

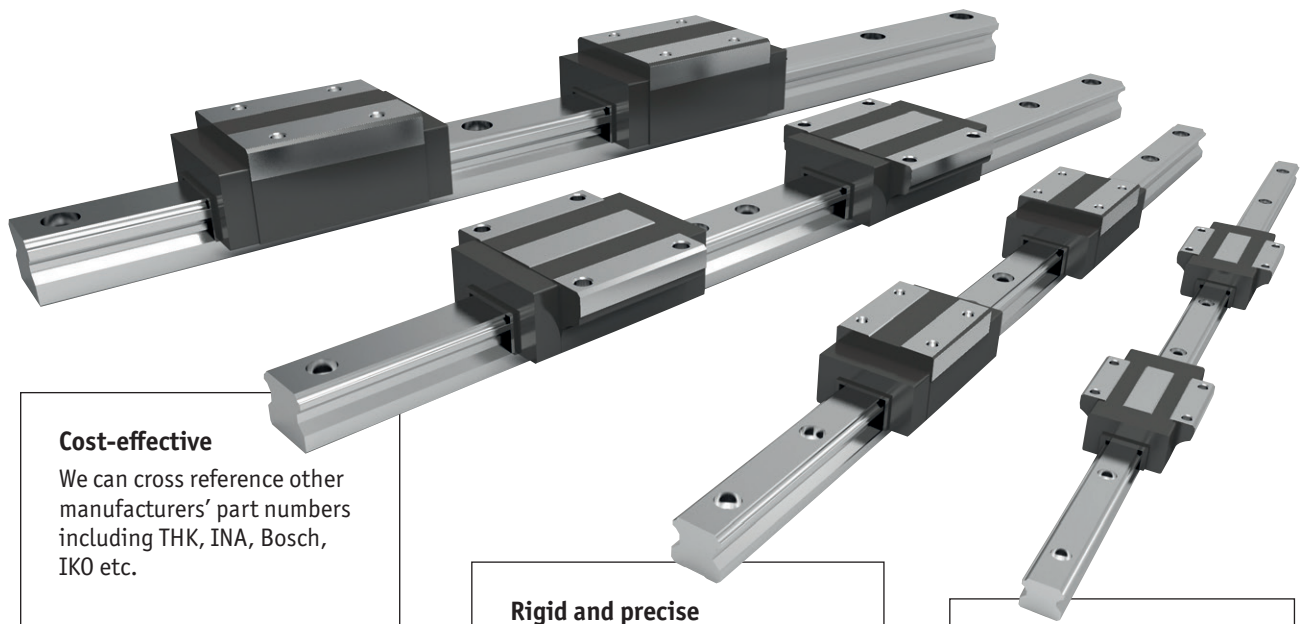


L1016 Linear guideways

Linear guideways are widely used throughout industry for heavy-duty and precise applications.

Precision high load rails

The use of steel balls and the design of the carriages and guideways mean that the rails can accept very heavy loads and significant moment loads. Our rails have circular as opposed to friction coefficient, lower driving resistance, lower wear and lower energy consumption.



Cost-effective

We can cross reference other manufacturers' part numbers including THK, INA, Bosch, IKO etc.

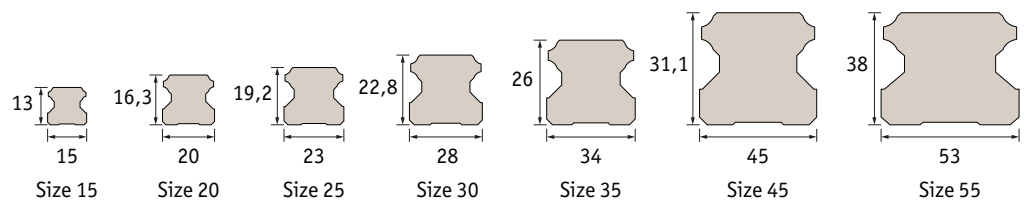
Rigid and precise

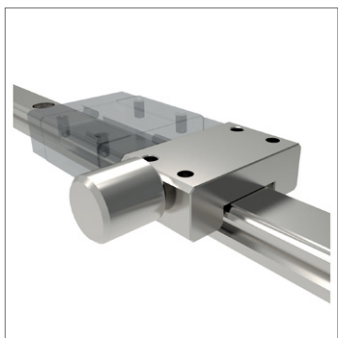
- High load rating.
- High moment load capacity.

Stocked

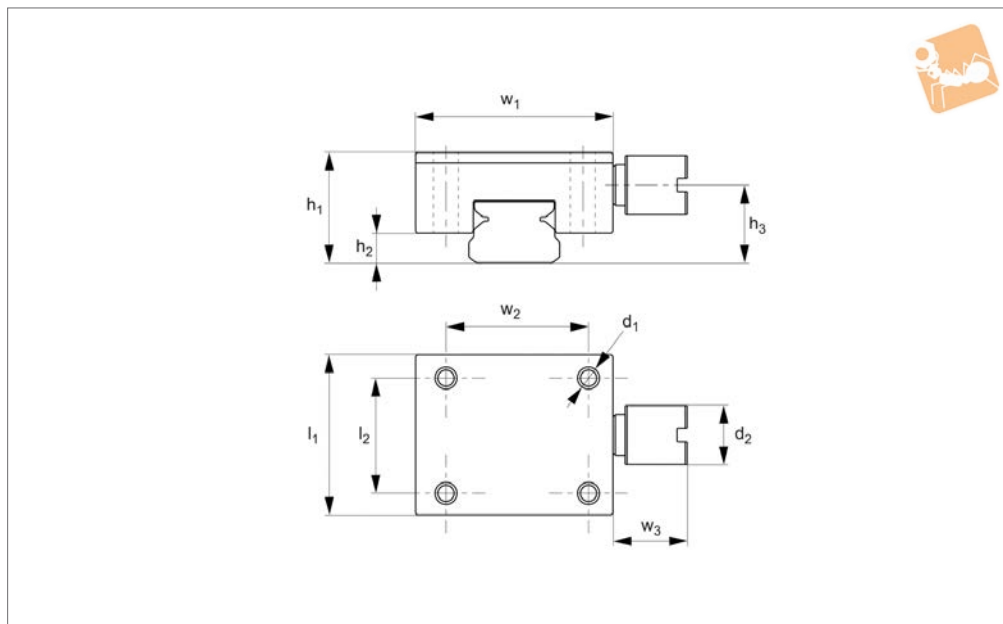
7 rail profiles ready for same day despatch. Lengths up to 4 metres.

Rail sizes





L1010.CL



Material

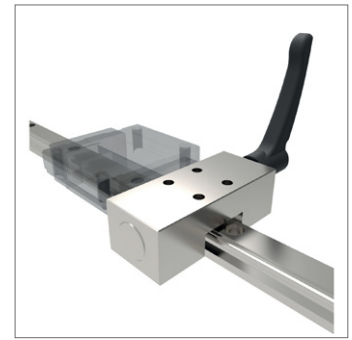
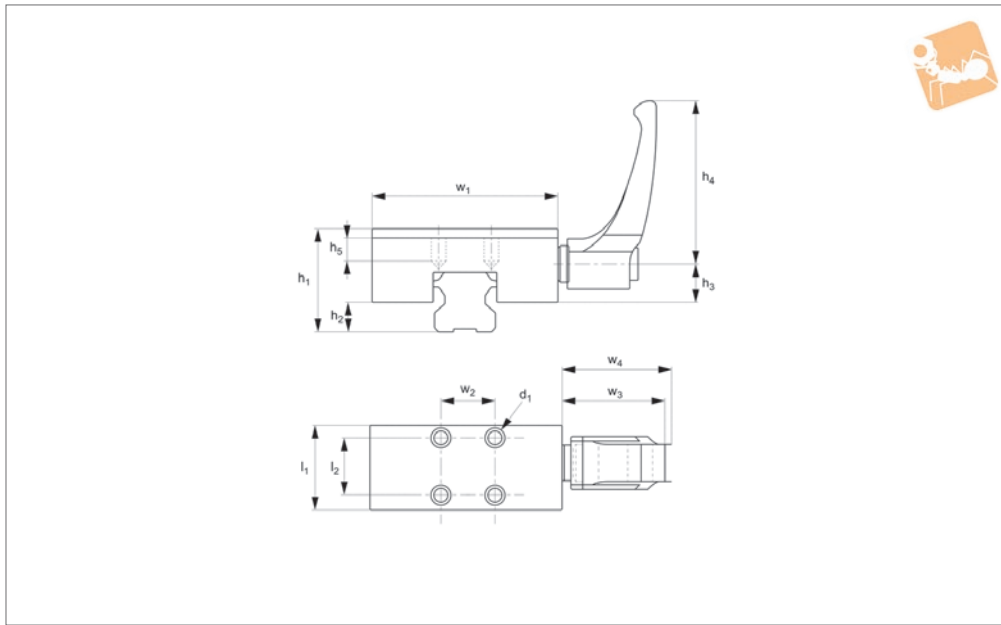
Corrosion resistant stainless steel, hardened (similar to 440C).

Technical Notes

The manual rail clamps are used alongside the rail carriages. Activating the clamping

knob presses the clamp contact surfaces onto the rail, clamping it in place.

Order No.	For rail	h_1	l_1	w_1	h_2	h_3	l_2	w_2	w_3	d_1	d_2	Holding force kgf	Torque to Nm
L1010.CL07	L1010.07	8	12	17	2	4.3	8	12	7	M2	6	65	0.11
L1010.CL09	L1010.09	10	17	20	2.7	5.35	11	15	9	M3	8	100	0.17
L1010.CL12	L1010.12	13	19	27	3.5	7.15	13	20	10	M3	10	150	0.35
L1010.CL15	L1010.15	16	20	32	5	8.05	14	25	14	M3	12	180	0.75
L1012.CL14	L1012.14	9	12	25	3	4.3	8	19	6.65	M2	6	65	0.10
L1012.CL18	L1012.18	12	17	30	4.2	5.85	11	23	9	M3	8	100	0.17
L1012.CL24	L1012.24	14	19	40	4	7.65	13	30	10	M3	10	150	0.35
L1012.CL42	L1012.42	16	22	60	4.5	8.55	15	45	14.7	M4	12	180	0.75



L1016.CL

LINEAR GUIDEWAYS

Material
Aluminium body, steel contact faces.

Technical Notes
The manual rail clamps are used in

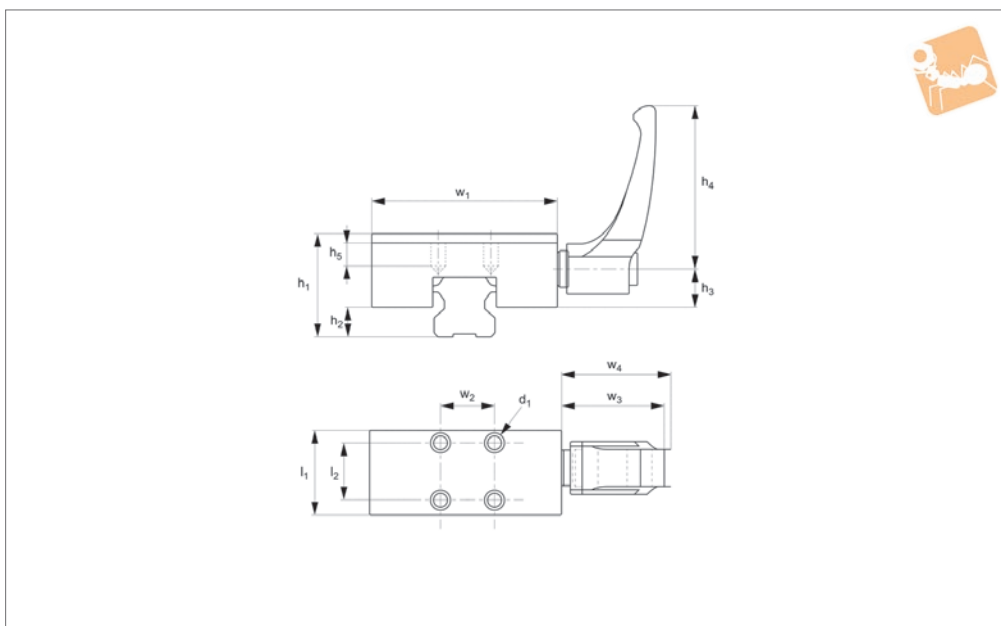
conjunction with the rail carriages L1016.F and L1016.U (flanged and unflanged). By adjusting the clamping lever, the contact sections are pressed into contact with the

rail, clamping the carriage in place.

Order No.	For rail	h_1	l_1	w_1	h_2	h_3	h_4	l_2	w_2	w_3	w_4	d_1	Holding force N	Torque to Nm
L1016.CL15-24	15	24	25	47	4.5	12.5	44	17	17	30.5	33.5	M 4	1200	5
L1016.CL15-28	15	28	25	47	4.5	12.5	44	17	17	30.5	33.5	M 4	1200	5
L1016.CL20-28	20	28	24	60	8.0	13.0	63	15	15	38.5	41.5	M 5	1200	7
L1016.CL20-30	20	30	24	60	8.0	13.0	63	15	15	38.5	41.5	M 5	1200	7
L1016.CL25-33	25	33	30	70	9.0	15.0	63	20	20	38.5	41.5	M 6	1200	7
L1016.CL25-36	25	36	30	70	9.0	15.0	63	20	20	38.5	41.5	M 6	1200	7
L1016.CL25-40	25	40	30	70	9.0	15.0	63	20	20	38.5	41.5	M 6	1200	7
L1016.CL30-42	30	42	39	90	12.0	21.5	78	22	22	46.5	50.5	M 6	2000	15
L1016.CL35-48	35	48	39	100	13.0	21.5	78	24	24	46.5	50.5	M 8	2000	15
L1016.CL45-60	45	60	44	120	12.0	26.5	78	26	26	46.5	50.5	M10	2000	15
L1016.CL55-70	55	70	49	140	17.0	31.0	95	30	30	56.5	61.5	M14	2000	22



L1018.CL



Material

Aluminium body, plastic contact faces.

contact sections are pressed into contact with the rail, clamping the carriage in place.

L1018.

Technical Notes

By adjusting the clamping lever, the

Suitable for our aluminium linear rails

Order No.	For rail	h_1	l_1	w_1	h_2	h_3	h_4	l_2	w_2	w_3	w_4	d_1	Holding force N	Torque to Nm max.
L1018.CL15-24	15	24	20	34	4.5	12.9	40	10	10	29.9	33.3	M 3	130	3
L1018.CL20-30	20	30	24	44	6.0	16.0	40	12	12	29.9	33.4	M 4	250	3
L1018.CL25-36	25	36	30	48	7.0	19.6	44	15	15	29.8	33.3	M 5	330	3



Load capacities – explained

- A number of load figures are stated for load capacity:

Dynamic Load – this is the main figure considered for linear guideways. It is the moving load that the system can bear. It takes account of the total moving load as well as considerations such as impact, vibration and fatigue.

Static Load – this is a load that is constant for an extended time (i.e. the dead load the system can bear before any movement). It can be in tension or compression.

For these linear guideways the radial and axial load capacities are the same.

Moment loads are twisting loads generated by offset loads in either X, Y or Z planes. Moment loads can be reduced by adding further carriages or rails to reduce any twisting of the carriage due to the load offset.

Straightness of rails

- The measurements of the straightness of the system are taken from the running accuracy of the sliders over the length of the rails (given in microns) – see system precision page.
- For standard accuracy this equates to around 20 microns for a metre length, increasing to 35 microns for a 4 metre length.

What lengths can be provided?

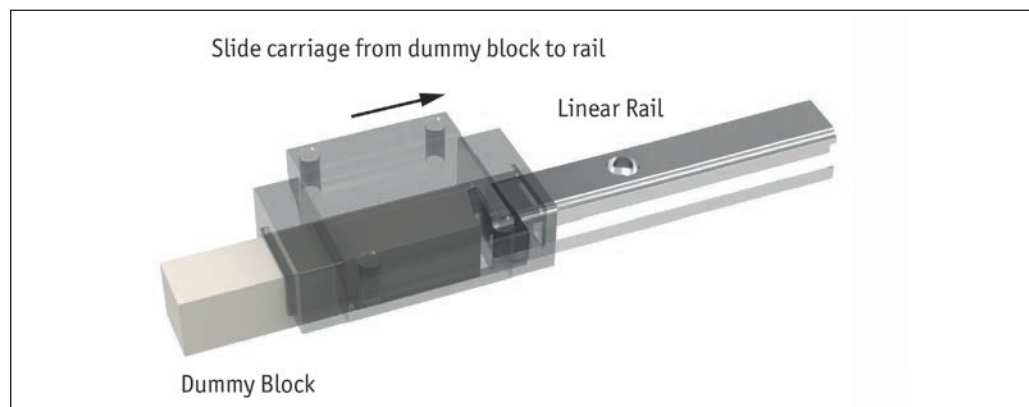
- We have standard rail lengths. These are based on the hole pitch of the rails and end machining to provide an equidistant length to the first and last hole centre.
- However we can cut the rail (from stock) to any length required – we just need to know the distance required to the first hole.
- In general our cutting procedures allow for a $\pm 2\text{mm}$ accuracy on the overall rail length. If greater accuracy than this is required then we have to machine the end accurately (rather than cut it) and this involves extra time and cost.
- Standard maximum length for each rail size is around 4 metres. Rails can be joined together but the preparation needs to be made in our workshop. The rails will be marked clearly with the ends to be placed adjacent to each other.

Installation

- The linear guideways are very accurate and as a result need to be installed on accurately prepared surfaces – please see installation instructions. If the two rails are installed parallel to each other, they need to be accurately aligned – see assembly precision page.
- If you are not able to prepare the surface as accurately as required you might want to consider using our Compact Rail system, as this has a master rail (T rail) and a slave rail (U rail) that allows for structural inaccuracies.

Mounting the carriages to the rails

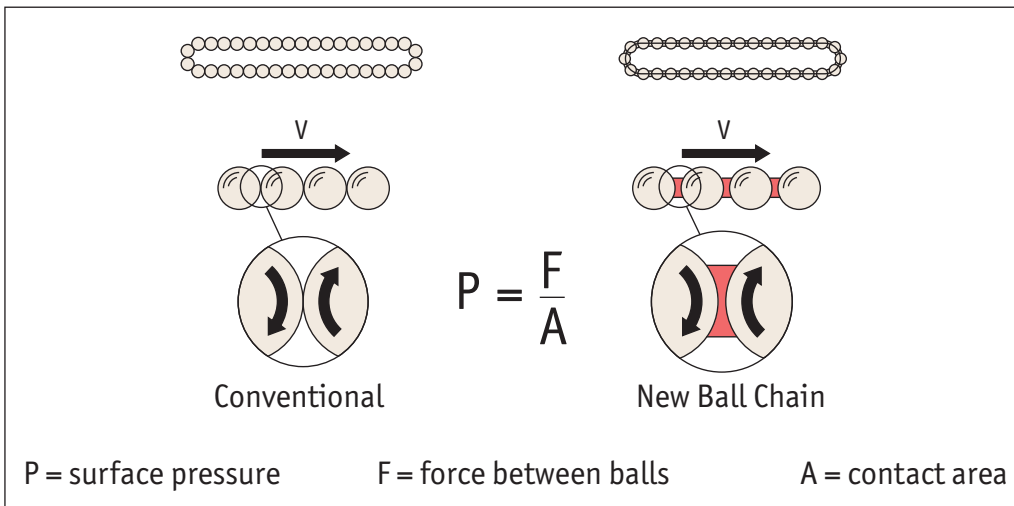
- In general the carriages will be supplied separately to the rails. To install the carriage onto the rails, offer the carriage up to the rails and slide it onto the rail itself.



New ball chain technology

Our new and improved linear guideway systems include the latest “ball chain” technology with the following benefits:

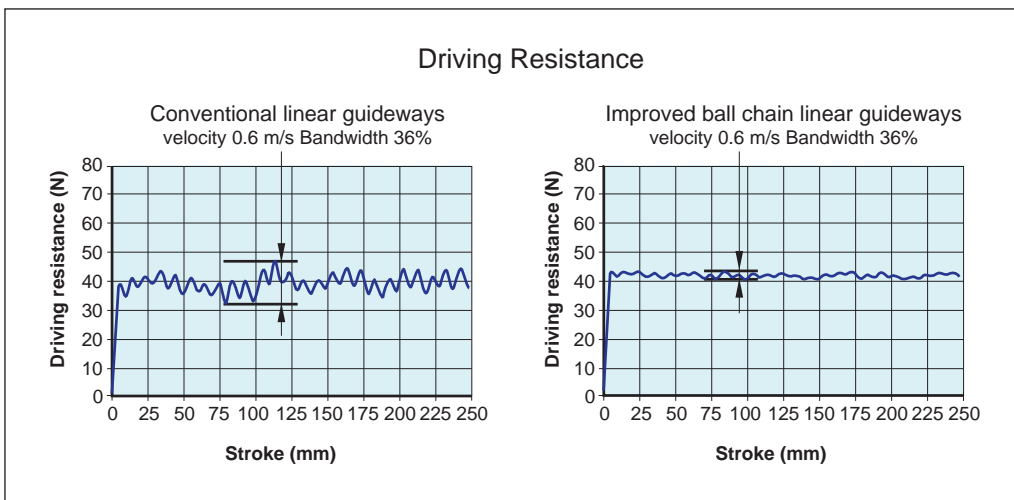
- Higher maximum velocity.
- Lower heat generation
- Lower noise generation.
- Very smooth running.
- Optimised lubrication system
- Even load distribution
- Longer service life



The rotating balls in conventional profile rail guides have point contact between each other. The rotation speed at the contact point is double the speed of the balls. The contact area (A) is so small that the surface pressure (P) tends towards infinity. This leads to heating and wear of the balls and the linear guide system.

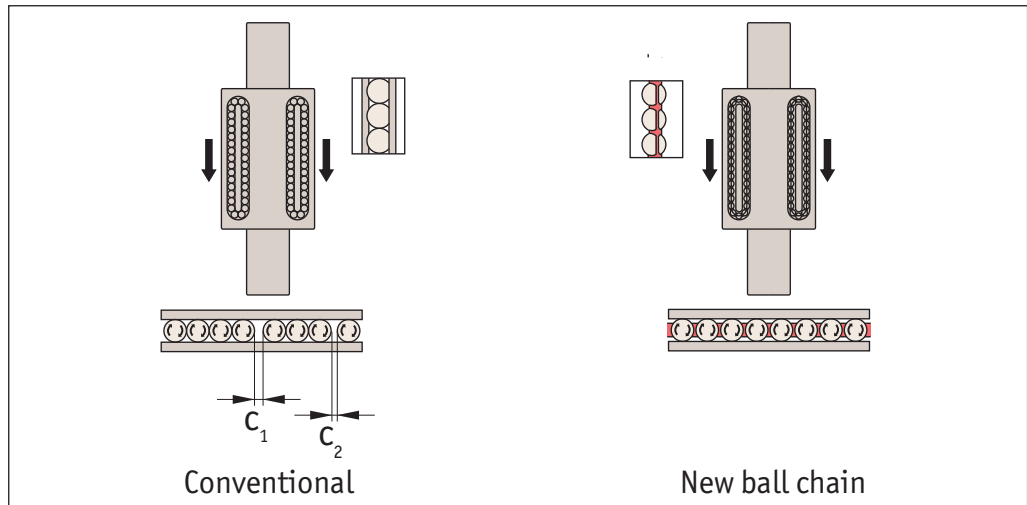
The chain system in our new linear guides have a relatively large contact area (A), this significantly reduces the surface area pressure (P). The rotation speeds at the contact surfaces of ball and chain are the same. The ball chain is used to transport the lubricant and to create a lubrication film on the balls. The design of the carriage allows effective supply of lubricant from the lubricant connection to the circulation areas of the ball chains.

This design of the of the ball chain ends in connection with the spacer ball closes the circulation and makes the movement of the carriage smooth and quiet.



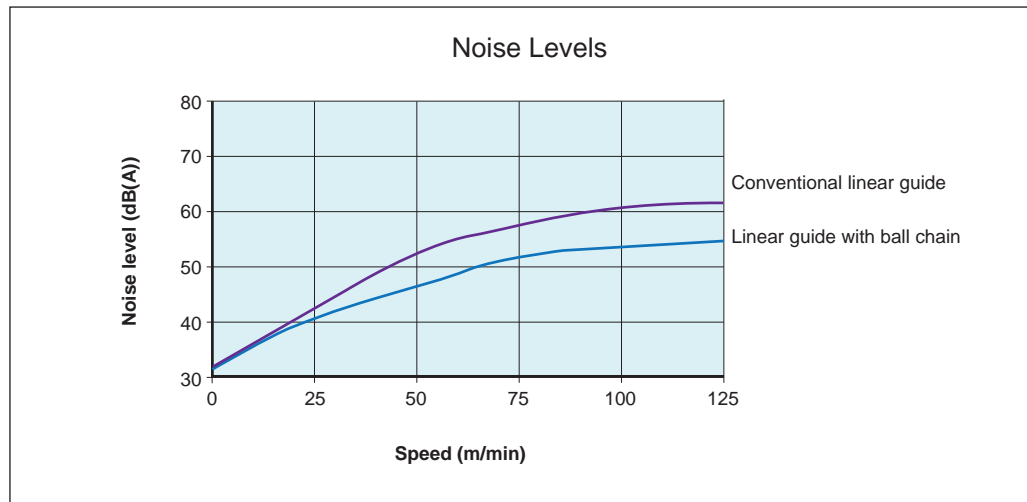


New technology



It is not possible to keep the distance of the balls (C_1 , C_2) constant in conventional linear guides. These irregular distances between the balls lead to uneven running behaviour.

The new ball chain system also allows the balls to be continuously supplied with lubricant, which reduces wear of the metal. This significantly extends the service life of the system and reduces lubricant and the maintenance intervals.



We can coat our rail with two types of corrosion protective finishes:

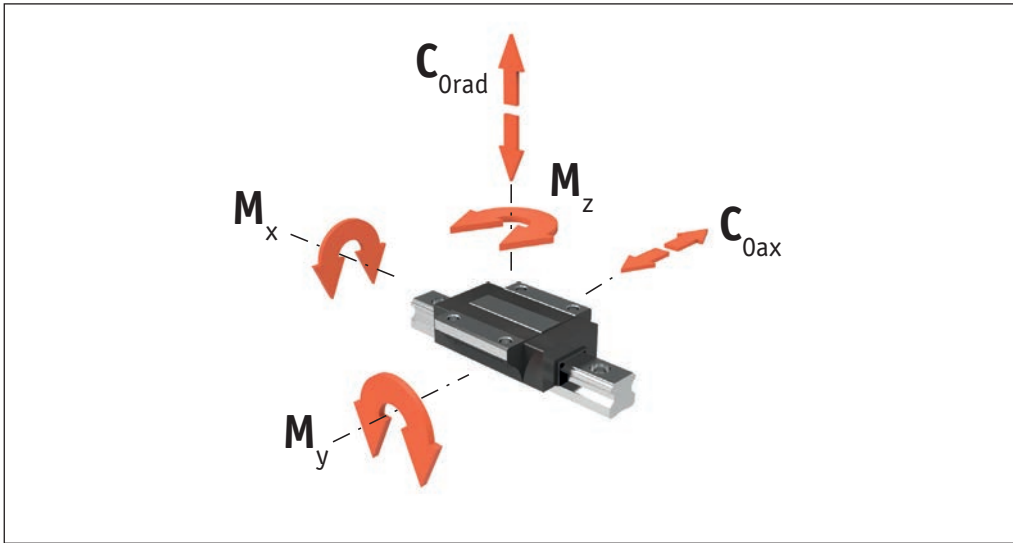
- Raydent coating; this is an electro-chemical process that applies a black oxide-ceramic layer (approx. 1 micron thick) that penetrates into the metal. As coating takes place at 0C the parts are not deformed. Good resistance against acids, bases and solvents.
- Chemical nickel coating; this offers a good resistance to corrosion, abrasion and chemicals. Black finish.

Please ask our technical department to help you select the best coating.

All of our rails are issued with oil-resistant plastic caps used to cover the screw holes. If there are aggressive chemicals present we can also provide brass versions of these caps.

Where there may be a high level of dust, dirt, weld splatters etc. we can provide bellows covers to protect the rails.

Load capacity overview - L1016.F Flanged carriages



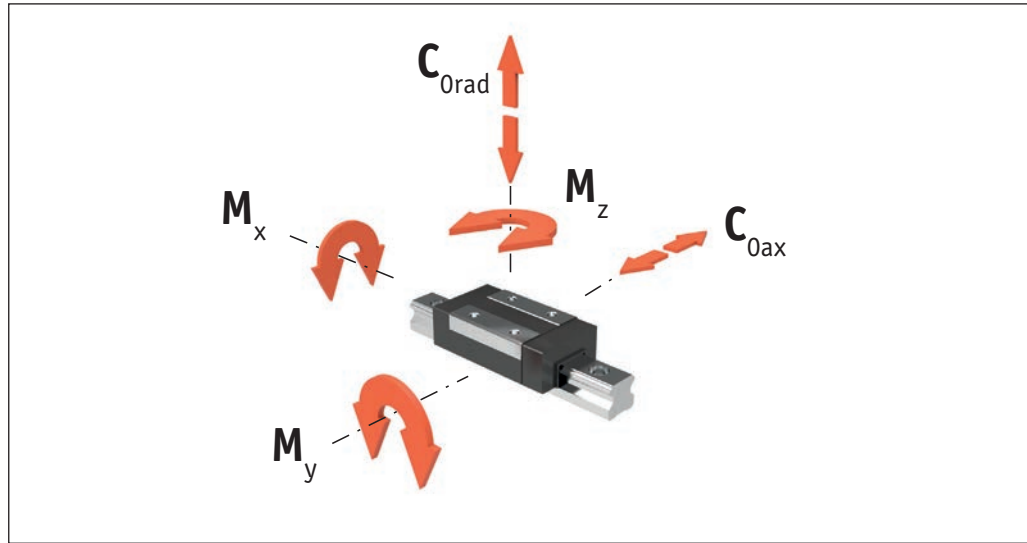
Part no.	Type	Length	Max. load capacities kN		Max. static moments Nm		
			Dynamic Load C _{kN}	Static load C _{Orad+ax} kN	M _x Nm	M _y Nm	M _z Nm
L1016.F15	Flanged	Standard	11,67	19,90	137	120	120
L1016.F15-L	Flanged	Long	14,12	24,05	166	171	171
L1016.F20	Flanged	Standard	17,98	30,96	289	224	224
L1016.F20-L	Flanged	Long	23,30	40,11	376	366	366
L1016.F25	Flanged	Standard	25,25	41,73	447	358	358
L1016.F25-L	Flanged	Long	32,44	53,63	576	577	577
L1016.F25-XL	Flanged	Extra Long	36,58	64,30	691	833	833
L1016.F30	Flanged	Standard	37,33	55,50	719	560	560
L1016.F30-L	Flanged	Long	48,35	71,88	931	836	836
L1016.F30-XL	Flanged	Extra Long	53,83	88,18	1142	1361	1361
L1016.F35	Flanged	Standard	53,31	82,66	1307	991	991
L1016.F35-L	Flanged	Long	66,61	103,29	1633	1424	1424
L1016.F35-XL	Flanged	Extra Long	73,29	127,68	2020	2330	2330
L1016.F45	Flanged	Standard	73,14	111,30	2353	1559	1559
L1016.F45-L	Flanged	Long	86,99	132,39	2798	2170	2170
L1016.F45-XL	Flanged	Extra Long	100,52	166,87	3527	3455	3455
L1016.F55	Flanged	Standard	88,26	136,62	3385	2361	2361
L1016.F55-L	Flanged	Long	119,10	183,14	4538	4202	4202
L1016.F55-XL	Flanged	Extra Long	161,43	259,71	6430	6617	6617

Linear Guideways from Automation Components

LINEAR GUIDEWAYS



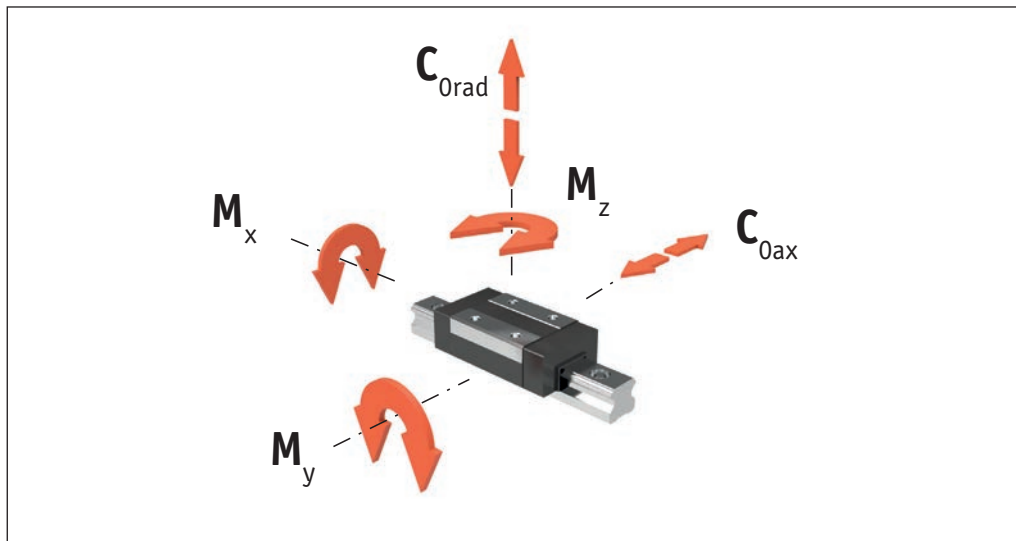
Load capacity overview - L1016.U Unflanged carriages



Linear Guideways from Automation Components

Part no.	Type	Length	Max. load capacities kN		Max. static moments Nm		
			dyn. C_{rad} dyn. C_{ax}	stat. C_{Orad} stat. C_{Oax}	M_x	M_y	M_z
L1016.U15	Unflanged	Standard	11,67	19,90	137	120	120
L1016.U20	Unflanged	Standard	17,98	30,96	289	224	224
L1016.U20-L	Unflanged	Long	23,30	40,11	376	366	366
L1016.U25	Unflanged	Standard	25,25	41,73	447	358	358
L1016.U25-L	Unflanged	Long	32,44	53,63	576	577	577
L1016.U25-XL	Unflanged	Extra Long	36,58	64,30	691	833	833
L1016.U30	Unflanged	Standard	37,33	55,50	719	560	560
L1016.U30-L	Unflanged	Long	48,35	71,88	931	836	836
L1016.U30-XL	Unflanged	Extra Long	53,83	88,18	1142	1361	1361
L1016.U35	Unflanged	Standard	53,31	82,66	1307	991	991
L1016.U35-L	Unflanged	Long	66,61	103,29	1633	1424	1424
L1016.U35-XL	Unflanged	Extra Long	73,29	127,68	2020	2330	2330
L1016.U45	Unflanged	Standard	73,14	111,30	2353	1559	1559
L1016.U45-L	Unflanged	Long	86,99	132,39	2798	2170	2170
L1016.U45-XL	Unflanged	Extra Long	100,52	166,87	3527	3455	3455
L1016.U55	Unflanged	Standard	88,26	136,62	3385	2361	2361
L1016.U55-L	Unflanged	Long	119,10	183,14	4538	4202	4202
L1016.U55-XL	Unflanged	Extra Long	161,43	259,71	6430	6617	6617

Load capacity overview - L1016.UL Unflanged low height carriages



Part no.	Type	Length	Max. load capacities kN		Max. static moments Nm		
			dyn. C_{rad} dyn. C_{ax}	stat. C_{0rad} stat. C_{0ax}	M_x	M_y	M_z
L1016.UL15-S	Unflanged	Short	5,81	9,90	69	32	32
L1016.UL15	Unflanged	Standard	11,67	19,90	137	120	120
L1016.UL15-L	Unflanged	Long	14,12	24,05	166	171	171
L1016.UL20-S	Unflanged	Short	9,25	15,63	148	66	66
L1016.UL20	Unflanged	Standard	17,98	30,96	289	224	224
L1016.UL25-S	Unflanged	Short	12,87	21,34	230	103	103
L1016.UL25	Unflanged	Standard	25,25	41,73	447	358	358
L1016.UL30-S	Unflanged	Short	18,50	27,51	356	153	153
L1016.UL30	Unflanged	Standard	37,33	55,50	719	560	560
L1016.UL30-L	Unflanged	Long	48,35	71,88	931	836	836
L1016.UL30-XL	Unflanged	Extra Long	53,83	88,18	1142	1361	1361
L1016.UL35-S	Unflanged	Short	26,72	41,43	655	275	275
L1016.UL35	Unflanged	Standard	53,31	82,66	1307	991	991
L1016.UL35-L	Unflanged	Long	66,61	103,29	1633	1424	1424
L1016.UL35-XL	Unflanged	Extra Long	73,29	127,68	2020	2330	2330
L1016.UL45	Unflanged	Standard	73,14	111,30	2353	1559	1559
L1016.UL45-L	Unflanged	Long	86,99	132,39	2798	2170	2170
L1016.UL45-XL	Unflanged	Extra Long	100,52	166,87	3527	3455	3455
L1016.UL55	Unflanged	Standard	88,26	136,62	3385	2361	2361
L1016.UL55-L	Unflanged	Long	119,10	183,14	4538	4202	4202
L1016.UL55-XL	Unflanged	Extra Long	161,43	259,71	6430	6617	6617

Linear Guideways from Automation Components

LINEAR GUIDEWAYS



Manual rail clamps

- Many of our customers wish to lock their moving element in position on the rails. Whilst this can be relatively simply achieved with the use of an adjustable clamping handle and thrust pad, we also offer a clamping element which can be integrated into your rail/system design.
- This is available in the standard manual version as well as (on request) a pneumatic version for linear guideways only (not compact rail systems).
- These manual clamps have a holding force of up to 2,000N.
- They are relatively compact in shape. Please bear in mind the extra space required for the clamping element when calculating the total stroke you require.

Applications

- Table cross beams.
- Sliding beds.
- Width adjustment stops.
- Positioning of optical equipment.



The manual rail clamps are used alongside the standard flanged or unflanged rail carriages. When selecting ensure:

- a) the rail clamp suits the rail that you are using.
- b) that the total assembly height of the rail clamp is the same as that of the rail carriage L1016.U or L1016.F.

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.

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 linear guideways are available in the two different preload classes K_0 or K_1 , see table below.

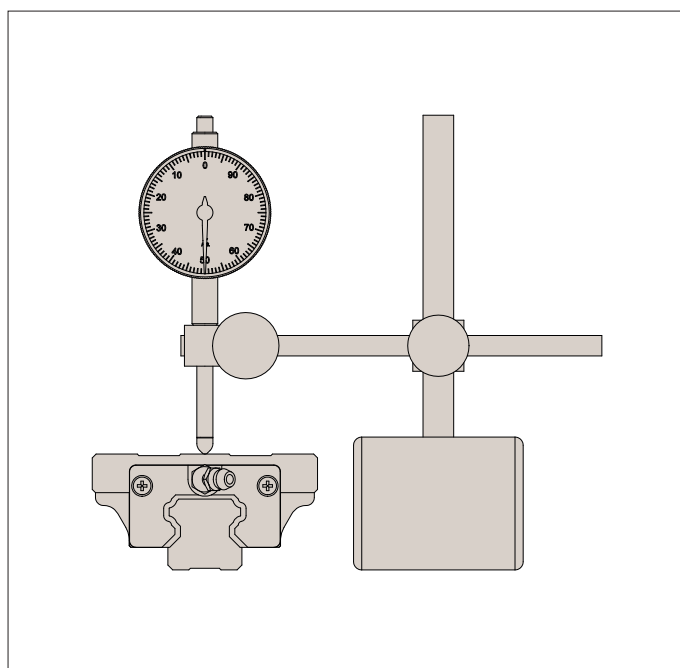
The preload influences the rigidity, precision and torque resistance and also affects the service life and displacement force.

The radial clearance for the respective preload classes are listed below.

Degree of preload	Preload class	Preload
No clearance	K_0	0
Small preload	K_1	$0,02 \times C^*$

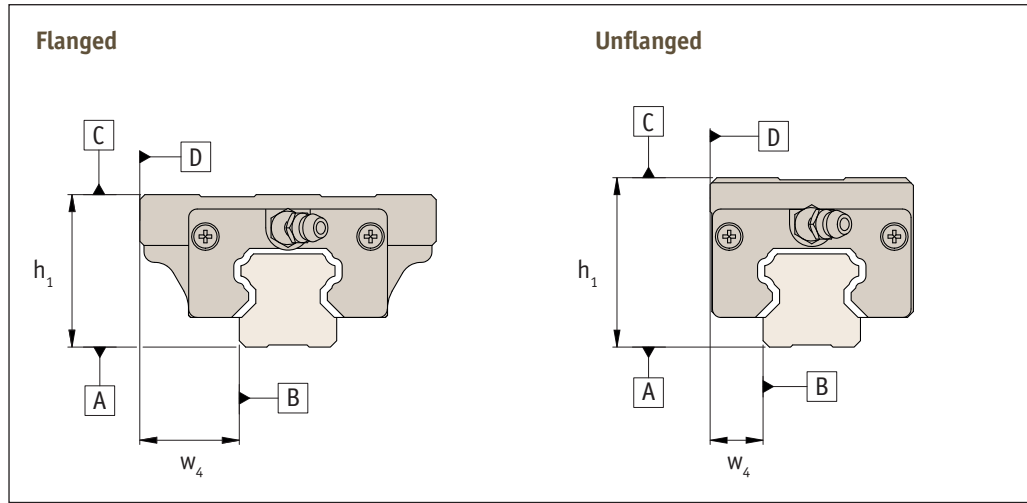
*C is the dynamic load capacity.

Size	Radial clearance of the preload classes μ	
	K_0 Impact free and easy movement	K_1 Small moments, one rail application, low vibrations
15	-3 to +3	-8 to -4
20	-3 to +3	-8 to -4
25	-4 to +4	-10 to -5
30	-4 to +4	-11 to -5
35	-5 to +5	-12 to -6
45	-6 to +6	-15 to -7
55	-7 to +7	-19 to -8



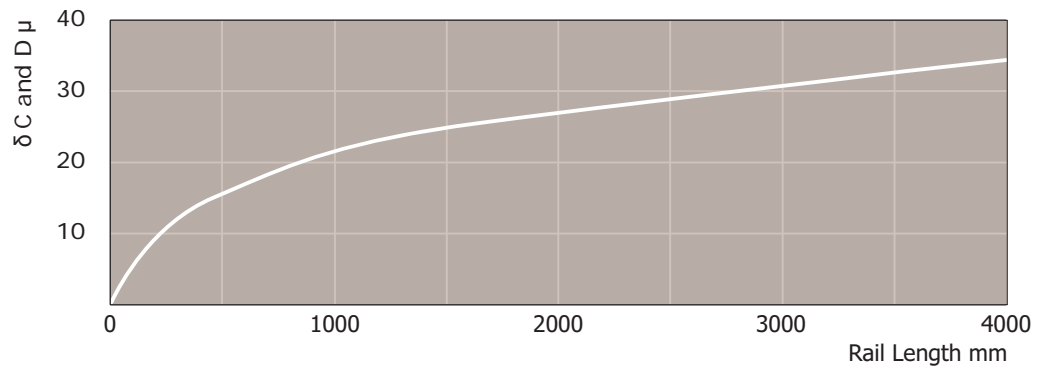


Precision means the guide accuracy or the maximum deviation of the carriage based on the side and support surfaces during the movement along the rails.



	Normal Precision (N)	H Precision (H)	P Precision (P)
Height tolerance h_1	$\pm 0,1$	$\pm 0,4$	0
Width tolerance w_4			-0,04
Guide accuracy of raceway C based on surface A	δC see graph below		
Guide accuracy of raceway D based on surface B	δD see graph below		

Running tolerances





Lubrication

Linear guideway 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 rail, insufficient lubrication and tribocorrosion can ultimately lead to total failure.

As well as reducing friction and wear, lubricants also serve as sealant, noise reducer and corrosion protection for the linear guide. Different lubricants for special applications are available upon request (e.g. lubricant with FDA approval for use in the food industry).

Our linear guideways are coated with an anti-corrosion resistant oil at the factory. This coating needs to be removed prior to installation, then lubricated as follows:

Important instructions for lubrication

- Linear guideways 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.
- Primary lubricated systems have an increased displacement resistance.
- Please contact us if oil lubrication is used for vertical use.
- If the stroke is <2 or >15 times the carriage length, the lubrication intervals should be reduced.

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.

Relubrication

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

Lubrication intervals

Operating speed, stroke length and ambient conditions influence the selection of time between lubrication intervals. Establishing a safe lubrication interval is based solely on the applications and conditions. However, a lubrication interval should not be longer than one year.

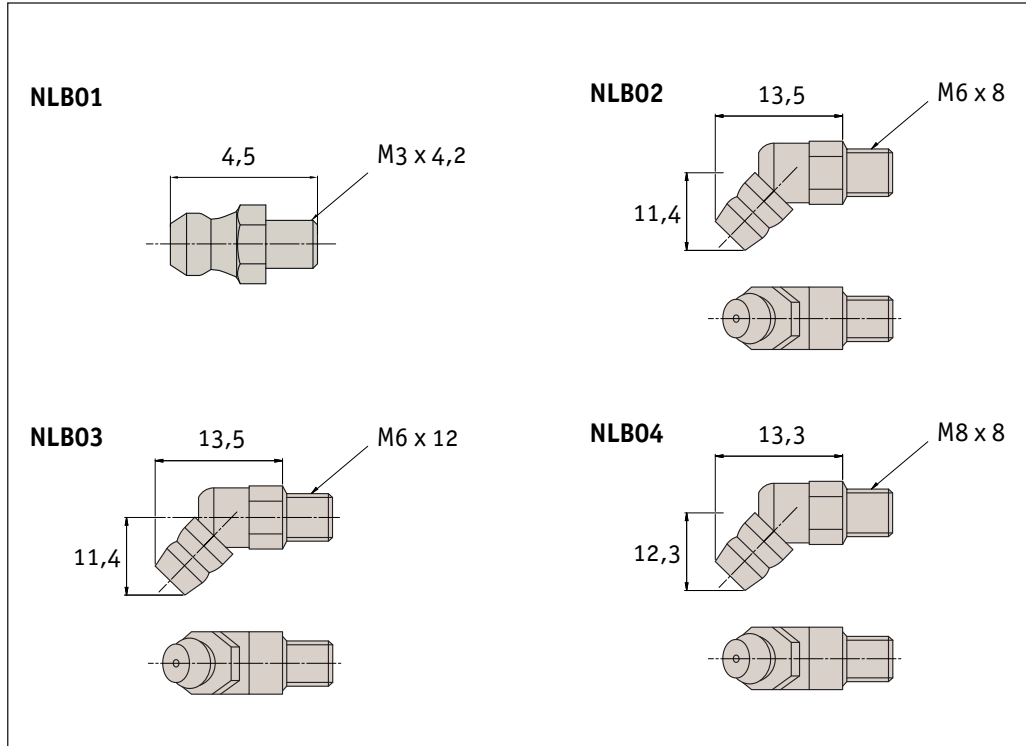


Lubrication nipple

The following lubrication nipples are supplied.

Other lubrication nipples, such as lubrication adapters with hose inlet or with quick-coupling, are available on request.

Lubrication nipple	Size
NLB01	15
NLB02	20
	25
NLB03	30
	35
NLB04	45
	55



Surface treatment

There are numerous application-specific surface treatments available for profile rails of the linear guideway product family, for example, black oxide coating (X), hard chrome plating (XC) or nickel plating (NIC) and an FDA-approval type for use in the food industry. For more information please contact us on 0845 850 99 40.



Technical Information

Friction/displacement resistance

Linear guideways 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).

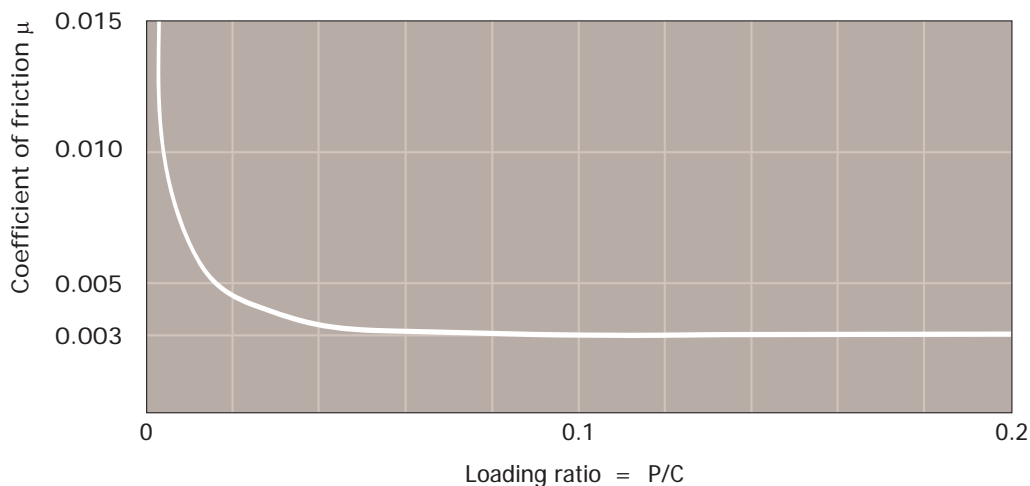
The displacement resistance (F_m) is dependent upon several factors:

- 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 caused by contamination in the lubricant.
- Preload for increased rigidity.
- Moment load.

Resistance of the seals f

Type	Max. seal resistance N
L1016.15	2,5 N
L1016.20	3,5 N
L1016.25	5,0 N
L1016.30	10,0 N
L1016.35	12,0 N
L1016.45	20,0 N
L1016.55	22,0 N

Coefficient of friction μ



P = Load
C = Dynamic load capacity

Displacement resistance F_m

The following formula is used for 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.

$$F_m = \mu \cdot F + n \cdot f$$

F_m = Displacement resistance (N)

μ = Coefficient of friction

F = Load (N)

f = Resistance of the seals (N)

n = Number of sliders

Linear guideways have a coefficient of friction of approx. $\mu = 0.002 - 0.003$



The given static load capacity (C_0) for each carriage represents the maximum permissible load value, which if exceeded causes permanent deformations of the raceways and adversely affects the operating performance.

Checking the load must be done as follows:

- Through determination of the simultaneously occurring forces and moments for each carriage.
- By checking these values with the corresponding load capacities.

$$S_0 > \frac{C_0}{(F_x \cdot f_c)} \quad S_0 > \frac{C_0}{(F_y \cdot f_c)} \quad S_0 > \frac{M_x}{(M_1 \cdot f_c)} \quad S_0 > \frac{M_y}{(M_2 \cdot f_c)} \quad S_0 > \frac{M_z}{(M_3 \cdot f_c)}$$

F_x, F_y = radial and axial resultants of external forces (N)

M_1, M_2, M_3 = external moments (Nm)

C_0 = static load capacity (N)

M_x, M_y, M_z = maximum permissible moments in the different loading directions (Nm)

f_c = contact factor (see next page)

S_0 = safety factor

The safety factors

The safety factor S_0 can lie on the lower given limit if the forces can be determined with sufficient precision. If impacts and vibrations affect the system, overloads might occur, then the higher value should be selected.

Reduced safety results from simultaneously occurring forces and moments.

For more information please contact our technical department.

Operating conditions	S_0
Normal operation	1,0 ~ 1,5
Loading with vibration or shock effect	1,5 ~ 2,0
Loading with strong vibration or impacts	2,0 ≥ 3,5

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 below.

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

f_c = Contact factor

f_i = Application coefficient

f_t = Temperature factor

C = Dynamic load (N)

P = See below (N)

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 formula below.

$$P = |F_x| + |F_y| + \left(\frac{|M_x|}{M_x} + \frac{|M_y|}{M_y} + \frac{|M_z|}{M_z} \right) C_0$$

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

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.

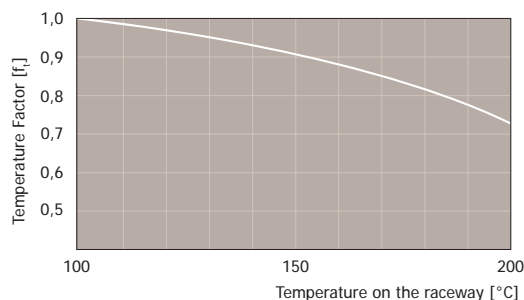
Operating conditions	Speed	f_i
Neither external impacts nor vibrations	Low speed $V \leq 15$ m/min.	1 - 1,5
Light impacts or vibrations	Average speed $V \leq 60$ m/min.	1,5 - 2
Average and high external impacts or vibration	High speed $V > 60$ m/min.	2 - 3,5

Temperature factor f_t

If the temperature affecting the system exceeds 100°C, the temperature factor f_t must be included in the service life calculation.

Note 1: For temperatures above 80°C, the seals and end caps must be designed for higher thermal resistance.

Note 2: Special processing to ensure the movement of the guides is required for temperatures above 120°C.



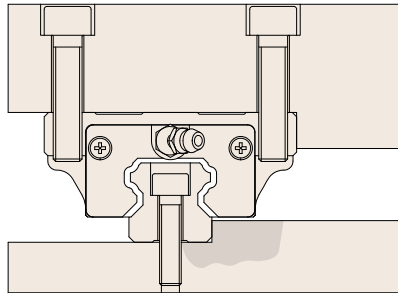


Installation examples

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

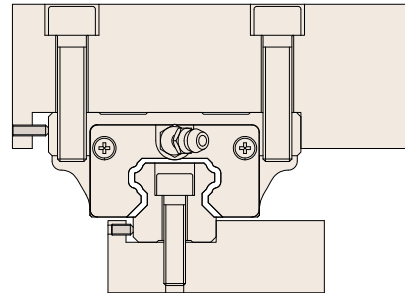
Example 1

Assembly of carriage and rail on shoulder edges



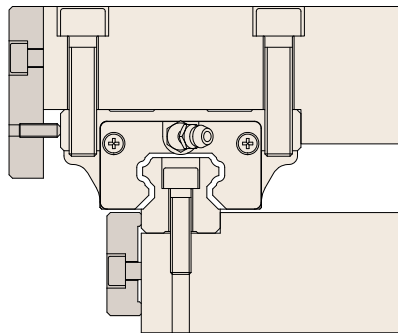
Example 2

Securing carriage and rail using set screws



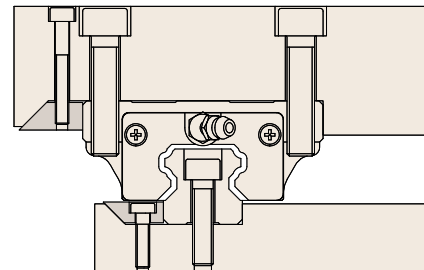
Example 3

Securing carriage and rail using pressure plates



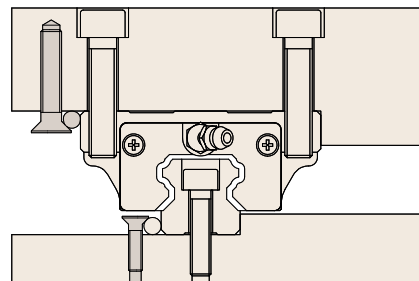
Example 4

Securing carriage and rail using taper gibs

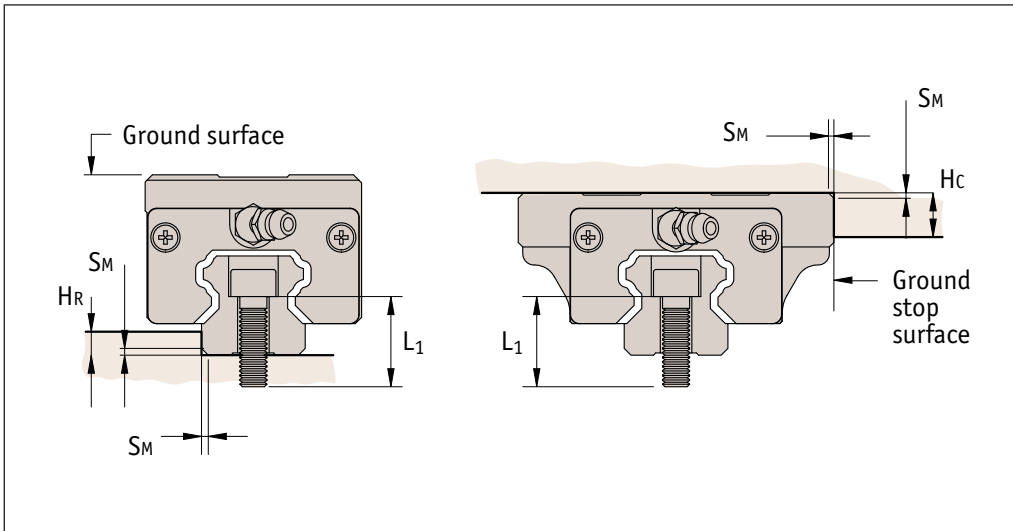


Example 5

Securing carriage and rail using bolts



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 guideways.



Size	SM	HR	Hc	L ₁
15	0,6	3,1	5	M4 x 16
20	0,9	4,3	6	M5 x 20
25	1,1	5,6	7	M6 x 25
30	1,4	6,8	8	M8 x 30
35	1,4	7,3	9	M8 x 30
45	1,6	8,7	11	M12 x 40
55	1,6	11,8	12	M14 x 45

Values in mm. HR* is the maximum height when using side seal on carriage.

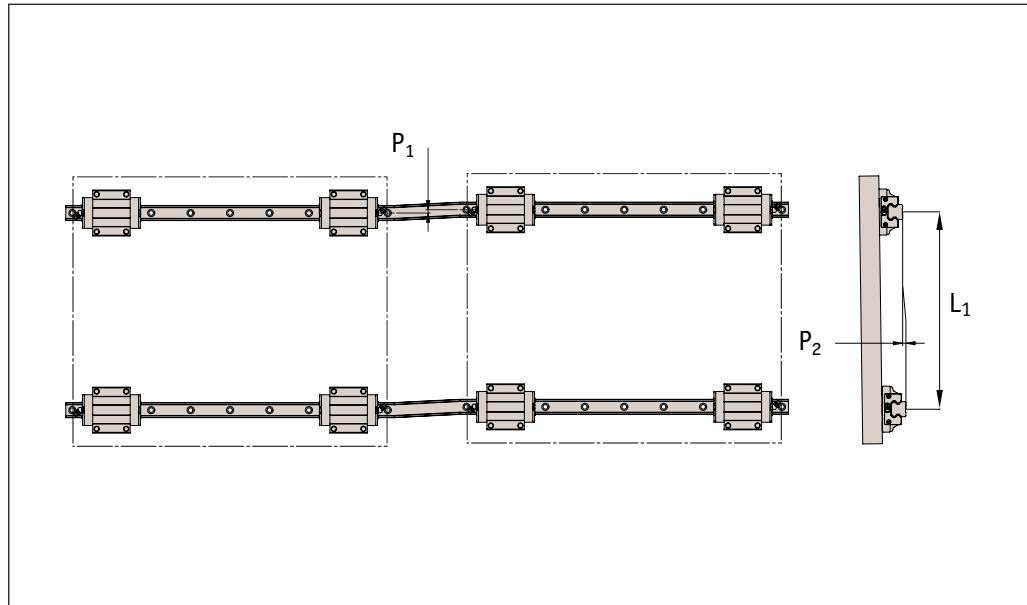
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Assembly precision

The maximum permissible deviations of the rail surfaces for assembly are given in the following drawing and the table below.

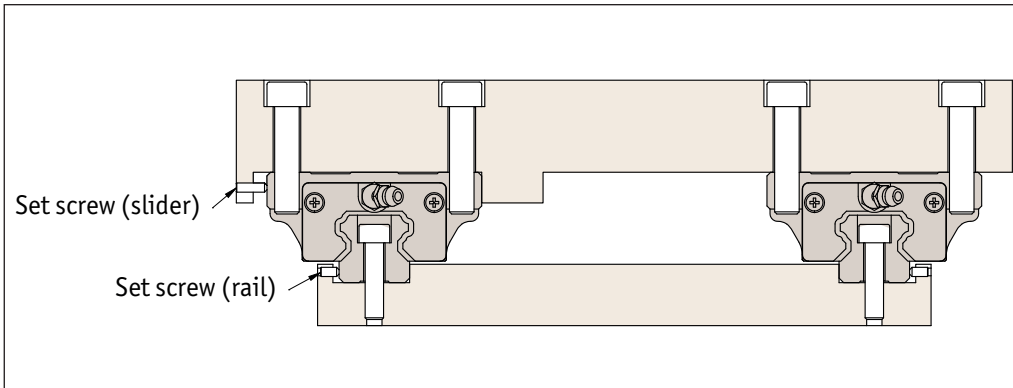


Size	Permissible tolerance for parallelism $P_1 \mu$		$P_2 = L_1 \times$ (calculation factor)		
	K_1	K_0	Calculator factor (x) $P_2 \mu$	K_1	K_0
15	18	25	0,17	0,26	
20	20	25	0,17	0,26	
25	22	30	0,17	0,26	
30	30	40	0,22	0,34	
35	35	50	0,30	0,42	
45	40	60	0,34	0,50	
55	50	70	0,42	0,60	

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

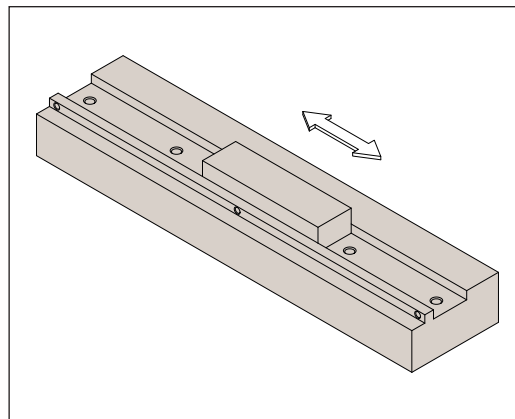
Bolt	Tightening torque M_t Nm	
	Steel 10,9	Steel 12,9
M 4	4,4	5,1
M 5	8,7	10
M 6	15	18
M 8	36	43
M12	125	145
M14	200	235

Assembly process



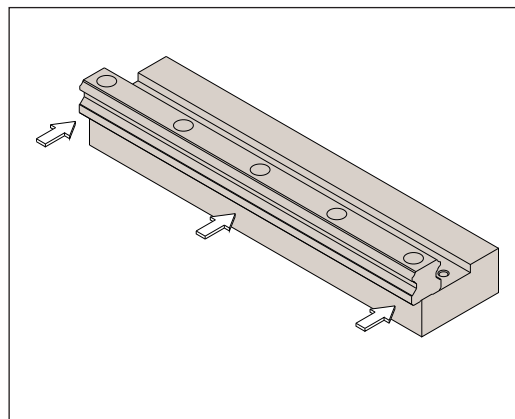
Fixing guide rails 1

Whet the assembly surface with a whetstone and also remove burrs, unevenness and dirt. Note: All linear guides are preserved with anti-corrosion 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.

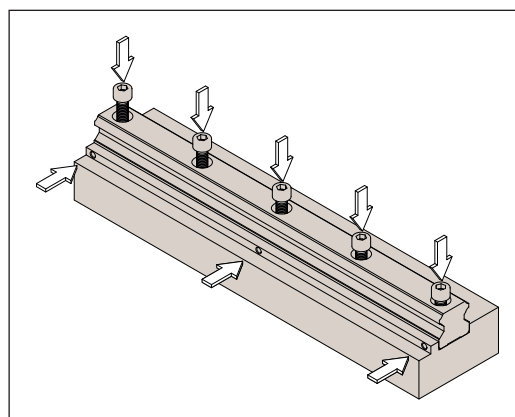


Fixing guide rails 2

Carefully lay the guide rail on the assembly surface 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). 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.



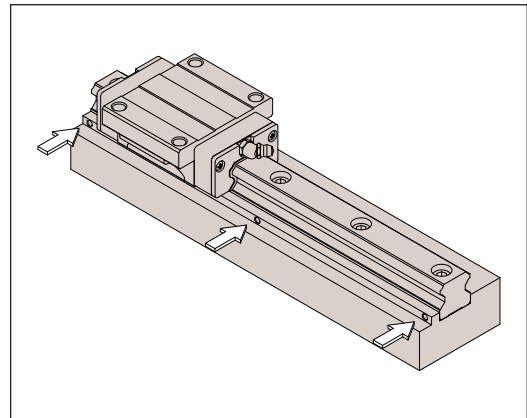
Fixing guide rails 2 continued





Fixing guide rails 3

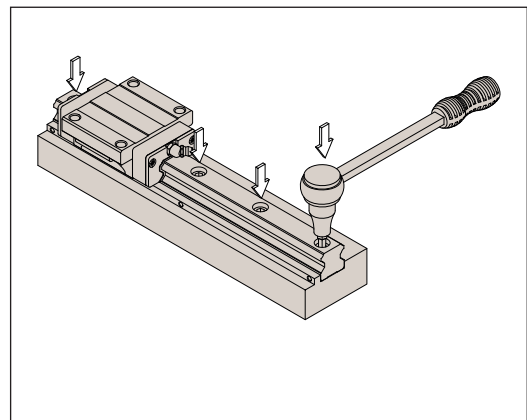
Tighten the thrust bolts on the guide rail until there is close contact on the side stop surface.



Fixing guide rails 4

Tighten the fixing screws with a torque wrench to the prescribed torque.

Note: For a high degree of accuracy, the fixing screws of the guide rail must be tightened in sequence outward from the centre.



Fixing guide rails 5

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

Table assembly 1

Set the table carefully on the carriage and tighten the fixing screws only lightly.

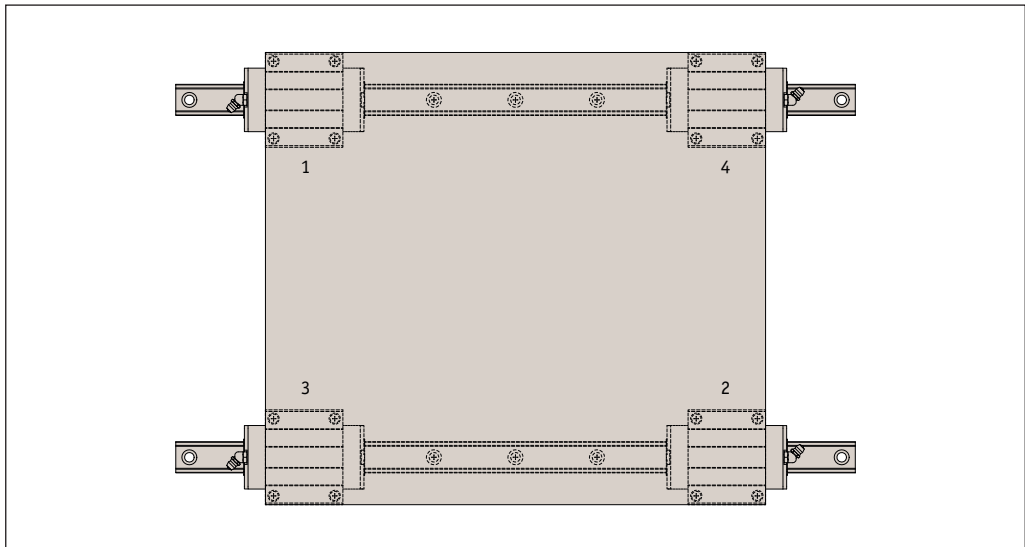
Table assembly 2

Press the carriage on the main guide side with the thrust bolts against the shoulder edge of the table and position the table.

Table assembly 3

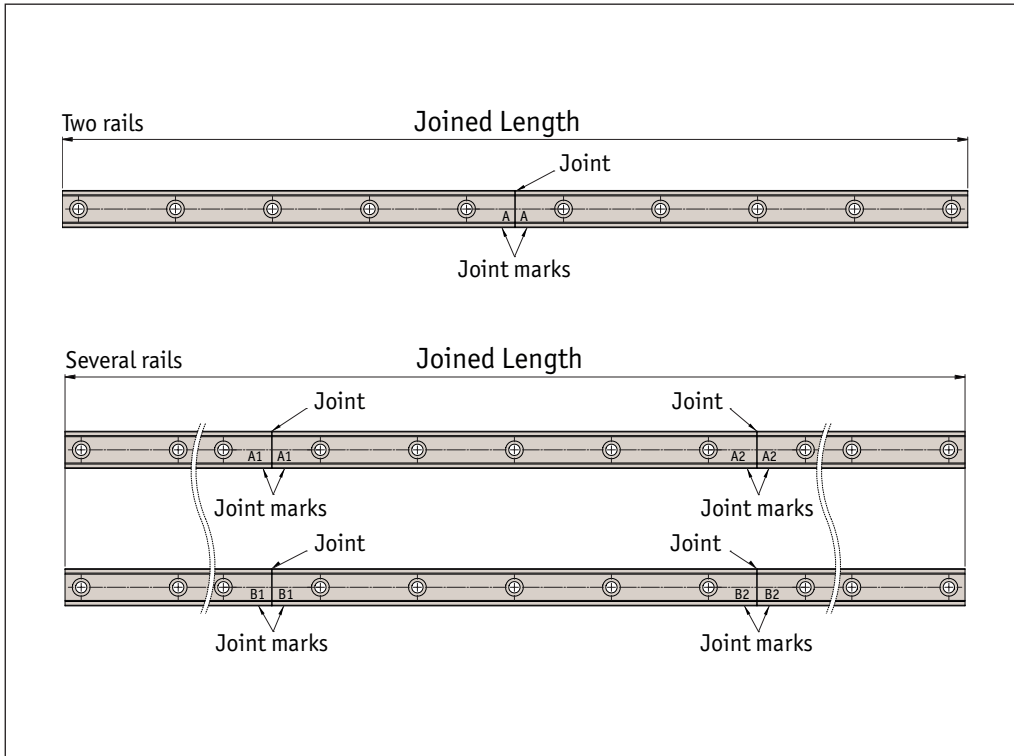
Tighten the fixing screws on the main side and the lateral side completely tight to finish the installation. Note: To attach the table uniformly, tighten the fixing screws diagonally (1, 2, 3, 4).

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



Joining rails

Guide rails longer than the one part maximum length are put together from two or more rails. When putting guide rails together, ensure the register marks are positioned correctly.



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