

# Schaeffler Innovation Insight

Issue 2 - 2013

**SCHAEFFLER**



**FAG**

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**Schaeffler  
Global Technology  
Network**

## Schaeffler Global Technology Network

### Global expertise – local knowledge – optimum customer performance

With the Global Technology Network, Schaeffler brings together its local knowledge within each region with the full know-how and innovative power of Schaeffler experts from all over the world. Schaeffler is strengthening its local expertise and bringing engineering and service knowledge even closer to its customers through the introduction of Schaeffler Technology Centers and collaboration in global expert networks. Consequently, customers throughout the world are able to benefit from the cumulative body of Schaeffler knowledge by simply reaching out to their local contact person: the Schaeffler sales engineer. The Global Technology Network thus allows Schaeffler to comprehensively reduce the overall costs of machines and systems and to increase the competitiveness of its customers through efficient solutions.

### Schaeffler Technology Center: In the region – for the region

The “Schaeffler Technology Center” certification serves as both tangible proof and as a guarantee of the global, uniformly high standard with which we approach our personal partnership with our customers. All of the Schaeffler Technology Centers throughout the world are distinguished by a standardized portfolio of best-in-class services. The title “Schaeffler Technology Center” is the confirmation – after a comprehensive internal audit – that these high demands are being met. To date, 21 Schaeffler Technology Centers have been certified worldwide, including two in Asia Pacific – China and Australia. Centers in Japan, Korea, Singapore and Thailand are expected to become part of the Global Technology Network during 2013 followed by the technology centre in India.

### A powerful network dedicated to your success

The technical expertise of the local engineers is complemented by the link to Schaeffler’s global expert networks, in which specialists from all Schaeffler locations around the world work together in a sector-specific way. The experts possess detailed specialist expertise, for example in rolling bearings, application engineering, service, or in customers’ manufacturing processes. They exchange their knowledge, experience, and ideas systematically and work together across regional borders. This means they can be called upon to assist in customer projects that require in-depth specialist knowledge. The exchange of knowledge in the Global Technology Network also allows Schaeffler sales engineers around the world to proactively provide their customers with innovative solutions. In this way, Schaeffler is providing comprehensive support to machine manufacturers and plant operators.

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### Benefits of the Global Technology Network:

- Access to our complete range of products and services with the added benefit of our comprehensive globally networked Schaeffler expertise
- One-stop shopping
- Innovative solutions for machines- and systems that focus on Total Cost of Ownership
- Application-specific service packages tailored to the customer’s individual requirements
- Increased reliability for machines and systems, reduced downtime and optimized maintenance costs
- Protects and enhances your competitive advantage
- With our Global Technology Network, Schaeffler provides intelligent, customized solutions to all of your technical challenges

### The Schaeffler Global Technology Network consists of more than

- 1250 local engineers at more than 130 sales offices and over 20 Schaeffler Technology Centers
- 1000 industry and product experts
- 6000 R&D engineers



**Easy Linear – New online module for calculation of monorail guidance systems**

Simple selection of configuration.

With the new BEARINX®-online module “Easy Linear”, you can very easily calculate the basic rating life of a driven linear axis supported by rolling bearings. The most commonly used linear axis combinations in a drive, guide way and carriage arrangement are preconfigured. In addition, users have the option of freely selecting an axis combination with up to four guide ways and 16 carriages.

Easy Linear models the actual load on the guidance elements taking account of the contact angle displacement, the non-linear deflection behavior of the rolling element contacts as well as the elastic guide way and the carriage. Calculation is based on the most up-to-date algorithms for the Simulation of linear rolling bearings. All data inputs for calculation, such as the axis configuration, forces and load cases can be saved for further processing and optimization purposes.

The user receives the results of the calculation by e-mail. The entry data and detailed results are also documented in a file attachment in PDF format.

New Bearinx® -online module for calculation of monorail guidance systems.

- Easy Linear can be used to calculate all INA monorail guidance systems**
- linear recirculating roller bearing and guide way assemblies RUE-E
  - two-row linear recirculating ball bearing and guide way assemblies KUE
  - four-row linear recirculating ball bearing and guide way assemblies KUVE-B
  - six-row linear recirculating ball bearing and guide way assemblies KUSE
  - two-row miniature linear recirculating ball bearing and guide way assemblies KUEM
  - four-row miniature linear recirculating ball bearing and guide way assemblies KUME-C

Easy Linear is only available online and can be used free of charge without restriction. Learn more and register now at: <http://bearinx-online-easy-linear.schaeffler.com/>



# Renewable Energy

## Solutions for extreme operating conditions



Plain bearing with ELGOGLIDE, plain bearing with ELGOTEX, spherical plain bearing with ELGOGLIDE, metal-polymer composite plain bearing.

### Precise bearing support for high efficiency and long life

Irrespective of whether solar power plants are photovoltaic or use solar thermal technology, they are particularly efficient if the collectors track the course of the sun. The more precise and trouble-free they operate, the better and more profitable the plants are. Rolling and plain bearings as well as linear units from the INA, FAG and ELGES brands make a decisive contribution here, since they have high rigidity and high load carrying capacity and operate reliably even under extreme operating conditions. With its extensive range of products and expertise in materials, coatings and seals, Schaeffler is an important development partner for projects involving parabolic trough, solar tower, Dish Stirling and Fresnel power plants.

### Plain bearings for single-axis tracking systems

In addition to the plain bearings with ELGOGLIDE that have proven themselves for several years, the product range also includes metal-polymer composite plain bearings as well as plain bearings with ELGOTEX.

The special characteristics of metal-polymer composite plain bearings are due to the combination of plastic and metal materials. This material compound allows low-wear sliding characteristics as well as a high load carrying capacity and thermal conductivity. It makes the bearings resistant to corrosive media and facilitates a constant low friction value with low wear and absolute freedom from maintenance. The material comprises two layers that are wound onto each other. The internal sliding layer, which is embedded in a resin matrix with fillers and solid lubricants, is made of synthetic and PTFE fibers. The external layer comprises continuous glass fibers (glass filament) in epoxy resin. A specific winding angle of the glass fibers stabilizes the layer, thereby significantly increasing the strength of the bush.



Axial angular contact roller bearing AXS, single-row slewing ring with external gear teeth, plummer block housing unit, track roller.

### Angular contact roller bearings AXS for double-axis tracking systems

Rolling bearings, such as AXS angular contact roller bearings, are used, for example, in the double-axis tracking systems of solar thermal plants such as solar tower and Dish Stirling power plants. Typical applications are reflector adjustment systems. High load carrying capacity, rigidity and positioning accuracy also play a decisive role here. These features are the prerequisites for a secure and smooth bearing support without vibrations for solar collectors. The bearings must also support high forces and moments, for example during sudden gusts of wind. The bearing supports are therefore decisive for the plants' reliability and cost-effectiveness.

### Modular System for Automation Tasks

Schaeffler Linear Technology provides fully-equipped linear modules designed to match customer-specific requirements in addition to a wide standard range ready for use linear units for the manufacture of solar collectors and photovoltaic modules as well as for solar tracking itself.



The driven linear unit MKUSE-KGT is characterized by very high positional accuracy.

The linear units (modules and tables) are based on anodized aluminum profiles and designed according to the modular principle, so they can be optimally equipped according to the specific requirements of the application.

### Seals and coatings are often indispensable

The environment of power plants – often deserted – is usually characterized by aridness, sand, high temperatures and significant temperature fluctuations. Such conditions require the use of reliable seals that prevent particles from entering the bearing and keep the high-quality bearing grease inside the bearing, as well as special materials and coatings that protect the bearing from corrosion. Schaeffler offers a modular seal system comprising a variety of sealing principles, sealing systems, sealing element arrangements and combinations. Schaeffler has been a leader in the area of innovative surface and coating technology for many years and has optimized the functionality of surfaces of rolling bearings and precision components that are subjected to high loads.



# Renewable Energy

## Outstanding Innovative Force -ASTRAIOS Large-size Bearing Test Rig

### Schaeffler is selected as landmark in the land of Ideas

The ASTRAIOS large-size bearing test rig at Schaeffler’s FAG location in Schweinfurt is a prize winner in the competition “365 landmarks in the land of ideas”. “Germany – Land of Ideas”, an initiative of the German Federal Government and the Federation of German Industry (BDI) awards 365 outstanding projects and ideas each year, which make a significant contribution to Germany’s future viability.

“This award is another example of Schaeffler’s outstanding innovative force and shows that we are making a significant contribution to the further development of renewable energies with our investment in the new large-size bearing test rig at our development location here in Schweinfurt”, said Dr. Arbogast Grunau, President of Product Development at Schaeffler Group Industrial.

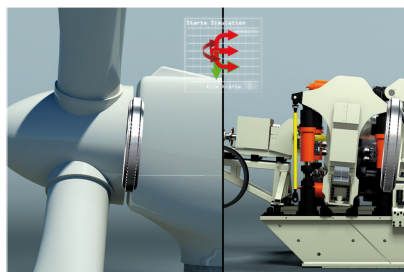
### Investment in the further development of renewable energies

In November last year, Schaeffler put ASTRAIOS, the world’s largest, most up-to-date and most powerful large-size bearing test rig officially into operation. The test rig enables large-size bearings of up to 15 tons and measuring up to 3.5 meters such as those used in wind power applications in particular to be tested in realistic conditions using a comprehensive simulation program. This means Schaeffler is making a major contribution to shortening development times for wind turbines as well as making the design process more reliable and increasing the cost-effectiveness and safety of these turbines. At around €7 million, the Schaeffler large-size bearing test rig is a significant investment in the further development of renewable energies and the company’s development location in Schweinfurt.

The new test rig will primarily be used for testing rotor bearing supports for wind turbines in the multi-megawatt class and will result in further improvements in the understanding of systems as a whole, influencing factors and the interrelations in the drive trains of wind turbines. This will result in bearings characterized by lower friction and increased design safety. In addition, the tests will provide information about and recommendations for wind turbine operation and maintenance as well as for optimum adjacent constructions. The test rig has been named “Astraios” after a Titan in Greek mythology who was father of the four wind gods.



Shortening development times and making the design process of wind turbines more reliable.



Four radial and four axial hydraulic cylinders generate real loads and moments occurring in wind turbines. Radial cylinders simulate weight of rotor hub with rotor blades, axial cylinders generate wind loads.

# Multifunctional Coatings

Higher performance and protection from corrosion and wear with multifunctional coating systems

## Surface and coating as design element

The Schaeffler Group has expanded its capacities in R&D and the application of coating technology by investing in the expansion of its Surface Technology Competence Center at the Herzogenaurach headquarters. With its new coating and R&D facilities, Schaeffler has created more capacity for the development of customized solutions and is also expanding its volume production capacities to rapidly meet the rising demand for high-quality coated components.

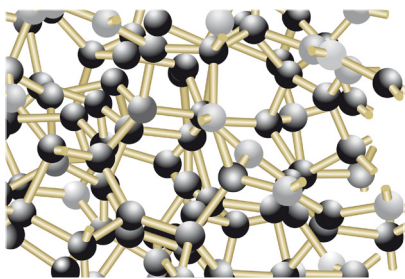
Today Schaeffler offers a comprehensive range of coatings designed to optimize the surfaces of components and systems in accordance with customer requirements, used either individually or in combination. These coatings extend the operating life of components and offer protection against fretting corrosion, corrosion and the passage of electric current, for example. Moreover, they can minimize friction, slippage-related damage and wear. The latest developments even enable sensor layers to be realized.

### Trend towards multifunctional and sensor coatings

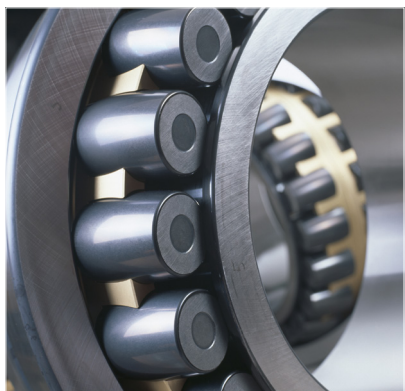
“There is a noticeable trend towards multifunctional and sensor layers that are developed individually to match the specific needs of our customers,” says Dr.-Ing. Tim Hosenfeldt, Head of the Surface Technology Competence Center at Schaeffler. This applies to relatively small batch sizes for industrial applications in the same way as to components produced in their millions for the automotive industry.

### Surface and coating as design element

“The decisive aspect today is that we at Schaeffler consider surfaces as design elements. With our technical equipment as well as our process and application expertise, we are in a position to provide samples early on and to develop them to volume production maturity directly and reliably,” said Hosenfeldt. Examples include, for instance, tappets with Triondur® coating developed for Nissan that ensure a significantly reduced friction in the valvetrain of car engines. Schaeffler has been supplying millions of these components annually for over ten years now. Back in 2005, the company received the Nissan Innovation Award in recognition of this component. After ten years of zero-defect delivery quality, Nissan recognized Schaeffler Japan with its Quality Award too.



Molecular structure of Triondur coating: This carbon-based, adamantane coating system offers a maximum level of protection against abrasive and adhesive.



Barrel rollers with Triondur coating in spherical roller bearings, used e.g. for paper calenders or hydraulic motors.

# Multifunctional Coatings

Higher performance and protection from corrosion and wear with multifunctional coating systems



Tappets with Triondur coating for automotive valvetrains reduce fuel consumption and emissions.

## Triondur coating systems: Higher performance and downsizing options

The production of Triondur uses the particularly environmentally friendly PVD and plasma-aided CVD processes. Due to very high hardness values even with coating thicknesses of approx. 2 µm, Triondur offers excellent protection against wear combined with reduced friction.

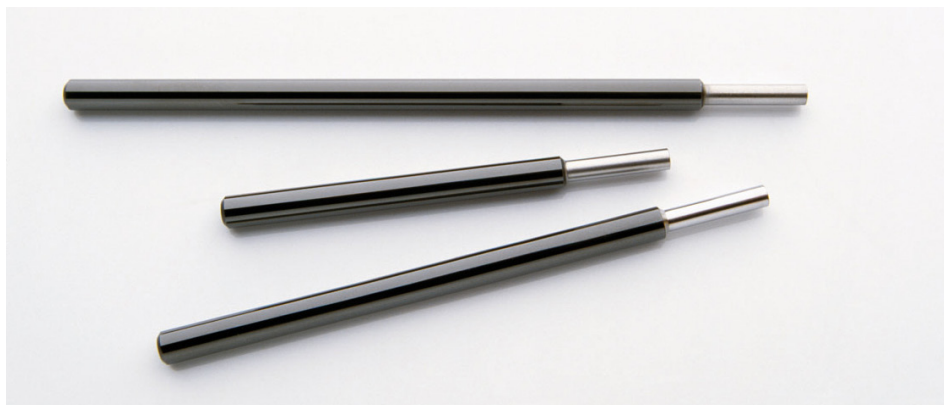
This makes it possible to optimize components and systems for a specific application without changing their dimensions or designs. They can therefore be used for downsizing purposes, which means that the components offer even better performance with unchanged dimensions or smaller and therefore more cost-effective versions can be used when loads remain unchanged.

## Significant increase of operating life of entire tribological system with Triondur C

In 2010 alone, Schaeffler supplied over 70 million parts with Triondur coating. One specific type is Triondur C. This carbon-based adamantine coating system offers an extremely high level of protection against abrasive and adhesive wear, whilst reducing friction to a minimum. Dry friction against steel is up to 80 percent lower. Even if only one friction surface is coated, the operating life of the entire tribological system is increased significantly. Due to its special coating structure, Triondur C can withstand the high contact pressures that occur in rolling bearings, for example. Typical applications include spherical roller bearings for paper machines and track rollers used in the printing industry. In addition to tappets for the valvetrain, the automotive industry uses, for instance support elements, finger followers or control pistons with Triondur coating. The development of new Triondur DLC coating systems that can be precisely matched to the respective operating conditions, has enabled a friction reduction of up to 50 percent between the camshaft and tappets to be achieved. The power loss of the engine and CO<sub>2</sub> emissions were significantly reduced in this way.



Barrel rollers with Triondur coating in spherical roller bearings, used e.g. for paper calenders or hydraulic motors.



Control piston with Triondur coating for diesel injectors.





# Easy Mounting

# FAG

## New generation of FAG heating devices – quality and safety redefined



FAG HEATER1200 – the largest device in the series.



FAG HEATER40 – one of seven inductive heating devices, suitable for workpieces of up to 40 kg.



FAG HEATER300 with trolley for ease of transportation.

FAG's new generation of HEATER inductive heating devices allows rolling bearings and rotationally symmetrical parts made from steel to be heated significantly more safely and gently than was possible before. The new devices are equipped with many technical innovations with enhanced safety features and optimized operating efficiency. The series has been tested and certified by TÜV Rheinland.

### Maximum safety for work piece and machine

High machine availability depends on the quality of the individual machine components. This means that work pieces must be heated as homogeneously as possible prior to mounting. Optimized positioning of the induction coil and introduction of combined temperature and time control feature in the new HEATER series prevents overheating thereby reducing risk of damage or distortion of work pieces. The demagnetization function prevents attraction of metallic contaminants.

### Maximum safety for the device

The devices are ideal for use in volume

production assembly as they are equipped with various functions to prevent overheating. Features like location of induction coil in the device housing and a thermal protection system to protect them from damage from overheating.

### Maximum safety for the user

All inductive heating devices produce a magnetic field during the heating process, and this magnetic field can affect the health of the user. A five-second countdown in some models gives users enough time to move away from the device. The larger devices in the series can be controlled using a flexible and convenient infrared remote control.

The new generation of heating devices comes complete with a broad scope of delivery. Schaeffler delivers various ledges, the corresponding special grease, heat-resistant gloves, and a cover as standard with all devices. Another first is the free device selection software FAG Heating Manager, which assists the user in selecting the optimum heating device for heating rolling bearings.

### Advantages

- Easy operation and optimized mounting times
- Very user friendly and cost efficient
- Controlled heating in ramp control mode (combined temperature-time-mode)
- Uniform heating of outer ring and inner ring
- User is protected from magnetic field
- Demagnetized, stress-relieved parts
- Easy positioning of large bearings thanks to sliding table
- High degree of flexibility as accessories include ledges of various sizes
- Large scope of delivery
- Ideal for batch mounting
- Free warranty extension (5 instead of 3 years)
- Maximum safety for user, heating device, part and machine



# Monitoring Systems



## FAG SmartCheck – Compact device for comprehensive monitoring solutions

FAG SmartCheck is a compact, innovative, modular online measuring system for continuous monitoring of machinery and process parameters on a decentralized basis. It can be used on assemblies where such monitoring was previously too cost-intensive. It provides customers with both reliable information to ensure availability and a comprehensive data basis about the behavior of their machines in the field. The device has met requirements for use in different customer units, for example, vibrating screens, electric motors, decanters, pumps or compressors.

detecting whether imbalance was caused by the worm or the drum. Due to its high level of flexibility, the FAG SmartCheck is an attractive solution for units, which are installed at remote locations, for example, pumps for flood control or at reservoirs.

### Small price – great reliability

The FAG SmartCheck is a new, innovative measuring system for real-time monitoring with patented diagnosis technology. This compact measuring device can be installed very quickly, is easy to operate and makes a significant contribution to optimizing processes and reducing life cycle costs due to its forward-looking features.

### Versatile applications

The FAG SmartCheck has proven to be a reliable online monitoring tool under rough conditions in the field of vibrating screens. The device accurately measures vibration signals in electric motors for early detection of bearing defects to enable intelligent process monitoring.

### Wide range of MRO offering

The FAG SmartCheck one of Schaeffler's unique and comprehensive range of services – from consultations, initial operation, remote monitoring service and maintenance contracts, right up to standard and individual training courses. All these offerings always aim toward optimizing plant safety and process reliability.

It operates with the same level of precision and reliability for other applications. For example, it was used on a decanter machine for precisely

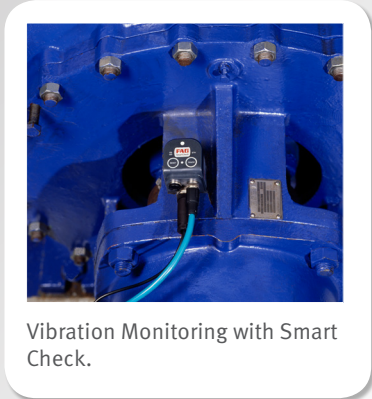
## New bearing reconditioning center in China (Taicang)

Schaeffler has broadened the scope of its MRO offering and extended its reach to customers in the Asia Pacific region by setting up a bearing reconditioning center at the Taicang plant in China. Bearing reconditioning is one of the key services provided by Schaeffler through the Industrial Aftermarket segment.

Reconditioning Center provides the full range of reconditioning services including bearing repair, cleaning and inspection to customers from the steel, mining, paper, wind energy and machinery sectors.

Reconditioning maximizes the function and lifespan of bearings, reduces the consumption of raw materials, lowers emissions and lessens the impact on the environment. Taicang

Schaeffler reconditioning centers are located at many locations across the world to ensure quick and professional service to local and regional customers. Besides Taicang, these centers are located in Germany, UK, US, Brazil, Australia as well as Yinchuan in China.



Vibration Monitoring with Smart Check.



Taicang Reconditioning Center.

# FAG DRACBB in X-life

Long service life and high reliability under high temperatures 40 % less friction with new HRS seal

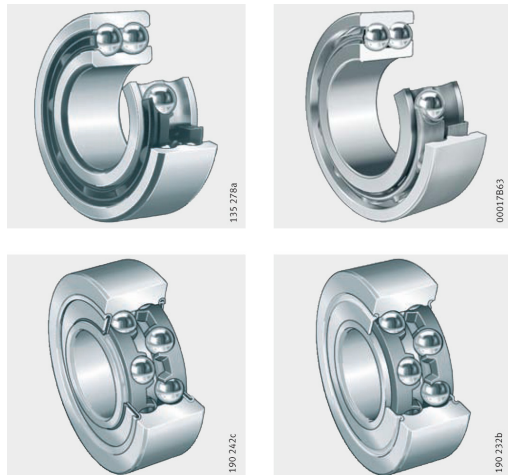
**FAG**

## New X-life quality for double row angular contact ball bearings

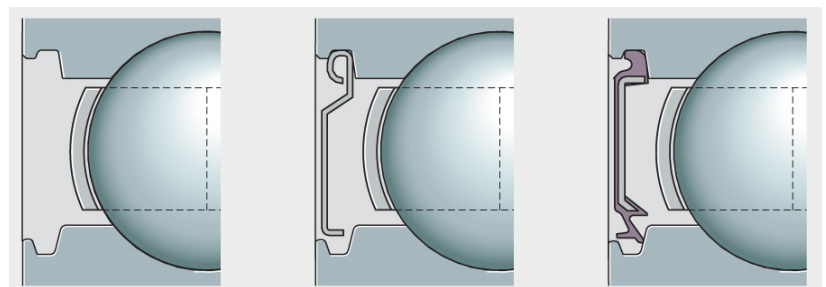
Double row angular contact ball bearings are particularly suitable for bearing arrangements where rigid axial guidance is required and high radial loads and axial loads in both directions have to be supported at the same time. As the axial load carrying capacity of these bearings is largely dependent on the contact angle, we have increased this angle to 30° in our new X-life design. Further X-life improvements have been included in addition so that the new FAG bearing is recommended for an even wider range of applications due to its long service life and high reliability. The innovative shape of the new, particularly robust and rigid sheet steel cage for especially challenging operating condition ensures optimal grease distribution within the bearing. Operating temperatures of up to 200 °C are therefore possible.

### 40 % less friction through conversion to HRS seal

Of course the sealing concept is new too. The innovative HRS seal (new lip geometry, venting grooves, dust deflector) provides optimal protection against the ingress of dirt and water as well as against the escape of lubricating grease. Since the seal is in axial contact (normally radial) with the inner ring in an undercut, sealing friction has been significantly reduced by approx. 40 % compared with the former RSR seal! All X-life bearings with HRS seal or Z shield are supplied filled with grease.



Double Row Angular Contact Ball Bearings.



Open bearing

Gap seals on both sides(2Z)

Lip seals on both sides(2HRS)

For more details, please refer to our Technical Product Information which is now available hot off the press.

# Wheel Bearings for Two-Wheelers

The low-friction bearing is available in the following types\*:

- 6201-C-2ELS-L100-FX
- 6202-C-2ELS-L100-FX
- 6203-C-2ELS-L100-FX
- 6301-C-2ELS-L100-FX
- 6302-C-2ELS-L100-FX

\*Other types are available on request.

Bearing redesigned. Friction reduced by 30%.

A new and extremely robust wheel bearing from FAG reduces friction in two-wheelers by 30 %. A combination of several individual measures has brought about such high level of improvement in efficiency.

To achieve this significant reduction in the friction values, Schaeffler adapted internal construction and seal of the bearing to produce maximum energy efficiency. Innovative design of the sealing lip brought significant improvement to the sealing action of the bearing. Application of an especially water-resistant, high-quality grease provides excellent wear protection.

### Unbeatable combination of reliability and energy efficiency

The new wheel bearing for two-wheel vehicles is a robust deep groove ball bearing with lip seals on both sides that has been specially developed for applications that utilize a rotating outer ring. Its main advantage is the unbeatable combination of reliability and energy efficiency that it provides. This is especially so at high speeds, where the bearing's frictional torque and thus the loss of power is significantly reduced. The bearing is also interchangeable with standard types.

### Superior sealing for longer life

The ingress of contamination and water into the bearing is hindered by adding projecting edges at the right points on the outer side and making the gap between the inner ring and the seal lip as narrow as possible. The recess on the inner ring and the geometry of the seal lip combine to create an effective labyrinth, so dirt has no chance of getting in. At the same time, the newly-designed grease guard on the inner side of the seal reliably ensures that the high-quality grease stays in the bearing.

### Tested quality

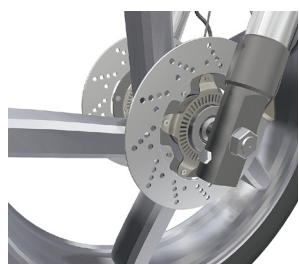
Efficiency of the seal and the frictional torque of the bearing were compared with those of a product from one of our premium-segment competitors in a benchmark test. The rotational speed of the FAG wheel bearing with optimized friction decreases at a significantly lower rate than that of its counterpart. Conclusion: The FAG deep groove ball bearing runs for significantly longer while using the same amount of energy.



Extends the operating life

- Requires little energy
- Remains very reliable even in harsh operating conditions
- Reduces maintenance outlay and operating costs

100%  
customer benefit



The new FAG wheel bearing.



Improves your motorcycle's fuel economy and saves you money.

# Ingenious Solutions for Your Smartphone

[www.schaeffler.com/apps](http://www.schaeffler.com/apps)

Schaeffler Apps offer a wide range of useful features, such as:

- ☑ Easy-to-read e-books
- ☑ Full-text search feature (PDFs)
- ☑ Table of contents with links to chapters
- ☑ Bookmark feature (onboard version)
- ☑ Zoom feature for graphics and technical drawings
- ☑ Swipe feature
- ☑ Thumbnail previews for quick searches
- ☑ Notepad (onboard version)
- ☑ Scientific calculator
- ☑ Screenshot capture with mail option (share with friends)
- ☑ Online search on the Internet
- ☑ Link to career opportunities at Schaeffler
- ☑ Function for contacting Schaeffler

SCHAEFFLER

LUK INA FAG



### The Technical Pocket Guide (STT) from Schaeffler for your smartphone and tablet



Available on the App Store

Download for Android

Get technical knowledge as a reference work on your smartphone or tablet! The Technical Pocket Guide (STT) from Schaeffler is now available to students of technical subjects, engineers, and technicians as a compact and mobile reference work on your smartphone or tablet (only in German language available).

In addition, you will find interesting information and links about Schaeffler and the LuK, INA and FAG brands.

### Schaeffler InfoPoint for tablets



Available on the App Store

Download for Android

Learn more about Schaeffler, a leading manufacturer of rolling bearings worldwide as well as a renowned supplier to the automotive industry, and the LUK, INA and FAG brands.

In addition to some interesting links, our virtual kiosk contains a fascinating selection of publications and catalogs from Schaeffler's media library. You can use these online or read them offline anytime in your library.

### Schaeffler Motorsport Quartets



Available on the App Store

Finally! Racers and friends of quartets card games have long been waiting for it – the Schaeffler Motorsport Quartets is now available as an iPhone and iPod touch app for free downloading from the Apple Store. Effective immediately, players can “gamble” against digital opponents with horsepower, cubic capacity, number of cylinders and weight.

We hope you enjoyed reading our second issue of “Schaeffler Innovation Insight”. If you have any questions or need further information, kindly contact your local account manager.

Cordially,

Your Schaeffler Team

## Imprint

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