



## THK Products

““ The letters “LM” in our LM Guides stand for linear motion. LM Guides are important components of machines used for facilitating gentle and accurate sliding action. ””

The letters “LM” in our LM Guides stand for linear motion. LM Guides are important components of machines used for facilitating gentle and accurate sliding action.

Machine movements can be classified into linear motion and rotary motion. If we use the familiar office environment to give an example of each type of motion, we can say that the backward and forward motion of a desk drawer represents linear motion, and that the turning of a swivel chair in place represents rotary motion.

In the very early days, when machines were made both linear motion parts and rotary motion parts involved the sliding of surfaces in mutual contact (that is to say, surfaces where moving parts came into contact with one another). However, sliding generated a great deal of abrasive resistance leaving much room for improvement in terms of both smoothness and speed. Then, roughly a century ago, rotary bearings were developed, making it possible to introduce a rotary action, which resolves the problems inherent to sliding, into rotary motion parts. The development of linear bushings in the United States in the 1960s marked the introduction of this rolling action into linear motion parts. However, since these bushings featured poor rigidity and durability,

their use in machine tools and other kinds of machines was limited. In 1971, THK developed Ball Splines, which eliminated the shortcomings of the linear bushing. These new parts made it possible to exploit the advantages of rotary action in linear motion parts. The following year, in 1972, the Company moved beyond the structure of the Ball Splines to successfully develop LM Guides, products which has become the Company’s mainstay.

Featuring characteristics that serve to improve the rigidity and extend the service life of linear motion parts, LM Guides rapidly achieved high usage rates in machine tools—a trend that was triggered when machine tool manufacturers in the United States started to incorporate them. Today, LM Guides are important components of a wide range of capital goods such as machine tools, industrial robots and semiconductor production equipment, while application has extended into fields closer to the lives of consumers: as evidenced by their use in seismic isolation devices to protect not only our lives but also the buildings around us and our household effects from the threat posed by earthquakes, and by their use in automotive parts necessary for improving the safety and comfort of our automobiles.



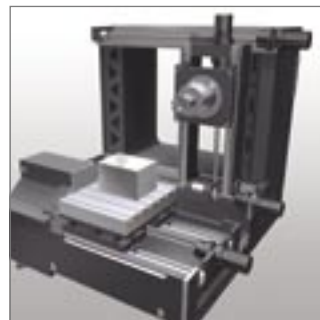
- LM Guides with Caged Ball Technology, each ball is held in place by a belt-shaped ball cage to prevent contact between the balls—something which translates into an extended service life, lower noise levels, together with reduced heat and dust generation. These LM Guides contribute to overall cost reductions for our customers.

As the pioneering force behind LM Guides and also as the world's leading manufacturer of LM Guides with the top share of the global market, THK offers a broad spectrum of products designed to meet the many and varied needs of its customers.

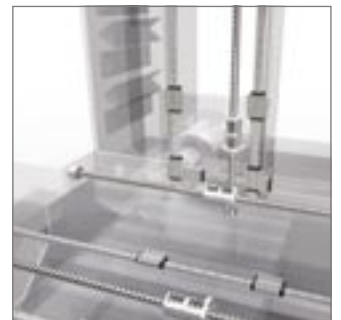
element parts, which have now become indispensable for achieving higher speeds, lower noise levels and a longer service life in today's machine tools as well as in semiconductor production equipment and other machines, which are deployed, in many different industries.

## LM Guides

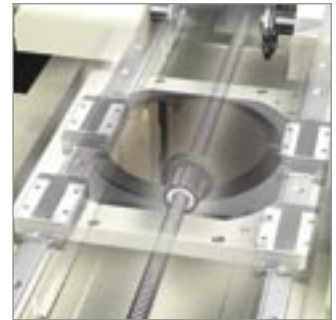
In 1996, THK became the first company in the world to come up with LM Guides dubbed LM Guides with Caged Ball Technology. These Guides represent the next-generation LM Guides, and the Company is now working to increase the number of these LM Guides in use. The ball cages are resin parts that keep the balls in place and guide them. Since vibration and friction between the balls are eliminated through the use of the ball cages, these LM Guides feature lower noise levels and a longer service life and they ensure maintenance-free operation for longer periods of time compared with earlier LM Guides. In short, LM Guides with Caged Ball Technology are key



• Machine tool (machining center)



• Application of LM Guides and Ball Screws



Shown in photos above

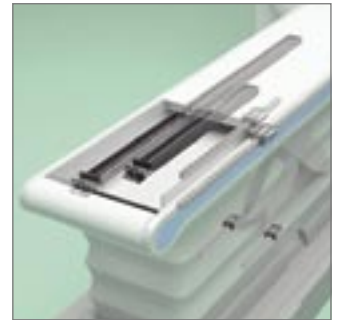
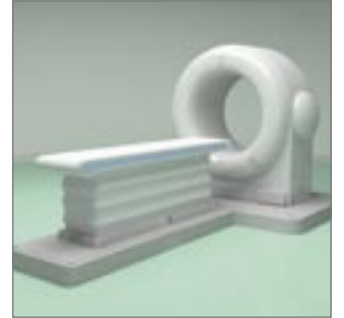
- Semiconductor production equipment (dicing saw)
- Application of LM Guides and Ball Screws

- By inserting ball cages between the balls, Ball Screws with Caged Ball Technology achieve higher speeds, a longer service life and lower noise levels—all features which are very much in demand from customers.

## Ball Screws

Ball Screws are machine element parts, which efficiently convert rotary motion into linear motion by causing a large number of balls to circulate between the screw shaft and the nuts. They are principally used as the drive components in the linear motion parts of machines, which are employed in many different industries. Developed by incorporating ball cages into the conventional ball screws, Ball Screws with Caged Ball Technology have paved the way

toward making a significant contribution to increasing the speeds, reducing the noise levels and prolonging the service life of machine tools, industrial robots and semiconductor production equipment. THK offers Ball Screws which support high loads and are ideally suited to replacing the hydraulic cylinders in injection molding machines, presses, die-cast machines, blow molding machines and extrusion molding machines, among others.



Shown in photos above

- Medical instruments (CT scanner)
- Application of Actuators and LM Guides

■ Shown here is a series of Actuators which are configured by combining LM Guides, Ball Screws and Linear Motors. By forging these elements into an integrated structure, these Actuators feature high rigidity and high accuracy while remaining compact in size.

## Actuators

Actuators are products which are made by combining LM Guides, which are guide parts, with Ball Screws, Linear Motors or other drive parts. By creating this kind of integrated structure, it has become possible to achieve compact dimensions and high levels of rigidity and accuracy at the same time. There is an ever-rising demand from the customers in many industries, particularly the

electronics industry, for the kind of modularization aimed at shortening development timeframes and reducing production lead times, and it is to meet these demands that THK is bolstering its lineup of Actuators. To this end, THK adopts a two-pronged approach: it not only provides discrete products but it also offers modularized products to fit the individual needs of its customers.



Shown in photos above

- Automobile
- Application of Link Balls

- The integral molding process incorporated for the aluminum die-cast of these Link Balls yields high levels of corrosion resistance and abrasion resistance. Large numbers of these Link Balls are now being used in such applications as the suspension systems of automobiles.

## Link Balls

Link Balls are special bearings, which are mainly used as automotive parts. They are created by an innovative production method unique to THK: highly accurate bearing steel balls are employed for the spherical areas, and after the holders have been formed by die-cast, the shank areas are specially welded. The incorporation of an integral molding process for the aluminum die-cast has made it possible to imbue the Link Balls with a high corrosion and wear resistance and make them considerably lighter than conventional

steel products. Large numbers of these Link Balls are being used in the suspension systems of automobiles, such as in the joints, which connect the stabilizers and suspension, and in vehicle height sensors where they make a valuable contribution to improving automobile safety and comfort. In recent times, they are being used in more and more automobile models mainly by the big automakers of Japan, Europe and North America.



Shown in photos above

- Industrial-use robot
- Application of Cross Roller Rings

- Cross Roller Rings are roller bearings which have orthogonally arranged cylindrical rollers inside them so that they are capable of bearing loads in every direction.

## Cross Roller Rings

Cross Roller Rings are roller bearings featuring cylindrical rollers which are arranged orthogonally inside to enable them to bear loads in every direction. The incorporation of the spacer cages between these orthogonally arranged rollers prevents roller skew and reciprocal abrasion between the rollers. These Rings feature a high

rigidity in spite of their compact structure, and they are used in the joint areas and swiveling parts of industrial robots, the swivel tables of machining centers and other rotating parts of machines which are used in a wide variety of industries.