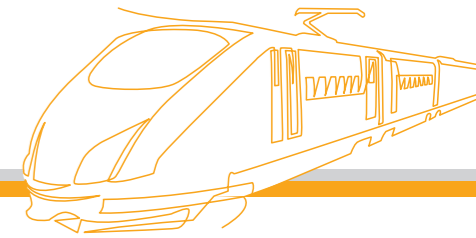


Transportation Business Segment



We support railway transportation that connects people and cities with safety and trust through the technologies we have cultivated since our founding and through our environmentally friendly manufacturing.



Naoki Okuyama
General Manager of
Transportation Business Unit

Business environment and strategy

The easing of the COVID-19 pandemic-related restrictions has been accompanied by the return of social and economic activities to normal levels, including a recovery in capital investment by businesses. Meanwhile, however, rising raw material prices, longer delivery waits, and other changes in the post-COVID-19 pandemic business environment have continued to pose daunting challenges. I believe that we need to respond by stepping up our efforts as a corporation and strengthening our actions for addressing the needs of customers.

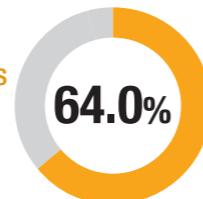
Looking at the domestic market, the improved business performance of railway operators has sparked an upward trend in their heretofore sluggish demand for new rolling stock production and equipment renewal. However, this bears close watching, as the demand in some areas is not on par with pre-COVID-19 pandemic levels.

As for overseas markets, demand has been significantly recovering in China, and we are working with our affiliates there to respond to this resurgence. Inquiries are streaming in from other Asian countries and global regions as well, and our production and sales teams are making a coordinated response.

Railway operators are showing a growing interest in initiatives for achieving the SDGs and carbon neutrality. In response, we will proactively offer our railway power storage equipment as a solution that can support those efforts.

Results for FYE May 2023

Percentage of total consolidated net sales



● Orders Received

20,963 million yen (Up 11.5% year on year)



● Net Sales

19,857 million yen (Up 2.1% year on year)



● Segment Income

2,259 million yen (Up 3.2% year on year)



Main actions

◆ Totally enclosed induction motor with inner fan and grease-lubricated bearings

In addition to our existing model that lubricates bearings with oil, we have developed a model with grease lubrication.

This product optimizes the trade-offs between product cost and efficiency, noise, and maintenance requirements in order to enhance the performance of railway vehicles while also reducing maintenance and improving comfort through noise reduction.



◆ Power storage system for Fukuoka City Transportation Bureau

Together with GS Yuasa Corporation, we supplied a power storage system for the Fukuoka City Subway's Nanakuma Line, which was extended in March 2023.

The regenerative power generated by train braking is stored in the system's batteries and can be discharged to compensate for voltage drops in the overhead lines, such as when many trains operate during rush hour. This enables effective utilization of regenerative power.

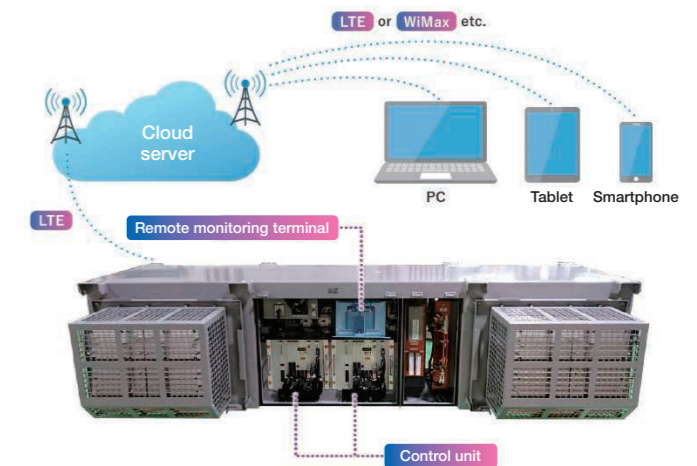
Moreover, the system can also function as an emergency power source for train movement. When trains get stopped between stations because a blackout or other issue has interrupted power transmission in the overhead lines, they can draw power from the system to travel to the nearest station.



◆ Vehicle condition monitoring system for realizing condition-based maintenance

We have begun testing a system for monitoring the condition of railway vehicles' electrical equipment to realize condition-based maintenance in the future. This project is being carried out with Keihan Holdings Co., Ltd. and KOTSU DENGYOSHA CO., LTD.

The project is proactively leveraging digital technology in order to expand the range of equipment that can be monitored. This will enable maintenance to be performed more efficiently and thus accommodate the labor shortages that are expected to occur from population shrinking in the coming years. The result will be safer and more stable railway vehicles.



◆ Energy-saving solutions for existing railway vehicles

We have been commissioned by Keifuku Electric Railroad Co., Ltd. to add a regenerative braking function to their MOBO 2001 series through modification of the controller and a change of software.

In addition, Kagoshima City Transport Bureau has contracted us to replace the VVVF inverter controllers of their 2110 series to provide preventive maintenance and improve energy efficiency as they have been in use for approximately 30 years since the service began.

Since these projects will reduce power consumption and the use of worn parts while also extending the replacement cycle, they can help our clients to lower their environmental impact and thus contribute to achievement of the SDGs.



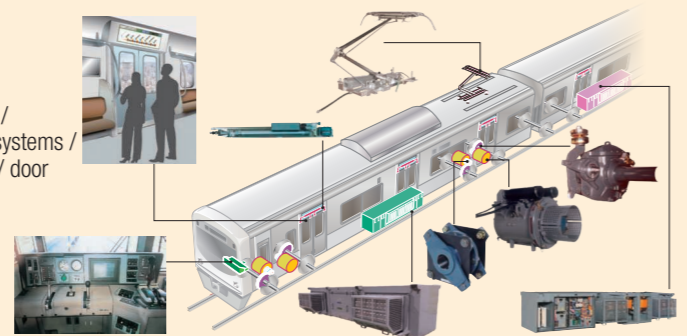
Main products

● Electrical equipment for railway vehicles

Propulsion inverters / auxiliary power supplies / Main motors / driving gear units / pantographs / total train communication systems / passenger information display systems / twin disk couplings / door operating equipment / high speed circuit breakers, etc.

● Railway power storage systems

● Door operating equipment for buses



Industry Business Segment

We use our high-efficiency, high-precision power electronics technology to provide customers with environmentally friendly social/industrial infrastructure equipment, contributing to the realization of a sustainable society.



Toshihito Nakanishi
General Manager of Industry Business Unit

Business environment and strategy

We are seeing a stronger influx of inquiries as many industries vigorously pursue capital investments amid diverse efforts to bring forth a sustainable society. Although our manufacturing was impacted by shortages in semiconductor chips and other components in the fiscal year ended May 2023, I believe that our situation will improve going forward.

In our production and processing equipment business, demand for equipment renewal is rising along with growing needs for energy-saving and low-maintenance solutions.

In the automobile testing machines business, we need to respond to the rapid shift toward EVs by adding more battery simulators to testing systems, and develop e-Axles (EV drive units).

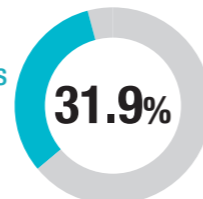
In the area of power generation and power supply, expectations are rising for the contributions to Japan's energy resilience that can be made by expansion of emergency power generation systems and renewable energy-based power generation.

Working in this business environment we will offer solutions that answer such expectations and can help realize a sustainable society.

In addition, we will collaborate with the Development Center to branch out into new fields, such as vehicle testing, where we could move into testing of advanced driver-assistance systems (ADAS) for automobiles.

Results for FYE May 2023

Percentage of total consolidated net sales



● Orders Received

10,855 million yen (Up 1.6% year on year)

2021	10,597
2022	10,688
2023	10,855

● Net Sales

9,905 million yen (Up 0.0% year on year)

2021	10,541
2022	9,902
2023	9,905

● Segment Income

479 million yen (Up 0.2% year on year)

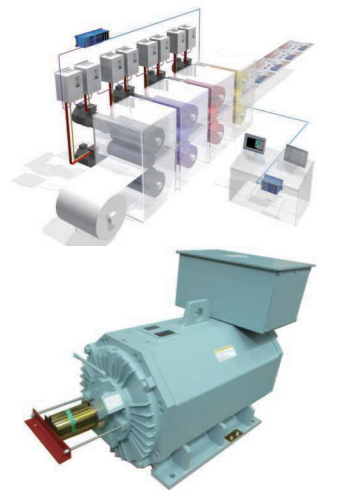
2021	718
2022	477
2023	479

Main actions

◆ Expanding the lineup of production/processing equipment drive systems that help save energy and reduce maintenance

We leverage our ED (Eco-Drive) Motors that incorporate permanent magnets and our high-precision controllable inverters to supply production and processing equipment drive systems that offer excellent precision, energy efficiency, and maintainability. Also, we have made it possible to apply ED Motors to a broader range of equipment by conforming them with EU directives and expanding the lineup to include large-capacity water- and dust-proof models. Moreover, the cooling of ED Motors can be changed from air to water cooling, which reduces the noise of cooling fans and thus can help improve working environments.

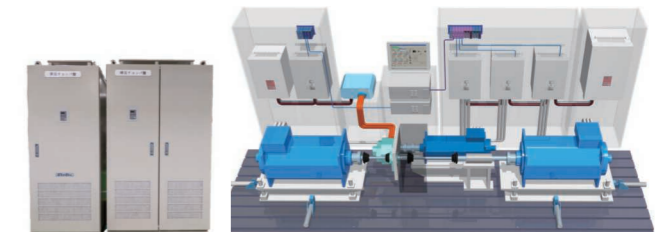
Going forward, we will further contribute to sustainable manufacturing by providing products that reduce the energy and maintenance needs of production and processing equipment.



◆ Responding to the shift toward EVs with our automobile testing machines

We supply automakers and automotive part manufacturers with automobile testing machines, mainly for testing drive systems. In response to the shift toward EVs, we offer battery simulators for use in testing machines. Manufacturers are turning to high-capacity, high-voltage batteries to address EV challenges such as limited range and charging needs. We have responded by developing and supplying a battery simulator model whose direct current power source supports high voltages of up to 1,000 V. This realizes automobile testing machines that can also be used for e-Axles and other EV drive components.

We will continue using industry-leading technologies to contribute to the development of next-generation automobiles.



◆ Proposing vehicle testing devices that use in-wheel-well dynamos

The development of battery-powered EVs and other energy-efficient vehicles is picking up pace amid efforts to achieve carbon neutrality. To support the evaluation of these vehicles, we are proposing an approach to vehicle testing that replaces the traditional chassis dynamometer with the in-wheel-well dynamo we developed. Since this system directly connects to the hub in the vehicle's wheel well, it saves space and can be installed in a wider range of locations compared with the chassis dynamometer. As a result, it has potential for use in diverse types of vehicle testing, including running mode testing.

Since it enables steering to be done during running tests, it also has potential for application to testing of ADAS and autonomous driving. We will work with the Development Center to further expand its range of application.



◆ Approaches to power generation systems using renewable energy

We supply a distributed power supply system for small hydroelectric power generation as a power generation system that uses renewable energy. We are also exploring new ways to utilize renewable power, including marine energy power generation.

Our distributed power supply system is powered by our standard ED Motor, and this feature is leveraged to support a variety of applications, such as generation and sale of electricity to commercial power grids, and, with the addition of stand-alone functionality enabling operation during grid outages, service as an emergency power source.



Main products

● Automobile testing machines

Various testing devices (durability, vibration, noise, etc.) for automobile components (engine, transmission, differential gear, etc.) / testing devices for automobiles (efficiency, driver-assistance systems, etc.)

● Production and processing equipment drive systems

For printing machinery / tire and rubber processing machinery / paper manufacturing machinery / films processing machinery, etc.

● Power generation and power supply systems

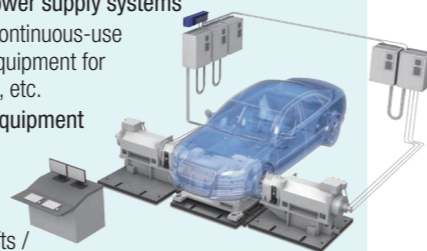
Emergency generators / continuous-use generators / generating equipment for distributed power sources, etc.

● Car-mounted electrical equipment

For passenger vehicles / construction machinery

● Others

Electrical equipment for lifts / Water supply and sewage equipment systems, etc.



ICT Solution Business Segment

Reorganized from the Information Equipment Systems segment in June 2022



Support the improvement of customers' operational efficiency, convenience, and added value and the construction and operation of DX-MaaS infrastructure with ICT solutions that combine advanced ICT and electronics.



Shingo Furuzawa
General Manager of ICT Solution Business Unit

Business environment and strategy

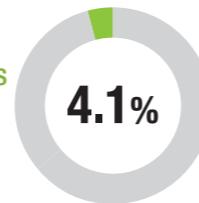
With the lifting of COVID-19 travel restrictions, the number of railway passengers, including inbound visitors, has been recovering and capital investment in railway station operating systems is showing signs of rebounding. As transportation service operators seek to improve user convenience with MaaS, cashless, ticketless, and other solutions, we are proactively developing systems that support such needs so that we can propose solutions that meet customer expectations.

Against the backdrop of dramatic advances in technologies such as cloud computing, communications, data analysis, and AI, as well as labor shortages and value creation using big data, the IoT market is starting to expand into new areas. These include countermeasures against the deterioration of infrastructure equipment, particularly in the manufacturing, public, and transportation sectors, upgrades in transportation infrastructure, and supply chains. We will leverage cloud services and systems/services utilizing IoT terminals and mobile communication to develop solutions that enable customers to monitor and control mobile entities and remote equipment so that they can improve operational efficiency, optimize maintenance, and carry out preventive and condition-based maintenance.

We will expand our business range as we strive to provide our customers with solutions that help to add value.

Results for FYE May 2023

Percentage of total consolidated net sales



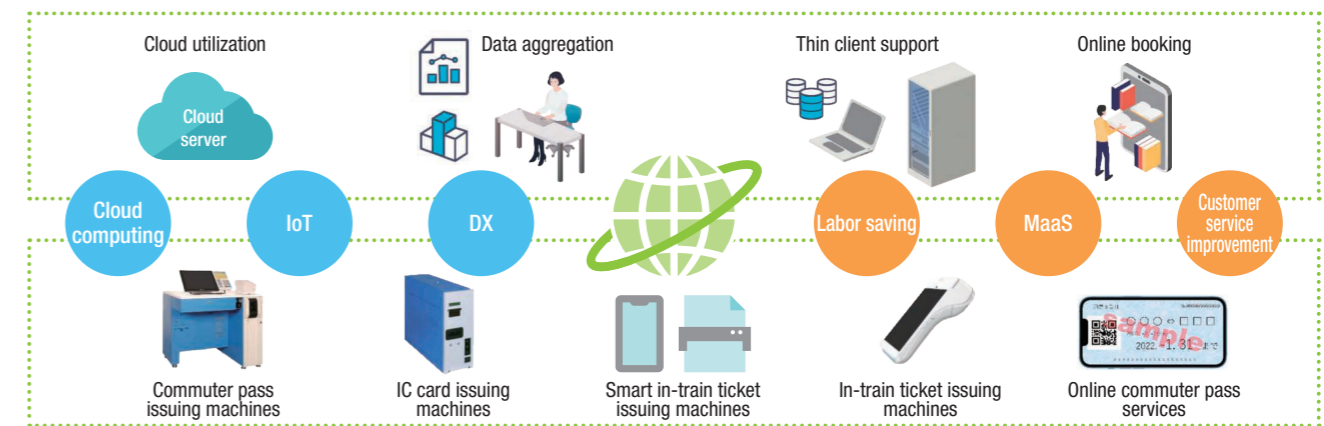
Category	2021	2022	2023
Orders Received 1,421 million yen (Up 49.7% year on year)	633	949	1,421
Net Sales 1,256 million yen (Up 59.0% year on year)	1,067	790	1,256
Segment Income 413 million yen (Up 189.6% year on year)	267	142	413

Main actions

◆ Railway station operating equipment systems

We combine our deep insights, reliable technologies, and extensive experience in the rail transport sector with advanced ICT to provide railway station operating equipment systems that improve passenger convenience and reduces the workload of railway operators.

Leveraging cutting-edge cloud computing and IoT technologies to respond to needs ranging from diverse station equipment to host systems and applications that run on smartphones already in use, we will continue supplying transport service operators with systems that help them to build their foundation for DX and MaaS, improve operational efficiency, reduce workloads, and improve customer service.

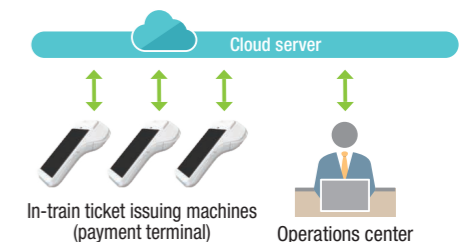


◆ In-train ticket issuing system using cashless payment terminals

Previously, our solutions for in-train ticket issuing systems focused on developing dedicated terminals, but now we have developed an in-train ticket issuing system in which an in-train ticket issuing app is used on portable general-purpose cashless payment terminals with a built-in printer function, as well as a sales data aggregation system that uses a cloud server.

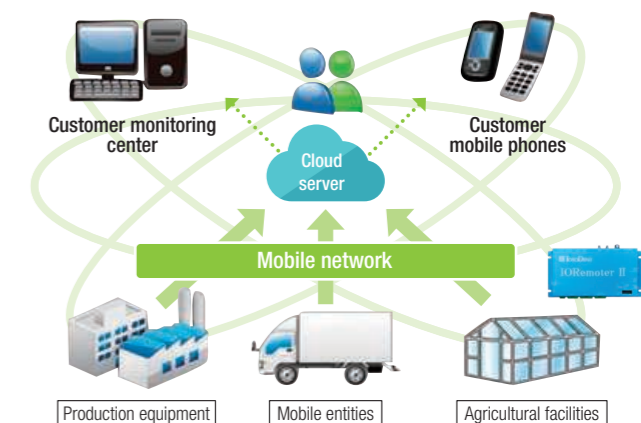
This use of general-purpose cashless payment terminals lowers costs, making it easier for customers to adopt the system, and thus helps to create a cashless society.

We will develop business apps tailored to customer needs so that the terminals can also be used for purposes other than in-train ticket issuing.



◆ IoT solutions

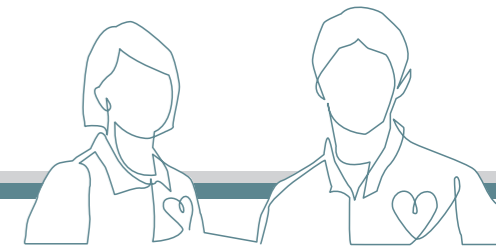
We offer diverse services with systems that utilize IoT terminals, mobile networks, and cloud servers. In doing so, we provide solutions that enable customers to monitor and control mobile entities and remote equipment so that they can improve operational efficiency, optimize maintenance, and carry out preventive and condition-based maintenance.



Main products

- **Railway station operating equipment systems**
Commuter pass vending machines / composite ticket vending machines / in-train ticket issuing machines / compact vending machines / judgement engines, etc.
- **IoT solutions**
(Cloud-based remote monitoring and control systems)





Through collaboration with business units, the Development Center proactively explores and proposes new business areas and develops new products by employing technologies that contribute to the development of power electronics products, smart grid-supporting equipment, and autonomous driving systems for vehicles, and by utilizing monitoring systems that use sensor technology and information equipment that incorporate communication technology for greater sophistication.

Achievements in development of new businesses and products

Remote monitoring system for electrical equipment for railway vehicles

- We supplied Aichi Rapid Transit Co., Ltd. with a system for real-time remote monitoring of VVVF inverter equipment.



Smartphone-based in-train ticket issuing machines

- We developed an in-train ticket issuing app for Shikoku Railway Company that operates on iPhones. Going forward, we will create a lineup of in-train ticket issuing machine products that utilize general-purpose smartphones and tablets, such as Android devices and iPads.



A first step toward realizing the 2030 energy mix

VOICE

Located in Fujiyoshida City, Yamanashi Prefecture, the Fujino Shizuku Power Plant is a small hydroelectric power generation plant that makes effective use of unused energy in the form of water flowing through local agricultural irrigation channels. All the electricity generated is sold to an electric power company.

Also, a feature of this Toyo Denki product that contributes to local disaster resilience is that electric power can be supplied to charge smartphones, EVs, and so on during power outages.

We will continue to help promote the adoption of renewable energy and thus support the realization of the 2030 energy mix.



Yusuke Nakanishi
Business Development Division
Development Center

Main actions

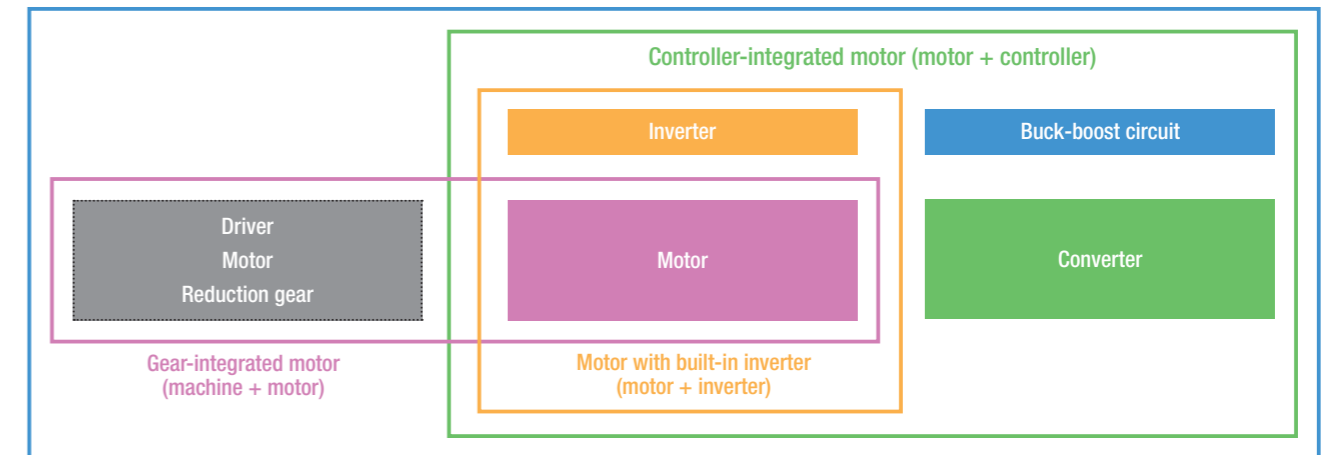
◆ On-demand motors (BTO Motors)

Capitalizing on our fundamental technologies in power electronics and manufacturing, we supply motors and inverters optimally tailored to the customer's needs (on-demand products).

We have provided flat large-torque motors to replace engines in electrification efforts and compact high-speed motors, but we will now develop on-demand products such as built-in electricals for motors (a key technology going forward) and motors with built-in inverters.



Example of product deployment



Gear and controller integrated motor (e Axle) (machine + motor + controller)

◆ Cloud-linked cashless payment terminal solutions with general-purpose terminals

We will collaborate with the ICT Solution Business Unit to develop diverse cashless payment systems that utilize devices such as general-purpose portable terminals and are customized for the customer's needs. We can also create business apps designed for use on these systems.



Intellectual Property

Our intellectual property is placed as a key corporate resource. Our intellectual property department is responsible for the management of intellectual property and the development divisions in each business unit and the Development Center actively apply for patents and utility models.

