

Research and Development

Guided by the corporate 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 company focused on creation and development.

A Global R&D System for the Next Generation

The THK Group conducts R&D at the Technology Center and its headquarters in Tokyo. At these locations, the Company is endeavoring to use its core linear motion system technology and expertise to develop its mainstay linear motion systems, mechatronic devices such as XY precision stages and linear motor actuators, and products in fields related to consumer goods such as automotive parts, seismic isolation and damping systems, and medical equipment.

In 2010, the THK Group established the R&D Center in China. This facility, which was THK's first R&D facility outside of Japan, began full operation in 2012. With the addition of TRA's German R&D facility in 2015, the THK Group is on its way to building R&D structures oriented toward the Americas, Europe, and Asia in order to more accurately meet the needs of customers around the world.



Headquarters (Tokyo)



Technology Center (Tokyo)



R&D Center (China)

Initiatives During the 2021 Fiscal Year

To meet the varied needs of its customers in the industrial machinery field, THK has expanded its lineup of LM Guide and ball screw products and developed a wide array of new products that contribute to the automation of customers' production lines.

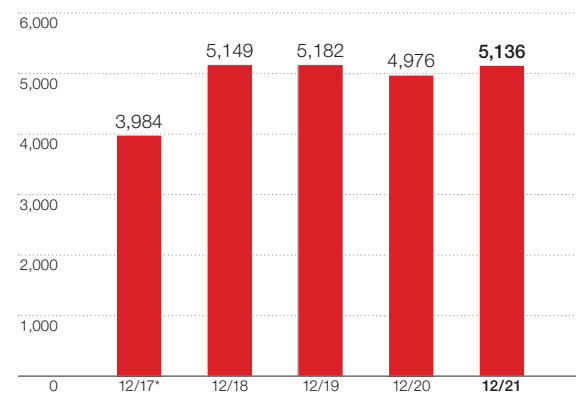
In terms of the IoT, the "OMNI edge" IoT service for the manufacturing industry had its full commercial launch in January 2020. This service visualizes the status of LM Guide, ball screw, and actuator products and enables predictive failure detection. In addition, rotary components such as motors, fans, and pumps were added to the lineup in 2022.

With regard to robotics, THK released the life-sized "SEED-Noid" humanoid robot, the "SEED-Lifter" lifting unit, and the "SEED-Mover" omnidirectional trolley as part of its SEED-R7 series. These platform robots come in various types of units that combine the mechanical design, electric and electronic controls, and core software that are essential to service robots. By reducing the burden of robot development, they help customers lower their total costs and accelerate development.

In its automotive and transportation business, in response to the shift towards electric automobiles, THK has utilized new production methods to introduce aluminum products to the market in order to expand sales and meet customer needs for more lightweight components. The Company has also developed aluminum hot forging technology in-house in North America, and products manufactured with this technology have been adopted by both American and Japanese-owned businesses looking to procure items locally. As a second pillar in addition to its linkage and suspension business, the Company is also developing and mass-producing CASE-related ball screws for use in automobiles. These products are officially being

adopted for new suspension-related components, and THK will work to serialize these items and expand sales. Furthermore, the THK Group will promote the development of next-generation products aimed at a truly market-in approach that looks forward five or ten years and anticipates needs customers might not be aware of yet while also working to expand the Company's product lineup to meet current customer needs.

R&D Expenses
(Millions of yen)



* This data reflects a modified reporting period that includes 9 months from consolidated companies whose fiscal years ended in March and 12 months from consolidated companies whose fiscal years ended in December.

THK's Philosophy on Intellectual Property

Policy

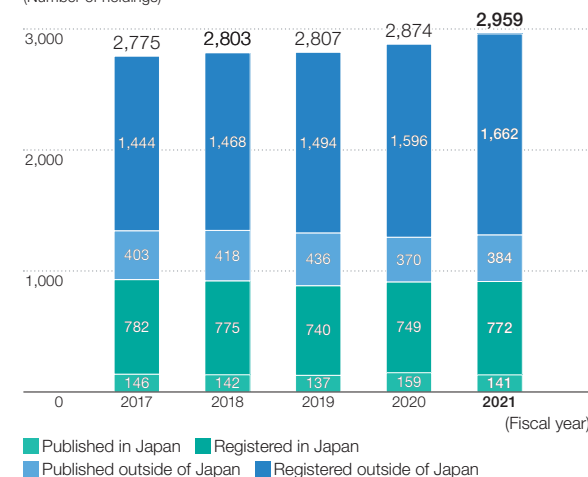
THK values and promotes the creation and full utilization of its intellectual property to continue contributing to the creation of an affluent society through the development of innovative products.

By applying for patents and preserving its specialized knowledge, THK exercises exclusive rights to its linear motion technology and eliminates imitations. At the same time, to avoid infringing upon the patents of others in the industry, THK works with its planning and development departments to conduct thorough patent searches while still in the development stage, and the Company internally educates its employees so that they respect the patent rights of third parties to avoid patent infringement.

Through full-scale globalization and other means, THK is striving to expand the breadth of its preservation of effective intellectual property rights that contribute to industry.

Intellectual Property

(Number of holdings)



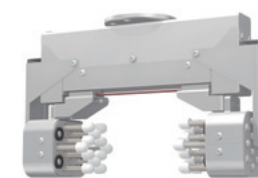
New Products for Improving Productivity

The Adaptive Hand Series TNH is a general-purpose robot hand that is both small and lightweight, capable of suctioning and gripping workpieces with complex shapes in a stable manner through its ability to adapt its form to that of the workpiece it is gripping. Traditionally, specialized tooling and hands would have to be manufactured and swapped out for different workpieces. However, this versatile product is capable of suctioning or gripping small components, food products, plastic goods, or ceramics, which eliminates the need to have an assortment of special tools or to replace hands. This helps lower

costs both in terms of the initial investment and improved productivity. The TNH was awarded the 2021 Grand Manufacturing Prize for Machine and Robot Components, a prize sponsored by THE NIKKAN KOGYO SHIMBUN and the MONODZUKURI Nihon Conference that recognizes superior components and materials that improve the competitiveness of Japanese manufacturing and contribute to the development of industry and society. This product supports solutions to the problems facing an aging society with a declining birthrate, such as labor shortages and rising labor costs.



Adaptive Suction Hand
The built-in flow restrictor accommodates for suction error.



Adaptive Gripping Hand
The opening and closing functions and gripping force can be controlled by just a digital signal.



Adaptive Unit
An adaptive unit available for customization.

Example Applications

Industrial Products



Tool



Machine part

Food Products



Can



Gum container