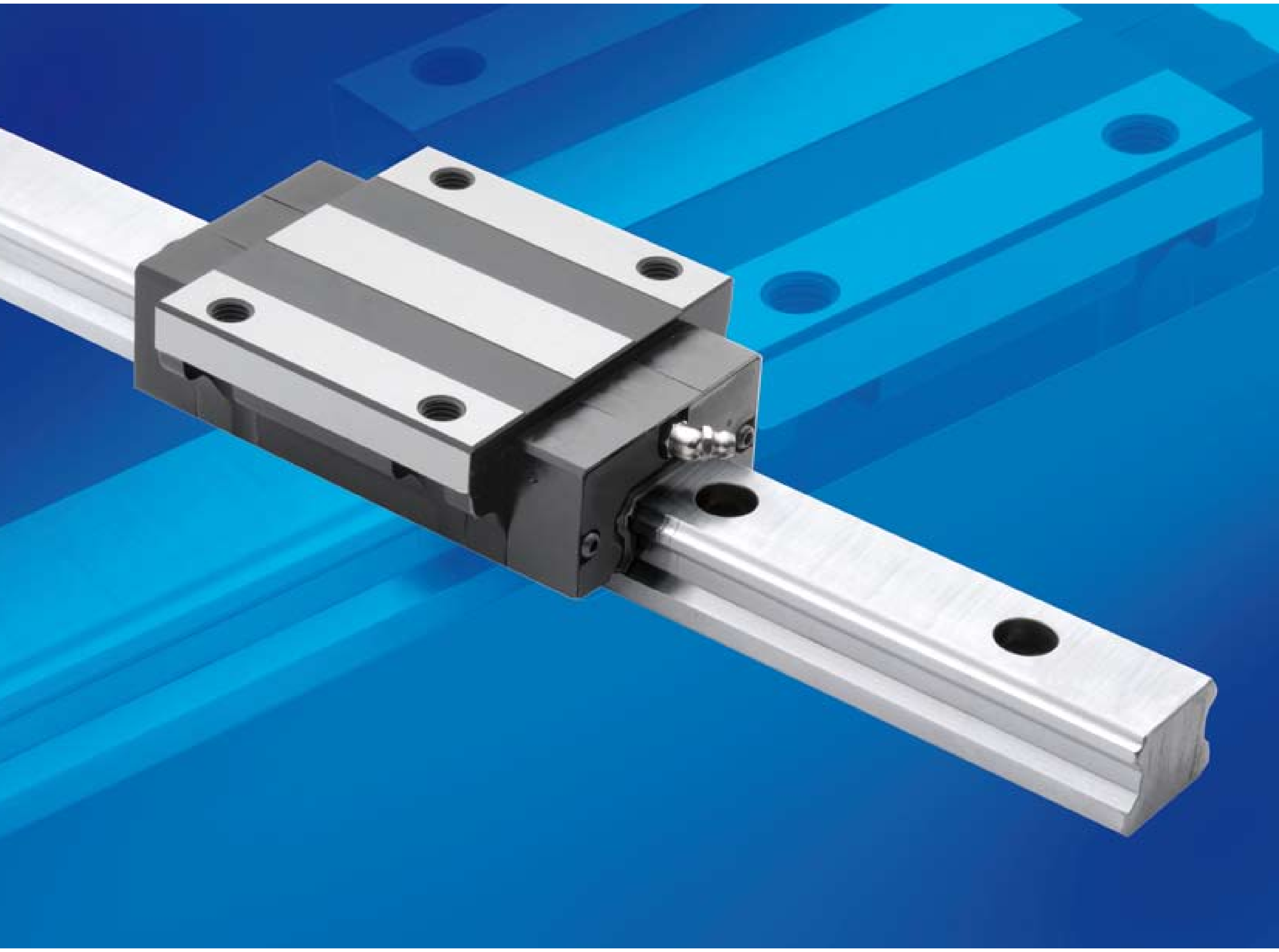
ROLLON®
LinearEvolution

MONO RAIL



www.rollon.com

About Rollon

Development of global business

1975 Parent company, Rollon S.r.l., founded in Italy

1991 Founding of Rollon GmbH in Germany

1995 Expansion of headquarters to new 4,000 m^2 factory
Assembly starts in Germany
Quality management certified to ISO 9001

1998 Rollon B.V. in the Netherlands and Rollon Corporation in the USA are founded
Expansion of German branch to new 1,000 m^2 plant

1999 Founding of Rollon S.A.R.L. in France
Environmental management certified to ISO 14001

2000 Rollon s.r.o. founded in Czech Republic

2001 Expansion of headquarters to new 12,000 m^2 manufacturing plant

2007 Restructuring of the GmbH and alignment of production in Germany to customer-specific adaptations
Takeover of the assets of a manufacturer of linear rail systems

2008 Expansion of sales network in Eastern Europe and Asia

Continual expansion and optimization of the portfolio

Founded in 1975, Rollon manufactured high-precision linear roller bearings for the machine tool industry. Early on, Rollon started manufacturing linear bearings based on the bearing-cage design. In 1979, the Compact Rail self-aligning linear bearings joined the Telescopic Rail industrial drawer slides and Easy Rail linear bearings and became the basis of the strong foundation on which the company is building upon today. Continuing optimization of these core products still remains one of the most important goals at Rollon. The development of the patented Compact Rail linear bearing, which uses different proprietary rail profiles and high-precision radial ball bearing sliders, enables the compensation of height and angle mounting defects in applications, and is only one example of the continuing efforts to innovative the development of our existing product families. In the same manner, we continually introduce innovative new product familiesdisplaying our continuing product development and optimization in the industry. These include:

- 1994 Light Rail - full and partial extension telescopic in lightweight design
- 1996 Uniline - belt driven linear actuators
- 2001 Ecoline - economical aluminum linear actuators
- 2002 X-Rail - inexpensive formed steel linear guides
- 2004 Curviline - curved monorail profile rail guide with roller carriages
- 2007 Monorail - miniature sizes and full sized

Each further innovation of our linear bearings is built upon the our extensive knowledge of the nine product families in production today as well as on the current market demands. Rollon is the ultimate linear technology for any application needs.

Content

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Ordering key

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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

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)

MRS / MRT

Standard carriage with flange in two different heights. MRT is the lower version.

Fig. 2

MRS...W / MRZ...W / MRT...W

Carriage without flange, also called block. Available in three different heights. MRT is the lower version; MRZ is the intermediate size.

Fig.3

MRS...L

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

Fig. 4

MRS...LW / MRT...LW

Carriage in long version without flange. Available in two different heights. MRT is the lower version.

Fig. 5

MRT...S

Carriage with flange in short version for lower loads with equally high precision.

Fig.6

MRT...SW

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

Fig. 7

MRR...F

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

Fig. 8

Technical data

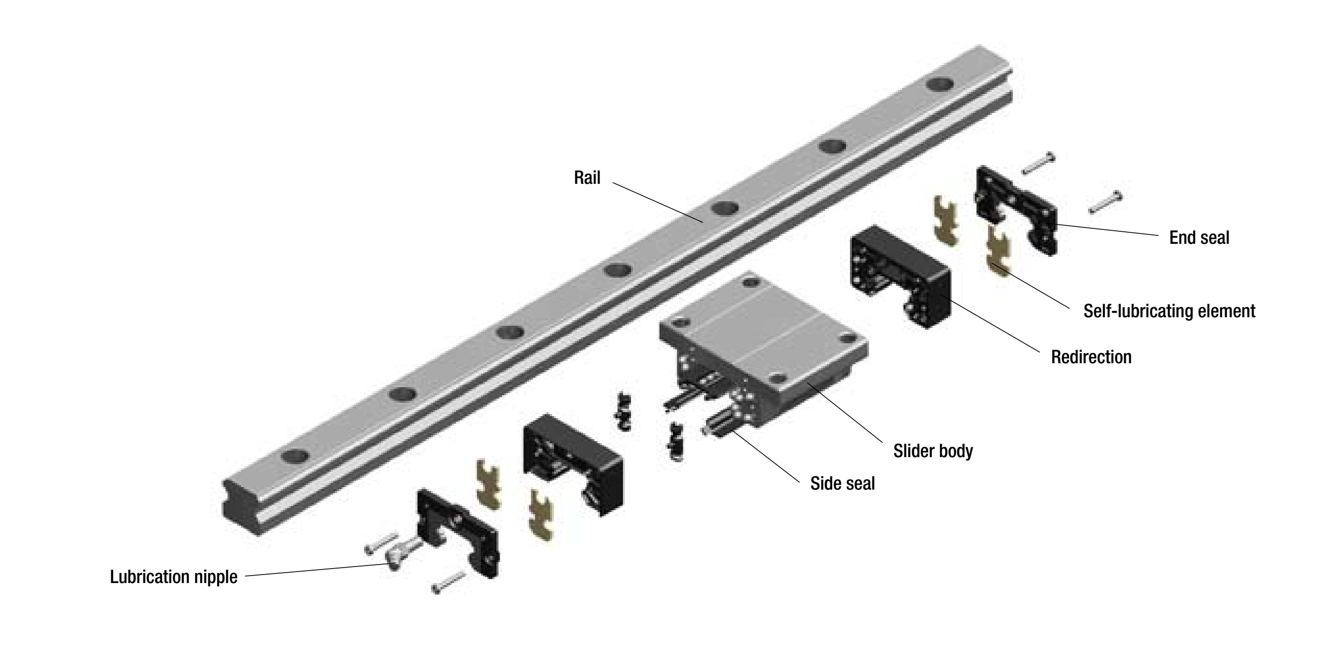


Fig. 9

Performance characteristics:

- Available sizes: 15, 20, 25, 30, 35, 45, 55
- 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) (see Ordering key, Table 31)
- Four preload classes: G1, K0, K1, K2
- Three precision classes: N, H, P

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, e.g. black coating, hard chrome plating, nickel plating
- 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. 16f
- The carriages in size 55 are equipped with ball chains
- Primary lubricated systems have an increased displacement resistance

Load capacities

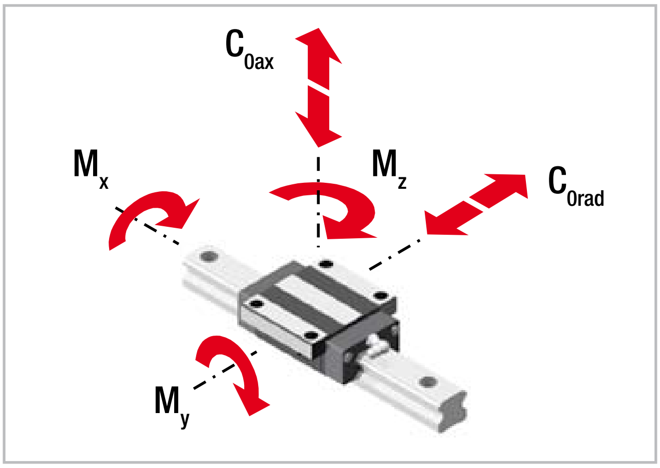


Fig. 10

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 MRT25 MRS25W MRT25W MRZ25W	19500	32000	368	228	228
MRT25S MRT25SW	12500	17500	175	69	69
MRS25L MRS25LW MRT25LW	26000	46000	529	455	455

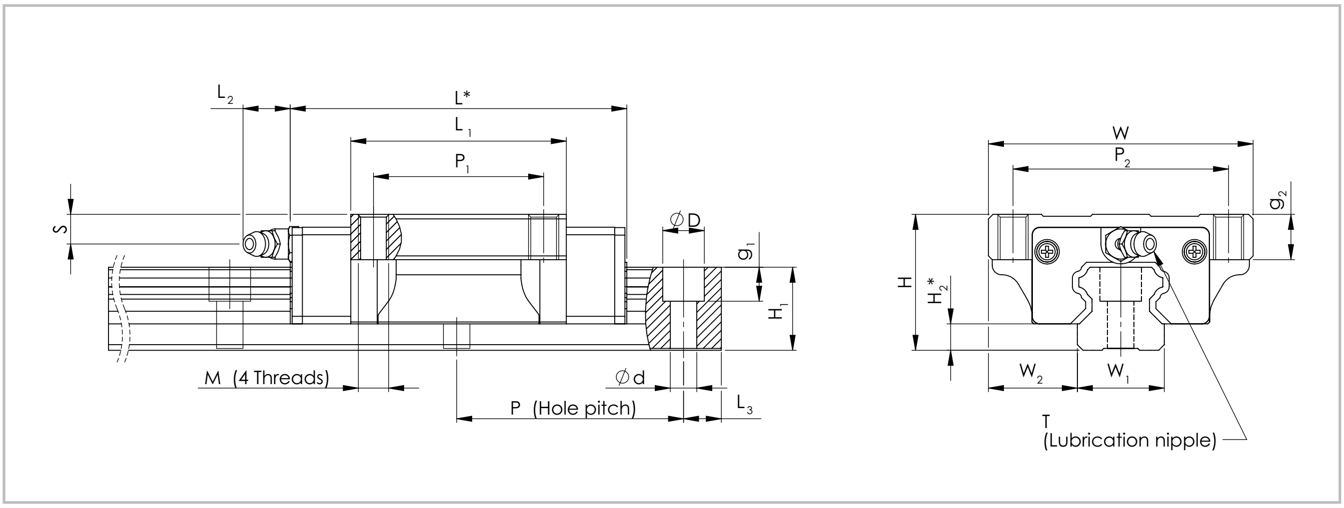
Tab. 1

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 MRT30LW	36000	64000	896	754	754
MRS35 MRS35W MRT35W	38500	62000	1054	620	620
MRT35SW	25000	36500	621	209	209
MRS35L MRS35LW MRT35LW	48000	83000	1411	1098	1098
MRS45 MRS45W MRT45W	65000	105000	2363	1378	1378
MRS45L MRS45LW MRT45LW	77000	130000	2925	2109	2109
MCS55 MCS55W MCT55W	123500	190000	4460	3550	3550
MCS55L MCS55LW MCT55LW	155000	249000	5800	6000	6000

Tab. 2

Product dimensions

MRS series – carriage with flange



* Dimensions H2 and L change when using metal deflectors and other seals (see pg. 17, tab. 12)

Fig. 11

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	5.3	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	8.5		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		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		5.2
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	22.5	12.3
MRS45L					167					129.8				3.6								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

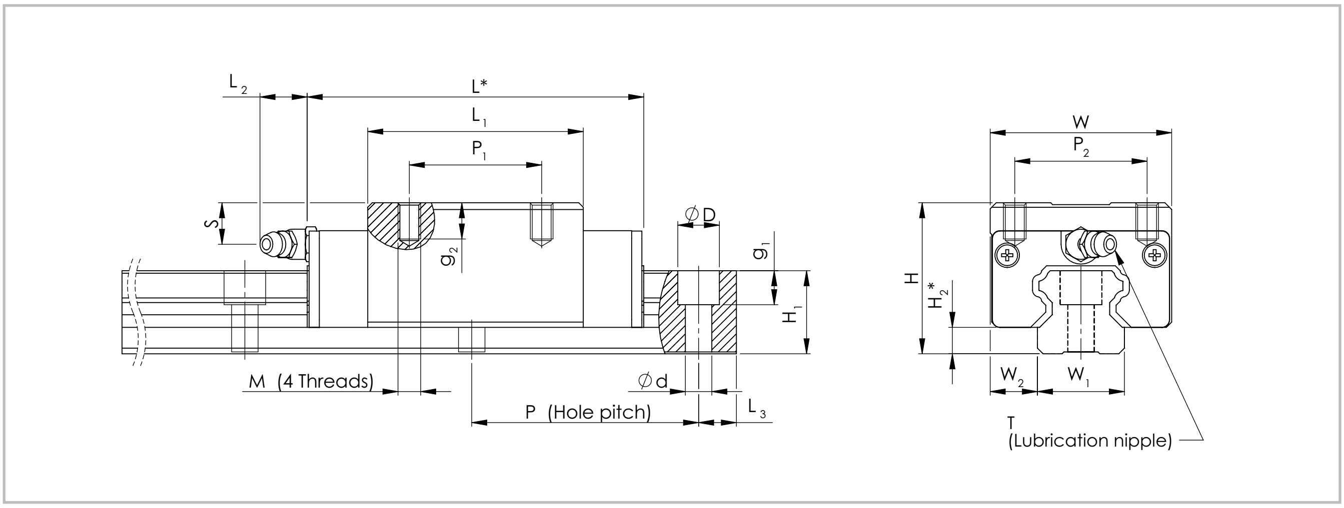
Tab. 3

Type	System [mm]				Slider MCS [mm]									Weight [kg]	Rail MCR [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. 31)

Tab. 4

MRS series – carriage without flange



* Dimensions H2 and L change when using metal deflectors and other seals (see pg. 17, tab. 12)

Fig. 12

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	5.3	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	8.5		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		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		5.2
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	22.5	12.3
MRS45LW					167		80			129.8				2.8								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

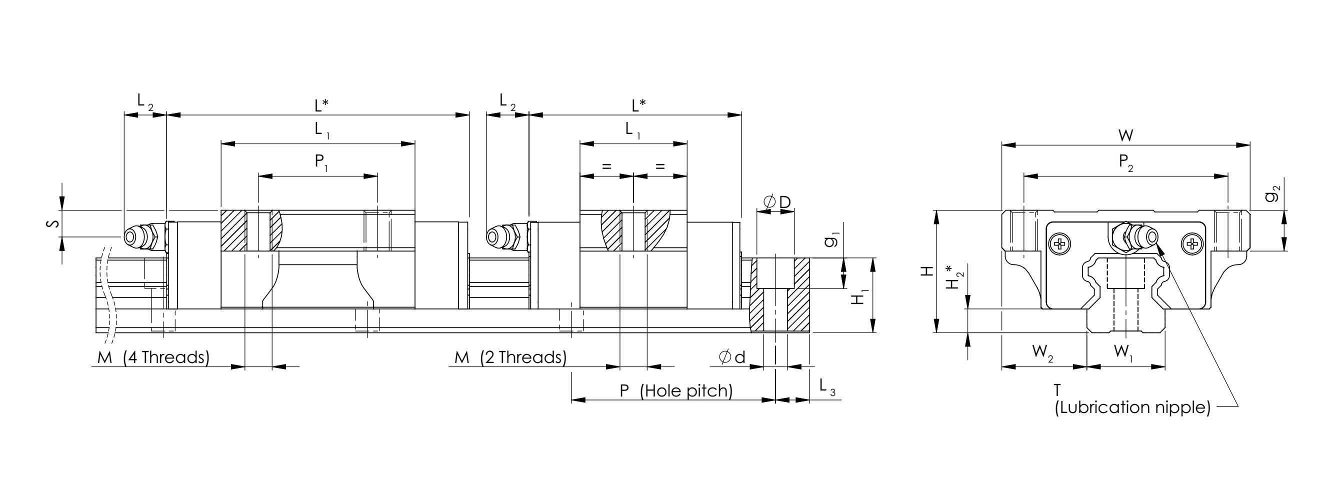
Tab. 5

Type	System [mm]				Slider MCS [mm]									Weight [kg]	Rail MCR [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
MCS55LW					223.7		95			173				6.7								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

Tab. 6

MRT series – carriage with flange



* Dimensions H_2 and L change when using metal deflectors and other seals (see pg. 17, tab. 12)

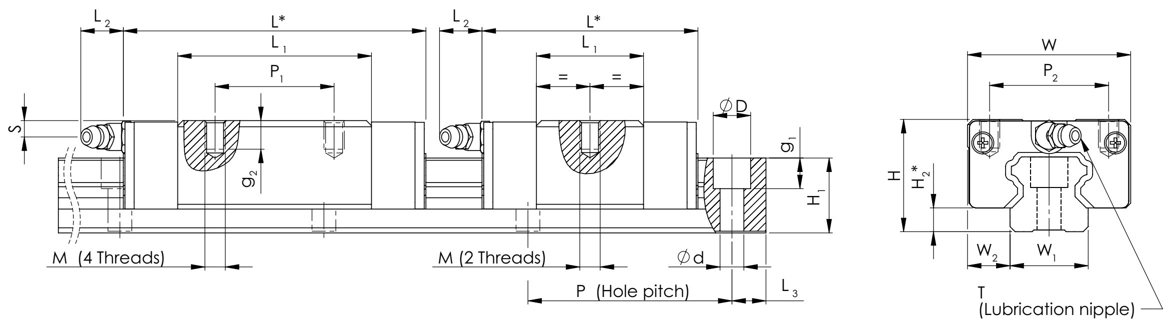
Fig. 13

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*	
MRT25	33	73	25	7	91	60	35	M8	9	57	12	M6 x 1	4.8	0.5	23	22	60	7	11	9	20	3.6
MRT25S					65		-			31.5				0.33								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

Tab. 7

MRT series – carriage without flange



* Dimensions H_2 and L change when using metal deflectors and other seals (see pg. 17, tab. 12)

Fig. 14

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	Ø3	4.3	0.17	15	14		4.5	7.5	5.3		1.4
MRT15SW					50.6		-			21.6				0.1								
MRT20W	28	42	11	5	81.2	32	32	M5	7	48.8			5	0.26	20	18		6	9.5	8.5		2.6
MRT20SW					60.3		-			28				0.17			60					
MRT25W					91		35			57				0.38								
MRT25SW	33	48	12.5	7	65.5	35	-	M6	8.4	31.5			4.8	0.21	23	22		7	11	9		3.6
MRT25LW					113		50			79.1				0.53							20	
MRT30W					114		40			72	12	M6 x 1		0.81								
MRT30SW	42	60	16	9	80	40	-			38.6			7	0.48	28	26						5.2
MRT30LW					135.3		60	M8	11.2	94.3				1.06			80	9	14	12		
MRT35W					114		50			80				1.2								
MRT35SW	48	70	18	9.5	79.7	50	-			45.7			8	0.8	34	29						7.2
MRT35LW					139.6		72			105.8				1.6								
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	22.5	12.3
MRT45LW					167		80			129.8				2.6								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

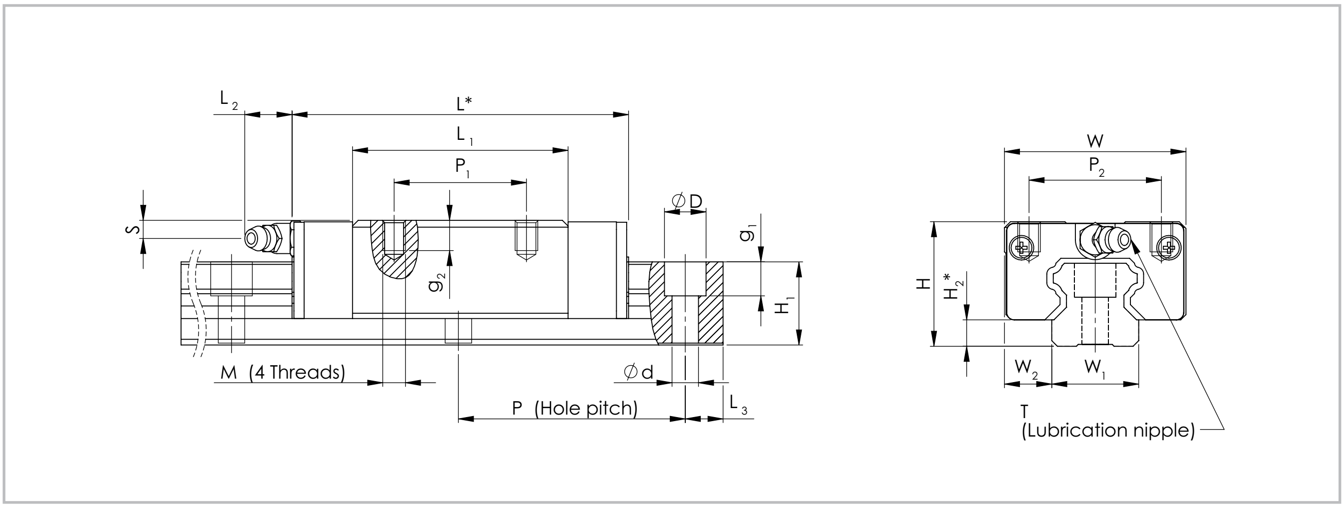
Tab. 8

Type	System [mm]				Slider MCT [mm]									Weight [kg]	Rail MCR [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*	
MCT55W	68	100	23.5	12.7	181.5	75	75	M12	15	131	13	M8 x 1	18	5	53	38	120	16	23	20	30	14.5
MCT55LW					223.7		95			173				6.6								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

Tab. 9

MRZ series – carriage without flange



* Dimensions H2 and L change when using metal deflectors and other seals (see pg. 17, tab. 12)

Fig. 15

Type	System [mm]				Slider MRZ [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*	
MRZ25W	36	48	12.5	7	90.3	35	35	M6	10	57	15.6	M6x1	7.8	0.4	23	22	60	7	11	9	20	3.6
MRZ25LW					113		50		8	79.1				0.5								

* Only applies when using max. rail lengths (see Ordering key, tab. 31)

Tab. 10

MRR...F series – rails mounted from below

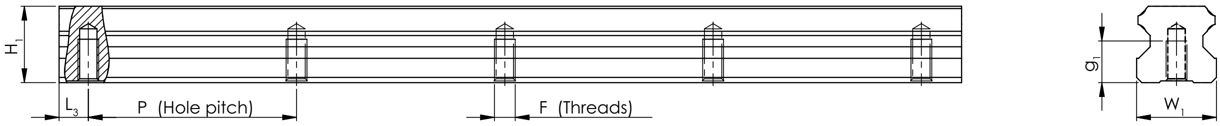


Fig. 16

<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. 31)

Tab. 11

Accessories

Safety equipment and covers

End seal

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

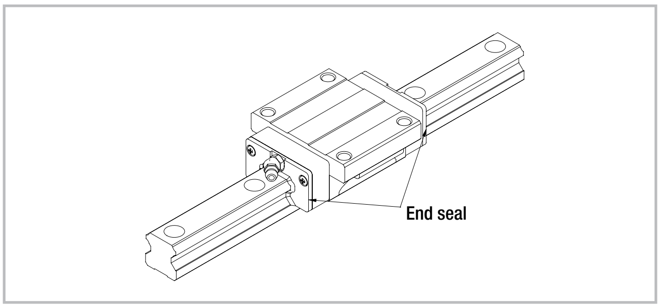


Fig. 17

Side seal

To prevent permeation of foreign matter from below, the carriages for this area are offered with appropriate seals.
No side seals are available for carriages in long or short version (...S / S...W and ...L / L...W).

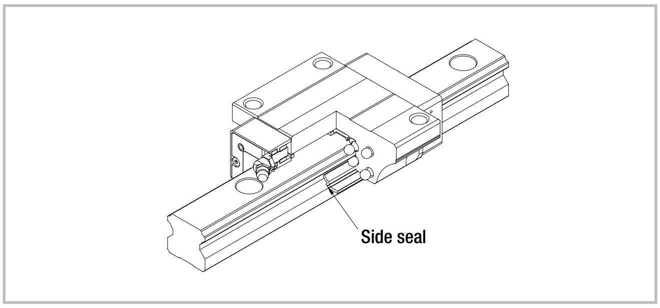


Fig. 18

Double seal

To improve the protection from contamination at higher loads the carriage can be provided with double end seals.

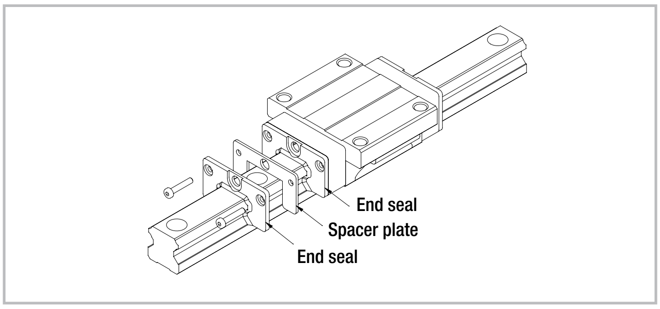


Fig. 19

Metal deflector (non-contacting)

Metal cuttings or coarse contamination can damage the end seals of the carriage. Metal deflector covers protect seal lips against damage.

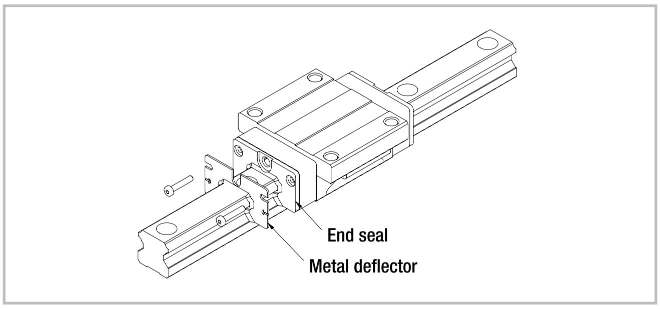


Fig. 20

Seal variants:

A: Carriage with end and side seal

C: Carriage with end and side seals and metal deflector

D: Carriage with double end seal and side seal

E: Carriage with double end seal and side seal and metal deflector

Changes of floor clearance and length changes of the carriages when using the corresponding seal variants

Seal variant		A, C, D, E,	A	C	D	E
Slider type[1]	Size	Changed dimension H_2* [mm]	Changed length L* [mm]			
MRS MRS...W MRT MRT...W	15	2.5	73	75	79	83
	20	2.9	85	87	91	95.2
	25	4.9	94.7	97.7	101.4	106.6
	30	6.9	117	119	127	131
	35	7.6	118	120	128	132.6
	45	12.05	146.7	148.7	157.4	161.9
MCS MCS...W MCT MCT...W	55	-	-	192	191	200
MRS...L MRS...LW MRT...LW	20	-	-	99.5	103.5	107.7
	25	-	-	117.7	121.4	126.6
	30	-	-	138.3	146.3	150.3
	35	-	-	143.6	151.6	156.2
	45	-	-	171.2	179.9	184.4
MCS...L MCS...LW MCT...LW	55	-	-	234.2	233.2	242.2
MRT...S MRT...SW	15	-	-	54.6	58.6	62.6
	20	-	-	64.1	68.1	72.3
	25	-	-	70.2	73.9	79.1
	30	-	-	83	91	95
	35	-	-	83.7	91.7	96.3

Tab. 12

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

* For comparison see Chapter 3 Product dimensions, pg. 10ff

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.

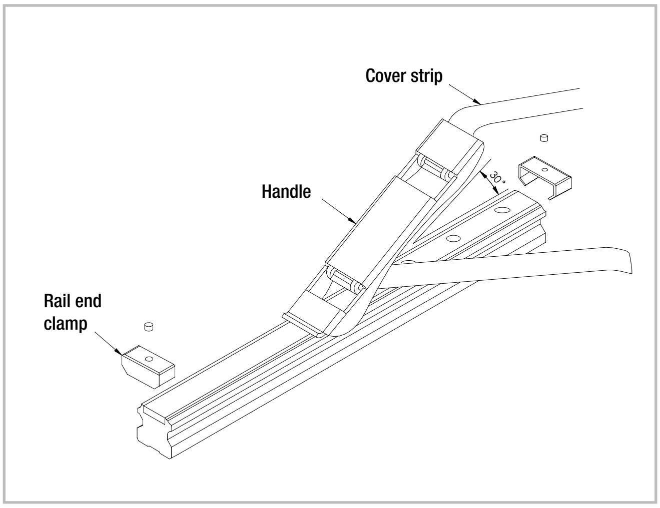


Fig. 21

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

Tab. 13

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. 22).

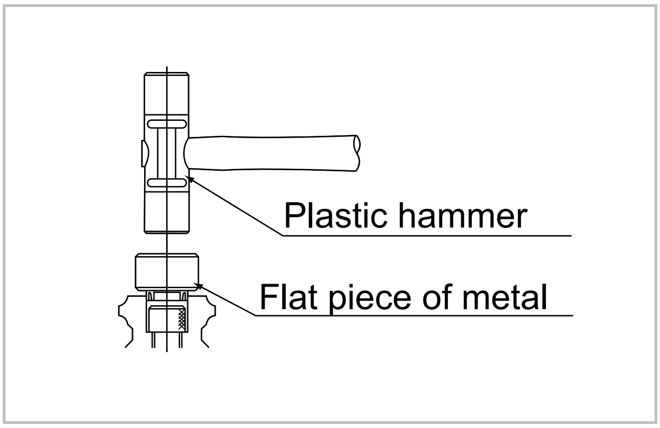


Fig. 22

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. 23, tab. 16).
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:

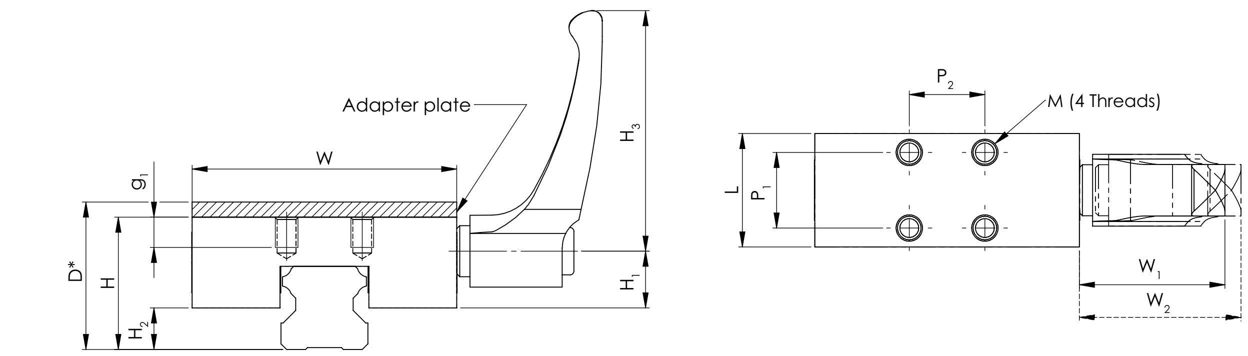
- Positioning axes
- Setting vertical axes
- Positioning lifting gear
- Clamping machine tables

Variants:
An additional adapter plate must be used depending on the height of the carriage (see pg. 23, tab. 17).
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



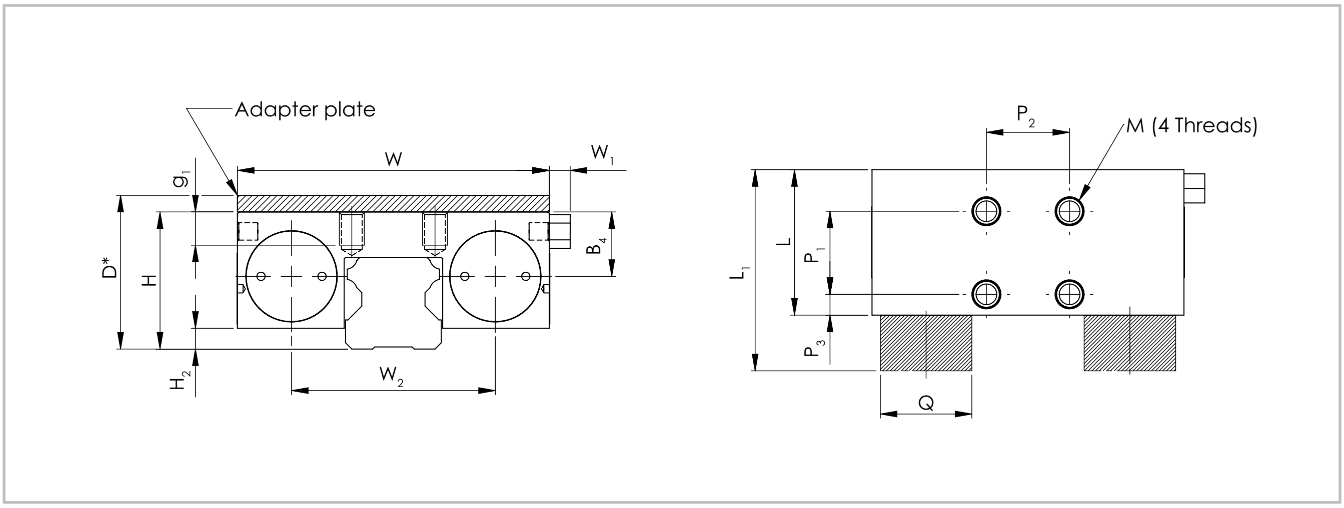
* Changed dimensions when using the adapter plate, see pg. 22, tab. 16

Fig. 23

<table>
<tr><th rowspan="2">Type</th><th rowspan="2">Size</th><th rowspan="2">Holding force
[N]</th><th rowspan="2">Tightening torque
[Nm]</th><th colspan="11">Dimensions
[mm]</th><th rowspan="2">M</th></tr>
<tr><th>H</th><th>H1</th><th>H2</th><th>H3</th><th>W</th><th>W1</th><th>W2</th><th>L</th><th>P1</th><th>P2</th><th>g1</th></tr>
<tr><td>HK1501A</td><td>15</td><td rowspan="5">1200</td><td rowspan="3">5</td><td>24</td><td>12.5</td><td>6.5</td><td rowspan="3">44</td><td>47</td><td rowspan="3">30.5</td><td rowspan="3">33.5</td><td>25</td><td>17</td><td>17</td><td>5</td><td>M4</td></tr>
<tr><td>HK2006A</td><td rowspan="2">20</td><td>28</td><td rowspan="2">17.5</td><td>5</td><td rowspan="2">60</td><td rowspan="2">24</td><td rowspan="2">15</td><td rowspan="2">15</td><td rowspan="2">6</td><td rowspan="2">M5</td></tr>
<tr><td>HK2006A</td><td>30</td><td>7</td></tr>
<tr><td>HK2501A</td><td rowspan="2">25</td><td rowspan="2">7</td><td>36</td><td rowspan="2">15</td><td>12</td><td rowspan="2">63</td><td rowspan="2">70</td><td rowspan="2">38.5</td><td rowspan="2">41.5</td><td rowspan="2">30</td><td rowspan="2">20</td><td rowspan="2">20</td><td rowspan="3">8</td><td rowspan="3">M6</td></tr>
<tr><td>HK2514A</td><td>33</td><td>11.5</td></tr>
<tr><td>HK3001A</td><td>30</td><td rowspan="4">2000</td><td rowspan="3">15</td><td>42</td><td rowspan="2">21.5</td><td>12</td><td rowspan="3">78</td><td>90</td><td rowspan="3">46.5</td><td rowspan="3">50.5</td><td rowspan="2">39</td><td>22</td><td>22</td></tr>
<tr><td>HK3501A</td><td>35</td><td>48</td><td>16</td><td>100</td><td>24</td><td>24</td><td>10</td><td>M8</td></tr>
<tr><td>HK4501A</td><td>45</td><td>60</td><td>26.5</td><td>18</td><td>120</td><td>44</td><td>26</td><td>26</td><td>14</td><td>M10</td></tr>
<tr><td>HK5501A</td><td>55</td><td>22</td><td>70</td><td>31</td><td>21</td><td>95</td><td>140</td><td>56.5</td><td>61.5</td><td>49</td><td>30</td><td>30</td><td>16</td><td>M14</td></tr>
</table>

Tab. 14

Pneumatic clamp MK / MKS



* Changed dimensions when using the adapter plate, see pg. 22, tab. 17

Fig. 24

<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. 15

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...S, MRT...W, MRT...SW	-	28
		MRS, MRS...L, MRS...W, MRS...LW	-	30
HK2514A	25	MRT, MRT...S, MRT...W, MRT...SW, MRT...LW	-	33
HK2501A		MRS, MRS...L,	-	36
		MRS...W, MRS...LW	PHK 25-4	40
HK3001A	30	MRS, MRS...L, MRT...W, MRT...SW, MRT...LW	-	42
		MRS...W, MRS...LW	PHK 30-3	45
HK3501A	35	MRS, MRS...L, MRT...W, MRT...SW, MRT...LW	-	48
		MRS...W, MRS...LW	PMK 35-7	55
HK4501A	45	MRS, MRS...L, MRT...W, MRT...LW	-	60
		MRS...W, MRS...LW	PHK 45-10	70
On request	55	MRT...W, MRT...LW	-	68
HK5501A		MRS, MRS...L	-	70
		MRS...W, MRS...LW	PHK 55-10	80

Tab. 16

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...S, MRT...W, MRT...SW	-	28
		MRS, MRS...L, MRS...W, MRS...LW	PMK 20-2	30
On request	25	MRT, MRT...S, MRT...W, MRT...SW, MRT...LW	-	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, MRT...LW	-	42
		MRS...W, MRS...LW	PMK 30-3	45
MK / MKS 3501A	35	MRS, MRS...L, MRT...W, MRT...SW, MRT...LW	-	48
		MRS...W, MRS...LW	PMK 35-7	55
MK / MKS 4501A	45	MRS, MRS...L, MRT...W, MRT...LW	-	60
		MRS...W, MRS...LW	PMK 45-10	70
On request	55	MRT...W, MRT...LW	-	68
MK / MKS 5501A		MRS, MRS...L	-	70
		MRS...W, MRS...LW	PMK 55-10	80

Tab. 17

Technical instructions

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.

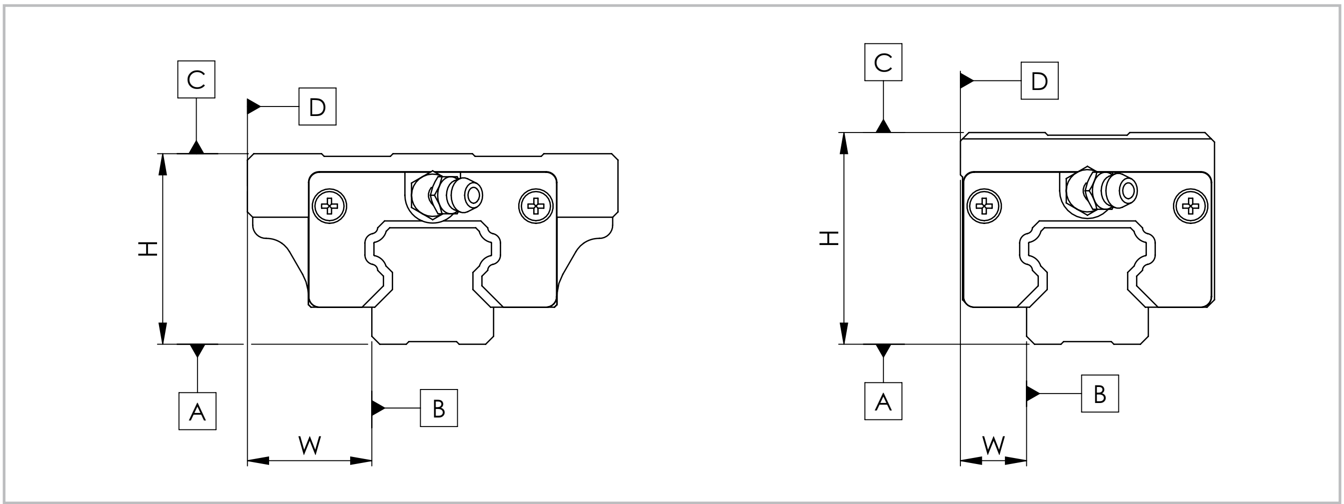


Fig. 25

	Precision class [mm]		
	Normal [N]	High [H]	Precise [P]
Height tolerance H Side tolerance W	± 0.1	± 0.04	0 to -0.04
Guide accuracy of raceway C based on surface A	ΔC see graph in fig. 26		
Guide accuracy of raceway D based on surface B	ΔD see graph in fig. 26		

Tab. 18

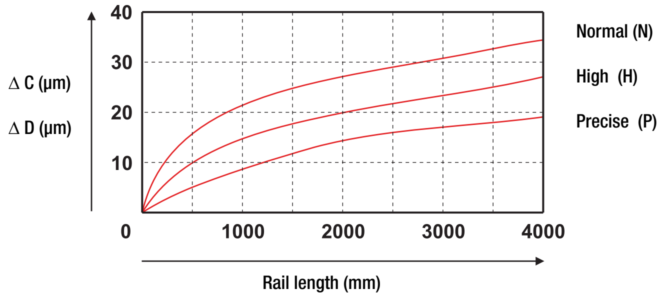


Fig. 26

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.

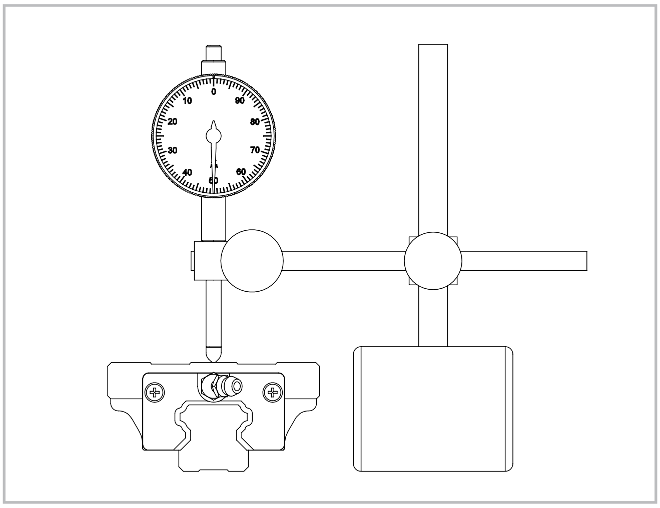


Fig. 27

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. 19). 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 20.

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. 9, tab. 1f

Tab. 19

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. 20

Anticorrosive protection

There are numerous application-specific surface treatments available for profile rails of the Mono Rail product family, for example, black coating (X), hard chrome plating (XC) or nickel plating (NIC), also with FDA-approval for use in the food industry. For more information please contact Application Technology.

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.
Example: Lubricant with FDA approval for use in the food industry.
For more information please contact Application Technology.

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 Application Technology if the oil lubrication is used for vertical use.
- 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 Application Technology.

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.

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 [cm^3]	Relubrication [cm^3]	Initial lubrication oil [cm^3]
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. 21

Not self-lubricating

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

Size	Initial lubrication grease [cm^3]	Relubrication [cm^3]	Initial lubrication oil [cm^3]
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. 22

Lubrication nipple

The following lubrication nipples are part of the standard delivery:

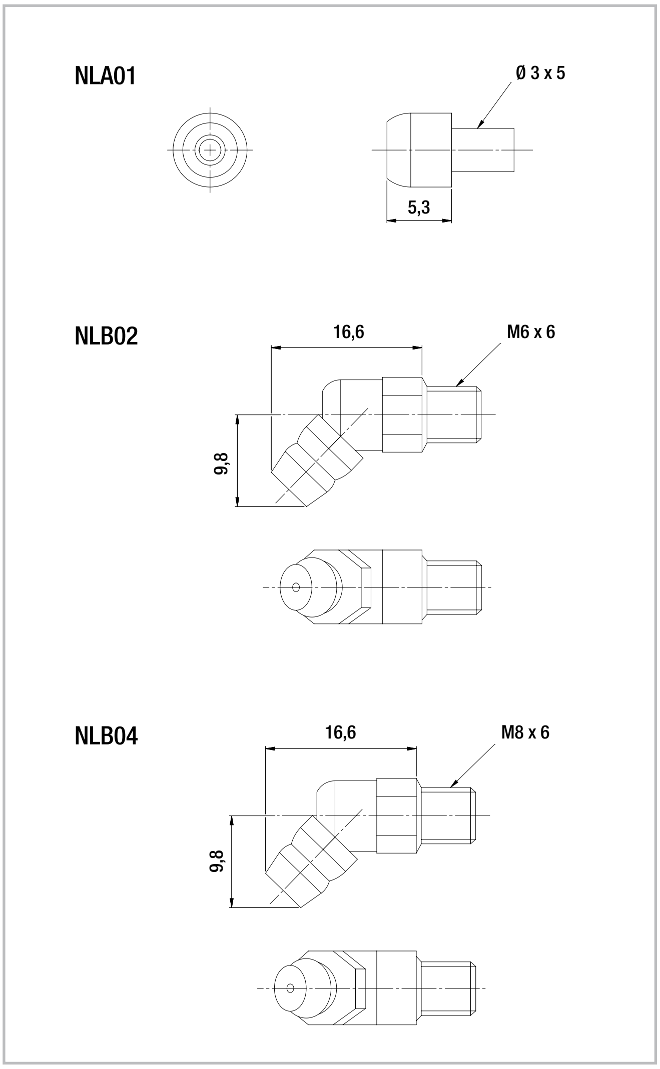


Fig. 28

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

Tab. 23

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. 28) can be changed when using additional deflectors and end seals. For more information please contact Application Technology.

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. 24

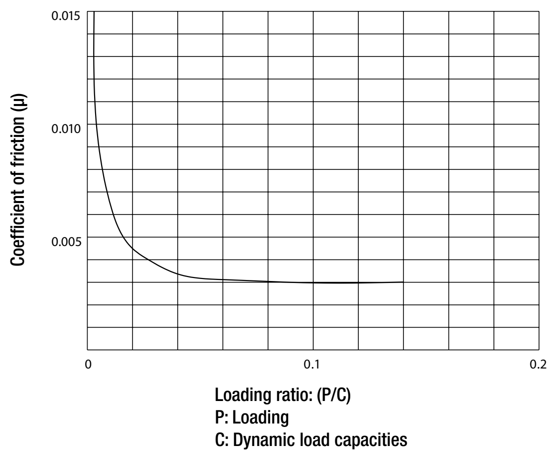


Fig. 29

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. 30

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

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. 31

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. 32

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. 25

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 the Application Engineering Department.

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:

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

f_c = contact factor

f_i = application coefficient

Fig. 33

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. 34

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. 26

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 $V \leq 15$ m/min.	1 - 1.5
Light impacts or vibrations	Average speed $15 < V \leq 60$ m/min.	1.5 - 2
Average and high external impacts or vibrations	High speed $V > 60$ m/min.	2 - 3.5

Tab. 27

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.

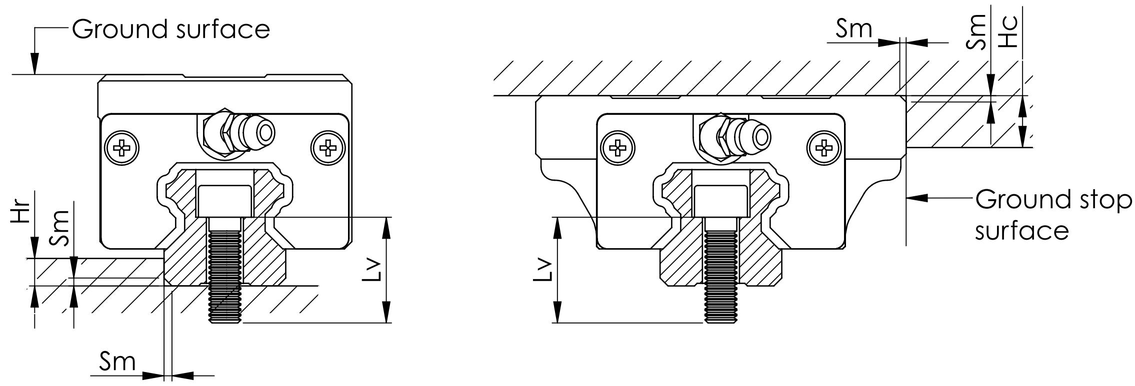


Fig. 35

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	-	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. 16, fig. 17ff

Tab. 28

Assembly precision

The maximum permissible deviations of the rail surfaces for assembly are given in the following drawing (see fig. 36) and the table below (see tab. 29):

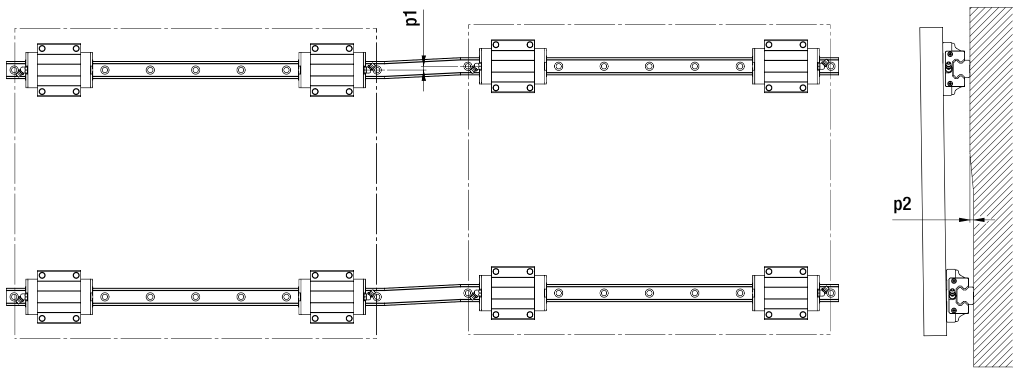


Fig. 36

<table>
<tr><th rowspan="2">Size</th><th colspan="4">Permissible tolerance for parallelism p1 [µm]</th><th colspan="4">Permissible tolerance for parallelism p2 [µm]</th></tr>
<tr><th>K2</th><th>K1</th><th>K0</th><th>G1</th><th>K2</th><th>K1</th><th>K0</th><th>G1</th></tr>
<tr><td>15</td><td>-</td><td>18</td><td rowspan="2">25</td><td rowspan="2">35</td><td>-</td><td rowspan="3">85</td><td rowspan="3">130</td><td rowspan="2">190</td></tr>
<tr><td>20</td><td>18</td><td>20</td><td>50</td></tr>
<tr><td>25</td><td>20</td><td>22</td><td>30</td><td>42</td><td>70</td><td>195</td></tr>
<tr><td>30</td><td>27</td><td>30</td><td>40</td><td>55</td><td>90</td><td>110</td><td>170</td><td>250</td></tr>
<tr><td>35</td><td>30</td><td>35</td><td>50</td><td>68</td><td>120</td><td>150</td><td>210</td><td>290</td></tr>
<tr><td>45</td><td>35</td><td>40</td><td>60</td><td>85</td><td>140</td><td>170</td><td>250</td><td>350</td></tr>
<tr><td>55</td><td>45</td><td>50</td><td>70</td><td>95</td><td>170</td><td>210</td><td>300</td><td>420</td></tr>
</table>

Tab. 29

The bolt sizes to be used and optimum tightening torques for rail assembly are listed in the table below (see tab. 30).

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. 30

Composite rails

Guide rails longer than the one part maximum length (see Ordering key, tab. 31), are put together from two or more rails.
When putting guide rails together, be sure that the register marks shown in fig. 37 are positioning correctly.
These are fabricated axisymmetric for parallel application of composite guide rails, unless otherwise specified.

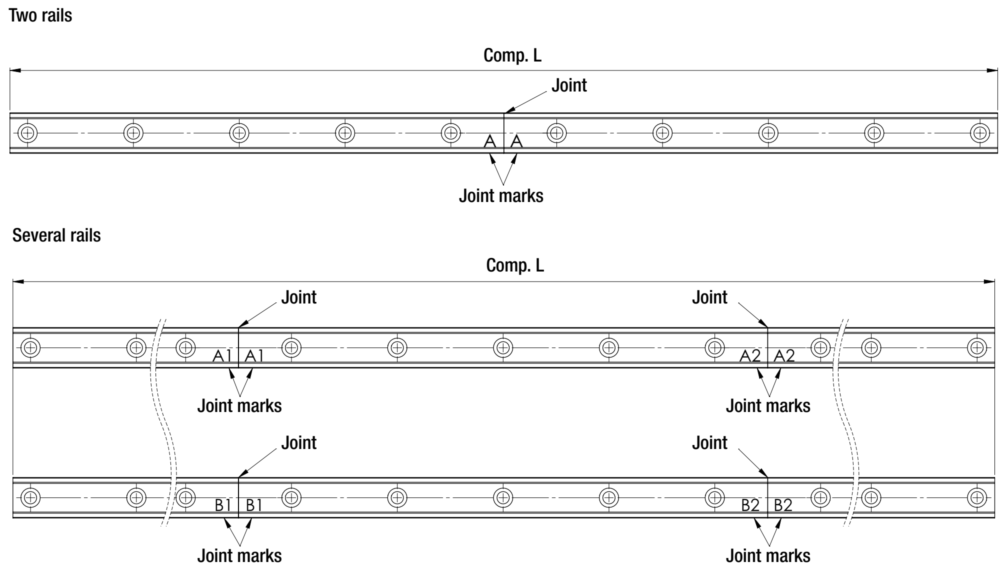


Fig. 37

Assembly process

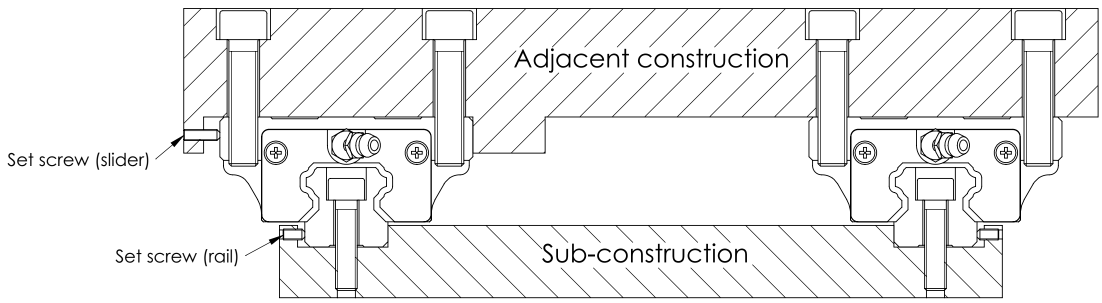


Fig. 38

Fixing guide rails:

(1) Whet the assembly surface with a whetstone and also remove burrs, unevenness and dirt (see fig. 39).

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.

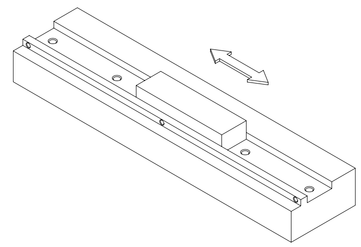


Fig. 39

(2) Carefully lay the guide rail on the assembly surface (see fig. 40) 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. 41).

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.

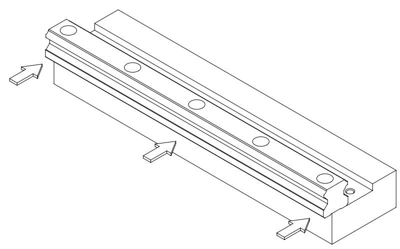


Fig. 40

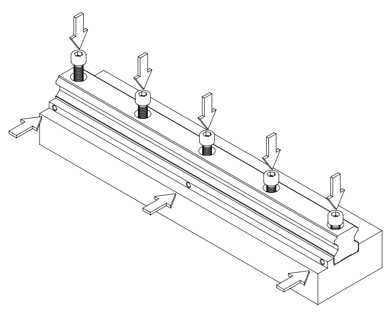


Fig. 41

(3) Tighten the thrust bolts on the guide rail until there is close contact on the side stop surface (see fig. 42).

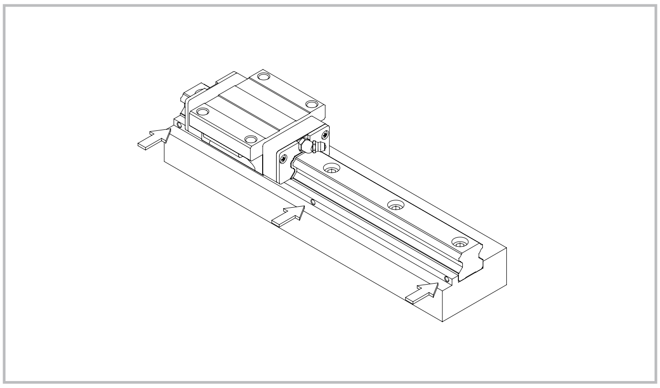


Fig. 42

(4) Tighten the fixing screws with a torque wrench to the prescribed torque (see pg. 31, tab. 30).

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. 43).

(5) Assemble the other rails in the same manner to complete the installation of the guide rails.

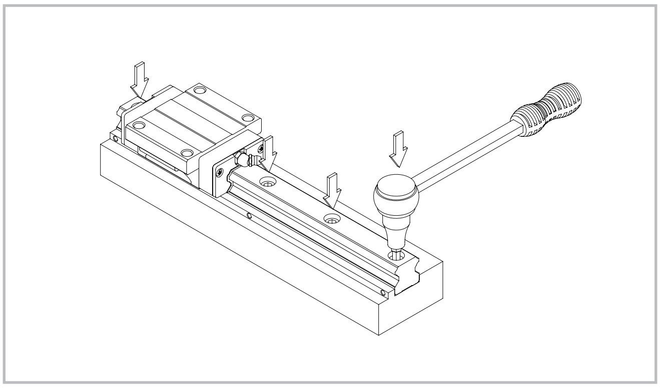


Fig. 43

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. 44). This method saves time when straightening the guide rail and makes the manufacture of positioning pins unnecessary, which considerably reduces assembly time.

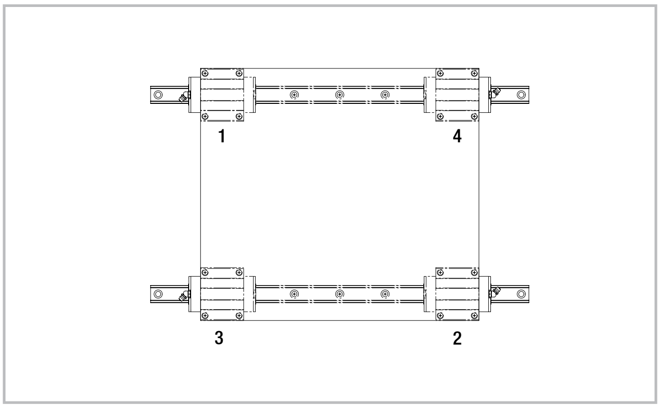
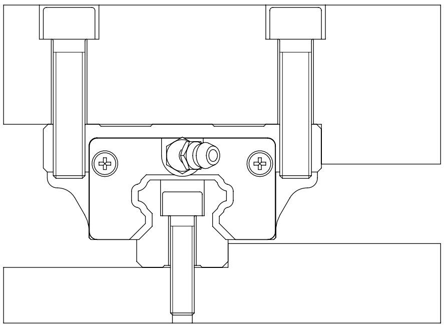


Fig. 44

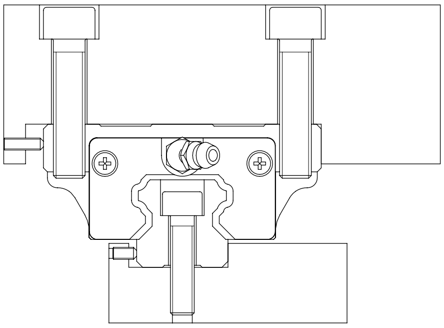
Installation examples

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

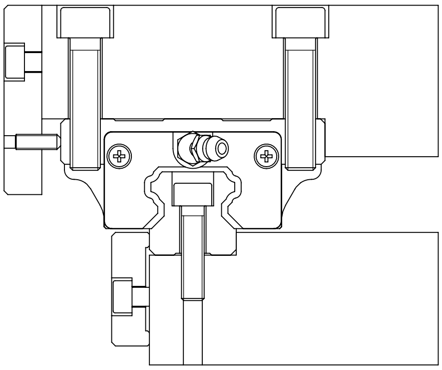
Example 1:
Assembly of carriage and rail on shoulder edges



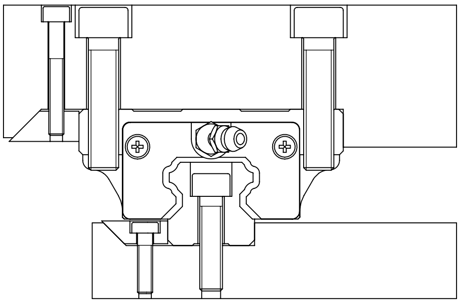
Example 2:
Securing carriage and rail using set screws



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

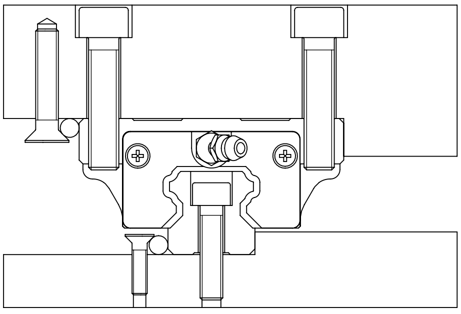


Fig. 45

Ordering key

Rail / slider system

MRS30W	Type
H	Precision class *see pg. 23, tab. 18*
K1	Preload class *see pg. 24, tab. 19f*
A	Seal variants *see pgs. 16f*
HC	Surface coating for carriage optional *see pg. 25, Anticorrosive protection*
1	Number of carriages
05960	Total rail length
F	Rails bolted from below, optional *see pg. 15*
T	Joint processed rails optional *see pg. 32, Composite rails*
HC	Surface coating for rail optional *see pg. 25, Anticorrosive protection*

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

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	Rail type
20	Size
6860	Total rail length
N	Precision class *see pg. 23, tab. 18*
F	Rails bolted from below, optional *see pg. 15*
T	Joint processed rails optional *see pg. 32, Composite rails*
HC	Surface coating for rail optional *see pg. 25, Anticorrosive protection*

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

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. 25, Anticorrosive protection*
			Seal variants	*see pgs. 16f*	
		Preload class	*see pg. 24, tab. 19f*		
	Precision class	*see pg. 23, tab. 18*			
Type					

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

Hole pattern

Rail

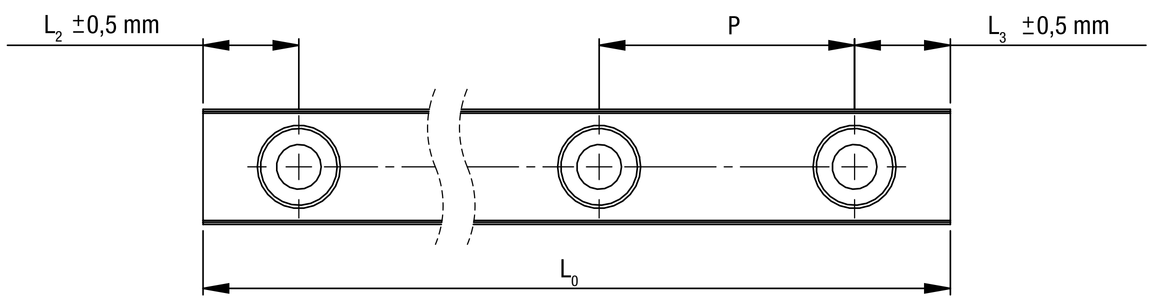


Fig. 46

Size	Hole pitch P [mm]	L_{2min}, L_{3min} [mm]	L_{2max}*, L_{3max}* [mm]	L_{0max} [mm]
15				
20	60	7		4000
25			20	
30				
35	80	8.5		3960
45	105	11.5	22.5	3930
55	120	13	30	3900

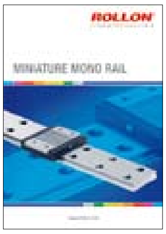
* Only applies when using max. rail lengths

Tab. 31

Portfolio

COMPACT RAIL

Rugged roller sliders with innovative
self adjustment

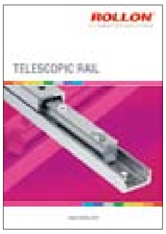


MINIATURE MONO RAIL

Miniature format profile guideways
with unique ball design

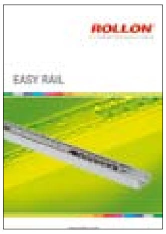
CURVILINE

Curvilinear rails for constant
and variable radii



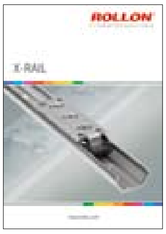
TELESCOPIC RAIL

Smooth-running telescopic linear
bearing drawer slides with
low deflection under heavy loads



EASY RAIL

Compact, versatile linear bearings

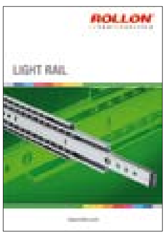


X-RAIL

Roller embossed stainless steel profiles
for the use in rough environments

UNILINE

Steel-reinforced, belt-driven linear actuators
with hardened steel linear bearings
and precision radial ball bearing rollers



LIGHT RAIL

Full and partial extension, lightweight
drawer slides

Fold out ordering key

To make this product catalog as simple as possible for you to use, we have included the following easy-to-read chart.

Your advantages:

- Description and ordering designations easy to read at one glance
- Simplified selection of the correct product
- Links to detailed descriptions in the catalog

Italy

ROLLON S.r.l.
Via Trieste 26
I-20871 Vimercate (MB)
Tel.: (+39) 039 62 59 1
Fax: (+39) 039 62 59 205
E-Mail: infocom@rollon.it
www.rollon.it

Germany

ROLLON GmbH
Bonner Strasse 317-319
D-40589 Düsseldorf
Tel.: (+49) 211 95 747 0
Fax: (+49) 211 95 747 100
E-Mail: info@rollon.de
www.rollon.de

Netherlands

ROLLON B.V.
Ringbaan Zuid 8
6905 DB Zevenaar
Tel.: (+31) 316 581 999
Fax: (+31) 316 341 236
E-Mail: info@rollon.nl
www.rollon.nl

France

ROLLON S.A.R.L.
Les Jardins d'Eole, 2 allée des Séquoias
F-69760 Limonest
Tel.: (+33) (0)4 74 71 93 30
Fax: (+33) (0)4 74 71 95 31
E-Mail: infocom@rollon.fr
www.rollon.fr

USA

ROLLON Corporation
101 Bilby Road. Suite B
Hackettstown, NJ 07840
Tel.: (+1) 973 300 5492
Fax: (+1) 908 852 2714
E-Mail: info@rolloncorp.com
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