

Franke Whitepaper



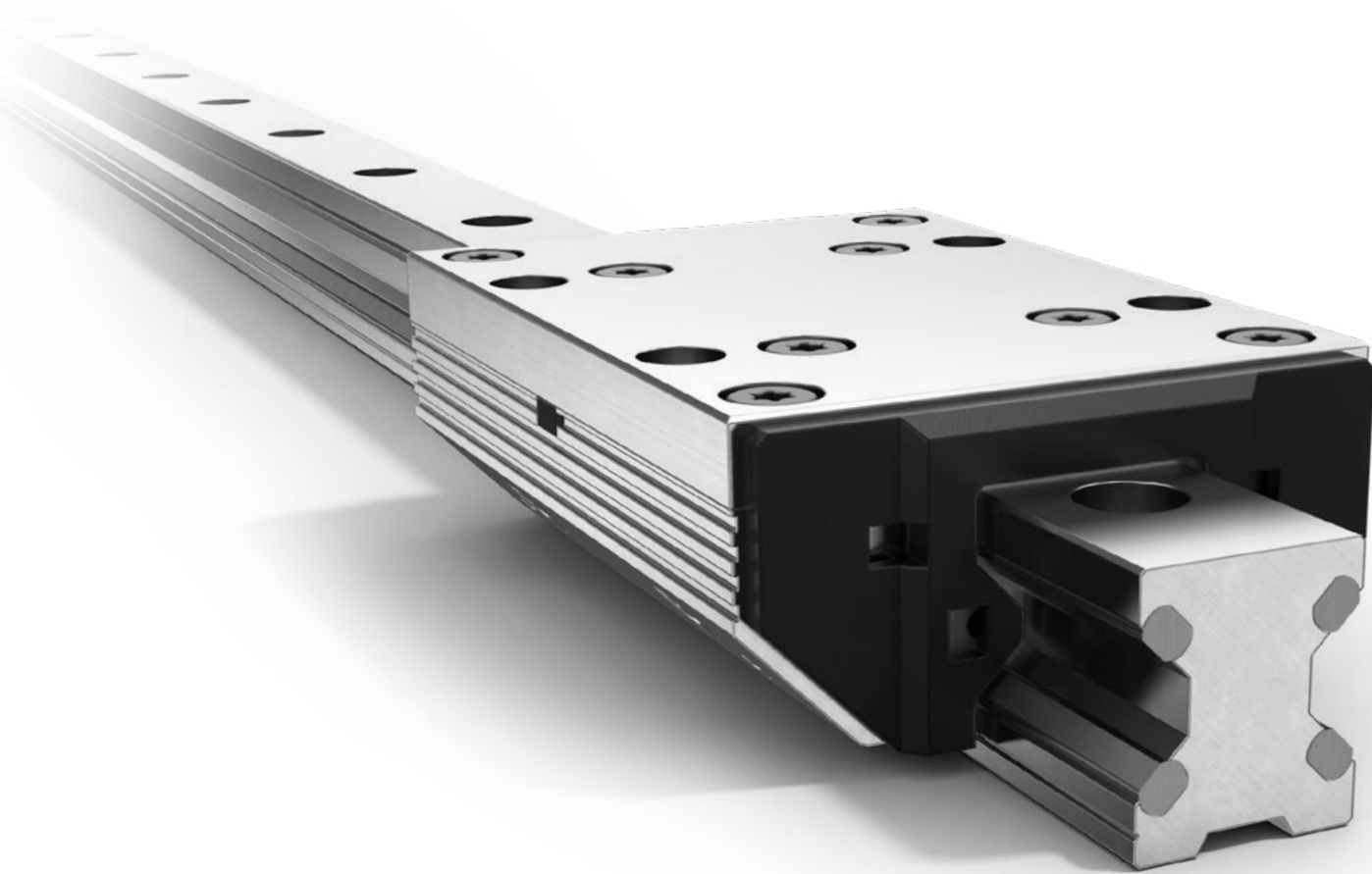
Linear Systems

Aluminum linear guides for mechanical engineering

Technology | Adaption Options | Best Practice

„With our lightweight linear guideways, we help our customers to be innovative.“

Sascha Eberhard // Managing Director Franke GmbH



Whitepaper

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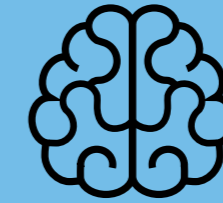
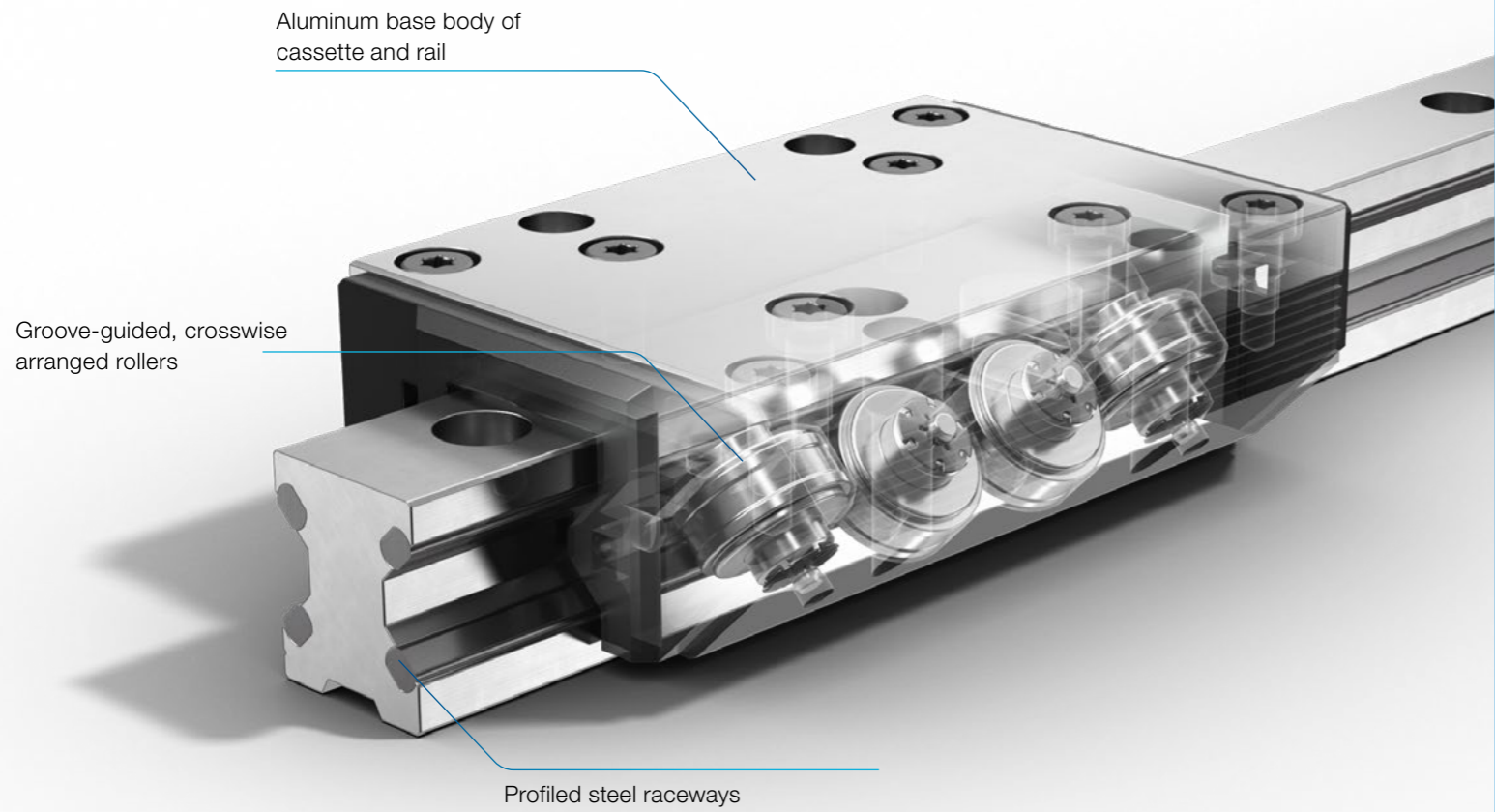
Abstract

This white paper analyzes the suitability of Franke aluminum linear guides in mechanical engineering. It explains the special features of these linear guides, their design and advantages as well as their applications and best practices for integration into various types of machines and devices.

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Franke Aluminum Linear System as double rail with cassette



1. Introduction

Choosing the right linear guide is crucial in mechanical engineering, as it has a significant impact on the precision and efficiency of machine movement. Franke aluminum linear guides have proven to be a promising option in this regard. This white paper looks at the suitability of these special linear guides and their role in various industries such as mechanical engineering, packaging, medical technology and optics.

2. Basics of the Franke Aluminum Linear Systems

2.1 Construction

Franke linear guides consist of a lightweight aluminum base body with needle or ball bearing mounted rollers made of steel or stainless steel and are completely maintenance-free. Special cover plates on the rollers seal the bearing to the outside. Rollers in an O arrangement ensure an equally high load capacity from all directions. The rollers are provided with a groove that is adapted to the profile of the track. This guided roller system guides the rollers axially and ensures smooth and quiet running. Track and cassette profiles can also be customized.

Franke aluminum linear guide as a single rail pair with roller shoe pairs



Aluminum base body of
Roller shoes and rails

Variable guide width,
direct integration

Groove-guided, crosswise
arranged rollers

Profiled steel raceways

2.2 Special features

Franke linear guides are characterized by their lightweight design and high rigidity. They are corrosion-resistant and can also be used in environments with high temperatures. Speeds of 10m/s and accelerations of 40m/s² can be realized. The guideways have excellent response behavior at high repetition rates. Stick-slip effects do not occur and the guide system immediately delivers full performance.

In the version as a single rail pair with roller shoe pairs, the guide width can be freely adjusted via the distance between the two rails. Franke supplies rails and roller shoes. The roller shoes are bolted directly to the continuing construction, so a cassette plate is not necessary. The shape of the rail profiles and the roller shoes can be customized.

3. Advantages of Aluminum Linear Systems

3.1 Lightweight construction

Low masses



Lightweight components in linear technology basically offer the same advantages as in other areas:

- Low moving masses
- Construction of compact, lightweight assemblies
- Reduced energy consumption for the drive

The potential for lightweight components in linear technology is growing. The more filigree the design, the lighter the components need to be in order to generate the lowest possible static and dynamic loads. The increase in the use of alternative materials such as CFRP or laser-sintered aluminum is creating requirements in completely new dimensions. While linear systems made of aluminum have always been considered particularly light, carbon guide systems are already appearing on the market today.

The biggest enemy of lightweight designs is „over-engineering“. Many designers still tend to design components with umpteen times the safety factor, which results in machines and vehicles becoming heavy and expensive. A rethink is needed here. Low weight always goes hand in hand with low moving masses. This means that the use of moving lightweight components not only has a positive effect in terms of pure weight savings, but also has an impact on the required strength of the downstream parts, where further weight can be reduced through clever design.

The biggest challenge for designers is therefore to differentiate between the areas of their application where strength and support are the primary requirements and those where the design can be lightweight and material-saving.

3.2 Maintenance-free

Maintenance-free, worry-free

Maintenance-free systems are increasingly in demand. The targets for packaging food, pharmaceutical, chemical or technical products, for example, are high flexibility and productivity with low maintenance and downtimes. For these reasons, the trend in the packaging industry is increasingly moving towards maintenance-free systems.

Franke linear guides meet these requirements: They are maintenance-free. The bearings of the rollers are lubricated for life. The closed design prevents lubricants from escaping and eliminates the need for relubrication. Completely lubricant-free versions of the guideway are also available for special applications and therefore help to guarantee production reliability.



3.3 Corrosion resistance

Insensitive & robust

Guide rails and cassettes from Franke aluminum linear guides are corrosion-resistant and are therefore well suited for harsh environments and applications where there is contact with moisture or aggressive substances. In the corrosion-free version with NIRO running wires, the guide system is food-safe and washable on request. Even aggressive media such as salt, whey or acid cannot harm the guide.



Metal scrapers and felt wipers on the end faces of the cassettes keep the tracks clean and dry.

3.4 Special requirements

Customizable & individual

Franke linear guides of type FDI are special guides suitable for use in high vacuum. The fully needle roller bearings are equipped with vacuum-compatible lubricant. Special details, materials and lubricants prevent outgassing in a vacuum.

Aluminum roller guides of type FDD in non-magnetic design impress with their magnetic neutrality and smooth, quiet running. Non-magnetic raceways with no influence on prevailing magnetic fields make them ideal components, e.g. in medical technology or electronics production.

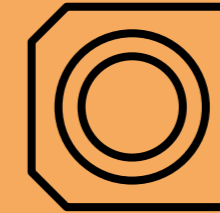
Even higher hygiene requirements, for example for packaging foodstuffs, are met through cleanroom certification. For this purpose, the linear guide was assessed and evaluated at the Institute for Manufacturing Engineering and Automation (IPA) of the Fraunhofer-Gesellschaft (FhG) in Stuttgart with regard to its suitability for operation in rooms with high air cleanliness classes.

The linear System type FDA25 is suitable for use in cleanrooms with air cleanliness class ‚Class 1000‘ at typical cleanroom speeds. The trends in the results (e.g. particle emission with increased moving mass) allow the prediction that suitability for ‚Class 1000‘ can also be achieved with higher loads.





Christoph Gschwind // Franke technical sales and Ivo Iossiger // Managing director of 4DigitalBooks



4. Best Practice

Franke linear systems are used in many industries. They impress with their high dynamics, their low weight and their precise and quiet running. In addition, the Franke system offers possibilities for individual customization like no other.

4.1 Book scanner 4DigitalBooks

Scanners are commonplace devices these days. However, when it comes to entire books, standard office devices and their users quickly reach their limits. The Swiss company 4DigitalBooks - ASSY SA manufactures scanning robots that are used to digitize books in national libraries efficiently and gently. 4DigitalBooks has been using linear guides from Franke in its market-leading fully and semi-automatic book scanners for 20 years.

4.2 Flat pouch packaging machine Mespac

The Spanish packaging machine manufacturer Mespac specializes in flexible packaging. Compared to rigid packaging, this not only saves costs and transport volumes, but also protects the environment by using fewer resources. Mespac uses linear guides from Franke in many of its machines for flexible packaging.

4.3 Flat glass cutting LiSEC

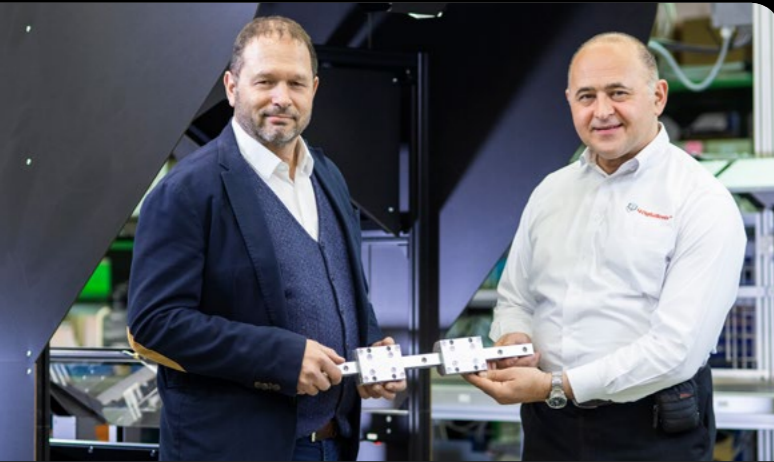
The company LiSEC is the world market leader with its complete solutions for flat glass processing - a hidden champion from Lower Austria. LiSEC uses linear systems from Franke at various points in its machines. During operation, these are exposed to an abrasive mixture of cleaning water and glass dust.

4.4 Mattress production Fecken-Kirfel

The Aachen-based family business Fecken-Kirfel has been in existence for over 150 years. And for over 100 years, it has been perfecting solutions for efficient cutting on an industrial scale. Fecken-Kirfel is a world leader with its cutting machines. Lightweight Franke linear systems guide the band knives evenly and precisely through the material.

4.1 Scan Robot 4DigitalBooks

How do you digitize a library?



Scanners are commonplace devices these days. However, when it comes to entire books, standard office devices and their users quickly reach their limits. The Swiss company 4DigitalBooks - ASSY SA manufactures scanning robots that can be used to digitize entire libraries efficiently and gently. 4DigitalBooks has been using linear guides from Franke in its market-leading fully and semi-automatic book scanners for 20 years.

Franke Linear Systems for critical movements

Franke linear systems are used in both the fully automatic and semi-automatic scanners from 4DigitalBooks.

Installed vertically, they are used to press the open book against a disk in order to fix the pages for scanning. In the fully automatic scanners, Franke linear systems are also used in horizontal alignment to move the carriage unit back and forth over the book for scanning and page turning. „Franke linear systems guide the critical movements in our scanners,“ says Ivo Iossiger. Each double page that is scanned corresponds to a movement of a pair of linear guides.

This means that the linear systems have to perform a large number of movements reliably over a long period of time. „Franke linear systems are extremely robust with a high resistance to tilting moments and high precision. They also have low wear,“ says Ivo Iossiger, praising the quality of Franke products.

„The very long service life without maintenance is the decisive aspect that we really appreciate. This means that our customers have machines at their disposal that can do their job for a very long time without any problems,“ continues Iossiger. Another particular advantage for him is the encapsulated lifetime lubrication of the needle bearings used. In contrast to open lubrication, this results in better tolerance to the fine paper dust that is always present when scanning books.

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We have developed our technology with one goal in mind: Reliability - from the first to the last page.

Ivo Iossiger
CEO and founder of 4DigitalBooks



4.2 Flat pouch packaging Mespack

Master of flexible packaging



So-called stick packs, horizontal and vertical pouch packaging with a lid or zip closure are produced, filled and sealed using Mespack packaging machines. They are used for food, pharmaceuticals, household, personal care and pet products.

For products such as coffee capsules, dishwashing liquid or liquid soap, Mespack offers a unique variety of systems for fully automated packaging: „We can support our customers with customized integrated solutions, from primary to secondary to final packaging,“ says Alonso Marquez, Operations Director at Mespack.

As a service partner, Mespack offers complete packaging lines for packaging processes. For example, a line for water-soluble detergent capsules, which are filled and formed with Mespack machines, packed into stable stand-up pouches with a horizontal machine and finally packed into a wrap-around carton or folding carton for dispatch to supermarkets or department stores with end-of-line machines.

„Franke linear systems are made of lightweight aluminum, which is very important for us because it allows us to achieve higher speeds,“ explains Alonso Marquez. At the same time, process reliability must always be guaranteed. „The durability and resilience of Franke linear systems is crucial for us, as they guide basic movements and the functioning of the entire machine depends on them,“ says Marquez.

Customers who clean their machines very frequently for hygiene reasons also use the completely corrosion-resistant linear guides of type FDC from Franke. The inserted raceways and rollers in this version are made of corrosion-resistant steel, which further improves resistance.

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The longevity of Franke linear systems is of crucial importance to us, as the functioning of the entire machine depends on them.

Alonso Marquez,
Operations Director of Mespack



4.3 Flat glas production LiSEC

The best complete program for flat glass processing



LiSEC's machines and software are primarily used for the production of insulating glass. LiSEC also serves the growing photovoltaic market with complete system solutions. LiSEC has been using linear systems from Franke since 2017, having previously used them in machines from Schraml, which has been part of the LiSEC Group since 2016. Moritz Geyrhofer is Lead Buyer at LiSEC. His biggest challenge at the moment: „Clearly the availability of supplier products.“ He has only had good experiences with Franke in this regard so far. A reliability that Geyrhofer greatly appreciates. Reliability is a decisive reason why LiSEC relies on linear systems from Franke.

Franke linear systems perform important functions

Corrosion-resistant Franke FDC 35 aluminum linear guides with stainless steel tracks are used at various points in LiSEC machines: They are used to guide grinding or milling tools in edge processing and edge finishing. They are also used in numerous machine types to precisely position the processed glass panes. They therefore „fulfill essential functions for our machines,“ says Geyrhofer.

Challenging conditions for the linear systems

At the place of use, the linear systems are exposed to washing water and ground glass dust. Nevertheless, they are well protected against corrosion because all metallic components of the FDC 35 type used are made of stainless steel or aluminum. The glass abrasion is removed from the raceways with every movement using wipers and therefore cannot collect in the guideway. Clogging is impossible. The rollers are encapsulated, which reliably prevents dirt or dust from entering the needle bearings. In addition, the roller bearings are lubricated for life and therefore maintenance-free.

In addition to the quality of the products, Moritz Geyrhofer praises the expertise and responsiveness of the Franke team. „When we turn to Franke for new developments or enhancements, we get a very quick response and expert advice. Our technicians then communicate directly with the Franke technicians. That works very well.“

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When we turn to Franke for new developments or further developments, we experience a very fast response and receive competent advice.

Moritz Geyrhofer
Lead Buyer at LiSEC



4.4 Mattress production Fecken-Kirfel

Precise cutting on a grand scale



Almost all Fecken-Kirfel cutting machines are based on the same principle: a continuously revolving bandknife is guided through the material to be cut and is usually also ground continuously. The company has continued to refine and perfect this principle in various machine types. Almost 50 machine types can be found on the company website under „Products“. If required, the development engineers at Fecken-Kirfel can adapt these to individual customer requirements or develop new machine shapes.

The challenge of memory foam

Originally developed as a seat material for the aerospace industry, it is now also used in earthly mattresses and upholstery. Under the influence of heat, the material adapts to the shape of the body. „Cutting this material is not easy,“ says Michael Tillmann. In order to achieve the best possible cutting result, it is necessary to study the specific properties of the material in detail beforehand. Apart from the cut, the material should not be deformed or impaired before it is used. The large volume of the material blocks to be cut often poses a further challenge. The bandknife must be guided around the entire block during cutting. The larger the volume, the greater the demands on the design.

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I can't remember a time when a Franke guide had to be replaced because of a problem.“

Stefan Lennartz, head of mechanical design at Fecken-Kirfel



5. Conclusion

Franke aluminum linear systems offer a number of advantages in mechanical engineering, including lightweight construction, high rigidity, corrosion resistance and high temperature application ranges. They are used in a wide range of applications, from automation to medical technology. Careful selection, installation and maintenance are crucial for the successful use of these linear systems in mechanical engineering projects.

Franke linear systems transfer the ingenious principle of the wire race bearing to linear movements. Inserted raceways ensure load-bearing capacity on all sides. This allows the rest of the construction to be made of lightweight aluminum. Large guided rollers ensure smooth running - maintenance-free over the entire service life. Thanks to their modular design, Franke linear systems can be individually adapted to requirements.

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All about the functional principle and the selection series of Franke linear systems.



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We supply rolling bearings and linear guides for AGVs and order picking systems.



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[Packaging and filling with Franke](#)

Franke rolling bearings and linear guides are predestined for high demands on hygiene and chemical resistance.



[Application examples](#)

Franke linear guides in other interesting applications.



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