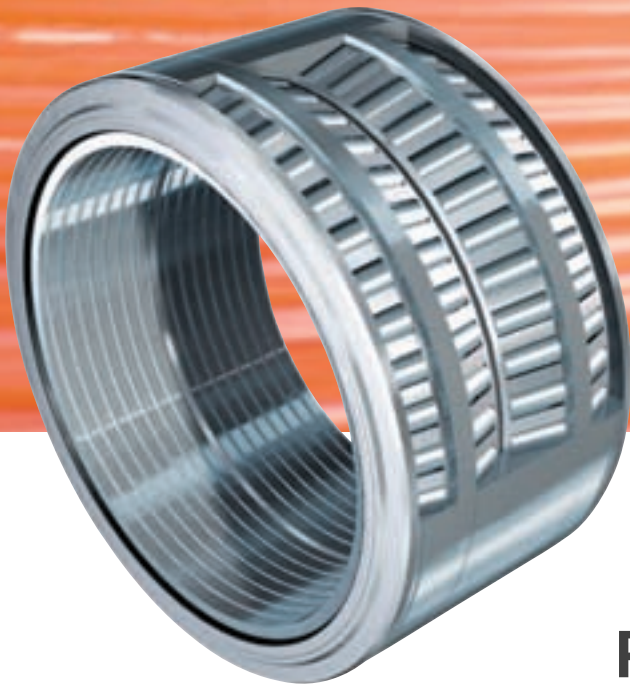




FAG



Bearings and Service Productivity and Reliability for Metal Production

SCHAEFFLER GROUP
INDUSTRIAL

Expertise through knowledge and experience

FAG Kugelfischer is the pioneer of the rolling bearing industry. In 1883, Friedrich Fischer designed a ball mill that was the historic start of the rolling bearing industry. INA began its path to success in 1949 with the development of the needle roller and cage assembly by Dr. Georg Schaeffler – a stroke of genius that helped the needle roller bearing to make its breakthrough in industry. The Schaeffler Group Industrial with its two strong brands, INA and FAG, today has not only a high performance portfolio in rolling bearings but also, through joint research and development activities, products of unsurpassed quality.

As part of the market sector “Heavy Industries”, INA and FAG have brought together their extensive ranges for metallurgical plants and rolling mills within the business sector “Steel”.

This includes bearing solutions for all bearing positions in plants for producing and forming steel and non-ferrous metals. Thanks to partnerships over several decades with plant manufacturers and end-users, “Steel” has outstanding know-how.

Hundreds of steelworks benefit from the quality of our tailor-made solutions – solutions that facilitate increasing

production rates with high reliability, both economically and safely.

“Steel” – high performance, customer focussed

- Expert advice from experienced engineers
- Optimised services for all rolling bearing products and applications
- Application-specific bearing designs, intensive product support, complete product range
- Precise orientation to challenging, widely varying operating conditions
- Optimised combinations of bearings, materials and seals
- Calculation program BEARINX® for the best possible product selection
- X-life premium products
- Worldwide adherence to quality and environmental policy (ISO 9000/QS 9000, ISO/TS 16949:2002, ISO 14001)
- General and customer-specific training programmes
- Bearings for the whole range of metallurgical plant and rolling mill equipment



The range



- Condition-based maintenance



- Cost-effective reconditioning



- Bearing housings



- Spherical roller bearings



- Split spherical roller bearings



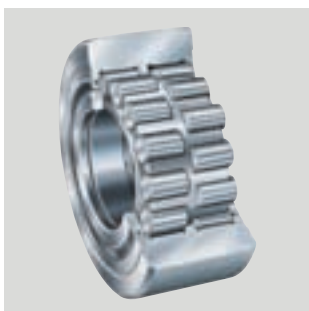
- Spherical plain bearings with ELGOGLIDE® coating



- Multi-row tapered roller bearings



- Multi-row cylindrical roller bearings



- Support rollers



- Full complement cylindrical roller bearings



- Special cylindrical roller bearings



- Needle roller bearings

Safe movement under extreme load and heat



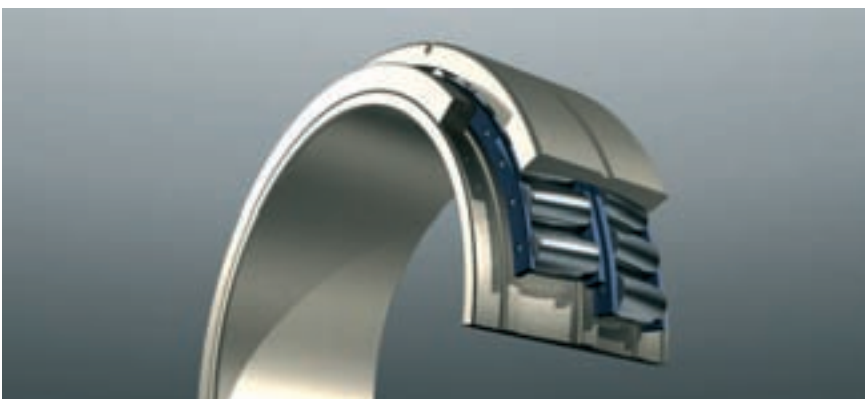
Bearing housings up to 13 tons in weight

Converters

Converters are used to produce steel from pig iron. A full converter vessel can weigh up to 2000 t. Long life ELGES spherical plain bearings are used to support the vessel in a trunnion ring that is itself supported in the converter housing with a swivel facility for pouring. Since swivel motion is carried out slowly under a large mass and shock loads, the bearings must have extremely high load carrying capacity.

Misalignments and deformations in the structure must be compensated. For this application, “Steel” has developed robust spherical roller bearings with outside diameters up to 1750 mm that have proven successful in day-to-day operation in more than 200 converter applications around the world.

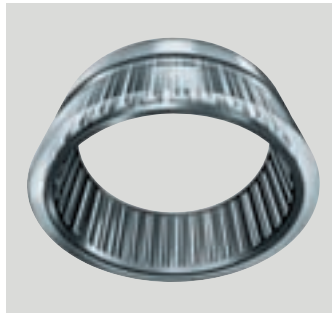
The bull gear in the gearboxes is supported by FAG deep groove ball bearings or cylindrical roller bearings; bearing diameters of more than 2 000 mm are not unusual here.



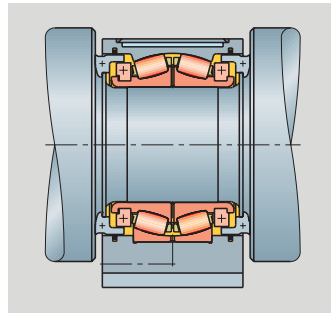
Split bearings reduce downtime and fitting costs



Maintenance-free, extremely wear-resistant spherical plain bearings with ELGOGLIDE® lining



Robust needle roller bearings in X-life quality



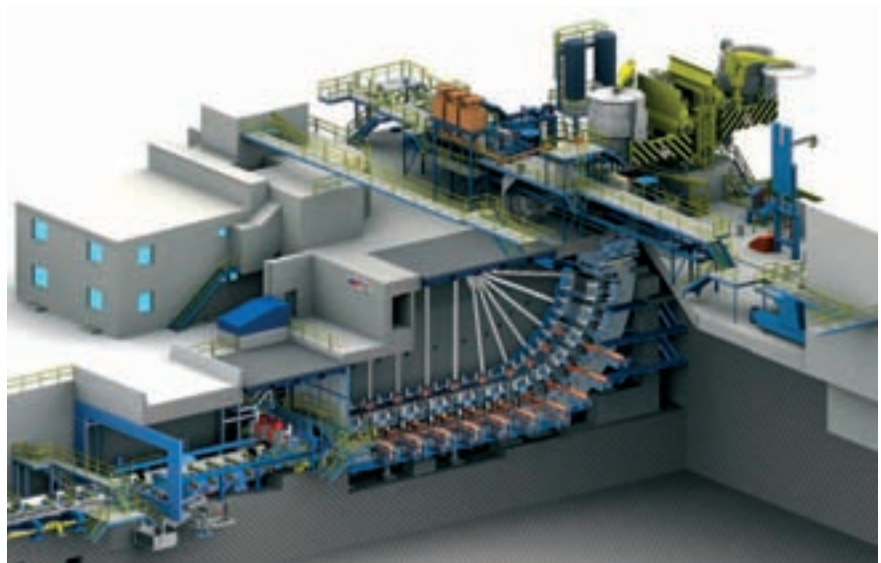
Spherical roller bearings in water-cooled housings



Sealed spherical roller bearings reduce the lubricant consumption by up to 80%

Ladle turrets

A ladle turret carries ladles between the casting position and the tapping position, thus ensuring smooth operation of the continuous casting machine. The bearing arrangements are continually subjected to high loads as well as abrupt shocks and tilting moments. Cylindrical roller bearings, spherical roller thrust bearings and spherical plain bearings from “Steel” are designed precisely for these loads.



Continuous casting machine with ladle turret (picture: VOEST-ALPINE Industrieanlagen GmbH & Co)

Continuous casting machines

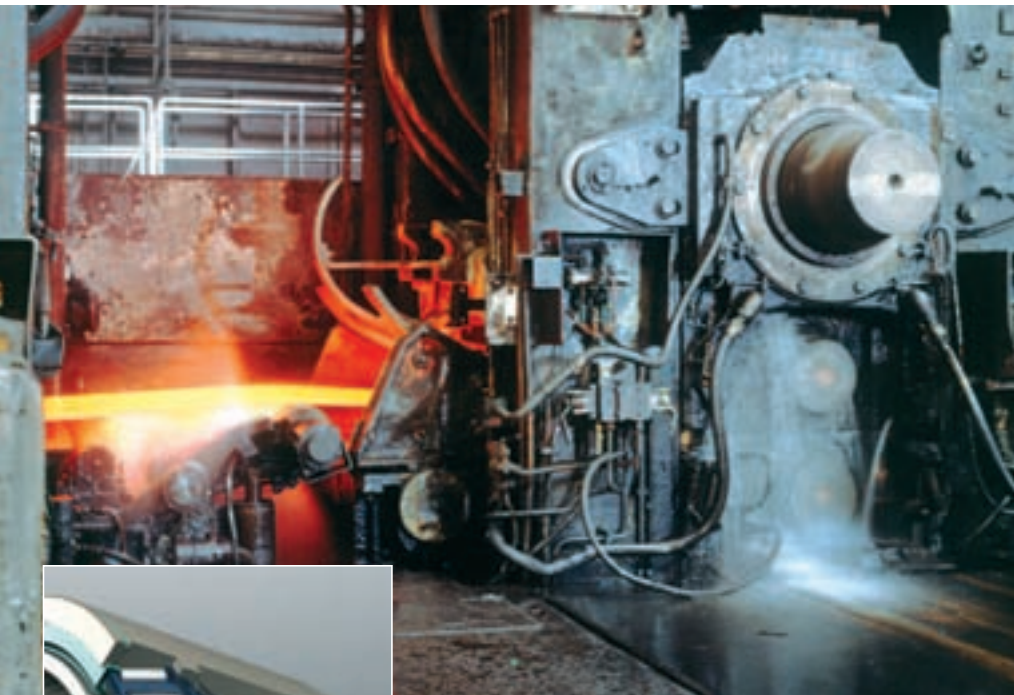
In this essential forming process, steel is continuously cast through a mould to form a strand. During cooling, the strand is transported and supported by slowly rotating rollers. The bearing arrangements for the rollers must function reliably – under high loads, at high temperatures and in areas subjected to water spray.

The design of rolling bearings is matched to the operating conditions: INA machined needle roller bearings, FAG spherical roller bearings and cylindrical roller bearings, in open or sealed versions; bearing housings with cooling water circulation; split spherical roller bearings or cylindrical roller bearings for difficult to reach locations.

Sealed spherical roller bearings

The numerous spherical roller bearings in continuous casting machines require generous amounts of grease. Practical experience has shown that sealed spherical roller bearings offer a cost-effective and environmentally-friendly alternative. Compared with unsealed bearings, the grease volume can be reduced by as much as 80%.

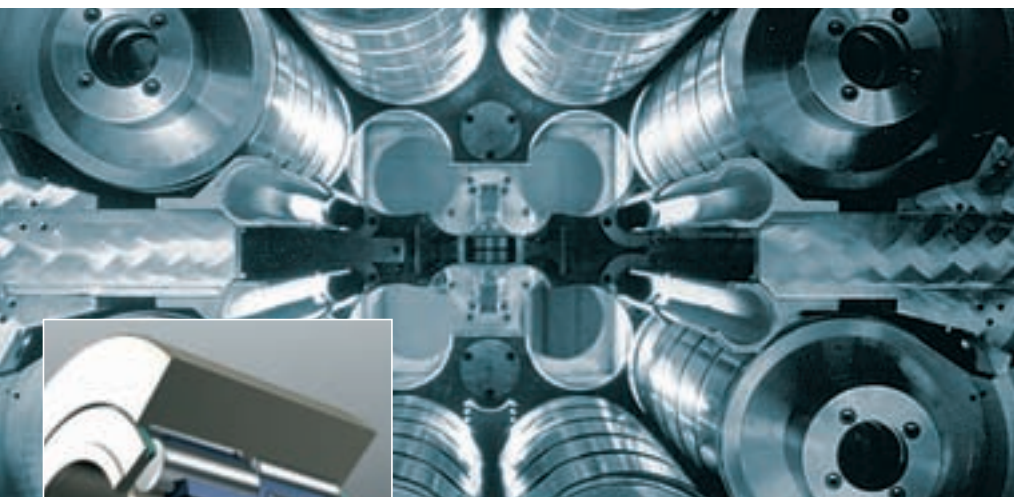
Reliable performers in rolling mills



Multi-row tapered roller bearings and cylindrical roller bearings in rolling mills

Hot rolling

Hot rolling is carried out above the re-crystallisation temperature of the rolling stock. Depending on the product, a distinction is drawn between plate, hot strip, section, bar and rod mills. The angular adjustment of the chocks in rolling mills allows the use of four-row tapered roller bearings and multi-row cylindrical roller bearings as radial bearings. The design of the axial bearings depends on the application: angular contact ball bearings for rapidly rotating rolls under low axial load, double-row tapered roller bearings and spherical roller thrust bearings for bearing positions subjected to high axial loads.



Back-up rollers ensure uniform sheet gauge, even to accuracies of a few microns

Cold rolling

In the cold rolling process, cold strip is generally shaped without prior heating. In comparison with the hot rolling process, higher dimensional accuracy and surface quality together with smaller sheet gauge are achieved.

Four-row FAG cylindrical roller bearings in version F12 fulfil the high demands on precision, even in high speed aluminium lines. In multi-roll mills for difficult to roll stock, cylindrical roller bearings are used as back-up roller systems and ensure uniform sheet gauge and surface quality under very high loads.

The perfect match, even for peripheral applications



For the exceptional demands of rolling mills as well as the downstream plant and processes for further processing of rolled stock, the business sector “Steel” has developed a wide range of application-specific solutions in close partnership with customers.

High speed laying head with special cylindrical roller bearings, angular contact ball bearings and spindle bearings



Coiler with tapered roller and cylindrical roller bearings



Cold pilger machine for rolling of seamless tubes with special spherical roller bearings



Rolling mill gearboxes with tapered roller bearings and cylindrical roller bearings



Cylindrical roller bearings with silver plated cages for high speed areas in finishing blocks of rod mills



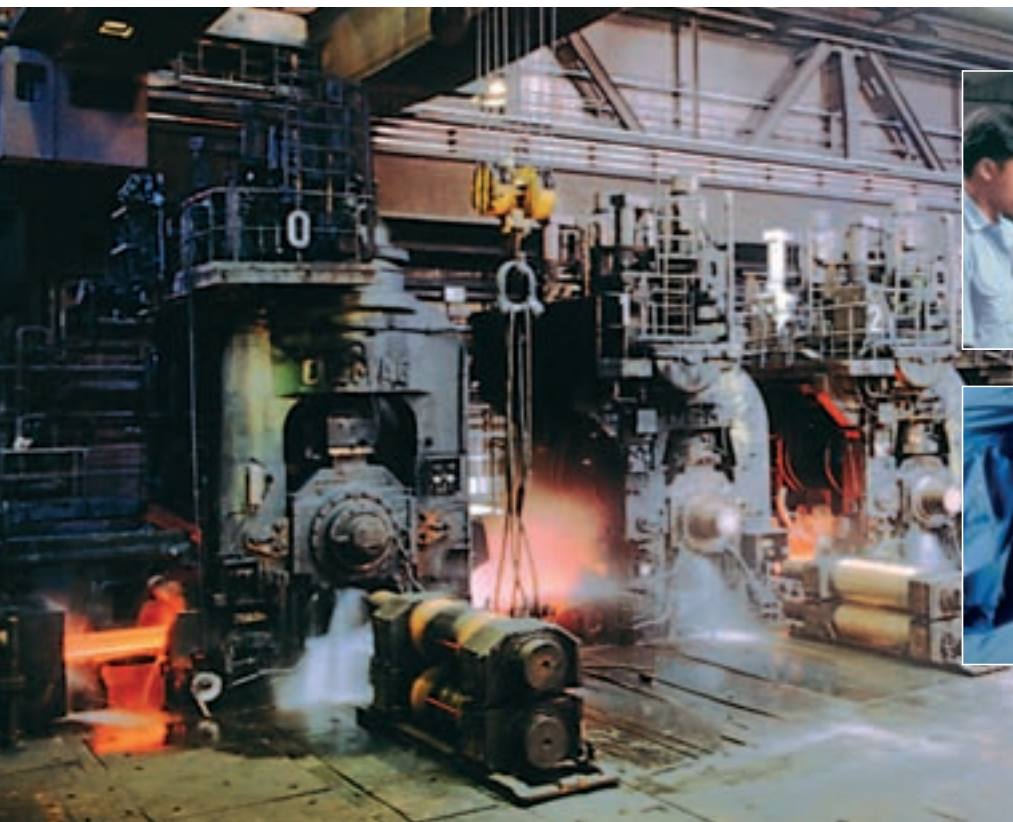
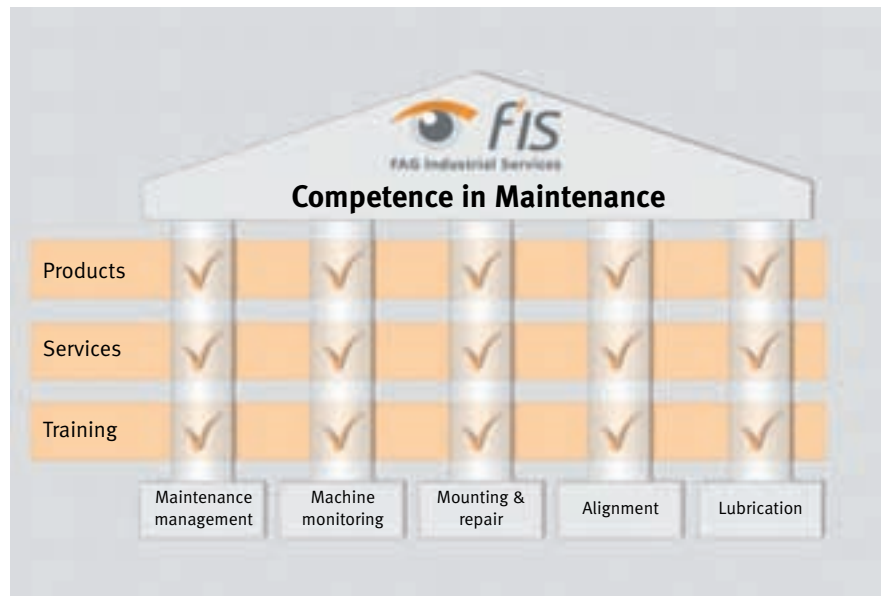
High precision angular contact ball bearings

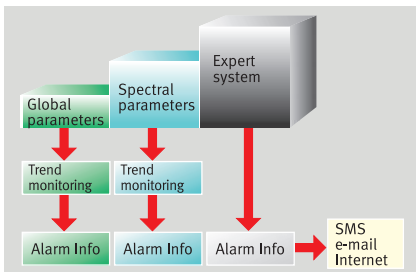


Double-row tapered roller bearings

Services for all rolling bearing products and applications

Capital-intensive production plant requires seamless availability, backed up by high quality plant and an intelligent lifecycle service that leaves nothing to chance. For the rolling bearings from the business sector “Steel” operating under particularly wear-intensive conditions, this means a requirement for reliable products and services for mounting, lubrication, alignment and condition monitoring.





INA and FAG meet this challenge through the service company FAG Industrial Services GmbH (FIS). FIS offers solutions for maintenance and quality assurance, independent of manufacturer, from plant monitoring to the introduction and implementation of preventive maintenance measures. The reconditioning service for rolling bearings offered by FIS makes a significant contribution, through short delivery times, to continuous availability. With a wide range of mounting and alignment tools, measuring instruments and lubricants as well as training, maintenance work is easier and more efficient work



processes can be designed. Thanks to considerable FAG experience and its qualified specialists, FIS is the expert partner for customer-oriented solutions including condition monitoring by remote diagnosis for maintaining continuous availability, quality monitoring of rolling stock ("Chatter Mark Detection") and linkage to process control (PLC).

Fast and flexible

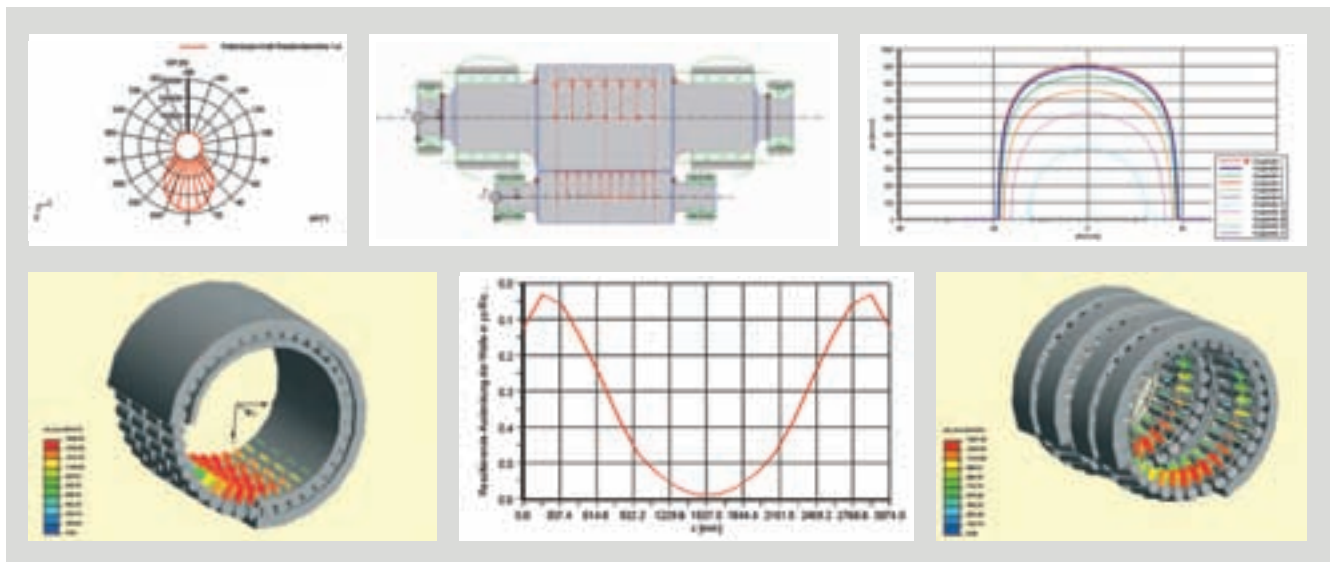
Monitoring systems matched to customer requirements detect damage at a very early stage. Planning reliability is increased – unplanned downtime is avoided and bear-

ing replacement can be correctly scheduled. FIS supports steel production worldwide with state of the art technology. If personal intervention is required, highly qualified technicians and engineers are available to help on site, if necessary only a short while after the call for help. Very high security is guaranteed by service contracts, with scope and terms according to the plant, operating conditions and customer requirements in particular. FIS will be delighted to give you further information!

www.fis-services.de

info@fis-services.de

Speed and comfort of use through practical software



BEARINX®

The software BEARINX® can be used, for example, to calculate the bending behaviour of elastic rolls under any loads and with spring support. The support reactions, the internal loads in the rolling bearings, the comparative stresses of the shafts and the most important parameters are presented in numerical and diagrammatic form.

BEARINX® takes account of:

- the elasticity of smooth and stepped shafts, either solid or hollow, made from various materials and their shear force deformation
- shaft loads, resulting from rolling forces and bending moments or arising from external forces acting on the bearings
- shaft support by rolling bearings without linear spring support; the bearing geometry, bearing clearance, rolling el-

ement and raceway profile as well as special conditions in loading are included

- any number of load cases

Documental results:

- deflection and inclination of the roll axis at freely selectable positions
- curves for shear force and bending moments
- stresses, bearing reaction forces and bearing deflection
- load conditions of the individual rolling elements
- pressure distribution in the rolling contacts
- parametric analyses of all input variables

In the calculation of fatigue life, the actual loads on individual rolling elements determined by BEARINX® are taken into consideration in rolling contact.

medias® professional

The electronic advisory and selection system *medias® professional* contains information on more than 40 000 standard products for some 60 industrial sectors.

It includes:

- extensive product information
- comprehensive design and safety guidelines
- details of bearing design
- representative installation ideas
- CAD downloads
- tables covering accuracy, tolerances, internal clearance
- bearing seals

Simply request a CD-ROM or go to <http://medias.ina.com>.

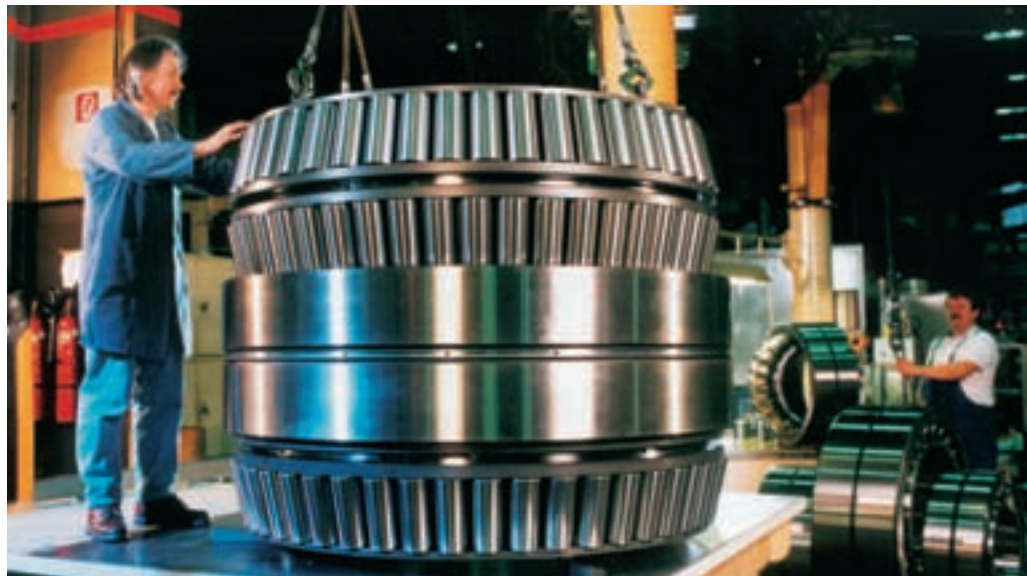


“Steel” ensures success

The Application Engineering facility “Steel” has expert knowledge of bearing technology, comprehensive know-how in steelmaking and rolling mill applications and many years of experience in working with the steel industry.

With the focus on maximum availability and quality, OEMs and plant end-users are offered a complete range with all-round service:

- expert technical advice, bearing design and product recommendation
- a comprehensive bearing range comprising FAG, INA and ELGES products
- customer support through fitting manuals, training and experienced service personnel
- complete service before and after purchase
- condition monitoring of bearing arrangements with remote diagnosis by Internet or GSM
- worldwide presence and rapid active assistance across all regions



Quality has a name: X-life

X-life represents premium products from INA and FAG. Products with optimum operating life far beyond conventional values. We have already anticipated and optimised all the parameters that are decisive for problem-free operations and thus made investment decisions much easier

- optimised product characteristics, lower noise, easier to maintain and higher load capacity individual and system solutions, often exceeding the requirements
- improved price/performance ratio, earlier bearing payback through minimised downtime and increasing productivity

- training programmes for defect-free fitting and dismantling, plus correct selection and supply of the right lubricant



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