



FRANKE INNOVATIV

THE MAGAZINE FOR CUSTOMERS AND PARTNERS



LIGHT AND DYNAMIC
**FRANKE ALUMINUM BEARINGS
WITH DIRECT DRIVE**

FRANKE IN CHINA
WIRE RACE BEARINGS FOR THE MIDDLE KINGDOM

3D-PRINTING
**FRANKE LIGHTWEIGHT DESIGN
LAYER BY LAYER TO THE FINISHED COMPONENT**

Dear readers,

I am pleased to present you with the seventh edition of our customer magazine Franke Innovativ today. This time we are focussing on technology and advantages of direct drive lightweight bearings. Many other topics from various areas of the company will complete the magazine. Learn more about ...

MOTORS, that are integrated directly into the housing of our lightweight bearings. This way we are able to design extremely compact motion units used for example in automotive engineering or in rotary indexing tables. Also, the expert interview concentrates on the topic of lightweight bearings with direct drive.

MODERN techniques such as 3D printing are great technologies for producing housing rings of bearing assemblies. They are the perfect solution in order to further enlarge and produce highly complex, ultra-lightweight bearings. The developers and designers of Franke think ahead when conventional machining methods reach their limits.

MARKETS, located far from Germany such as China can only be managed by joint ventures with reliable partners. We would like to introduce our Chinese partner BDI. They are working hard to make the idea of the wire race bearing become popular in China. These efforts are accompanied by colleagues here in Germany to support the Chinese representatives with material and visits.

MAKE use of our online bearing selector on our website. This new little tool will give you the ability to check technical and economic aspects of your configuration and will give you an idea of the possibilities suitable for your application.

MANY PEOPLE are working as brand ambassadors at Franke. Our employees carry our brand values wherever they get in touch with our customers and partners. Innovative, competent, cooperative and reliable are the properties that we have defined as our core brand. And that's how you should perceive us. Are you? – Tell us about it, we have prepared a small survey for you (see page 15).

I hope you enjoy the read!



Sascha Eberhard
Managing Director



> Managing Director Sascha Eberhard:
"Do you like this new issue?
I would be thrilled to receive your ideas,
wishes and criticisms. Feel free to write to me:
s.eberhard@franke-gmbh.de"



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Direct Drive

Franke wire race bearings with direct drive combine lightweight and dynamics

Franke wire race bearings are modular. The range extends from the pure bearing element consisting of raceways and rolling elements to complete systems with integrated drive and control units. The trick: by using aluminum components, lightweight construction and dynamics are combined in an ideal way.

The principle is ingenious: With wire race bearings the rolling elements do not run directly in raceways of the mating structure but on special race rings made of hardened wire which are inserted into surrounding structures. Through this constructive trick Franke wire race bearings allow the individual design of the mating structure and a free choice of material of the housing parts. This makes it possible, to manufacture the housing parts of the bearing tailored to the requirements of the application. It also allows the customer to use alternative materials such as aluminum or even plastic or carbon for the production of the enclosing structure. Customers receive pre-finished systems with a high potential for savings in weight and drive energy.

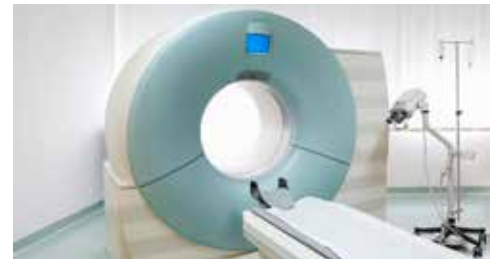
In its highest configuration level Franke Wire race bearings are available as complete systems consisting of bearing, drive and control. The motor is integrated directly into the housing. The static bearing part carries the stator, the moving part works as the rotor of the electric drive. There are no additional components needed to mechanically set the bearing in transition which increases the efficiency of the system. Through the use of housing parts made of aluminum, the weight of the motor can be more than compensated. A lightweight Franke bearing with direct drive is therefore still much lighter than a conventional steel

bearing without drive. The small masses to be moved also ensure that the engine can be designed smaller and will operate with higher dynamics and speed. These are important benefits for example in applications such as indexing tables or e-mobility.

Franke wire race bearings with direct drive are proven systems. In mass production they are already installed in high-end CT-scanners, doing an excellent job there. Further applications are filling stations, pick-and-place machines for PCB assembly and initial prototypes of electric vehicles.

At a glance:

- Ready-made, customized and compact systems
- Free choice of material and design of the bearing
- Reduction of weight and drive energy



>> Wire race bearings with direct drive can be found in vehicles, filling stations or CT-scanners.

DIRECT DRIVE

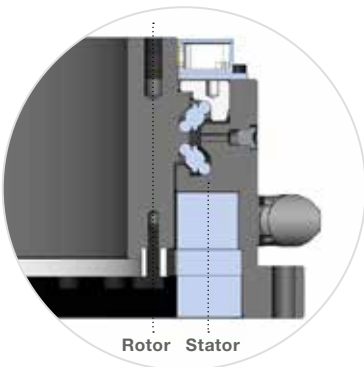
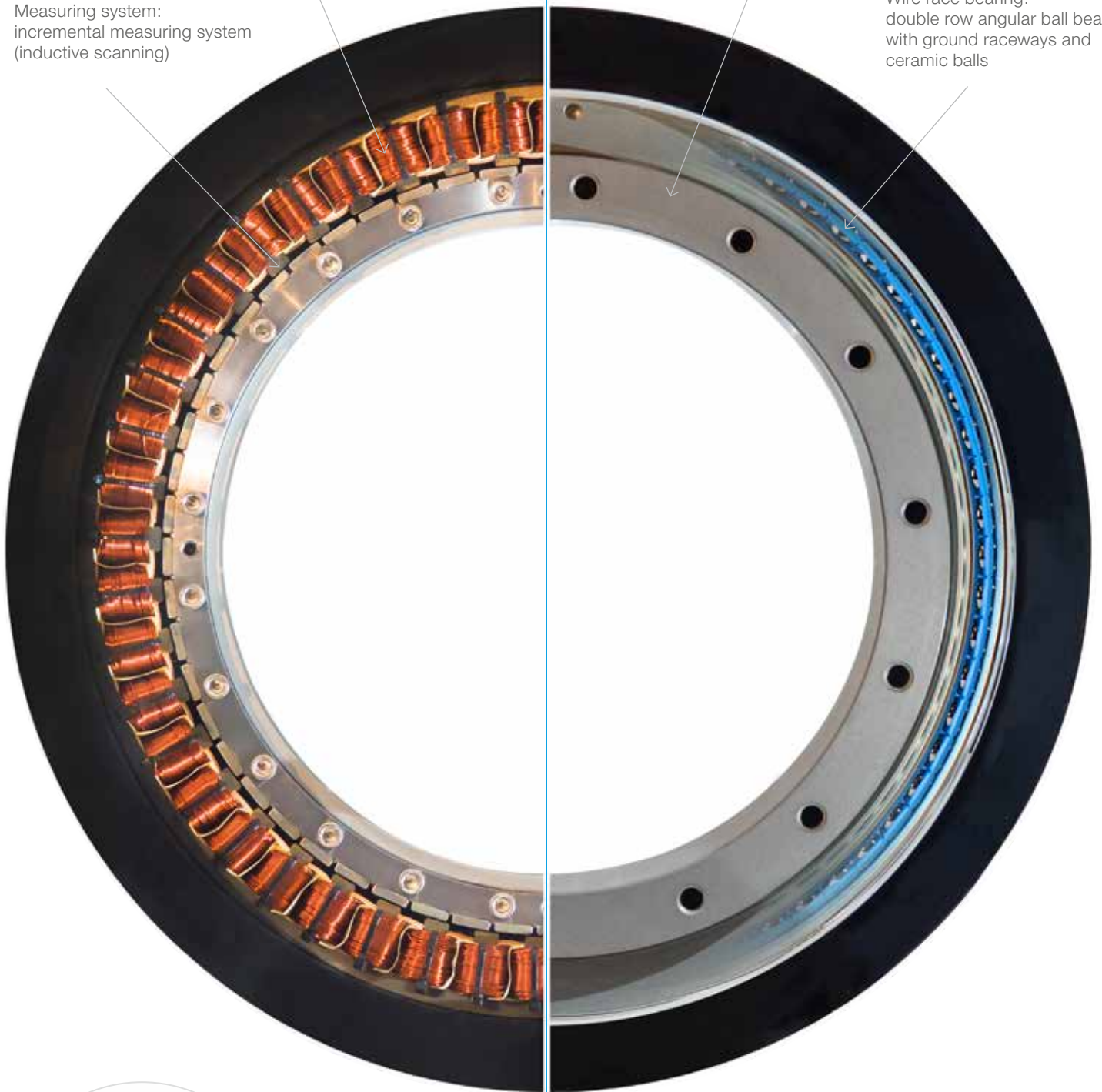
ELEKTRICAL
MECHANICS

Motor data:
Peak torque: 145 Nm
max. speed: 306 U/min

Material:
Housing: Aluminum
magnetic ring: C45N

Wire race bearing:
double row angular ball bearing
with ground raceways and
ceramic balls

Measuring system:
incremental measuring system
(inductive scanning)



What are direct drive systems?

Direct drive systems generate motion without gears or pinions. Rotor and stator are directly adapted to the parts to be moved. Negative impacts of conventional drives such as friction, play, noise or wear do not occur. Direct drive systems increase the precision and productivity of a plant, and thus the product quality. In addition, they reduce the cost of maintenance and energy. Direct drives are becoming increasingly important in the course of e-mobility.



The customer gets a bespoke comprehensive set of bearing and drive system

Technology specialist Stefan Strobel is a technical consultant at Franke. In our expert interview he talks about opportunities and projects in the field of direct drive lightweight bearings. And about why he finds wire race bearings cool.

Mr Strobel, what is so special about wire race bearings with direct drive?

Stefan Strobel: The enormous variety of design options. Although other vendors have also directly motorized bearings in the program but we are able to customize geometry and material.

Why is this customization in your view so important?

Stefan Strobel: Because this creates additional value for the customer. Imagine, the bearing is to move a radar unit in the nose of your aircraft. We build it for you out of aluminum so that it withstands vibrations and temperature changes without any problems. Or think of the hub of an electric vehicle. We design the housing parts so that they conform to the shape of the rim on which you can draw your tires without further components. You won't need any components, adapter plates and similar additives. And that saves both: costs and weight.

Do your customers think about this in the same way?

Stefan Strobel: Absolutely.

For example?

Stefan Strobel: For example, the designer of an innovative electric vehicle. We have integrated a double-row angular contact ball bearing in the wheel, the motor is directly adapted and the tire is mounted directly on the outer ring of the bearing. The free center of the rim provides space for installing a braking system. The plan is to run all four wheels of the vehicle like is. Then all you need is a high-performance control unit, to coordinate the drives and a compact design power supply. Finished!

Of course, the entire rim is made of aluminum, reducing the weight of the vehicle. And the drive power has an easy time. Cool stuff, right?

No question – do you see further more potential for this technology?

Stefan Strobel: Vehicles are currently an interesting application. We have several projects at the start and at the trial here. Other sectors are the classic mechanical engineering – for example, in rotary indexing tables or tool changers – and the food and packaging industries.

Here we score with special materials and seals for the bearing housing to offer a compelling movement system in moist or aggressive environment. Other potential applications include aerospace, medical technology and robotics. Especially robotics deal more and more with small, lightweight designs for the workplace and in service. Here, the direct drive bearings could be small and powerful integrated directly into the joints.

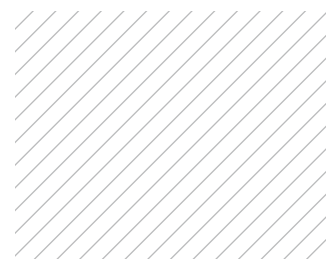
A wide field. You seem to rely on wire race bearings a lot ...

Stefan Strobel: Of course. Throughout my young career at Franke I've seen some spectacular applications for wire-race bearings and I must say the product is incredibly versatile. Whoever once has recognized the potential of this technology, can not help to become enthusiastic about it. "Light bearings for innovation" is our brand claim. Cool bearings it might as well be! (laughs)

Kontakt



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“We adapt our bearings to the needs of our customers. Drive systems included.”



> Stefan Strobel (28) is a technical consultant at Franke. Together with his team he finds the best possible solutions in the field of wire race bearings and linear systems for his customers.

The bearing gets off his fat

Franke develops a lubricant-free bearing.

For quite some time, Franke has been engaged in the development of a wire race bearing, which does not require lubrication. Interesting are those bearings in special environments, such as clean room, high vacuum or in food production.

Lubricant-free bearings are available in the market mostly as plastic plain bearings. However, these bearings have only a small degree of precision and resilience. Lubricant-free bearings made of steel or aluminum are therefore interesting alternatives for applications in sensitive environments. Currently Franke is testing aluminum bearing assemblies with ball pitch diameter 250 mm. Inside it carries a wire race bearing in the form of a double row angular contact ball bearing. The race rings are made of stainless steel and plasma-X7. In tests 2.5 million revolutions have already been implemented with a load of 900 N/mm² at a speed of 10 rev/min.



Lightweight from stock > The Series LVE

Further standard series are available from stock in January.

The standard series of Franke bearing assemblies made of steel (LVA) and aluminum with AT10 tooth (LVE) will be available from 2016 in further diameters from stock. The type LVA diameters 150 and 250 mm as well as type LVE diameters 200, 300 and 400 mm are added to the stock list.

> More Information: www.franke-gmbh.com



CO₂ – Footprint for large Bearings

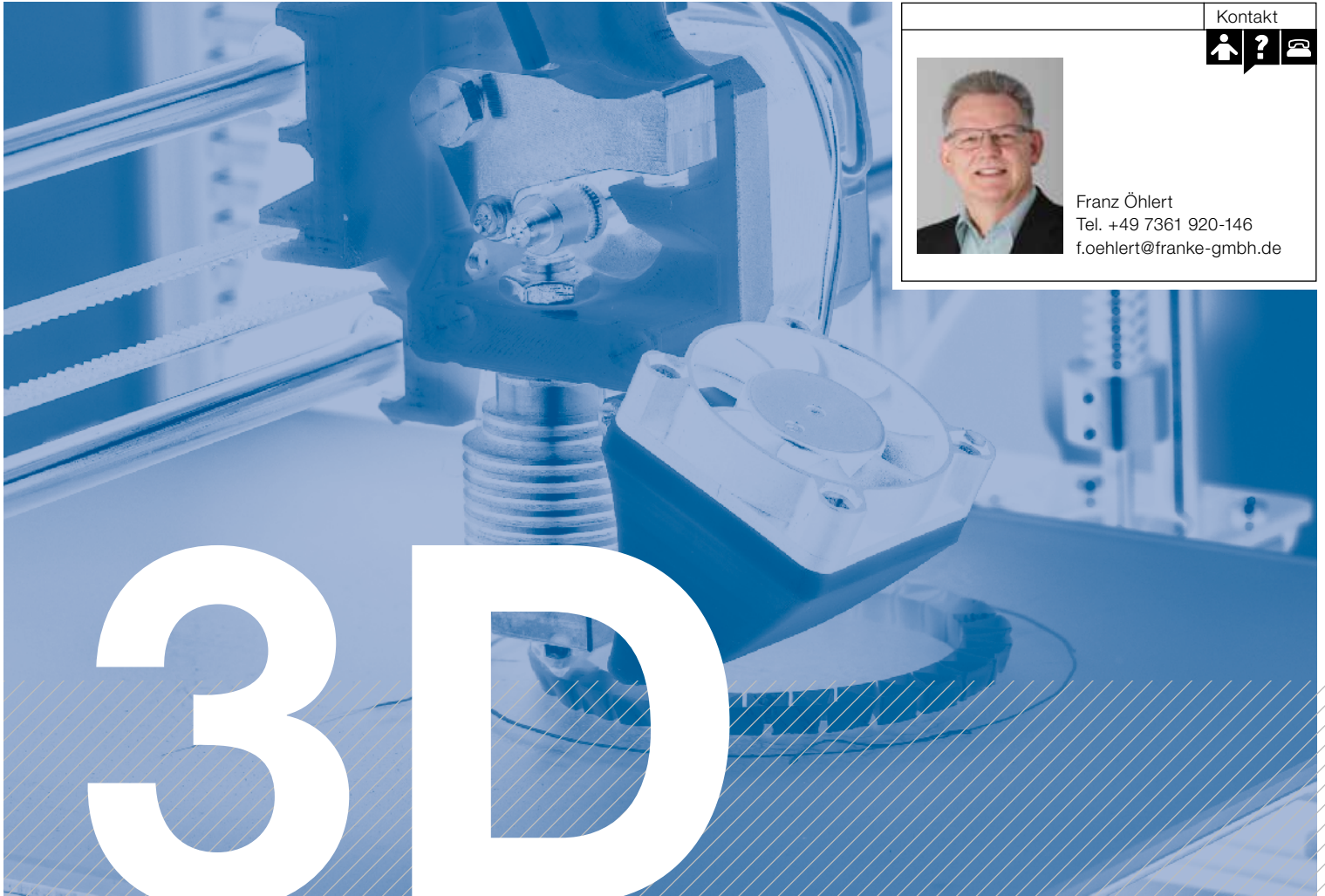
How much CO₂ is produced by the production of a large bearing assembly?

This issue is currently examined under a bachelor thesis together with external Specialists. The study sheds light on the emission of greenhouse gases

1. during the transport of raw materials to Franke
2. in the manufacture of the energy for the processing machines
3. when disposing of waste materials such as chips and consumables.

The investigation has shown that the energy consumption of the production machines has the greatest impact on the CO₂ balance. The shorter the cycle times the better for the environment. Knowing these relationships, it is worth considering measures to improve the ecological balance in the bearing manufacturing. Possibilities reach from optimizing the blanks for shorter processing times up to the use of green energy. Thus, an ecological production helps to increase the efficiency by reducing the costs of energy and waste disposal.





Kontakt	
  	
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Lightweight from the printer

>> Lightweight bearing rings as 3D printing in the trial

Aluminum, plastic, carbon – lightweight bearing assemblies with integrated wire race bearings have already been successfully implemented in many different combinations of material. Now the focus goes to alternative manufacturing methods for the production of the housing parts. Laser-sintered aluminum rings from the 3D printers are currently being tested. The addition method makes it possible to create a kind of honeycomb structure inside the rings, which makes the ring at the same time light and gives it the necessary rigidity.

Currently a prototype is tested and an entire bearing assembly is built. Extensive tests will show in the end how the lightweight bearing from the printer performs compared to conventionally produced aluminum bearings in terms of load and accuracy.

> For more information, please contact Franz Öhlert.





Franke in China

BDI is Franke's Partner in the Middle Kingdom

In the course of doing business in the textile industry Franke first came into contact with the Asian market. Even nowadays Asia is the center of the garment and fabric production.

With the company BDI Franke has now found a powerful partner in Tianjin. Tianjin is one of the earliest municipalities directly under the Central Government, as well as one of the cradles of Chinese industry.

Now it is the center of economic development of the country, with more than 15 million inhabitants.

Chemical industry, mechanical engineering and automotive industry with all its many suppliers determine the image of the business location Tianjin. Here you will find both large corporations as well as numerous small factories and shops. For Franke wire race bearings and linear systems Tianjin is a complex and huge market.



Franke marketing manager Stephan Kuhn during a visit at the headquarters of BDI in Tianjin together with Evelyn Zhu, technical consultant at BDI. Stephan Kuhn pays his visits regularly to contact customers or to train employees and to coordinate activities for market development.



Franke wire race bearings for circular knitting machines are used by many manufacturers. But Asia, in particular China, is also interesting for Franke in other industries. The markets are huge and wire race bearings are easily shipped from Europe.

Without a strong local partner, however, lead management as well as customer service will not be successful. This partner is for Franke since 2011 the company BDI.

BDI is a leading supplier and distributor of machine components worldwide. Founded in 1935 in Cleveland, Ohio, the subsidiary BDI (Tianjin) Bearing Co., Ltd. established in 1997 in China. The product portfolio will find bearings, mechanical and electrical drive technology, fluid technology, sealers, conveyor belts, linear technology and related industrial products and services. Distribution centers of BDI are in Tianjin and Suzhou. Many smaller offices are spread across the country.

A total of 280 employees work for BDI. Just recently a new building could be purchased in Tianjin, which now houses a showroom for products and generous office and storage spaces. BDI is supported in the Franke headquarters by marketing manager Stephan Kuhn. He is regularly on site in China to tune strategies and hold workshops. Together numerous new customers could already be acquired in different sectors. For the future it is optimistic to increase sales.

Kontakt



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The special slim bearing


>> Franke wire race bearing type LSA

The LSA is the logical development of the wire race bearing technology. With the LSA two race rings are combined to a single one. Instead of four race rings as the conventional wire-race bearing, the LSA only needs two. Due to the special profile of the raceways with two contact points on each of the rolling elements, the four-point principle is

maintained. The races are open and can be continuously obtained in any desired diameter within the respective limits. Installation and adjustment are just as easy as with conventional slim bearings with a large gain in load capacity and resilience (see table).

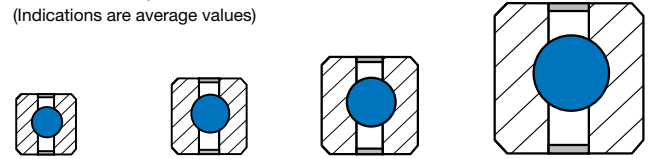
LSA

Values for bearings with KK Ø 300 mm



Querschnitt [Zoll]	LSA 4	LSA 6	LSA 8
Cr [kN]	8	8	11
Ca [kN]	9	9	13
Cor [kN]	36	49	55
Coa [kN]	76	105	117

Conventional slim bearings for comparison
The LSA 8 corresponds to the standard ratio 5/16 inches (Indications are average values)



Querschnitt [Zoll]	LSA 4	LSA 6	LSA 8	5/16	3/8	1/2	3/4
Cr [kN]	8	8	11	7	9	14	28
Ca [kN]	9	9	13	19	23	35	69
Cor [kN]	36	49	55	25	30	40	71
Coa [kN]	76	105	117	74	86	117	204

The advantages of the LSA:

- Compact design
- Easy construction
- High load capacity and precision due to four-point principle
- Available continuously in diameters ranging from 3–30"
- Up to 50 % cheaper than conventional slim bearings





Franke Linear Systems open doors

Franke lightweight linear guides of aluminum are ideal for the movement of doors in vehicles. Lightweight, dynamic movement and robustness against environmental influences are the key benefits of Franke linear guides and allow the use, for example, in trains and planes.

Example waggon doors

For the movement of the waggon doors the demands for a guide system are sturdy, dirt-insensitive and low-maintenance. Other environmental factors such as humidity, vibration must also be compensated. The linear guide used has the size 15 and meets this requirement with more than 200,000 operating cycles.

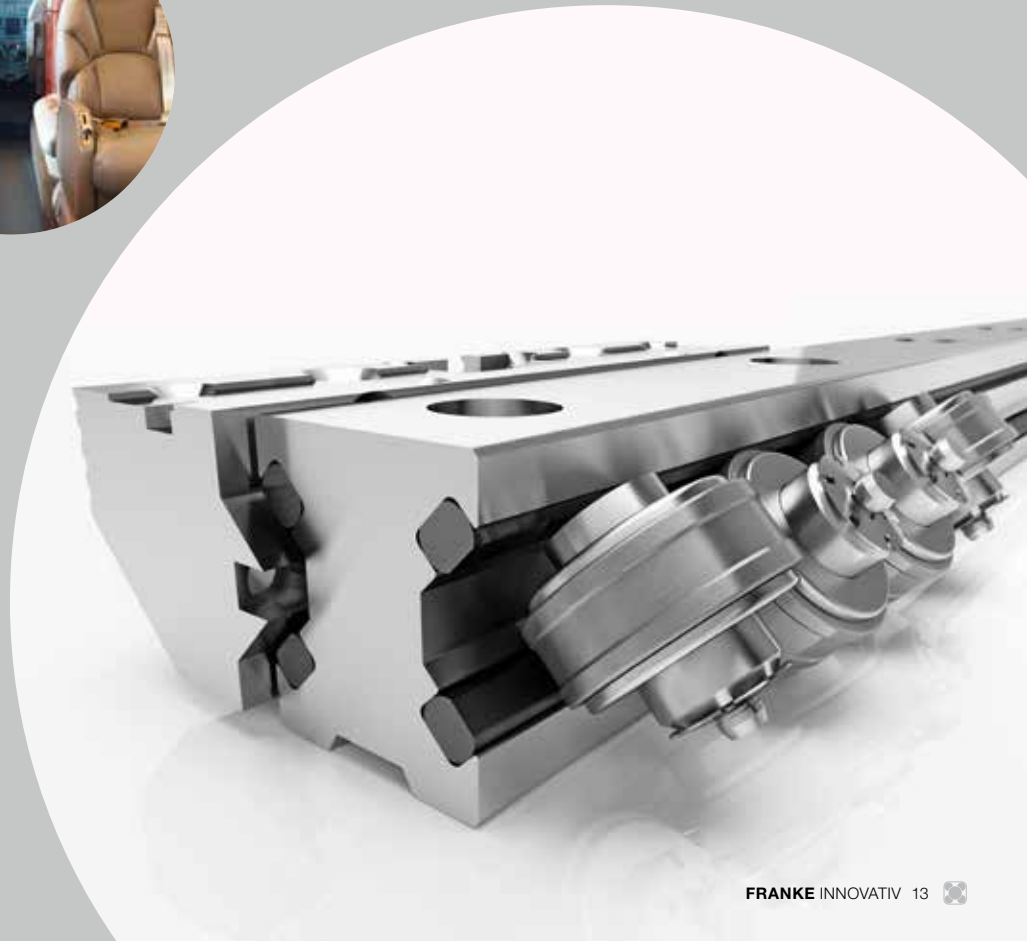
Example aircraft doors for cockpit or washroom

Low noise and low friction are the requirements for cockpit or washroom doors inside of an airplane. Since the guides are not encapsulated and up to 20 years in use, they must be corrosion-resistant and able to accommodate tilting moments. Small installation space, low weight are further requirements. Franke linear guides made of stainless steel meet the requirements perfectly.



4-point system for taking loads from all directions

The large rollers rotate in needle or ball bearings and are arranged crosswise. They take loads from all directions and are remarkable for their quick acceleration.



For PC and tablets

The new Franke website comes in responsive design

The Franke website has been completely redesigned. In addition to a new layout from scratch the new page offers many substantive and functional details.

First and foremost is the programming of the page in so-called responsive design, which means nothing else than the automatic adjustment of the layout of the output medium.

The side with conventional, clickable links and navigation appears on the PC. On mobile devices the pages can be scrolled through the usual gestures and fingertips. Content can be distinguished into three major areas:

The basics

What is a wire-race bearings? How does it work and what benefits does it offer? – These are the questions which occur during the first contact with the Franke principle. Through graphics, animations and links to You-Tube videos the basics of the technology of wire-race bearings are explained to the visitor. The same is done with the function principles of the aluminum linear guides.

The Standard Products

Here you can find everything worth knowing about Franke standard series with all relevant data and dimensions. All catalog items are displayed on a daily basis. A download section provides the appropriate print media and CAD data.

The special bearings

In addition to the technical data of the standard series extensive information can be found about the possibilities of customized adaptation of Franke Wire race bearings and linear systems to specific applications. Examples of applications and a selection of realized constructions shed light on the variety of possibilities. An online bearing selector supports the visitors of the site in the initial selection of bearings and suggests suitable products.

www.franke-gmbh.com

> Scan the codes for more information



Basics



Standard products



Special products

www.



Franke employees are brand ambassadors

What brings a brand to life? Firstly, the products on which the brand logo is placed. On the other hand the behavior of employees who work for a brand.

To keep products and services at a high level, is therefore a constant challenge for Franke. The brand essence is clearly defined: innovative, competent, cooperative and reliable Franke wants to be a valuable partner for you.



Participate and win!

	<p>What does Franke mean to you? Respond online now at: https://de.surveymonkey.com/r/WG5H5F3 The survey runs until 31st of January 2016. Winners will be informed afterwards.</p>	<p>Among all participants we are giving away 10 USB batteries on the go.</p>		<p>Contest</p>	
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LEAP YEAR 2016

List of leap years from 1600 to 2400

1600	1700	1800	1900	2000	2100	2200	2300	2400
1604	1704	1804	1904	2004	2104	2204	2304	
1608	1708	1808	1908	2008	2108	2208	2308	
1612	1712	1812	1912	2012	2112	2212	2312	
1616	1716	1816	1916	2016	2116	2216	2316	
1620	1720	1820	1920	2020	2120	2220	2320	
1624	1724	1824	1924	2024	2124	2224	2324	
1628	1728	1828	1928	2028	2128	2228	2328	
1632	1732	1832	1932	2032	2132	2232	2332	
1636	1736	1836	1936	2036	2136	2236	2336	
1640	1740	1840	1940	2040	2140	2240	2340	
1644	1744	1844	1944	2044	2144	2244	2344	
1648	1748	1848	1948	2048	2148	2248	2348	
1652	1752	1852	1952	2052	2152	2252	2352	
1656	1756	1856	1956	2056	2156	2256	2356	
1660	1760	1860	1960	2060	2160	2260	2360	
1664	1764	1864	1964	2064	2164	2264	2364	
1668	1768	1868	1968	2068	2168	2268	2368	
1672	1772	1872	1972	2072	2172	2272	2372	
1676	1776	1876	1976	2076	2176	2276	2376	
1680	1780	1880	1980	2080	2180	2280	2380	
1684	1784	1884	1984	2084	2184	2284	2384	
1688	1788	1888	1988	2088	2188	2288	2388	
1692	1792	1892	1992	2092	2192	2292	2392	
1696	1796	1896	1996	2096	2196	2296	2396	

For explanation:
1700

The years 1700, 1800, 1900, etc. are not leap years, although they are divisible by 4.

The years 1600, 2000, 2400, etc. are leap years, although they are divisible by 100.

What is a leap year?

A leap year is a year that has not 365 days like a normal year, but 366 days. As an additional day February 29 is inserted.

Why are there leap years?

An astronomical year (also called solar year or tropical year) is the amount of time our Earth needs to revolve once around the sun.

This period is not exactly 365 days, but about 365.2422 days (ie 365 days and a little less than 6 hours – the exact duration varies each year by a few seconds). By the insertion of a leap year the calendar year will be extended at regular intervals and synchronized in this way with the astronomical year. Without leap years the calendar year and the seasons would drift apart slowly.

Why serves February 29 as leap day?

In the Roman calendar the month Februarius (which gave its name to our month February) had been placed originally twelfth and thus the last place at the end of the year. Therefore the leap day was added at the end.

How to calculate leap years?

To bring the astronomical year of 365.25 days in length to the calendar year of 365 days, every four years, an additional day will be added. However, since the astronomical year is slightly shorter than 365.25 days, a leap year is omitted occasionally. This is the case in years which are divisible by 100 (eg 1900 and 2100). For this purpose, however, there is also an exception: years divisible by 400 (eg 1600, 2000 and 2400), are leap years. A leap year is therefore left out three times in 400 years.

Through these adjustments, the average calendar year has a length of 365.2425 days, The deviations are minimized this way to only one day in 3000 years.



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