

Optimizing upstream oil and gas production

SKF solutions for the high performance of your equipment



Improve performance of
your upstream equipment





The energy industry is under constant pressure in all production environments: conventional or unconventional; onshore or offshore; oil or gas. In the face of rising costs and recent widespread production target misses, exploration and production companies are looking to grow reserves and maximize production—while ensuring safe operations and avoiding environmental impact. But imprecise or redundant decisions often result in unnecessary downtime, suboptimal production rates, and increased maintenance and safety issues.

Global demand for oil and natural gas is expected to increase by 30% in the next 20 years. The race is on to find new sources upstream despite challenging market, labour and regulatory conditions.

Both onshore and offshore, above the ocean's surface and below, most exploration and production facilities are focused on improving the reliability and availability of rotating equipment. Other key challenges are implementing or optimizing overall asset reliability and maintenance program. For the oil and gas industry, it is also crucial to:

- Develop workforce competency and skills
- Reduce staff size in some markets while increasing on others
- Increase environmental and safety regulations
- Manage demands to be more cost effective while still improving performance
- Make more rapid decisions in an era of increasing risk management
- Increase influence of equipment reliability on slim operating margins

Delivering experience and expertise

For many decades now, SKF has been at the forefront of upstream oil and gas technology. Based on our heritage of over 100 years as global leader in bearing technologies, we've made strategic investments over the last 30 years to also become a leading supplier of sealing systems, lubrication systems, condition monitoring technology and services.

These competence areas enable us to deliver effective, integrated solutions, while improving machine reliability and performance. Working closely with both OEMs and their customers, SKF has provided assistance to improve designs of all types of upstream equipment. These span the entire range of drilling platform, downhole tools, well stimulation, well completion, well control and artificial lift.

SKF Solutions for top drives

The top drive systems turning drill strings at top today's platforms represent a major improvement over older drilling rig technologies. In part, top drive systems are enabling the use of extended-reach well bores and helping to reduce production costs.

They are however, subject to failures caused by the same conditions that plagued their conventional rotary table and counterparts. These include mud and lubricant contamination, excessive loads and vibration, or electrical discharges and hydraulic blockages. SKF can help rig operators handle these challenges and more. From specially designed optimized tapered roller thrust bearings to sensorized traction motor units, SKF solutions can enable better top drive reliability and productivity.

Gearbox bearings

Gearbox bearings take radial and axial loads generated throughout the gearbox by the motor, the gearing and shaft torque of the drilling string. SKF Explorer gearbox bearings combine material and design innovations that can increase bearing service life. SKF's gearbox bearing offering includes:

- Angular contact ball bearings
- Tapered roller bearings
- Spherical roller bearings
- Cylindrical roller bearings



Gearbox seals

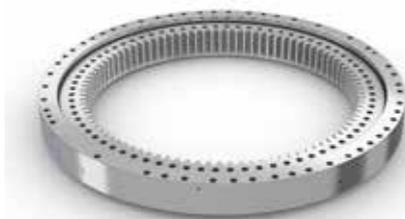
Good lubrication conditions are essential to gearbox performance. SKF provides a wide range of high-performance motor and gearbox seals for both oil and grease that are optimally designed to:

- Retain lubricant
- Exclude contaminants
- Withstand pressure differences



Slewing ring bearings

Pipe handling systems and iron rough necks are critical to rig efficiency. SKF can offer a full range of slewing ring bearings for these applications.



Our capability was further enhanced through the 2013 acquisition of Kaydon, a leading North American supplier of slewing ring and thin section bearings. Slewing bearings comprise an inner ring and an outer ring, one of which usually incorporates a gear.

Together with attachment holes in both rings, they enable an optimized power transmission with a simple and quick connection between adjacent machine components.

Tapered roller thrust bearings

Main thrust bearings in a top drive must accommodate extreme operating conditions including very heavy axial loads, shock loads and shaft deflections. Plus, the combination of low speeds and heavy loads limits the oil's ability to form an effective lubricant film, which results in metal-to-metal contact and accelerates wear. To meet these demanding conditions, SKF has optimized both the design and manufacturing process of tapered roller thrust bearings to provide:

- High load-carrying capacity
- High wear-resistance under an ineffective lubricant film condition
- Ability to accommodate shock loads



Gearbox oil lubrication

Top drive gearboxes generally use oil splash lubrication for all bearings including the main thrust bearing. As a world leader in lubrication, SKF is a single source for lubrication systems that include motors, pumps, heat-exchangers, flow controls, filters and pipes with ATEX certification.

SKF also offers services such as simulations for temperature regulation and foam elimination through tank modification.

Pipe handling system lubrication

Grease lubrication of top drive pipe handling systems generally requires manual re greasing and maintenance. SKF offers ATEX certified, fully automated grease lubrication systems to ensure the right amount of grease is applied at precisely the right time. In addition, SKF offers compact, easy-to-use grease pump components including distributors and pipes.



Engineering Consultancy Services (ECS)

SKF helps OEMs boost top drive performance and reliability with advanced simulations of the overall gearbox in combination with Design for Six Sigma tools. Our experienced engineers identify critical design and operating parameters and help to select the right bearing system to achieve the best performance.



SKF Solutions for Drilling tools



Drilling and exploration have never been more challenging. Difficult operational conditions such as extreme temperatures demand uncompromising durability, performance and high efficiency. To meet these challenges, SKF are on hand to assist with solutions designed to extend life and improve performance and reliability, leading to more efficient drilling and improved utilization of tools. This results in lower repair and maintenance costs as well as reducing overheads. Explore opportunities for efficient maintenance, from re-manufacturing till customization of your industrial equipment.



SKF Teflathene seal

Cylindrical thrust bearings

To provide superior axial thrust load support for sealed motors, SKF's cylindrical thrust bearings are manufactured to the highest quality standards. The contact surfaces between the rollers and the raceways, and the internal geometry are all controlled to extremely tight tolerances to improve performance compared to low-quality cylindrical thrust bearings available in the marketplace.



Downhole sealing solutions

SKF has innovative seal designs and quality materials for downhole rotating seals exposed to high pressure. The SKF Teflathene seal incorporates a low-friction PTFE seal ring bonded to a rubber body.

The all-rubber DM2 seal separates drifting mud from lubricants in oil-lubricated mud motor bearings. Bottom hole assembly (BHA) tools such as shocks and jars require seals to protect the tool hydraulics from the abrasive drill muds and cuttings in the hole. Measure-while-drilling (MWD) tools sometimes require high-temperature sealing solutions.

SKF has developed a full line of field-proven seals to work in this demanding environment, including seal capable of withstanding up to 315 °C (600 °F).

Mudstack thrust bearings

Mud bearings close to the drill string end have a major impact on productivity and reliability. In addition to severe axial and shock loads, these bearings are "lubricated" with highly abrasive mud, which for a bearing is the definition of an extreme operating condition.

SKF's mudstack bearings are optimized for our customers' applications through rigorous finite element analysis and physical lab tests by testing the bearings with drilling mud circulating through them. SKF mudstack bearings provide:

- Improved wear resistance
- Increased load-carrying capacity
- Optimized load distribution
- Increased robustness
- Improved reliability
- Customized design



Tungsten carbide bearings

Specially designed to provide excellent radial load support for both sealed and mud motors, SKF tungsten carbide radial bearings are made using a unique microwave sintering process (resulting in 1 600 Vickers hardness) as compared to typical conventional sintering (with 1 000 Vickers hardness).

This results in a high hardness of 92 HRA for excellent wear resistance and longer life.

SKF Solutions for Well stimulation

A photograph of an oilfield at sunset. The sky is a mix of blue, purple, and orange. In the foreground, there are several tall, dark metal structures, likely part of a well stimulation rig. Some of these structures have lights on them, which are glowing. The overall scene is industrial and dramatic.

Commonly associated with hydraulic fracturing, well stimulation is one of the major parts of petroleum and natural gas extraction. It is a well intervention to improve and increase the production of oil or gas wells and, consequently, revenues therefrom.

To help the oil and gas OEMs to improve the performance of tools and compete in this rapidly expanding and continually evolving market, SKF uses its expertise to increase frac pump service life and beyond.

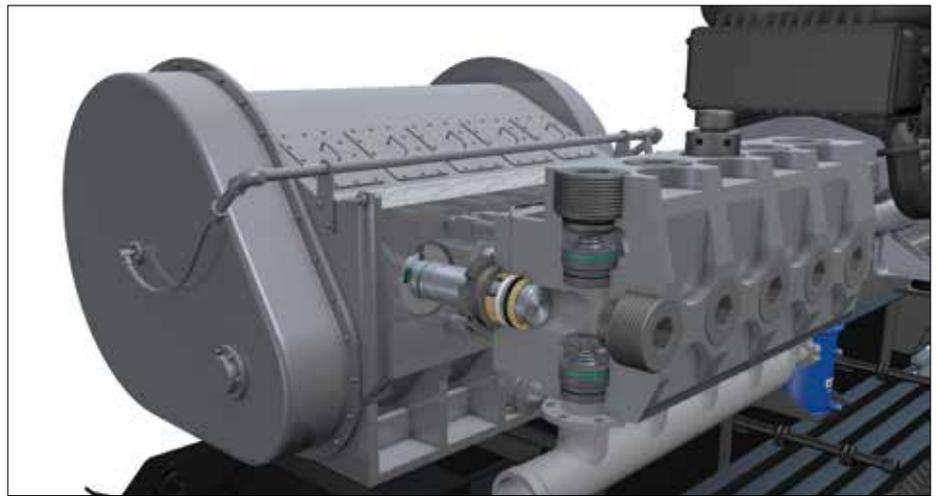
Main crankshaft and pinion shaft bearing

Early field failures often result from using low cost, low quality cylindrical roller bearings and spherical roller bearings as main crankshaft and pinion shaft bearings respectively. This is due primarily to a lower quality material composition that can lead to dimensional changes during operation, and failure when you can least afford it. SKF offers high quality cylindrical roller bearings for main crank-shafts and world-class spherical roller bearings for pinion shafts. The internal dimensions of these bearings are optimized and expertly engineered to withstand the harsh conditions encountered during well stimulation. SKF frac pump bearings:

- Help achieve maximum uptime with high capacity ratings capable of handling large crankshaft and pinion loads
- Are designed using advanced bearing simulation and analysis tools with a Design for Six Sigma approach to optimize the bearing for given application loads
- Can be customized for a variety of application loads and life requirements – SKF has developed custom bearing solutions with a target life of 10 000 hours compared to 3 000 hours

Frac pump seals

From plunger packing and valve seats to access cover and pony rod seals, frac pumps use a variety of these critical components.



SKF offers designs and a wide variety of seal materials developed to handle the high-pressure requirements of reciprocating and static applications.

In addition, oil and gas OEM's benefit from a robust global supply chain network thanks to SKF's local presence in worldwide locations.

Frac pump lubrication systems

To increase the life of critical plunger packing seals, SKF offers Lincoln automatic lubrication systems that deliver the right quantity of oil lubricant at the right time.



Benefits include:

- Increased packing seal life – 300 to 400 hours on average compared with 60 to 80 hours with competitive systems

- Reduced maintenance – no need to fill system during operation
- Increased rig crew safety – minimized exposure to high-pressure iron as lubricant is transported to location rather than filled at location.

SKF Engineering Consultancy Services (ECS) for frac pumps



Drawing on years of experience and multi-platform expertise, SKF can help oil and gas OEMs design their next generation frac pumps.

SKF's ECS capabilities, along with a Design for Six Sigma (DfSS) approach, can help OEMs model and simulate various application load case scenarios to better analyze and understand bearing performance, shaft deflections, re-lubrication intervals and the behavior of surrounding components.

SKF Solutions for Well completion

A worker in an orange safety suit and white hard hat is focused on a task at an industrial well completion site. The worker is wearing safety glasses and white gloves, leaning over a complex assembly of metal pipes and cables. In the background, there are blue industrial containers with markings like 'W 170' and 'H 165'. The scene is set outdoors under a clear blue sky.

Oil and gas exploration and production companies must perform one very important phase after drilling a well to its total depth. They need to prepare the well for production of oil or gas - in other words, to go through the well completion stage of hydrocarbon extraction.

The right sealing solutions for well completion and control are critical to avoid leakage, contamination and reduce maintenance while protecting the environment. SKF technologies and materials are developed by some of the world's leading sealing solutions scientists and engineers.

Seals for hoisting and rotating equipment

Draw works, top drives, rotary control devices and other large rotating equipment have critical bearings that require protection from the elements and/or production fluids. Keeping lubricants in and contaminants out of systems is a serious challenge in tough oil field environments. SKF heavy industry seals can meet the challenge with heavy-duty metal-cased seals, rubber outside diameter seals with metal inserts or fabric-reinforcement, and polyurethane seals.



Locking T-seal

Locking T-seals are a patented innovation on the well-known T-seal design. Retention features on the backups provide ease of installation without damage. For this reason, locking T-seals are used to replace S-seals, enabling higher pressures and temperatures while reducing damage to metal components.



For ram blow-out preventers, we offer a wide variety of rod seals, piston seals and guide rings.

FS-Seal and FS-seals

High-pressure static sealing against casing and tubing surfaces and tolerances presents a considerable challenge. To meet these challenges, SKF produces high quality FS-seals from a proprietary NORSOK M710 approved grade of HNBR with excellent resistance to explosive decompression and chemical attack.



Valve seals

SKF offers an array of choke and valve seals for pressure control applications during drilling or production on Christmas trees. In customer valve installations, SKF gate valve stem and seat seals have passed API 6A PR2 tests up to 20 kpsi (1 378 bars).



Hydraulic seals for blow-out preventers

SKF offers an extensive range of hydraulic sealing solutions for blow-out preventers (BOPS).



SKF Solutions for Artificial lift

Artificial lift systems are among the most widely used production technologies in global oil and gas operations and a vast majority of the oil and gas wells around the world require this technology to maintain and maximize production.

Artificial lift, the method used to lower the producing bottom hole pressure on the formation to obtain a higher production rate from the well, is no doubt the most daunting phase of conventional oil and gas development.

SKF portfolio of efficient and reliable solutions can overcome every technical challenge and help OEMs achieve their business objectives. But, technology is only part of a successful artificial lift strategy. Our experienced engineering teams can advise you on the best artificial lift solutions throughout the life-cycle of your well and then keep them operating at peak performance to deliver the production rates you expect at the lowest possible lifting costs.



Reciprocating rod lift pumping units

Operating unattended in remote areas, reciprocating pumping units demand reliable bearings, sealing solutions and lubrication systems to prevent unplanned downtime. SKF's suite of solutions includes bearings engineered for unrivaled performance, seals designed for long life under harsh field conditions, and condition monitoring tools to maximize uptime and simplify fault diagnosis.

Horizontal multi-stage pumps

Used for fluid transfer, pipeline boosting and water disposal, reliability is key for these pumps.

Specially engineered SKF bearings, optimized for extreme loads and high speed, are used to maximize load capacity and run for life, while SKF sealing and condition monitoring solutions provide an extra measure of protection and peace of mind.



Wellhead drive units

SKF bearings carry the load of up to two miles (3 218 m) of drive shaft for these rotary pump drives.

SKF sealing solutions provide well fluid containment and minimize environmental risk associated with production. Condition monitoring tools provide site surveillance, operational data logging and early fault detection.

Ball and seat valve assemblies

Due to the SKF acquisition of Kaydon in 2013, SKF now offers a broad range of ball and seat valve solutions for downhole artificial lift pump assemblies.



With a full range of the highest quality materials, double-lapped ball/seat sets with both a guide radius and large sealing radius, SKF can develop a solution to satisfy your most demanding application requirements.



SKF Solutions for Mooring systems



Mooring systems are crucial to the oil and gas midstream industry. They are typically “bottle neck machines” with no alternate option to fulfill their function if they go down. Add this to the fact that they operate in extreme marine environments, and the need for reliable components becomes even more critical.

Slewing bearings

Slewing bearings comprise an inner ring and an outer ring, one of which usually incorporates a gear. Together with attachment holes in both rings, they enable an optimized power transmission with a simple and quick connection between adjacent machine components. SKF manufactures standard and customized slewing bearings in various designs, with outside diameters from 0,1 to 18 m to meet the demands of particular applications.



Sealing system

SKF can provide custom-designed sealing systems within the slewing ring bearing and/or as redundant external seals for an extra measure of protection when warranted. We offer large-diameter seals of proprietary G-ECOPUR polyurethane with enhanced chemical and hydrolysis resistance.



We also use a special welding technique to join split-profile segments on site, eliminating the need for costly, time-consuming equipment disassembly. The innovative production system - SKF SEAL JET - reduces manufacturing and dispatch time to a minimum. Virtually any kind of seal for any conceivable application, in any dimension and design, can be produced.

Bolting system

Bolting systems with a range of hydraulic tensioning designs are available to simplify and automate the slewing ring bearing installation process and ensure bolt system integrity.



Lubrication

The lubrication of a slewing ring bearing and its gearing is essential to achieve its 25-year design life. Lubrication type, quantity and intervals are included within the bearing design package.



As the leading global supplier of lubrication delivery systems, we can automate this important task with a variety of centralized, multi-point systems. This increases efficiency as there is no need to stop machinery for lubrication. Lubricating while the bearings are rotating also improves the distribution of lubricant. A small amount of grease remains flowing, keeping out contamination even when the machine is operating in a harsh environment.

Condition monitoring

Condition monitoring can be integrated into the bearing arrangement to monitor health over its lifetime or provided as a service for trouble-shooting or for confirming condition before/after commissioning. Additionally, because of the slow speed operation of a slewing ring bearing, SKF has developed special vibration analysis techniques for very slow speeds.

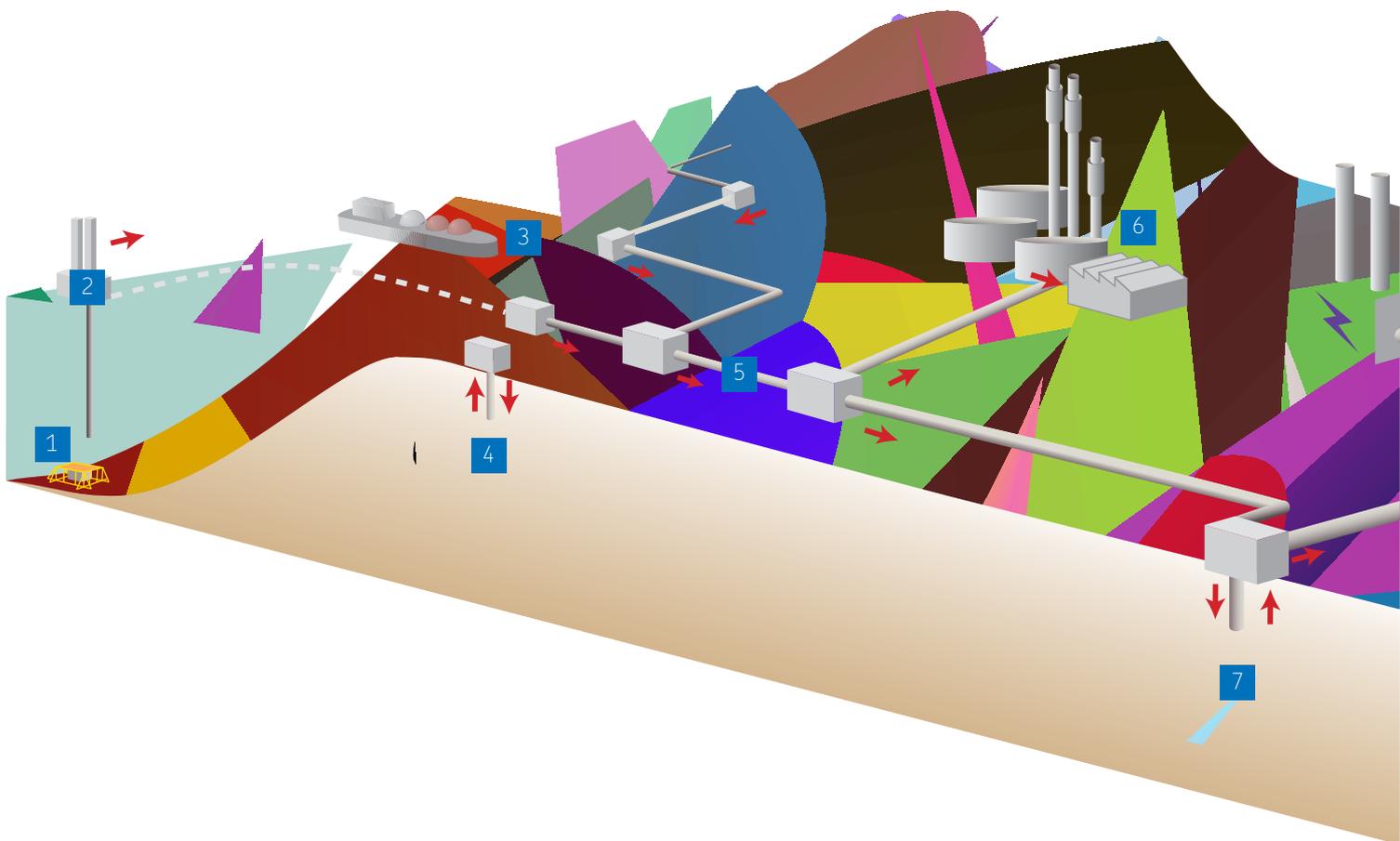


Geometric alignment services

To help ensure proper flatness, levelness and straightness of machine bed and foundation surfaces, SKF provides geometric alignment as a commissioning or trouble-shooting service. In addition to inspecting the form of the mounting surfaces, we can also provide on-site machining to create or repair those surfaces.

SKF Magnetic Bearings

Because active magnetic bearings operate with no surface contact, they eliminate bearing friction and wear. Electromagnets generate forces in radial and axial directions to levitate the shaft, allowing it to rotate contact-free. A control system actively monitors and continuously adjusts the current in the electromagnets to maintain shaft position.



Partner with an industry pioneer

Commissioned in the mid-1980s, the first compressors equipped with SKF Magnetic Bearings are still running today, delivering optimal reliability after 35 years. We've since commissioned more than 1,000 turbomachine systems for oil and gas. Many operate in the world's most demanding environments, from Saudi Arabian deserts, to North Sea platforms, to Siberian fields above the Arctic Circle. SKF applies the same technology, expertise and experience to every project. We can equip machinery from any manufacturer, with every solution customized to meet specific application requirements.

Operating upstream to downstream

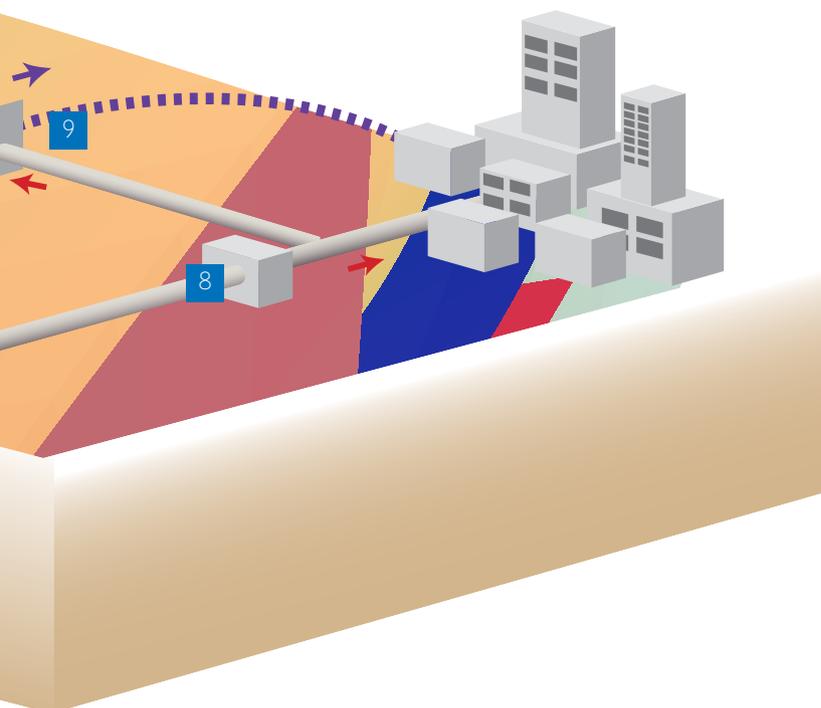
SKF has equipped all major turbomachinery manufacturers with magnetic bearing solutions, and we can adapt one to help virtually any turbomachine boost reliability and widen operating range.

Tailored to oil and gas requirements

Magnetic bearings offer compelling advantages compared to lubricated bearings. Oil-free SKF Magnetic Bearings eliminate the possibility of oil freezing, contamination leakage and fire hazards.

Robust enough to handle higher speeds and loads, SKF Magnetic Bearings widen machine operating range and flexibility. They also accommodate instant and frequent start-ups and are suitable for cryogenic applications.

When elimination of the lubrication system and gearbox are considered, SKF Magnetic Bearings dramatically reduce the footprint and tonnage requirements for offshore platforms and FPSO vessels. In upstream applications, the bearings can operate directly in natural gas and harsh acid gas environments. In certain cases they can eliminate the need for dry gas seals, and with it the related issues of seal wear, maintenance, replacement and downtime.



Operating upstream to downstream

- 1 Subsea compression**
Compressors
- 2 Platform**
Turboexpanders
Compressors
- 3 FPSO/FLNG**
Turboexpanders
Compressors
- 4 Gas lift or injection**
Compressors
- 5 Gas transportation**
Compressors
- 6 Petrochemical processing**
Compressors
Turboexpanders
- 7 Gas storage**
Compressors
- 8 Pressure letdown energy recovery**
Expander-generators
- 9 Power generation**
Turbo generators
Gensets

1 000+ reasons to go with SKF Magnetic Bearings

SKF Magnetic Bearing systems have been installed in over 1 000 turbomachinery in the oil and gas industry, including the world's first magnetic bearing pipeline compressor in 1985. Today, SKF is the open-source supplier for all rotating machinery manufacturers. Below are key applications using SKF Magnetic Bearings and highlights from pioneering projects.



Hermetically sealed compressors

Active magnetic bearings provide the only suitable option for hermetically sealed compressors. SKF has commissioned more than 130 of them, mastering complex machine designs and pushing performance limits to maximize machine capacity. The result? More flexible operation for harsh processes in urban areas and unmanned remote applications. The world's first sub-sea gas compression system SKF Magnetic Bearings are enabling the world's first sub-sea gas compressor operating on the sea-floor of Norway's Åsgard gas field. This pioneering installation is maximizing gas recovery and prolonging the life of the field.



Turboexpanders

Thanks to SKF advanced solutions, turboexpanders featuring magnetic bearings have become the industry's standard solution for cryogenic applications. SKF Magnetic Bearings allow turboexpanders to operate directly in natural gas and harsh acid gas environments, simplifying auxiliary equipment requirements and related maintenance. The bearings eliminate the need for pressurized oil lube skids, separate cooling/heating systems and complex sealed gas processes.



Supporting the world's largest LNG plant

SKF Magnetic Bearings equip 23 turboexpanders operating at Qatar's largest LNG super train site. SKF Magnetic Bearings have become a standard for Floating LNG (FLNG), increasing safety and reducing footprint, weight and maintenance.



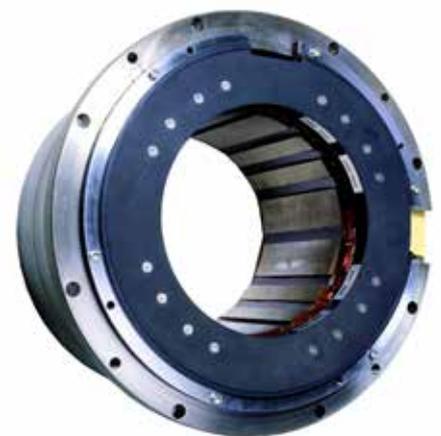
Stand-alone compressors and drives

Removing oil-lubricated bearings from the operating equation allows stand-alone compressors to lower energy consumption as well as maintenance and monitoring activities.

During a typical 20-year compressor life cycle, SKF Magnetic Bearings can deliver significant life cycle cost savings vs. oil-lubricated bearing designs.

25 MW compressor operating for more than 35 years

Since the mid-1980s, the first compressors equipped with SKF Magnetic Bearings have been operating continuously with the highest availability rates. More recently, SKF has also pioneered unmanned offshore upstream compressor trains in the North Sea, proving advanced capabilities in remote operations.



Lubrication solutions

Single point automatic lubricators

Single point automatic lubricators are dispensing the proper amount of lubricant to the application based on a setting that takes into account the operating conditions and the bearing type and dimensions.

Especially when the lubrication points are difficult to access for safety reasons or their location in the plant is remote, automatic lubricators can offer the solution.

The wide range of single point automatic lubricators and accessories from SKF offers solutions for most lubrication points.

SKF SYSTEM 24 lubricators are suitable for a variety of applications, but often are used on pumps, electric motors, cranes and chains.



The single point lubricators can be adjusted to ensure that the correct quantity of lubricant is delivered to the lubrication point during a predetermined period of time.

This provides a more accurate control of the amount of lubricant supplied, when compared to traditional manual lubrication techniques.

SKF SYSTEM 24 LAGD series

The units are supplied ready-to-use straight from the box and filled with a wide range of high performance SKF lubricants. Tool-free activation and time dispense setting by SKF DialSet free software allows easy and accurate adjustment of lubrication flow.

- Flexible dispense rate from 1 to 12 months
- Stoppable or adjustable if required (for a few days)
- Intrinsic safety rating: ATEX certified for Zone 0 hazardous areas
- Transparent lubricant container allows visual inspection of dispense status
- Compact size, permits installation in restrictive areas
- Bearing greases and chain oils available

Typical applications

- Applications in restrictive and hazardous locations
- Bearing housing lubrication
- Electric motors
- Pumps
- Cranes
- Chains (oil)



Manual lubrication tools

Various manual lubrication tools are available from SKF to complement any maintenance staff toolbox upon their needs.

Among them you can benefit of the SKF unique battery driven grease gun TLGB 20, which has an incorporated grease metering system to enable the technicians monitor the dispense grease into the application and thus to avoid an over-greasing or an under-greasing.

There are also various grease pumps to be chosen, such as manual or air-driven or filler pumps. An oil condition monitoring device (TMEH 1) from SKF or a portable grease test kit (TKGT 1) to check on-site if the grease in the application is alive, will complement your lubrication management practices.



TMEH 1

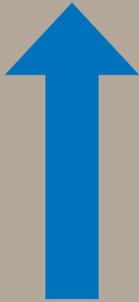


TKGT 1



Lubrication Management

What the right lubrication programme can do for you



Increase

- Productivity
- Reliability
- Availability and durability
- Machine uptime
- Service intervals
- Safety
- Health
- Sustainability

Reduce

- Energy consumption due to friction
- Heat generation due to friction
- Wear due to friction
- Noise due to friction
- Downtime
- Operating expenses
- Product contamination
- Maintenance and repair costs
- Lubricant consumption
- Corrosion



In order to achieve optimal lubrication, SKF has developed consulting services, geared to improve the performance of your rotating equipment.

SKF Lubrication Management process



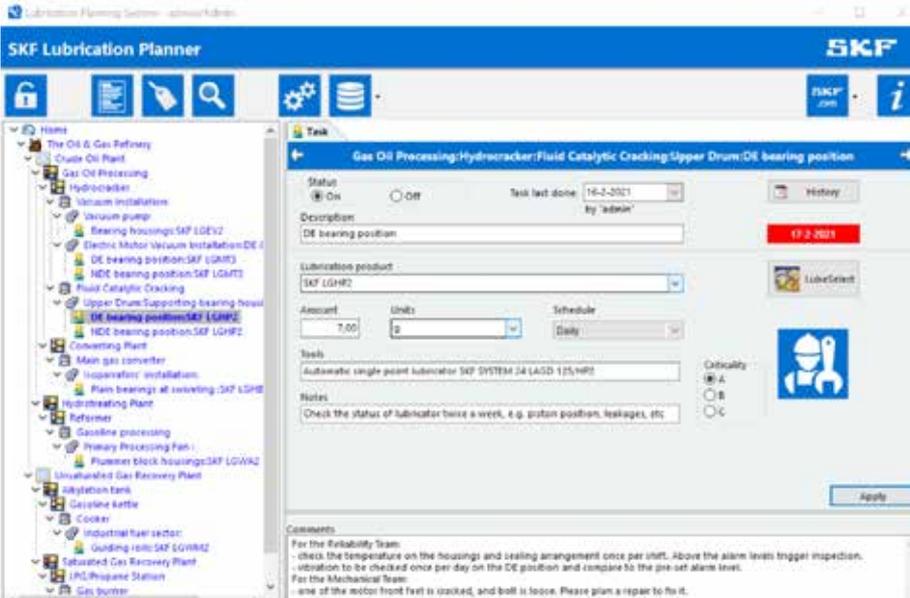
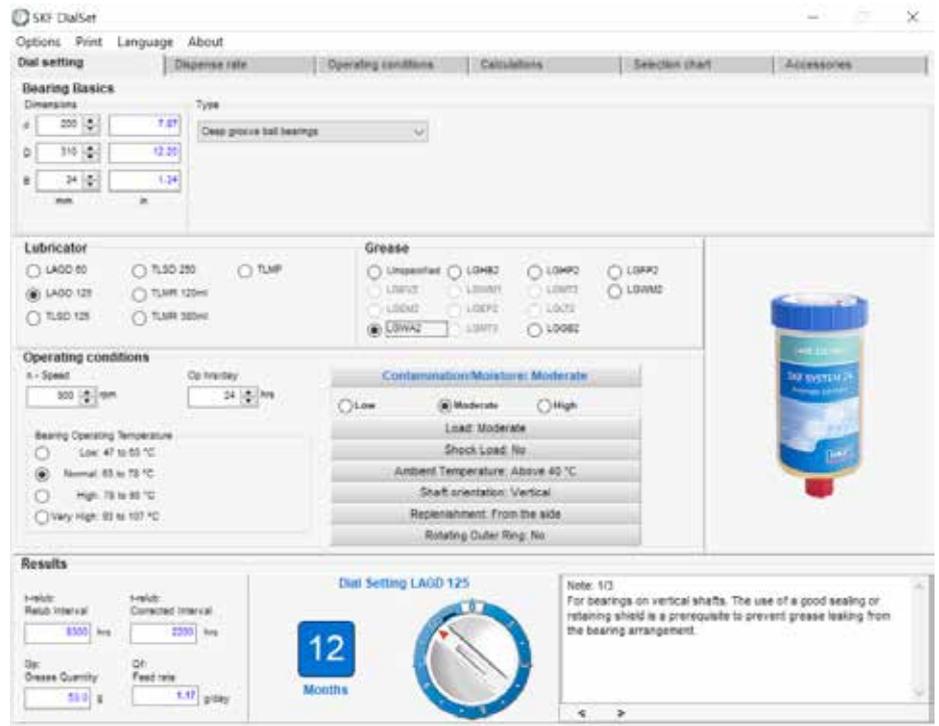
SKF DialSet

Software for quick calculation of the lubrication cycles

SKF DialSet has been designed to help you to set up your SKF automatic lubricators. After selecting the main operating criteria and the grease/oil appropriate for your application, the program provides you with the correct dispense settings for your SKF automatic lubricators. The software also provides pin-point values calculation for the relubrication intervals and quantity at the manual regreasing.

Free download at: mapro.skf.com/dialset

The app is available for iPhone and Android



Property	Score	Weight	Total Points	Target	Grade	Rank
Viscosity	100%	10%	100%	100%	100%	100%
Temperature	100%	10%	100%	100%	100%	100%
Shock Load	100%	10%	100%	100%	100%	100%
Load	100%	10%	100%	100%	100%	100%
Speed	100%	10%	100%	100%	100%	100%
Moisture	100%	10%	100%	100%	100%	100%
Contamination	100%	10%	100%	100%	100%	100%
Sealing	100%	10%	100%	100%	100%	100%
Orientation	100%	10%	100%	100%	100%	100%
Replacement	100%	10%	100%	100%	100%	100%
Rotating	100%	10%	100%	100%	100%	100%



SKF Lubrication Planner

Software for easy management of lubrication tasks – with some minimal IT settings is compatible with CMMS (SAP, Maximo, etc.) skf.com/lubrication

LubeSelect for SKF lubricants

Software for generalized selection of lubricants and calculation of lubrication cycles skf.com/lubrication

Condition monitoring

SKF Multilog On-line System IMx-16/IMx-16Plus

SKF Multilog devices provide a complete system for early fault detection. Improve the reliability, availability and performance of your rotating equipment with automatic advice for correcting existing or impending conditions.

These compact devices offer 16 analogue and 4 digital channels, with connectivity to mobile devices and networks for easy configuration and monitoring.

Machine intelligence from IMx data will help you avoid unplanned downtime and schedule maintenance proactively, prolonging machine availability and minimizing maintenance and repair costs.

The IMx-16Plus integrate easily with other IMx units and can connect with the SKF Cloud for storing and sharing data, enabling SKF Remote Diagnostic Services for expert reporting and recommendations.



They are DIN rail mounted or can be housed in an IP65 cabinet to provide additional protection in demanding industrial environments.

Features:

- 16 analogue and 4 digital inputs
- Simultaneous measurements on all channels and configurable for true synchronous measurements
- PoE (Power over Ethernet) and/or 24 – 48 V DC
- 4 GB internal memory for data and event captures
- Data buffering in non-volatile memory when communication is down
- Improved Modbus TCP/IP and Modbus RTU capabilities including multiple and simultaneous use
- Stand-alone mode or compatible with SKF @ptitude Observer
- Bluetooth configuration and data access in stand-alone mode via iOS and Android apps
- App support for SAT (Site acceptance test)
- Crash detection capability (machine tools)
- Event and run cycle based long time waveform captures
- LTE/GSM mobile data and Wi-Fi capabilities are built-in, as alternatives to hard wired Ethernet
- In addition to the standard capability for the analogue channels to accept a range of vibration transducers, channels 9 to 16 support directly connected PT1000, temperature sensors P



SKF Multilog On-line System IMx-M

Protect and enhance the reliability of critical machinery

The SKF Multilog On-line System IMx-M is a powerful, cost effective solution suitable for a variety of machinery monitoring applications. Together with SKF @ptitude Monitoring Suite software, the SKF Multilog IMx-M can provide a complete system for initiation of machinery shutdown, early fault detection and diagnosis.

In addition, the SKF Multilog IMx-M system can provide automated advice for correcting existing or impending conditions that can affect machine reliability, availability and performance.

Companion software

The SKF @ptitude Monitoring Suite forms the basis for a completely integrated approach to condition monitoring. It enables fast, efficient and reliable storage, manipulation and retrieval of large amounts of complex machine and plant information.

SKF @ptitude Observer's easy-to-use operator interface and intelligent diagnostics functions provide users of all levels the tools needed to set up and run effective on-line monitoring programs.

SKF Quick Collect

Fast, simple machine health monitoring

Do you need to start with digitalization of maintenance in your production plant? Basic diagnostics without larger investments?

Start today with the SKF QuickCollect sensor!

The SKF QuickCollect sensor makes machine data collection simpler and more cost-effective.

This easy-to-use, handheld, portable vibration and temperature sensor is combined with mobile apps that reduce the complexity of data collection and analysis so that you can detect machine issues before they cause failures and impact on your business.

- You will detect an emerging problem of your rotating equipment in real time
- It is ideal for walk around diagnostics, combining vibration, temperature and acceleration enveloping sensing
- All data can be viewed on the spot and in real time or uploaded to the cloud for future analysis

- The future data analysis can be facilitated by SKF application for free on your smart phone or tablet and connected to the sensor by Bluetooth
- You can rely on the expert support of specialists in the Remote Diagnostic Center

SKF QuickCollect app

Get started straight away with the QuickCollect app. It's easy to use - simply download the app and pair with your sensor to get on-the-spot indications of machine health.



SKF Enlight ProCollect app

Upgrade to ProCollect and enhance your maintenance program. Empower your operations team, create, schedule and execute manual inspection, lubrication routes, gain deeper insights into your machinery, save and share data to the cloud, gain access to

easy-to-understand dashboards, and connect to SKF expertise whenever you need it.



SKF Enlight Centre Cloud Based Software

SKF Enlight Centre is a first-of-its-kind, asset-based (as opposed to measurement focused) machine health monitoring system.

It features a radically simplified user interface, designed for use by operators, engineers and managers and enabling the scalability needed to support SKF Rotating Equipment Performance value proposition through a seamless integration to the customer work processes, analytics tools and a native integration to the SKF Digital Platform.



Rotating Equipment Performance (REP)



The industrial world is changing. And as new challenges emerge, plant managers, engineering managers, maintenance and service engineers are all looking for ways to maximise machine performance, while lowering operational and maintenance costs.

SKF offers you solutions to drive business success by getting the most from your machinery. With experience from almost every industrial sector and machine type, SKF can work closely with you throughout a machine's complete life cycle, using our knowledge, experience and insight to provide improved equipment design specifications, as well as the high quality products, services, and advice required to help you meet your business objectives.

What does Rotating Equipment Performance mean to you?



Gain new insights into your machinery

Gain visibility into the health of your equipment and turn data into performance-driving insights. Allowing your business to be more agile, deliver greater output, or optimise safety, reliability and sustainability. Drive forward digitalization of your operations using Internet of Things (IoT) solutions to connect to your machinery plant wide and planet wide. Store and share data in the

SKF Cloud and benefit from Big Data through SKF Enlight Centre dashboards, tailored to your workflows and giving easy to understand data interpretation. Connect directly to expert diagnostics and analysis, providing unrivaled application insights and advice to maximize rotating equipment performance.



Be more sustainable

SKF can work with you to reduce energy usage, waste output, spare parts consumption and more, helping you to deliver against your sustainability agenda, as well as saving on costs.



Improve output

By optimizing the performance of your rotating equipment you can increase availability, performance rate and quality – all driving greater Overall Equipment Effectiveness, and boosting output for your business.



Trim your Total Cost of Ownership

Poor performance and unplanned downtime don't just affect your productivity and cost of production, they can also directly affect the cost of energy, maintenance, spare parts, labor and more – all adding up to a higher Total Cost of Ownership (TCO).

SKF can help you achieve more reliable rotation, so you can reduce your TCO.



Reducing reliance on scarce talent

By working with SKF to connect our rotating equipment expertise to your business, you can reduce the time and cost of recruiting, training and retaining increasingly scarce and expensive maintenance and diagnostic skillsets.



Operate more safely

Whether you want to ensure maximum operational safety, reduce product safety risks or navigate the minefield of EHSS regulations, SKF can help you drive operational safety, and a reduced incident rate will feed into your productivity too.



**DOWNTIME
COSTS
AVOIDED**



Maintenance solutions from SKF

Machinery shaft alignment

Shaft misalignment is a major contributor to rotating machinery breakdowns. Accurately aligning connected shafts can prevent a large number of machinery breakdowns and reduce unplanned downtime that results in a loss of production. In today's challenging environment of reducing costs and optimizing assets, the necessity of accurate shaft alignment is now greater than ever.

Generally, misalignment of coupled machinery is caused by inadequate measurement techniques, an improper foundation, degradation of the foundation, problems with the feet of the connected machinery e.g. soft feet, defects of manufacturing, degradation of the supporting feet (cracks corrosion), deterioration of the couplings, etc .

From SKF you can have various precision alignment systems to adapt your applications needs.

SKF Shaft alignment tool TKSA 71

Designed for professional alignment in harsh industrial environments, the TKSA 71 is a very versatile tool with ultra-compact measuring units for use in extremely narrow spaces. Its dedicated software applications enable different types of alignments, including horizontal and vertical shafts, spacer shafts and machine trains.

- Easy-to-use - Intuitive software applications, guided alignment processes and explanatory videos
- Wide range of applications - Comprehensive accessories and dedicated software applications
- Superior alignment performance - Up to 10 m measurement distance, disturbance compensation, measurement flexibility, only 40° total rotation, automatic measurement and customised alignments with target values
- Protection against harsh environments - Completely sealed measuring units (IP67) to withstand dust and water

- Ultra-compact measuring units - Use in extremely narrow spaces
- Robust carrying case - Excellent protection, convenient transport and wireless in-case charging



SKF Shaft alignment tool TKSA 41

The ergonomic display unit with intuitive touch screen navigation makes your alignments fast and easy, whilst innovative features, like the "free measurement", increase the alignment performance. With the focus on improving alignment practices, the SKF Shaft Alignment Tool, TKSA 41, is one of the industry's best value alignment solutions.



TKSA 11

TKSA 31

TKSA 41

TKSA 51

TKSA 71

- Wireless communication
- Automatic measurement enables handsfree measurements by detecting the head position and taking a measurement when the heads are rotated into the right position
- Automatic reports are generated after each alignment
- Live view supports intuitive measurements and facilitates horizontal and vertical alignments.
- QR codes can be used to further simplify machine identification and improve the alignment workflow



SKF Machinery shims TMAS series

For accurate vertical machinery alignment

- Made of high quality stainless steel, allowing re-use
- Easy to fit and to remove
- Close tolerances for accurate alignment
- Thickness clearly marked on each shim
- Fully de-burred
- Pre-cut shims are supplied in packs of 10 and complete kits are also available



SKF Vibracon

The universal adjustable re-useable chocks

SKF Vibracon is a machinery mounting chock that is easily and accurately adjusted. The chock accommodates the angular difference, up to 4°, between machine and the mounting base without expensive machining of the base or the extra work of installing epoxy resin chocks. The self-levelling capability, combined with the height adjustment feature, eliminates the possibility of a soft foot in the production line throughout the life cycle of the machinery.

The SKF Vibracon is available in different materials to meet the need of your application, even those in the harshest environments.

This adjustable chock is available in standard carbon steel (CS series) and in surface-treated carbon steel (CSTR series) for improved corrosion protection.

Developed to withstand the most challenging conditions, a stainless steel version (SS series) is offered with the highest corrosion protection available.



Stainless steel chocks (-SS)

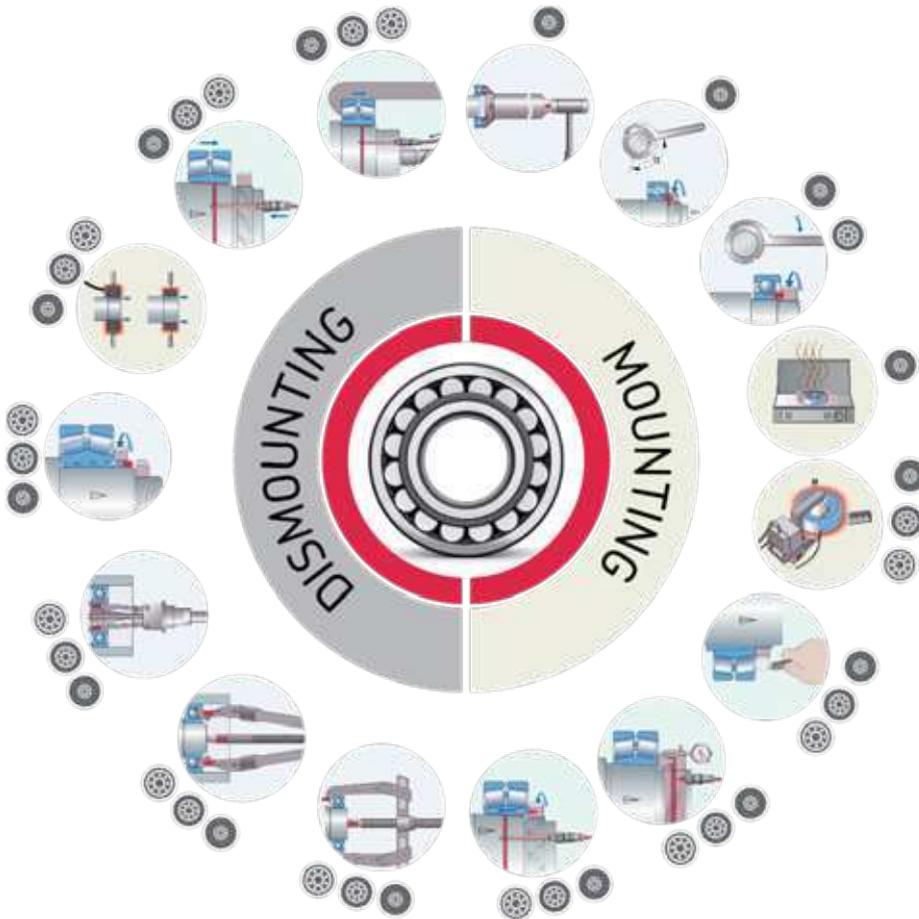


Low profile chock (-ASTR)



Carbon steel chocks (-CS)

Mounting and dismounting solutions



Depending on the size of the bearing to be mounted or dismounted, and on the seating arrangement, there are different recommended methods which vary from:

- Cold mounting / dismounting
- Hot mounting / dismounting by using oil injection, mechanical or hydraulic tools and induction heating

The portfolio of SKF induction heaters varies from heating plates, portable heaters to very large induction heaters to heat up bearings and solid components of up to 1200 kg and 800 mm bore diameter.

SKF TWIM 15

A portable solution for bearing heating

The unique on the market SKF portable induction heater TWIM 15 is designed to heat up roller bearings that are mounted with an interference fit onto a shaft. Heating the bearing causes it to expand, which eliminates the need to use force during installation. Generally, using the TWIM 15 to generate a 90 °C (162 °F) temperature difference between the bearing and shaft is sufficient to enable installation.

In addition, the TWIM 15 can be used to heat other ring-shaped, metallic components, providing flexibility of use.

TWIM 15 advantages:

- Innovative heating of bearings
- Portable, compact and lightweight
- No support yokes required
- Automatic temperature monitoring
- Detects bearing size and heats appropriately
- Different power levels
- User-friendly LED control panel
- Quiet operation



Large induction heater SKF TIH 220m

With a 300 kg bearing heating capacity, the large induction heater TIH 220m is a reliable and robust induction heater from the TIH...m range suitable for heating bearings up to a maximum weight of 300 kg (660 lb.) and solid components up to a maximum weight of 150 kg (330 lb.).



Advanced design of the power electronics including current and overheating control, combined with user friendly features such as sliding arms and remote control are standard to the TIH...m range.

- Capable of heating a 220 kg (480 lb.) bearing in just 20 minutes
- Supplied standard with two yokes, allowing bearings with a bore diameter from 60 mm (2.3 in.) up to a maximum weight of 300 kg (660 lb) to be heated
- Sliding arm for large size yoke

SKF Online heater selection -

Available on <https://www.skf.com/group/support/engineering-tools/heater-selection-tool>



SKF Hydraulic pumps

Technical data	TMJL 50	729124	TMJL 100	728619 E
Designation	TMJL 50	729124	TMJL 100	728619 E
Maximum pressure	50 MPa (7 250 psi)	100 MPa (14 500 psi)	100 MPa (14 500 psi)	150 MPa (21 750 psi)
Oil container capacity	2 700 cm ³ (165 in. ³)	250 cm ³ (15 in. ³)	800 cm ³ (48 in. ³)	2 550 cm ³ (155 in. ³)
Volume/stroke	3,5 cm ³ (0.21 in. ³)	0,5 cm ³ (0.03 in. ³)	1,0 cm ³ (0.06 in. ³)	1st stage: 20 cm ³ below 2,5 MPa (1.2 in. ³ below 362 psi) 2nd stage: 1 cm ³ above 2,5 MPa (0.06 in. ³ above 362 psi)
Length of pressure hose fitted with quick connection coupling	3 000 mm (118 in.)	1 500 mm (59 in.)	3 000 mm (118 in.)	3 000 mm (118 in.)
Connection nipple (included)	G ¹ / ₄ quick connection			
Weight	12 kg (26 lb)	3,5 kg (8 lb)	13 kg (29 lb)	11,4 kg (25 lb)



SKF Oil Injection Method

The SKF Oil Injection Method allows bearings and other components with an interference fit to be fitted in a safe, controllable and rapid manner. The method does not require keyways to be machined on the shaft, saving valuable time and money in materials and production.

SKF Oil injection program -

Can be downloaded at <https://www.skf.com/group/support/engineering-tools/oil-injection-method-program>



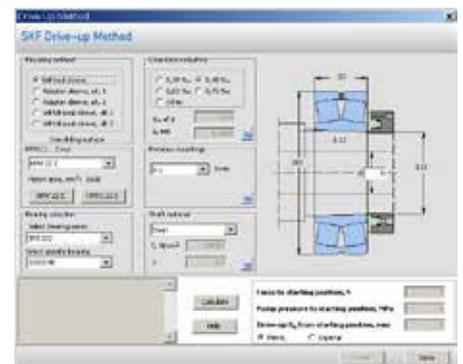
SKF Drive-up Method

The SKF Drive-up Method is a well-proven method, unique to SKF, of accurately achieving the adjustment of SKF spherical roller and CARB toroidal roller bearings mounted on tapered seatings. The method incorporates the use of an SKF HMV ..E hydraulic nut fitted with a dial indicator, and a high accuracy digital pressure gauge, mounted on the selected pump.

The correct fit is achieved by controlling the axial drive-up of the bearing from a pre-determined starting position, defined by the pressure in the SKF HMV..E hydraulic nut.

The second stage is monitored by driving the bearing up a calculated distance on the taper seating.

The program can be downloaded at <https://www.skf.com/group/support/engineering-tools/drive-up-method-program>



SKF Sealing Solutions

Radial shaft seals

SKF's main offer of sealing solutions for oil & gas applications includes all-rubber HS and HSS seals as well as metal-cased HDS seals, also known as SKF Edge seals as part of the CR Seals assortment, with optional add-on features and the machined HRS seals made of Polyurethane. The offer is based on a flexible concept to customize the solutions in terms of design and dimension to optimize them to the varying demands of different applications without additional tooling.



Axial shaft seals

If contaminants enter the bearing area of an axial shaft, they can pollute the lubricant, causing corrosion and premature bearing failure. To combat these issues, axial shaft seals are designed as a suitable secondary seal in applications where seals are subjected to excessive quantities of contaminants.

They are available as V-ring seals, metal-clad V-type sealing rings, axial clamp seals and mechanical seals. With the exception of axial clamp seals, axial shaft seals rotate with the shaft and act as flingers, tolerating small misalignments of the shaft and providing reliable sealing if the shaft is out of round or rotates eccentrically.



SKF Speedi-Sleeve

Over time, contaminants, high pressure and speed, or inadequate lubrication can cause particles to become trapped underneath a shaft sealing lip. Wear grooves begin to form on the shaft as it rotates, eventually leading to sealing failure and severe shaft damage. Repairs usually involve dismantling and re-machining the shaft, and installing a new seal size. SKF Speedi-Sleeve and large diameter wear sleeves offer a much faster, more cost-effective alternative.



SKF Speedi-Sleeve is a well-proven solution used to provide an excellent sealing surface for radial shaft seals, while reducing the need for costly shaft machining or maintenance. SKF Speedi-Sleeve combines a proprietary stainless steel material and manufacturing process, resulting in an optimized seal counterface that minimizes wear on both the sleeve and sealing lip.

- Standard size range covers shaft diameters from 11.99 to 203.33 mm (0.472 to 8 in.). Each sleeve is designed to fit a specific shaft range to accommodate variations in the actual shaft diameter. If the right size is selected, the sleeve will have an adequate tight fit on the shaft and will not require any adhesive.
- Seal contact surface is wear resistant and manufactured to minimize directionality ($0^\circ \pm 0,05$) with a finish of Ra 0,25 to 0,5 μm (10 to 20 $\mu\text{in.}$).
- Available in two versions: Standard for general purpose and SKF Speedi-Sleeve Gold with a thin, metallic coating for use under highly abrasive conditions.
- No need to take apart the shaft or to machine it again.
- Reduces maintenance and repair costs.
- Fixes problems in minutes and reduces environmental impact.
- Allows manufacturers of machinery to avoid costly superficial and finishing treatments on the shaft.



Power transmission solutions

Power transmission products play an important role in overall bearing performance and are the vital link between moving parts in equipment. By creating its own range of power transmission products, SKF can offer products that are well-matched and give engineers a wide design choice according to performance and cost considerations.

Belts

SKF Cogged Raw Edge Wedge and SKF Cogged Raw Edge Narrow Wedge Belts have been developed to handle oil & gas applications.

The tension cords are made from polyester yarn. Pre-loading the cords during their rubber impregnation process results in low stretch during operation. The rubber cushion is fibre loaded chloroprene compound giving good transverse belt rigidity.

Features:

- High transverse rigidity
- High flexibility
- Temperature range from -30 to +75 °C
- Constant length per ISO matching set tolerances
- Suitable for tropical climates
- Lengths available up to 3 500 mm



Couplings

SKF also offers disc couplings. These are the ideal solution in medium to high torque applications that require torsional rigidity, offer some allowance for misalignment, and do not require lubrication. These applications typically have a capacity range up to 178 kNm in a range of configurations including single disc, double disc, and spacer for both horizontal and vertical mounting. Standard shaft capacities are up to 289 mm.

- High torsional stiffness – zero backlash
- Energy efficient – no frictional losses *
- No internal moving parts – no lubrication required *

- Quiet running – no meshing *
- Temperature tolerant
- Fully machined surfaces – high speed capability New SKF (may require dynamic balancing over 50 m/s)

* Assuming proper alignment



Pulleys

- ISO and RMA profiles – dimensions according to applicable standards
- Phosphate coated for ISO pulleys a measure of corrosion protection
- RMA pulleys powder coated for economical protection
- Taper bush and QD locking systems as standard

SKF Training Solutions

Training needs analysis

If you don't know where to start, we can help. SKF has developed programs to assess the maintenance skills of your team and identify individual strengths and weaknesses. Together we then create a program that fits your needs and gives the best return on your investment in your people.

The SKF Client Needs Analysis (CNA) Training enables this crucial understanding, combining our experience in training and knowledge of maintenance and reliability. The goal is to provide useful and meaningful information to help you focus on improvements for plant performance. These assessments are conducted with individuals or a group of your staff from the following work areas:

- Mechanical maintenance
- Reliability & Condition monitoring
- Engineering
- Planning & scheduling

Targeting eight areas of competency for improvement

Opportunities for improvement are determined based on findings from the SKF CNA - Trainings. Typical improvements fall in the following areas:

- Bearings and seals technology
- Power transmission
- Lubrication
- Oil analysis
- Vibration analysis
- RCA/RCFA
- Maintenance strategy
- Thermography



Training course categories

While specific course topics vary widely, SKF training courses are organised around the following five facets of the SKF Asset Efficiency Optimisation (AEO) model:

Maintenance and reliability (code MS)

Relates to methods and technologies used to develop a maintenance strategy. Courses emphasise a technically and financially sound maintenance strategy developed to match business goals.

Condition-based maintenance (code CBM) (code WI)

Relates to methods and technologies used to identify maintenance work. Course topics include condition monitoring, data collection, information integration and analysis.

Work control processes (code WC)

Relates to methods and technologies used to control maintenance work. Course topics include maintenance planning and scheduling, standard job plans, spare parts alignment and inventory control.

Proactive maintenance or mechanical maintenance (code WE)

Relates to methods and technologies used to complete maintenance tasks. Course topics mainly include bearing maintenance, best practices in lubrication, precision alignment, dynamic balancing, and electric motor maintenance.

Engineering (code LP)

Relates to Engineering or Engineering product, methods and technologies used to evaluate maintenance work and strategy, thereby 'closing the loop' and making maintenance a continual improvement process. Course topics include root cause analysis, reliability analysis, maintenance work feedback and performance management system, machine redesign, and technology upgrades

Protect your business – avoid counterfeit products



What is a counterfeit SKF product?

All types and sizes of products and packaging marked with SKF trademarks, but not manufactured by SKF or with the consent of SKF, is considered counterfeit. Branding workshops illegally mark unbranded products with SKF trademarks and other look alike markings. The products are packed in counterfeit look-alike packages and marketed as genuine products. However, the pricing of counterfeit products to the end-user is close to the same as for genuine products. Price is not an indicator whether a product is counterfeit or not.

Avoid being cheated

Carefully select your supplier of SKF products. Compromising secure sourcing can cause great harm to your business. A “good deal” from an unknown supplier may end up costing a lot more.

The best way to safeguard authenticity is to buy SKF products from authorized SKF distributors.



The warning signs

Marketing to distributors is done in a way most distributors would recognize. An e mail is sent from a person claiming partnership with premium brand owners, offering industrial or automotive products directly from stock at competitive prices. Be careful! This could be a source of counterfeit SKF products.

Be suspicious when non-authorized suppliers offer short lead times for products known to have longer lead times from SKF. Suppliers of counterfeits may also offer certificates stating that the products are genuine SKF. Such documents are not trustworthy. Mounting difficulties and /or pre mature failures, could be signs that a product is counterfeit.

The risks

The quality and performance of counterfeit SKF products is unknown and unpredictable. All efforts and dedication to improve OEE (overall equipment effectiveness) and operational costs can quickly change if counterfeits get into your operation. If installed in safety critical equipment, counterfeit products may present a great safety risk for people and/or the environment.

What if you suspect a product to be counterfeit?

Only experts from SKF can verify authenticity of a product or package marked with SKF trademarks. Please send sharp pictures of all visual markings on the product and product box to genuine@skf.com and you will be contacted by SKF. For all verification requests, providing name of the supplier and proof of purchase is mandatory.

SKF Authenticate App

The SKF Authenticate application for smartphones allows users to take and send photos of suspect products and proof of purchase directly to SKF for verification. The application can be downloaded for free from App Store or Google play.



[skf.com](https://www.skf.com)

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