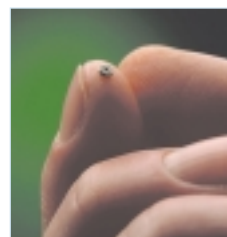


worldwide quality for a wide range of applications

the challenge continues...



From aircraft and missile guidance systems to computer disk drives and rotary encoder applications, Timken Super Precision is leading

the way in technology with its super-precision and miniature bearings. Timken Super Precision can also be found in jet engines, satellites, X-ray tubes and other high technology applications. This Timken Company subsidiary has the capability to produce any standard or advanced design ball bearing. Timken Super Precision designs and manufacturers custom integral assemblies and precision components to specific customer applications. As an ISO 9001 certified company, Timken is positioned to provide customers worldwide with quality products for a wide range of applications.

#### AEROSPACE

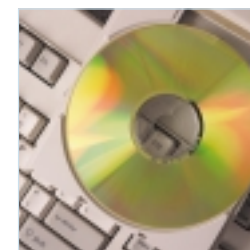
For more than 50 years, aircraft performance has relied upon Timken bearings. These bearings play a critical role in inertial navigation, cockpit instrumentation, engines, night vision systems, radar accessories, actuators, fuel controls, pumps and valves. Missile and ordnance applications include accelerometers, seeker subsystems, actuators and safe/arm devices.

Our standard or custom bearings are engineered to the highest performance levels possible. Satellites, launch vehicles, planes, rotocraft and strategic and tactical missiles all utilize Timken bearings.

#### MEDICAL/DENTAL

Timken bearing applications can be found in X-ray tubes, surgical devices and dental handpieces that operate up to 500,000 revolutions per minute.

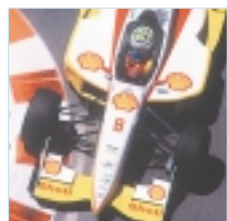
Like dental handpieces, X-ray tubes have their own challenges, such as operating in a vacuum at high temperatures resulting in a harsh environment for bearings. We're working with powdered metals, coatings and solid lubricants to extend the life and improve performance of X-ray tubes.



Performance, quality and reliability.

#### COMPUTER/PERIPHERAL

Performance, quality and reliability are all essential components in computer disk drives. Our bearings and assemblies deliver solutions to the relentless demands of the computer industry as it drives towards further miniaturization and increased capacity. From disk drives to laptops, evolving disk-drive and spindle technology has required improved precision at every turn.



#### INDUSTRIAL/SPECIALTY

From the world's foremost encoder manufacturers to championship auto racing teams using high speed turbochargers, Timken has

Challenging applications.

the engineering and machining capabilities that meet the most stringent demands. These are applications requiring new generations of high precision ball bearings utilizing the latest in high-tech materials to meet challenging applications.

The challenge, however, does not end with the development of these new products. It continues with the development of new techniques to manufacture products to even higher standards, requiring investment in processes, facilities, and staffing to provide for the ever-changing future needs of customers.

**Timken Super Precision**  
Precision Park  
Keene, New Hampshire 03431 USA  
Tel: 603-352-0310 Fax: 603-355-4553  
Visit our Web site at [www.timken.com/tasp](http://www.timken.com/tasp)

**Timken Super Precision Singapore**  
Tel: (65) 6841-4380

**Timken Super Precision Europa BV**  
Tel: (31) (0) 227-542344

#### PRODUCTS:

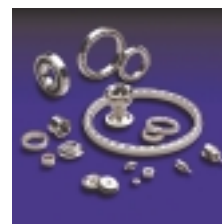
- ▶ Super-Precision Ball Bearings
- ▶ Miniature Bearings
- ▶ Integral Assemblies
- ▶ Precision Components

#### SIZE RANGE:

- ▶ Miniature and Instrument Bearings: .059" OD to 1.25" OD
- ▶ Thin Section Bearings: .625" OD to 6.0" OD
- ▶ Torque Tube Bearings: Up to 3.875" OD
- ▶ Airframe Bearings: Up to 4.250" OD

#### TYPICAL APPLICATIONS:

- ▶ Computer Hard Disk Drives
- ▶ Precision Encoders
- ▶ Aircraft Engines, Gearbox and Accessories
- ▶ Gyros and Gimbals
- ▶ Satellites
- ▶ Missiles
- ▶ X-ray Tubes
- ▶ Dental Handpieces
- ▶ Automotive Turbochargers



# TIMKEN®

TECHNOLOGIES  
AND CAPABILITIES



Timken Super Precision  
A TIMKEN COMPANY SUBSIDIARY

**Ideas in Motion**

Timken® is the registered trademark of  
The Timken Company.  
[www.timken.com/tsp](http://www.timken.com/tsp)

© 2002 The Timken Company  
Printed in the U.S.A.  
5M-06-02-19 Order No. 5901

# TIMKEN

WORLDWIDE LEADER IN BEARINGS AND STEEL



leading the way in technology and commitment

## WE WELCOME THE CHALLENGE...

Solving bearing problems has never been easy; as a matter of fact it's a challenge. At Timken Super Precision, we raise that challenge by tackling the toughest bearing applications, from artificial hearts to the space shuttle. Our bearings meet some of the highest standards and the harshest environments in the world, including the weightlessness of outer space, the cleanliness of a semiconductor clean room, and even the inner cavities of the human mouth.

Whether you need high performance bearings in a non-standard size, or simply a bearing that can survive in a hostile environment, Timken Super Precision has the experience to formulate the right combination of technical elements to provide the optimal solution.

Our approach combines our design and technical capabilities with a diversity of materials, coatings, and lubricants. No other precision bearing manufacturer can match our experience with such a diverse offering of materials, lubricants, coatings, services, and design innovations. At Timken Super Precision, we welcome the challenge of providing you with custom bearing solutions to meet your exact requirements.

extensively experienced



Our approach combines our design and technical capabilities with a diversity of materials, coatings, and lubricants.

## MATERIALS

Material selection is key to bearing performance. Ring, retainer and ball selections are based on performance requirements and environmental factors.

- Traditional ring materials are 52100 chrome steel and 440C stainless steel. Also available are M50, BG42®, 440 N-DUR®, CPM® Rex20®, BeCu, Stellites®, Hastelloys®, and ceramics.
- Retainers are available in a range of metallic, polymer and composite materials. Torque, lubrication retention and ball separation are the primary selection considerations, and these are matched to the requirements of each specific application.
- Balls are normally the same material as the rings. However, ceramic or TiC-coated balls are available for performance enhancement.

In addition to basic bearing materials, we work with many materials that interface with the bearings – titanium, aluminum, magnesium, Kovar® and Inconel. We have extensive experience with the turning, grinding, milling and heat-treating processes required for this diverse range of materials.

## LUBRICATION

Lubrication is an essential ingredient for maximum bearing performance and service life. In many instrument bearings, it is the most critical feature of the bearing's design. In optimizing performance, we draw from more than 600 different lubricants. Most of these lubricants are super-clean and micro-filtered. The application of the lubricant also may involve precision metering and multi-stage processes.

## COATINGS

Coatings take many forms:

- Thin hard films are generally applied to prevent or reduce wear. Titanium carbide coated balls have proven successful in marginal lubrication environments for instrument bearings.
- Corrosion protection coatings such as cadmium, zinc-nickel and thin dense chrome, commonly applied by electroplating, offer proven benefits.
- Dry film lubricant such as silver, lead, molybdenum disulfide, tungsten disulfide or graphite, may be applied in varying thicknesses and controlled for your application's needs.

In addition to a wide range of coatings with proven performance, Timken Super Precision has an active program for the development of even better compounds to meet the increasing demands of hostile environments.

## TESTING AND SUPPORT

Timken Super Precision's standards for manufacturing excellence have driven the technology behind our bearing instrumentation. Instruments developed by Timken Super Precision are used worldwide to achieve high standards of bearing quality and precision.

Whether your testing requirements include bearing torque, geometry, cleanliness and bearing performance, or specific tests such as evaluating and documenting performance, Timken Super Precision is your ball bearing instrumentation source.



Test instrument development.

our commitment to the challenge

Timken Super Precision provides the engineering support necessary to modify testers with custom designed tooling, software, and design. An individual design consultation focuses on the proper use of the instrumentation for your particular application. Timken Super Precision stocks spare parts for your bearing instrumentation. Printer paper, transducers, microphones, and tooling are all available for order.

## SERVICES

Timken Super Precision can also apply our extensive capabilities to provide contract engineering services. We regularly conduct research and development programs, either at our New Hampshire facilities, or in conjunction with the network of Timken Research facilities located throughout the world.

Bearing handling seminars, on-site training, and design guidelines are some of the services Timken Super Precision provides through our field sales engineers and product engineers.

Whatever your needs, we have the experience and staffing to provide you with innovative bearing solutions.

## DESIGN INNOVATION

Design innovation starts with understanding your needs. Our engineers apply the experience gained through solving a wide variety of problems to create an optimum solution.

Frequently, the performance of a precision assembly can be achieved only by reducing the tolerance stack-up with integral design concepts, or by grinding the races directly on the

shaft or housing. This might involve flanges, threads, double-row components or a combination thereof. Knowing when to apply these features, drawing from the matrix of possibilities, comes from years of experience.

## BEYOND BEARINGS

The starting point for many applications is the wide range of standard catalog bearings in inch and metric dimensions:

- Miniature & instrument bearings: 0.059" – 1.125" OD.
- Thrust bearings: up to 6.00" OD.
- Thin section ball bearings: 0.625" – 6.00" OD.

These may be offered in a variety of standard configurations, to ABEC9 standards, or customized to meet the specific application's needs.

But we don't stop with the bearings, we consider the assembly as well, and can work with you to minimize assembly yield concerns in your facility. Where component coding is required for system accuracy, we can match bearing and component codes for more efficient yields. Combine that with our ability to machine a wide variety of materials - titanium, aluminum, magnesium, Kovar® and Inconel – and we can provide the next-level assembly solution for you, or just the components machined to extreme precision. Innovative solutions.

