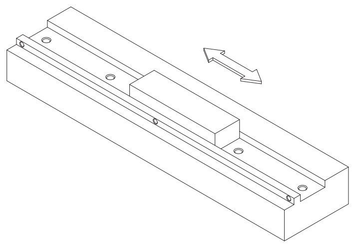


Fig. 51

(2) Carefully lay the guide rail on the assembly surface (see fig. 52) and slightly tighten the fixing screws so that the guide rail lightly touches the assembly surface (align the guide rail along the shoulder edge of the assembly surface, see fig. 53).
Note: The fixing screws of the linear guide must be clean. Check if the fixing holes are located in the correct place when you insert the bolts. A forced tightening of a fixing screw in an offset hole can negatively affect accuracy.

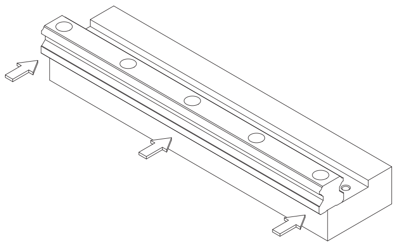


Fig. 52

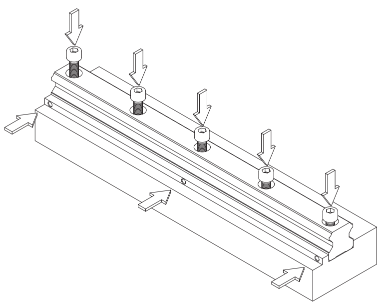


Fig. 53

(3) Tighten the thrust bolts on the guide rail until there is close contact on the side stop surface (see fig. 54).

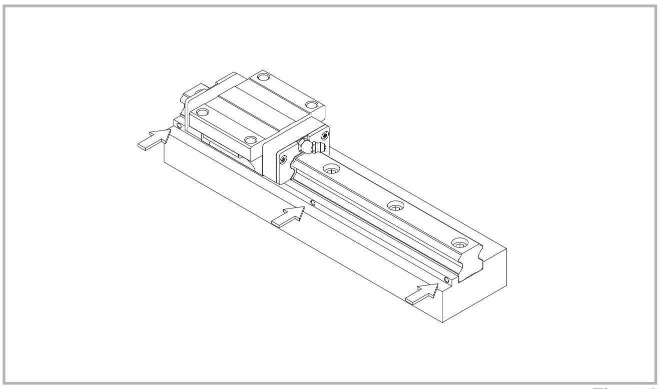


Fig. 54

(4) Tighten the fixing screws with a torque wrench to the prescribed torque (see pg. MR-36, tab. 37).
Note: For a high degree of accuracy, the fixing screws of the guide rail must be tightened in sequence outward from the centre (see fig. 55).
(5) Assemble the other rails in the same manner to complete the installation of the guide rails.

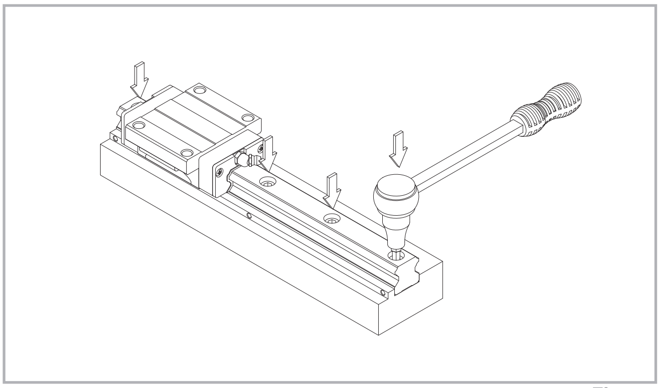


Fig. 55

Table assembly:

(6) Set the table carefully on the carriage and tighten the fixing screws only lightly.
(7) Press the carriage on the main guide side with the thrust bolts against the shoulder edge of the table and position the table.
(8) Tighten the fixing screws on the main side and the lateral side completely tight to finish the installation. Note:
To attach the table uniformly, tighten the fixing screws diagonally (see fig. 56). This method saves time when straightening the guide rail and makes the manufacture of positioning pins unnecessary, which considerably reduces assembly time.

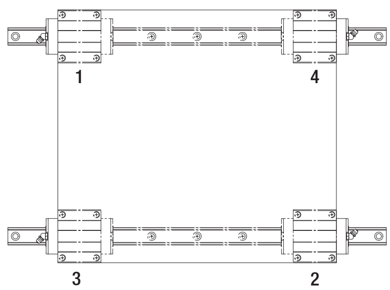


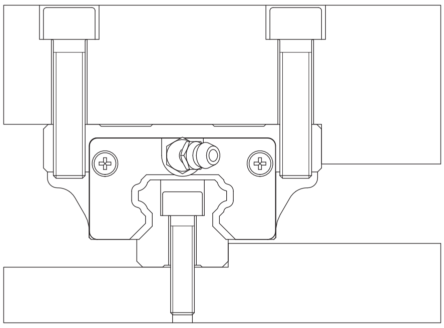
Fig. 56

Installation examples

The following drawings illustrate some assembly examples for rail/carriage combinations corresponding to the structure of various machine frames:

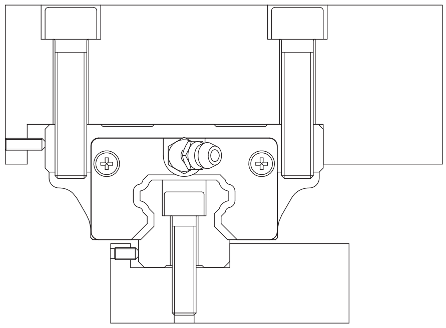
Example 1:

Assembly of carriage and rail on shoulder edges



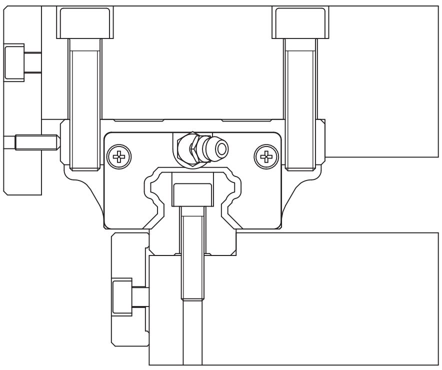
Example 2:

Securing carriage and rail using set screws



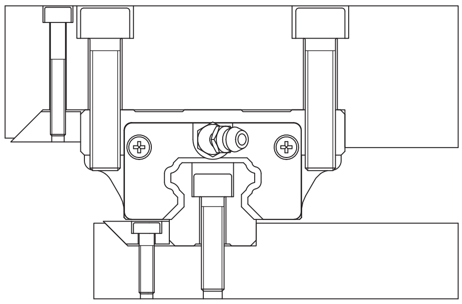
Example 3:

Securing carriage and rail using set pressure plates



Example 4:

Securing carriage and rail using taper gibs



Example 5:

Securing carriage and rail using bolts

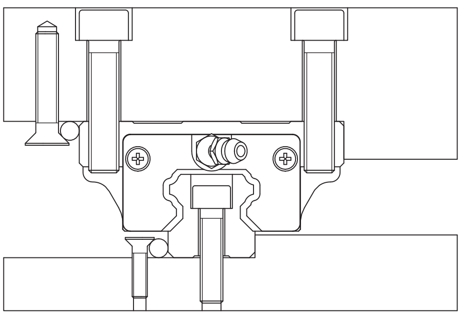


Fig. 57

Ordering key

Rail / Mono Rail slider system

MRS30W	H	K1	A	1	05960	F	T	HC

- HC: Surface coating for rail optional *see pg. MR-25, Anti-corrosive protection*
- T: Joint processed rails optional *see pg. MR-39, Composite rails*
- F: Rails bolted from below, optional *see pg. MR-11*
- 05960: Total rail length
- 1: Number of carriages
- A: Seal variants *see pg. MR-15f*
- K1: Preload class *see pg. MR-23, tab. 23f*
- H: Precision class *see pg. MR-21, tab. 21*
- MRS30W: Type

Ordering example: MRS30W-H-K1-A-HC-1-05960F-T-NIC

Rail composition: 1x3100+1x2860 (only for joint processed rails)

Hole pattern: 20-38x80-40//40-35x80-20 (please always indicate the hole pattern separately)

Notes on ordering: The rail lengths are always indicated as 5 digits with 0 prefixes

Rail

MRR	20	6860	N	F	T	HC

- HC: Surface coating for rail optional *see pg. MR-25, Anticorrosive protection*
- T: Joint processed rails optional *see pg. MR-39, Composite rails*
- F: Rails bolted from below, optional *see pg. MR-11*
- N: Precision class *see pg. MR-21, tab. 21*
- 6860: Total rail length
- 20: Size
- MRR: Rail type

Ordering example: MRR20-06850-NF-T-NIC

Rail composition: 1x2920+1x3940 (only for joint processed rails)

Hole pattern: 10-48x60-30//30-65x60-10 (please always specify the hole pattern separately)

Notes on ordering: The rail lengths are always indicated as 5 digits with 0 prefixes

Carriage

MRS35	N	K0	A	HC
				Surface coating for carriage optional *see pg. MR-25, Anticorrosive protection*
			Seal variants *see pg. MR-15f*	
		Preload class *see pg. MR-23, tab. 23f*		
	Precision class *see pg. MR-21, tab. 21*			
Type				

Ordering example: MRS35-N-K0-A-NIC

Rail / Miniature Mono Rail slider system

MR	15	M	N	SS	2	V1	P	310
								Rail length *see tab. 44 and 45*
							Precision class *see pg. MR-22, tab. 22*	
						Preload class *see pg. MR-24, tab. 25*		
					Number of sliders on one rail			
				End seal				
			Slider type					
		Rail type *see pg. MR-12, tab. 11 / pg. MR-13, tab. 13*						
	Rail width *see pg. MR-12, tab. 12 / pg. MR-13, tab. 13*							
Product type								

Ordering example: MR15MN-SS-2-V1-P-310

Hole pattern: 15-7x40-15, see fig. 59, tab. 44 / fig. 60, tab. 45

Mono Rail hole pattern

Rail

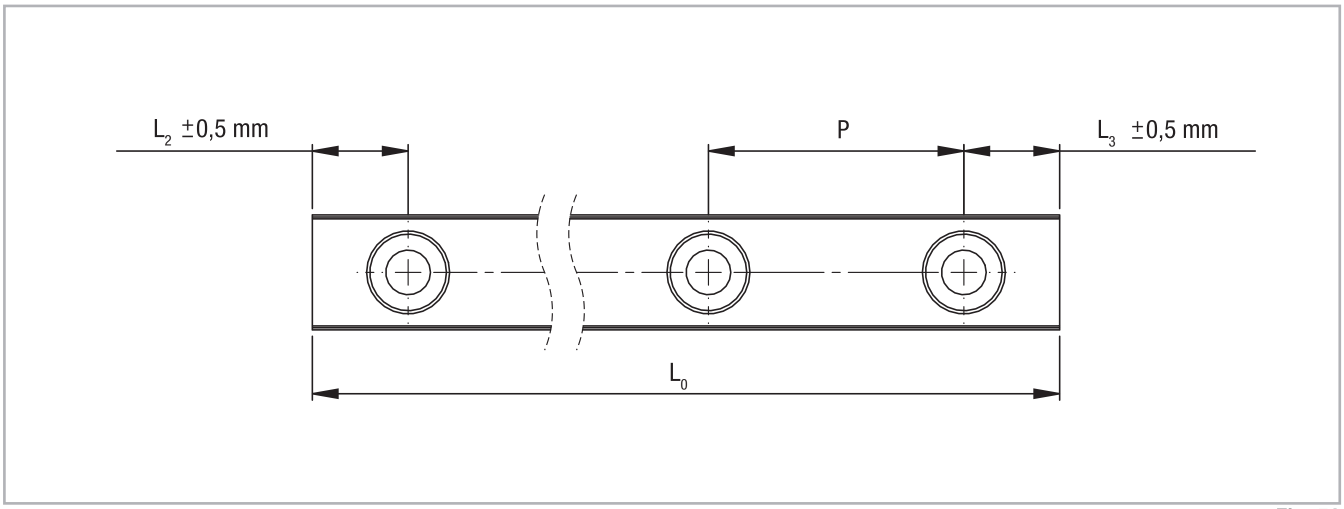


Fig. 58

<table>
<tr><th>Size</th><th>Hole pitch P
[mm]</th><th>L_{2min}, L_{3min}
[mm]</th><th>L_{2max}*, L_{3max}*
[mm]</th><th>L_{0max}
[mm]</th></tr>
<tr><td>15</td><td rowspan="3">60</td><td rowspan="3">7</td><td rowspan="5">20</td><td rowspan="3">4000</td></tr>
<tr><td>20</td></tr>
<tr><td>25</td></tr>
<tr><td>30</td><td rowspan="2">80</td><td rowspan="2">8.5</td><td rowspan="2">3960</td></tr>
<tr><td>35</td></tr>
<tr><td>45</td><td>105</td><td>11.5</td><td>22.5</td><td>3930</td></tr>
<tr><td>55</td><td>120</td><td>13</td><td>30</td><td>3900</td></tr>
</table>

* Only applies when using max. rail lengths

Tab. 43

Miniature Mono Rail hole pattern

Standard width

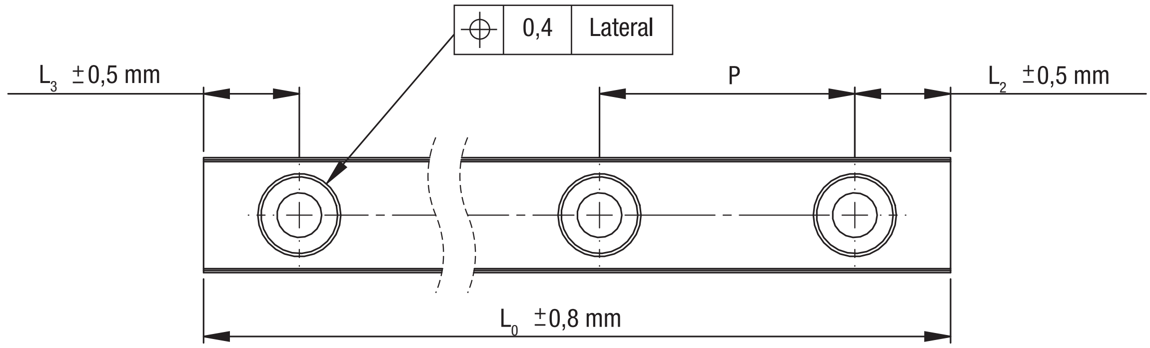


Fig. 59

Size	L_{min} [mm]	Hole pitch P [mm]	L_2, L_{3min} [mm]	L_2, L_{3max} * [mm]	L_{max} [mm]
7	40	15	3	10	1000
9	55	20	4	15	
12	70	25	4	20	
15	70	40	4	35	

* does not apply to minimum (L_{min}) and maximum rail length (L_{max})

Tab. 44

Large width

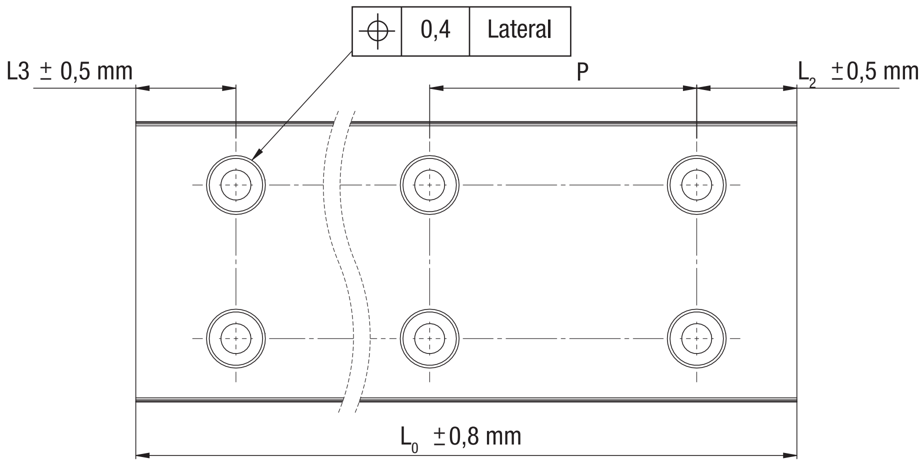


Fig. 60

Size	L_{min} [mm]	Hole pitch P [mm]	L_2, L_{3min} [mm]	L_2, L_{3max} * [mm]	L_{max} [mm]
9	50	30	4	25	1000
12	70	40	5	35	
15	110	40		35	

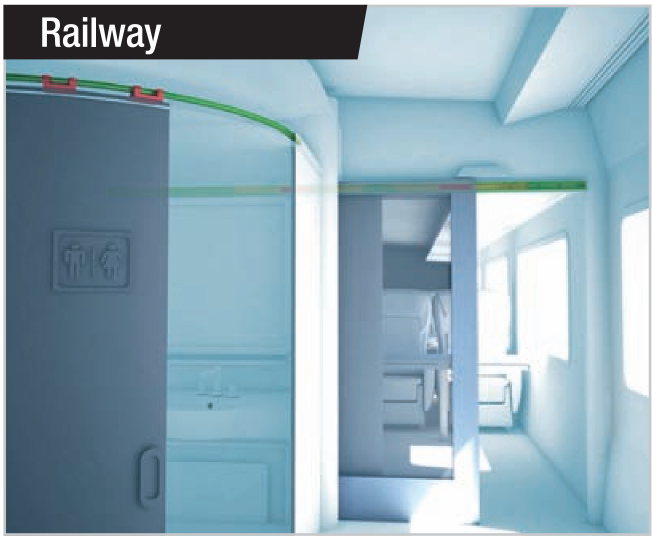
* does not apply to minimum (L_{min}) and maximum rail length (L_{max})

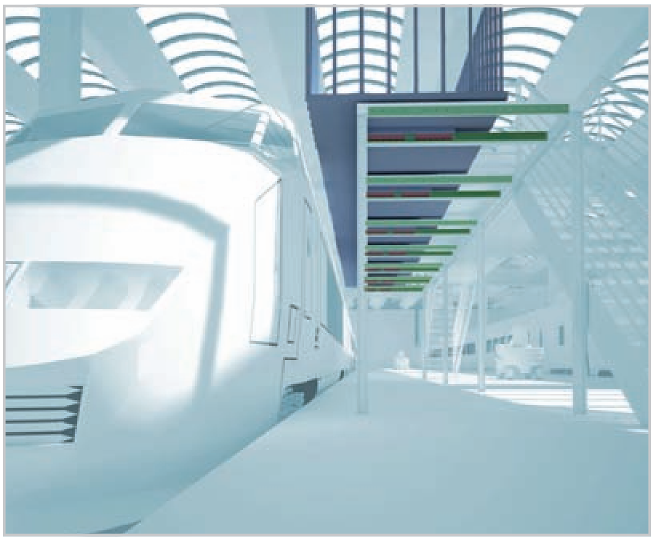
Tab. 45

Notes

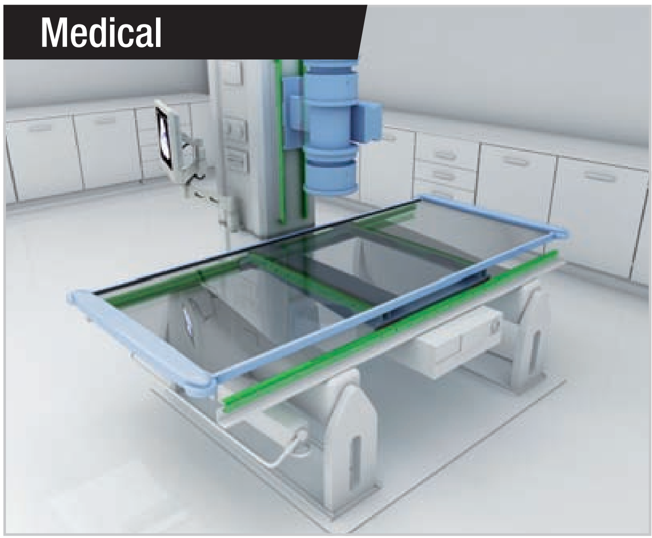
Guides suitable for all applications

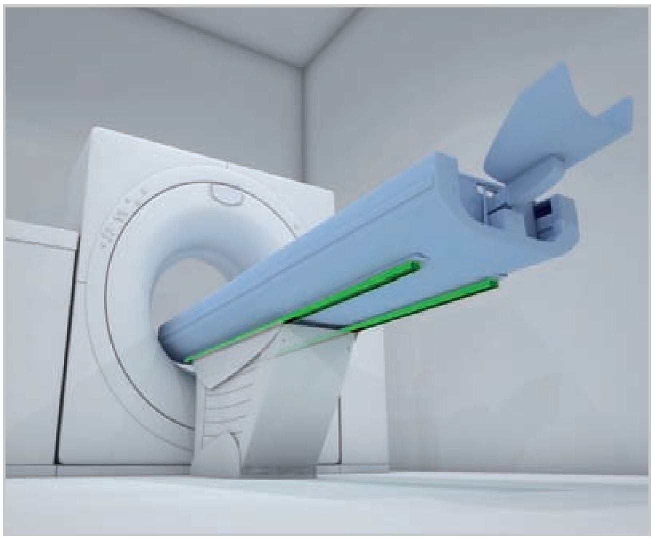
Railway



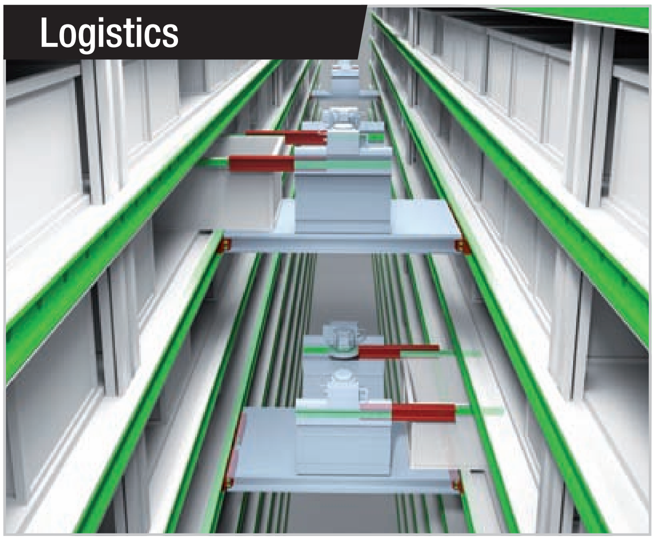


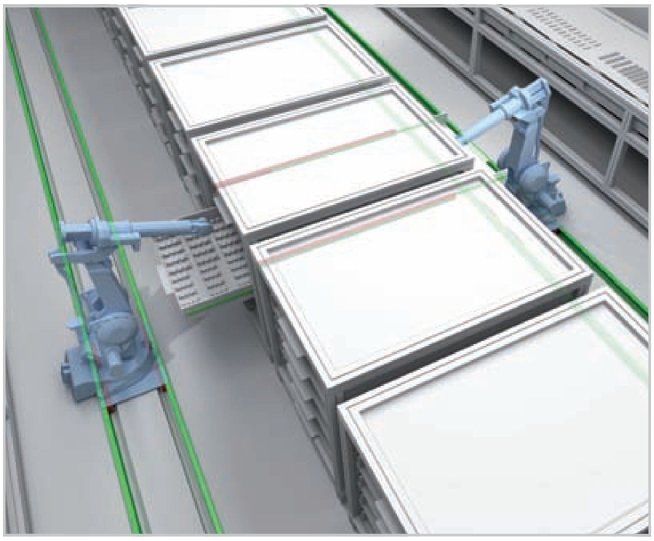
Medical



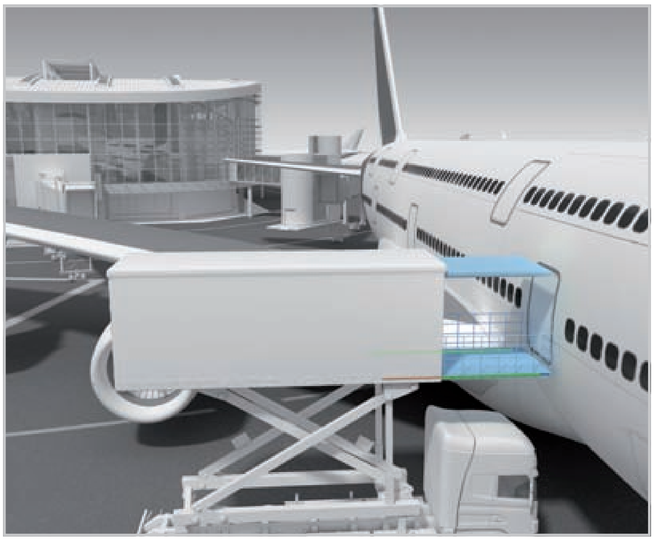


Logistics

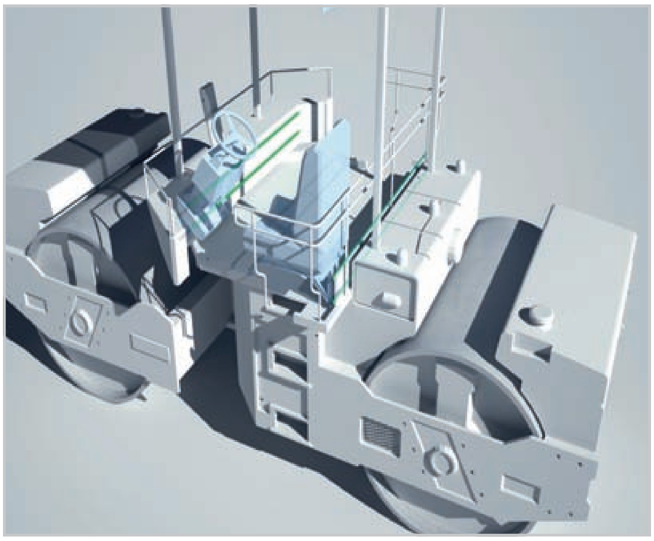


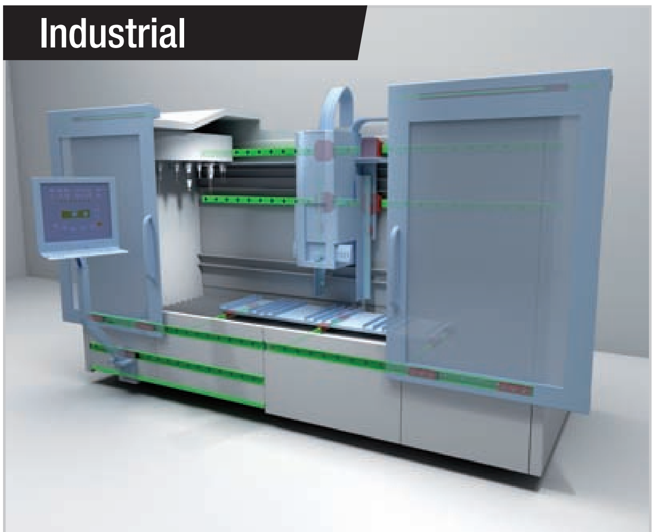


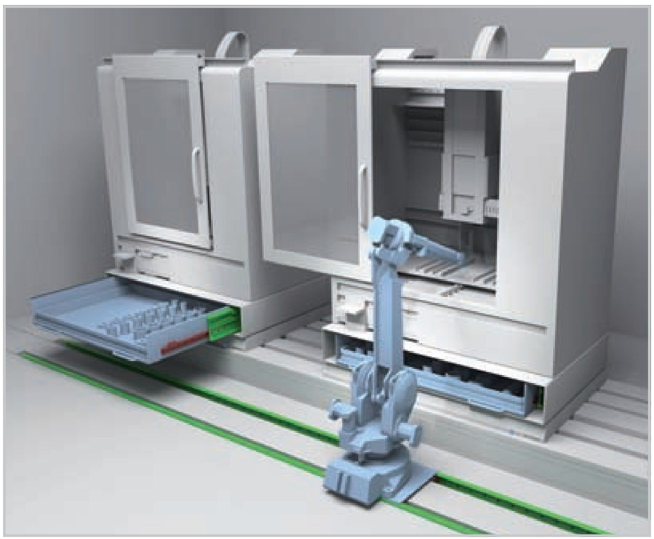

Aerospace




Special Vehicles




Industrial



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