

# RESEARCH AND DEVELOPMENT

Guided by the business philosophy of “providing innovative products to the world and generating new trends to contribute to the creation of an affluent society,” THK continually strives to create original products as a creative development-driven enterprise.

## THK Product Development as a Contributor to Industrial Development

THK’s concept toward business is based on the philosophy of “providing innovative products to the world and generating new trends to contribute to the creation of an affluent society.” This thinking has guided our drive to be a creative development-driven enterprise, enabling us to develop a varied stream of products since our establishment in 1971. Besides contributing to industrial development, these efforts have also resulted in THK steadily accumulating technical expertise that has been a primary source of growth.

THK developed the world’s first linear motion (LM) guide. For the first 10 years after we started production and sale of these products in 1972, LM guides were primarily used in machine tools. During this period, we developed a series of new products to fulfill our customers’ needs for increased precision and lower cost. In the 1990s, other industries—such as manufacturers of semiconductor production equipment and industrial robots—began to adopt THK products. We responded by developing various new products that were optimized for customer-specific applications and operating environments in these sectors.

In 1996, we pioneered the development on the world’s first-ever LM guide using caged ball technology, an advance that enabled LM guides to operate without maintenance for much longer periods. Although such technology was already common in rotary bearings at that time, the problem was the need to cope with both linear and circular movements. This made it extremely difficult to develop ball cages with sufficient durability to move along straight lines or curves. THK successfully took steps to overcome this issue. LM guides based on caged ball technology not only provide the benefit of long-term maintenance-free use, but have also made a significant contribution to the development of high-speed, low-noise industrial machinery with longer productive lives, in such sectors as machine tools and semiconductor production equipment. The advance also paved the way for the development of LM guides for additional applications. Today, we continue to develop products that use caged ball technology. Besides LM guides, this range has expanded to include ball screws, ball splines and hybrid units, which combine LM guides and ball screws.

## A Global R&D System for the Next Generation

Operating primarily out of the Technology Center located in Tokyo, THK’s R&D activities are undertaken by the elite minds working at the ACE, FAI and IMT divisions, with a particular focus on the Engineering Division. In addition to mainstay LM systems, a task force composed of members of these divisions is making every effort to develop innovative products targeting the mechatronics and consumer markets. Drawing on its core linear motion system technologies and know-how, THK is therefore ramping up its product development activities in such wide-ranging fields as seismic isolation and damping systems, transportation equipment, medical equipment, aircraft, and renewable energy in a bid to expand into new fields.

Turning to activities outside Japan, THK established an R&D facility with-

in the head office of THK (CHINA) CO., LTD. in Dalian, Liaoning Province in April 2010 and operates a designated R&D Center opened in April 2012. THK is building a global development system that has already completed several projects and is engaging in product development to meet diversified global needs in tandem with the Engineering and Development Division in Japan.

## Product Development in Fiscal 2014: Realizing the “cubic E” Concept

Leveraging creative ideas and the Group’s unique technologies, the main theme of THK’s current R&D activities is the “cubic E” concept, which embraces the three keywords “Ecological,” “Economical” and “Endless.” Based on this theme, we continued throughout fiscal 2014 to speed up development with the aim of extending the range of applications for our technologies while at the same time seeking to develop highly original and attractive products for launch 5–10 years in the future. Major achievement in fiscal 2014 included the development of products for a number of original applications. In the industrial machinery field, and with an emphasis on ball screws and roller rings, we developed electric actuator-related new model products for use in areas where demand is projected to increase in line with the ongoing progress toward electric-powered living.

With regard to our endeavors in new business areas, the Group focused on further raising competitiveness particularly from the perspective of costs in the transportation equipment field. In this context, steps were taken to develop new crafting techniques, more compact and lightweight products as well as products for use in electric vehicles. The Group also focused attention on product development aimed at entering new markets and increasing sales in other fields including renewable energy, aircraft, robotics, construction equipment, and welfare/nursing/rehabilitation. In the renewable energy field, THK used running data from existing wind and hydroelectric power generators to develop and commence mass production/sales of optimal low-torque shaft units for wind power generators. In hydroelectric generation, we continued conducting demonstration experiments overseas and commenced such experiments at agricultural ditches in Japan. In the aviation field, THK engaged in joint development of airplane interiors with major aircraft manufacturers as well as developed rotating/sliding components for seat reclining mechanisms and table sliding components, both of which utilize the characteristically smooth movements of THK products. In the robotics field, we upgraded and expanded the lineup of “SEED Solutions,” the element/components of a robotics technology system for next-generation robots, releasing SEED drivers, SEED small-sized electric actuators, and robotic hands in such fields as factory automation (FA) and education. Moreover, we are working to expand into the industrial robotics field by developing peripheral technologies for upper-body humanoid robots. “Extra-Vehicular Activity (EVA) Support Robot Experiment on JEM (REX-J)” conducted in 2012 on the International Space Station included small ball-screw actuator-equipped robotic hands developed by THK. In recognition of its contributions to the success of this mission, THK received a certificate of appreciation from the Japan Aerospace Exploration Agency (JAXA) in July 2014.

## Fiscal 2015 Policies and Initiatives

We plan to continuously focus our efforts in fiscal 2015 on the efficient development of new products with the aim of expanding applications for THK technology further. Specifically, we will pursue themes such as customer convenience while promoting designs that incorporate the potential for enhanced productivity and quality. Moreover, by conducting in tandem basic and applied development activities, we will focus on developing products that

can quickly generate commercial returns. Complementing these endeavors, and while strengthening our global development capabilities, the R&D base within THK CHINA will serve at the center of efforts to actively promote product development that addresses local market needs. The THK Group boasts a wide variety of proprietary technologies. Looking ahead, we will actively promote technological interaction between Group companies in an effort to stimulate maximum synergies through the mutual rerouting of technologies thereby leading to new product development.

## MAJOR NEW PRODUCTS



### Caged Roller LM Guide Model SRG ultra-long block type

In connection with its SRG caged roller LM guide, the Company introduced an ultra-long block version model. This initiative is aimed at addressing the need for higher load capacity.



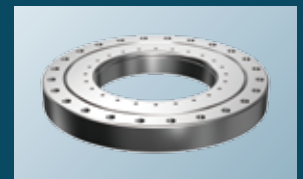
### Caged Ball Screw Model SDA-V

Aiming to expand its global market share in ball screws, THK offers the SDA caged ball screw compatible with DIN specifications, an industry standard in Germany. It enables high-speed motion with low noise levels and can be operated without maintenance for long periods.



### DIN Standard Compliant Ball Screw Model EP/EB-V

The EP/EB-V is ball screw compatible with DIN specifications. It enables high-speed motion thanks to improved processing technology and features a wider array of shaft diameters.



### High-Speed Roller Ring Model RHB/RHE

The RHB/RHE is capable of higher speeds thanks to its redesigned rolling element contact configuration. Incorporating the RHB as an inner-ring as well as an RHE outer-ring rotation configuration, the RHB/RHE realizes greater rigidity and precision than conventional models.



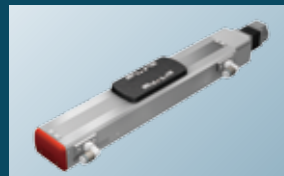
### Electric Actuator Compact Series KSF

The KSF features a large shaft diameter ball screw, enabling high speeds and quick acceleration/deceleration with the same body size using a large rated-output motor.



### Electric Actuator Linear Motor Series GLM20AP

The GLM20AP features additional high-speed specifications. Coil optimization increases the GLM20AP's maximum power output.



### Electric Actuator Clean Series CKRF

Retaining the KRF's basic configuration, the CKRF features a redesigned structure suitable for clean rooms. The upper surface's strip seal keeps surface areas free from contamination.



### Electric Actuator Universal Series USW-L

A new addition to the USW series, the USW-L is compatible with long-stroke, high-speed, higher load capacity conveyance. Adopting a full-cover configuration, the USW-L is designed to prevent intrusion of foreign matter from outside.



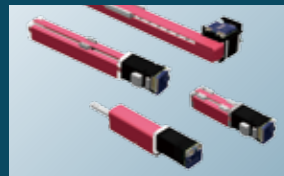
### Network Unit TNU

The TNU is easy for customers to use, featuring specifications that meet telecommunication standards compatible with all major networks used in Japan.



### Robotic Hand TRX

The TRX is an all-in-one general-use gripper able to hold various work pieces. Lightweight and compact, the TRX features both high efficiency and high rigidity.



### Simple Actuator SEED + Picisel

The SEED + Picisel is a simple actuator that combines small-sized wireless control driver SEED Driver with compact actuator Picisel. Applying robot technologies, this model reduces wiring, enables multiple axis control, is easy to operate, and is more space saving than existing systems.