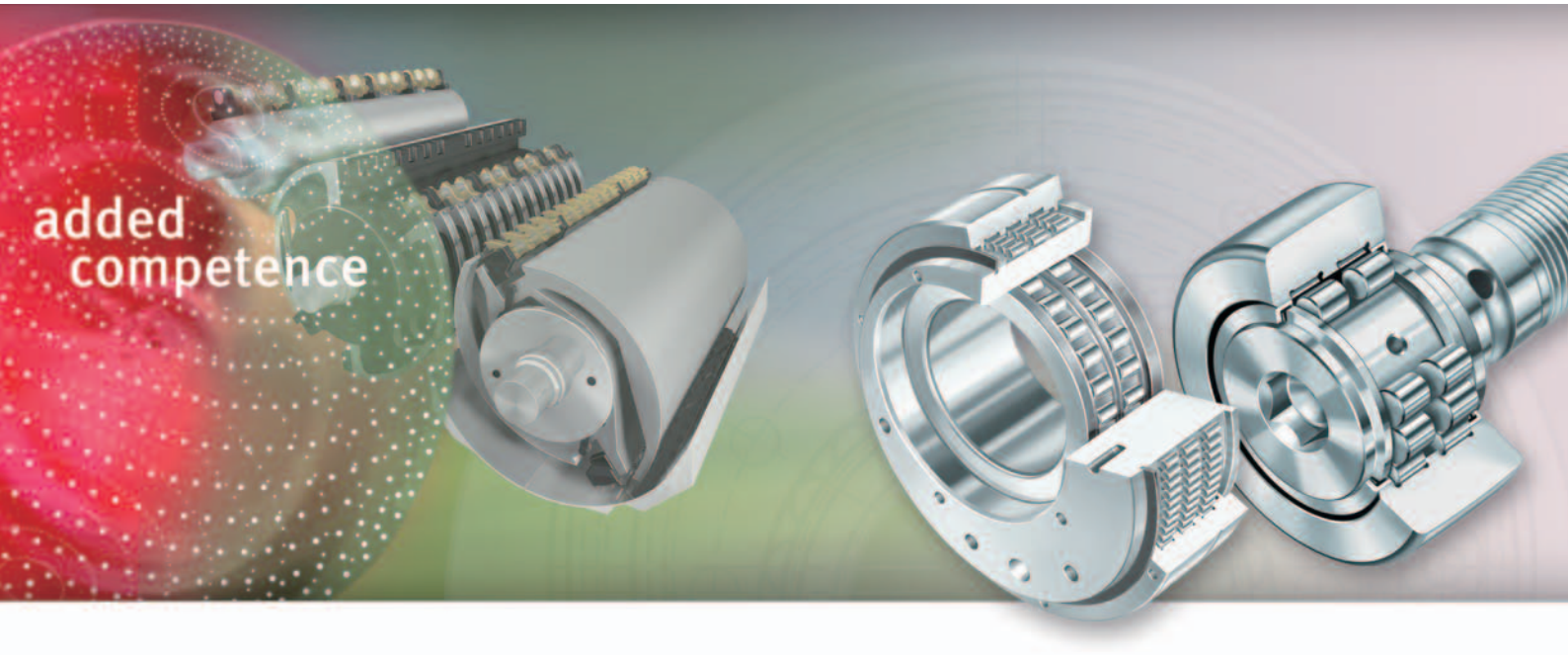


Bearing Solutions for Printing Machines

SCHAEFFLER GROUP
INDUSTRIAL

“Added competence” for your success

For several decades now, Schaeffler Group Industrial and its INA and FAG brands has specialized in printing machine applications. Based on technology and market share, Schaeffler Group Industrial is a global leader in this segment. Products made by INA and FAG cover all bearing supports in printing machines and also provide optimum bearing solutions for operations such as vibrating, cutting, binding or stapling. Products range from precise standard bearings to customized system solutions. Optimization potential is no longer found only in the continuous improvement of individual components. In order to meet consistently increasing requirements for performance and efficiency, it is of ever greater importance that we understand the entire system. Our new “added competence” approach is in line with this way of thinking. It was developed by our Production Machinery market sector group and focuses on system solutions for bearings, bearing positions and the overall system. For you this means that you can benefit from a comprehensive product range that not only gives but best possible coverage of your applications in printing machines but also optimum matching to each other.

Since production machinery increasingly uses direct drives and mechatronics solutions, we have added another strong partner to our group of companies: INA Drives and Mechatronics (IDAM). This new addition now allows us to supply perfectly matched complete systems from a single source by offering both bearing components and suitable drives. This in turn provides you with all new technical and economic opportunities as well as obvious time and process benefits.

The Schaeffler Group sees itself as a development partner for the printing machine industry. Our goal is to achieve unique selling points and sophisticated technical solutions for the customer with durable ready-to-mount products. Our services include expert application support and comprehensive design expertise as well as rolling bearing calculations, testing and access to our tribology department. A global network of engineers, service and sales technicians work for you and ensure that you can contact us quickly whenever you need to.

We are certain that we can supply the right product for your application.

Just give us a call to find out more!

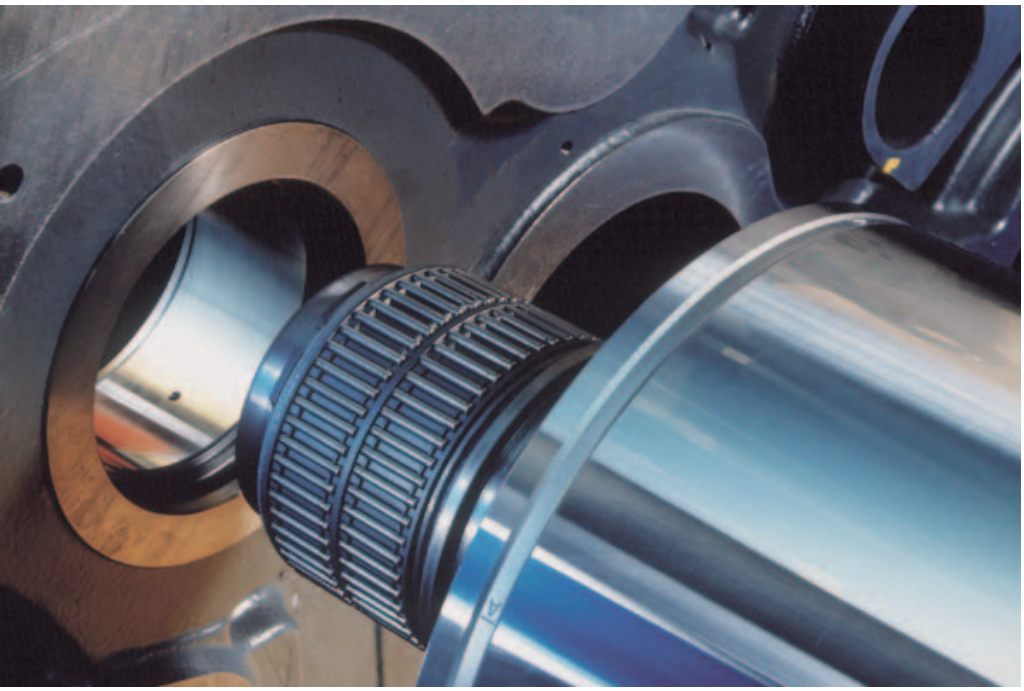
Contents

Bearing solutions for printing machines

Every single bearing support must be of high quality if you want printed images to be razor sharp. However, it isn't until all subsystems in a printing machine are optimally coordinated that the result is the best possible and most reliable print quality and lowest possible costs.

This optimization potential for printing machines is exactly what our Production Machinery market sector group's new "added competence" approach is aiming at. Whether it's non-locating bearings, locating bearings, track rollers, bearings for rotary and linear motion or the entire range of linear technology products, whether it's standard bearings or customized solutions – INA and FAG products always provide system solutions. Developments focus on reducing the number of interfaces through integrated functions, compact and ready-to-mount designs and matching components and subsystems to achieve higher performance and efficiency for printing machines.

Perfect runout and very high accuracy



A classic among printing machine bearings: INA needle roller bearings with offset cage pockets (Photo: Heidelberger Druckmaschinen AG)

INA's cage-guided needle roller bearings have played a major role in promoting the use of rolling bearings in printing machines. The now classic design of main cylinder non-locating bearing supports in offset printing presses has been based on a Schaeffler solution for 50 years – the double row needle roller bearing with offset cage pockets. Whenever higher load carrying capacity is required, multi-row, high-precision cylindrical roller bearings are available.

The benefits of this non-locating bearing support are its high radial rigidity, very low friction and perfect axial displacement capability. This design is particularly suitable for plate cylinders with an axial register function.

Double-row needle roller bearing NAO with offset cage pockets

Precision cylindrical roller bearings, double row NN and four-row N4U with high radial load capacity and rigidity

Innovative developments for main cylinder bearing supports in offset presses include completely clearance-free multiple-ring bearings DML.. with single or double eccentric. A typical application for this product is in rubber cylinder supports, which have to operate at a very high level of precision and runout accuracy.

Beyond just acting as bearing supports for the cylinder, these multiple ring bearings allow the centre distance between cylinders to be changed, for instance in switch-on and switch-off operations or to compensate varying paper thicknesses. This task is carried out by integrated eccentrics with rolling bearing supports: low-friction, reliable and clearance free. Sealed efficiently and filled with a special grease, the pivot bearing supports are maintenance free – an ideal situation for ensuring the best printing quality in the long term.

In many cases, this modern design can do without cylinder bearers for rubber and plate cylinders.

This reduces costs and improves the reliability of your printing machine.

Four-ring bearing unit with double eccentric DMLD

Printing machine bearing unit DML with thick-walled outer ring

Three-ring bearing unit with double eccentric DML3D

Clearance-free – radially and axially

Highest reliability in newspaper printing thanks to bearing solutions from the Schaeffler Group

To achieve the best possible printing results, main cylinders in printing machines must be guided clearance-free and rigidly on the locating bearing side, both axially and radially. Matched tapered roller bearings used as locating bearings have proven to be a reliable and efficient solution. They are clearance-free and can support high axial and radial loads. Compared to single-component solutions, FAG assemblies matched during manufacture have significant mounting benefits and increased functional safety. They are very precise (P_5 and P_4 tolerances) and meet the enormously high requirements for runout accuracy.

The thick-walled outer ring in FAG tapered roller bearings also provides

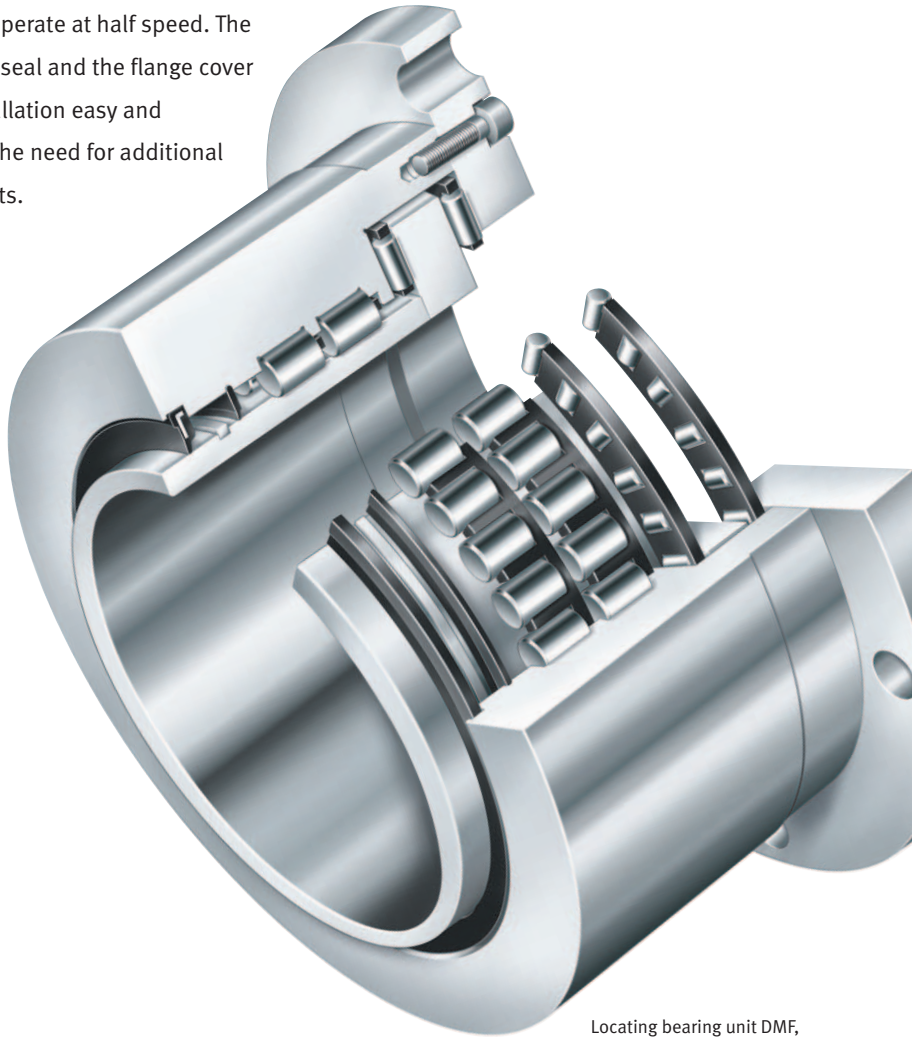
Tapered roller bearing unit TBS, matched in O arrangement

Tapered roller bearing unit TBS, with thick-walled outer ring

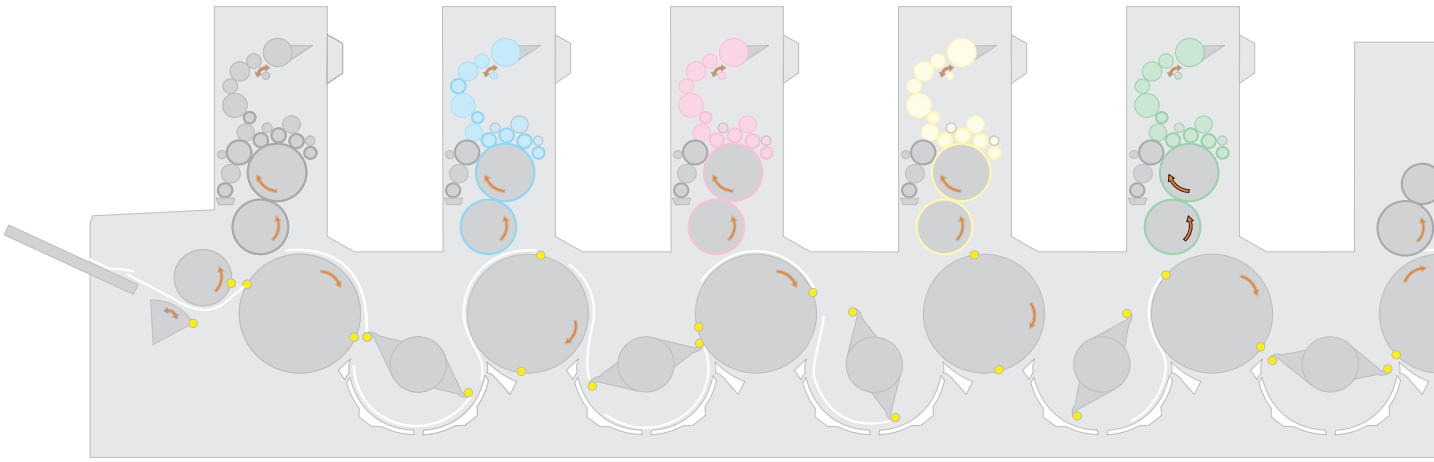
another benefit with regard to functional safety and precision. Eliminating a separate mounting sleeve reduces tolerances and costs.

Rigidity and zero backlash are essential for the locating bearing supports in the paper-guiding cylinders of sheet offset printing presses. INA's bearing unit DMF, which is predrilled for flange mounting, meets these requirements in an ideal way.

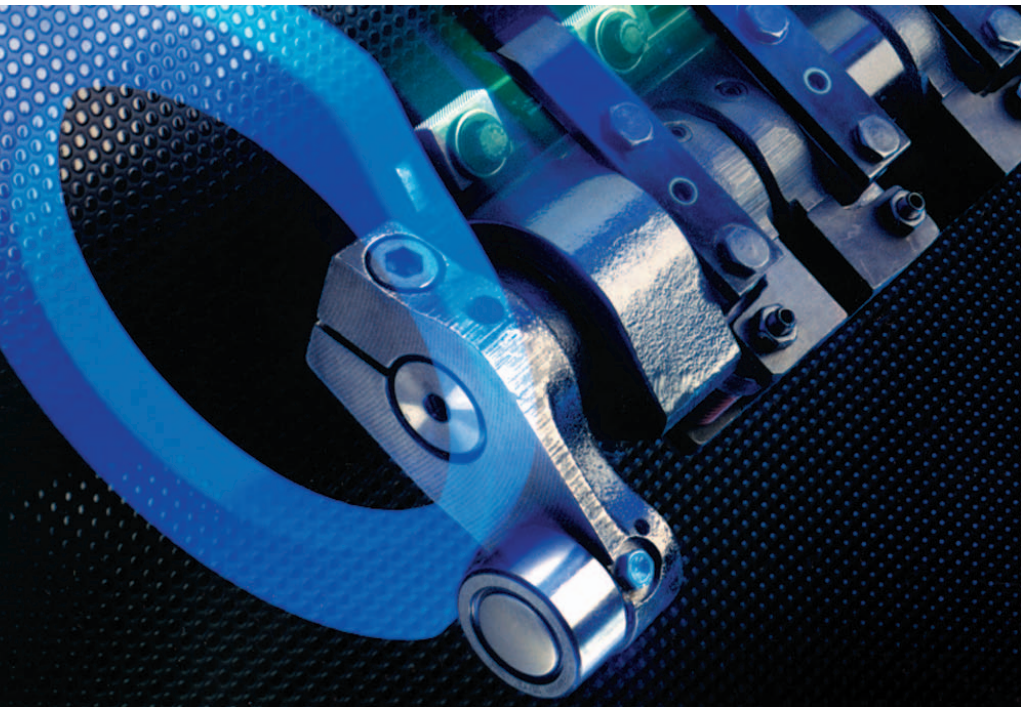
The unit consists of a double row precision cylindrical roller bearing with two integrated thrust needle roller and cage assemblies. These can support all forces. The extremely high radial and especially axial running accuracy as well as the high rigidity in both directions offered by this design ensure very high printing quality, particularly when the cylinders operate at half speed. The integrated seal and the flange cover make installation easy and eliminate the need for additional components.



Locating bearing unit DMF, predrilled for flange mounting



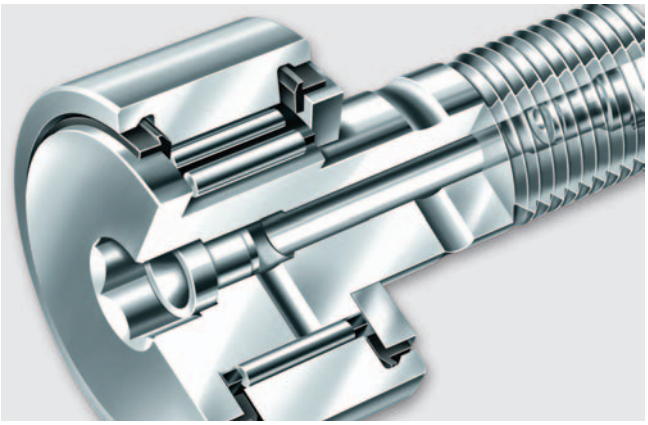
Increased safety thanks to technical superiority



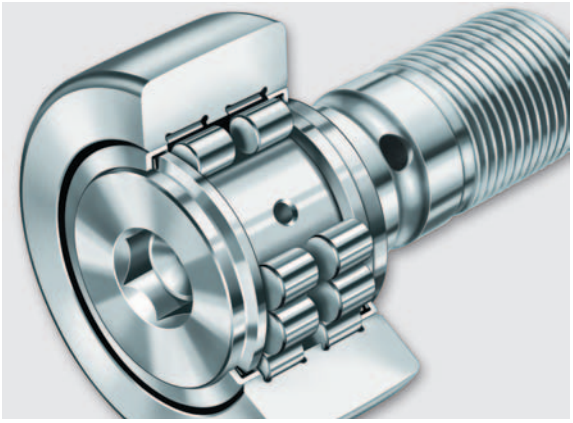
Gripper shaft in a sheet offset printing press. A typical application for INA track rollers
(Photo: Heidelberger Druckmaschinen AG)

INA's track rollers with optimized outside profile are clearly superior to conventional components. Hertzian pressure at the contact point is always lower than with conventional rollers, both with and without tilting. This reduces wear of the mating track and increases the rigidity of the design.

It is when you need to control the ink distribution or the gripper shaft of a sheet offset machine that the track rollers' many benefits are most evident. They have a very compact and space-saving design and are characterized by high load capacity, a low level of wear and high reliability. Thanks to their large grease reservoirs, relubrication intervals can be considerably increased, which reduces costs.



High wear resistance and long lubrication intervals:
Track roller KR.. PPA with needle rollers and newly developed seal



Stud type track roller PWKRE with eccentric pin for precise adjustment

The further development of our stud type and yoke type track rollers with needle rollers focused on increasing operational reliability and service life. The result is a new design of the thrust rings and sealing rings made from high-quality plastic.

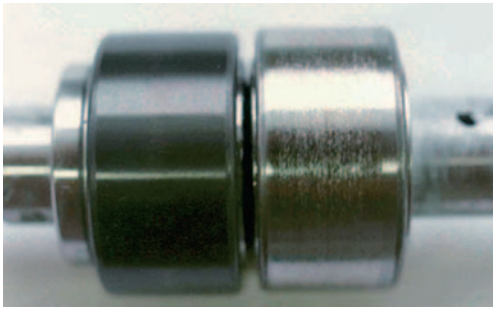
The Schaeffler Group also has many convenient solutions for extreme environmental conditions, such as in dampeners. For instance, Corrotect® corrosion protection can be applied to track rollers during manufacture. This thin, electroplated layer does not give corrosion a chance to develop and is very economically priced.

We also design special track rollers, such as rollers including eccentric studs.

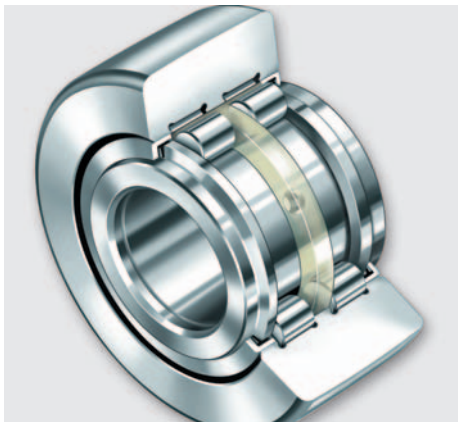
Extremely wear-resistant with TRIONDUR

Track rollers with TRIONDUR coating offer the highest operational safety. The PVD coating is only a few microns thick but extremely hard and protects the track rollers and the cam plates against wear.

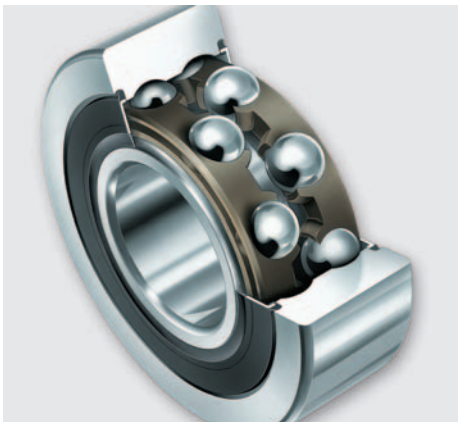
TRIONDUR coating systems have a friction coefficient that can be up to 80% lower than in steel-steel combinations. This coating provides durable protection for high tribomechanical stress, insufficient lubrication and dry running.



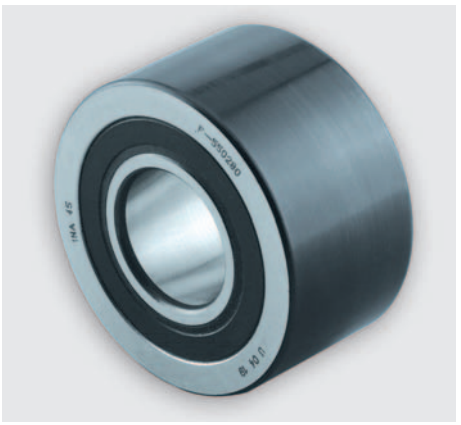
At left, TRIONDUR-coated track roller after 100 hours of operation in a canning facility, at right, a conventional track roller in the same application – after only 17 hours.



Yoke type track roller PWTR for extremely high loads, with large grease reservoir



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



TRIONDUR-coated yoke type track roller LR

Expertise for combined motion

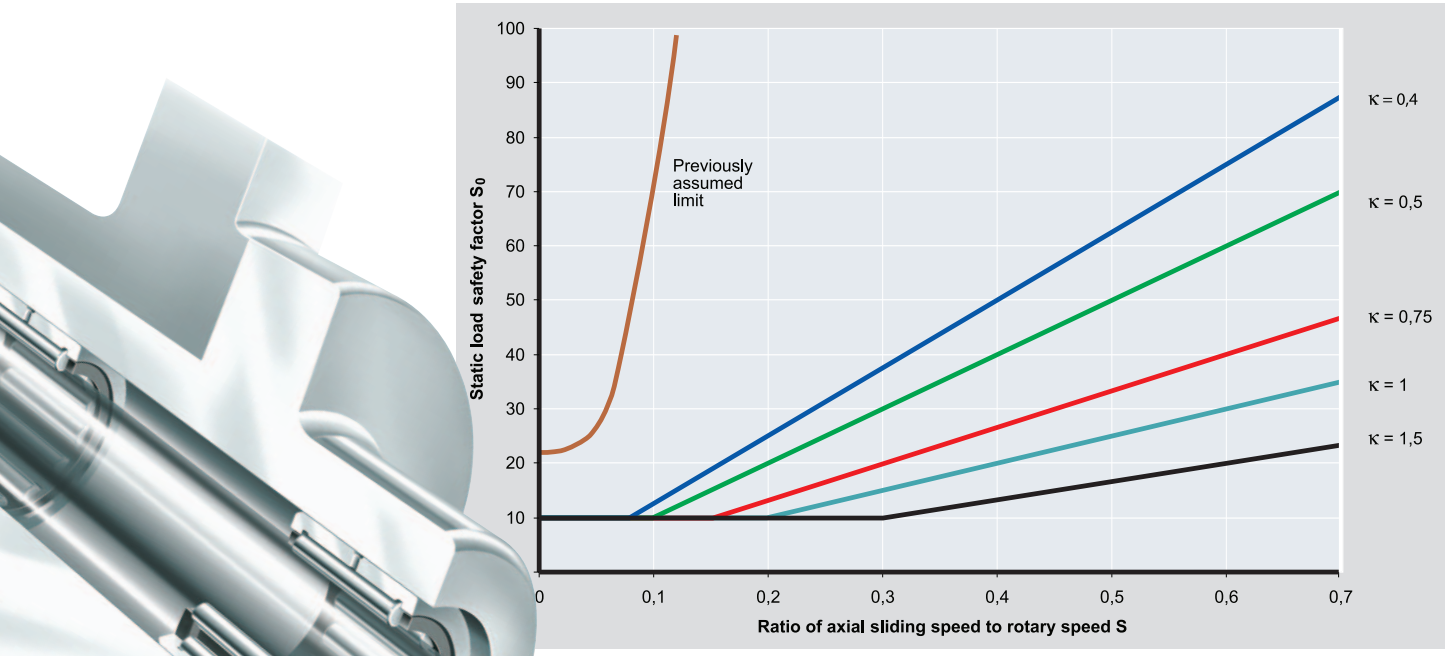
Operational safety round-the-clock with bearing supports from the Schaeffler Group (Photo: MAN Roland Druckmaschinen AG)

Previously, combinations of needle roller bearings and linear ball bearings were used to support rotating and simultaneously oscillating ink distribution rolls. These designs are relatively costly and require large design envelopes, often not achieving the desired load carrying capacity.

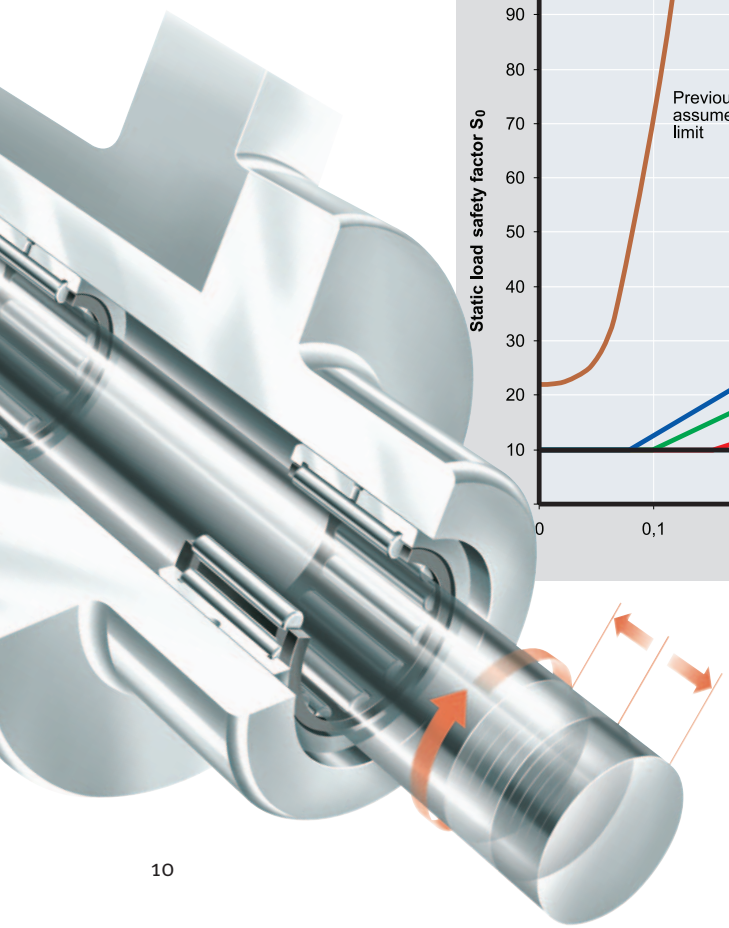
Until recently, needle roller and cylindrical roller bearing solutions were used only within very limited operating parameters. The Schaeffler Group was able to make significant progress here by performing intensive running tests at our in-house test facility. We were able to demonstrate that machined needle and cylindrical roller bearings can be used in a much wider range of applications.

The advantages of these bearing series can now also be used for extreme combined rotary and linear motion. These include the low radial section height and also the excellent availability of cost-effective standard bearings.

Machined needle and cylindrical roller bearings are available with or without seals for oil or grease lubrication.



Limiting curves in relation to the viscosity ratio κ



Powerful and straight to the point

Designers of printing machines are increasingly using the advantages of linear technology to solve design challenges. The Schaeffler Group also has a wide and well-engineered product range in this area.

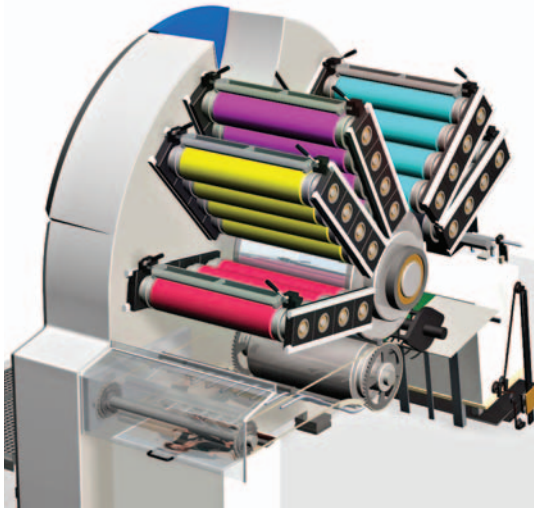
For example, one of the best known linear products is the INA roller monorail guidance system RUE with its outstanding load capacity and rigidity.

The effectiveness of the seal RUE against dust, aggressive media or other damaging environmental influences has been significantly improved for our premium quality X-life versions. With our specially developed modular seal system, we have an optimal solution for every application.

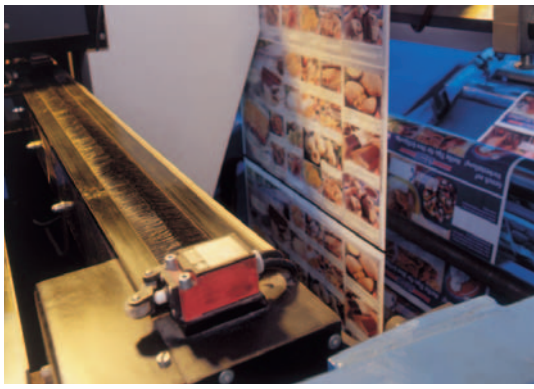
Further examples of linear technology in printing machines are lightweight locating and non-locating track rollers.

They run quietly, have low-friction characteristics and provide stick-slip free movement; they also require reduced design space. If oval or other types of curved paths are planned, different types of guideway geometry can be easily combined.

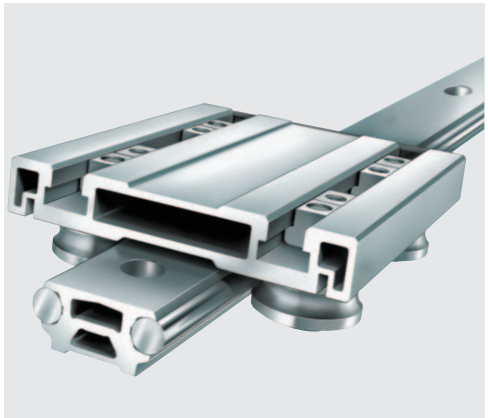
A further application for linear guidance systems is the adjustment of the main cylinder for “print on/off”, which need not always be carried out by an eccentric motion. For example, INA flat cage guidance systems M+V can support high forces, are particularly rigid, run extremely smoothly and have a high degree of positioning accuracy. They are supplied in different lengths and are also available in coated versions for demanding applications, for example, with corrosion protection (Corrotect®) or additional wear protection (Protect B).



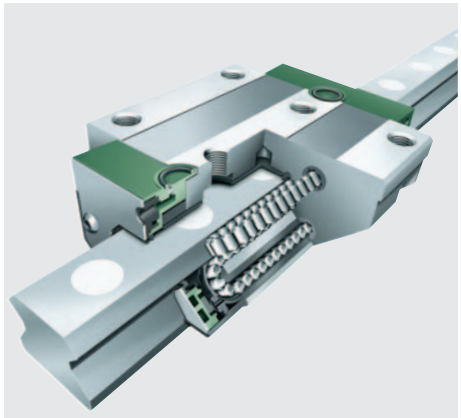
Adjustment of the printing cylinder by INA flat cage guidance systems M+V (Drawing: König & Bauer AG)



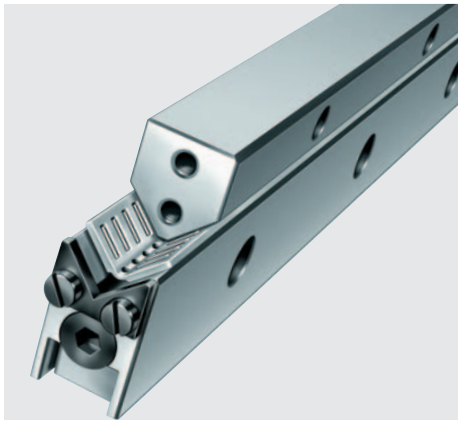
Web monitoring device, supported by INA track roller guidance system LFCL



Quiet operation and stick-slip free movement:
INA track roller guidance system LFCL



Outstanding load capacity and rigidity, and highly dynamic: Improved roller monorail guidance system RUE



Modern technology, compact design:
INA flat cage guidance system M+V

Matched to your printing machine

Ideal bearing supports for coating cylinders in coating units: INA polygon bearing

The Schaeffler Group is a reliable engineering partner for its customers beyond the delivery of components. We work closely with all leading printing machine manufacturers worldwide which results in continuously growing, shared application and production expertise. This in turn leads to a host of new ideas that enable both sides achieve leading positions in the market.

Example: polygon bearings

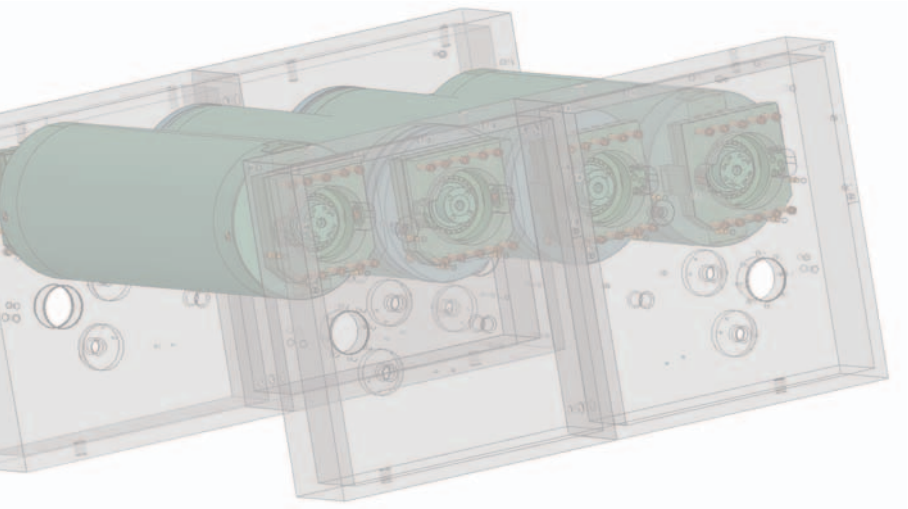
Polygon bearings were developed for longer, radial traverse distances, such as those in coating units for sheet offset printing presses. What is so special about these bearings is the fact that they have a polygonal outer ring with lubrication and locating holes as well as precise functional surfaces for mating parts (polygon adjustment). The outer ring is supported by three track rollers that are used to obtain a long traverse distance for oscillating motions. The inner high-precision cylindrical roller bearing operates clearance-free and with extremely low friction.

Example: Bearing units DMLL

In the newly developed printing machine bearing unit DMLL, the eccentric is replaced by a maintenance-free linear guidance system in a needle roller and flat cage assembly. This means that the blanket and plate cylinders of a rotary printing press can now be adjusted in a linear movement, instead of a circular path. An hydraulic piston element has been integrated into the unit for the first time which enables precise control of the adjustment.

The cylinder is supported by double row high-precision cylindrical roller bearings that are designed for high speed and have particularly effective seals.

Short shaft journals – without bearer rings – are sufficient for the bearing unit which is flanged on the inside of the side wall. This arrangement still maintains the full rigidity of the printing cylinder system.



Printing unit with NipTronik bearing technology for the Cortina offset newspaper printing press (Drawing: Koenig & Bauer AG)

Linear guidance system as replacement for eccentric: Forward-looking printing machine bearing unit DMLL for blanket and plate cylinders

Drives and systems : dynamic, flexible, precise

Direct drives from Schaeffler's 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 variance, excellent dynamics and rigidity, and as a result track 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 performances as well as all the electronic assemblies required for operation.

Powerful and dynamic: Torque motors as internal and external rotors

Linear motors

Slotted synchronous L1, L2 and L2D series as well as the ironless ULIM motors are especially suitable for printing machines. They are characterized by their excellent power to weight ratio and outstanding synchronization. They are particularly suitable for applications where high levels of track accuracy and constant speeds are required.

With the L2 motor series, we have succeeded in combining high power generation (›10 N/cm²) with excellent synchronization characteristics and excellent efficiency – precisely the combination of characteristics required for printing machinery.

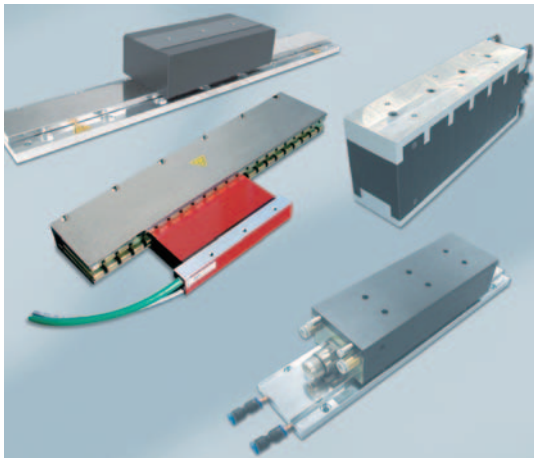
Torque motors

Highly efficient torque motors enable totally new types of drive systems, for example, for the main cylinder.

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 speeds. These power packs are contact-free and operate without wear.

System solutions

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 direct drive positioning systems at the highest technical level.



Outstanding synchronization, high speed: IDAM linear motors

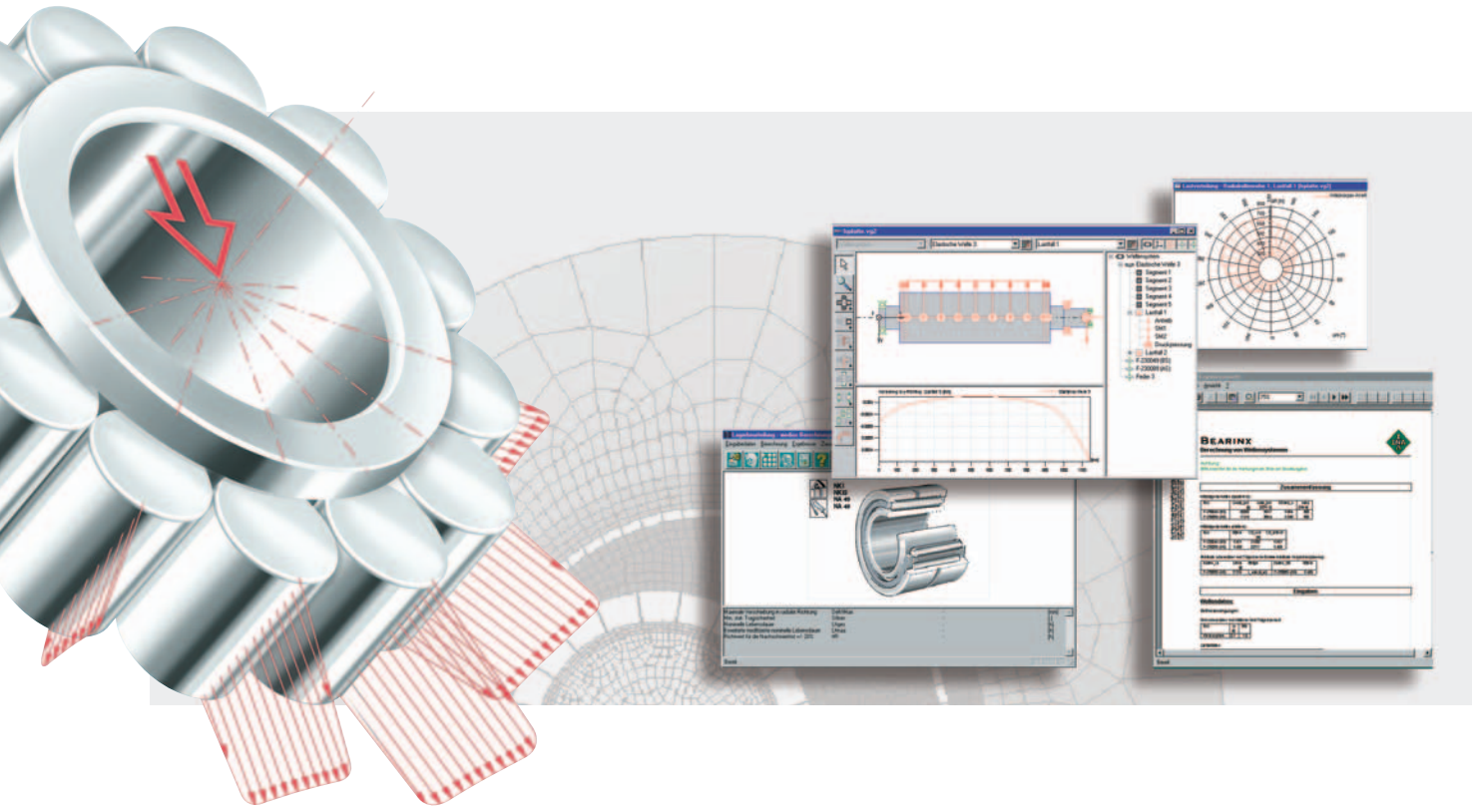
Calculated safety

The rolling bearing calculation program BEARINX® can precisely calculate, present and document bearing loads in complex machine systems, taking account of a wide range of environmental conditions. The program can not only calculate bearing life, but also shaft deflection, tilting and even deformation in rotary and linear systems.

Progressive optimization is also possible, for example, regarding the influence of lubrication and contamination, fit and tolerances etc. From the calculation results, you can see the exact loads on the bearing supports under different load conditions. BEARINX® also supplies important information about the rigidity of the entire system.

The program enables the design to be matched to the application. You can determine the optimal design rapidly and cost-effectively by changing bearing position, design and size in the simulation.

The calculation service from the Schaeffler Group is supplemented by FEM Analyses, dynamic modeling or on-site measurements.



Services for our customers

Even the best rolling bearing is no more than just a “good product” without the proper support service. To make optimal use of the performance potential, you require expert, application-oriented support.

Therefore, Schaeffler Group Industrial attaches great importance to a professional, global service. Our customers are in close contact with expert engineers right from the first consultation. The technically and economically most appropriate design solution is developed jointly for every machine, every application.

The range of services is growing continuously. The ***medias***® product selection and information system is now much more than just a virtual catalog. As a highly functional tool for ordering the correct product, it contains everything that the designer requires right up to complete purchasing documents: pictographs, calculation tools, lubrication information, application examples and technical drawings of products as DXF files that can be directly imported.

medias® is available free of charge. You can order it as a CD-ROM or use the version on the Internet at: http://medias.ina.de

But we offer you even more:

- On-site bearing analyses
- Technical tests
- Tribology
- Materials engineering
- Research and Development
- Training and further education programs
- Assembly tools
- Enveloping circle diameter, monitoring und additional measurement equipment
- Lubrication systems ...

Benefit from our expertise and experience for your success!

FAG enveloping circle diameter measurement equipment for precision adjustment of the radial clearance in cylindrical roller bearings

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