# RESEARCH & DEVELOPMENT AND PRODUCTS

THK was the world's first company to convert rolling motion into linear motion and commercialize the technology, and since this initial breakthrough has continually developed creative new products.

## The Basic Philosophy of THK's Technological Development

If one attempts to sum up THK in a single phrase, "a company focused on creation and development" immediately springs to mind. THK was the first company in the world to succeed in developing the technology needed to convert rolling motion into linear motion under a high load condition and to commercialize it. Since this initial breakthrough, THK has continually drawn on its corporate creativity to stay at the cutting-edge of product development. THK has been able to offer customers high-quality products with excellent added-value based on the corporate creed of "providing innovative products to the world and generating new trends to contribute to the creation of an affluent society."

THK's family of products falls naturally into three main categories. They are (1) LM guides, (2) Ball Screws, and (3) Spherical Joints, all of which are element parts used by various industries.

New products are developed mainly at the Engineering Development Department with the cooperation of the Fundamental Technological Laboratory, the MRC Center and several projects which are created on an as needed basis. Since establishment in 1986, the Techno Plaza at the Kofu Plant has become another base for THK's research and development activities. Together with trial manufacturing and the testing of innovative LM guides, the Techno Plaza conducts stringent durability testing to maintain the high quality of products. Unique ideas and high quality have ensured that our products enjoy a good reputation among customers.

THK has continued to increase R&D spending steadily, from 1.9 billion yen in FY 2001 to 2.1 billion yen in FY 2002 and further to 2.5 billion yen in FY 2003. In addition, R&D activities are carried out not only at the R&D-related departments but also at each production site. Therefore, actual R&D spending substantially exceeds the amounts indicated above.

THK's main customers are machine tool makers, general machinery makers, semiconductor production equipment makers and others. However, recently the customer base has steadily expanded to consumer durable goods makers, such as automotive makers, medical equipment makers and construction companies.

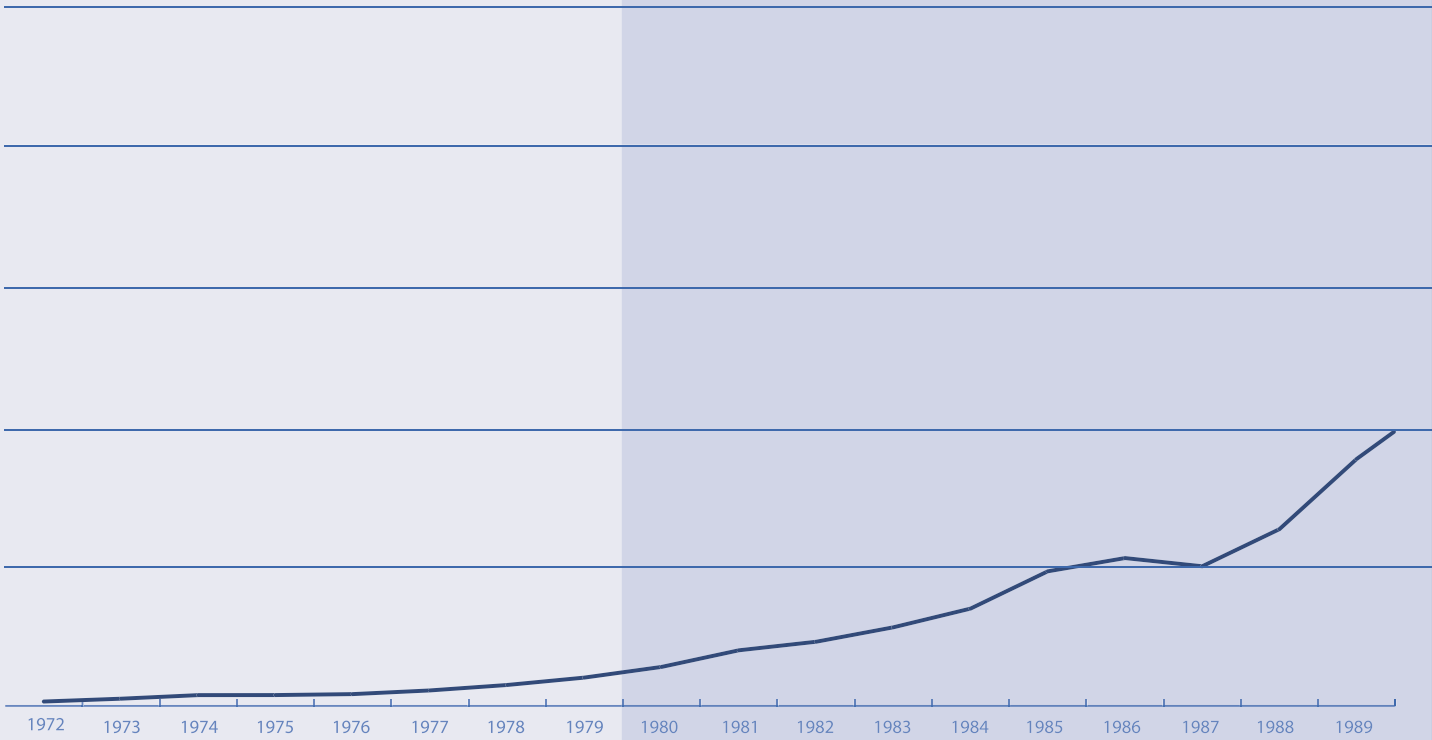
## Development of New Products and Expansion of New Applications

Since it began manufacturing and selling LM Guides in 1972, THK has commercialized a steady stream of new products. In 1996, THK developed a breakthrough LM Guide with Caged Ball™ Technology, a Linear Motor Actuator in 2002, followed by a Straight-Curved Guide in 2003.

Today a major corporate goal for THK is to expand the application of LM guides, ball screws and other products to new markets, while continuing to develop new products. We have steadily expanded the application of our products beyond traditional customers such as machine tools and chip mounting machines into new fields including medical equipment makers, automotive parts makers and construction companies. In semiconductor production, for example, the need for faster speeds, greater precision and modularization are increasing. To meet such needs, THK is attempting to develop hybrid products combining linear motors with LM Guides. For the micro-machine sector, THK is also striving to develop micro guides, micro ball screws, micro splines and others. The development of new products to meet the need for high speed and rigidity has also become an important issue.

1970s | 1980s

## SALES




## MILESTONES

**1971**
THK Co., Ltd. established

**1972**
Production and sale of LM guides commences

**1977**
Kofu Plant (JPN) built

**1981**
THK America (USA) established

**1982**
THK Europe (GER) established

**1984**
Gifu Plant (JPN) built

**1985**
Mie Plant (JPN) built
Yamaguchi Plant (JPN) built

**1989**
THK listed on OTC
THK Taiwan (TPE) established

## PRODUCT TIMELINE

1972
LM Guide (LSR)

1971
Ball Spline (LBS)

1971
Link Ball (RBL)

1975
LM Guide (NSR)

1979
Ball Screw (BNFN)

1981
LM Guide (HSR)

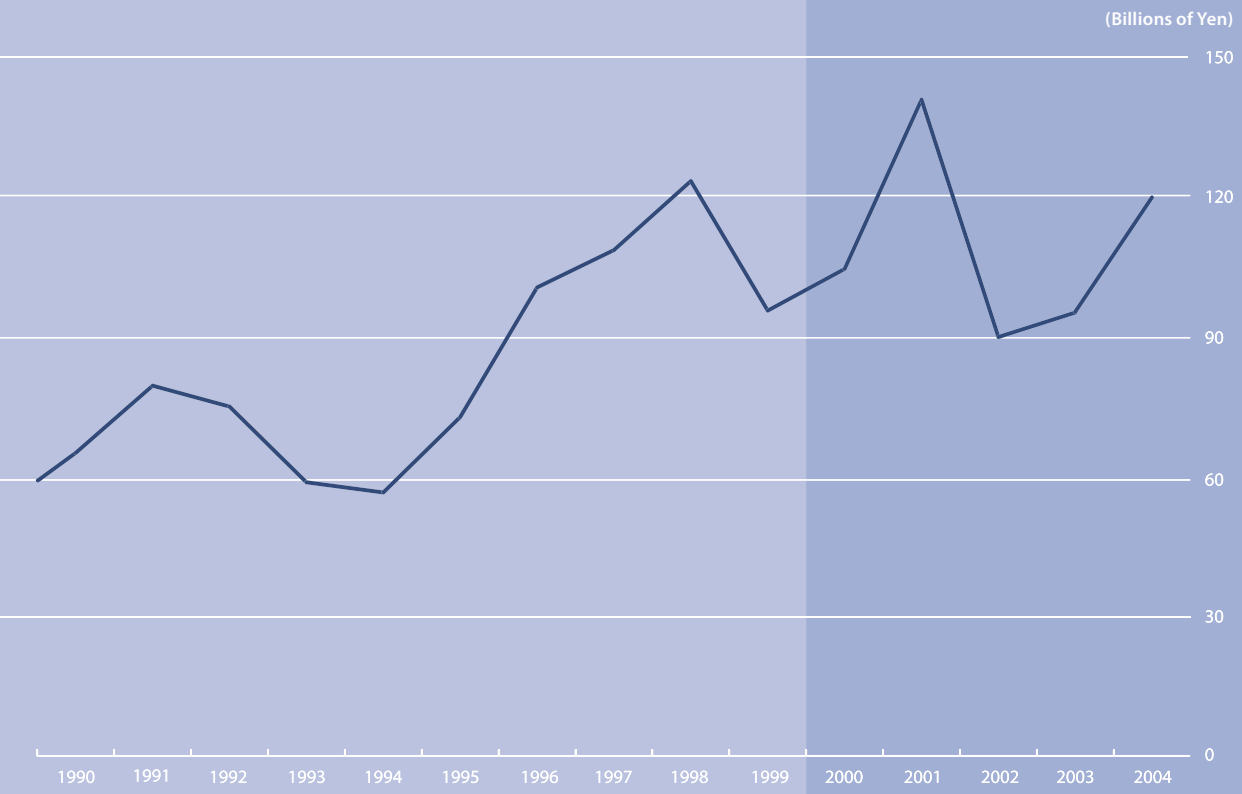
1982
Cross Roller Ring (RB)

1983
Ball Screw (BLK)

1988
Link Ball (BL)

## 1990s

## 2000s




- FY 1971 - FY 1989 Non-Consolidated Net Sales
- FY 1990 - FY 2003 Consolidated Net Sales

**1991**
Yamagata Plant (JPN) built

**1992**
PGM (UK) acquired

**1996**
Production and sale of LM Guide with Caged Ball™ Technology commences
Dalian THK (CHN) established

**1997**
TMA (USA) established

**2000**
TME (FRA) established

**2001**
THK Listed on TSE

**2003**
THK Wuxi (CHN) established

1990
LM Guide Actuator (KR)

1998
LM Guide (SHS)

1996
LM Guide (SSR)

1998
LM Guide (SNR)

1997
Linear Motor Actuator (GLM)

1999
LM Guide (SRS)

2000
LM Guide (SHW)

2002
Ball Screw (HBN)

2002
Linear Motor Actuator (RDM)

2003
LM Guide (HMG)

The development of new products to be used in sectors such as transportation, housing and automated commercial off-the-shelf components is another priority. The FAI (Future Automotive Industries) Division, the ACE (Amenity Creation Engineering) Division and the CAP (Consumer Application Products) Project are focusing on product-out marketing to anticipate future needs which are expected to appear five to ten years from now. Running continually ahead of the industry in the development of new products and new applications, THK has earned a reputation for excellence.

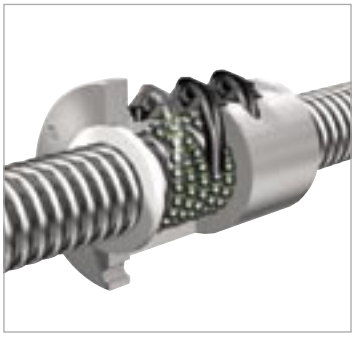
## The Product Family

THK's major products fall into three main groups. The first group comprises "LM Systems," which facilitate the linear motion of machinery. The main products in this category are LM guides, which are the principle breadwinner for our company. The second group comprises "Ball Screws." The third group comprises "Spherical Joints" such as ring balls, demand for which has recently been increasing for use in automotive parts. All of these products are mainly invisible to the end consumer, being subcomponents of machinery and equipment. Nevertheless, these products are indispensable to industries such as the machine tool industry and others.

THK was established in 1972 as a pioneer in the manufacturing and marketing of LM guide products. Initially, there was a great deal of reluctance within industrial circles to adopt this new technology because it was revolutionary in its approach. Now, however, LM guide products are widely recognized as the global standard in their area of application. They are used by almost all capital goods industries, ranging from the machine tool industry and the industrial robot industry to the electronics industry. Recently their application is expanding steadily from capital-investment related to consumer-related industries and the construction industry. This expansion in the LM guide market can be ascribed to two main factors: one is that industry in general needs ever higher precision and efficiency of production and LM guide products meet these requirements; and the other is that as the superiority of LM guide products has become widely recognized, an increasing number of companies have started to introduce them.

**The world's smallest LM Guide - Type RSR 1**

**THK introduced a new series of LM Guides—the "Micro LM Guide" or Type RSR 1 and Type RSR 2. Featuring rail widths of 1 mm & 2 mm's, respectively, these LM guides are the smallest available anywhere in the world. This new product first shipped in April 2004.**



### High Load Ball Screw with Caged Ball™ Technology Type HBN

**This new ball screw can be applied in injection molding machines, press, blow molding machines, die-casting machines and extruders, and it is also suitable for the replacement of hydraulic cylinders. In addition, a new product that corresponds to the existing High Load Ball Screw with Caged Ball™ Technology Type HBN will be added to the line-up of products.**

The machine tool industry, our major customer, needs to grind and process steel more precisely and at higher speeds than ever before, which means that the demand for LM guide products is increasing. In the semiconductor manufacturing equipment industry and LCD production equipment industry, which need high precision and low emission of dust particles in operation, LM guide products are well entrenched. As LM guides have exceptional low friction and wear-resistant properties, they are also becoming widely used in automobiles and special vehicles. Application of LM guides is expanding to encompass aseismatic structures used in buildings and factories. The Caged Ball LM Guide, which THK developed in 1996, is now the most promising product due to its characteristics of low-noise, long service life, superior high speed responsiveness and long-term maintenance-free operation.

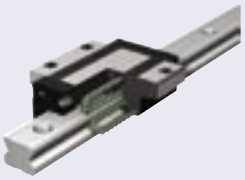
Ball Screw products offer high-precision rolling functions. Here we have introduced new products such as the High Speed Ball Screw with Caged Ball™ Technology and the High Load Ball Screw with Caged Ball™ Technology. THK produces various kinds of Ball Spline products, which offer torque-transferable, direct-acting, rolling movement. Meanwhile, LM Guide Actuators with Caged Ball™ Technology and Rod Type Linear Motor Actuators have grown to become the major products in the Actuator product group. By maintaining a comprehensive product line-up, THK can respond quickly to the needs of customers.

THK has enjoyed a dominant position in both the domestic and overseas markets for LM guide products for a long time. THK offers leading-edge products based on unrivalled know-how and production technology as well as an efficient production system all backed by the strong marketing power which THK has accumulated through its long-term commitment to the market as a specialized manufacturer. THK's quick responsiveness to changing market trends is embodied in its approach to the development of new products. The Techno Plaza located in the Kofu factory runs very rigorous tests to measure the endurance and reliability of new products. No product may be marketed unless it passes these tests. This procedure guarantees the high quality and reliability of the products and enhances customers'

trust in THK, which is naturally the ultimate source of the company's competitiveness. Information gathered through the "market-in" sales method—under which sales staff visit customers, ascertain their needs and present appropriate solutions to them—is used for the development of new products. In addition, THK has also energetically embraced the technology-led "product-out" method, by which we focus on the development of next generation products for introduction five or ten years hence.

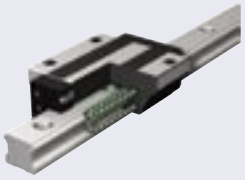
As a company focused on creation and development, THK is committed to the development of new products as well as the improvement of conventional products. During FY 2003, we introduced a number of excellent products. These include two new models—"Micro LM Guide Type RSR1 and Type RSR2" which feature narrow rail widths of 1 mm and 2 mm,

## LM Guide with Caged Ball™ Technology

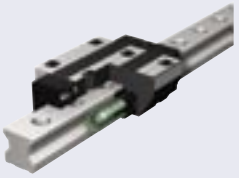


SSR

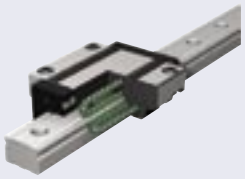
SRS



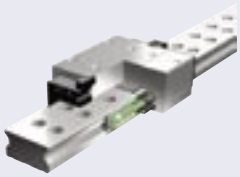
SHS



SRG



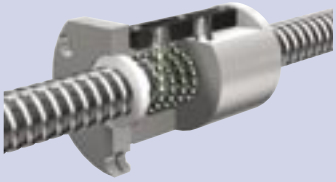
SNR



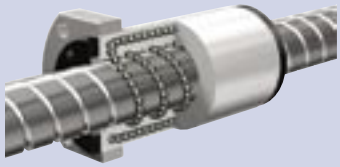
SRW

SHW

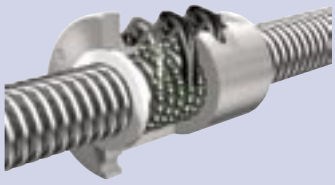
## Ball Screw with Caged Ball™ Technology



SBN



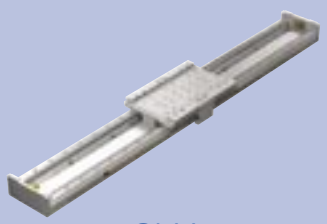
SBK



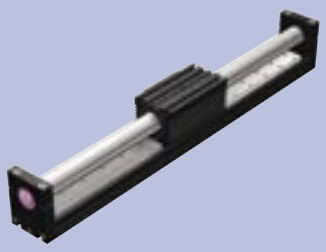
HBN

respectively. Type RSR1 is provided by THK to meet demands for smaller and more space-saving designs from customers. Other new products include High Load Ball Screw with Caged Ball™ Technology-Type HBN, which drastically improves rated load compared with conventional models by utilizing an internal structure optimized for use in heavy load conditions; LM Guide Miniature Actuator Type KR15, with minimum cross section area construction, high precision and rigidity; and Micro LM Guide Type RSR 3M/3N, which boasts an ultra compact design and high reliability, allowing savings in space and weight. This model also has low rolling resistance and excellent wear resistance as martensitic steel is adopted in all of the LM blocks. THK has been striving not only to develop new products in response to the changing needs of customers, but also to create new demand by developing new and unique products.

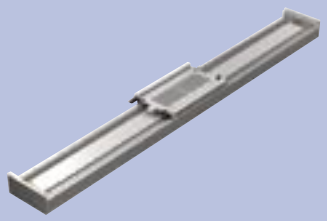
## Linear Motor Actuators



GLM



RDM



CLM

## Link Balls

BW

AL

BL

RBI