

Minebea's Competitive Advantages

**Ultraprecision
machining technologies
amassed through
the production of
ball bearings**

**A vertically integrated
manufacturing system
that facilitates mass
production of
high-precision
components**

High-growth markets

Minebea has cultivated ultraprecision machining technologies as it has developed its bearing operations

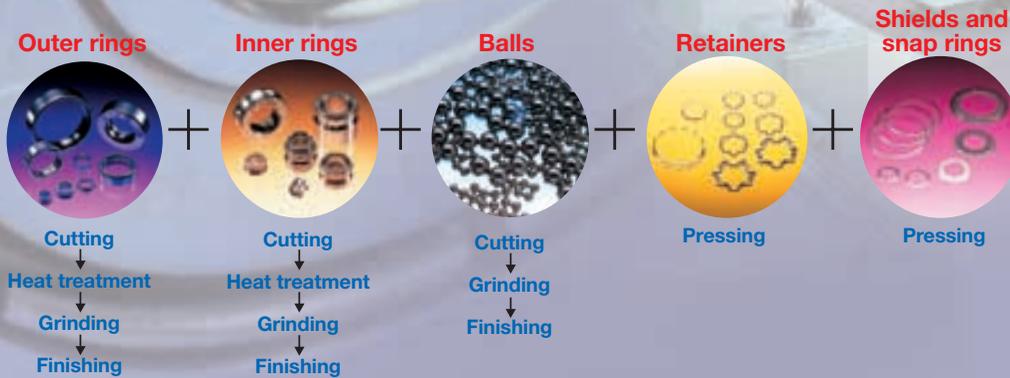
A ball bearing is a typical machine-processed part and usually comprises an outer and inner ring; balls; one or two retainers, which keep the balls in place; shields, protective covers fitted onto the outer rings; and snap rings. Very little about this basic design has changed in more than a century.

Today, however, ball bearings—particularly miniature and small-sized ball bearings—are the most crucial high-precision machined components in industry and the key element in determining the performance and quality of innumerable products essential to contemporary life, including PCs and other information and telecommunications equipment and household electrical appliances.

The precision of a ball bearing is determined by several factors, including the raceway roundness of the inner and outer rings, sphericity of balls and the raw materials used in each component. Improving precision demands uncompromising strictness on all counts. Moreover, the ability to mass produce high-precision ball bearings while ensuring a stable level of quality requires production lines composed of high-precision machining and assembly equipment, as well as high-level maintenance technology to ensure line efficiency.

The specialized expertise Minebea has amassed over the past 50 years enables it to achieve levels of precision that competitors cannot match simply by using state-of-the-art production equipment. The difference is our vertically integrated manufacturing system, whereby we conduct all ball bearing manufacturing processes—from machining to final assembly and testing—in-house. This system ensures the same superior quality for ball bearings produced at any of our mass-production bases worldwide.

Internal Production of Parts



RO bearings



Ball bearings



Integrated-shaft bearings

Minebea's Ultraprecision Machining Technologies



Ultraprecision machining technologies
amassed through the production
of ball bearings

Minebea's Small Motors



HDD spindle motors



HDD spindle motors
containing fluid
dynamic bearings



Fan motors



Stepping motors

Other Minebea Products



Pivot assemblies



Rod-end bearings



Spherical bearings



Precision machined parts
for aerospace vehicles



PC keyboards



Speakers



Front light assemblies
for reflective color LCDs



FDD subassemblies



Fasteners



Resolvers

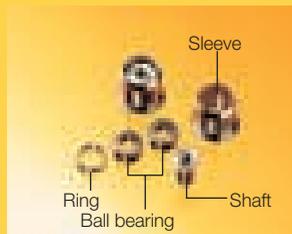


Special machinery
components



Measuring equipment

A good example of Minebea's ultraprecision machining technologies at work is our fluid dynamic bearings, for which demand is expected to rise sharply in the future. The basic structure of a fluid dynamic bearing comprises a shaft, sleeve and plate—essentially the same as that of our global market-leading pivot assemblies for HDDs. This has given us a considerable competitive advantage, in terms of quality and manufacturing costs, in mass producing these revolutionary bearings.



Pivot Assembly

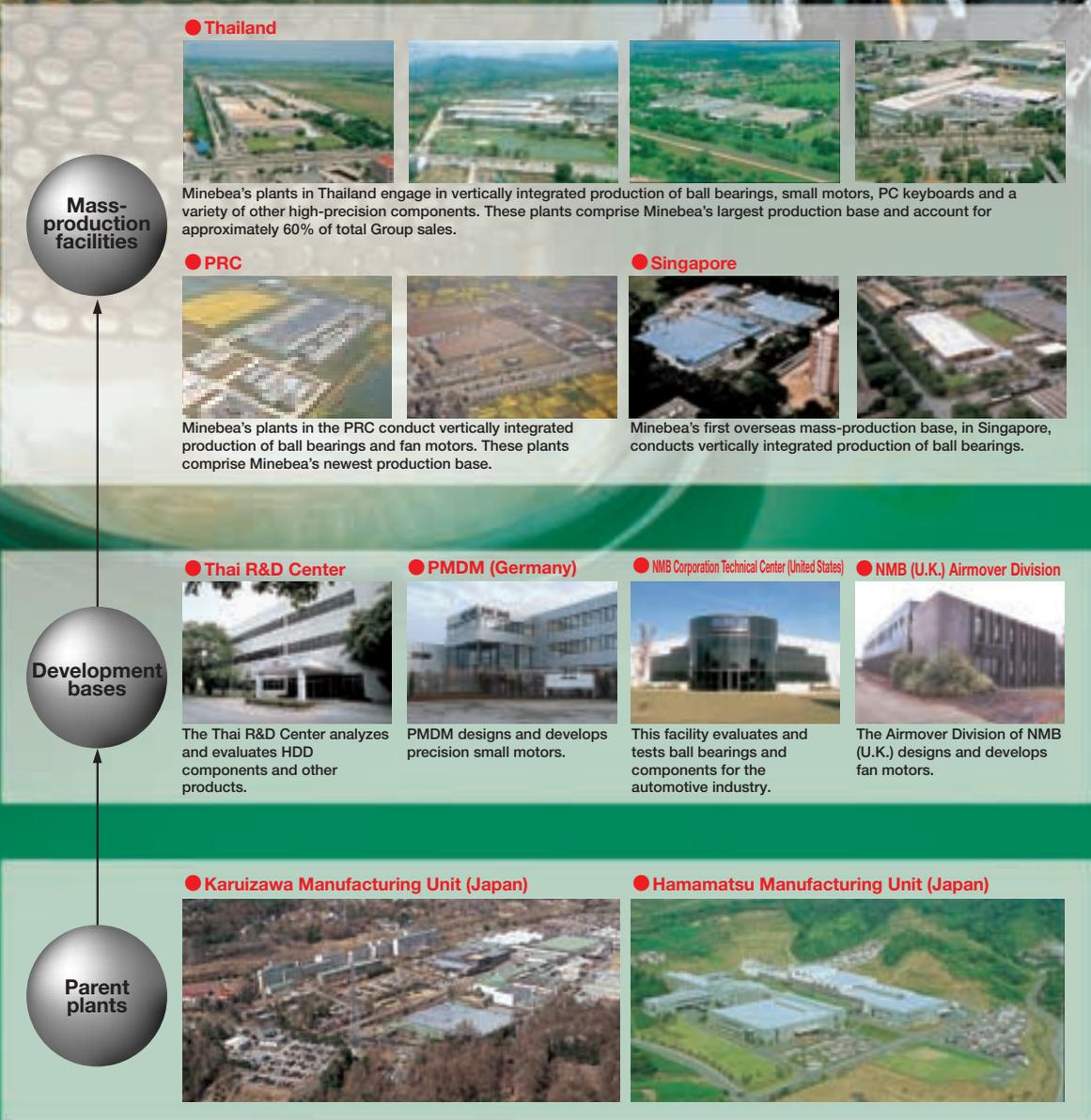


Fluid dynamic bearing

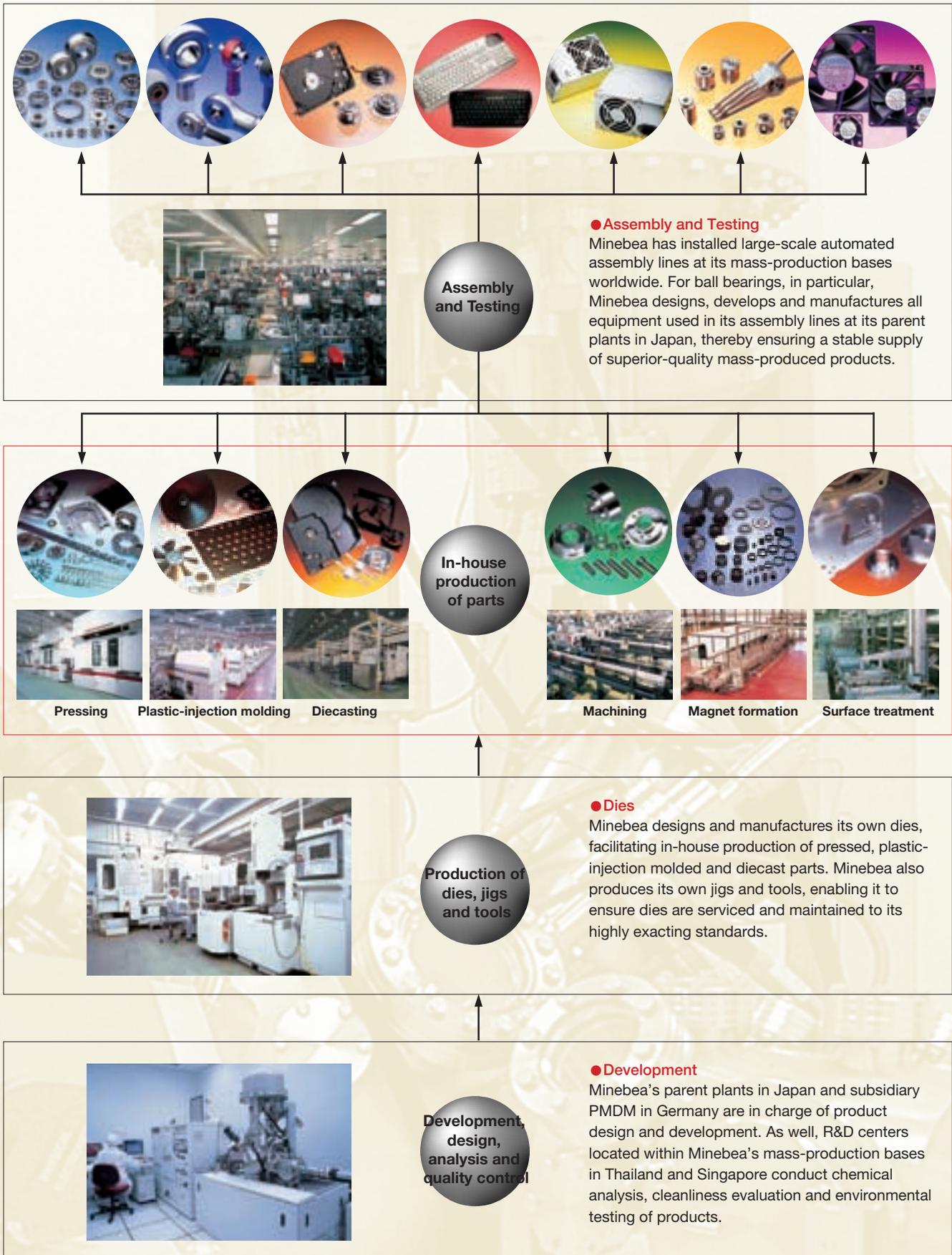
Minebea's vertically integrated manufacturing system facilitates mass production of high-precision components

Minebea's mainstay products are used primarily in information and telecommunications equipment, household electrical appliances and automobiles. Growing technological sophistication in these industries continues to spur demands for higher levels of precision and quality at greater-than-ever production volumes. Minebea's ability to respond to such demands is due to its unique vertically integrated manufacturing system. This system, which encompasses all processes—including design and research; production and maintenance of dies; production of parts for in-house use, including pressed, plastic-injection molded, diecast and machined parts, and magnets; assembly and testing—facilitates mass production of high-precision machined components.

This system also enables our mass-production facilities in Thailand, the PRC and Singapore—which account for approximately 80% of total group sales—to coordinate smoothly and efficiently with parent plants in Japan and R&D bases worldwide. This ensures our ability to provide consistently superior-quality products from all of our mass-production bases.



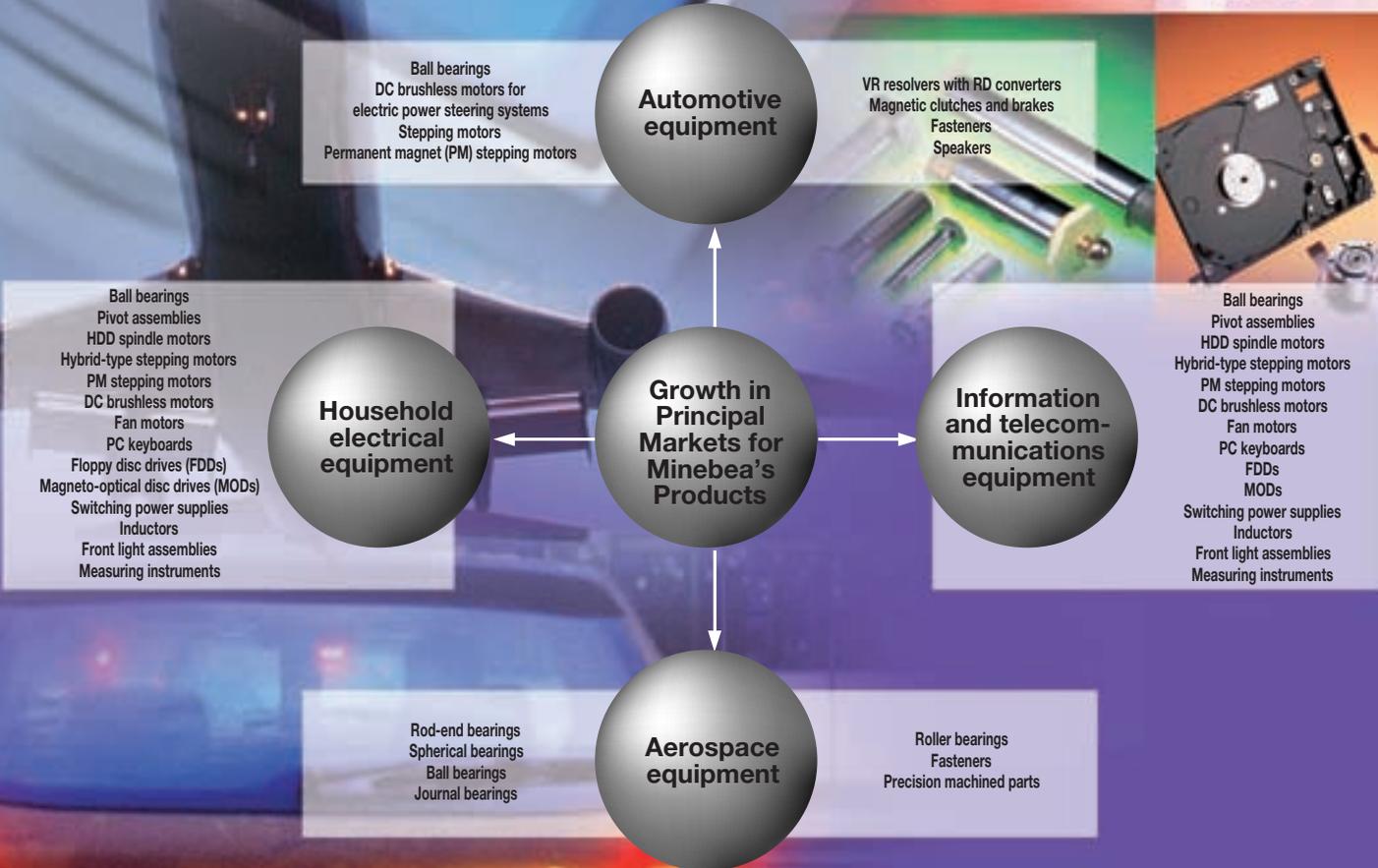
Vertically Integrated Manufacturing System



Minebea continues to capitalize on the expansion and diversification of key markets to achieve growth

Minebea's mainstay products are sold extensively to manufacturers of information and telecommunications equipment, household electrical appliances, aerospace equipment and automobiles.

When we started out 50 years ago as a specialized manufacturer of miniature ball bearings in Japan, we supplied bearings for use in aircraft instruments. Since then, we have responded to demand for our precision machined components in an increasingly wide range of industries. In the 1970s, we expanded our focus to include VCRs and other household electrical appliances. We added office automation (OA) equipment to our list of key customer industries in the 1980s and PCs in the 1990s. These markets are expected to continue growing. We also anticipate increased demand from the automotive industry for high-precision, highly reliable control sensors, reflecting greater concern for fuel efficiency, safety and comfort, and from the markets for cellular telephones, personal digital assistants (PDAs) and digital household electrical appliances. Accordingly, we anticipate new opportunities to maximize the competitive edge afforded by our ultraprecision machining and mass-production technologies.





DC brushless motor for electric power steering systems

● Automotive Components

Minebea, which enjoys a solid reputation as a manufacturer of high-quality special machinery components, and U.S. firm Analog Devices, Inc., a leading VR resolver and hybrid integrated circuit (IC) manufacturing company, have developed an innovative VR resolver with RD converter that combines a VR resolver, which senses the rotation angle and the revolutions per minute of the motor shaft, and an RD converter. We also manufacture motors for electric power steering systems, dashboard units and light control systems for automakers in Europe and are developing ABS motors, electric brake motors and other rotary components, which we expect to bring to market in the near future.



VR resolver with RD converter

Growth in New Markets



● Front Light Assemblies for Reflective Color Liquid Crystal Displays (LCDs)

These front light assemblies comprise a light-conducting, transparent polymethyl methacrylate (PMMA) panel made from a number of fine prisms and white light-emitting diode (LED) chips. This exclusive product, which capitalizes on Minebea's advanced plastic-injection molding technologies, improves the brightness and readability of the display, delivering better visibility in the dark and lower power consumption, enabling it to significantly reduce the power demands of PDAs, which use batteries, cellular telephones and other mobile equipment.



● Fluid Dynamic Bearings

In a fluid dynamic bearing, a thin layer of oil or other lubricant is injected between the shaft and sleeve. The structure of the bearing features a rotating shaft, which generates a hydrodynamic force, causing the shaft to float. The noncontact construction of fluid dynamic bearings gives them certain advantages over conventional ball bearings. Minebea's fluid dynamic bearings bring together Seagate Technology, Inc.'s design and development capabilities and Minebea's ultraprecision machining and mass-production technologies, giving the Company a significant advantage in terms of precision, quality and manufacturing costs.

 Desktop PCs	 Notebook PCs	 Facsimile machines	 Laser printers	 Sewing machines	Ball bearings
 Copy machines	 Electronic music and game devices	 Air conditioners	 Audio components	 Dehumidifiers	Fan motors
 Televisions	 VCRs	 Interphones	 Portable cassette players	 Air sanitizers	Hybrid-type stepping motors
 Video cameras	 Telephones	 Sliding bookshelves	 Microwave ovens	 Weight scales	PM stepping motors
 Micro-computerized wash/dry toilets	 Oil fan heaters	 Window shutters	 Vacuum cleaners	 Oil and gas water heaters	HDD spindle motors
 Rice cookers	 Blenders	 PDAs	 Low tables with built-in heaters	 Models	FDD spindle motors
 Refrigerators	 In-line roller skates	 Electric power tools	 Fishing reels	 Cellular telephones	DC spindle motors

Minebea's Mainstay Products at Home and at Work