

SKF S2M Magnetic Bearings for the oil and gas industry

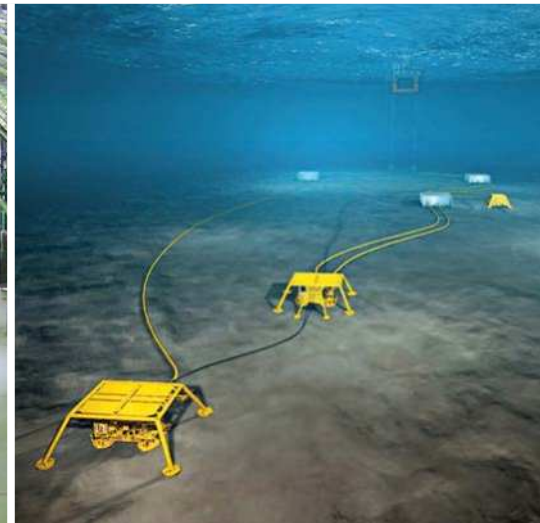
Increasing equipment reliability and uptime





No contact, no wear,
no worries

For turbomachinery in oil and gas applications, active magnetic bearings enable greater reliability and energy efficiency than conventional bearings.



The world's first subsea gas compression system

SKF S2M Magnetic Bearings are a key technology in the world's first subsea gas compressor, operating on the seafloor of Norway's Åsgard gas field since 2015.

1 000+ friction-free references

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.

Their extreme precision and stability makes active magnetic bearings suitable for a much wider operating range than conventional bearings. And no bearing friction means there is no need for oil lubrication, a key advantage that simplifies turbomachinery design and reduces maintenance. SKF S2M Magnetic Bearings have been making these design and performance possibilities a reality for more than three decades.

Simpler operation and lower costs

For turbomachinery manufacturers, SKF S2M Magnetic Bearings open up new possibilities for machine design. Not having to integrate auxiliary components reduces the footprint and simplifies civil engineering and construction requirements, making installations simpler and less costly, especially offshore.

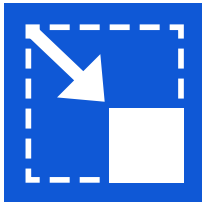
For end-users, eliminating bearing friction virtually eliminates maintenance, increasing uptime and reducing operational costs. SKF S2M Magnetic Bearings also offer unprecedented remote monitoring, health diagnostic, and service capabilities to help simplify daily operation.

Partner with an industry pioneer

Commissioned in the mid-1980s, the first compressors equipped with SKF S2M Magnetic Bearings are still running today, delivering optimal reliability after 25 years. We've since commissioned more than 1 000 turbomachine systems for oil and gas. Many operate in the world's most punishing 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.

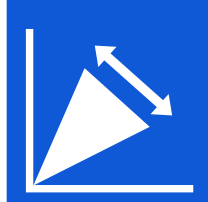
Smaller footprint



Oil free



Wider speed range



More reliability



Lower life cycle cost



Integrated monitoring



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.

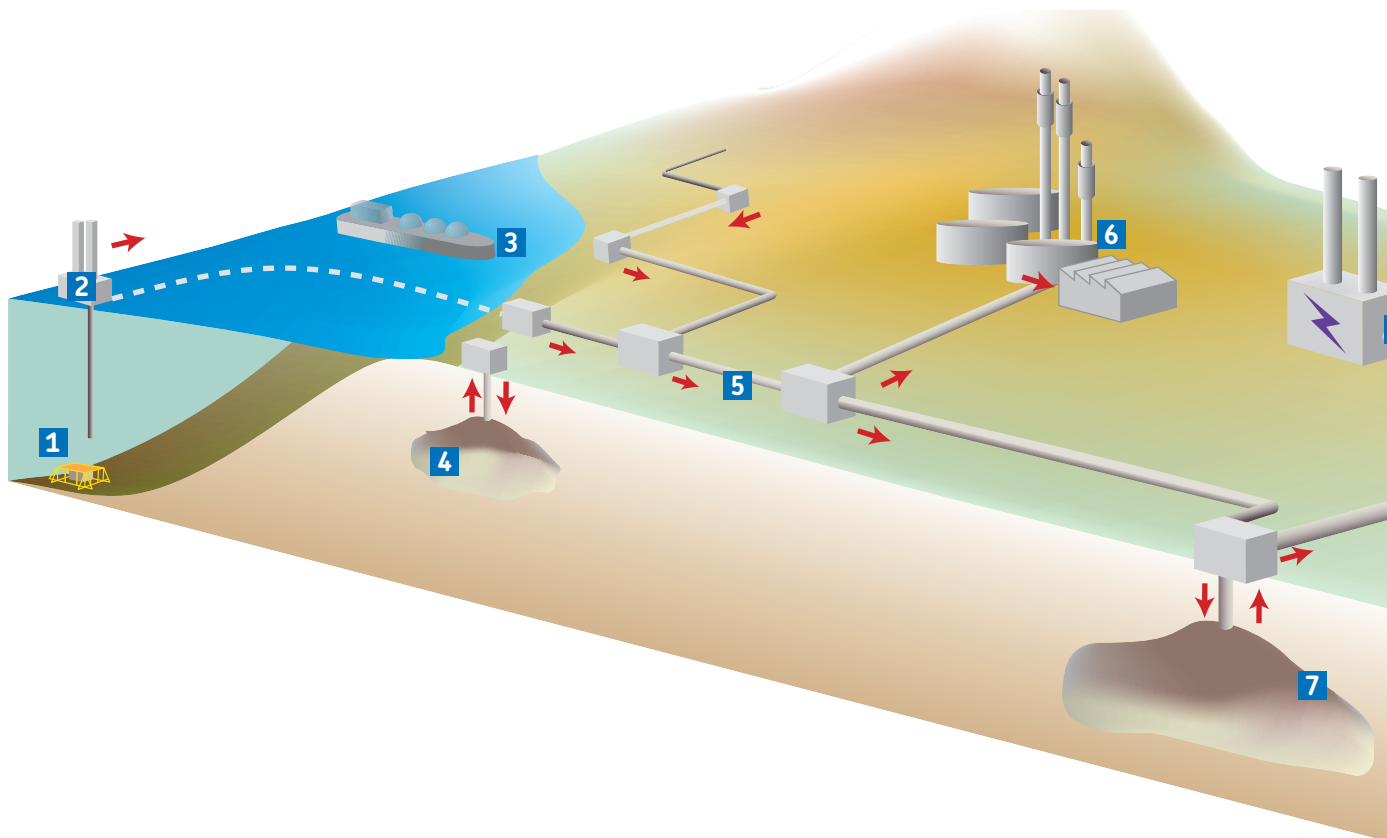
Tailored to oil and gas requirements

For mid- and downstream applications, magnetic bearings offer compelling advantages compared to oil bearings. Oil-free SKF S2M Magnetic Bearings eliminate the possibility of oil freezing, contamination leakage and fire hazards.

Robust enough to handle higher speeds and loads, SKF S2M 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 S2M 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.



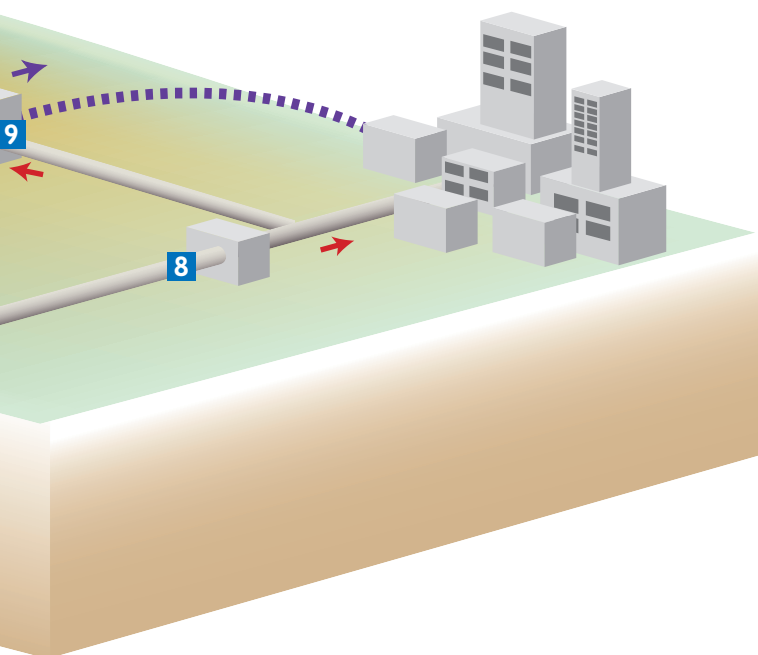
Standardized magnetic bearing controller

The E300V2 is the result of expertise gained at more than 1 000 oil and gas installations worldwide. The control cabinet is standardized and offers a range of configurations to suit different installation requirements.

The latest generation E300 V2 uses technology bricks from our subsea compression developments to provide an optimized, fully digital control loop that can handle 30 MW compressors and beyond.

For operators, the E300 V2 offers an unprecedented level of autonomy, backed up with the remote or onsite presence of SKF experts. Suitable for topside applications and virtually any unmanned site, it allows users to increase the uptime of their rotating equipment and help minimize costs over the entire system life cycle, from installation and commissioning to long-term operation.

- Improved equipment reliability
- Shorter commissioning time
- Easier verification of API standards
- New machine monitoring capabilities
- Remote access to data and SKF support
- Interface with condition monitoring software
- Modular design optimizes cost and footprint
- Globally supported by SKF experts

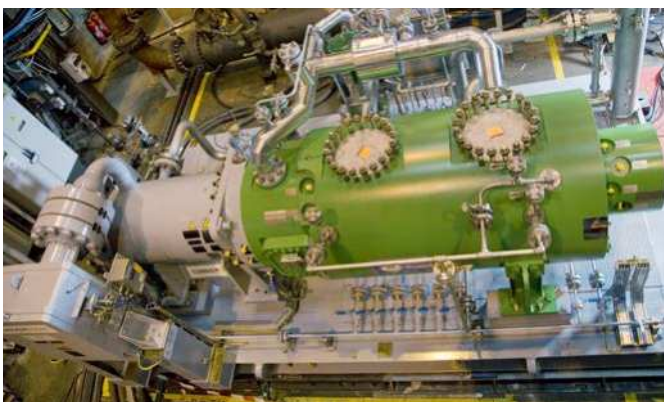


Operating upstream to downstream

- 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 S2M Magnetic Bearings

SKF S2M 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 S2M 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 subsea gas compression system

SKF S2M Magnetic Bearings are enabling the world's first subsea gas compressor operating on the seafloor of Norway's Åsgard gas field. This pioneering installation is maximizing gas recovery and prolonging the life of the field.



Turboexpanders

Thanks to SKF advances, turboexpanders featuring magnetic bearings have become the industry's standard solution for cryogenic applications. SKF S2M 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 S2M Magnetic Bearings equip 23 turboexpanders operating at Qatar's largest LNG super train site. SKF S2M Magnetic Bearings have become a standard for Floating LNG (FLNG), increasing safety and reducing footprint, weight and maintenance.



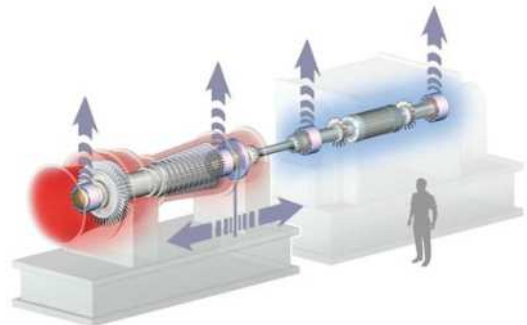
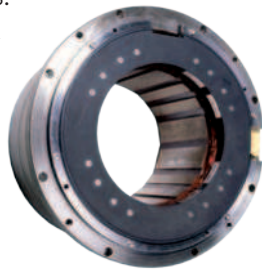


Stand-alone compressors and drives

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 S2M Magnetic Bearings can deliver significant life cycle cost savings vs. oil-lubricated bearing designs.

25 MW compressor operating for more than 25 years

Since the mid-1980s, the first compressors equipped with SKF S2M 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.



Power generation trains

SKF S2M Magnetic Bearings are helping Combined Heat & Power (CHP) plants shrink system footprints, eliminate fire hazards and optimize energy efficiency. Most important, the bearings allow wider speed range, giving CHP operators more control and flexibility in meeting peak shaving requirements.

26 trains in a dozen CHP plants

SKF S2M Magnetic Bearings are operating smoothly in 26 power generation trains across a dozen CHP plants. The trains feature a 9MW gas turbine driving a variable-speed synchronous generator at 6 000 rpm; SKF S2M Magnetic Bearings levitate a 10-ton shaft-line.

Dedicated service and support worldwide

Along with more than three decades of deep industry expertise, SKF S2M Magnetic Bearings are backed by a network of dedicated field engineers serving every major oil and gas region worldwide.

Local specialists are available in:

- France
- Canada
- The United States
- Russia
- Japan
- The United Arab Emirates.



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