

# SHAPING A BETTER FUTURE

JTEKT's evolving solutions

## Linkless Steer-by-Wire\*1

A steering mechanism that has eliminated the mechanical linkage between the steering wheel and the tires

Peace of Mind & Safety

- Drivers' safety in the event of a collision has been enhanced by removing the shaft previous in the vehicle's interior.

Comfort

- Optimal tire control is calculated instantaneously from the driver's steering wheel operation and various vehicle information, thus providing passengers with a comfortable driving experience.
- Enhances the degrees of freedom in the driving space (the steering wheel can be stored away during autonomous driving mode)

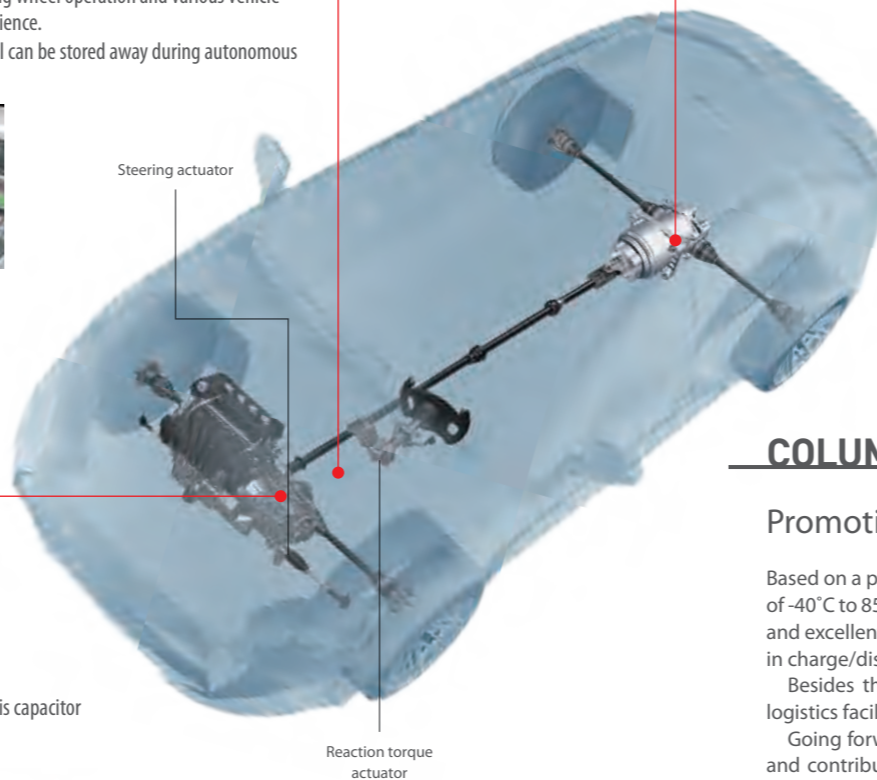


During normal driving



During autonomous driving

\*1 A mechanism that transmits the rotation of the steering wheel to the tire electronically rather than mechanically



Steering actuator

Reaction torque actuator

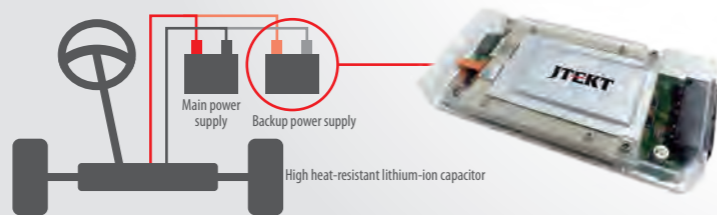
## High Heat-Resistant Lithium-Ion Capacitor\*2

A lithium-ion capacitor that can be used at a temperature range of -40°C to 85°C

⇒ Please refer to COLUMN on page 28.

Peace of Mind & Safety

- Installed in the system and used as a backup power supply  
If for some reason there is a disruption to electric power in the vehicle, this capacitor can supply power to the actuator that moves its tires.



Main power supply

Backup power supply

High heat-resistant lithium-ion capacitor

Electrification & Autonomous Driving

- Can be used for backup power supply, power assist, energy recovery, and various other purposes

Improved System Installation Flexibility

- High heat resistance allows it to be installed within vehicles without cooling equipment

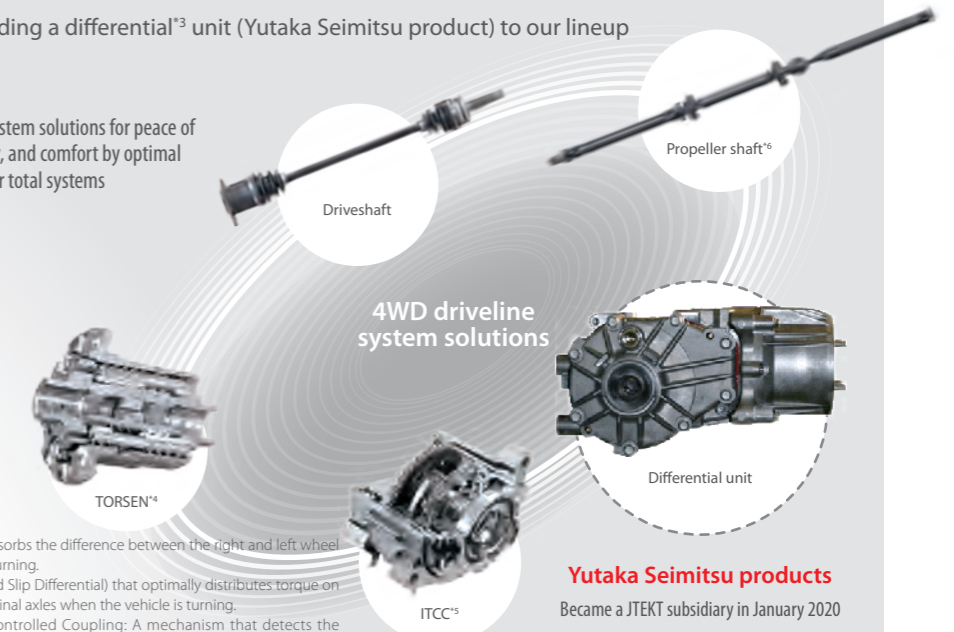
\*2 A power storage device with increased energy density by adding lithium ions to the negative electrode material of a power storage device (capacitor) having an electric double layer of a positive electrode and a negative electrode

## 4WD Driveline Systems

Becoming a system supplier by adding a differential<sup>3</sup> (Yutaka Seimitsu product) to our lineup

Peace of Mind & Safety Comfort

- Providing system solutions for peace of mind, safety, and comfort by optimal proposals for total systems



\*3 A mechanism that absorbs the difference between the right and left wheel rotation for smooth turning.

\*4 A type of LSD (Limited Slip Differential) that optimally distributes torque on the lateral or longitudinal axes when the vehicle is turning.

\*5 Intelligent Torque Controlled Coupling: A mechanism that detects the difference between front and rear wheel rotation and achieves optimal front and rear wheel torque distribution by electronic control

\*6 A shaft that transfers power from the engine to the rear axle in 4WD and rear-wheel drive vehicles.

### Yutaka Seimitsu products

Became a JTEKT subsidiary in January 2020

In January 2020, JTEKT acquired all shares of Yutaka Seimitsu Kogyo, Ltd. and made it a subsidiary.

## COLUMN

### Promoting further sales expansion of high heat-resistant lithium-ion capacitors

Based on a patented technology, high heat-resistant lithium-ion capacitors are "No. 1 & Only One" products that can operate in a range of -40°C to 85°C. They offer improved system installation flexibility as they can be installed in a vehicle without requiring a cooling device and excellent durability against deterioration caused by self-heat generation during large current charge/discharge, giving advantages in charge/discharge performance and durability over competitors' products.

Besides the automotive industry, we are receiving inquiries from customers that manufacture trains, construction machineries, logistics facilities, and other equipment and are working aggressively to expand our sales channels.

Going forward, JTEKT will spark new innovation with our No. 1 & Only One technologies and contribute to resolving an expanding array of social issues, such as global warming, declining birthrates, a shift to an elderly society, and disaster risks.



• Maintenance-free  
• Highly durable  
• Low loss

• High installation flexibility  
• Resilient to tough environments  
• Supports large current

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## Bearing technologies required in the spread of vehicle electrification

- **Improved reliability:** Respond to new issues that arise from electrification
- **Response to autonomous driving:** Contribute to safe and reliable driving
- **Response to high speed:** Address needs for high-output and smaller motors
- **Torque reduction\*1:** Contribute to even better fuel efficiency

\*1 To reduce force to move objects (equivalent to low friction)  
 \*2 This is a kind of machine element comprising a screw shaft, a nut, balls, etc. with a mechanism for converting linear motion to rotational motion, and vice versa.  
 \*3 A phenomenon that the outer ring rotates in relation to the housing

**“Only One” technology**

### Non-circulating type ball screw for electric brakes\*2

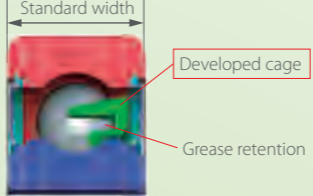


Non-circulating type ball screw

We have simplified the ball screw mechanisms that efficiently convert the rotational motion of an electric motor into linear motion. This will contribute to the evolution of electric braking technology that is needed to meet the demands for size and weight reduction and for autonomous driving technology.

**“No. 1” technology**

### Grease-lubricated high-speed ball bearing for EV motors



Standard width  
Developed cage  
Grease retention  
Developed item

JTEKT developed a grease-lubricated ball bearing for EV motors that enables the world's fastest\* high-speed rotation of all those bearings for EV motors. This development addresses the need for smaller motors and higher motor output, which will help to improve electric power efficiency and extend the cruising range of the vehicle.

\* According to JTEKT research

## COLUMN

### Ultra-high precision bearing PRECILENCE\*4



Koyo Seiko Co., Ltd., one of the predecessors of JTEKT, will celebrate the 100th anniversary of its founding in 2021. In honor of this milestone, we are working to elevate JTEKT's Koyo brand of bearings to a global top brand. Toward that goal, we worked to deepen our base technologies (materials and heat treatment technologies) and innovate our processing technologies. This led to the successful development of PRECILENCE, a bearing that offers ultimate rotational accuracy, quietness, high speed, low torque, and longevity that conventional bearings were not able to achieve. We will continue contributing to the advancement of all sorts of industries with our “No. 1 & Only One” technologies.

\*4 PRECILENCE is the brand name of an extra precision bearing that offers both precision and silence. The brand will be developed as a series in the future.

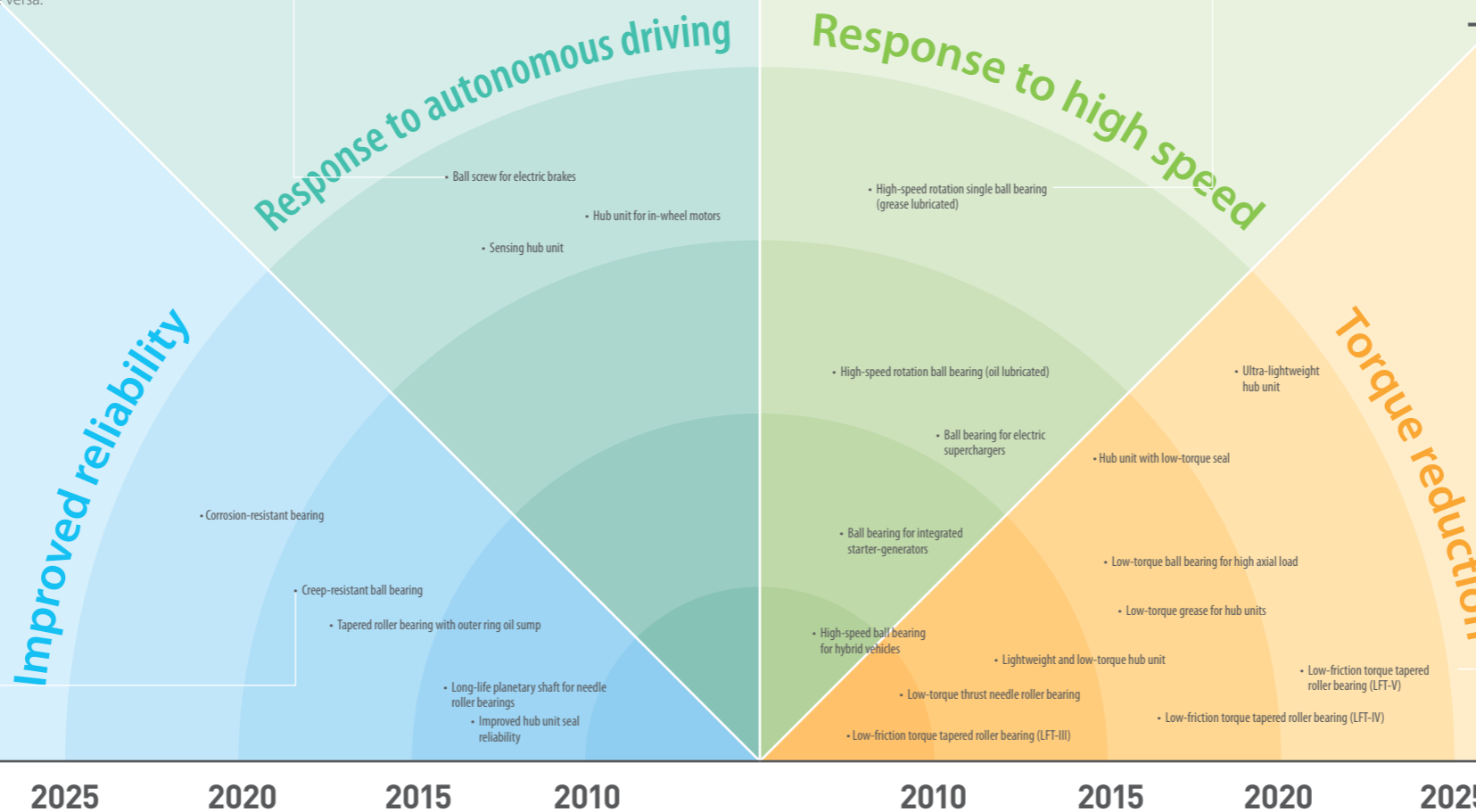
**“Only One” technology**

### Ball bearing with suppressed creep wear\*3



Special coating  
Circumferential groove

We have enhanced resistance to creep caused by the strain of the outer rings of thin section ball bearings used in electrified powertrain units. We are therefore able to contribute to making transmissions smaller, lighter, and more reliable.



**“No. 1” technology**

### (LFT\*5 series) 5th generation Low-Friction-Torque tapered roller bearing “LFT-V”



As tapered roller bearings used in automotive transmissions and differential units\*6, we have developed the LFT-V, which offers the No. 1 lowest torque and weight in the LFT series. LFT-V will contribute to making automobiles lower in fuel consumption and higher in energy efficiency.

\*5 Low Friction Torque  
 \*6 A mechanism that absorbs the difference between the right and left wheel rotations for smooth turning.

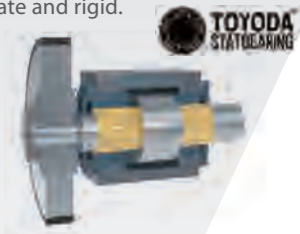
# SHAPING A BETTER FUTURE

JTEKT's evolving solutions

## High accuracy cylindrical grinders\*1

### Static technology STAT BEARING

STAT BEARING is installed in the grinding wheel spindle, known as the heart of the grinder, which has no metal-to-metal contact and is highly accurate and rigid.



### Thermal control

We use CAE analysis\*3 to thoroughly reduce thermal deformation and achieve stable grinding accuracy.



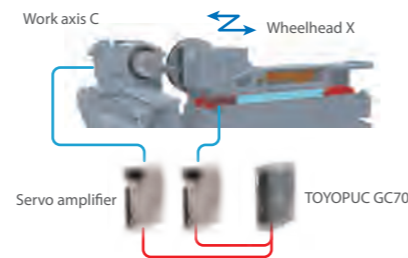
### High-speed CBN processing technology

We provide productivity improvement to our customers through our rich experience in processing gained from our development of grindstones that began in the early 1970s.



### C-X control technology

A highly responsive servo system that synchronizes the amount of movement in the grinding bed and work axis rotation with high accuracy is achieved through a built-in CNC\*2 device.



\*1 A machine that grinds the surface of a workpiece using a rotating grinding wheel  
 \*2 Computer Numerical Control: A device that controls machinery based on predetermined numerical values  
 \*3 Computer Aided Engineering: Simulations and analyses using computers during the machine design process

## Gear skiving centers\*4

### Skiving tools

Based on the Skiving Theory of Creation\*5, our gear skiving centers achieve tool design with low-resistance and high accuracy and a variety of tooth formations, such as an involute\*6 and special shapes.



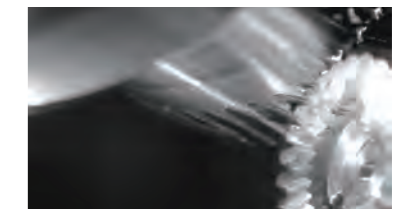
### Highly durable with a high-speed spindle

A compact, high-speed, and highly durable unit created from a high-output, built-in motor and our in-house large-diameter bearings.



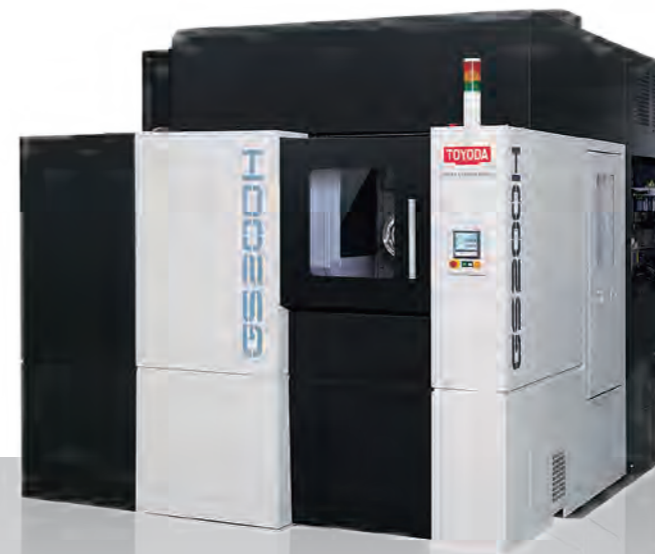
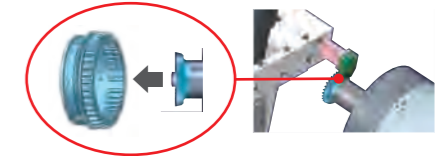
### High-speed and synchronized gear machining control

Our proprietary CNC achieves high-speed and highly accurate synchronized rotation and gear tooth formation with perfect freedom.



### Gear tooth position control technology

This is a non-contact position detection technology used to accurately determine the tool blade position in order to accurately machine the item to be cut without re-affixing it while changing tools for complex gears.



## COLUMN The voice of the customer

### Realizing an ideal general-purpose line for gears

Unit Production Technology Division  
Hino Motors, Ltd.

Hino Motors is a manufacturer of trucks, buses, and other commercial vehicles.

In addition to a broad product lineup, its vehicles have a long model life, which means it has an extremely large number of parts to manufacture and manage. Of these, it has a wide range of manual transmissions that are made on in-house lines comprising specialized machines (gear shavers\*7 and broaching machines\*8) for each item. JTEKT's gear skiving center recently adopted by Hino Motors concentrates gear cutting and a variety of other jobs within one unit regardless of differences in size or specifications of the item. This enables the ideal production of multiple items in small lots, greatly reduces manufacturing lead times, and overcomes a range of issues such as removing tasks that require intuition and experience.

JTEKT received the following positive feedback, "We received the best solution for dealing with multi-product and small-lot production of parts from the latest models to those released over 30 years ago." We will work together with Hino Motors to create low-cost, lightweight and compact next-generation transmissions while further enhancing the performance of machined parts.



## COLUMN The voice of the customer

### "Circle for True Circle" with an eye toward the product ahead

Hideto Yamada  
President of Yamada Seisakusho Co., Ltd.

In the 50 years since its foundation, Yamada Seisakusho has focused on grinding processes to make things perfectly round in a way only possible by master craftsmen. It is known as a company with the slogan "Circle for True Circle" that works to improve and maintain the accuracy of roundness. In contrast to manufacturing sites in Japan supported by veteran employees with long years of experience, at Yamada Seisakusho young female staff in their 20s are energetically operating processing machines. The background to this is the belief that business continuity would be difficult when relying on the skills and experience of specific individuals. They therefore pursued business innovation by standardizing internal operations and deploying IoT and robots so that anyone could perform the required tasks. In addition, the introduction of IoT enabled the company to analyze operating conditions on the factory floor and have younger employees make improvements.

The TOYODA grinders that support Yamada Seisakusho's highly accurate processing have received such feedback as, "They are easy to operate, and it is easy to achieve accuracy. Since we get accuracy, tasks can be standardized, it is easy to work with robots."

In this way, "No. 1 & Only One" TOYODA grinders are contributing on the factory floor, where there are issues with business continuity and automation is progressing at a rapid clip.

