


# ***Harmonic Drive Systems Inc.***

## Presentation on Business Results for the 1st-Half of Fiscal Year Ending March 31, 2019

November 16, 2018

This presentation contains forward-looking statements relating to expected future performance as of Nov. 16, 2018. 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.

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# Performance Summary

# 1st-half consolidated results (versus original forecasts for the period)

	Original forecasts (announced May 11)		1st-half FY ending Mar.31,2019		(millions of yen) Vs. original forecasts for the period	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate(%)
Net sales	32,300	100.0	34,474	100.0	2,174	6.7
Operating income	8,300	25.7	8,914	25.9	614	7.4
Ordinary income	8,400	26.0	9,337	27.1	937	11.2
Net income	5,400	16.7	5,908	17.1	508	9.4
EPS (yen)	56.10	—	61.37	—	5.28	9.4

※ Net Income refers to net income attributable to owners of parent.

# 1st-half consolidated results (year-on-year change)

(millions of yen)

	1st-half FY ended Mar.31,2018		1st-half FY ending Mar.31,2019		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	25,014	100.0	34,474	100.0	9,459	37.8
Gross profit	12,058	48.2	15,655	45.4	3,596	29.8
Operating income	5,761	23.0	8,914	25.9	3,153	54.7
Ordinary income	5,638	22.5	9,337	27.1	3,699	65.6
Net income	3,663	14.6	5,908	17.1	2,244	61.3
EPS (yen)	40.00		61.37		21.38	53.4
Capital investment	3,128		10,506		7,377	235.8
Depreciation costs	2,712		2,784		72	2.7
R&D costs	714		1,204		490	68.6

※ Net Income refers to net income attributable to owners of parent.

※ Capital investment amounts are the amounts of tangible and intangible fixed assets acquired in the term.

※ We adjusted 1st-half FY ended Mar.31,2018 retroactively due to the tentative accounting process.

# Performance of main group companies for 1st-half of fiscal year ending March 31, 2019

(millions of yen)

	Equity stake	Net sales		Net income		
		Amount	Change(%)	Amount	Change(%)	
	Harmonic Drive Systems Inc.	—	25,229	40.7	5,196	43.2
*2 *5	HD Systems, Inc. (Harmonic Drive L.L.C.) (U.S.A)	100% (51%)	3,227	27.6	233	80.6
	Harmonic AD, Inc.	100%	1,595	18.3	151	20.6
*3	Harmonic Drive Systems (Shanghai) Co., Ltd.	100%	2,195	11.0	151	53.4
*4 *6	Harmonic Drive AG (Germany)	74.7%	8,050	26.3	1,309	46.7

Percent change(%) indicates increase or decrease from same period of previous fiscal year.

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

\*2 Exchange rates: Jan. – Jun., 2017 1US\$ = 112.37 yen, Jan. – Jun., 2018 1US\$ = 108.68 yen

\*3 Exchange rates: Jan. – Jun., 2017 1CNY = 16.39 yen, Jan. – Jun., 2018 1US\$ = 17.09 yen

\*4 Exchange rates: Jan. – Jun., 2017 1€ = 121.64 yen, Jan. – Jun., 2018 1€ = 131.64 yen

\*5 Net income of US subsidiaries (consolidated) is after excluding non-controlling interests.

\*6 Net income of German subsidiaries (consolidated) is before excluding non-controlling interests.

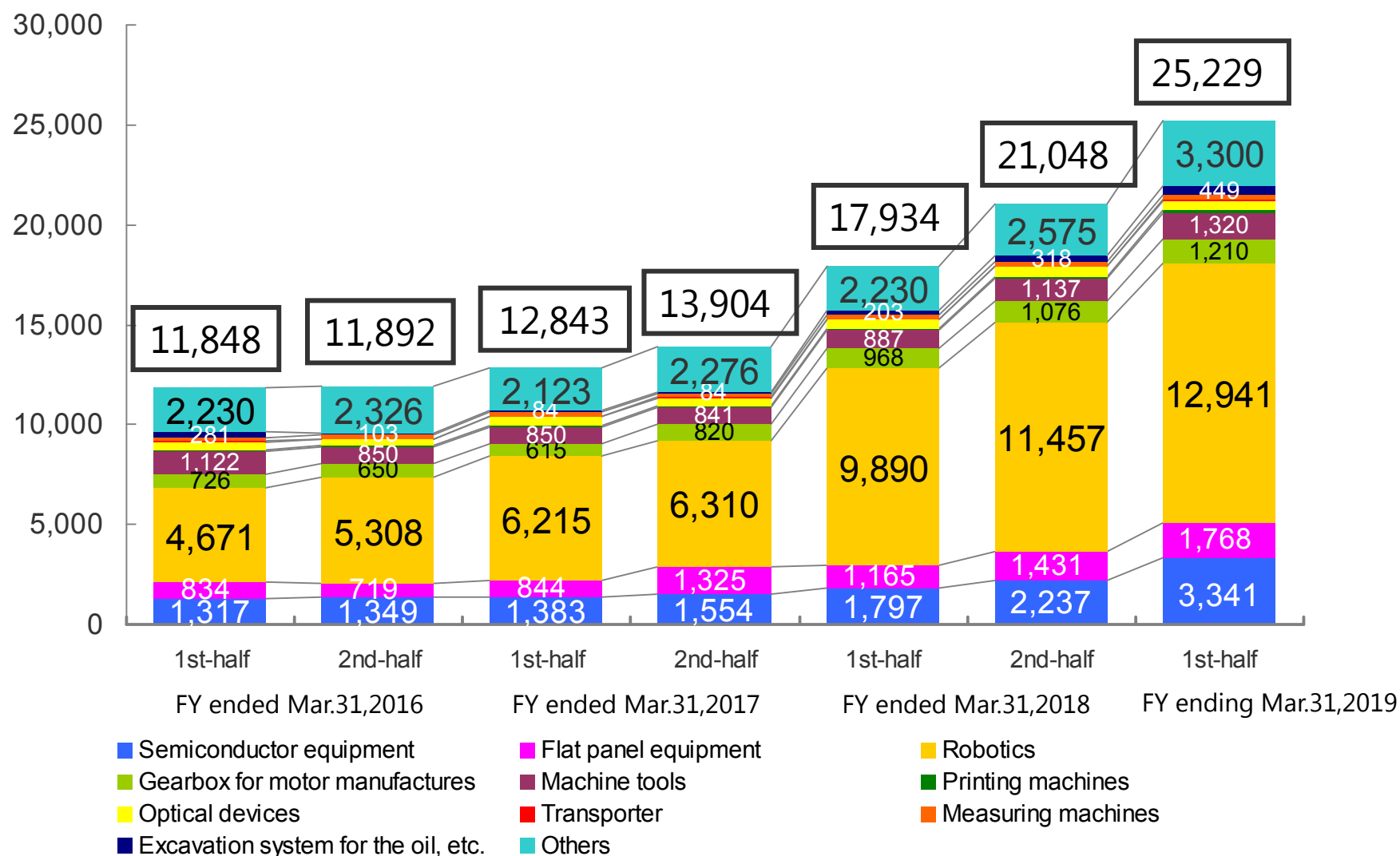
# 1st-half non-consolidated results

(millions of yen)

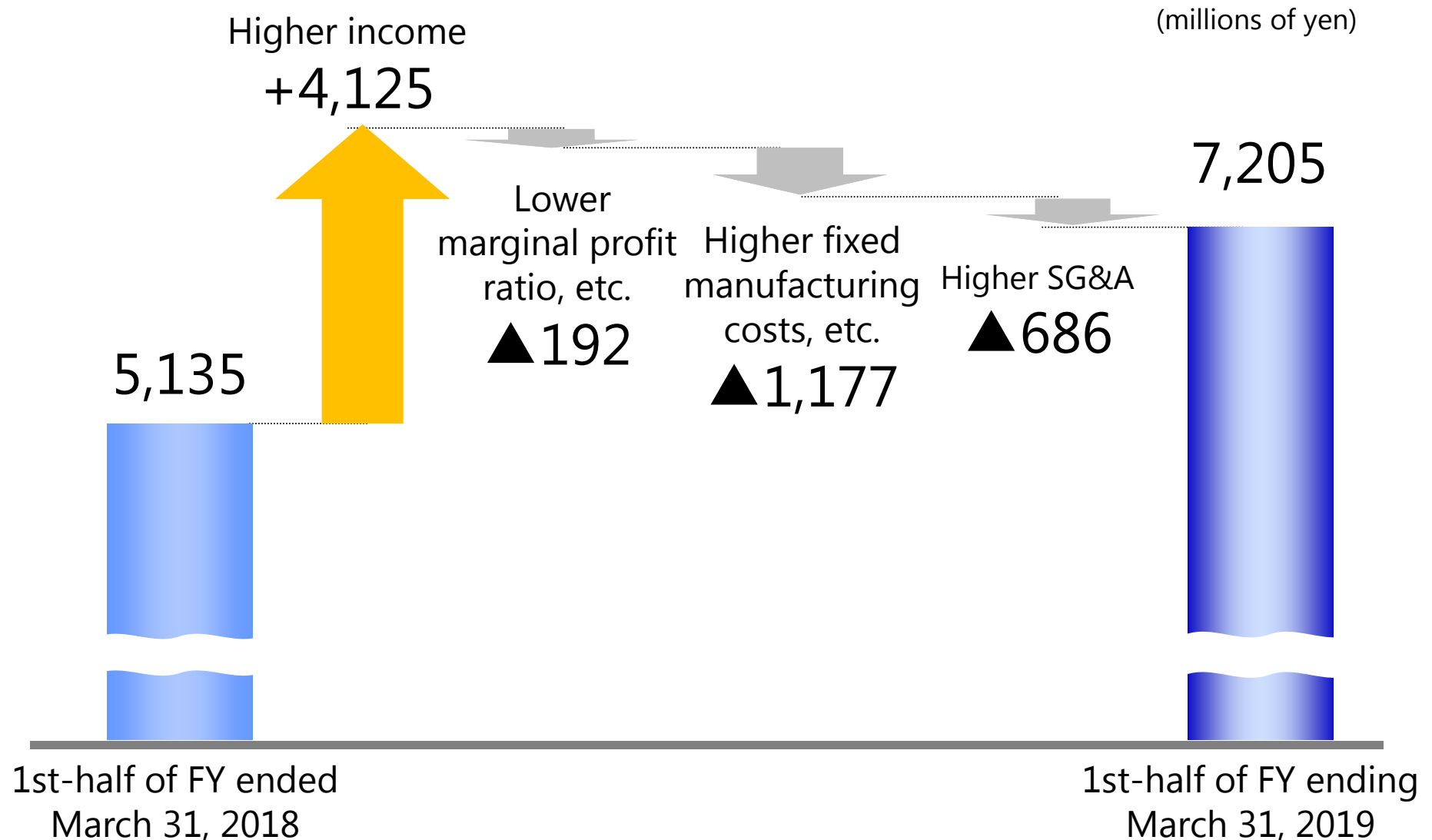
	1st-half FY ended Mar.31,2018		1st-half FY ending Mar.31,2019		Year-on-year change	
	Amount	Percent(%)	Amount	Percent(%)	Change	Rate(%)
Net sales	17,934	100.0	25,229	100.0	7,294	40.7
Gross profit	7,659	42.7	10,415	41.3	2,756	36.0
Operating income	5,135	28.6	7,205	28.6	2,070	40.3
Ordinary income	5,243	29.2	7,510	29.8	2,266	43.2
Net income	3,628	20.2	5,196	20.6	1,568	43.2
EPS (yen)	39.61		53.98		14.37	36.3
Capital investment	2,077		8,716		6,639	319.6
Depreciation costs	708		966		257	36.3
R&D costs	674		805		130	19.4

# Net sales by application (non-consolidated)

(millions of yen)



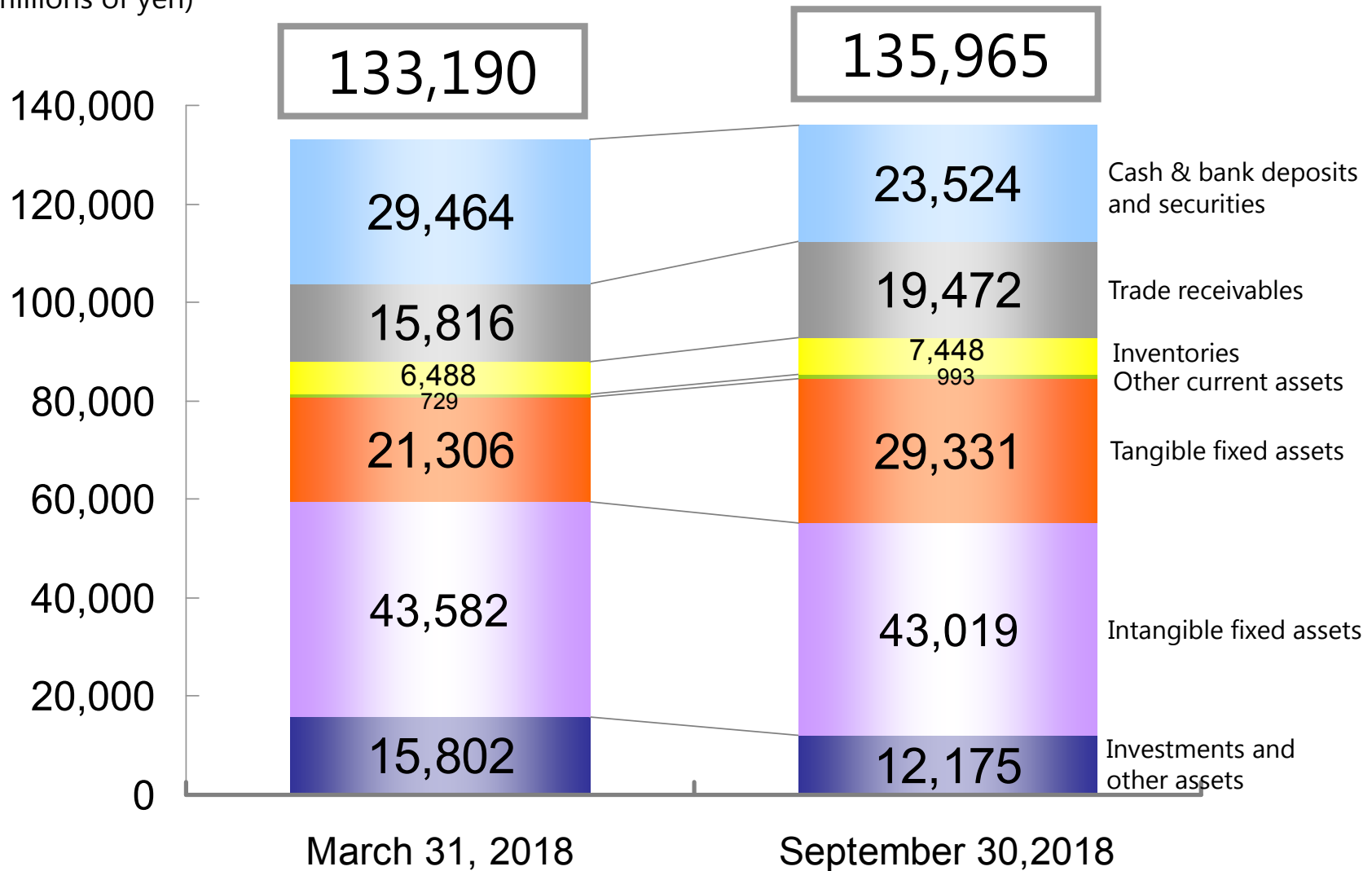
# Factors in year-on-year change in 1st-half non-consolidated operating income



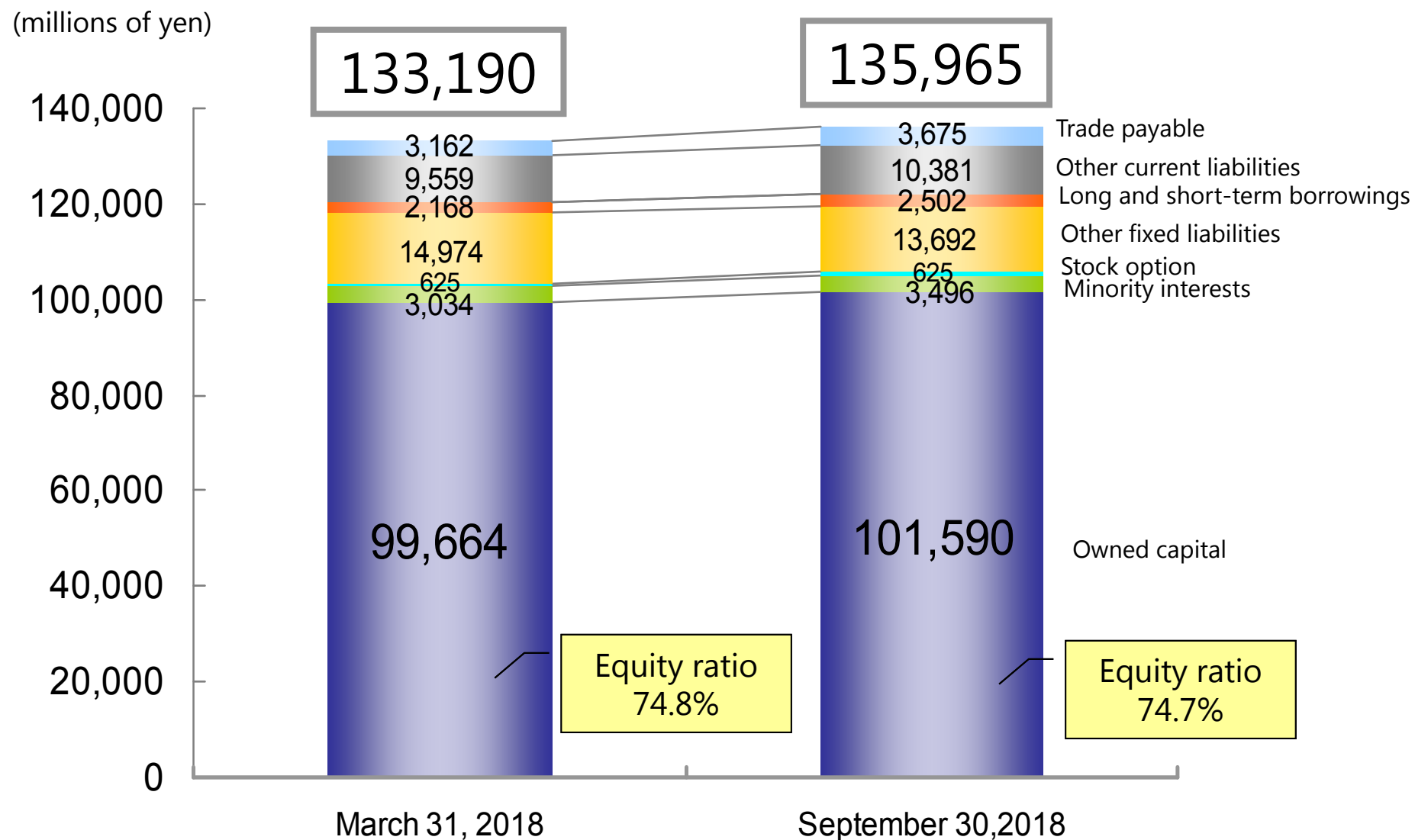


# Status of consolidated assets

(millions of yen)



# Status of consolidated liabilities and net assets



# Status of consolidated cash flows

(millions of yen)	1st-half of FY ended Mar.31,2018	1st-half of FY ending Mar.31,2019
Cash flow from operating activities	1,480	3,555
Cash flow from investing activities	▲1,973	▲8,415
Cash flow from financing activities	▲1,037	▲1,126
Effect of exchange rate changes on cash and cash equivalents	▲35	▲168
Net increase (decrease) in cash and cash equivalents	▲1,566	▲6,156
Cash and cash equivalents at end of year	8,102	22,164



# Performance Forecast For Fiscal Year Ending March 31, 2019

# Revised consolidated results forecast for fiscal year ending March 31, 2019

(millions of yen)

	Original forecasts (announced May 11)		Revised forecasts (announced Nov. 8)		Vs. original forecasts	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	68,500	100.0	67,000	100.0	▲1,500	▲2.2
Operating income	17,400	25.4	16,100	24.0	▲1,300	▲7.5
Ordinary income	17,600	25.7	16,500	24.6	▲1,100	▲6.3
Net income	11,500	16.8	10,600	15.8	▲900	▲7.8
EPS (yen)	119.46	—	110.11	—	▲9.35	▲7.8

※ Assumed exchange rate for FY19/3 forecasts 1USD = ¥110.00 1EUR = ¥130.00 1CNY = ¥16.00

※ Net income refers to net income attributable to owners of parent.

# Revised non-consolidated results forecast for fiscal year ending March 31, 2019

(millions of yen)

	Original forecasts (announced May 11)		Revised forecasts (announced Nov. 8)		Vs. original forecasts	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	50,000	100.0	48,000	100.0	▲2,000	▲4.0
Operating income	14,100	28.2	12,600	26.3	▲1,500	▲10.6
Ordinary income	14,300	28.6	13,000	27.1	▲1,300	▲9.1
Net income	10,000	20.0	9,100	19.0	▲900	▲9.0
EPS (yen)	103.88	—	94.53	—	▲9.35	▲9.0

※Assumed exchange rate for FY19/3 forecasts 1USD = ¥110.00 1EUR = ¥130.00 1CNY = ¥16.00

# Consolidated performance forecast for fiscal year ending March 31, 2019

(millions of yen)

	FY ended Mar. 31, 2018		Forecasts FY ending Mar. 31, 2019		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	54,339	100.0	67,000	100.0	12,660	23.3
Operating income	12,598	23.2	16,100	24.0	3,501	27.8
Ordinary income	12,228	22.5	16,500	24.6	4,271	34.9
Net income	8,059	14.8	10,600	15.8	2,540	31.5
EPS (yen)	86.90	—	110.11	—	23.22	26.7
Capital investment	8,757	—	23,500	—	14,742	168.3
Depreciation costs	5,852	—	6,300	—	447	7.7
R&D costs	2,114	—	2,600	—	485	22.9

※ Net income refers to net income attributable to owners of parent.

※ Assumed exchange rate for FY ending Mar.31, 2019 forecasts 1US\$ = ¥110.00 1€ = ¥130.00 1CNY=¥16.00

※ Depreciation costs include depreciation cost of tangible assets and amortization cost of intangible assets and goodwill.

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# Forecasts of main group companies for fiscal year ending March 31, 2019

(millions of yen)

	Equity stake	Net sales		Net income	
		Amount	Year-on-year change (%)	Amount	Year-on-year change (%)
	—	48,000	23.1	9,100	16.8
*2 *5	100% (51%)	6,700	21.6	470	94.5
	100%	3,400	22.2	280	14.0
*3	100%	4,000	▲13.9	220	▲21.8
*4 *6	74.7%	15,700	15.2	2,250	10.0

Percent change(%) indicates increase or decrease from same period of previous fiscal year.

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

\*2 Exchange rates: Jan. – Dec., 2017 1USD = 112.19 yen, Jan. – Dec., 2018 forecast 1USD = 110.00 yen

\*3 Exchange rates: Jan. – Dec., 2017 1CHY = 16.63 yen, Jan. – Dec., 2018 forecast 1CYN = 16.00 yen

\*4 Exchange rates: Jan. – Dec., 2017 1EUR = 126.67 yen, Jan. – Dec., 2018 forecast 1EUR = 130.00 yen

\*5 Net income of US subsidiaries (consolidated) is after excluding non-controlling interests.

\*6 Net income of German subsidiaries (consolidated) is before excluding non-controlling interests.



# Non-Consolidated performance forecast for fiscal year ending March 31, 2019

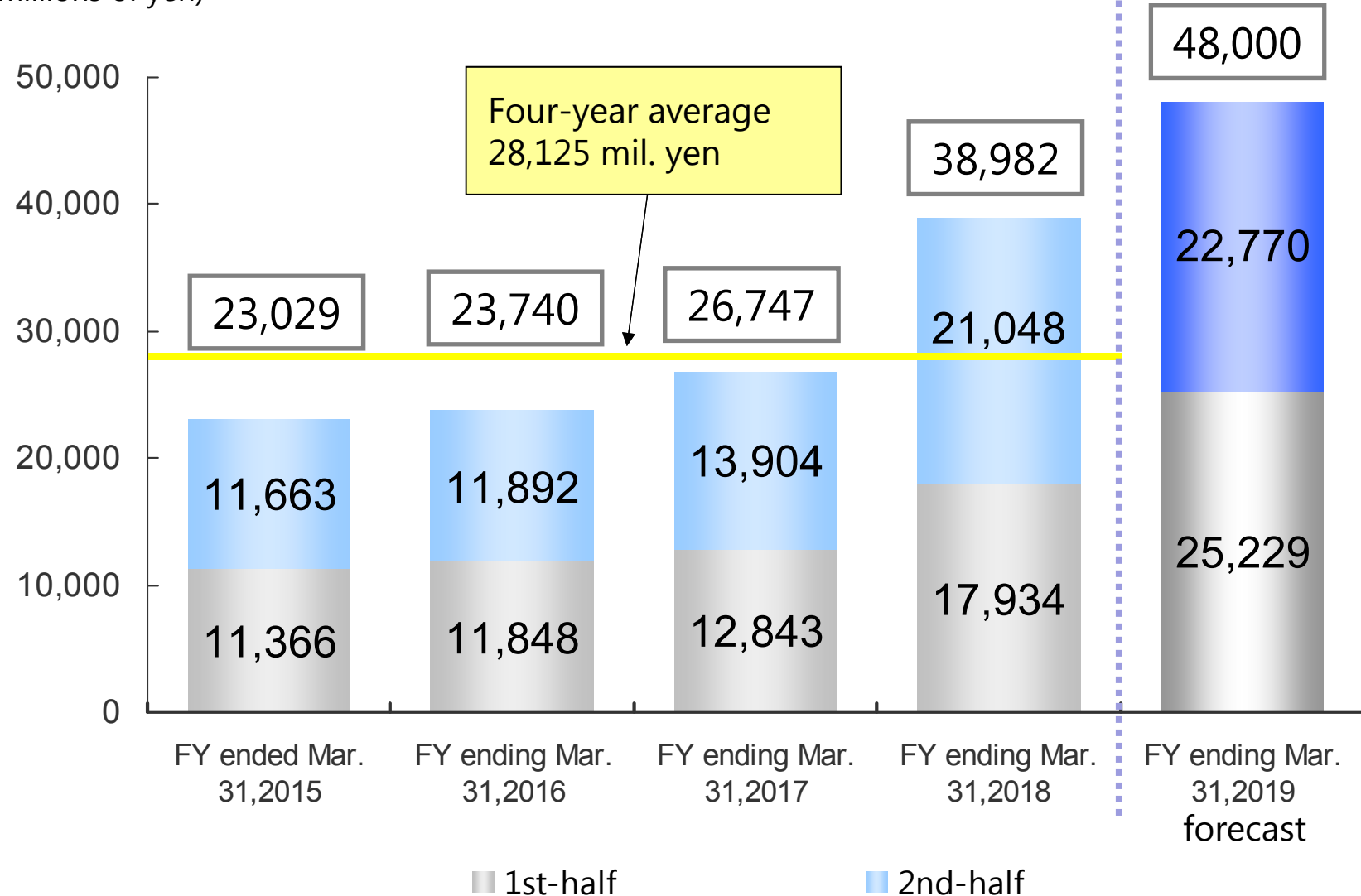
(millions of yen)

	FY2018/3		FY2019/3 forecasts		Year-on-year change	
	Amount	Percent (%)	Amount	Percent (%)	Change	Rate (%)
Net sales	38,982	100.0	48,000	100.0	9,017	23.1
Operating income	11,016	28.3	12,600	26.3	1,583	14.4
Ordinary income	11,044	28.3	13,000	27.1	1,955	17.7
Net income	7,788	20.0	9,100	19.0	1,311	16.8
EPS (yen)	83.97	—	94.53	—	10.56	12.6
Capital investment	6,523	—	19,500	—	12,976	198.9
Depreciation costs	1,634	—	2,600	—	965	59.1
R&D costs	1,368	—	1,700	—	331	24.2

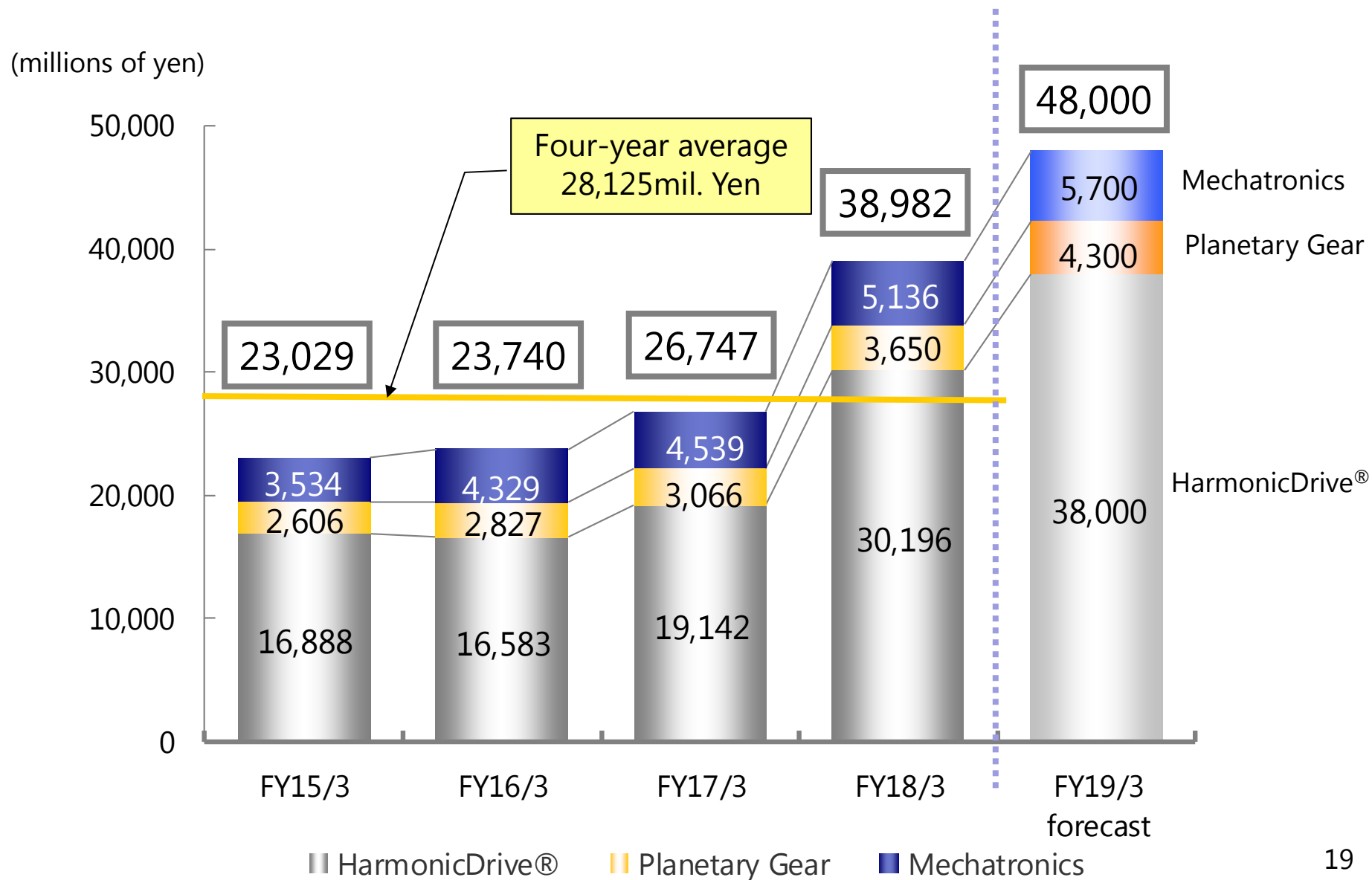
※ Assumed exchange rate for FY19/3 forecasts 1USD = ¥110.00 1EUR = ¥130.00 1CNY = ¥16.00

# Sales trend line (non-consolidated)

(millions of yen)

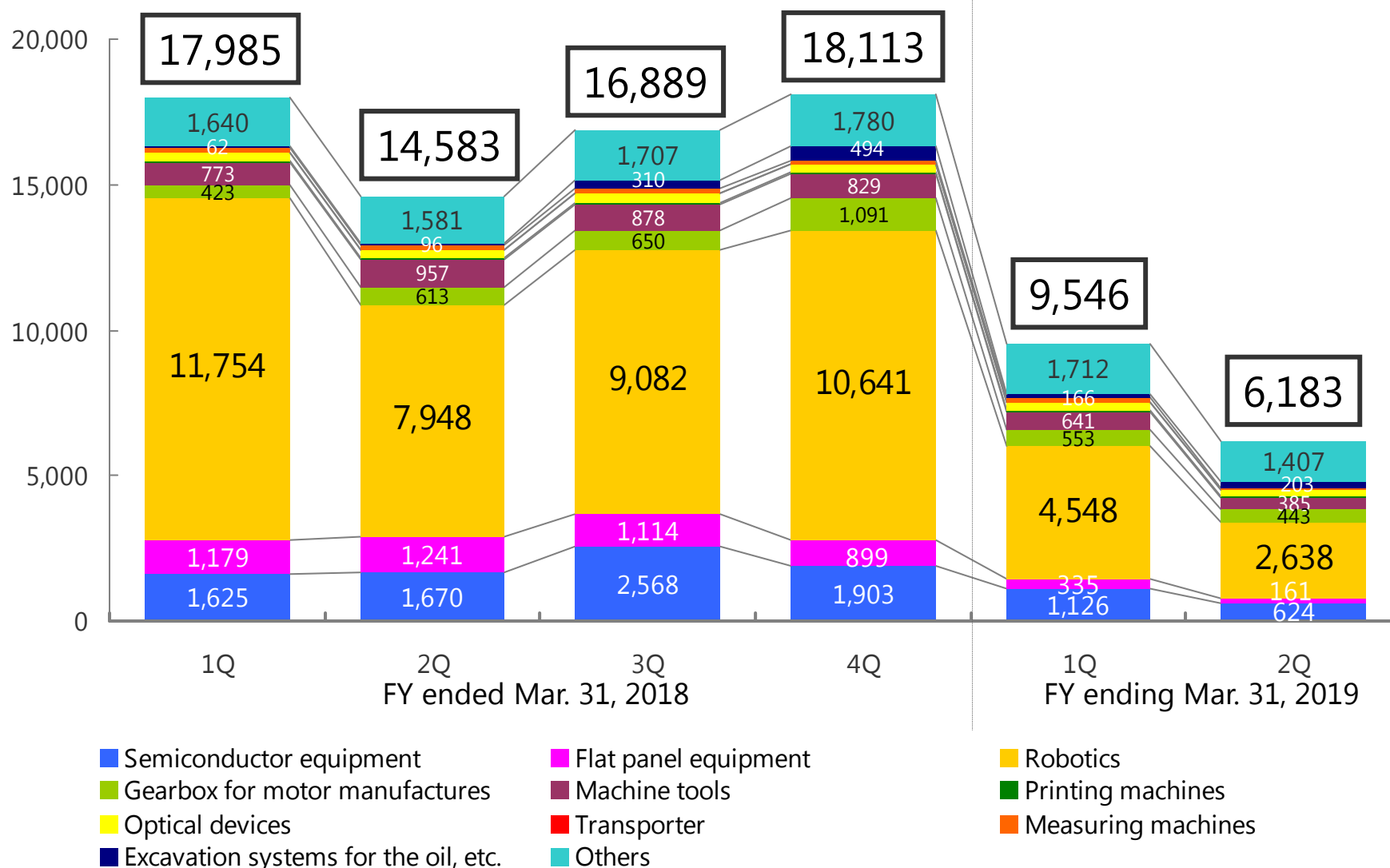


# Sales trend line by product (non-consolidated)

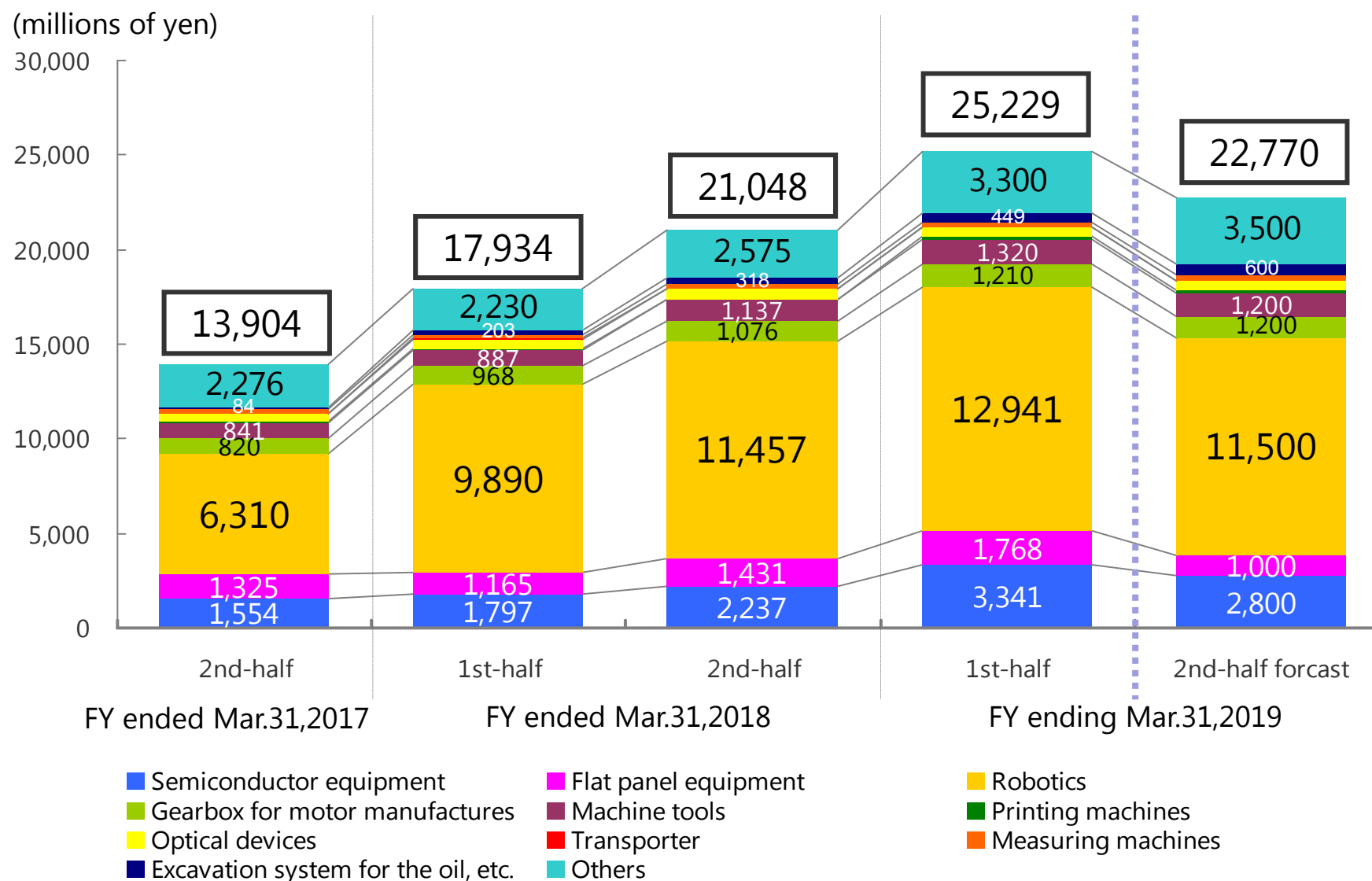


# Non-consolidated bookings by application (quarterly)

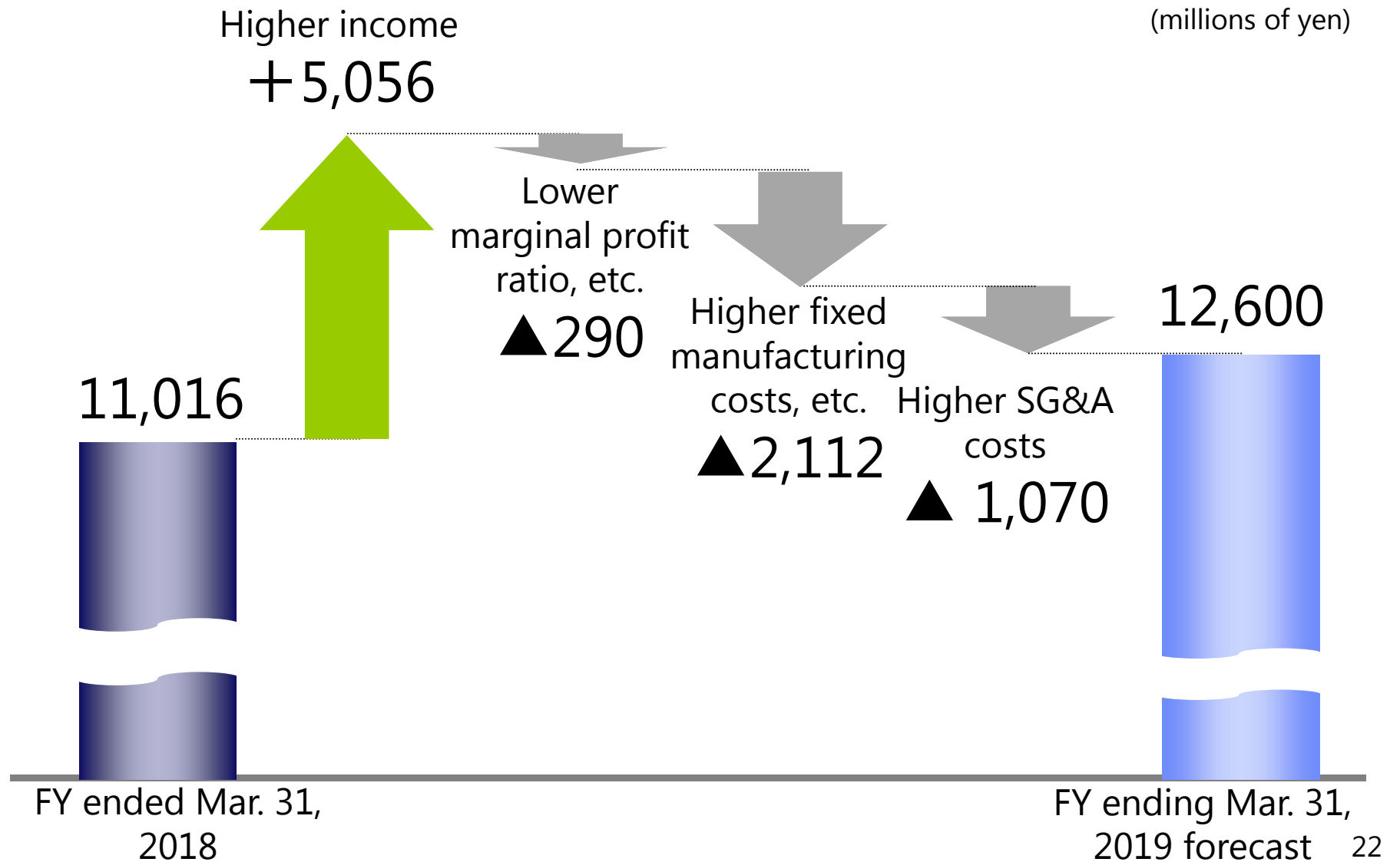
(millions of yen)



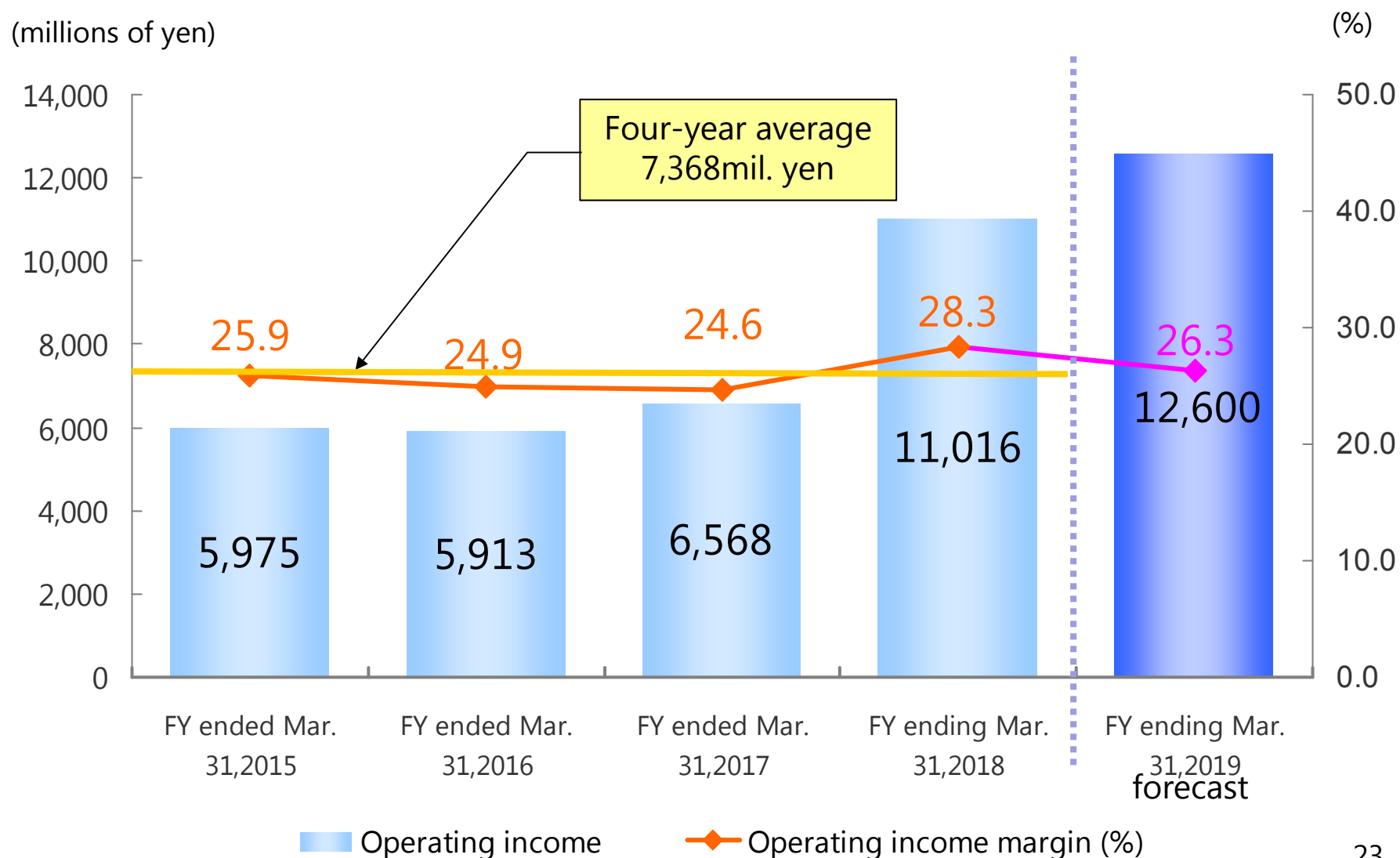
# Non-consolidated net sales by application (premise for 2nd-half forecasts)



# Factors in year-on-year change in non-consolidated operating income (fiscal year ending March 31, 2019 forecast)



# Trends in operating income (non-consolidated)



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# Future Outlook



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# Orders by Region

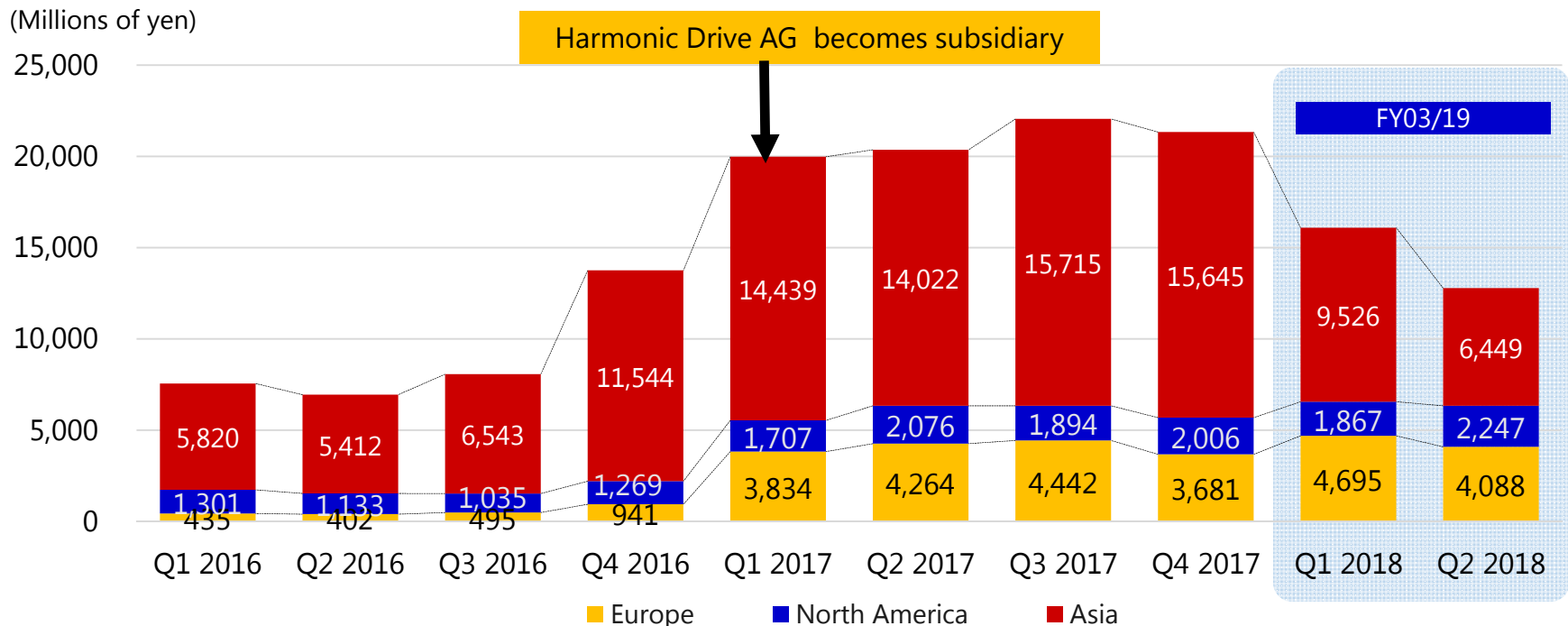
# Consolidated Orders, by region

## External environment

- In the preceding fiscal year, adjustment process in Asia due to “investment overheating” and “advance orders” centering on robots
- Adopting a wait-and-see approach for some investment due to US–China trade friction and revisions to China’s state subsidy system

## Internal environment

- Strong performance in Europe and North America
- Competitive advantage unchanged
- Expect upturn in orders from Q4 (firm in advanced-country economies, strong progress in plans for investing in automation)



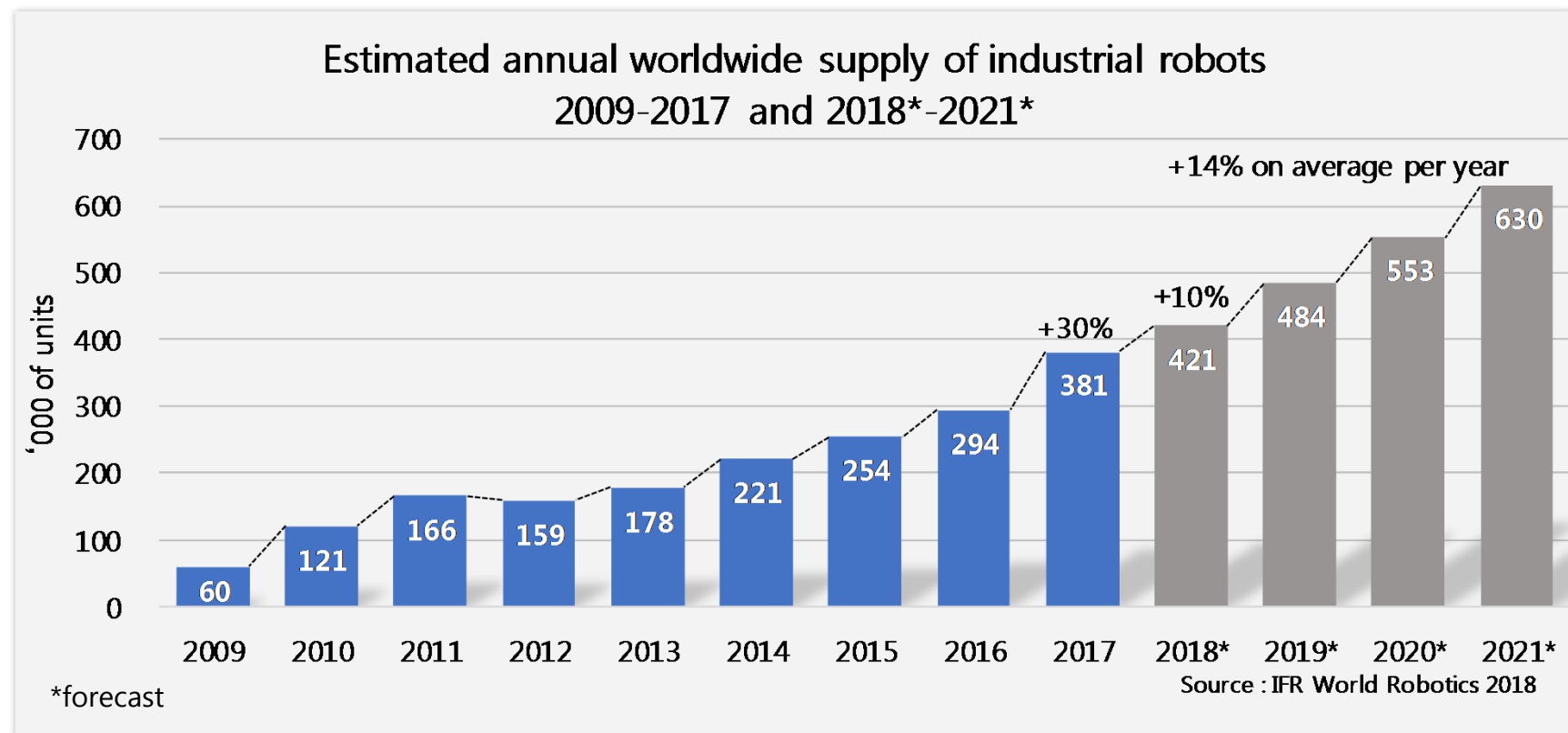
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# Trends in Main Fields of Application

# 1. Industrial robots

- Growth leveling off in 2018 due to US–China trade friction and revisions to China’s state subsidy system
- A wait-and-see attitude on some investment in Asia
- “Bringing jobs back home” campaigns in the US and other countries, as well as favorable demand for investment in automation in advanced and newly industrialized countries (backdrop of rising personnel expenses, worker shortages, and a growing quality focus)

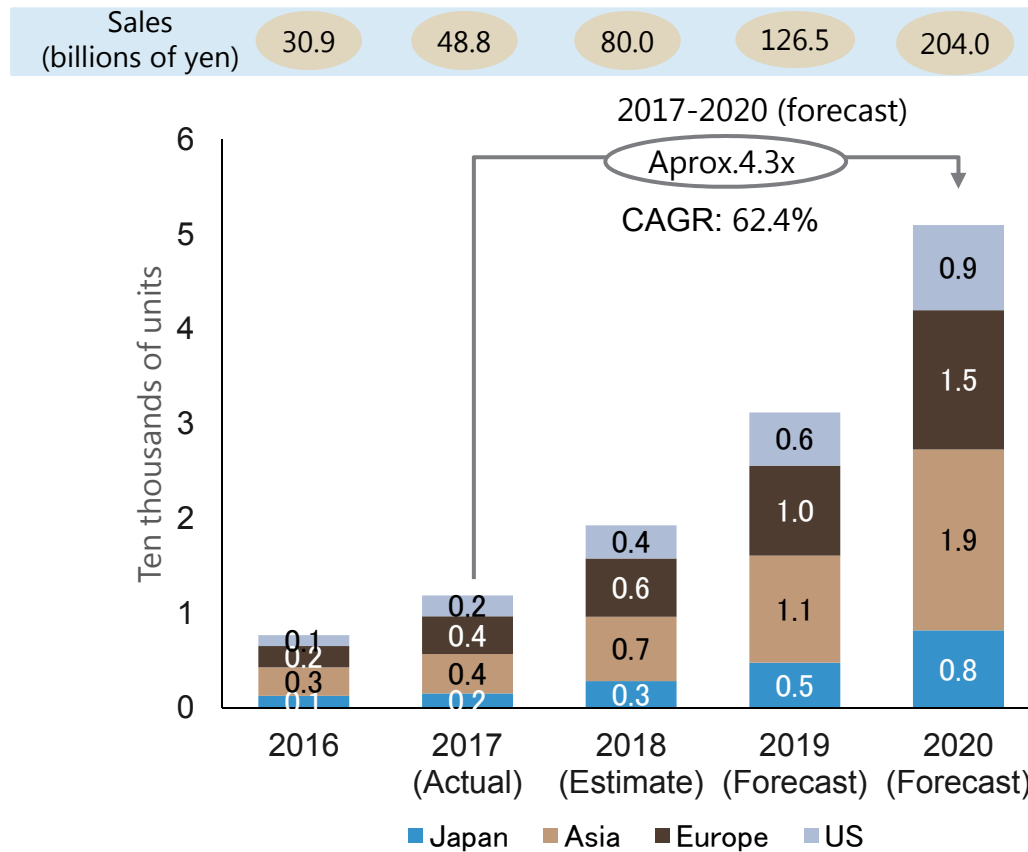
## Worldwide outlook for number of industrial robots sold



## 2. Collaborative robots (co-bots)

- Expanding adoption in the manufacturing and service industries
- Robust demand, centered on Europe

Expected size of the market for co-bots  
(by amount and units)



Source: Techman Robot Inc.

Source: "Reality and Future Outlook of Worldwide Robot Related Market 2018; Vol.1 FA Robot Market Edition," Fuji Keizai Group

### 3. Semiconductor manufacturing equipment, LED and OLED manufacturing equipment

#### Semiconductor manufacturing equipment

- At present, adjustments underway to invest in higher semiconductor multilayer and miniaturization technologies
- Growing demand for AI, VR, and CASE (automobile-related)
- Driven by 5G-related investment (3G [voice] → 4G [data] → 5G [video])
- Explosion in data volume driving increases in server demand and accelerating the shift toward cloud computing
- Shift from hard disk drives to solid-state drives



#### LED and OLED manufacturing equipment

- Demand for small- and medium-sized panels falling as smartphone growth levels off
- Demand emerging for OLEDs used in large TVs and onboard automotive electronics



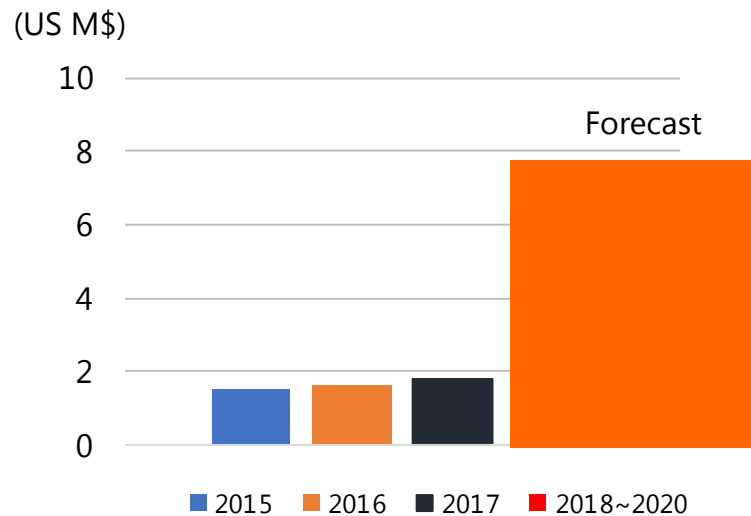
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# New Applications

# 1. Medical applications

- Robotics technology is playing an active role in medical practice
- Use of power assistance is expanding in physical therapy clinics and for easing the burden of carrying heavy objects
- Health insurance applicability to surgery assistance robots is growing

Market forecast for surgical robots



Source: IFR "World Robotics 2017 Industrial Statistics"

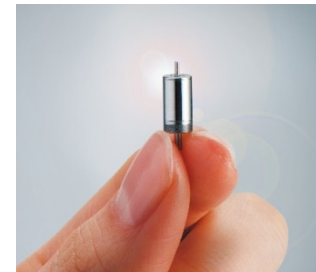
Surgical robots



Power assist suits



5mm diameter HarmonicDrive®

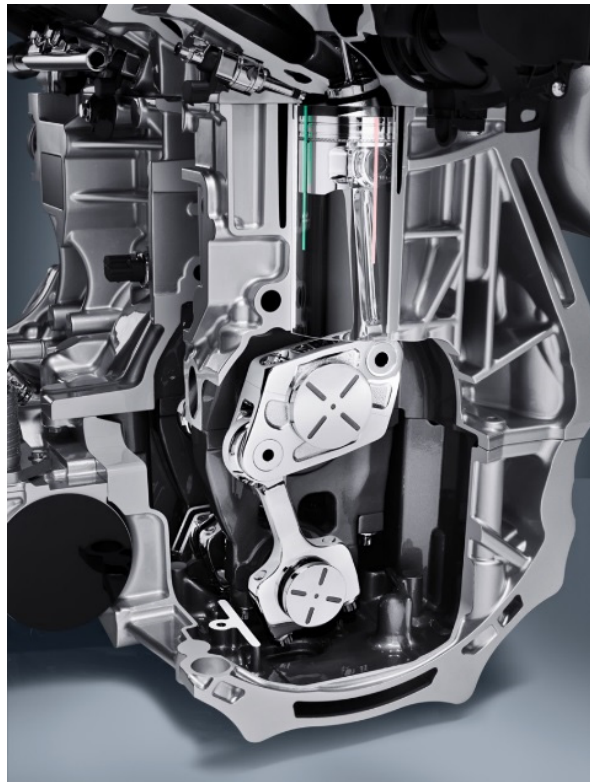




## 2.-(1) Helping to bring a revolutionary type of new engine into practical use

### ■ Nissan Motor Co., Ltd.

Used in actuator for variable compression ratio (VCR) engine  
One Harmonic Drive® used in each engine



Source: Nissan Motor Co., Ltd.

### **Significantly improved fuel performance**

- Compression ratio continuously changes according to driving conditions
- Significantly improved thermal efficiency
- Has been something of a dream among internal engine technologies, under development for more than 20 years



- ◆ Expected to drive next-generation technologies  
State-of-the-art technology contributing to the fusion of internal combustion engines and electric vehicles

## 2.-(2) Helping to bring a revolutionary type of new engine into practical use

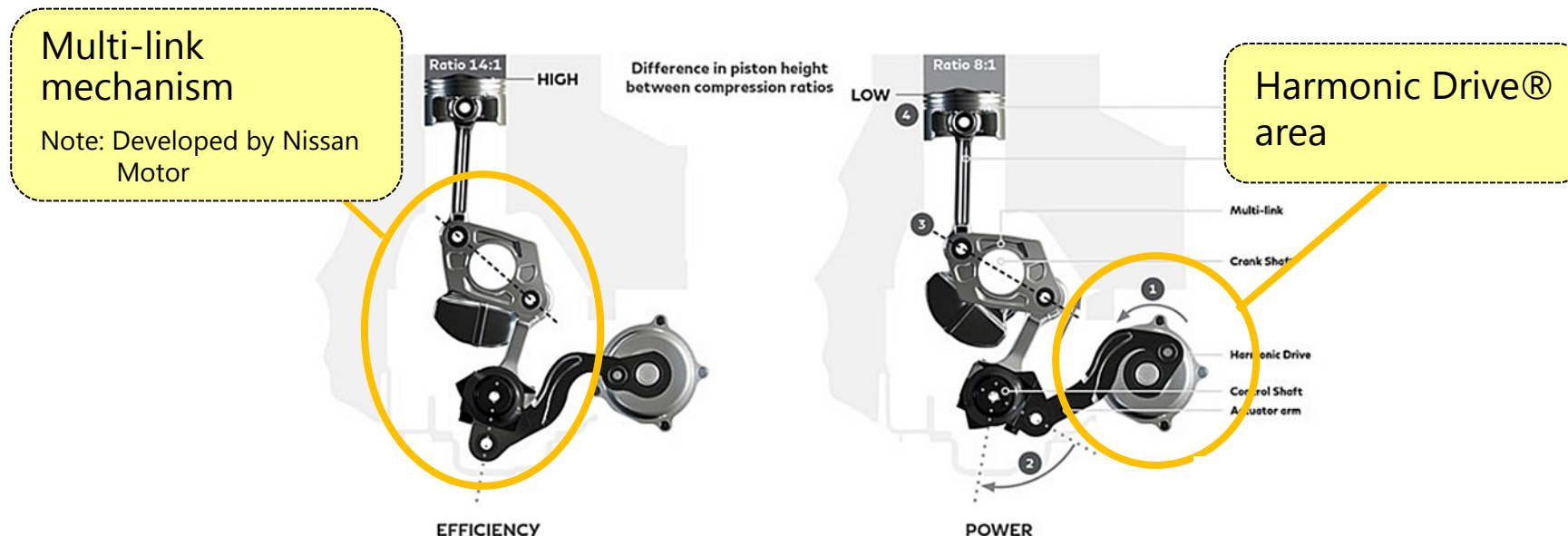
### ◆ Major technological breakthrough in internal combustion engines

Optimal compression ratio for travel obtained by changing the top dead center position of the piston

### ◆ We are developing and commercializing specialized speed reducer for VCR engines

Newly developed Harmonic Drive® Dual type

COMPARISON OF VC-T TECHNOLOGY IN HIGH AND LOW COMPRESSION RATIOS



Technology once considered a dream achieved through multi-link mechanism and new Harmonic Drive®

## 2.-(3) Autonomous motorcycle

### ■ Yamaha Motor Co., Ltd.'s MOTOROiD

Uses batteries as weights and pendulum principles to control balance

➤ Used in actuators to control vehicle position



Source: Yamaha Motor Co., Ltd.

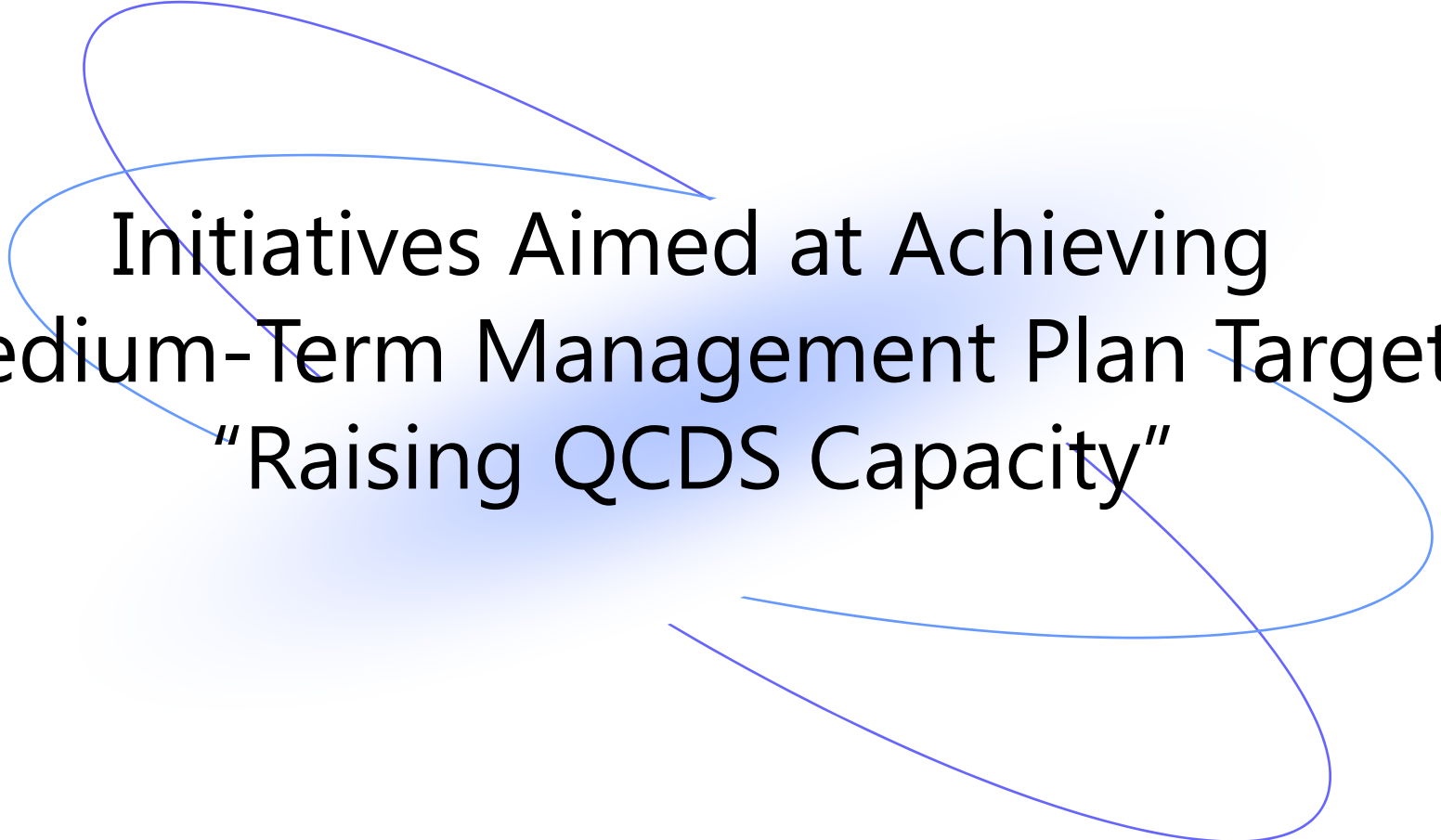
◆ Our AC servo actuators contribute help control vehicle balance

- Used to control steering and center of gravity
- Non-backlash contributes to improved controllability
- High marks for being lightweight and compact

◇ Unveiled at the 2017 Tokyo Motor Show

◇ On display at the Yamaha Motor Booth at World Robot Summit 2018 (October 17–21)



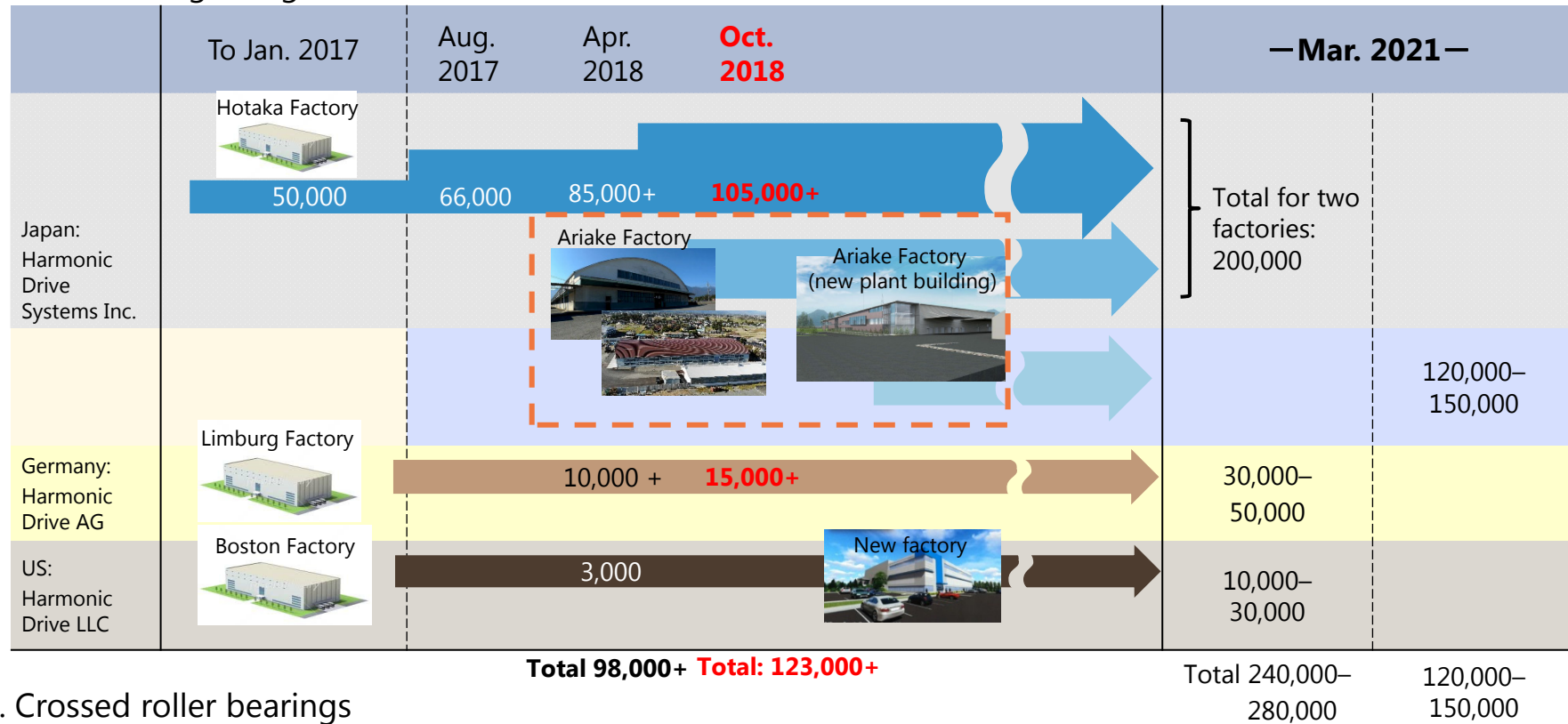


# Initiatives Aimed at Achieving Medium-Term Management Plan Targets “Raising QCDS Capacity”

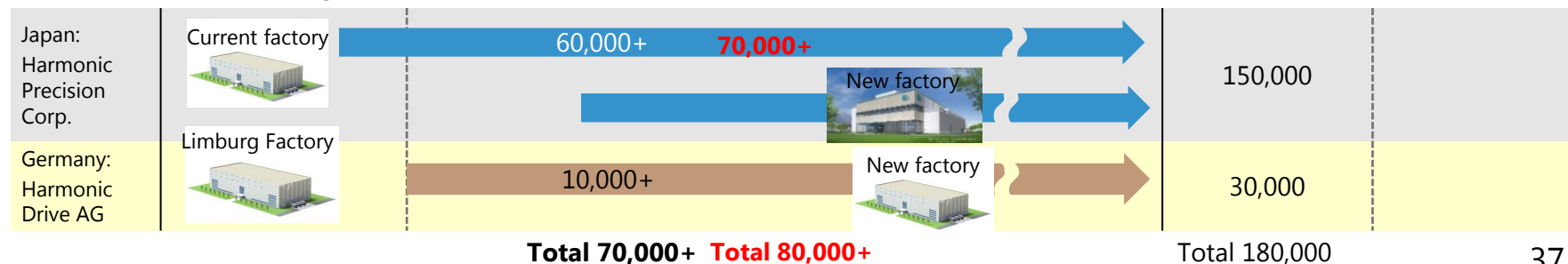
# 1. Roadmap to raising production capacity

## 1. Strain wave gearing devices

(Numbers indicate units produced per month)



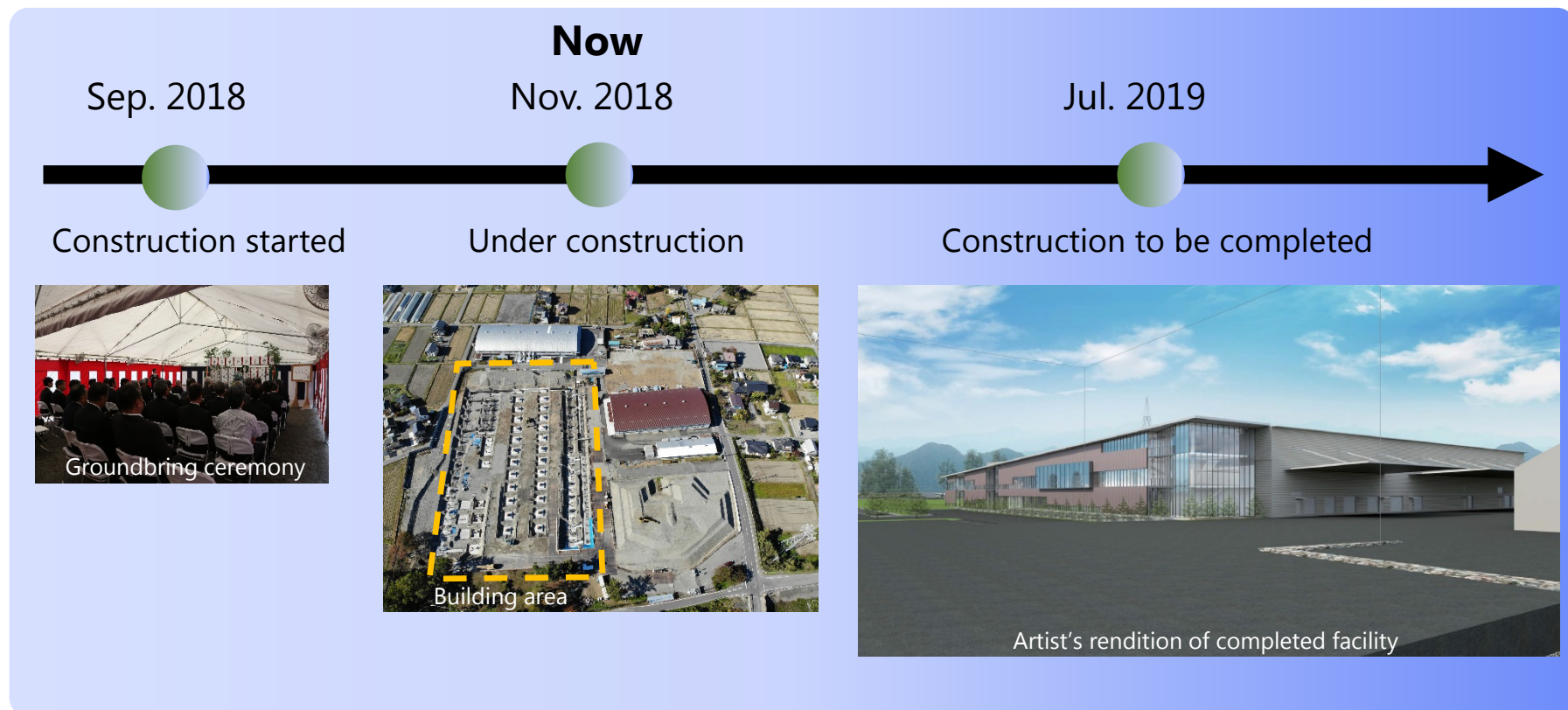
## 2. Crossed roller bearings





## 2. Construction of new plant building at the Ariake Factory (Azumino, Nagano Prefecture)

- Production base for strain wave gearing devices (Harmonic Drive®)
- Factory designed in anticipation of production increases over the medium term (total floor space of 21,818sqm)
- We plan to increase capital investment in equipment and increase the number of personnel in stages, keeping a close watch on demand trends



### 3. Construction of new plant building at the Matsumoto Factory (Matsumoto, Nagano Prefecture)

- Production base for crossed roller bearings
- Factory designed in anticipation of production increases over the medium term (total floor space of 23,659sqm)



## 4. Construction of new plant building at the US Factory (Beverly, Massachusetts)

- Production base for strain wave gearing devices (Harmonic Drive®)
- Designed to increased North American local production ratio and meet future demand increases (total floor space of 8,830sqm)





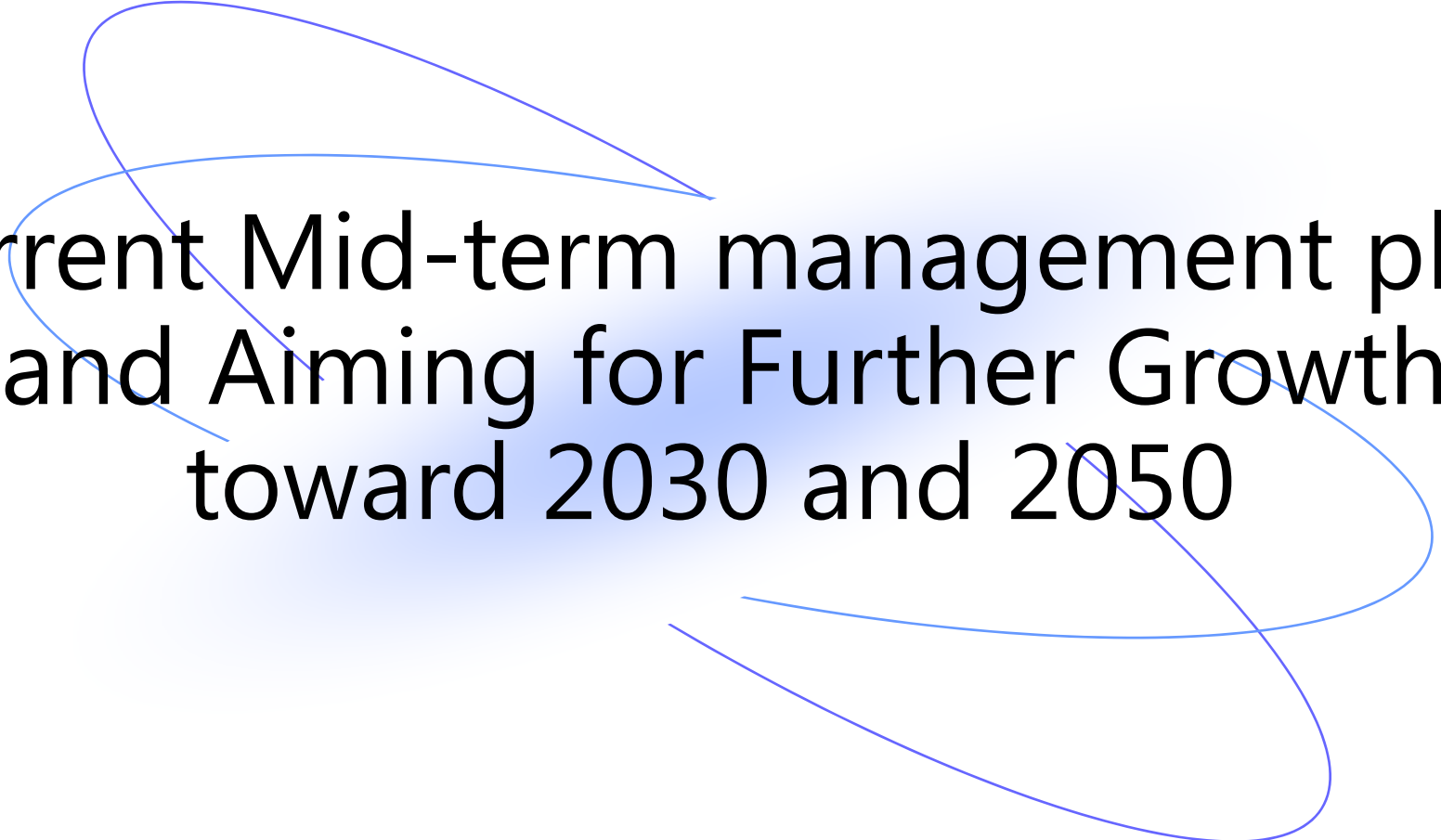
## 5. Efforts to increase productivity

- Expand automated lines
- Promote cross-trained workers
- Achieve ongoing improvements in fabrication, assembly, and testing processes



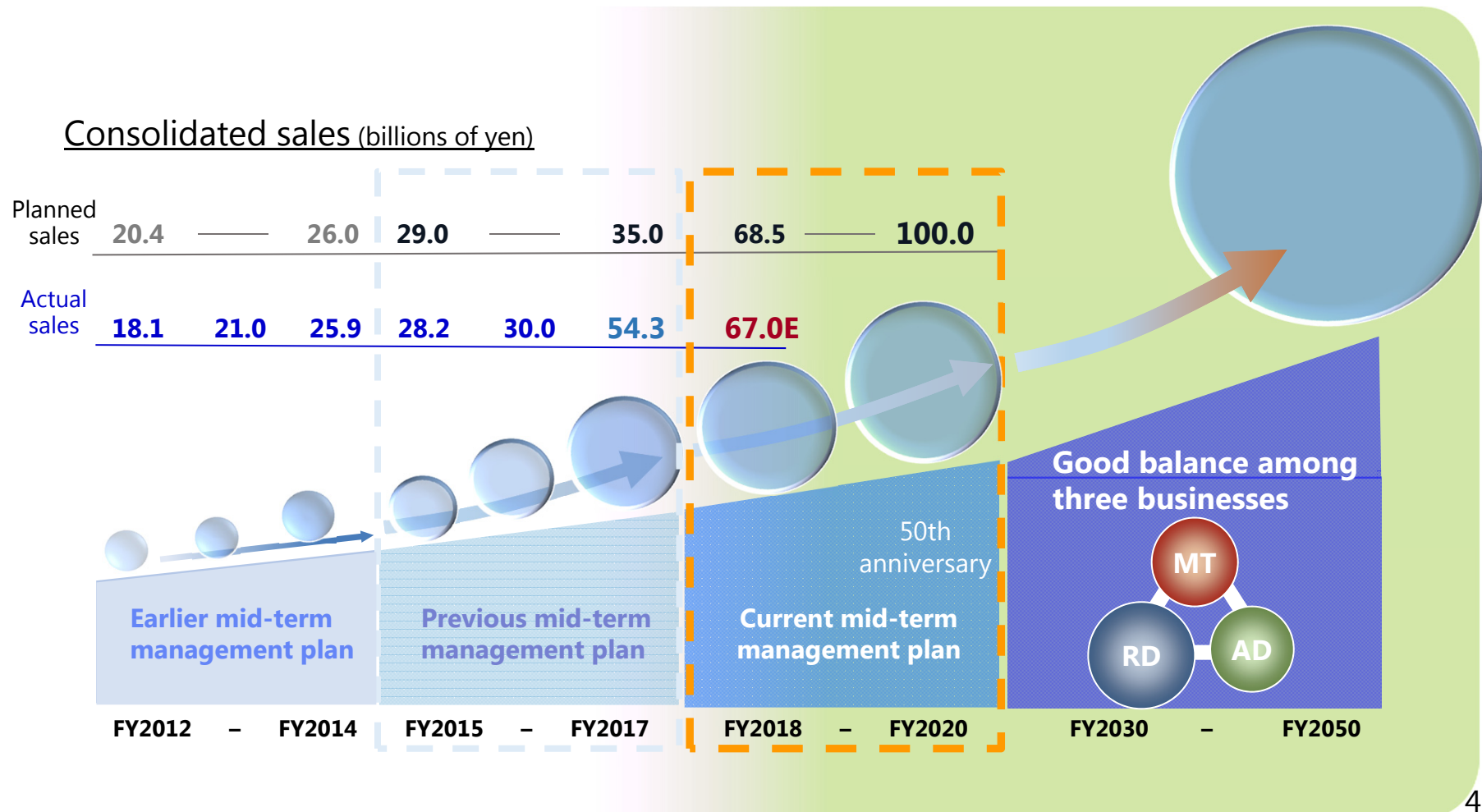
- Normalize and shorten delivery times
- Pursue further quality increases
- Enhance cost competitiveness



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# Current Mid-term management plan and Aiming for Further Growth toward 2030 and 2050

# Mid-term management plan and long-term vision



The performance targets and other numerical data presented herein are forecasts based on information available to the HDS Group at the time this material was prepared, and are subject to the influence of uncertainties including those in the economic and competitive environment. Actual performance may therefore differ materially from the forecasts given in this material.

***Harmonic Drive Systems Inc.***

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