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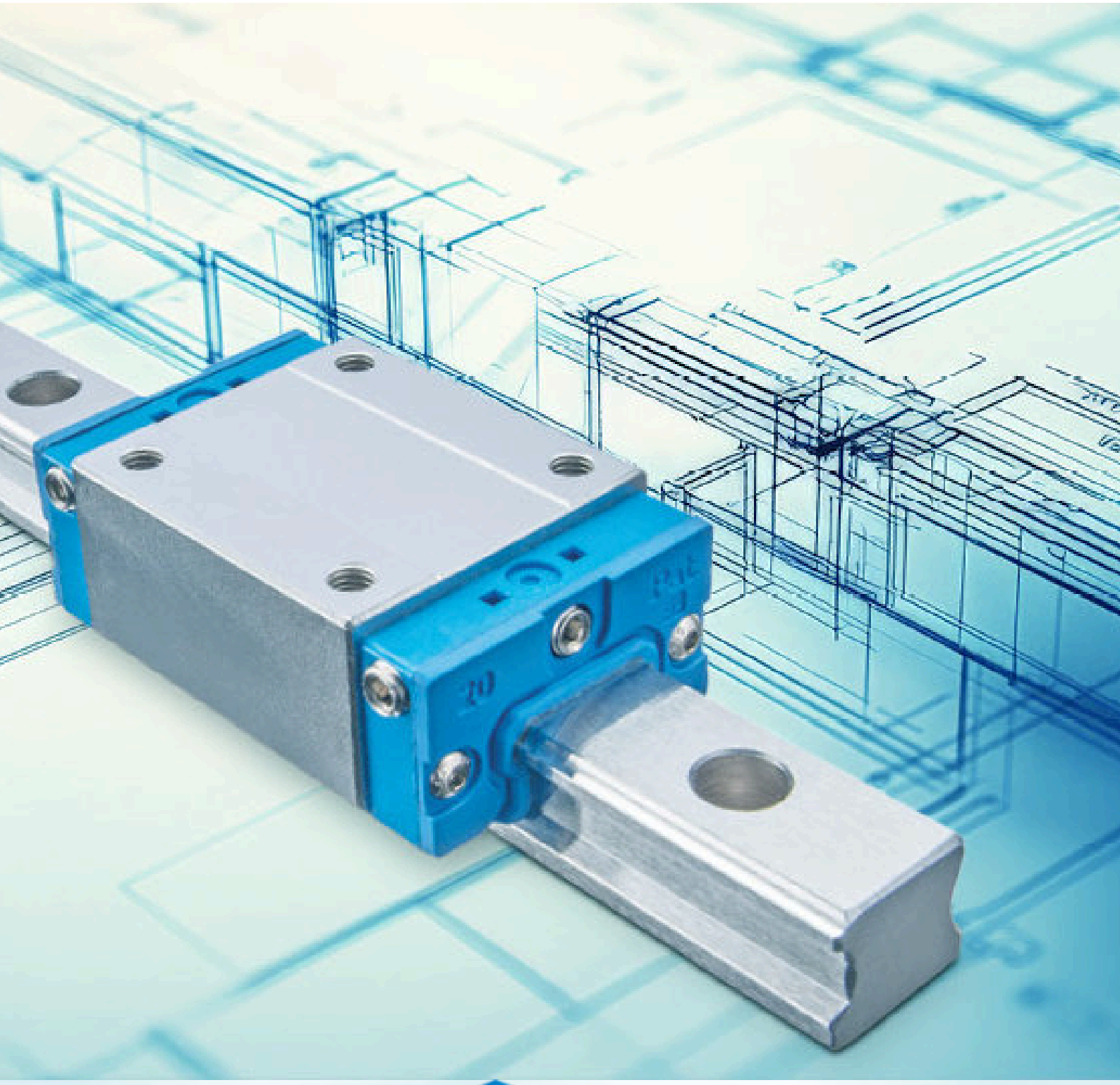
ALL ABOUT LINEAR MOTION



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Materials

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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 in linear guide systems. These include plastic and synthetic rubber. The table summarizes the most important materials and their use.

Material	Components
Steel	Rolling elements, guide rails, carriages, screws, grease nipples (for relubrication) and special end plates
Plastic	End plates, cage parts and ball chains
Synthetic rubber	Seals/wipers

Super important: High-quality steels are the be-all and end-all of linear motion materials.
As in the rotative area, the appropriate lubrication of linear guide systems has an existential function. In addition, all materials used, especially plastics and lubricants, must be adapted to the permissible operating temperatures and application parameters. The specific operating conditions must be considered when using the respective materials. In case of doubt, the respective manufacturer should be consulted regarding the temperatures and components.

Steel in rolling elements, guide rails, carriages and screws

In the rolling elements of linear systems, carbon steels standardized according to ISO or JIS, for example with the designation 100Cr6 (according to JIS: SUJ2), are used, which were originally developed for rolling bearings. The steel 100Cr6 is the worldwide standard material for rolling bearings as well as for rolling elements and is also used in a similar form in linear motion.
The guide rails in linear guide systems have a profiled square or rectangular cross-sectional shape. Their raceways are generally edge-hardened under a high-frequency current (inductive). This means that the rails are guided linearly past the inductor and hardened in the process – not through-hardened! However, small sizes can also be through-hardened.
The carriages are made of low-carbon chrome steel, which is relatively easy to machine. Machining is followed by carburizing, which involves hardening the steel under heat. Smaller carriage designs are through-hardened for production reasons. Hardened, rust-resistant steel is used in environments with an increased risk of corrosion; this also applies to rolling elements and guide rails.
Numerous screw types and sizes can be used in linear guide systems. The screws are often made of alloy

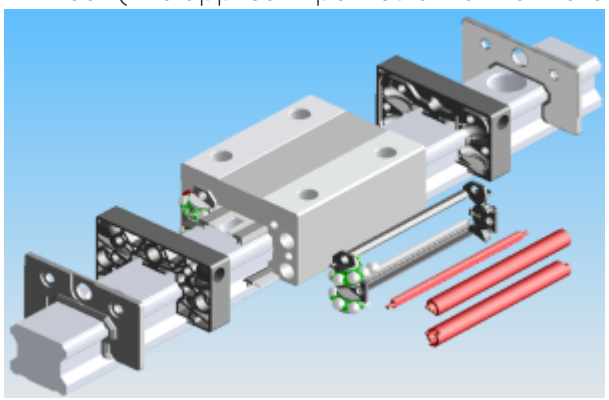
steel. If corrosion protection is required, coated steel screws are also used. Due to their robustness, hexagon socket screws are used to fix rails and carriages. There is a hexagonal pillar hole in the center of their cylindrical head.

Plastics for end plates, cage parts and ball chains

Plastics in linear systems are used for the end plates, cage parts, ball chains and rail caps (brass caps are also available as an alternative). Plastics offer the possibility of being injected into metal moulds, so that even complex shapes can be produced relatively quickly. However, it should be noted that some types of plastic melt at high temperatures.

Synthetic rubber seals

Synthetic rubbers are elastic to ensure good contact with the rail and offer comparatively high resistance to oil and wear. They also have a long service life but a limited operating temperature. The three relevant materials for synthetic rubbers are NBR, ACM and Viton. In addition to the standard version, there are seals for special conditions, for example those characterized by excellent resistance to chemicals and heat (this applies in particular to the material Viton).



Unlike rolling bearings, each component in linear motion has a fixed material that does not vary.

You can find information on the materials used for rolling bearings here. If you would like to find out more about the various linear guide systems, click through the articles on linearwizard.com that deal with the types of linear guides, screw drives, linear axis and ball bushings.

You may also be interested in

Basics of linear motion

Are you new to the field of linear motion and want to get an overview of what is meant by “linear motion“ and what characterises linear systems? Then this article is perfect for you. What is a linear system? A linear system is a machine component that performs a translational movement. To ensure safe use and prevent the ingress of

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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
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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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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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History of linear motion

Linear motion has been around for a very long time – its history even stretches back to ancient times! In ancient Egypt, it was necessary to transport heavy loads from one place to another to build palaces and pyramids. Creative ideas were already being put into practice back then, as it was of course not possible to simply pull the
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