



Optimal Paper Production

Full-service bearing technology



SCHAEFFLER



Expertise through knowledge and experience

FAG Kugelfischer is a pioneer in the rolling bearing industry. In 1883, Friedrich Fischer designed a ball grinding machine. This idea is regarded as the historic beginning of the rolling bearing industry.

INA's success story began in 1949 with the development of the needle roller and cage assembly by Dr. Georg Schaeffler, an ingenious idea that helped the needle roller bearing achieve an industrial breakthrough.

With our two strong product brands INA and FAG, we currently have a high-performance range of rolling bearings as well as products and services of unsurpassed quality due to the joint research and development activities of both brands.

INA and FAG have consolidated their bearing technology and services for customers in the paper and cellulose industries in the Pulp & Paper sector within the Industrial division.

As a result of their cooperation over many decades with reputable paper machine manufacturers as well as with maintenance and production departments, the Pulp & Paper

sector has gained a great deal of expertise. Paper mills all over the world have benefited from the quality of customized solutions that are reliable and efficient and achieve ever-increasing production speeds.

Pulp & Paper has more to offer:

- Expert support by experienced engineers
- Services for all rolling bearing products and applications
- Efficient product support and development
- Higher cost-effectiveness and operational reliability with X-life
- Optimized bearing, material, and seal combinations
- Specially designed products for various operating conditions
- General and customer-specific training programs
- Binding quality and environmental policy worldwide (ISO 9000/QS 9000, ISO/TS 16949:2002, ISO 14001)
- BEARINX calculation software for the best possible product selection
- Comprehensive product range of peripheral equipment for paper machines and for auxiliary equipment.



Bearing solutions and service from one source



- Coatings that offer corrosion protection (Corrotect) or for improving the wear and friction behavior (e. g. Triondur C)



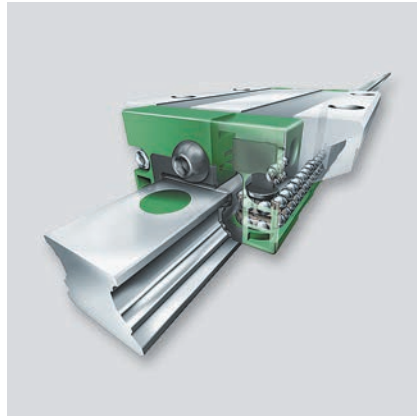
- Spherical roller bearings in X-life quality with superior load carrying capacity, low operating temperature and very long operating life
- Split spherical roller bearings for quick bearing replacement in hard-to-reach-locations



- Toroidal bearings for tilting and length compensation without constraining forces
- Hybrid deep groove ball bearings (steel/ceramic) with very long operating life for spreader rolls
- Self-aligning cylindrical roller bearings for tilting and length compensation without constraining forces



- Triple ring bearings with very high load carrying capacity
- ASSR bearings (anti-slippage spherical rolling bearings) for preventing slippage in CD-profile control rolls

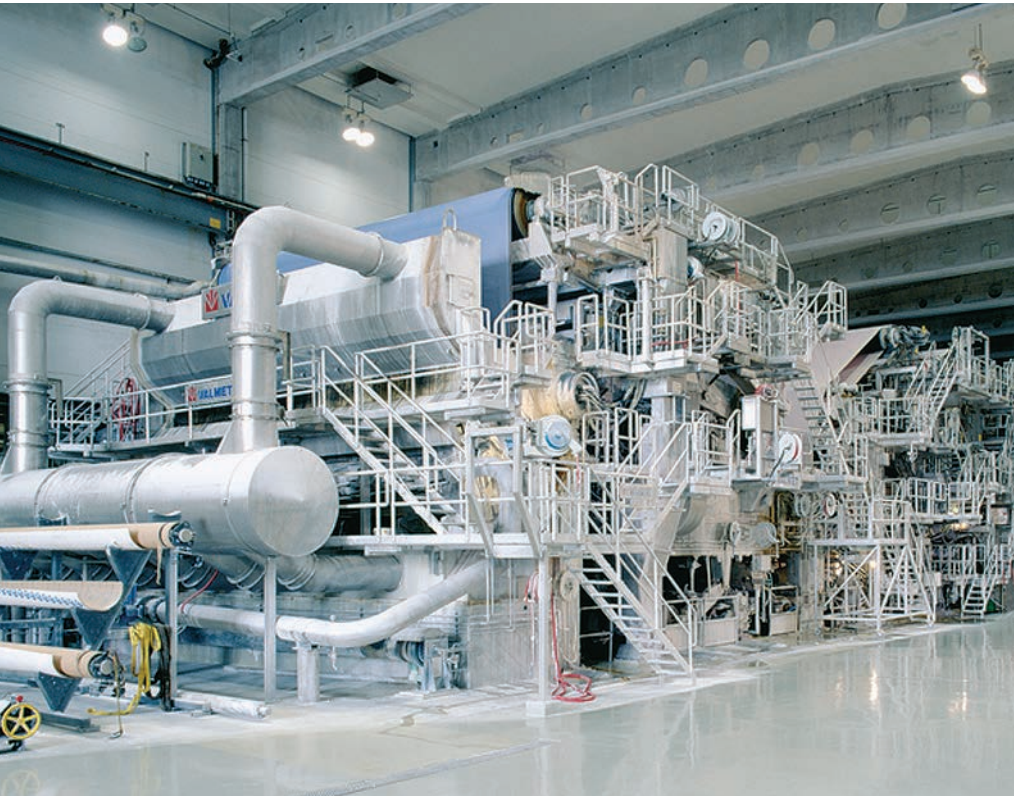


- Maintenance-free spherical plain bearings with ELGOGLIDE for anti-deflection rolls
- Roller and ball type profiled rail units for tensioning rolls and regulating rolls

- Comprehensive range of services, incl. product and service training with regard to mounting, lubrication, and condition monitoring



Designed for smooth production



Paper lines have to operate without failures and problems, ideally round the clock 365 days a year. Paper webs that are 2,000 meters long and over 10 meters wide are produced from cellulose pulp or wastepaper within minutes, depending on the machine used.

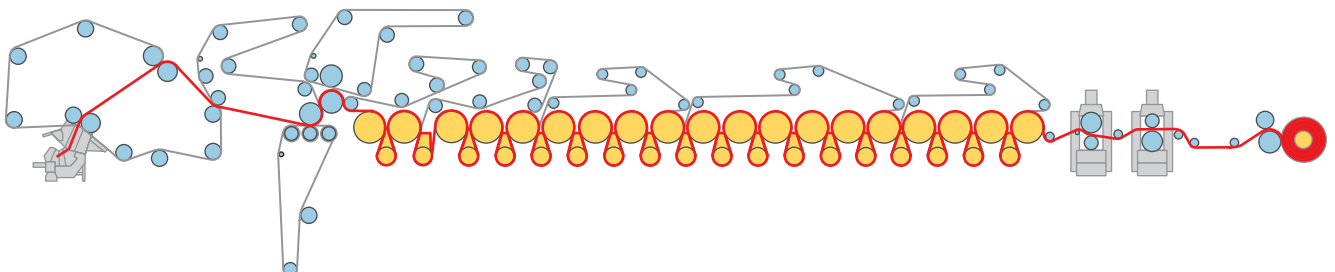
This is extremely tough on cylinders, rolls and of course rolling bearings. They have to work smoothly and they have to work well. INA and FAG rolling bearings in paper machines are characterized by excellent design and top quality.

In spite of ever increasing speeds, extreme moisture and high operating temperatures, extending the service life has top priority. Only rolling bearings that can continu-

ously withstand shaft deflections, moisture and high temperatures ensure long-term smooth operation.

Spherical roller bearings

These bearings play a dominant role in paper machines. The Pulp & Paper sector provides a matching product range and excellent options. Typical variants include bearings with cylindrical or tapered bores, with increased radial clearance and running accuracy, with case hardened inner rings, with lubrication holes in the inner rings or split design for timesaving installation in hard-to-reach locations.



Improved performance: E1 XL spherical roller bearings in X-life quality

Up to 70% longer basic rating life results from an increase in dynamic load ratings by approximately 17%. The increased static safety for these bearings is the result of increased static load ratings, based on improved surface quality and optimized internal geometry. Significantly longer bearing service life is achieved for the same operating conditions. On the other hand, the previous operating life is achieved even if loads increase considerably. In new designs, smaller bearings reach the performance of previous larger bearings. Downsizing helps achieve more cost-efficient bearing supports (smaller design envelope, less friction, less lubricant required, higher speeds).

Lower operating costs are the result of improved bearing kinematics that keep friction and bearing temperatures at a low level, which puts less strain on the lubricant.

TORB toroidal roller bearings

Toroidal roller bearings are the ideal non-locating bearings for numerous applications in the paper industry.

Roll deflections can occur due to large distances between bearings. Bearings that allow angular adjustment are therefore required. During the heating phase, significant length changes of up to 12 mm occur in drying and Yankee cylinders, depending on the distance between the bearings and the heating temperature.

TORB bearings are the solution: Due to their internal construction with long, slightly crowned rollers and adjusted radial internal clearance, they can compensate roll deflections and length changes and therefore perfectly fulfill both requirements. TORB is an ideal non-locating bearing because the inner ring can be moved relative to the outer ring with almost no force.

All TORB bearings are manufactured in X-life quality and therefore possess all the advantages of these premium products.



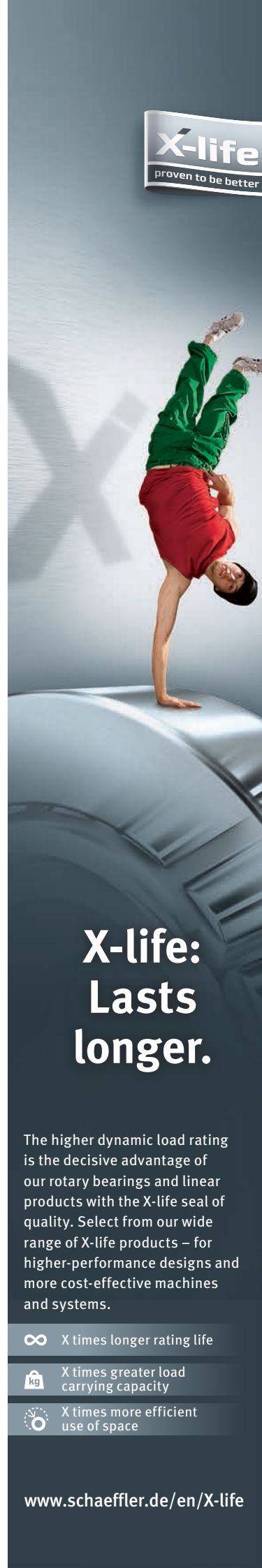
**X-life:
Lasts
longer.**

The higher dynamic load rating is the decisive advantage of our rotary bearings and linear products with the X-life seal of quality. Select from our wide range of X-life products – for higher-performance designs and more cost-effective machines and systems.

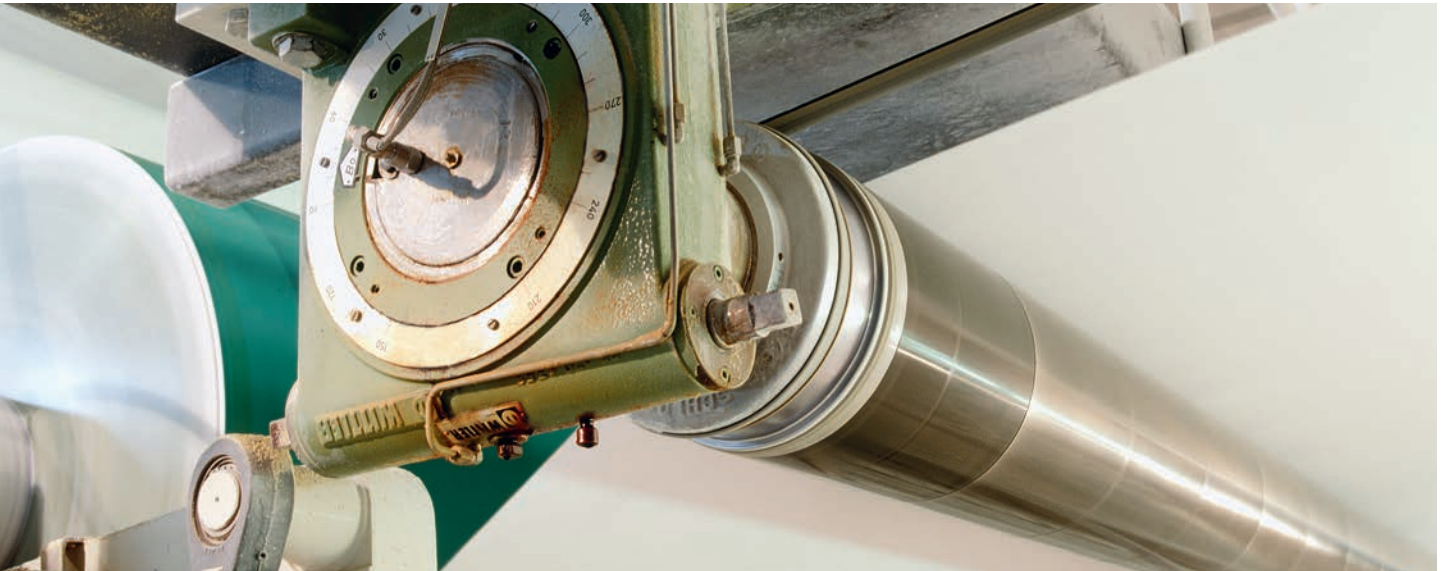
∞ X times longer rating life

kg X times greater load carrying capacity

⊙ X times more efficient use of space



Higher operational reliability through innovative solutions



Complex bearing requirements make it necessary to blaze new trails.

Through continuous product support and development, we are able to confront new challenges by offering functionally reliable and efficient solutions.

Hybrid deep groove ball bearings

Hybrid ball bearings with steel rings and ceramic balls have proven effective for spreader rolls with high speeds. To reduce the rotating masses (ball and cage assembly), only half the number of balls are installed. The risk of slip decreases as a result of the higher load on each ceramic ball. Compared to the conventional steel-steel design, the operating life is two to three times longer.

Self-aligning cylindrical roller bearings

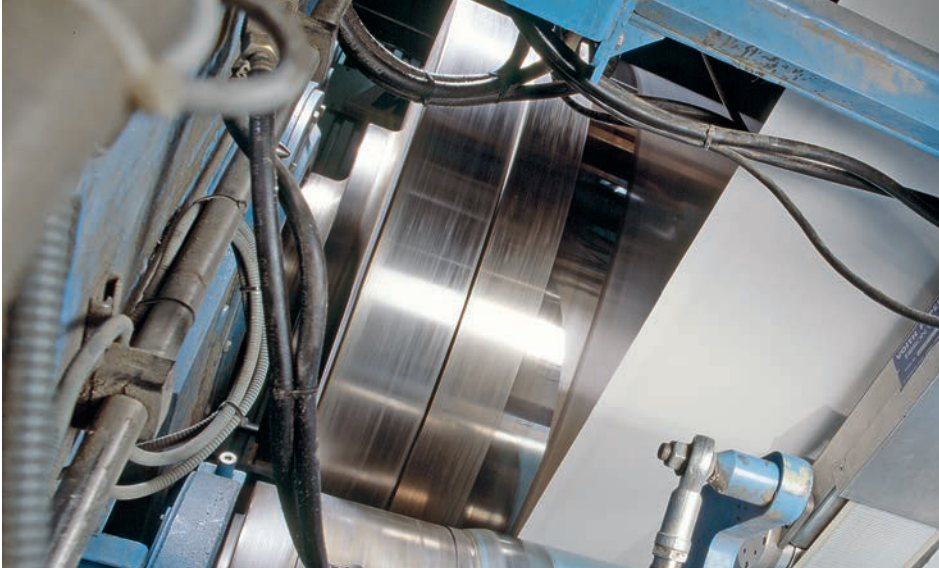
Drying cylinders of older designs are still equipped with spherical roller bearings in rocker block housings as non-locating bearing supports. If the speed of a paper machine is increased

as a result of redesigning, vertical vibrations can be excited in the rocker block housings.

The solution:

Fixed adapters are used instead of rocker blocks to firmly screw mount the housings to the machine frame. The spherical roller bearings are replaced by self-aligning cylindrical roller bearings of the same size. This solution is particularly economical since the existing housings can remain in use without the need for modifications. This is due to the fact that the self-aligning cylindrical roller bearings require the same oil feed as the spherical roller bearings.

The bearings have the same internal construction as an NU cylindrical roller bearing, which ensures load-free axial displacement between the inner and outer ring. The outer ring and the pivot ring form a spherical plain bearing that can compensate static angular misalignments.



The ASSR bearings

Varying load phases occur in the CD-profile control rolls of calenders and the press sections in paper machines. During production, the gap between the rolls is closed, which means a certain pressure acts between the two rolls. Both the nip load and the weight of the roll shell are taken up by hydrostatic control elements. This means that only very low loads act on the rolling bearings and there is a risk of slippage, which can lead to premature bearing failure.

The solution:

Schaeffler developed an innovative bearing concept with a customer for preventing slippage – the ASSR bearing (anti-slippage spherical rolling bearing). Our customers benefit from a long bearing life and reduced maintenance expenditure. While standard bearings reach an operating life of about one year because of cracks on the raceway surfaces caused by slippage, the expected operating life of the ASSR bearing is at least ten years without damage caused by slippage.

This means longer rolling bearing operating life, lower maintenance requirements and therefore a higher potential for saving costs.

This “spherical roller bearing” consists primarily of the rings of a standard spherical roller bearing. In each of the two rows of rolling elements, each barrel roller alternates with a ball. In the low-load phase, the balls ensure slippage-free operation.

The barrel rollers take up the loads in the high-load phase.



Innovative solutions



Triple ring bearings

Triple ring bearings are ideal for the high-performance roll drive side in conventional anti-deflection rolls. The rotating center ring is guided on the inside and outside by appropriately designed barrel or cylindrical rollers. The selection and combination of these bearings are based on the requirements. Brass cages are designed in a way that enables them to support the rolling elements securely and ensures optimum oil supply.



Rolling bearing coatings

Coatings are applied on rolling bearings or components to improve the running-in behavior and dry-running characteristics or to optimize wear and friction behavior. Bearings that have a risk of slippage in paper machines are coated with a tungsten carbide/carbon layer (Triondur C). This layer is characterized by high hardness and a low friction coefficient. Wear resistance increases, and as a result of the low friction coefficient, adhesive wear in particular is minimized. This offers significant benefits for mixed friction or problems resulting from slip strain.

If particularly effective corrosion protection is a priority, Corrotect electroplated cathodic corrosion protection is used. In the case of heavily loaded bearings, PTFE coatings on the external circumference of the outer ring ensure good sliding behavior with a very low coefficient of friction. This means that bearings coated with this material can be used effectively as non-locating bearings and the axial displacement forces caused by friction remain very low.

Expert consultation and the right software for your application



Expert technical consultation

Our Pulp & Paper sector offers technical consultation for all aspects of the life cycle of rotating components as part of TCO (total cost of ownership). Our experts possess an outstanding level of knowledge of bearing technology as well as comprehensive know-how in pulp and paper industry applications. Customers can expect expert consultation and support with bearing design and product selection.

medias professional

Our electronic support and selection system *medias professional* provides information on more than 40,000 standard products for approximately 60 industrial sectors.

For all bearings, *medias professional* lets you calculate the modified rating life to DIN/ISO 281. In addition, a comprehensive database simplifies the selection of adequate lubricants. In just a few mouseclicks, you can access Schaeffler's entire range of products and services for the industrial sector.

You will find the *medias* product catalog on the internet at: <http://medias.schaeffler.com>. Here you also have access to *medias campus* and *medias interchange*.

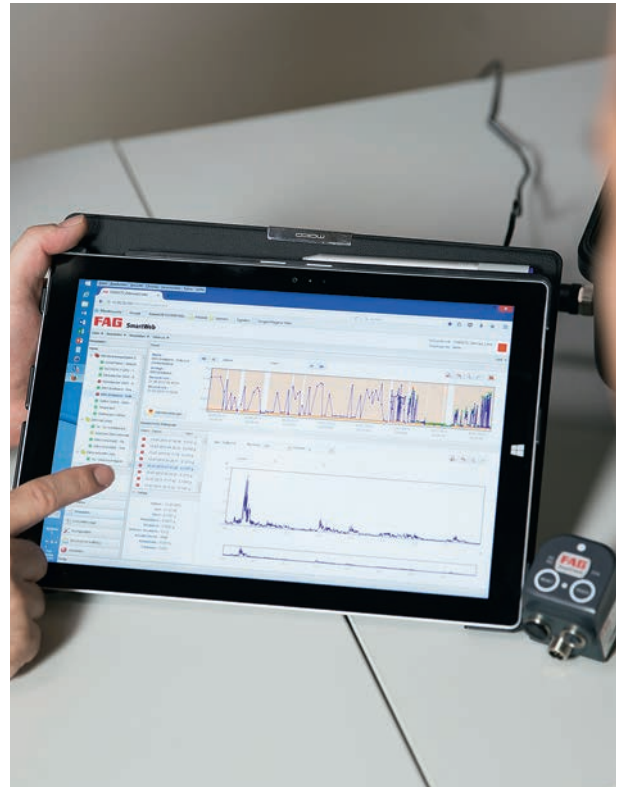
Our online training courses at *medias campus* provide you with the rolling bearing know-how you require in short learning units.

medias interchange enables you to find the correct INA and FAG bearings using designations from other manufacturers.

BEARINX

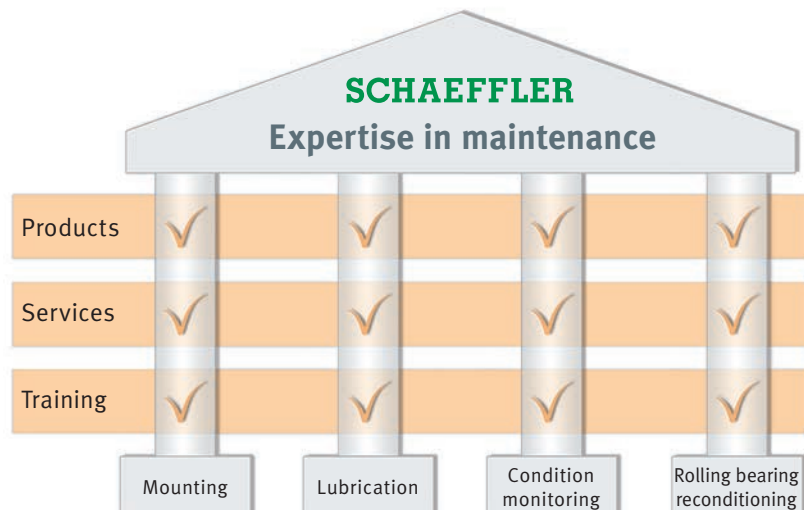
BEARINX can be used to perform detailed analyses on rolling bearings including individual rolling contacts in order to calculate their suitability for each application. Rolling bearing loads in complex machine systems can be calculated, displayed and documented while taking a large number of ambient conditions into account. The same applies for natural frequencies, natural vibration forms, critical speeds and out-of-balance responses for shaft systems.

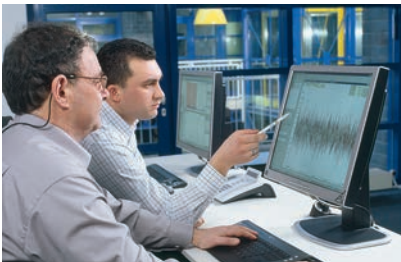
Services for all rolling bearing products and applications



Capital-intensive paper lines require permanent availability, which is provided by top quality equipment and an intelligent life cycle service that leaves nothing to chance. This in turn calls for reliable products and services for mounting and maintaining the rolling bearings used in pulp and paper applications worldwide.

We accept this challenge and offer a wide range of industrial services to cover all life cycle phases of rolling bearings.





The portfolio of maintenance and quality assurance services ranges from installation and system monitoring all the way down to the introduction and implementation of preventative maintenance measures. The reconditioning of rolling bearings, for instance, another service offered by Schaeffler, has short delivery times, contributing significantly to ensuring permanent availability of plant and machinery.

A wide range of mounting and alignment tools, gages, lubricators and lubricants as well as training facilitates maintenance work and helps design efficient work processes. Thanks to many years of experience and highly-qualified specialists, Schaeffler is the expert partner for customer-focused solutions for all aspects of the life cycle of rolling bearings.

Fast and flexible

Schaeffler off- and online condition monitoring systems for the paper industry detect machine defects at a very early stage. This means unplanned downtimes can be prevented and bearing replacements can be scheduled in advance.

Service experts provide support worldwide for paper production using state-of-the-art technology, including remote diagnosis via the internet or mobile networks. Whenever required, highly-qualified technicians and engineers provide assistance on site. Individualized service agreements, based on customer and machine requirements, ensure the highest possible machine reliability.

We would be happy to provide you with further information.
industrial-services@schaeffler.com

Global expertise – local knowledge – optimum performance for the customer



Schaeffler has been a renowned development partner for the pulp and paper industry for many years. This is not least due to our excellent product quality and strong individual support. Yet, our thinking is consistently global. You can find our engineering expertise practically anywhere in the world and at a location near you.

Schaeffler Global Technology Network – A strong network for your success

With the Global Technology Network, Schaeffler combines its local expertise in each region with the know-how and innovative strength of its experts around the world in one

single source. Our local centers of expertise – “Schaeffler Technology Centers” – let us offer our engineering and service expertise close to you. This combination provides you with optimum support anywhere in the world and our consolidated know-how brings you innovative, customized solutions of the highest quality.

Benefit from the experience and knowledge of our engineers. Locally, anywhere in the world.

Find out more about the GTN:
www.global-technology-network.de



Schaeffler Global Technology Network



www.schaeffler.de/en

Schaeffler Technologies AG & Co. KG

Georg-Schäfer-Strasse 30

97421 Schweinfurt

Germany

Internet www.schaeffler.de

E-mail FAGinfo@schaeffler.com

In Germany:

Phone 0180 5003872

Fax 0180 5003873

From other countries:

Phone +49 9721 91-0

Fax +49 9721 91-3435

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Issued: 2017, September

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