



FY2024 Second Quarter

(Fiscal Year Ending March 2025)

FINANCIAL RESULTS BRIEFING

November 24, 2024

日本電子株式会社
JEOL Ltd.

Becoming a top niche company supporting science and technology around the world

COMPANY PHILOSOPHY

On the basis of "Creativity" and "Research and Development," JEOL positively challenges the world's highest technology, thus forever contributing to the progress in both Science and Human Society through its products.

Vision

"Evolving in the 70th Year"

Accelerate business expansion and achieve even higher profitability based on our unique technologies and human networks which have been developed since the company's founding.

Mid-term Management Plan

"Evolving Growth Plan"

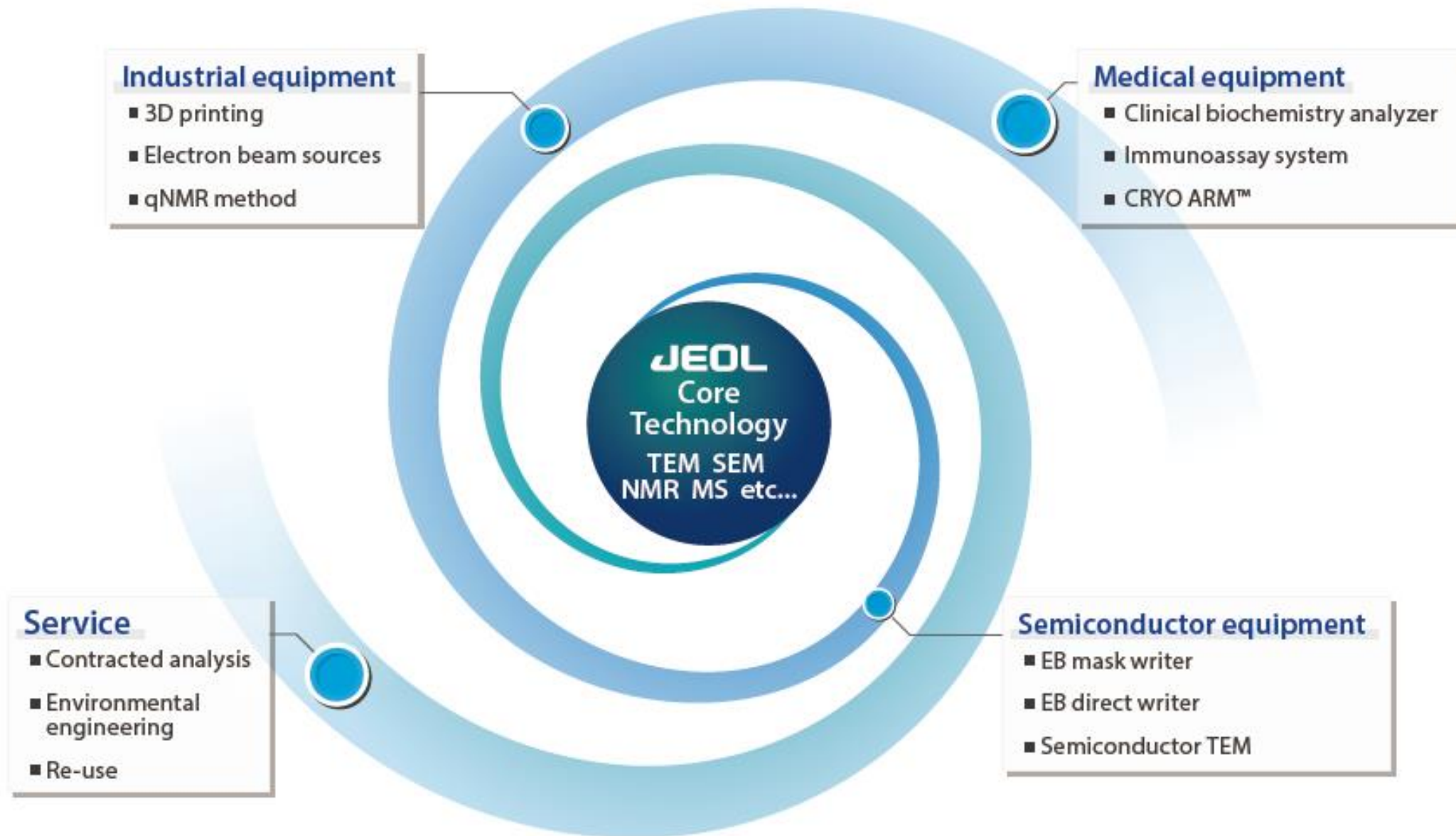
We aim to improve customer satisfaction by strengthening our R&D, manufacturing, and service capabilities.

→ YOKOGUSHI ←

Promote Innovation by co-creation

Growth vision of “Evolving in the 70th Year” remains unchanged

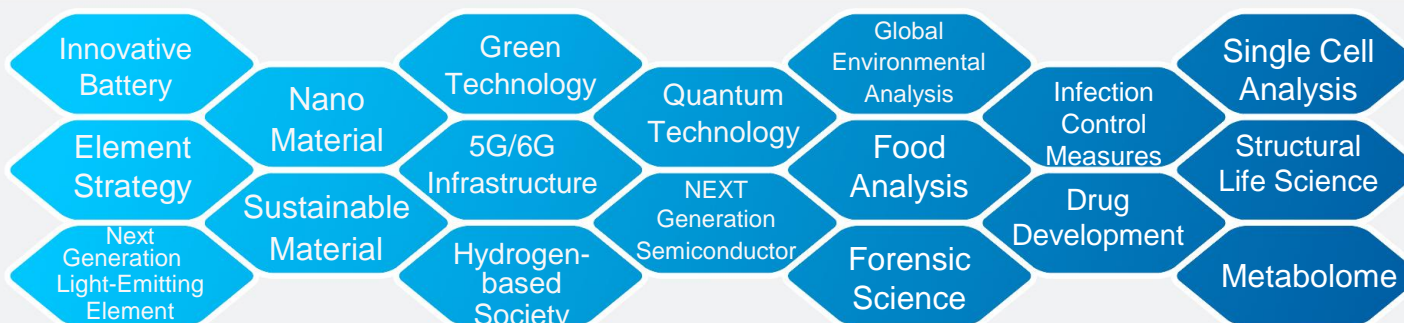
- Expand the scale of JEOL business and achieve higher profitability



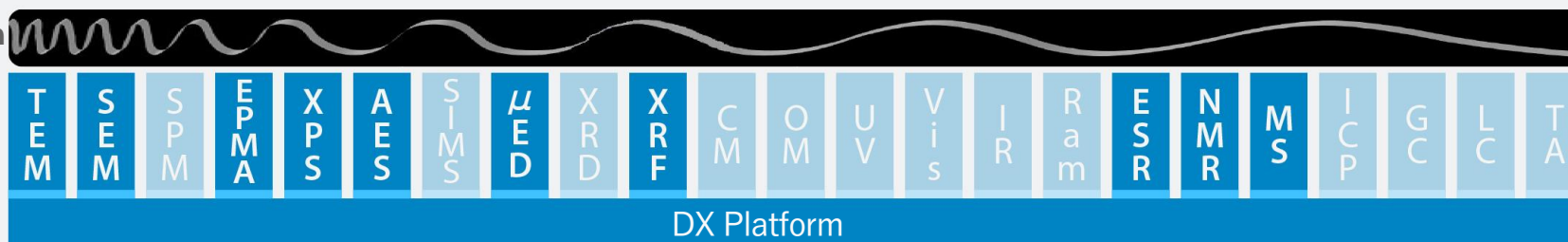
Strengthen and Develop YOKOGUSHI Strategy

- Providing comprehensive solutions that support cutting-edge technologies

YOKOGUSHI



Wavelength



Scientific and Metrology Instruments

Medical Equipment

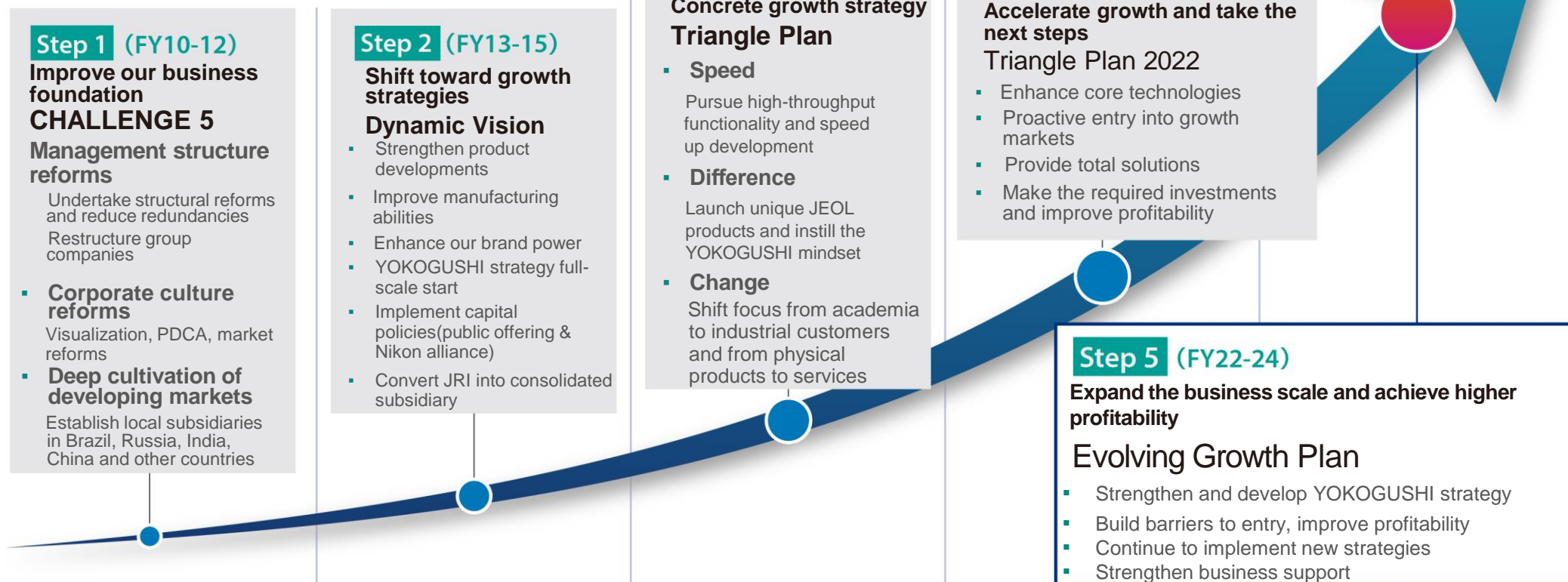
Industrial Equipment

Solutions



Mid-term Management Plan “Evolving Growth Plan” (FY2022-FY2024)

Mid-Term Management Plans since FY 2010



Net Sales/Operating Profit Transition



Summary

Evolving Growth Plan

Accelerate business scale expansion and achieve higher profitability by further implementing the “Evolving in 70th Year”

FY 2024 1H Results

Highest records were achieved for sales, operating profit, ordinary profit and profits attributable to owners of the parent

Semiconductor Market

Multi-beam mask lithography systems continue to be affected by the slow recovery of the advanced semiconductor investment.
Single beam mask lithography systems continue to see strong demand, mainly from China.

FY2024 Forecast

Net sales 196.0 billion JPY, operating profit 33.0 billion JPY
ordinary profit 31.5 billion JPY, net profit 23.5 billion JPY

Mid-term Management Plan Evolving Growth Plan - Initiatives

1. Build barriers to entry and improve profitability
2. Expand business in growing markets such as semiconductors, drug discovery, batteries, etc.

INDEX

1. FY2024 2Q result and FY2024 forecast
2. Business status of each segment
 - 2-1. Scientific/Metrology Instruments
 - 2-2. Industrial Equipment
 - 2-3. Medical Equipment
3. Summary

1. FY2024 2Q result and FY2024 forecast



FY2024 2Q Results (P/L)

- Record high for the 1st half of the year

Consolidated figures (P/L)		(100 million JPY)	
	FY2023 2Q Result (1)	FY2024 2Q Result (2)	Year-on-Year (2) -(1)
1 Net sales	687	872	185
2 Sales cost	357	441	85
3 (Cost rate)	(51.9 %)	(50.6 %)	(-1.3 %)
4 Gross profit	330	431	101
5 SGA	195	211	17
6 R&D cost	53	61	9
7 SGA total	247	273	26
8 Operating profit	83	158	75
9 Non-operating income	20	7	-13
10 Non-operating expenses	1	24	23
11 Ordinary profit	102	141	39
12 Extraordinary income	2	0	- 2
13 Extraordinary loss	1	0	- 1
14 Net profit before tax	102	141	39
15 Corporate taxes	27	32	5
16 Net profit	75	109	34
Exchange rate (1\$=)		¥141	¥152
Exchange rate (1€=)		¥154	¥165

Factors for fluctuating ordinary profit (year-on-year)

(100 million JPY)	
(A) Positive Factors	101
1. Sales volume increase	72
2. Exchange margin (yen depreciation)	29
(B) Negative Factors	-26
1. SGA increase	-17
2. R&D cost increase	-9
(A)+(B)	75

Transition of Consolidated Sales & Operating Profit by Segment (Cumulative 2Q)

		(100 million JPY)		
		FY2022 2Q result	FY2023 2Q result	FY2024 2Q result
Company Total	Net sales	647	687	872
	Operating profit	69	83	158
	Ordinary profit	88	102	141
	Net profit	72	75	109
Scientific/Metrology Instruments	Net sales	358	441	522
	Operating profit	-1	37	40
Industrial Equipment	Net sales	205	172	287
	Operating profit	93	70	146
Medical Equipment	Net sales	85	74	64
	Operating profit	3	5	4
Company Total	Operating Expenses	26	29	32
Exchange rate(1\$=)		¥133	¥141	¥152
Exchange rate(1€=)		¥139	¥154	¥165

FY2024 Forecast (P/L)

- Consolidated net sales ¥196 billion, Operating profit ¥33.0 billion, Ordinary profit ¥31.5 billion, Net profit ¥23.5 billion

Consolidated figures (P/L)

(100 million JPY)

	FY23 Full-year Result (1)	FY24 Full-year Forecast (as of May2024)	FY24 Full-year Forecast(2) (as of Nov.2024)	Year-on-Year (2)-(1)
1 Net sales	1,743	1,830	1,960	217
2 Sales cost	951	972	1,055	104
3 (Cost rate)	(54.5%)	(53.1%)	(53.7%)	(-0.8%)
4 Gross profit	793	858	905	112
5 SGA	415	424	450	35
6 R&D cost	103	134	125	22
7 SGA total	518	558	575	57
8 Operating profit	275	300	330	55
9 Non-operating income	28	10	10	-18
10 Non-operating expenses	3	5	25	22
11 Ordinary profit	300	305	315	15
12 Extraordinary income	2	2	2	0
13 Extraordinary loss	8	2	2	-6
14 Net profit before tax	295	305	318	23
15 Corporate taxes	78	80	83	5
16 Net profit	217	225	235	18
Exchange rate (1\$=)	¥ 144	¥ 145	¥ 147	
Exchange rate (1€=)	¥ 157	¥ 158	¥ 161	

Factors for fluctuating ordinary profit (year-on-year)

(100 million JPY)

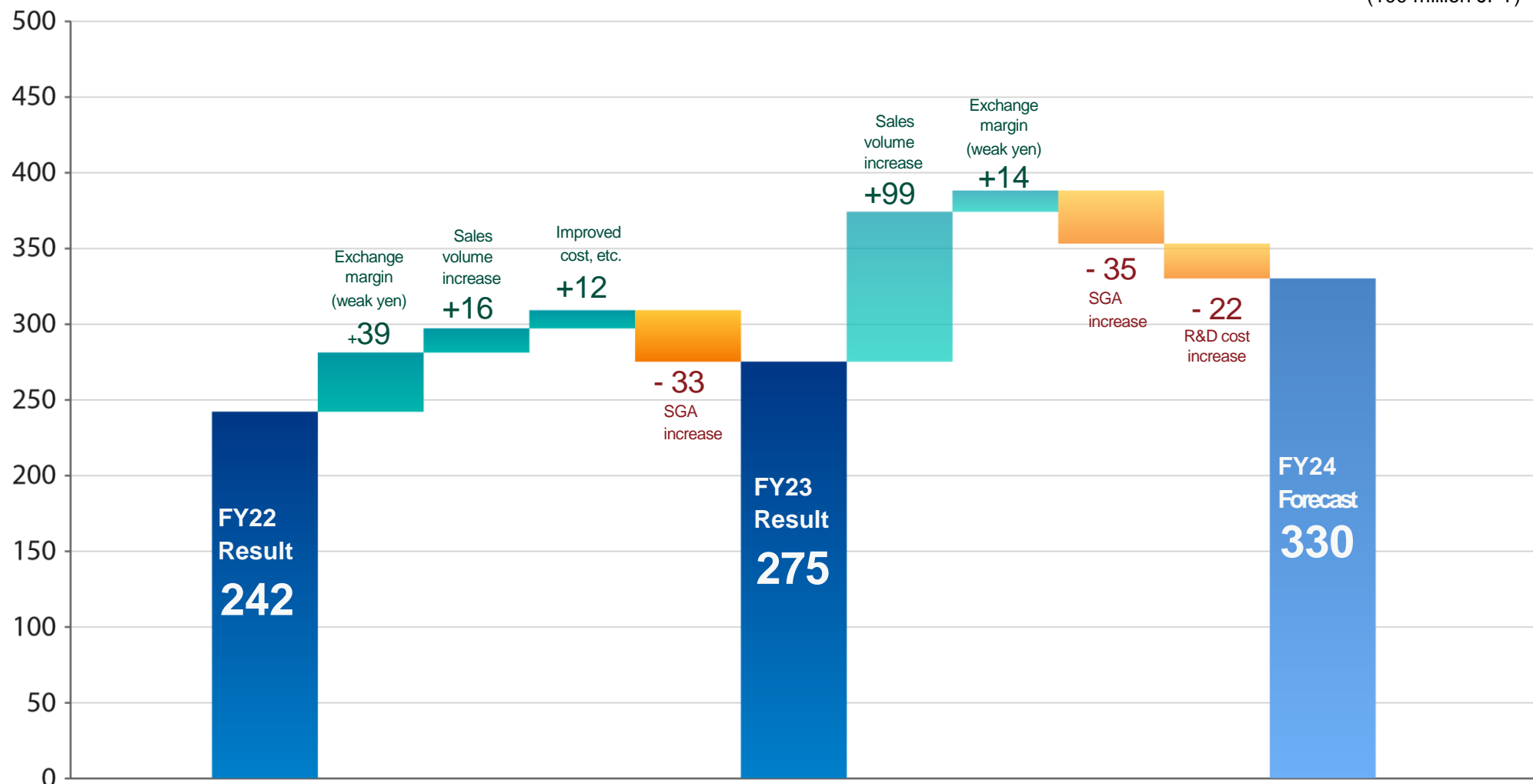
(A) Positive Factors	112
1. Sales volume increase	99
2. Exchange margin (yen depreciation)	14
(B) Negative Factors	- 57
1. SGA increase	- 35
2. R&D cost increase	- 22

(A)+(B) 55

Factors Leading to Increase/Decrease in Profits

Ordinary profit analysis

(100 million JPY)



Transition of Consolidated Sales & Operating Profit by Segment (Full-year)

(100 million JPY)

		FY2022 Full-year result	FY2023 Full-year result	FY2024 Full-year Forecast (as of May 2024)	FY2024 Full-year Forecast (as of Nov. 2024)
Company Total	Net sales	1,627	1,743	1,830	1,960
	Operating profit	242	275	300	330
	Ordinary profit	235	300	305	315
	Net profit	178	217	225	235
Scientific/Metrology Instruments	Net sales	948	1,200	1,176	1,278
	Operating profit	58	168	168	161
Industrial Equipment	Net sales	495	390	497	530
	Operating profit	233	162	189	228
Medical Equipment	Net sales	184	153	157	152
	Operating Profit	5	5	5	5
Company Total	Expense	54	60	62	63
Exchange rate(1\$=)		¥ 135	¥ 144	¥ 145	¥ 147
Exchange rate(1€=)		¥ 141	¥ 157	¥ 158	¥ 161

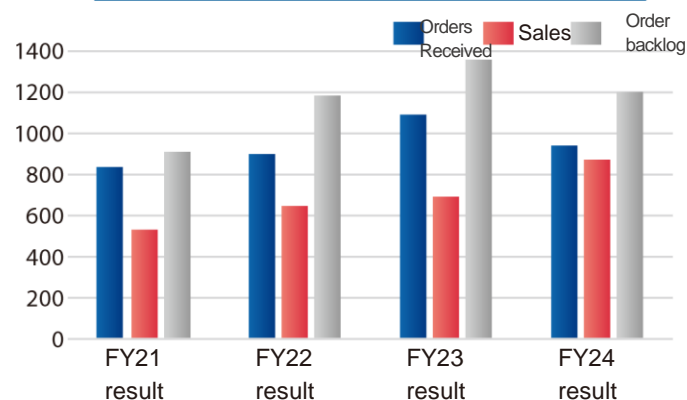
Transition of Major Accounts

2nd Quarter

(100 million JPY)

(Consolidated)	FY2022 2Q result	FY2023 2Q result	FY2024 2Q result
1 Inventory	706	821	822
2 Interest-bearing debt	140	90	108
3 Net assets (capital-to-asset)	927 (49.0%)	1,094 (53.4%)	1,316 (57.3%)
4 Dividend (JPY)	30 JPY	33 JPY	44 JPY
5 Overseas sales ratio	75.4%	66.7%	76.4%
6 Consolidated Orders received	899	1,092	941
7 Consolidated Order Backlog	1,187	1,361	1,203

2Q Transition of Consolidated Orders, Sales and Backlog



Full-year

(100 million JPY)

(Consolidated)	FY2022 Full-year result	FY2023 Full-year result	FY2024 Full-year forecast
1 Inventory	688	768	740
2 Interest- bearing debt	115	145	91
3 Total assets	1,993	2,302	2,170
4 Net assets (capital-to-asset)	1,019 (51%)	1,255 (55%)	1,420 (65%)
5 Dividend(JPY)	66 JPY	102 JPY*	92 JPY
6 Capital investment	37	56	50
7 Depreciation cost	47	47	50
8 Consolidated Orders received	1,647	1,922	1,830
9 Consolidated Order backlog	956	1,135	1,005
10 Oversea sales ratio	70.7%	65.4%	70.0%

* Includes a commemorative dividend of 20 JPY for the 75th anniversary of the company

Capital Efficiency Indicators

1 ROE	19.0%	19.1%	17.6%
2 ROIC	16.7%	15.9%	15.0%
3 PBR	X 2.1	X 2.6	—

Business Environment

- Scientific and Metrology Instruments orders continue to be strong. Advanced semiconductor market continues to be in an adjustment phase

Overview			
Scientific and Metrology Instruments	Universities and Governmental Demand	○ (Good)	<ul style="list-style-type: none"> Governmental investment in science and technology is strong. However, in China, supplementary budgets for low-interest loan policies have run their course
	Private Demand (Semiconductor)	○ (Good)	<ul style="list-style-type: none"> Demand continues to be brisk, especially in South Korea and Taiwan
	Private Demand (Other industries)	○ (Good)	<ul style="list-style-type: none"> R&D investments continue in the battery market
Industrial Equipment	Lithography System Market	○ (Good)	<ul style="list-style-type: none"> Multi-beam mask writer market saw a delay in the recovery of EUV investments. Future full-scale recovery is expected Single beam mask writer demand continues to be brisk, mainly in China Spot beam continues to be strong
	EB Source Market	△ (Slow)	<ul style="list-style-type: none"> EB source market continues to be weak
Medical Equipment	Japan	○ (Good)	<ul style="list-style-type: none"> Demand continues to be strong, mainly for test centers
	Overseas Market	△ (Slow)	<ul style="list-style-type: none"> Orders and sales continue to decrease due to the impact of the “Buy China” policy

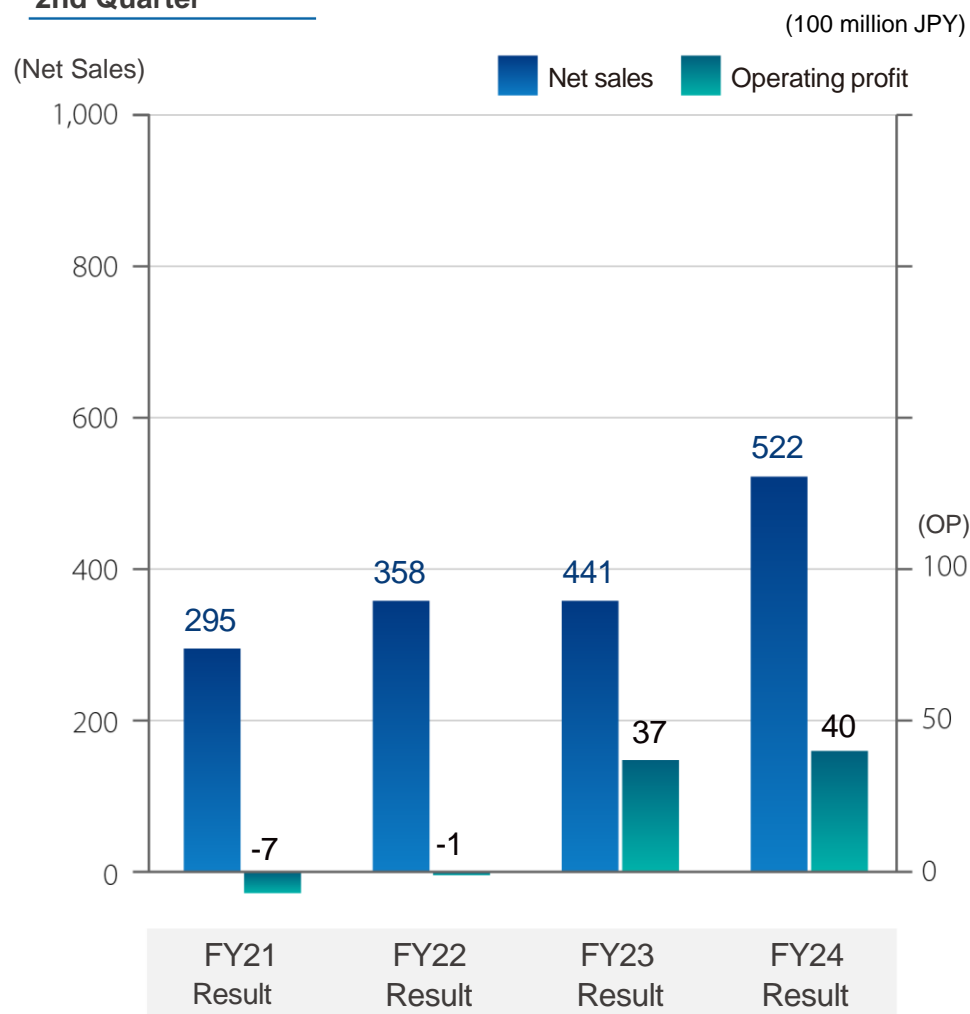
2. Business status of each segment

2-1. Scientific/Metrology Instruments

Scientific/Metrology Instruments Segment

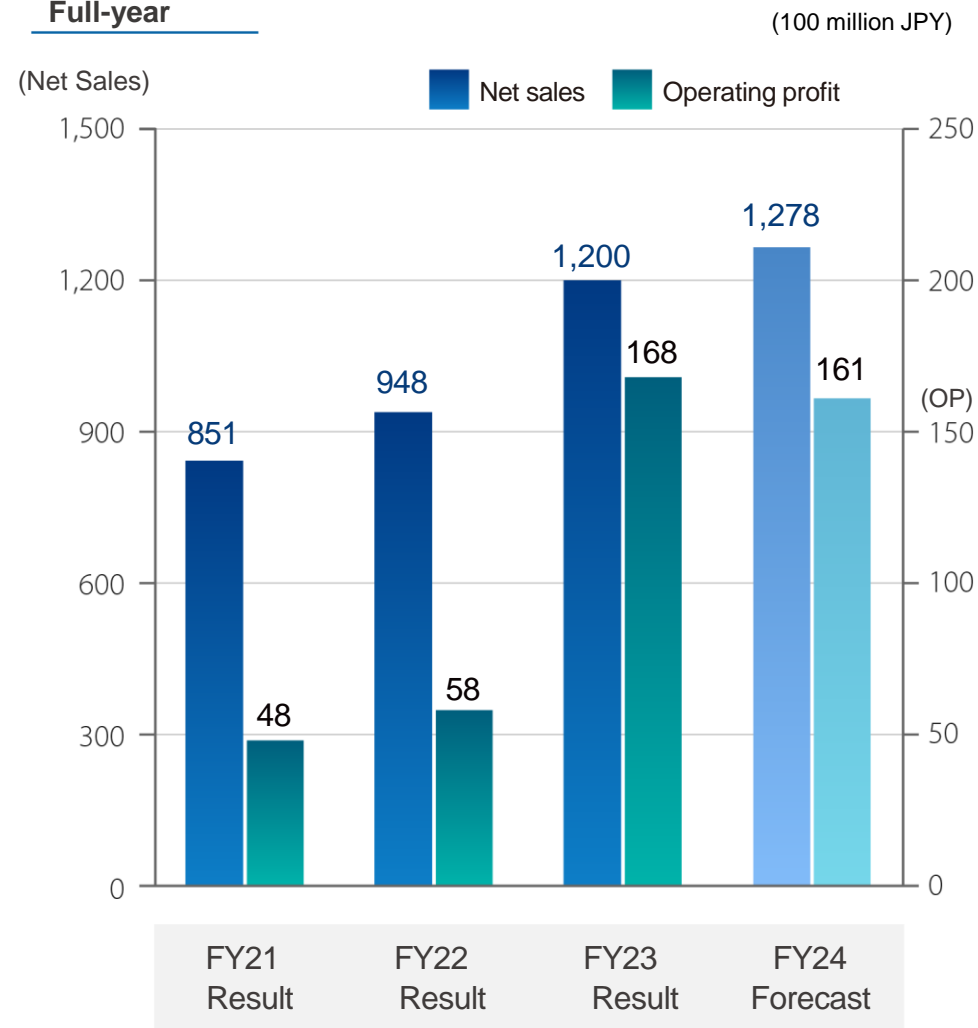
Consolidated Net Sales and Operating Profit Transition

2nd Quarter



Exchange rate(1\$=)	¥ 110	¥ 133	¥ 141	¥ 152
Exchange rate(1€=)	¥ 131	¥ 139	¥ 154	¥ 165

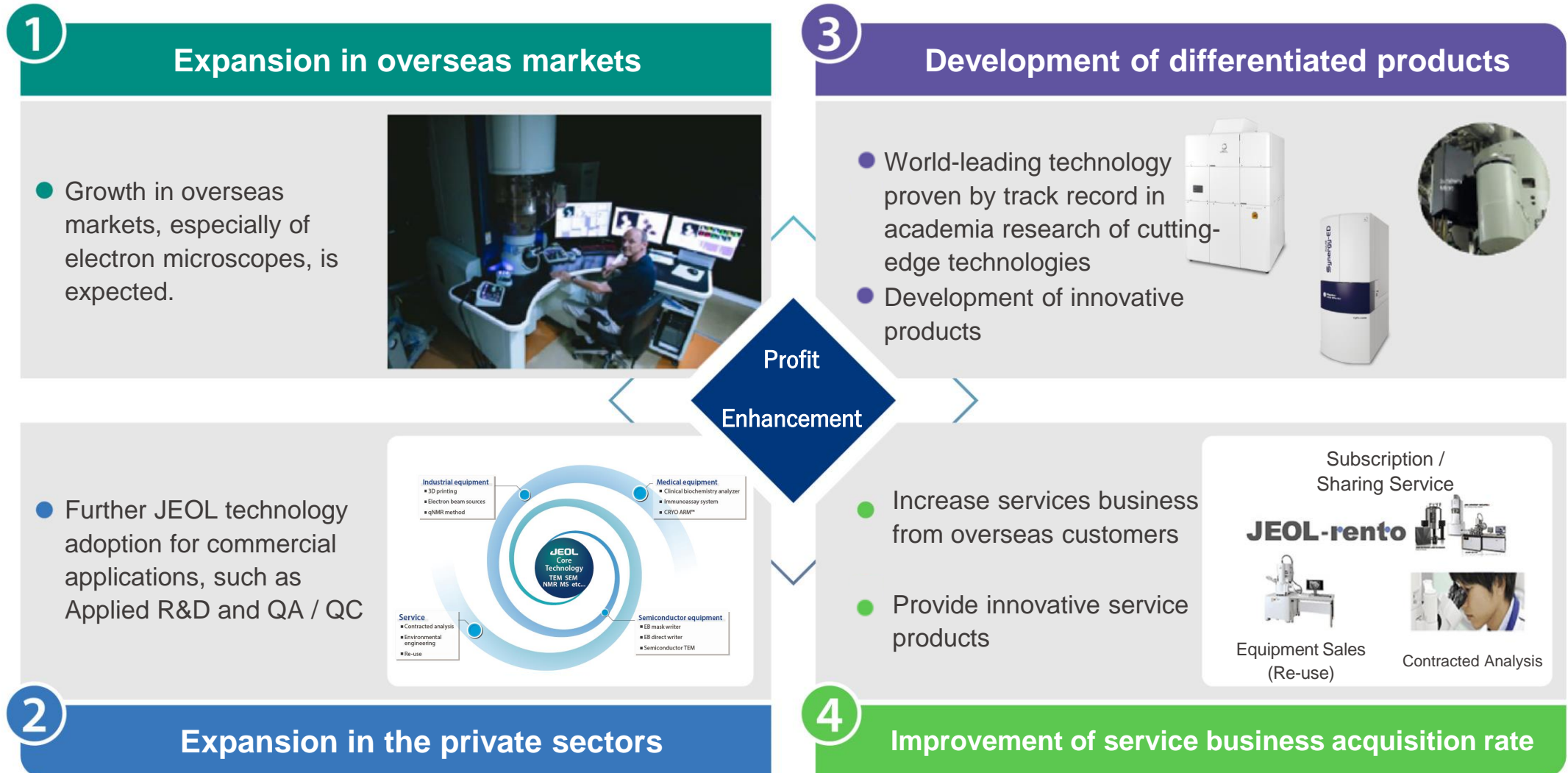
Full-year



Exchange rate(1\$=)	¥ 113	¥ 135	¥ 144	¥ 147
Exchange rate(1€=)	¥ 131	¥ 141	¥ 157	¥ 161

Scientific and Metrology Instruments

- Continue efforts for profit enhancement through further development of Scientific and Metrology Instruments



Solutions in semiconductor market by our scientific and metrology instruments

- Semiconductors are fundamental technologies for everything
- Developing technologies that can solve social issues requires legacy to cutting edge semiconductors

Semiconductor Technologies

Development of next-generation semiconductor

- New structure transistor development
- New material development
- Advanced packaging technology development

Production technologies for semiconductor

- High yield stabilization technology
- Market defect rate reduction technology
- Clarification of failure//defect mechanism

Solution provided by JEOL

Semiconductor structure measurement (Optimization of production condition)

- Preparation of very thin membrane TEM specimen by FIB and measurement of its thickness, high throughput and automation of shape observation



JEM-PS500i



JEM-ACE200F

Analysis to improve yield/reliability

- Morphological observation of defective specimen/membrane thickness measurement by TEM, composition analysis (EDS), bonding state measurement (EELS), micro volume analysis, damageless measurement, high resolution observation(interface, grain boundaries)
- Observation and analysis of defective specimen by SEM, identification of defective areas



NEOARM

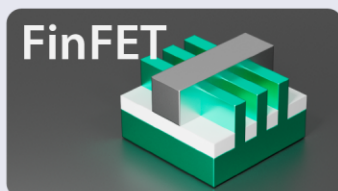


JSM-IT810

Electronic state measurement of materials

- Measurement of material band gap/defect level/bonding state

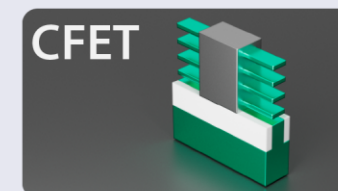
The needs for sophisticated analysis system has increased due to miniaturization of semiconductor and progress in layering



FinFET



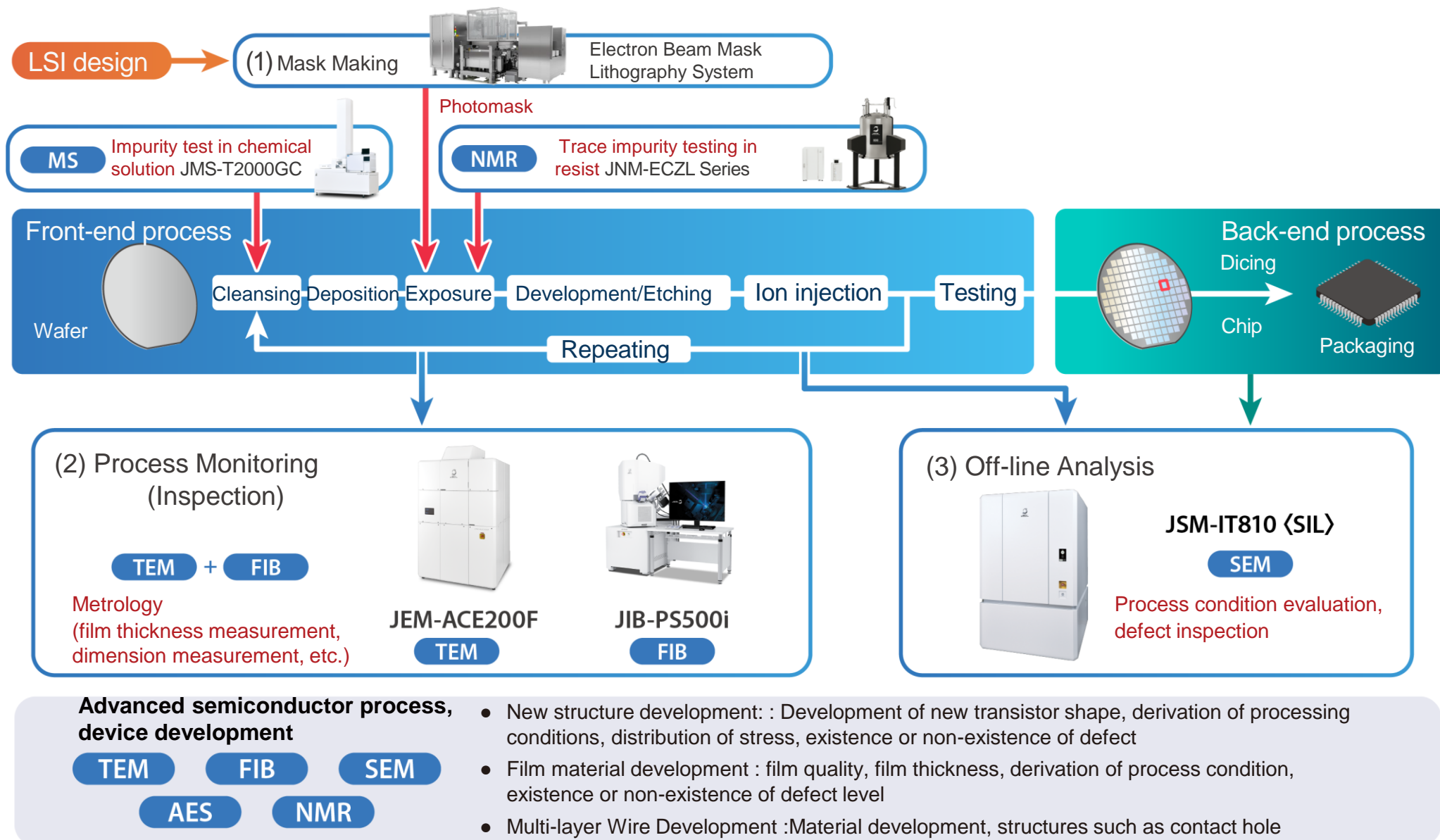
GAA



CFET

Solutions for Semiconductor Manufacturing Processes

Growth opportunities in integrated circuit manufacturing processes (1)(2)(3)



JEOL-Taiwan Advanced Semiconductor Solution Center (JTASC) established

- JEOL-Taiwan Advanced Semiconductor Solution Center (JTASC) is established in Zhubei City, Hsinchu Country, Taiwan to provide more fulfilling total solution to contribute to further development of the semiconductor industry in Taiwan.



President & CEO Izumi Oi at JTASC Opening Ceremony



JEM-ACE200F
High Throughput Analytical
Electron Microscope



JIB-PS500i
FIB-SEM System

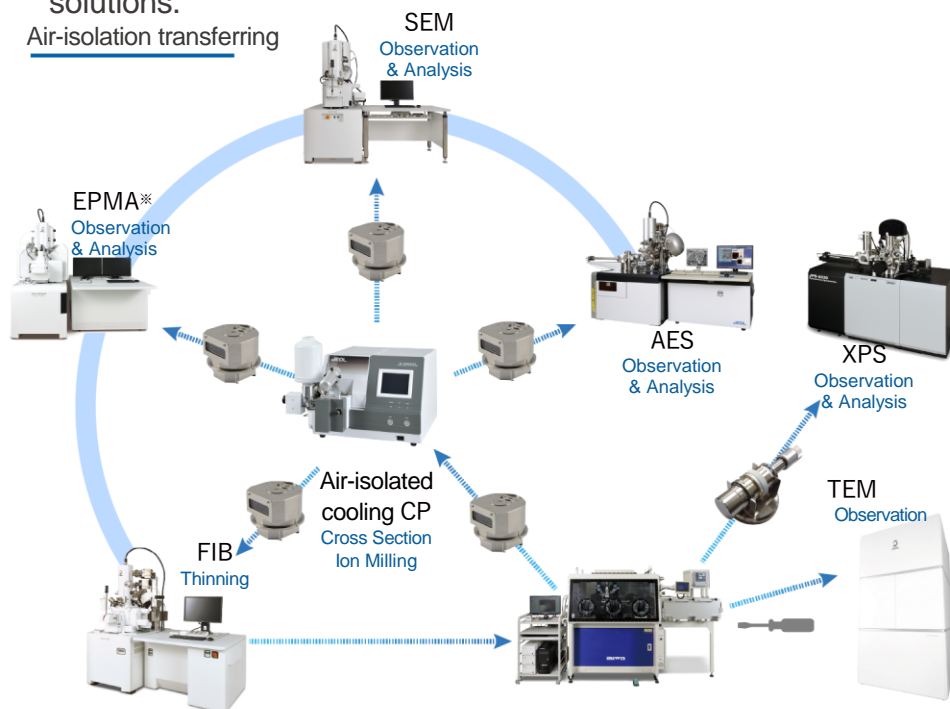
Analytical/Testing Solutions for the Next Generation Battery Technologies

- Batteries contain lithium and sulfur which must be handled without exposure to air to avoid oxidation. Our metrology, analytical, and sample preparation products provide an air-isolation transfer solution.
- In addition to R&D for next-generation batteries, contamination control in the manufacturing environment is also required.
- The need for Particle Contamination Inspection (PCI) systems based on Scanning Electron Microscopy (SEM) is increasing.
- Strong demands continues.

Next Generation Battery ▶ YOKOGUSHI ◀ Analytical Solutions

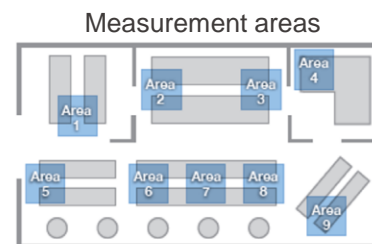
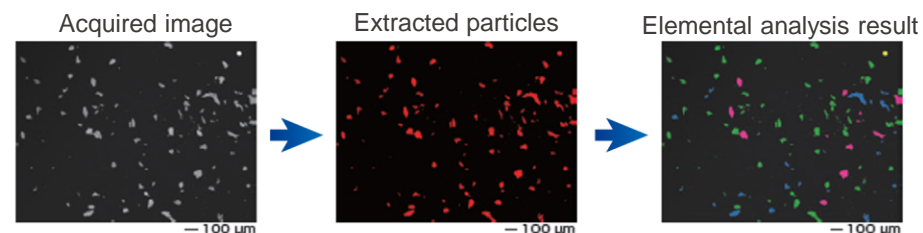
- Battery materials require handling without air exposure to avoid alteration. Our sample preparation equipment and observation/analysis instruments provide Air-isolated transfer solutions.

Air-isolation transferring



Environment Inspection System for Automotive Battery Production Line

- LIBs for EV requires control of contaminants originating from the production environment, increasing the need for particle analysis systems integrated into scanning electron microscopes (SEM).



Example of calendar reflection

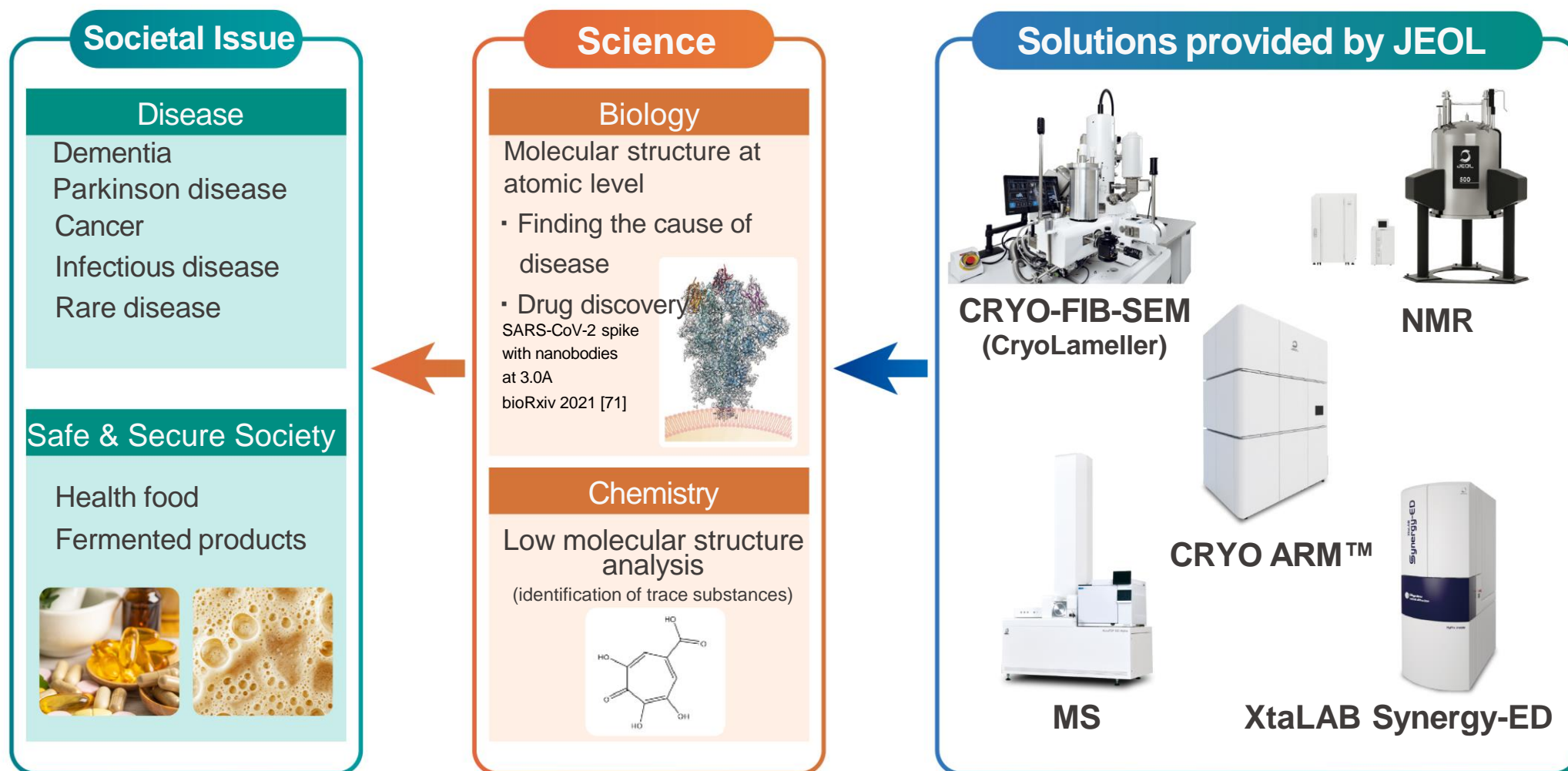
DATE	11/1	11/2	11/3	11/4	11/5	11/6	11/7	11/8	11/9	...
Area 1	388	452	346	398	954	686	330	284	152	
Area 2	103	122	118	154	329	292	210	162	115	
Area 3	111	114	131	111	292	227	187	118	125	
Area 4	137	125	185	128	134	143	190	127	103	
Area 5	109	130	112	72	142	137	97	124	107	
イベント										

Illig value ■ X ≥ 500 ■ 200 ≤ X < 500 ■ X < 200

Solutions for the Life Science market

- Develop products and solutions for structural biology (observation of molecules at the atomic level) that will solve societal issues.

JEOL's approach to problem solving



JEOL Growth Opportunities in the Life Science Market

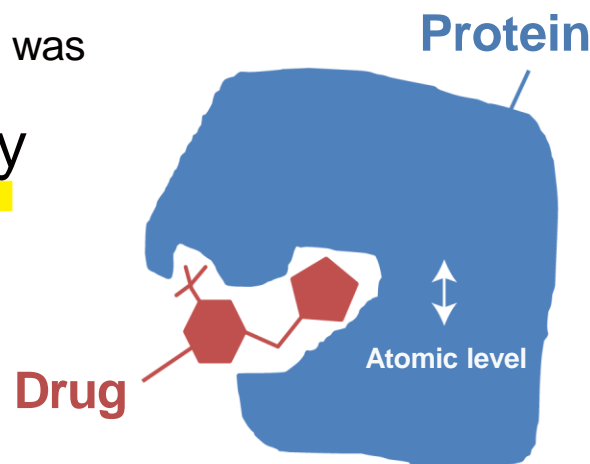
- Cryo-electron microscopes (TEM) and nuclear magnetic resonance spectrometers (NMR) are invaluable tools for the analysis of proteins at the atomic level.

The drug is a key designed to fit a protein's lock

Classical drug discovery before 1990 was

centered on Chemistry

Nobel Prize
1915 X-ray crystallography
1952 NMR Signal



Current drug discovery

Utilizes Structural Biology

Nobel Prize
1962 Protein X-Rays
2002 NMR of Biomacromolecules, MS of proteins
2017 Cryo-electron microscopy of biopolymers

Acquisition of Japan Superconductor Technology Inc. (“JASTEC”)

- JEOL Ltd. and Kobe Steel, Ltd. agreed to acquire all shares of Japan Superconductor Technology Inc. (“JASTEC”) and make JASTEC a subsidiary of JEOL Ltd.
- Since its establishment, JASTEC has been engaged in the manufacture and sales of superconducting wires and magnets, and is an important supplier of magnets, which are the major components of the NMR spectrometer (NMR: Nuclear Magnetic Resonance), one of the main products in our Scientific and Metrology Instruments business.
By making the company a subsidiary, we will further strengthen our development and production systems and product competitiveness.
- Date of share transfer: Early January 2025 (scheduled)

JASTEC Outline

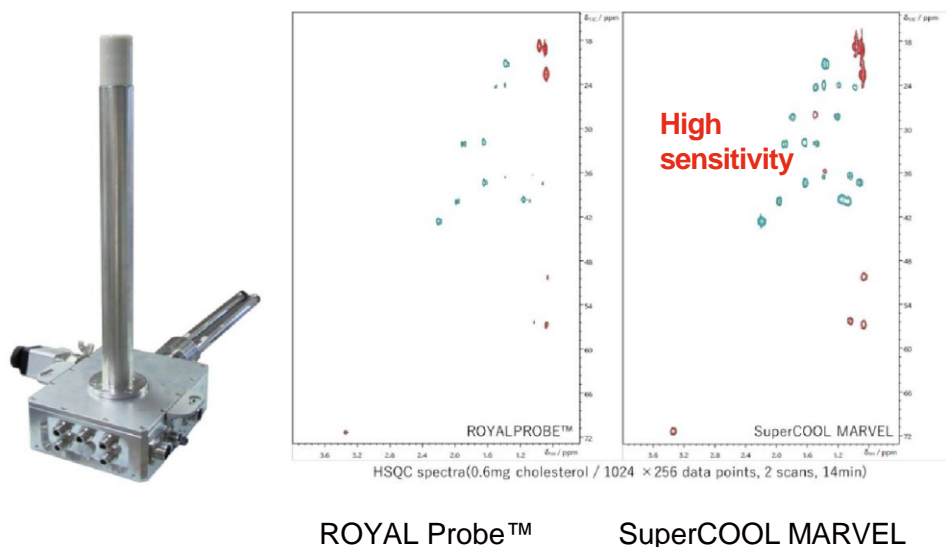


Name	Japan Superconductor Technology Inc.	
Address	1-5-5 Takatsukadai, Nishi-ku, Kobe, Hyogo	
Company representative	CEO Takahiro Anai	
Business description	Manufacture/sales of superconducting wires & magnets	
Capital	400 million yen (as of March 31, 2024)	
Established Date	April 1, 2002	
Shareholders & ratio	Kobe Steel, Ltd.	85.1%
	JEOL Ltd.	14.9%
Sales	410 million yen (year ending March 2023)	



New Product “SuperCOOL MARVEL” High Sensitivity Cooling Probe (for NMR) (Launched in July 2024)

- Extremely useful for measurement of samples that decompose or change quickly, or of trace samples that are difficult to obtain.
- Sensitivity improved by more than two-times that of our conventional NMR ROYAL Probe™)



- SuperCOOL MARVEL is the 4th generation probe of Super COOL Probe series launched in 2013.
- SuperCOOL MARVEL is a multi-nuclear probe capable of measuring not only basic nuclei such as ^1H and ^{13}C , but also ^{19}F and ^{31}P nuclei.

SuperCOOL MARVEL Feature

1. High sensitivity

- This product has more than doubled the sensitivity of our representative solution probe, the ROYALPROBE™
- In NMR, doubling the sensitivity means that the number of integrations required to achieve the same signal intensity is reduced to one-quarter. SuperCOOL MARVEL can achieve the same results in a shorter time than ever before, significantly improving throughput.

vs ROYALPROBE™, example of 400~600MHz

Nuclei	Ratio of sensitivity	Required integration ratio
^1H	ca. X 2	ca.1/4
^{19}F	ca. X 2.1	ca.1/4
^{31}P	ca. X 3.2	ca.1/10
^{13}C	ca. X 2.6	ca.1/7

2. Open cooling system

- By adopting an open cooling system, and by using liquid nitrogen, both the probe coil and preamplifier are cooled.
- Refilling liquid nitrogen is possible during measurement and enables seamless measurement without interruption for coolant refilling.

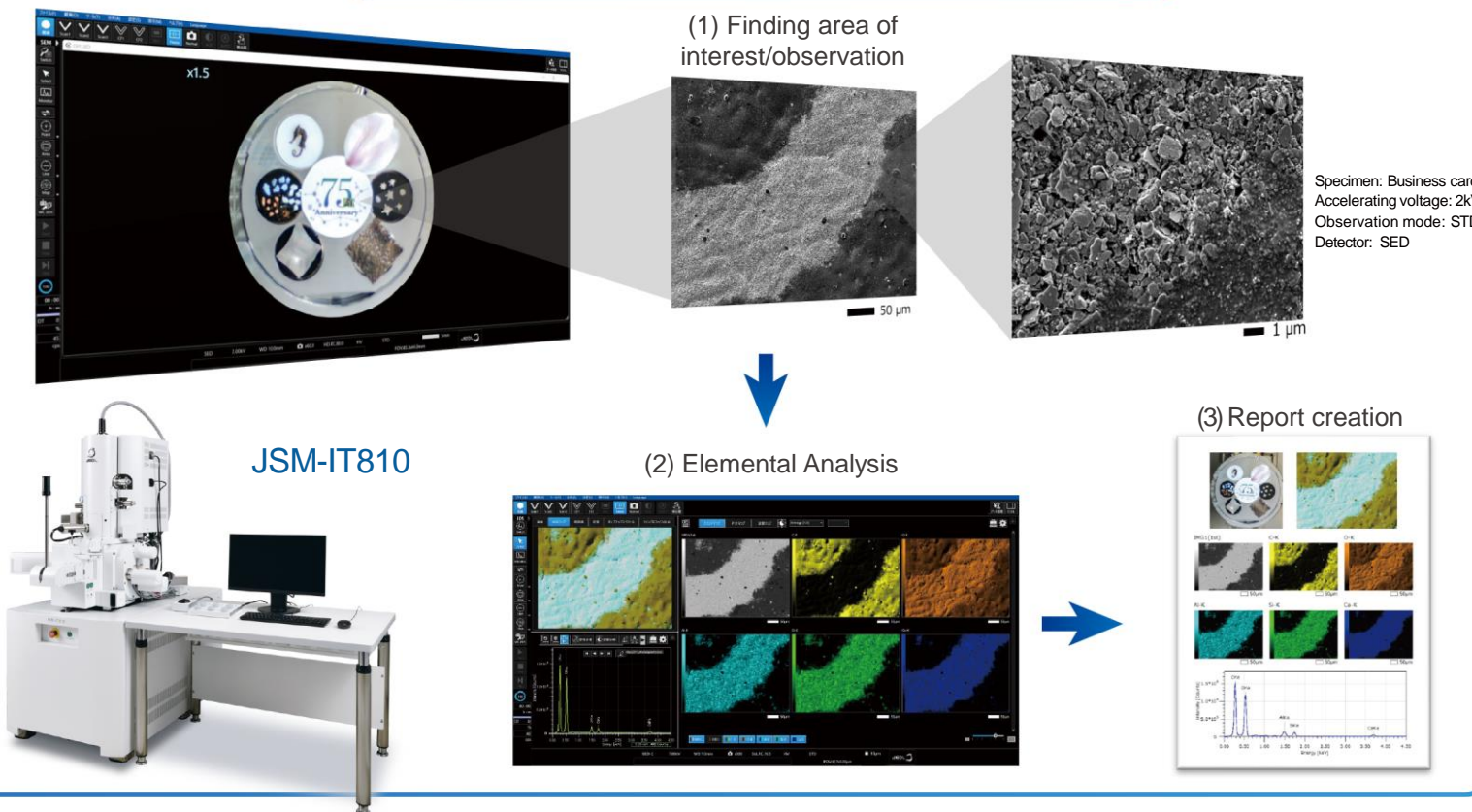
New Product "JSM-IT810"

Schottky Field Emission Scanning Electron Microscope

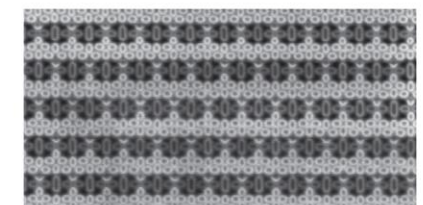
(Launched in July 2024)

- Field Emission Scanning Electron Microscopes (FE-SEM) are widely used in science and technology fields such as research institutes, universities, and industry. There is a growing demand for an instrument that can be used easily, accurately, quickly, and efficiently from observation to analysis.
- The JSM-IT810 is equipped with the next-generation electron optical control system "Neo Engine", the "Zeromag" that seamlessly connects optical and SEM image, the "SEM Center" for high operability such as EDS integration, as well as automatic observation and analysis function "Neo Action" and automatic calibration function, to improve operability and productivity.
- The version JSM-IT810 (SIL) equipped with a semi-in lens offers superior performance in semiconductor physical analysis, including potential contrast observation, which is essential for semiconductor device failure analysis, and high-resolution observation of tilted and cross-sectional samples.

Easy operation from finding the area of interest to creating a report



JSM-IT810 <SIL>



Specimen: SRAM Information: Secondary electron (voltage contrast)

New Product "IB-19540CP/IB-19550CCP"

Cross Section Polisher™

(Launched in September 2024)

- The Cross Section Polisher™ IB-19540CP/Cooled Cross Section Polisher™ IB-19550CCP is a new cross-section preparation device for electron microscope that enables easy preparation of good cross sections of composite materials and brittle samples without mechanical distortion.
- The new GUI and IoT make it easy to operate, and the increased ion beam current density improves throughput.
- The Cross Section Polisher™ (CP) is widely used in the fields of electronic components, ceramics, metals, batteries, polymers, and life sciences.

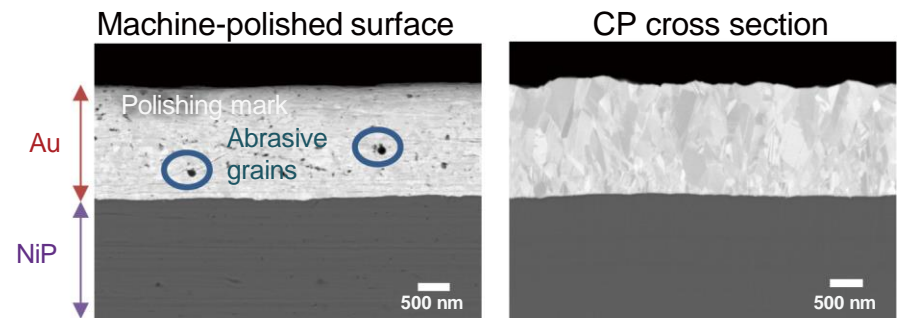


IB-19540CP

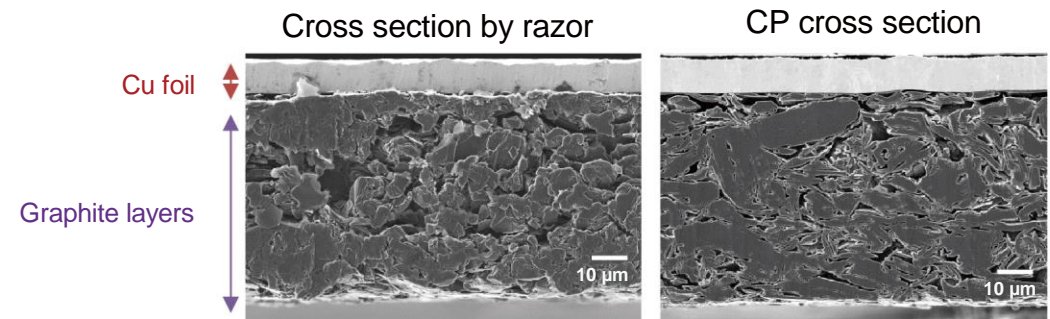


IB-19550CCP

Specimen : Au coating of electronic parts
SEM image : Backscattered electron image



Specimen : Li ion battery anode
SEM image : Secondary electron image



2. Business status of each segment

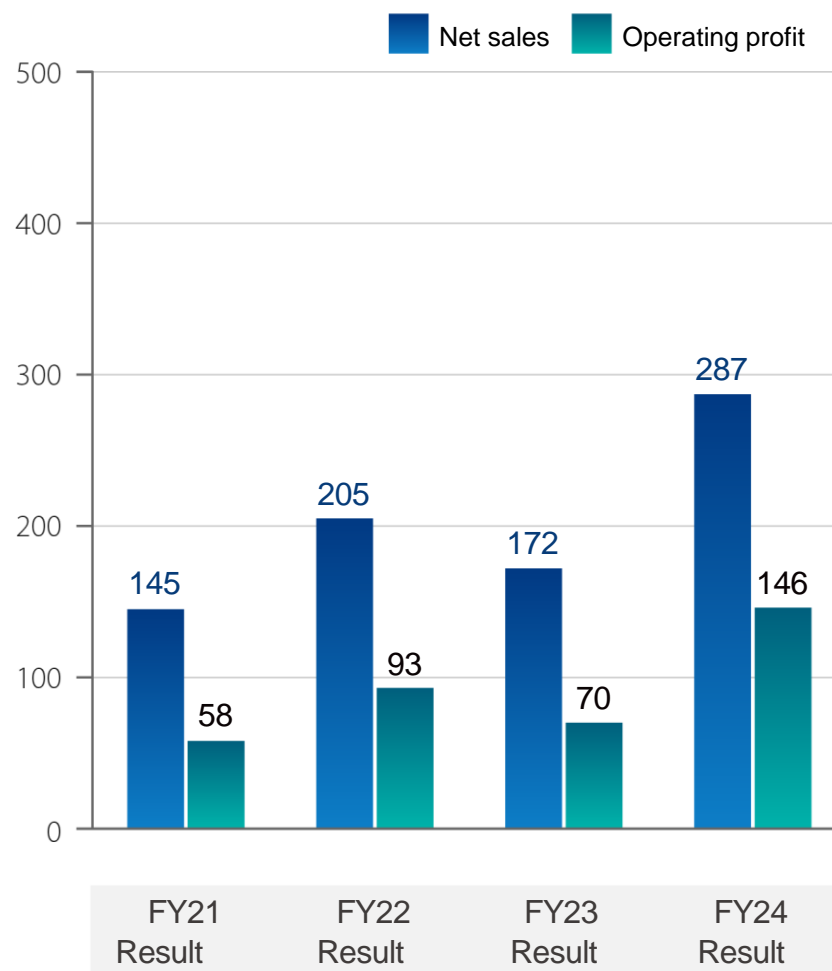
2-2. Industrial Equipment

Industrial Equipment Segment

Consolidated Net Sales and Operating Profit Transition

2nd Quarter

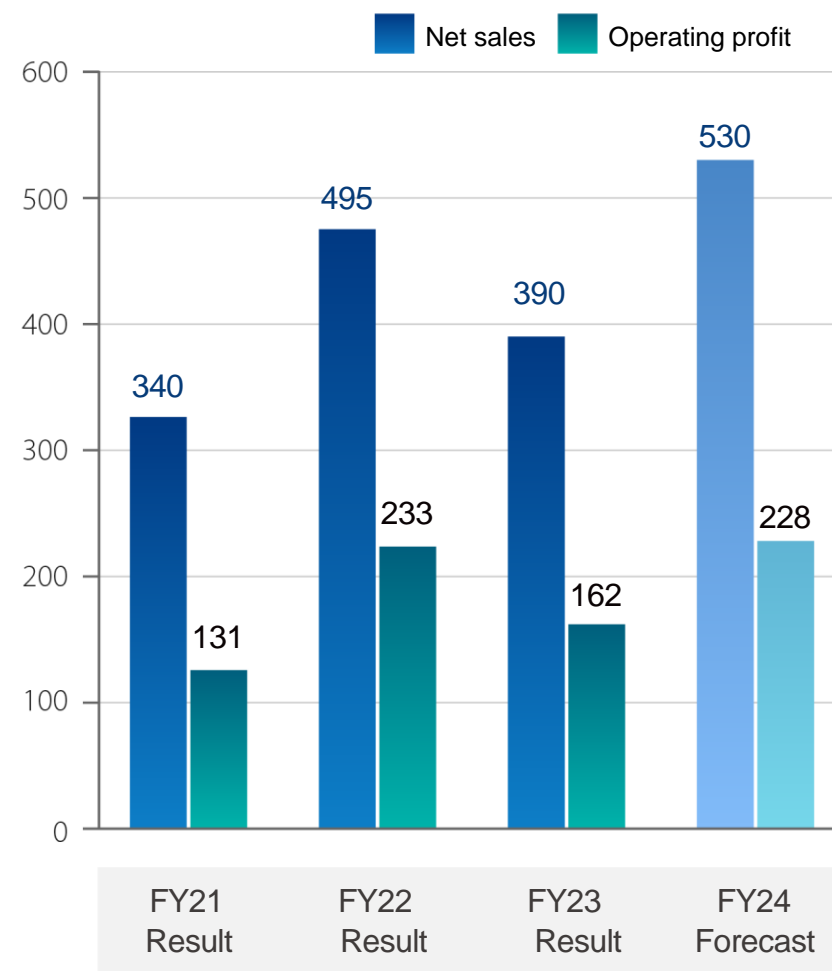
(100 million JPY)



Exchange rate(1\$=)	¥ 110	¥ 133	¥ 141	¥ 152
Exchange rate(1€=)	¥ 131	¥ 139	¥ 154	¥ 165

Full-year

(100 million JPY)



Exchange rate(1\$=)	¥ 113	¥ 135	¥ 144	¥ 147
Exchange rate(1€=)	¥ 131	¥ 141	¥ 157	¥ 161

Multi-beam Mask Writer Development Roadmap and MBMW-401

- Maintain and expand our competitive advantage by continuing to improve performance and functionality in parallel with the continued miniaturization of semiconductor devices
- Growth opportunities: Increased the number of EUV layers, application to some DUV masks due to growing needs for curve-liner drawing

Mature Nodes

Leading Edge

Next Generation

<div>MBMW 100 Flex</div> <div>2023</div>	45nm	32nm	22nm	14nm	10nm						
<div>MBMW 261</div> <div>2022</div>					10nm	7nm	5nm	3nm			
<div>MBMW 301</div> <div>2023</div>							5nm	3nm	2nm	14A	
<div>MBMW 401</div> <div>2025</div>							5nm	3nm	2nm	14A	10A



**MBMW
401**

For 5nm down to 10A nodes

<5 hours write time for full 5nm mask

Automated beam size switching

Cost of ownership reduction

Electron Beam Mask Lithography System

- Single beam mask lithography systems for legacy nodes continue to be strong mainly in China.
- Supports mask-making from cutting edge node to legacy node area with our multi-beam mask lithography systems and single beam lithography systems

Node

45nm

32nm

14nm

10nm

7nm

5nm

3nm

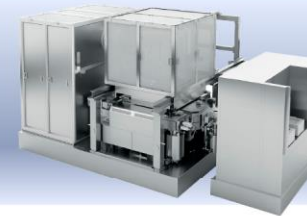
14A

10A

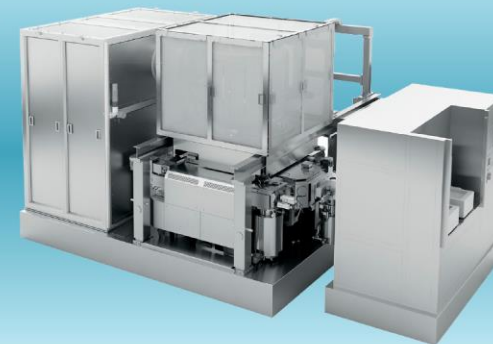
Single-beam mask lithography system
JBX-3050MV/3200MV



Multi-beam mask lithography system
MBMW-100 FLEX



Multi-beam mask lithography system
MBMW-261/301/401



Spot type Electron Beam Lithography System

- Optical transceivers with intensity modulation are widely used in data centers and many DFB laser chips are installed as a single wavelength, high power light source. The demand for Spot Beam system is increasing due to increased DFB production.



JBX-8100FS

Electron Beam
Lithography System



JBX-A9

Electron Beam
Lithography System

Electron Beam Metal 3D Printer

- Sales promotion activities are ongoing, centered on each sales base (Japan, USA, Germany)
- Increased inquiries from domestic and overseas customers

Advantages of electron beam metal 3D printer

Mass production by stacking

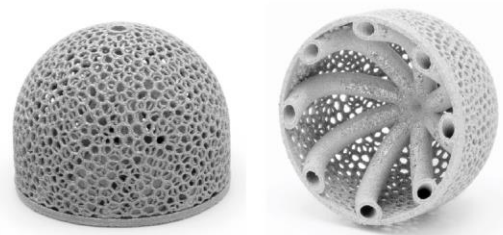
Preheating function suppresses cracking and deformation, enabling mass production of models stacked in height direction



Material : Ti64
Builds : Hip cup (artificial hip joint)

Molding of high melting point metals

In addition to high thermal energy, high-performance heat shielding enables large tungsten molding



Melting point 3,420°C / $\Phi 65\text{mm} \times 55\text{mm(H)}$

Material : Tungsten
Builds : Heat exchange parts for radiation shields



2. Business status of each segment

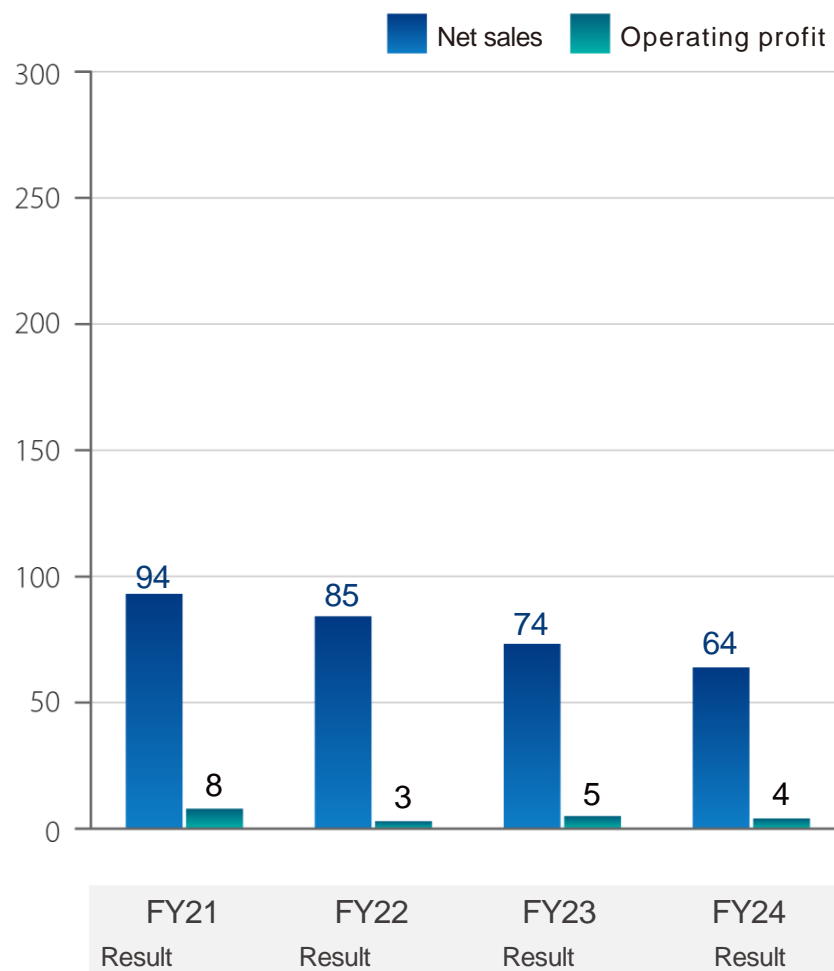
2-3. Medical Equipment

Medical Equipment Segment

Consolidated Net Sales and Operating Profit Transition

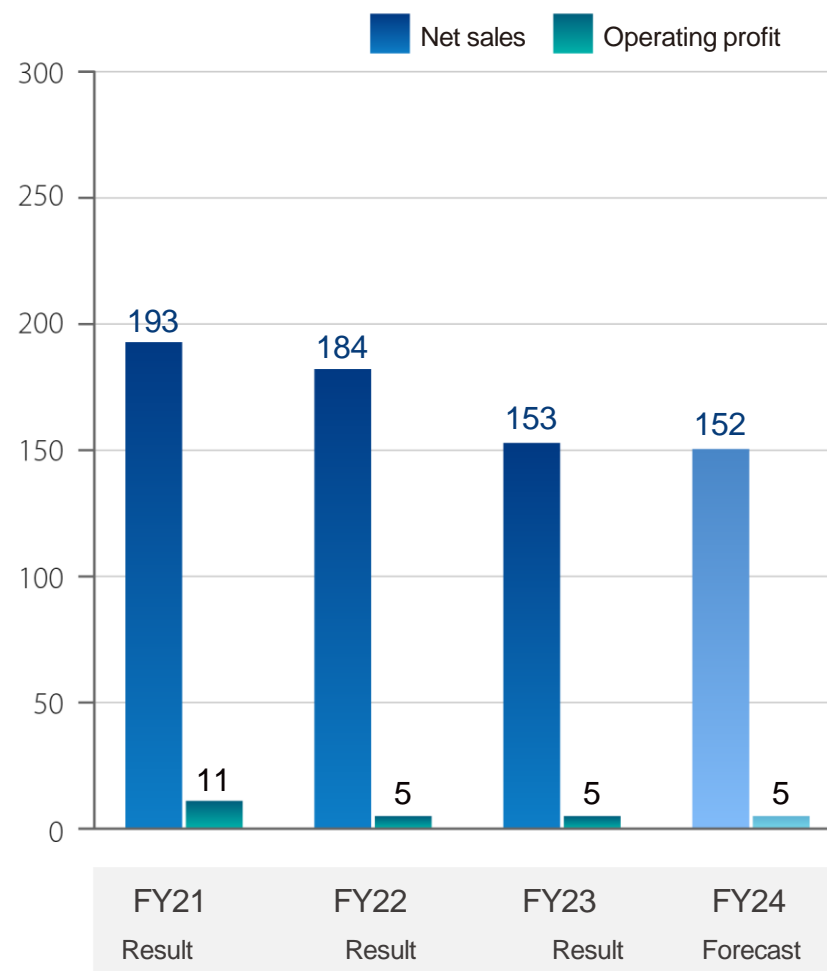
2nd Quarter

(100 million JPY)



Full-year

(100 million JPY)



Exchange rate(1\$=)	¥ 110	¥ 133	¥ 141	¥ 152
Exchange rate(1€=)	¥ 131	¥ 139	¥ 154	¥ 165

Exchange rate(1\$=)	¥ 113	¥ 135	¥ 144	¥ 147
Exchange rate(1€=)	¥ 131	¥ 141	¥ 157	¥ 161

Medical Equipment: Clinical Chemistry Analyzer

- Inquires and orders are strong mainly for test centers in Japan
- Aim to re-establish overseas sales strategy with the competitive products



JCA-BM6010 G

Clinical Chemistry Analyzer
BioMajesty™



JCA-ZS050

Clinical Chemistry Analyzer
BioMajesty™ ZERO



JCA-BM8000 series (BioMajesty 8000 GX)

Clinical Chemistry Analyzer
BioMajesty™

*BioMajesty™ is a registered trademark of JEOL Ltd.

Feature of JEOL Equipment

Micro volume sample & reagent / High-throughput

3. Summary





Becoming a niche top company supporting science and technology in the world

Company Philosophy

On the basis of "Creativity" and "Research and Development", JEOL positively challenges the world's highest technology, thus forever contributing to the progress in both Science and Human Society through its products.

Vision

"Evolving in the 70th Year"

Accelerate business expansion and achieve even higher profitability based on our unique technologies and human networks which have been developed since the company's founding.

▶ YOKOGUSHI ◀

Promote Innovation by co-creation

Mid-Term Management Plan "Evolving Growth Plan"

We aim to improve customer satisfaction by enhancing our R&D, manufacturing, and service capabilities.

Note on document handling

Information provided by this document and presented orally by our representative contains assumptions and beliefs based on data currently available.

Readers should be aware that actual results could differ materially from this outlook due to various known and unknown factors that impact our performance such as economic trends, upturn or downturn in the semiconductor industry, and changes in R&D spending.