YASKAWA

Investor's Guide
Business Part

Notes:

- **This material is composed mainly of basic contents to promote understanding of Yaskawa for analysts and investors.**
- **Figures in this document are rounded off and may differ from those in other documents such as financial results.**
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YASKAWA ELECTRIC CORPORATION
(TSE6506)

Index

1. Motion Control

   1-1. AC servo & controller
   1-2. Drives

2. Robotics

3. System Engineering

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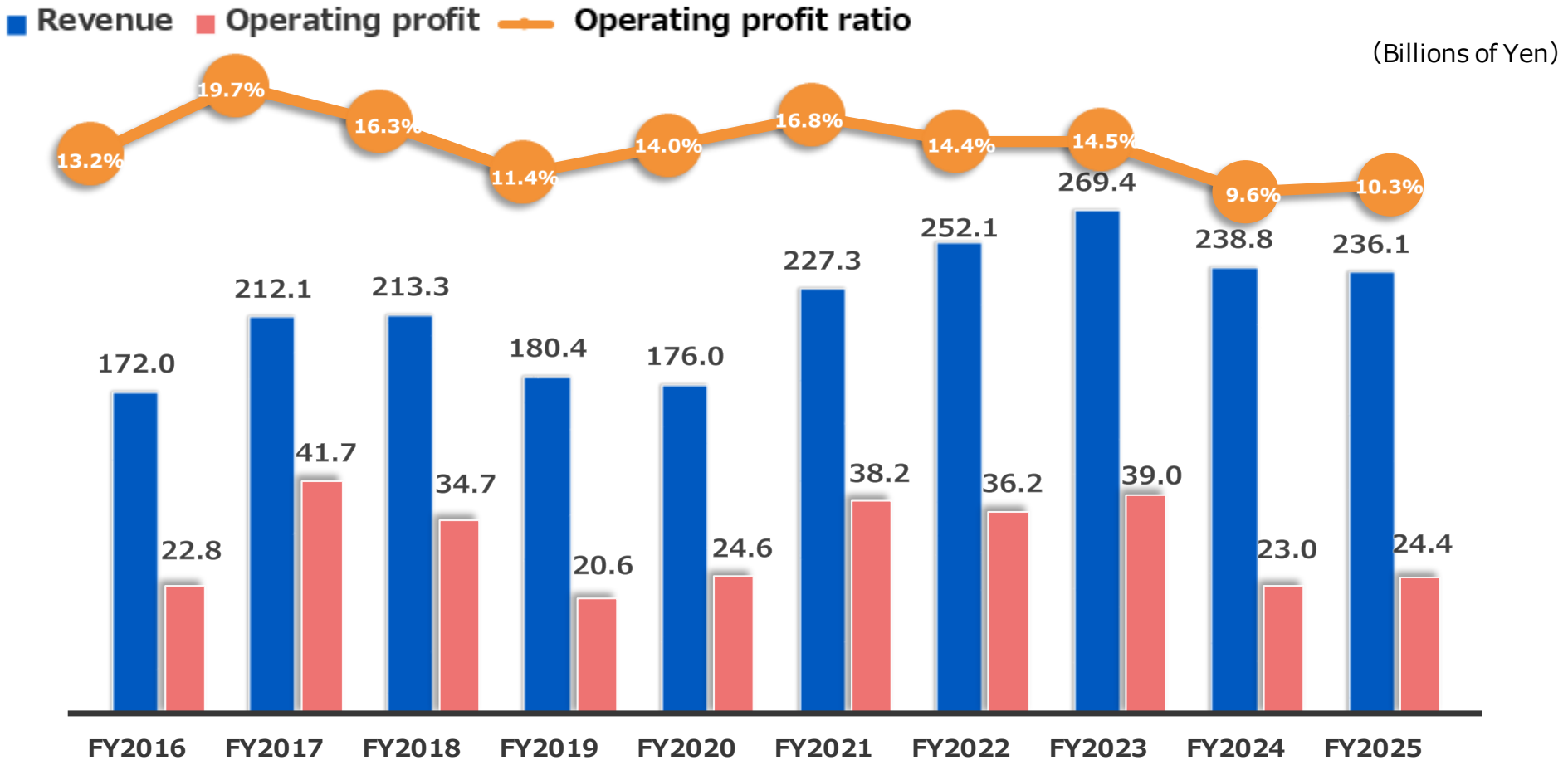
1. Motion Control

Product Basics

- **Motion control product includes "AC servo & controller" and "AC drive".**
- **Main difference is subjects and types of control.**

	AC servo & controller	AC drive
Subject of control	**Position and speed** of motor-driven machines 	**Rotational speed** of motors 
Features	・**Move exactly and steadily** to the commanded position and speed	・Provide **smooth and stable movement** by freely changing the speed of rotation ・**Contribute to energy saving** by adjusting the speed of rotation and **reducing wasted power consumption**
Range of use	**Narrow** : Field where high speed and precision are required	**Wide** : Life related, industrial equipment, etc.
Application	 **Machine tool**  **Semiconductor production equipment**  **Industrial robots**	 **Elevator**  **Air conditioning fan**  **Conveyor**

Revenue / Operating Profit （Motion Control）



Note1: Data up to FY2017 are based on Japanese GAAP.
Note2: The Company changed its accounting period starting FY2017 from March 20 to the last day of February. As a transitional year for this change, FY2017 was from March 21, 2017 to February 28, 2018.
Note3: Revisions were made to the division of businesses segments starting FY2017. The PV inverter business, which was previously included in Motion Control, is included in System Engineering. Figures and profit ratios of each segment for FY2016 reflect this change. The change is not applied to figures and profit ratios for the period up until FY2015
Note4: Revisions were made to the division of businesses segments starting FY2020. The high voltage AC drives, which was previously included in System Engineering, is included in Motion Control. Figures and profit ratios of each segment for FY2019 reflect this change. The change is not applied to figures and profit ratios for the period up until FY2018.
Note5: From FY2024, we revised the segment classification of PV inverter, which had been included in the System Engineering segment, to be included in the Motion Control segment. Figures for FY2023 are also presented based on the revised information.

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1-1. AC servo & controller

Product Basics (1/3)

What is an AC servo drive ?

An automatic controller consisting of a servo amplifier and a servo motor that follows the target level indicated by the controller

AC servo drives

Commanding controller

Command the target level

Controlling servo amplifier

Control the torque, speed and position of the motor to follow the target level

Driving and Detecting motor / encoder

Feedback the operation status to the servo amplifier

Controller

Position・Speed・Torque command

Operating status

Servo amplifier

Current Command

Dedicated servo motor

Position・Speed Feedback

* A servo amplifier can only control **a dedicated synchronous motor**.

The purpose is to improve equipment performance and stabilize quality through highly accurate position, speed and torque control.

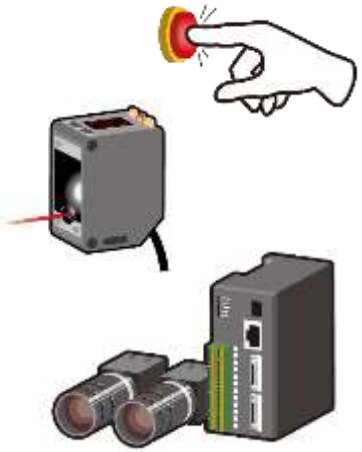
Product Basics (2/3)

What is a controller?

A control equipment that controls AC servo drives, AC drives, and robots, etc.

Input

Push buttons, sensors, cameras, etc.



Processing program

Input information and controll output

Controller (MP Series)

Output

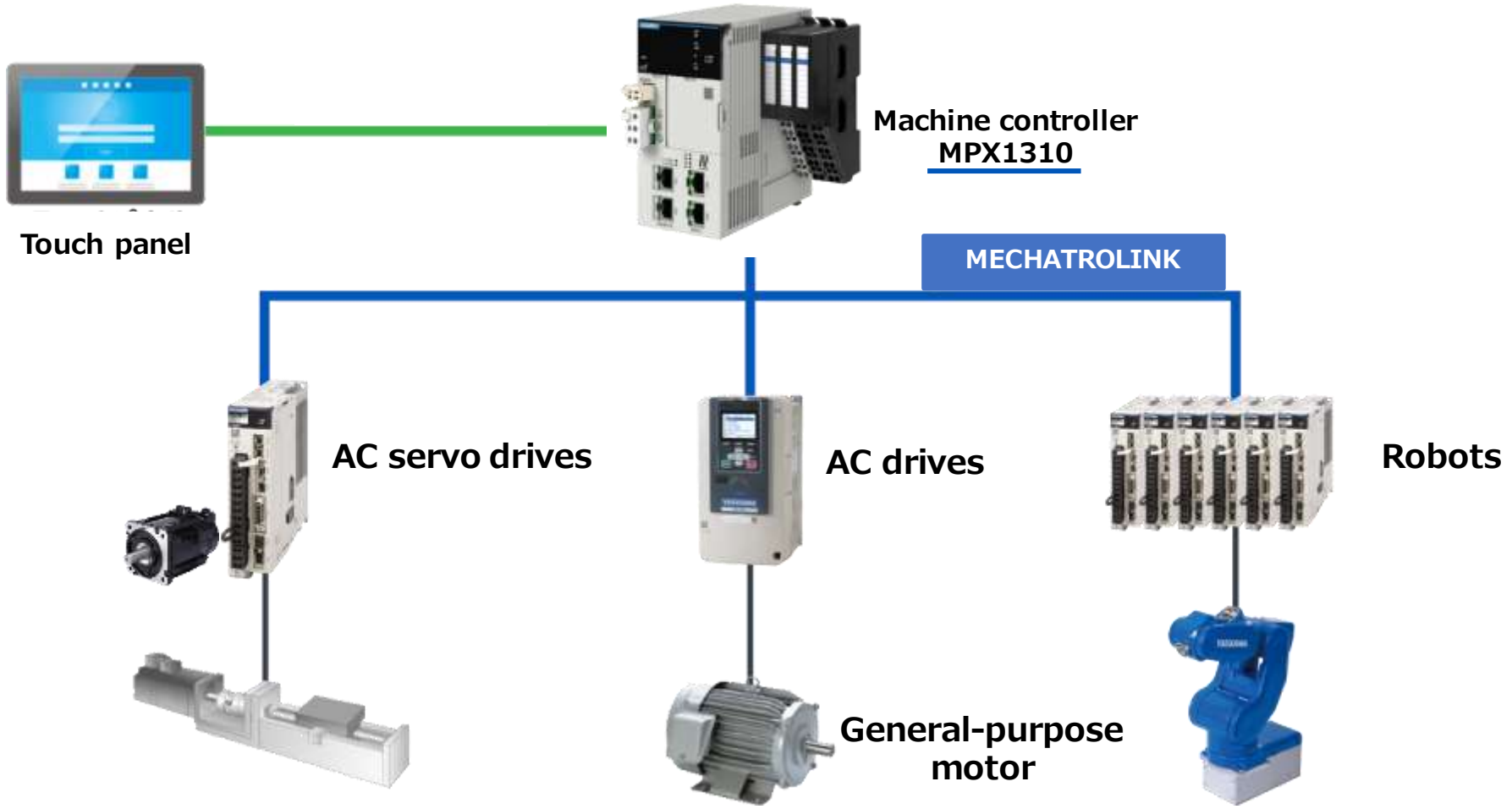
AC servo drives, AC drives, robots etc.

The purpose is to improve productivity through highly accurate control

Product Basics (3/3)

Flowchart of machine controller (MP Series)

Receive signals from touch panels to control AC servo drives, AC drives, and robots, etc.

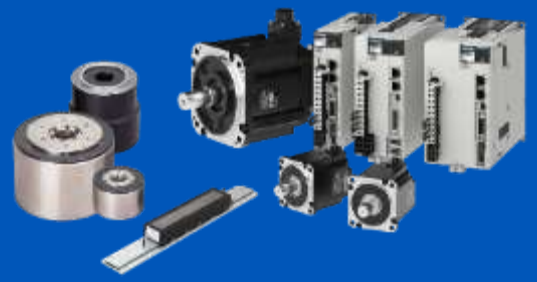


Applications and Market

Machines for semiconductor, LCD & electronic component

- Semiconductor manufacturing Equipment
- LCD manufacturing equipment
- Electronic component processing and assembly equipment

AC servo motor



Supports motion control for various applications

General industrial machines

- Metal processing machine
- Wood processing machine
- Resin molding machine
- Food processing machine
- Packaging and filling machine
- Logistics and transportation equipment
- Medical equipment
- Printing machine
- Textile machine
- Papermaking

Machine tools

- NC lathe
- Machining center
- Milling machine
- Grinder

Robots

- Industrial robot
- Clean transfer robot
- Vacuum transfer robot

Product Lineup

Wide lineup to accommodate to various applications

Controller

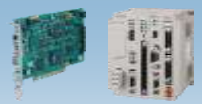
iCube Control

YRM1000 Series
YRM Controller

MPX1000 Series
Machine Controller

SLIO I/O Series
I/O Products

MP3000 Series
Machine Controller
Board type
Modular type etc..



MP2000 Series
Machine Controller
Board type
Modular type etc..

MIRAMOTION

Galvano controller

2D 3D
Galvano scanner

Network

MECHATROLINK (MECHATROLINK-4, MECHATROLINK-III etc..)
other Field Network

AC Servo Drives

Σ-X Series

SERVOPACKs
Σ-XS model
Single-axis
AC200V/400V
50W to 15kW

Σ-XW model
Two-axis
AC200V
200W to 1.0kW

Σ-XT model
Three-axis
AC200V
200W to 400W

Rotary Servomotors

SGMXA model
Low inertia,
high-speed
50W to 7.0kW

SGMXJ model
Medium inertia,
high-speed
50W to 750W

SGMXG model
Medium inertia,
high torque
300W to 15kW

SGMXP model
Medium inertia,
flat type
100W to 1.5kW

Σ-7 Series

SERVOPACKs
Σ-7S model
Single-axis
AC100V/200V
11W to 15kW

Σ-7W model
Two-axis
AC200V
200W to 1.0kW

Rotary Servomotors

SGM7M model
Low inertia,
ultra-small capacity
3.3W to 33W

SGM7J model
Medium inertia,
high-speed
50W to 750W

SGM7A model
Low inertia, high-speed
50 to 7.0kW

SGM7P model
Medium inertia, flat type
100W to 1.5kW

SGM7G model
Medium inertia, large torque
300W to 15kW

Direct Drive Servomotors

SGM7E model
Coreless,
Inner Rotor
2N·m to 35N·m

SGM7F model
With Core,
Inner Rotor
Small capacity
2N·m to 35N·m
Medium capacity
45N·m to 200N·m

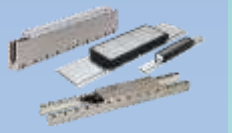
SGM7D model
With Core,
Outer Rotor
1.3N·m to 240N·m

Linear Servomotors

SGLG model
Coreless
12.5N to 750N

SGLFW2 model
With core F
45N to 2520N

SGLTW model
With core T
130N to 2000N



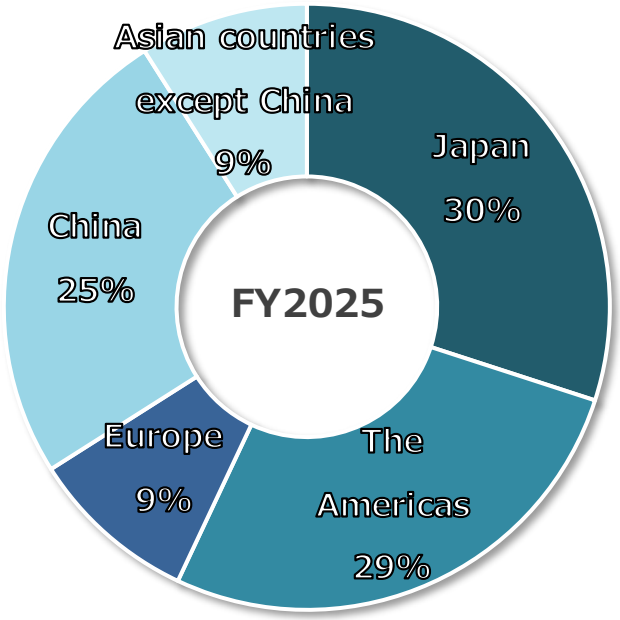
Large-capacity Σ-V Series

SERVOPACKs
SGDV model
22kW to 55kW

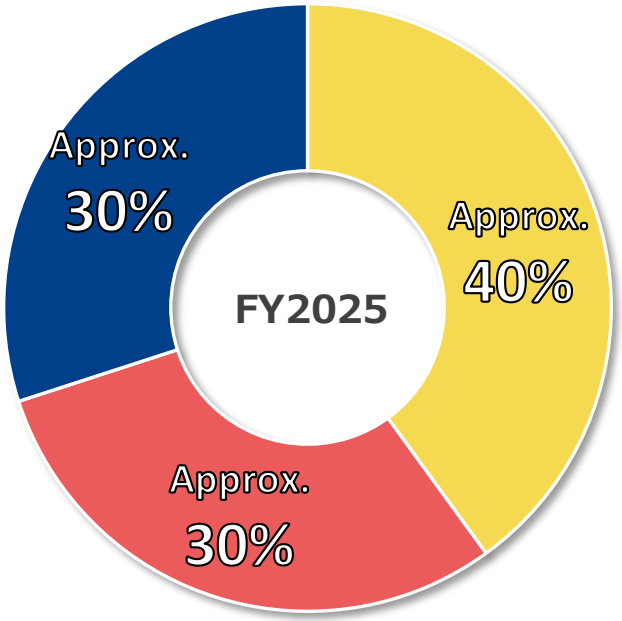
Rotary Servomotors
SGMVV model
Large capacity,
Low inertia
22kW to 55kW

Revenue Breakdown by Region and Application, Market Share

Breakdown of revenue by region

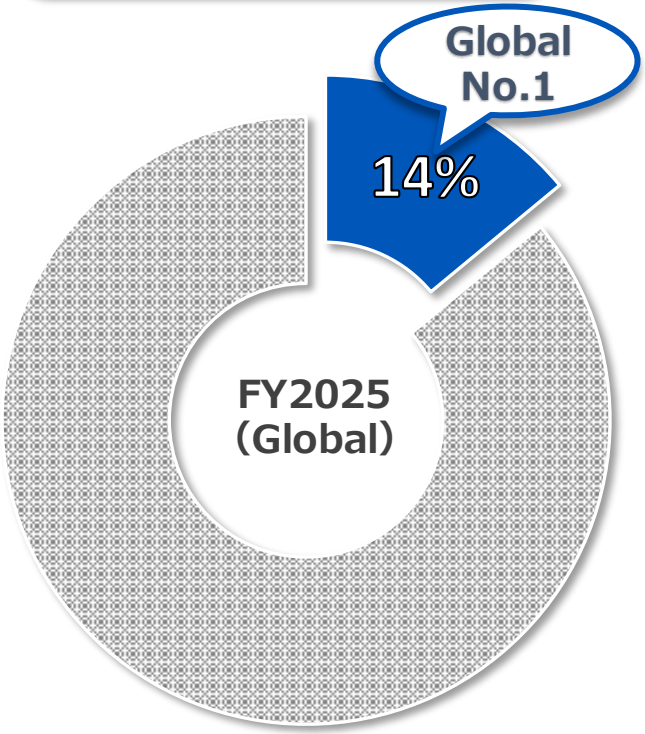


Revenue breakdown by application



- Electronics-related industries including semiconductor, FPD and electronic components
- Machinery-related industries including machine tool, metal processing, press machine and robots
- Other (Packaging,textile,injection molding,etc.)

Market share



[Note] Company estimate

Total Shipment

AC Servo Drive
Σ-X Series

FY1983
AC Servo Drives
Debut

FY1990
AC Servo Drives
All Digital

FY1992
Σ-Ⅰ Series Release
Small・Fast・Operating Ease

FY1997
Σ-Ⅱ Series Release
International Safety Standard

FY2002
Σ-Ⅲ Series Release
Compact・High Speed・High Precision

FY2007
Σ-Ⅴ Series Release
Field-Proven Performance

FY2013
Σ-7 Series Release
7 Ultimate e-motional Solution

FY2021
Σ-X Series Release
Motion × Digitaldata Solution

1 Million Units

5 Million Units

10 Million Units

20 Million Units Over

(10 Thousand Units/Year)

(10 Thousand Units/G.TTL)

300 250 200 150 100 50 0

3,000 2,500 2,000 1,500 1,000 500 0

1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

Fiscal Year

New Product Features (1/3)

Features of Σ-X Series – Improvement of motion performance

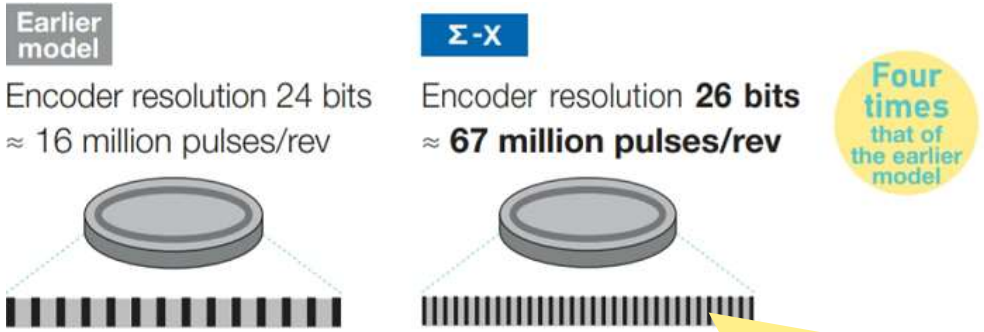
Maximum motor rotation speed

The maximum rotation speed of the motor has increased from the earlier value of 6,000 min^{-1} to 7,000 min^{-1}.

Applicable models:
All SGMXJ and SGMXA models

Equipped with a high-resolution 26-bit encoder

The resolution* of the encoder has been increased to 26 bits, four times that of the earlier model.
24 bits of encoder resolution is position precision resolving 1 revolution of a motor to 67 million pulses



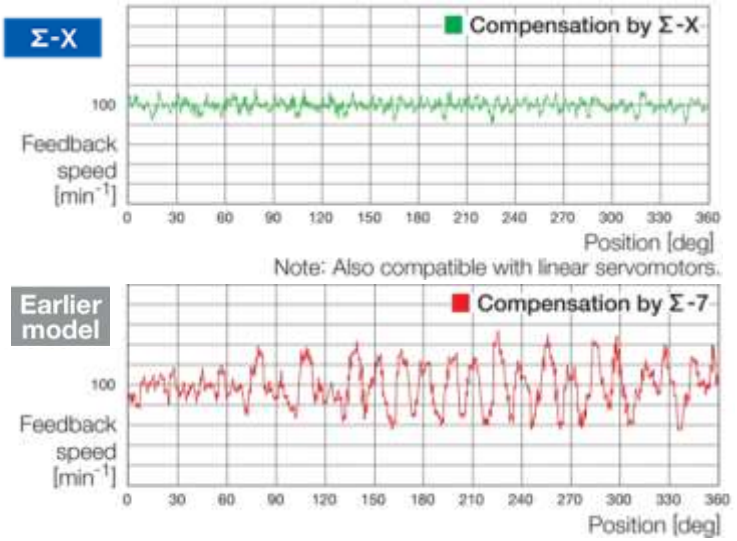
*Ability to measure how finely a motor rotation can be split

Speed frequency response

Speed frequency response has changed from 3.1 kHz for the earlier model to 3.5 kHz. Maximizing the following performance for the speed reference improves equipment productivity.

Improved control precision and smoothness

Smoother drive is possible from a more effective speed ripple compensation algorithm for cogging compensation. This helps reduce inconsistency in equipment machining precision and quality.



New Product Features (2/3)

Features of Σ-X Series –Sensing and use of data

The servomotor acts as a sensor and collects various data. It can be used for preventive maintenance of equipment.

Σ-X uses the servomotor as a sensor to sense and monitor the parts used by the servo and the servo's installation environment. This can be useful for accurately determining maintenance periods and for preventing sudden failures.

■ Sensing Items

Encoder Power-on Time (New)
Encoder Supply Voltage
Encoder Battery Voltage
Motor Rotation Count
Maintenance Prediction Monitor: Bearing
Maintenance Prediction Monitor: Oil Seal
Acceleration Sensor Monitor

Estimated External Disturbance Torque
Number of Serial Encoder Communications Errors
Settling Time
Amount of Overshoot
Residual Vibration Frequency
Estimated Vibration
Maximum Value of Accumulated Load Ratio
Number of MECHATROLINK Communications Errors
Margin until Overload
Temperature Margin until Servomotor Overheats

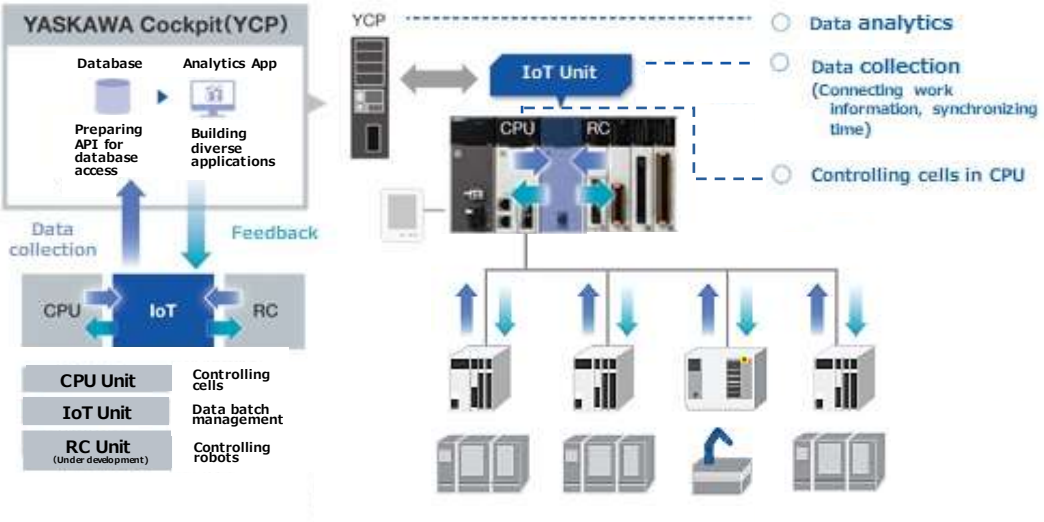
● Both installation environment information and the service life of parts used by the servo can be monitored.

New Product Features (3/3)

YRM controller

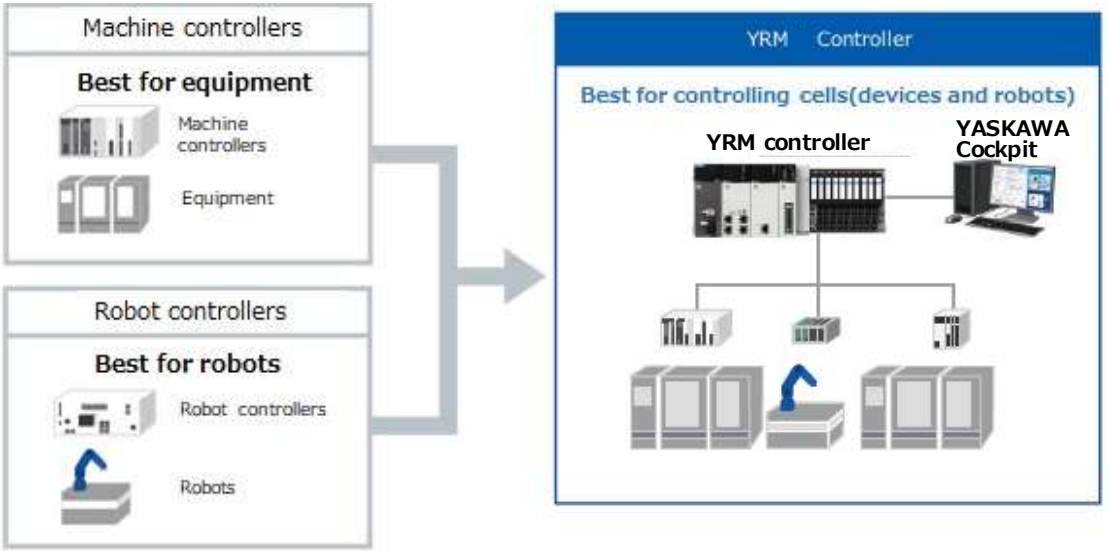
YRM-X controller

YRM1010



① Controller **controlling cells**

Cells : A connected equipment where data relatedness exists
e.g.) Facilities composing devices or/and industrial robots etc. and working on common tasks

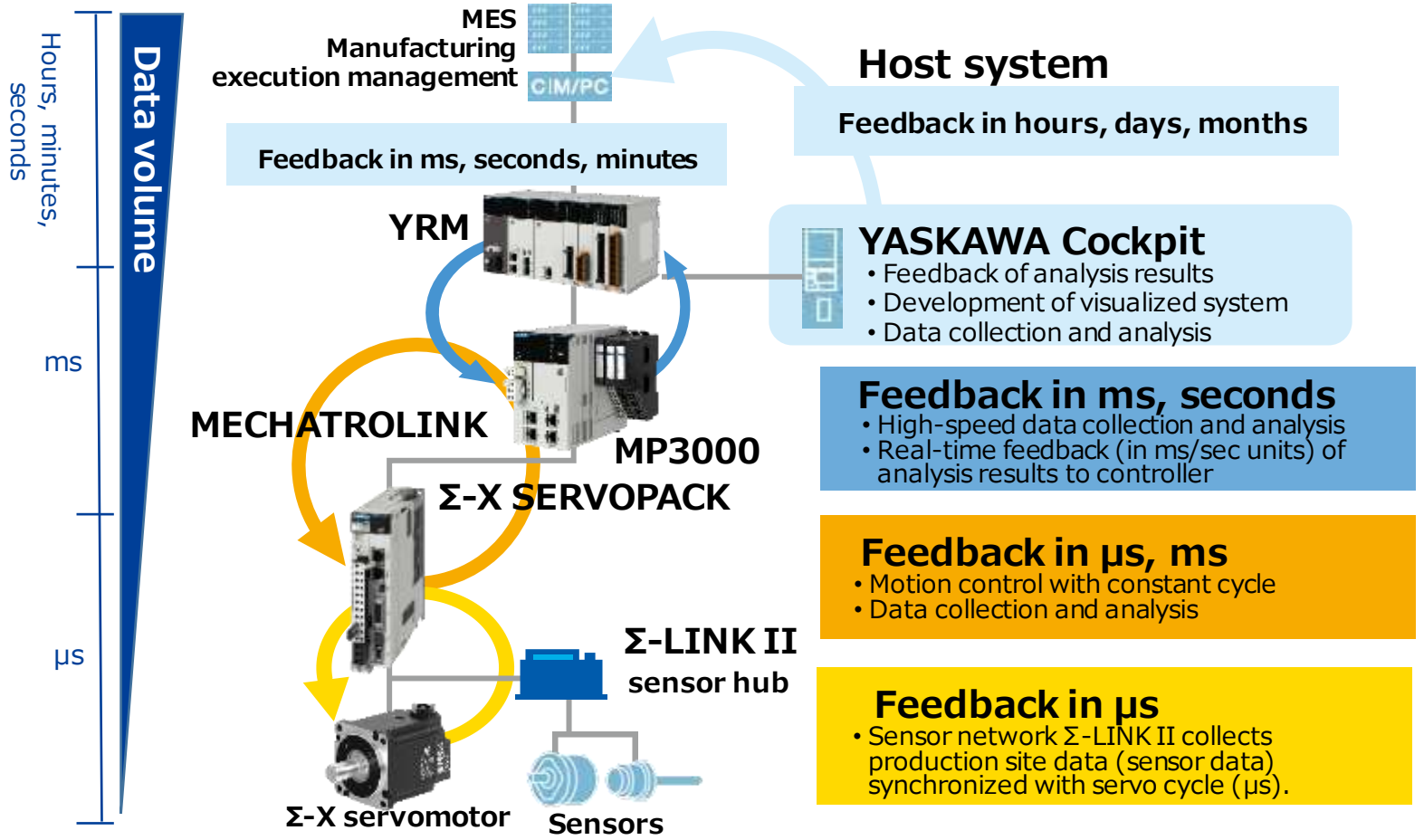


② A controller that enables to **integrate equipment, robots, and data** and turn data into movement

- Real-time understanding of the status of an entire cell by acquiring **synchronized data** of equipment and robots is possible. **The results of analysis** of the acquired data **are fed back to the entire cell** as "data" and "motion" to realize automation of manufacturing (stable operation, stable quality, and process improvement).

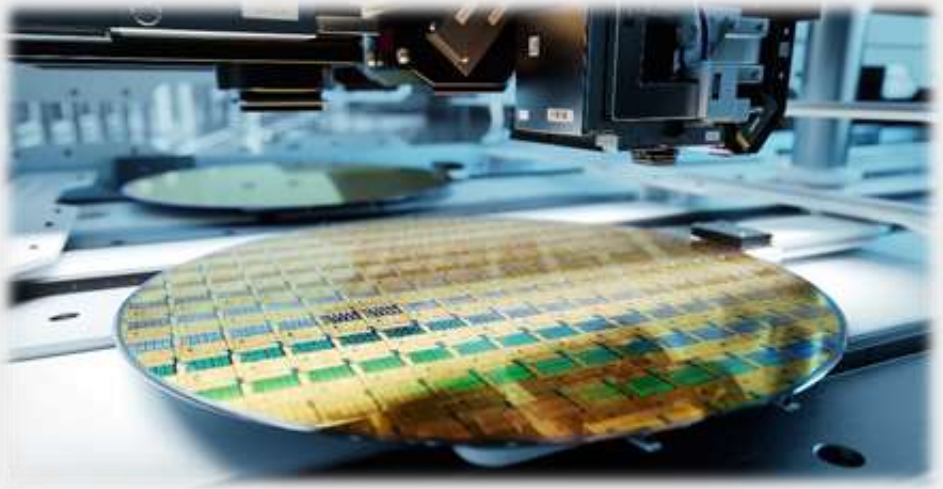
Products realizing i³-Mechatronics

- Products realizing i³-Mechatronics enable the collection and use of time-aligned data
- While Σ-X enables the acquisition of small amounts of data at a high frequency of μs, YASKAWA Cockpit and YRM controller enable the collection and analysis of large amounts of data in seconds and use them for feedback.



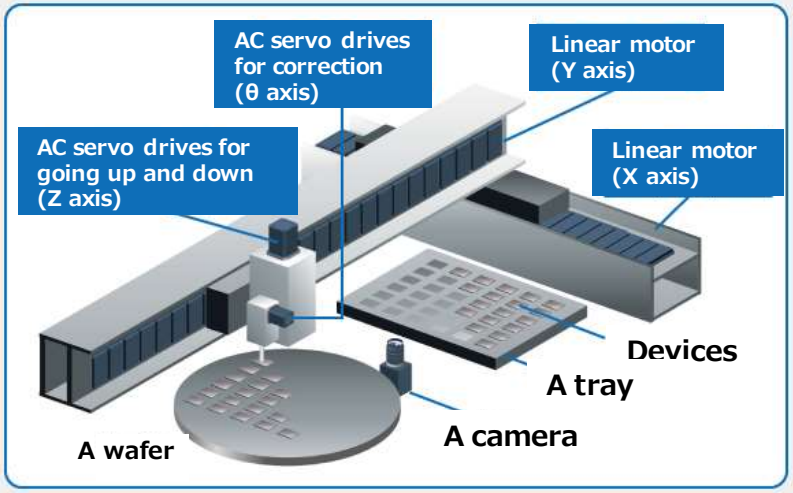
(Reference) Application of AC servo & controller

Electronic component



Semiconductor production equipment

Structure of die bonder



Metal processing machine

Injection molding machine

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1-2. Drives

Product Basics (1/3)

What is an AC drive?

Device for controlling rotation speed by changing voltage and frequency supplied to motor

Commanding controller

Direct operation command or operation command via controller

Controlling AC drive

Convert voltage and frequency set internally and externally and output to the motor

Driving and Detecting motor / encoder

Controller

Forward/Reverse

Operation command

AC drive

Power signal

General induction motor
Synchronous motor

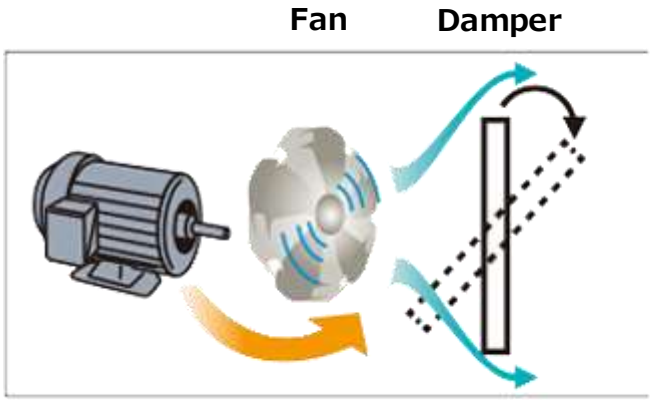
Encoder feedback

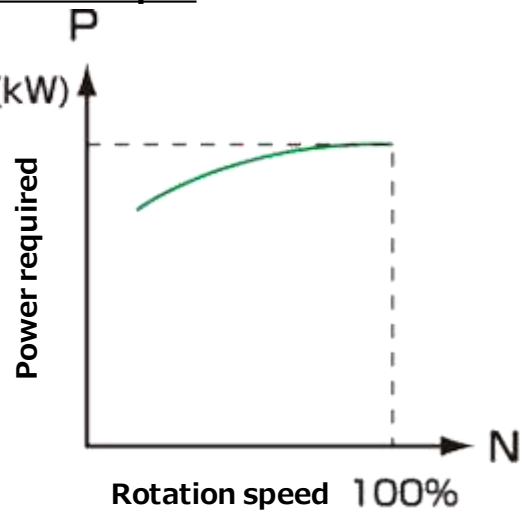
※AC drives can control motors from **other companies**

Product Basics (2/3)

What are energy conservation benefits of AC drives?

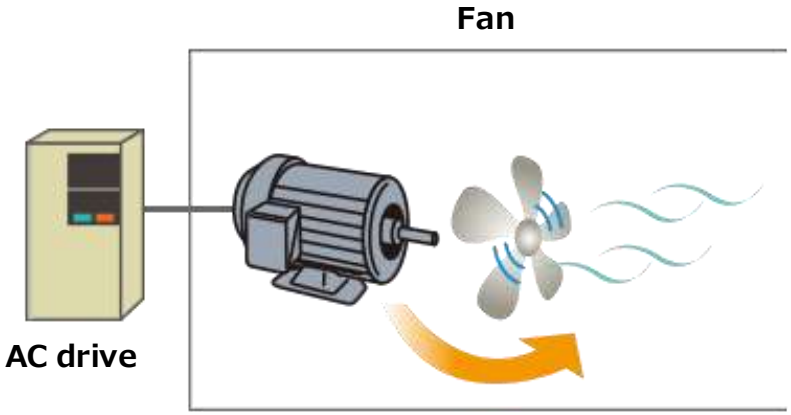
◆Conventionally, motors had constant speed + damper

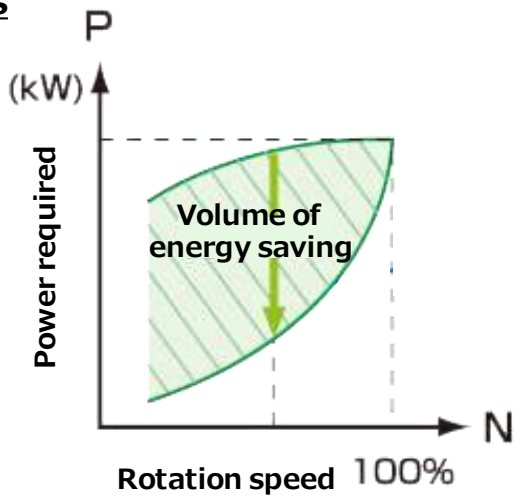




Without AC drives, the rotational speed of the motor cannot be changed, so the air volume is adjusted with a damper (on-off valve).

◆Variable speed motor control by AC drives



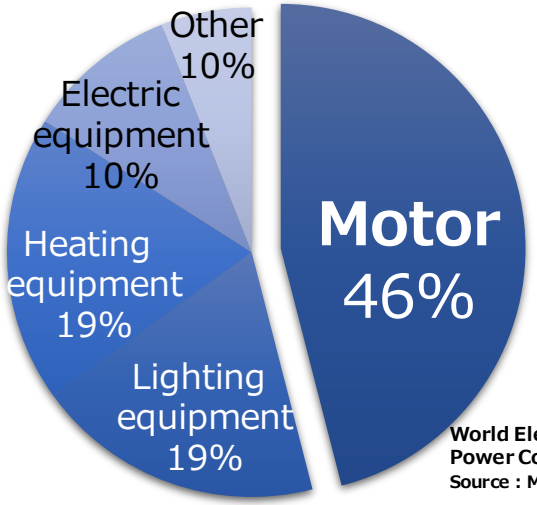


AC drives can adjust the motor speed according to the required air quantity, resulting in saving a lot of energy.

Product Basics (3/3)

The reason AC drives are needed

◆**Motor takes about half of the world's electric power consumption**



World Electric Power Consumption
Source : MOTOR SUMMIT 2012

◆**Global regulations have accelerated the high efficiency-oriented needs towards motors**

Country Name (Region)	Schedule for introducing high efficiency regulations										
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Japan	IE1	Top Runner standards					IE3				
U.S.	IE3 (Foot mount type, etc) / IE2 (Flange type, etc.)						IE3				
China	IE2					IE3 or IE2 IE3(PM motor added)			IE3		
Europe	IE2				IE3 or IE2+drive			IE3		IE4 / IE3	
Korea	IE2						IE3				

Refer to "Trends in Overseas Efficiency" published by JEMA (The Japan Electrical Manufacturers' Association) (Oct, 2020)

◆**High efficiency motors require AC drives**

Efficiency Classified	Motor Type	
IE5 Ultra Premium High Efficiency Motor	Permanent magnet motors, Magnet-assisted Synchronous reluctance motors	AC drives required
IE4 Super Premium High Efficiency Motor	Permanent magnet motors, Magnet-assisted Synchronous reluctance motors	
IE3 Premium High Efficiency Motor	Permanent magnet motors, Synchronous reluctance motors	
IE2 High Efficiency Motor	Induction motors	AC drives required in EU
IE1 Standard Motor	Induction motors	

High ↑ Efficiency ↓ Low

Applications and Market

Fluid machinery

- Air conditioning system
- Fan pump
- Compressor
- Vacuum pump

AC Drive/PM motor

Supports motion control for broad applications

General industrial machine

- Metal processing machine
- Food machine
- Wood processing machine
- Textile machine
- Resin molding machine
- Chemical machine
- Papermaking and printing machines
- Packaging and filling machines
- Environment-related machine
- Life-related machine

Conveyance machine

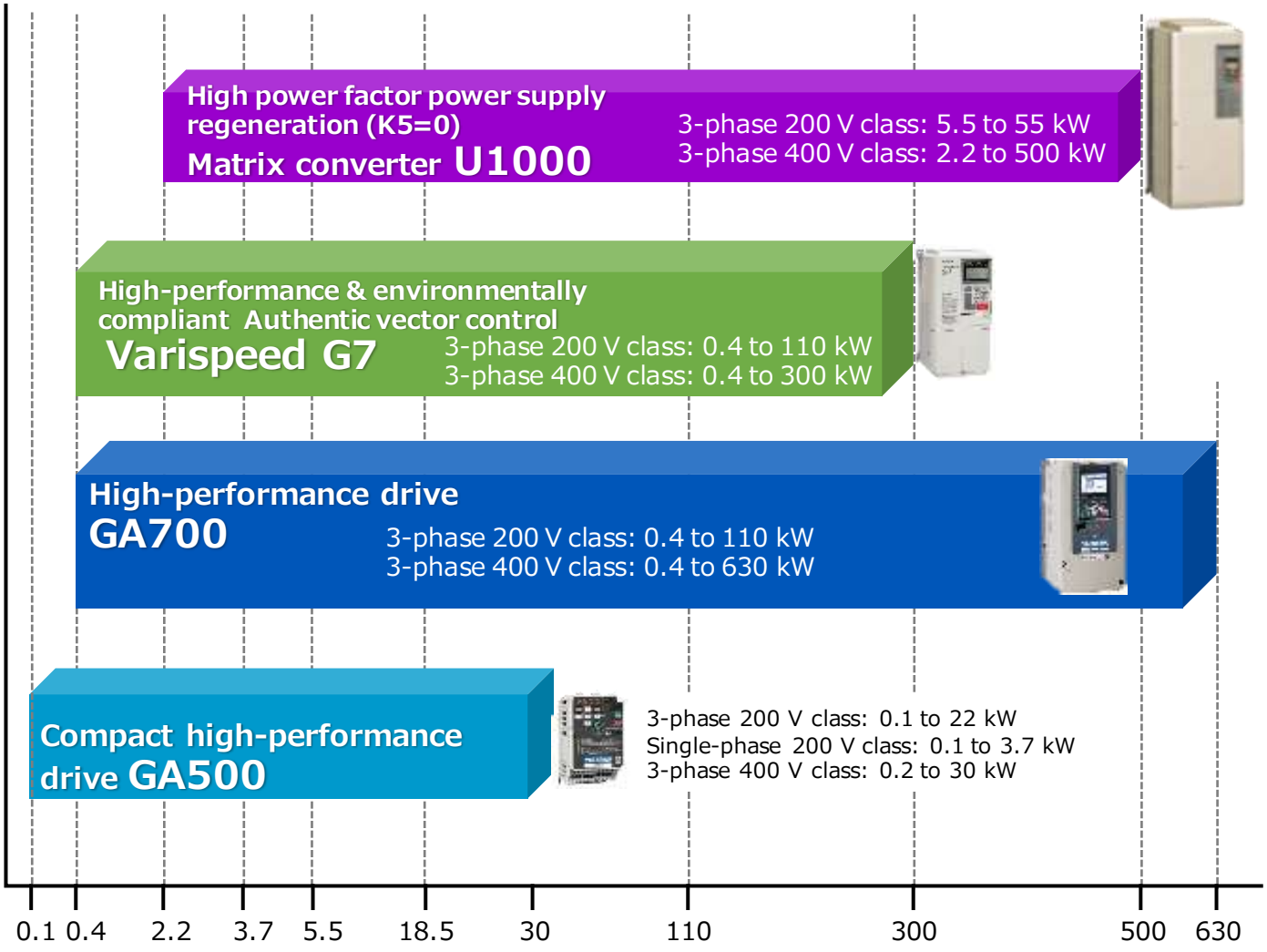
- Conveyor
- Crane
- Hoisting machine
- Multistory parking garage

Lift

- Elevator
- Escalator
- Light Lift
- Automated warehouse

Product Lineup

Develop lineup for application-specific products, including power supply regeneration and vibration suppression functions



For Lifts
LA700/ES700*1

For HVAC
HV600*1

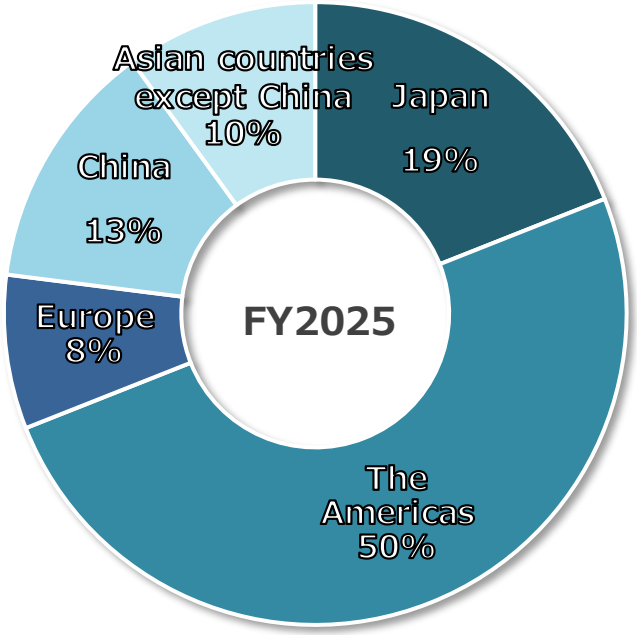
for pumps
FP605*1

For cranes
CR700/CH700*1

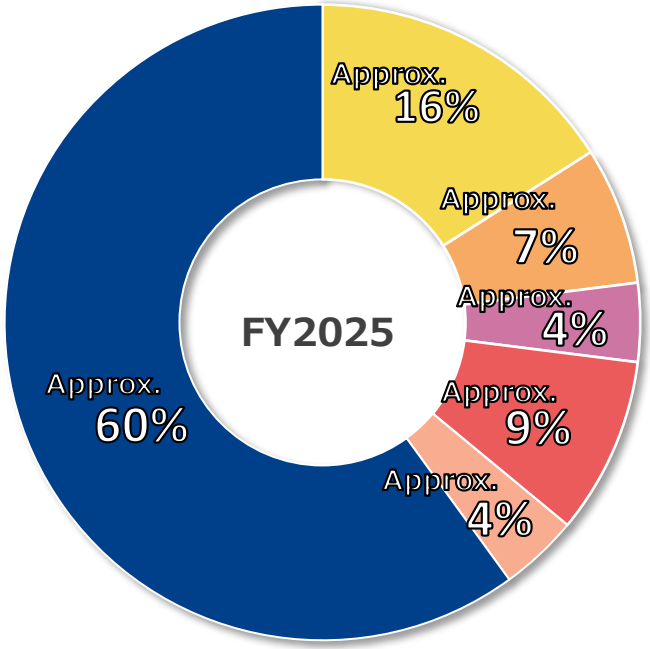
*1: Sold overseas only

Revenue Breakdown by Region and Application, Market Share

Breakdown of revenue by region

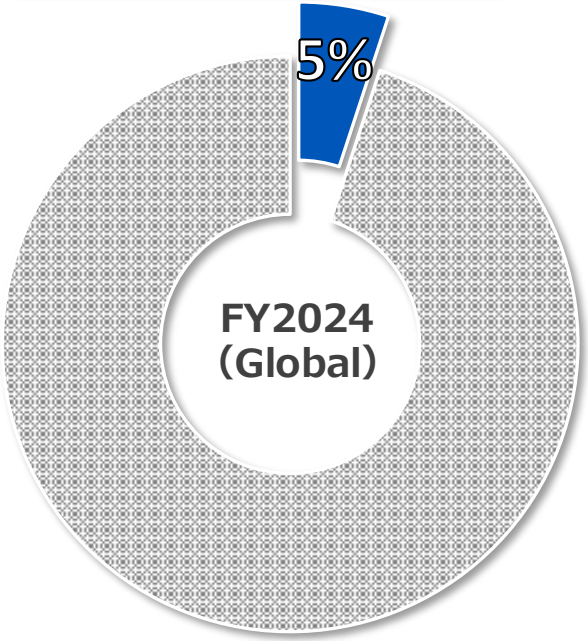


Revenue breakdown by application



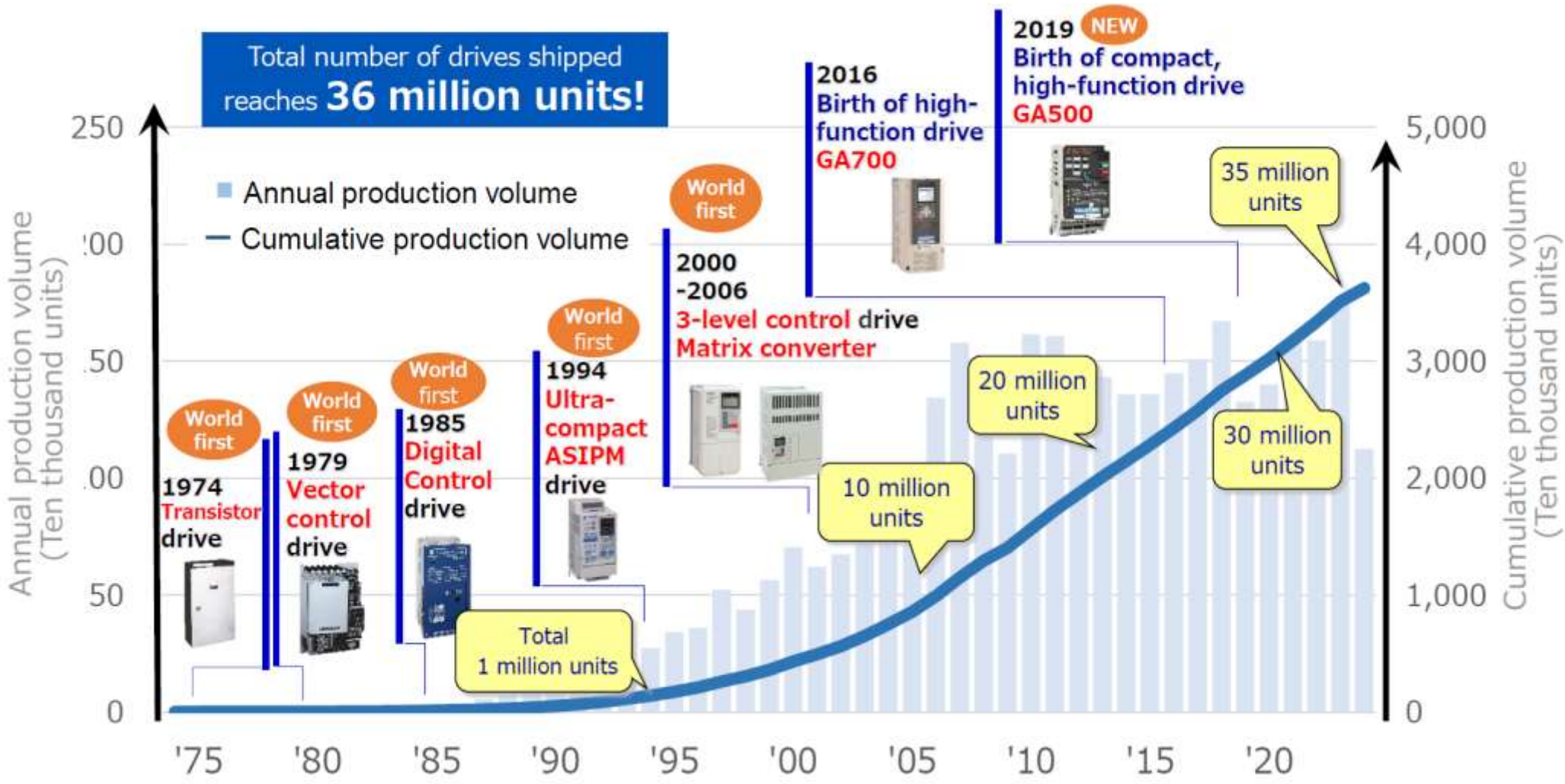
- Air-conditioning systems for buildings (HVAC and compressors)
- Cranes and hoists
- Pumps and fans
- Oil & gas
- Elevators
- General-purpose machinery / Other (Textile machinery, metal processing machinery, packaging machinery, conveyors, etc.)

Market share



[Note] Company estimate

Total Shipment



Features of Yaskawa's products (1/4)

Unique detecting function

Monitoring machine behavior data through AC drives and preventing serious troubles by detecting machine changes in detail

Using behavior data
to detect deterioration of machine and equipment

Conveyor for transportation
- Belt rupture
- Drive chain rupture
- Bearing deterioration at roller area

Fan
- Filter clogging
- Broken fans
- Loosened pulley belt

Pump
- Bearing for motor
- Bearing deterioration

Compressor for chiller
- Liquid pack detection

Features of Yaskawa's products (2/4)

Energy-saving initiatives 1

Selling **PM motor** achieving high-efficiency, energy-saving operation when used in combination with AC drives

Lineup

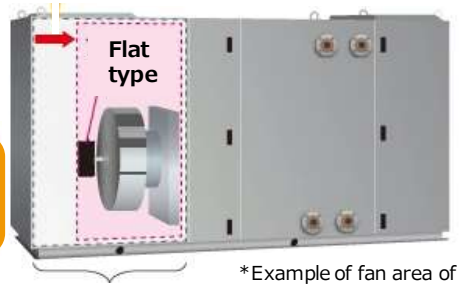
Eco PM motor flat type

- Achieving the highest (IE5) efficiency of the five efficiency classes
- Contributing to space-saving, resource-saving, and energy-saving by significant reduction of motor length
- Decreasing noise level by reduction of fans

IPM motor SS7

- Realizing the high efficiency which is nearly the second highest (IE4) of the five efficiency classes
- Compact and lightweight, contributing to resource conservation

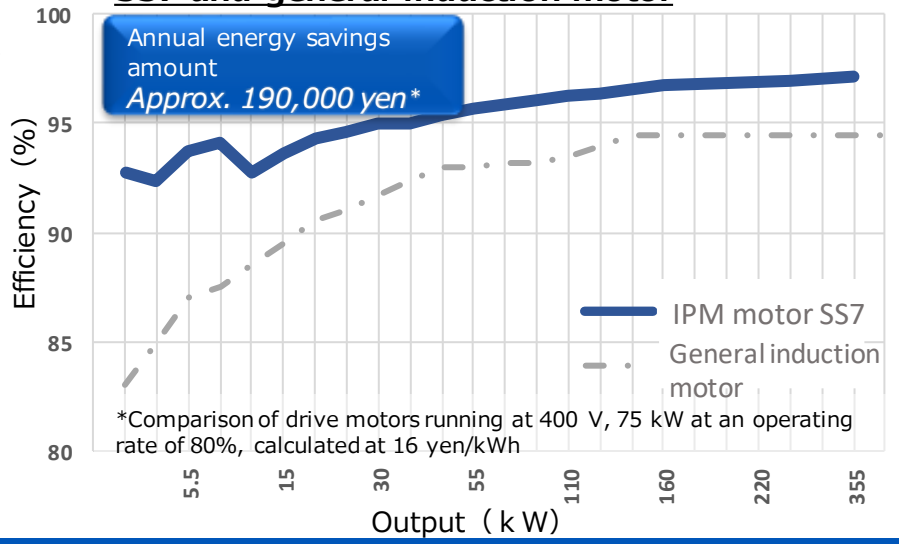
Image of air handling unit



Installation area 25%* reduction

*Example of fan area of motor 7.5 kW. Comparison with induction motor.

Comparison of efficiency between IPM motor SS7 and general induction motor



*Comparison of drive motors running at 400 V, 75 kW at an operating rate of 80%, calculated at 16 yen/kWh

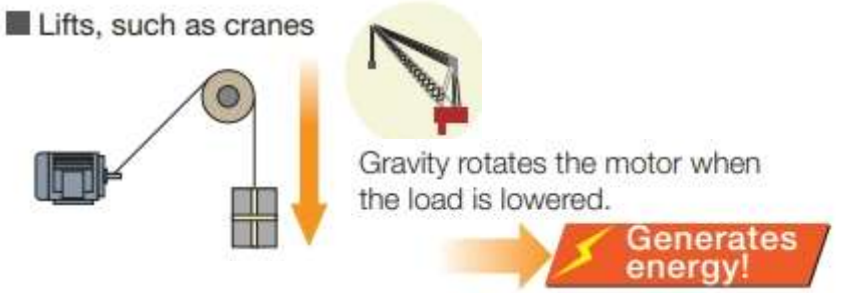
Features of Yaskawa's products (3/4)

Energy-saving initiatives 2

Save energy by reusing the regenerative energy

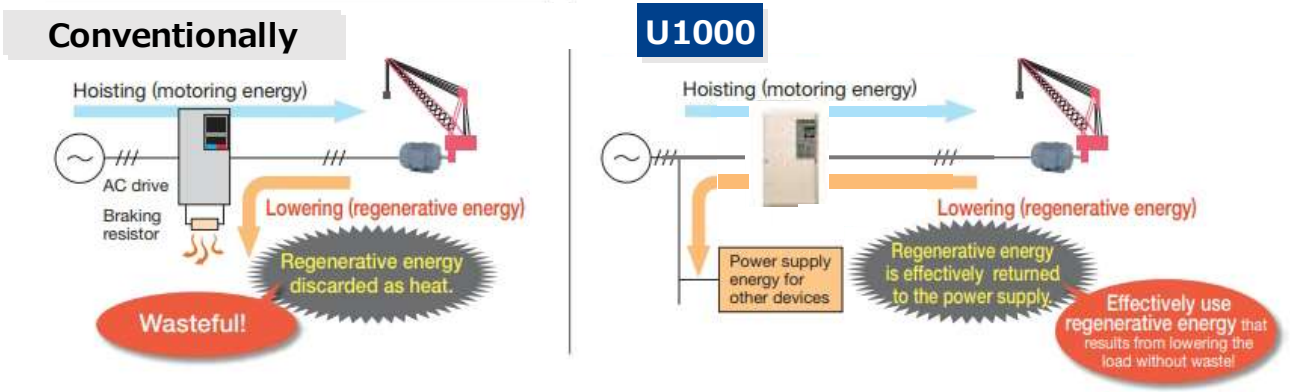
Regenerative energy

- Energy generated by the motor
- When the crane lowers the load, the weight of the load rotates the motor and generates energy.



Low Harmonics Regenerative Matrix Converter U1000

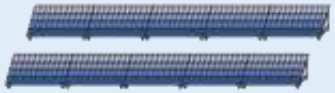
- Return the regenerative energy which was conventionally discarded as heat to the power supply and reuse



Features of Yaskawa's products (4/4)

PV inverter for solar power generation*

Supporting a wide range systems, from self-use and low-voltage grid connection less than 50kW to mega solar.

For low voltage commercial Systems (10~50kW)		For Medium and High voltage systems
 Public facilities	Newly installed self-consumption	Plant / Factory 
 Ground mounted small scale Solar	Replace and Repowering	Utility scale Solar 

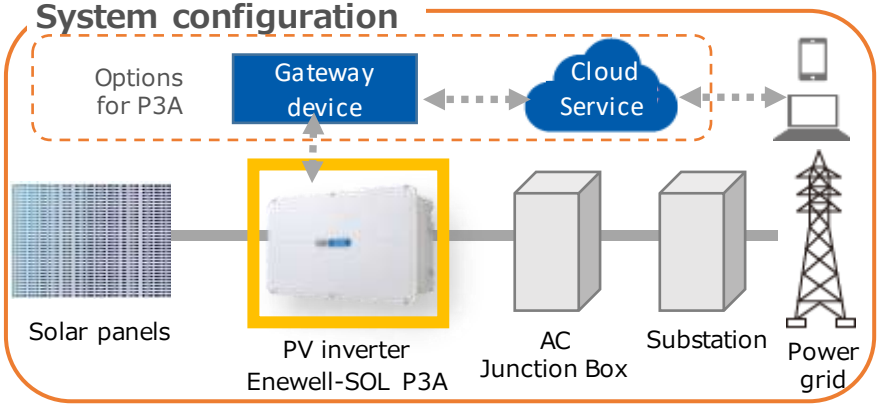
Good for self-consumption

9.9kW 200V class 3-phase transformer-based
Enewell-SOL P2H
HF transformer integrated.

25kW 200V class 3-phase
Enewell-SOL P3A
Helps slim down PV system with integrated self-consumption features.

Optimized for self-consumption

System configuration



*Device for converting DC power generated by solar panel into AC power

(Reference) Application of AC drives

Cranes

Fans

Pumps

Conveyors

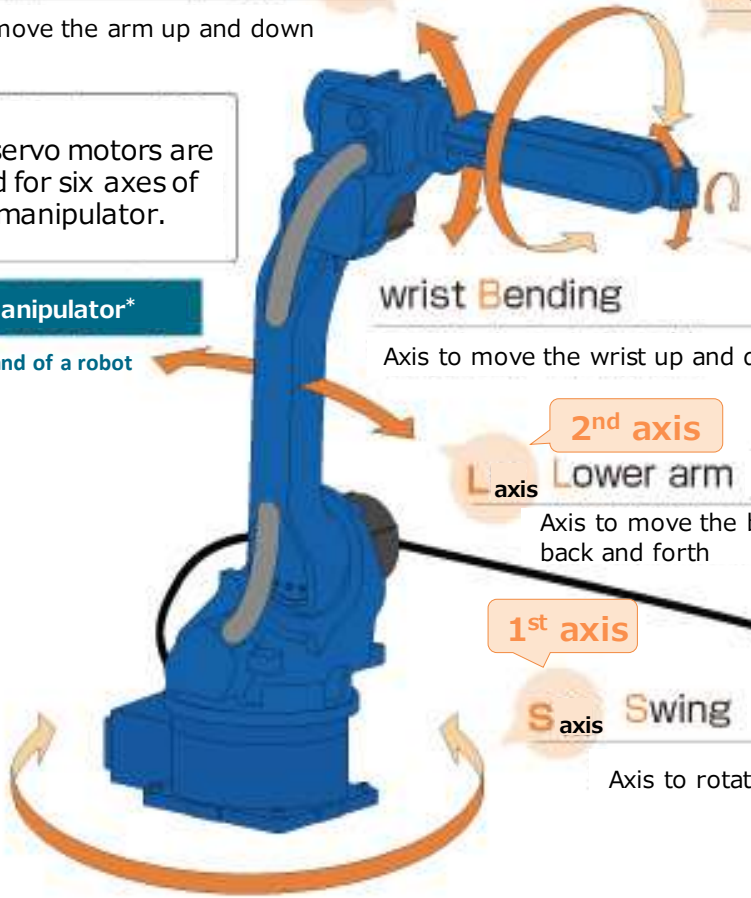
Automated warehouse

YASKAWA

2. Robotics

Product Basics (1/2)

Basic configuration of industrial robots



3rd axis
U axis
Upper arm
Axis to move the arm up and down

4th axis
R axis wrist Rotation
Axis to rotate the arm

6th axis
T axis wrist Turning
Axis to turn the wrist

wrist Bending
B axis
5th axis
Axis to move the wrist up and down

2nd axis
L axis Lower arm
Axis to move the body back and forth

1st axis
S axis Swing
Axis to rotate the body

AC servo motors are used for six axes of the manipulator.

Manipulator*

*Arm or hand of a robot

Teach movements to the manipulator

Programming pendant

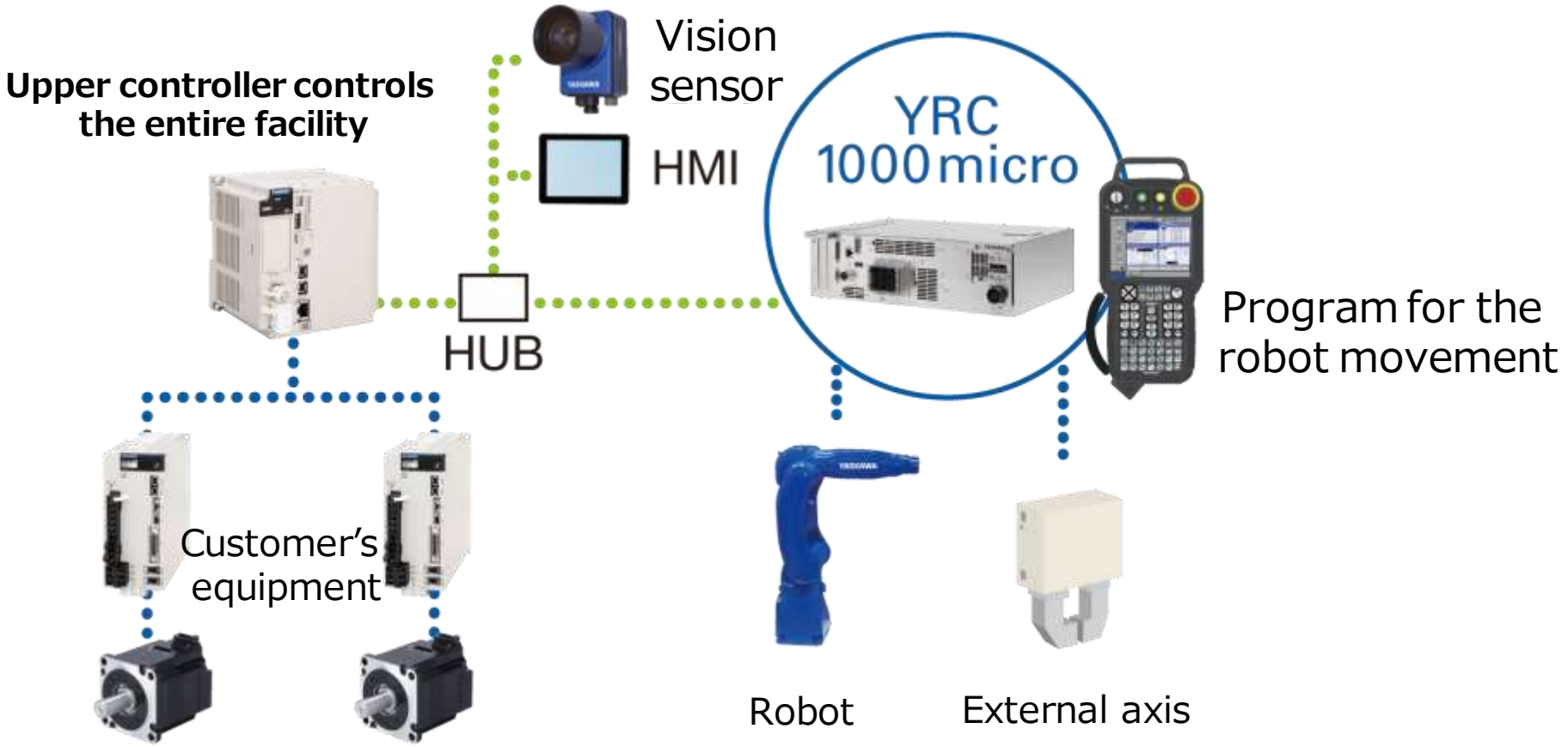
Controller

Comprehensively control the complicated movement of a manipulator

Product Basics (2/2)

Image of robot control

- A robot motion program is created in the dedicated robot controller (e.g.: YRC 1000 micro) with a teach pendant.
- The upper controller such as MP controller controls the entire facility including starting the operation program and collecting operation status data.

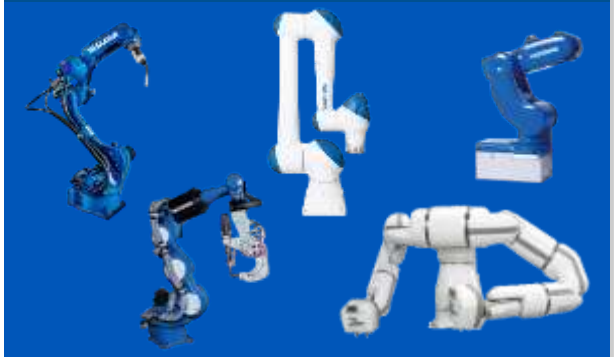


Applications

Home appliance, smartphone

- Assembly process
- Inspection process
- Grinding process

Robots



Supports factory automation

Automotive-related

- Welding process
- Paint process
- Assembly process

Semiconductor

- Wafer transportation process

Logistics・Food・Medical

- Picking process
- Packing process
- Palletizing process
- Pre-inspection process

Product Lineup

Industrial robots for Automotive and Other markets

Arc Welding

AR700 AR1440 AR1730 AR2010

Spot Welding

SP100B SP210 SP225H

Paint

MPX1150 MPX1400 MPX1950 MPX2600 MPX3500

Picking, Packing, Palletizing

MPP3S PL80 PL190,PL320 PL500 PL800

Handling

GP8 Special surface treatment for food specification

MotoMINI GP4 SG400 GP8 GP12 GP50 GP225 GP300R GP600

Welding cell/system

Automobile body paint system

Clean room robots (Semiconductor)

Semicon. Wafer Transfer

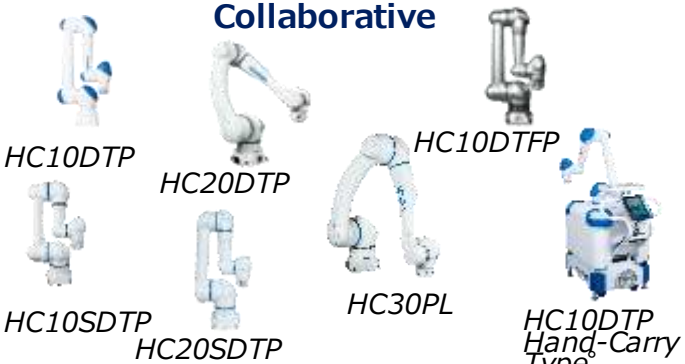
SEMISTAR-M,V series

Clean Robot Vacuum Robot

GEKKO MD124D VD31HDA VD31HQF

Collaborative

Collaborative



HC10DTP HC20DTP HC10DTFP HC10SDTP HC20SDTP HC30PL HC10DTP Hand-Carry Type

Dual Arm

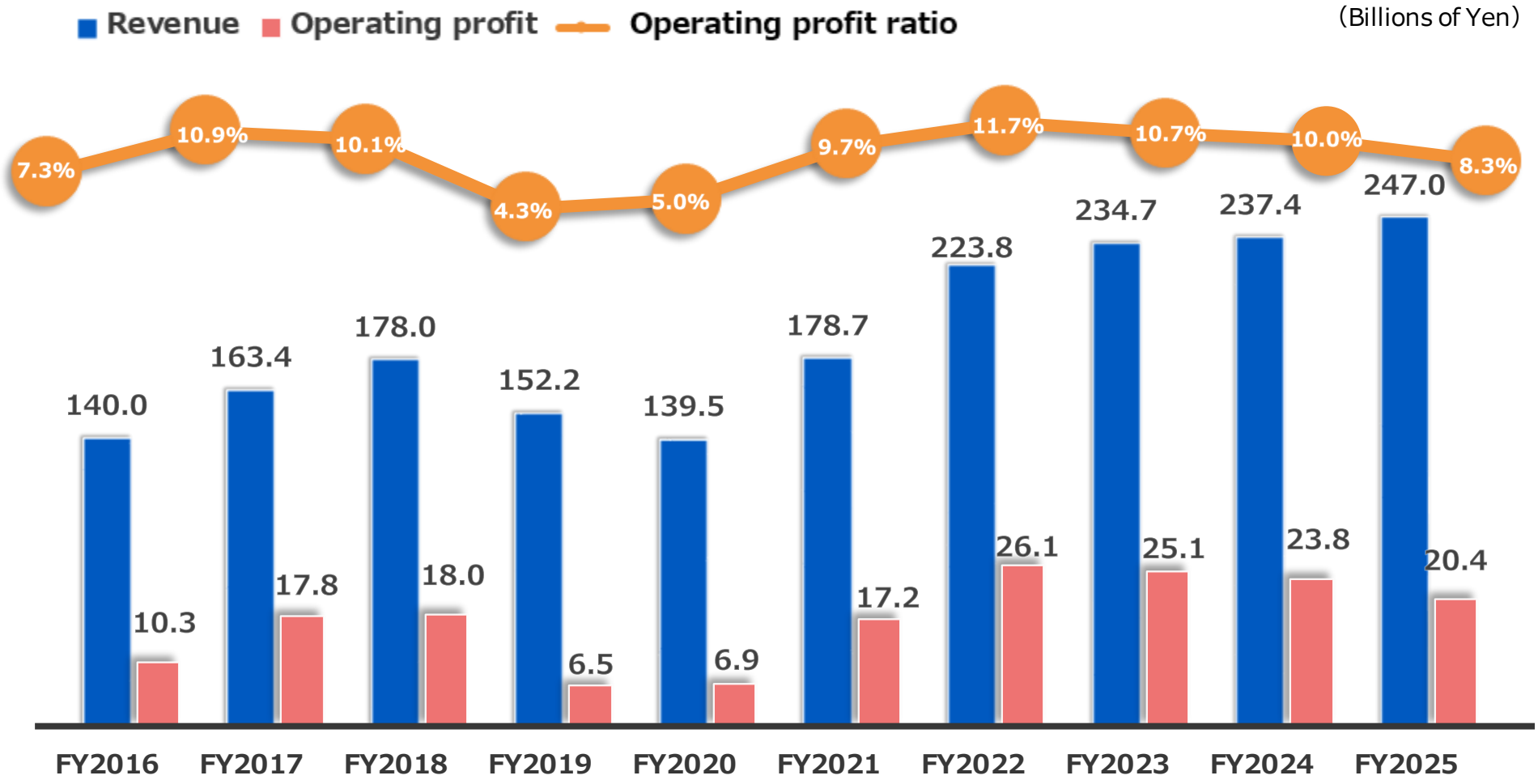
Handling, Assembly

SIA10F SDA10F

Biomedical

MH5BM MH3BM BMIA10 BMDA5 CSDA10F

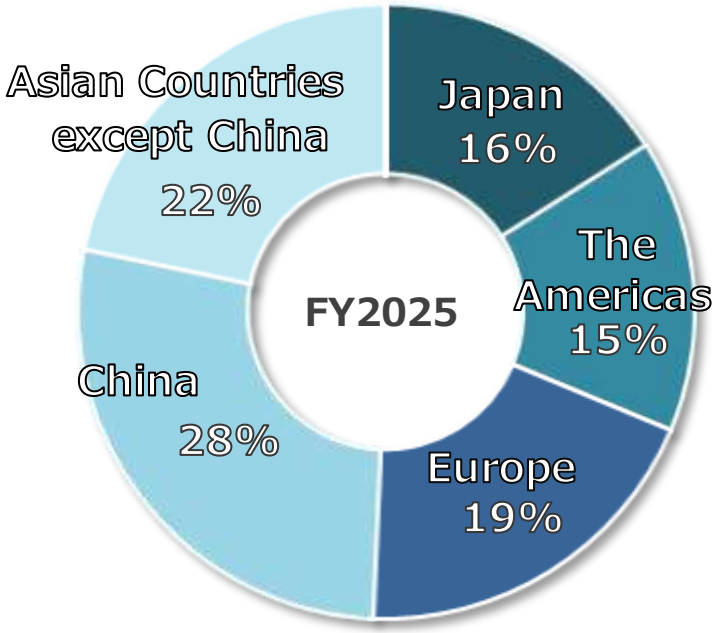
Revenue / Operating Profit （Robotics）



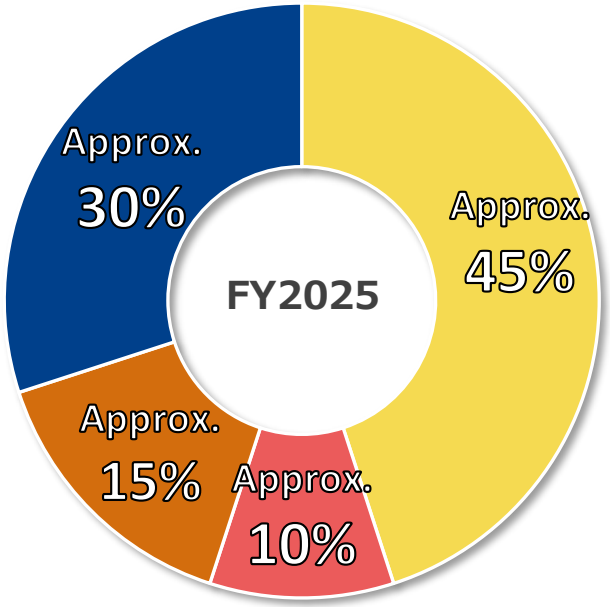
Note1: Data up to FY2017 are based on Japanese GAAP.
Note2: The Company changed its accounting period starting FY2017 from March 20 to the last day of February. As a transitional year for this change, FY2017 was from March 21, 2017 to February 28, 2018.

Revenue Breakdown by Region and Application, Market Share

Breakdown of revenue by region

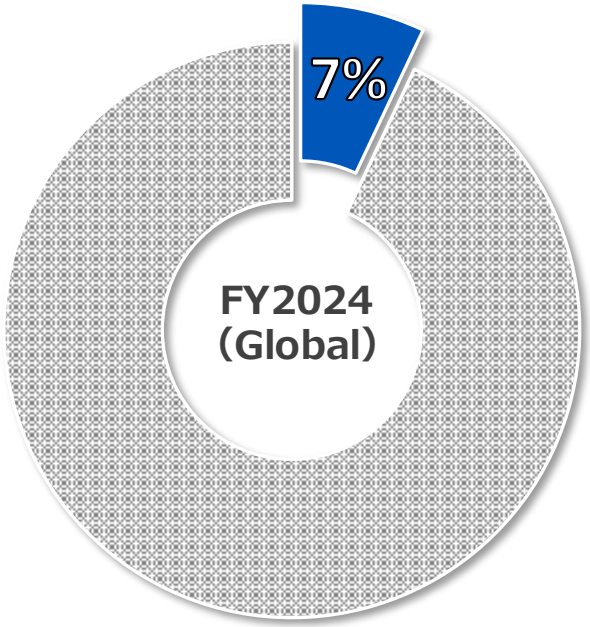


Revenue breakdown by application



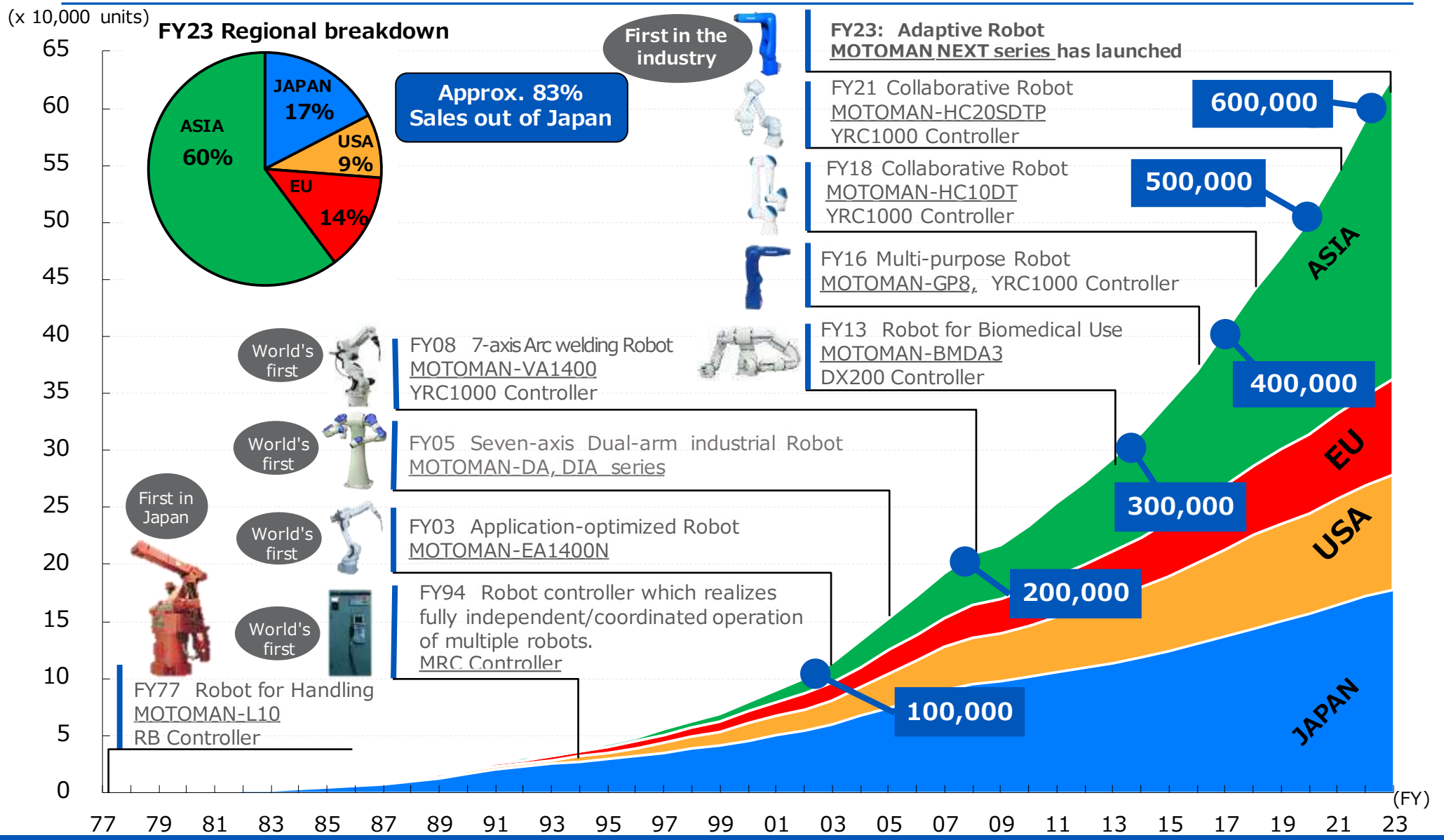
- Automotive-related applications (Arc welding, spot welding, painting, etc.)
- Semiconductor and LCD related applications
- Customer service
- General / Other (3C, Handling, etc.)

Market share



[Note] Company estimate

Total Shipment



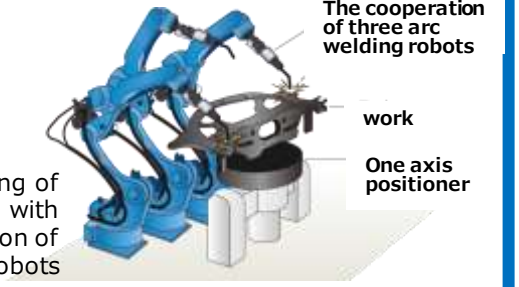
Yaskawa's Robots (1/4)

Arc welding

An adhesion method by melting base material. It contributes to the automation of parts processing in various industries, including the automotive industry. It increases productivity by expanding flexibility of robot posture and speeding up operation.

AR1440

The work point of arc welding



Arc welding of auto parts with the cooperation of three robots

Spot welding

A welding method in which two steel plates are crimped together, a large electric current is passed through them, and make them high temperature. It is used in automobile body joining

SP100B

7-axis structure enables to install in high density

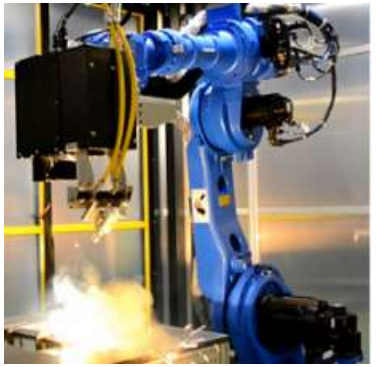
SP225H

Hollow arm is designed for spot rigging.

Car production line
Spot welding system

Laser welding

A welding method in which metal is melted and joined by a laser beam.



MOTOPAC-RL2D

Laser welding package

- Robot controller and laser scanner are fully synchronized.

Yaskawa's Robots (2/4)

Handling

Provide wide variation of robots (payload: 0.5 - 600kg) to contribute automation of customers' production line

MotoMINI
(Payload 0.5kg)

GP4
(Payload 4kg)

GP8
(Food specification)

GP225
(Payload 225kg)

Handling of tomatoes with small robots MotoMINI

Collaborative

MOTOMAN-HC series is designed to collaborate with human

Realize the cost reduction
1) Elimination of the safety fences by the safe structure and function.
2) Saving spaces because of elimination of safety fences.

Expansion of the applicable area by extensive product lineup
1) Dust & Drip-Proof Specifications
2) Food Specifications
3) High payload type
4) Hand-carry type

Smart functionality
1) Robot teaching can be simplified by the direct teaching function and Smart Pendant.

HC10SDTP
(Dust & Drip-Proof Specifications)

HC20DTP
(Dust & Drip-Proof Specifications)

HC10DTFP
(Food Specifications)

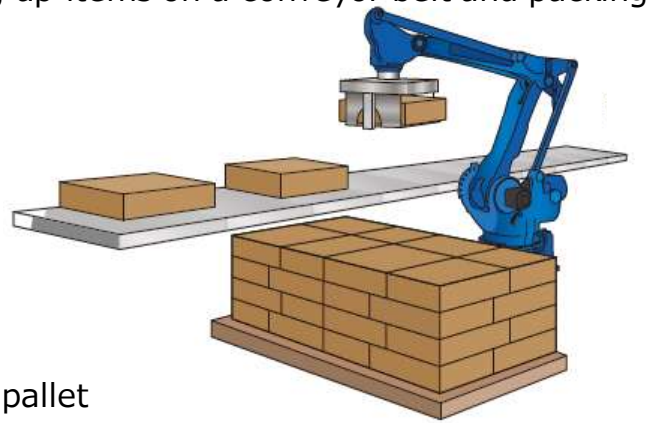
HC10DTP
(Hand-carry type)

Yaskawa's Robots (3/4)

Picking・Packing・Palletizing

Contributing to automated conveyor system for food, cosmetics and pharmaceuticals

Picking・Packing
Grabbing and lining up items on a conveyor belt and packing them in boxes



Palletizing
Placing boxes on a pallet

Painting

- **Installing a paint gun and painting cars and small parts**
- **Explosion-proof for work in an environment with flammable gases**

Automobile Industry
(Painting Car Body)
MPX2600

General Industry
(For medium-size work piece)
MPX1950

Car painting by painting robot and door opener robot

Yaskawa's Robots (4/4)

Bio Medical

Best for automation in Bio-Medical field which requires hygiene control

- Resolve challenges such as manual variations and errors, risk of exposure to powerful drugs, and long routine work
- Use of analytical equipment and containers used by humans

MHシリーズ

BMIA10

BMDA5

CSDA10F

Application Examples

- Bio analysis
- Drug development
- Preparation of anticancer

Clean Robot

A wide range of products to meet diverse needs

[Clean robot]

High speed and reliable clean robot for wafer transfer

MU201

M122

MU124

GEKKO MD124D

[Vacuum robot]

VD31HDA

Adopting a direct-drive system that does not require a speed reducer

VD31HQF

VS22LDS

Surrounding equipment designed for wafer transfer

Traverse axis

TL1010

Pre-aligner

PVS1130

Industry's first adaptive robot
MOTOMAN NEXT series

Aim

Automation of "unautomated areas," where workers make judgments and do tasks, such as indefinite state, shape, and size of items, changes in work order, and interruptions.

Examples

Human-centered workplace, such as restaurant backyards

Heavy-duty workplace, such as logistics warehouses and airport unloading

Hazardous work, such as post-processing at medical sites

Features

① **Autonomous control unit**

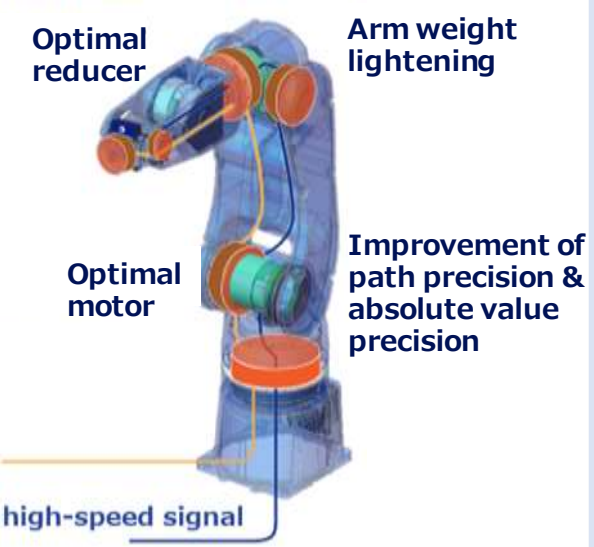
An autonomous control unit is adopted to make a motion planning and perform based on the recognition and judgment process of the environment and the position data acquired from the sensor.

② **Optimal motor developed in-house**

An optimal motor developed in-house is adopted to enhance its capability to follow commands from the controller (minimize the difference between the commanded position and the actual position).

③ **Open platform**

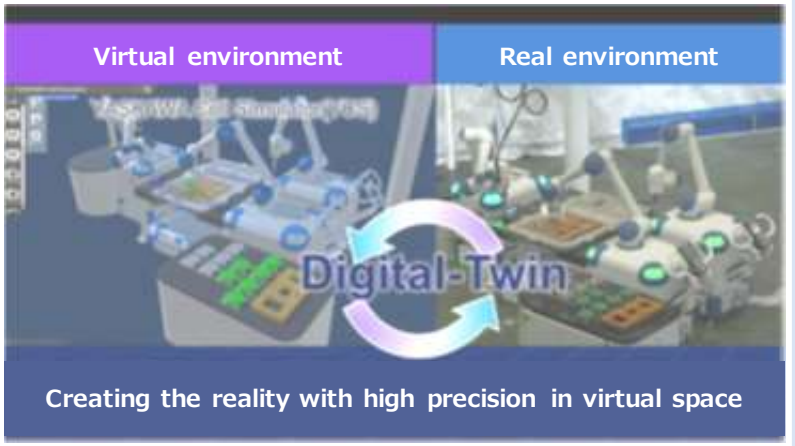
The development environment is opened up, so customers and partners utilize their know-how and technologies for robot applications.



Features of manipulator

YASKAWA Cell Simulator

- An engineering tool that can provide total support from design to launch, to checking the operation of the entire cell, to analyzing and redesigning the operation in a digital twin.
- It can build a digital twin with high accuracy using environmental data.

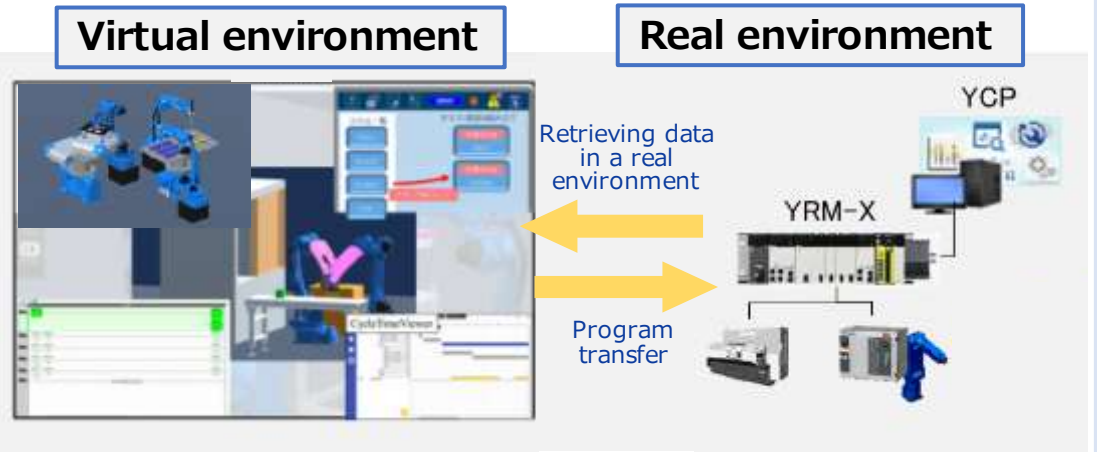


Features

① Cell engineering
From designing to checking the operation all in one place in the virtual environment

② Cell motion analysis
Analyzing the differences between a real environment and a virtual environment.

③ Cell replanning
Performing the same work as engineering in a real environment by using data from a real environment in a virtual environment.



New technologies (3/3)

Food process automation

Automating solution for "labor shortage", "rising labor cost", and "countermeasures against contamination" in food industry

Automation for process required special skills

- Foreign matter contamination and sanitary
- Inline support for production

Sandwich bagging cell

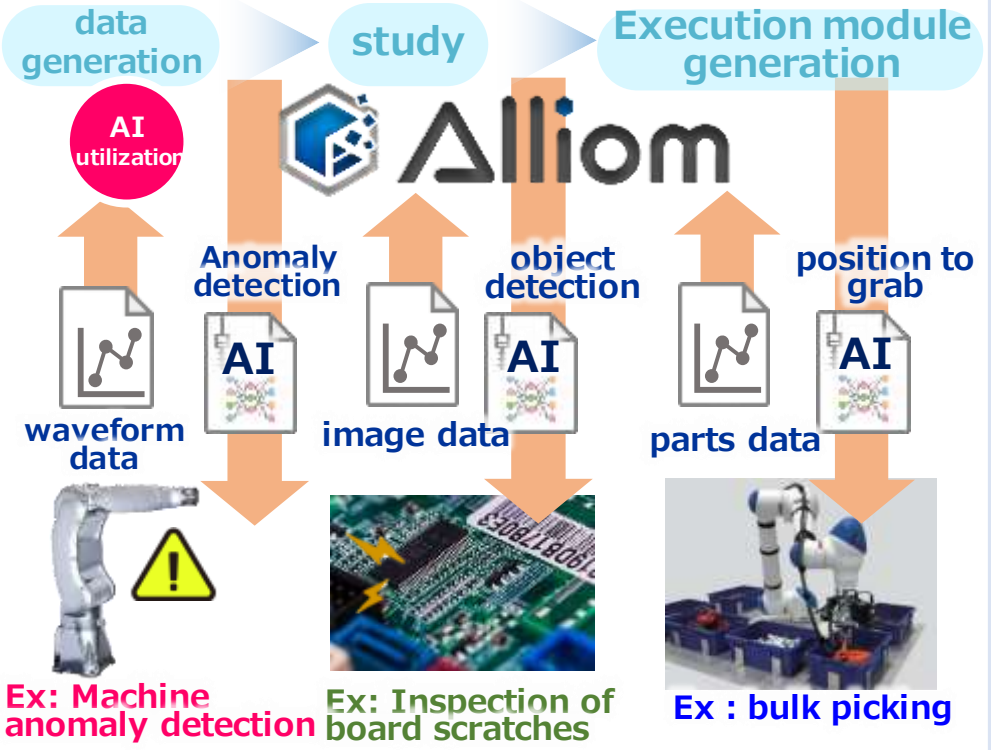
Laborsaving for simple work

- Installation space similar to people
- Foreign matter contamination and sanitary
- Cells applicable to various processes

Topping cell

Artificial intelligence (AI)

Developing AI(Alliom) for manufacturing and industrial robots in the subsidiary, AI Cube Inc. Expansion of automation area in the FA field



3. System Engineering

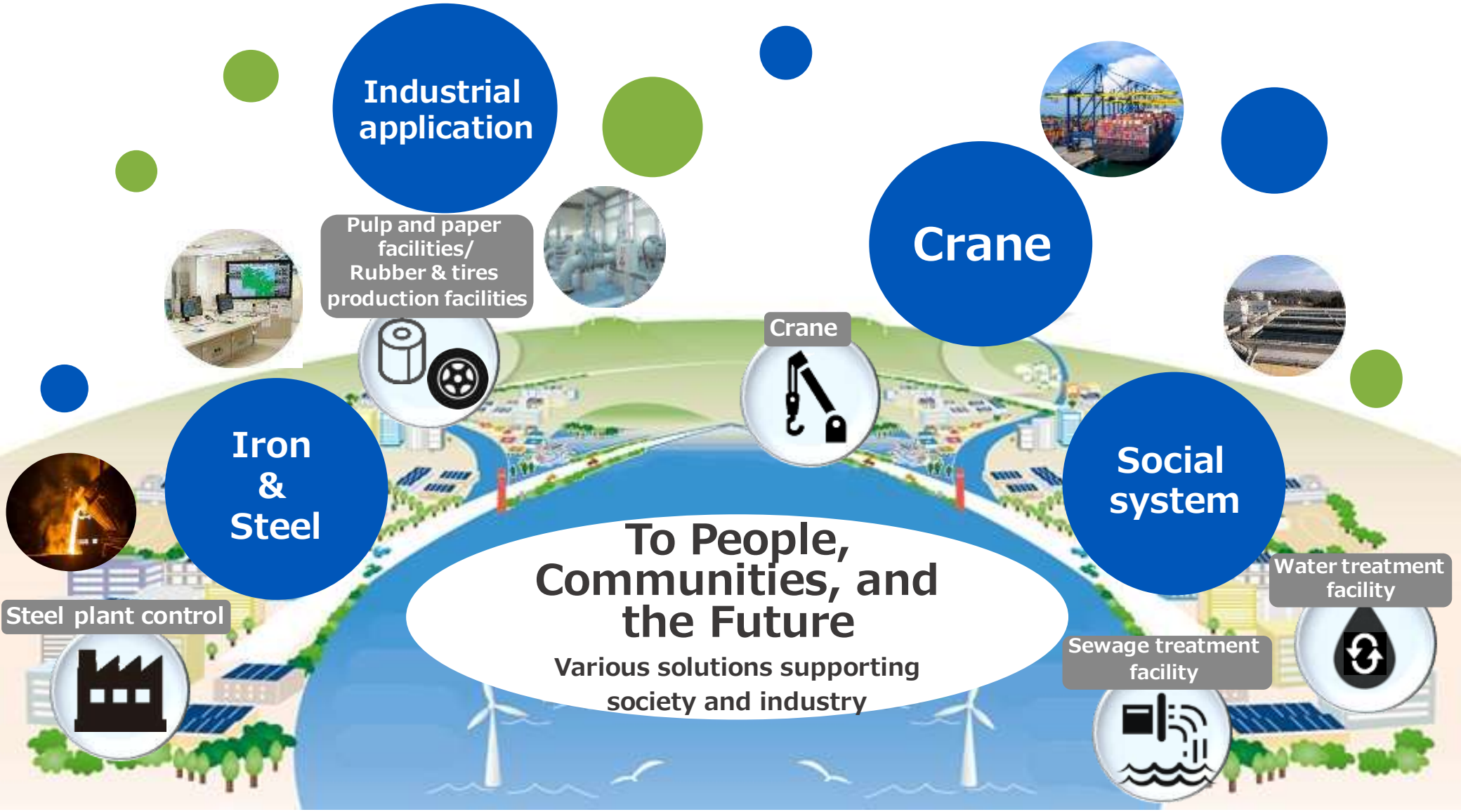
Monitoring and control of water supply and sewerage systems

Notes :

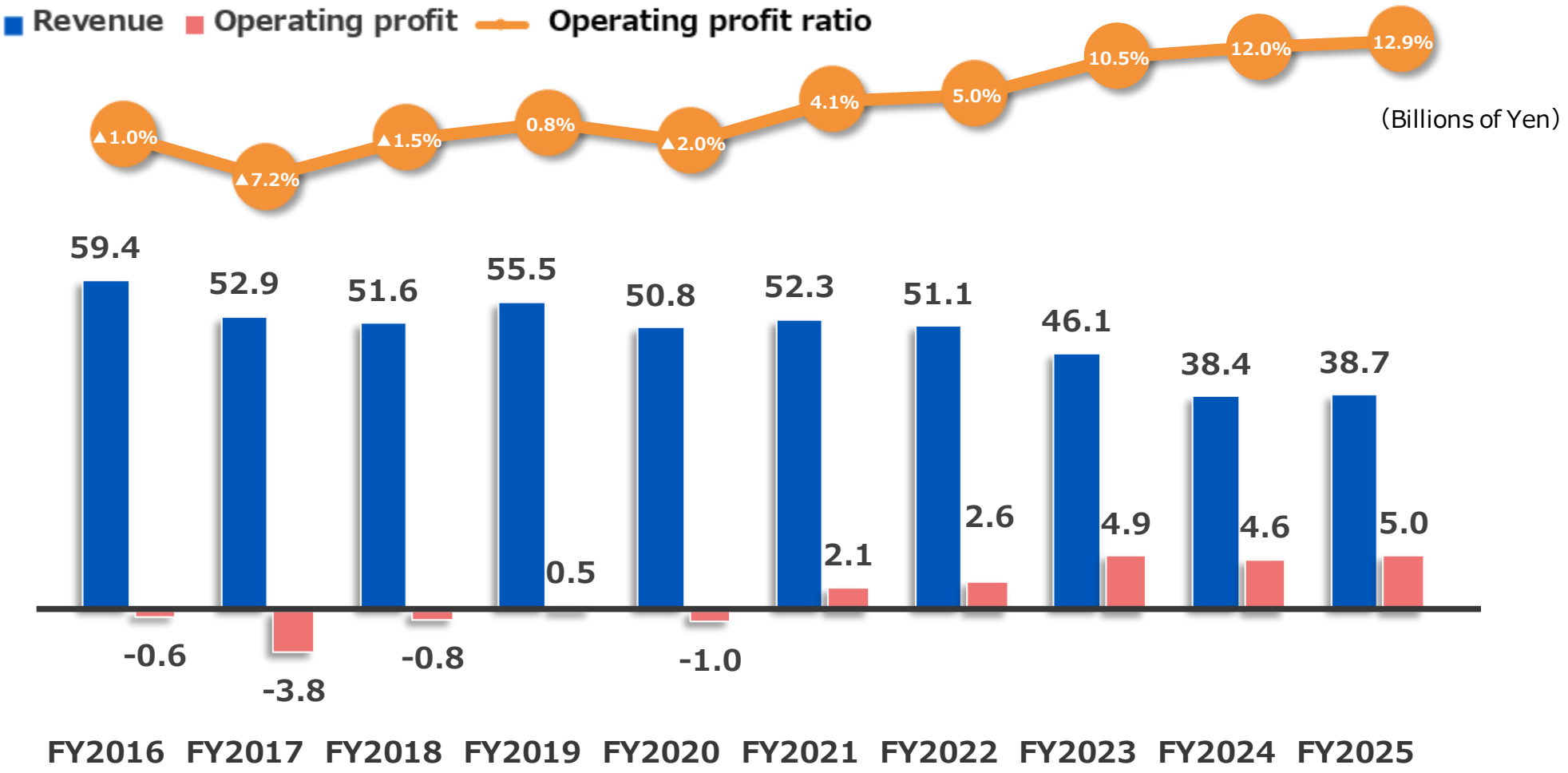
- **From FY2024, we have revised the segment classification of PV inverter to be included in Drives business. Figures for FY2023 are also presented based on the revised information.**

Supply of control systems and electrical products for continuous casting facilities

System engineering business



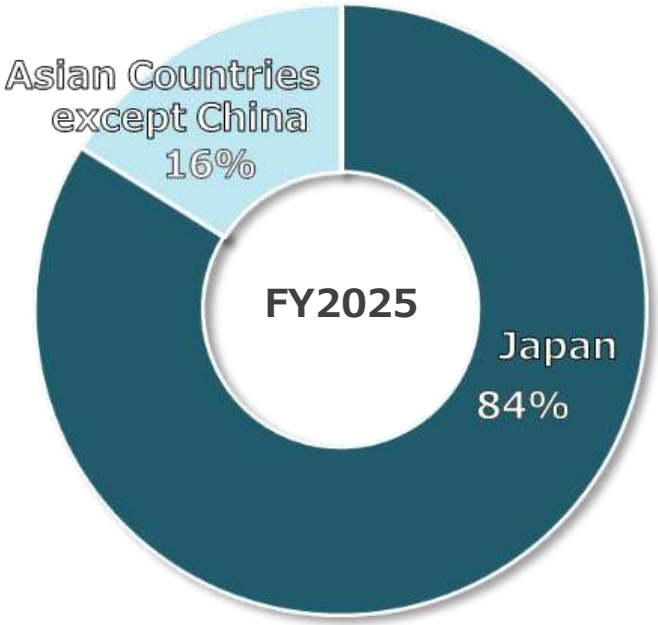
Revenue / Operating Profit （System Engineering）



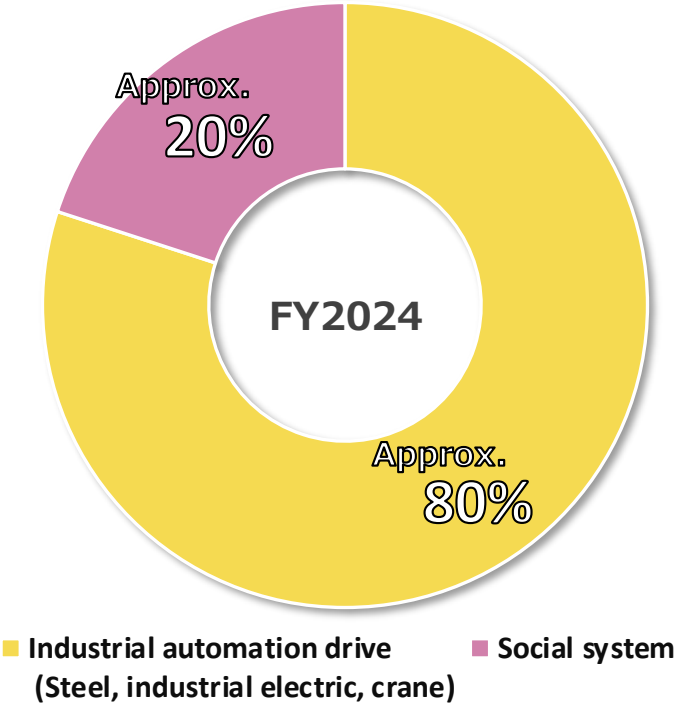
Note1: Data up to FY2017 are based on Japanese GAAP.
Note2: The Company changed its accounting period starting FY2017 from March 20 to the last day of February. As a transitional year for this change, FY2017 was from March 21, 2017 to February 28, 2018.
Note3: Revisions were made to the division of businesses segments starting FY2017. The PV inverter business, which was previously included in Motion Control, is included in System Engineering. Figures and profit ratios of each segment for FY2016 reflect this change. The change is not applied to figures and profit ratios for the period up until FY2015
Note4: Revisions were made to the division of businesses segments starting FY2020. The high voltage AC drives, which was previously included in System Engineering, is included in Motion Control. Figures and profit ratios of each segment for FY2019 reflect this change. The change is not applied to figures and profit ratios for the period up until FY2018.

Revenue Breakdown by Region and Application, Market Share

Breakdown of revenue by region

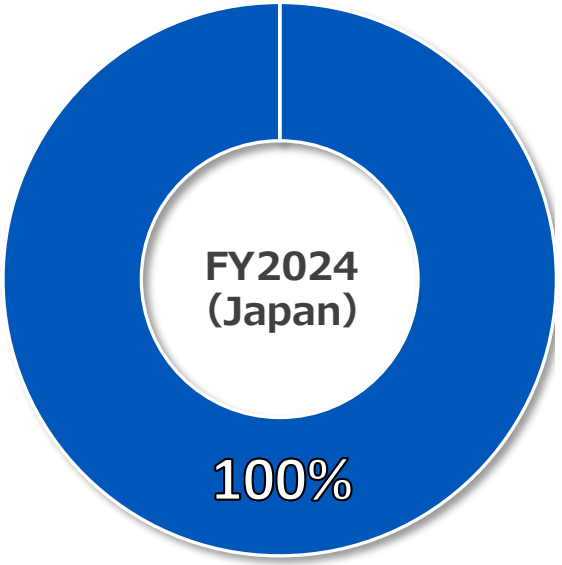


Revenue breakdown by application



Market share

Steel plant systems (Blast furnace)



[Note] Company estimate

Social system business

Yaskawa supports the advanced operating management and maintenance management of social infrastructure including water treatment plant.

Main target facilities

Waterworks Facility

Sewerage Facility

Centralized Monitoring & Control Facility

Centralized Monitoring & Control Facility

Electric products for water supply and sewerage

Monitoring control

Human Machine Interface
CP-540

Power receiving and distribution electricity self-generation

Medium-voltage Enclosed Switchboard

System Controller
CP-3550

Iron & steel business

Contributing to stable continuous operation with high reliability by providing dedicated control systems and electrical equipment that meet the needs of various facilities in steel plants

Key process	Features of the equipment	Application features/Yaskawa strengths
Blast furnace  Blast furnace  Control room	・The process of making hot metal from iron ore ・Stable operation and long-term continuous operation under adverse environment are required.	①100% share of raw material charging control in Japan ②Stable production of consistent quality pig iron in response to changes in the operating environment ③High-reliability products and system redundancy enable long-term continuous operation
Continuous casting  Continuous casting equipment	・Step of solidifying molten iron from a blast furnace ・Stable operation is essential because equipment shutdowns have a major impact on operations.	①Domestic market share: 50% or more ②System redundancy and reliability design for stable operation ③Implement backup control to prevent internal coagulation in case of trouble.
Process / cold rolling  Process line equipment  Cold rolling mill	・Final process of steel manufacturing process ・Continuously process connected steel plates (Surface processing, heat treatment processing, etc.)	①High-precision and high-function line control that makes the most of years of accumulated control technology ②High-precision control of steel plate speed, tension, slack, etc. by drive system ③Large number of products delivered in Japan and overseas

Industrial application business

We contribute to the engineering in various industries, including pulp and paper, textiles, rubber and tires, film, metal processing, and plastics industries which we have a lot of experience and reliability, with our outstanding continuous drive technology.

System construction examples

Paper-making control system

Film manufacturing・machining facility control system

Equipment system for synthetic fiber, carbon fiber, and synthetic leather