



FAG



Bearing Supports for Industrial Trucks

High Load Capacity – Energy-Saving – Cost-Effective

It All Adds up: Cost-Effective Bearing Technology for Warehousing and Logistics

Our customers can add up. They know it is not the purchase costs for a machine part that are decisive, but the total costs over the entire operating life that count. In the Schaeffler Group, this approach is part of our company's philosophy. Each of our products generates a measurable economic benefit – regardless of whether it is a longer operating life, an increase in performance, a saving in energy or a reduction in noise.

With the Schaeffler Group, you not only gain a reliable supplier, but also gain a development partner at the same time. As an all-round supplier, we can offer services for every conceivable bearing position in industrial trucks. And our application engineers will be pleased to assist with all the others that are perhaps “inconceivable” today...

On the following pages, we would like to introduce you to our range of catalog and special bearings. See for yourself, how large our range of bearings is. Please do not hesitate to contact us if you cannot find what you are looking for. Together, we can turn your technical visions into reality.



Bearings for Lift Masts

Pages 4 – 5



New Ideas for Chassis Systems

Pages 6 – 7



Solutions for Drive Systems

Pages 8 – 9



Engineering & Service

Page 10



Setting Things in Motion: INA Lift Mast Rollers as an Economic Factor



Lift mast and chain guide rollers ensure precise movement of the lifting load

Almost every industrial truck has lifting equipment which is subjected to high dynamic and static loads. High shock loads, vibrations and challenging environmental influences such as heat, moisture, dust, or aggressive media are part of day-to-day operations. Lift mast guides should, therefore, have a particularly high load carrying capacity and be robust. Profile and fork carriers must have low friction and run practically clearance-free in relation to each other to ensure precise movement of the lifting load. These requirements are fulfilled excellently by INA lift mast and chain guide rollers.

We offer various lift mast rollers based on ball bearings and bearings with cylindrical rollers for heavy-duty applications.



Modern lift masts are equipped with four point contact bearings and/or double row angular contact ball bearings



Various outer profiles possible: Here a chain guide roller with wheel flanges for chain guidance

Why should you use INA lift mast rollers?

Four answers to this question highlight the economic benefits for the user.

1. INA lift mast rollers operate significantly more reliably and longer than other lift mast rollers. This, for example, is thanks to the high-purity steels from which they are manufactured. Or the special hardening processes matched to the future application (such as case hardening). And, of course, we only use high quality greases to lubricate the rollers for life.

The lift mast rollers can be driven closer together due to their high load carrying capacity thereby enabling a greater lifting height.

2. An additional advantage of INA lift mast rollers is their compact design. Since the lift mast rollers are able to support radial and axial forces simultaneously, an additional axial bearing is not required and space is gained in the profile carrier.

Compact lift mast rollers have a high load carrying capacity. This means that industrial truck manufacturers can select narrower profile carriers, thus, saving weight and improving visibility for the driver.

3. INA lift mast rollers minimize profile carrier wear due to the form and surface texture of the outer profile.

4. The radial clearance of the rollers in the profile carrier is kept low by so-called oversized types. This is achieved by offering a lift mast roller with three different outside diameters at intervals of several tenths of a millimeter. These measures increase the guidance accuracy and reduce noise.

Customized: Chain guide rollers

The lift mast is raised by chains and hydraulic cylinders. We offer the rollers required to guide the tension chain and the lift mast rollers in high grade materials.



Attachments such as those for handling paper rolls are the applications for INA slewing rings

Due to the design of the rollers, it is possible to use a space-saving construction and minimize friction. We are able to cater for individual customer requirements for chain guide rollers, for example, by matching the outer profile to the form of the respective chain.



Requiring maintenance or maintenance-free: ELGES spherical plain bearings for lift mast connections or bearing supports



Highly effective anti-corrosion protection: INA yoke type track rollers, left with special coating Corrotect®



For more operational safety: Slewing ring with internal gear teeth e.g. for attachments

New Ideas for More Performance: From FAG Wheel Bearings ...



High load carrying capacity and low-maintenance – these requirements must be fulfilled by wheel bearings in industrial trucks. We offer cost-effective solutions for these bearings. (Photo: Jungheinrich AG)

Easy to fit, high benefit: Integral tapered roller bearings JKOS

The wheel bearings in the driven rear axles of three-wheeled vehicles are subjected to axial loads of several tons when following a curved path. However, precise wheel guidance is still required at low speeds. With tapered roller bearings JKOS, we offer an attractive solution for these high requirements: Easy to fit, maintenance-free and with a high load carrying capacity also under shock loads.

Bearings JKOS are ready-to-fit, self-retaining tapered roller bearing units. The single row bearings are equipped on one side with low-friction double lip seals and are lubricated for life. Since the bearings are fitted in pairs, this produces a bearing support that is sealed on both sides.

Due to the large support base – it is significantly larger than in the case of double row cylindrical roller bearings – the bearing support can reliably support all load combinations from radial, axial and tilting forces.

INA and FAG products are first choice for innovative bearing solutions in chassis applications. FAG is setting the trend for wheel bearings – away from standard tapered roller bearings and towards easy-to-fit, maintenance-free units. These are attractive both for three and four-wheeled solutions in industrial trucks.



Bearing JKOS (l.) and insert bearing (r.):
High load carrying capacity – preset preload
– efficient sealing system



... to Maintenance-Free ELGES Spherical Plain Bearings

Reducing operating costs with maintenance-free plain bearings

With ELGES, the Schaeffler Group offers a plain bearing brand that is regarded as a trendsetter for maintenance-free bearing solutions. Accordingly, the range of products we offer is comprehensive and sophisticated.

ELGOGLIDE®, a group of Teflon® sliding layers, is particularly important for these products. We can, therefore, offer you the optimal sliding layer that is individually tailored to the operating conditions of every application.

Maintenance-free ELGES spherical plain bearings and rod ends have a high load carrying capacity, are durable and give reliable operation even under harsh operating conditions. They are a recommended way of saving costs particularly for manufacturers who lease their industrial trucks to customers with a maintenance contract.

Innovative solutions for tie rods

Tie rods usually contain two plain bearings which must be regularly relubricated.



Tie rod: Maintenance-free solutions are also possible here

Our solution provides you with a means of increasing your cost-effectiveness. The idea: A forged unit with two maintenance-free spherical plain bearings.

The advantages:

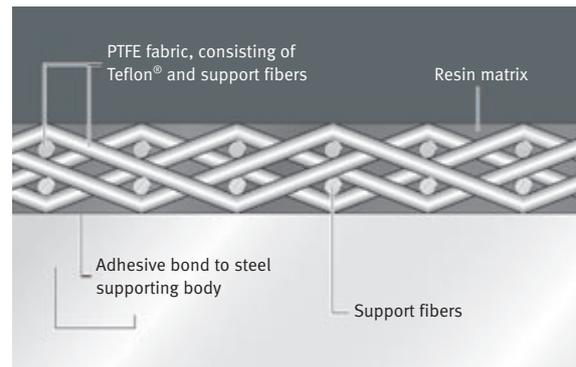
- Maintenance-free for life
- No environmental contamination due to lubricating greases
- High load carrying capacity
- Complete unit instead of individual parts.



A proven FAG standard: Case hardened tapered roller bearings for a steering knuckle bearing support



Maintenance-free for life: ELGES spherical plain bearing, e.g. for the tie rod in a double-pivot steering system



High-performance ELGOGLIDE® sliding layer (schematic)

High Performance within the Smallest Space: Components and Systems for Drives, Transmissions, Hydraulics



Integrated travel drive of a pallet truck

The industrial truck sector requires drive systems with high performance within the smallest space, which must operate as quietly as possible and also have a low maintenance requirement. The Schaeffler Group can set things in motion here. Because whether it's an electric motor or an internal combustion engine, whether it's a transmission or a hydraulic system

– all these systems contain a variety of rolling and plain bearings.



As a system supplier, we are able to supply you with the most technologically and economically optimized solution for every bearing position. The joint product range from INA and FAG offers the complete spectrum – from proven standard ball bearings from volume production to customized compact roller bearings for high-performance, economical transmissions.

Increasing the energy efficiency of electric motors: FAG Generation C deep groove ball bearings

A Generation C ball bearing is, so to speak, in energy efficiency class AAA, because it allows, for example, a reduction in the energy consumption of an electric motor. The new bearing generation in the FAG catalog range has around 35% less friction and runs significantly quieter compared to the previous design. The use of new Generation C bearings not only reduces the power loss, but also lowers noise levels. This can have a significant effect on the energy and environmental characteristics, especially for small forklift trucks.



Generates economic benefits when used! Low-friction Generation C deep groove ball bearings save energy

Customized: Slewing rings for bogie steering systems

We offer robust bearings in four point design for the bogie steering systems of three-wheeled vehicles. These are simply screw mounted to the bogie truck by means of the outer ring. They can safely support high forces and moments such as weight forces which act axially and the acceleration and braking forces which act as a tilting moment, as well as the cornering forces generated when following a curved path. Shock loads resulting from unevenness in the road surface are also cushioned without any problems. INA slewing rings – a reliable application solution with a long operating life.

Compact and with high performance: Our bearing range is just like the transmission

Compactness results in more economical transmissions, increased payloads, reduced mass inertia and, thus, higher energy efficiency. The space available for bearing supports is often in short supply,

there is little space to transfer high forces and moments safely.

Decades of practical experience and a great deal of application engineering know-how lie behind the transmission bearings from INA and FAG. We do not just supply “off-the-peg” rolling bearings, we match every solution to the respective application.

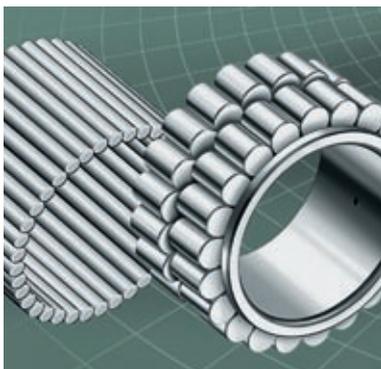
High performance and economical concepts are required for small forklift trucks, for example. We supply bearings with load carrying capacities matched precisely to these applications in large quantities. In contrast, heavy-duty bearings provide a high load safety factor within the smallest space for large forklift trucks. With these bearings, we place particular emphasis on the highest precision – a requirement that is particularly necessary in high precision planetary transmissions.

Another example are our full complement cylindrical roller bearings without an outer ring that allow very compact planetary



Matched to your requirements: INA and FAG rolling bearings enable high-performance drive systems (Source: ZF Friedrichshafen AG)

transmissions. A special location system consisting of integrated thrust washers and axial retaining rings facilitates fitting and, thus, saves the user costs.



Compact: Full complement bearings without an outer ring – high load carrying capacity within the smallest space due to the maximum number of rolling elements

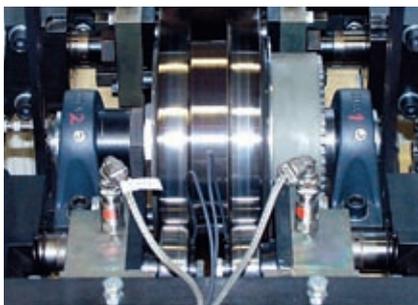


For applications in which accuracy and high speeds are required: Cage type bearings with cylindrical, needle or tapered rollers

Comprehensive Service – With In-Depth Understanding of Industrial Trucks



Research and development that serves the customer: Investigations for increasing the grease operating life – for reliable lubricants



Lift mast roller test stand – an in-house development by Schaeffler Group Industrial



In-house competence center for surface coatings

The Schaeffler Group has a long tradition of providing good service. As a Schaeffler Group customer, you have access to a wide range of rolling bearing products and services. Use our systems expertise to increase the performance of your industrial trucks. We would be happy to advise you.

Bearing selection and calculation.

By using our software BEARINX®, we can model and calculate all INA/FAG bearings, as well as complex shaft systems and even complete transmissions. Of course, the internal load distribution in the bearing is also determined exactly – from the stress analysis of the outer ring to the contact pressure taking the rolling element profile into account. Performance reserves are revealed by automatically manipulating the bearing parameters.

This ensures that you will quickly receive a technologically and economically optimized solution for your application.

Technical testing. In our in-house testing centers, we test our products to ensure their suitability for various operating conditions – this includes both fully-fitted bearings and individual components and materials.

Surface coating. A rolling bearing that is “correctly” coated will last longer. The bearings supports in industrial trucks must be provided with effective anti-corrosion protection due to the operating conditions in which they are used. We recommend Corroprotect®, an extremely thin, corrosion-resistant cathodic layer that is applied using electroplating methods. The coating is resistant to condensation water and contaminated water.

Tribology. Bearings provided with optimal lubrication have a significantly longer life. Our lubrication recommendations are, therefore, always matched to the application. The range includes rolling bearing greases suitable for use with foodstuffs and high-performance lubricants with EP additives for bearings which are subjected to high loads.

Mechatronics. With a view to the future, we are carrying out targeted development of mechatronic systems and components. For example, ready-to-fit sensor bearings for electric motors.

And what can we do for you?



Schaeffler KG

Industriestrasse 1 – 3
91074 Herzogenaurach (Germany)
Internet www.schaeffler.com
E-Mail info@schaeffler.com

In Germany:

Phone 0180 5003872
Fax 0180 5003873

From Other Countries:

Phone +49 9132 82-0
Fax +49 9132 82-4950

Every care has been taken to ensure the correctness of the information contained in this publication but no liability can be accepted for any errors or omissions. We reserve the right to make technical changes.

© Schaeffler KG · 2008, November

This publication or parts thereof may not be reproduced without our permission.