Corporate Profile 2022

ZUKEN

The Partner For Success

Ring of Scenery – a contemporary sculpture at the front entrance of the Global Headquarters and R&D Center in Yokohama, Japan. It symbolizes the engagement between Zuken and customers.

Message from the Chairman

The changes in society are by no means easy to predict. But what has been a constant throughout history is how human beings have always moved forward one step at a time seeking better, more enriching ways to live. Since our founding, Zuken has supported the development of a wide range of electronic products based on our firm belief that the advance in electronics will be increasingly important to achieving more enriching ways of life. In doing so, our business has grown.

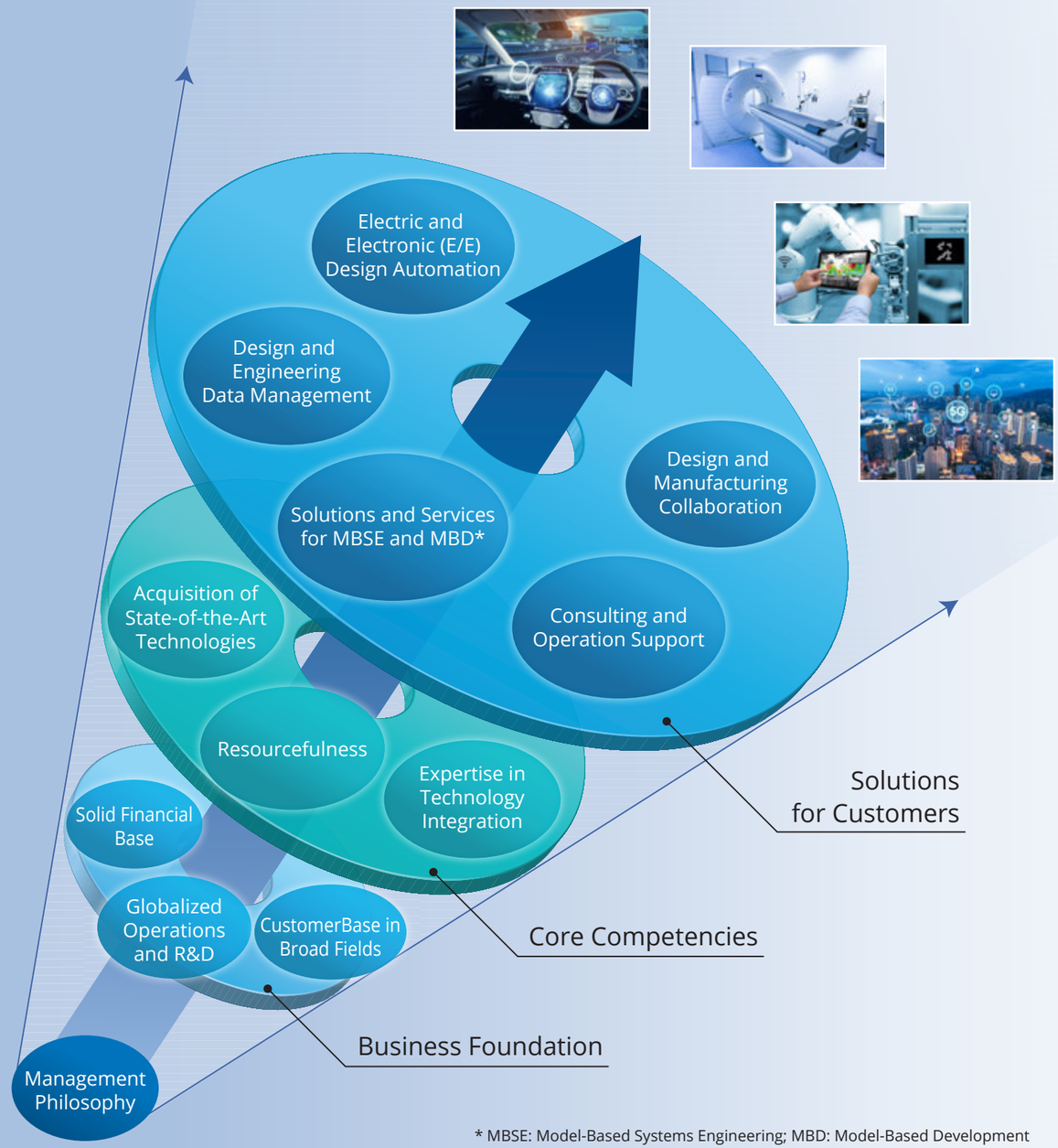
What is meant by “enriching” changes with the times? Today, electronic products are expected to enrich the lives of the people who use them and help improve society. Manufacturing companies that develop electronic products have begun to pursue this new mission boldly. To help them take on the challenge, Zuken is steadily upgrading the technological capacities that will be needed. To be a company that benefits society, even more, we will continue to progress, we will continue to evolve.

Chairman and CEO Makato Kaneko

Our Value

A Trusted Partner for Product Development

Zuken steps forward, smoothly linking conceptual design to detailed design



* MBSE: Model-Based Systems Engineering; MBD: Model-Based Development

Message from the President

Creating Value that Exceeds Expectations with Engineering IT

Digital technologies have penetrated every aspect of society to enrich people's lives further. Connecting people, things, and information not only makes life more convenient, but these connections also constitute new value, generating innovations and business opportunities. This is no less true in manufacturing. Digital technologies transform engineering processes by weaving together the knowledge and data produced daily at worksites, enabling new value to be created. Anticipating the future of manufacturing, Zuken began preparing conceptual design solutions from an early stage, including Model-Based Systems Engineering (MBSE), and developed engineering IT to connect data in a digitally seamless fashion from planning and design to production. As technology for connecting data, engineering IT will undoubtedly be indispensable to manufacturers' efforts to help build a sustainable society by reducing environmental impact along their supply chains and by developing smaller, lighter, and more energy-efficient products. With more areas within manufacturing industries for Zuken to contribute through the power of our engineering IT, as a partner that can be trusted to pioneer the future of digital engineering, we intend to refine further our ability to make effective proposals to create value that exceeds the expectations of customers.

President and COO Jinya Katsube

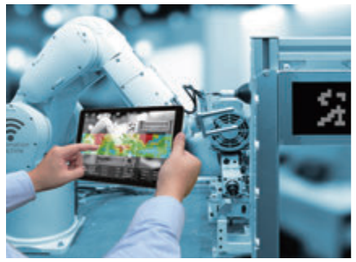
Our Business

Zuken’s Ever-Expanding Business Domains

Company Taking an Evolutionary Leap as a Digital Engineering Innovator

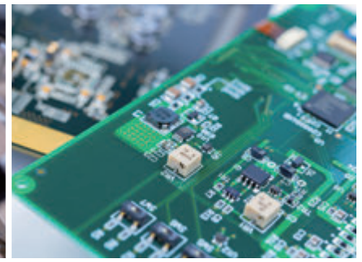
Since our establishment, Zuken’s s core business has been to provide electrical and electronic design solutions that support the development of electronics products. Today, the significant advances we see in communications technology, artificial intelligence, and computing capabilities are transforming manufacturing processes. Zuken aims to provide an even wider range of engineering solutions beyond the simple electronics field to help manufacturing customers develop a more holistic view of various technical domains and realize innovative product development more effectively and swiftly.

Main Industries Served by Zuken



Industrial Machinery

Consumer Electronics



Electronic Components

Medical Devices

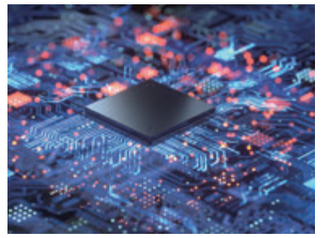
Mobility,
Special-Purpose Vehicles

Rail Transport

Aerospace

Products and Solutions

Electronic Design Automation (EDA)



Printed Circuit Board Design Solutions to Serve as a Platform for Electronics Product Development

Printed circuit board (PCB) electronic circuits equipped with semiconductors and other electronic components underpin the advanced functions of electronics products. We provide the software required to automate and optimize the design and manufacturing of their electrical and electronic systems.
By creating a design and verification environment driven by 3D technology, our latest electronics design platform, the CR-8000 series, can support the advanced design processes required for developing cutting-edge electronics products.

Electrical Control and Wiring Design

Electrical Engineering Solutions That Help Boost the Operational Efficiency and Superior Quality of Industrial Equipment Development

All industrial and electronic equipment have complex cables and harness inside them that link and control each part electrically. Our E3.series helps reduce operational errors and respin frequently happening in such electrical engineering processes. The E3.series improves operational efficiency and product quality by automatically generating drawings and bills of materials (BOM). We are also expanding the potential application of our solutions by devising 3D wiring plan tools and developing specialist applications for wiring in factories and plants.

Engineering Data Management (EDM)

Product Lifecycle Management That Only Zuken, with Its Rich Electric and Electronic (E/E) Design Expertise, Can Provide

We provide product data/lifecycle management (PDM/PLM) products that offer unparalleled perfection and are most suited to the development of electronics products, such as the central management of electronic component information and design deliverables management that links and stores information on parts, circuits, and circuit boards. Due to matters such as the global division of development processes, the need to comply with laws and regulations, and dealing with increasing development variants, the use of EDM will become increasingly important to those seeking to address the ever more challenging parameters of product development to create competitive products.

Automotive Electrical and Electronic (E/E) Systems Engineering

E/E Systems Design Solutions for Ever-Advancing Automobile Manufacturing

Automotive development is becoming increasingly sophisticated and complex as automobiles employ many state-of-the-art electronic systems. Zuken offers E/E systems design environments central to those automobiles' development. To accommodate rapidly changing product development needs from connected, autonomous, sharing, electric (CASE) trends and issues, such as building supplier ecosystems in the global market, we are committed to devising a next-generation engineering platform. That can support the creation of ever-evolving cars by enhancing functions such as examining E/E architecture in the conceptual design phase and automatically generating drawings in subsequent processes that reflect the design aims.

Model-Based Systems Engineering (MBSE)

Cutting-Edge Product Development Methodology for a Connected World

Today all kinds of products are starting to offer innovative functions by leveraging communications through the Internet. This requires the development of functions based on the complex and advanced inter-working of multiple systems. When developing such products, Zuken encourages customers to introduce MBSE, which enables them to gain a comprehensive view of the overall systems at the product concept stage and create optimal solutions. In addition to introducing the GENESYS modeling tool for MBSE and conducting training, Zuken is highly adept at applying the merits of MBSE to the electrical design process and, as such, we can create unrivaled solutions that offer unique tools and services to facilitate the successful development of products in a connected world.

Our History

A Steady Accumulation of Value

Zuken's story, founded in 1976, mirrors the growth of the electronics industry. Zuken has provided behind-the-scenes support for the development of a multitude of electronic devices that have made society a better place, and as the use of electronics has spread, so have Zuken's solutions and businesses. All around the world, customers take on the challenge of creating new technologies. Zuken continues to accept this challenge.

Create 2000 at its launch

Zuken opened the floodgates with Japan's first CAD/CAM system for PCB design in 1978.

Contributed to the miniaturization of electronic devices

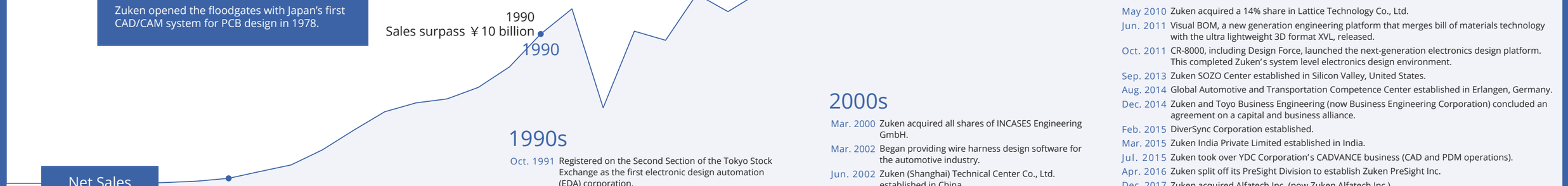
Our CAD/CAM technology established an unshakable position amid growing demand for smaller, thinner, and lighter electronic devices.

Zuken SOZO Center established

We have cultivated a global R&D and business network.

Enrique Krajmalnik is appointed ZUKEN Vitech's CEO

Strengthening global product development while expanding our domain.



1970s

Dec. 1976 Zukei Shori Gijutsu Kenkyusho Inc. established in Isogo-ku, Yokohama.

Jun. 1978 Japan's first full-scale CAD/CAM system Create 2000, for the design of printed circuit boards, developed.

1980s

Nov. 1983 Zuken America Inc. (now Zuken USA Inc.) established in California, United States.

Jan. 1988 CR-3000 (PWS), a printed circuit board CAE/CAD/CAM network workstation, developed.

1990s

Oct. 1991 Registered on the Second Section of the Tokyo Stock Exchange as the first electronic design automation (EDA) corporation.

Jan. 1992 Zuken Europe GmbH (now Zuken GmbH) established in Germany.

Jan. 1992 Zuken Korea Inc. established in South Korea.

Aug. 1992 Zuken Singapore Pte. Ltd. established in Singapore.

Apr. 1994 EDA vertical integration solution CR-5000 developed.

Jun. 1994 Zuken acquired Racal-Redac Ltd. of the United Kingdom.

Sep. 1994 Moved to the First Section of the Tokyo Stock Exchange.

2000s

Mar. 2000 Zuken acquired all shares of INCASES Engineering GmbH.

Mar. 2002 Began providing wire harness design software for the automotive industry.

Jun. 2002 Zuken (Shanghai) Technical Center Co., Ltd. established in China.

Feb. 2004 ePLM DS-2, a PLM solution specially designed for the electrical and electronics industries, announced.

Aug. 2005 Zuken Taiwan Inc. established in Taiwan.

May 2006 Zuken acquired Germany's CIM-TEAM (now Zuken E3 GmbH).

Jun. 2007 V54EE, a mechanical CAD system specially designed for the electronics industry, released.

Jun. 2009 Enterprise PLM PreSight released.

2010s

May 2010 Zuken acquired a 14% share in Lattice Technology Co., Ltd.

Jun. 2011 Visual BOM, a new generation engineering platform that merges bill of materials technology with the ultra lightweight 3D format XVL, released.

Oct. 2011 CR-8000, including Design Force, launched the next-generation electronics design platform. This completed Zuken's system level electronics design environment.

Sep. 2013 Zuken SOZO Center established in Silicon Valley, United States.

Aug. 2014 Global Automotive and Transportation Competence Center established in Erlangen, Germany.

Dec. 2014 Zuken and Toyo Business Engineering (now Business Engineering Corporation) concluded an agreement on a capital and business alliance.

Feb. 2015 DiverSync Corporation established.

Mar. 2015 Zuken India Private Limited established in India.

Jul. 2015 Zuken took over YDC Corporation's CADVANCE business (CAD and PDM operations).

Apr. 2016 Zuken split off its PreSight Division to establish Zuken PreSight Inc.

Dec. 2017 Zuken acquired Alfatech Inc. (now Zuken Alfatech Inc.)

Aug. 2019 Zuken acquired Vitech Corporation (now Zuken Vitech Inc.) of the United States.

Sep. 2019 Zuken and Ghelia Inc. concluded an agreement on a capital and business alliance.

Oct. 2019 Zuken Modelinx Inc. established.

2020s

Nov. 2021 Business Engineering Corporation became an equity-method affiliate following an additional investment by ZUKEN.

Apr. 2022 Stock listing was moved to the Prime Market because of the restructuring of the Tokyo Stock Exchange into new market segments.

The Evolution of Electronic Products

Global Network

Challenges in Global Markets Accelerate Our Growth

Headquarters　Regional headquarters　Business locations　Main R&D offices　Sales offices

Japan & Asia

Our head office is in Yokohama, the city where Zuken was founded. The head office oversees product and business development in Japan and worldwide.
The operating environment faced by manufacturing industries is increasingly global and borderless. Companies look to Asia as not only a manufacturing base, but as an important center for product development. We have therefore established subsidiaries in China, South Korea, Taiwan, Singapore, and India. We have built a system for accurately identifying the needs of customers in each region to offer the best possible solutions.

Japan ● ○ ■ Global Headquarters/ R&D Center (Yokohama)
● Center Minami Building (Yokohama)
● Shin-Yokohama Building (Yokohama)
● Kansai Branch (Osaka)
● Nagoya Branch (Nagoya)

South Korea ● Zuken Korea Inc.
Singapore ● Zuken Singapore Pte. Ltd.
Taiwan ● Zuken Taiwan Inc.
China ● Zuken Shanghai Technical Center
● Zuken Inc.Shenzhen Representative Office
India ● Zuken India Private Limited

Americas

North America has many innovative companies that greatly influence manufacturing worldwide, and is also an important business development base for Zuken. Zuken provides many leading U.S. high-tech companies with advanced solutions in this market. In addition, to develop products and businesses for global markets, the Zuken SOZO Center promotes strategic partnerships with companies that own innovative technologies.

USA ○ Zuken USA Inc.(American Headquarters)
● ■ Zuken SOZO Center(Zuken Inc., US branch)
● ■ Zuken Vitech Inc.

Europe

Zuken has a strong business foundation in Europe, a region that is home to many leading companies in global markets such as industrial machinery and automotive products. We complement our European sales network with bases that carry out core technology development. Our Global Automotive and Transportation Competence Center in Germany is part of Zuken's organization for developing next-generation automotive electronic and electrical design solutions for global markets.

UK ■ Zuken Ltd. (Zuken Technology Center)
● Zuken Group Ltd.
● Zuken UK Ltd.
Germany ○ Zuken GmbH (European Headquarters)
● ■ Zuken E3 GmbH (Laemmerweg)
● Zuken E3 GmbH (Sedanstr.)
■ Zuken GmbH (EMC Technology Center)
● Zuken E3 GmbH Office Nord
■ Zuken E3 GmbH (Global Automotive and Transportation Competence Center)

Poland ● Zuken E3 GmbH Sp.z o.o
Switzerland ● Zuken E3 GmbH, Zweigniederlassung
France ● Zuken S.A.
Italy ● Zuken S.r.l.
Netherlands ● Zuken GmbH, Sales Office Benelux

Distribution of Personnel

(As of the End of March 2022)

Japan* (Zuken Inc.) 422

Global 387

*Excluding domestic affiliated companies and employees stationed overseas.

Sustainability

We can create a sustainable future with the power of our engineering IT

Sustainability Management Vision

Our business objective is to improve the efficiency of engineering processes in the manufacturing industry by leveraging IT. Such improvement can contribute significantly to reducing the burden placed on the global environment not only in terms of design and manufacturing efficiency but also by improving the efficiency in procurement and services operations across the entire supply chain. In addition, our technology is indispensable for manufacturers striving to develop energy-saving, smaller, and lighter products. The popularization of such products will help drive the realization of a sustainable society.

Going forward, we aim to be a company that can contribute toward building a sustainable future by incorporating the perspective of "realizing a sustainable society" more clearly into our management and growth strategy planning and by further expanding the range of products and solutions we offer.

Future Business Risks and Opportunities

■ Environment

We are engaged in efforts to reduce CO2 emissions by adopting LED lighting for our office buildings and switching to HEV for company vehicles, but there is a limit to what a company alone can do to reduce environmental burdens.

Meanwhile, looking at the CO2 reduction potential of the five digital fields—EV/autonomous driving, IT and remote services, energy management, smart agriculture and forestry, and social infrastructure monitoring—if socially implemented toward the realization of carbon neutrality, there are many areas where our engineering IT can help and which will provide us with business opportunities.

In light of the risks associated with environmental issues, we must ensure the protection of the lives and safety of employees and the continuity of business operations against natural disasters. The products and services we provide to our customers are directly linked to product development and manufacturing—the core operations of a manufacturing business. It is therefore important that we create a system where, even if our offices were to become temporarily unusable due to a natural disaster, it would have a minimal impact on our operations.

To this aim, we have put in place a system enabling permanent remote work, and we will continue to proactively address issues to make it easier for employees to perform their work regardless of where they are based, which includes the IT infrastructure and internal systems required to achieve this.

■ Social

The decline in the working-age population will seriously impact companies like us that handle software, a product of the human brain. On the other hand, engineering IT—the software product that we develop—makes significant contributions to labor-saving measures, technology transfer, and the utilization of technical know-how that will allow companies to respond to the challenges of an ever-shrinking labor force. Digital transformation (DX) is necessary for tackling them, and its core technology is engineering IT. In this sense, we will be playing an ever-larger role in the manufacturing industry DX.

For the manufacturing industry as a whole, we contribute to developing and reskilling digital human resources by leveraging the engineering IT knowledge that the Group possesses in the manufacturing sector. In terms of securing and making the most of human resources, we will expedite hiring women and empowering them. To achieve this, we will create work environments and systems where female employees can work productively and have fulfilling careers at Zuken. From the perspective of diversity, we will increase the ratio of female employees in the company overall and their number in management positions.

Furthermore, to vitalize the manufacturing industry overall, we will continue to support activities and projects to help find solutions to various social issues through manufacturing.

■ Governance

Our vision for sustainability is a management and growth strategy. We must put in place a governance system allowing management to appropriately review and implement strategies and to examine and verify results.

We moved to the prime market in April 2022. Work is underway to establish a governance system consistent with the stock market's requirements, and the new corporate governance code includes various environmental and social requests as demanded by companies in the prime market. We will create a system to implement and verify sustainability-related policies and measures as management priorities.

Materiality

In identifying materiality, we have anticipated the impact that long-term mega trends in the macro-economy will have on our group's business and defined business challenges based on various ESG evaluation criteria along with the requests and expectations of our stakeholders. We then evaluated the "importance to Zuken" and its "importance to our stakeholders" in terms of risks and opportunities for each of the challenges and identified the following four materialities.

Key Themes

1 Contribution to sustainable manufacturing through engineering IT

To help resolve issues such as technology transfer, human resource shortages, and aging systems, we will strengthen our investment in the development of solutions that promote the smart (intelligent) manufacturing industry.

2 Maximizing the capabilities and potential of employees

In order to maximize human capital —a source of strength in our software business—we will create a work environment where diverse teams can work to their full potential and each member can develop their career over the long term.

3 Implementation of environmentally conscious management

We will ensure business continuity by taking into account long-term challenges in the surrounding environment, including such items as responding to climate change and dealing with labor shortages in the manufacturing environment.

4 Establishing agile and sound governance

We will respond with speed and flexibility to a business environment undergoing a great many changes and strengthen our management structure to ensure that we can carry out business activities that are legal, appropriate, and sound.

ESG Initiatives

Environment

Efforts to Reduce CO2 Emissions

We have taken steps to reduce CO2 emissions, such as introducing a system for remote working, switching to LED lighting for company buildings, and using HEVs for company-owned vehicles, thereby reducing CO2 emissions by 29.6% compared to FY2013. In the future, we will continue to monitor changes in CO2 emissions over time and promote energy conservation measures to ensure that the burden our business activities place on the environment does not increase.

Remote Working System

In preparation against potential climate-change-driven natural disasters such as heavy rains and tornadoes, we have introduced a remote working system to help protect the lives and ensure the safety of our employees, and also to ensure the continuity of our business. We have created an environment that allows our employees to work both from the office and from their home office, depending on the situation.
FY2021 Remote Work Implementation Rate: 55.3%.

Social

Promotion of Women's Empowerment

We believe that the existence of diverse perspectives and values throughout the company leads to corporate growth, and assigning the right person to the correct positions regardless of gender or nationality is a best practice. Based on the concept of the right person for the right job, we actively promote the hiring of women and their promotion to manager-level positions.
We provide extensive support for women dependent on their current stage of life to enable them to develop long-term careers. Some examples: to support a balance between work and childcare, we have introduced various systems for employees to take leave and a system for shorter working hours. The reduced working hours are available for employees with children in the 3rd grade of elementary school or younger, which is longer than the legally stipulated period. We are also actively leveraging remote work to help create a comfortable working environment for women.

Development of Digital Talent

To upskill and reskill our employees, we provide IT and digital training utilizing external sources while promoting the development of digital talent demanded in our growth strategy. We have introduced a reward system for employees who acquire IT qualifications to continually encourage them to improve their IT skills.

Next Generation Project, Support for Engineers

We aim to contribute to the development of the manufacturing environment. In service of this, we will actively support the next generation of manufacturing and the educational development of manufacturing human resources to foster a manufacturing culture that aims for a good and prosperous society through technology and innovation.

For details on our ESG and other initiatives as well as their progress, please visit our sustainability website.
https://ir.zuken.co.jp/en/policy/sustainability/

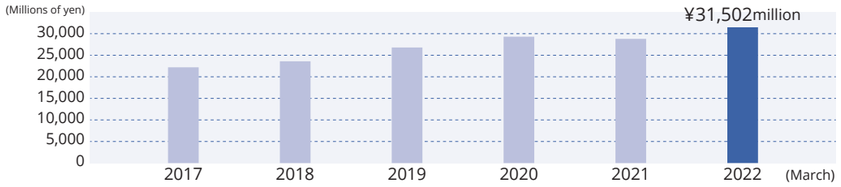
Financial Information

A Solid Financial Foundation

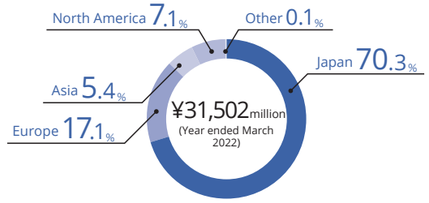
For the manufacturing industry and product development is an important, fundamental operation that determines future growth.
Zuken provides solutions required for competitive product development. For us to support our customers' strategic product development and give them long-term confidence in our solutions, we must have solid financial foundations ourselves.

In the world of information technology, where technological innovation is intense, we must invest flexibly in order to continue providing cutting-edge technology in a timely manner. For this reason, since our founding, we have established and maintained a solid financial foundation as one of our most important management strategies.

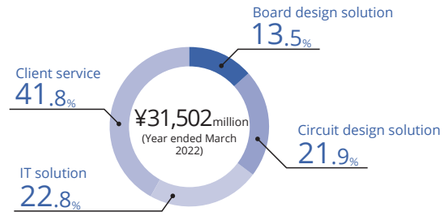
Net sales



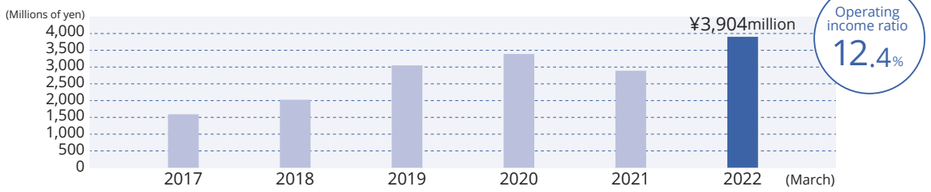
Sales by region



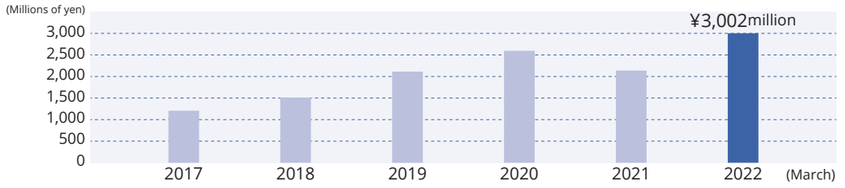
Sales by product



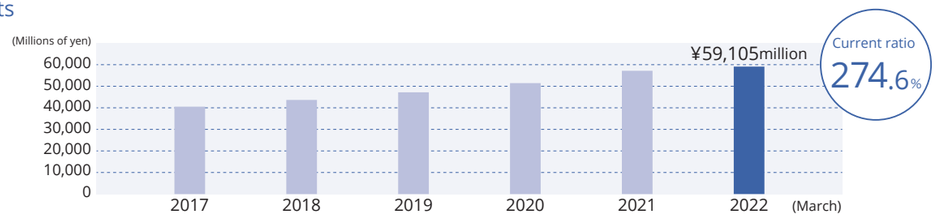
Operating income



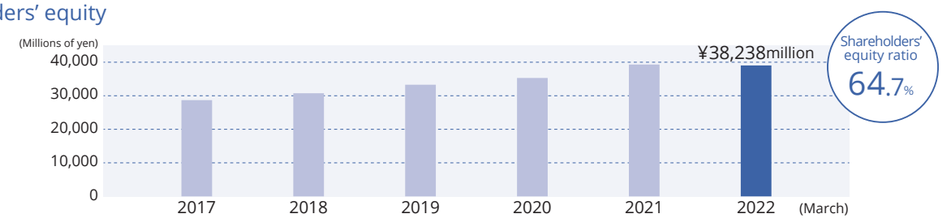
Profit attributable to owners of parent



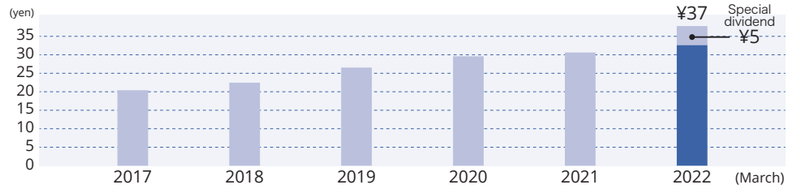
Total assets



Shareholders' equity



Dividends



Group Companies In Japan

Zuken Tec Inc.

Zuken Tec provides consulting, on-site manager and engineer dispatch, as well as contracting services that support a broad range of design and development operations, including CAD installation, startup, and operation.

Zuken NetWave Inc.

Zuken NetWave sells and supports state-of-the-art hardware and software for corporate networks, which are indispensable for today's business activities.
These networks also include security and storage solutions.

Zuken Elmic Inc.

Zuken Elmic focuses on communication as the key element in technologies. It develops, sells, and provides support for middleware IP libraries, software, and related hardware for the embedded systems that support the security, industrial, and invehicle network fields.

Zuken PreSight Inc.

Zuken PreSight develops and markets creative products that support the manufacturing industry, including product lifecycle management (PLM) systems based on technology that coordinates lightweight 3D data and bill of materials (BOM).
It also provides knowledge management solutions with a unique concept that reduces user burden.

Zuken Alfatech Inc.

Zuken Alfatech provides a variety of solutions and services primarily to customers in the mechatronics industry, including development, sales, and support for electrical CAD. It sells and customizes 2D/3D general-purpose mechanical CAD and CAE systems.
As a new business area, Zuken Alfatech is also developing 3D modeling applications for the construction field, which is a domain with excellent potential.

Zuken Modelinx Inc.

Zuken Modelinx provides comprehensive and expert services centered on development support for companies aiming to introduce and operate methods such as MBD (modelbased design) and MBSE (model-based systems engineering) in product development.

Business Engineering Corporation

Business Engineering Corporation provides manufacturing customers with abundant IT solutions, including ERP consulting, development, and implementation services and SCM (Supply Chain Management) package systems development and sales services, to support their operational reforms.

Beyond Limits - The Challenge of Developing Next-Generation Semiconductor Technology

Creating 3D integration technology that enables higher performance, smaller sizes, and reduced power consumption of semiconductors is needed for creating the new infrastructure required to support future society.

Various types of semiconductors used for CPUs, memory, and other applications are indispensable to the electronic products that support our daily lives. Their performance has been improved over time via miniaturization, but it is generally thought that further performance advancements using existing technologies are reaching their limits.
At the same time, with society becoming more and more dependent on IoT and AI, and with expectations for the metaverse also on the rise, demand for higher-performance servers and terminals will only increase. This means the search is on for ways to improve performance using 3D packaging technology*1.
Zuken is promoting the joint research and development of the next generation of semiconductors as a participant in the WOW Alliance using our proprietary 3D large-scale integration technology. The WOW Alliance seeks to create ultra-compact semiconductor devices with higher performance and lower energy consumption through original technologies for large-scale 3D integration.

*1 Technology for integrating and mounting multiple chips, including memory chips and microcomputer chips, in three dimensions in the same package. In the broad sense, this includes integrating and packaging passive components, etc. on a printed circuit board and methods for integrating the LSI package itself.

For Higher Performance Semiconductors with Lower Power Consumption

According to a global science journal, the amount of power consumed by IoT servers and electronic devices worldwide is projected to reach 9,000 TWh in 2030. This is equivalent to the energy that would be generated by approximately 3.18 million square kilometers of solar panels, an area the size of India. Growth in electronic devices will have to stop unless electricity can be generated on this scale, so technological innovations are needed for energy generation-related issues as well. In order to reduce energy consumption, it is necessary to physically shorten the distances between chip to chip, device to device, and system to system. Efforts are therefore being made to compress physical distances and shorten wiring through 3D integration that makes chips and wafers thinner and integrates them vertically. However, when chips become thin, they bend under stress, and with through-silicon via (TSV) wiring that uses bumps for the vertical chip connection, defects occur when the connection between the bumps is poor. For these reasons, it is thought that further miniaturization using current practices will not be feasible. Another concern with 3D-integrated devices is that thermal resistance increases with vertically connected layers., This is expected to cause thermal issues. The WOW Alliance is currently working to overcome these challenges.

BBCube Integrating Future Possibilities

The WOW Alliance is a platform for joint industry-academia research led by Takayuki Ohba, professor at Tokyo Institute of Technology's Institute of Innovative Research. The alliance engages in research and development that will contribute to the further growth of society through the collaboration of semiconductor companies and research institutes involved in semiconductor design, processes, devices, and other related areas.
Among the technologies that have emerged through the alliance's activities, there are two in particular that have caught our attention: (i) wafer thinning technology, which thins 300 mm wafters down to the micro level, and (ii) bumpless wiring technology, which is TSV wiring that does not use bumps. Utilizing these two technologies in wafer-on-wafer (WOW), which integrates wafers with wafers, and chip-on-wafer (COW), which integrates chips and wafers, the alliance has established BBCube (Bumpless Build Cube), an innovative large-scale 3D integration technology. By further evolving these new technologies, research, and development are working on the next generation of semiconductors with the goal of making semiconductors ultra-small, one thousandth smaller and reducing power consumption to one thousandth or less as well. (Figures 1 and 2).

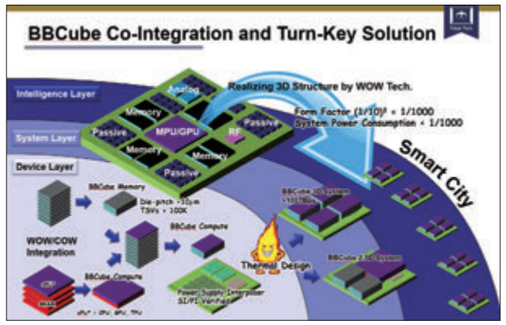


Figure 1
BBCube allows high-density parallel wiring to be done over short distances for devices (memory, CPU, condenser, etc.) that make up a system, which substantially lowers power consumption and, in memory devices, allows for terabyte memory space.

Exceeding the Limits of Wafer Thinning

With current wafer production technology, the limit to thinning is said to be 20–30 μm*2. The WOW Alliance has succeeded in using wafer thinning technology to thin down the wafer to 4 μm, which is thinner than the device layer, and it is currently continuing its research with the goal of a thickness of 2–3 μm.
(*2 μm: micrometer or micron; 10-6 m)
Using bumpless high-density vertical wiring with WOW integrated wafers thinned with this technology, a degree of integration is obtained that is proportional to the number of layers. Moreover, with bumpless wiring, TSV can be shrunk, so capacitance is one-twentieth of the conventional bump method. And power consumption will be reduced in proportion to the wire length. With high-density TSV, thermal conductivity is improved to around one-hundredth of the conventional method, making it possible to reduce the heat given off by the connections.
COW is a technology for integrating chips on a wafer. Along with thinner wafers and bumpless wiring, a 3D packaging technology has also been developed that embeds a passive device under the chip. Doing this reduces the size by half and the wiring length to one-hundredth of the conventional method. In addition to reducing sizes and cutting power consumption, it has also achieved low noise. These characteristics allow COW also to be used for chiplet integration.

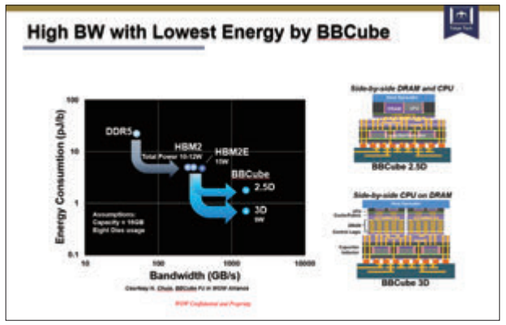


Figure 2
With 2.5D and 3D integration using BBCube transmission energy per bit is an order of magnitude lower than conventional methods, even when the transmission band is in the terabytes per second range, so system power consumption is 10 W or less.

Sending WOW Alliance Achievements Out into the World as Quickly as Possible

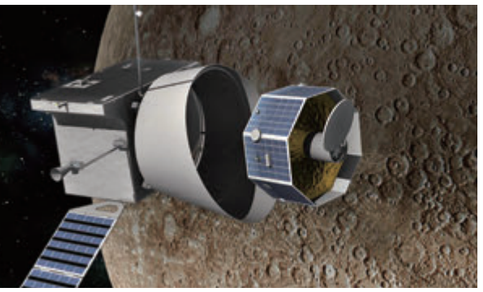
The further evolution of BBCube will make semiconductors ultra-small while giving them higher performance and lower power consumption.
Semiconductors that handle advanced functions such as ultra-high-speed computing, IoT, and VR/AR will become easier to mount on various products. Moreover, raising the efficiency by which electricity is used will contribute to further energy savings by society as a whole and reduce the global impact on the environment.
In this way, semiconductors play an essential role in our evolution toward a more sustainable society. So, the expectations for 3D integration continue to rise. To meet these expectations, the WOW Alliance will accelerate BBCube's s evolution to establish a system in harmony with 5 nm and 3 nm*3 generations, which are the current targets of the semiconductor industry. From there, the alliance will continue with its groundbreaking innovations until ultra-low power consumption is achieved at an insect's brain level. In this way, the alliance is working to evolve technologies that contribute to society.(*3 nm: nanometer; 10-9 m)
Zuken supports the research goals of the WOW Alliance and is participating in this project. Utilizing CR-8000 Design Force in packaging design for 3D-integrated circuits, we are working through industry-academia partnerships to create next-generation semiconductors that go beyond existing limits.

[From the left] Members of the WOW Alliance ; Kazunori Koga (Zuken), Takayuki Ohba (Professor at Tokyo Institute of Technology' s Institute of Innovative Research), Hirohiko Matsuzawa (Zuken)

Close Up 02

Measuring the Earth

Zuken's customer EREMS provides high-tech electronical equipment for space missions



EREMS, a French enterprise specializing in the design and realization of high-tech electronic equipment and of associated software for Space, Defense, and Aeronautics, uses CR-8000 and DS-CR from Zuken for the design and lifecycle management of flight electronics, ground electronic equipment, and test benches.

Over the past 3 or 4 decades, space satellites have been delivering valuable information that helped make our lives safer and more connected by, e.g., monitoring geological conditions, weather phenomena, and even traffic. A growing number of these missions, while still under the guidance of national space agencies like NASA or ESA, are today driven by private enterprises, such as Airbus in Europe or SpaceX in the US, which in turn employ a network of highly specialized suppliers to develop innovative and cost-effective solutions. This trend of reducing the cost of space missions by harnessing private entrepreneurship is typically referred to as New Space.

Examples of the many New Space programs currently in operation or under preparation are the Mars Exploration Program, which has been sending spectacular images from the surface of Mars since March 2021, and the 3D Optical Constellation (CO3D) program, which is supposed to provide a high-resolution 3D digital surface model of the earth. CO3D, initiated by the French Center National d' Etudes Spatiales (CNES,) will be comprised of four identical lightweight satellites produced by Airbus DS, which will provide stereoscopic images that are used to create ultra-precise 3D maps of the surface of our planet.

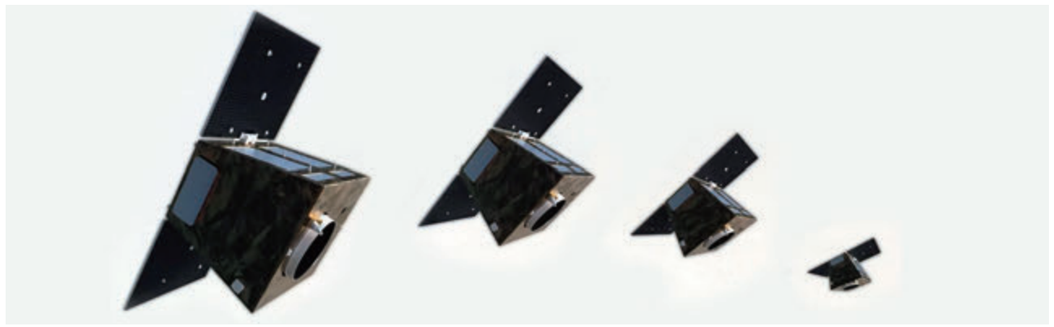
EREMS – specializing in design and production of high-tech electronic aerospace equipment

One of the key contributors to Airbus and the CO3D satellites is EREMS, a French Enterprise located in the French high-tech area of Toulouse. EREMS is specialized in the design and production of high-technology electronic equipment and associated software. Among the many successful projects handled by EREMS in its more than 40 years of history is the design and manufacture of major equipment on board SPOT6 and SPOT7 Observation satellites, the last 2 satellites of the SPOT (Satellite pour l' Observation de la Terre) program, which has been providing high-resolution optical images of the earth since 1986, or on board the recently launched Very High-Resolution Pleiades Neo satellites. For CO3D, EREMS was selected to develop and produce several key electronic systems to be deployed in the four satellites.

To keep up with the growing challenges of New Space and to lay the foundation for a managed product development and production process of its sophisticated electronic products, EREMS has recently upgraded its PCB design environment to the Zuken's 3D multi-board PCB design suite CR-8000 and its closely integrated design data and lifecycle management environment DS-CR.

"The space community is currently evolving with the arrival of the so-called New Space projects" , explained Gerard Dejonghe, President and CEO of EREMS. In these New Space projects, the industry is looking for cheaper, smaller, lighter, and more powerful equipment, which, in the area of in-flight electronic equipment is achieved through the use of the latest commercial off-the-shelf components, such as high-speed ICs, fast memory chips and fine-pitch

Gerard Dejonghe, President and CEO of EREMS



The CO3D constellation comprises four identical satellites, that will deliver stereoscopic images of the Earth. Credit: Airbus Defense & SpaceX

Advanced requirement for high-speed design and component management

"Therefore, we needed a PCB design tool with solid high-speed design and 3D verification capabilities", Gerard Dejonghe continued. "In addition, we realized that electronic components have a central place at EREMS and interact with many parts of our business. This starts in electronic engineering and sourcing and goes on to board layout and mechanical design departments through to manufacturing and quality assurance. Therefore, we wanted to equip ourselves with a tool that is capable of centralizing all component and design-related information."

After thorough market research and evaluation, CR-8000 and DS-CR from Zuken emerged as the best fit. "CR-8000 enables us to manage the constraints related to fast signals and to carry out 3D verifications of our board layouts with the mechanical environment", explains Laurent Dedecker, PCB & Packaging Design Manager at EREMS. "In addition, the tool has many interesting modules such as the verification of several different sets of manufacturing rules, or a design rule check at the schematic level, which is useful for engineers to assess the feasibility of their design in the physical layout phase.

Another useful feature, in particular for the space industry, is the ability of CR-8000 to manage different board level implementations from the same version of the schematic, using cheaper commercially available components for prototyping and testing purposes and replacing them with certified components for the final realization."

Right first time

The benefits of CR-8000 and DS-CR came to bear immediately during the deployment phase when the tools were used to create the first mock-ups of the high-speed boards that EREMS developed for the CO3D satellites mentioned earlier.

"Using CR-8000 immediately in a concrete project allowed us to get a grip on the tool and to set up the component library", commented Laurent Dedecker, "and it allowed us to correctly manage the various constraints (skews, lengths, impedances, etc.) linked to the fast signals at the schematic level and to verify them at the PCB level."
The ease of reusing all or part of a routing pattern (on the same, as well as on a different board) was a great help in optimizing the routing times. "The CR-8000 tool has had an impact on the quality of the work done on the design of the project boards," concludes Laurent Dedecker. "Today, all the boards in the CO3D project are made with CR-8000; we have been able to remove board interconnection issues using the multi-board module, and thanks to the management of constraint, we can predict the performance of our boards with confidence."
So, when the Airbus-made CO3D constellation satellites are eventually launched at the end of 2022, sending very high-resolution stereo images of the earth, a new era of measuring the earth in 3D will be chimed in, thanks also to the contribution of EREMS and their efficient use of design tools provided by Zuken.

Laurent Dedecker, PCB & Packaging Design Manager at EREMS

ZUKEN
The Partner For Success

Company Name	Zuken Inc.
Foundation	December 17, 1976
Head Office Location	2-25-1, Edahigashi, Tsuzuki-ku, Yokohama, 224-8585 Japan
Paid-in Capital	JPY 10,117,065,000
Number of Employees	427 (consolidated: 1,476 ; as of the end of March 2022)
Stock Listing	Tokyo Stock Exchange, Prime Market
Business Areas	Research and development of a wide variety of software solutions that support the optimization of product design and engineering operations for manufacturing industries, and marketing of software solutions with expert consulting services.
Directors and Auditors	Makoto Kaneko, Chairman and CEO Jinya Katsube, President and COO Yoshikazu Soma, Executive Vice President Takashi Sano, Director* Yoichi Arai, Director* Fusao Wada, Full-time Audit & Supervisory Board Member Takashi Handa, Audit & Supervisory Board Member* Yoshinobu Maeba, Audit & Supervisory Board Member* * Outside Directors / Outside Audit & Supervisory Board Members.
Executive Officers	Kazuhiro Kariya, Senior Managing Executive Officer Yasuo Ueno, Senior Managing Executive Officer Takeo Osawa, Executive Officer Koichi Saotome, Executive Officer Hiroyuki Fujiwara, Executive Office