SKF tapered roller bearings

Performance and service life optimized for your application

The Power of Knowledge Engineering

Setting new standards in service life

Every application has its own highly specific bearing requirements. SKF tapered roller bearings can help you meet virtually any requirement with an optimized solution. Available in four specialized performance classes, SKF tapered roller bearings are setting new standards in service life across a range of industries.

Load ratings don't tell the whole story

There's a common perception that bearing load ratings dictate their relative product performance. But load ratings merely follow current ISO standards and mirror a bearing's physical dimensions.

In reality, bearing performance is influenced by many factors, including specific internal geometry, surface finish, design optimization and manufacturing precision. None of them are noted in ISO standards and each can vary significantly between bearing manufacturers. Some manufacturers don't even use the ISO calculation, instead applying their own formula just to reach higher values.

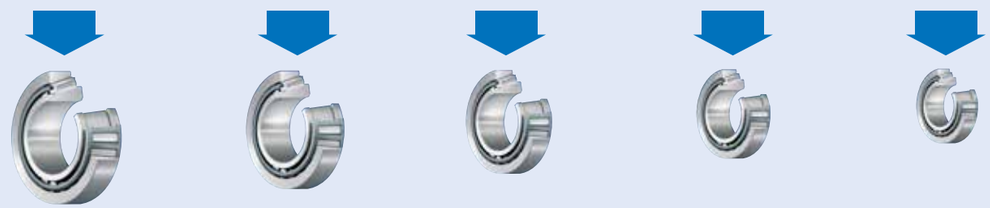
Exceed existing limits with SKF

SKF tapered roller bearings adhere to official ISO calculations. Their high performance is evident from extensive field experience and visible in SKF application-driven calculations.

Whatever your industry or application, SKF tapered roller bearings can deliver several proven performance benefits, including:

- **Extended service life**
- **High load carrying capacity**
- **Lower operating temperatures**
- **Less vibration and noise**
- **High performance in poor lubrication**
- **Reduced energy and lubricant consumption**
- **Extended maintenance intervals**
- **Reduced operating costs**

SKF tapered roller bearings: an evolution in downsizing



The convergence of knowledge and performance

Thanks to their specific geometry and internal load distribution, all tapered roller bearings can handle combined axial and radial loads. The contact angle of their raceways converges on a common point on the bearing axis, and that angle can be selected to deliver optimum axial and radial load capabilities for a given application.

SKF tapered roller bearings offer the equally valuable convergence of deep SKF knowledge and decades of field-tested performance that's behind every one of them. It has allowed SKF to develop four different tapered roller bearing performance classes, all of which exceed the performance of conventional bearings.

A performance class for every challenge

Every application has specific bearing requirements. SKF tapered roller bearings are available in four different performance classes and one application-specific CL7C precision class to meet them:

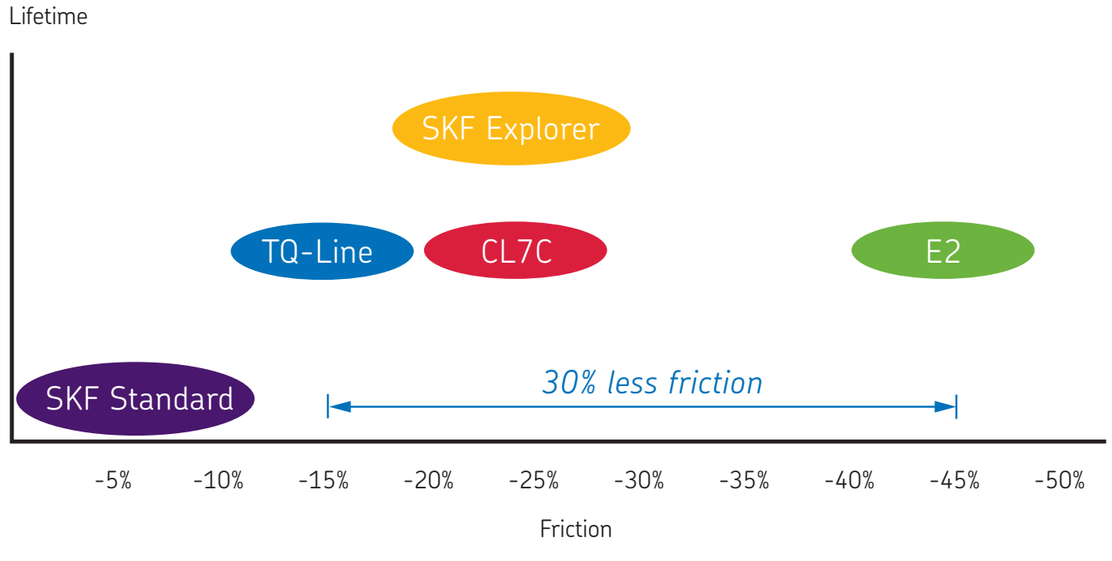
SKF standard tapered roller bearings
Offering standard load ratings according DIN/ISO and often more, SKF standard tapered roller bearings offer a cost-effective solution for standard requirements that's been well accepted by the market.

SKF TQ-line tapered roller bearings
Time and field-tested in various industries and applications, SKF TQ-line tapered roller bearings deliver performance benefits far apart from the competition.

SKF Explorer tapered roller bearings
Featuring several design, manufacturing and performance upgrades, SKF Explorer tapered roller bearings operate with lower noise, higher speeds and significantly longer service life.

SKF Energy Efficient (E2) tapered roller bearings
As a result of optimized geometries and manufacturing techniques, these bearings exhibit significantly less friction torque, or power loss, than the same size standard SKF bearing – a 30% reduction or more, depending on bearing size and application conditions.

SKF CL7C tapered roller bearings
SKF's application-specific CL7C bearings are a precision class of their own. Particularly suitable for pinion arrangements, CL7C bearings are excellent for applications requiring high stiffness, low friction, high speeds or where boundary lubrication conditions may apply. High preload ensures precise location throughout the entire service life, essential for an optimal gear mesh.



SKF standard tapered roller bearings

SKF standard tapered roller bearings are used primarily for industrial applications without extreme requirements. Available only within upper size ranges, the bearings are manufactured to normal tolerances. For standard-requirement applications, SKF standard tapered roller bearings offer an attractive, proven performance-to-value ratio.

Superior manufacturing

Highly accurate manufacturing processes make adjustment of the bearings against each other more reliable.

The benefit: Better bearing performance, particularly during the very first hours of operation.

High quality steel

The high-purity steel in SKF tapered roller bearings exceeds DIN/ISO requirements in terms of homogeneity and inclusions **(→ fig. 1)** enabling exceptional strength and durability.

The benefit: Typical causes for premature bearing failure are clearly reduced.

Lower operating temperature

A unique roller end/flange contact zone allows the immediate build-up of lubricant film even at low speeds, preventing temperature spikes during running-in and continuous operation (**→ fig. 2**). This makes targeted adjustment values easier to achieve, while minimized wear eliminates the need for special running-in procedures.

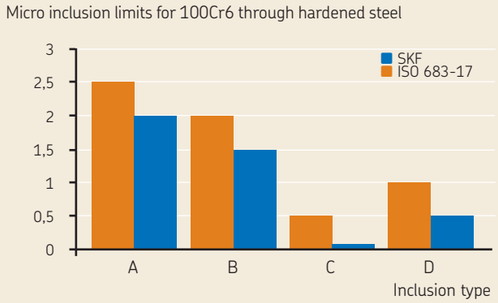
The benefit: Longer service life and higher operational reliability even under the most difficult operating conditions.

Best-in-class rollers

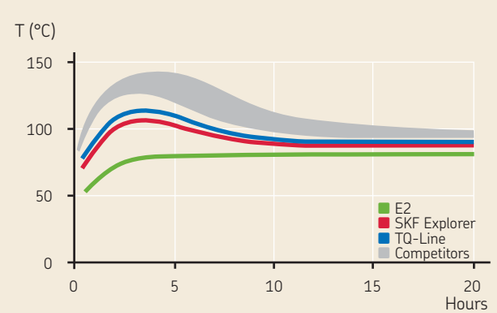
Zero Defect manufacturing helps ensure that each roller is virtually identical to the next. Optimized roller surface typography and minimum spread in diameter dimensions supports load carrying capacity and enables even stress distribution in the bearing (**→ fig. 3**).

The benefit: Significantly longer service and reduced vibration levels.

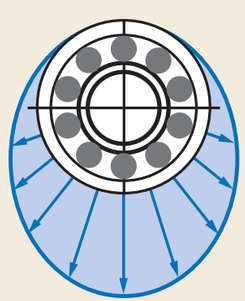
Steel quality **Fig. 1**



Operating temperature **Fig. 2**



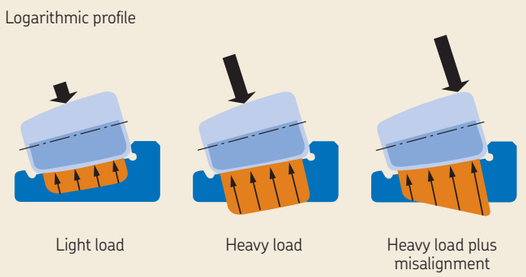
Load distribution **Fig. 3**



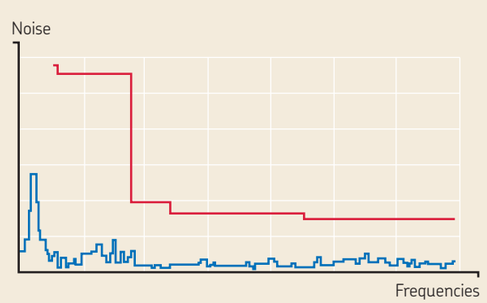
SKF TQ-line tapered roller bearings

Tried and proven over many years, the SKF TQ-line can help achieve application performance that will set them apart from the competition. TQ bearings feature a logarithmic contact profile that limits stress peaks and misalignment. Optimized roller flange contact helps control friction and temperature while maintaining proper preload throughout the bearing lifecycle. The TQ-Line is the basis for SKF Explorer, SKF Energy Efficient and CL7C tapered roller bearings.

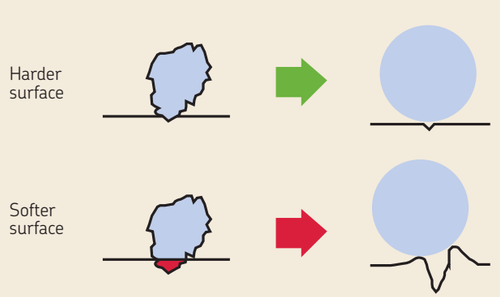
Roller/raceway contact **Fig. 4**



Noise check **Fig. 5**



Surface hardness **Fig. 6**



High effective load carrying capacity

The logarithmic profile of the TQ-line is less sensitive to extreme load variations, misalignment, moment and shock loads. Optimized contact length between the raceway and rollers creates a larger contact area, enabling a higher effective carrying capacity, particularly during shock and peak loads (**→ fig. 4**).

The benefit: High reliability in terms of load capacity and service life, with typical bearing failure causes clearly reduced.

Low noise and vibration level

State-of-the-art manufacturing techniques such as separation of components ensures very low dimensional spread and deviation of ring and roller parameters (**→ fig. 5**). For bearings with an outside diameter of up to 160 mm, SKF performs a 100% in-flow noise check.

The benefits: Damage during manufacturing that can cause early failures is avoided. Reduced noise for critical applications such as cars or escalator gearboxes is eliminated.

High surface hardness

TQ-Line tapered roller bearings feature high surface hardness up to 65 HRC, plus homogenous material and hardness structures of the bearing rings (**→ fig. 6**).

The benefits: High resistance to surface damages caused by contaminated lubricating oils, leading to longer service life and oil change intervals.

SKF Explorer tapered roller bearings

Featuring significantly improved performance parameters, SKF Explorer tapered roller bearings offer clear technological advantages over standard and TQ-Line performance classes. These include considerably longer service life, verified by both in-house and independent tests. SKF Explorer tapered roller bearings can support long-term reliability – and a better bottom line.

Ultra-high performance density

SKF Explorer tapered roller bearings offer exceptionally high performance density. They deliver +15% higher dynamic load ratings and +10% higher reference speeds than SKF standard and TQ-line bearings.

The benefits: Designs can be downsized to save space or performance can be upgraded in existing dimensions.

Significantly longer service life

SKF Explorer tapered roller bearings combine high performance density, optimized rolling contact surfaces, Zero Defect manufacturing, high preload capacity and low spread in dimensions and adjustment. The result? Significantly improved service life, verified by endurance testing (→ **fig. 7**) and proven by field performance.

The benefits: Significantly extended maintenance intervals and lower operating costs for end-use applications.

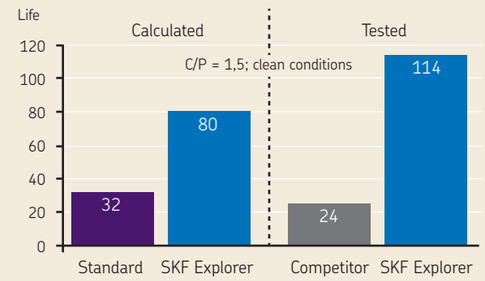
Further improved profile and ring contact surfaces

SKF Explorer tapered roller bearings feature manufacturing improvements like optimized grinding speed and pressure and computerized profile analysis. (→ **fig. 8 and 9**)

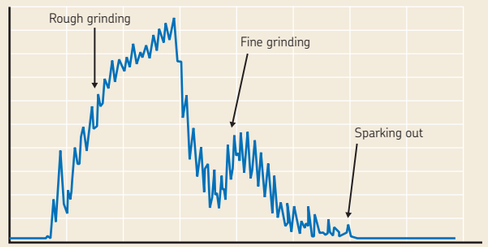
Such upgrades enable reduced ring surface roughness and long carrying contact areas that eliminate micro contact stress peaks. Fully automated in-process inspections helps ensure compliance with Zero Defect manufacturing.

The benefits: Less friction and lower temperatures in the bearing, reduced sensitivity to misalignment, higher speed capabilities, higher load carrying capacity and much longer service life.

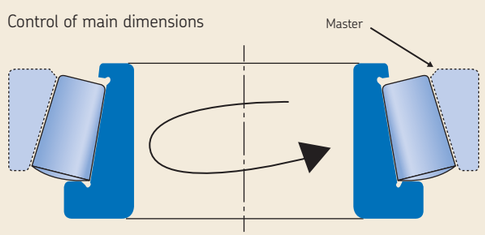
Endurance testing **Fig. 7**



Grinding monitoring and control **Fig. 8**



Quality control **Fig. 9**



SKF Energy Efficient (E2) tapered roller bearings

Representing our ultra low friction performance class, SKF Energy Efficient (E2) tapered roller bearings deliver a 30% friction moment reduction compared to SKF standard bearings. Part of the SKF Beyond Zero portfolio of products designed to reduce environmental impact, ultra low friction E2 bearings can lower total cost of ownership by cutting energy and lubricant consumption.

Interchangeability

Featuring outer dimensions that meet DIN/ISO guidelines, SKF E2 tapered roller bearings are fully interchangeable with standard tapered roller bearings.

The benefit: Full interchangeability with standard bearings facilitates energy-saving upgrades to existing equipment or new designs.

Reduced friction

SKF Energy Efficient (E2) tapered roller bearings cut friction by 30% or more, enabling reductions in bearing energy consumption. To achieve this ultra low friction performance, SKF tightened bearing specifications and improved manufacturing techniques.

The benefits: Significant potential energy and CO_2 savings for every industrial sector, from pulp and paper, metals and mining to hydrocarbon processing, food, textiles and wastewater.

Reduced weight

By optimizing the number of rollers and modifying the raceway, SKF reduced the weight of rotating parts by 10% without affecting performance.

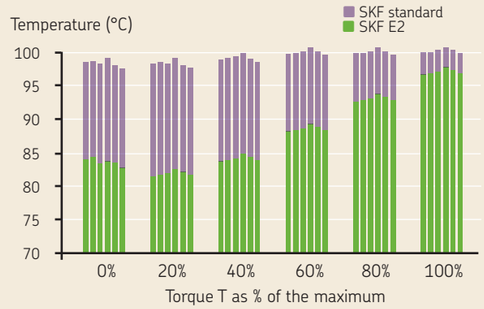
The benefits: Less friction means less energy consumption. Less weight reduces the risk of skidding and smearing.

Lower temperature and higher speeds

To measure the operating temperatures of E2 bearings, SKF conducted trials at fixed speeds and loads. Results indicate that E2 bearings run 5 to 20 °C cooler than standard SKF tapered roller bearings (→ **fig. 10**).

The benefits: Less friction means lower temperatures, enabling higher operating speeds and longer lubrication intervals.

Industrial transmission oil sump and bearings **Fig. 10**



SKF CL7C tapered roller bearings

SKF's application-specific CL7C bearings are ideal for applications that require high stiffness, low friction and very high speeds. Marked with the SKF designation suffix "CL7C", this precision class offers high operational reliability even in boundary lubrication conditions. Very high preload ensures precise axial location throughout the entire service life, essential for an optimal gear mesh in pinion arrangements.

Designed for stiff bearing arrangements

SKF CL7C bearings combine several performance features that make them highly suitable for highly stiff, high-speed, high load bearing arrangements. Extreme preload capabilities combine with the quasi run-in behavior of the roller end/flange contact zone to minimize wear and loss of preload during running-in (→ **fig. 11**).

Minimal loss of preload during running-in results in a high probability of achieving targeted adjustment under operating conditions. Higher preload of the CL7C bearings may be applied without risk as long as the total temperature balance is controlled.

The benefits: Defined high stiffness, low noise and vibration and optimized service life for bearings and gears.

Controlled temperature generation

Thanks to their quasi run-in characteristics, SKF CL7C bearings generate much lower friction, heat, vibration and noise than conventional bearings, even during initial operating hours (→ **fig. 12**).

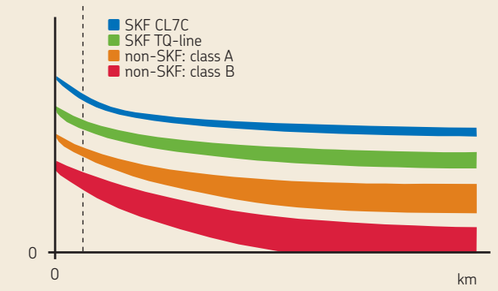
The benefits: Controlled friction and temperature rise result in high load capability and operational reliability.

Proper lubricant film formation

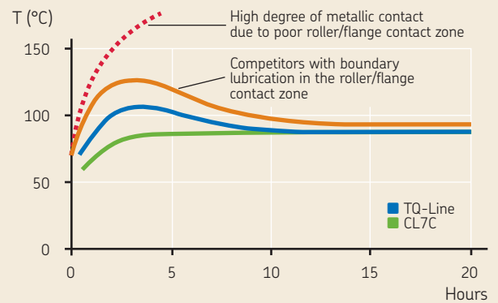
The surface topography of SKF CL7C bearing flanges, rollers and rings supports instant lubricant film formation, an essential requirement for high preloads.

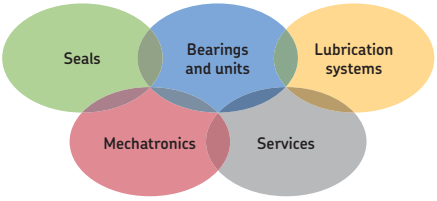
The benefits: Reduces the risk of lubricant break-down and enables higher load carrying capacity.

Reduced preload loss enables service life **Fig. 11**



Temperature during running-in **Fig. 12**





The Power of Knowledge Engineering
Combining products, people, and application-specific knowledge, SKF delivers innovative solutions to equipment manufacturers and production facilities in every major industry worldwide. Having expertise in multiple competence areas supports SKF Life Cycle Management, a proven approach to improving equipment reliability, optimizing operational and energy efficiency and reducing total cost of ownership.

These competence areas include bearings and units, seals, lubrication systems, mechatronics, and a wide range of services, from 3-D computer modelling to cloud-based condition monitoring and asset management services.

SKF's global footprint provides SKF customers with uniform quality standards and worldwide product availability. Our local presence provides direct access to the experience, knowledge and ingenuity of SKF people.

SKF BeyondZero is more than our climate strategy for a sustainable environment: it is our mantra; a way of thinking, innovating and acting.

For us, SKF BeyondZero means that we will reduce the negative environmental impact from our own operations and at the same time, increase the positive environmental contribution by offering our customers the SKF BeyondZero portfolio of products and services with enhanced environmental performance characteristics.

For inclusion in the SKF BeyondZero portfolio, a product, service or solution must deliver significant environmental benefits without serious environmental trade-offs.

The SKF Energy Efficient (E2) tapered roller bearings are included in the SKF BeyondZero portfolio because they improve energy efficiency and reduce environmental impact.

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