TIMKEN

Timken® Precision Tapered Roller Bearings

Superior Accuracy for Industrial Applications

Precision bearings: superior accuracy & control

Some applications demand a high level of precision that cannot be achieved with standard tapered roller bearings. This includes many machining, printing press and rolling mill applications where combinations of tight tolerances, high speeds and radial and thrust loads are present. For more than 50 years, The Timken Company has offered a wide array of precision-class tapered roller bearings that deliver superior accuracy and control in critical applications.

Standard vs. Precision: Making the Right Choice

Although standard product is sometimes used as a substitute for precision class, there are many inherent design characteristics that uniquely qualify precision tapered roller bearings for manufacturing and machining operations. In particular, precision tapered roller bearings feature:

- tighter manufacturing specifications resulting in greater rotational accuracy;
- reduced tolerances on bore and outside diameter creating improved performance in high speed, high temperature applications;
- straight race and/or roller profile designs (versus crowned profile designs) for increased accuracy and rigidity;
- controlled machining and assembly processes to ensure that components are matched properly and exact specifications are met;
- high load-carrying capability compared to other bearing types so that fatigue life is enhanced;
- the ability to be adjusted during installation so that operating torque, shaft rigidity and operating temperature can be precisely controlled.

Making the right choice between standard and precision class product is an important decision. Equally important is making sure the

company that manufactures precision tapered roller bearings has the processes in place to produce reliable bearings on a consistent basis.

About Timken® Precision Tapered Roller Bearings

To provide high-level precision, Timken offers a full line of precision tapered roller bearings up to 13 inches outside diameter (33 cm). These bearings can be made with accuracy equivalent to the width of a human hair split 600 times. Timken® precision bearings offer extreme rotational accuracy combined with inherent stiffness and high load-carrying properties.

Our precision tapered roller bearings are found wherever spindle, roll or cutting edge run-out and accuracy are essential. Typical applications include machine tools, printing presses, back-up rolls, optical grinders, profile cutters, indexing tables and many others.

Different Levels of Precision Meet Critical Needs

The more demanding the precision objective, the more accurate the bearing must be. Timken provides four precision classes, in both metric and inch systems, that cover the full range of precision application requirements. In ascending order of accuracy, they are identified in the metric system as Class C, B, A and AA, while in the inch system as Class 3, 0, 00 and 000.

The chart below summarizes the accuracy of Timken precision bearings as compared to standard bearings. All Timken precision bearings have an electrolyte acid dot etched on both faces of each cone and cup. This dot indicates the high point of the cone and cup run-out, respectively, and is used when mounting to obtain the best performance.

Timken Bearing Class Tolerance Range Example*

Data is for a 4.0000" cone bore and a 6.0000" cup OD.

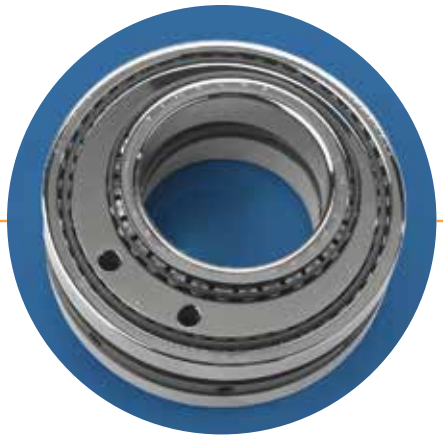
	Standard		Precision				
Imperial Bearing Precision Class	4	2	3	0	00	000	
Assembly Radial Run-Out	0.002 51	0.0015 38	0.0003 8	0.00015 4	0.000075 2	0.00004 1	inch micron = 0.001 mm
Cone Bore Tolerance	0.001 25	0.001 25	0.0005 13	0.0005 13	0.0003 8	0.0003 8	inch micron = 0.001 mm
Cup OD Tolerance Range	0.001 25	0.001 25	0.0005 13	0.0005 13	0.0003 8	0.0003 8	inch micron = 0.001 mm
High Point of Radial Run-Out	NO	NO	YES	YES	YES	YES	
Roller Crown	YES	YES	NO	NO	NO	NO	

Data is for a 100.000 mm cone bore and a 150.000 mm cup OD.

	Standard		Precision				
Metric Bearing Precision Class	K	N	C	B	A	AA	
Assembly Radial Run-Out	40 0.0016	40 0.0016	7 0.0003	4 0.0002	1.9 0.00007	1 0.00004	micron = 0.001 mm inch
Cone Bore Tolerance Range	-20 -0.0008	-20 -0.0008	-15 -0.0006	-10 -0.0004	-8 -0.0003	-8 -0.0003	micron = 0.001 mm inch
Cup OD Tolerance Range	-20 -0.0008	-20 -0.0008	-15 -0.0006	-10 -0.0004	-8 -0.0003	-8 -0.0003	micron = 0.001 mm inch
High Point of Radial Run-Out	NO	NO	YES	YES	YES	YES	
Roller Crown	YES	YES	NO	NO	NO	NO	

*Tolerance ranges vary with the size of the product.

Precision in every step of production



Dedicated Manufacturing Facility

Precision must be incorporated into a bearing's design and manufacturing processes. It cannot be replicated after a standard bearing is made.

That is why Timken has invested in a manufacturing facility dedicated exclusively to the production of precision class bearings. Located in New Philadelphia, Ohio, this ISO 9002 certified plant is temperature and humidity controlled and equipped with state-of-the-art machinery. In addition, our highly qualified and trained associates implement cell-manufacturing techniques to ensure world-class precision in every step of the process.

Timken Precision Bearings for Machine Tool Applications

Machine tool builders must respond to customer demands for accuracy and quality, while reducing downtime and increasing productivity. Timken precision bearings offer machine tool builders an economical solution that meets or exceeds most application needs for rotational accuracy, consistency and rigidity. Many of our precision bearings are also designed to meet the high-speed, low-heat demands of the machine, enabling non-synchronous run-outs below .00040 inch (<1 um). This capability, also known as non-repetitive run-out, increases the accuracy, repeatability and resolution of the machine.

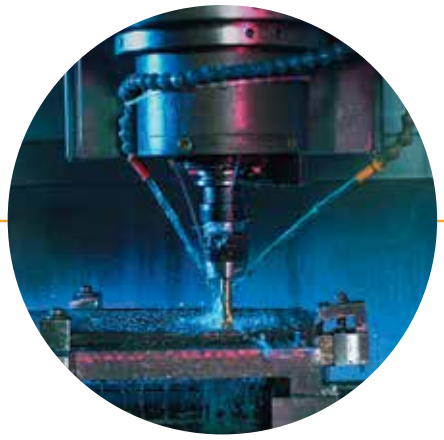
The following special bearings are only available in precision classes:

HydraRib™ Bearing

The Timken® HydraRibTM bearing is a tapered roller design available in any class of precision to maintain optimum spindle system preload. The HydraRib has a floating outer race rib, positioned by hydraulic or pneumatic pressure, and is in contact with the large roller ends, instead of the usual fixed inner race rib. This retains system stiffness while allowing for thermal expansion. The HydraRib bearing's floating rib design allows it to compensate for thermal growth variations, while maintaining the optimum setting and accuracy for a variety of speeds and loads.

SpringRib™ Bearing

The SpringRib™ bearing is similar to the HydraRib except the bearing



preload is maintained by springs rather than hydraulic pressure. It is ideal for applications where load and speed conditions are relatively constant, such as a transfer line spindle. Three different spring pack pre-loads are available: light, medium and heavy.

Crossed Roller Bearing-TXR

Timken precision crossed roller bearings (TXR) are designed to offer the highest levels of rotational accuracy and rigidity, while conserving space and saving material costs.

The bearing features two sets of races and rollers brought together at right angles, with alternate rollers facing in opposite directions. This allows two half rows of rollers to fit into the space of one. The steep-angle, tapered geometry results in a total effective bearing spread much greater than the width of the bearing itself.

Able to withstand high overturning moments, the crossed roller bearing is ideal for the table bearing of machine tools, including vertical boring and grinding machines. It is also uniquely suited to many other pivot and pedestal applications where space is limited or the lowest possible center of gravity of a rotating mass is required.

Single Row with Axial Oil Provision-TSMA

The single-row bearing with a special provision for lubrication (TSMA) ensures adequate lubrication at high speeds at the important roller-rib contact area. Oil is captured in a manifold attached to the inner race and is then directed to the roller-rib contact area through holes drilled axially in the inner race. The TSMA bearing is used on machine tool spindles.

Single Row with Radial Oil Provision-TSMR

The TSMR type single-row bearing also has a special provision for lubrication of the critical roller-rib contact area in high-speed applications. With this bearing design, the oil is directed to the rib-roller contact area through holes drilled radially into the inner race. This ensures proper lubrication at high speeds – and enhances bearing fatigue life.

Increased Productivity for Rolling Mills

The performance of roll neck bearings affects not only the quality of rolled steel or aluminum, but also a mill's profitability. Using precision bearings may help meet your customer's demands for increased productivity, while reducing costs and material waste. Precision bearings – applied to the back-up roll – help ensure strip uniformity by minimizing variations in thickness along the strip's length. For applications where the aesthetic appeal of the strip is important, precision bearings help improve gage accuracy, resulting in a smoother and less wavy finish.

Timken provides several precision bearings for rolling mill operations. This includes the non-adjustable, heavy duty, double outer race

bearing (TNASWH). This type of bearing is similar to a two-row, non-adjustable bearing (TNA), but the cup is made with a self-supporting, heavy wall section. Like TNA bearings, the cones of TNASWH bearings are non-adjustable, so that the front faces of the cones are in contact. Because they are pre-set, this saves assembly time. The heavy outer rings of the TNASWH are self-supporting for heavy-duty applications. This type of bearing also allows oil lubrication from the shaft.

Four-row bearings combine the inherent high-load, radial/thrust capacity and direct/indirect mounting variables of tapered roller bearings into assemblies that provide maximum

Precision bearings: performance & productivity

load rating in a minimum space.

For low- and medium-speed rolling mills, a four-row, straight bore assembly with cone face lubrication slots (TQOW) precision bearing is often used. TQOW assemblies have slots in the front faces of the cones to provide critical lubrication between the cone bore and roll neck. For high-speed applications, four-row, tapered bore assembly (TQITS) is the ideal choice. This type of bearing allows the operator to minimize roll body run-out. The tapered bore on the TQITS bearing allows a tight fit on the roll neck, which further increases its precision capabilities.

High-Quality Performance for Printing Presses

Today's print shops must respond to customer demands for high-quality, fast, cost-effective printing by using presses that are not only extremely accurate and reliable, but capable of high levels of productivity. The performance of any printing press is directly impacted by the bearings that support the print cylinders, drives and ancillary equipment. Precision tapered roller bearings help to ensure precise alignment of the printing rolls so that print quality is achieved, run after run.

Timken Products and Services for Precision Applications

In addition to our precision tapered roller bearing line, Timken offers several other programs to reduce downtime and keep your machinery running smoothly, day after day, year after year. Through our network of Timken authorized distributors, we help meet your needs for related components, repair and replacement products in a timely, efficient manner.

Timken Lubricants

Ideal for machining and printing press applications-among others, Timken offers the G-Power and M-Power single-point lubricators. These devices dispense precise amounts of grease into your equipment, resulting in time and cost savings over manual lubrication practices.

Timken also offers several lines of lubricants that not only outperform other lubricants in industry-recognized tests, but offer tremendous value to our customers.

For example, Timken premium mill grease, a calcium sulfonate complex grease, is specifically formulated to provide superior protection in steel and aluminum mills where intense operating conditions exist. It is ideal for anti-friction bearings as well as roll necks, drive shafts, vertical edgers, liners and most other mill applications requiring grease.

Integrated Packages

Leveraging Timken's vast knowledge of bearings and our research and design capabilities, we can package individual components into a complete bearing housing. This integrated assembly provides you with the bearing, housing, seals and pre-lubrication – all from a single source. You'll be able to reduce your supplier base while saving on design and assembly time.

Bearing Repair

Harsh environments and high speeds are tough on bearings. That's why Timken offers bearing repair services. Our Timken Industrial Services team repairs all sizes, types and brands, often for a fraction of the cost of new bearings. Our repair process includes precision grinding, installing new or remanufactured components, complete wear pattern analysis, and a one-year limited warranty.

Timken Express Services

The speed of business today requires all participants in the supply chain to deliver products cost effectively and efficiently. However, in some cases, emergencies arise where product must be expedited so that equipment can quickly return to full operation. To address those urgent needs, Timken offers Timken Express Services, our expedited bearing delivery program.

Precision Express

One of Timken's many express services is Precision Express, our short lead-time solution for Timken precision bearings. Through Precision Express, customers may choose to receive precision bearings in one, three or six weeks.

Precision To Go℠

To satisfy immediate requests for precision bearings, Timken offers the Precision To Go program. Our stocking analysis has identified 1,000 precision part numbers that are inventoried and readily available from our network of regional service centers.

Our Commitment to Quality

If a product is marked with the Timken name, you can be sure that it meets Timken's own stringent performance standards. Timken precision tapered roller bearings are made from case-carburized steel to provide tough, shock-resistant cores and hard, wear-resistant surfaces. Additionally, when you buy from Timken, you also receive a wealth of engineering and technical support. Leveraging more than 100 years of design and manufacturing experience, our engineering teams can assist in the selection, installation and maintenance of precision product so that your equipment uptime can be achieved.

For more information about Timken precision bearings and services, contact your local Timken sales engineer or visit www.timken.com/precision.

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TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance mechanical components, including bearings, gears, belts, chain and related mechanical power transmission products and services.

Stronger. By Design.

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