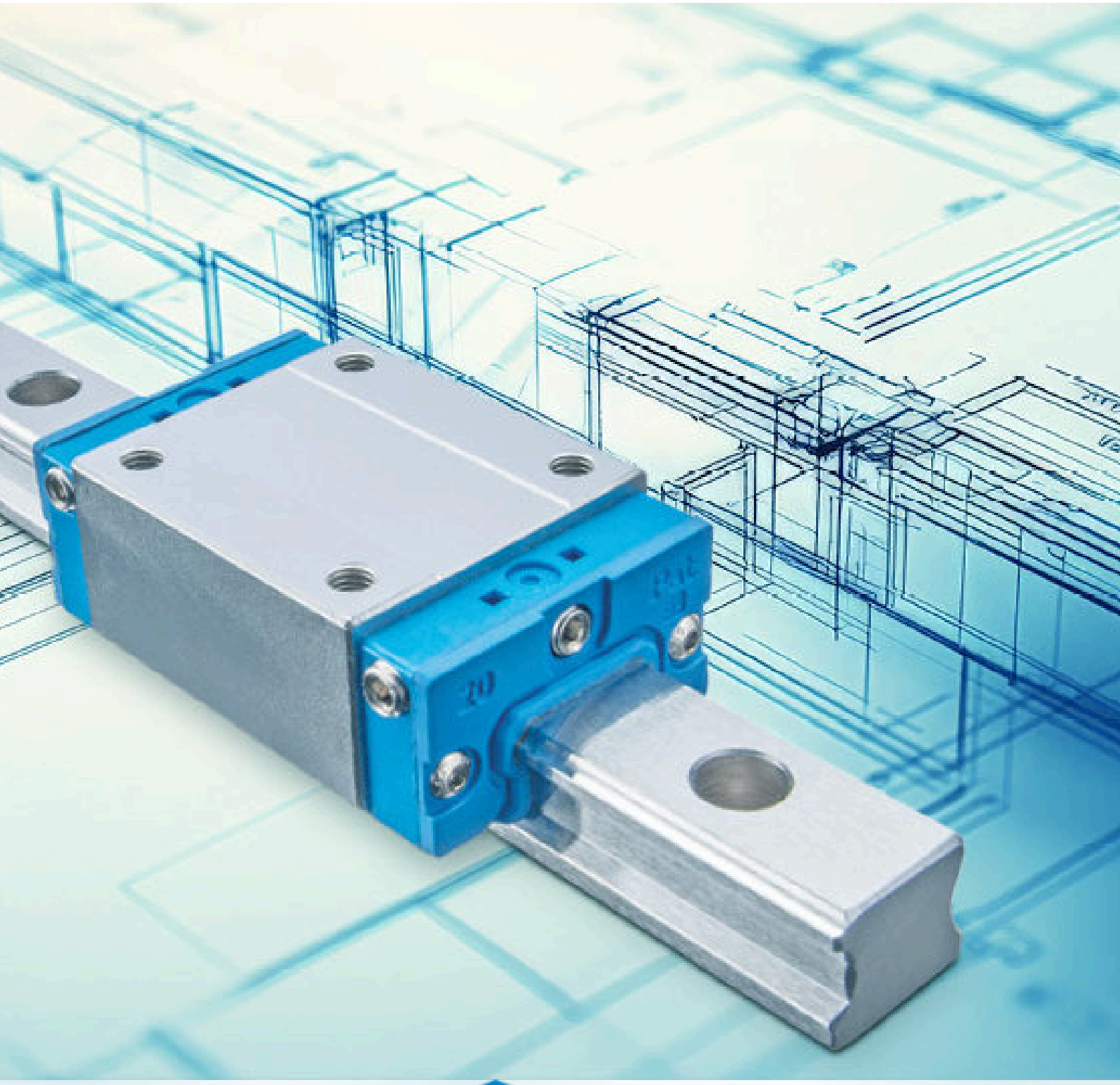
NTN

ALL ABOUT LINEAR MOTION



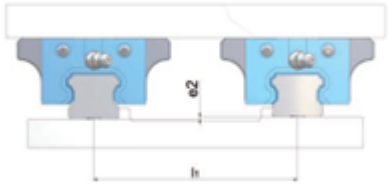
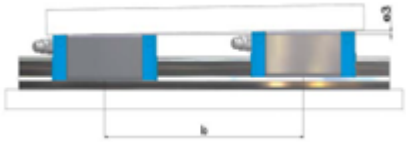
linearwizard.com

Assembly of linear guides

Are you planning to install a linear guide for the first time and don't yet have a clear overview of the process? Or have you already looked over someone's shoulder during assembly and want to make sure you know how the process works? This article focusses on the assembly and design of the mounting surfaces of linear guides – and of course, assembly instructions are also included!

Tolerances

A distinction is made between three assembly tolerances: the parallelism tolerance e1, the height tolerance between two rails e2 and the height tolerance in the rail direction e3. These are dependent on various criteria, which are listed in more detail in the table. Incidentally, linear guides with rolling elements in a DF arrangement offer more mounting tolerances than those with rolling elements in a DB arrangement„ as the former allow more deformation.

Montagetoleranz	depending on	Picture
Parallelism tolerance e1	• Size • Preload class	
Height tolerance between two rails e2	• Size • Preload class • Rail distance	
Height tolerance in rail direction e3	• Size • Carriage length • Preload class • Carriage distance	

All three assembly tolerances depend on the size and preload class, with e2 and e3 there are additional factors.

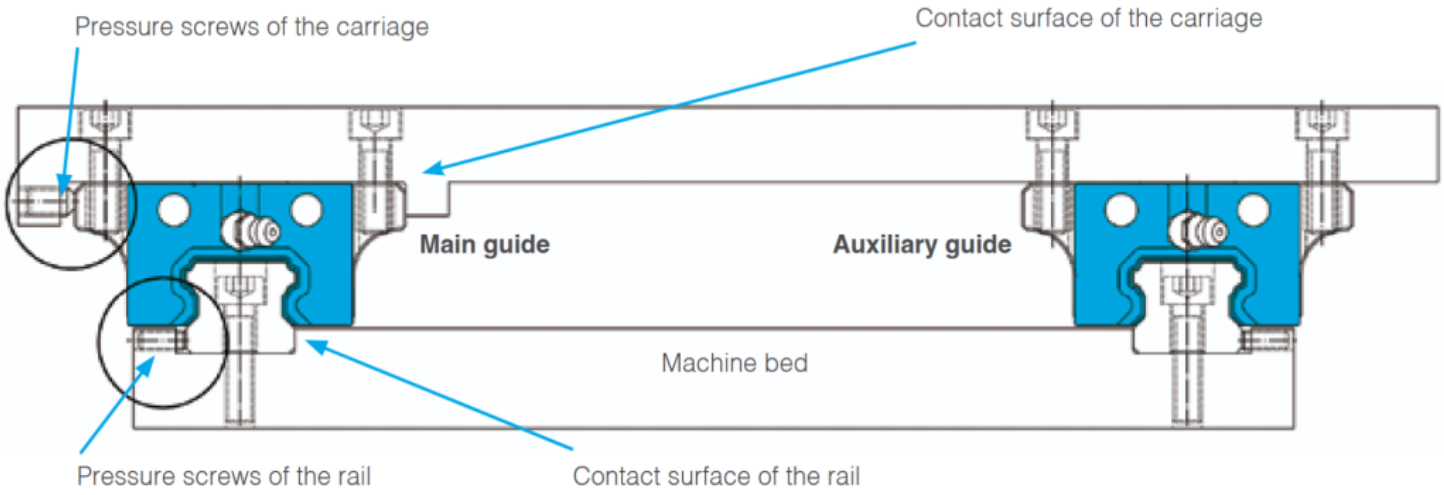
Marking of linear guides

SNR linear guides have two sides, one of which has important markings for identification purposes. The type designation and traceability code are indicated on this side, while the second side, the reference side,

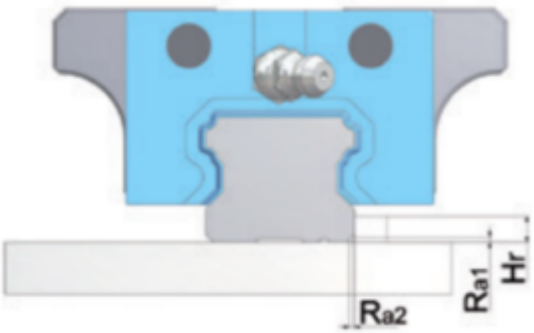
has a ground surface.
Rails have one or two grooves on the bottom; if there is one groove, this is the reference side; if there are two grooves, the side with the narrow groove is the reference side.
For asymmetrical rails, there are different definitions with regard to the position of the bore pattern depending on the rail arrangement. Jointed rails are labelled at the rail ends with “J”. During installation, it is particularly important to ensure that the rails run smoothly over the rail joint. As the tolerances of these rails are matched at the rail joints, the clear markings of the rail segments with “J” must always be observed in order to avoid confusion. All rail segments labelled with “J” can be combined as required. There is no fixed sequence for the segments.

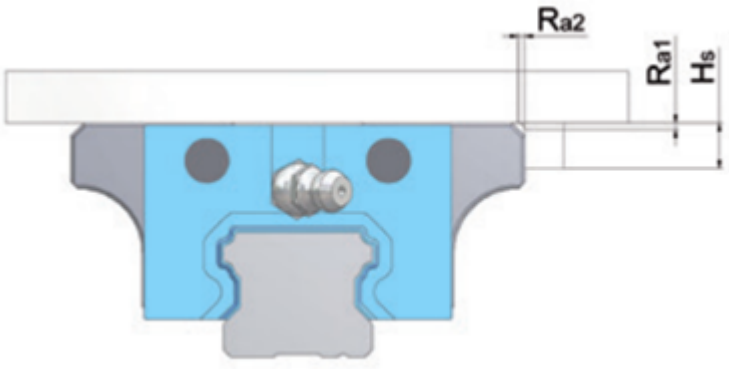
What needs to be considered when designing the mounting surfaces?

Linear guides are most commonly installed with two rails arranged in parallel; one or more carriages are mounted on each rail. In the picture, the rails are mounted next to each other on a flat surface such as a machine bed. The table is fixed to the carriages.



This example illustrates the assembly when using two linear guide systems arranged in parallel.
When a mounting surface is manufactured, a certain radius must be maintained. The contact edges must not exceed or undercut the connection geometries specified by the manufacturer: These dimensions have to be always taken into account so that the carriage does not touch down (jam) but still has a sufficiently large contact area. The primary function of the contact edges is to position the linear guide system precisely during assembly. The fact that assembly is generally simplified by using the contact edges should also be emphasized positively. For assembly, information is required regarding the height of the contact edge Hr for the rail and the height of the contact edge Hs for the carriage (shown in the images). Both are important dimensions to ensure a form-fit connection on the carriage and rail. In addition to the contact edges Hr and Hs, the values of the edge radii Ra1 and Ra2 are also important.





These illustrations show you the important dimensions for the connecting structure.
The specific assembly tolerances can be found in the manufacturer's catalogues, for example here. These depend on the respective manufacturer and are therefore individual. The above-mentioned contact surfaces must always be adhered to in accordance with the manufacturer's specifications in order to ensure homogeneous, smooth running, prevent impermissible deformation of the carriages and not reduce the service life. In addition, the straightness and evenness of the mounting surfaces is essential for many applications, such as machine tools, due to clear precision requirements.

Example of an assembly sequence

Suitable tools and aids must be used for the installation of linear guides. Certain instructions from the manufacturer must be observed: Screws of strength classes 10.9 or 12.9 must be used for the installation of linear guides. All screws must be tightened to the specified torque. Before starting assembly, preservatives must be removed from the mounting surfaces and linear guides. Temperature differences between the components to be assembled must be avoided. In order to protect against corrosion, it is recommended that clean gloves are worn – a direct contact with the linear guide should be avoided due to the transfer of salts through sweaty hands. Last but not least, components should only be removed from the packaging at the assembly site to prevent possible contamination of the components. The assembly area must also be free of dust and dirt, as the smallest particles in the µ range can cause significant damage to the linear guide if they get into the interior of the carriages. Assembly takes place in the order listed:

Assembly instructions
1) Preparation and cleaning of the mounting surface
2) Aligning the main rail
3) Pre-assembly of the rail
4) Positioning the rail (tightening the guide screws)
5) Fastening the rail (tightening the fastening screws)
6) Fastening further rails (steps 1 to 5 are repeated)
7) Assembly of the table
8) Completion of assembly (check of running behaviour to detect assembly errors before commissioning)
More information can be found in the catalogue in chapter 3.5.

In addition to the instructions in the catalogue, NTN offers training and installation support for linear guide systems.
The type of mounting depends on the configuration of the linear guide. In this practical example, a linear guide with only one contact edge and no pressure screws is assumed. In such a case, four steps must be observed.

Practical example: Exemplary

1) The rail is pressed against the contact edge by hand and screwed tight. Tightening begins in the center of the rail and goes screw by screw to both rail ends. It must first be ensured that the contact edge and the contact surfaces are free of dust and dirt.
2) The second rail is then fitted; this is tightened slightly.
3) The table is positioned on the carriages and screwed in place.
4) The table is now moved along its entire length and the second rail is aligned with the first and screwed in place at the same time. The highest precision and accuracy must be ensured here in order to guarantee homogeneous running behaviour of the carriages on the rail.

In practice, installation is relatively straightforward in many cases.

Now you are well prepared for the installation of linear guides. If you would also like to find out more about the calculation principles for these products, click here.

You may also be interested in

Types of ball bushings

Ball bushings, which are also known as “linear ball bearings“, are an important product in linear motion. This article deals with the different variants of ball bushings and their properties but first provides you with basic information regarding their history, characteristics and design.
Read more »

Types of linear axis

Alongside linear guides, screw drives and ball bushings linear axis are an important product in the field of linear motion. Although the first linear axis came onto the market in the early 1990s, they only became established as a standard component for industrial applications at the beginning of the current century. It should be emphasized that there is no uniform
Read more »

Types of screw drives

You may have heard of ball screws before. These are certainly the best known of the screw drives, but they are not the only ones, as trapezoidal screw drives are a second type. This article will focus on the former, but you will still find everything you need to know about both types here. Design, mode of operation and areas
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Types of linear guides

Linear guides are presented below as one type of linear system. Linear guides are among the most important guide systems on the market, mainly because they can be used universally. Types of linear guides A distinction is mainly made between two types of linear guides: Shaft guides and rail guides. Both can be subdivided into different types. Types of shaft
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Materials

This article is the right address for you if you want to find out more about the materials used in linear systems. First of all, all components that need to be robust are made of steel, including the rolling elements, the guide rails and the carriages. General information on the materials In addition to steel, various other materials are used
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Point, surface and line contact

If you have already dealt with the point and linear contact of rolling bearings, you will recognise a few things. As with rolling bearings, the rolling elements of linear guide systems have either a ball or roller shape. The contact with a raceway (rolling contact) is different for balls and rollers due to their round or elongated shape. With rolling
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