Installation Guidelines

Figure 1

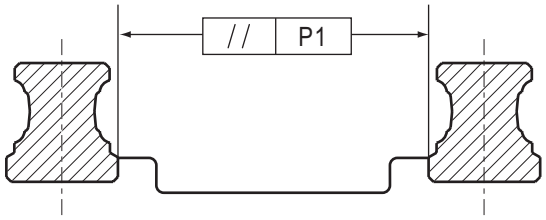

Table 1. Parallelism Between Multiple Rails, mm

		Preload		
Bearing Type	**Clearance**	**0,03 C†**	**0,08 C†**	**0,13 C†**
500 Series Ball Linear Guide				
15	.015	.010	.007	.003
20	.017	.012	.008	.004
25	.024	.016	.010	.005
30	.024	.016	.010	.005
35	.032	.021	.014	.008
45	.036	.024	.016	.009
500 Series Roller Linear Guide				
25	–	.016	.010	.005
35	–	.012	.014	.008
45	–	.024	.016	.009
55	–	.026	.017	.010
65	–	.028	.018	.011
AccuMini Linear Guide				
10	.009	.004	–	–
15	.011	.006	–	–
20	.013	.008	–	–
T-Series* Linear Guide				
15	.045	–	–	–
20	.045	–	–	–
25	.050	–	–	–
30	.055	–	–	–
35	.060	–	–	–
400 Series Ball Linear Guide				
15	.025	.018	–	–
20	.025	.020	–	–
25	.025	.020	–	–
30	.040	.030	–	–
35	.050	.035	–	–
45	.060	.040	–	–
55	.070	.050	–	–

† Where C = Dynamic Load Capacity

Surface Preparation
ProfileRail bearings are generally mounted to structures that are inherently stiffer than the rail. For this reason, the bearings tend to assume the orientation of the surfaces to which they are fastened, through bearing deflection. When a deflection is imposed upon a bearing, especially a preloaded one, resultant forces occur. These forces are transferred to the rolling elements and races, potentially resulting in an increase in system friction and a decrease in system resolution, precision and life.

Various sources can contribute to the overall error of the mounting surfaces. These include the surface flatness of the base surfaces, the location and parallelism of the reference surfaces, and the attendant errors of the bearing as described within the accuracy classes.

The surfaces that contact the base and reference edges may be milled, scraped, ground, or prepared by any other method that will produce a flat mounting surface free of inconsistencies, which would tend to distort or skew the bearing. A simple stone may be used to remove high spots. Dirt and debris should be cleaned off, as they could contribute to the inaccuracies.

Associated with preload is a slight potential concavity of the carriage top surface. The preload is established when all the carriage screws are affixed to a planar surface, flattening the carriage base. Deviations affecting the planarity of the carriage mounting surface could result in a preload change.

Mounting Tolerances
The tolerances found in Tables 1–3 are intended to provide an installation for which the associated derating is negligible. These specifications are based upon the assumption that the structures of the application are infinitely rigid and are of consideration for the bearing reactions only.

Rail Parallelism (See Figure 1)
A variation in the distance between the rails will induce a shear or side load on the bearings.

In order to minimize the effect of this shear load, tolerances for rail reference edge parallelism may be found in Table 1.

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Figure 2

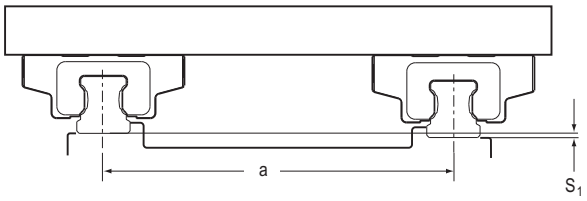

Table 2. Allowable Vertical Offsets Between Rails (S1/a), inch

	Preload			
Bearing Type	**Clearance**	**0.03 C†**	**0.08 C†**	**0.13 C†**
500 Series Ball	0.0006	0.0004	0,0003	0.0002
500 Series Roller	–	0.0007	0.0005	0.0004
AccuMini Linear Guide	0.0006	0.0004	–	–
T-Series Linear Guide	0.0020	–	–	–
400 Series 15, 20 & 25	0.0050	0.0030	–	–
400 Series 30	0.0060	0.0040	–	–
400 Series 35	0.0080	0.0050	–	–
400 Series 45	0.0090	0.0060	–	–
400 Series 55	0.0118	0.0080	–	–

†Where C = Dynamic Load Capacity

Figure 3

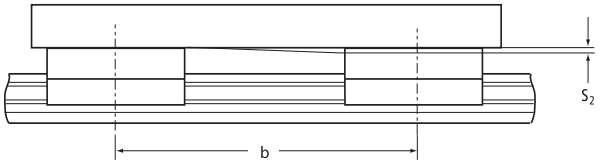

Figure 4

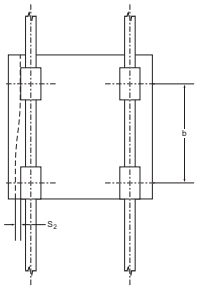

Table 3. Allowable Carriage Offsets (S2/b)

	Preload			
Bearing Type	**Clearance**	**0.03 C†**	**0.08 C†**	**0.13 C†**
500 Series (All)	0,00006	0,00005	0,00004	0,00003
400 Series 15 & 20	0.0009	0.0007	–	–
400 Series 25	0.0011	0.0008	–	–
400 Series 30	0.0015	0.0011	–	–
400 Series 35	0.0019	0.0013	–	–
400 Series 45	0.0023	0.0015	–	–
400 Series 55	0.0027	0.0017	–	–

†Where C=Dynamic Load Capacity

T-Series Linear Guide	0,00012

Rail Vertical Offset (See Figure 2)
A vertical offset of the rails across the axis will induce a roll moment onto the carriages.

To minimize the effect of this roll moment, tolerances for the vertical offset may be found in Table 2. This tolerance describes the attributes of the mounting surface, perpendicular to the rail axis.

Vertical Carriage Offset (See Figure 3)
A vertical offset between fore and aft carriages will induce a pitch moment on the bearings.

Lateral Carriage Offset (See Figure 4)
A lateral offset of the carriage reference edges will induce a yaw moment.

In order to minimize the effects of these pitch and yaw moments, tolerances may be found in Table 3. This tolerance describes the attributes of the mounting surface parallel to the rail axis, and the reference edge straightness.

NOTE: All mounting tolerances should be inclusive of the H and A3 tolerances. Thus, a lower accuracy class bearing may require a more accurate installation.

Mounting Hole Tolerances
The positional tolerance between the through holes in the rails is 0.5 mm.

The positional tolerance of the first rail mounting hole dimensioned from the datum end (called the "Y-dimension") is ±1.0 mm.

The overall rail length tolerance is ±2.0 mm.

The positional tolerance between the mounting holes in the carriages is 0.2 mm.

Reference Edge Specifications
The maximum shoulder heights and corner radii are listed in Table 4.

Installation Guidelines

Table 4. Shoulder heights and corner radii, mm

Guide Type	Rail		Carriage	
	h1 max	r1 max	h2	r2 max
500 Series Ball Linear Guide				
15	3.5	.8	3.5	.6
20	4	.9	4	.9
25	5	1.1	5	1.1
30	5.5	1.3	5.5	1.3
35	6	1.3	6	1.3
45	8	1.3	8	1.3
500 Series Roller Linear Guide				
25	5	.8	5	.8
35	6	.8	6	.8
45	8	.8	8	.8
55	10	1.2	10	1.2
65	10	1.5	10	1.5
AccuMini Linear Guide				
10	1.75	0.4	3.5	0.4
15	1.75	0.4	5	0.4
20	2	0.5	7	0.5
T-Series* Linear Guide				
15	3	.3	8	.2
20	3.9	0.4	10	0.3
25	5.5	0.5	12	0.4
30	5.9	0.7	14	0.5
35	5.9	0.8	15	0.6
400 Series Ball Linear Guide				
15	2.8	0.6	5	0.6
20	4.3	0.9	6	0.9
25	5.6	1.1	7	1.1
30	6.8	1.4	8	1.4
35	7.3	1.4	9	1.4
45	8.7	1.6	12	1.6
55	11.8	1.6	17	1.6

Table 5. Recommended Bolt Tightening Torque, Nm

Bolt Size	Class 8.8	Class 12.9
M2.5	0.7	1.2
M4	2.8	4.6
M5	5.7	9.5
M6	9.5	16
M8	23	39
M10	46	77
M12	80	135
M14	129	215
M16	198	330

Installation Procedure
Clean and inspect all mating surfaces for burrs, nicks, dirt, etc. A simple stone can be used to remove minor imperfections in the mounting surfaces.

Note: T-Series is not as sensitive to imperfections of the mounting surface.

Rail Mounting
1. Carefully place the rail on the mounting surface.

2. Insert screws into the mounting holes and tighten lightly.

3. Clamp the reference edge of the rail against a locating edge on the mounting surface.

   The locating edge can be a machined reference edge, a straight edge, a row of dowels or keys, or some other edge which the rail can be clamped against. It should be straight, either within the mounting tolerances shown in Table 3 or according to the application requirements, whichever is tighter.

4. Starting from the center of the rail moving outwards, tighten each screw to the recommended tightening torque in Table 5.

5. If parallel rails are to be used, one of the following methods may be employed to obtain the parallelism recommended in Table 1:
   a. two parallel locating edges
   b. a gage block or parallel between the rails
   c. the use of the top plate with the carriages mounted, to locate or "float" the second rail into place.

6. Repeat steps 1–4 to install the second rail.

7. Insert a rail plug into each counterbore in the rail. Carefully tap rail plugs into place using a soft material such as brass or wood. When properly installed, the rail plugs should be flush with the top surface of the rail. Do not countersink the rail plugs.

   Note: Rail plugs are available and are shipped with all rails except for the AccuMini Linear Guide size 10.

8. If desired, rail tape can then be applied to the top of the rail. For sizes 35 and below, the rail tape may be used without the rail plugs.

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Figure 5. Shoulder Heights and Corner Radii

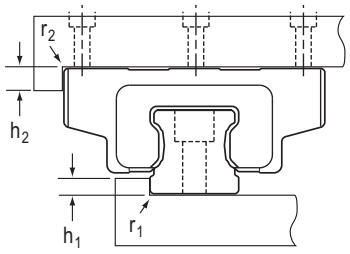


Figure 6. Butt jointed rails

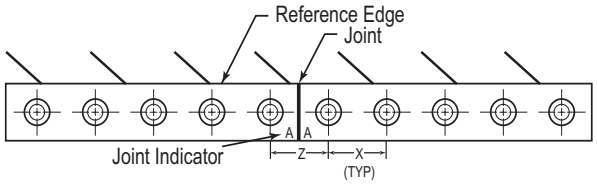
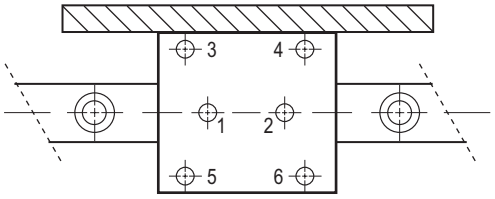


Figure 7. Recommended Tightening Sequence



Butt Joints

For rails longer than the longest length available in one piece, a butt joint is required. A butt joint is formed by butting the end of two matched rails together. The ends of rails to be butt jointed are specially machined and marked with same letter (A, B, C, etc.).

We strongly recommend the use of a locating edge when using butt jointed rails. This will ensure proper alignment of the raceways across the joint.

500 Series Ball, Roller and 400 Series linear guide rails, the mounting hole spacing across the joint, Z, will be equal to the standard mounting hole spacing, X.

Once mounted, a gap between the ends of the butt jointed rails of 0.5 mm or less is acceptable.

Carriage Mounting

1. Carefully place the table top on the carriages.

2. Insert the screws into the mounting holes and tighten lightly.

3. Clamp the reference edge of the carriages to locating edges under the top plate.

   Note: This is only required if the location of the center of the top plate is critical to the application, or if the top plate is being used to position a second rail parallel.

4. Tighten each screw to the recommended tightening torque in Table 5. For carriages with six mounting screws, the tightening sequence shown in Figure 7 is recommended.

5. Lubricate bearings.

   Note: Extreme care should be taken when mounting the carriages to the rails. Forcing a carriage onto a rail can knock out rolling elements and/or damage the carriage and rail.

   For large side forces, hard mounting is recommended to resist any translation. Some methods for hard mounting are the use of tapered gibs, retaining plates, or set screws in combination with machined reference edges. Other methods include the use of an epoxy/replicating material, dowels, and keys. Upon request, carriages and rails can be special machined to accommodate dowels or keys. Consult the factory for details.