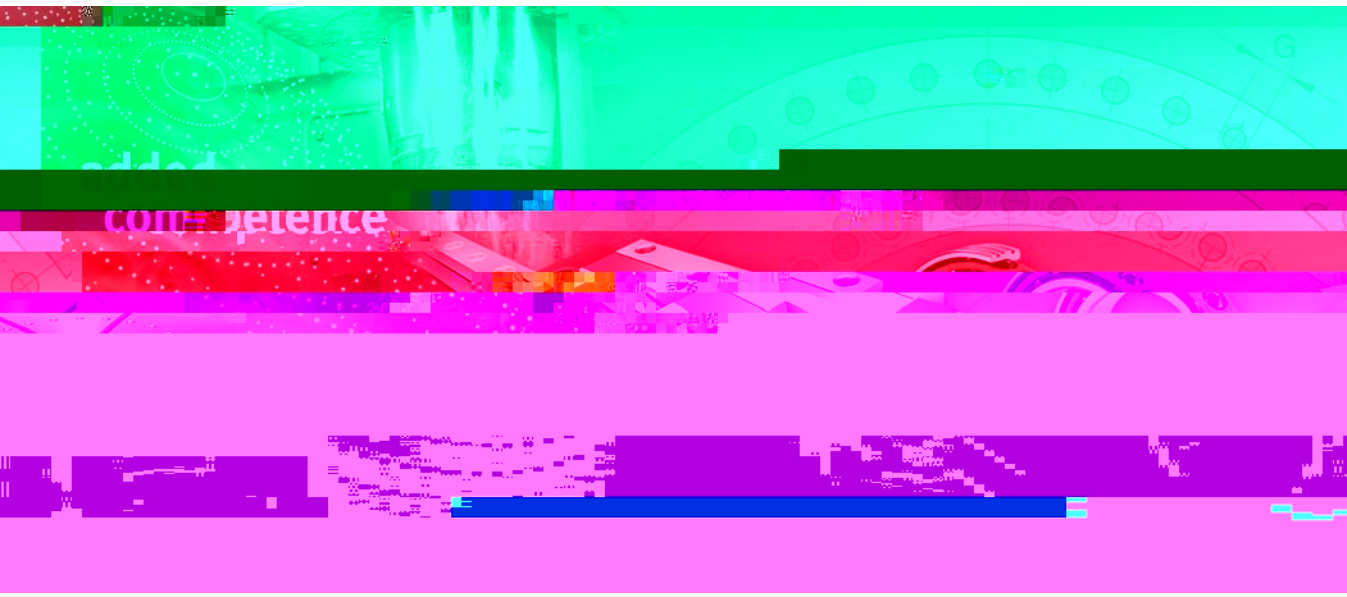


Bearing Solutions for Machine Tools

A C Y S

With their trend-setting bearing solutions for ball screw supports, main spindles, rotary tables and linear guidance systems, INA and FAG have been leaders on the global market for decades. However, in most cases, the bearing components alone are not the decisive factors for these machine subsystems.

Our customers still benefit from a significant increase in efficiency and unique selling points for our “ready-to-mount” products. After all, these compact bearings are put into operation with this basic principle in mind: unpack it, bolt it on, and it’s ready to use. Also, the integration of important functions such as measuring, sealing, lubrication, braking, and so on in the components themselves becomes increasingly important alongside the bearing supports for optimizing the entire machine tool system. This approach lives up to our new strategy for production machinery called “added competence,” since it centers on the idea of system solutions for the bearing, bearing support position and the complete system. This means that you now have access to a range of products that covers all your machine tool applications.

We have added another exceptional partner to our group of companies – IDAM (INA Drives & Mechatronics), since direct drives and mechatronic solutions are increasingly put into operation in machine tools. This means that with the bearing components and the right drives, we supply complete systems from a single source to meet all your requirements.

This opens up a wealth of new technical and commercial design scopes for your applications as well as considerable advantages regarding time and process chains.

As far as products are concerned, we offer a comprehensive, well-balanced range, precision technology and the highest quality. A global network of engineers, service technicians and sales technicians is available in order to keep up with the pace of your developments, thereby ensuring constant communication between you and us.

We always have the right product for your application.

Just ask us about it.

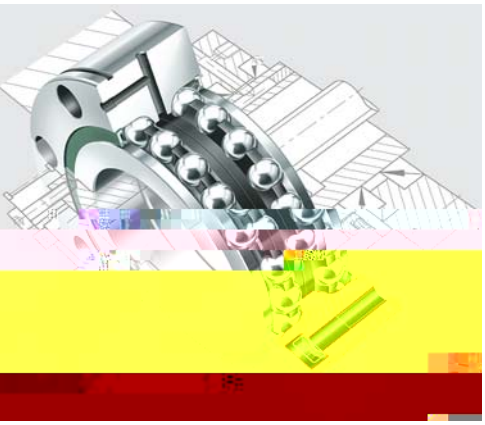
SHENYANG TOTAL BEARING CO.,LTD.

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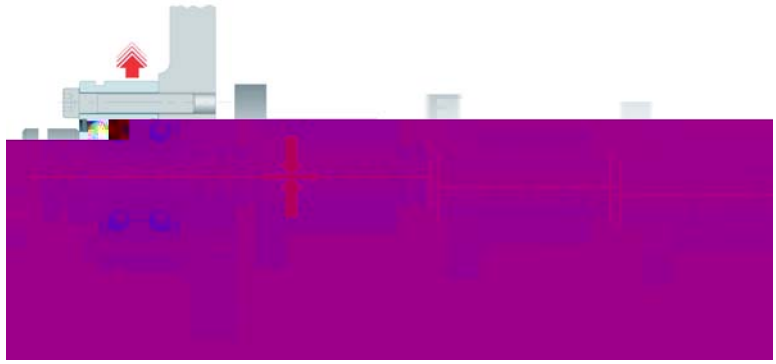
R -M B S



INA Ball screw support bearing unit for screw drive nuts

Electromechanical drive systems for machine axes can be put into operation easily and economically with maintenance-free ball screw supports made by INA and FAG. Our product range originates from a deep understanding of systems and an attention to detail, which, due to our ready-to-mount products, leads to verifiable simplification and savings in the entire machine tool system.

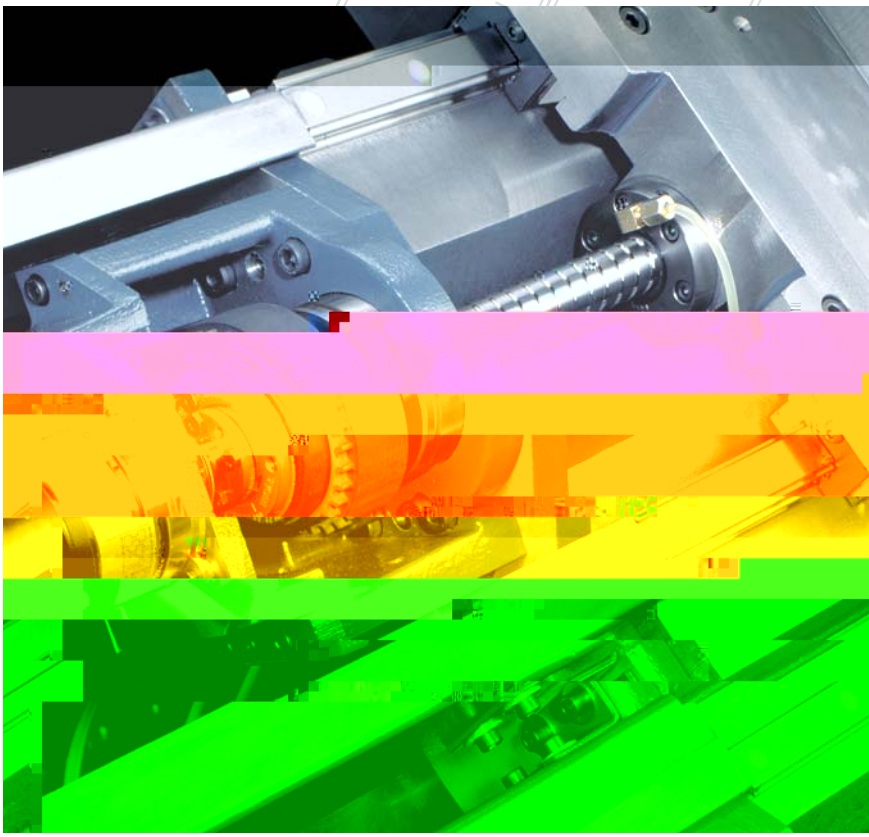
Maintenance-free thrust angular contact ball bearing units that can be bolted on are particulary efficient in reducing system costs. INA series ZKLN and ZKLF are the classics of our range that ensure reliable bearing supports for ball screw shafts in small spaces without the need for complex adjacent structures.



axial load on one side that is caused by the stretching forces. In addition, DKLFA bearings are extremely well suited for vertical shafts in machine tools under heavy loads. The outer ring leveled on both sides facilitates designs with extremely low section heights. These are also ready-to-mount.

The range is rounded off by FAG's single-row 7602, 7603 and BSB universal bearings. They can be used in any combination for specific operating conditions.

You can find detailed product information about ball screw supports in INA Publication TPI 123.



State-of-the-art ball screw support arrangement

M S

I B S



Precise workpieces through innovative bearing solutions

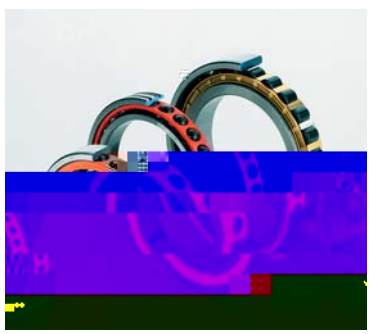
For years now, FAG spindle bearings have been setting standards when it comes to reliability, precision and very high speeds. Innovative products such as hybrid designs, sealed bearings, FD non-locating ball bearings and X-life ultra premium bearings have played an important role in increasing the efficiency of spindles and machine tools. Today, they reflect the industry's standards. Extensive application experience, close development partnerships with leading spindle manufacturers and consistent know-how transfer from FAG's aviation and aerospace technology have all contributed to this success story.

The generation of low temperature spindle bearings has recently started setting new milestones as a result of their optimized cage design compared to previous spindle bearings. The new design allows operation at up to 10% lower temperatures. Users can opt to increase speed limits by up to 10%. Practical applications of these bearings have been so successful that the cage design has been made the new standard design for all FAG spindle bearings. Spindle bearings are available as open or sealed bearings and as bearings lubricated for life as well as in a direct lube design for oil-air lubrication.

For non-locating bearing positions, FAG offers customers a sophisticated range of high-precision cylindrical roller bearings that are available in both a double-row and a hybrid design. These bearings are characterized by their capability to support high loads, their high rigidity and excellent accuracy.

Special non-locating ball bearings have been designed for motor spindles. These floating displacement bearings (FD..) consist of an outer ring with a deep-groove ball bearing design, of ceramic balls and a cylindrical inner ring made from Cronidur high performance steel. They are available as both sealed non-locating bearing solutions lubricated for life and as versions designed for oil-air lubrication. The non-locating ball bearings ensure that the outer ring can be displaced without affecting the inner ring. They achieve operating side speeds for the first time.

Our new spring-loaded and ready-to-mount components provide a safe system solution for the non-locating



Hybrid bearings for very high spindle speeds: top products in machine tools



Sealed TX spindle bearings – fast, cool and lubricated for life

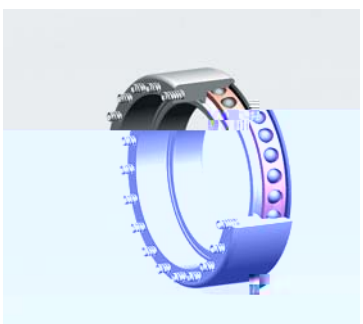


Direct lube spindle bearings for oil-air lubrication – for very high speeds

bearing position. They are compact bearing units with an integrated close sliding fit function. Spindle manufacturers benefit from using such a systeman integsteman integs(They)-2th[(be)t(They)-243.6tim.6(are c)19.2(6(d(es)e cum)3.5toools:



For extremely fast and high performance machine tools:
FAG spindle bearings set standards



Spring preloaded non-locating bearing unit –
ready-to-mount system solution



Floating displacement bearings –
high-speed non-locating ball bearings



High-precision cylindrical roller bearings –
very rigid, large load-supporting capacity

R D



Profiled rail linear guides

... with rollers

INA RUE roller-type profiled rail linear guide systems have been working reliably for many years in many production machines. However, manufacturers and design engineers always want more.

More load carrying capacity, more dynamics, more long-term precision, more machine availability...For us, this can only mean more X-life, since only products whose parameters clearly exceed the norm receive the X-life mark of quality.

X-life profiled rail linear guides advance into a new performance class. With a running speed that is 40% higher with unchanged load carrying capacity and rigidity, they are ideal for highly-dynamic machine tools.

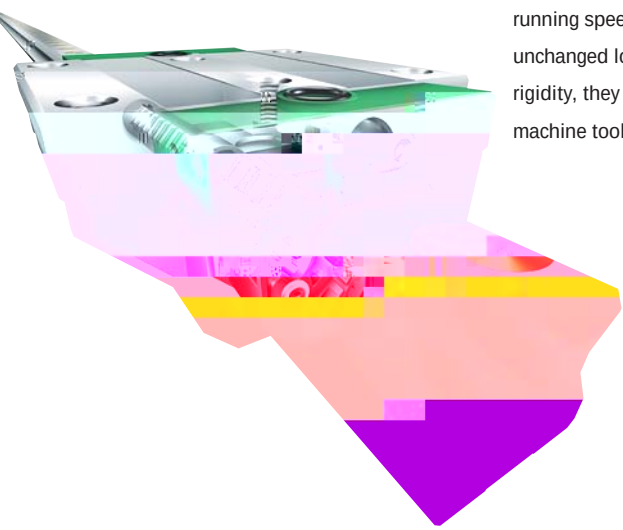
... and with balls

Our customers increasingly request reductions in noise emissions. We meet these demands with our “quietest” product, our four-row ball-type profiled rail system KUVE..B KT in X-life-quality. It is based on a new rolling element separation principle – the quad spacer. This means that the collision noises in the system are reduced, noise is lowered to a minimum, and the high dynamics required by the adjacent structures remains high.

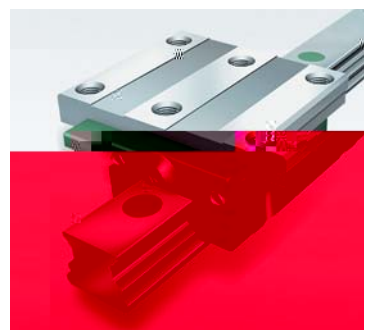
... and the appropriate accessories

The unrivaled range of accessories for INA profiled rail linear guides contains everything you need: damping carriages, seals, equipment for long-term and minimal-quantity lubrication, braking and clamping elements, etc.

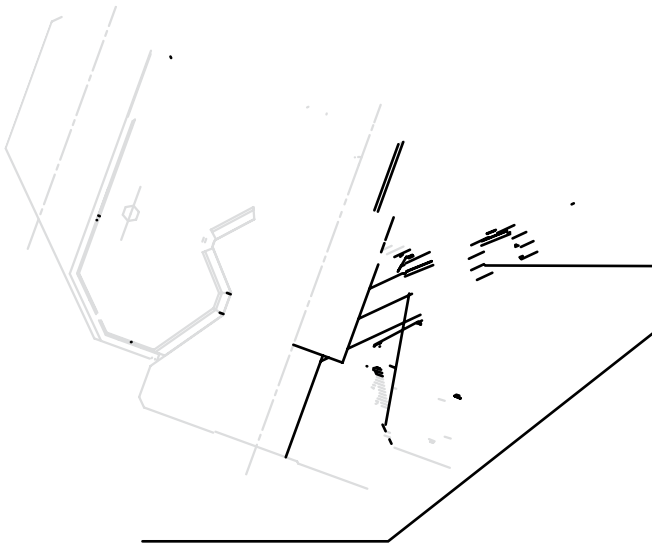
Just ask us!



“Heavy-duty sprinter”: 40 % higher running speed, robust due to fewer components and available with optional roller chain – all in the same mounting space!



Our compact model: four-row ball type profiled rail units combine high load carrying capacity and rigidity with high dynamics. An X-life product from INA Linear Technology





Precision linear tables for milling and grinding machines with L2D motor

They produce enormous power density in the smallest of mounting spaces. These are just some of the advantages of these virtually wear-free drives:

- High rotational and linear speed variance
- Excellent dynamics and rigidity
- High final speeds
- High acceleration and braking capabilities
- High positioning and repeat accuracy

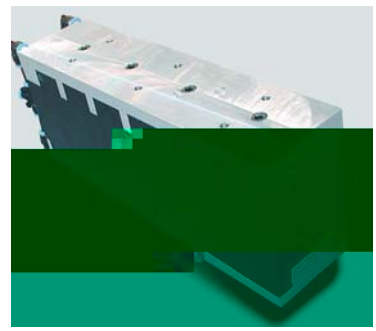
INA Drives & Mechatronics (IDAM) develops and manufactures linear and rotary AC synchronous motors that are increasingly replacing conventional drive technology. IDAM direct drives are at the forefront of modern technology and offer the perfect solution for every application.



Linear synchronous motor: Type L1

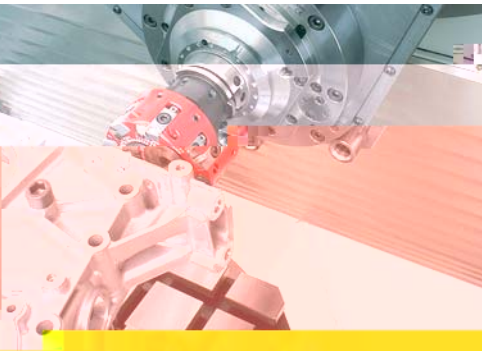


Linear synchronous motor: Type L2



Linear synchronous motor: Type L2D

M L B D



Increased operating safety – shorter development times. We create models of real-life operating conditions when we design our bearings

With its BEARINX® software, INA has created one of the leading programs for making rolling bearing calculations. The software allows detailed rolling bearing analyses – from individual bearings all the way down to complex shaft systems.

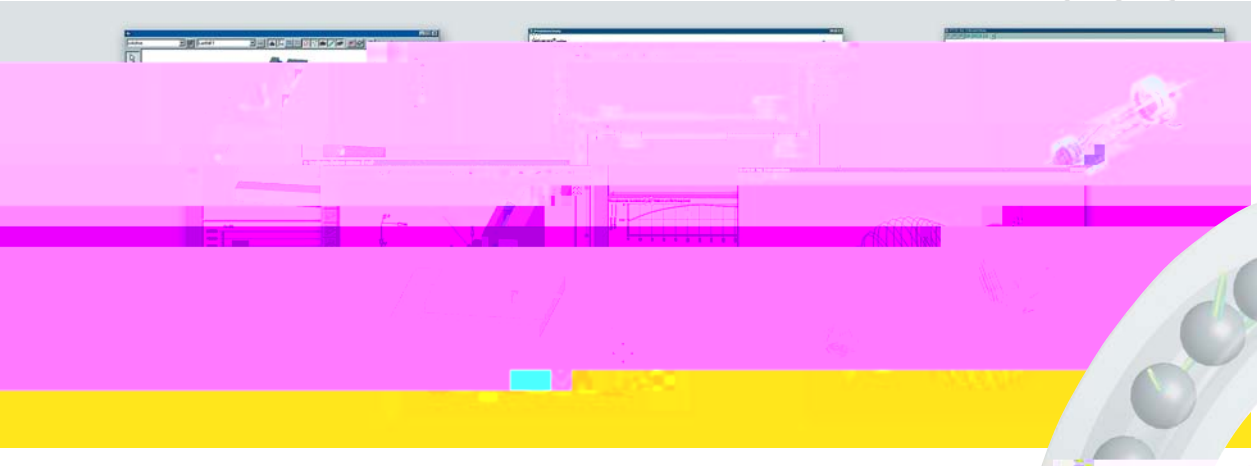
Over the past few years, FAG's rolling bearing calculation know-how has been successively integrated. Now the current version has been upgraded again by including a special module for spindle calculations.

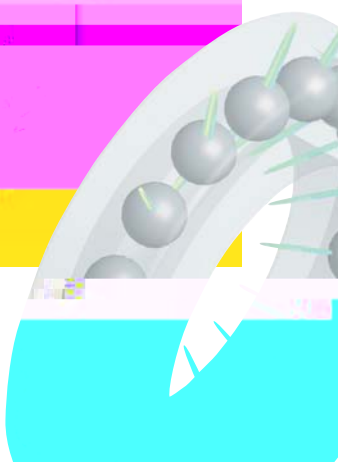
The range of BEARINX® functions has been extended to include the impact of centrifugal forces on load distribution and the running behavior of rolling elements in ball bearings.

BEARINX® online spindle calculations lets customers determine real spindle bearing loads and offers the following options:

- Recommendations for mounting fit based on specified speeds
- Calculation of design parameters for contact pressure and kinematics in the bearing
- Kinematic bearing frequencies for vibration analyses
- Calculation of bearing supports rigidity at the operating point while accounting for all relevant influences
- Graphic shaft reactions such as shaft deflection and shaft inclination
- Critical speeds and graphic representation of eigenforms
- Calculation of fatigue life to DIN ISO 281

The program includes many more useful components that allow users to select the appropriate bearing solution quickly and safely.





As your development partner, we provide you with practical, efficient products and the professional design of bearing positions in machine tools. But our services include much more, such as machine evaluations in terms of dynamics, geometry, noise, etc. (modal analysis).

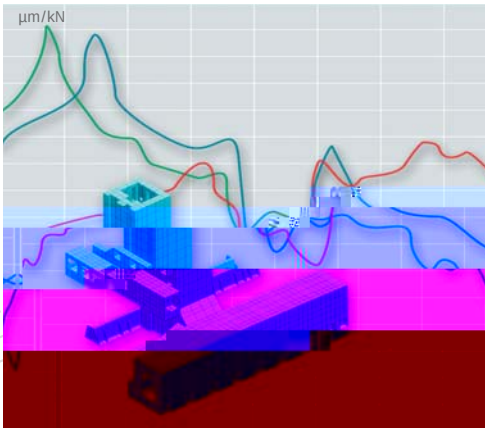
Our subsidiary FAG Industrial Services GmbH (F'IS) complements this range in an ideal way, offering services, tools and lubricants for machine operation and maintenance.

The offline and online monitoring of main spindles is of particular interest for the machine tool industry. Performing frequency-selective analyses of vibration patterns can provide early indications of changes in spindle conditions.

In addition, we offer comprehensive mounting services. You can request our technicians to provide support on site for large machines.

FAG offers periodical classroom instruction and practical training on spindle bearings that are held at either our training center or at the customer's location on request.

Schaeffler Group Industrial can offer a well-balanced product range – from individual components to customized bearing support systems.
Our application engineering and technical services departments work together to provide customers with efficient solutions that meet all technical requirements – as a complete package from a single source!



Modal analysis

Sach-Nr. 005-172-047/PKW US-D 09051 Printed in Germany

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