

SCHAEFFLER



Bearing Supports and System Solutions for Motorcycles



Schaeffler is the perfect partner for you

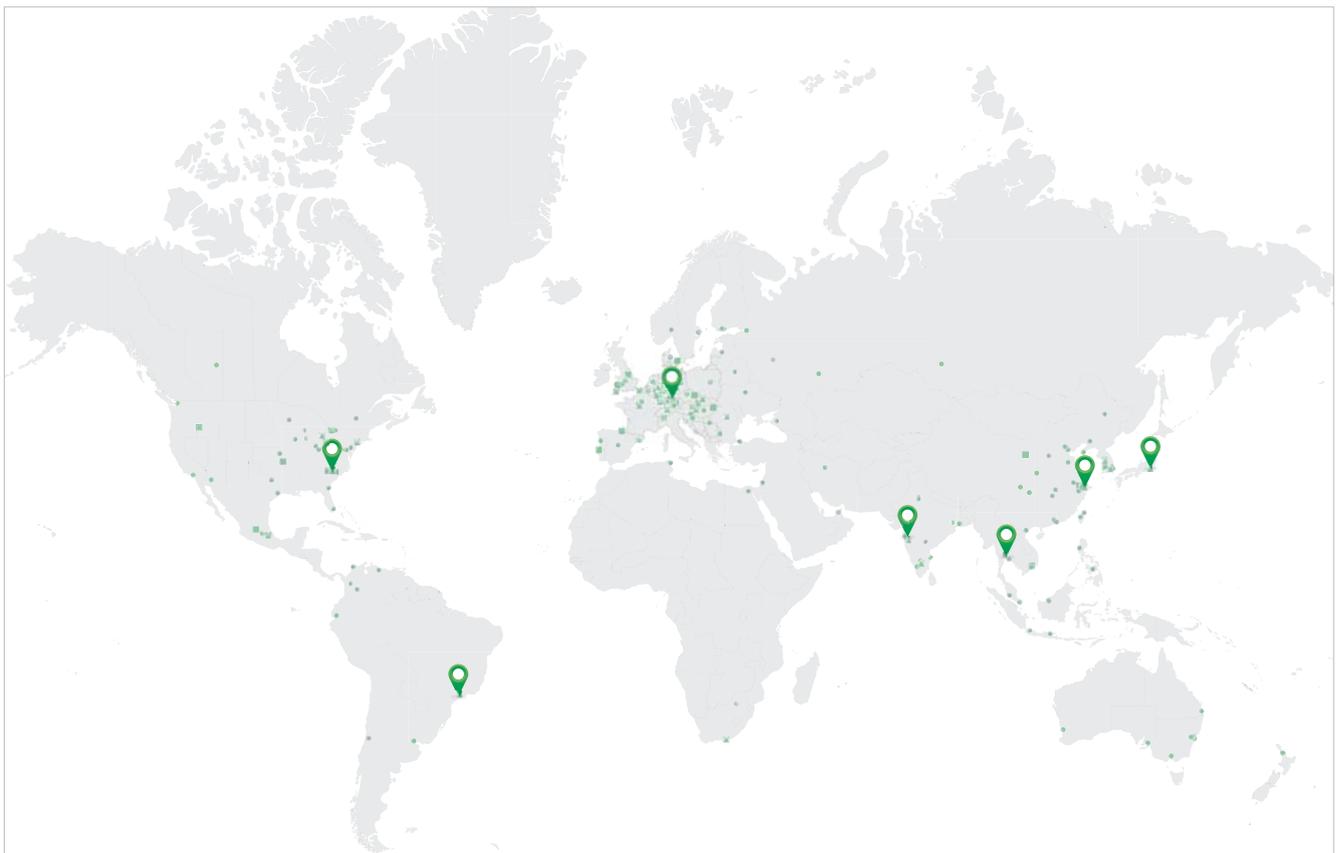
With its 76,000 employees, Schaeffler is one of the world's leading manufacturers of rolling bearings. It ranks among the world's major automotive suppliers and successfully serves more than 60 industry sectors.

With the INA and FAG brands we have a unique and high quality range of components and system solutions available. Almost 40,000 catalog products are

part of this range as well as numerous customized special solutions. Where possible, we manufacture in close proximity to the customer – “in the market, for the market.” Large volumes and up-to-date manufacturing technologies ensure efficient production.

Sophisticated, economical and environmentally-friendly solutions are generated from customer requirements and creative

ideas developed in our worldwide network of Engineering Centers. The motorcycle industry has benefited from this for many decades. Here, the synergy effects that result from our proximity to the automotive sector are transformed into advantages for the customer.



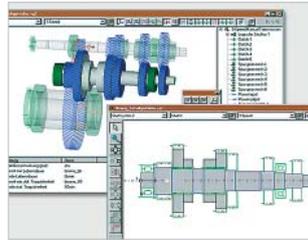
Schaeffler motorcycle sector: Engineering Centers all over the world

Wherever motorcycles are built, we are close at hand with the expertise and resources of our strong, international group of companies. After all, a successful cooperation is one that already begins in the development stage.

Your benefits: Reduced fuel consumption, reduced CO₂, maintenance-free and longer operating life



Expert customer support from development right up to delivery



On site calculation service



State-of-the-art development processes such as rapid prototyping



Engineering capabilities for testing entire systems

Our product range offers motorcycle manufacturers and their customers maximum benefits:

- Extended operating life of motorcycles via highly-developed components and assemblies with durable materials
- Reduced fuel consumption and increased cost-efficiency through innovative engine components and weight-optimized parts –

Schaeffler is regarded as the number one specialist in deep drawing technology, which is used to produce many of these components

- Products that contribute to the reduction of CO₂ emissions, which helps protect the environment
- Customer orientation with a strong focus on optimum solutions for large and small motorcycles

- Customer-specific innovations by using state-of-the-art technologies in design, calculation, testing and manufacturing
- Perfection by optimizing costs, performance and quality in an integrated approach

To make the most out of the advantages of our product range – just ask us! We would like to talk to you about your application.



Engine Applications



Transmission Applications

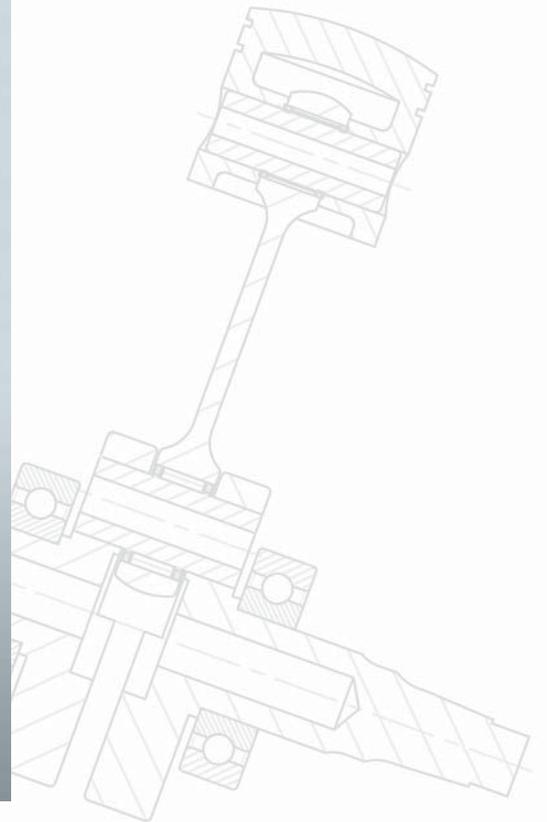
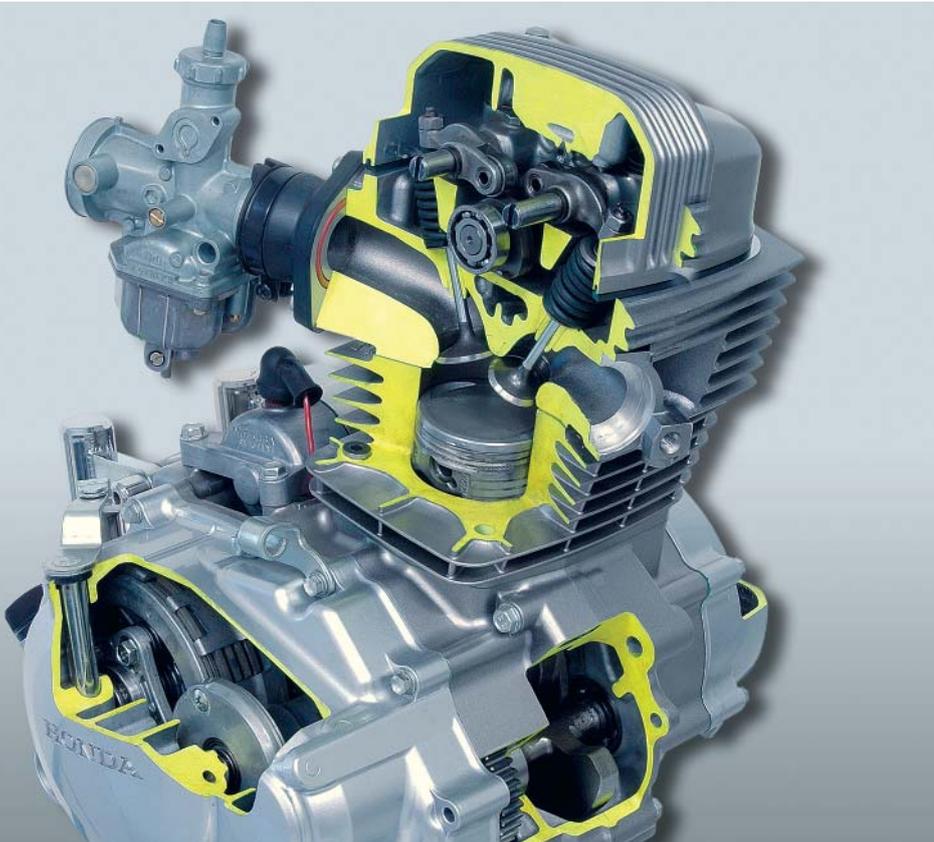


Chassis Applications



Special Applications

Low-friction, lightweight and maintenance-free



We have developed numerous engine solutions in cooperation with our customers' engine design specialists. With the development of the INA cage-guided needle roller bearing, a complete economical machine element for high-speed shafts was available as early as 1949. Later, the first cam followers with cam rollers were put into volume production. Rolling bearings significantly reduce friction in the valve train.

We help our customers design hydraulic valve lash adjustment elements with the correct mating materials in order to

create a solution that is as cost-effective as possible. The adjustment elements ensure that the valve lash always remains constant. The combustion process is ideal and the optimal operating state of the engine remains unchanged regardless of the varying operating conditions. The result: a reduction in fuel consumption and CO₂ emissions.

INA and FAG components also assist in balancing individual mobility with economy and ecology in numerous other motorcycle applications.

Crankshaft

Main bearing: low-friction FAG ball bearings (with optional integrated seal) and cylindrical roller bearings manufactured with the highest precision. They help keep noise levels and fuel consumption down.

INA needle roller and cage assemblies guided on the outside diameter (crank pin cages) are used for the connecting rod bearing supports. The dry-running characteristics are significantly improved by the use of coatings.



Camshaft bearing supports



Mechanical roller type center pivot rocker arm



Hydraulic bucket type tappet



Chain tensioner and tensioning blades



Drawn cup needle roller bearing (open end)



Crank pin cage



Ball bearing



Cylindrical roller bearing

Piston pin bearings keep the radial internal clearance as small as possible. INA needle roller and cage assemblies guided on the inside diameter (piston pin cages) have proved to be an ideal solution in wear-resistant designs with extreme temperatures.

Chain Drive Systems

Mechanical and hydraulic chain tensioners with tensioner blades and chain guides dampen the vibrations from the timing chain. This reduces noise development and increases operating life. The camshaft runs at low friction in

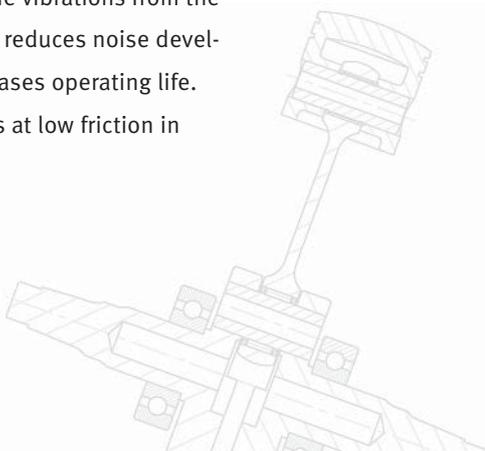
maintenance-free needle roller bearings or ball bearings.

Valve Train Systems

In the valve train, rocker arms, finger followers, and end pivot rocker arms or bucket type tappets with mechanical or hydraulic valve lash adjustment elements ensure optimal valve performance.

Accessories

Wherever components rotate in engines, cost-efficient bearings supplied by INA and FAG have proven highly effective: examples include, light, small drawn cup needle roller bearings with open ends in the starter motor or durable needle roller bearings and ball bearings in the oil pump.



Durable technology in small spaces



Together we find the best technical and economical solutions

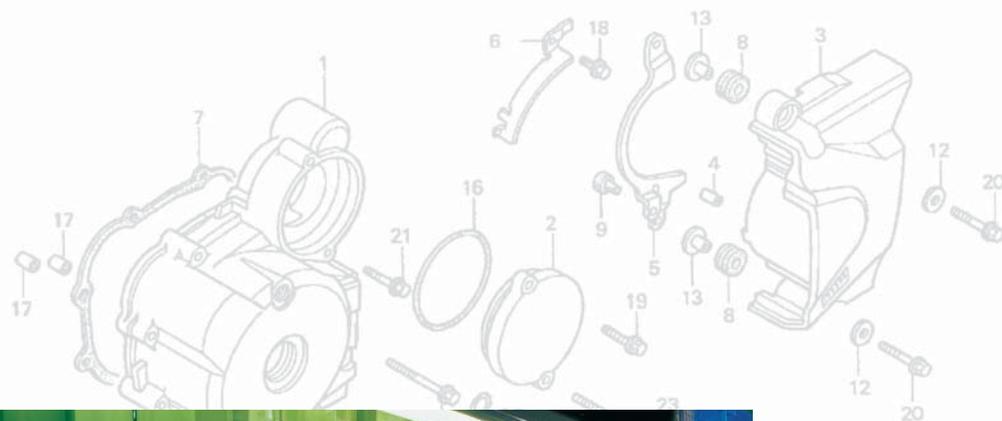
Drivers of light and heavy motorcycles take durable components with high fuel economy for granted. Hidden from sight and absolutely reliable, rolling bearings play a decisive role.

Developing and manufacturing light-weight and space-saving components is one of our core areas of expertise. For example, for almost 50 years now, we have produced rolling bearings with economical cold-formed bearing rings. We develop high-precision components with the lowest movable mass, which can be economically produced in volume.

Transmission

For drive shafts and output shafts, our customers put their trust in FAG ball bearings with optimized load ratings and space-saving INA drawn cup cylindrical roller bearings.

Low-noise, hi-speed gear bearing supports with lightweight, split plastic cages increase the life of the transmission since they minimize the risk of false brinelling.



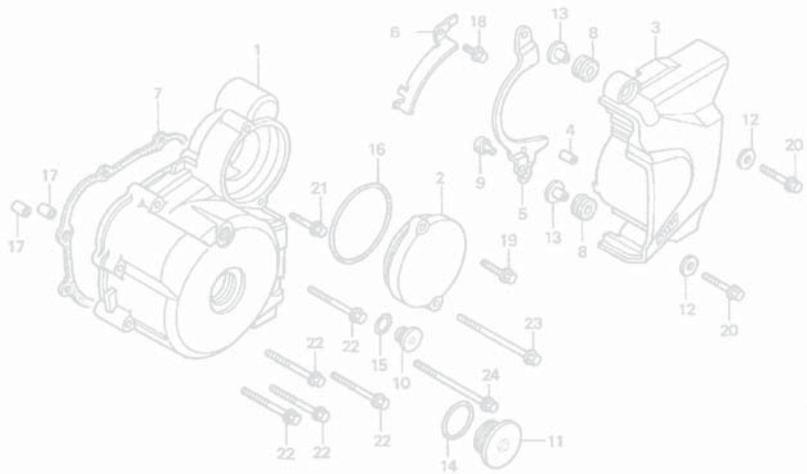
Forming bearing rings



Drawn cup cylindrical roller bearing (open end)



Ball bearings

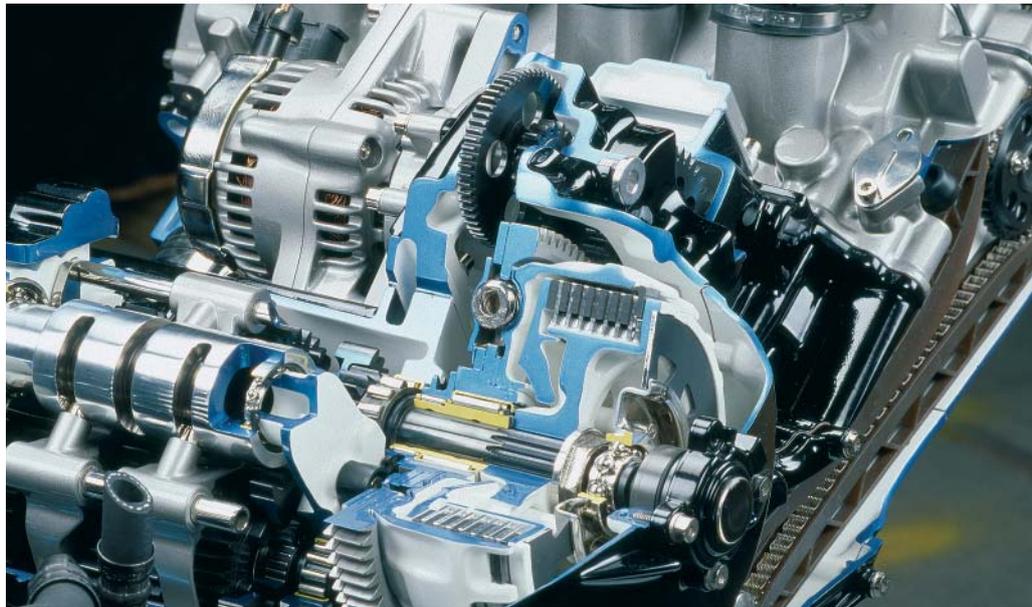


Clutch

Durable release bearings with formed rings provide high load carrying capacity in a small design space.

Gearshift

Low-friction FAG ball bearings and INA needle roller bearings make shifting easy. In contrast to steel-steel or steel-aluminum solutions, these rolling bearings offer consistent, low radial internal clearance for the shift drum and wear-free operation.



Transmission applications



Solid needle roller bearing



Split plastic cages for speed gear bearing supports



Drawn cup needle roller bearing (open end)



Clutch release bearing

Reliability in all components



We do not want safety aspects to fall by the wayside. This is why we provide our customers with support in developing and designing the chassis. A perfectly adjusted chassis and precise steering system ensure that the motorcycle does exactly what the driver wants in critical situations.

Chassis

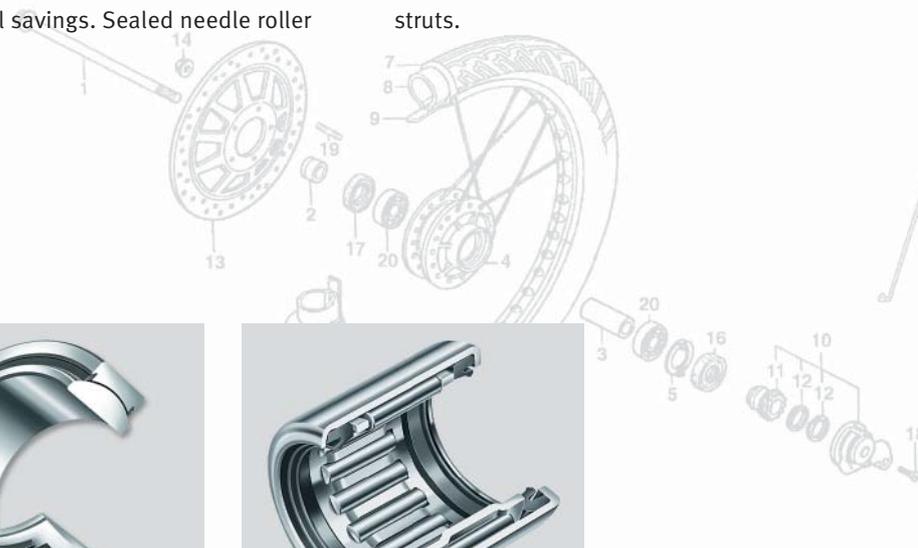
Ball bearings with integrated seals that have been lubricated for life are the preferred choice due to their shock resistance and smooth operation. Their low friction and low wear also contribute to fuel savings. Sealed needle roller

bearings are a cost-effective solution for special swing arm designs.

Sealed, adjustable tapered roller bearings, angular contact ball bearings or angular contact needle roller bearings serve to support axial and radial loads in the steering head. These rolling bearings, designed for high loads, provide safety in extreme situations.

Many motorcycle manufacturers put their trust in durable INA needle roller bearings with a full complement of rollers, or with cages for use as swing arm bearing supports. Our specialists offer advice regarding the required load carrying capacity and internal radial clearance in order to ensure the highest level of safety with regards to operating life.

Maintenance-free, robust ELGES plain bearings or spherical plain bearings are available for forks and suspension struts.



Wheel bearings



Spherical plain bearings

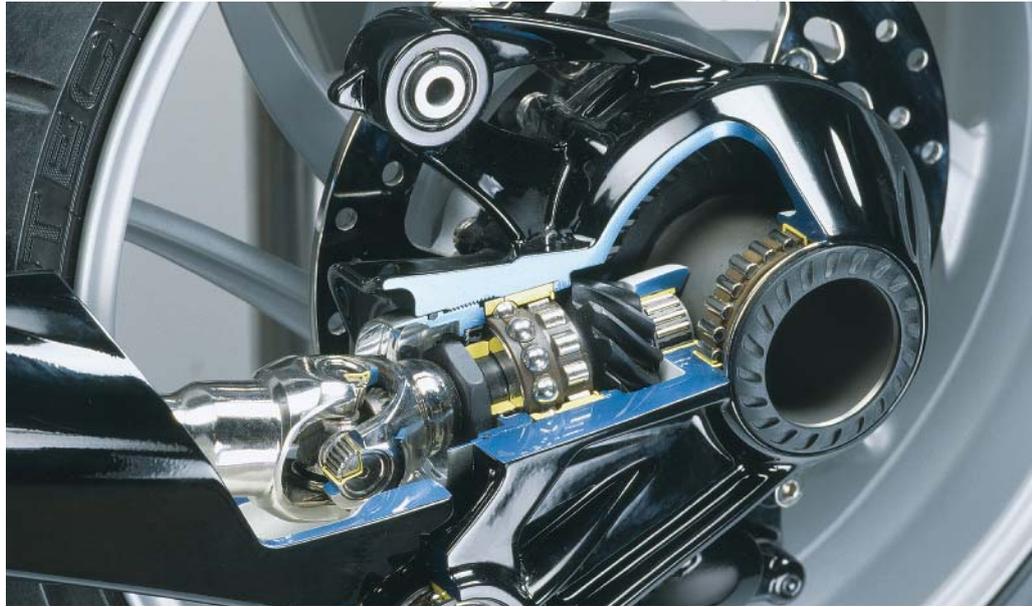


Drawn cup needle roller bearing (open end)

Special applications

Propshaft

INA deep-drawn bearings used as bearing supports in the universal joints transmit the power through the driveshaft. Staked retention is an efficient method developed by Schaeffler that allows the universal joints to be mounted axially and without clearance. This leads to excellent symmetries and therefore a reduction in vibrations and running noise.



Bearing supports in the universal propshaft



Reversing lever

Our strong customer orientation is also shown in the fact that for decades we have developed and produced assembly processes and machines specifically for rolling bearings.

IPH (the INA stake retention method), for example, enables a spider to be guided without axial clearance and without any additional safety components.

All with unrivaled cost-effectiveness!

We can also supply a complete assembly machine at your request.

ABS

If a wheel locks, an INA sensor ring triggers the ABS control system. High pitch accuracy requires manufacturing precision, and the coatings protect the components from corrosion during the operating life.



Tapered roller bearing



Thrust needle roller bearing



Universal joint bearing

Customer-oriented expertise



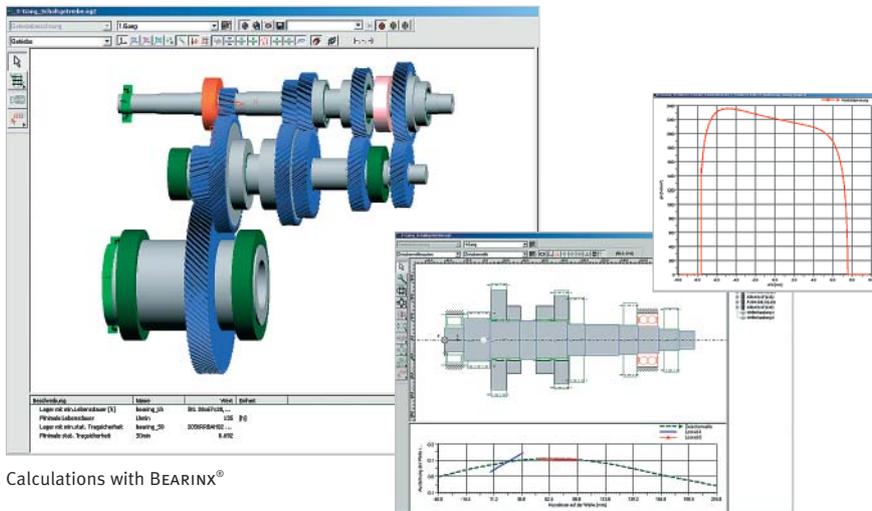
Development meetings

Specialists in engineering teams across the globe provide advice and support from the very beginning. Our customers benefit from the experience of our employees who demonstrate their knowledge and skills day after day.

As a company that is geared to the future, we invest in the development of your products. We use modern simulation processes, test stands and laboratories for physical and chemical tests.

Consistent quality control management in all stages of production ensures the highest level of product quality and safety for our customers. All steps are integrated in our company's internationally recognized environmental management system.

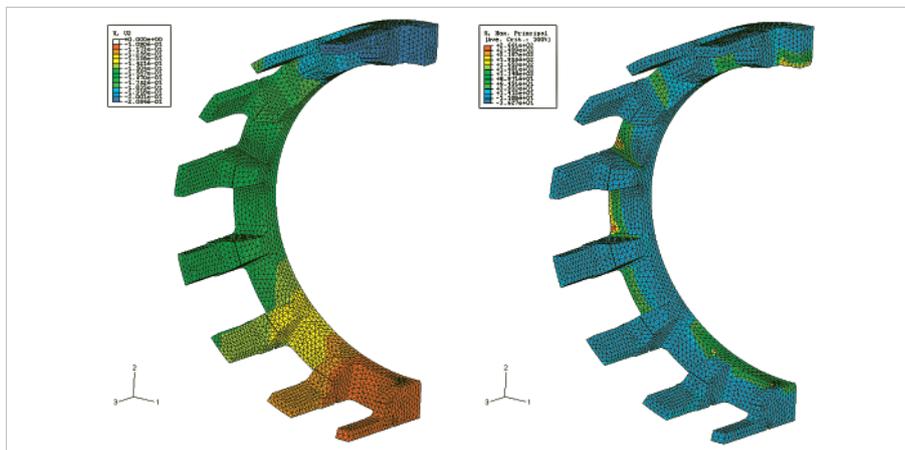
An example of this is optimized transmission elements that reduce component weight while actually improving rigidity.



Calculations with BEARINX®

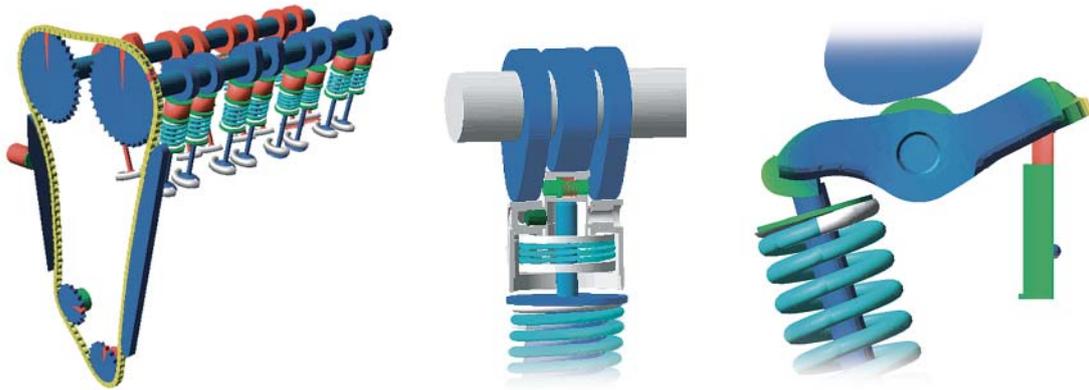


BEARINX® rolling element loads



FEM analysis of a needle roller and cage assembly

From theory into practice



Dynamic simulation of a valve train

Design

Customer-specific bearing systems and components are standard for the INA and FAG brands. The use of state-of-the-art tools such as CAD goes without saying and is beneficial for both sides.

Calculation and selection

By using BEARINX[®] software developed by Schaeffler, we are able to model and calculate complex shaft systems as well as entire transmissions. The internal loads of all bearing types right down to individual rolling element contact are calculated and can be displayed as a table or a graph.

From the loads of each contact, BEARINX[®] accurately determines the calculated operating life of the bearing system.

Simulation

In the design and modeling phase, state-of-the-art methods such as dynamic simulation and FEA analysis are used. By means of “rapid prototyping,” the customer can even order a dimensionally accurate model that can be tested for fit and form in the application.

Testing

Only then – after optimization – does a product move to testing. By request, our customers’ prototypes can be tested in all situations and for all functions in our state-of-the-art R & D Centers. Tests are carried out on everything from wear behavior to noise range, isolated within the surrounding structure or in a complete vehicle. After a series of stringent, application-oriented tests, the volume production can confidently begin.



Rapid Prototyping



Transmission test stand



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