WAUKESHA BEARINGS

Bearing Selection Guide

DOVER PRECISION COMPONENTS

Expert Engineering. Proven Results.®

Waukesha Bearings Corporation™ is a world leader in technology, size and application experience for the rotating equipment industry. Our highly specialized hydrodynamic and magnetic bearing systems reflect expert engineering and refinement, delivering proven results for the most demanding high-performing turbomachinery.

We anticipate and assess the challenges facing our industry and continually invest in advanced technologies and research and development to best serve the needs of our customers in oil & gas, power generation, marine and industrial markets around the globe.

Our custom-engineered bearings allow for optimized performance in a broad range of rotating equipment, including gas, steam and hydro turbines, compressors, gearboxes, motors and pumping systems.

TILTING PAD THRUST BEARINGS

Tilting pad thrust bearings are available with a variety of design features including 'Directed Lubrication', engineered pivot types and offsets, pad backing material and several different styles of thrust retainers, all designed to optimize performance and meet unique requirements in turbomachinery. The CQ compact equalized and MS non-equalized bearings are of similar size and offer unprecedented choice and flexibility to machine builders.

Custom solutions are also available that offer reduced power losses, oil flows and pad temperatures, and that address industry-wide issues such as axial vibration.

For use with: pumps, motors, compressors, turbines, generators and gearboxes

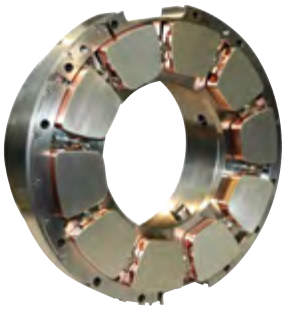
Patented brands include: Flexure Pivot® and Deflection Pad®

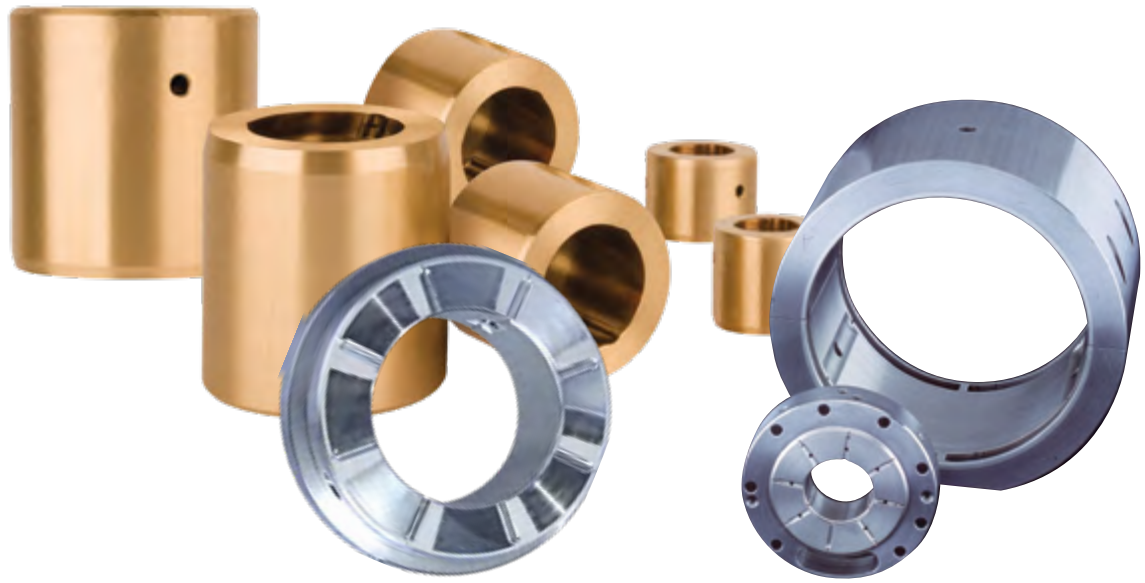
TILTING PAD JOURNAL BEARINGS

Tilting pad journal bearings are available with a broad range of design features that ensure high performance and optimal compatibility with a variety of turbomachinery. Available options include hydrostatic jacking, combined single or double acting thrust capability, spherical seats, electrical insulation and squeeze film damping, engineered by Waukesha Bearings to meet the unique challenges of every application. To achieve varying degrees of alignment capability, a wide selection of pad pivot types and pad geometries are also available.

For use with: pumps, motors, compressors, turbines, generators and gearboxes

Patented brands include: Maxalign®, ISFD®, and Flexure Pivot®





FIXED PROFILE BEARINGS

Fixed profile bearings are optimized to meet the changing demands of various applications operating at a wide range of speeds. Specially engineered designs of multi-lobe bore versions are ideal for high-speed applications. Design options include thrust load capacity on the end faces, hydrostatic jacking for use at start-up and run-down and machining for instrumentation. In addition to standard steel/whitemetal, other material combinations are readily available to meet individual customer or application requirements.

For use with: pumps, motors, compressors, turbines, generators and gearboxes

Patented brands include: ISFD® and MLSF®

HORIZONTAL BEARING ASSEMBLIES

Horizontal bearing assemblies include highly customized journal or combined journal and thrust units designed to interface with an external pressurized oil system. Expertly engineered to meet each customer's specifications, proven arrangements can be fitted with an external casing or engineered to interface with the customer's own housing. The extent of supply, including hydraulic jacking systems, can be varied to suit application requirements and customer specifications.

For use with: pumps, motors, compressors, turbines and generators

VERTICAL BEARING ASSEMBLIES

Vertical bearing assemblies are available in a wide range of sizes and include a variety of design options, including electrical insulation, hydrostatic jacking and instrumentation. Proven designs range from large, self-contained combined journal and thrust units for primary coolant pumps and motors used in nuclear power stations to small, self-contained air cooled units for LNG pumps. Air cooling has been increasingly used as it avoids the complications associated with water-filled coils and allows operation on remote sites where water may not be available.

For use with: pumps, motors and generators

POLYMER-LINED & SOLID POLYMER BEARINGS

Polymer-lined and solid polymer bearings feature proprietary bearing-grade polymers used in combination with a variety of custom-engineered mating surfaces. Polymer-lined bearings are suitable for both oil and clean product lubrication. In applications where the bearing material needs to be both chemically resistant to the clean fluid and able to support thin films, solid polymer bearings provide a high load capacity and inert solution. These engineered polymers are used on both journal and thrust bearings and provide exceptional temperature capabilities (beyond 250° C or 482° F), thin film operation, high fatigue strength, insulating properties and the ability to withstand a continuous high load.

For use with: pumps, motors, compressors and turbines

Patented brands include: Hiperax®

CERAMIC BEARINGS

Ceramic bearings can be used with virtually any liquid lubricant, making them the ideal solution for many challenging field conditions. Liquefied gas, hydrocarbon condensates and seawater are commonly used. Pads and mating sleeves or collars are matched to suit the specific application and lubricant, even if it contains abrasives. Ceramic bearings are primarily used in pumps to provide more compact, lower cost machines, saving weight, space, sealing and the expense involved with an oil lubrication system.

For use with: pumps and motors

ACTIVE MAGNETIC BEARINGS

Active magnetic bearing systems offer a proven “oil-free” solution. Energy efficient and requiring less maintenance by eliminating supporting oil systems, active magnetic bearings may be implemented to be emission-free and provide increased machine availability and uptime. Bearing systems are custom designed with controllable rotordynamics, a unique auxiliary bearing technology, remote monitoring and control, and the security of an advanced controller with proven field experience in the most challenging turbomachinery applications.

For use with: pumps, motors, compressors, turbines and generators

Product – Application Key

Pumps
Pumps are built in a wide variety of sizes and types, from nuclear primary to electric submersible. As a result they may employ the whole range of products from Waukesha Bearings, including active magnetic bearings. Pumps also utilize polymer-lined and solid polymer bearings with oil and water lubrication as well as process lubricated ceramic bearings.

Motors
Similar to pumps, motors make use of the entire range of products from Waukesha Bearings, including active magnetic bearings. This is partly due to the fact that pumps and motors are often matched together as a motor/pump set. Smaller motors, particularly in vertical submersible motor/pump sets, use polymer or ceramic bearings for load carrying capability and long life.

Generators
Depending on size and orientation, generators use the full range of Waukesha Bearings products as internal bearings or complete assemblies with a housing. Power generators tend to use the conventional material combination of whitemetal and steel backing. Hydrostatic jacking for start-up and run-down is common on larger machines.

Turbines
Depending on size, gas and steam turbines normally use tilting pad journal and thrust bearings, sometimes in combined assemblies. 'Directed Lubrication' is usually employed to minimize power losses and oil flows, and to reduce pad surface temperatures. Gas turbine thrust bearings are high-speed and high-load, often requiring the use of Cu/Cr backing material and assured pivoting mechanisms.

Compressors
Dynamic conditions of high-speed axial and centrifugal compressors often necessitate the use of tilting pad journal and thrust bearing technologies. Design features such as directed lubrication and Cr/Cu backed pad materials are key aspects for efficiency improvements. Compressors can also utilize active magnetic bearing technology for oil-free and reliable operation.

Gearboxes
Low speed shafts of gearboxes normally use fixed profile journal bearings, often with simple cylindrical bores. High-speed shafts have historically used multi-lobe fixed profile bearings, but are increasingly using tilting pad journal bearings. High-speed applications can require special material combinations and may utilize directed lubrication to reduce pad surface temperatures and improve efficiency.

INNOVATION:
ENGINEERED SOLUTIONS

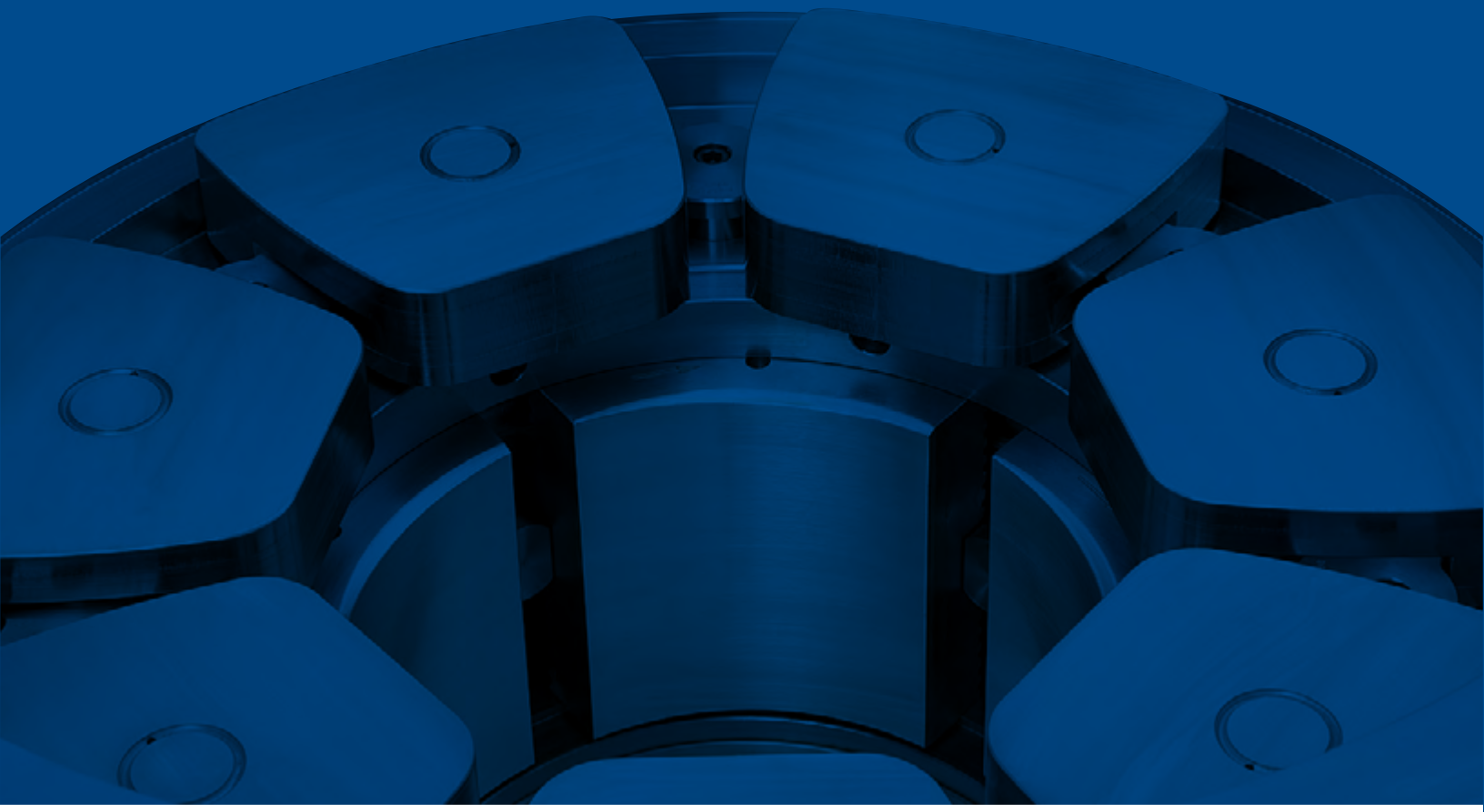
Waukesha Bearings Corporation remains unmatched in the level of knowledge and engineering expertise we consistently demonstrate on the most challenging applications. Our engineers apply a collection of patented design features and advanced materials knowledge to an already extensive range of fixed profile and tilting pad products, resulting in customized bearings that can support high-speed, high-temperature and high-load applications.

Our hydrodynamic bearing technology is considered the most extensive and advanced in the industry, and our active magnetic bearing systems offer superior performance without the need for lubrication, exceeding the demands of high-performing rotating equipment. To ensure peak performance in every application, Waukesha Bearings Corporation combines years of field experience with empirical data obtained from unmatched internal testing capabilities and external technology alliances.

The world's leading manufacturers of rotating machinery trust Waukesha Bearings to deliver proven solutions and superior technology that keeps them ahead of the competition.

GLOBAL ENGAGEMENT:
LOCALIZED SUPPORT

With locations worldwide and an increasingly global customer base, we are equipped to meet the unique challenges presented across a range of markets and applications. Manufacturing locations in the US, UK, China and Mexico allow us to serve our customers around the world. With sales and engineering locations in the US, Europe, Japan, China and Russia, customers are assured of intimate and knowledgeable support in several different languages.



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www.waukeshabearings.com | info-wb@doverprecision.com

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