Toward Building a Strong and Resilient Society

Semiconductors used in TVs, PCs and smartphones have advanced along with IoT, AI and 5G as social infrastructure. Today, life without semiconductors is almost unimaginable. As semiconductors continue to evolve, the market for semiconductor production equipment is also entering a new phase of growth. Tokyo Electron is continuously creating high value-added, cutting-edge equipment, and technical service to lead the world, with the aim of enabling a prosperous future for all.

CEO’s Message

I would like to express my sincere gratitude to all stakeholders for your continued support and patronage. In recent years, industry, society and the lives of the public have been significantly affected by a series of challenges. These include the spread of COVID-19, natural disasters caused by climate change, geopolitical risks—typified by trade frictions and international conflicts—and the human rights issues they engender. On the other hand, in order to build a strong and resilient society in which economic activities do not stop under such circumstances, various efforts are underway, including the implementation of ICT (information and communication technology) and decarbonization to preserve the global environment. Meanwhile, the transition to a data-driven society is progressing at an unprecedented speed, and digital technologies are now used furthermore: IoT, AI and 5G are becoming more widespread, industries are growing smarter, autonomous driving is evolving, and the much-hyped metaverse is seeing real-world applications. For semiconductors, which are supporting the core of this shift, expectations for technological innovations such as larger capacity, higher speed, higher reliability and lower power consumption are limitless. The semiconductor market exceeded US$500 billion for the first time in 2021 and is expected to exceed US$1 trillion by 2030, more than double the current market. And we expect the semiconductor production equipment market in which we operate to grow even further. Tokyo Electron celebrates its 60th fiscal year in 2022, and we have formulated a new Vision to become “A company filled with dreams and vitality that contributes to technological innovation in semiconductors.” We will pursue this vision based on our driving forces, which include 1) Abundant technological capabilities cultivated as an industry leader, 2) Trust from customers based on our reliable technical services, and 3) The challenging spirit of our employees, who are capable of flexibly and rapidly adapting to changes in the environment. By doing so, we will strive to expand profits over the medium- to long-term and continuously enhance corporate value.

We deeply appreciate your support for Tokyo Electron and look forward to your continued support and patronage.

Toshiki Kawai
Representative Director, President & CEO
Tokyo Electron’s Mission, Vision and Value

Tokyo Electron’s Corporate Principles are comprised of four elements that together detail our mission as a company and identify the values and behaviors necessary to fulfill our goals.

Corporate Philosophy

We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support.

Mission

We will tirelessly take on the challenges of technological innovation to achieve continuous growth through business expansion and market creation.

Management Policies

■ Profit is Essential

The TEL Group aims to contribute to the development of society and industry and to the enhancement of corporate value while continuously pursuing profit.

■ Growth Philosophy

We respect each other’s individuality and we place a high priority on teamwork.

■ Employees

We take pride in providing high-value products and services.

■ Safety, Health, and the Environment

We accept the challenge of going beyond what others are doing in pursuing our goal of becoming number one globally.

■ Social Responsibility

We must have awareness and accept responsibility for our behavior as respectful members of society.

Value

TEL Values highlight the values and codes of conduct as Tokyo Electron.

■ Pride

The TEL Group leads markets by providing high-quality products in leading-edge technology fields with a focus on electronics.

■ Challenge

We will keep ownership in mind as we think things through, and engage in thorough implementation in order to achieve our goals.

■ Teamwork

We respect each other’s individuality and we place a high priority on teamwork.

■ Ownership

We will work with creativity, a sense of responsibility, and a commitment to teamwork.

■ Awareness

Protecting our employees, customers, and the environment.

Vision

A company filled with dreams and vitality that contributes to technological innovation in semiconductors.

Technology Enabling Life

It is our corporate message that expresses the Corporate Principles which consist of our Corporate Philosophy, Management Policies, Vision and TEL Values.
The History of TEL

From 1963 to 2022, the evolution of TEL has been driven by a commitment to innovation and a passion for leading-edge technologies. Here is a summary of significant milestones in the company's journey:

1963
Founded as a technology trading company, Tokyo Electron Laboratories, Inc., with capital of five million yen and a conviction that semiconductors were about to transform the industry.

1964
TEL begins import and sales of Fairchild Semiconductor Corp. (U.S.)’s IC testers in Japan.

1965
TEL acquires importing and selling rights for diffusion furnaces manufactured by Thermco Products Corp. (U.S.) and begins sales.

1967
TEL consolidates an agency agreement with Fairchild Semiconductor Corp. (U.S.) to sell Fairchild’s IC testers in Japan.

1968
TEL establishes a joint venture with Thermco Products Corp. (U.S.), Thermco-Thermco Engineering Co., Ltd., for diffusion furnace production.

1970
TEL begins domestic production of diffusion furnaces.

1976
TEL-Thermco Engineering Co., Ltd., develops the world’s first high-pressure oxidation furnace.

1978
Listed on the First Section of the Tokyo Stock Exchange.

1980
Listed on the Second Section of the Tokyo Stock Exchange.

1984
TEL becomes a leading player in the semiconductor production equipment market.

1990
TEL marks a major move into development and marketing of FPD production equipment.

1994
TEL wins the Order of the Rising Sun, Gold and Silver Star for its contributions to the semiconductor industry.

1999
TEL receives Tokyo Stock Exchange’s Tenth Annual Award for Excellence in Disclosure for the second time since 1999.

2002
TEL announces new vision and medium-term management plan.

2005
TEL receives Prime Minister’s Award for the second time since 2013.

2011
TEL wins Grand Prize for Corporate Governance of the Year® 2011.

2013
TEL concludes merger agreement with Applied Materials, Inc. (to be dissolved in 2015).

2016
TEL wins the Order of the Rising Sun, Gold and Silver Star for its contributions to the semiconductor industry.

2020
TEL receives Prime Minister’s Award for the second time since 2013.

2022
TEL announces new vision and new medium-term management plan, and introduces Corporate Message.

The growth of TEL has always been in sync with the history of the semiconductor industry. Ever since its inception, TEL has tirelessly pursued the leading-edge technologies and innovations. Here are the milestones of the company’s development.
A Future realized by TEL

At TEL, our focus is on developing, manufacturing, and selling equipment that makes semiconductors, as well as on providing associated technical support. Building on the technological expertise and know-how that we have been cultivating for almost 60 years, we will also contribute to the achievement of a dream-inspiring society.

Smart healthcare

Smart mobility

Smart devices

IoT · AI · 5G/6G · Cloud · Metaverse

Smart cities

AR / VR / MR

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Market size of semiconductors

Today, semiconductors are not only pervasive in electronic equipment, but are also indispensable to datacenters and 5G/6G network infrastructure that support a wide range of applications. Reflecting its soaring importance, the semiconductor market is forecast to top US$1 trillion by 2030, more than double its current size. As the evolution of semiconductors is set to continue, TEL is expected to play an even greater role than before.

Outlook for the Semiconductor Market

Growing to more than double over the next 10 years


$1 trillion

$0.8

$0.6

$0.4

$0.2

$0.0

2010

2020

2030

2040

2050

Smart healthcare

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IoT · AI · 5G/6G · Cloud · Metaverse

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Toward sustainable growth of society

To achieve the digital transformation and decarbonization of society, we have launched a supply chain initiative called E-COMPASS, aiming to reduce the environmental impact of our equipment throughout the supply chain and promote conservation of the global environment.

TEL’s medium- to long-term environmental goals

To enhance the environmental performance of our products, plants, and offices, we have set the medium-term environmental targets as shown in the chart below. As a long-term goal, we are seeking “net zero” emissions—which means offsetting our greenhouse gas emissions with reductions. We plan to effectively eliminate scope 1 and 2* emissions by 2040, and scope 3** emissions by 2050.

* Scope 1 and 2: Emissions from the use of energy such as electricity in business activities
** Scope 3: Emissions from the use and disposal of sold equipment, purchase of materials, distribution, etc.

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E-COMPASS

Environmental Co-Creation by Material, Process and Subcomponent Solutions

Smart healthcare

Smart mobility

Smart devices

IoT · AI · 5G/6G · Cloud · Metaverse

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As the transition to a data-driven society accelerates and the scope of semiconductor applications expand, customers’ requirements for production equipment are becoming even more diverse and advanced. This is why we at TEL are not only committed to developing innovative technologies, but also to providing "reliable service and support.” By contributing to the customers’ value creation processes, we aim to remain their sole strategic partner.

Since semiconductors are critical building blocks of social infrastructure, the technologies that drive them are set to evolve further. As future semiconductors will need even larger capacity, higher speed, higher reliability, and lower power consumption than ever before, it is critical for us to come up with advanced next-generation R&D capabilities so we can provide production equipment with higher added-value and competitiveness in a timely manner.

Developed as the center for enhancing our DX capabilities, the office features highly advanced functions and design that not only stimulate state-of-the-art software technology ideas for nanoscale semiconductor production, but also support the recruitment and training of personnel necessary for implementing DX.

More than 1 trillion yen planned for 5 years from FY'23

R&D Facilities

Addressing Complex and Diversifying Nanoscale Technology Needs

TEL Digital Design Square

Opened in November 2020 (Sapporo City, Hokkaido)

Advanced technology development
Molecular simulation
Calculation/simulation with AI
Deep learning
Use of open source development
Image classification
Power

Molecular simulation
Calculation/simulation with AI
Deep learning
Use of open source development
Image classification
Power

TEL’s “AI x DX” Initiative

Equipment Autonomy
Monitoring, control, predictions
Image mining
Control equipment modeling
AI model construction

Exploration of New Materials
Natural language processing
Machine learning algorithm
Text analysis
Data analysis

Material informatics
Exploration of New Materials
Monitoring, control, predictions
Image mining
Control equipment modeling
AI model construction

Knowledge Management
Equipment support/trouble logs
Exploration of New Materials
Monitoring, control, predictions
Image mining
Control equipment modeling
AI model construction

Miyagi Technology Innovation Center

Completed in September 2021 (Taiwa Town, Miyagi)

The Miyagi Technology Innovation Center promotes R&D for creating advanced equipment and production technologies for several generations to come. The training area for customers and the lab area are designed to enhance internal and external collaboration to meet the challenge of advancing semiconductor production technologies.

New Development Building

Nirasaki City, Yamanashi (To be completed in spring 2023)
Koshi City, Kumamoto (To be completed in autumn 2024)
Taiwa Town, Miyagi (To be completed in spring 2025)
Manufacturing

Our manufacturing operations start with early phases of product development and covers everything from designing and manufacturing to quality management.

We develop and manufacture our equipment mainly at manufacturing subsidiaries in Japan. One of our major strengths lies in our ability to control the entire production flow, including equipment design, manufacturing, and quality management. The integrated nature of our processes allows us to capture and incorporate our customers’ technological needs quite early in the development phase, resulting in timely provision of high-quality products.

As semiconductors become more advanced, customers’ requirements also grow more sophisticated. To produce equipment of ever-higher quality, we have been promoting a company-wide productivity improvement initiative for over a decade. The initiative aims to thoroughly eliminate inefficiency and wastefulness from our manufacturing operations, thus improving productivity while also influencing the employees’ mindset and behavior.

Sales

Making sales starts with gathering information on customers’ needs and business trends to quickly and accurately discern what kind of equipment and technologies are in demand. We then take full advantage of our core competence and expertise to propose the optimum solution that helps create the best value for our customers. We have formed strong partnerships with our customers and are daily engaged in intense sales activities on a global field.

Technical Service and Support

Committed to pursuing the best technical service possible in a constantly changing business environment, we are ensuring that our technical service and support will bring satisfaction to all customers around the world. Anticipating the shifting trends and diversifying customer needs, we are also continuously upgrading our global support capabilities.

At TEL, we refer to technical service and support before-and-after equipment delivery as "field solutions business." We assure high equipment availability through total technical service and support, including everything from delivery and installment of equipment to after-sales maintenance service. Our field solutions business takes advantage of the largest installed base in the industry (about 83,000 units), while also employing the latest AI, digital technologies, and knowledge management tools to boost the efficiency of our service.

Assorted Services to Address Diverse Needs

- Sales of new small-diameter wafer processing equipment (including 200 mm)
- Sales/procurement/warranty/total support of refurbished equipment
- Genuine spare parts supply and repair service
- Engineering service/support
- Equipment upgrade service

Use of Digital Technology

We employ the latest wearable devices to capture real-time images and sounds from our customers’ production sites. Shared availability of such data is vital to the efficiency of our remote support system. Our advanced and user-friendly smart glasses feature original functions including enhanced data security, restriction on image transmission, and speech translation, all of which contribute to accurate and speedy support. Our TELeMetrics™ service connects the equipment installed at customers’ sites with TEL’s servers via a highly secure communication lines, allowing remote analysis of the equipment data to enhance operational stability and productivity.

By implementing these technologies in close cooperation with field engineers and manufacturing sites, we provide high value-added technical service.

**Smart glasses: an eyewear-type device capable of projecting images and digital information in the user’s field of vision.**
World-Leading Capabilities for Technological Innovation Enable the Evolution of Semiconductors

Semiconductors are critical components of digital products such as TVs, PCs, and smartphones, and they are also essential to industrial digitalization including smart factories, smart agriculture, smart healthcare, and smart cities. Accordingly, semiconductor engineers are responding to unending requests for larger capacity, higher speed, higher reliability and lower power consumption.

**Semiconductor Production Equipment**

To form wiring that connects individual transistors, a dielectric (oxide) layer is deposited to insulate the wiring. Contact holes (vias) are then opened in the dielectric layer and are filled with metal film (Cu). Another dielectric layer is deposited on top, in which trenches are etched to form wiring patterns. The trenches are filled with metal film, and then the excess metals are polished and the surface is planarized. These processes are repeated to make a multi-level interconnect.

**Testing**

Each integrated circuit is tested by a wafer prober to form an interconnect formation. The chips are attached to package substrates or lead frames, and are sealed with ceramic or plastic.

**Packaging/Assembly**

After fabricating redistribution layers, the back-end processes such as bumping and bonding are performed, after which the chips are assembled into a package.

Examples of semiconductor product applications:

- **CMOS Image Sensor**: Photo, Microwater
- **DRAM**:logic circuit
- **Logic**: multiprocessor
- **3D NAND**: memory storage
- **Completed Semiconductors**: Completed Packaging

**Wafer process (Front-end)** is the process of fabricating individual transistors on a wafer, while **Assembly and Test process (Back-end)** is the process of packaging individual transistors into a complete semiconductor chip.

**Semiconductor Manufacturing Process**

- **Deposition**: Oxide/Nitride film deposition
- **Photolithography**: Photolithography (Photomasking, Development)
- **Etching**: Etching
- **Cleaning**: Ashing/Cleaning

**Isolation Formation/Gate Formation**

After fabricating redistribution layers and bump electrodes, a temporary substrate may be bonded to the wafer to facilitate thinning, and it is then removed by a debonder.
World-Spanning Business Operations and Outstanding All-Around Capabilities that Lead the Market

Net Sales 2,003.8 Billion yen
Composition of Net Sales by Region (FY2022)

- **Europe**: 5.4%
- **Japan**: 11.5%
- **North America**: 13.4%
- **Taiwan**: 18.0%
- **Asia**: 28.3%
- **Japan**: 11.5%
- **Others**: 19.0%

Equipment Lineup Covering Four Sequential Processes

TEL is the only manufacturer in the world that offers a lineup of equipment covering the four sequential processes that are critical to ultra-fine semiconductor manufacturing: deposition, coater/developer, etching, and cleaning. Our solutions identify technical needs and issues concerning our products as early as at the development stage and co-optimize relevant processes.

Products Holding No. 1 or No. 2 Shares in the Global Market

- **Deposition**: Coater/developer, cleaning
- **Etching**: Cleaning

Largest Installed Base in the World

The global installed base of TEL’s equipment is the largest in the industry at about 83,000 units. In addition, about 8,000 new equipment are being shipped to customer fabs every year. These products also bring significant after-market opportunities for servicing, parts sales, and equipment upgrades, which constitute a growing business segment.
TEL’s Sustainability Initiatives for the Advancement of a Dream-Inspiring Society

By dealing with the material issues and pursuing TEL FOR GOOD social contribution activities, we are aiming to contribute to the resolution of industrial and social issues, the development of industry and society, and the achievement of the SDGs. “We strive to contribute to the development of a dream-inspiring society through our leading-edge technologies and reliable service and support.” By practicing this corporate philosophy, we strive to achieve medium- to long-term profit expansion and continuous corporate value enhancement.

Business Operations focused on Material Issues (key issues)

We have identified the following four material issues that require prioritized attention and actions, and are implementing sustainability initiatives through our business operations.

- Continuously create high value-added next-generation products
- Build a strong management foundation that underpins our business activities
- Strong relationship based on trust
- Pursuit of operational efficiency

Participation in Global Initiatives

Responsible Business Blueprint (2002)

Third-Party Recognition

Our sustainability initiatives have been receiving high acclaim from rating organizations around the world.

- Technology and Innovation
  Fostering innovation through cutting-edge technologies is essential to the evolution of semiconductors and displays. Through TEL FOR GOOD, we create learning opportunities that foster creativity and support highly original research and development on a global scale.

- Conserving the Global Environment
  As climate change becomes more severe, we strive to build a decarbonized society through TEL FOR GOOD and our business activities. We also make efforts to conserve water resources and maintain biodiversity. In addition, we contribute to the conservation of the global environment by promoting a circular economy.

- Co-creation with Communities
  In addition to contributing to the development and revitalization of the communities where we conduct business through employment opportunities and fostering local industries, we strive for co-creation with communities through TEL FOR GOOD, which is rooted in our communities. We also fulfill our role as a corporate citizen by participating in international humanitarian aid and disaster recovery initiatives.

TEL FOR GOOD is the brand name for our social contribution activities. Considering the activities’ importance to society and relevance to our business, we have defined the three focus areas below. Activities of TEL FOR GOOD are being implemented throughout the world, while promoting initiatives through our business operations.