# **Our Cultivated Strengths**

Over its 75-year history, DENSO has cultivated various unique strengths. Since the founding of the Company, these strengths have been augmented and passed down as the DENSO Spirit, which is encapsulated in the actions of all DENSO employees around the world. These strengths have resonated with all employees and driven DENSO's growth over the years. Amid the constantly changing business environment, DENSO will remain committed to refining these strengths as the unshakable driving force behind value creation that is uniquely DENSO.



# Robust Business Foundations

DENSO's business activities are supported by robust foundations built over many years, giving the Company an advantage that cannot be easily replicated. The driving force behind all our business activities is the expertise of our approximately 160,000 employees across the globe as well as our relationships with diverse stakeholders, including customers, suppliers, and business partners. By evolving and increasing such relationships and expertise, we will realize further growth.

# Roots of Our Strengths

- 1949 Split from Toyota Motor Co., Ltd. and established NIPPONDENSO CO., LTD. as an independent company, with the aim of becoming a company active on a global scale, amid worsening economic conditions
- Established the Technical Training Center. This center fostered the principles of "Monozukuri is Hitozukuri (Our performance relies on 1954 our people)" and "Engineering and technique go hand in hand." These principles continue to be passed down within the Company. Deepened cooperation with suppliers by establishing the DENSO Cooperative Association (currently DENSO HISHOKAI), which 1959
- currently accounts for annual procurement of ¥4.0 trillion from approximately 7,540 suppliers
- Opened a Chicago sales office and a Los Angeles branch office. Anticipated trade liberalization and other global trends through the 1966 establishment of this first overseas sales office
- 2020 Opened the Hirose Plant, which together with the Electrification Innovation Center, housed within the plant, established outstanding development and production capabilities and became the core of our electrification domain

### The Key to Our Strengths

nan Capital Human resources that support value creation

> Number of employees worldwide: Approximately 160.000 (35 countries and regions)



cial Capita

(fiscal 2024 year-end): 60.9%

Suppliers (fiscal 2024): Approx. 7,540 across the globe

Social and Relationship Capital

Robust supply structure

DENSO split from Toyota Motor Co., Ltd., and was established as an independent company amid worsening economic conditions. Since that time, our employees have been making achievements under challenging operating environments, passing on an unbreakable spirit for developing technologies and promoting Monozukuri activities that offer social value from one generation to the next. Throughout our history, we have continued to develop talent that will lead the future of DENSO. At the moment, our roughly 160,000 employees around the world are making tireless efforts to ascertain the needs and trends in each region in a timely and accurate manner and apply that knowledge to our R&D and Monozukuri activities. Over the course of 75 years engaging in our business activities, we have built strong trust-based relationships with a broad range of customers,

pursued technologies that cater to customer needs, and deepened our insight together with our customers. We have also established a stable supply structure as a direct response to customer needs. Underpinned by a robust financial foundation enabling us to tackle new pursuits, we are realizing unprecedented new value by combining the knowledge we have refined across the globe with the strengths of our diverse business partners.

## Further Enhancing Growing with Our Suppliers, Earning the Trust of Society, and Following the Path Our Strengths to the Stable Procurement of Semiconductors

At the start of the 2020s, people's consumption behavior began to change, triggered by the global spread of COVID-19. Demand for semiconductors also surged, resulting in a severe semiconductor shortage in the automotive industry. Amid these challenges, we began to see the stark contrast between the unique business practices of the automotive industry and those of other industries, including practices such as small-quantity, high-mix orders for products with long life cycles and short lead times with unpredictable order quantities.

To address this contrast, DENSO is working to transform its procurement structure into one that truly appeals to suppliers. While closely sharing information with our customers, we will actively select and adopt recommended components based on the perspective of QCD.\* By doing so, we aim to reduce the risk of discontinued production (end-of-life products) while also enhancing the ability of our suppliers to offer a sustainable supply. Also, while actively communicating long-term trends and sharing information with suppliers and customers, we will promote examinations for transitioning production in response to requests for the discontinuation of production by suppliers, as soon as there is any indication of such requests. In this way, we will help establish a sound business environment together with our suppliers. By working with our suppliers to build a supply structure that earns the trust of society, we will ensure a stable supply and bolster our competitiveness.

\* QCD: Quality, Cost, and Delivery. QCD is an indicator used to evaluate production management in the manufacturing industry.



# Advanced R&D

DENSO has contributed to the development of the mobility society by creating an array of competitive products that accurately cater to social needs. Amid diversifying values and increasingly complex social issues, we aim to extend the scope of our contribution with mobility as our starting point. To this end, we have defined priority fields in accordance with our green and peace of mind principles. Moreover, we are planning technologies and strengthening R&D capabilities with an eye on the future. We will continue creating new value through internal and external collaborative initiatives that transcend organizational boundaries and include global research institutions and universities.

## Roots of Our Strengths

- production base with the aim of becoming a comprehensive manufacturer of automotive parts that can keep pace with global companies
- 1985 Established Nippondenso America, Inc., with which we jointly created our first overseas technical center. Through this center, we built an optimized structure for the development, production, and supply of local products.
- 1991 Established the Fundamental Research Center (currently the Advanced Research and Innovation Center), which conducts R&D on future technologies that cover a wide range of fields
- 2014 Completed the establishment of technical centers in seven regions across the globe. Through these centers, we have set up a structure to create competitive products that can promptly meet diversifying local needs.
- Established the Electrification Innovation Center (EIC), which strengthens our capabilities in the development and production of electric 2020 vehicle components. Accelerated R&D activities in the green and peace of mind domains
- Received IEEE Corporate Innovation Award in recognition of our development of the QR Code® and our contribution to its global 2022 popularization

structure

## The Key to Our Strengths

# ectual Capita changing times

Commitment to creation in anticipation of the

Number of world-first products: Over 180 Number of new patent registrations in the automotive industry (fiscal 2024): Japan, 3: United States, 9

Number of global R&D bases: 13 in seven regions around the world

We have established "contributing to a better world by creating value together with a vision for the future" as the DENSO Philosophy. By keenly ascertaining social changes, we have been engaging in product development with a commitment to world-firsts. We have created over 180 world-first products since our establishment, and to this day we remain committed to developing new technologies and products that address complex social issues.

In 1991, we established the Fundamental Research Center (currently the Advanced Research and Innovation Center), where we have pio-To further sharpen our competitive edge into the future, we invested ¥550.9 billion in R&D expenditure in fiscal 2024. By promoting better

neered advanced technologies in such fields as semiconductors, electronic materials, Al, and ergonomics that have helped us remain competitive today. In 2014, we completed the establishment of technical centers in seven regions across the globe, in addition to laboratories in Israel, Silicon Valley, and other epicenters of innovation. By doing so, we established a structure that enables us to promptly incorporate diversified regional needs into our development process to create and deliver competitive products to our customers. Through industry-governmentacademia partnerships and collaborations with business partners, we are creating innovative technologies that help resolve social issues. efficiency through a digital transformation, including the use of AI, we will continue to strengthen our R&D activities centered on the focus fields of green and peace of mind.

#### Further Enhancing Developing Quantum-Inspired Technology with World-Class Performance Our Strengths to Resolve Large-scale, Complex Social Issues

Quantum computers are garnering attention as a next-generation computing technology. However, more time is required for resolving issues related to the practical application of these computers on their own. For this reason, we have been focusing on harnessing the usefulness of guantum computers through a hybrid approach with conventional computers, and we are actively engaged in R&D activities to realize the practical application of their advanced technological capabilities. As part of these efforts, we developed DENSO Mk-D, a proprietary quantum-inspired technology created based on the frameworks of quantum technology. It was the development of DENSO Mk-D that first demonstrated globally that a realworld problem with as many as five million variables could be efficiently solved, surpassing the previously recognized one million-variable limits of quantum-inspired technology.

As such, there are high expectations that this technology can be applied to resolve social issues with substantial variables, such as optimizing logistics and easing traffic congestion. DENSO utilized the quantum-inspired technology DENSO Mk-D to optimize truck delivery schedules, using actual data from logistics centers for the basis of optimization calculations. The logistics process involves numerous constraints, such as the number of trucks used per day, delivery routes, driver rest times, loading times, and delivery time restrictions. At a speed of more than 500 times faster than conventional technologies, DENSO Mk-D calculated that the delivery schedule could be reduced from the usual 77 trucks per day to 58 trucks. This represents approximately a 25% reduction in the number of trucks. Looking ahead, we will continue to advance our R&D activities with a focus on applying our technologies to not only logistics but also a wide range of social issues that cannot be resolved via conventional mathematical optimization technologies.

1953 Commenced a technical cooperation agreement with Robert Bosch GmbH. Under this agreement, we established a technological and



Fiscal 2024 R&D expenditure: ¥550.9 billion



# Three-pronged Solutions for Systems

DENSO has always optimized its business portfolio ahead of the times to provide society with valuable products and services that meet customer needs. For example, we expanded from our founding business in the mechanical parts field to foray into the electronics and software fields. While expanding, we enhanced our capabilities in each field and, as a result, we are now able to go beyond the manufacture of stand-alone components to offer optimal whole-system solutions that combine mechanical parts, electronics, and software. These system solution capabilities provide us with a competitive edge unique to a comprehensive manufacturer such as DENSO, as they could not be acquired easily by a company working solely in one specific business domain.

## Roots of Our Strengths

- 1968 Created the IC Research Center to establish a structure for the production of semiconductors completely in-house in anticipation of the shift to the electronic control of automotive parts in the future
- Became the first in the world to mass-produce an electronic fuel injection system (common rail system), a precursor to current system 1995 solutions, which are aligned with overall vehicle specifications as a matter of course
- 2007 Mass-produced an inverter with dual-side cooling. Combined our proprietary technologies from the mechanical parts, electronics, and software fields to develop a differentiated system, which was highly acclaimed by the market

2008 Launched the DENSO Project Companywide initiative. Adapted to stricter environmental regulations by enhancing the ability to provide optimal vehicle solutions that straddle technology fields

Began recurrent education program for software engineers. Met the growing need for software development and supported employees 2021 in transfer to growth fields

# The Key to Our Strengths





Number of alliances: Stakes in more than 90 companies (total since 2010)



Comprehensive components manufacturer: Seven core businesses

ellectual Capital

Ability to realize concepts

through the integration of

hardware and software

In addition to the mechanical parts field, in which we have been engaged since our earliest days, we have been involved in the electronics and software fields for more than half a century. DENSO has contributed to the development of mobility by combining its technologies in the fields of mechanical parts, electronics, and software to create next-generation inverters and advanced safety systems. Combining our expertise in each business domain, we are able to gain a timely and accurate understanding of the needs and future outlook of our customers as well as end-users. This in turn allows us to engage in planning and offer proposals from the early stage of vehicle development. In certain cases, we collaborate directly with customers to create vehicles together.

Our professional personnel in the fields of mechanics, electronics, and software work to gain expertise on advanced technologies around the world through partnerships that transcend organizational boundaries to include research institutions and universities and incorporate such expertise into our products. Our personnel also rigorously conduct product evaluation and testing under actual vehicle use conditions, considering factors such as temperature and how the vehicle is used. We handle a wide range of components and have a deep understanding of the requirements needed for vehicle development. For this reason, we are able to develop technologies and products that, when installed in vehicles, truly meet the needs of users—a strength that other companies active in only one domain cannot offer.

We will draw on this one-of-a-kind competitive edge as a means to realize genuine added value for mobility in an era where the role and importance of software in vehicles is increasing. By doing so, we will achieve further differentiation from other companies.



# Further Enhancing Our Strengths Accelerating R&D for In-Vehicle Applications of High-Performance Digital Semiconductors, Together with Business Partners

Approximately 1,000 semiconductors are used per vehicle. Among these are high-performance digital semiconductors (SoCs: System on a Chip), which are required for autonomous driving technology. These semiconductors require advanced technologies in order to achieve their advanced processing capabilities

In December 2023, DENSO CORPORATION and MIRISE Technologies Corporation, a Group company that conducts R&D on in-vehicle semiconductors, established Advanced SoC Research for Automotive (ASRA), together with auto manufacturers and semiconductor-related companies. Through ASRA, we are promoting R&D on automotive SoCs that make use of technology enabling different types of semiconductors, known as chiplets, to be combined freely in a similar manner as LEGO® blocks. With this effort, we aim to achieve the practical application of such advanced technology while also pursuing the high level of safety and reliability needed for automobiles. By promoting industry-government-academia collaboration both inside and outside Japan and accumulating technological capabilities and experience in the automotive, electronic components, and semiconductor fields, together with business partners, we will further enhance our competitiveness as a world-leading R&D organization.



# Highly Efficient, High-Quality Monozukuri

Since its inception, DENSO has consistently emphasized the creation and utilization of in-house technologies. We design and manufacture equipment, production lines, materials, and processing methods. This emphasis on in-house Monozukuri (manufacturing) has enabled us to provide society with products that give concrete form to the leading-edge technologies conceived by our R&D team. Having our own production technologies has also allowed us to develop high-speed, efficient production lines and compact facilities as well as streamline distribution and inspection. By digitalizing know-how and utilizing it as explicit knowledge, we are adding even more competitiveness and value to our products.

### Roots of Our Strengths

- 1961 Received the Deming Prize, the most prestigious award for quality control. Winning this prize laid the foundations for the "Quality First" approach and corporate culture that we still adopt to this day.
- 1972 Established our first overseas production company. Since then, we have accelerated the establishment of additional overseas production companies and conducted production activities that meet the needs of each region.
- 1979 Received the Okochi Memorial Production Prize. This prize was received in recognition of our highly accurate, high-guality Monozukuri that was realized through our comprehensive in-house manufacturing of production lines and equipment.
- 1984 Launched a project for the practical application of robots. Furthermore, the development of such technologies as barcode readers and RFID,\*1 which we pursued in a similar manner as robots, helped establish the foundation of our current factory automation (FA) business. Commenced Excellent Factory (EF) activities. Through plant improvement led by frontline production personnel, globally developed a 1997
- kaizen (improvement) culture, which is the source of our ambitious improvement activities
- 2019 Began operating Factory-IoT (F-IoT), which networks plants worldwide to enable the accumulation, analysis, and utilization of various data. Took advantage of digital technologies to accelerate long-standing improvement activities
- \*1 RFID (radio frequency identification): A non-contact system that reads data from RF tags using electromagnetic waves

### The Key to Our Strengths





Number of plants with F-IoT: Approx. 130 Amount of capital expenditures (fiscal 2024): ¥394.6 billion

Ratio of renewable energy use globally (fiscal 2024): 36.8% Energy conservation grand prize award: Received for 14 consecutive years

DENSO boasts micro-processing accurate to 1/1000mm and assembly lines that increase both production efficiency and quality. Our research on leading-edge production, elemental, processing, and measurement technologies as well as our development of production lines and systems that incorporate these technologies underpin products with world-leading performance and quality. Furthermore, we have connected our roughly 130 plants across the globe to a network allowing us to analyze a broad range of data obtained from personnel and equipment on the production front lines. In this way, we have greatly enhanced our competitiveness. By promptly detecting and addressing signs of equipment malfunctions, establishing the know-how of our talented personnel at each individual production site as explicit knowledge for global use, and bolstering productivity through data-driven energy conservation activities, we are working to further enhance our Monozukuri foundation. With the aim of achieving carbon-neutral Monozukuri by 2035, we are leading the industry with efforts to reduce environmental burden not just within the Group but across the entire supply chain.

Our cutting-edge Monozukuri activities are underpinned by our advanced Monozukuri personnel. The DENSO Industrial School, a technical training school created based on the concept of "Monozukuri is Hitozukuri (Our performance relies on our people)" and dedicated to strengthen both our technologies and capabilities, celebrated its 70th anniversary in 2024. Throughout its history, the school has fostered students with exceptional skills that are globally recognized, including students that have won gold medals at the WorldSkills Competition.

#### Further Enhancing Supporting a Circular Economy in the Automotive Industry and Taking on the Challenge Our Strengths of Expanding Recycled Material Use across the Industry

To realize a sustainable society, it is necessary to transition to a circular economy across various industries. In the automotive industry, promoting the expanded use of recycled materials has become a pressing issue. However, with the current method for processing end-of-life vehicles, which involves first crushing them and then sorting and extracting recyclable materials, it is difficult to obtain recycled materials with a high level of purity. Moreover, there has not been sufficient collaboration between companies that manufacture automobiles through processed resources and companies that collect, resell, and reprocess end-of-life vehicles, and this has kept the average rate of closed-loop recycling\*2 in the automotive industry relatively low. This also has contributed to the lack of progress with efforts to utilize recycled materials as materials for automotive components. To remedy this situation, DENSO sought out partners across various industries, including dismantling service providers for end-of-life vehicles, material manufacturers, automotive components manufacturers, and universities and research institutions, and jointly commenced a technological verification test in March 2024 for an automated precision dismantling process, a groundbreaking method that enables extraction of highly pure recycled materials from end-of-life vehicles. This verification test has been chosen as an industry-government-academia collaborative project that aims to expand the use of recycled materials in automobiles, and is supported by Japan's Ministry of the Environment. Through the verification test,

we will take a new step forward in realizing a circular economy in the automotive industry. \*2 Closed-loop recycling: A recycling process in which materials from a used product are used to create the same kind of product

Initiatives to achieve



iman Canital Advanced Monozukuri personnel

Cultivation of technical talent over the past 70 years