# added competence



Issue 2014/2015

A Customer Newsletter Published by Schaeffler Technologies GmbH & Co. KG's Production Machinery & Linear Technology Business Unit

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Lower operating temperatures, fewer contact angle deviations Page 4



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## Precision and Quality – Up Close & Personal

Schaeffler solutions for medical technology



High-tech bearing supports for operating room automation

There are certainly more pleasant things in life than lying on an examination table as you move through a CT scanner. But if such a procedure is unavoidable, it is comforting to know that you can depend on FAG SIMTUS to provide you with the following benefits:

- Short scanning times, thanks to the high speeds generated by the system
- Razor-sharp images that can even capture active internal organs such as a beating heart
- Virtually silent operation.

FAG's SIMTUS, which stands for Special Integrated Mechatronic Turning Unit System, is just one of a number of Schaeffler Group products for medical technology applications that enable hu-



mans - and not just machines - to enjoy the immediate benefits of superior bearings. SIMTUS incorporates direct-drive bearing units in the form of complete, ready-to-install solutions from FAG Aerospace GmbH & Co. KG that meet the exacting demands of computer-aided imaging procedures used in hospitals and radiological clinics.

With a multi-disciplinary and cross-

departmental Schaeffler team - under the direction of the Aerospace division - working in concert with the end customer, the development process for these special mechatronic systems featured a level of cooperation that truly epitomizes "added competence."

An example of this collaborative spirit: The drive unit consists of a torque motor from IDAM (INA Drives & Mechatronics), while the Aerospace division showcased its core competence by supplying the mechanical components, the specially developed bearing and the actual assembly work. The electronic interfaces and mechanical connection geometry along with the requirements for accuracy and rigidity were developed with the help of the customer.

Continued on page 2



### **Editorial**

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### Schaeffler Solutions for Medical Technology -Precision and Quality That's up Close and Personal



Chances are, the lead article in this latest issue of our newsletter affects all of us on a far more personal level than we might think! After all, unlike other industrial sectors, medical technology is primarily focused on our own health and well-being, rather than just machines and equipment. The degree of precision and quality that is required when positioning, lifting, x-raying and treating patients directly affects our own well-being, and this also applies to the production of implants and other medical aids and devices.

It goes without saying that our internal targets for high-precision machining, zerodefect tolerances and "best performance" - already in place for our customers in industries such as machine tools, printing and textile machinery - should apply just as much in an area that directly affects our personal well-being. Which is why we are pleased that the medical technology segment - with its vital contributions to areas such as laboratory equipment, surgical automation and imaging techniques - is now part of the Production Machinery business unit.

At the upcoming Compamed trade show in Düsseldorf, Germany, one of the industry's leading trade fairs, we would like to give you an initial look at Schaeffler's solutions for medical technology – with the expectation that they can be made available to you anywhere, but in the sincere hope that you will never really need them for yourself!

Who knows, perhaps we will have a chance to meet at the trade fair in Düsseldorf. In the meantime, this latest issue of "added competence" that you currently have in your hands is another opportunity for you to get to know us. I am certain that we have quite a few products in stock that have an 'up close and personal' connection to your everyday responsibilities and applications.

Enjoy!

Best regards. H. Jobe Kr Martin Schreiber

Martin Schreiber President - Production Machinery Business Unit

#### Continued from page 1



CT scanners utilize a radiographic imaging method to produce tomographic images (virtual "slices") that create a better view of organs, bones and muscles inside the human body. During this process, a massive device – consisting of a high-voltage generator, an x-ray tube and a sensor system – weighing nearly one



metric ton rotates around the patient at speeds that are quick enough to produce non-invasive images of fast-moving coronary arteries. These specially designed, ready-to-install systems are extremely precise and contribute significantly to making this type of circumferential radiography faster, while ensuring everhigher image quality. However, it is entirely possible that not just the bearing inside the CT scanner but also the examination table underneath the patient is based on a Schaeffler system solution. In the latter case, an INA scissor-type linkage with an actuator might be responsible for accurate height adjustment, or one of our linear guides may be silently gliding the examination table into the scanning tube.

If an operation has to follow the CT scan, its successful outcome is likely due in large part to cutting-edge ceiling mount bearing supports from Schaeffler. They enable vital equipment such as monitoring screens, supply systems and ventilators to be perfectly positioned in the operating room without creating a trip hazard. This is because INA ZAXFM bearing units and IDAM FBS bearing systems with an integrated electromagnetic brake are ready-to-fit complete solutions that offer operating rooms and intensive-care stations

- optimal positioning,
- maximum safety factor for load-carrying capacity and titling resistance,
- adjustable swivel angles,
  and cost-effective connect-
- ing components.

And despite requiring minimal installation space, their inside diameters are large enough to easily allow supply lines and cables to pass through.



Electromechanical lifting columns are compact and robust hoisting devices that can reliably and consistently handle loads of up to several hundred kilograms. This is particularly critical for C-arms and operating tables as well



as for lift units in respiratory equipment. These devices could also be interesting solutions for other industrial applications.

Schaeffler Solutions for Medical Technology are synonymous with unsurpassed quality, versatility and – of paramount importance, not only for humans – longevity.

For more information, please see our PMT brochure "Rolling Bearings and System

Solutions for Medical Technology" and be sure to download our DMT animation.



## **Magnetically Hard Composite Layer as a Design Feature**

For extremely accurate, interference-resistant and durable angle measurement

Schaeffler has completed the development of a flowable, magnetically hard composite coating with embedded magnetic particles that is designed to be used with bearings and linear guidance systems featuring an integrated measuring system and encoder. This coating has been successfully used in Schaeffler products since 2013. With YRTM/YRTSM rotary table bearings, an automated in-house process is used to apply the coating to the shaft washer's outside diameter, after which it is thermally hardened, ground to 0.1mm thickness and, finally, magnetically encoded. This enables high-precision multi-pole pitches to be achieved on rotary table bearings for high-precision, bearing-integrated angle-measuring systems. Another benefit: magnetic paste (as opposed to the cobalt layer that has been employed in previous bearing-integrated measuring systems) allows for a larger air gap to be created between the dimensional scale and the sensor. This makes it easier to adjust this already extremely installation-friendly measuring system.

For angle-measuring systems, this magnetically hard composite coating for the magnetic dimensional scale is an outstanding feature for integrating functions such as position, speed and acceleration measurement. The magnetically encoded layer enables measurements to an absolute accuracy of +/- 5 arc seconds for rotary table bearings with up to 180 mm inside diameter, and even +/- 3 arc seconds for bearings with inside diameters of 200 mm and larger. The material is temperature and corrosion resistant, environmentally friendly and highly immune to interference from external magnetic fields. It can be applied to almost all of the components.

YRTM and YRTSM are high-precision rotary table bearing units that feature a

directly integrated angle-measuring system. As opposed to optical measuring systems, directly integrated magnetoresistive measuring systems cannot be contaminated by grease, oil and emulsions. They require hardly any installation space, plus the center of the rotary axis remains



Application example YRTM: High-precision multi-pole pitch for bearing-integrated measuring systems (as seen under a magnet magnifier).

unobstructed so that peripherals such as cables and supply ducts can pass through. The units can measure speeds as high as 1,160 rpm, while their accuracy levels are comparable to those of optical measuring systems. The signal quality in YRTM bearing units and their high-speed YRTSM counterparts can be adjusted to the demands of optionally available torque motors. YRTM and YRTSM units are especially suited for use in direct-drive turning/milling machines. The benefits of these ingenious bearings exert a downright 'magnetic attraction' on design engineers and users!



YRTM/YRTSM (Screen capture from Mm2.27 animation)

### **ISO GPS and Bearing Standardization: Speaking the Same Language** Schaeffler's active involvement in standardization efforts

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Magnetic paste

WSM

The world keeps turning – and standards (aka norms) keep changing, too. Norms not only have to keep up with the increasingly dynamic advances in technol-

ogy, they also have to keep pace with the demands of globalization. While the initial foundation for standardization in the bearing industry was established nearly one hundred years ago, today we stand at the gates of a new age in standardization: Geometrical Product Specifications, or GPS, are part of this evolution in standardization.

GPS' objectives include the following:

- Establishing a clearer and more comprehensive geometrical specification of workpieces and measuring equipment
- Reducing waste and promoting international interchangeability
- Ensuring worldwide acceptance (currently facing challenges, especially in the USA)
- Encouraging rapid implementation in countries that do not have their own history of standardization

With the introduction of internationally recognized GPS symbols in the ISO 492 and ISO 199 norms, a new milestone has been reached in international standardization.

The new symbols of the GPS standards enable a more precise description of our products. The complete definition of a workpiece with regard to its assembly or function is now clearly and unequivocally shown in the below drawing. Companies that participate in the standardization process provide an invaluable service to the respective industrial sector of their country by helping to ensure best-possible quality assurance, streamlining & simplifying work processes, and promoting internationalization. At the same time, these companies bolster the economic prestige of those who set the standard. In turn, they gain clear competitive advantages for themselves and their customers, particularly in the



Speaking a clear and consistent "language" both internally and externally – that's the great benefit of GPS



form of a head start with regard to knowhow and time. This also enables them to reduce R&D uncertainties and costs. As a global company, it was a "no-brainer" that Schaeffler would make a significant contribution to the recent revisions of ISO 492 and ISO 199. Future standardization efforts will also see the Schaeffler Group continuing to advocate for a simplification in component-machine integration.

For more information, visit www.iso.org

## **Better Than Ever: FAG B Spindle Bearings**

Lower operating temperatures, fewer contact angle deviations

As part of our efforts to continuously improve our products, FAG B719- and B70-series spindle bearings are currently being upgraded. In fact, some B719-series bearings have been available since the start of this year with a number of improvements that offer you the following benefits:

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- Greater consistency with regard to rigidity, kinematics and preload, thanks to a design-based limitation of permissible contact-angle deviations
- Greater smoothness and stability in terms of running and temperature behavior, thanks to our new cage design
- A material upgrade that has resulted in additional improvements to the cage's dimensional stability
- Reduced frictional torque and up to 15% lower operating temperatures, thanks to lower cage friction
- Reduced likelihood of cage-related noise ("cage rattle")



FAG B spindle bearing

- A rigorously tested new cage design that has successfully proven itself for years in RS bearings inside many customer applications
- Less noise, thanks to tighter ball tolerances

Across the board, the optimization efforts have significantly improved the smoothness and performance of FAG spindle bearings. During this product upgrade, no changes are being made to any internal design features that would impact rigidity, load ratings or preload forces. Similarly, no changes are being made to the injection pitch circles. Consequently, all of the upgraded bearings can be used as before; old and new versions can be installed side-by-side and interchanged at anytime.

Initially, this upgrade is being undertaken successively for all bearings manufactured at the Schweinfurt location for both dimension series with an outside diameter of  $\leq$  160mm. The conversion phase is scheduled to take place between January 1, 2014 and December 31, 2015.



FAG B spindle bearing

## Maximum Reliability on the High Seas

### FAG SmartCheck undergoes long-term testing aboard maritime search & rescue vessels

Whenever maritime search & rescue vessels are deployed, it is usually a matter of life and death. In addition to the hazards of the mission itself, the vessels as well as the on-board machinery and equipment are exposed to extreme stresses and weather conditions. Rescue personnel place the highest priority on the reliability of their machines, since any unplanned equipment failures during a rescue operation could have fatal consequences. As part of a pilot project, an FAG SmartCheck device was installed on a ship belonging to the German Maritime Search and Rescue Service (DGzRS) for a period of twelve months.

An LED on the SmartCheck unit alerted the ship's crew to any potential gearbox irregularities, while the data collected by the device was analyzed at regular intervals by the staff of REINTJES GmbH and by the experts at Schaeffler. This test was an an opportunity for REINTJES, a manufacturer of transmissions for maritime applications with a power output of between 250 and 30,000 kilowatts, to experience firsthand the performance of the FAG vibration measuring device. The test was also intended to determine how the weather conditions during the different seasons affect the vibrations of the gearboxes. To that end, an entire year's







FAG Smart Check monitoring the performance of a gearbox



CTX beta 800 turning machine from DMG/Mori Seiki with FAG SmartCheck

worth of vibration data was collected and recorded.

FAG SmartCheck is an ideal online monitoring system for analyzing vibrations and other parameters in main spindles, as it communicates with the machine control system. FAG SmartCheck is already being used in applications such as the CTX beta 800 turning machines from DMG/Mori Seiki. added competence





## **BEARINX®-online Easy Friction**

### Detailed friction calculations for rolling bearings

Other calculation tools currently on the market usually employ highly simplified calculation methods that typically ignore the bearing misalignment resulting from shaft deflection as well as the elastic behavior of rolling bearings and contact points. Friction calculations are determined using only approximation methods, yielding a result that provides few or only vague reference points for practical applications.

### A new addition to the acclaimed Bearinx<sup>®</sup> family

With the Bearinx<sup>®</sup>-online module "Easy Friction" you can now determine the friction values of Schaeffler rolling bearings according to a detailed procedure. Of course, this process takes the internal load distribution with the contact pressures on the raceways and ribs with the actual rolling element profiles into consideration. The new module is built upon a friction calculation theory, which is based on physical algorithms, that has been validated by comprehensive test results. In addition, bearing life is also calculated in accordance with ISO/ TS 16281. The algorithms in Bearinx®online Easy Friction take numerous parameters into account, especially the following:

- Losses in rolling contact and sliding contact
- Losses in the load-free zone
- Churning losses
- Seal friction
- Radial and axial load
- Bearing ring misalignment
- Lubricant (viscosity class)
- Temperature
- Precise internal geometry of the bearings
- Internal clearance
- Profiling of bearing components
- Rib geometry

### Intuitive, menu-guided user interface that needs no explanation

The self-explanatory menu navigation enables users to quickly and easily enter data for modeling, bearing selection and operating conditions. The bearing arrangement for the elastic shaft system can be modeled with either a locating/ non-locating bearing support or as an adjusted bearing arrangement. The geometric data of INA and FAG rolling bearings is easily loaded from an integrated database. Online users need only to enter data such as the loads acting on the shaft system, shaft speed and the internal clearance class or axial preload of the rolling bearings. Lubrication and cleanliness data round out the information that needs to be entered into the system.

## Quickly compare friction values for a variety of bearing designs

By substituting different bearings, it is possible to quickly and easily make comparisons between a variety of bearing support concepts. All data that has been input can be saved locally, eliminating the need to reenter the data when making changes to an existing design, and facilitating direct data exchanges with Schaeffler's Engineer-



detail: Even the contact pressure at every single rolling element is factored into the calculations.

ing Service. The actual calculations are performed on the Schaeffler Group's powerful servers. The most important results are displayed immediately in a results window, while the input data and the complete calculation results are documented in a PDF file.

#### Applicable bearing types

Bearinx<sup>®</sup>-online Easy Friction allows for the following bearing types to be calculated:

- Deep-groove ball bearings
- Angular contact ball bearings
- Tapered roller bearings
- Spherical roller bearings
- Needle roller bearings
- Cylindrical roller bearings

### Registering for BEARINX®-online is easy and free!

The calculation program Bearinx<sup>®</sup>-online Easy Friction is available online only and can be used free of charge. After initial registration, which takes very little time,

you can start your calculation immediately.



http://bearinx-online-easy-friction.schaeffler.com

### **Need even more features? Consider BEARINX®-online Shaft Calculation** For individual requirements in shaft

modeling, fitting bearings, selecting bearings and for considering special operating data, we offer our customers and distributors the more comprehen-

sive Bearinx®-online Shaft Calculation system.





Elastohydrodynamic (EHD) contact



Stribeck curve







## Successful Core Program Has Everyone Taking Notice

Drastically shorter delivery times for INA's YRT rotary table bearings

Rotary table bearings are complex bearing units that are manufactured with the utmost precision and fitted with premium components. Each one has to pass a battery of quality tests before it can leave the factory. As lead-time requirements become increasingly shorter and individual order sizes continue to shrink in order to closely adhere to customers' takt times and their need for a broad range of product types, the ability to deliver on time - even across complex global distribution channels - is today at least as important as certain performance parameters of the product itself. Whoever can deliver defect-free, reliably and, most importantly, very quickly, has a competitive

edge in the market. To accomplish all this with the very best products - that was the task set before Schaeffler's Supply Chain Management team in charge of INA's YRTseries rotary table bearings.

#### Individual order quantities delivered within 3-5 days – to practically anywhere in the world

Firmly in place since March 2014, Schaeffler has a new core program for an initial, selected range of INA rotary bearing types that is intended to ensure optimized stocking and delivery processes. The results have been quite impressive and the market has already taken notice: Standard INA rotary table bearings - ranging from YRT200-C through YRT460-C can now be delivered in small individual order quantities to practically anywhere in the world within just 3-5 days. Larger quantities can now also be supplied much faster than before. This means that these bearings now offer yet another critical advantage: Already unbeatable in the marketplace with respect to quality, since March 2014 it has become virtually impossible to match these Schaeffler machinery components with regard to lead times as well. These bearings are now available right when they are really needed. Many of our customers have become believers; maybe you're one of them?



Schaeffler will be adding more of its industry-leading products to this core program; an announcement will be following shortly.

## XL – The New X-life Standard for ZKLN and ZKLF Axial angular contact ball bearings for ball screw drives

Since the beginning of 2014, INA's ZKLNand ZKLF-series double-row axial angular contact ball bearings have been manufactured exclusively in X-life quality. X-life is the seal of quality for exceptionally high-performance products from Schaeffler's INA and FAG brands. X-life products are distinguished by increased mechanical and operating life, the result of higher dynamic load ratings that significantly exceed the previous standard.



### **Longer life, higher speeds** Schaeffler bearings in X-life quality feature optimized contact surfaces

feature optimized contact surfaces between the rolling elements and raceway, resulting in less friction inside the

bearing and enabling higher limiting speeds. This, in turn, reduces energy consumption and lowers operating costs. Consequently, X-life bearings make a significant contribution to improving the overall efficiency of customer applications. Technical improvements made to INA's ZKLN and ZKLF double-row axial angular contact ball bearings have led to a 10% increase in dynamic load ratings. The result: nominal bearing life is increased by as much as 33%. This means that, under unchanged operating conditions, these angular contact ball bearings last longer. Alternatively, if the service life specifications remain unchanged, the bearing can handle higher loads.

### Optimized heat treatment, reduced lubricant stressing

In addition to the improved surfaces, the material for the bearing rings undergoes a special heat treatment process. This makes the raceways on the inner and outer rings more resistant to foreign particles and increases their durability under mixed friction conditions. The resulting reduction in lubircant stress, in turn, extends the service life of the grease.

The "XL" suffix is added to the part number/designation for ball screw drive bearings that bear the X-life seal of quality. Previously available standard bearing versions (identified by a "...PE" suffix) will continue to be offered as part of the product range. The new versions will gradually replace the previous products throughout the course of the year. For more information, please see the new SSD 32 publication (available in English, German, Chinese and Japanese).



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### Starting January 1, 2015, Only DEHP-Free Seals Will Be Used in Schaeffler Spindle and Ball Screw Bearings

As part of the REACH Regulation (EC) No. 1907/2006, the use of plasticizer DEHP (di-(2-ethylhexyl)phthalate, CAS No. 117-81-7) to manufacture products is prohibited as of February 21, 2015. The sale and use of bearings manufactured prior to this statutory deadline are not affected by this legal requirement.

Schaeffler has already been progressively switching over to legally acceptable NBR seals in the production of sealed high-precision bearings since May 1, 2014. Consequently, beginning on January 1, 2015, all ZKLN/ZKLF ball screw bearings, all B spindle bearings/ FD bearings with seals marked RSD as well as all high-speed spindle bearings with seals marked S will be manufactured exclusively with DEHP-free NBR plastic seals.



Extensive testing has proven that the new plasticizer in the NBR seal does not cause any changes with regard to geometrical, chemical/tribological and mechanical characteristics, nor are there any resulting changes in color. Without exception, the functional properties of the new NBR seals are the same as those

of the previous versions. The main benefit is that a substance recently classified as carcinogenic will have been eliminated from our products and production processes in advance of the statutory deadline - with no change in price.

### **Mounting Training**

The next spindle bearing training sessions have been scheduled as follows: Nov. 27, 2014 March 26, 2015 Sept. 10, 2015 Nov. 26, 2015

This training is offered at regular intervals. Further sessions can be scheduled upon request.

Your contact person: Karin Morgenroth

Phone: +49 (0) 9522 71 503 F-Mail: Schulungszentrum@schaeffler.com



## **Ready-to-Install Devices for Laboratory Automation** Made by Schaeffler

For many years now, the Schaeffler Group has been supplying ready-to-install devices for laboratory automation via its Barneveld, Netherlands-based subsidiary, Radine B.V. As a result of continuous development efforts and an aggregation of extensive systems engineering expertise at its Homburg plant, Schaeffler is now able to design and manufacture complete medical devices at this facility as well.

The device being presented here is a sample changer used in wavelength dispersive x-ray spectroscopy. Thanks to its high level of automation, x-ray fluorescence analysis of large quantities of diverse samples takes place completely autonomously. Manual intervention is required only when samples are loaded into the device. By extending the conveyor belt system, it is even possible to further automate the loading and unloading processes. Testing is based on the analysis of the characteristic x-ray radiation emitted by a sample that has been excited by an electron beam. Elements with an atomic number of at least 4 (beryllium) can be detected in this manner. The relative detection limit for elements is 0.01 percent per weight, which corresponds to an absolute detection limit of between 10<sup>-14</sup> g and 10<sup>-15</sup> g.

In close cooperation with Schaeffler's unit, the necessary electronics as well as the required ancillary components and power supply units. Once the device has passed a performance test and received its programming, Radine delivers it to the customer, who merely needs to integrate the actual testing equipment.

> The modular 3D robot offers exceptional stability, precision and versatility, enabling it to meet the most stringent requirements such as:

- Low vibration levels & smooth operation
- High positioning accuracy
- Maintenance-free operation.

At the same time, the device offers improved performance and optimized throughput with a consistently high level of reliability.

Linear Technology division, MLFI-series modules are selected for the built-in multi-axis positioning system. The linear system is customized to the customer's specifications, complete with a gripper





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## ENTER FOR A CHANCE TO WIN!

### Win an iPad Air!



### **CONTEST:**

What is the name of the medical trade fair in Düsseldorf where Schaeffler will be exhibiting in November 2014?

Please enter the correct answer on the coupon shown on the right. Complete the form and return it to:

Schaeffler Technologies GmbH & Co. KG GB Produktionsmaschinen & Lineartechnik **IFBSWF-SM** Georg-Schäfer-Stra?e 30 D-97421 Schweinfurt

Fax: +49 (0) 9721 911 435 Closing date: September 30, 2015

There is no legal recourse. Employees of Schaeffler Technologies GmbH & Co. KG and its distribution sales partners are not permitted to take part.

### **PREVIEW** of Issue 2015

### EMO 2015 Highlights

for rotary and linear axes, main spindles and direct-drive technology

## Yes, please enter me in the prize drawing to win an iPad Air. SOLUTION: Last name, first name: Company: \_ Street/No.: City/postal code: \_\_\_\_ Tel.: Fax:

#### E-Mail:

We would appreciate your responses to the following questions: Did we get your address right? Please let us know of any changes we need to make. (Please print letters)

Who else in your company should receive "added competence"?

What improvements would you like to see in the Production Machinery and Linear Technology Business Unit of Schaeffler Technologies GmbH & Co. KG?

### **Congratulations to the Winner** of Our Quiz in Issue 2013/2014



Schaeffler field service engineer Axel Dunkel (right) presents Stephan Reinartz, head of the Düren branch of KSA (Kubben + Steinemer Aachen GmbH & Co. KG), with his prize: a JURA espresso machine.



### +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER

The Schaeffler Group will once again participate in a number of trade shows in 2015, including: HMI in Hannover (April 13-17) **CIMT in Beijing** (April 20-25) EMO 2015 in Milan (Oct. 5-10) ITMA in Milan (Nov. 12-19)





### +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER +++ NEWSTICKER

Your local distributor:

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### LAST BUT NOT LEAST

### **Cargo Space Increased** by 10%!

#### Schaeffler transport packaging is now being standardized

Since March 2014, Schaeffler has been steadily upgrading its 830x630 mm transport pallets to the international 800x600 mm standard. This changeover is scheduled to be completed for all Schaeffler plants by the end of 2015. For Schaeffler, this means that our delivery trucks have gained an additional 10% cargo space. More importantly, customer satisfaction is increased as well! As part of the conversion process, product packaging and shipping accessories such as blisters, dividers, padding, etc. will also be upgraded.

### 830×630 800×600



Saves space: With the new standard, 10% more pallets can now fit inside our trucks.

### About added competence

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