



**The Barden Corporation**

A company of the FAG Kugelfischer Group

**FAG**

**Innovation in Motion**

**PRECISION  
TECHNOLOGY  
INSIDE**

**BARDEN SUPER PRECISION BALL BEARINGS – SPECIALITY PRODUCTS**

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SPECIALITY PRODUCTS**

**FAG Aerospace and Super Precision Bearings**



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# INTRODUCTION

## How This Catalogue Is Organised

Welcome to the world of Barden Precision Bearings.

This catalogue contains details of “Speciality Products” which are super precision bearings and assemblies for all applications except Machine Tool (see page 145 for details).

If you have a copy of an earlier Barden catalogue, you’ll notice this version is organised differently. First of all, the catalogue is divided into two primary sections:

1) Product, 2) Engineering.

The product section is organised by bearing type:

- Deep Groove Instrument (Inch)
- Deep Groove Instrument (Metric)
- Deep Groove Flanged (Inch)
- Deep Groove Thin Section (Inch)
- Deep Groove Spindle and Turbine (Metric)
- Angular Contact (Inch)
- Angular Contact (Metric)
- Special Bearings

Each series of bearings is listed by bore diameter — from the smallest to the largest.

Another key change to this catalogue is that data on limiting speeds, static capacity and basic dynamic load ratings has been moved to the appropriate product page, alongside bearing dimensions and nomenclature.

Additional relevant data (e.g. on seal and cage options, etc.) can also now be found in the appropriate product sections, instead of appearing in the general engineering reference section, as before.

The engineering section also has been reorganised. Much of the specific bearing operating data, as mentioned, can now be found in the appropriate product section. New material has also been added to the engineering section, particularly on handling and mounting procedures.

Also note that this catalogue has two fold-out pages at the beginning of the Deep Groove and Angular Contact product sections. Each fold-out page contains detailed descriptions of appropriate bearing nomenclature.

These changes improve the usefulness of our primary product catalogue. Finding the right Barden Precision Bearing is now easier than ever.

Finally, we would welcome any comments or suggestions you may have regarding our new format.

And, as always, thank you for choosing Barden.



*Barden Super Precision Bearing plant located in Plymouth, Devon, U.K.*



*Barden Super Precision Bearing plant in Danbury, Connecticut, U.S.A.*



*Winsted Precision Ball plant in Winsted, Connecticut, U.S.A.*

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The data, specifications and characteristics in this catalogue were developed using sound testing and engineering techniques and are believed to be accurate. Every attempt has been made to preclude errors. However, use of this information is the customer's responsibility. The Barden Corporation's sole responsibility or liability is contained in the Warranty statement at the end of this catalogue.

## CAPABILITIES

Quality and reliability...every time.



### **Barden's Commitment to Excellence**

The Barden Corporation was originally founded to make ball bearings of exceptional quality requiring rotational precision and tolerance control beyond the scope of technology then available. Today, over fifty years later, Barden continues to meet the challenge of manufacturing to super-precise/super-critical levels, and is recognised as an industry leader in this achievement. Excellence in manufacturing remains our guiding principle.

Barden produces thousands of bearing types, sizes and designs for a wide range of precision applications serving narrow — but highly demanding — market segments, like spindle and turbine bearings for industrial machinery and aircraft accessories, as well as instrument bearings for medical applications and gyroscopes.

Barden's goal remains not only to provide the highest quality, most precise bearings that can be made, but to enable our customers to compete more successfully in the markets they serve.

Regardless of design, all Barden bearings share one thing in common: they adhere to the highest standards possible, with tolerances measured in nanometers.

### **International Recognition**

The Barden name — long synonymous with quality, precision and excellence — is known and respected in virtually every industrialised nation, including the Far East.

In 1991, Barden became part of FAG Kugelfischer Georg Schaefer AG and now forms the nucleus of its Business Unit — Precision Bearings. Also included in this division are Barden U.K. and Winsted Precision Ball, together with facilities in Stratford, Canada and Schweinfurt, Germany.

Barden's customers are served primarily by a staff of Barden Sales Engineers. The replacement market is served by approximately 1,000 distributor outlets. Both are supplemented by a network of agents and distributors throughout the world.

With this global distribution system, Barden can provide bearings of identical quality at any point of need. Customers include multinational companies that buy Barden bearings in more than one country.

### **Barden Products**

The Barden product line encompasses predominantly radial, single row, super precision angular contact (separable and non-separable) and deep groove ball bearings. Ball bearings are made to exacting ABEC-7 and ABEC-9 specifications, standards which Barden routinely exceeds.

Barden super precision bearings come in inch or metric dimensions with diameters ranging from 4mm (5/32") O.D. up to 300mm (11½") O.D. A variety of seals, shields and metallic/nonmetallic cage designs are available to satisfy most requirements. Many Barden bearings operate comfortably at speeds ranging to 2.0 million dN (bore in mm × RPM), or above.



## CAPABILITIES

### Quality and reliability...every time.

#### Precision Classes

Precision ball bearings are manufactured to tolerance standards set by the Annular Bearing Engineers Committee (ABEC) of the American Bearing Manufacturers Association (ABMA). These standards have been accepted by the American National Standards Institute (ANSI) and conform essentially with equivalent standards of the International Organisation for Standardisation (ISO).

ABEC standards define tolerances for several major bearing dimensions and characteristics. They are divided into envelope dimensions (bore, O.D. and width) and bearing geometry. General-purpose, large deep groove and angular contact “spindle and turbine” ball bearings are manufactured to precision classes ABEC 1, ABEC 3, ABEC 5, ABEC 7 and ABEC 9 (ISO P0, P6, P5, P4 and P2). All Barden bearings of these types meet or exceed ABEC 7 geometric standards. Bores and O.D.’s may be calibrated for greater mounting flexibility. Barden deep groove spindle bearings meet or exceed ABEC 7.

Instrument bearings are produced in comparable classes, with added refinements designated by suffixes: ABEC 3P (ISO P6), ABEC 5P (ISO P5A), ABEC 7P (ISO P4A) and ABEC 9P (ISO P2). Barden bearings in this category are made to ABEC 7P (ISO P4A) or better.

Barden thin section “torque tube” bearings are manufactured to either ABEC 5T or ABEC 7T, according to requirements.

#### Going Beyond ABEC Standards

While ABEC classes are very helpful in categorising precision, they are not all-inclusive. At Barden, we are concerned about total bearing quality and “fitness for use” in critical applications. We often maintain closer tolerances than specified and we address many factors affecting bearing performance and life that are not covered by ABEC standards.

ABEC criteria, for example, do not include functional testing of assembled bearings, yet this measure can be extremely important. Barden applies self-established standards, using a number of proprietary tests and measuring equipment to ensure that we deliver



*Barden precision bearings are manufactured to ABEC 7 and ABEC 9 tolerances and are available in sizes ranging from 4mm (5/32") O.D. to 300mm (11 1/2") O.D.*

quiet, smooth-running bearings that will perform exceptionally well.

Bearing design is also not included in ABEC standards, but it too can make the difference between success and failure in bearing use. Barden design criteria are based on knowledge of all the factors which are significant for individual applications.

Thus, a Barden bearing may have specific low torque characteristics for a gyro gimbal, extra stiffness for textile spindle, or extremely high reliability for an aerospace accessory application.

Because ball quality affects the ability of a bearing to run smoothly, Barden uses both steel and ceramic balls produced to its own exacting specifications for ball geometry, finish and size control. Winsted Precision Ball supplies Barden with both steel and ceramic balls.

## **CAPABILITIES**

### **Quality and reliability...every time.**

#### **Sizes**

Barden bearings are supplied in both inch and metric dimensions. They are categorised as either miniature and instrument or spindle/turbine. This distinction is primarily size-related but is sometimes application-related.

#### **Configurations**

Barden manufactures deep groove and angular contact (separable and non-separable) bearings, some of which are available with flanged outer rings.

Flanged bearings are especially useful in through-bored housings. The inboard side of the flange provides an accurate positioning surface for bearing alignment, eliminating a need for housing shoulders or shoulder rings.

Extra wide, or cartridge width, deep groove bearings are available in Series 9000 for applications requiring extended operation without relubrication. Series 9000 bearings have more interior free volume and therefore hold more grease.

All Barden bearings can be equipped with ceramic balls for increased speedability, or improved lubricant life in extreme applications or hostile environments. Considerable experience has now been established in most theatres of bearing application, and the considerable benefits are now well proven.

Most Barden bearings are available with a variety of cage and closure options.

# CAPABILITIES

## Applications

Many now-standard bearings featured in this catalogue were once considered “special,” since they offered users something new in precision, size or configuration. At any given time, Barden has dozens of such new designs and developments being used very successfully in limited quantities. Current examples of Barden bearing applications include:

- Turbo molecular pumps
- Jet engine starters
- Auxiliary aircraft equipment
- Gyroscopes for marine & aerospace applications
- X-Ray tubes
- Dental
- Formula 1
- Canning



*Barden precision miniature and instrument bearings are an integral part of dental drill design, where high speeds, reliable performance and low maintenance are critical.*



*The precision bearings found in CAT scanner X-ray tubes use a special Barden bearing design which must operate in a vacuum under boundary lubrication conditions.*



*Commercial aviation applications include a wide variety of aircraft accessories and critical components, and comprise a large percentage of Barden's core business.*



*Vacuum pumps place severe demands on precision bearings which must operate reliably under extreme conditions and meet long life requirements.*

Photo courtesy of Barden's High Vacuum Products.



Photo courtesy of NASA

*The Barden super precision bearings used in the International Space Station must meet stringent performance requirements with minimal lubrication.*

## CAPABILITIES

### Quality Control

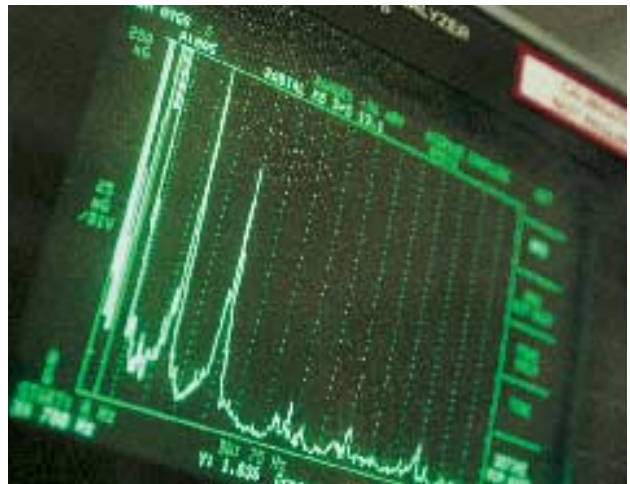
#### Quality Control

Barden facilities are ISO 9001 certified. The quality control systems used at Barden U.S. comply fully with MIL-I-45208, Inspection System Requirements; MIL-H-6875, Heat Treat Procedures and ISO 10012-1, Quality Assurance Requirements for Measuring Equipment (formerly MIL-STD-45662). Barden U.S. is also certified by The National Aerospace and Defense Contractors Accreditation Program (NADCAP) for our non-destructive testing processes and is an approved supplier for the Federal Aviation Administration. Barden U.K. is similarly an approved supplier for the U.K. Civil Aviation Authority. These controls are coupled with a planned flexibility which enables Barden to comply with specific requirements of individual customers through a system of quality levels, inspections levels and certification of our product.

Quality is built into all Barden products. This thinking is applied to every aspect of manufacturing, from raw materials to packaged assembled bearings.

Through the use of Statistical Process Control, the Quality Engineering staff determines and monitors process capabilities to assure that process tolerances can be maintained. In-process machine control is facilitated using precontrol. These statistical methods are employed as production tools to gain better and more consistent quality.

The inspection department is the operating arm of our quality control process. Each lot of parts or assembled bearings must conform to quality requirements before being allowed to move to the next operation. Rather than delay inspection until operations have been completed, Barden's operators are certified through rigorous training and auditing to perform inspection operations during the manufacturing process. Our "Certified Supplier" programme ensures that our suppliers are top notch, consistently supplying us with acceptable product.



*Functional testing — like this vibration analysis — is a critical and on-going part of Barden's quality control program.*

The Metrology Department of Barden's quality control organisation provides basic standards of reference, using many advanced types of instrumentation. All linear measurements are certified to The National Institute of Standards and Technology.

Our Metallurgical and Chemical Laboratories are the surveillance unit for all incoming bearing steel, lubricants, cage material and other supplies. These laboratories work closely with other laboratories, universities and manufacturers to develop the highest quality parts, new bearing cleaning equipment, and the most advanced heat treating systems.



## **CAPABILITIES**

### **Product Engineering**

#### **Product Engineering**

Barden Product Engineering services are available to all customers and prospective users of Barden precision bearings. Our engineers and technicians have capabilities in every area of bearing design, application, testing and development. When bearing performance involving torque, vibration or stiffness is an issue, they can perform computer analysis of characteristics and requirements in order to determine a suitable bearing design.

If standard catalogue bearings lack the necessary characteristics for a particular application, our Product Engineering Department can design a special bearing to satisfy your need.

With over 50 years of specialisation in the field of precision ball bearings, Barden engineers can draw upon a wealth of technical information to aid in failure analysis or troubleshooting of performance problems. They can readily identify the contributing causes and recommend solutions to improve bearing performance or useful life.

Our Product Development Laboratories conduct special investigations into new materials, coatings, lubricants and bearing designs. These laboratories are the center for Barden's work on unusual bearing problems, special environmental testing and vibration analysis. Endurance and reliability testing is also performed here.

If you have a particular problem that you would like Barden's engineers to review, please contact your Barden Sales or Application Engineer, or an Authorised Barden Distributor.