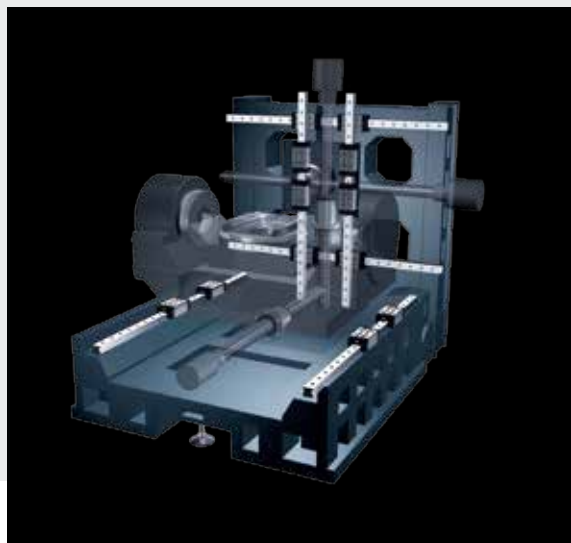


# INNOVATIVE PRODUCTS

As a global pioneer, THK developed the linear motion (LM) guide, which is based on an original concept and innovative technology. Within the mechatronics sector, LM guides are used as a vital machinery component and have varied industrial applications. THK also develops, produces and supplies to the world a range of other vital machinery components, including ball splines and ball screws.

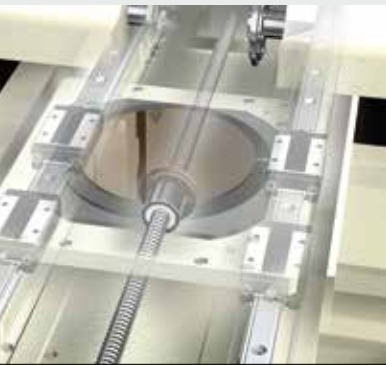
## LM Guides

LM guides are critical elements in many types of machinery. By converting slippage into a rolling motion, they enable parts of machinery to move smoothly, easily and precisely in a straight line. As a result, LM guides help to enhance the precision, rigidity and speed of a wide range of industrial machinery. In 1996, THK became the first company in the world to successfully develop the next generation of LM guides featuring caged ball technology. Later, in 2001, the Company introduced to the market LM guides with caged rollers. Since then we have striven to expand the usage of these improved LM guides. The ball cages are resin parts that keep the balls in place and guide them. This stops direct contact between the balls or rollers, eliminating noise and friction. Compared with first-generation LM guides, the use of caged ball technology achieves long service life, low noise and long-term maintenance-free operation. LM guides based on caged technology are now vital components of many types of equipment. They have provided major contributions to the machine tool, semiconductor production equipment and related sectors.



An example of use as a machine tool (machining center)





An example of use as a semiconductor production (Dicing saw)



## Ball Screws

Ball screws are machinery parts that function by causing a large number of balls to circulate between the screw shaft and the nuts. This mechanism of action efficiently converts rotary motion into linear motion. THK has developed ball screws featuring caged ball technology, thus helping to realize longer life with lower noise and provide an extended maintenance-free period. As a result, these offerings are now essential elements in the machine tools, industrial robots, semiconductor production equipment and related sectors. Other ball screws supplied by THK are designed to support high loads, making them ideally suited for replacing the hydraulic cylinders used in capital equipment such as injection molding machines, presses and die-cast machines.



Electric actuators are used in medical equipment such as CT scanners

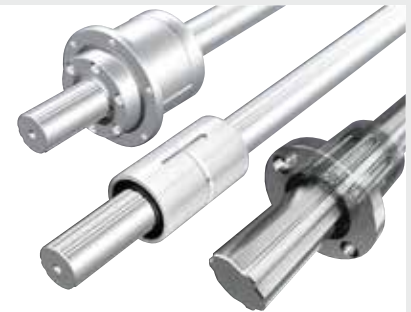


## Electric Actuators

Electric actuators are hybrid products combining a guide component such as an LM guide with a ball screw, linear motor or other drive component. In industries such as electronics, there is an increasing need to shorten development and manufacturing lead-times. Modularization allows electric actuators to realize benefits such as simplified design and fewer assembly components, thus helping to meet such requirements. THK supplies a varied lineup of electric actuators ranging from basic, low-priced units to high-end components designed to operate at high speed or perform to clean-room specifications. Such advanced electric actuators have become indispensable parts in equipment used in the manufacture or inspection of semiconductors and flat-panel displays.



Used in bathing assistance equipment



## Ball Splines

Developed in 1971, the same year that the Company was established, ball splines were the precursor to the LM guide. Balls roll along an R-shaped groove machined into the spline axle. This critical advance boosts the load that the device can tolerate and permits the transmission of torque, resulting in a revolutionary linear motion system. Compared with the existing configuration, which does not contain such grooves, ball splines boost the tolerable load by a factor of 13 and service life by a factor of 2,200. Today, ball splines play a number of highly functionalized roles in a variety of machines. Usage examples include industrial robots, medical equipment and chip mounters.

## Cross Roller Rings

Cross roller rings are roller bearings that feature internal cylindrical rollers arranged orthogonally so as to facilitate load bearing 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 are highly rigid despite their compact structure. Cross roller rings are used in the rotating parts of many different types of industrial machinery, including the joint areas and swiveling parts of industrial robots, machining center swivel tables, the rotating parts of industrial manipulators and precision rotary tables. Other applications include medical equipment, measuring instruments and semiconductor production equipment.



Usage in industrial robots



## Link Balls, THK RHYTHM Products

A product that THK has manufactured along with LM guides since the time of the Company's foundation is the link ball, an automobile undercarriage component made from aluminum. Manufactured by a proprietary process, link balls are spherical joints in which a high-precision steel ball bearing forms the spherical surface. After molding a die-cast holder, the shank portions are specially welded. Using an integral molding process for the aluminum die-cast makes the link balls highly resistant to corrosion and wear due to abrasion. They are also considerably lighter than the steel parts traditionally used. Playing an important role in automobile safety and comfort, link balls have been adopted by leading automakers in the world for a number of undercarriage mechanisms, such as the joint sections connecting stabilizers to the suspension and ground clearance sensors. As adoption of link balls shifted into high gear, RHYTHM CORPORATION (now THK RHYTHM CO., LTD.), was included in THK's scope of consolidation as a subsidiary in 2007 and, as a company that was primarily involved in the manufacture of steel ball joints, developed business as an automotive parts manufacturer covering the full gamut of ball-joint products. THK RHYTHM manufactures and sells related products, such as steering, suspension, brake, engine and transmission components. In addition to its mainstay cold-forged ball joints, THK RHYTHM is currently expanding operations in the component field, with aluminum links that are integrated ball joints with aluminum suspension links. As critical automotive safety components, these products must meet the highest standards of quality and performance. Responding to market demands by offering guarantees of zero defects and zero delivery problems, THK RHYTHM is contributing to the production of safer, more comfortable automobiles.



Usage of link balls in automotive parts



Usage of THK RHYTHM products in automotive parts

