Linear slides
Structure

All linear slides consist of an outer rail with a runner moving inside. Anti-friction bearings, kept at a distance and in position by means of a ball cage, lie between the rail and the runner.

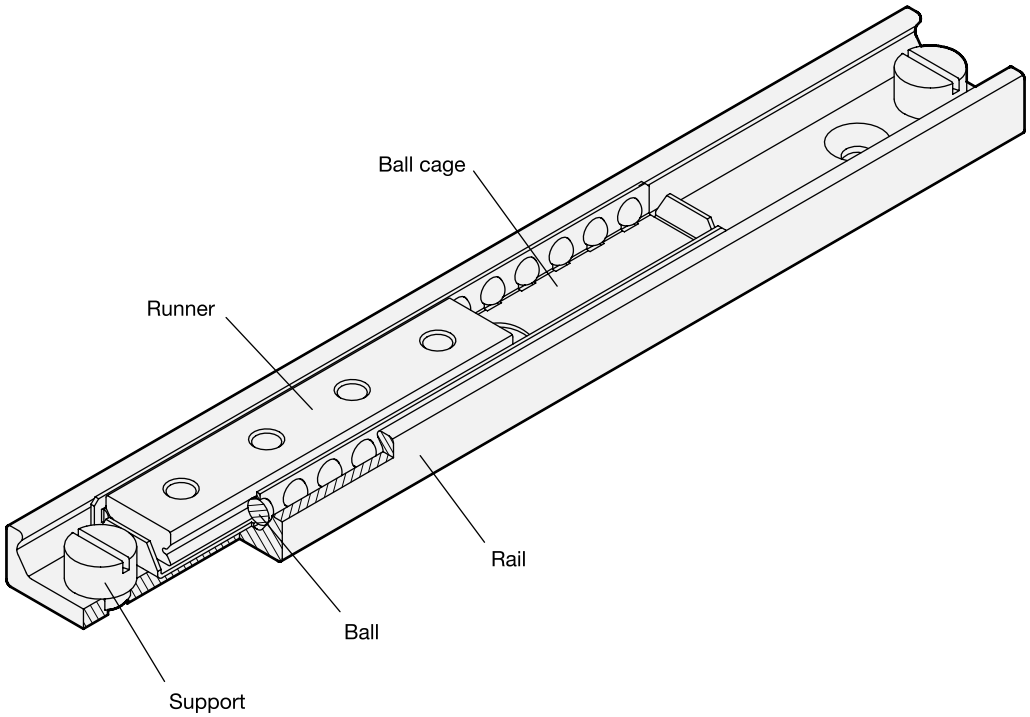
Rail and runner are made of heat treatable steel, enabling their use in industrial environments with higher requirements in terms of load rating, quiet operation and useful service life.

All designs are available in the nominal rail dimensions h_1 = 28, 35 and 43 mm and may also be supplied beyond the standard range in lengths from 130 mm to 1970 mm, appropriate for individual requirements.

Linear slides are normally adjusted so that a clearance-free (i.e. moderately pre-stressed) match-up is created between rail and runner. The raceways of the rails and runners are induction hardened, which combined with the antifriction bearings results in lower wear and longer service life. Linear slides are permanently lubricated with a high-grade special grease designed for linear guide rail systems.

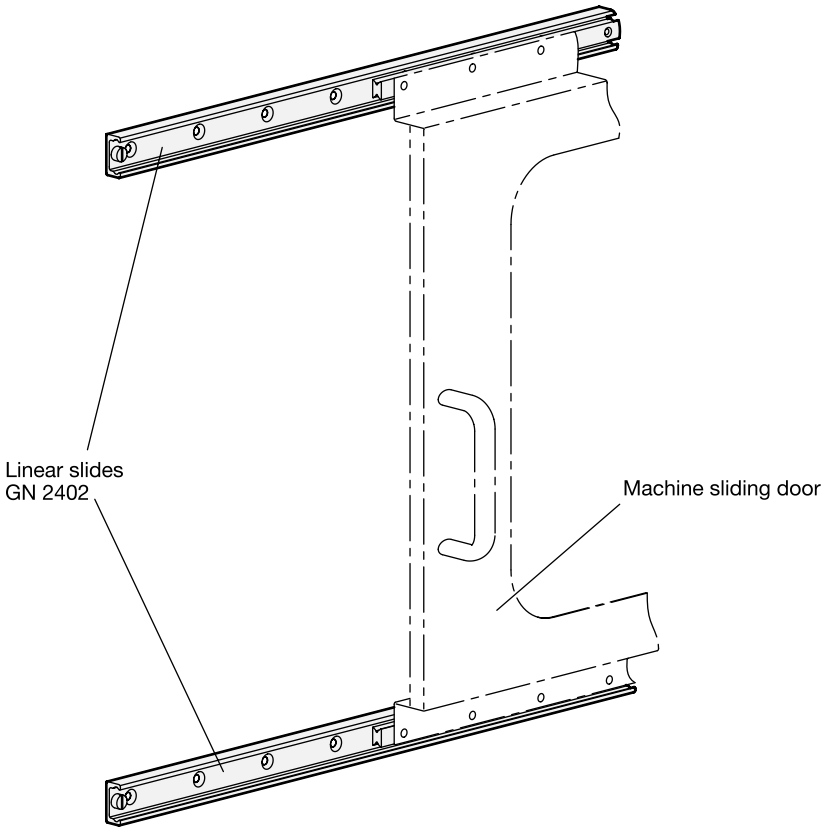
Depending on requirements, a variety of different types are available. Sliding distances of the runners are inside, partly outside or entirely outside the length of the rails. Fully extendable telescopic linear slides consist of linear slides directly interconnected at the rails, the runners or with the help of an intermediate profile.

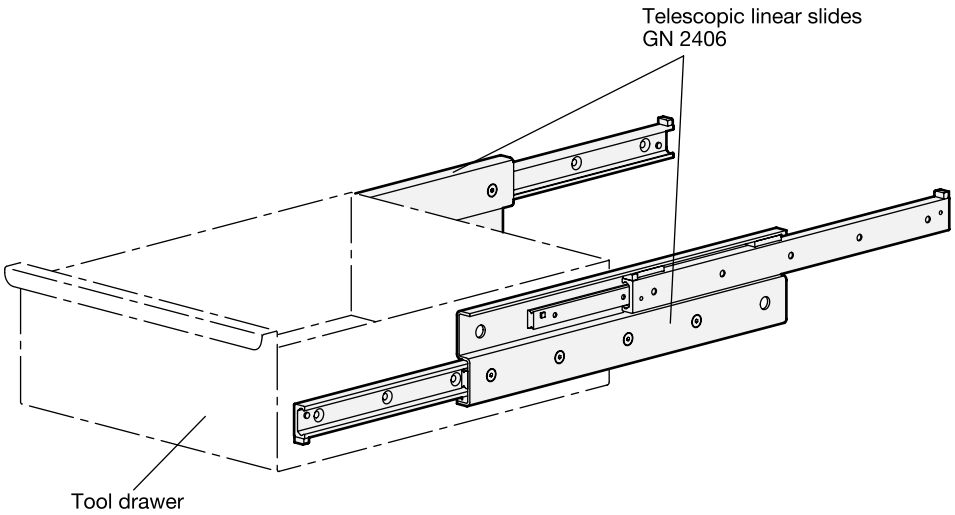
To mount linear slides, countersinks in the rails and, depending on type of construction, threaded or countersunk holes in the runners are available. The compact style is generally advantageous for use in tight spaces.



Linear slides / Telescopic linear slides

Assembly examples



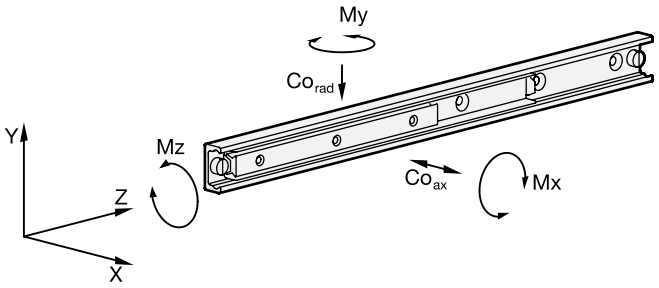


Load rating of telescopic linear slides

in ascending order of the standard numbers

When selecting a suitable linear slide, it is primarily the available space, the desired stroke and the load carried which must be taken into consideration. The values listed below are intended as guidelines for selecting the most suitable nominal rail size.

The details on load rating are non-binding guide values given without liability and does not constitute any type of guarantee or warranty of its intended use. The user must determine in each individual case whether a product is suitable for the intended application. Environmental factors and aging may affect the stated values.



Static load rating

Description	Load ratings		Permissible load torques		
	Co rad in N	Co ax in N	Mx in Nm	My in Nm	Mz in Nm
GN 2402 -28- 60-...	3580	2500	37	25	18
-28- 80-...	4780	3345	65	45	23
-28-130-...	7765	5435	166	117	38
-28-210-...	12545	8780	430	300	62
-35-130-...	9980	6985	219	156	50
-35-210-...	16125	11290	560	397	87
-35-290-...	22270	15590	1085	745	109
-43-210-...	23140	16200	790	552	157
-43-370-...	40775	28540	2445	1710	275
GN 2404 -28-130	645	452	30	23	17
-28-210	1165	816	86	60	27
-28-290	2015	1410	190	135	41
-28-370	2540	1780	309	215	52
-28-450	3065	2145	540	316	64
-28-530	3595	2515	625	435	74
-35-290	2100	1470	218	155	56
-35-370	2685	1880	348	247	69
-35-450	3270	2285	515	365	80
-35-530	4350	3045	787	553	101
-35-610	4930	3450	1025	722	113
-35-690	5510	3860	1295	914	125
-43-370	3540	2480	444	313	119
-43-450	4905	3435	735	514	151
-43-530	6305	4415	1090	766	184
-43-610	7725	5410	1525	1065	210
-43-690	8185	5730	1850	1295	240
-43-770	9490	6530	2405	1685	273

Load rating of telescopic linear slides

in ascending order of the standard numbers

Description	Load ratings
	$C_{0\,rad}$ in N
GN 2406 -28- 290-E	587
-28- 370-E	793
-28- 450-E	999
-28- 530-E	1205
-28- 610-E	1510
-35- 450-E	1265
-35- 530-E	1700
-35- 690-E	2150
-35- 850-E	2830
-43- 530-E	2140
-43- 690-E	2885
-43- 850-E	4010
-43-1010-E	4755
-43-1490-E	3820

Description	Load ratings
	$C_{0\,rad}$ in N
GN 2408 -28-210-...	447
-28-370-...	1000
-28-450-...	1205
-28-530-...	1140
-35-370-...	1035
-35-450-...	1265
-35-530-...	1705
-35-610-...	1930
-43-450-...	1890
-43-610-...	3035
-43-770-...	3145
-43-930-...	2580

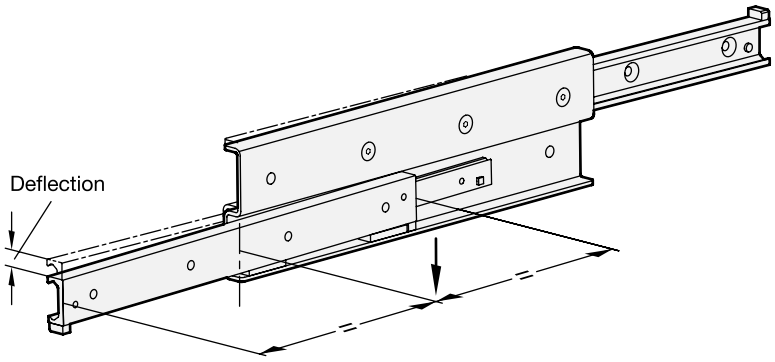
Description	Load ratings
	$C_{0\,rad}$ in N
GN 2410 -28-210	444
-28-370	496
-28-450	405
-28-530	342
-35-370	534
-35-450	439
-35-530	403
-35-610	346
-43-450	1370
-43-610	1115
-43-770	870
-43-930	714

No details on the permissible load torques are given for the telescopic linear slides as these are normally used for paired applications. Loads of these dimensions occur to a minor degree because it may be assumed that the surrounding construction has sufficient rigidity and stiffness. Transferring load torques within certain limited is permitted.

Static load and deflection

The load values given in the tables refer to a maximum permissible force allowed to act in the middle of the fully extended profile rail at the third segment.

If the given values are observed and if the telescopic linear slide is fully extended, a minor deflection (sag) occurs at the end of the runner or of the rail. This has normally no detrimental effect on the proper function of the application. If required, guide values may be given if requested.



Mounting screws, assignment of the mounting holes

The standard mounting hardware is DIN 7991-10.9 countersunk head screws, to be mounted with the recommended tightening torque. Depending on type, not all mounting holes may be utilized. In general, these holes can be left unused. In exceptional cases, especially in bilateral stroke, mounting holes can be accessed by loosening the support screws and by pulling out the runner. The support screws are then put back in place.

Travel speed, cage slip

The traversal speed in linear slides can be as much as 0.8 m/s. The particular application and the installation length can have an effect on this value. In the event of rapid changes of direction and high accelerating forces, cage slip may occur in some cases, especially in long ball cages. In cases such as these, the cage does not move synchronously with half the speed of the runner, but gradually loses its correct position owing to the slip. Whenever possible, running a blank stroke to the end of the traversal distance should be provided for back positioning.

Linear guide rail systems

Structure

Linear guide rail systems allow the reliable and economical linear movement of hardware modules. Their outstanding attributes are low-maintenance operation, long service life and quiet running. These are attributes which make roller guide systems indispensable components for efficient and safe movement of devices, and meet the needs of facilities with low energy requirements.

The product range includes all components necessary for constructing linear guide rail systems that are compact and easy to assemble and install. All inear guide rail systems consist of one outer rail with rollers or roller carriages moving inside the rail.

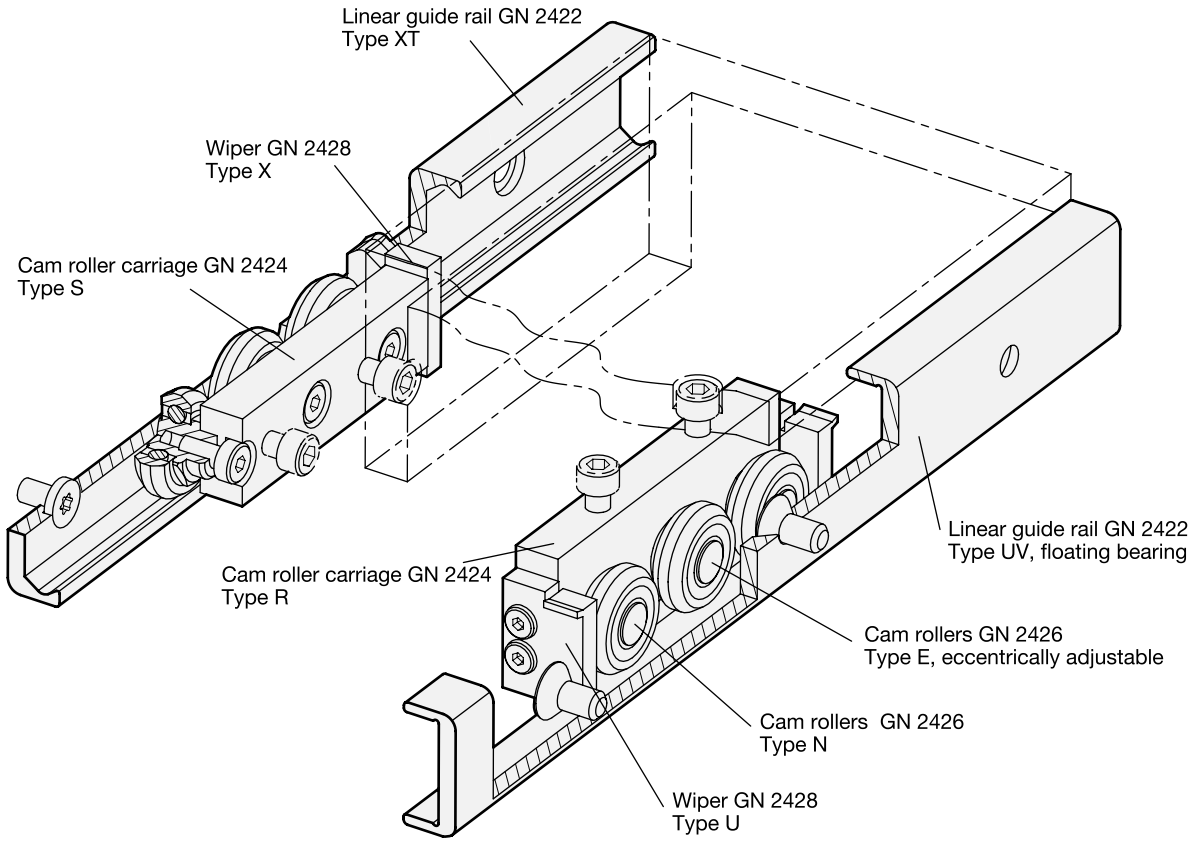
Rails are the foundations for linear guide rail systems. They can be constructed as fixed or floating bearing versions, with the fixed bearing type guiding the rollers running inside the rail on two levels, while the floating bearing type does so only on one level. By combining both versions, any misalignments or parallelism errors in the connected construction can be corrected. Complex preliminary work caused by the precision machining of surrounding parts can thus be kept to a minimum. Both rail versions can be mounted in one of two ways: cylindrical countersunk holes, or 90° conical holes for self-centering.

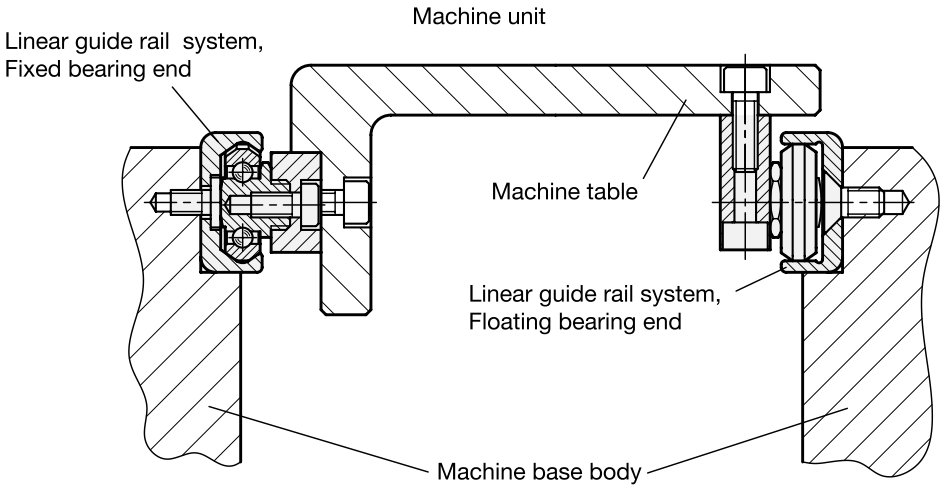
Cam roller carriages are available in 3 different types of designs, differing by their radial or axial assembly arrangement, their material, and their degree of sealing. All cam roller carriages consist of 3 rollers, with the middle one always supplied with an eccentrically adjustable bearing pivot for determining the initial tension or the clearance/play inside the rail. Depending on the rail version, a wiper is mounted on either end of the roller carriage.

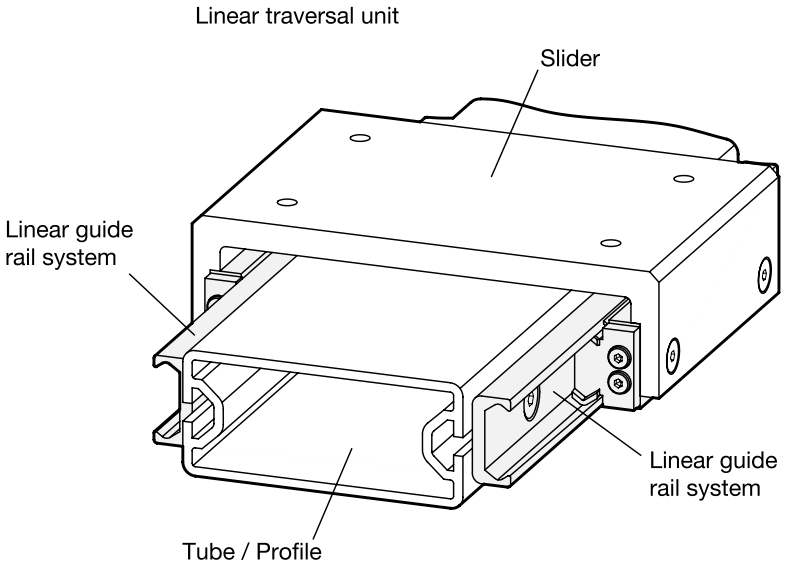
Cam rollers are similar in structure to deep-groove ball bearings, with a non-detachable bearing pivot used as mounting point.

For special applications, cam rollers and wipers can also be supplied separately from the cam roller carriages under separate standards.

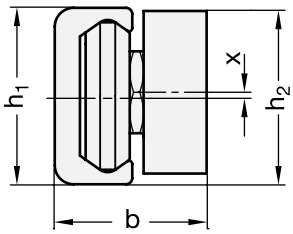
All design variants are available in the nominal rail dimensions h_1 = 18, 28, 35 and 43 mm. Beyond the standard range, they can also be supplied in lengths of up to 3600 mm in one piece, or as combined rails for individual and customized requirements.







Tolerance for mounted linear guide rail systems



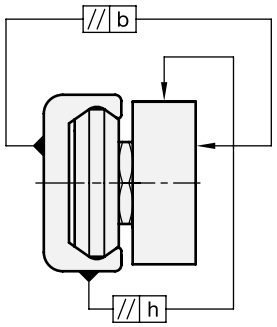
In the combination of rails GN 2422 and cam roller carriages GN 2424, the following dimensions / tolerances exist.

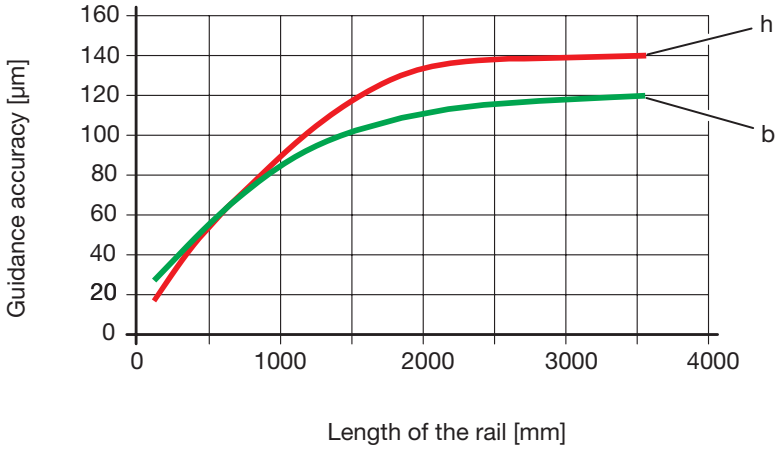
If several cam roller carriages are installed into one rail, an offset x can occur between the cam roller carriages which must be added to the dimension h_2.

h_1	b	h_2	x
18 +0.25/-0.10	+0.15/-0.16	+0.25/-0.25	±0.20
28 +0.25/-0.10	+0.25/-0.10	+0.15/-0.35	±0.20
35 +0.35/-0.10	+0.25/-0.10	+0.10/-0.30	±0.20
43 +0.36/-0.10	+0.25/-0.10	+0.20/-0.35	±0.20

Guidance accuracy

Linear guide rail systems feature the linear guidance accuracy shown in the diagram.





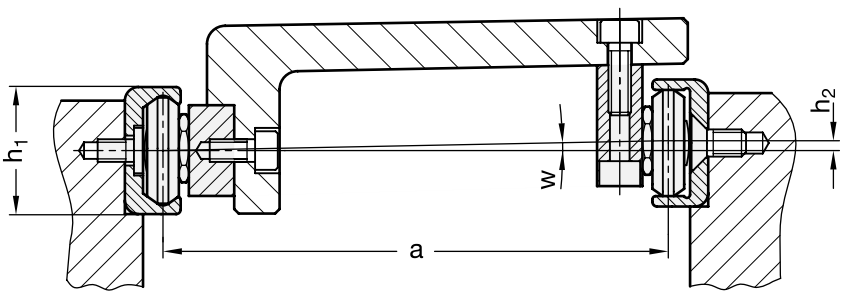
Permissible height offset

The fixed and floating bearing principle ensures that misalignments in the base construction are compensated. However, when using Type UV / UT and XV / XT rails, certain limits should not be exceeded. The following table shows the maximum permissible angle of the height offset of the fixed and floating bearing rails. Please note that the load rating must be reduced by 30% once the specified value is reached.

To calculate h_2, the following equation should be used: $h_2 = a \times \tan w$, with the tabular values shown below used for w.

Example: $h_1 = 43$, a = 650 mm, w max. = 0.171°

h_2 = 650 mm x tan 0.171° = 1.94 mm

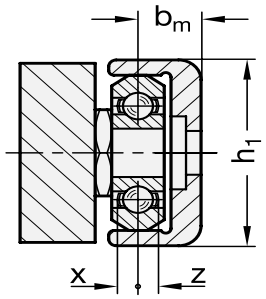


h_1	w max.
18	0.057°
28	0.143°
35	0.151°
43	0.171°

Permissible lateral offset

It is possible to compensate for angular defects and the offset of the mounting surface with the help of fixed and floating bearing rails. The permissible offset of cam rollers and cam roller carriages in the Type UT / UV rails is given by the values for x and z. The reference is the nominal middle of the raceway b m.

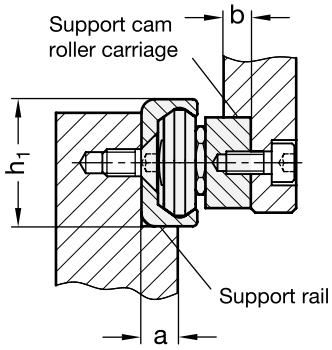
A parallelism or angular error can thus be compensated for across the whole length of the rail, which corresponds to an offset from the sum of the values for x and z.



h1	b m	x	z
18	6.3	1.1	0.3
28	8.6	1.3	0.7
35	10.5	2.7	1.3
43	14.5	2.5	1.5

Support widths

To guarantee the proper running motion, outside dimensions must be observed during the assembly of cam roller linear guide rail systems. Suitable components include supports at the rail and at the roller carriage which should not be smaller than the widths a or b. Also, forces acting from the outside can thus be transferred reliably from the linear guide rail system without submitting the mounting screw to shear stress.

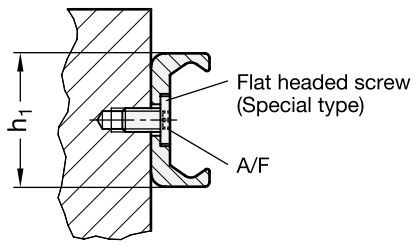


h1	a	b
18	5	4
28	8	4
35	11	5
43	14	5

Tightening torque

When positioning the rails with countersunk mounting holes, Type UT and XT, make sure the surface is flat and the mating tapped holes are tapped deep enough so the flat head screw is flush with the rail.

The specified tightening torque of the flat head screws must be maintained.



h1	Screw	A/F Drive	Tightening torque
18	M 4 x 8	T20	3 Nm
28	M 5 x 10	T25	9 Nm
35	M 6 x 12	T30	14 Nm
43	M 8 x 16	T40	24 Nm

Traversal speed

Depending on application and installation length, the maximum traversal speed of cam roller linear guide rail systems is 7 m/s.

Lubrication

Once the cam roller carriage has been placed in the rail, it is recommended to slightly grease the raceway surfaces of the rail with a heavy duty lubricant for linear guide rail systems, such as Klüberplex BE 31-222, using a brush.

Check the lubricant film at regular intervals for any dirt or pollution, e.g. with metal chips.

In the event of visble pollution or clear discoloration of the lubricant, use a clean rag to clean the rails and the rollers and apply new lubricant.

Applying new lubricant is normally necessary once a year or after 100 km of running distance.

Operational temperatures

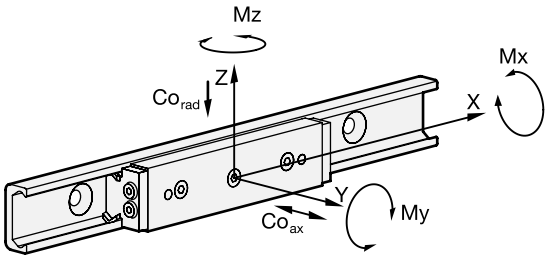
The components of the roller guide systems are suitable for use in a temperature range of -30 °C to 130 °C.

Load rating

The installation space, the desired mode of attachment and the load to be carried are the determining factors when selecting the best possible roller guide system. The values given below will help in selecting the most suitable cam roller carriage or the most suitable cam rollers.

The details on load capacity are non-binding guide values given without liability and does not constitute any type of guarantee or warranty of intended use. The user must determine in each individual case whether a product is suitable for the intended application. Environmental factors and aging may affect the stated values.

Description		Load ratings in main load direction		Permissible load torques		
		Co rad in N	**Co ax** in N	**Mx** in Nm	**My** in Nm	**Mz** in Nm
GN 2424	-18-...	825	260	1.6	8.3	4.8
	-28-...	2210	650	6.4	28	16.4
	-35-...	3550	1070	13.2	63	34.1
	-43-...	5520	1580	23.7	104.7	60.1
GN 2426	-18-...	410	-	-	-	-
	-28-...	1100	-	-	-	-
	-35-...	1760	-	-	-	-
	-43-...	2700	-	-	-	-



Cam roller carriages

Instructions for installation - Linear guide rail systems

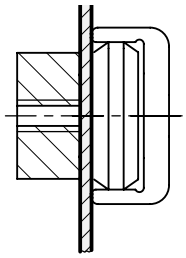
Linear guide rail systems consist of a cam roller linear guide rail GN 2422 and a cam roller carriage GN 2424. All components are packed separately and supplied not assembled. When delivered, the play between cam roller carriage and rail is not preset.

During assembly, set the cam roller carriage as follows:

1. Make sure that the raceways and the cam rollers are clean.

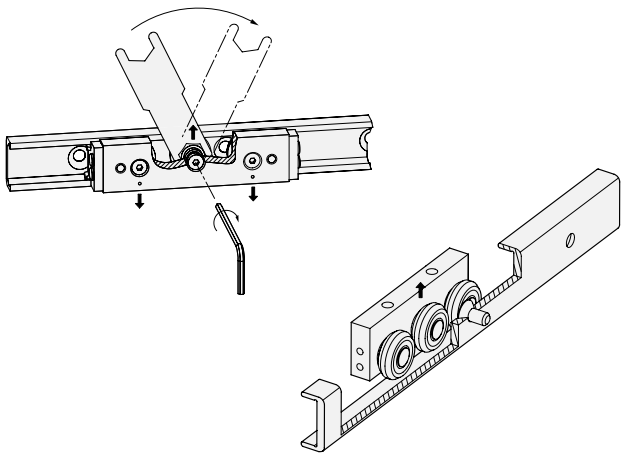
2. Slightly loosen the mounting screw of the central, eccentrically adjustable roller and insert the cam roller carriage (without the wipers supplied) into the rail (see also items 4 and 6).

3. Position the cam roller carriage at one end of the rail. For the floating bearing rails of Type UT and UV, a thin and stable support (e.g. open-end wrench or a feeler gauge) must be placed underneath the ends of the cam roller carriage body and the rail to ensure the parallel alignment of the cam roller carriage in the level raceways.



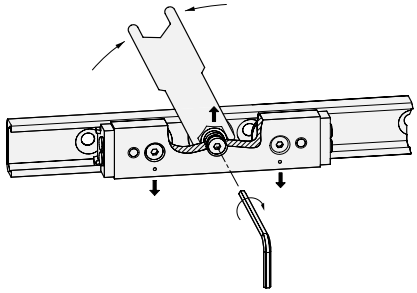
Use support for floating bearing rails!

4. Insert the open-end wrench GN 2424.1 (included) between the eccentric cam roller and the cam roller carriage body. (The centering bores to the left and right mark the position of the running side of the concentric cam rollers / load-bearing cam rollers.)



5. Turning the open-end wrench clockwise will press the cam roller to be adjusted against the top raceway which will set the roller carriage free of play. Excessive pre-tensioning must be avoided because this will increase friction and reduce useful service life.

6. While using the open-end wrench to hold the bearing pivot in the correct position, the mounting screw may be moderately tightened. The correct tightening torque will be checked later.



7. Move the cam roller carriage in the rail and make sure that the play / the moderate pre-tensioning is constant along the full length of the rail. The running motion should be free-moving, with the cam roller carriage having any play or jamming at no point inside the rail.

8. Now tighten the mounting screw with the recommended tightening torque shown in the table, with the open-end wrench holding the angular position of the cam rollers in place.

h_1	Tightening torque
18	3 Nm
28	7 Nm
35	7 Nm
43	12 Nm

9. Now mount the wipers, and for cam rollers carriage Type N, the longitudinal seal. To do so, remove the cam roller carriage from the rail.

10. Before reinserting the cam roller carriage, make sure that the raceways / rollers are properly lubricated using a heavy duty lubricant for linear guidance.