Precision Equipment Business

Masato Hamatani
Senior Vice President

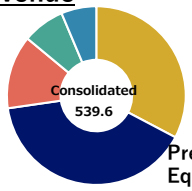
- I am Hamatani, Senior Vice President.
- I will explain about Precision Equipment Business.

Precision Equipment: Business Outline

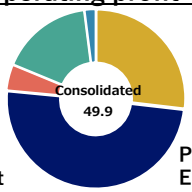
Precision Equipment Business

FY2022/3 Billions of yen

Revenue



Operating profit (※1)



Major products & Services

Lithography systems, Measuring & Inspection systems, Digital lithography, Services

FPD Scanner 「FX-103S/SH」

ArF immersion Scanner 「NSR-S635E」

Alignment Station 「Litho Booster」

Automatic Macro inspection system 「AMI-5700」

Vision

Continue delivery of innovative solutions to customers and support a digital society

Financial target

	FY2023/3	FY2026/3
Revenue	¥240.0B	¥260.0B
Operating profit	¥35.0B	¥36.0B
OPM	15%	14%

(※1) Operating profit ratio in FY2022/3 is shown before deduction of corporate P/L non-attributable to any reportable segments
(※2) "Next Generation Project Div." transfers from Precision Equipment Business to Corporate P/L non-attributable to any reportable segments

- This slide provides an overview of the business.
- Our vision is "Continue delivery of innovative solutions to customers and support a digital society". We aim to deliver new value to customers by going beyond systems that produce the panels and semiconductors that support a comfortable society and providing solutions in order to achieve that society as well.
- The pie charts in the upper left show revenue and operating profit from this business as a percentage of overall Nikon results from the fiscal year ended March 2022.
- With revenue of ¥211.2B and operating profit of ¥39.4B, the Precision Equipment Business accounted for 40% to 50% of Nikon's consolidated results last year.
- Moving forward, the major products shown in the bottom left and the service business will continue to provide a foundation supporting the company as a whole.
- In FY 2026/3, we plan to increase revenue by almost ¥50B to reach ¥260B. We also aim to reach ¥36B in operating profit and secure a stable level of profit of ¥30B or more.
- Looking forward, we will solidly advance preparations to make digital lithography a growth driver supporting future earnings.

Precision Equipment: Business Strategy

Precision Equipment Business

Redisplaying of Medium-Term Management Plan (FY2022-FY2025) announced in April 2022

Vision

Continue delivery of innovative solutions to customers and support a digital society

Operational direction

FPD
- Advance technology development to support next-generation panels (Pursue higher resolution and productivity)

Semiconductor
- On-the-mark support for customer plans (Secure production capacity)
- Strengthen initiatives toward expanding new accounts (Support individual customer needs such as 3D)
- Expand sales in peripheral equipment (inspection and measurement)

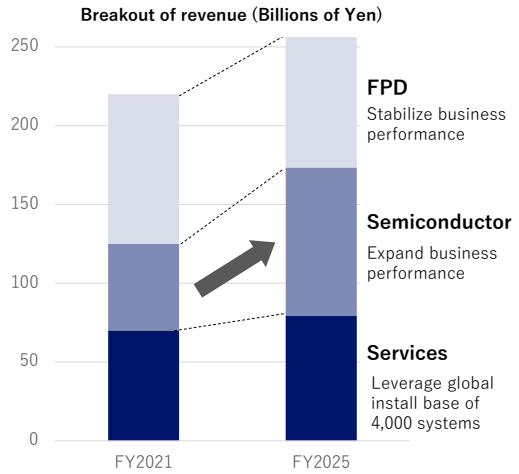
Services
- Support demand to relocate existing lines or modify equipment (Includes maintenance and parts supply)

Earnings plan

Secure stable operating profit of ¥30.0B+

(Operate across both FPD and Semiconductor)

Direction for Precision Equipment Business



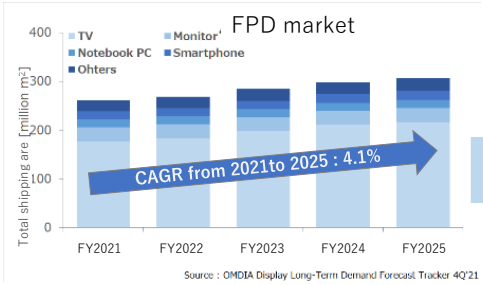
*Effective April 1, 2022, the Next-generation Projects Division will be transferred from Precision Equipment to Corporate P/L non-attributable to any reportable segments.

- Next, I will explain our business strategy.
- As you can see from the graph on the right, our Medium-Term Management Plan calls for solid revenue from FPD lithography business, growing revenue from semiconductor lithography business and solid topline growth from the service business.
- In FPD lithography systems, we aim to secure our position as a major player and generate stable revenue by advancing development supporting next-generation panels and pursue both higher resolution and higher productivity.
- In semiconductor lithography systems, we will prepare for our core customer's plans to increase production at the same time we aim to grow new customers by supporting individual customer needs such as 3D.
- We will also focus on expanding sales in inspection, measurement and other peripheral equipment.
- Moreover, leveraging our global install base of more than 4,000 systems, we plan to secure service revenue by capturing demand for work involving line relocations and modifications, maintenance, parts supply and the like.
- By pursuing balanced management operations of these two businesses--FPD and semiconductor--that follow different business cycles, we aim to reach operating profit of more than ¥30B in a stable fashion in the Precision Equipment Business as a whole.

Precision Equipment: Business Environment

Precision Equipment Business

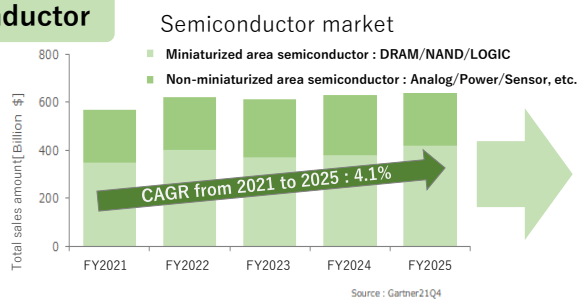
FPD



- Market to grow 4% YoY (by area base) mainly in OLED, driven by larger display for TVs and mobile phones
- The number of exposure processes increases with the increasing functionality of the panel

Market scale for FPD lithography systems holds steady to a certain degree, despite decline in large-scale investments

Semiconductor



Growth in both miniaturized logic and memory as well as non-miniaturized analog and power devices, driven by AI, 5G & 6G, IoT, autonomous driving and various other fields

Market for semiconductor lithography systems continues to grow

- Moving on, I will explain the business environment of the Precision Equipment Business.
- TV and mobile phone applications continue to drive the FPD panel market, which is expected to grow approx. 4% annualized, mainly due to OLED.
- Moving forward, we expect fewer large-scale investments in building big new fabs, but we do expect to see a certain level of demand, including application conversions.
- In terms of revenue, we expect the semiconductor market to continue to show strong growth as demand for cutting-edge miniaturized semiconductors for AI, 5G/6G and the like combines with demand for non-miniaturized semiconductors for IoT, autonomous driving and the like.
- The market should break new ground by topping $600B and continue its trajectory from there.
- Semiconductor makers have announced plans to make large-scale investments in building new fabs and we expect the semiconductor lithography equipment market to grow, as well.

Precision Equipment: Primary Measures

Precision Equipment Business

Enhance customer satisfaction by delivering high-precision, high-productivity Products and high value-added Services

Capture new demand for systems

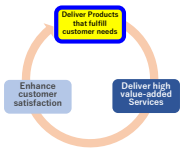
Create a business model with a virtuous cycle

Complement each other (Semiconductor and FPD) across economic cycles

- Amid this environment, in the Precision Equipment Business, we are focused on providing service post-installation and aim to build a business model with a virtuous cycle by delivering to customers high value-added items and solutions.
- By getting to know our customers better and identifying their needs, we aim to provide service that customer need, enhance customer satisfaction and reflect new needs into product development efforts. That is the business model we aim to establish.
- We believe this will help stabilize Nikon's earnings and build a win-win relationship with our customers.
- The business environment for FPD and semiconductor differ from each other. By having these businesses complement each other, we aim to build a strong business structure that is resilient against economic cycles.

Precision Equipment: FPD Primary Measures

Precision Equipment Business



Deliver Products that fulfill customer needs

Ascertain needs through customer intimacy

Small and mid-size panels

- Pursue even higher resolution for VR and AR applications
- Differentiate through enhanced CoO

Large panels

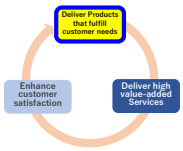
- In March 2022, release FX-88S with high resolution support for G8 sizes manufacturing IT panels
- Drive further productivity gains in G8 systems and improve CoO
- Improve productivity in G10.5 systems, too

Provide on-target support for customer needs by pursuing higher resolution and productivity

- This slide indicates the primary measures we plan for FPD lithography system products.
- You can see the measures that relate to delivering products that fulfill customer needs, which is an important part of achieving the virtuous cycle we described in the previous slide.
- Ascertaining needs through customer intimacy is key to delivering products that fulfill customer needs.
- In small and mid-sized panels, we will pursue system development that supports higher resolutions targeting advances in the market for VR and AR.
- In large panels, in March 2022, we released our FX-88S product, which features high resolution support for G8 sizes for manufacturing IT panels.
- Customers are increasingly focusing on investment returns. We will continue to drive productivity gains in G8 systems at the same time we improve productivity and prepare for a future resumption of investment in G10.5 systems, too.

Precision Equipment: Semiconductor Primary Measures

Precision Equipment Business



Deliver Products that fulfill customer needs

Ascertain needs through customer intimacy

i-line/KrF

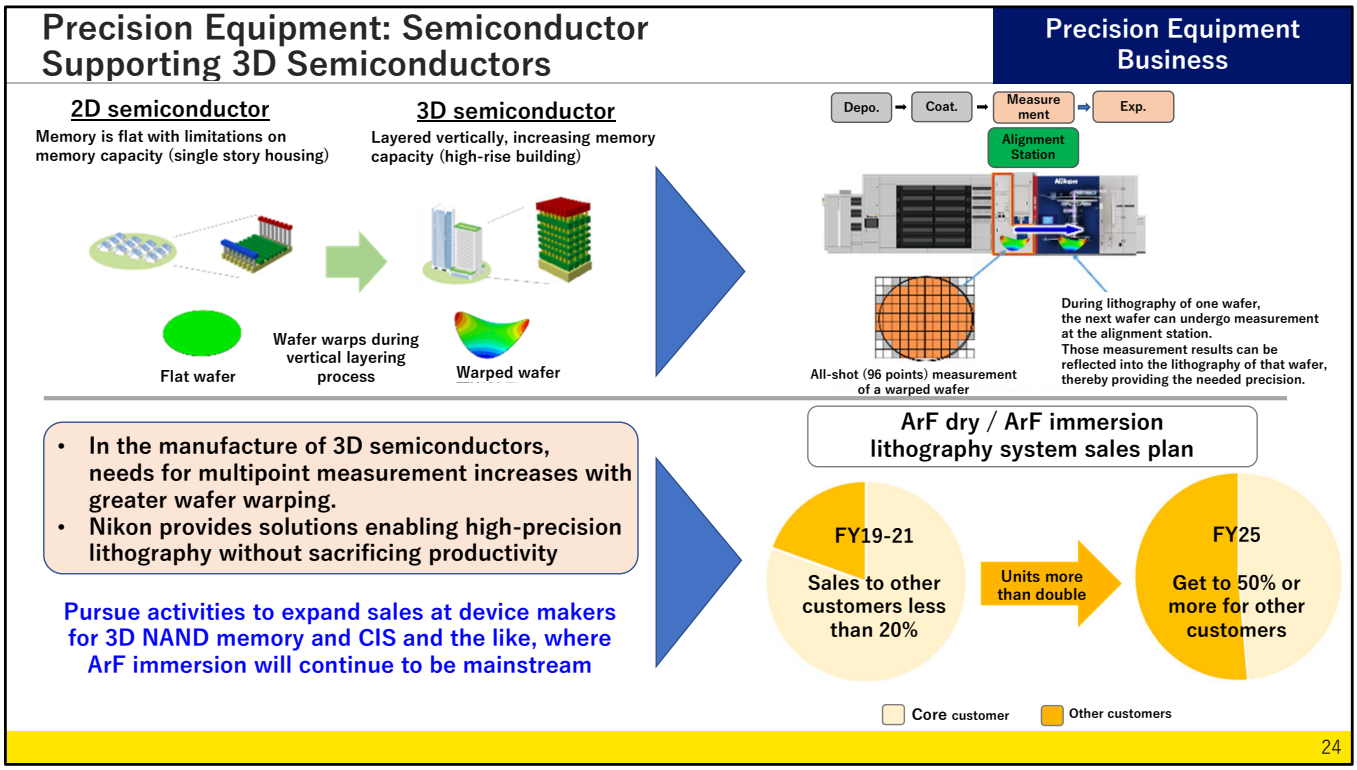
- **Expand product lineup with new product launches and grow sales, given broader adoption of semiconductors**
- **Return to market where there are lithography system shortages (mainly 200mm wafer systems)**

ArF Dry/ Immersion

- **Leverage alignment station to achieve higher precision and productivity**
- **Expand customer base targeting device markets where ArF immersion systems will continue to be mainstream (3D-NAND memory, CIS, etc.)**

Prepare production infrastructure and accurately support customer needs and investment plans

- This slide indicates the primary measures we plan for semiconductor lithography system products.
- As with the previous slide, you can see the measures that relate to delivering products that fulfill customer needs, which is an important part of achieving a virtuous cycle in the Precision Equipment Business.
- Demand for i-line and KrF lithography systems is increasing with growth in applications for power, analog and other semiconductors. We plan to launch new products that can support investment plans by semiconductor makers.
- There continues to be a shortage of lithography systems for 200mm wafer size, and we expect strong investment moving forward, too.
  We aim to serve a non-miniaturized semiconductor market where concerns about lithography system shortages have intensified with the drying up of the market for refurbished systems.
- In ArF, we are focused on markets such as 3D NAND memory and CIS (CMOS Image Sensor), where cutting-edge EUV lithography systems are not used and ArF lithography systems will continue to be mainstream. We will leverage the strength of our alignment station to achieve products with high precision and high productivity and expand sales.



- This slide indicates how we plan to support 3D semiconductors.
- Historically, semiconductors have focused on the miniaturization of circuit pitch to effectively utilize wafer space. However, we have approached the physical limitations of miniaturization.
- Technological issues involving the capacitor have prevented applications such as 3D NAND memory and CIS from using EUVL. Therefore, we believe 3D semiconductors, which create vertical layers on the wafer, will become mainstream.
- In 3D semiconductors, wafers can warp in the process of creating vertical layers, which we believe will lead to increasing demand for multipoint measurement of wafers before lithography.
- To support these needs, our lithography systems are equipped with an alignment station, which measures the wafer within the lithography system.
- During lithography of one wafer, the next wafer can undergo high-speed, multipoint measurement for wafer warping. Those measurement results can be reflected into the lithography of that wafer, thereby providing a solution that enables high-precision lithography without sacrificing productivity.
- We plan to expand sales to 3D NAND memory, CIS and other semiconductor makers where ArF immersion will continue to be mainstream. As a result, customers other than our core customer should account for 50% of sales in FY25, compared to an average of less than 20% during the three years from FY19 to FY21. At the same time, we plan to more than double sales unit volumes.

Precision Equipment: Primary Measures in Service Business

Precision Equipment Business

Deliver high value-added Services

Working with 4,000+ install base

FPD

- Propose lens refurbishment and the like for installed systems
- Provide Fab Solutions such as preventive maintenance
- Expand modification items that improve performance (precision, productivity, etc.)

Semiconductor

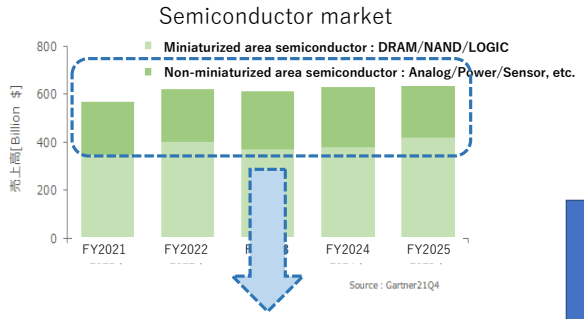
- Bolster support for replacement of and service-life extension on installed systems
- Provide on-target support for needs to enhance performance or make modifications to move lines
- Provide solutions for manufacturing processes that leverage measurement instruments

Accurately grasp and respond to the needs associated with customer equipment wear and tear, changes in production items, etc.

- This slide indicates the primary measures we plan for service business in the Precision Equipment Business.
- You can see the measures that relate to delivering high value-added service, which is an important part of achieving the virtuous cycle we described in an earlier slide.
- Of the 9,000+ systems we have shipped to date, more than 4,000 systems are in service today at customer plants. We aim to provide value-added service for those systems.
- In FPD, we will provide Fab Solutions, including refurbishment work such as replacing lenses that have been in use for a long time and preventive maintenance. We also aim to expand performance enhancement items to boost precision, productivity and the like.
- In semiconductor, we will leverage our install base to further bolster service. In addition to supporting demand to extend service life or replace equipment that has been in use for a long time, we will actively pursue needs to enhance performance in conjunction with line relocations.
- In addition, we also provide Fab Solutions such as refurbishing and preventive maintenance for long-term use equipment, as well as solutions for customers' manufacturing processes by utilizing measurement instruments such as AMI, an automatic macro inspection system, and the Litho Booster, an alignment station.

Precision Equipment: Semiconductor Service Business

Precision Equipment Business



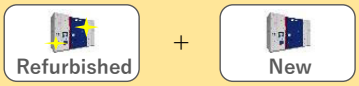
Strong demand for non-miniaturized semiconductors for IoT and EV, etc.

Active demand for i-line and KrF production equipment for non-miniaturized semiconductors coupled with recent semiconductor shortage

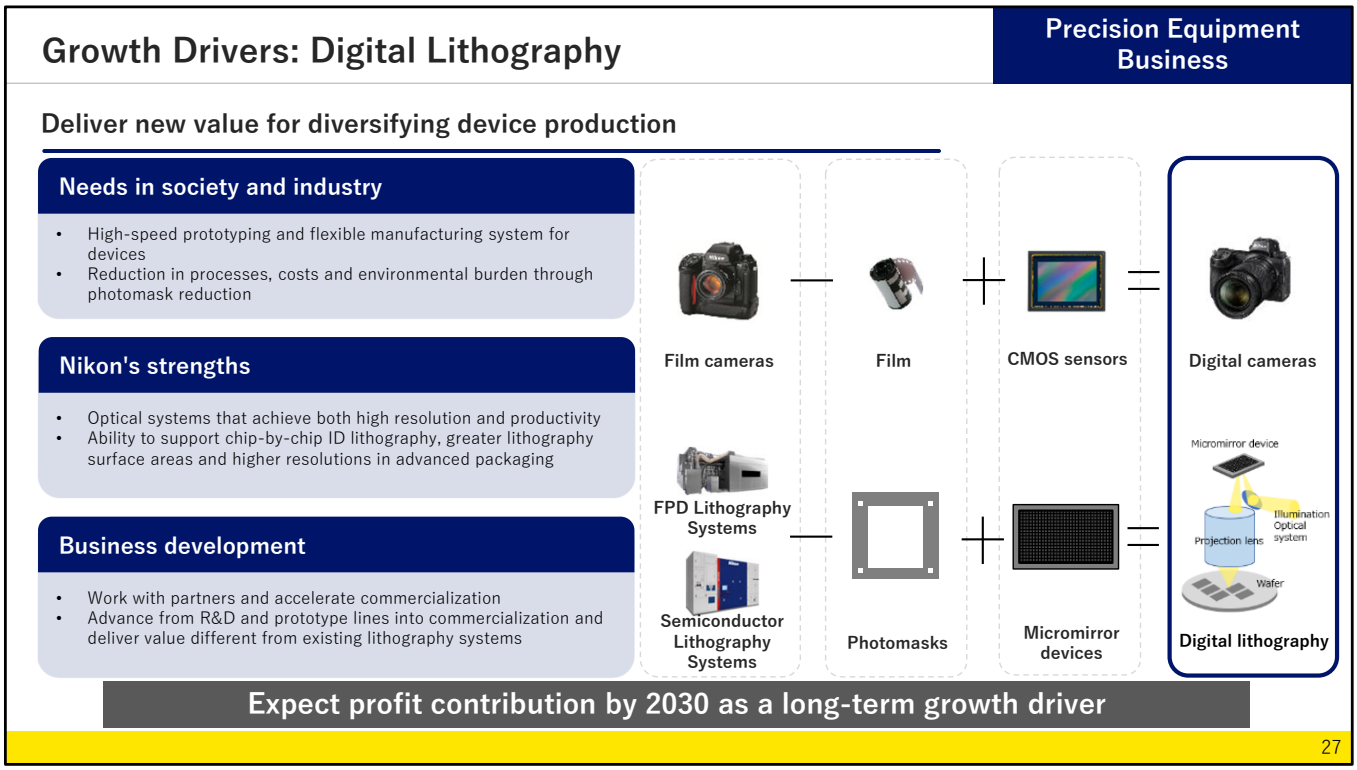
【Until Now】 Buy back systems we sold in the past and modify or refurbish for used system sales

Refurbished market depressed due to brisk production activity at semiconductor makers

【Future】
In addition to refurbished business, launch new products that meet the needs of a refurbished market that is drying up



- This slide explains our direction for the semiconductor service business.
- Demand for non-miniaturized semiconductors continues to be strong, due to expanding applications for power, analog and other semiconductors.
- We expect demand for i-line and KrF lithography systems for non-miniaturized semiconductors to grow in concert with recent semiconductor shortages.
- To date, we have pursued a refurbished system business to support demand for lithography systems in this domain by buying back systems we sold in the past and modifying or refurbishing and re-selling those systems.
- However, brisk production activity among semiconductor makers has dramatically reduced the supply of old systems released into the used market, a trend we expect to continue moving forward.
- To meet demand for refurbished systems in the face of dwindling supply, we will introduce a new i-line lithography system into the market.
- We aim to complement our existing refurbished system business and support growing demand for production equipment for non-miniaturized semiconductors.



- Digital lithography is a growth driver in the Precision Equipment Business.
- In today's lithography systems, the use of a master plate called a photomask to transcribe onto the wafer is mainstream.
- Just as film cameras evolved into digital cameras, we believe technological innovations will take hold in the world of lithography systems, too.
- At Nikon, we are developing technology to transcribe a digitally input pattern directly onto a wafer without using a photomask. We are making tremendous progress toward commercialization.
- Digital lithography can substantially reduce the time needed to prototype semiconductors and other devices and enable flexible manufacturing systems. The broad range of benefits also includes reduced photomask costs and ease of design changes.
- It also contributes to productivity gains at foundries. Furthermore, it is suited for ID lithography of individual chips for enhanced security. We are convinced digital lithography is a new technology that will be sought by an advanced digital society in the Year 2030.
- As a frontrunner in digital lithography, which we position as the next technological innovation following semiconductor miniaturization and 3D, Nikon aims to deliver new value to society.

Growth Drivers: Semiconductor Digital Lithography

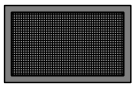
Precision Equipment Business

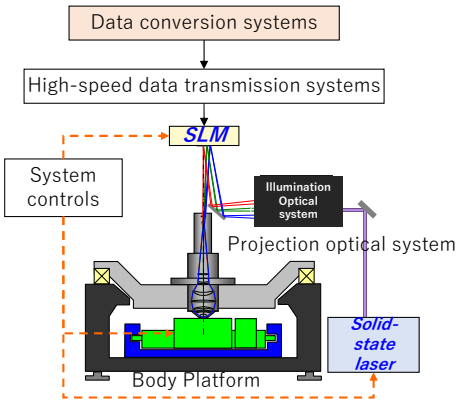
Digital lithography core technologies

Data conversion systems
- **High-speed conversion to SLM pixel data**

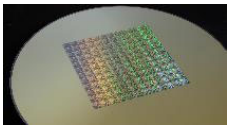
SLM (Spatial Light Modulator)
- **Micromirror device**
- **High-speed mirror drive**

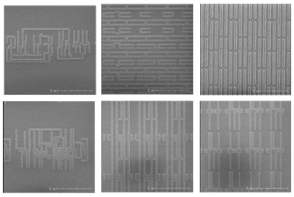
Solid-state laser
(Nikon proprietary development)
- **Wavelengths (λ) 193nm, 248nm**
- **High-repeat frequency (No. Of MHz)**





180nm node Logic IC Pattern example



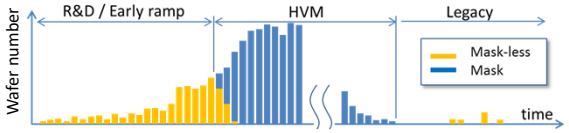


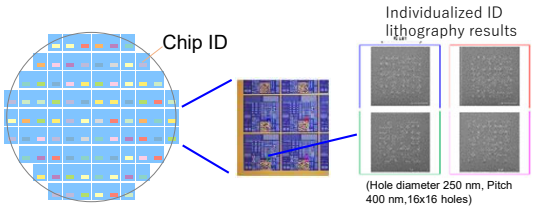
- Next, I will introduce you to our Digital lithography, which we are studying for semiconductor applications.
- Digital lithography uses a Spatial Light Modulator (SLM) to generate a pattern in place of a reticle that serves as a master plate for a circuit.
- The SLM is a micromirror device that generates a pattern on a wafer by performing lithography while driving each mirror in accordance with the digital pattern information forwarded to it from a high-speed data transmission system.
- For the light source, we have developed our proprietary solid-state laser. There are two wavelengths--KrF248nm and ArF193nm.
- The image on the bottom of the slide is the lithography result from a 180nm node logic IC test pattern. Lithography was performed periodically in XY for about 100 chips on a 300mm wafer. All chips are the same design.
- The CD-SEM image is an example of the logic pattern.
  The smallest half-pitch is 180nm.
- The test results have been positive.

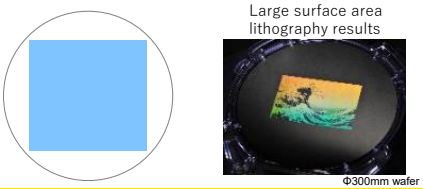
Growth Drivers: Semiconductor Digital Lithography Target

Precision Equipment Business

Applications	Customers
High-speed prototyping and low-volume production of devices • Eliminate cost of photomasks • Easy to change design	**Research labs Foundry**
Chip design customization • Chip individualized ID lithography (Security code, etc.)	**Low-volume, high-variety Device makers**
Large surface area lithography • Wafer-scale chip	**Packaging Makers**





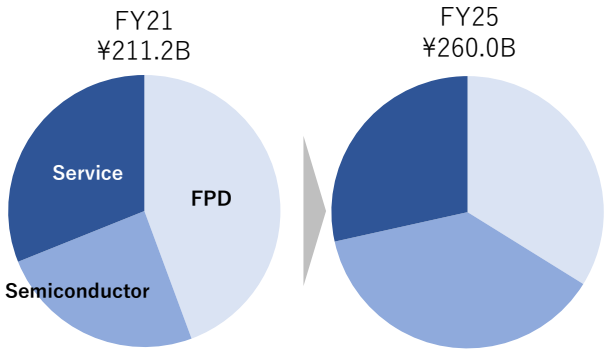


- There are a number of potential applications for Digital lithography.
- One is the high-speed prototyping and low-volume production of devices. Going maskless eliminates the photomask cost and makes it easy to modify designs. This application is from an economic perspective.
- The second is chip design customization. Because the pattern can be changed each shot within a single wafer, individualized ID or security code can be embedded into each chip. This is a technological advantage to going maskless.
- The third is large surface area lithography. In a maskless format, there are no limitations to chip size, so the chip could be about as big as the wafer, an unprecedented feat.
- The image on the bottom right of the slide is an example of results from large surface area lithography. The size of the picture is 154mm x 103mm. The picture comprises lines and space patterns at a half-pitch of 270nm to 570nm. You can see the color of the diffraction ray. This lithography demonstrates the possibilities of wafer-scale chip production.

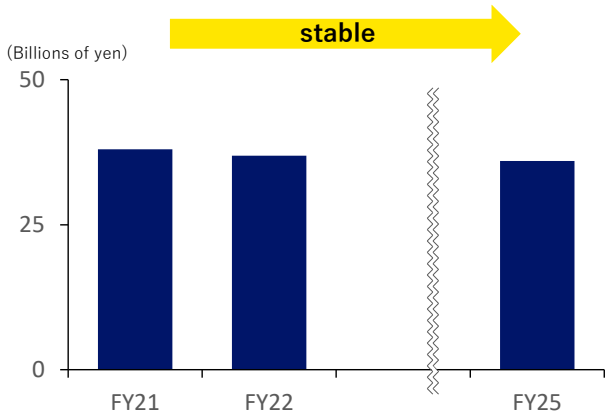
Precision Equipment: Earnings Plan

Precision Equipment Business

Revenue



Operating profit



Secure stable operating profit of ¥30.0B+
(Operate across both FPD and Semiconductor)

- Finally, I will speak to our earnings plan.
- We plan to grow revenue by almost ¥50B by FY 2026/3, the final year of our Medium-term Management Plan, to ¥260B, compared to the ¥211.2B in revenue achieved in FY2022/3.
- The pie charts on the left side represent that plan broken out into the FPD, semiconductor and service segments.
- We plan to secure solid revenue in the FPD lithography business, expand revenue in the semiconductor lithography business and achieve a solid contribution to revenue from the service business.
- By achieving revenue with strong bottom support from the service business and balancing the FPD and semiconductor businesses, we aim to generate operating profit of ¥30B or more in a stable fashion.
- That concludes my presentation about the Precision Equipment Business.