



FAG



Bearing Supports for Food Processing and Packaging Machines

SCHAEFFLER GROUP
INDUSTRIAL



added
competence

Added competence for your success

We have been an expert development partner for the manufacturers of food processing and packaging machinery for decades. With our strong brands INA and FAG, we are one of the world's leading manufacturers of complete bearing support units in this sector.

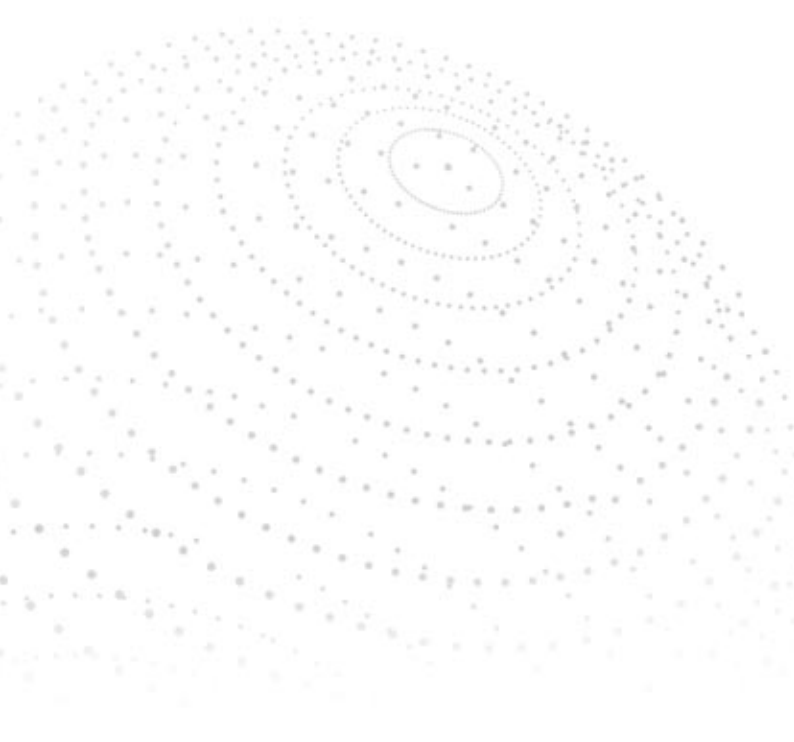
As a customer of the Schaeffler Group, you can expect a comprehensive range of catalog products with around 40,000 volume-produced products to choose from. In addition, we can also offer you system solutions tailored to your application and a series of high-tech products that are extremely resistant to corrosion and wear. In short, we can offer you the highest level of reliability and a long operating life.

Gone are the days when the optimization potential of machinery relied only on the continuous improvement of single components. Only those who can analyze and understand an entire system can further increase the performance and cost-effectiveness of their machines

on a long-term basis. This approach also corresponds with our "added competence" concept, since we consistently focus on system solution thinking for bearing supports. As a customer, you therefore have access to a range of products that gives optimum coverage to all your bearing applications in the machine.

The Schaeffler Group sees its role as that of a development partner for your sector. This leads to customized and optimized technical solutions for customers with durable "ready-to-fit" products. Expert application support and comprehensive design know-how are just as much a part of our strengths as rolling bearing calculation, testing and tribology. A close network of engineers and service and sales technicians work for you around the world to ensure customer proximity.

We always have the right product for your application. Just talk to us.



Our range of products and services for your sector



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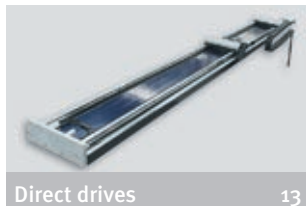
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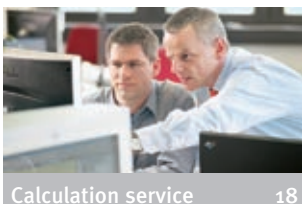
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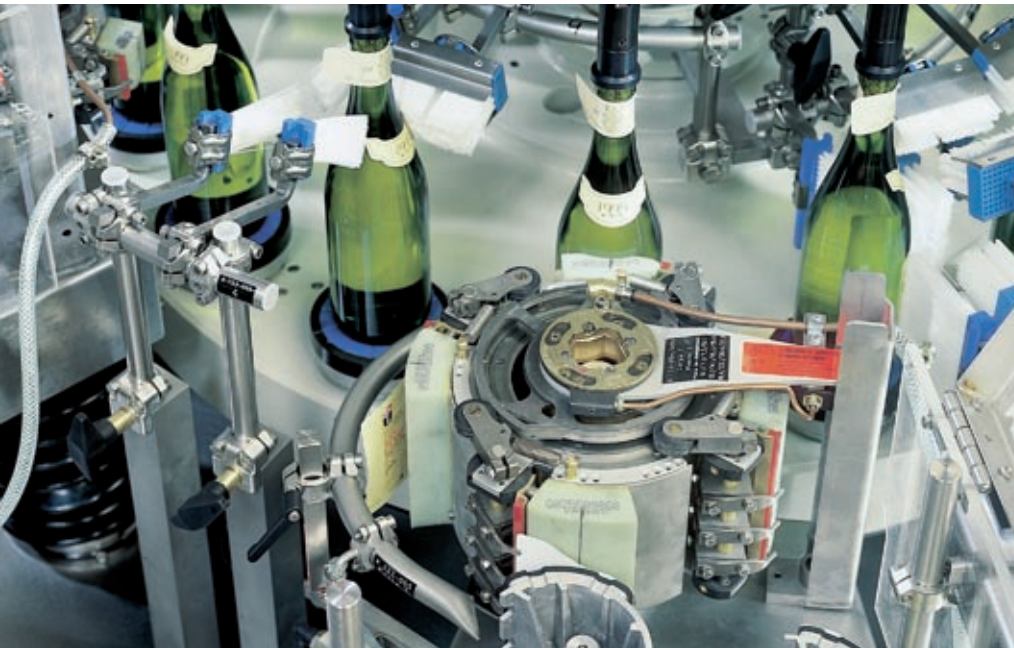
The processes involved in manufacturing foodstuffs must be highly efficient and cost-effective. These processes are usually fully-automated and often take place under extreme operating conditions. This requires a high level of safety and reliability. This means that high-quality machine components designed for continuous operation are essential. Our contribution: robust bearings with corrosion protection and effective seals that are often lubricated for life for reliable operation around the clock. Modern materials and surface coatings, undergoing continuous development work, give our bearings the necessary edge in terms of operating life.

Whether you require radial insert ball bearings, track rollers, slewing rings, our entire range of linear products, catalog bearings or a customized unit, for all these INA and FAG products, your benefit is the focus of our developments.

- Reducing the number of interfaces by integrating functions
- Compact designs
- Freedom from maintenance
- Reliable operating life
- Components and subsystems that are matched precisely to one another

Place your trust in quality and a wide variety of products from one source. We look forward to working with you.

FAG Deep groove ball bearings: World champions in application



Reliable quality: FAG deep groove ball bearings in a bottle labeling machine (photo: KRONES)

Behind the range of ball bearings offered by the Schaeffler Group stands FAG, a brand that can look back over more than 100 years of tradition. The FAG name continues to stand today for precision, quality, reliability and innovation.

Deep groove ball bearings are the most widely used of all rolling bearings. Accordingly, they are often used in food processing and packaging machinery.

Cost-effective and readily available

Deep groove ball bearings are cost-effective, readily available and easy to maintain. We continuously improve and adjust the quality of the bearings to meet the increasing and often varying requirements of industry. High-quality materials and precision-machined surfaces ensure reliability and reduce running noise, even in the case of tilted bearings.



Standard deep groove ball bearings with steel or plastic cages, with or without seals

A wide variety of volume-produced products and special solutions

FAG deep groove ball bearings are available as volume-produced products in a wide variety of designs, with cages made from sheet steel, polyamide or brass, with various seal types and also from corrosion-resistant steel.

High-performance corrosion-resistant steels and ceramics are available for applications that require extremely corrosion-resistant and wear-resistant bearing supports (please refer to “Materials” on page 14). This enables media lubrication and even dry running. Ask about our special bearings.

Modern sealing concepts

Characteristics such as the quality of materials, seal design, the lubricant selected and reliable adherence to tolerances are decisive factors for the operating life of a bearing. Using sealed FAG deep groove

ball bearings that are greased for life is the simplest way to ensure success. The grease type and quantity and the seals themselves are perfectly matched to each other. Our recommendations for deep groove ball bearing seals in this sector are RSR or HRS, depending on requirements and the ambient conditions.

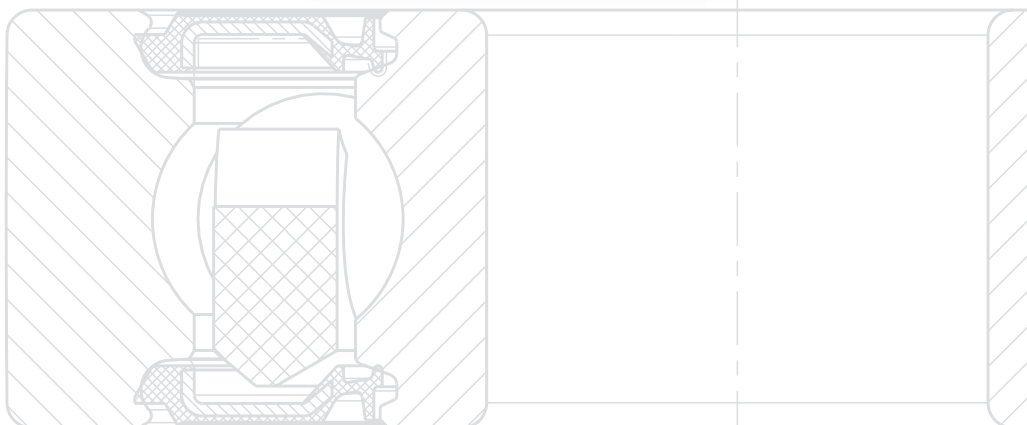
RSR sealing shields offer a balanced relationship between friction and sealing action and are suitable for damp operating conditions. The HRS seal is a new development. An optimal seal lip geometry and the narrowest tolerances ensure the bearings have a long operating life.



Well-thought out right down to the last detail: The new HRS seal is the winner in the category “Seal integrity under exposure to water”



Ball bearings of high-performance corrosion-resistant steel with ceramic balls for extremely high requirements



Robust and cost-effective: Radial insert ball bearings and ...



Safe for use with foodstuffs and protected against corrosion: Plastic flanged housings in a waffle conveyor belt system (photo: TMF Belting Systems B.V.)

Modern housing units are often so similar, it is hard to tell them apart. The same rolling bearing steel or cast iron, similar cages and housing designs, series according to DIN or JIS standards, and so on. However, the differences are apparent upon closer inspection.

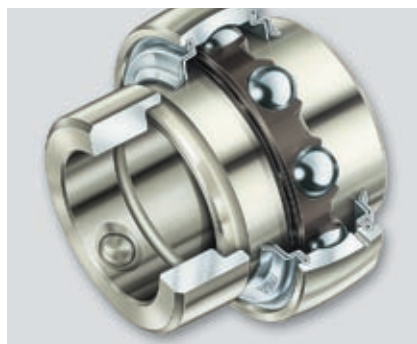
Robust and zinc-plated:

Our three-piece seal concept

We have developed a unique seal system from three components – an outer cap, seal lip and inner cap, that covers nearly all operating and ambient conditions.



Radial insert ball bearings are available in designs that are resistant to high temperatures up to 250 °C



Cast iron plummer block housing with a radial insert ball bearing protected by Corrotect®

The advantages at a glance:

- A concentric seal contact surface means that the sealing action and operating life are considerably improved
- Mechanical protection due to outer caps that extend towards the center of the bearing
- Zinc-plated inner and outer caps
- Seal lips for standard applications as well as for operation in high and low temperatures
- Rolled in sheet steel seals for fixed seal seating and easy relubrication.

Durable and protected against corrosion by corrosion-resistant steel and Corrotect®

Radial insert ball bearings made from corrosion-resistant high-alloy rolling bearing steel are available where high demands are placed on corrosion protection. These are essential if it is anticipated that the bearings will come into contact with foodstuffs.

As a cost-effective alternative to bearings made of corrosion-resistant steels, radial insert ball bearings are available with the Corrotect® special coating. You can find more information in the section “Coatings” on page 16.

Flexible and effective: Location methods

You can choose between five location methods for INA radial insert ball bearings. The standard methods are those using eccentric locking collars or grub screws that enable the bearings to be mounted quickly and cost-effectively.

... housing units made of cast iron, sheet steel, plastic

Versatile and cost-effective:

INA housing units

Radial insert ball bearings made of corrosion-resistant steel in various types can be combined with

Plummer block housings

- made of solid cast iron or
- sheet steel – particularly cost-effective and light, painted or coated with Corrotect®

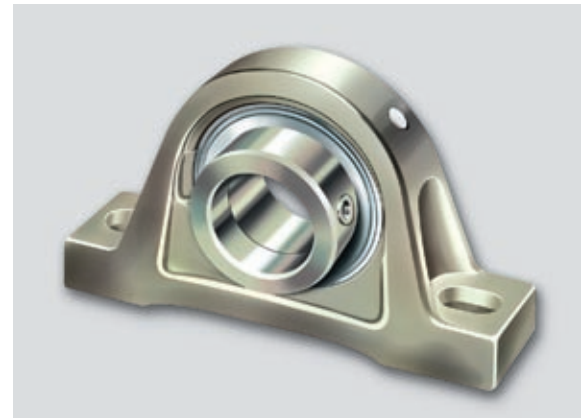
Flanged housings

- in two-bolt or four-bolt designs
- made of plastic – where high demands are placed on hygiene and corrosion protection.

We can supply you with the correct housing unit for practically every application.

The benefits for you are clear:

- particularly economical – without engineering compromises
- easy to fit
- robust and reliable
- shaft misalignment is prevented by the self-alignment facility.

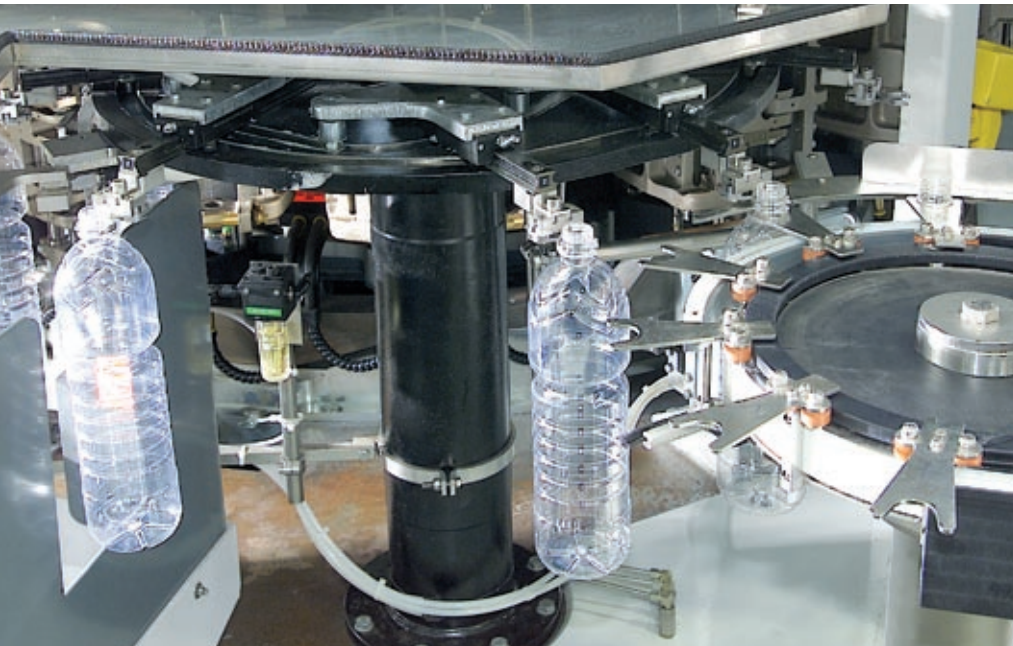


Radial insert ball bearing protected against corrosion by Corrotect® plating



Suitable for use with foodstuffs: Corrosion-resistant radial insert ball bearings with plummer block and flanged housings made of plastic

Higher operational safety due to technical superiority

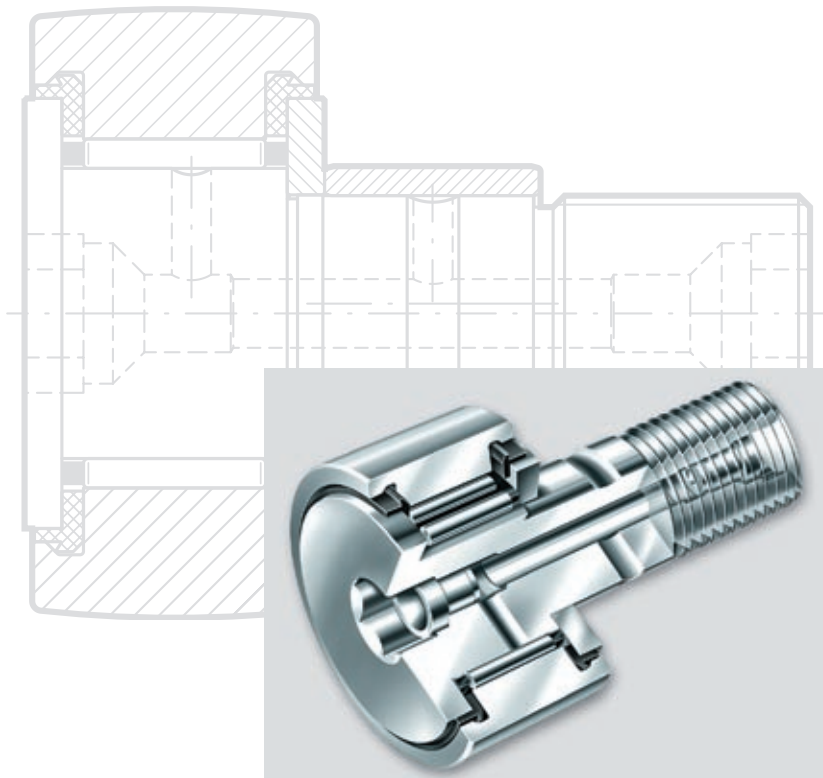


No wear on the outside surface and mating track: INA stud type track rollers with Triondur® coating in the cam control system of a star wheel transfer unit for a PET bottle filling machine (photo: KRONES)

INA track rollers with an optimized outer surface are significantly superior to conventional components. The Hertzian pressure at the contact point is always lower than conventional track rollers – with or without tilting. This reduces wear of the mating track.

Track rollers as an economic factor

Due to their many technical advantages, our track rollers generate an added economic benefit for machine operators, for example in bottling plants. They require little space and operate reliably with low wear. They seldom require relubrication thanks to their large grease reservoirs and particularly effective seals. The user benefits from reduced maintenance requirements and lower costs. Perfecting existing products in order to increase their benefit for users is one of the demands the Schaeffler Group places on itself as



Long relubrication intervals: Stud type track roller KR...PPA based on a needle bearing with improved sealing



Low maintenance due to large grease reservoirs: Stud type track roller PWKR for heavy loads

an engineering partner to its customers. Significantly increased operating reliability and a longer operating life were the objectives of a further stage in development of yoke type and stud type track rollers based on needle bearings. The result: redesigned thrust and sealing rings made of wear-resistant plastic.

High-tech concepts

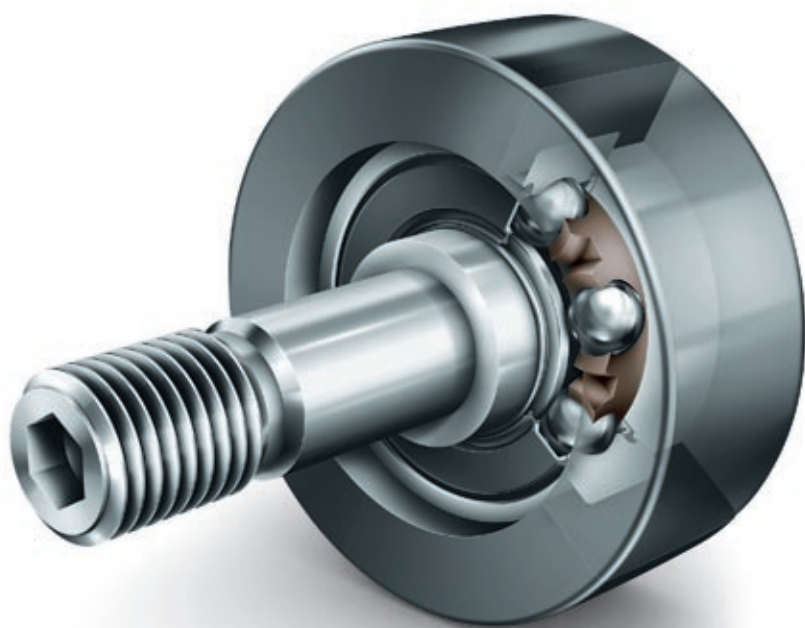
We can offer you the right product even for extreme operating conditions such as high humidity and constant exposure to water. Our special Corrotect® coating can be applied to track rollers during manufacture. Or perhaps you'd be interested in one of our high-tech track roller concepts based on the new high-performance corrosion-resistant steel Cronitect?

Used in conjunction with ceramic balls, even the most difficult applications with

media lubrication up to dry running can be controlled. The significantly increased protection against corrosion compared with conventional corrosion-resistant rolling bearing steels provides the user with considerable economic benefits. You should also talk to us if you are looking for a solution where the wear resistance

of the outer surface of the track roller and the mating track have been considerably improved.

You will find more information in the sections Materials and Coatings starting on page 14. Speaking to us personally is even more effective – contact us to arrange a consultation with our specialists.

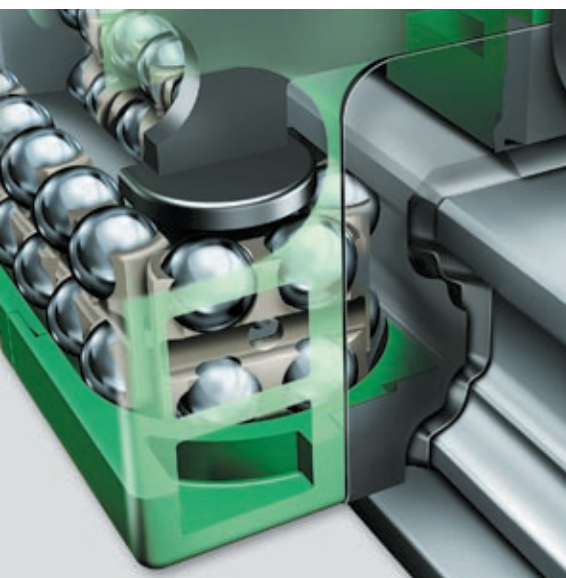


Extremely high load capacity:
Yoke type track roller with large grease reservoir

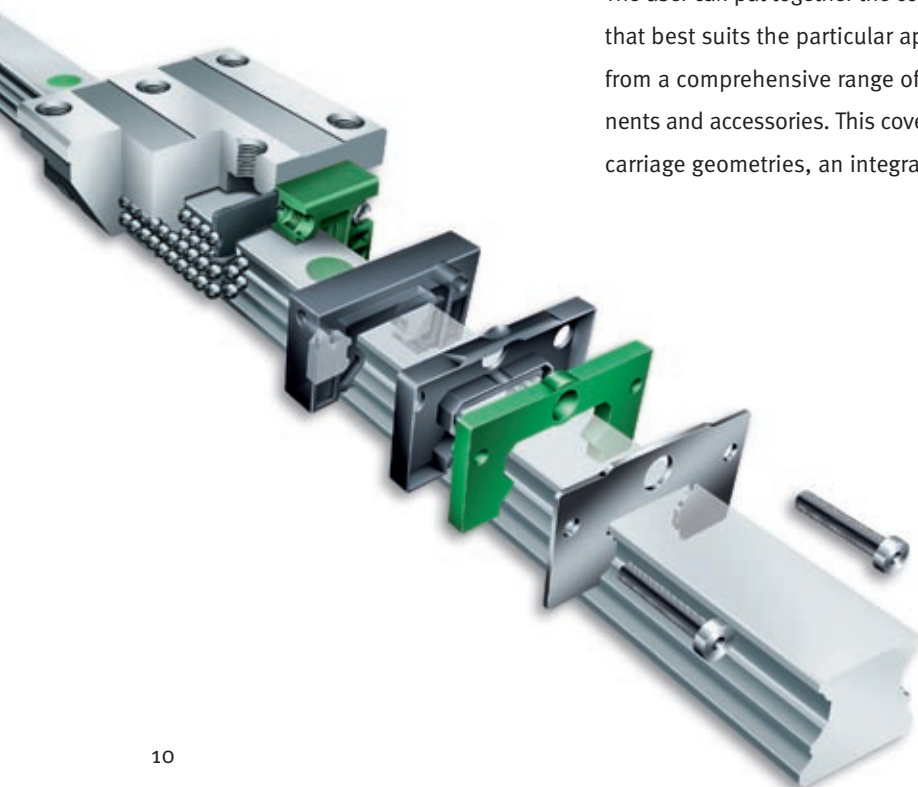


Low-friction running and very long maintenance
intervals – track roller LR52

High performance in a straight line: INA Linear guidance systems



Dynamic linear ball bearing and guideway assemblies in X-life quality. Above: with quad spacers in the ball rows to minimize collision noise. Below: the robust design featuring a full complement of balls and the KUBE-KIT range of accessories



INA linear technology stands for a wide variety of high quality products – tried and tested and full of interesting ideas. We can offer an optimized solution for every application. Choose from the world's widest range of linear products.

INA linear recirculating ball guidance systems – a modular concept full of good ideas

Our KUBE four-row, modular linear recirculating ball guidance system is one of our proven “classics”. Two basic designs are available: either robust with a full complement of rolling elements for high loads or with so-called quad spacers for quiet and highly-dynamic operation. Both designs are practically maintenance-free due to an integrated lubricant reservoir close to the raceway.

The user can put together the combination that best suits the particular application from a comprehensive range of components and accessories. This covers various carriage geometries, an integrated

measuring system, toothed guideways, braking and clamping elements, end pieces made of metal or plastic, and much more.

We especially recommend KUBE-KIT for the food processing and packaging industry – a finely-matched sealing and lubrication concept for taking account of all ambient conditions. It contains versatile components such as front and additional wipers, sealing strips and long-term lubrication units. These accessories protect the running system of the guideways against contamination, ensure lubricant is provided when required and give long relubrication intervals.

Low-noise and without stick-slip: Track roller linear guidance systems in lightweight design

INA track roller linear guidance systems are products that are robust, insensitive to contamination and have been used for decades in many industrial sectors. They run smoothly with low friction and



The operating life of our new lightweight linear ball bearings KN..-B is 50 % longer than its predecessor with the same dimensions

without stick-slip at speeds of up to 10 m/s. Various guideway geometries can be combined if oval or other curved tracks are required.

Positioning and transporting with linear actuators

Feed and discharge processes are the preferred applications for our compact, highly-integrated INA linear actuators. As a system supplier, we can offer you ready-to-install complete solutions that include motors, gearboxes, controllers, etc. Depending on the type, these actuators are characterized by the following benefits:

- long maintenance intervals
- long axes
- highly-dynamic movements
- high positioning and repeat accuracy.

We offer a wide variety of guidance systems such as track roller guidance systems, linear recirculating ball guidance systems or shaft guidance systems for various customer requirements.

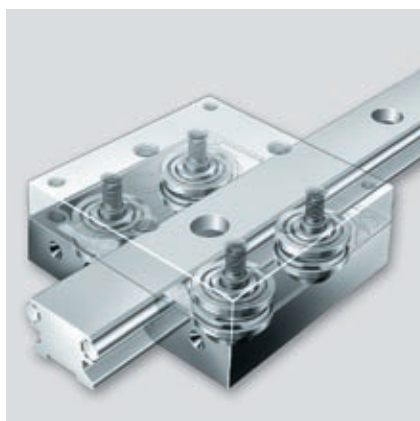


INA linear recirculating roller bearing and guideway assemblies in a packing and palletizing robot mean that the required precision at high loads as well as long-term process reliability is ensured for the machine manufacturer (photo: KRONES)

This is also the case for drive elements. Here, you can select from toothed belt drives, spindle drives or linear motor drives. The range is rounded out by special solutions such as telescopic actuators, clamping actuators or actuators with two or more carriages.

INA linear technology – quality with a tradition from Schaeffler.

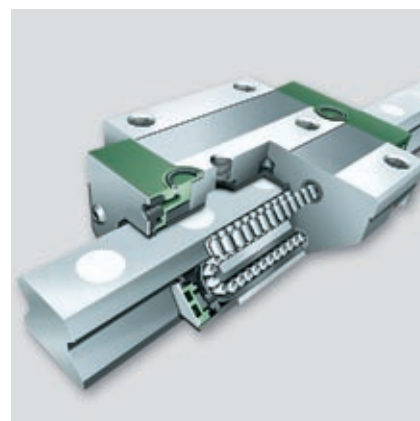
For an information pack, contact:
info.linear@schaeffler.com



Lightweight track roller guidance system LF: reliable, fast, compact



Speeds up to 10 m/s: Track roller guidance system MLFI is also available in a corrosion-resistant design



RUE..-E: These compact high-performance guidance systems have high load carrying capacity and rigidity with long operating life

More security for large bearing positions



Total reliability required: The high performance capacity of slewing rings is required in product fillers for PET bottles (photo: KRONES)



It's not always small bearings that are required in food processing and packaging machines. Consider the example of a filling plant. The load carrying capacity of large slewing rings is required for the secure bearing supports of the product fillers, star wheel transfer units or rinsers

for cleaning bottles. Total reliability in damp and aggressive operating conditions is also required here.

We can meet these very high demands with our comprehensive range of slewing rings. The choice is yours – four point contact bearings or crossed roller bearings, heavy or light series, with internal or external teeth, sealed, and so on. Our range extends from “small” to “large” – now up to 4 meters in diameter. This means we also have the right bearing for the largest machinery in the industry! We would be only too happy to help you select the solution you require.

And if your idea can't be put into practice with a standard bearing from our range, then we can develop a special solution with you.

Both in the case of standardized or customized products, one thing is guaranteed. You will receive a high-quality product from the Schaeffler Group – reliable, precise and economical.



For compact drive concepts: Four point bearings can be supplied with internal or external teeth



Save on one bearing position: INA crossed roller bearings XSU support radial and axial loads, tilting moments as well as any combination of loads

Drives with a system – dynamic, flexible, precise

Direct drives from the Schaeffler subsidiary IDAM (INA Drives and Mechatronics) are state-of-the-art and offer the right solution for every application. These virtually wear-free drives have the following advantages: high speed variability, excellent dynamics and rigidity, and as a result, tracking accuracy, high final speeds, high accelerating and stopping capability as well as the highest positioning and repeat accuracy. Linear, rotary and two-coordinate direct drives are available in a wide range of sizes and capacities as well as all the electronic assemblies required for operation.

Linear motors

The L2 series of motors is especially suitable for handling systems and for transporting small and medium sized masses. They fulfill high requirements in precision and dynamics. The L1 series is part of our range of slotted linear synchronous motors. These drives are particularly suitable for small and medium-sized positioning units due to their

compact design and high power density. The design of the motor is simple and cost-effective.

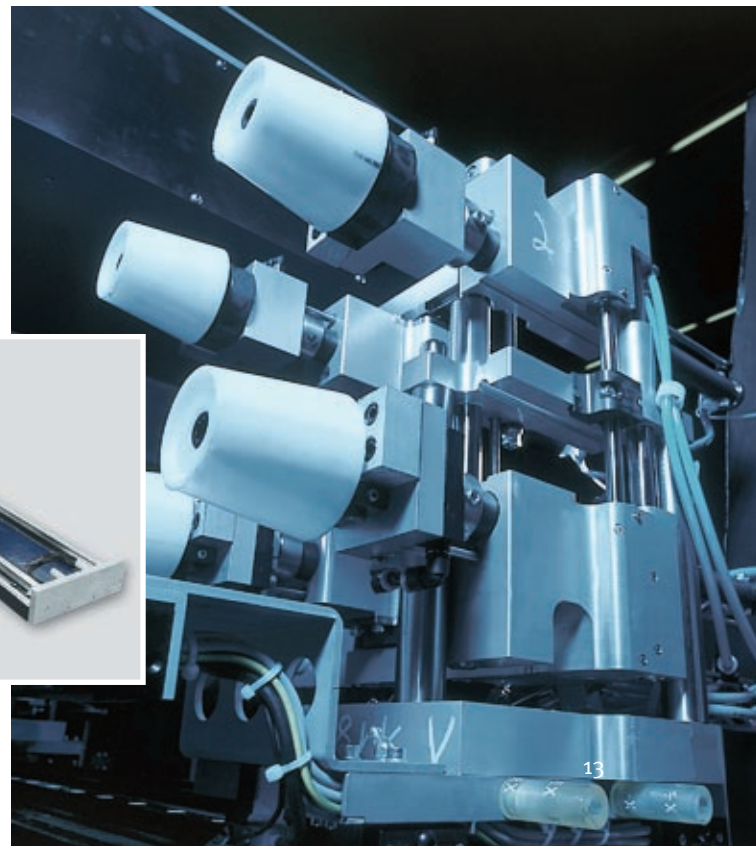
Torque motors

IDAM torque motors are ideal for applications that require high torque and smooth running behavior. Slotted high-torque synchronous motors designed as internal and external rotors are characterized by efficient power generation, maximum power density, high acceleration capability and high final speeds. These power packs are contact-free and operate without wear and friction.

System solutions

The strength of our “added competence” approach is particularly apparent here. By forming development partnerships with our customers and through continuous interdisciplinary cooperation within Schaeffler Group Industrial, we can provide high-performance customer-specific system solutions. This is how we produce innovative mechatronic solutions that provide you with completely new concepts. A system comprising a bearing and motor, ready-to-install, perfectly matched and all from one source. Does this give you new ideas for your machines? Just talk to us.

Molding, filling and sealing machine equipped with four DDS24 systems that achieve acceleration of 12 m/s^2 with an additional mass of 18 kg (photo: Adolf Illig Maschinenbau GmbH & Co. KG)



Torque motor RI: compact and powerful



Linear system DDS24: precise and dynamic

PEEK, ceramics and high-performance corrosion-resistant steel – using the right combination for success



Ceramic balls make rolling bearings lighter and more durable

Corrosion-resistant special steels, high-performance plastics, ceramics – we combine these materials with each other in order to achieve the best possible bearing properties. The purpose determines the material. And you determine the purpose!

Plastics

The high-performance plastic PEEK is a modern material in the rolling bearing industry. Its effective media resistance in particular makes it invaluable for demanding bearing applications in the foodstuffs sector. However, it is not only the plastic itself that influences the properties of the bearing. The type and quantities of fillers such as glass fiber, graphite or PTFE also play an important role. We specify the “right” combination of all components separately for each application. This ensures that the bearing cage, the end piece of a linear guidance system or the plastic tire of a yoke type

track roller are all matched to the purpose in the best possible way. Use the Schaeffler Group’s expertise to find the best solution regarding dry running characteristics, mechanical stability or media resistance for your application.

Ceramics

Ceramic is the supermaterial for rolling bearings since it is light and durable. Bearings with ceramic balls (hybrid bearings) have significant advantages since the bearings demonstrate considerably longer operating life, can achieve higher speeds, have lower bearing temperatures and require less lubrication.

High-performance corrosion-resistant steels

The advantages offered by ceramic balls become particularly significant when used in conjunction with our new high-performance corrosion-resistant steels.



Durable and low-noise: This track roller with a plastic tire operates quietly and without lubrication



Depending on the purpose: End pieces made of PEEK or metal for linear recirculating ball guidance systems



It all depends on the right combination – various ball cages made of plastic and metal

Comparison of the media resistance of various steels

Name of material		100Cr6	Cronidur*	X46Cr13	X90Cr MoV18	X102Cr Mo17	440C
Material number		1.3505		1.4034	1.4112	1.4125	
Suitability for use as rolling bearing steel		++	++	–	+	+	+
Medium 20°C	Conc. in %						
Salt water	4	--	++	o	++	–	–
Hydrochloric acid HCl	0.1	--	++	--	–	--	--
Sulfuric acid H ₂ SO ₄	10	--	--	--	--	--	--
Nitric acid HNO ₃	5	--	++	++	++	--	--
Phosphoric acid H ₃ PO ₄	10	--	++	–	+	+	+
Citric acid C ₆ H ₈ O ₇	25	--	++	–	+	--	--
Sulfurous acid H ₂ SO ₃	1	--	++	--	–	--	--

* The media resistance of the new high-performance steel Cronitect is comparable with that of Cronidur.

++ resistant + moderately resistant – hardly suitable -- not resistant o not tested

The starting point for our developments in this area was a vision. This vision was to create a rolling bearing that no longer requires lubricant, is not affected by media such as water and cleaning agents, can cope with an atmosphere

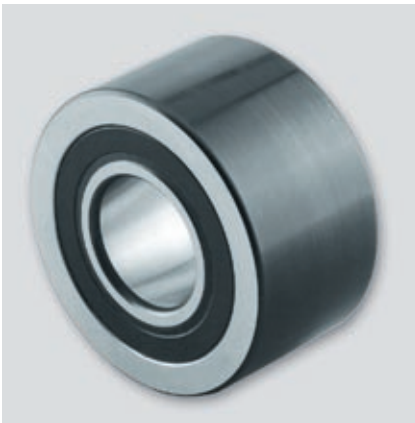
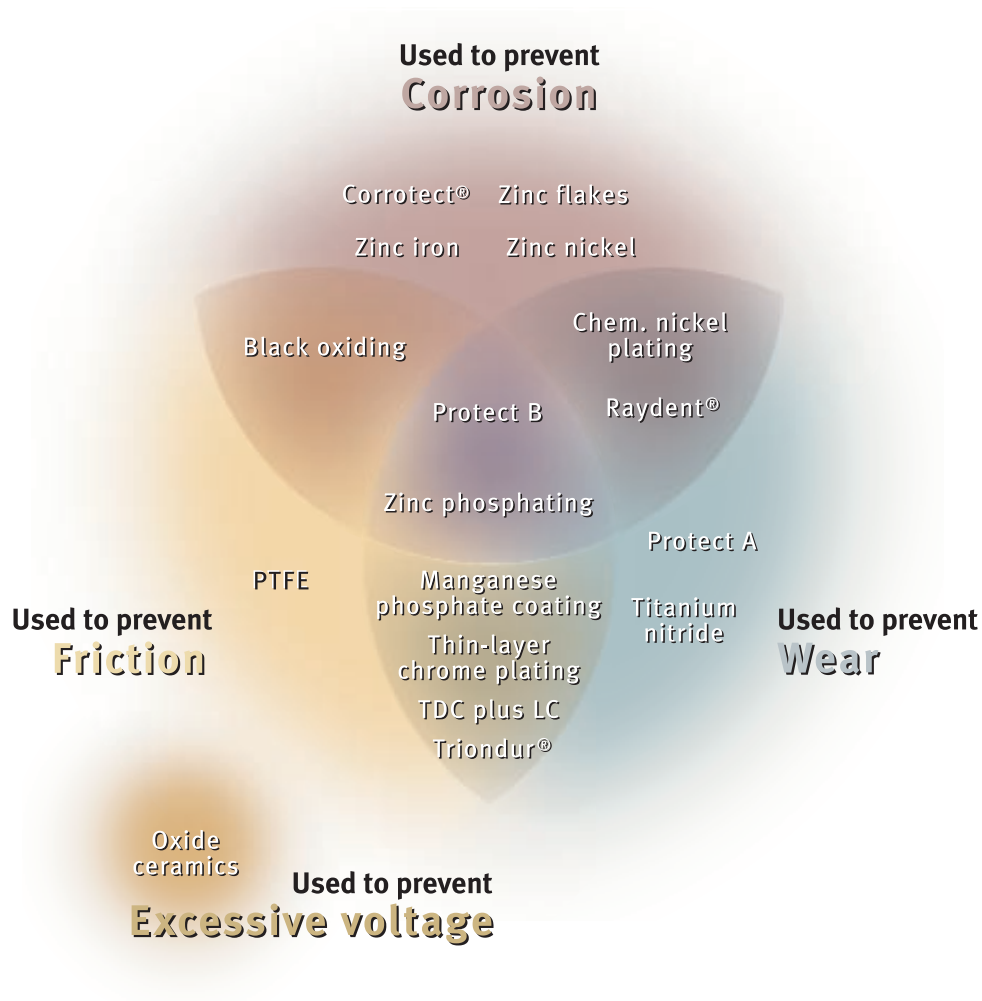
saturated with hydrogen peroxide and can even operate reliably and for a long time under dry running conditions.

With Cronidur and the new special steel Cronitect, we have come a great deal closer to realizing this vision. Due to the

finely embedded nitrogen in the material matrix, these new materials are far superior to conventional corrosion-resistant rolling bearing steels (e. g. 440C) in terms of corrosion resistance, fatigue life and wear resistance.



Versatile protection – from Corrotect® to Triondur®



Triondur® protects against severe wear during sliding stress or insufficient lubrication



Corrosion is the arch-enemy of every rolling bearing. The Schaeffler Group continues its fight against it, for example, with Corrotect®. Here is a comparison with an untreated bearing after a 24-hour salt spray test

In order that standard components operate for long periods and with high operational reliability in extreme operating conditions, the Schaeffler Group has developed several coatings for such requirements. These coatings influence the run-in behavior and emergency running characteristics and optimize the corrosion protection as well as the wear and friction behavior. In addition, we have an entire range of coatings that offer protection against abrasion, lubricant starvation, false brinelling, aggressive media or the passage of electrical current.

Unbeaten in the fight against corrosion – Corrotect® special coating

Corrotect® offers the best anti-corrosion protection of all the Schaeffler Group's special coatings. Corrotect® is an extremely thin, corrosion-resistant cathodic layer that is applied by electroplating methods. Under load, this layer is rolled into the surface and partially worn away. It protects rolling bearings and the running surfaces of seals against corrosion for long periods of time. The coating is resistant to condensation water and contaminated water.

Tribological coating systems: Protect

Protect A is a columnar thin layer chromium plating. The structured surface of the chromium layer increases the

surface hardness and provides effective wear protection. The column-like geometry of the layer has a positive effect on the build up of oil pressure, forms lubricant pockets and therefore prevents lubricant starvation under extreme operating conditions.

Protect B is a suitable alternative if additional anti-corrosion protection is required. It consists of two layers – the thin layer chromium plating Protect A and an additional layer of chromium oxide. The upper layer assists the lubricant and offers effective protection against corrosion under high operating temperatures and aggressive operating conditions. Protect B is, for example, resistant to various chlorides, oils, sulfur compounds and weak acidic media.

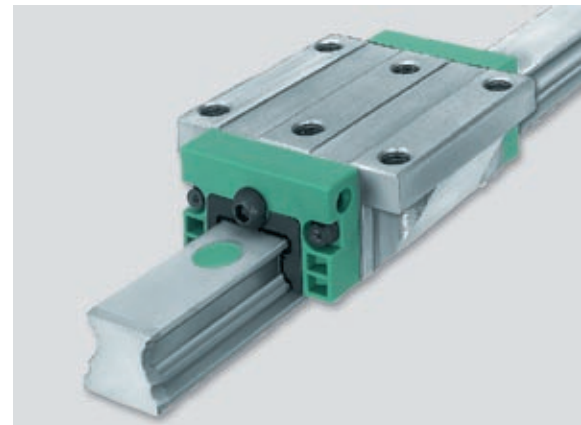
Extreme wear resistance with Triondur®

Triondur® coatings systems have up to 80% lower friction coefficients compared with dry steel-steel contacts. The coating offers durable protection in cases of high tribomechanical stresses, lubricant starvation and dry running.

Track rollers protected by Triondur® coating offer high operational reliability. This extremely hard PVD coating, which is only a few μm thick, effectively protects stud type track rollers and cam plates against wear.



Corrotect® offers highly effective protection against corrosion



Authorized for use in direct contact with foodstuffs: Protect A is effective against wear and light corrosion



Protect B is effective against heavy corrosion and high wear

Calculated safety with BEARINX®



Bearing design using BEARINX®: Operational reliability for bearing supports in customers' applications by modeling all boundary conditions

Even the best product is worthless if it is incorrectly used. So you should draw on the experience and expertise of our engineers in bearing design and calculation.

For example, by using the BEARINX® calculation program, rolling bearings can be analyzed in detail – right down to a single rolling contact. It is possible to experiment with the influence of various measurables and operating conditions during various optimization steps. The results show how the bearing support is stressed under the various load conditions. The program enables the bearings to be dimensioned according to the application. During simulation, the optimum design for the application can be determined easily and cost-effectively by changing the position, type and size of the bearing.

The Schaeffler Group's calculation service is rounded out by FEM analyses, dynamic simulations or measurements at the customers' premises.



More than just a virtual catalog: **medias**®, our product selection and information system is available free of charge. Request a CD-ROM or go to the online version at <http://medias.ina.com>

The correct lubricant for every application

A well thought-out design and precision manufacturing are behind every high-quality rolling bearing. However, lubrication plays an important role in determining the reliability and operating life of a bearing. Selecting a suitable grease, the effect of the additives, cleanliness in terms of contaminants and compliance with the specified lubrication intervals help to determine the quality of the system. We can also recommend the right grease for every application as part of our service. Regardless of whether this is for initial greasing or relubrication during maintenance.

We thoroughly test the technical performance of all lubricants that we use for the initial greasing of our products. You will find a selection of greases for initial lubrication suitable for your sector in the table below.

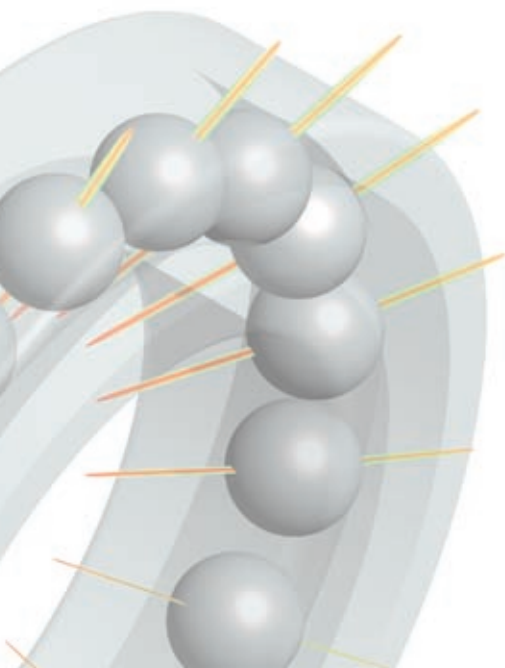
Whether you require food grade, media resistance, anti-wear and anti-corrosion protection, you will find the right grease for any application in the Arcanol range.



Testing in our in-house lab:
Analysis of lubricants for water content

	NSF-H1 approval	NSF-H2 approval	Media resistance	Low operating temperatures	High operating temperatures	Anti-wear protection
Greases for initial lubrication (selection)						
L 077	■		■		■	
L 091				■		
L 114			■			■
L 271						■
L 281		■	■			■
L 289	■					
L 448						■
L 460	■					

Not every grease is the same: We lubricate our bearings to meet the precise requirements of your application





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Issued: 2010, June

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