



**Harmonic Drive Systems Inc.**

# **Harmonic Drive Systems Inc.**

## **Financial Results for the 1st-Half of the Fiscal Year Ending March 31, 2024**

November 17, 2023

This presentation contains forward - looking statements relating to expected future performance as of November 17, 2023. Such statements are based on the views and assumptions of company management and involve risks and uncertainties such as changes in the business environment that may cause the actual results to differ materially from expectations.



# Performance Summary for 1H FY03/24

# Consolidated results for 1H FY03/24 (Vs. original forecasts)

(millions of yen)

	Original forecasts (announced Aug. 8)		1H FY03/24 (actual)		Vs. original forecasts	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	28,500	100.0	28,765	100.0	265	0.9
Operating income	900	3.2	872	3.0	▲27	▲3.0
Ordinary income	900	3.2	1,163	4.0	263	29.3
Net income	0	—	313	1.1	313	—
EPS (yen)	0	—	3.29	—	3.29	—

Net income (loss) refers to net income (loss) attributable to owners of parent.

# Consolidated results for 1H FY03/24 (year-on-year change)

(millions of yen)	1H FY03/23		1H FY03/24		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	33,451	100.0	28,765	100.0	▲4,686	▲14.0
Operating income	4,640	13.9	872	3.0	▲3,768	▲81.2
Ordinary income	4,924	14.7	1,163	4.0	▲3,761	▲76.4
Net income	2,938	8.8	313	1.1	▲2,625	▲89.3
EPS (yen)	30.74	—	3.29	—	▲27.45	▲89.3
Capital investment	7,293	—	1,760	—	▲5,532	▲75.9
Depreciation	4,420	—	4,946	—	526	11.9
R&D expenses	1,629	—	1,659	—	30	1.8

Net income (loss) refers to net income (loss) attributable to owners of parent.

Depreciation includes depreciation of tangible assets and amortization of intangible assets and goodwill.

# Performance of main group companies in 1H FY03/24

(millions of yen)	Equity stake	Net sales		Operating income	
		Amount	Year-on-year Change(%)	Amount	Year-on-year Change(%)
HD Systems, Inc. (Harmonic Drive L.L.C.) (U.S.A)	100% (100%)	6,669	45.9	888	80.7
※2 Harmonic AD, Inc.	100%	993	▲18.8	▲3	—
Harmonic Precision Inc.	100%	999	▲63.1	▲431	—
※3 Harmonic Drive Systems (Shanghai) Co., Ltd	100%	2,273	▲7.2	283	11.8
※4 Harmonic Drive SE (Germany)	100%	8,207	5.4	990	▲11.7

\*1 For overseas subsidiaries, the fiscal year ends December 31.

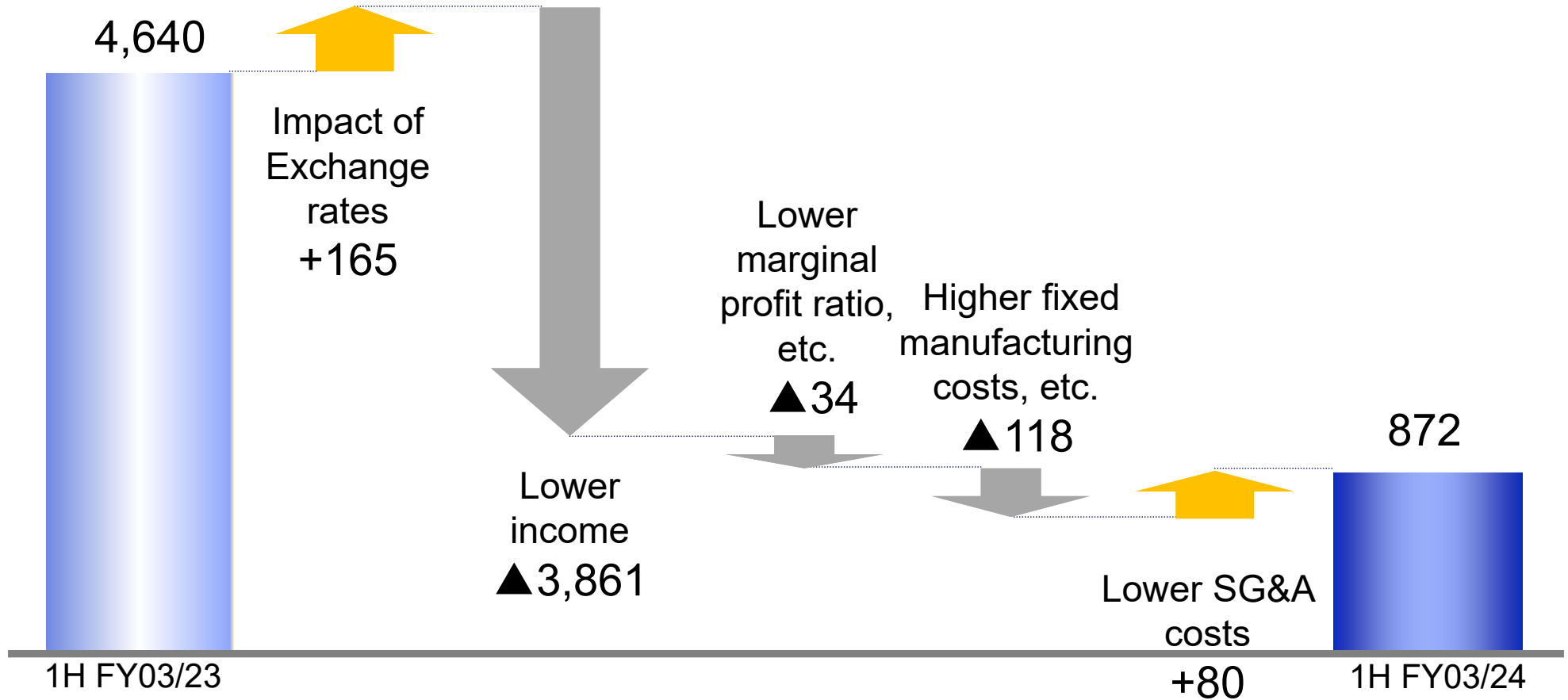
\*2 Exchange rates: Jan–Jun 2022 1USD = ¥122.89, Jan–Jun 2023 1USD = ¥134.85

\*3 Exchange rates: Jan–Jun 2022 1CNY = ¥18.94, Jan–Jun 2023 1CNY = ¥19.45

\*4 Exchange rates: Jan–Jun 2022 1EUR = ¥134.25, Jan–Jun 2023 1EUR = ¥145.79

# Breakdown of year-on-year change in consolidated operating income

(million of yen)

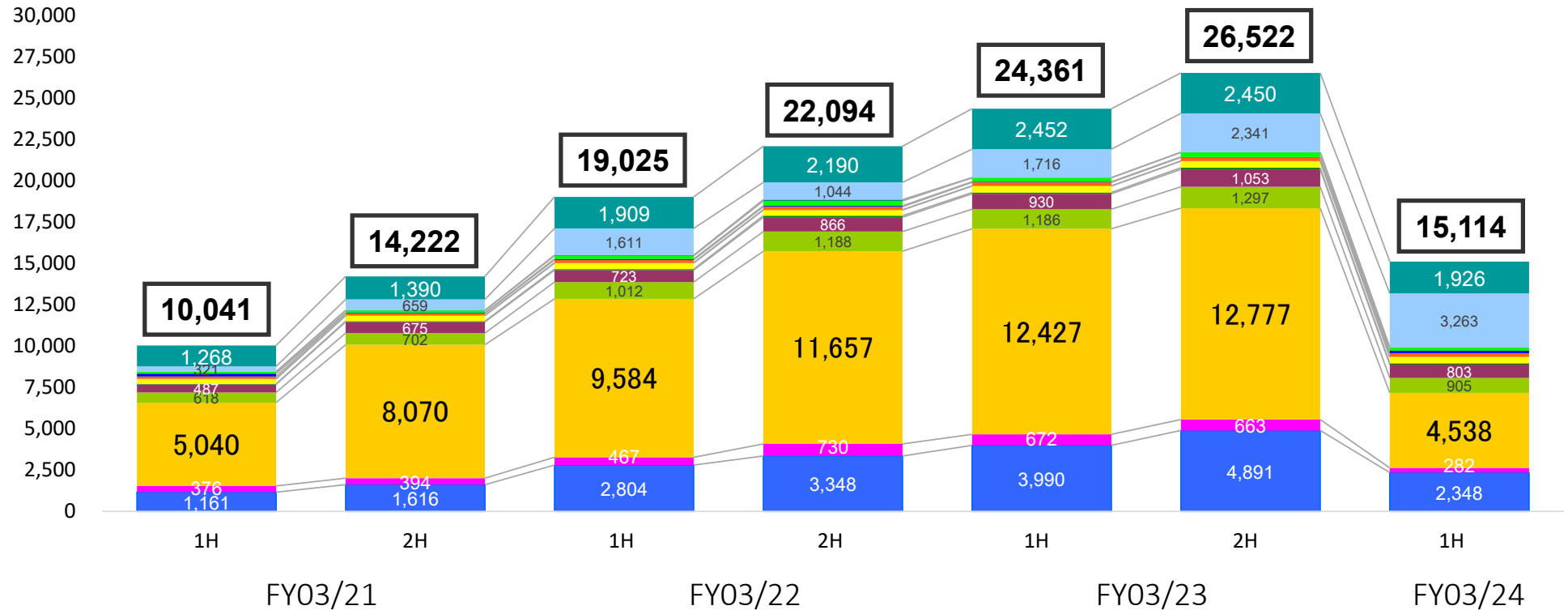


# Non-consolidated results for 1H FY03/24 (year-on-year change)

(millions of yen)	1H FY03/23		1H FY03/24		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	24,361	100.0	15,114	100.0	▲9,246	▲38.0
Operating income	4,207	17.3	503	3.3	▲3,703	▲88.0
Ordinary income	4,633	19.0	3,299	21.8	▲1,333	▲28.8
Net income	2,889	11.9	3,028	20.0	139	4.8
EPS (yen)	30.39	—	31.86	—	1.47	4.8
Capital investment	6,277	—	959	—	▲5,318	▲84.7
Depreciation	1,924	—	2,228	—	303	15.8
R&D expenses	1,173	—	1,087	—	▲85	▲7.3

# Non-consolidated net sales by application

(millions of yen)

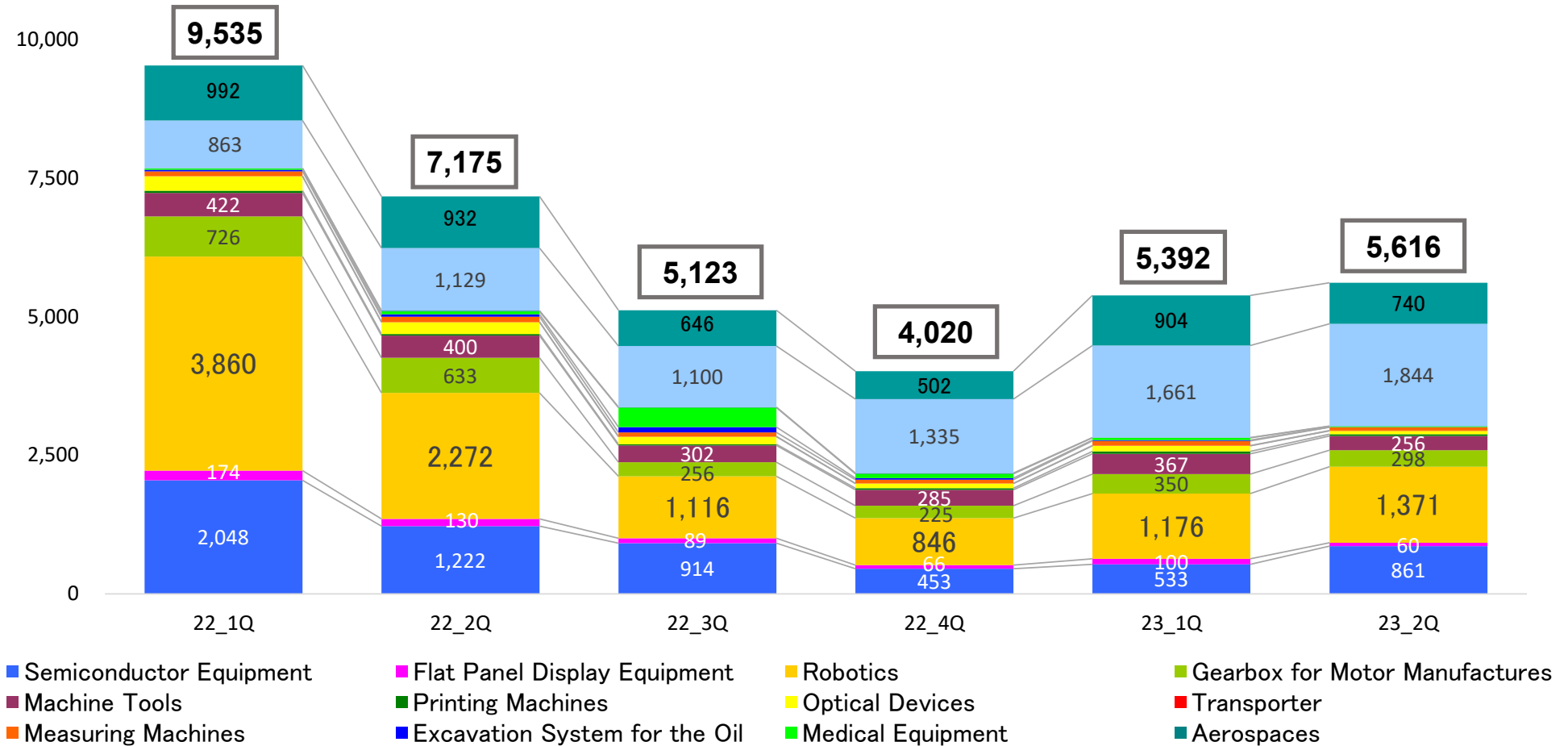


- Semiconductor Equipment
- Flat Panel Display Equipment
- Robotics
- Gearbox for Motor Manufactures
- Machine Tools
- Printing Machines
- Measuring Machines
- Excavation System for the Oil
- Optical Devices
- Transporter
- Aerospaces



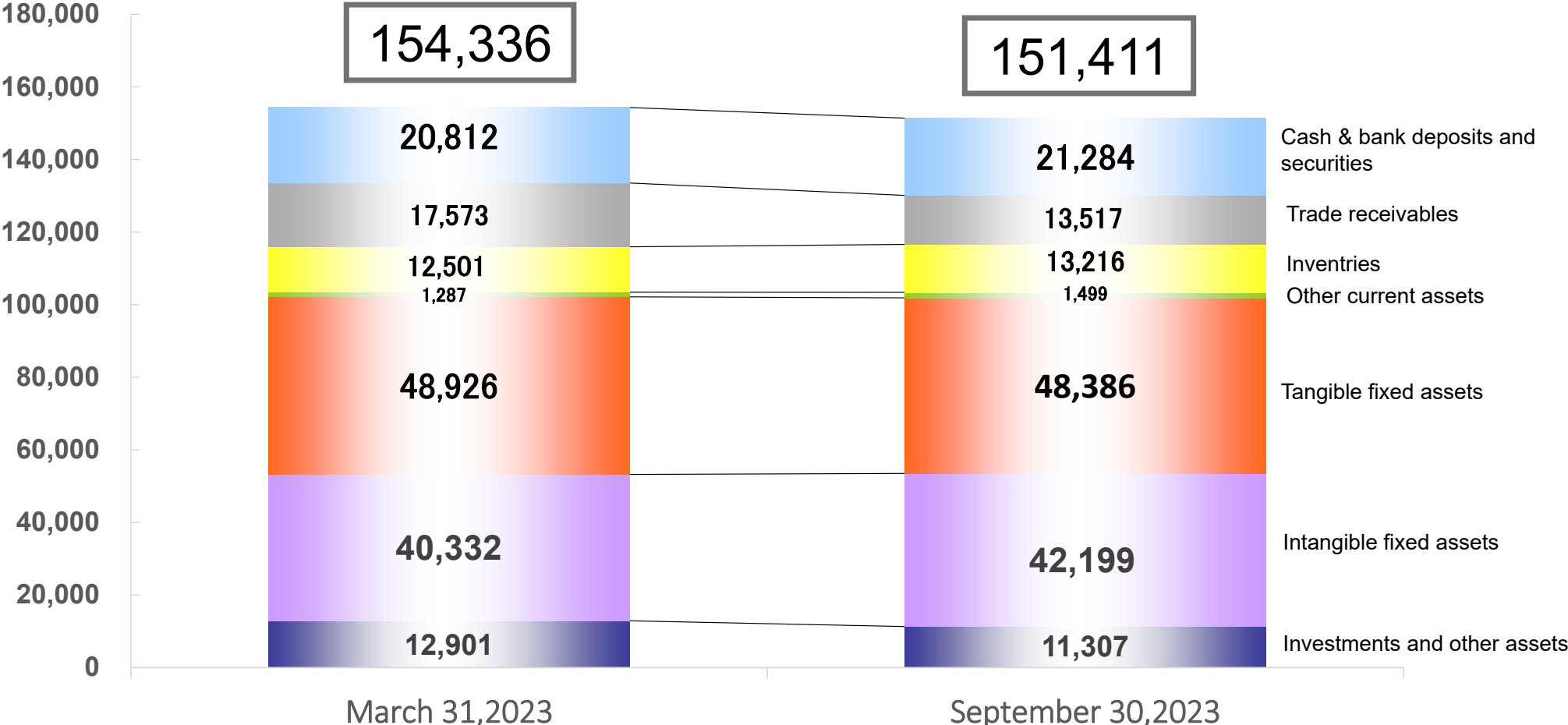
# Non-consolidated bookings by application (quarterly)

(millions of yen)



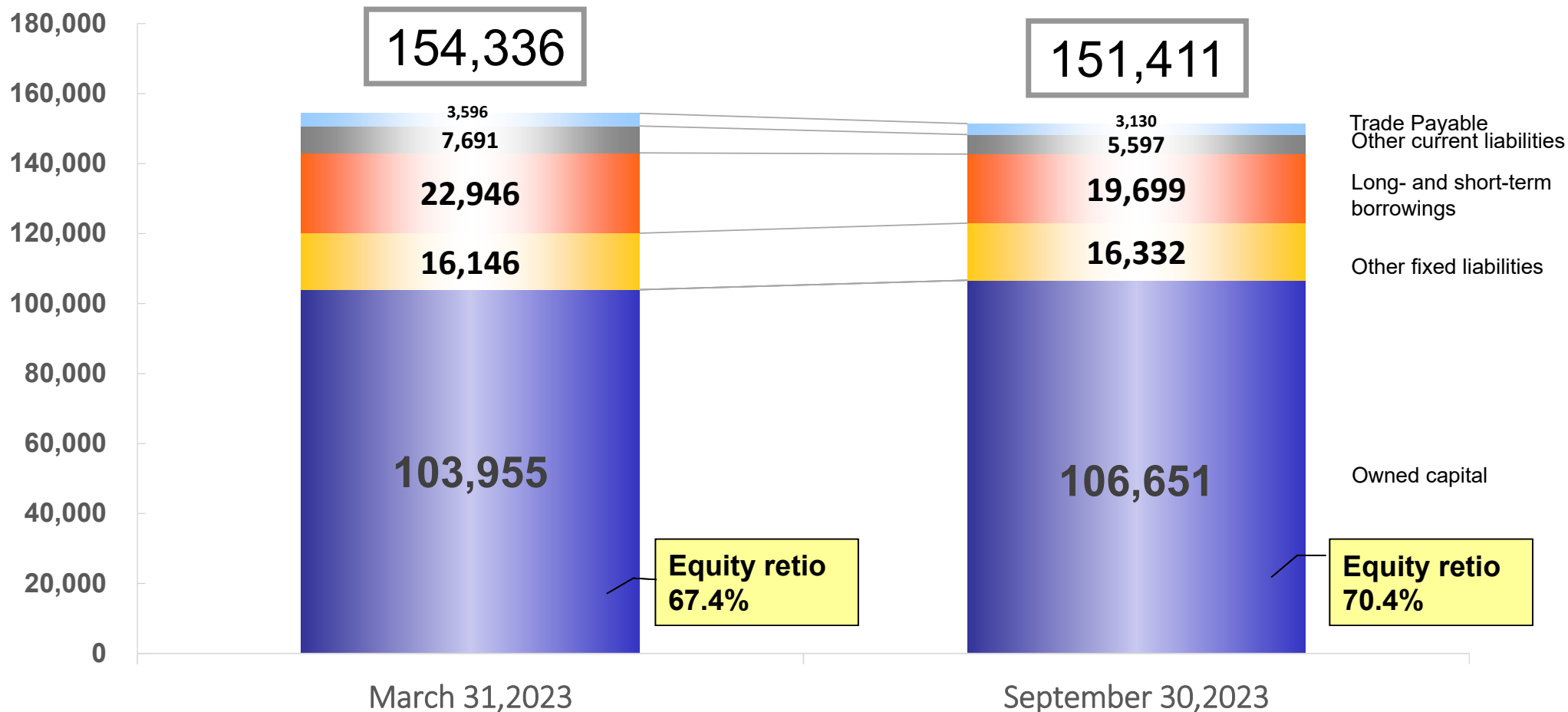
# Status of consolidated assets

(millions of yen)



# Status of consolidated liabilities and net assets

(millions of yen)



# Status of consolidated cash flows

(millions of yen)

	1H FY03/23	1H FY03/24
Cash flow from operating activities	2,298	8,246
Cash flow from investing activities	▲3,275	▲4,379
Cash flow from financing activities	▲2,280	▲5,164
Effect of exchange rate changes on cash and cash equivalents	490	362
Net increase (decrease) in cash and cash equivalents	▲2,767	▲936
Cash and cash equivalents at end of period	16,000	18,985

# Performance Forecasts for Full-year FY03/24

# Consolidated performance forecasts for full-year FY03/24

(millions of yen)	FY03/23		FY03/24 (forecast)		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	71,527	100.0	55,000	100.0	▲ 16,527	▲ 23.1
Operating income	10,224	14.3	▲ 400	▲ 0.7	▲ 10,624	—
Ordinary income	10,757	15.0	▲ 200	▲ 0.4	▲ 10,957	—
Net income	7,595	10.6	▲ 800	▲ 1.5	▲ 8,395	—
EPS (yen)	79.67	—	▲ 8.41	—	▲ 88.09	—
Capital investment	9,236	—	6,300	—	▲ 2,936	▲ 31.8
Depreciation	9,574	—	9,900	—	325	3.4
R&D expenses	3,274	—	3,500	—	225	6.9

Assumed exchange rate for FY03/23 forecasts: 1USD = ¥140.00    1EUR = ¥149.50    1CNY = ¥19.50

Net income (loss) refers to net income (loss) attributable to owners of parent.

Depreciation includes depreciation of tangible assets and amortization of intangible assets and goodwill.

# Performance forecasts on main group companies for full-year FY03/24

(millions of yen)

	Equity stake	Net sales		Operating income		
		Amount	Year-on-year Change(%)	Amount	Year-on-year Change(%)	
※2	HD Systems, Inc. (Harmonic Drive L.L.C.) (U.S.A)	100% (100%)	13,000	19.5	1,500	4.8
	Harmonic AD, Inc.	100%	1,900	▲17.9	▲100	—
	Harmonic Precision Inc.	100%	1,800	▲65.8	▲1,000	—
※3	Harmonic Drive Systems (Shanghai) Co., Ltd	100%	4,100	▲15.7	400	12.8
※4	Harmonic Drive SE (Germany)	100%	16,500	3.3	2,050	▲2.7

\*1 For overseas subsidiaries and affiliates , the fiscal year ends December 31.

\*2 Exchange rates: Jan–Dec 2022 1USD = ¥131.43, Jan–Dec 2023 1USD = ¥140.00

\*3 Exchange rates: Jan–Dec 2022 1CNY = ¥19.48, Jan–Dec 2023 1CNY = ¥19.50

\*4 Exchange rates: Jan–Dec 2022 1EUR = ¥138.04, Jan–Dec 2023 1EUR = ¥149.50

# Non-consolidated performance forecasts for full-year FY03/24

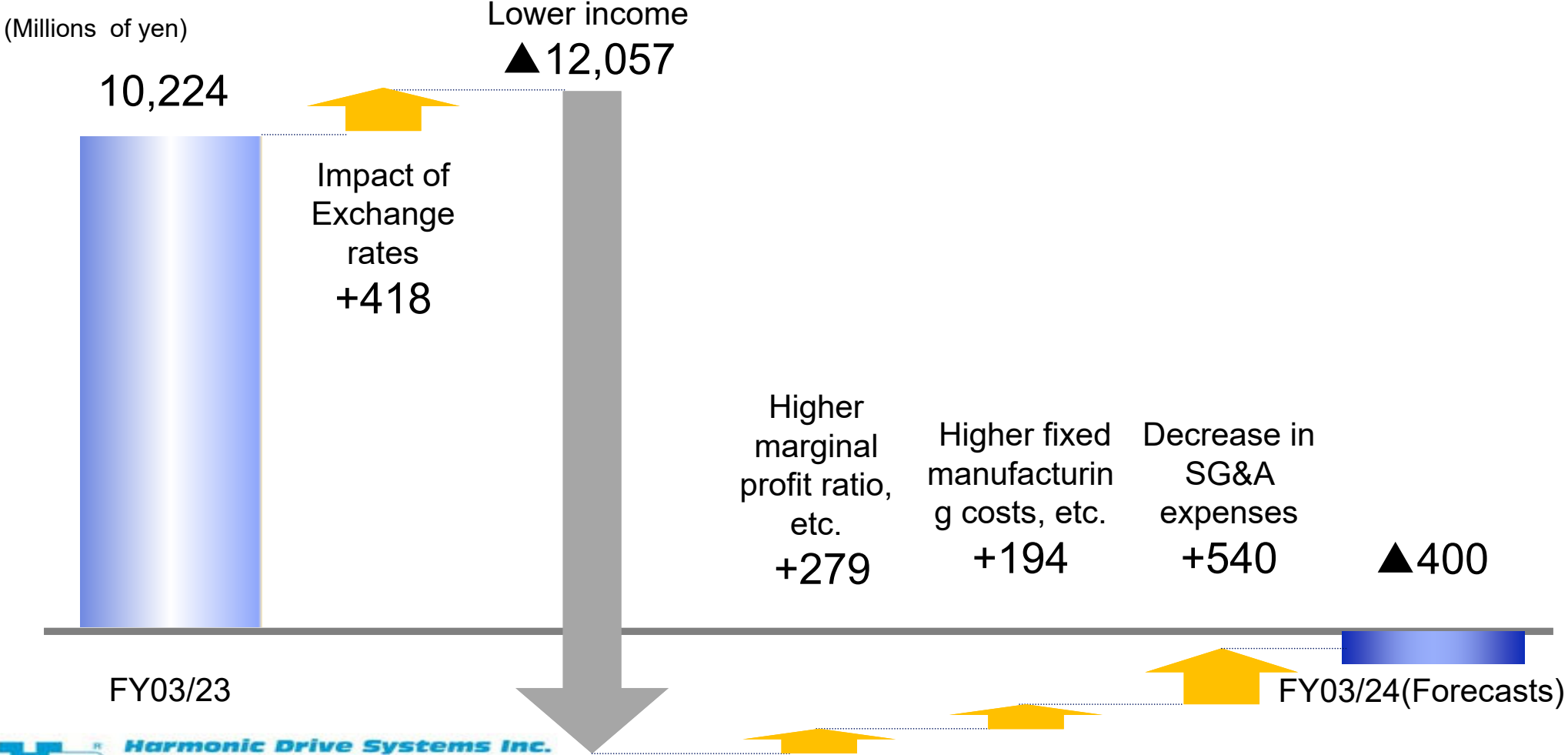
(millions of yen)

	FY03/23		FY03/24 (forecast)		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	50,883	100.0	28,000	100.0	▲22,883	▲45.0
Operating income	8,927	17.5	▲500	▲1.8	▲9,427	—
Ordinary income	9,378	18.4	2,300	8.2	▲7,078	▲75.5
Net income	6,880	13.5	2,300	8.2	▲4,580	▲66.6
EPS (yen)	72.17	—	24.19	—	▲47.98	▲66.5
Capital investment	7,557	—	4,400	—	▲3,157	▲41.8
Depreciation	4,408	—	4,700	—	291	6.6
R&D expenses	2,430	—	2,400	—	▲30	▲1.2

Assumed exchange rate for FY03/23 forecasts: 1USD = ¥140.00    1EUR = ¥149.50    1CNY = ¥19.50  
 Depreciation includes depreciation of tangible assets and amortization of intangible assets and goodwill.



# Factors in year-on-year change in consolidated operating income (fiscal year ending March 31, 2024 forecasts)



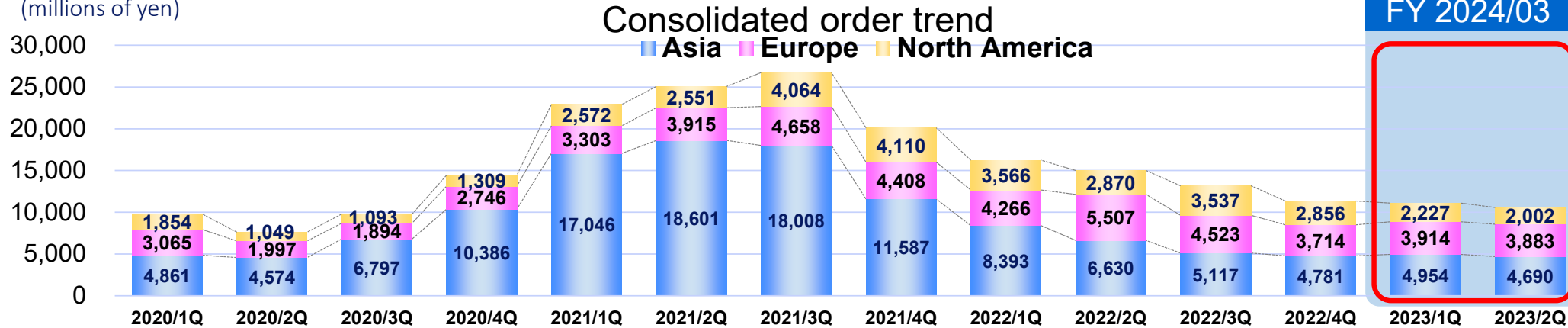
# Future Outlook

# 1. Our operating environment

# 1-1. Demand for HDSI's products

- Orders in Japan set a major bottom, but...
- Robotics inventory has not adjusted as we expected owing to stagnation in the Chinese market

(millions of yen)



FY 2024/03

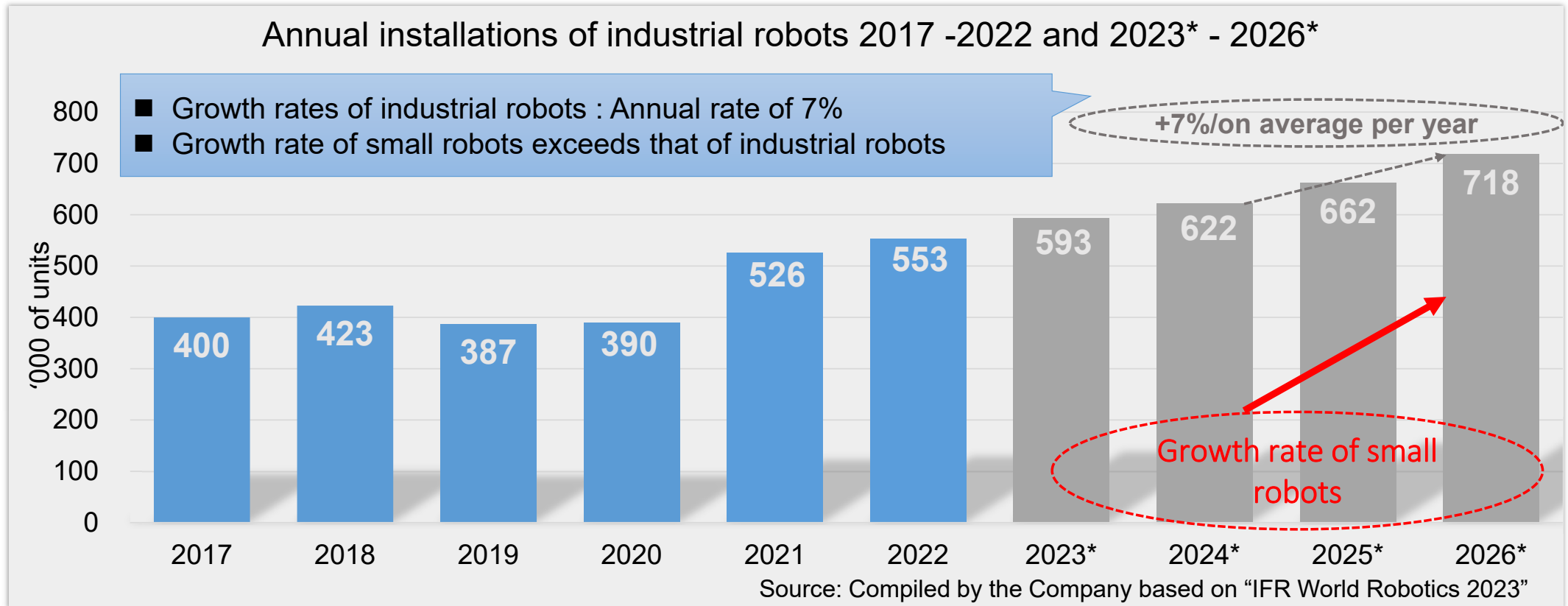
**Asia** Excessive buildup of inventory held by distributors and customers has been partially cleared

**Europe** Orders are down in line with an economic slowdown, but remain firm

**North America** Orders for medical market are strong, while orders for semiconductor manufacturing equipment are undergoing adjustment

## 2. Trends in Main Fields of Application

## 2-1. Factory automation robot market forecast



## 2-2. Collaborative robot market forecast

Resolve labor shortages  
Enhance corporate

Orientation towards  
autonomy through  
AI development

Automation  
Labor-saving

Market expansion

### ■ Labor management:

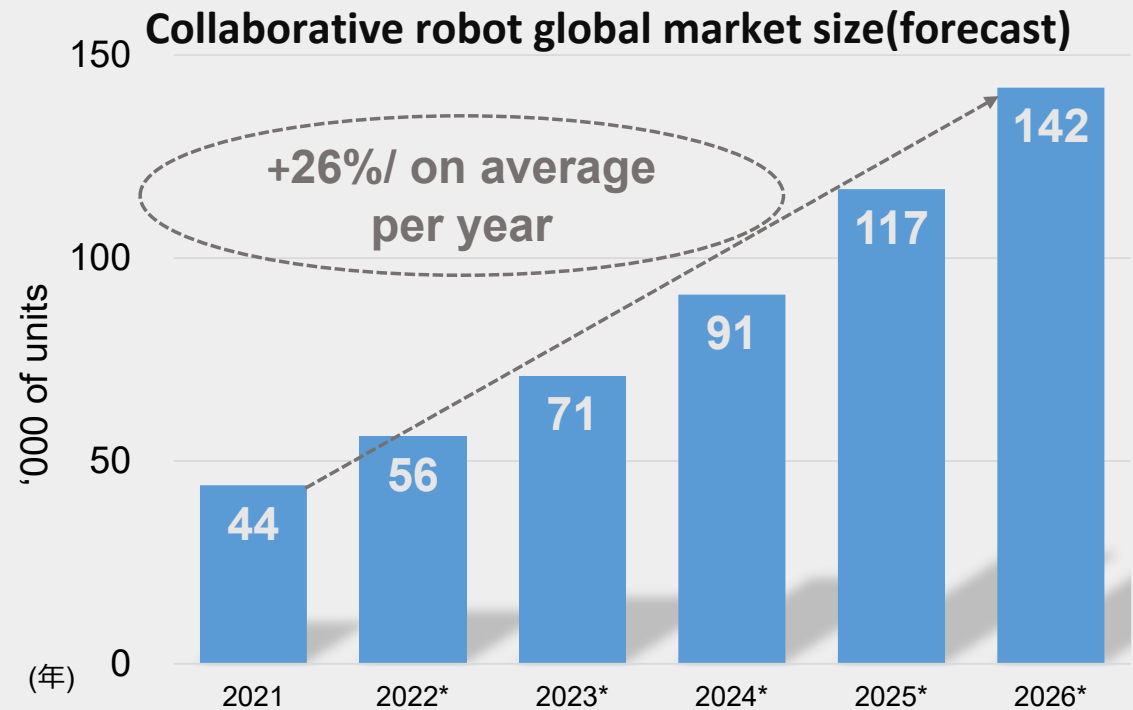
Application expected even for tasks that can be completed by a single individual

■ Through the utilization of AI, operations will become simpler, even for beginners

■ Production nationalism: A shift away from reliance on China



Courtesy of NEURA Robotics GmbH



Note: Figures for 2022 are estimates, figures for 2023 and beyond are forecasts, based on the number of units shipped by manufacturers  
Source: Compiled by the Company based on "Survey on the Global Market for Collaborative Robots (2023)" published by Yano Research Institute Ltd. on March 01, 2023

## 2-4. Semiconductor equipment and Automotive

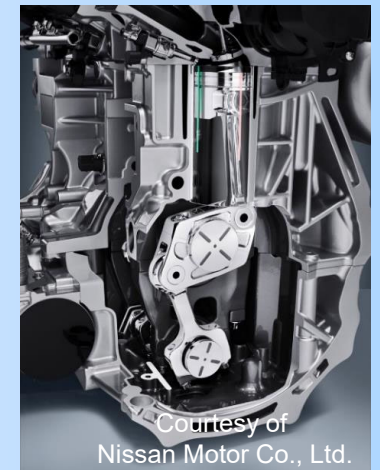
### Semiconductor equipment

- End of semiconductor industry downcycle nears
- ➔ Closely monitoring the timing of recovery for large-scale investments over the medium to long term.
- Demand for semiconductors will grow as long as technology continues to evolve
- ➔ Generative AI, digitalization, and shift to green energy
- Heightened economic and security risks prompt governments to support their own semiconductor industries



### Automotive: Used in variable compression ratio (VCR) engines

- Production volume increased owing to a recovery in vehicle production following the easing of the semiconductor shortage
- Solid performance from 2H FY03/23, contributing substantially to FY03/24 earnings

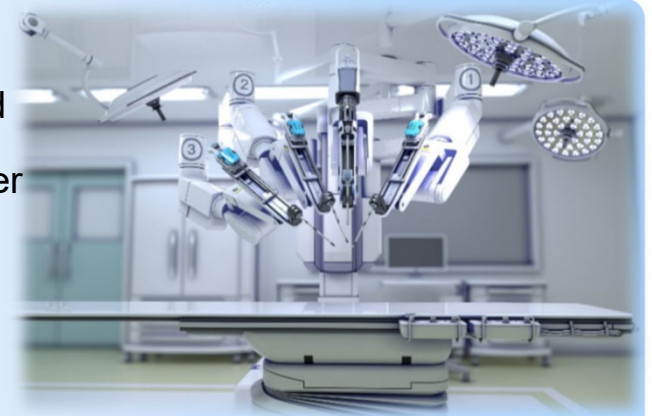




## 2-4. Medical and health care

### Surgical robots

- Top medical equipment manufacturers from Japan, the US, and Europe have entered the market
  - ➔With the broadening of therapeutic areas, the market is anticipated to expand further
  - ➔Japanese manufacturers received sales approval in Singapore as well
  - ➔Advancements in communication speeds (from 5G to 6G) are expected to facilitate remote surgeries
- The major manufacturers of surgical robots in Japan, the US, and Europe, being rise to oligopoly by our products



### Other potential healthcare applications



**Medical equipment** · Specimen analysis/Test equipment/  
Genome analyzer



**Exoskeleton**

- Moving into a phase of practical adoption with expanded insurance coverage and subsidies



**Electric wheelchairs** · Autonomous driving enhances convenience

# 3. New Applications

# 3-1. Aviation and Space

## 3-2-1.eVTOL (Electric Vertical Take-Off and Landing aircraft)

- eVTOLs are anticipated to become increasingly common as an eco-friendly method of short-distance travel
- eVTOL companies to conduct experimental commercial operations at “EXPO 2025 OSAKA, KANSAI, JAPAN”

[HDSI Group Initiatives]

- Get adopted as a critical component of eVTOL mechanism
  - ➔ Initiatives to meet quality requirements
  - ➔ Began preparations for mass production for eVTOL



## 3-2. Amusement

### Animatronics

- Harmonic Drive® helps to realistically replicate the movements of people, animals, and fictional creatures
- Amusement companies are now using animatronics in their attractions and shows to provide immersive entertainment in order to differentiate themselves
- Proactive capital investments in theme parks being made mainly by major amusement companies
  - ➔ Creation of a full-fledged animatronics market
    - ~ Moving into a growth phase



Source: Harmonic Drive SE website



# 3-3-1. Space

HarmonicDrive®

The Hallmark of Hi-Precision

## Our Challenge Began in 1971,

1971年、アポロ15号の月面車に始まり、

2022年7月、最初の観測データが公開された

「ジェームズ・ウェッブ宇宙望遠鏡(JWST)」に至るまで、

多くの宇宙用機器にハーモニックドライブ®が使われてきました。



Image courtesy of NASA

会社紹介ムービー



株式会社

ハーモニック  
ドライブ  
システムズ

<https://www.hds.co.jp/>

「ハーモニックドライブ」は商標製品を示す登録商標です。  
学標の名前あるいは一般の名前は「登録商標」です。



## and...Never Ends.

Image courtesy of NASA



Harmonic Drive Systems Inc.

## 3-3-2. Speed reducer operable in -200°C

Presented at the ESMATS (European Space Mechanisms and Tribology Symposium) on September 21, 2023

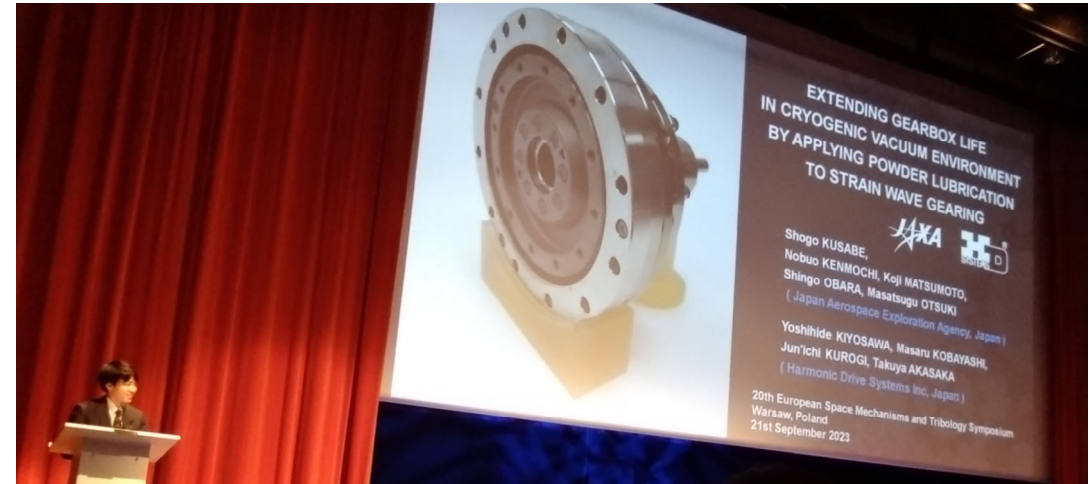
### Background

- Speed reducers for moon rovers
- Lubricant hardens in a cryogenic + vacuum environment
- Alternatives that do not involve the use of heaters are a challenge



### Development

- [Joint research with JAXA]
- Focus on powder lubrication
  - Lubrication mechanism resistant to cryogenic temperatures with long operating life even in a vacuum



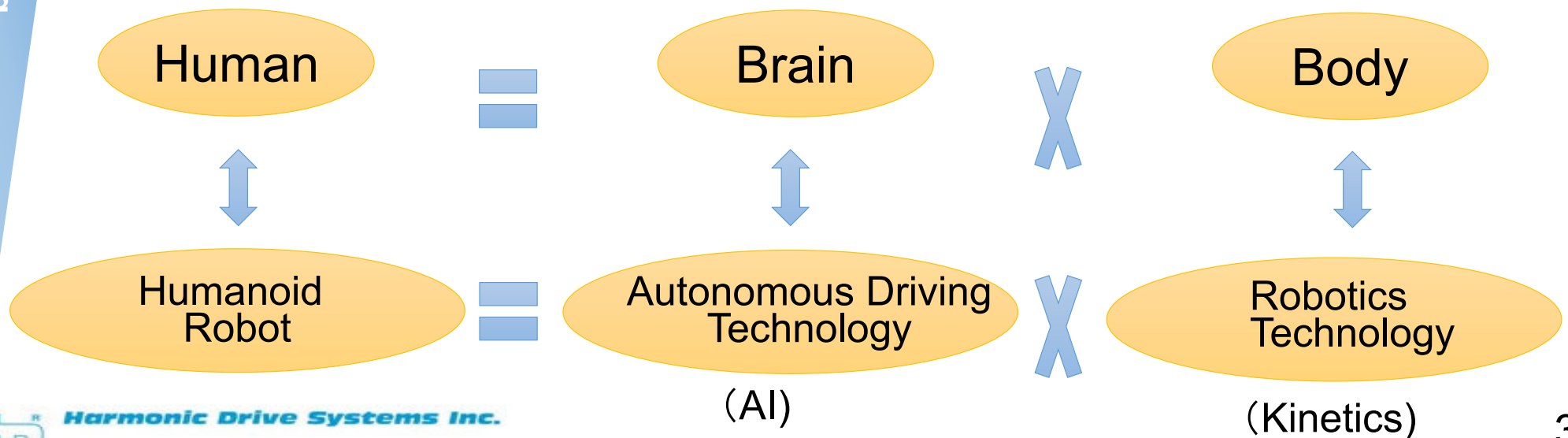
Presented at the 20th ESMATS2023 event (Sept. 21-23)

- One of the world's most prestigious space-related mechanism and tribology symposiums
- Joint presentation with JAXA on powder lubrication as a practical new lubrication mechanism under cryogenic + vacuum environments

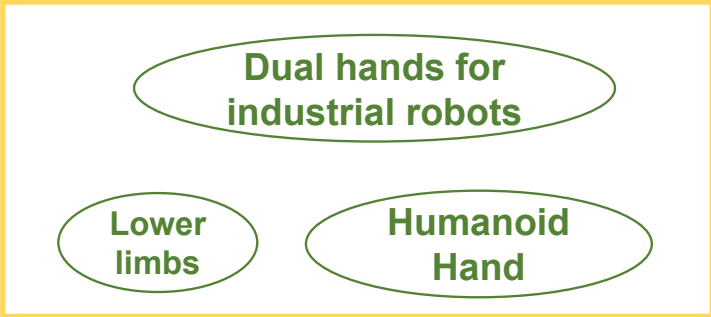
# 3-4-1. Necessity and feasibility of humanoid robots

## Ultimate automation = unmanned factory

- Industrial robots (fixed, used particularly to take over heavy work at production sites, etc.)
- Human-collaborative robots (portable, used for light work that one person can perform)
  - Easy to handle, safe = slow [worker friendly]
- Human replacement robots (Human-like speed and dexterity)



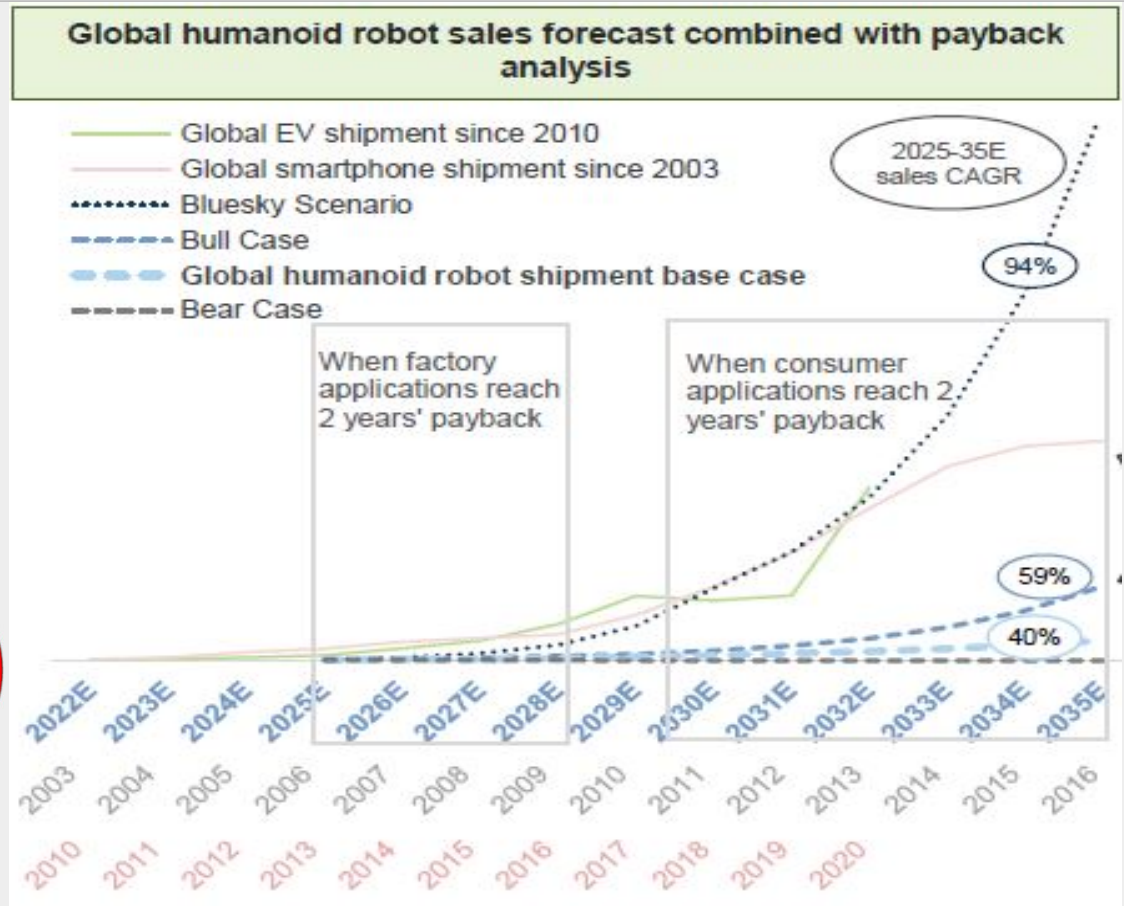
## 3-4-2. Classification of robots

Classification		Use	Features
I. Industrial Robots	Industrial robots	Heavy work that cannot be done by a single person at a manufacturing site, installed inside a wire fence for safety	Heavyweight, fixed installation, high precision, high reliability High capital investment, subject to depreciation <For the production manager?>
	Human-collaborative robots co-bots	Light work that can be performed by a single person at a manufacturing site, safety measures = slow movement, no wire fence required	Lightweight, compact, portable High precision, high reliability, human replacement = replace labor cost, <For the HR manager?>
II. Service Robots	Professional robots	Medical care, nursing care, rehabilitation, distribution, resource mining	High precision, high reliability, lightweight, compact
	Consumer robots	Home appliances, hobbies, toys	Does not always require high accuracy, high reliability, compactness, lightweight, etc.?
III. Humanoid Robots	Non-bipedal walking	Advanced version of human-collaborative dual-armed robot	
	Bipedal walking	Lower limb mechanism, hand, fingers	
		<ul style="list-style-type: none"> <li>• Cutting-edge automation in a society with a declining work population</li> <li>• Create a prosperous society using humanoid robots</li> </ul>	



# 3-4-3. Anticipating growing demand for humanoid robots

- Growing interest in humanoid robots
  - Various companies from start-ups to major corporations have entered the market
  - Operational test of warehouse work by a humanoid robot
- Difference from co-bots: **“Humanoid Hand”**
- Despite the high technical and cost barriers, the ultra-compact speed reducers, which are our strength, are indispensable for humanoid robots



Source : The Goldman Sachs Group, Inc. “Global Automation\_ The investment case for humanoid robots”

# Overseas Business Strategy

# 4-1. Chinese robotics market

## Current Status of Chinese Market

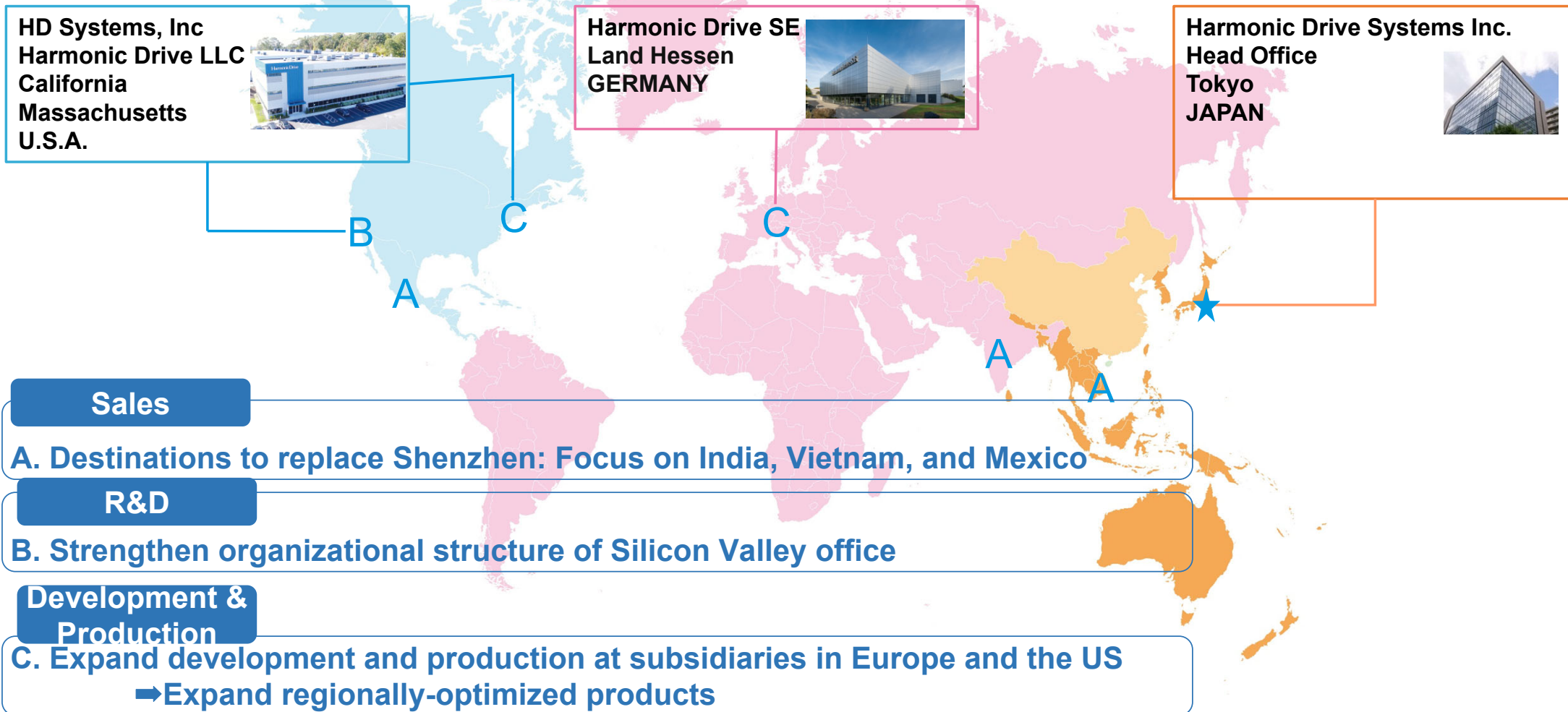
- Democratization of industrial robots (rapidly progressing※)
- High-end/low-cost polarization of Chinese robot manufacturers

※550,000 industrial robots were installed worldwide in 2022, of which 290,000 were in China (Source: IFR World Robotics 2023)

## Our response

- Product strategy: Develop products that are mindful of competing products (including strain wave gearing made in China)
  - ➔ Improve productivity: Thoroughly implement QC by automating and digitally transforming production sites
  - ➔ Vertically integrate products (enhance mechatronics products)
- Customer strategy: Based on the above, address emerging manufacturers (including for service robots) as well as existing customers

## 4-2. Boosting and promoting international competitiveness



# 5. Initiatives for a Sustainable Future



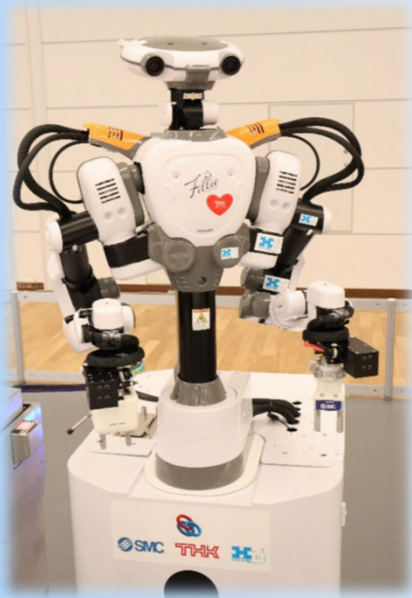
# 5-1. Second Mechatronics Exhibition held jointly by Three Companies

Dates: Aug 31- Sep 1, 2023

Venue: Tokyo Metropolitan Industrial Trade Center

Visitors: Approx. 880 people

- Joint private show by three leading companies (SMC, THK, and HDSI)
- Co-create customer solutions for labor saving, energy saving, and carbon neutrality: Presented three-company collaboration robot system
- Held recruiting event: Presented "Cutting-Edge Automation" to job-hunting students who will be the future of automation



Three-company collaboration robot system



HDSI booth



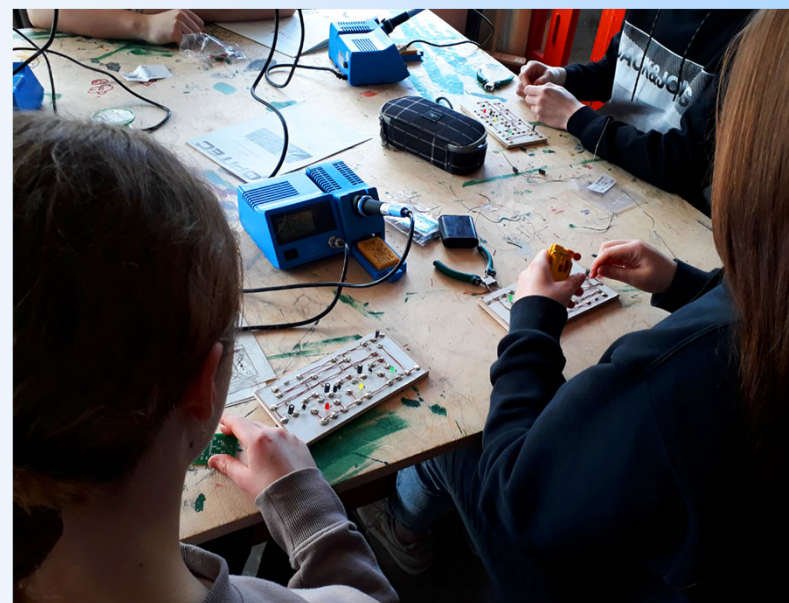
Company information session for job-hunting students

## 5-2. Sustainability activities: On-site high school lectures

### ■ Contribute to fostering future engineers

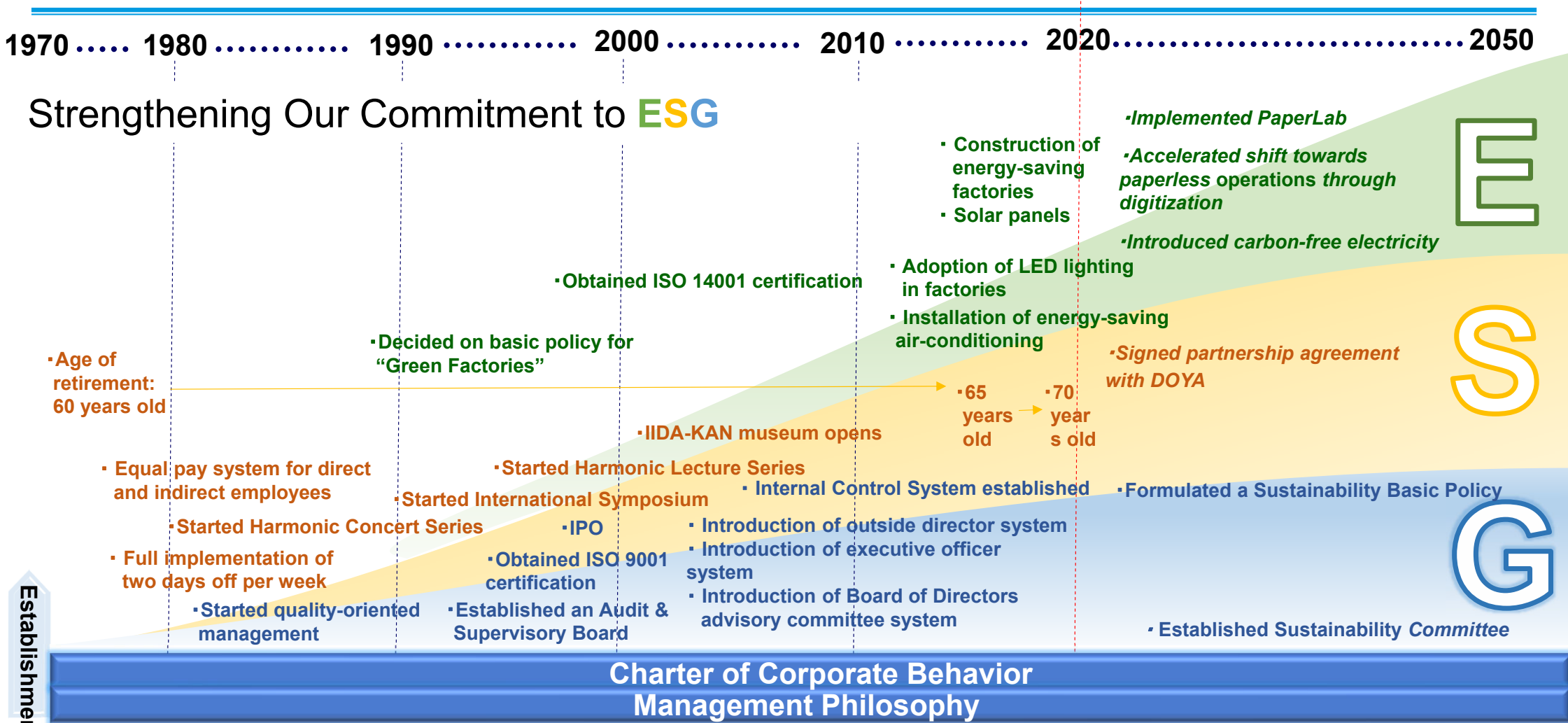


HDSI



Harmonic Drive SE(German Subsidiary)

# 4-8. Our path to sustainability







**Harmonic Drive Systems Inc.**

## Topics in 1H FY03/24

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April: Winbel Inc. renamed Harmonic Winbel Inc.

April: Paper Lab begins full-scale operations

June: Held on-site lecture at Nagano Prefectural Okaya Technical High School

June: Sponsored Shinshu Azumino Half Marathon as a Gold Partner

June: Approved as one of the companies under the Economic Security Promotion Act

