HQW

BARDEN

Super Precision Bearings for Vacuum Pumps

HQW Precision GmbH
HQW Aerospace (UK) Ltd

Partners in Precision

Precision Bearings for Vacuum Pumps

HQW Aerospace (UK) Ltd designs and manufactures world-class super precision Barden bearings for customers across the globe. Working together with owner company HQW Precision GmbH as Partners in Precision, our products are recognised for their reliability and superior performance in challenging applications.

Our products are used in virtually every sector of industry where there is the need to meet critical tolerances, high speeds and optimal performance under the most demanding operating conditions.

An Industry Specialist

As specialists in this field, our reputation for excellence in vacuum pump bearing production spans many decades. We have developed precision bearings that accommodate the entire vacuum pump market and our bearings fit seamlessly in pumps from every major OEM worldwide.

The Barden super precision range is designed specifically to add value while meeting the harsh requirements of today's high performance pumps and compressors.

Barden precision vacuum pump bearings deliver:

- High temperature capability
- High speed running
- Low vibration levels
- Enhanced resistance to contamination
- A wide range of lubricants for all environments
- High reliability
- Long life and minimal maintenance

Special Design Features

Some of the value-added design features that enable Barden pump bearings to work reliably in high performance pumping applications include:

- SV30 high nitrogen steel - for optimum performance and reliability.
- High performance ceramic balls - chosen to meet performance and corrosion requirements.
- High-speed small ball technology - for improved pumping speeds.
- Shielded designs - to protect against contamination ingress and prolong lubricant life.
- Special internal design - to maximise in-application performance.
- Specially developed internal finish - for quieter running, longer life and high reliability.

Contact our specialist engineering team for more information:
info@hqw-aerospace.com

Quality, Precision, Performance

Energy Efficient Design

- Designed to reduce parasitic losses in the bearing system by optimising the bearing design and reducing friction torque.
- Increased speedability of bearings resulting in faster and more efficient running of the pump.
- High performance materials allow for increased resistance against fatigue and wear and support of higher loads.

Life & Maintenance

- Designs incorporating specialist materials, heat treatments and surface coatings allow for typical operating life of 5 years without failure.
- Turbomolecular pump bearings lubricated with grease consistently allow for 30,000+ hour life at high speeds in excess of 800,000 ndm.
- The effects of friction, corrosion and wear are addressed by the application of advanced coatings and surface treatments.

Optimised Running

- Ceramic balls can be incorporated into any Barden vacuum pump bearing, lowering operating temperature and allowing running speeds to increase by up to 50%.
- The highly smooth surface finish of ceramic balls enables vibration levels up to 7 times lower than conventional bearings.
- Precision class directly affects the efficiency and reliability of vacuum pump bearings, Barden pump bearings are classified as ISO tolerance class 4 as standard.

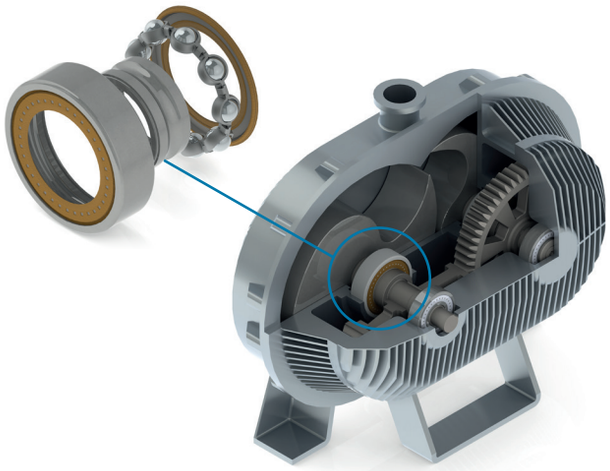
Rapid Response

We offer a fast-track system to support pump manufacturers getting their products to market competitively and in as short a time as possible. Bespoke solutions can be produced in as little as 3 weeks from receipt of order, while our standard lead time is typically just 15 weeks.

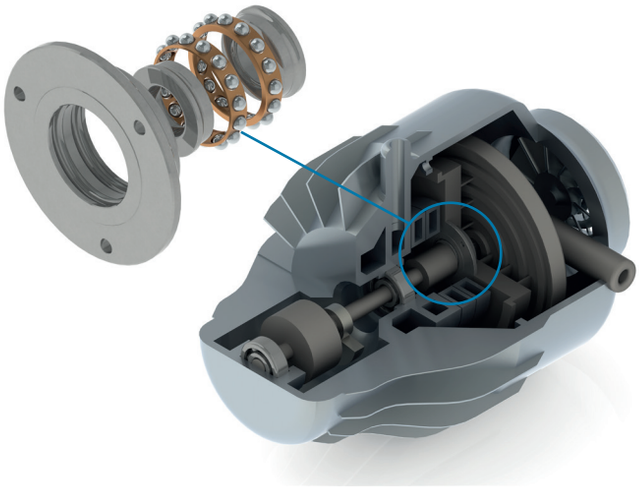
Due to the complex parameters involved in pump design, we offer full support in calculating, modelling and testing bearing systems. The flexible approach of our engineering specialists results in bearings which are fully optimised to the pump design, allowing our customers to remain at the forefront of their market.

A Bearing for Every Pump

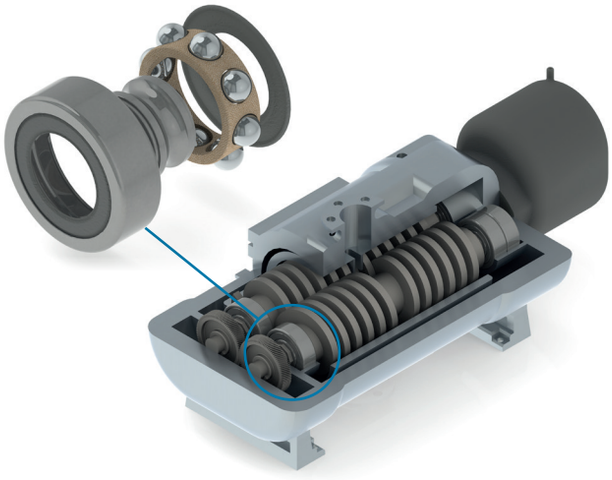
Claw Pump



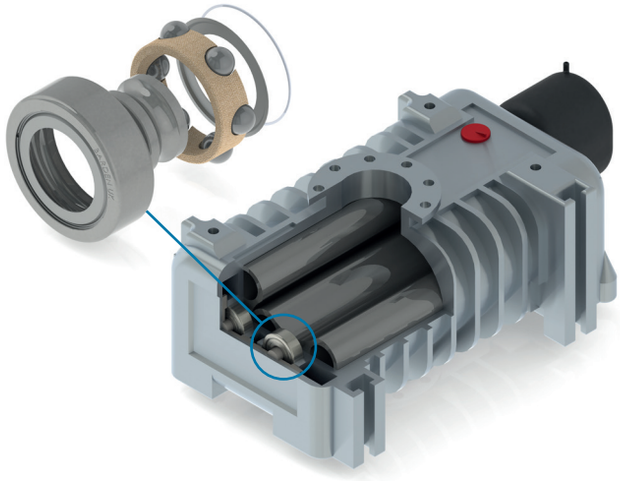
Scroll Pump



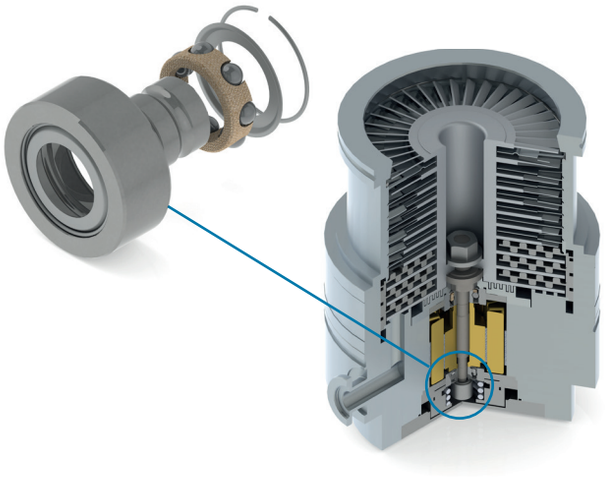
Screw Pump



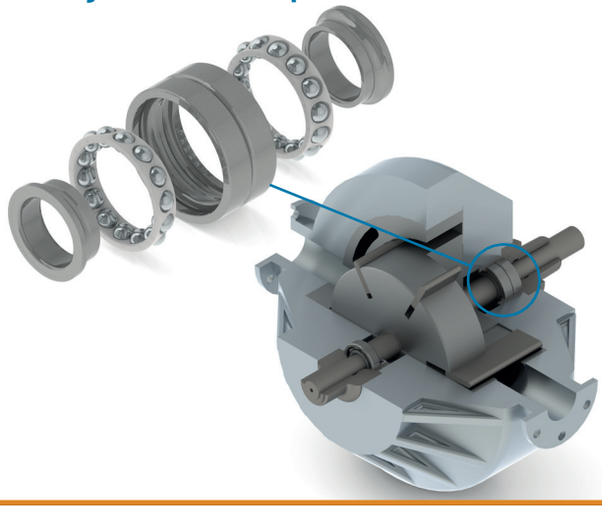
Roots Pump



Turbo Molecular Pump



Rotary Vane Pump



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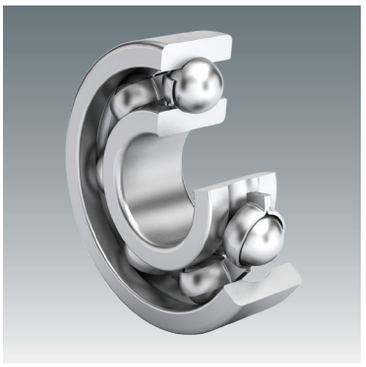
Bearing Types

Deep Groove Ball Bearings



- Open and sealed versions available.
- High-load capacity with optimised internal geometry.
- Design enhancements allow a 70% longer bearing lifetime when compared to conventional bearings.
- Reduced maintenance intervals.
- High reliability.

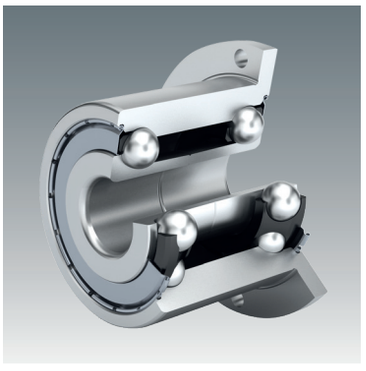
Angular Contact Ball Bearings

- High-load capacity with optimised internal geometry.
- Machined phenolic cage as standard. Other cage materials available as required.
- Minimal maintenance.
- Allows for higher operating speeds.

Double Row Angular Contact Ball Bearings (Super Duplex)

- Bearings have a greatly increased radial and axial rigidity.
- Bi-directional thrust load capacity (DF/DB).
- Ease of assembly.
- Runnout is minimised.

Customised Bearings & Special Designs



- Bearings developed to suit new or specialist vacuum pump applications.
- High performance material options, integrated design and lubrication features.
- Surface engineering processes for performance enhancement.
- Expert engineering makes unique designs or modifications to existing designs possible.

Bearings for Turbomolecular Pumps (Mechanical/Hybrid)

Turbomolecular pumps typically operate in the high to ultra high pressure region between 10^{-3} to 10^{-11} mBar, with pumping speeds of 10 to 4,000 l/s. Typically used in instrumentation, they require very low vibration and noise in operation and long lifetimes.

Barden Bearing Solution:

- Ultimate precision with highly controlled roundness and harmonic amplitudes of raceways.
- Bespoke and modular designs possible.
- Optimised surface finish, ceramic balls for high speed operation and long life.
- Special low outgassing lubrication.
- Application specific internal geometry to optimise rolling element kinematics.

Bearings for Emergency Touchdown Systems

Touchdown bearings are sometimes referred to as emergency support bearings and used to avoid catastrophic pump damage in the event of magnetic bearing failure. High acceleration speeds from static to 2.5 million n·dm (rpm x PCD) can be acheived by the bearings. Touchdown bearings ensure pump reliability and prevent costly pump damage and downtime.

Barden Bearing Solution:

- Deep groove or angular contact with full ball complement and no cage due to high acceleration.
- High performance materials; corrosion resistant SV30 for rings, solid lubrication and ceramic balls.
- High precision, controlled raceway roundness/ harmonics.
- Designed to withstand 10 hard touchdowns.

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Bearings for Rotary Vane Pumps

Rotary vane pumps reach vacuum levels of around 10^{-2} to 10^{-3} mBar and a pumping speed up to 3000m^3/hr.
Rotary vane pumps offer long term performance and low maintenance due to their wear compensating construction.

Barden Bearing Solution:

- Typically cylindrical roller bearing (CRB) and deep groove ball bearing designs.
- Manufacture from high performance materials to high precision levels.
- Excellent reliability and robust design.

Bearings for Scroll Pumps

Scroll pumps operate at approximately 10^{-2} mBar with a pumping speed between 3 and 60m^3/hr. Scroll pumps offer progressive compression with low power and constant loads.

Barden Bearing Solution:

- Typically a super duplex pair with flanged modular design and simplified assembly.
- High moment stiffness and precision geometry for parallelism of mating scroll surfaces.
- Extremely clean materials ensure long fatigue life.
- Optimised geometry for low power/torque performance.

Bearings for Screw Pumps

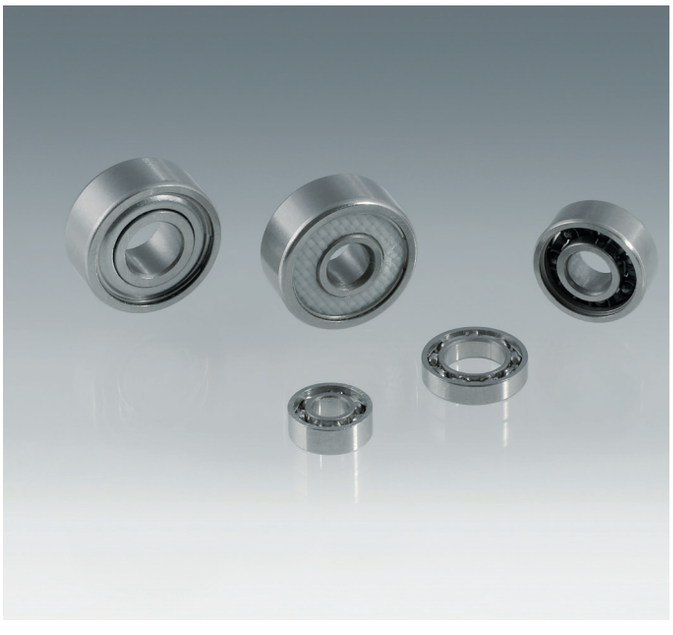
Screw pumps will reach pressures of ~10^{-4} mBar with a typical operating pressure of 10^{-2} to 10^{-3} mBar. They feature high pumping rates (therefore high loads) up to 1200m^3/hr. High reliability and low power consumption are required to ensure low operating costs and maintenance requirements.

Barden Bearing Solution:

- High precision ring geometry, rings specially prepared for stability over high temperature ranges.
- Hybrid design (steel rings, ceramic balls) offers good resistance to contamination from gears.
- Special seals and modular design to reduce part count and simplify assembly.
- Specially designed to minimise contact pressures and bearing generated temperatures.

Bearings for Roots Pumps

Roots pumps achieve impressively high pumping speeds of between 40 and 200m^3/hr, their typical operating pressure ranges between atmosphere down to the low 10^{-3} mBar region. They are often used to boost the performance of primary pumps and must therefore be highly reliable.



Barden Bearing Solution:

- Super clean materials ensure a long fatigue life.
- Ceramic balls for improved performance, low contact pressures and maximum oil film thickness.
- Single, non-contacting seal design, oil lubrication and stainless steel ribbon cage.
- Special heat treatment for rings to ensure stability over high temperature ranges.
- Special lubrication selection for extreme operating conditions.

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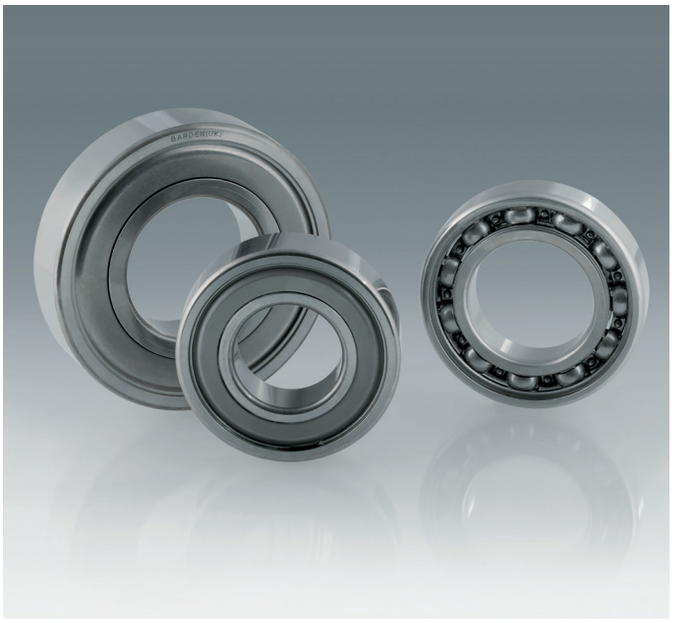
Bearings for Claw Pumps

Multiple stage claw pumps can reach vacuum levels of $1.4x10^{-3}$ mBar with pumping speeds reaching $425m^3/hr$. They are robust and efficient, with little maintenance required. This makes them especially suited to harsh environments.



Barden Bearing Solution:

- Typically deep groove configuration and radially loaded.
- Ceramic balls for optimum tribological properties.
- Specially heat-treated rings ensure stability over high temperature ranges.
- Special low outgassing lubrication.
- Internal geometry designed to minimise contact pressures and extend lifetime.

Accessories

Barden also offers supply of ancillary components, including wave springs and precision ground spacers. Additional components such as shafts and sleeves can be supplied individually or designed into bespoke products. Please contact our engineering team for more information.

Special Designs

Due to the complexity of vacuum pump bearing system designs and the harsh environmental operating conditions, bearings which are designed specifically for the pump type at an early stage of its development can offer multiple benefits. Our engineering teams will work alongside customers to develop unique designs that meet application requirements and solve functional problems, including;

- Reduction in overall system costs.
- Optimised geometry/bearing scaling to ensure low parasitic losses.
- Increased capacity design.
- Lowered maintenance requirements and machine downtime.
- Increased efficiency and reliability.
- Optimal performance and wear resistance using non-standard materials.
- System integration and optimised space/weight requirements.

Full system testing, analysis and design modification services are available and our long history of specialism in this field ensures our engineers will design and deliver the right bearing for the system.

Special features can be incorporated to reduce assembly time, lower operating costs & improve performance:

- Flanges for precision/repeatable fitting.
- Anti-rotation features to prevent the outer ring turning within the housing.
- Extra bearing width to accommodate additional grease and extend life.
- Bearing calibration for matched fits.

Contact our specialist engineering team for more information:
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Notes

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