FAG Active Magnetic Bearing
A comprehensive system solution from one source
Global presence
Schaeffler as a solution provider

Schaeffler with its product brands INA, LuK, and FAG is a leading global provider of rolling bearing and plain bearing solutions and of linear and direct drive technology, as well as a renowned supplier to the automotive industry. With more than 80,000 employees and approximately 170 locations in 49 countries, Schaeffler has a worldwide network of manufacturing locations, research and development facilities, sales companies, engineering offices, and training centers.

Our customer proximity is one of the most important factors behind our success: We provide engineering, production, and service in the region for the region. We develop market-specific solutions with our customers and ensure that they are produced locally, and delivered just in sequence. One example is the FAG Active Magnetic Bearing.
An innovative complete system
The active magnetic bearing as a modular system

With the FAG Active Magnetic Bearing we offer a standardized complete system: The unit comprises back-up bearings, an active magnetic bearing, corresponding power electronics, and condition monitoring systems. Our modular system comprises matched magnetic bearings and back-up bearings and thus makes optimized machine designs possible. The electronic control system and power electronics allow the adjustment of parameter sets according to the machine’s operating requirements. The range of products and services from a single source is completed by specific service modules.

Further customer benefits

- Optimization of machine processes thanks to the FAG Active Magnetic Bearing's power electronics
- Virtually no speed restrictions as a result of the magnetic field, which offers a non-contact solution
- Increased performance density = increased performance with the same design envelope
- Improved total cost of ownership (TCO) and overall equipment effectiveness (OEE) due to a higher level of system reliability
Active magnetic bearing

The functional principle of the active magnetic bearing is remarkably simple: The shaft is levitated by means of regulated magnetic fields and can be made to rotate using the machine’s motor. Sensors are used to measure any deviations by the shaft from its reference position, and the electronic control system and power electronics set the necessary magnetic forces in order to ensure the stable operation of the shaft.

Back-up bearings

Every magnetic bearing support is equipped with a safety system – the back-up bearings. These serve as a support for the rotor when the magnetic bearings are switched off. They also serve as a safety mechanism for the machine, if for example, unexpected process forces occur or an interruption in the power supply leads to magnetic bearing failure.

**Active magnetic Bearing**
- Non-contact bearing support (magnetic fields)
- No mechanical frictional losses occur
- Lubricant-free operation
- Position control of the rotor in the air gap of the back-up bearing
- Air gap of 0.4 mm to 2.1 mm between magnetic bearing and rotor

**Back-up bearings**
- Safety system for active magnetic bearings in systems with shaft weights of over 9 tons
- Prevention of machine damage by safe and controlled system shutdown
- The back-up bearing can withstand several touchdowns (shaft drops)
- Fast bearing condition inspection following touchdown thanks to condition monitoring
- Customer-oriented engineering based on technical requirements
- Schaeffler’s complete solution provides FAG magnetic and back-up bearings from a single source
Electronic control system and power electronics

The use of standardized electronic control systems and power electronics that have been proven and on the market for many years allows easy integration of the active magnetic bearing signals into the machine architecture. Magnetic bearing machine operators thus receive an overall system that is optimized in every respect: The use of rolling back-up bearings, the proven electronic control systems and power electronics, and the high level of replacement parts availability reduce outlay and costs and increase performance and reliability.

Electronic control system and power electronics

- Standard hardware modules
- Individual customers’ parameter sets can be integrated in an application-specific way
- Power electronics up to 540V/150A
- User interface customized to suit the customer’s requirements
- System condition monitoring through currents and measurement of the shaft position
- Increased imbalance compensation
Worldwide service network
Schaeffler’s range of services

Expert network
As a solution provider for magnetic and back-up bearing applications, Schaeffler offers all relevant services ranging from initial operation through to electronic and mechanical monitoring, in addition to the development and manufacture of the magnetic and back-up bearing systems themselves. Schaeffler customers have a global network of experts at their disposal for this purpose.

Engineering
- Technical consultation and support
- Customer-oriented engineering based on technical requirements
- System simulation and system design
- Programming of parameter sets
- Training programs and courses
- Initial installation of magnetic bearing systems
- Remote monitoring via condition monitoring

Condition monitoring
The FAG ProCheck condition monitoring system and Schaeffler’s system behavior and analysis expertise allow statements and recommendations to be made regarding the further operation of the system. This means that downtimes are reduced and damage to bearings and machinery prevented in the event the shaft drops into the back-up bearings. Schaeffler thus offers a cost-effective complete system that is capable of fulfilling the most demanding requirements.
Possible fields of application
Applications for active magnetic bearings

Oil and gas
FAG Active Magnetic Bearings are an efficient solution for use in machines that produce, store, and transport oil and gas. Typical areas of application in this sector include compressors, expanders, and electric motors. The Schaeffler solution is characterized by sustainability; as the operation of FAG Active Magnetic Bearings is oil-free, environmental regulations are complied with, which makes them suitable for application in nature reserves. In these cases, the use of condition monitoring reduces downtimes and production stoppages.

Power Generation
The high efficiency and reliability of active magnetic bearings means that they can be found in the power generation sector, for example in: Gas and steam turbines, gas micro-turbines, ORC machines, and coolant and feed water pumps. Using FAG Active Magnetic Bearings in power plants reduces the risk of fire because oil tanks are not required to cool the bearings, which means there is no combustible mass in the hazard area of the turbine. The magnetic bearing sensors help to monitor the condition of the machine and plan the maintenance work that has to be carried out, e.g. on the turbine blades.

Further industrial applications
- Turbo generators and engines, refrigerating compressors (HVAC), and fans for water treatment applications
- Production machinery, centrifuges and separators, and inertia mass storage devices
- The use of high-speed FAG Active Magnetic Bearings allows an extremely high increase in performance density to be achieved. This in turn makes it possible to create more compact machine types, which are virtually maintenance-free due to their non-contact design.
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.

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