KEYS TO QUALITY

Developing Unparalleled Precision Machining Technologies



BALL BEARINGS

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Often called the primary element of industry, ball bearings are found in innumerable products in contemporary society. The precision of the ball bearings used in these products plays a crucial role in determining their performance.

Miniature and small-sized ball bearings, particularly those up to 22 millimeters in external diameter, are the most prevalent classes and are used extensively in information and telecommunications equipment, as well as household electrical appliances. Minebea is the world's leading manufacturer of these ball bearings, with a 65% global market share.

Growing technological sophistication in key customer industries continues to spur demand for higher levels of ball bearing precision. In particular, the growing technological sophistication of HDDs is increasing demand on bearing manufacturers to achieve constantly higher levels of quality. Moreover, such industries demand this improved quality at greater-than-ever levels of production. Minebea's unmatched competitiveness in this market and reputation for product reliability are due to its unique vertically integrated manufacturing system, which facilitates internal sourcing of all parts used in its ball bearings.

ТОРІС

Raceway Roundness and Ball Sphericity



Improving the raceway roundness of a ball bearing's inner and outer rings and the sphericity of the balls greatly enhances the bearing's rotating speed, non-repeatable runout (NRRO), sound level and life span. This, in turn, strengthens the quality of the motors or other components in which the bearing is used. Minebea develops and builds all jigs

and tools used in the production of ball bearing parts in-house, enabling it to ensure consistently high levels of raceway roundness and ball sphericity for ball bearings manufactured at its 10 mass-production facilities worldwide.

Snap Rings

Snap rings are C-shaped steel wires used to affix metal shields to outer rings.

Retainers

Retainers are used to separate the balls housed between the inner and outer rings and keep them in place within the raceway. Retainers are usually made of metal or resin.



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Shields

Shields are fitted onto outer rings to prevent foreign matter and dirt from penetrating and lubricants from escaping. Materials commonly used to manufacture shields include metal rubber and resin



Balls

Balk—usually between five and 13, although the number varies depending on the type and size of bearing—are housed between the inner and outer rings. The most prevalent materials are chrome and stainless steel, with ceramics also popular. The raceway roundness of the inner and outer rings for ultrahighprecision ball bearings manufactured by Minebea for use in HDDs and videocassette recorders (VCRs) exceeds 0.05 microns—less than one 1,600th the thickness of a strand of human hair. Moreover, the sphericity of balls used in such ball bearings exceeds 0.02 microns. If the earth, which has a diameter of 12.8 million meters, had such a high level of sphericity, the tallest mountain would be a mere 25.6 meters.



Inner Rings The inner ring has a raceway on the outside in which the balls roll. Inner rings are made from the same materials as outer rings.

Outer Rings

The outer ring of a ball bearing has a raceway on the inside, in which the balls roll, and grooves on the top and bottom which hold protective shields. Outer rings are generally made of chrome or stainless steel.

Internal Sourcing of All Parts

The typical ball bearing comprises an outer ring, inner ring, between five and 13 balls, two retainers, two shields and two snap rings. Enhancing the precision of each of these parts is essential to raising the quality of the finished ball bearing. Minebea manufactures all parts used in its ball bearings in-house, giving it complete control over part precision and enabling it to massproduce ball bearings of unsurpassed quality.

Minebea's Vertically Integrated Manufacturing System

The level of precision in each ball bearing production process is another essential factor in determining the quality of finished products. Minebea conducts all processes in-house, as well as manufactures most production and assembly equipment used therein, thus ensuring complete control over the precision of each process and facilitating mass-produced superior-quality ball bearings.

