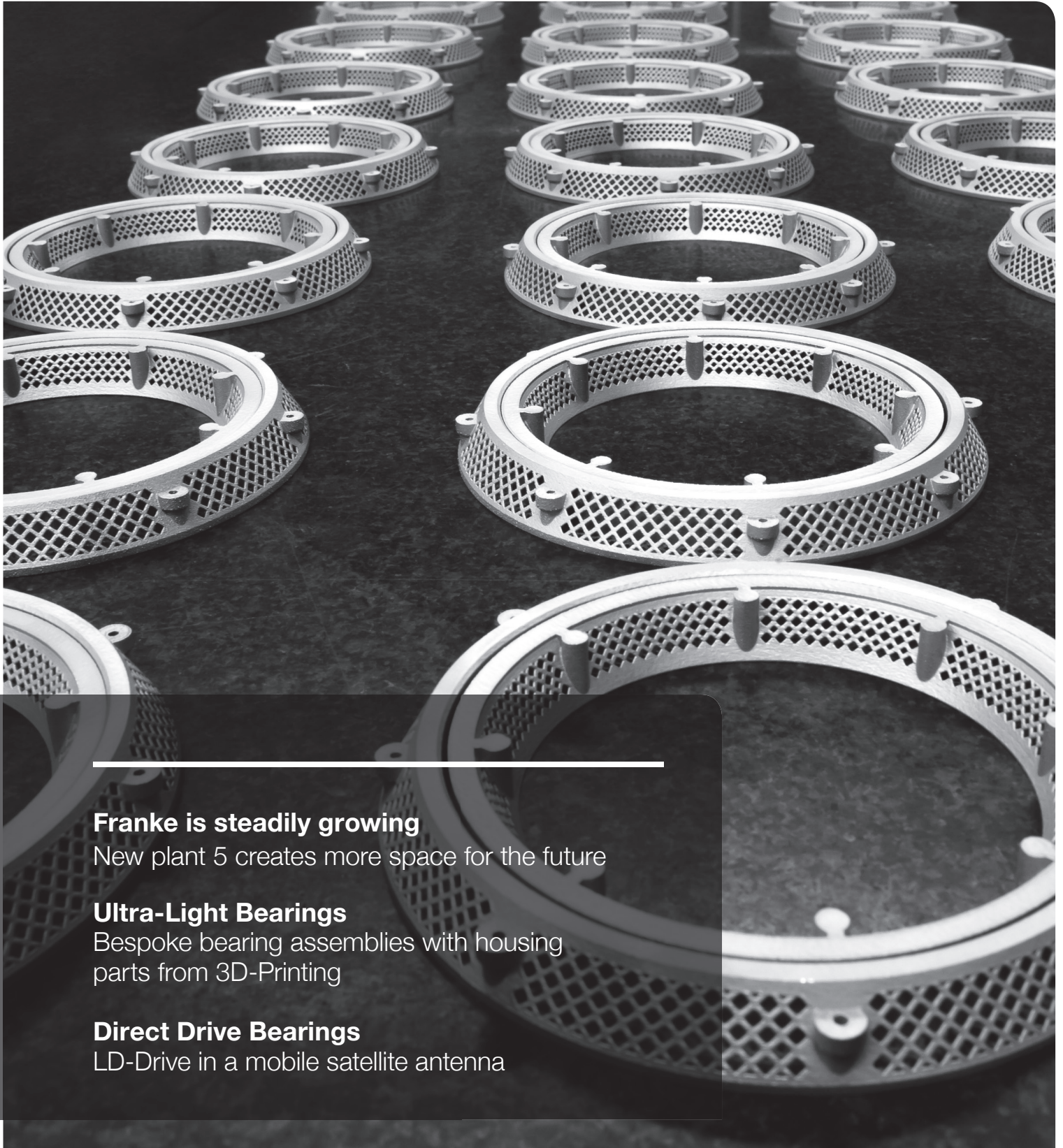




FRANKE INNOVATIV

The Magazine for Customers and Partners



Franke is steadily growing

New plant 5 creates more space for the future

Ultra-Light Bearings

Bespoke bearing assemblies with housing parts from 3D-Printing

Direct Drive Bearings

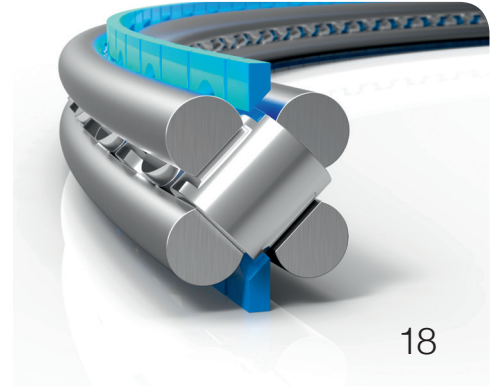
LD-Drive in a mobile satellite antenna



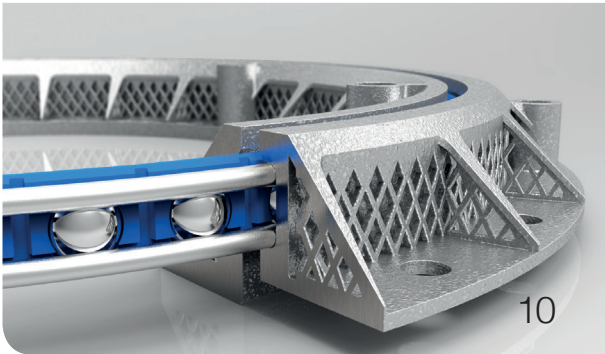
4



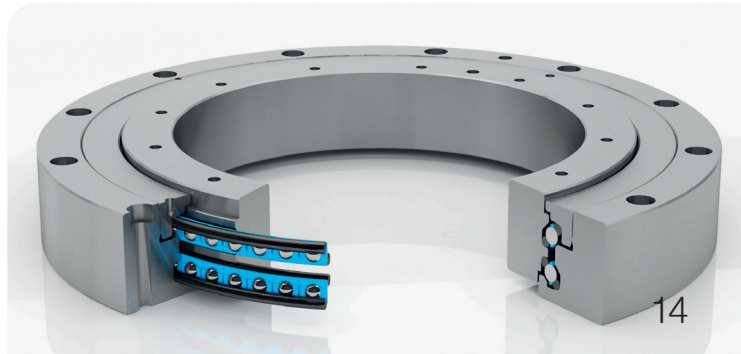
12



18



10



14

Strategy

- 4 **Franke 2020**
The new plant 5 expands the production area by 3,000 m²

Strategy

- 8 **Customer Journey**
How our values contribute to giving you the best possible service experience

Cover Story

- 10 **3D-Printing**
Lightweight bearings with housing parts from the 3D-printer are ultra-light and quickly available

Cover
Housing parts of lightweight bearings made from 3D-printing.

Cover Story // Expert Interview

- 12 **3D-Printing in Detail**
We talk to Philipp Engert from Technical Sales department

News

- 14 **Bearings from Stock**
Standard bearing assemblies are available from stock in many sizes

New Products

- 18 **Rock & Roll**
Wire race bearings and bearing assemblies in cross-roller-version.

Applicaten Examples

- 16 **Lightweight & Direct Drive**
Camera crane, X-ray unit, satellite antenna, barrel handling





Dear Customers and Partners,

With our magazine **Franke Innovativ** we inform you about what we do for the sustainable development of our company. Franke is currently very active and on the move.

A clear sign of our development is the newly created **Plant 5**, which represents the largest investment in the company's history. The extended capacities allow us to optimize the production structure throughout the company.

Further machines were purchased and through a **matrix organization** the company works on product lines that independently serve their respective products. You as our customer benefit from all these measures through high delivery reliability and short delivery times.

Efficiency and customer service are based on our corporate values. We do everything we can to satisfy you on our journey from the first request to the delivery of your order and beyond. What we are doing to achieve this has been summarized under the **Franke 2020** strategy. The details are explained below.

Our new **Franke Technicum** creates space for training and ideas and builds on the inventive genius in our region. By pooling training and development, we find many synergies. Our training department is becoming more attractive and fulfills the ever-increasing demands on a modern training company for the skilled workers of tomorrow.

This is where **innovative new products** as well as machines and plants for the production of our lightweight bearings and linear systems are regularly produced. We have collected examples of interesting applications for you in this issue.

As you can see, it is worthwhile once again to look behind the scenes at Franke. We hope you enjoy the read, the management of Franke GmbH,

Daniel Groz

Sascha Eberhard

Franke 2020

Customer-oriented corporate development

Two years ago, under the motto Franke 2020, profound change processes in the areas of investment, organization and corporate culture were triggered. Now the results are gradually becoming visible. For our customers and for ourselves.



The Management:	Daniel Groz General Manager General Partner	Oliver Schröder Head of Procurement	Harald Müller Head of Production	Stephan Kuhn Head of Technical Sales	Jörg Egelhaaf Head of Design and R & D	Günter Fischer Head of Sales	Sascha Eberhard General Manager
-----------------	---	---	--	--	--	---------------------------------	------------------------------------

Franke 2020 is an elementary project for the company. Outward through the new plant 5 as well as inside, a lot happens at the moment.

The Franke 2020 development process is based on three pillars that are coordinated. Investments in the form of buildings and machines are the externally visible signs of change. Their effect is minimal, however, if at the same time organization and culture in the company are not coordinated with them.

The expansion of the production area allows us to install a matrix organization organized according to product groups. For the first time, teams are working together across departments, taking care for individual product lines. New types of meetings, new shop floor areas and the involvement of all employees in decision-making processes create a completely new form of cooperation.

This helps us to optimize the self-organization of the areas for higher productivity, shorter delivery times and, last but not least, higher customer satisfaction.

All of this only works if the culture in the company is right. Communication, teamwork and appreciation of the entire workforce are being demanded by the new organization to a very different extent than before.

Values and guidelines were developed in direct exchange with the employees, which define our daily cooperation within Franke and our dealings with our customers and partners.

Whether as a participant in internal workshops, as somebody who has new proposals and suggestions for improvement or as an active supporter of ideas and measures

in our customer surveys - we would like to sincerely thank everyone who supports us in the further development of our company.



Completion of Plant 5 is a major step in increasing Franke's performance.

The Franke plant in Aalen. Around 250 people work here on the development and manufacture of innovative lightweight bearings and linear systems.



- Plant 1 - 1956, Administration, production of bearing elements
- Plant 2 - 1978, Machining of housing parts, 2018 Technicum
- Plant 3 - 2003, Production of linear systems
- Plant 4 - 2006, Production of bearing assemblies, quality management
- Plant 5 - 2018, Production of high-dynamic bearings
- Plant 6 - 2020, Extension possibility by 5,000 sqm.

Investment and Organization: Plant 5 is a sustainable step into the future

More than 450 pile foundations are anchored up to 10 meters deep in the ground. The bottom plate is 40 cm thick. Individual areas of the ground are separated from each other to compensate for vibrations.



>> + 3,000 sqm

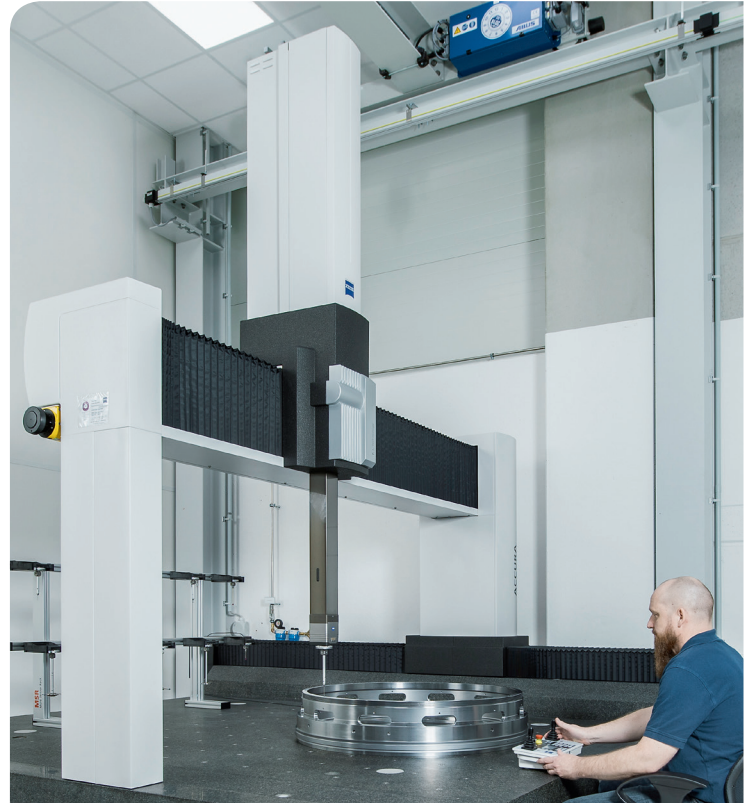
With our new production plant 5 we are opening a new chapter in the history of Franke. Plant 5 is the largest investment to date and the outwardly visible sign of fundamental change.

Over the past decade, we have invested a great deal of energy into the **development of special bearings for high-dynamic applications**. Thanks to extensive development work as well as convincing quality and delivery reliability, we were able to win many prominent customers for such bearings.

This product group will be manufactured in plant 5. Plant 5 is a further step towards **reorganizing the company by product group** which had been started years ago with the production of linear systems at plant 3. Our experience has shown that this strategy leads to large improvements in the value stream and thus greater delivery reliability. Like the building itself, the material flow has been well planned. The entire storage and production area is on one level. As a result, there are short distances and a nearly ideal production cycle.

The extended capacities allow us to optimize the production structure throughout the company. Further machines were purchased and the company uses a **matrix organization** to work out product lines whose production runs largely independently of each other.

Newly created **shop floor areas** enable the teams to communicate on-site in the production. This will quickly resolve emerging issues and increase collaboration within teams on a sustainable basis.



Facts & Figures

Property:	3,981 sqm
Building dimensions:	L 72 x W 53 x H 9.5 m
Production area:	2,500 sqm
Offices / Social / Technology:	750 sqm
Energy-saving class:	KfW 70
Heating:	gas & heat pump
Ventilation:	automatic ventilation system
Lighting:	LED
Photovoltaic system:	delivers 150 kWp electricity

Culture and Brand Values: We want to offer you the best service

As part of the Franke 2020 measures, the „Best Service“ campaign has been launched. It aims to provide the best service to our customers and to work together internally as best as possible.

Our customers are looking for solutions to a technical problem. Whenever we succeed in winning them over for a solution from Franke, our customers can rely on us: Franke products fulfill their promises. Our technical solutions convince every time anew.

Every day at Franke, we work hand in hand together to offer, manufacture and deliver innovative products to our customers. Our motivation is to get better every day. This is supported by our internal values

- Reliability,
- Appreciation,
- Responsibility and
- Cooperation.

However, more is needed for a successful partnership. We want to get known to our customers as

- innovative,
- competent,



- flexible and
- reliable.

As part of the Franke 2020 measures, we discussed how we can improve our relationship with our customers. Both internal and external communication were considered.



Exchange of experiences: The Franke Best Service Team consists of employees from all relevant areas in the company.

Moderated by external specialists, processes are analyzed in workshops and round tables and solutions are found.

Customer Journey - here we start

For satisfied customers, we want to improve our communication. The trigger for this is a customer journey, which gives us valuable impulses for improvements. The support of the customer still has some gaps.

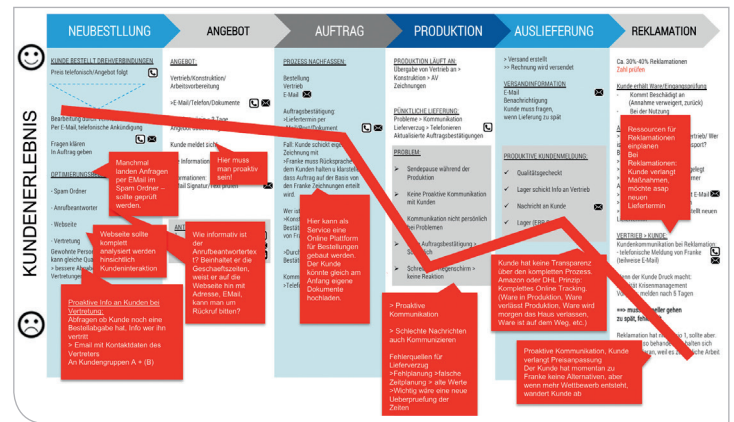
The Best Service Team has examined the customer's journey from inquiry to delivery. The result is clear:

1. In the beginning of the cooperation with our customers the communication runs outstandingly. Here we can play our strengths in terms of advice, technical expertise and service.
2. Once the order has been placed and the order is on the way to production, the communication with our customers breaks off. The reasons for this lie mainly in the currently still lacking transparency of the production processes. Here we already successfully apply.

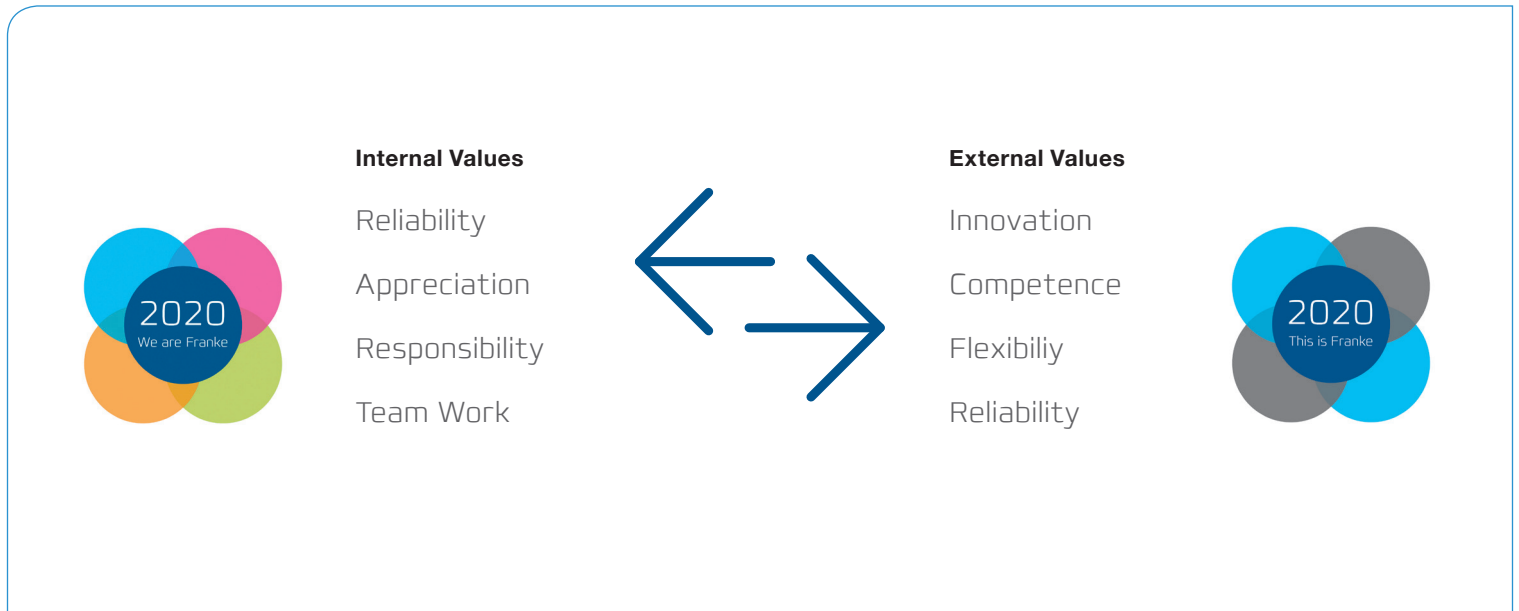
If we do that well, if it was a pleasant journey for the customer, if the result is correct, and if we subsequently take care of the installation of

the product, customer satisfaction or further contact, the chances are great that our customer will be with us next time and come back to us.

For a new journey and a new customer experience with Franke.



The good communication at the beginning of the cooperation has decreased significantly during the journey. A clear starting point for improvements.



Interactions: Our brand values are based on internal corporate values. How we interact internally is also reflected externally. The positive feedback from our

customers and partners in return strengthens us on our way and promotes the internal company spirit of the employees.

Lightweight Bearings from 3D-printing: 3D-printing revolutionizes the Production

Less material means less weight. 3D printing processes enable the production of components whose shape and internal structure can be freely designed. Combined with Franke wire race bearings, this creates the lightest bearing assemblies on the market.

The Principle of Wire Race Bearings

Integrated into an enclosing housing the wire race bearing absorbs forces from all directions. In order to adapt wire race bearings to the requirements of the application, numerous options are available in terms of wire profile, raceways, ball diameter and material.

By using lightweight materials and state-of-the-art manufacturing techniques, Franke's lightweight bearings enable substantial weight, energy and space savings with comparable rigidity and maximum precision over the entire service life. The advantages are apparent:

- Alternative materials such as 3D printing, high-strength plastic or carbon (CFRP) allow significant weight savings.
- Low moving masses ensure energy efficiency and smooth running.
- A free design of the enclosing construction allows savings in connected assemblies.
- Many lightweight materials have positive secondary properties, such as low material expansion or non-magnetism.

Through examinations and analyzes, the enclosing parts of bearing assemblies can be designed so that the material used and the wall thicknesses meet the loads.

However, there are often limits to the design. Not everything that looks good on the CAD screen can be manufactured in reality. There are limitations in machining production as well as economic restrictions, in particular for mold making for CFRP parts.

3D printing is remixing the cards

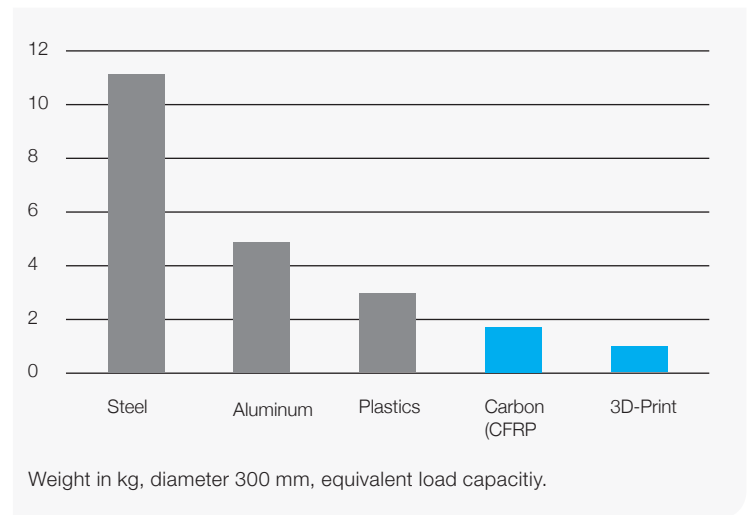
In 3D printing, objects are built up layer by layer from metal particles. This is also called an „additive procedure“. This implies a reversal of conventional manufacturing methods, which are usually associated with the removal of material.

The layered structure of the parts enable completely new possibilities of design. Internal honeycomb structures, varying wall thicknesses and even a mix in the texture of the material are possible and help to make constructions even more delicate and easy. Another advantage of this technology is the fast availability. An appropriately configured CAD file is sufficient to put the printer into action. Shortly thereafter, the required parts are available for further processing. Starting with batch size 1, 3D printing becomes the ideal manufacturing method, as no further tools are needed.

This results in a number of advantages for customers of Franke's 3D printed lightweight bearings:

- extremely low weight and compact design
- bespoke design according to your requirements
- Bearing diameter currently available from 80 - 300 mm (larger diameters on request)
- Batch size 1 possible with fast availability

The weight savings of 3D printed bearing assemblies over conventional manufactured bearings are huge. With the same bearing diameter and the integration of a comparable wire race bearing in the housing rings, the weight saving compared to a conventional steel bearing is almost 90%.





90% lighter



Franke lightweight bearing with housing made of 3D printing and integrated wire race bearing. Clearly visible is the filigree structure of the enclosing parts.

The LSA procedure

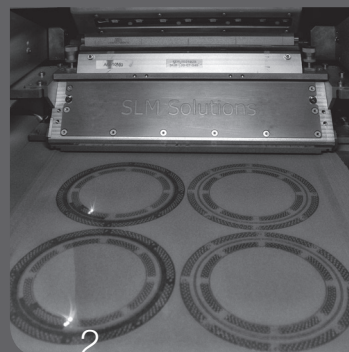
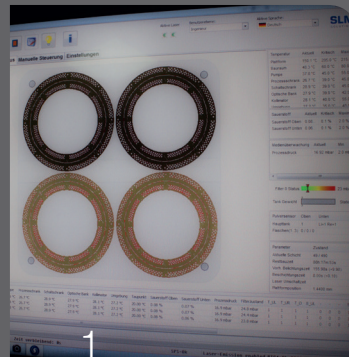
„Laser Sintered Aluminum“

Franke lightweight bearings with housing parts from the 3D printer are probably the lightest bearing assemblies in the world. The aluminum body parts are 3D printed. Made from the finest aluminum granules and equipped with a lightweight yet solid honeycomb structure, they are up to 90% lighter than conventional steel bearings.

How does this work?

First, the components are created in a CAD program (1). The program slices the component into innumerable layers in order to send the laser to the right track level by level.


The aluminum powder is solidified by laser beam at those points which later form the housing parts (2). After each laser layer, new powder is applied and laser-etched again. Until the whole part is „printed“ (3). To use all of the available working space of the printer, several parts are printed simultaneously. In our case, four complete bearings could be manufactured in one operation. The printing lasted 13 hours.



Video

YouTube™

The video for 3D printing at Franke can be found here:
<https://youtu.be/c-XsVHGn5zU>




Lightweight Bearings from 3D-printing: New chances for designers and manufacturers

3D printing opens up completely new possibilities for designers. Philipp Engert from the Technical Sales Department talks in an expert interview about how the new technology can be used to build lightweight bearings. And about the benefit of this technology.

Mr. Engert, what is 3D-printing all about?

Philipp Engert: In principle, this means production processes in which objects are built up in layers of small particles. We also call it „additive procedure“.

Do you have a specific procedure for the application at Franke?

Philipp Engert: We are currently concentrating on so-called laser sintering. This creates workpieces made of metal or plastic. From our point of view, laser sintering is one of the most promising variants in the field of additive processing.

How does this work?

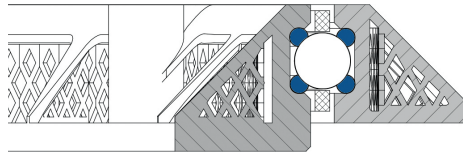
Philipp Engert: As the name implies, laser sintering uses a high-energy laser beam. He heats the metal powder at defined points and melts it together. We have illustrated in detail the principle on page 11 in this issue.

Why is Franke interested in 3D-printing?

Philipp Engert: We are always on the lookout for innovative technologies that enable us to meet the demands of our customers. Lightweight construction is currently on everyone's lips across all industries. 3D printing has a lot to offer in this respect.

What has 3D-printing to do with lightweight?

Philipp Engert: Perfect lightweight construction is the ability to omit material wherever it is not needed. 3D printing gives us completely new ways to design parts geometries. The adaptation of the housing parts to the enclosing construction can also be done almost seamlessly.



Is there a risk that this might lead to a weakness of the bearing concerning the load capacity?

Philipp Engert: No. This is where the ingenious principle of the Franke Wire Race Bearings enters the game. The performance of the bearing is only partially influenced by the enclosing structure. All loads are initially absorbed by the races of the wire race bearings.

Certainly, these races need a corresponding ring bed. But the nature and material of the enclosing construction are freely selectable. Wire race bearings are therefore ideally suited for 3D components.

Where do you see applications for 3D printed bearing assemblies?

Philipp Engert: Applications are interesting as soon as the following parameters are required:

- lowest weight,
- bespoke design,
- smallest installation space and
- fast availability even with batch size 1.

For example, service robots, which are designed to be small and lightweight and designed to relieve people of their jobs, can benefit from 3D printed lightweight bearings, as well as aerospace or light electric vehicles.





Contact

Philipp Engert
 Technical Sales
 Phone +49 7361 920-125
 p.engert@franke-gmbh.de

Special brochure about lightweight bearings

All variants of lightweight bearings in comparison

The most important information about lightweight bearings can be found in our brochure. Compactly summarized on 8 pages, the respective production processes are compared there and the application possibilities of the bearings are shown. The brochure can be ordered in paper form and is available as PDF in the download area of our website www.franke-gmbh.com.

Aluminium for the movies:
 Example of a highly dynamic camera gyroscope



Individual
 customised
 bearing
 made of aluminium

For the articulated joints of the gimbals, lightweight, customised bearings with high stiffness are used. They are lightweight and characterised by a low rotational torque and a low rotational resistance. Forces and moments arise from all directions. This will not interfere with the recording quality of the camera.

The bearing housing is optimised by the release of surplus material. FEM analyses provided the evidence for the reduction of the mass in crucial points. The bearing housing can absorb forces from all directions and is insensitive to temperature fluctuations and vibrations. The result is a smooth running bearing with high stiffness at a low price.



3D printed aluminium for aviation:
 Example rescue helicopter



Lightweight flying
 The rescue helicopter

Designers of components for aviation use every opportunity for weight reduction. Here too this does not mean: pure weight loss but a direct impact on the performance of the aircraft as well as on the fuel costs.

One application for a wire race bearing with surrounding parts from the 3D printer is the mount of a rotor's hub to a rescue helicopter. The hub's external part can be installed easily and evenly to facilitate the loading and unloading of the part.

The special bearing from aluminium is characterised by extremely low weight and insensitivity to temperature fluctuations and vibrations. And by a weight of only 800 grams.



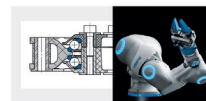
Carbon CFRP for robotics:
 Example of a service robot



Perfect fit selected
 for service robot

Lightweight robots are increasingly used as service and mobile robots. The mass of such robots is very sensitive. It is with optimal control of it. They consist of light CFRP materials with good stiffness and low mass. Space saving bearings are used for the motion axes, which have a high stiffness, low weight and a small installation space.

Wire race bearings are very compact and are integrated directly into the design of the robot. The material of the surrounding construction therefore does not depend on the bearing and can be chosen freely. The high load capacity of the bearing from all directions is ensured by a four-point engagement of the wires.

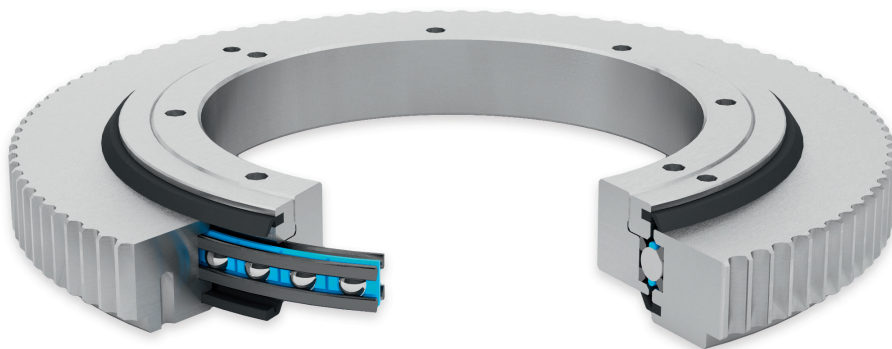
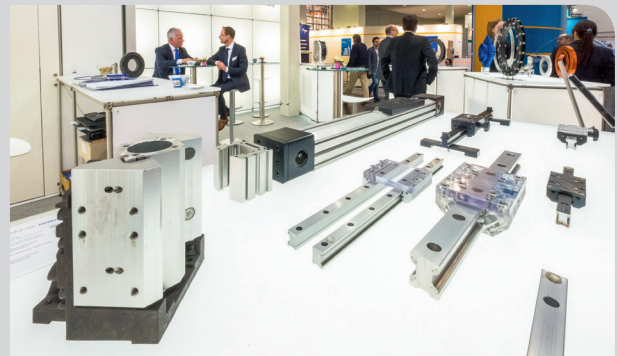


Franke at Trade Shows

Light Bearings for Innovation around the World

Motek (Germany), AIM (Germany), KOMAF (Korea), FMB (Germany), ELMIA (Sweden), ILA (Germany), Automatica (Germany), MECSPE (Italy), MetalMadrid (Spain) – the trade show year at Franke is densely packed. Together with our representatives, the advantages of wire race bearing technology were presented at the trade show booths in Germany and abroad. Lightweight design, customer-specific solutions and high-tech bearings with integrated direct drive testify to the range of products offered by the technical possibilities of Franke wire race bearings and linear systems.

Many visitors to the booths came into contact with this technology for the first time and were very interested. The concept of wire race bearings is far from common knowledge and marketing work is still required to show designers and developers around the world the potential of Erich Franke's invention. Participation in trade shows is a promising strategy for this.



Bearings from Stock

Great selection range - quickly available

As a manufacturer of customer-specific lightweight bearings, we have made a name for ourselves in numerous industries and applications. In addition to special bearings, we also offer ready-to-install standard bearing assemblies, which are available in numerous variants.

The most common diameters between 100 and 600 mm are available from stock. So if you need a fast standard bearing assembly, it is always worth asking us. We certainly have the right bearing in stock for you.

Available from stock:

- Bearing assemblies made of steel or aluminum
- Diameter range 100 - 600 mm
- With or without gear

More information can be found on our website or in our new standard catalog, which we will gladly send you.



Facts & Figures

Start of planning:	May 2017
Opening:	April 2018
No. of working places:	25
Size:	600 sqm

Equipment

CAD workstations, meeting rooms, CNC processing machines and workbenches for in-company training, assembly tables and test cabins for tests on highly dynamic wire race bearings

Franke **Technicum** combines Training and R & D

Training and R & D cooperate under the same roof in the newly created Franke Technicum.

The Franke Technicum creates space for training and ideas and builds on the inventiveness of our local region: even the ancient Romans, who once colonized Southern Germany coined the term „Technicum“.

19 apprentices are currently undergoing their apprenticeship at Franke. All training-relevant machines as well as the assembly and testing facilities of the R & D find their place here. By pooling the areas we use

synergies of training and development. Our education is becoming more attractive and fulfilling the increasing requirements for training urgently needed specialists.

The cooperation of training and development regularly produces innovative new products as well as machinery and equipment for the production of our products.

New Representation for our Customers in Northern Germany

Company AnWeTec becomes new Franke representation.



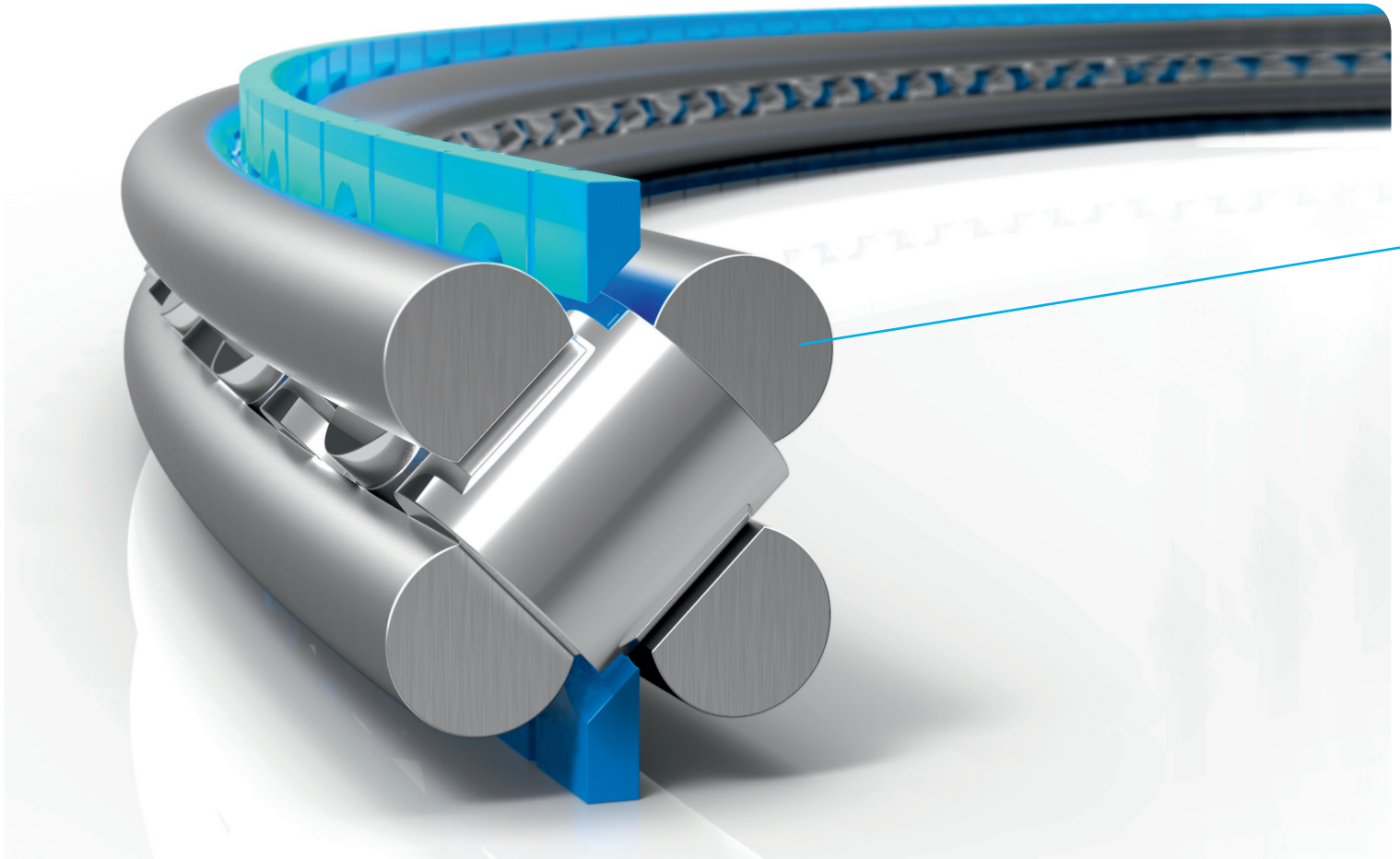
The company AnWeTec was founded in 2012 by **André Wegner**. Mr. Wegner was employed by an industrial agency for 10 years and then set up his own agency. Mr. Wegner has three employees - two of them in the sales department and one who takes care of the IT-systems. Since July 2, the team has been working for Franke on the areas of Lower Saxony, Hamburg and Schleswig Holstein.

Meanwhile, André Wegner, Ina Hinkerode and Sandra Rothensee have undergone intensive training to get to know our products and to coordinate the cooperation with the internal contact persons.

We are glad to have won the company AnWeTec for us and look forward to a successful cooperation. www.anwetec.de



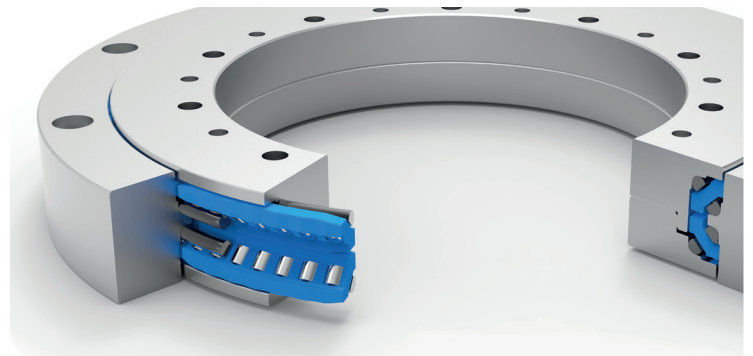
Rock & Roll: Cross Roller Bearing for higher Load Capacity



Roller bearings are used wherever high load capacity and high rigidity are required. An example of this is the pivot axis of a pallet changer for large CNC processing machines or special devices in medical technology.

From time to time, our technical consultants come across applications that would be of interest for Franke bearings, but can not be solved with the existing series due to the high load ratings. In future, the new **LEW roller bearing element** and the associated **LVG bearing assembly** can be offered here.

Roller bearings use rollers instead of balls as rolling elements. In contrast to balls, rollers have a larger contact surface between the rolling element and the running wire. Larger contact surfaces can accommodate larger loads



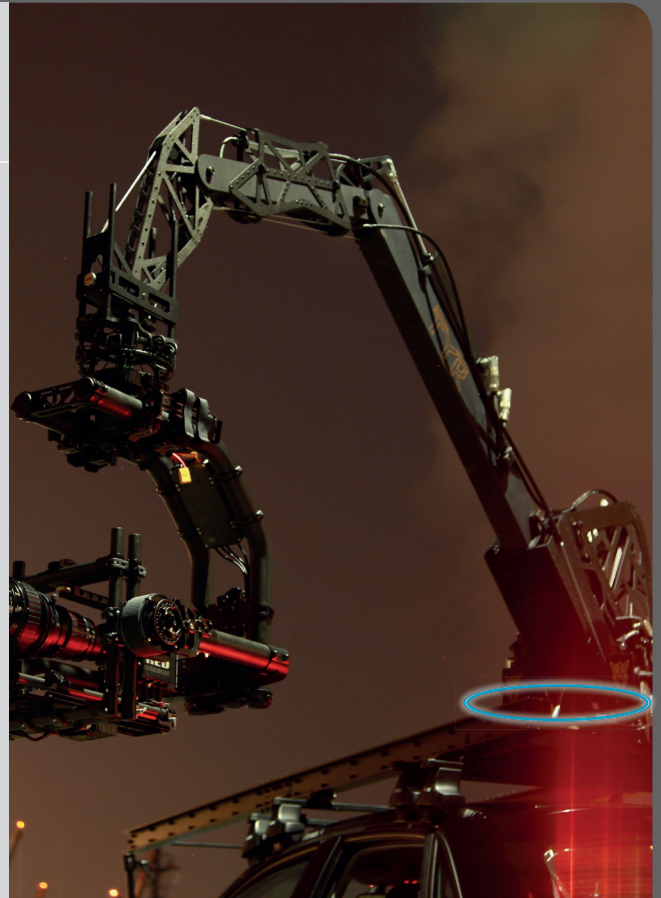
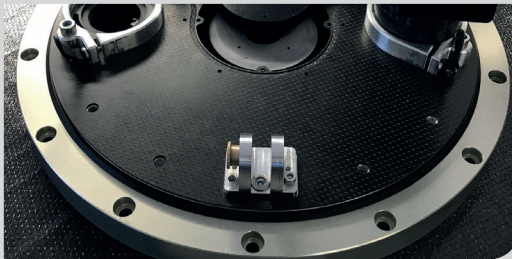
and thus increase the load capacity of the bearing by up to 50% compared to ball bearings. Due to the crosswise arrangement of the rollers, the same high loads can be absorbed from all directions.

Light Weight: Swivel Bearing for Camera Crane

Advantages: lightweight, high rigidity, maintenance-free

The Task: A mobile camera crane, which is mounted on vehicles, is to be rotated pivotally. The bearing has to cope with high tilting moments due to the boom. Lightweight construction and robustness against impacts and vibrations are further requirements for the bearing.

The Solution: Bearing assembly with weight-reducing bores and a round wire without raceway. The holes reduce the weight by almost 50%. The round wire can not tilt under load and ensures full function of the bearing even when twisting the mating structure.

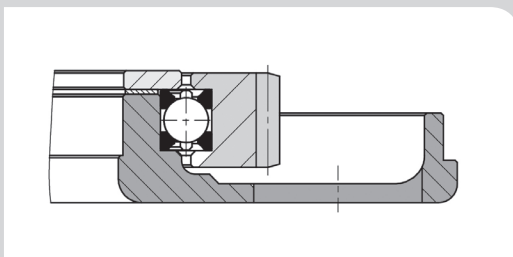


High Rigidity: X-ray device for Oncology

Advantages: high rigidity and extremely low rotational resistance

The Task: The irradiation device is rotatably mounted around the patient bed. Thus, the radiation energy can be targeted to the body in best position. The bearing has to cope with a high tilting moment and should run as smoothly as possible in order to be able to exactly execute the positioning of the probe.

The Solution: A customized hard anodized aluminum bearing is used. The bearing is extremely thin-walled and designed for easy running.

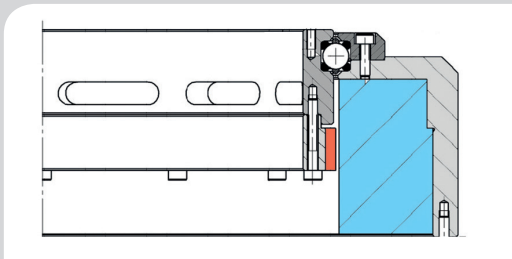


Small, Strong and Smart: Direct Drive Bearing for Antennas

Advantages: small mounting space, high rigidity, integrated direct drive

The Task: A radar antenna should be moved by motor. The antenna rests on the telescopic boom of an off-road vehicle. To avoid obstacles when sending and receiving, the antenna can be raised several meters. The transmission of the rotary drive must participate in this height adjustment.

The Solution: Franke light-weight bearing type LD-Drive with integrated motor. The drive is integrated in the bearing. This eliminates further drive elements such as toothed belts or drive shafts. Only the wiring has to be guided downwards through the telescopic tube.



Clean and Maintenance-free: Gripper for Plastic-Barrels

Advantages: low slide resistance, clean, maintenance-free

The Task: Mechanical grippers for safe movement of plastic barrels must be horizontally adjustable in order to accommodate barrels of different diameters.

The adjustment of the gripper is motorized. The motor also holds the cassettes in position and secures the system against unwanted displacement.

The Solution: Franke aluminum linear guides of size 25 are used in two-lane arrangement. Their smooth running ensures fast movement and requires minimal drive power. This allows the motors to be designed small and energy-saving.

The encapsulated rollers are life lubricated and thus maintenance-free over the entire mileage. The grease remains in the rollers and prevents pollution of the environment.





Franke

Drahtwälzlager
Linearsysteme

Wire Race Bearings
Linear Systems

Besucher
Visitors



YouTube™

XING[®]

Editor:
Franke GmbH
Obere Bahnstraße 64
73431 Aalen, Germany
Phone +49 7361 920-0
Fax +49 7361 920-120
info@franke-gmbh.de

Responsible:
Gerhard Reininger
Franke GmbH

In cooperation with:
carbonauten, Heidenheim
d_tec.tif GmbH, Aalen

www.franke-gmbh.com