



for a greener tomorrow



**MITSUBISHI  
ELECTRIC**

*Changes for the Better*

FACTORY AUTOMATION

SERVO SYSTEM CONTROLLERS  
MELSEC iQ-R SERIES/MELSEC iQ-F SERIES

**e-Factory**

# SERVO SYSTEM CONTROLLER



**MELSEC iQ-R**  
series



**MELSEC iQ-F**  
series

Total system performance, not individual component specifications leads to maximum performance

# GLOBAL IMPACT OF MITSUBISHI ELECTRIC



Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

## ***Changes for the Better***

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

### **Energy and Electric Systems**

A wide range of power and electrical products from generators to large-scale displays.

### **Electronic Devices**

A wide portfolio of cutting-edge semiconductor devices for systems and products.

### **Home Appliance**

Dependable consumer products like air conditioners and home entertainment systems.

### **Information and Communication Systems**

Commercial and consumer-centric equipment, products and systems.

### **Industrial Automation Systems**

Maximizing productivity and efficiency with cutting-edge automation technology.

# OVERVIEW

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# Revolutionary, next-generation servo system controllers building a new era in automation

## MELSEC iQ-R series

As the core for next-generation automation environment, realizing an automation controller with added value while reducing TCO\*

To succeed in highly competitive markets, it's important to build automation systems that ensure high productivity and consistent product quality. The MELSEC iQ-R Series has been developed from the ground up based on common problems faced by customers and rationalizing them into seven key areas: Productivity, Engineering, Maintenance, Quality, Connectivity, Security and Compatibility. Mitsubishi Electric is taking a three-point approach to solving these problems: **Reducing TCO\***, increasing **Reliability** and **Reuse** of existing assets.

As a bridge to the next generation in automation, the MELSEC iQ-R Series is a driving force behind **revolutionary** progress in the future of manufacturing.

\*TCO: Total cost of ownership



### Productivity



Improve productivity through advanced performance/functionality

- New high-speed system bus realizing shorter production cycle
- Super-high-accuracy motion control utilizing advanced multiple CPU features
- Advanced servo amplifiers and motors offering industry leading level of performance

### Maintenance



Reduce maintenance costs and downtime utilizing easier maintenance features

- Visualize entire plant data in real-time, contributing to preventative maintenance
- Reduce downtime and easily locate error causes

### Engineering



Reducing development costs through intuitive engineering

- Intuitive engineering environment covering the product development cycle
- Simple point-and-click programming architecture
- Easy debugging, from controllers to servo amplifiers

### Quality



Reliable and trusted MELSEC product quality

- Robust design ideal for harsh industrial environments
- Improve and maintain actual manufacturing quality
- Conforms to main international standards



# SERVO SYSTEM CONTROLLER

## Connectivity



**Seamless network reduces system costs**

- Seamless connectivity within all levels of manufacturing
- Optical network "SSCNET III/H" providing high response and high reliability
- "CC-Link IE Field Network" - Integration of IA components on ONE single network

## Compatibility



**Extensive compatibility with existing products**

- High compatibility with existing servo system controllers
- Utilize existing assets while taking advantage of cutting-edge technology

## Security



**Robust security that can be relied on**

- Protect intellectual property
- Unauthorized access protection across distributed control network

**Total system performance, not individual**



## component specifications leads to maximum performance

Create machine systems with higher production and total overall performance that surpass your wildest imaginations with Mitsubishi Electric Servo System Controllers. With the iQ Platform at the center, higher FA performance is achieved through dual driving engines, improved Servo Amplifier and Network performance, and flexible cooperation of partner organizations.

# Performance Maximization

## Speed Up

### Faster Startup with Intuitive Operation

Programming efficiency matters when it comes to productivity. The MELSEC iQ-R series optimizes all procedures, from designing, debugging, to startup.



## Change Up

### Dual Engines Revolutionize Machine Capability

The MELSEC iQ-R series is provided with sophisticated dual engines: the PLC CPU engine for machine control and the Motion CPU engine for Motion control. The engines respectively process different types of control based on the characteristic of each engine while working together on data through a high-speed system bus. CPU loads are significantly distributed by these dual engines compared with a single engine, enabling any equipment to maximize its performance, even for a load change machine or multi-axis equipment.

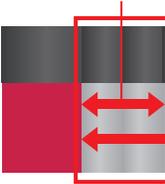
High-speed system bus Approx. <b>40 × faster</b>	Operation cycle <b>2 × faster</b> *1 0.444ms	CPU buffer memory (fixed-cycle) Approx. <b>1.7 × larger</b> 24k words	Cam working area Approx. <b>16 × larger</b> 16M bytes
Data exchange cycle with PLC CPU Approx. <b>4 × faster</b> 0.222ms	Operation cycle Approx. <b>1.5 × faster</b> *2 6 axes/0.222ms	Device memory Approx. <b>3 × larger</b> 128k words	Cam registration data Approx. <b>4 × more</b> 1024 cam data

\*1 Simple Motion module

\*2 Motion controller

(Compared to previous model)

Data exchange cycle with PLC CPU



Select the most suitable combination of CPU engines that can reduce cost and maximize machine performance to the fullest from our extensive product line. Efficiency in designing and debugging is also improved.



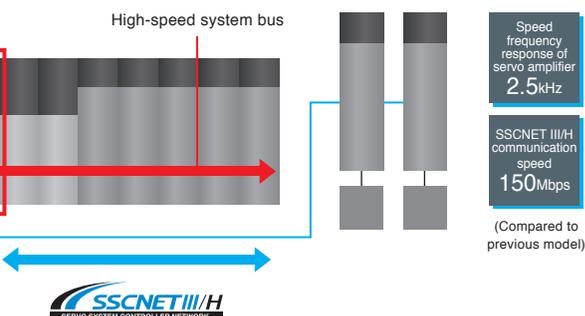
# Productivity

# for Productivity.

## Power Up

### Advanced Servo Amplifier Maximizes Drive Performance

The MELSERVO-J4 series servo amplifier is an environmentally and user friendly product, while offering industry-leading level of performance. Connecting the amplifiers to "SSCNET III/H" optical network enables high-speed and high-accuracy control with the MR-J4 dedicated engine and high-resolution encoder.



## Gather Up

### Ground-breaking Machine Innovation

Equipped with advanced dual engines that are only possible with our cutting-edge iQ platform technology, the MELSEC iQ-R series takes a step further to accelerate the equipment revolution by collaborating with our partner companies. Now, a wide variety of SSCNET III/H compatible partner products are available, such as stepping motors and direct drive motors.

Mitsubishi Electric servo system partner companies (in alphabetical order)



CC-Link Partner Association (CLPA) was established to promote the worldwide adoption of the CC-Link open field network and to strongly support creation of FA integrated network system.

**component specifications leads to maximum performance**

Would you buy a car solely based on engine power?

Fuel Efficiency? Crash test rating?

Only a test drive will give you a true indication of the performance potential.

Test drive the MELSEC iQ-R Motion System with MR-J4 Servos and experience the performance.



**Total System  
Performance is  
Productivity.**

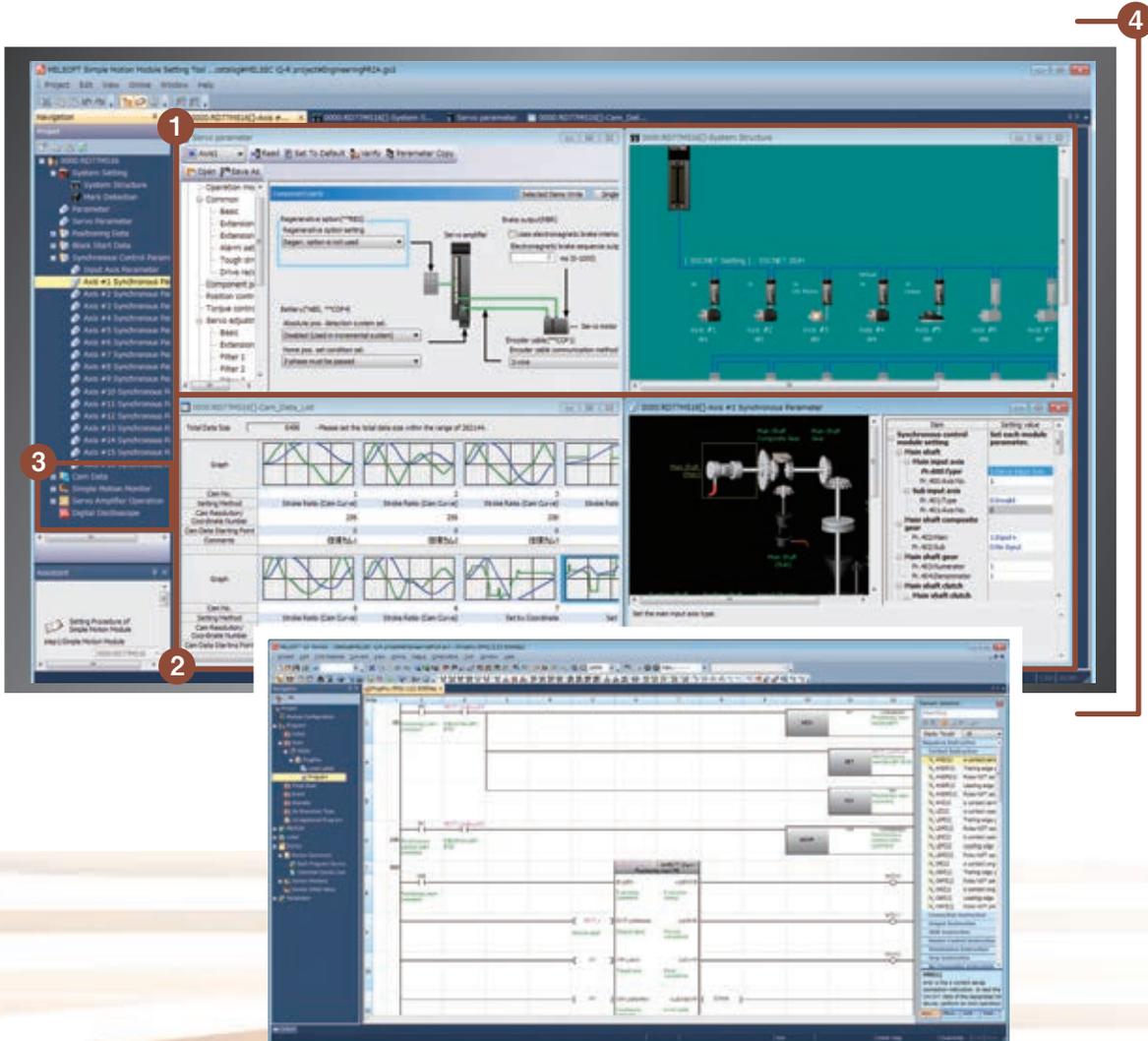


# Engineering

## The easy-to-use programming software allows you to work

Program creation is largely dependent on human skills; therefore an enormous amount of time is often spent on creating a servo program where high programming skills are required.

To eliminate any programming hassle as much as possible, “MELSOFT GX Works3” introduces a more intuitive, efficient, and user-friendly programming environment, revolutionizing the way of programming.



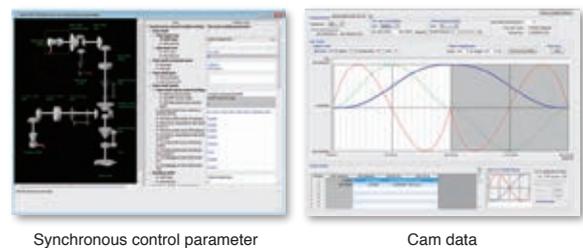
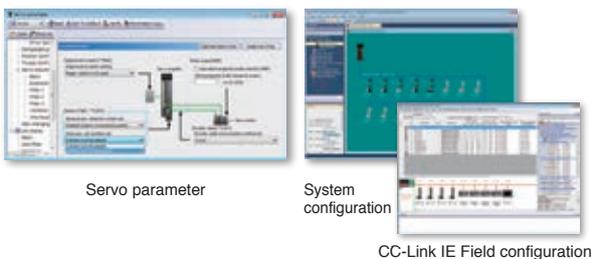
more intuitively, freely, and flexibly



All-Inclusive Software, from Sequence Program Creation to Simple Motion Module Setting

# MELSOFT GX Works3

This software supports a whole product development cycle - from development, startup, debugging through maintenance for sequence programs, Simple Motion module parameters, and positioning/cam data.

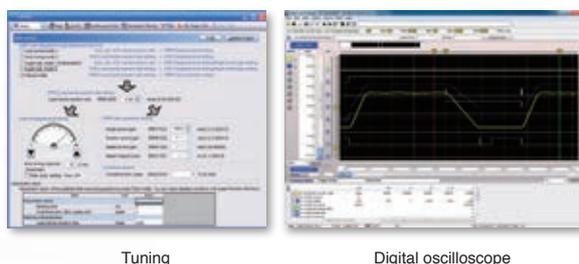


## 1. Intuitive Operation

The graphical screen allows you to design a Motion system easily. Also, you can configure servo amplifier and module settings easily on the system setting screen, and check them at a glance.

## 2. Synchronous control without complex programming

Synchronous control can be easily performed just by setting parameters, using software instead of controlling mechanically with physical gears, shafts, speed change gears or cam etc. For example, create a rough cam waveform on the graph and then make it more precise by adjusting the numerical values.



## 3. Advanced Monitoring, Setup, and Adjustment

The items and axes needed to be displayed can be selected from various monitoring information. Servo adjustment and setup, data collection and waveform display that are synchronized to the Motion operation cycle are also available.

## 4. Multiple Languages Supported

The language is supported for Japanese, English, Chinese, and Korean, helping engineering staff work in this globalized industry and enabling faster startup abroad on site.



# Maintenance

## Reduce maintenance costs and downtime utilizing

A manufacturing plant is seldom stopped or taken offline and continuously produces the desired product or component. However, the control system occasionally requires maintenance; for example, at the time of a faulty product or system upgrade for manufacturing a new or updated component. At that time, thanks to the extensive maintenance functions embedded in the hardware and software, the user can trust the control system to handle transition into/out of the maintenance period for both preventive and post maintenance.

### Preventive maintenance with a wide range of information collected throughout various manufacturing processes

#### Preventive maintenance

Easily managing individual data of CPU modules and Simple Motion modules

##### Batch Data Management for Multiple Parameters and Programs

- Multiple data from PLC CPUs, Simple Motion modules, and servo amplifiers can be collectively managed.
- Equipment data can be easily managed.



Project files

#### Preventive maintenance

Being informed of the lifespan of the capacitor and relay in a servo amplifier

##### Servo Amplifier Life Diagnosis Function Preventing System Downtime in Advance

This function displays:

- Cumulative power-on time
- Number of inrush current switching times
- Target lifespan of capacitor and relay, etc.

Support the preventive maintenance of the servo amplifier.



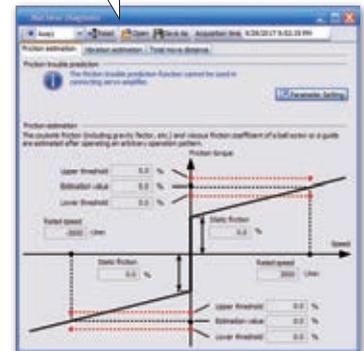
#### Preventive maintenance

Minimizing risks of machine failure

##### Utilizing Machine Aging Information for Preventive Maintenance

- Estimated machine friction and vibration are displayed.
- Comparing the current machine data and the initial machine data helps to find out the machine aging.

Prevent machine failure with advanced preventive maintenance beforehand.



# easier maintenance features



## Corrective maintenance by utilizing various operation and error information recorded for quick troubleshooting

### Corrective maintenance

Quickly locating causes that stop the machine

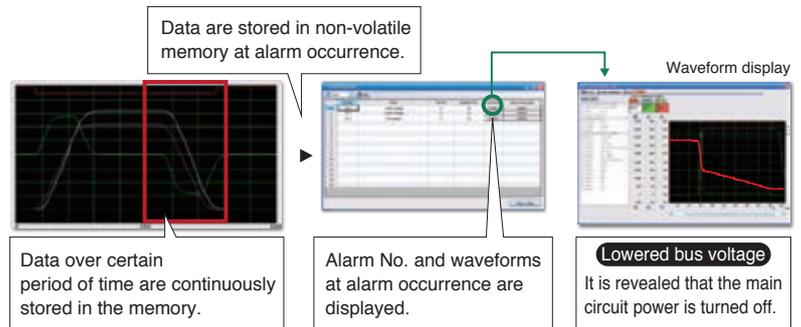
#### Digital Oscilloscope Function Performing Cause Analysis

- Sampling can be performed without a personal computer connected.
- Sampling of current value, etc., for multiple axes is available.
- Sampled data trajectory can be traced on 2-dimensional coordinate.



#### Visualizing the Status of Alarm Occurrence with Large Capacity Drive Recorder of Servo Amplifier

- Servo data (motor current and position command, etc.) of before and after the alarm occurrence are stored in non-volatile memory.
- Data are read during restoration for cause analysis.
- Check the waveform of 16 alarms in the alarm history.

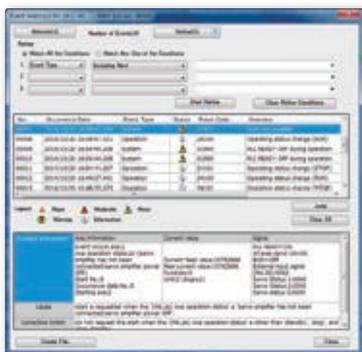


### Corrective maintenance

Quickly locating causes that prevent the machine from starting

#### Event History for Quick Troubleshooting

- Event history including program changes, errors occurred, power OFF, etc. can be saved.
- A list of the event history can be confirmed.
- Errors that have been made by mistake can be quickly detected.



### Corrective maintenance

Easily identifying the location of errors

#### Diagnosis and Troubleshooting Even with limited knowhow

- Network errors are easily identified at a glance.
- Graphical representation of the network automatically created on the engineering software makes wiring and PLC errors clearly visible.





# Quality

## Reliable and trusted MELSEC product quality

The MELSEC iQ-R Series is based on two fundamental aspects of quality.

“Quality of product”

“Quality for application”

These two characteristics are part of the main principle behind the MELSEC iQ-R Series. This new control system includes various features designed-in to provide a solution that not only improves the overall manufacturing productivity, but also maintains a high level of industrial quality that is ideal for the harsh and rugged environments that it is subjected to on a daily basis.

### Assuring high-standard, highly reliable product



Electromagnetic compatibility (EMC) testing room (simulated test)



1. Conforms to stringent quality evaluations and tests that are based on robust industrial environments including EMC, LSI, temperature, vibration and HALT tests.
2. High manufacturing quality control through QR code based quality management system.
3. The front face has a wide and open design with an easy-to-use front cover.

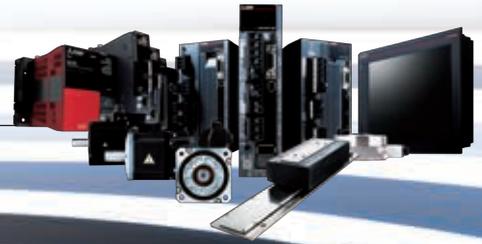
### Robust design ideal for harsh industrial environments

Synonymous with the Mitsubishi Electric name, the MELSEC iQ-R Series is designed with high quality and reliability, which is a prerequisite for industrial applications. In addition, the overall aesthetics and usability enable easier maintenance that customers routinely expect.

#### Classification according to IEC 60721-3-3 Class 3C2

For protection against aggressive atmosphere and gases, products with a conformal coating (IEC 60721-3-3 Class 3C2) are available on request \*1.

\*1: Contact your local Mitsubishi Electric office or representative for further details.

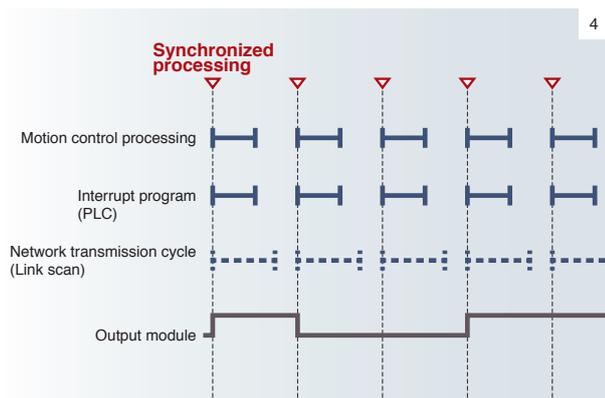


## Conforms to main international quality standards

The MELSEC iQ-R Series conforms to most of the main international standards that realizes applications requiring multiple global locations.



## Improve and maintain actual manufacturing quality



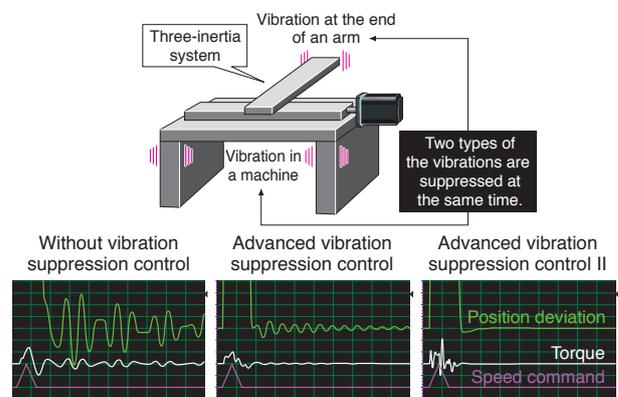
4. Motion control processing, interrupt programs (PLC) and network transmission cycle (link scan) are synchronized. Also, as the graph shows, the signals between several modules, such as output modules can be synchronized.

### Improve and maintain actual manufacturing quality

With inter-module synchronization, it's now possible to precisely synchronize interrupt programs (PLC) with the network communications cycle (link scan). Any variations in data transmission response time (network transmission delay time) between the controller and other devices on the network are eliminated, realizing high integrity between manufacturing processes that are dependent on each other, ensuring high performance and processing.



## MELSERVO-J4



### MELSERVO-J4 series improving product quality even further

High-accuracy positioning and smooth constant-speed operation can be achieved with a combination of the MELSEC iQ-R series servo system controllers and MELSERVO-J4 series servo amplifiers. Vibration can be minimized with the advanced servo adjustment function, maintaining the product quality.

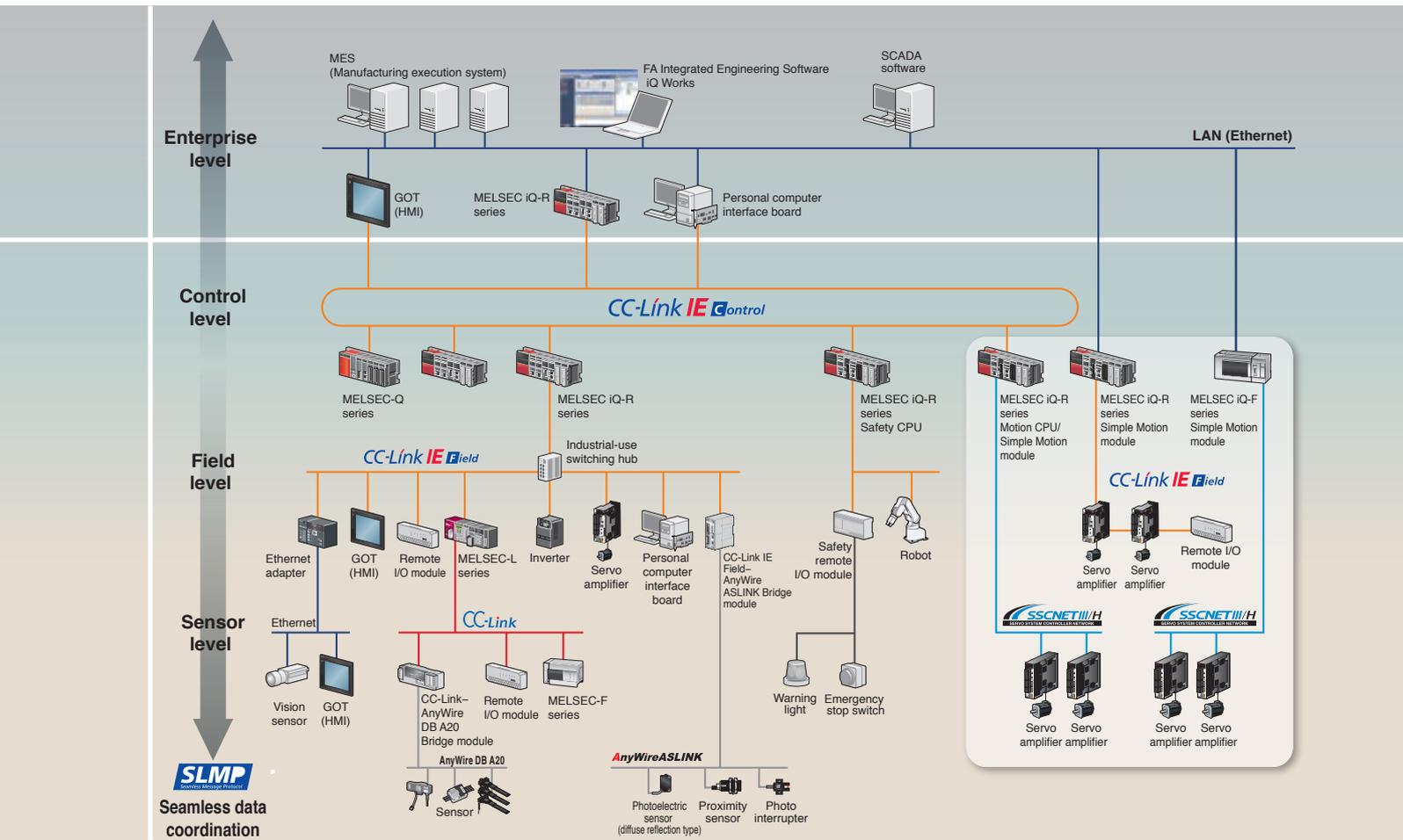


# Connectivity

## Seamless network reduces system costs

The MELSEC iQ-R Series is part of a family of products all interconnected across various levels of automation. Based on the seamless message protocol (SLMP\*1), data flow transparently between the sensor level and the management level across multiple industry-standard automation networks. CC-Link IE, Asia's No. 1 industrial network, realizes fast gigabit data transmission speeds, further optimizing the manufacturing cycle. In addition, the SSCNET III/H high-speed motion control network further enhance the factory-wide connectivity solution.

\*1. Seamless Message Protocol (SLMP): A simple client-server common protocol that enables communication between Ethernet products and CC-Link IE-compatible machines.





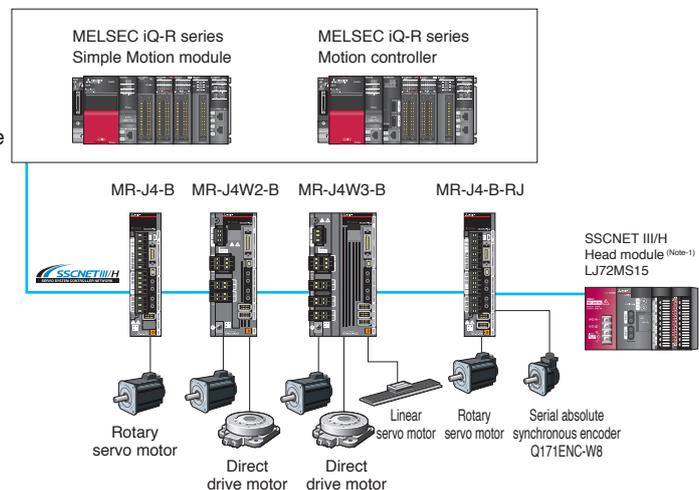
## Optical network “SSCNET III/H” accelerating system response

“SSCNET III/H” enables the servo system controllers to synchronize to servo amplifiers by using an optimized data frame for a servo system. This network is suitable for printing machines, food machines, and processing machines which require highly synchronized operation.

### Highlights of SSCNET III/H

- Optimized high-speed communications achieving a servo system of 150Mbps
- Cycle time as fast as 0.222 ms
- Synchronous communications allowing equipment to improve performance further
- Improved noise tolerance by optical communications
- Dramatically reduced wiring
- Central control with network
- Long distance wiring up to 3200 m
- SSCNET III/H compatible and SSCNET III compatible products connected in a same system

\*SSCNET (Servo System Controller NETWORK)



(Note-1): Motion controllers only

## The backbone of e-F@ctory, leveraging connectivity between the shop floor and IT

### Extensive visualization with advanced data connectivity

Big Data analytics requires deterministic data collection, which can be realized by incorporating two key features: SLMP that enables seamless connectivity between devices in the IT layer and on the shop floor; and a high-speed, large-capacity 1 Gbps communications network that enables the handling of large-data, such as production, quality and control data between different production processes.

### General, motion and safety control integrated into one network

CC-Link IE incorporates generic distributed control, synchronous motion control, and safety control enabling safety communications across multiple safety devices, all on the same network. The topology is quite versatile, based on twisted-pair cables, which enables flexibility in system configuration while helping to keep installation cost low.

### Comprehensive diagnosis realizing higher reliability

Disruptions to the control system are kept to a minimum via comprehensive diagnostics functions, high communications integrity owing to the noiseresistant characteristics of the optical cable, and communication re-routing capabilities made possible as the result of using a ring topology. Also, network errors can be rectified quickly by visualizing the network system image using the engineering software, and remotely from a GOT (HMI) directly on the machine or production line.



# Security

## Robust security that can be relied on

As technology becomes more complex and the distribution of manufacturing systems more global, the protection of intellectual property is even more significant. When shipping a finished product overseas, the last thing an OEM needs to consider is unauthorized copying or changing of the original project data. In addition to this, unauthorized access to the control system can have very serious implications to the control system and the end user, which can compromise the overall safety of the plant. The MELSEC iQ-R Series has a number of embedded features that help to maintain these requirements, such as hardware and software keys to protect intellectual property, and multi-level user access password hierarchy to protect the project at the design stage.

### Powerful security features protecting intellectual property

#### Security key authentication protecting project data

The security key authentication prevents programs from being opened on personal computers where the security key has not been registered. Furthermore, because programs cannot be executed by CPU modules where the security key has not been registered, the integrity of customer technologies and other intellectual property is not compromised.

When using the Simple Motion module, the security key can be registered on an extended PLC CPU's SRAM cassette and PLC CPU itself. Therefore, when replacing the CPU module, there is no need to re-register the security key, making replacement very simple.

When using Motion CPU, the security key is registered on Motion CPU.

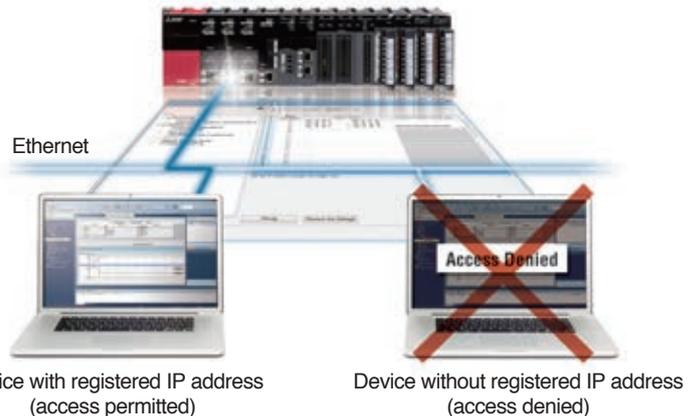


#### Prevent unauthorized access across the network

The IP filter can be used to register the IP addresses of devices permitted to access the CPU module. As a result, access from non-registered devices can be blocked, thereby lowering the risk of program hacking and unauthorized access by a third party.

Another feature is a remote password function<sup>(Note-1)</sup> for password-based security. Passwords of up to 32 characters can be set to prevent unauthorized access to the CPU module via networks such as Ethernet.

(Note-1): The PLC CPU is provided with this function.





# Compatibility

## Extensive compatibility with existing products

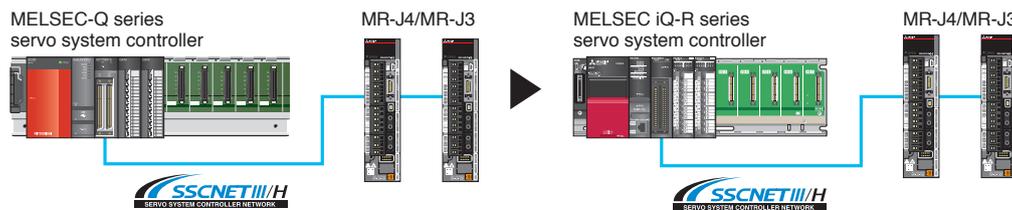


Whenever introducing a new system or technology into an existing manufacturing plant or control system, utilization of existing assets as much as feasibly possible is a mandatory requirement with today's manufacturing needs. The MELSEC iQ-R Series addresses these subtle but substantial needs with various system hardware support and engineering project compatibility to achieve an easy path to higher technology and improved performance capabilities.

## Utilize existing servo system controller assets

### Replacement of iQ Platform compatible MELSEC-Q series with MELSEC iQ-R series

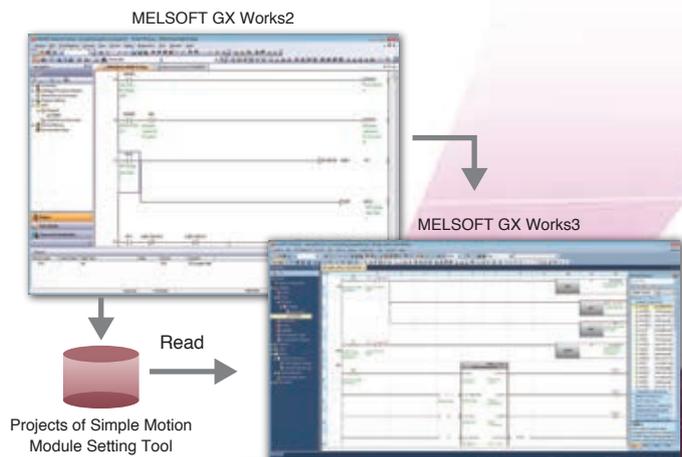
The existing iQ Platform compatible MELSEC-Q series Simple Motion modules/Motion controllers can be replaced with the MELSEC iQ-R series.



## Utilization of existing MELSEC-Q series assets

[MELSOFT MT Works2/MELSOFT GX Works3]

A simply conversion process is all it takes to enable the use of MELSEC-Q Series programs with the MELSEC iQ-R Series. Customers can effectively use the program assets they have accumulated, thereby reducing the overall engineering time.



# Next-generation, Compact Servo System Controller with Extensive Built-in Functions

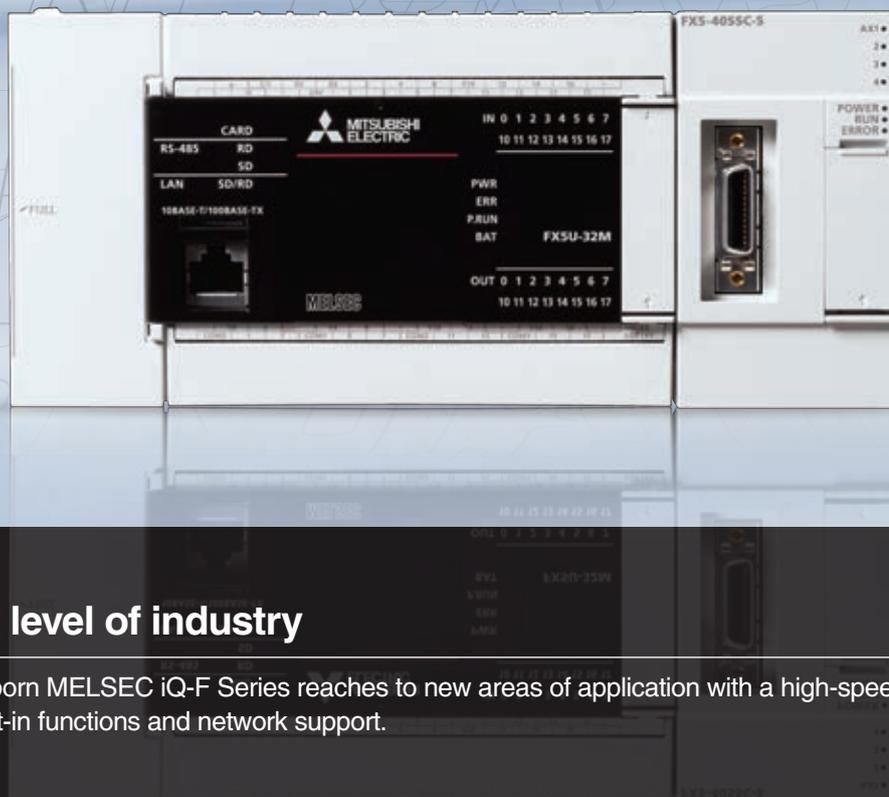
## MELSEC iQ-F series

Designed on the concepts of outstanding performance, superior drive control and user centric programming, Mitsubishi Electric MELSEC-F Series has been reborn as the MELSEC iQ-F Series.

From stand alone use to networked system applications, MELSEC iQ-F Series brings your business to the next level of industry.

### MELSEC iQ-F series

## Simple Motion Module Debut



### The next level of industry

The newly reborn MELSEC iQ-F Series reaches to new areas of application with a high-speed system bus, extensive built-in functions and network support.



Conveyance



Food & Beverage



Packaging



**MELSEC iQ-F**  
series



MELSOFT **GX Works3**

The next level of industry



**SSCNET III/H**  
SERVO SYSTEM CONTROLLER NETWORK

# SERVO SYSTEM CONTROLLER

## Productivity



### Outstanding performance

- Control up to 8 axes
- Include the synchronous encoder input and mark detection as standard features
- Equipped with a high-speed bus system that significantly reduces cycle time

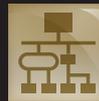
## Engineering



### Intuitive programming

- Easy setting without complex programming by GX Works3
- Easy programming via drag & drop
- All-in-one engineering tool reducing programming time

## Connectivity



### Network

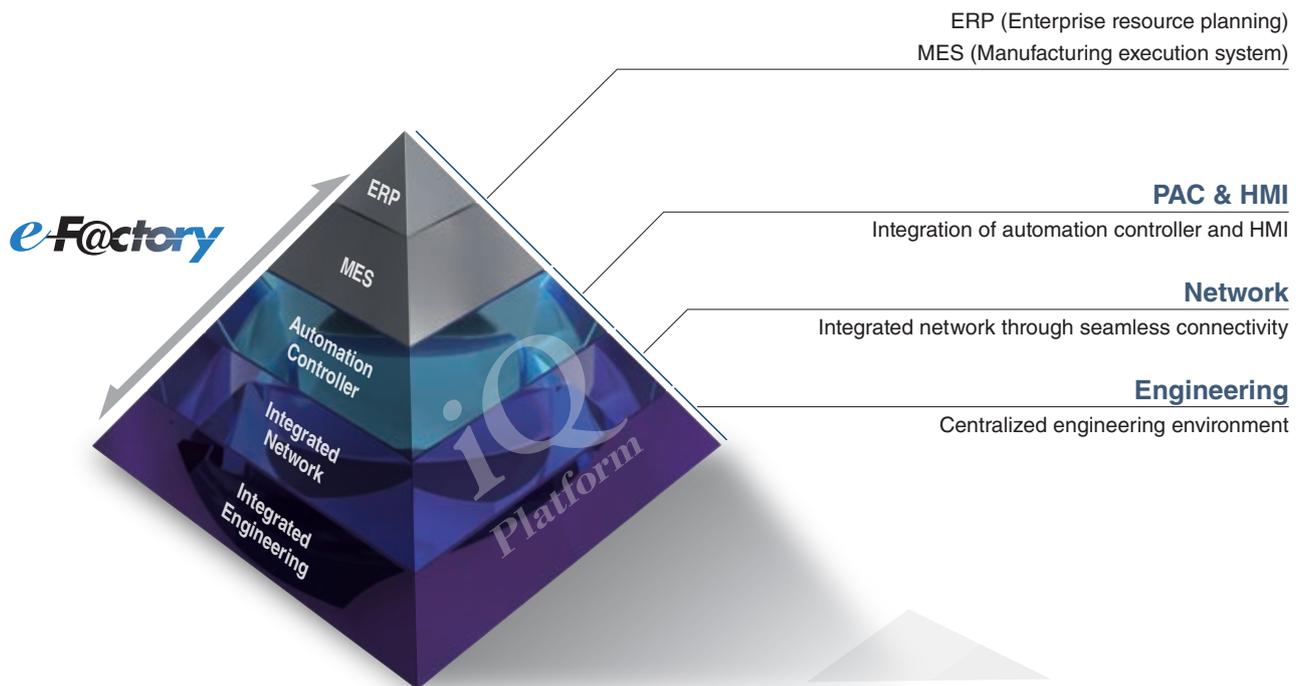
- Parameters and servo data managed centrally via SSCNET III/H.
- Sophisticated servo amplifier and servo motor offering industry leading level of performance
- Optical network "SSCNET III/H" providing high response and high reliability



FA Integrated Platform  
"iQ Platform" Movie

## iQ Platform for maximum return on investment

Minimize TCO, Seamless integration, Maximize productivity, Transparent communications: these are common items that highlight the benefits of the iQ Platform and e-F@ctory. The iQ Platform minimizes TCO at all phases of the automation life cycle by improving development times, enhancing productivity, reducing maintenance costs, and making information more easily accessible across the plant. Together with e-F@ctory, offering various best-in-class solutions through its e-F@ctory alliance program, the capabilities of the manufacturing enterprise is enhanced even further realizing the next level for future intelligent manufacturing plants.



## Further reduce TCO while securing your manufacturing assets

### Automation Controller

Improve productivity and product quality

1. High-speed system bus realizing improved system performance
2. On-screen multi-touch control enabling smooth GOT (HMI) operations

### Integrated Network

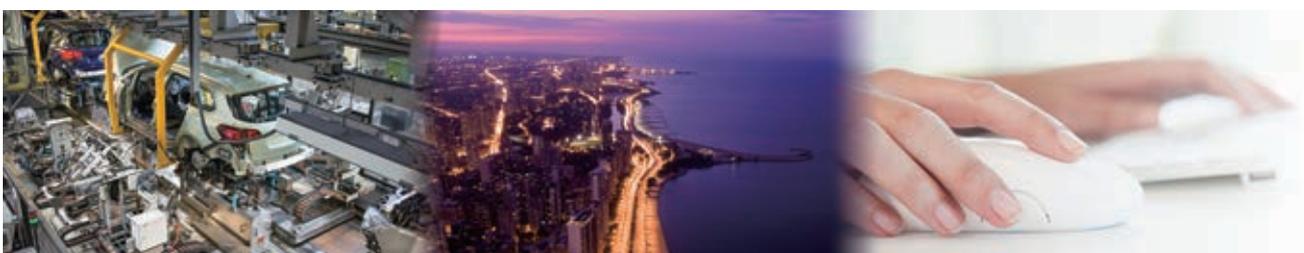
Best-in-class integrated network optimizing production capabilities

1. CC-Link IE supporting 1 Gbps high-speed communication
2. Seamless connectivity within all levels of manufacturing with SLMP

### Centralized Engineering

Integrated engineering environment with system level features

1. Automatic generation of system configuration
2. Share parameters across multiple engineering software via MELSOFT Navigator
3. Changes to system labels are reflected between PAC and HMI



# Servo System Designed with Automation in Mind

The required characteristics of servo systems vary with the applications and industries. Not only the high-speed and high-accuracy, but also the functions in accordance with each of field-specific processes are necessary. Together with other FA-related products, Mitsubishi Electric offers a wide range of servo system product lines to satisfy the diversified application needs in various industries.

## Automotive



Improve productivity and realize flexibility in different automotive assembly lines with high-accuracy motion control, including linear/circular interpolation and electric cam profile.

## Automated warehouse



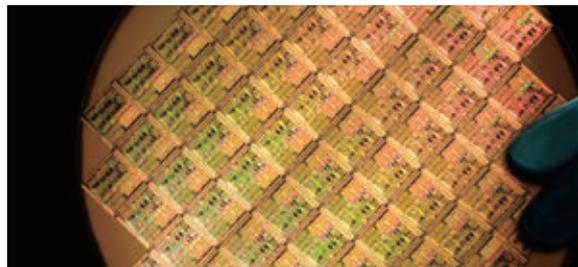
Realize advanced logistics coordination and eliminate errors in repetitive processes. Servo-based high-speed material handling and highly accurate positioning improve productivity and reduce energy consumption.

## Food and beverage, CPG



Realize improvements in various packaging applications such as high-speed filling, which requires a highly accurate, continuous feed rate and precision.

## Semiconductor



In today's semiconductor manufacturing process, wafer diameter is getting larger and components smaller. To meet the requirements of higher quality and productivity, Mitsubishi Electric's high-performance servos and high-resolution encoder achieve fast and accurate positioning at stable speeds.

## Mounter



Flexible mounting of electronic components with high speed and density is demanded in printed circuit board applications. Mitsubishi Electric offers a high level of servo system solutions for rapid mounting of highly miniaturized components and for flexible mounting of irregular shapes.

## Printing



Mitsubishi Electric provides high-accuracy synchronous system solutions for the paper feeding, printing, cutting, and assembly functions within the printing process, achieving high-speed and high-quality converting applications.

# A complete system lineup to meet your production and manufacturing needs

Motion controllers and Simple Motion modules are flexibly coordinated with Mitsubishi Electric's other product lines such as displays and programmable controllers as well as servo amplifiers and servo motors. Mitsubishi Electric allows you to freely create an advanced servo system.

## SOLUTION



e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise by enhancing productivity, and reducing the maintenance and operation costs together with seamless information flow throughout the plant.

## SOFTWARE

Motion Controller Engineering Software  
**MELSOFT MT Works2**

Programmable Controller Engineering Software  
**MELSOFT GX Works3**

Capacity Selection Software

Graphic Operation Terminal

Personal computer



GOT2000 series

## HUMAN MACHINE I/F

## PROGRAMMABLE CONTROLLER

## SERVO SYSTEM CONTROLLER

### Simple Motion module



CC-Link IE Field Network compatible  
MELSEC iQ-R series  
Simple Motion module

**RD77GF32**  
**RD77GF16**  
**RD77GF8**  
**RD77GF4**

### Simple Motion module



SSCNET III/H compatible  
MELSEC iQ-R series  
Simple Motion module

**RD77MS16**  
**RD77MS8**  
**RD77MS4**  
**RD77MS2**

## NETWORK

CC-Link IE Field Network

SSCNET III/H

CC-Link IE **Field**  
CC-Link IE **Field Basic**



## SERVO AMPLIFIER

## SENSING MODULE

### Servo amplifier



CC-Link IE Field Network compatible  
servo amplifier

**MR-J4-GF(-RJ)**



SSCNET III/H compatible  
servo amplifier

**MR-J4-B(-RJ)**

## SERVO MOTOR

## LOW-VOLTAGE SWITCHGEAR

### Rotary servo motor



Small capacity,  
low inertia  
**HG-KR series**  
Capacity: 50 to 750 W



Small capacity,  
ultra-low inertia  
**HG-MR series**  
Capacity: 50 to 750 W



Medium capacity,  
medium inertia  
**HG-SR series**  
Capacity: 0.5 to 7 kW



Medium/large capacity,  
low inertia  
**HG-JR series**  
Capacity: 0.5 to 55 kW



Ultra-compact,  
ultra-small capacity  
**HG-AK series**  
Capacity: 10 to 30 W



Medium capacity,  
ultra-low inertia  
**HG-RR series**  
Capacity: 1 to 5 kW



Medium capacity,  
flat type  
**HG-UR series**  
Capacity: 0.75 to 5 kW



Ultra-large capacity  
**HG-JR series**  
Capacity: 110 to 220 kW



Large capacity, ultra-low inertia  
**HG-RR series**  
Capacity: 11 to 22 kW

**NEW**

Available  
in the future



Mitsubishi Electric's integrated FA platform for achieving lateral integration of controllers & HMI, engineering environments and networks at production sites.

**Programmable controller**



**MELSEC iQ-R**  
series  
MELSEC iQ-R series  
Programmable  
controller



**MELSEC iQ-F**  
series  
MELSEC iQ-F series  
Programmable controller

**Simple Motion module**



SSCNET III/H compatible  
MELSEC iQ-F series  
Simple Motion module  
**FX5-80SSC-S**  
**FX5-40SSC-S**

**Motion Controller**



SSCNET III/H compatible  
MELSEC iQ-R series  
Motion controller  
**R64MTCPU**  
**R32MTCPU**  
**R16MTCPU**

**SSCNET III/H**



**Servo amplifier**



SSCNET III/H compatible  
2-axis servo amplifier  
**MR-J4W2-B**



SSCNET III/H compatible  
3-axis servo amplifier  
**MR-J4W3-B**



SSCNET III/H compatible  
2-axis servo amplifier  
Ultra-small capacity  
**MR-J4W2-0303B6**

**Servo amplifier**



SSCNET III/H  
compatible  
servo amplifier  
**MR-JE-B**

**Sensing module**



SSCNET III/H compatible  
sensing module  
**MR-MT2000 series**

**Linear servo motor**



Core type  
**LM-H3 series**  
Rating: 70 to 960 N



Core type  
(natural/liquid cooling)  
**LM-F series**  
Rating: 300 to 3000 N  
(natural cooling)  
Rating: 600 to 6000 N  
(liquid cooling)



Core type with magnetic  
attraction counter-force  
**LM-K2 series**  
Rating: 120 to 2400 N



Coreless type  
**LM-U2 series**  
Rating: 50 to 800 N

**Direct drive motor**



**NEW**  
Low-profile flange type  
**TM-RG2M series**  
Rating: 2.2 to 9 N·m



**NEW**  
Low-profile table type  
**TM-RU2M series**  
Rating: 2.2 to 9 N·m



High rigidity  
**TM-RFM series**  
Rating: 2 to 240 N·m

**Servo motor**



Small capacity,  
low inertia  
**HG-KN series**  
Capacity: 100 to 750 W



Medium capacity,  
medium inertia  
**HG-SN series**  
Capacity: 0.5 to 3 kW

**Magnetic contactor**



**MS-T**

**Molded-case circuit breaker**



**WS-V**

**CASE 1** **Vertical Form, Fill & Seal** Advanced Sync. Cam Auto-Generation Mark Detection

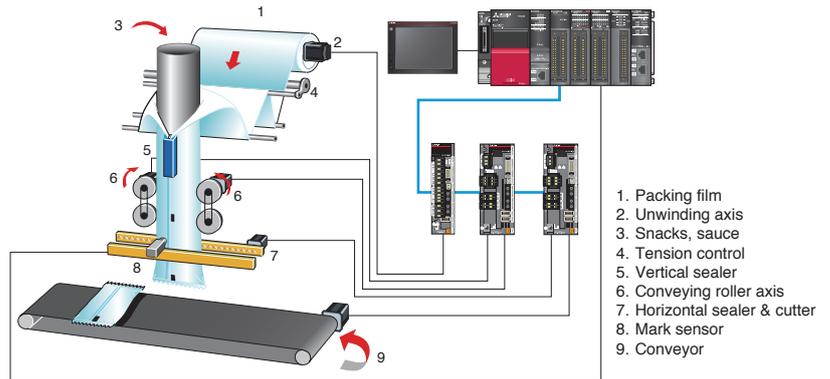
When the machine packs food, the whole process is synchronized by using advanced synchronous and cam controls. The packing film is cut using the registration mark as a reference with the mark detection function, improving the packaging quality. Additionally, cam data for the rotary knife axis can be easily created with the cam auto-generation function, achieving more efficient production.

**Main functions**

- Advanced synchronous control
- Cam control
- Cam auto-generation function
- Mark detection function

**Application examples**

- Horizontal form, fill & seal
- Labeling machines
- Wrap-around case packer
- Diaper manufacturing machines
- Packing machines
- Food/beverage bag filling machines



**CASE 2** **Liquid Filling Machines** Advanced Sync.

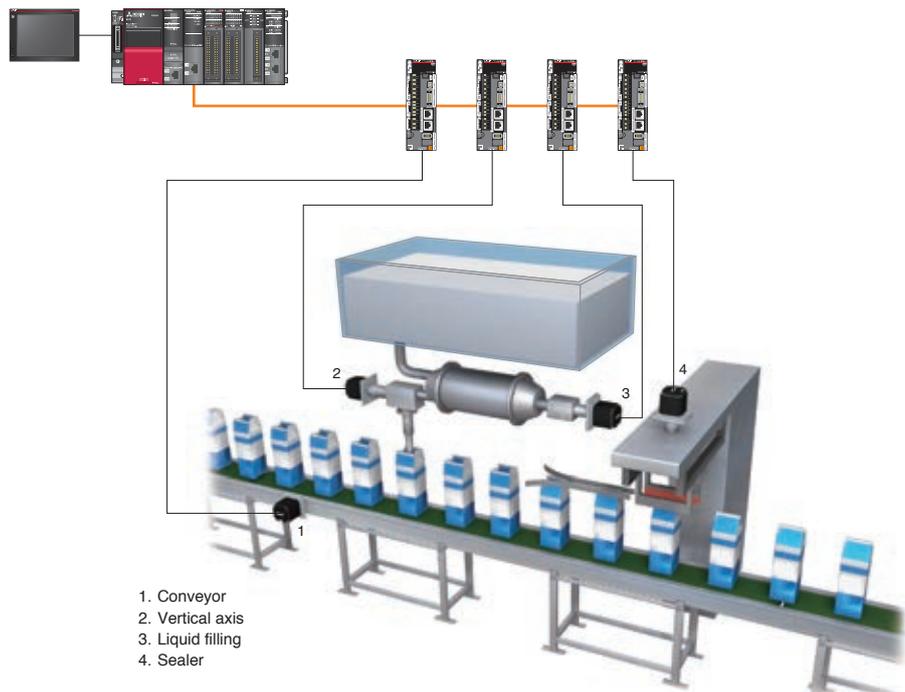
The machine can adjust the speed of the nozzle's vertical motion according to the liquid level to be filled in the bottle by using advanced synchronous and cam controls. Different bottle shapes can be filled on the same conveyor line, enabling more efficient use of production equipment.

**Main functions**

- Advanced synchronous control
- Speed control
- Cam control

**Application examples**

- Vertical form, fill & seal
- Horizontal form, fill & seal
- Labeling machines



**CASE 3** **Converting Machines** Advanced Sync. Speed-Torque

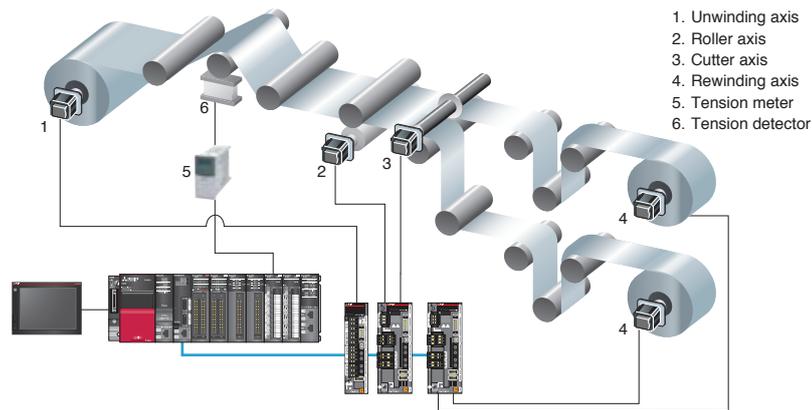
The film can be sent at constant tension, preventing it from stretching or shrinking. The speed or torque is compensated with the tension detector and tension meter for keeping the tension constant. The whole line can be synchronized by using advanced synchronous control while executing speed control simultaneously.

**Main functions**

- Speed-torque control
- Advanced synchronous control

**Application examples**

- Packaging machines
- Printing machines
- Slitting machines
- Wire drawing machines
- Laminating machines



**CASE 4** **Screw Tightening Machines** Speed-Torque Tightening & Press-fit

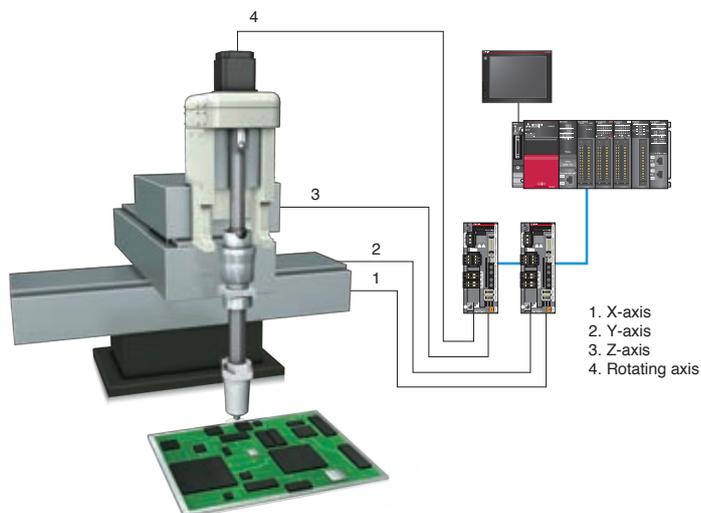
The machine tightens screws by using speed-torque control (tightening & press-fit control). Since the current position is controlled even after switching from the position control to the speed-torque control, positioning based on the absolute position coordinates is possible when switching back to the position control.

**Main functions**

- Positioning control
- Speed-torque control (tightening & press-fit control)

**Application examples**

- Vertical form, fill & seal
- Press-fit machines
- Caulking machines



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CASE 5

Material Handling Machines

- Positioning
- Linear Interpolation
- Circular Interpolation
- Contin. Trajectory
- Advanced S-curve

The machine can move workpieces easily from one line to another by using a combination of linear interpolation, 2-axis circular interpolation, and continuous trajectory control.

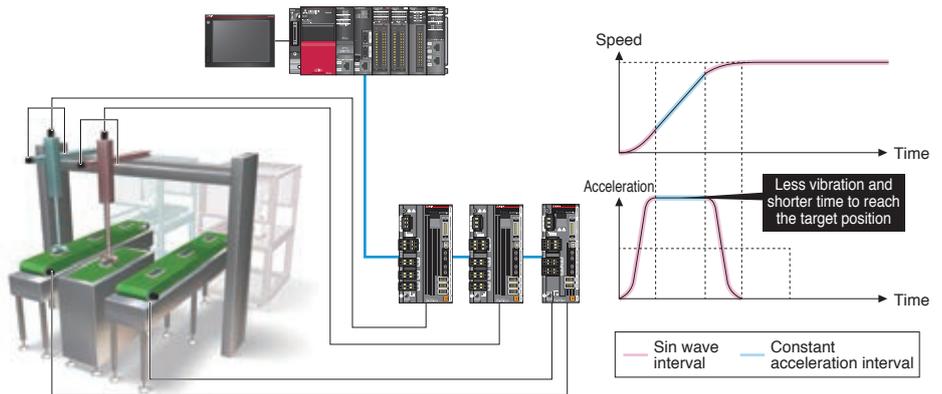
Machine vibration is minimized and a shorter cycle time is achieved by setting the smooth acceleration period (Sin wave interval) and maximum acceleration period (Constant acceleration interval) with the advanced S-curve acceleration/deceleration function.

Main functions

- Positioning control
- Linear interpolation and circular interpolation
- Continuous trajectory control
- S-curve acceleration/deceleration
- Advanced S-curve acceleration/deceleration

Application examples

- Material handling machines
- Pick and place robots
- Machines with frequent accelerations/decelerations



CASE 6

Sealing

- Positioning
- Linear Interpolation
- Circular Interpolation
- Contin. Trajectory

The machine can coat the workpiece by using a combination of linear interpolation, 2-axis circular interpolation, and continuous trajectory control.

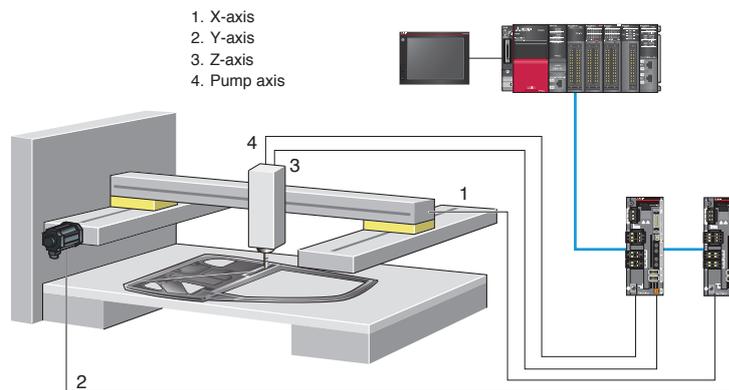
A smooth trajectory can be traced with the S-curve acceleration/deceleration function.

Main functions

- Continuous trajectory control
- Linear interpolation
- Circular interpolation
- S-curve acceleration/deceleration

Application examples

- Sealing
- Dispensers



**CASE 7** **Printing Machines** Advanced Sync. Speed-Torque

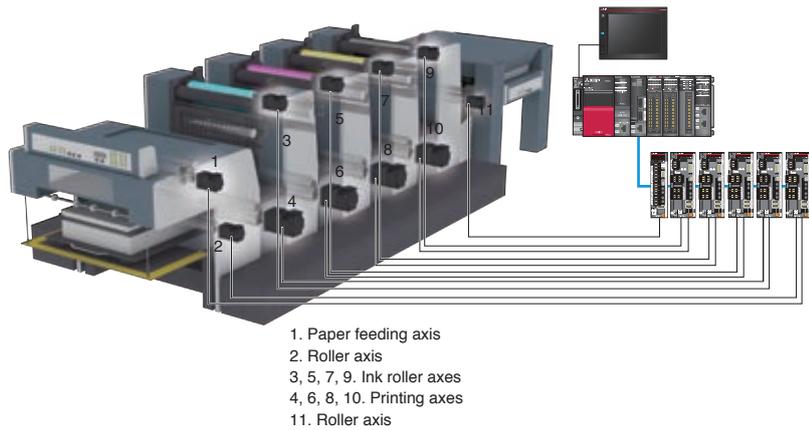
The machine can carry out printing processes by using a combination of advanced synchronous control and speed-torque control. Also, with the robust filter function of servo amplifier, both high response and stability can be achieved for high inertia equipment such as a printing machine driven by belts and gears.

**Main functions**

- Advanced synchronous control
- Speed-torque control
- Robust filter
- Resonance suppression filter

**Application examples**

- Printing machines
- Sheet-fed offset printing machines
- Web-fed offset printing machines



**CASE 8** **Alignment Systems** Positioning Vision

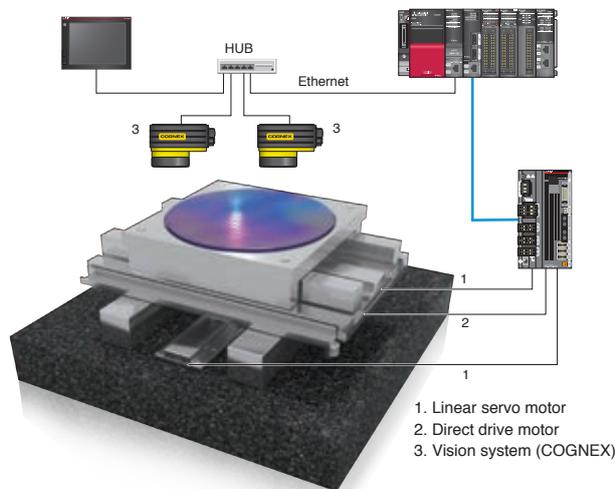
The alignment time can be reduced by the system changing the target position during positioning, and starting positioning for the new target position with the workpiece data from the vision system. High-speed and high-accuracy positioning can be achieved, with the Motion controller and the vision system directly connected. For the Simple Motion module, the data from vision camera is read via the PLC CPU for position compensation.

**Main functions**

- Vision system
- Target position change function

**Application examples**

- Solar panel manufacturing equipment
- FPD manufacturing equipment
- LCD manufacturing equipment
- Image processing systems for inspection



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CASE 9

Synchronization of Input and Output with Servo Control

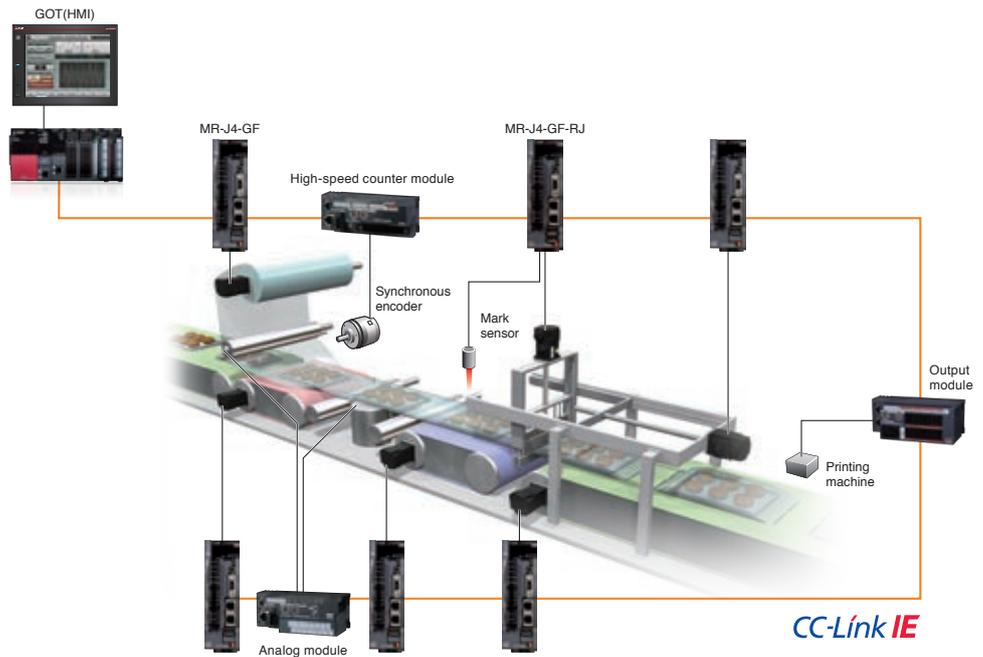
Various data, such as synchronous encoder values, sheet tension values, and text data, are inputted and outputted in accordance with the servo command communication cycle, enabling a wide range of Motion control applications.

Main functions

- All-in-one network
- Synchronous communication
- Network diagnosis
- Motion mode
- I/O mode

Application examples

- Packaging machines
- Filling machines
- Labeling machines
- Packing machines
- Material handling machines



CASE10

Flexible network topology

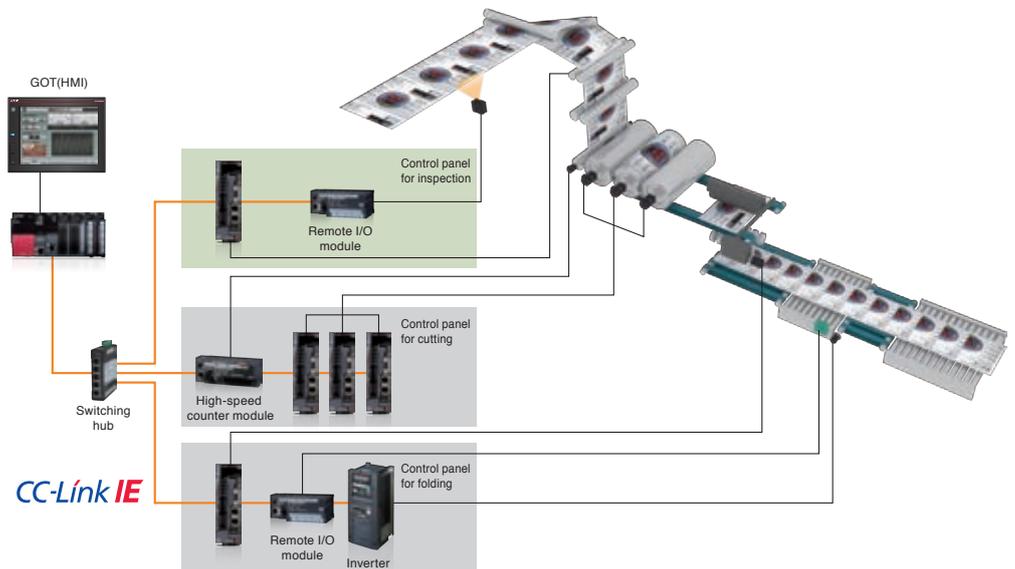
With a switching hub, multiple network topologies are supported including star, line, ring, star and line combinations. This flexibility allows additional equipment to be simply connected to any available port, with little concern for restrictions.

Main functions

- Line topology
- Star topology
- Star/line mixed topology

Application examples

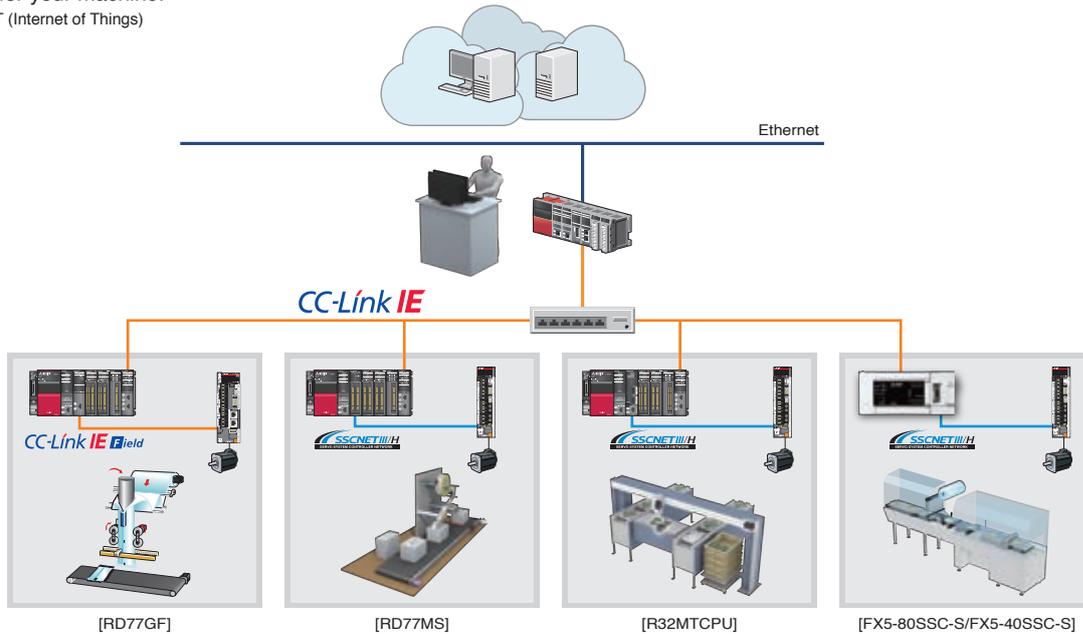
- Packaging machines
- Filling machines
- Labeling machines
- Packing machines
- Material handling machines



**CASE11 Data Transmission to IT System**

Data of servo amplifiers and servo motors for each machine can be collected via CC-Link IE Field Network. The status of the entire product line can be visualized by batch management of the collected data. A CC-Link IE Field Network servo system supports to build IoT<sup>(Note-1)</sup> for your machine.

(Note-1): IoT (Internet of Things)



**CASE12 Monitoring of Servo Data**

Servo operation can be monitored with extensive monitor data (selectable from up to 50 items). The monitor items can be flexibly changed during operation. The operation status of servo amplifiers and servo motors (including partner products) acquired via CC-Link IE Network and SSCNET III/H are transferred and displayed on the host system or on any GOT screens created by customers.

**Monitoring items**

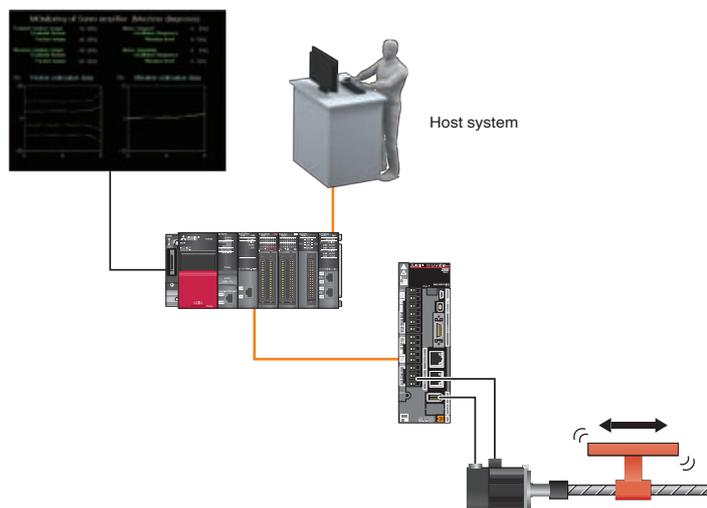
[Monitoring and data collection]

- Alarm history of servo amplifiers
- Identification information of servo amplifiers and servo motors
- Power consumption
- 7-segment LED display status
- Load ratio of servo motors • Speed
- Temperature of various parts

[Preventive maintenance]

- Inrush relay ON/OFF number
- Power ON cumulative time
- Machine diagnosis information (the estimated friction value and the estimated vibration value)

(Note): Monitoring items and its specifications vary by model type.



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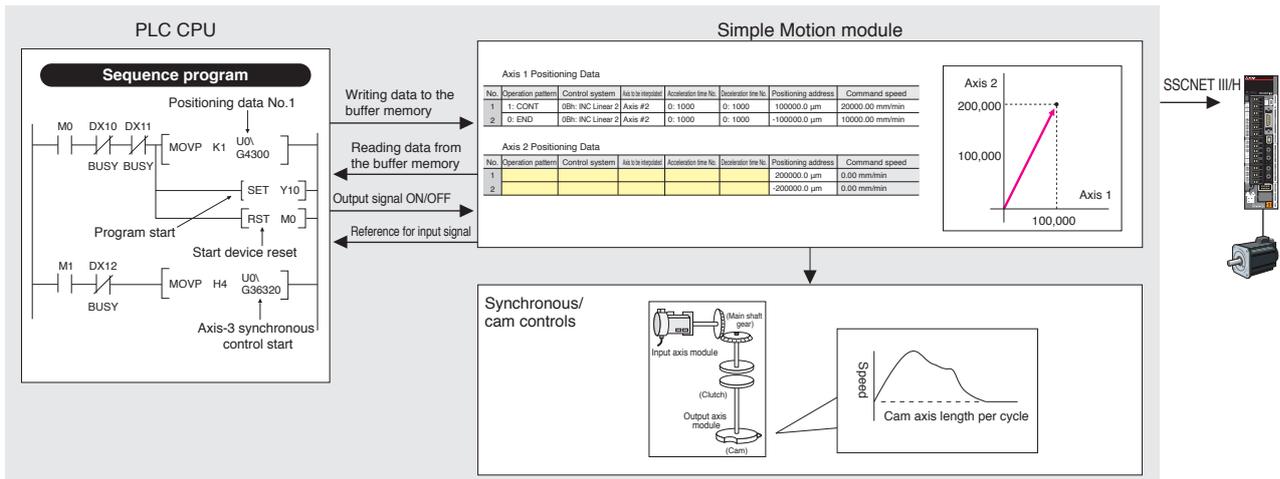
Servo Amplifiers

Perfectly Coordinated with Customer Needs and Applications

Features of Simple Motion Module

The Simple Motion module is an intelligent function module which performs positioning control by following the instructions of the PLC CPU.

- The positioning functions are used exactly in the same manner as those of Positioning modules.
- Linear interpolation control and other controls can be achieved easily just by writing positioning data to the buffer memory with sequence programs and function blocks.
- MELSOFT GX Works3, the engineering software, supports everything needed, from programming to servo adjustment.
- Positioning/advanced synchronous/cam controls can be performed with simple parameter settings and a start from a sequence program.



Advanced control while being simple to use just like Positioning modules

**MELSEC iQ-R series** **CC-Link IE Field**



CC-Link IE Field Network compatible MELSEC iQ-R series

RD77GF32  
RD77GF16  
RD77GF8  
RD77GF4

- For configuring a servo system with ONE single network
- For high-accuracy positioning with synchronous control up to μsec precision

**MELSEC iQ-R series** **SSCNET III/H**



SSCNET III/H compatible MELSEC iQ-R series

RD77MS16  
RD77MS8  
RD77MS4  
RD77MS2

- For easily performing a wide-range of Motion control, such as advanced synchronous control, cam control, and speed-torque control (tightening & press-fit control) with the sequence programs, such as function blocks

**MELSEC iQ-F series** **SSCNET III/H**



SSCNET III/H compatible MELSEC iQ-F series

FX5-80SSC-S  
FX5-40SSC-S

- For performing superior Motion control as a micro PLC
- For configuring a system covering from stand-alone use to networked system application with the micro PLC



**MELSEC iQ-R**  
series

SSCNET III/H compatible  
MELSEC iQ-R series

**MELSEC iQ-F**  
series

SSCNET III/H compatible  
MELSEC iQ-F series

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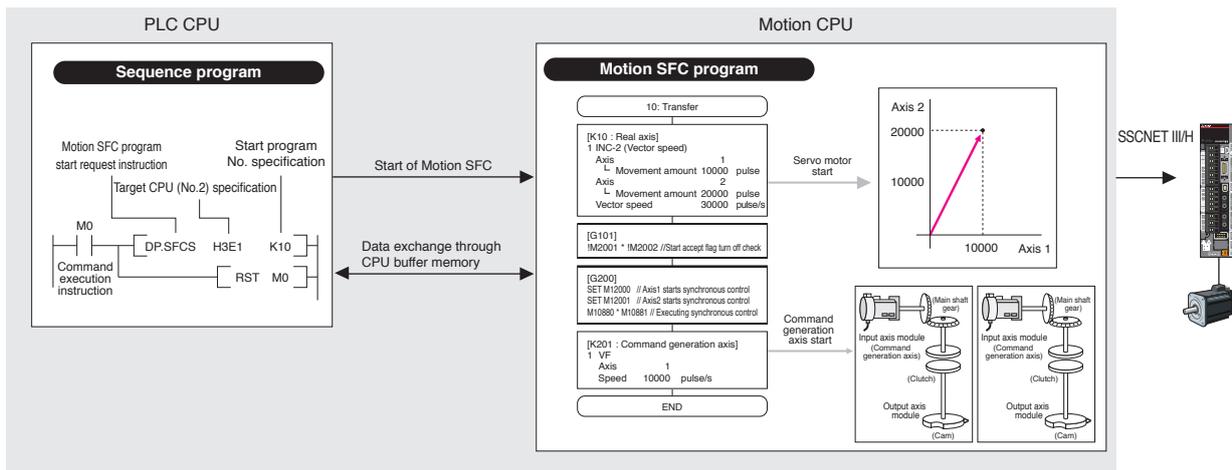
Networks

Servo Amplifiers

## Features of Motion Controller

The Motion controller is a CPU module used with the PLC CPU for Motion control.

- Using Motion SFC programs, the Motion CPU separately controls operation from the PLC CPU. Thus CPU loads are distributed, achieving advanced Motion control.
- Various advanced Motion controls, such as tightening & press-fit, cam, and advanced synchronous controls can be performed in addition to basic controls including positioning, speed and torque controls.
- COGNEX vision system can be directly connected to the controller with Ethernet.



## Advanced Motion control



**MELSEC iQ-R**  
series

SSCNET III/H compatible  
MELSEC iQ-R series

R64MTCPU  
R32MTCPU  
R16MTCPU

- For large and medium systems
- For performing more advanced control
- Possible to control up to 192 axes by use of three R64MTCPU modules

## Function Comparison of Simple Motion Module and Motion Controller

	Simple Motion module					Motion controller					
	MELSEC IQ-R series		MELSEC IQ-F series			MELSEC IQ-R series					
	RD77GF32 RD77GF16 RD77GF8 RD77GF4	RD77MS16 RD77MS8 RD77MS4 RD77MS2	FX5-80SSC-S FX5-40SSC-S			R64MTCPU	R32MTCPU	R16MTCPU			
Module type	Intelligent function module					CPU module					
Servo amplifier	MR-J4-GF(-RJ) 	MR-J4-B(-RJ) MR-J4W -B 	MR-JE-B 	MR-J4-B(-RJ) MR-J4W -B 	MR-JE-B 	MR-J4-B(-RJ) MR-J4W -B 					
Servo motor	 Rotary servo motor	 Linear servo motor	 Direct drive motor	 Rotary servo motor	 Rotary servo motor	 Linear servo motor	 Direct drive motor	 Rotary servo motor	 Rotary servo motor	 Linear servo motor	 Direct drive motor
Command interface	CC-Link IE		SSCNET III/H			SSCNET III/H					
	1 line					2 lines		1 line			
Maximum number of control axes	32/16/8/4 axes	16/8/4/2 axes		8/4 axes			64 axes	32 axes	16 axes		
Operation cycle	0.5 ms or longer	0.444 ms or longer		0.888 ms or longer			0.222 ms or longer				
Engineering environment	MELSOFT GX Works3					MELSOFT MT Works2					
Programming method	Motion profile table					Motion SFC		Direct positioning start instruction			

■ Featured functions

	Simple Motion module			Motion controller		
	MELSEC iQ-R series		MELSEC iQ-F series	MELSEC iQ-R series		
	RD77GF32 RD77GF16 RD77GF8 RD77GF4	RD77MS16 RD77MS8 RD77MS4 RD77MS2	FX5-80SSC-S FX5-40SSC-S	R64MTCPU	R32MTCPU	R16MTCPU
Control mode	Position control Torque control Advanced synchronous control	Speed control Tightening & press-fit control (Note-1) Cam control		Position control Torque control Advanced synchronous control Pressure control G-code control	Speed control Tightening & press-fit control Cam control Machine control	
Positioning control	Linear interpolation Continuous trajectory control Speed/position switching control (ABS) Position/speed switching control	Circular interpolation Helical interpolation (Note-2) Speed/position switching control (INC)		Linear interpolation Continuous trajectory control Speed control with fixed position stop High-speed oscillation control	Circular interpolation Helical interpolation Speed/position switching control Position follow-up control	
Acceleration/deceleration control	Trapezoidal acceleration/deceleration	S-curve acceleration/deceleration		Trapezoidal acceleration/deceleration Advanced S-curve acceleration/deceleration	S-curve acceleration/deceleration	
Manual control	JOG operation	Manual pulse generator operation Inching operation		JOG operation JOG operation simultaneous start	Manual pulse generator operation	
Function that changes the control details	Current value change Torque limit value change Acceleration/deceleration time change	Target position change Speed change Override		Current value change Torque limit value change Acceleration/deceleration time change	Target position change Speed change Override	
Home position return method	Proximity dog method Scale home position signal detection method  Driver home position return method	Count method (2 types) Data set method		Proximity dog method (2 types) Scale home position signal detection method Dog cradle method Dogless home position signal reference method Driver home position return method	Count method (3 types) Data set method (3 types) Stopper method (2 types) Limit switch combined method	
Auxiliary function	Forced stop Software stroke limit Amplifier-less operation Optional data monitor Event history Safety observation (Note-3)  Driver communication (Note-1) Command generation axis (Note-4)	Hardware stroke limit Absolute position system Unlimited length feed Mark detection M-code output Digital oscilloscope  Cam auto-generation		Forced stop Software stroke limit Amplifier-less operation Optional data monitor Event history Safety observation (Note-3) Security key Limit switch output Driver communication Command generation axis	Hardware stroke limit Absolute position system Unlimited length feed Mark detection M-code output Digital oscilloscope Vision system Cam auto-generation Vibration Suppression Command Filter	

(Note-1): Available only with RD77MS and FX5-80SSC-S/FX5-40SSC-S  
 (Note-2): Available only with RD77GF and RD77MS  
 (Note-3): Use the safety observation function of a servo amplifier.  
 (Note-4): Available only with FX5-80SSC-S/FX5-40SSC-S

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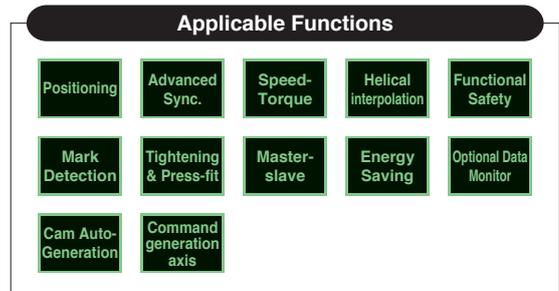
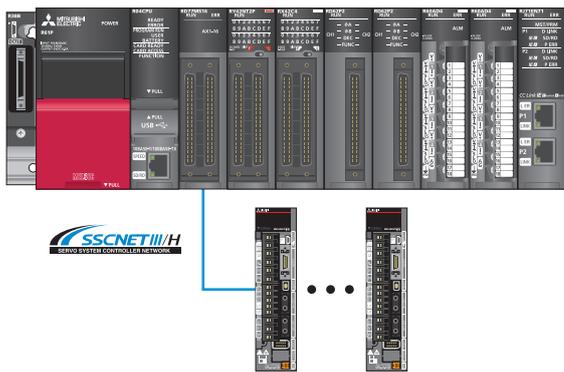
**MELSEC iQ-R** series  
SSCNET III/H compatible  
MELSEC iQ-R series

**MELSEC iQ-F** series  
SSCNET III/H compatible  
MELSEC iQ-F series

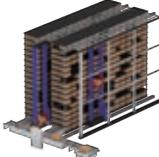
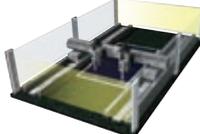
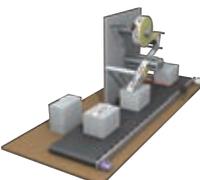
## Simple Motion Modules

- Wide-range, sophisticated Motion control, such as advanced synchronous control, cam control, speed-torque control (tightening & press-fit control), can be achieved just with sequence programs including function blocks.
- All the functions of QD75MH are included in the Simple Motion module.
- Programming, servo adjustment, operation/maintenance for the Simple Motion modules are supported by ONE engineering software (MELSOFT GX Works3).

### Superb Functionality for Wide-range Applications



(Note): The applicable function varies depending on the model.

<p><b>Stacking cranes</b></p>  <p>Positioning</p>	<p><b>Packing machines</b></p>  <p>Advanced Sync. Mark Detection</p>	<p><b>FPD manufacturing device</b></p>  <p>Advanced Sync.</p>	<p><b>Cutting machine</b></p>  <p>Cam Auto-Generation Advanced Sync.</p>
<p><b>Screw tightening machines</b></p>  <p>Tightening &amp; Press-fit</p>	<p><b>Labeling machines</b></p>  <p>Advanced Sync. Positioning</p>	<p><b>Pressing machines</b></p>  <p>Tightening &amp; Press-fit Master-slave</p>	<p><b>Converting machines</b></p>  <p>Speed-Torque</p>



Outline

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## All-in-One Engineering Software

This all-in-one software covers all aspects of the product development cycle - from system design, programming, to debugging and maintenance - maximizing efficiency while minimizing your effort.

### Easy system design

#### No need of manuals in system and parameter settings

- MELSOFT GX Works3 includes everything needed from system configuration to servo parameter settings.
- “One-point help” enables easy settings without manuals.

[Servo parameter]



[System configuration]

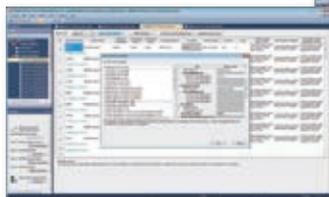


System Design

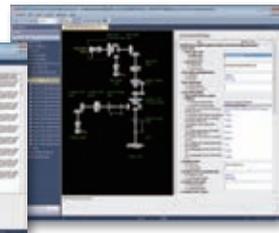
Programming

### Easy motion control

[Positioning data]



[Synchronous control parameter]



#### Increased usability in synchronous/positioning control settings

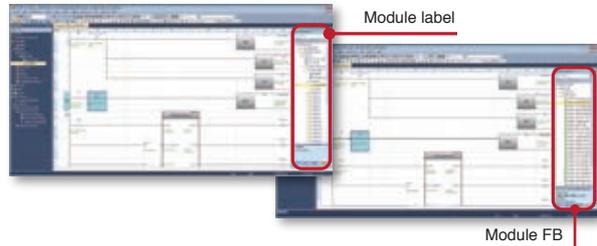
- An array of sub functions helps you create positioning data.
- Synchronous control is performed easily just by parameter settings.
- Creation of a rough cam waveform on a graph via drag & drop, or direct numerical value input to the graph enables easy creation of cam data.

### Easy programming

#### Simple point-and-click programming

- A sequence program is created effortlessly via drag & drop of module labels/FBs.

[Sequence program]



Debug

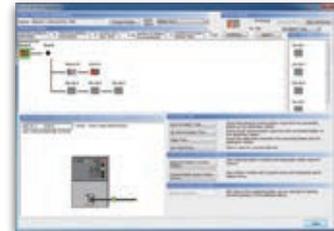
Maintenance

### Easy startup

[One-touch tuning]



[Network diagnostics]



#### Increased efficiency in debugging and maintenance

- Servo adjustment is automatically completed using the One-touch tuning function.
- Debugging of a program without an actual machine is possible by simulation.
- The network errors are displayed by Network diagnostics.

**MELSEC iQ-R**  
series

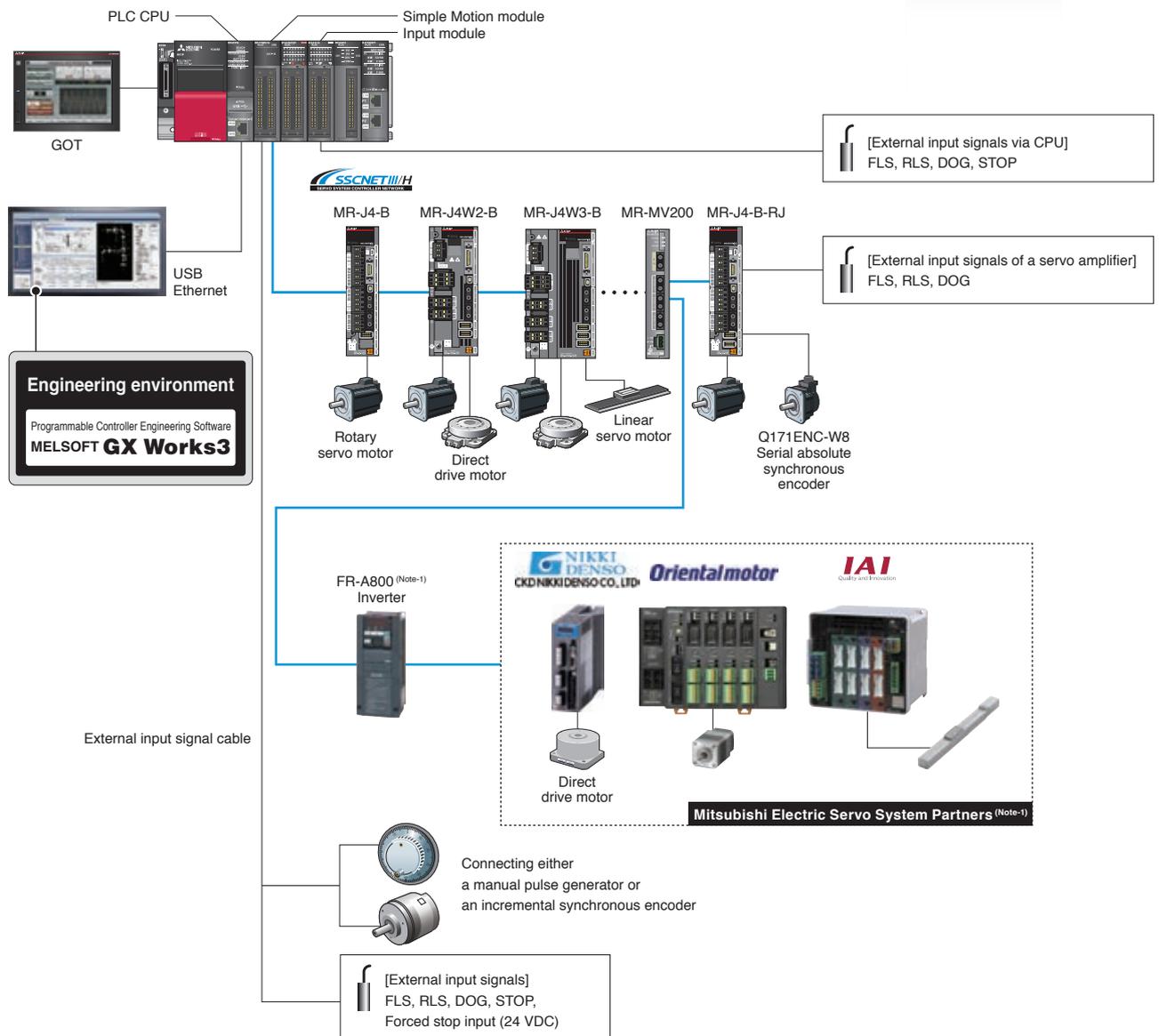
SSCNET III/H compatible  
MELSEC iQ-R series Simple Motion module

**RD77MS16/RD77MS8/RD77MS4/RD77MS2**

Achieving Various Control While Being  
Simple to Use Just Like Positioning Modules



## System configuration



RD77MS16: Up to 16 axes / RD77MS8: Up to 8 axes / RD77MS4: Up to 4 axes / RD77MS2: Up to 2 axes

(Note-1): When using a partner product or the inverter FR-A800, use one whose version supports the Simple Motion module.

**MELSEC iQ-F**  
series

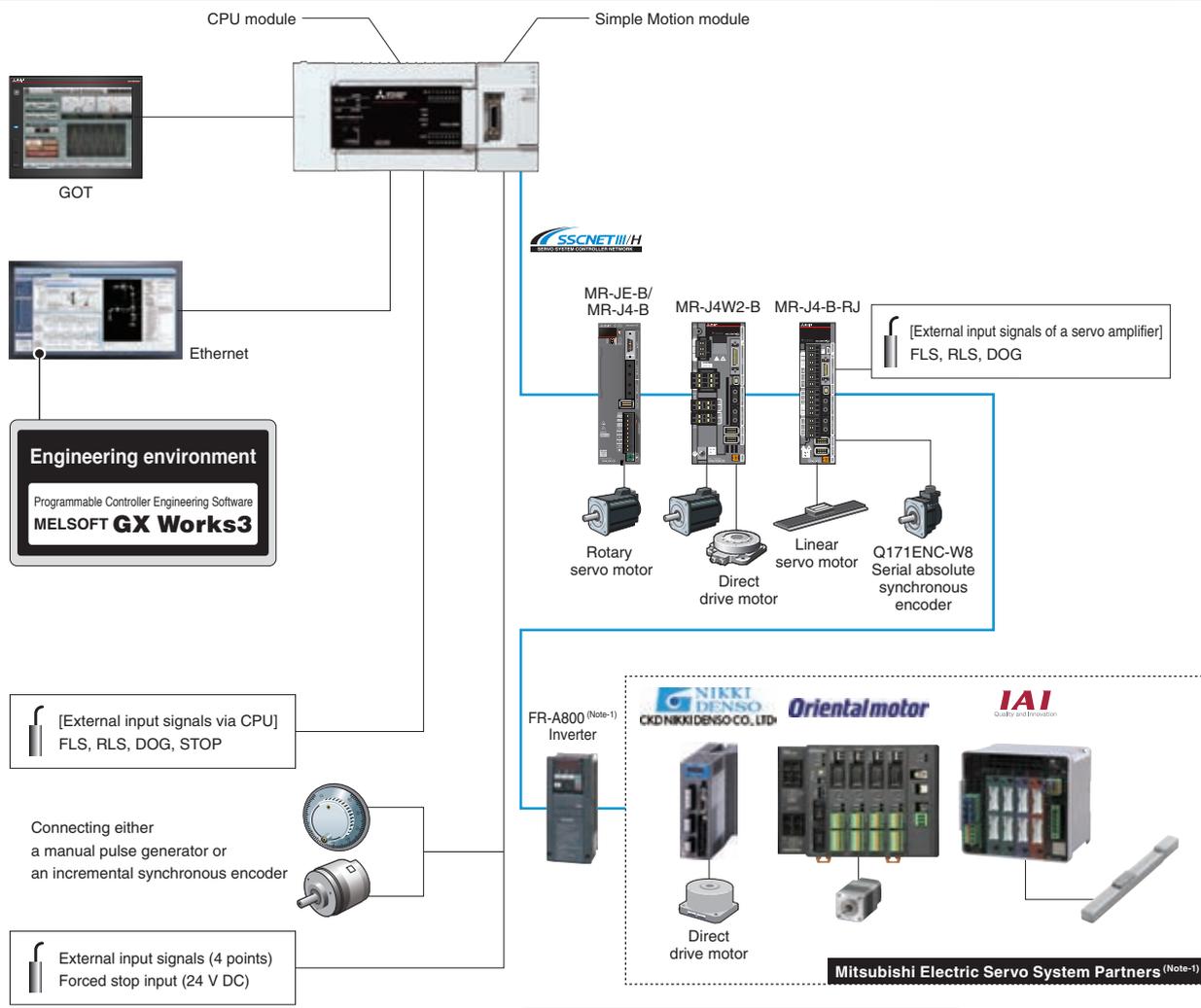
SSCNET III/H compatible  
MELSEC iQ-F series Simple Motion module

**FX5-80SSC-S/FX5-40SSC-S**

Cutting-edge motion control packed  
in a compact module



**System configuration**



**FX5-80SSC-S: Up to 8 axes/FX5-40SSC-S: Up to 4 axes**

(Note-1): When using a partner product or the inverter FR-A800, use one whose version supports the Simple Motion module

Outline

Simple Motion

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## MELSEC iQ-R series

CC-Link IE Field Network compatible  
MELSEC iQ-R series Simple Motion module

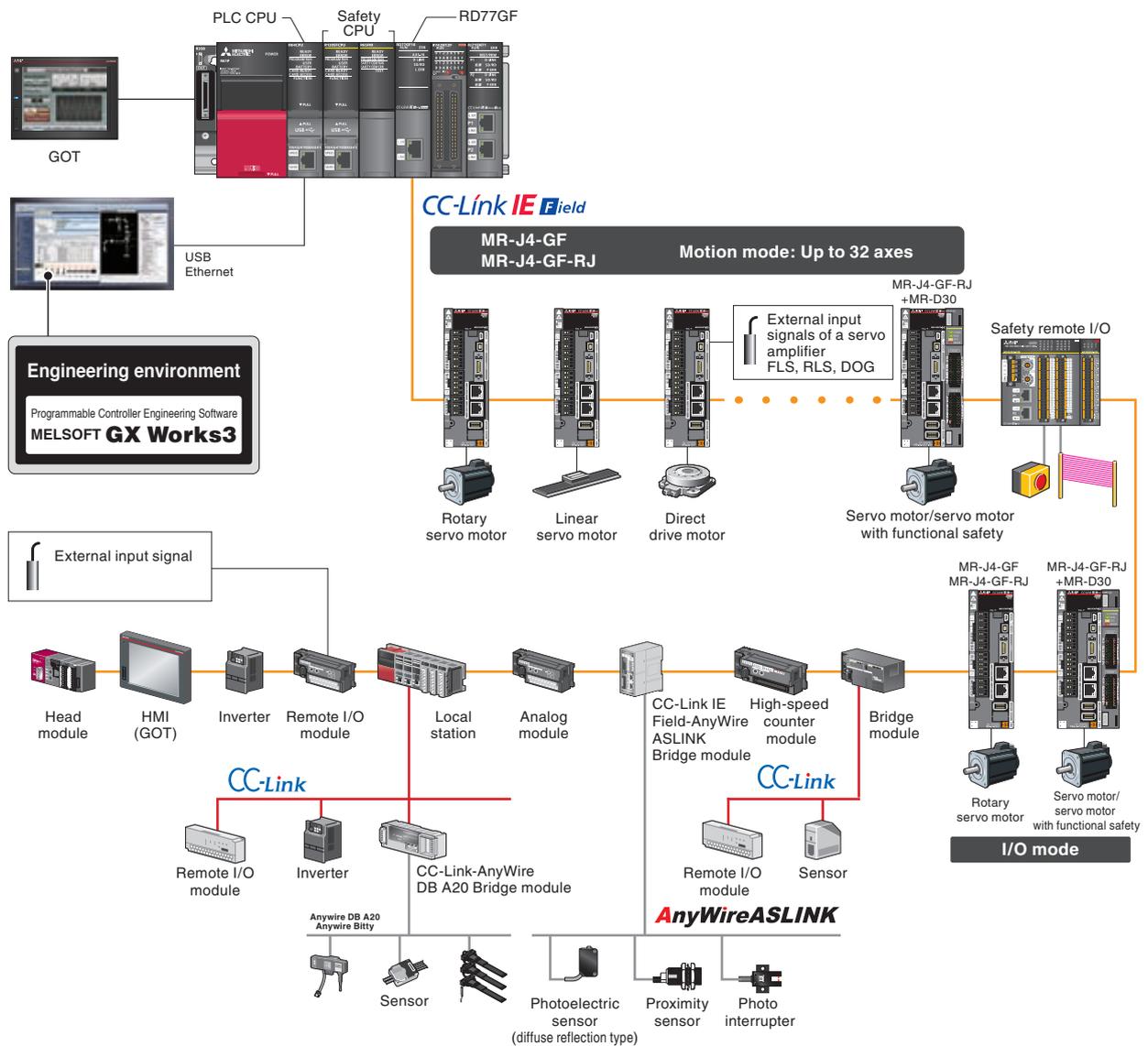
### RD77GF32/RD77GF16/RD77GF8/RD77GF4

Synchronous control up to  $\mu\text{sec}$  precision,  
suitable for high-accuracy positioning

CC-Link IE Field



## System configuration



Slave station: Up to 120 stations (including the number of servo amplifiers in motion mode)  
(Note): A switching hub is required for star topology.

## CC-Link IE Field Network Compatible Functions

### Preventive maintenance

RD77GF



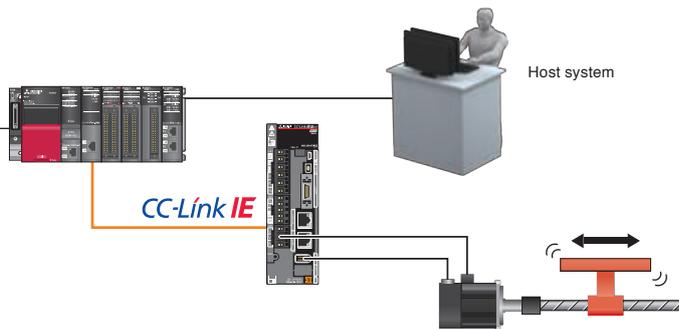
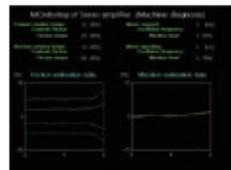
Productivity



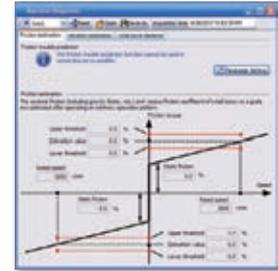
Maintenance

Machine diagnosis function detects changes in mechanical parts (ball screw, guide, bearing, belt, etc.) by analyzing changes in machine friction, load moment of inertia, unbalanced torque, and vibration components from the data inside a servo amplifier, supporting timely maintenance of these parts. In addition, the data are transferred to a host system and used to monitor the entire line.

[Machine diagnosis function window created by user]



[Machine diagnosis function window on MR Configurator2]



### Control mode

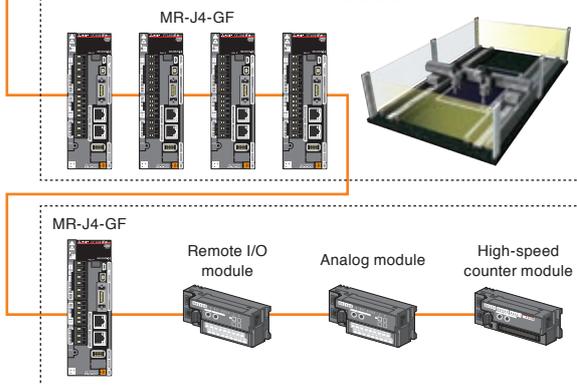
RD77GF



Productivity

Two types of modes are available according to your needs:

- Motion mode for a wide range of motion control such as positioning of multiple axes, synchronous control, etc.
- I/O mode for positioning of one axis



#### Motion mode

This mode enables advanced motion control functions, such as positioning for multi-axis interpolation, synchronous control, and speed-torque control in combination with the Simple Motion module.

**Maximum number of control axes : 32 axes**

#### I/O mode

With the CC-Link IE Field Network, various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules, can be connected flexibly.

**Maximum number of control stations : 120 stations**  
(Including the number of servo amplifiers in motion mode)

### CC-Link IE Field Network master station

RD77GF



The CC-Link IE Field Network Simple Motion module covers the functionality that a CC-Link IE Field Network master/local module provides <sup>(Note-1)</sup>. The Simple Motion module can function as a master module, and is also equipped with link devices equivalent to a master/local module. This leads to reduced cost on system because it includes functions of both Simple Motion module and a master module.

(Note-1): Excludes the function of a sub-master station.

#### Maximum link points per network

Item	RD77GF	Master module
Remote input (RX)/Remote output (RY)	16k points each (16384 points, 2k byte)	16k points each (16384 points, 2k byte)
Remote register (RwW, RWr)	8k points each (8192 points, 16k byte)	8k points each (8192 points, 16k byte)

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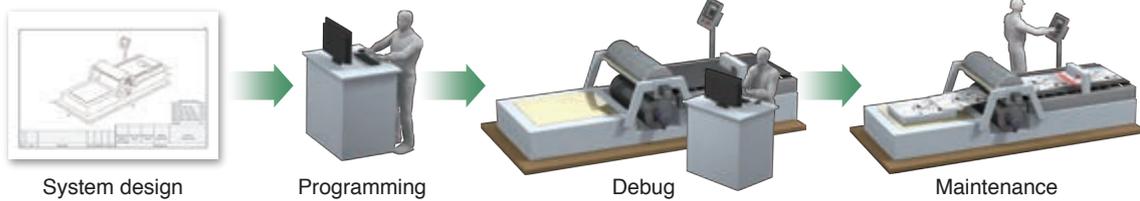
Networks

Servo Amplifiers

### Programming Environment



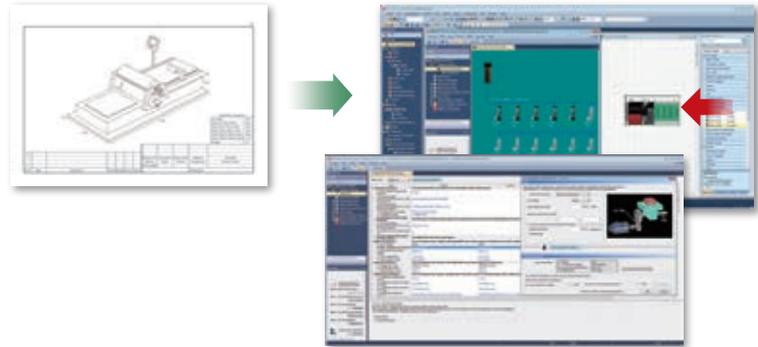
There are many works with software in the processes from machine design through its operation - system design, programming, debug, to maintenance. MELSOFT GX Works3 is equipped with various features that simplify those works.



### System design



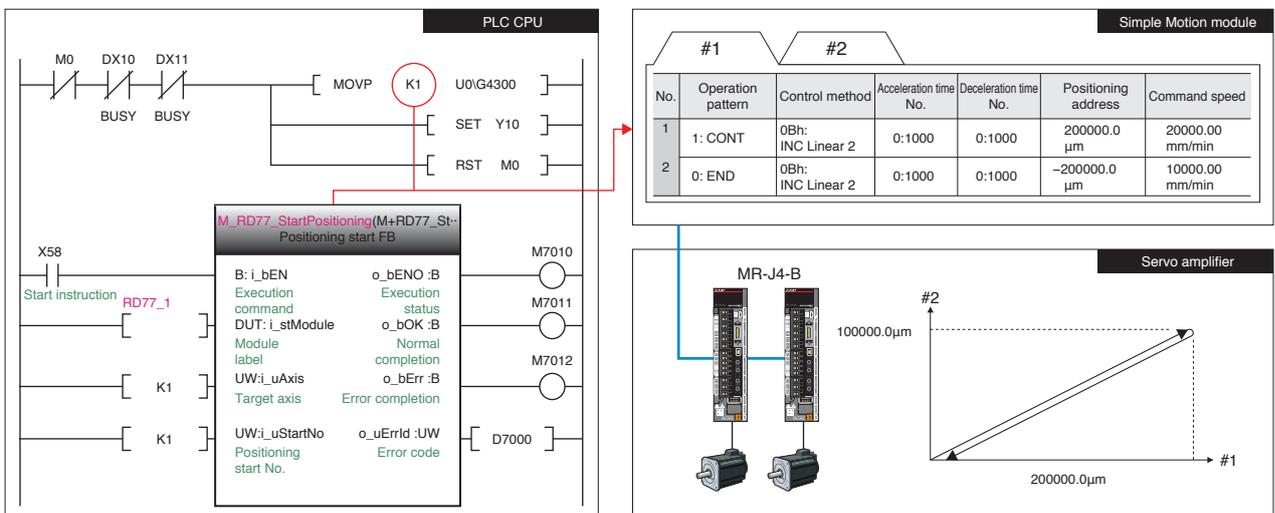
A system is simply and quickly designed just by selecting a module needed for your system via drag & drop. The parameter and positioning data windows appear by double-clicking on the desired module.



### Programming



Various positioning controls such as linear interpolation can be performed just by writing positioning data to the buffer memory using a sequence program or a function block.



## PLCopen® Motion Control FB



Simple Motion modules and servo amplifiers with built-in positioning are used to execute Motion control. Each device uses specific programming, thus the time and cost involved in understanding how each device works is a burden.



PLCopen® Motion Control FB is a standardized interface, which provides the following benefits:

- Reduced workload for programming, saving time and reducing costs.
- People other than the program designer can understand the programming, leading to reduced maintenance time.

### Conforms to IEC 61131-3

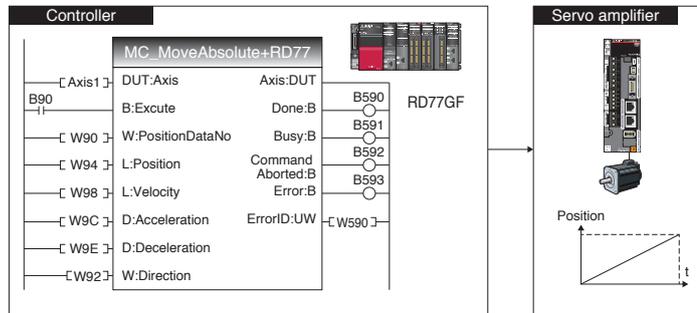
GX Works3 realizes structured programming such as ladder and ST, making project standardization across multiple users even easier.

### Programming examples

The PLCopen® Motion Control FB enables positioning of devices requiring different control methods with the same programming.

[When using the Simple Motion module]  
 Devices : RD77GF + MR-J4-GF  
 FB : MC\_MoveAbsolute + RD77

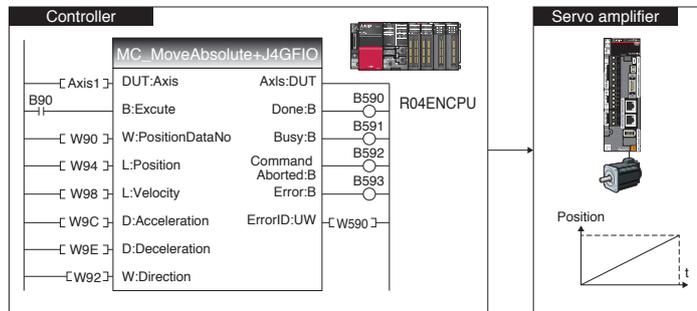
Positioning starts after setting the Simple Motion module such as the target position and speed.



[When using the servo amplifier with the built-in positioning function]

Devices : R04ENCPU + MR-J4-GF  
 FB : MC\_MoveAbsolute + J4GFIO

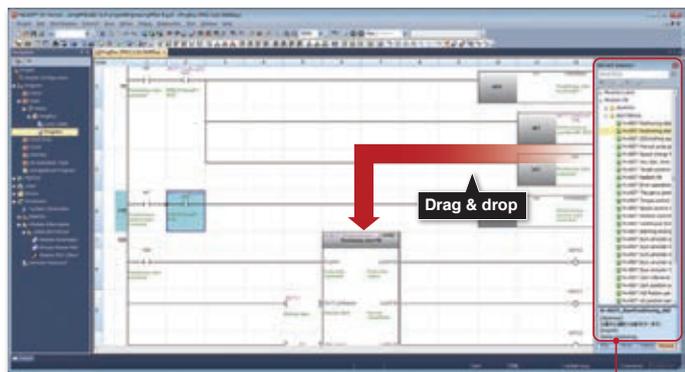
Positioning starts after transferring data of a target position and speed from a master station to the servo amplifier with the built-in positioning function.



## Module Function Block (Module FB)



A program for positioning control is easily created via drag & drop of required FBs from a list of Mitsubishi Electric module FBs to the program editor screen.



Module FBs

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### Simulation

RD77GF

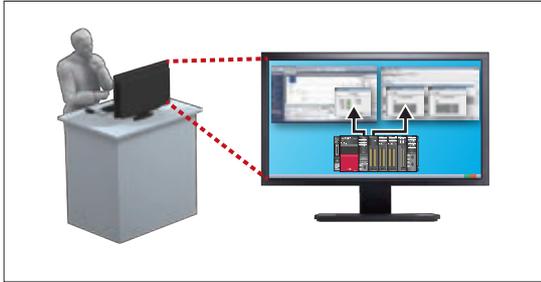
RD77MS



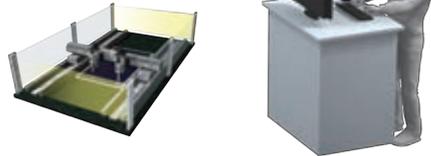
Engineering

The MELSOFT GX Works3 simulation enables a program operation to be checked without an actual machine even during the debugging process and hence a shorter startup time. In addition, multiple Simple Motion modules can be simulated at the same time.

Debugging by simulating program on PC



Operation check by axis monitor and digital oscilloscope



Startup and adjustment by actual machine

### Event history

RD77GF

RD77MS



Engineering



Maintenance

For the MELSEC iQ-R series, events occurred on each module and servo amplifiers can be stored to the CPU module. Information of "WRITE" operation to the program, error information, and written data to the flash ROM, etc. is listed chronologically, which makes error cause investigation and restoration work smoother and quicker.

MELSOFT GX Works3

Detailed information	Axis information	Current value	Signal
	Event occurs axis:2 Axis operation state:20 (Servo amplifier has not been connected/servo amplifier power OFF) Start No.:5 Occurrence data No.:5 Starting axis:2	Current feed value:10762666 Real current value:10762666 Feedrate:0 Unit:2 (degree)	PLC READY:ON All axes servo ON:ON BUSY:OFF External input signal (Md.30):0003 Servo Status 1:0000 Servo Status 2:0000 Servo status 3:0000
Cause	Start is requested when the '(Md.26) Axis operation status' is 'Servo amplifier has not been connected/servo amplifier power OFF'.		
Corrective Action	Do not request the start when the '(Md.26) Axis operation status' is other than 'standby', 'stop', and 'start'.		

The cause of event can be easily identified through the event history which chronologically lists errors and operation for the CPU module.

## Positioning Control



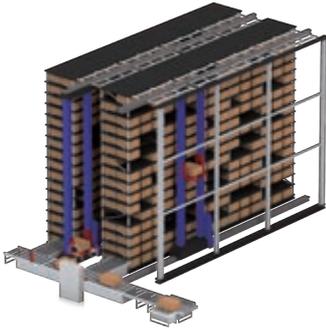
Positioning control is easily executed using a Motion profile table.

### Basic positioning control

RD77GF

RD77MS

FX555C



- To respond to various application needs, the Simple Motion module offers various control methods, such as linear interpolation, 2-axis circular interpolation, fixed-pitch feed, and continuous trajectory control.
- Automatic operation can be executed easily by setting positioning addresses, speeds, and other setting items in a sequence program.
- Powerful sub-functions, such as M-code output, skip, speed change, and target position change functions, are available.

### Speed-position switching control

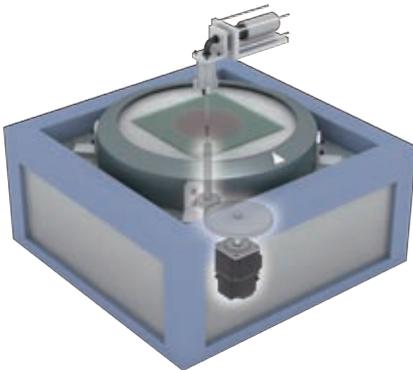
RD77GF

RD77MS

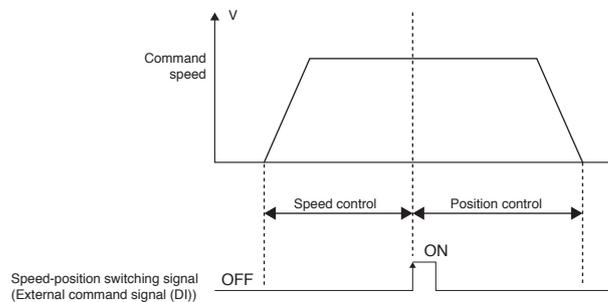
FX555C



The servo motor, rotating at the specified speed in the speed control, stops at the specified position when turning ON the speed-position switching signal.



[Time chart]



### Helical interpolation

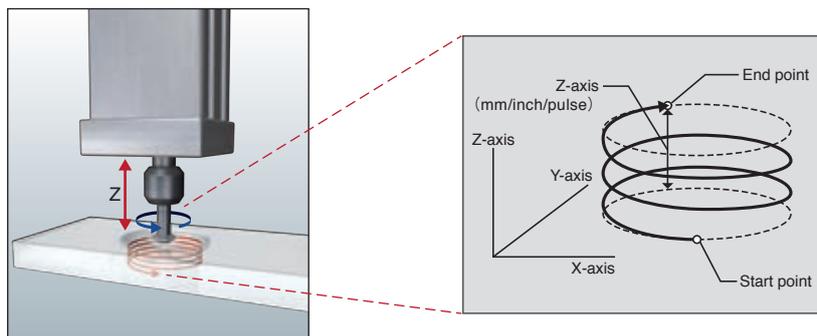
RD77GF

RD77MS



Helical interpolation draws a helical path by a linear interpolation axis (Z-axis) following to 2-axis circular interpolation control (X-axis and Y-axis). For applications that require the boring of deep, large holes, usually the helical interpolation of the three axes must be taken into consideration.

- Milling is done in a circle, with the X and Y axes synchronized to achieve the pre-set size.
- The depth of the hole is simultaneously controlled along the Z axis, ensuring minimal deviation in the cutting bit position.



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### Target position change function

RD77GF

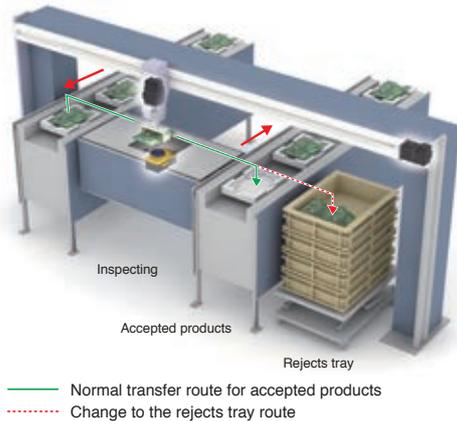
RD77MS

FX5SSC

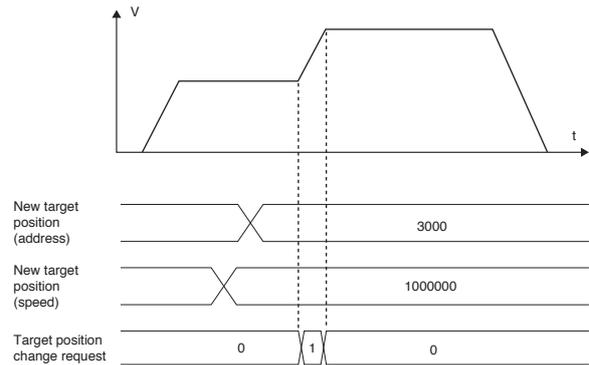


Productivity

The target position can be changed at any time even when the products are being moved (1-axis linear control). The product is examined while being moved to the next line. If a faulty product is found, the target position is changed so that the faulty product is put in a separate tray for those rejected.



[Time chart]



### Block start

RD77GF

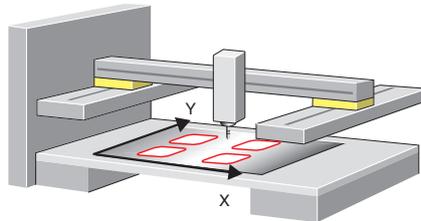
RD77MS

FX5SSC

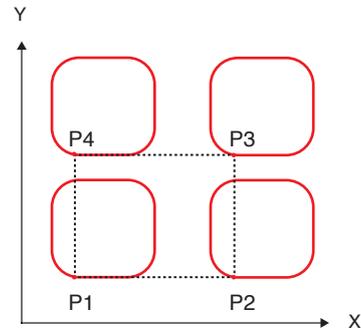


Productivity

The block-start executes multiple sequential positioning data set as block start data by a single start trigger, and is used in control that follows the same repetitive path.



Positioning starts from "First point" in block start data to draw four squircles.



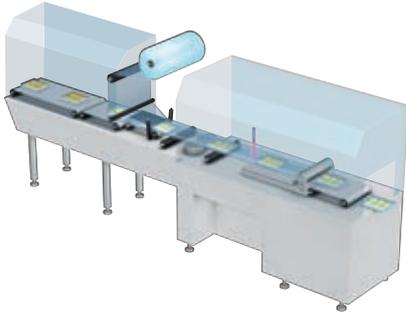
#### Setting example of block start data

Block start data	Operation pattern	Start data No.	Special start instruction	Description
First point	1: Continue	1	0: Block start	Move to P1
Second point	1: Continue	21	0: Block start	Draw a squircle (P1 to P1).
Third point	1: Continue	2	0: Block start	Move to P2.
Fourth point	1: Continue	21	0: Block start	Draw a squircle (P2 to P2).
		⋮		
Eighth point	0: End	21	0: Block start	Draw a squircle (P4 to P4).

## Advanced Synchronous Control



The advanced synchronous control is software-based synchronous control as an alternative to mechanical control, such as gear, shaft, clutch, speed change gear and cam. In addition, cam control becomes even easier with cam auto-generation function. The synchronous control can be flexibly started/ended for each axis, allowing the synchronous control axis and positioning control axis to be used within the same program.



All axes are synchronized using a synchronous encoder axis or a servo input axis.

**Application examples** Packaging machines, printing machines, diaper manufacturing machines, tire molder



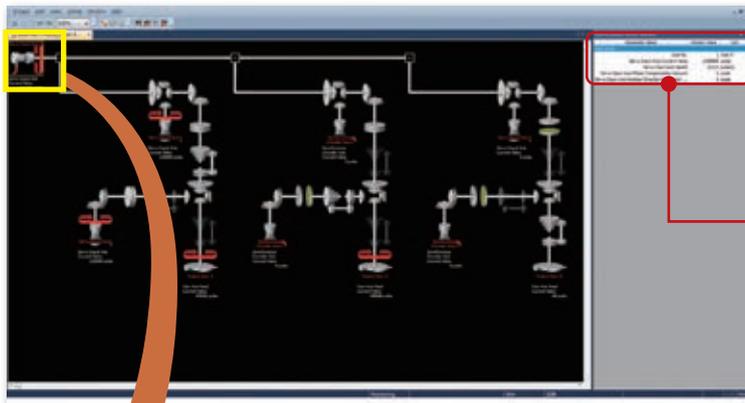
Only two axes are in synchronization. The other axes are in positioning control.

**Application example** Tandem configuration

### Module configuration of synchronous control



The whole module configuration of the advanced synchronous control can be displayed in one screen, and monitoring of the target modules can be also viewed, which enables more efficient debugging.



- All the output axes that are connected to the main shaft main input axes modules can be displayed in the monitoring screen.
- Monitoring of each module can be performed, and parameter settings can also be made.

Monitoring of the selected module can be performed.

Double click the module to open the parameter setting screen.



- Synchronous control is easily achieved just by setting parameters.

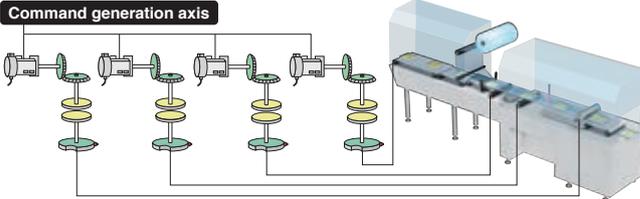
### Input axis module



A command generation axis, a servo input axis under control, or a synchronous encoder axis, can be set as an input axis module for synchronous control according to your application.

#### When the command generation axis is set

FX555C



When the command generation axis is set as the input axis module, servo amplifiers can be connected for the number of control axes.

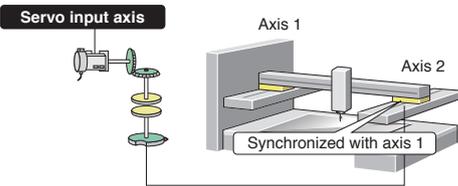
[Command generation axis]  
The command generation axis is the axis that performs only the command generation. It is controlled independently of other axes connected to servo amplifiers. (not counted as a control axis)

#### When the servo input axis is set

RD77GF

RD77MS

FX555C



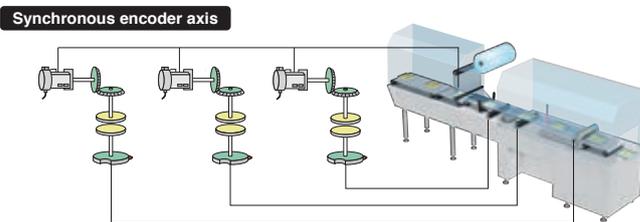
The master axis (Axis 1) of tandem operation is set as the input axis module of the synchronous control axis (Axis 2). Axis 2 is synchronously operated with Axis 1 by the commands given to Axis 1.

#### When the synchronous encoder axis is set

RD77GF

RD77MS

FX555C



When the synchronous encoder axis is set as the input axis module, one packaging line can be synchronized with another line to achieve the integrated automation of a packaging machine.

### Clutch

RD77GF

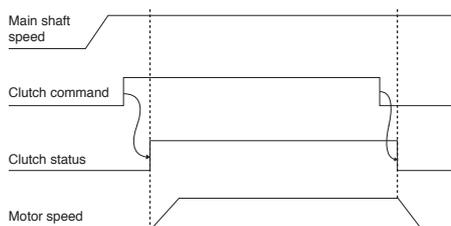
RD77MS

FX555C



The clutch is a module that transmits command pulses from the main shaft or the auxiliary shaft to an output axis module. There are two ways of controlling a clutch: "ON control mode" or "OFF control mode", which allow you to set the specific conditions to the starting and stopping of an axis.

[Time Chart]



Clutch ON control mode	Clutch OFF control mode
No clutch	OFF control invalid
Clutch command ON/OFF	One-shot OFF
Clutch command leading edge	Clutch command leading edge
Clutch command trailing edge	Clutch command trailing edge
Address mode	Address mode
High speed input request	High speed input request

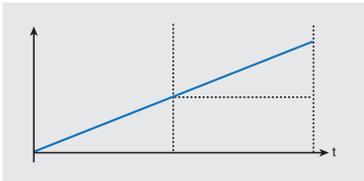
**Cam functions**



The output axis for synchronous control is operated with a cam.

The following three operations can be performed with the cam functions: Linear operation, Two-way operation, and Feed operation; therefore any of the three can be selected to suit your application.

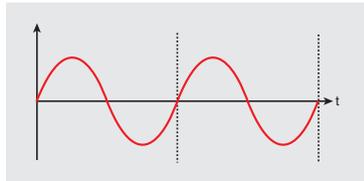
**Linear operation**



Linear operation in a cycle



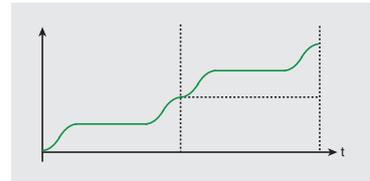
**Two-way operation**



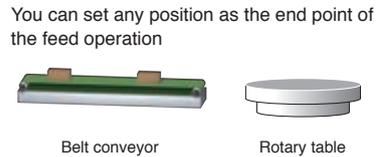
Reciprocating operation with a constant cam strokes range



**Feed operation**



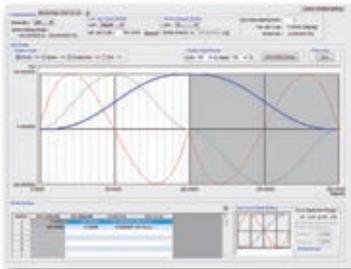
Cam reference position updated every cycle



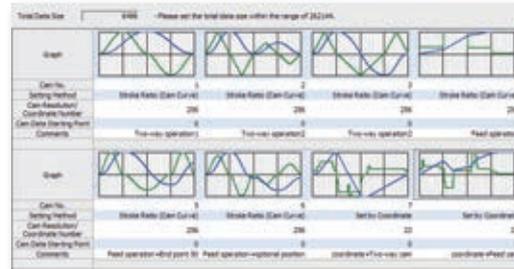
**Cam pattern creation**

A wide variety of cam patterns can be easily created with GX Works3.

[Cam Data Creation Screen]



[Cam Data List]



- Cam data can be created more freely and flexibly.
- Click the graph and drag it, which causes the waveform to automatically change according to the pointer's movement.
- Stroke, speed, acceleration, and acceleration jerk can be set while checking graph change.
- Cam data can be imported and exported in CSV format.

- The created cam data are easily viewed as thumbnails.
- The screen for cam data creation opens by double-clicking the cam data to be edited.

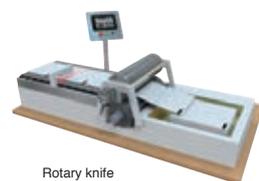
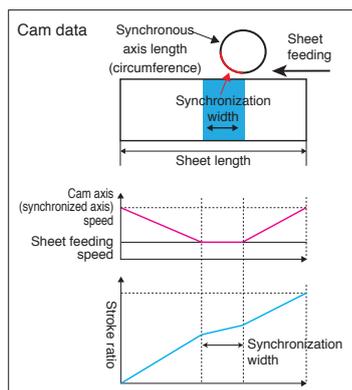
**Cam auto-generation**

Cam data for a rotary knife can be automatically generated by parameter settings of sheet length, synchronization width, cam resolution, etc.

User-created GOT screen



Parameter settings, including items like sheet length, etc.



### Restarting synchronous control

RD77GF

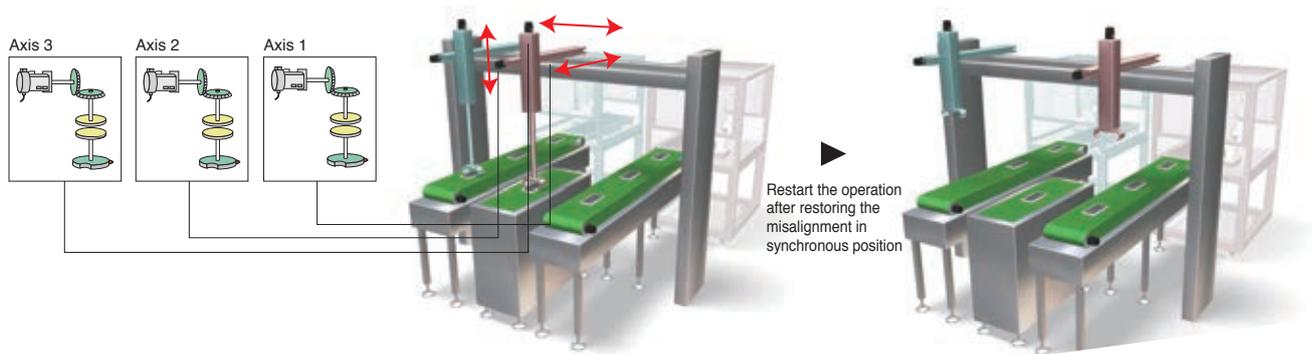
RD77MS

FX5SSC

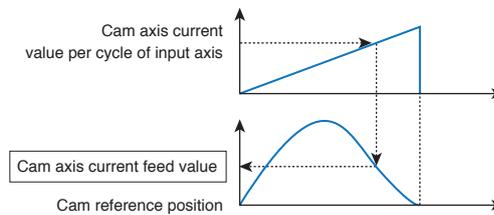


Productivity

In case that the synchronous position becomes misaligned after an emergency stop, etc., a new synchronous position is calculated from each axis position to restore the misalignment, and then the synchronous control can be restarted at the specified position based on the calculation.



1. In synchronous control analysis mode, the cam axis current feed value of each output axis (axis1, 2, 3) is updated based on the cam axis current value per cycle of input axis.

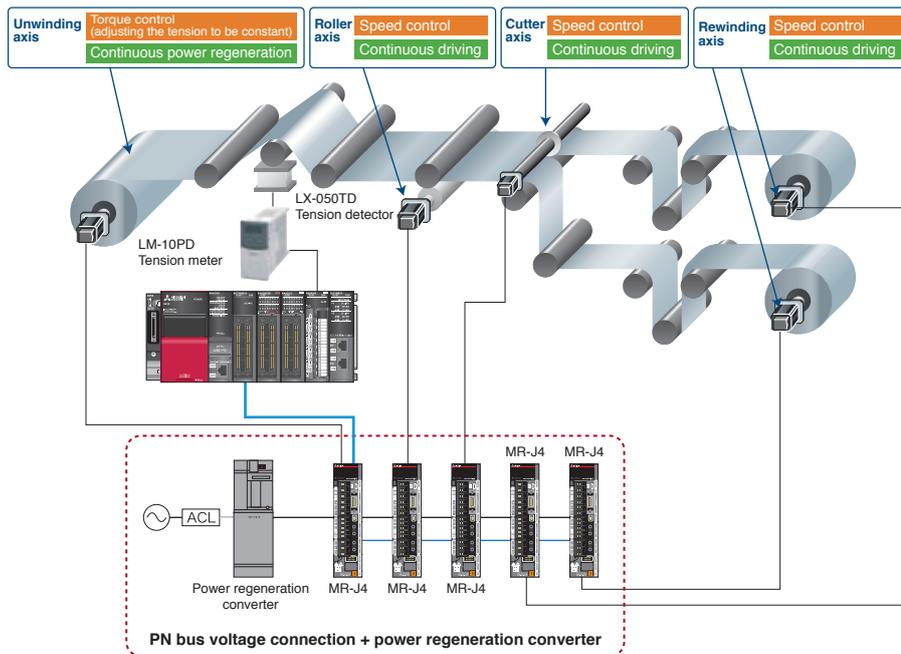


2. The output axes perform positioning based on those updated current feed values.
3. Turn OFF the synchronous control analysis mode, and turn ON the axes to perform synchronous control.

## Speed-torque Control

RD77GF RD77MS  
FX555C Productivity

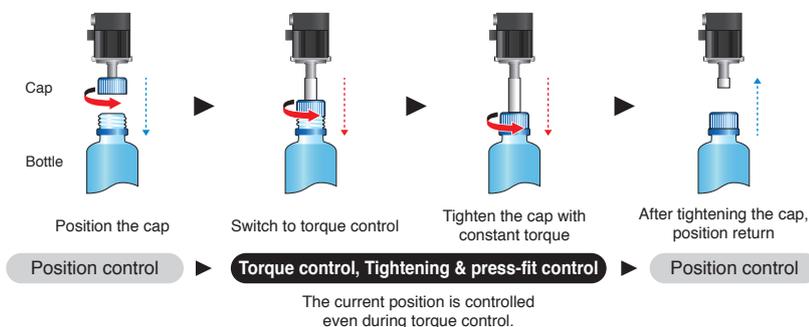
Speed control follows speed commands to keep speed constant, and torque control follows torque commands to keep torque constant. The Simple Motion module can be used for tension control, such as unwinding or rewinding. Positioning using absolute position coordinates can be smoothly performed even after switching back to position control because the current position is controlled during the speed-torque control.



## Speed-torque control (Tightening & press-fit control)

RD77MS FX555C Productivity

The motor can be switched to torque control (tightening & press-fit mode) during positioning without stopping. Since the current position is controlled in any control mode, positioning operation based on the absolute position coordinates can be performed smoothly after switching back to positioning control.



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**Master-Slave Operation Function** RD77MS  
FX555C  Productivity

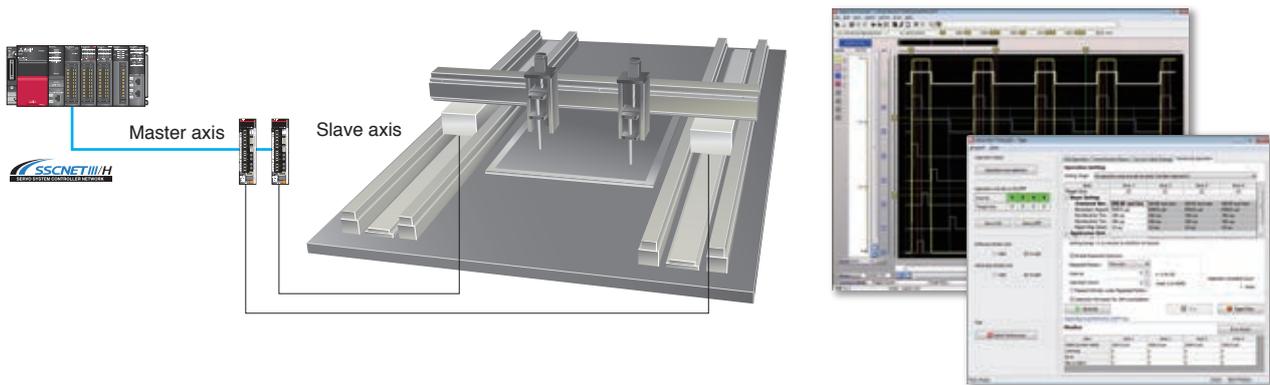
Two or more axes can be driven with a combination of the driver communication function and the master-slave operation function of the servo amplifier. When the controller transmits speed control commands to the master axis, the torque command corresponding to that speed control is transmitted to the slave axes via the driver communication function.



**Multi-Axis Adjustment Function** RD77MS  Quality  Maintenance

The multi-axis adjustment function enables simpler servo adjustment and quicker startup for machines executing multi-axis simultaneous operation, such as a tandem configuration.

- Multi-axis simultaneous JOG operation by specifying speed and acceleration/deceleration time
- Multi-axis simultaneous positioning
- Multi-axis simultaneous tuning by the same settings



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### Functional Safety



#### Achieving Category 4 PL e, SIL 3

##### ■By wiring to MR-D30 functional safety unit <sup>(Note-1)</sup>

Safety level is Category 4 PL e, SIL 3 when the safety signals are inputted directly to MR-D30 functional safety unit.

The safety observation function is operated on the MR-D30 by parameter setting, and therefore expansion of the safety observation function is possible independent of controllers.

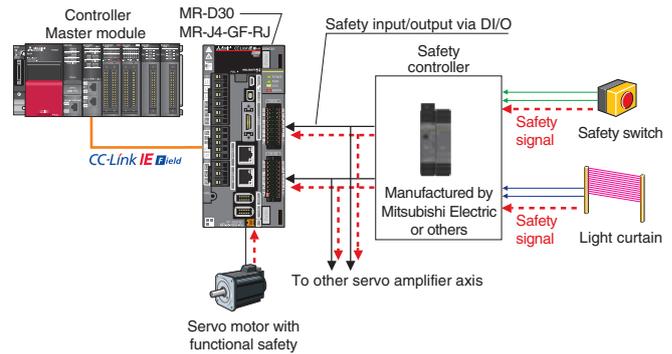
IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 PL e, SIL 3
SS1 (Safe stop 1)	
SS2 (Safe stop 2) <sup>(Note-2)</sup>	
SOS (Safe operating stop) <sup>(Note-2)</sup>	
SLS (Safely-limited speed) <sup>(Note-3)</sup>	
SBC (Safe brake control)	
SSM (Safe speed monitor) <sup>(Note-3)</sup>	

(Note-1): Requires modules which support the functional safety.

Refer to relevant manuals or catalogs for details.

(Note-2): Requires the use of a servo motor with functional safety.

(Note-3): Safety level is Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.



##### ■By CC-Link IE Field Network <sup>(Note-1)</sup>

Safety signals are monitored by a combination of the safety CPU and RD77GF Simple Motion module. The safety CPU checks the safety signals received via the safety remote I/O module and outputs the safety signals (STO, etc.) to the servo amplifiers.

Since the safety signals are outputted through CC-Link IE Field Network, wiring of the safety signals to each functional safety unit are not necessary.

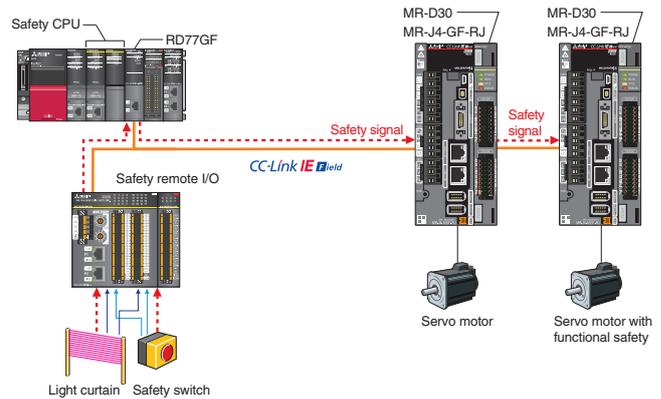
IEC/EN 61800-5-2:2007 function	Safety level
STO (Safe torque off)	Category 4 PL e, SIL 3
SS1 (Safe stop 1)	
SS2 (Safe stop 2) <sup>(Note-2)</sup>	
SOS (Safe operating stop) <sup>(Note-2)</sup>	
SLS (Safely-limited speed) <sup>(Note-3)</sup>	
SBC (Safe brake control)	
SSM (Safe speed monitor) <sup>(Note-3)</sup>	

(Note-1): Requires modules which support the functional safety.

Refer to relevant manuals or catalogs for details.

(Note-2): Requires the use of a servo motor with functional safety.

(Note-3): Safety level is Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.



## Distribution by the Optical Hub Unit

RD77MS



Productivity

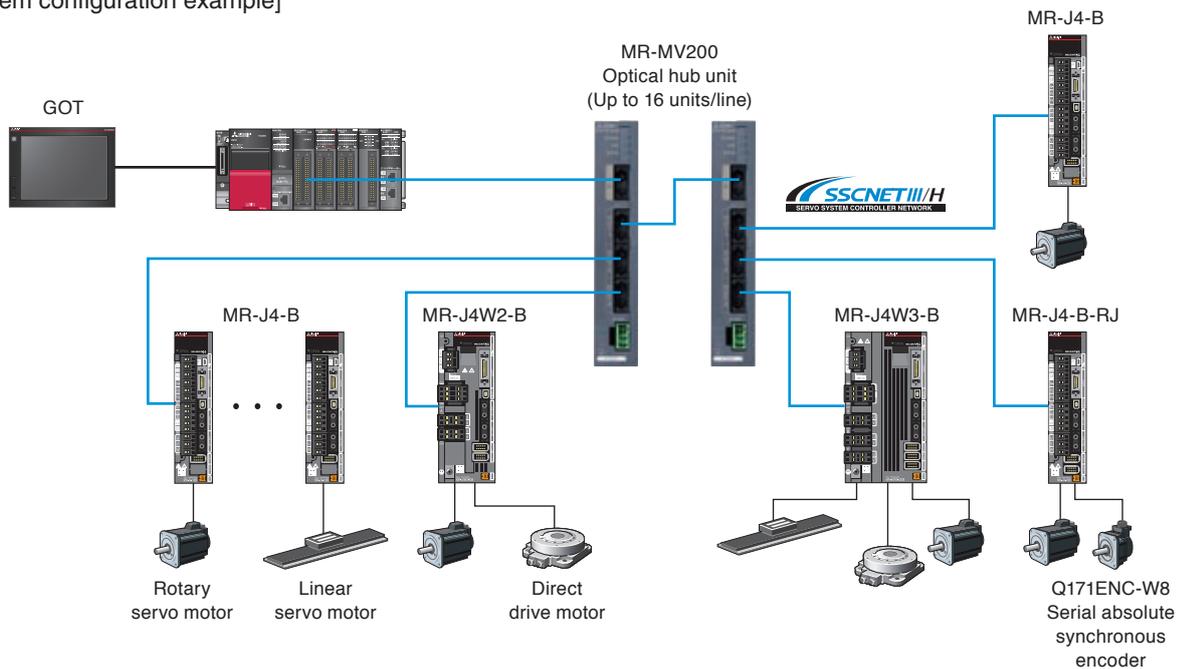


Maintenance

The MR-MV200 optical hub unit can branch a single SSCNET III/H network line in three separate directions. This enables distribution of the SSCNET III/H compatible devices with flexible wiring arrangement. In addition, the distributed amplifier can be partly OFF for maintenance without stopping the whole system; thus, the machine availability can be improved.

- The SSCNET connect/disconnect function of the controller allows you to power off only the desired servo amplifiers.
- The optical hub unit is introduced just by making some changes in wiring without making any new settings.
- Longer-distance wiring becomes available by using the optical hub unit.

[System configuration example]



(Note): Confirm that "SSCNET III/H" is selected in the system setting when using the optical hub unit.

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## Various Functions

RD77GF

RD77MS

FX55SC



Productivity

### JOG operation

While the JOG start signal is ON, the workpiece moves in the designated direction.

JOG operation can be executed without completing home position return.

### Motion profile table operation

The operation is executed by the motion profile table method, in which position data and feed speed are set. Once the start signal is turned ON, the set commands are executed sequentially from the start point to the end point.

### Stroke limit functions

This function is used to establish the physical movable range for a machine. The hardware stroke limit function and the software stroke limit function are available.

### Absolute position system

This function restores the absolute position of the designated axis. Once the home position return is executed at the start of the system, it is unnecessary to perform the home position return again when the power is turned ON next time.

### Step function

This function temporarily stops the operation to confirm the positioning operation during debugging, etc.  
The operation is stopped at each of "automatic deceleration" or "positioning data".

### M-code output function

This function issues commands for sub works corresponding to the M-code No. 0 to 65535 that is set for each positioning data. The commands are used for clamp or drill stop, tool change, etc.

### External input signal setting function

This function allows you to set the input type, the input terminal, and the input filter for each external input signal (the upper/lower limit signal, the proximity dog signal, and the stop signal).

### Home position return methods

Five types of home position return methods, the retry function and the shift function are available to establish a home position used as the machine reference point. Select any of these home position return methods that suits your machine type.

### Stop operation functions

Forced stop, axis stop, and forced stop for servo amplifiers are available. Utilize these stop operation functions based on your application.

### Unlimited length feed

Unlimited length feed is performed by disabling the stroke limit function. This function is used for a rotary table, a belt conveyor, etc.

### Amplifier-less operation

This function executes the positioning control by the Simple Motion module without connecting to servo amplifiers, thus enabling debugging of a user program and simulation of positioning operation on a personal computer.

### Skip function

This function stops the positioning being executed when the skip signal is inputted, and executes the next positioning. It is used for measurement with a sensor.

### Execution data backup function

This function stores the "setting data", currently being executed, into the flash ROM/internal memory without a battery. The command for this function is executed on MELSOFT GX Works3 or a sequence program.

### External I/O signal logic switching function

This function switches I/O signal logic according to devices connected to the Simple Motion module, etc.



### Control specification

Item	Specifications										
	MELSEC iQ-R series								MELSEC iQ-F series		
	RD77GF32	RD77GF16	RD77GF8	RD77GF4	RD77MS16	RD77MS8	RD77MS4	RD77MS2	FX5-80SSC-S	FX5-40SSC-S	
Maximum number of control axes (Virtual servo amplifier axis included)	32 axes	16 axes	8 axes	4 axes	16 axes	8 axes	4 axes	2 axes	8 axes	4 axes	
Operation cycle (Operation cycle settings) [ms]	0.5, 1.0, 2.0, 4.0				0.444, 0.888, 1.777, 3.555				0.888, 1.777		
Interpolation function	Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes) <sup>(Note-1)</sup>										
Control modes	Positioning control, Trajectory control (Linear, arc, and helical), Speed control, Speed-torque control, Tightening & Press-fit control <sup>(Note-2)</sup>										
Acceleration/deceleration process	Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration										
Compensation function	Backlash compensation, Electronic gear, Near pass function										
Synchronous control	Synchronous encoder input, Cam, Phase compensation, Cam auto-generation										
Control unit	mm, inch, degree, pulse										
Number of positioning data	600 data (positioning data No. 1 to 600)/axis										
Backup	Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)										
Home position return	Home position return method	Driver home position return method <sup>(Note-3)</sup>				Proximity dog method, Count method 1, Count method 2, Data set method, Scale home position signal detection method, Driver home position return <sup>(Note-3)</sup>					
	Fast home position return control	Provided									
	Sub-functions	Provided (using sub-function of servo amplifier)				Home position return retry, Home position shift					
Positioning control	Linear control	Linear interpolation (Up to 4 axes) <sup>(Note-4)</sup> (Vector speed, Reference axis speed)									
	Fixed-pitch feed	Fixed-pitch feed control (Up to 4 axes)									
	2-axis circular interpolation	Auxiliary point-specified circular interpolation, Central point-specified circular interpolation									
	Speed control	Speed control (Up to 4 axes)									
	Speed-position switching	INC mode, ABS mode									
	Position-speed switching	INC mode									
	Current value change	Positioning data, current value changing start No.									
	NOP instruction	Provided									
	JUMP instruction	Unconditional JUMP, Conditional JUMP									
LOOP, LEND	Provided										
High-level positioning	Block start, Condition start, Wait start, Simultaneous start, Repeated start										
Manual control	JOG operation	Provided									
	Inching operation	Provided									
	Manual pulse generator	Possible to connect 1 module (Incremental), Unit magnification (1 to 10000 times)									
Expansion control	Speed-torque	Speed control without positioning loops, Torque control, Tightening & press-fit control <sup>(Note-2)</sup>									
Absolute position system	Made compatible by setting a battery to a servo amplifier										
Synchronous encoder interface	32CH	16CH	8CH	4CH	Up to 4 channels						
	Internal interface	—				1CH (Incremental)					
	Via CPU (buffer memory)	Provided (Incremental)				Provided					
	Link device	Provided (Incremental)				—					
	Via servo amplifier	32CH	16CH	8CH	4CH	4CH (Absolute)					
Functions that limit control	Speed limit	Speed limit value, JOG speed limit value									
	Torque limit	Torque limit value same setting, torque limit value individual setting									
	Forced stop	Valid/Invalid setting									
	Software stroke limit	Movable range check with current feed value, movable range check with machine feed value									
Functions that change control details	Hardware stroke limit	Provided									
	Speed change	Provided									
	Override	0 to 300 [%]							1 to 300 [%]		
	Acceleration/deceleration time change	Provided									
Other functions	Torque change	Provided									
	Target position change	Target position address and speed are changeable									
	M-code output	WITH mode/AFTER mode									
	Step function	Deceleration unit step, Data No. unit step									
Parameter initialization function	Skip function	Via PLC CPU, Via external command signal									
	Teaching function	Provided									
	External input signal setting function	Provided									
External input signal setting function	Internal interface	—				Provided				—	
	Via CPU (buffer memory)	Provided				Provided				—	
	Link device	Provided				—				—	
	Via servo amplifier	Provided									
Event history function	Provided								—		
Amplifier-less operation function	Provided										
Mark detection function	Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode										
	Mark detection signal	Up to 32 points <sup>(Note-5)</sup>	Up to 16 points <sup>(Note-5)</sup>			Up to 20 points			Up to 4 points		
	Mark detection setting	Up to 32 settings	Up to 16 settings			Up to 16 settings			Up to 16 settings		

**Control specification (continued)**

Item		Specifications									
		MELSEC iQ-R series								MELSEC iQ-F series	
		RD77GF32	RD77GF16	RD77GF8	RD77GF4	RD77MS16	RD77MS8	RD77MS4	RD77MS2	FX5-80SSC-S	FX5-40SSC-S
Functions that monitor servo data	Optional data monitor	—								4 settings/axis	
	Servo cyclic transmission	4 settings/axis								—	
	Servo transient transmission	4 settings/axis								—	
Driver communication function		—								Provided	
SSCNET connect/disconnect function		—								Provided	
Digital oscilloscope function <small>(Note-6)</small>	Bit data	—								16CH	
	Word data	—								16CH	

(Note-1): Available only with RD77GF and RD77MS  
 (Note-2): Available only with RD77MS and FX5-80SSC-S/FX5-40SSC-S  
 (Note-3): The home position return method set in a driver (a servo amplifier) is used.  
 (Note-4): 4-axis linear interpolation control is enabled only at the reference axis speed.  
 (Note-5): The Mitsubishi Electric remote I/O module is required.  
 (Note-6): 8CH word data and 8CH bit data can be displayed in real time.

**Synchronous control specification**

**Synchronous control**

Item	Number of settable axes									
	MELSEC iQ-R series								MELSEC iQ-F series	
	RD77GF32	RD77GF16	RD77GF8	RD77GF4	RD77MS16	RD77MS8	RD77MS4	RD77MS2	FX5-80SSC-S	FX5-40SSC-S
Servo input axis	32 axes/module	16 axes/module	8 axes/module	4 axes/module	16 axes/module	8 axes/module	4 axes/module	2 axes/module	8 axes/module	4 axes/module
Synchronous encoder input axis	32 axes/module	16 axes/module	8 axes/module	4 axes/module	4 axes/module					
Composite main shaft gear	1 module/output axis									
Main shaft main input axis	1 module/output axis									
Main shaft sub input axis	1 module/output axis									
Main shaft gear	1 module/output axis									
Main shaft clutch	1 module/output axis									
Auxiliary shaft	1 module/output axis									
Auxiliary shaft gear	1 module/output axis									
Auxiliary shaft clutch	1 module/output axis									
Auxiliary shaft composite gear	1 module/output axis									
Speed change gear	1 module/output axis									
Output axis (Cam axis)	32 axes/module	16 axes/module	8 axes/module	4 axes/module	16 axes/module	8 axes/module	4 axes/module	2 axes/module	8 axes/module	4 axes/module

**Cam control**

Item		Specifications											
		MELSEC iQ-R series								MELSEC iQ-F series			
		RD77GF32	RD77GF16	RD77GF8	RD77GF4	RD77MS16	RD77MS8	RD77MS4	RD77MS2	FX5-80SSC-S	FX5-40SSC-S		
Memory capacity	Cam storage area	Up to 3 M bytes								256k bytes			
	Cam working area	Up to 16 M bytes								1024k bytes			
Number of registration		Up to 1024								Up to 256		Up to 128	Up to 64
Comment		Up to 32 characters for each cam data											
Cam data	Stroke ratio data type	Maximum number of cam registration	Cam resolution	256	512	1024	2048	4096	8192	16384	32768		
			RD77GF	1024	1024	1024	1024	1024	512	256	128		
			RD77MS	256	128	64	32	16	8	4	2		
			FX5-40SSC-S	64	32	16	8	4	2	1	—		
			FX5-80SSC-S	128	64	32	16	8	4	2	—		
	Coordinate data type	Maximum number of cam registration	Cam resolution	128	256	512	1024	2048	4096	8192	16384	32768	65535
			RD77GF	1024	1024	1024	1024	1024	512	256	128	64	32
			RD77MS	256	128	64	32	16	8	4	2	—	—
			FX5-40SSC-S	64	32	16	8	4	2	1	—	—	—
			FX5-80SSC-S	128	64	32	16	8	4	2	—	—	—
Coordinate data		Input value: 0 to 2147483647 Output value: -2147483648 to 2147483647											
Cam auto-generation		Cam for rotary knife, Easy stroke ratio cam, Advanced stroke ratio cam					Cam for rotary knife						

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### Module specification

#### Simple Motion module RD77MS16/RD77MS8/RD77MS4/RD77MS2



Item		Specifications			
		RD77MS16	RD77MS8	RD77MS4	RD77MS2
Number of control axes (Virtual servo amplifier axis included)		Up to 16 axes	Up to 8 axes	Up to 4 axes	Up to 2 axes
Servo amplifier connection method		SSCNET III/H			
Maximum overall cable distance [m(ft.)]		1600 (5249.34)			
Maximum distance between stations [m(ft.)]		100 (328.08)			
Peripheral I/F		Via CPU module (USB, Ethernet)			
Manual pulse generator operation function		Possible to connect 1 module			
Synchronous encoder operation function		Possible to connect 4 modules (Total of the internal interface, via CPU interface, and servo amplifier interface)			
Input signals (SIN)	Number of input points	20 points			10 points
	Input method	Positive common/Negative common shared (Photocoupler isolation)			
	Rated input voltage/current	24 VDC/Approx. 5 mA			
	Operating voltage range	19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)			
	ON voltage/current	17.5 VDC or more/3.5 mA or more			
	OFF voltage/current	7 VDC or less/1.0 mA or less			
	Input resistance	Approx. 6.8 kΩ			
	Response time	1 ms or less (OFF→ON, ON→OFF)			
Recommended wire size		AWG24 (0.2 mm <sup>2</sup> )			
Forced stop input signal (EMI)	Number of input points	1 point			
	Input method	Positive common/Negative common shared (photocoupler isolation)			
	Rated input voltage/current	24 VDC/Approx. 5 mA			
	Operating voltage range	19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)			
	ON voltage/current	17.5 VDC or more/3.5 mA or more			
	OFF voltage/current	7 VDC or less/1.0 mA or less			
	Input resistance	Approx. 6.8 kΩ			
	Response time	4 ms or less (OFF→ON, ON→OFF)			
Recommended wire size		AWG24 (0.2 mm <sup>2</sup> )			
Manual pulse generator/ Incremental synchronous encoder signal	Signal input form		Phase A/Phase B (magnification by 4/2/1), PULSE/SIGN		
	Differential output type (26LS31 or equivalent)	Input pulse frequency	Up to 1 Mpulse/s (After magnification by 4, up to 4 Mpulse/s)		
		Pulse width	1μs or more		
		Leading edge/ trailing edge time	0.25μs or less		
		Phase difference	0.25μs or more		
		Rated input voltage	5.5 VDC or less		
		High/Low-voltage	2.0 to 5.25 VDC/0 to 0.8 VDC		
		Differential voltage	±0.2V		
	Cable length	Up to 30m (98.43ft.)			
	Voltage- output/ Open- collector type (5 VDC)	Input pulse frequency	Up to 200 kpulse/s (After magnification by 4, up to 800 kpulse/s)		
		Pulse width	5μs or more		
		Leading edge/ trailing edge time	1.2μs or less		
		Phase difference	1.2μs or more		
		Rated input voltage	5.5 VDC or less		
		High/Low-voltage	3.0 to 5.25 VDC/2 mA or less, 0 to 1.0 VDC/5 mA or more		
Cable length		Up to 10m (32.81ft.)			
Number of I/O occupying points		32 points (I/O allocation: Intelligent function module, 32 points)			
Number of module occupied slots		1			
5 VDC internal current consumption [A]		1.0			
Mass [kg]		0.23		0.22	
Exterior dimensions [mm(inch)]		106.0(4.17) (H) × 27.8(1.09) (W) × 110.0(4.33) (D)			

### Applicable CPU

PLC CPU module	R00CPU, R01CPU, R02CPU, R04CPU, R08CPU, R16CPU, R32CPU, R120CPU R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU R08PCPU, R16PCPU, R32PCPU, R120PCPU R08SFPCPU-SET, R16SFPCPU-SET, R32SFPCPU-SET, R120SFPCPU-SET R12CCPU-V
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(Note): Depending on the combination of the modules, there are restrictions on the firmware version of the PLC CPU module.  
Refer to "MELSEC iQ-R Module Configuration Manual" for details.

Simple Motion module FX5-80SSC-S/FX5-40SSC-S



Item		Specifications		
		FX5-80SSC-S	FX5-40SSC-S	
Number of control axes (Virtual servo amplifier axis included <small>(Note-1)</small> )		Up to 8 axes	Up to 4 axes	
Servo amplifier connection method		SSCNET III/H		
Maximum overall cable distance [m(ft.)]		800 (2624.67)	400 (1312.32)	
Maximum distance between stations [m(ft.)]		100 (328.08)		
Peripheral I/F		Via CPU module (Ethernet)		
Manual pulse generator operation function		Possible to connect 1 module		
Synchronous encoder operation function		Possible to connect 4 modules (Total of the internal interface, via CPU interface, and servo amplifier interface)		
Input signals (DI)	Number of input points	4 points		
	Input method	Positive common/Negative common shared (photocoupler isolation)		
	Rated input voltage/current	24 VDC/Approx. 5 mA		
	Operating voltage range	19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)		
	ON voltage/current	17.5 VDC or more/3.5 mA or more		
	OFF voltage/current	7 VDC or less/1.0 mA or less		
	Input resistance	Approx. 6.8 kΩ		
	Response time	1 ms or less (OFF→ON, ON→OFF)		
	Recommended wire size	AWG24 (0.2 mm <sup>2</sup> )		
Forced stop input signal (EMI)	Number of input points	1 point		
	Input method	Positive common/Negative common shared (Photocoupler isolation)		
	Rated input voltage/current	24 VDC/Approx. 5 mA		
	Operating voltage range	19.2 to 26.4 VDC (24 VDC +10%/-20%, ripple ratio 5% or less)		
	ON voltage/current	17.5 VDC or more/3.5 mA or more		
	OFF voltage/current	7 VDC or less/1.0 mA or less		
	Input resistance	Approx. 6.8 kΩ		
	Response time	4 ms or less (OFF→ON, ON→OFF)		
	Recommended wire size	AWG24 (0.2 mm <sup>2</sup> )		
Manual pulse generator/ Incremental synchronous encoder signal	Signal input form		Phase A/Phase B (magnification by 4/2/1), PULSE/SIGN	
	Differential output type (26LS31 or equivalent)	Input pulse frequency	Up to 1 Mpulse/s (After magnification by 4, up to 4 Mpulse/s)	
		Pulse width	1 μs or more	
		Leading edge/ trailing edge time	0.25 μs or less	
		Phase difference	0.25 μs or more	
		Rated input voltage	5.5 VDC or less	
		High/Low-voltage	2.0 to 5.25 VDC/0 to 0.8 VDC	
		Differential voltage	±0.2V	
	Voltage- output/ Open- collector type (5 VDC)	Cable length	Up to 30 m (98.43ft.)	
		Input pulse frequency	Up to 200 kpulse/s (After magnification by 4, up to 800 kpulse/s)	
		Pulse width	5 μs or more	
		Leading edge/ trailing edge time	1.2 μs or less	
		Phase difference	1.2 μs or more	
		Rated input voltage	5.5 VDC or less	
		High/Low-voltage	3.0 to 5.25 VDC/2 mA or less, 0 to 1.0 VDC/5 mA or more	
Cable length		Up to 10m (32.81ft.)		
24 VDC internal current consumption [A]		0.25		
Mass [kg]		0.30		
Exterior dimensions [mm(inch)]		90.0 (3.55)(H) × 50.0 (1.97)(W) × 83.0 (3.27)(D)		

(Note-1): When the command generation axis is set as the input axis module, servo amplifiers can be connected for the number of control axes.

Applicable CPU

PLC CPU module	FX5U, FX5UC
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(Note): Refer to "MELSEC iQ-F FX5U User's Manual (Hardware)" for details.

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### Simple Motion module RD77GF32/RD77GF16/RD77GF8/RD77GF4



Item	Specifications			
	RD77GF32	RD77GF16	RD77GF8	RD77GF4
Number of control axes (Virtual servo amplifier axis included)	Up to 32 axes	Up to 16 axes	Up to 8 axes	Up to 4 axes
Servo amplifier connection system	CC-Link IE Field Network			
Maximum distance between stations [m(ft.)]	100(328.08)			
Peripheral I/F	Via CPU module (USB, Ethernet)			
Manual pulse generator operation function	Possible to connect 1 module (Link device)			
Synchronous encoder operation	32 modules	16 modules	8 modules	4 modules
	A total of link devices, interfaces via CPU and interfaces via servo amplifier			
Number of I/O occupying points	64 points (I/O allocation: Intelligent function module, 64 points)	32 points (I/O allocation: Intelligent function module, 32 points)		
Number of module occupied slots	1			
5 VDC internal current consumption [A]	1.1			
Mass [kg]	0.23			
Exterior dimensions [mm(inch)]	106.0(4.17) (H) × 27.8(1.09) (W) × 110.0(4.33) (D)			

### Applicable CPU

PLC CPU module	R00CPU, R01CPU, R02CPU, R04CPU, R08CPU, R16CPU, R32CPU, R120CPU, R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU, R08PCPU, R16PCPU, R32PCPU, R120PCPU, R08SFPCU-SET, R16SFPCU-SET, R32SFPCU-SET, R120SFPCU-SET
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(Note): Depending on the combination of the modules, there are restrictions on the firmware version of the PLC CPU module. Refer to "MELSEC iQ-R Module Configuration Manual" for details.

### Performance specifications of CC-Link IE Field Network

Item		MELSEC iQ-R series			
		RD77GF32	RD77GF16	RD77GF8	RD77GF4
Maximum link points per network	RX	16k points (16384 points, 2 kbytes)			
	RY	16k points (16384 points, 2 kbytes)			
	RWr	8k points (8192 points, 16 kbytes)			
	RWw	8k points (8192 points, 16 kbytes)			
Maximum link points per station	Master station	RX	16k points (16384 points, 2 kbytes)		
		RY	16k points (16384 points, 2 kbytes)		
		RWr	8k points (8192 points, 16 kbytes)		
		RWw	8k points (8192 points, 16 kbytes)		
	Local station	RX	2k points (2048 points, 256 bytes)		
		RY	2k points (2048 points, 256 bytes)		
		RWr	1k points (1024 points, 2 kbytes)		
		RWw	1k points (1024 points, 2 kbytes)		
	Intelligent device station	RX	2k points (2048 points, 256 bytes)		
		RY	2k points (2048 points, 256 bytes)		
		RWr	1k points (1024 points, 2 kbytes)		
		RWw	1k points (1024 points, 2 kbytes)		
Remote device station	RX	128 points, 16 bytes			
	RY	128 points, 16 bytes			
	RWr	64 points, 128 bytes			
	RWw	64 points, 128 bytes			
Ethernet	Communications speed	1 Gbps			
	Connection cable	1000BASE-T Ethernet cable <sup>(Note-1)</sup> (Category 5e or higher), (Double shielded/STP) Straight cable			
	Maximum distance between stations [m(ft.)]	100(328.08) (conforms to ANSI/TIA/EIA-568-(Category 5e))			
	Topology	Line type, star type, line/star mixed type			
Overall cable distance	Line type [m(ft.)]	12000(39370.08) (When 1 master station and 120 slave stations are connected)			
	Star type <sup>(Note-2)</sup>	Depends on system configuration			
Maximum stations per network	121 stations (1 master station, 120 slave stations)				
Maximum number of networks	239				

(Note-1): Use the cables recommended by CC-Link Partner Association for CC-Link IE Field Network. CC-Link IE Controller Network cables are not compatible with CC-Link IE Field Network.

(Note-2): A switching hub is required for star type topology.

### Ethernet cable specifications

Item		Description
Ethernet cable		Category 5e or higher, (double shielded/STP) straight cable
	Standard	The cable must meet the following standards: <ul style="list-style-type: none"> <li>• IEEE802.3 (1000BASE-T)</li> <li>• ANSI/TIA/EIA-568-B (Category 5e)</li> </ul>
	Connector	RJ-45 connector with shield

## Optical hub unit MR-MV200

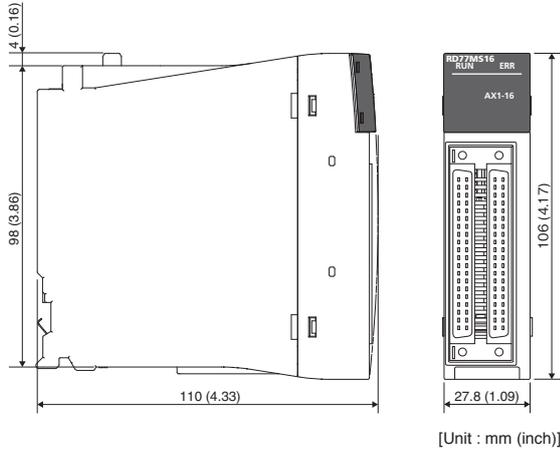


Item		Specifications
		MR-MV200
Input power supply	Input voltage [V]	21.6 to 26.4 V DC (24 V DC±10%)
	Input current [A]	0.2
Consumption power [W]		4.8
Mass [kg]		0.2
Mounting method		Directly mounted to the control panel or with DIN rail
Cable length [m(ft.)]		Up to 100 (328.08)
Number of optical hub units		Up to 16 units/line
Number of servo amplifiers <sup>(Note-1)</sup>		Up to 16 axes/line
Exterior dimensions [mm(inch)]		168.0 (6.61) (H) × 30.0 (1.18) (W) × 100.0 (3.94) (D)

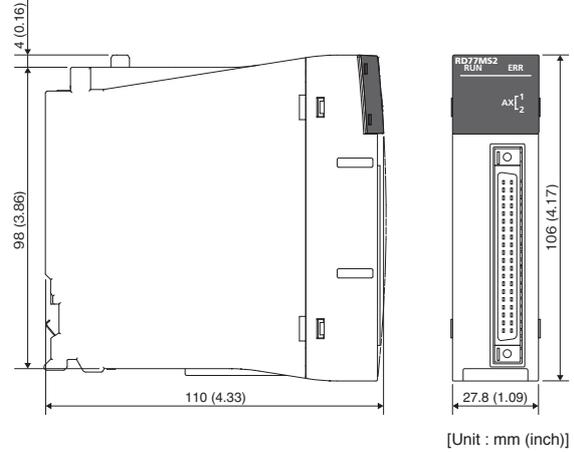
(Note-1): MR-J4-B, MR-J4W2-B, and MR-J4W3-B are 1-axis, 2-axis and 3-axis amplifiers, respectively.

### Exterior Dimensions

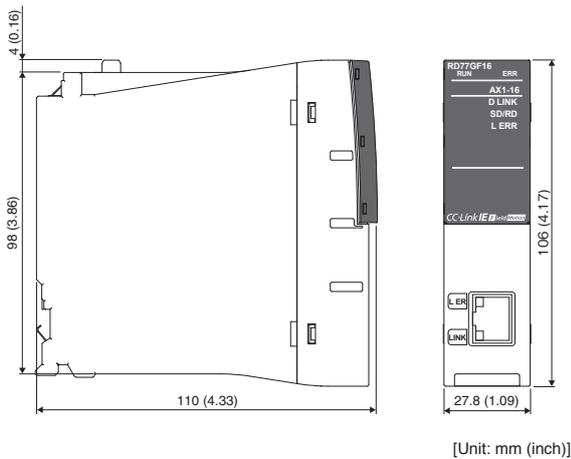
#### RD77MS16/RD77MS8/RD77MS4



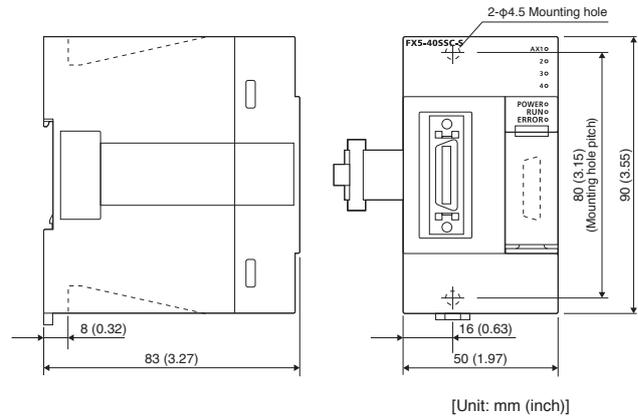
#### RD77MS2



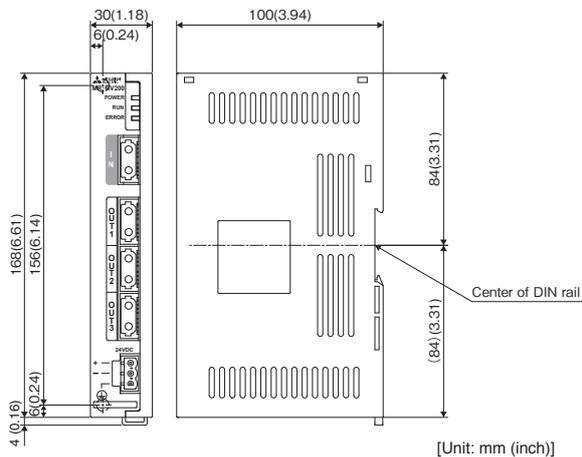
#### RD77GF32/RD77G16/RD77GF8/RD77GF4



#### FX5-80SSC-S/FX5-40SSC-S



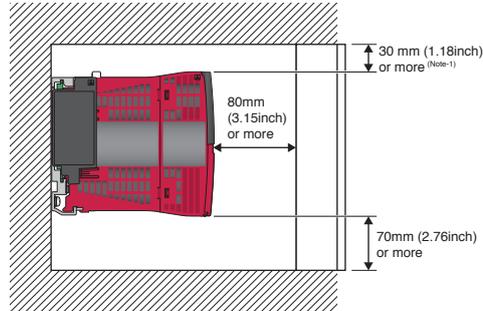
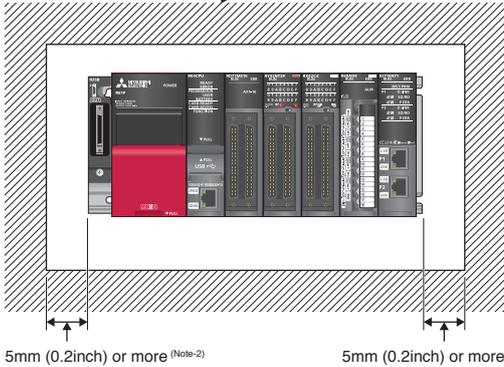
#### MR-MV200



**Mounting**

**RD77MS16/RD77MS8/RD77MS4/RD77MS2  
RD77GF32/RD77GF16/RD77GF8/RD77GF4**

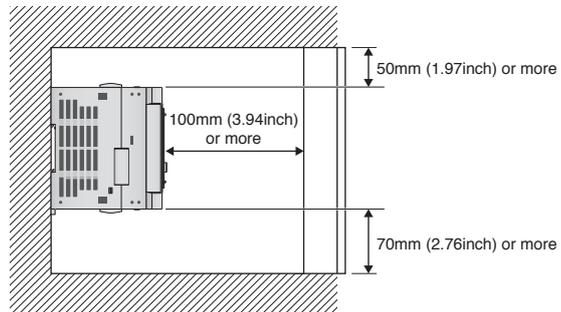
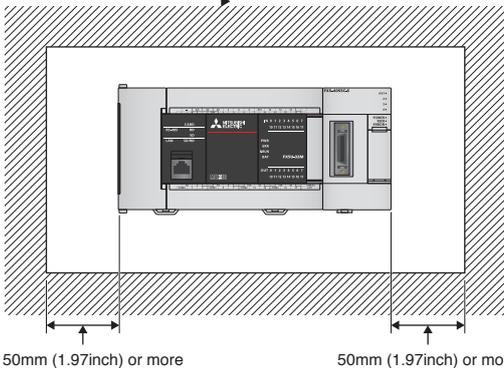
Top of panel, wiring duct, or other components



(Note-1): Provide clearance of 30mm (1.18inch) or more when the height of a wiring duct is 50mm (1.97inch) or less. In other cases, provide clearance of 40mm (1.57inch) or more.  
 (Note-2): Provide clearance of 20mm (0.79inch) or more when an extension cable is connected/removed without removing a power supply module.

**FX5-80SSC-S/FX5-40SSC-S**

Top of panel, wiring duct, or other components



Outline

Simple Motion

Motion Controllers

Sensing Modules

Engineering Environment

Networks

Servo Amplifiers

### ■ Components

#### Simple Motion module

Part	Model	Description		Standards	
Simple Motion module	RD77MS16 <sup>(Note-1)</sup>	Up to 16 axes		CE, UL, KC, EAC	
	RD77MS8 <sup>(Note-1)</sup>	Up to 8 axes		CE, UL, KC, EAC	
	RD77MS4 <sup>(Note-1)</sup>	Up to 4 axes		CE, UL, KC, EAC	
	RD77MS2 <sup>(Note-1)</sup>	Up to 2 axes		CE, UL, KC, EAC	
	FX5-80SSC-S	Up to 8 axes		CE, UL, KC, EAC	
	FX5-40SSC-S	Up to 4 axes		CE, UL, KC, EAC	
	RD77GF32	Up to 32 axes		CE, UL, KC, EAC	
	RD77GF16	Up to 16 axes		CE, UL, KC, EAC	
	RD77GF8	Up to 8 axes		CE, UL, KC, EAC	
RD77GF4	Up to 4 axes		CE, UL, KC, EAC		
SSCNET III cable <sup>(Note-2)</sup>	MR-J3BUS_M	<ul style="list-style-type: none"> <li>Simple Motion module ↔ Servo amplifier</li> <li>Servo amplifier ↔ Servo amplifier</li> </ul>	Standard code for inside panel	0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft)	—
	MR-J3BUS_M-A		Standard cable for outside panel	5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)	—
	MR-J3BUS_M-B <sup>(Note-3)</sup>		Long distance cable	30m (98.43ft.), 40m (131.23ft.), 50m (164.04ft.)	—
Manual pulse generator	MR-HDP01	Number of pulses per revolution: 25pulse/rev (100pulse/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation)		—	
Internal I/F connector set <sup>(Note-4)</sup>	LD77MHIOCON	Incremental synchronous encoder/Mark detection signal interface connector set		—	
Optical hub unit	MR-MV200	Three branches/unit, DC power supply connector enclosed		CE, UL, KC, EAC	

(Note-1): Order the A6CON1, A6CON2, and A6CON4 separately because the connectors are not included in the package.

(Note-2): " \_ " indicates cable length. (015: 0.15m (0.49ft.), 03: 0.3m (0.98ft.), 05: 0.5m (1.64ft.), 1: 1m (3.28ft.), 3: 3m (9.84ft.), 5: 5m (16.40ft.), 10: 10m (32.81ft.), 20: 20m (65.62ft.), 30: 30m (98.43ft.), 40: 40m (131.23ft.), 50: 50m (164.04ft.)

(Note-3): For a long distance cable of up to 100m (328.08ft.) or an ultra-long bending life cable, contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION (Email:osb.webmaster@melsc.jp)

(Note-4): Use this connector set for FX5-80SSC-S/FX5-40SSC-S.

### ■ Products on the market

#### Manual pulse generator on the market

Mitsubishi Electric has confirmed the operation of the following manual pulse generator. Contact the manufacturer for details.

Product	Model	Description	Manufacturer
Manual pulse generator	UFO-M2-0025-2Z1-B00E	Number of pulses per revolution: 25pulse/rev (100pulse/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation)	Nemicon Corporation

#### Ethernet cable

Item	Model		
	Model	Description	Standards
Ethernet cable	For indoor	SC-E5EW-S_M	_ : cable length (100 m max., unit of 1 m)
	For moving part, indoor	SC-E5EW-S_M-MV	_ : cable length (45 m max., unit of 1 m)
	For indoor/outdoor	SC-E5EW-S_M-L	_ : cable length (100 m max., unit of 1 m)
Double shielded cable (Category 5e)			

For details, contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION (Email:osb.webmaster@melsc.jp)



**MELSEC iQ-R** series SSCNET III/H compatible  
MELSEC iQ-R series

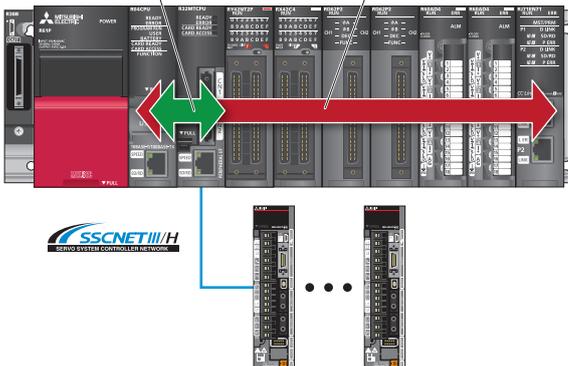
## Motion Controllers

- Now that “High-mix Low-volume” production is a big trend in the market, Motion controllers are expected to be used for various applications. The MELSEC iQ-R series Motion controller is capable of various controls such as positioning control, speed control, torque control, tightening & press-fit control, advanced synchronous control and cam control, etc. They are applied to various machines such as X-Y tables, converting machines, packing machines and filling machines.
- A combination of Mitsubishi Electric advanced PLC system, servo amplifiers, servo motors, and servo networks offers exceptional solutions that allow you to maximize your system’s productivity.

### Higher Basic Performance and Further Improved Total System Performance

High-speed data communication  
(Data exchange cycle)

High-speed system bus communication



High-speed system bus  
Approx.  
**40** × faster

Data exchange cycle with PLC CPU  
Approx.  
**4** × faster  
0.222ms

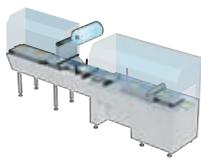
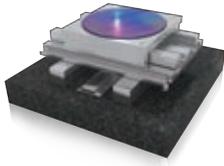
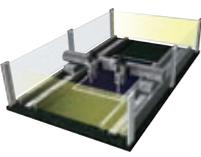
Operation cycle  
Approx.  
**1.5** × faster  
6 axes/0.222ms

Speed frequency response of servo amplifier  
**2.5** kHz

SSCNET III/H communication speed  
**150** Mbps

Event task fixed cycle  
Fastest  
**0.222** ms

(Compared to previous model)

<p><b>Packing machines</b></p>  <div style="display: flex; justify-content: space-around; font-size: x-small;"> <span>Advanced Sync.</span> <span>Mark Detection</span> </div>	<p><b>Alignment systems</b></p>  <div style="display: flex; justify-content: center; font-size: x-small;"> <span>Vision</span> </div>	<p><b>Converting machines</b></p>  <div style="display: flex; justify-content: space-around; font-size: x-small;"> <span>Speed-Torque</span> <span>Advanced Sync.</span> <span>Energy Saving</span> </div>	<p><b>Simple industrial robots</b></p>  <div style="display: flex; justify-content: center; font-size: x-small;"> <span>Machine control</span> </div>
<p><b>Tandem configuration</b></p>  <div style="display: flex; justify-content: space-around; font-size: x-small;"> <span>Advanced Sync.</span> <span>Tandem operation</span> </div>	<p><b>Printing machines</b></p>  <div style="display: flex; justify-content: space-around; font-size: x-small;"> <span>Speed-Torque</span> <span>Advanced Sync.</span> </div>	<p><b>Screw tightening machines</b></p>  <div style="display: flex; justify-content: center; font-size: x-small;"> <span>Tightening &amp; Press-fit</span> </div>	<p><b>Pressing machines</b></p>  <div style="display: flex; justify-content: space-around; font-size: x-small;"> <span>Driver Communication</span> <span>Master-slave</span> </div>



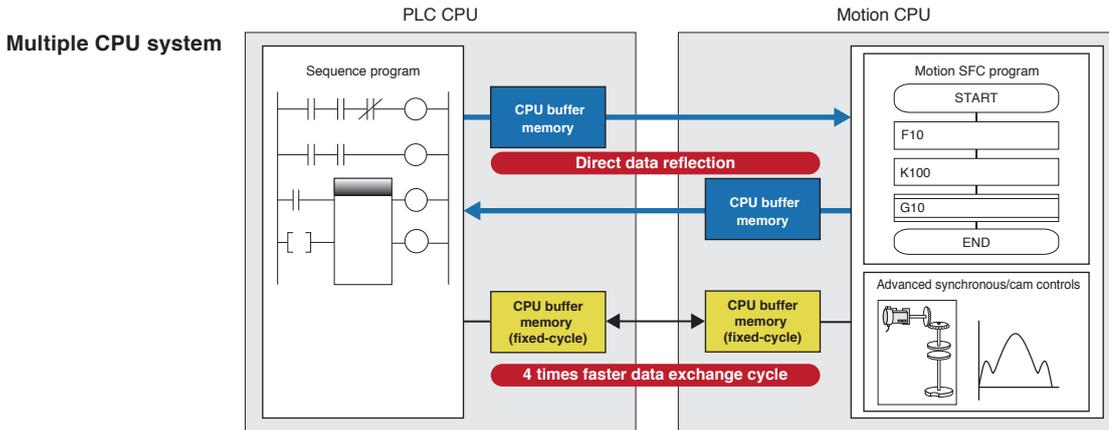
- Outline
- Simple Motion
- Motion Controllers
- Sensing Modules
- Engineering Environment
- Networks
- Servo Amplifiers

### Total System Performance, Not Individual Component Specifications Leads to Maximum Performance

The MELSEC IQ-R series is provided with sophisticated dual engines: the PLC CPU engine for machine control and the Motion CPU engine for Motion control. The engines respectively process different types of control based on the characteristic of each engine while working together on data through a high-speed system bus. CPU loads are significantly distributed by these dual engines compared with a single engine, enabling any equipment to maximize its performance, even for a load change machine or multi-axis equipment. Select the most suitable combination of CPU engines that can reduce cost and maximize machine performance to the fullest from Mitsubishi Electric extensive product line. Efficiency in designing and debugging is also improved.

### Experience Powerful Performance of Multiple CPU with Ease of Use Just Like Using One CPU

You can select either the Motion CPU or the PLC CPU based on the application, allowing you to configure a system more flexibly. The easy-to-understand flowchart form is adopted by Motion SFC for Motion control programming. Also, the direct positioning start instruction allows you to program Motion controls, such as positioning and synchronous control, just with sequence programs.



### Motion CPU Memory Expansion

- The cam working area has been expanded to 16M bytes, enabling you to use more cam data with higher resolution.
- The device memory has been increased to 128k words, so even multi-axis equipment requiring more devices can be applied.
- The cam data storage area has been expanded to 12M bytes. An SD card is also available for storing cam data.

**Memory expansion**

Cam working area Approx. <b>16x larger</b> 16M bytes	Cam registration data Approx. <b>4x more</b> 1024 cam data	Device memory Approx. <b>3x more</b> 128k words	Cam data storage area <b>SD memory card</b> available
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(Compared to previous model)

## MELSEC iQ-R series

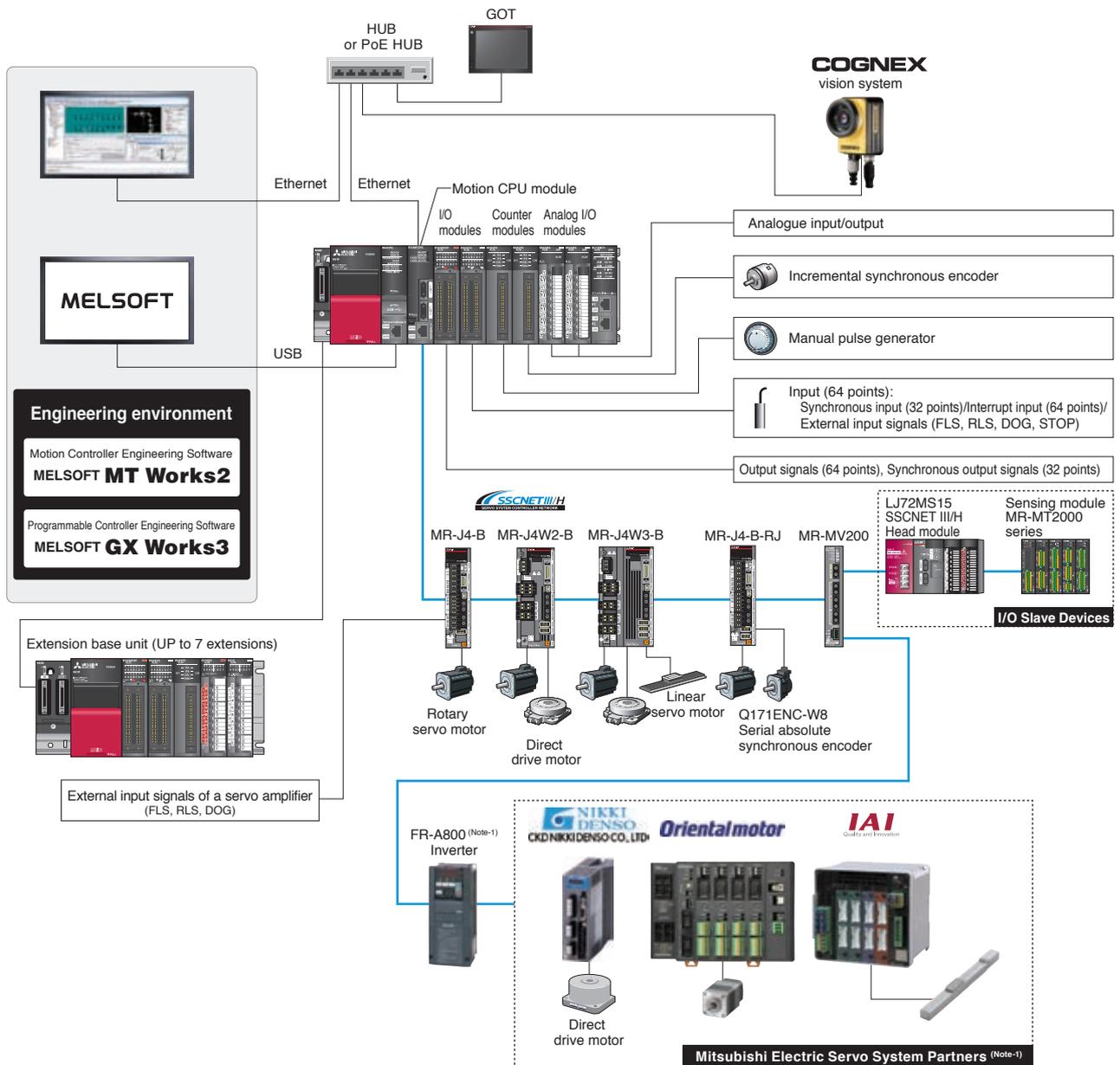
SSCNET III/H compatible  
MELSEC iQ-R series Motion controller

### R64MTCPU/R32MTCPU/R16MTCPU

Multiple CPU System for High-speed Motion Control



## System configuration



R64MTCPU: 2 lines (Up to 64 axes) / R32MTCPU: 2 lines (Up to 32 axes) / R16MTCPU: 1 line (Up to 16 axes)

(Note-1): When using a partner product or the inverter FR-A800, use one whose version supports the Motion controller.

## Motion SFC Program



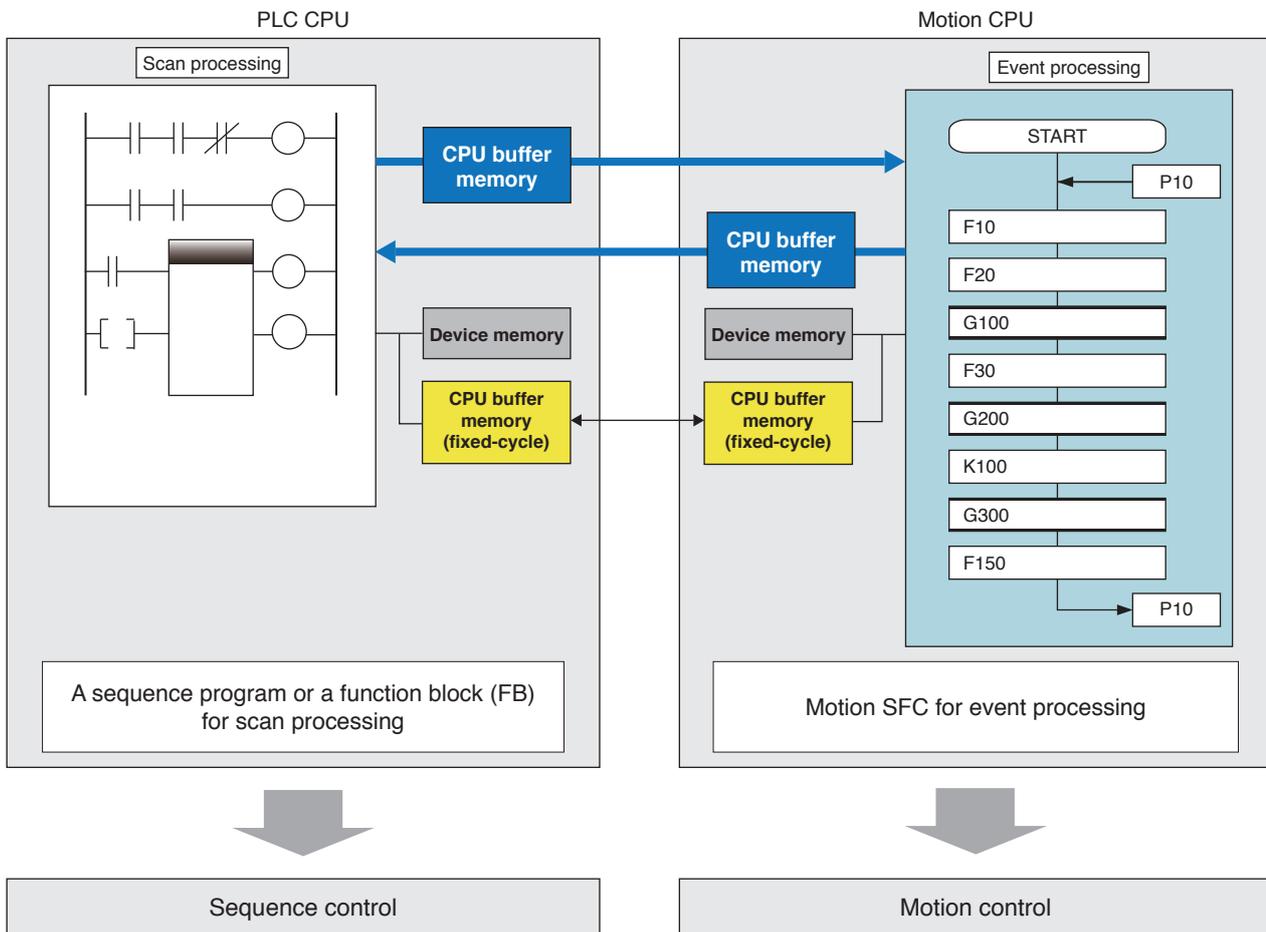
The Motion control program is described in flowchart form using the Motion SFC (Sequential Function Chart) format. The Motion SFC format program is suitable for event processing and allows the Motion CPU to perform batch control of multiple sequential machine operations, pursuing high event responsiveness.

### Flowchart description is easy to read and understand

- The machine operation procedure is visualized in the program by using the flowchart descriptions.
- A process control program can be created easily, and control details can be visualized.

### Controlling sequential machine operation using the Motion CPU

- Servo control, I/O control, and operation commands can be combined in the Motion SFC program.
- Motion SFC program can execute servo control by itself, eliminating the need of creating the sequence program for servo control.



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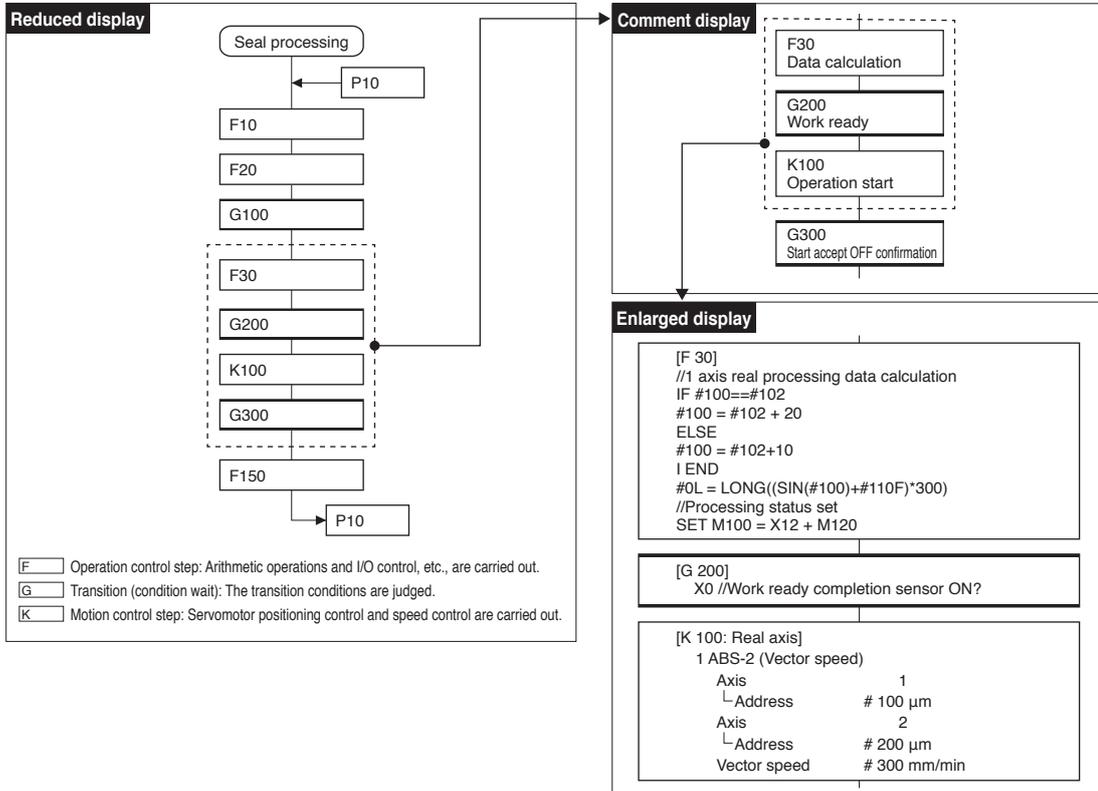
Networks

Servo Amplifiers

### Motion SFC Description



- An easy-to-understand program can be created by adding comments as an operation explanation.
- Operation commands are detailed in a step by step format in a layered structure program.

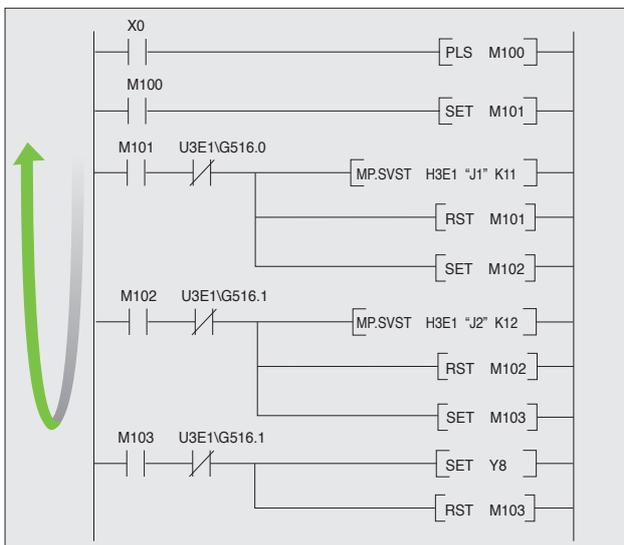


### Motion SFC scanning method

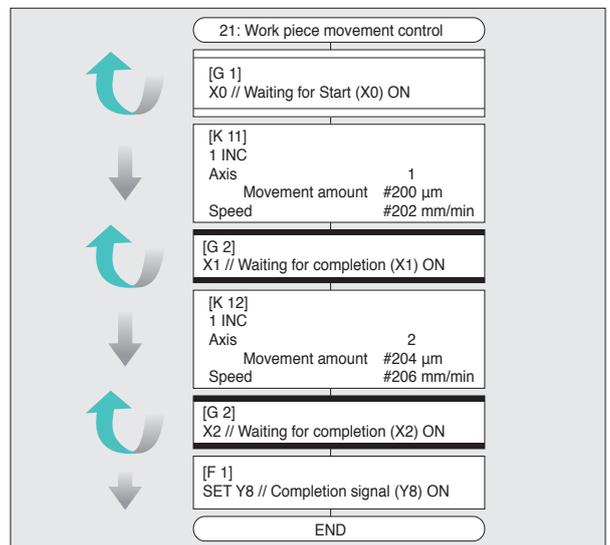


While the sequence program runs using “Scan execution method” where all of the steps are scanned at all times, the Motion SFC program runs using “STEP execution method” where the steps are scanned following the “SHIFT” instruction, reducing operation process for high-speed processing and high-response control.

#### Scanning all the steps in the sequence program



#### Scanning only active steps following the transition conditions in Motion SFC program.

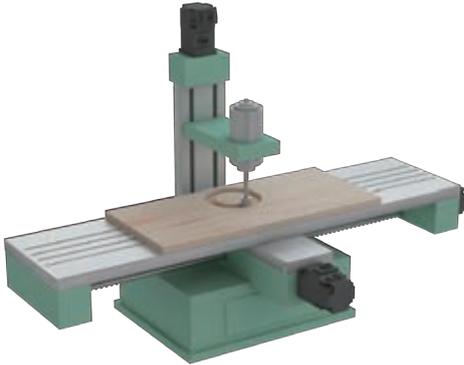


## Positioning Control



A variety of positioning controls, such as PTP control, position follow-up, and continuous trajectory control are available with the Motion controller.

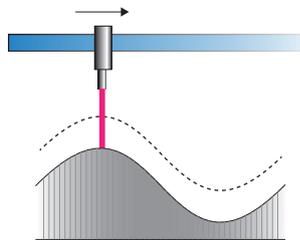
### Basic positioning control



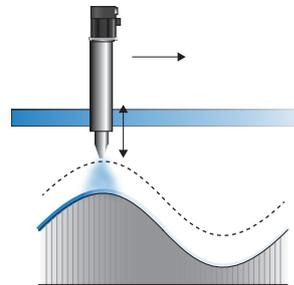
- To respond to various applications, the Motion controller offers various control methods such as PTP control, speed control, speed-position switching control, continuous trajectory control, position follow-up control, Speed control with fixed position stop, and high-speed oscillation control, etc.
- Powerful auxiliary functions are available such as M-codes, the target position change function, the acceleration/deceleration time change function, and the advanced S-curve acceleration/deceleration.
- Positioning operation can be activated by Motion SFC, or the direct positioning start instruction by the PLC CPU, etc.

### Position follow-up control

With a one-time start, the operation continues until a stop command is inputted. If the word device value is changed in the middle of the operation, the positioning for the set address starts immediately.



Measure the height of the workpiece by a sensor. Set the measurement result to a device memory.



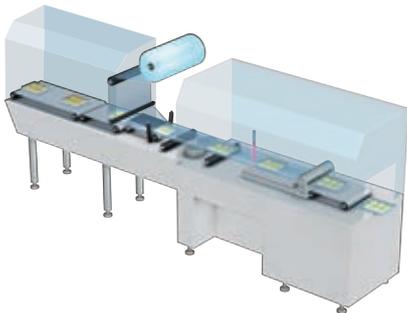
Based on the measurement result, calculate the distance between the spraying nozzle and the workpiece. Set the data to the specified device memory for the position follow-up.

### Advanced Synchronous Control



The advanced synchronous control is software-based synchronous control as an alternative to mechanical control, such as gear, shaft, clutch, speed change gear and cam. In addition, cam control becomes even easier with cam auto-generation function.

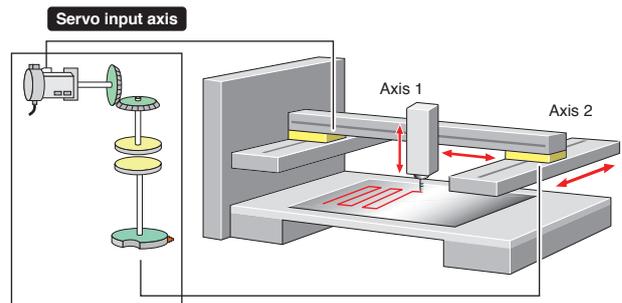
- The synchronous control can be started/ended on axis-by-axis basis.
- Axes in synchronous and positioning controls can be used together in one program.
- Speed-torque control can be performed simultaneously with the synchronous control.
- Up to 192 axes can be synchronized by use of three R64MTCPU modules.



All axes are synchronized using a synchronous encoder axis or a servo input axis.

#### Application examples

- Packing machines
- Printing machines
- Diaper manufacturing machines
- Tire molder

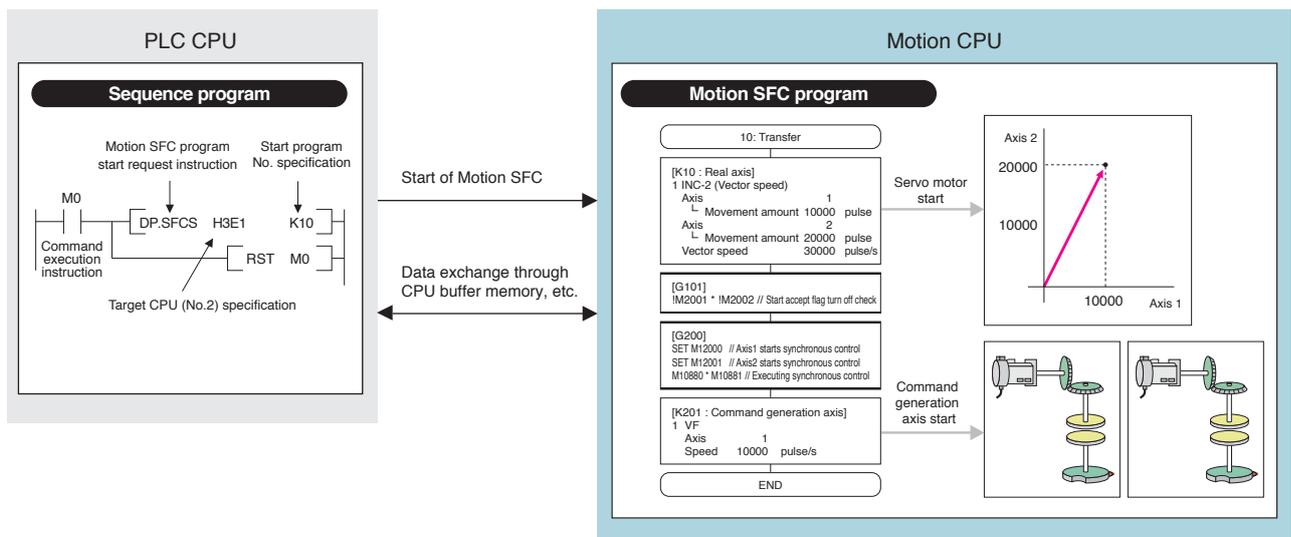


Only two axes are in synchronization. Axis 2 is set as to synchronize to axis 1. The other axes are in positioning control.

#### Application example

- Tandem configuration

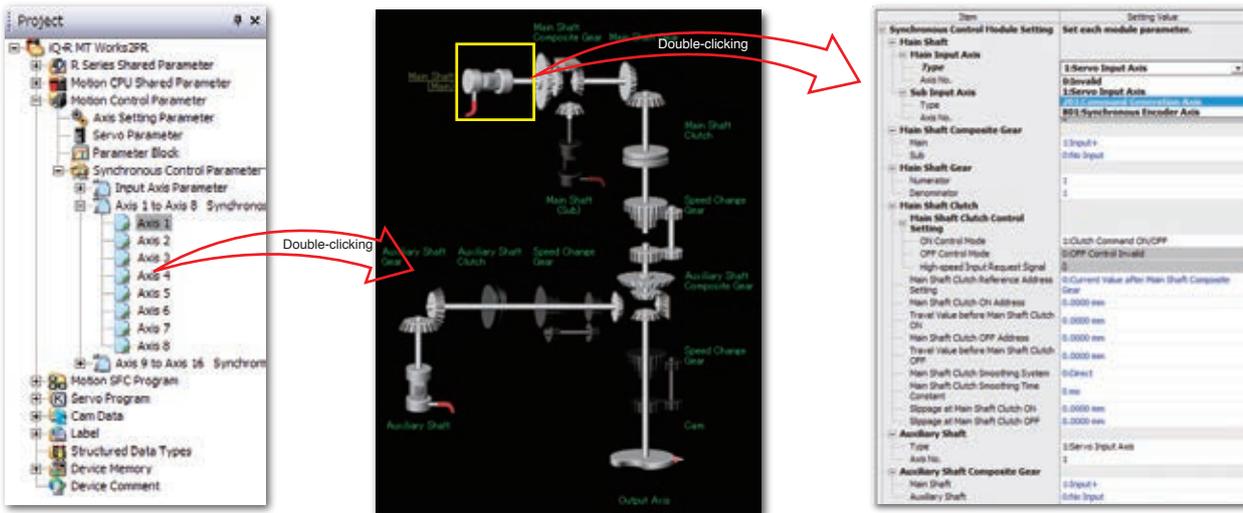
### Control flow



**Synchronous control parameters**



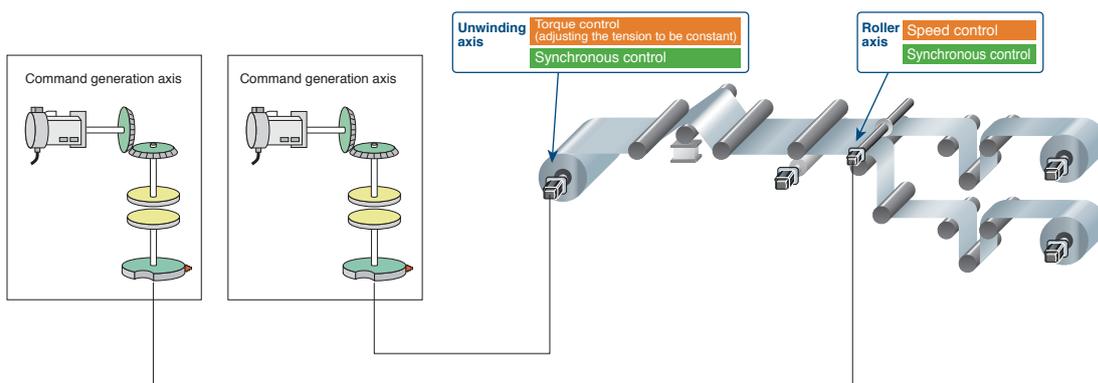
- The synchronous control is easily executed just by setting parameters.
- One of the following three can be set as the input axis: Synchronous encoder axis, Command generation axis, or Servo input axis.
- “Command generation axis” is not counted as a control axis; therefore all the control axes can be used as output axes.
- The cam axis can be operated in linear operation (a rotary table, a ball screw, etc.), two-way operation, or feed operation by setting cam No. and cam data.



**Speed-torque control during synchronous control**



With the Motion controller, the output axis in the advanced synchronous control can perform the speed-torque control simultaneously. This control can be applied to unwinding/rewinding equipment, which needs synchronized operation.



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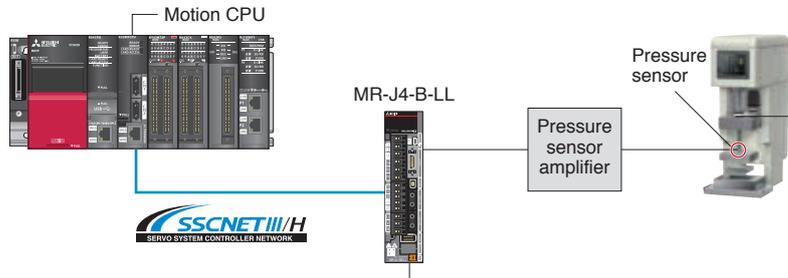
Networks

Servo Amplifiers

### Advanced Pressure Control



The machine is controlled so that the pressure commands match the pressure sensor values; therefore pressure is maintained constant even with a changing load. Each pressure process ("Feed", "Pressure maintaining", and "Pressure release") can be set with the Pressure Profile, and those processes can be tested on MELSOFT MT Works2, which makes a changeover and adjustment easy.

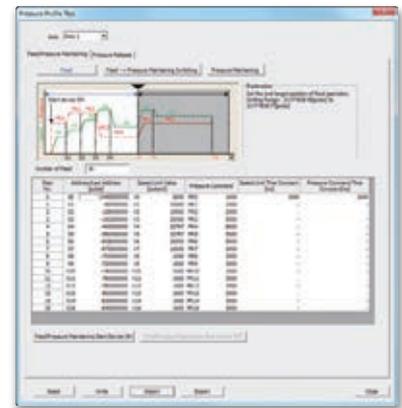


#### Application examples

- Injection machines
- Bonder

#### [Test operation example]

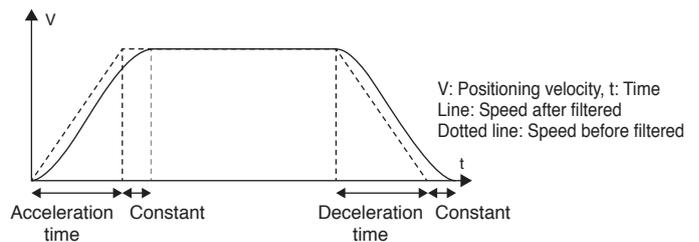
Tests can be carried out individually for each process of pressure control, which increases efficiency in debugging. For example, the feed process is divided into multiple steps, and the pressure command can be sent for each step; so pressure can be tested in great details.



### Vibration Suppression Command Filter



The filter function is used to suppress the vibration at the end of the workpiece and in the machine frame during positioning control. This filter is effective even for low-frequency vibration that cannot be suppressed by the machine resonance suppression filter or for when the frequency changes during operation.



For example, when the machine resonance frequency varies as the arm extends/returns, setting individual frequency for each case enables to suppress vibration by generating suitable commands.

Machine resonance frequency when the arms extend.



Machine resonance frequency when the arms return.

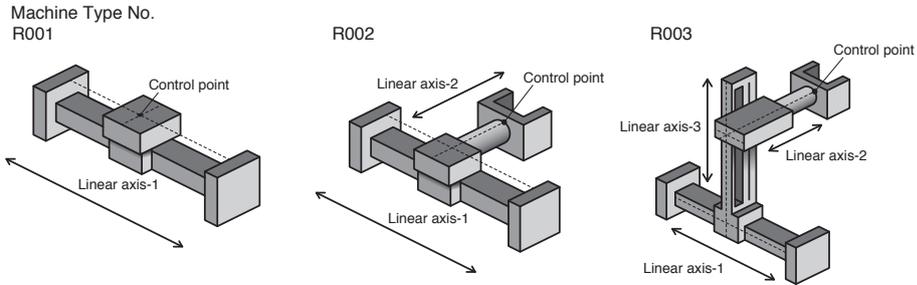


## Machine Control Function

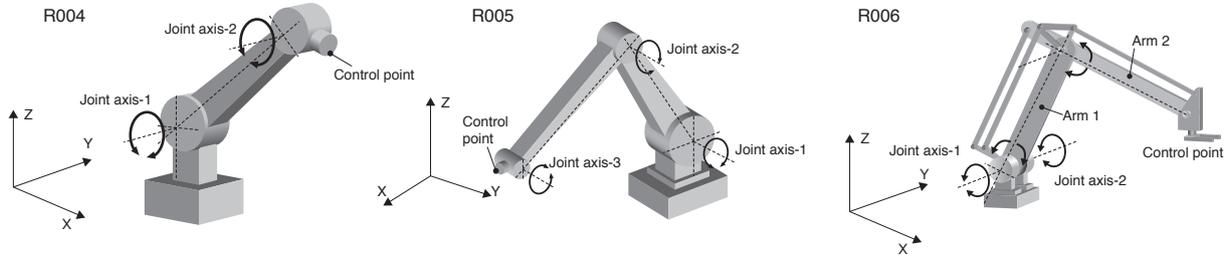


The Motion controller controls a simple industrial robot by installing an add-on library "Machine Library". The robot is controlled by machine control with Cartesian space coordinates.

### Cartesian Robot



### Vertical Articulated Robot



Machine Library Name  
**MCNTYP-R**□□□  
 Machine Type No. (R001-R006)

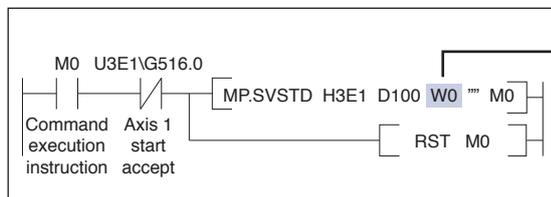
## Direct Positioning Start Instruction (MP.SVSTD)



Programming for Motion control (positioning, synchronous control, etc.) can be created just with sequence programs, eliminating the need of creating a servo program.

Positioning is performed by positioning data being set to the PLC CPU device, followed by the MP.SVSTD instruction execution.

PLC CPU



[Setting example]

Device	Content	Setting example
W0	Positioning type/Number of points	0
W1	Setting of positioning data items	0
W2	Axis No.	1
W3	-	0
W4	Control mode, Interpolation axis speed designation	0200H
W5	M-code	0
W6	Dwell time	0
W7	Torque limit value	300
W8	Command speed	100000
W9		
WA	Positioning address/movement amount	12345678
WB		
WC	Arc address	0
WD		

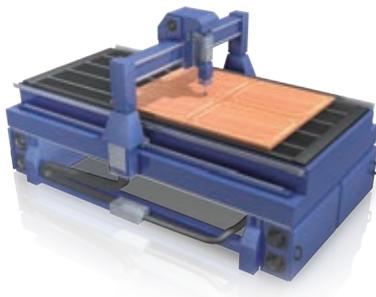
### G-code Control NEW



A G-code program is analyzed and executed by the Motion controller.

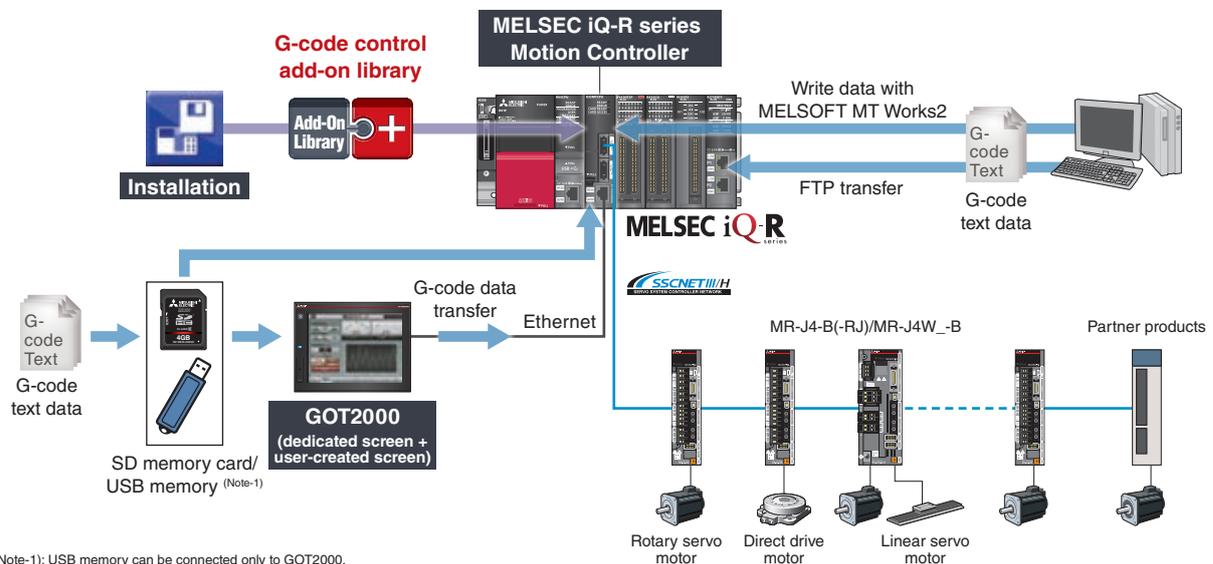
G-code control is applied to various types of trajectory control such as drawing and cutting by a simple machine tool.

- G-code control is available by additionally installing the G-code control add-on library (provided for a fee).
- G-code programs can be edited on GOT and transmitted between GOT and a Motion controller.
- Up to 16 axes can perform G-code control (Simultaneous interpolation: Up to 4 axes)
- It is possible to switch between control by a servo program and by a G-code program.
- G-code control can be combined with other functions in the Motion controller such as Motion SFC program and synchronous control.
- A G-code program, which is in text format, can be edited with a generic editor.
- FTP transfer function allows transmission of data via a CC-Link IE compatible Ethernet interface module.



```
N10 G01 X800. Y430. F13800.
N11 G03 X880. Y350. I880. J430.
N12 G01 Y100.
N13 G03 X800. Y20. I880. J20.
N14 G01 X100.
N15 G03 X20. Y100. I20. Y20.
N16 G01 Y350.
N17 G03 X100. Y430. I20. J430.
```

### System Configuration

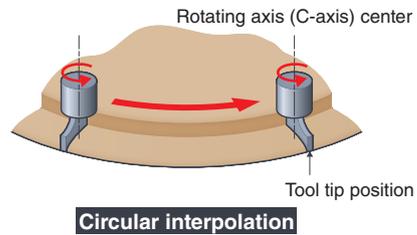
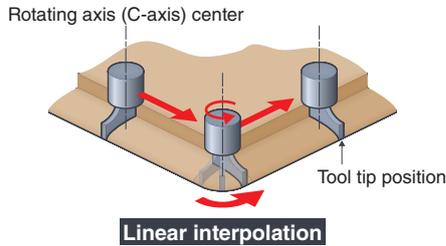


## Functions



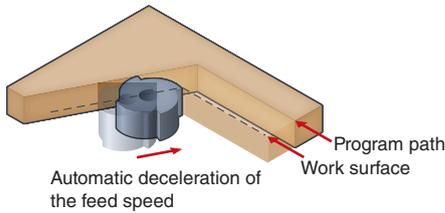
### Normal line control

Controls the rotation of a rotating axis (C-axis) so that the tool is always in the normal direction.



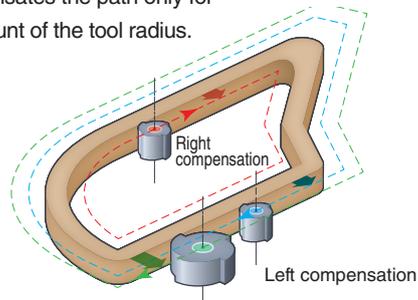
### Automatic corner override

Reduces the load on the tool during inside corner cutting by automatic deceleration.



### Tool radius compensation

Compensates the path only for an amount of the tool radius.



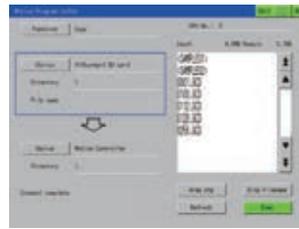
## Editing and Reading/Writing G-code Programs on GOT2000



G-code programs can be edited and read from/written to a Motion controller with GOT2000. The on-site operation without a personal computer helps to boost productivity.



**[Editing Motion programs]**  
G-code programs from a Motion controller are displayed as a list and edited on GOT.

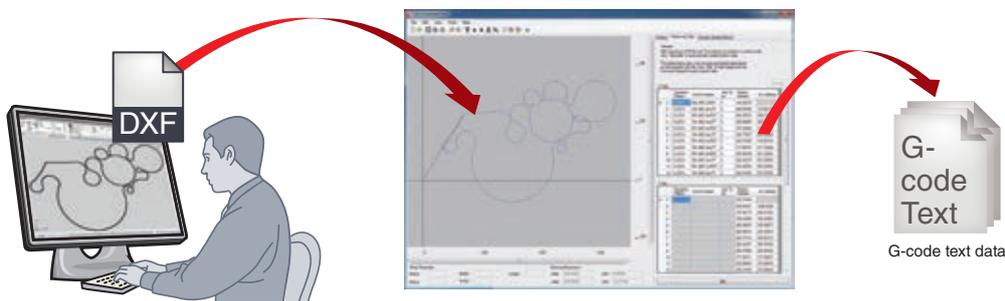


**[Input/output of Motion programs]**  
G-code programs can be transmitted between GOT and Motion controllers, and the data originally saved in the controller can be deleted on GOT.

## Conversion from CAD Data into G-code Available soon



CAD data in DXF format is converted into a G-code program, and then the program is exported as G-code text data.

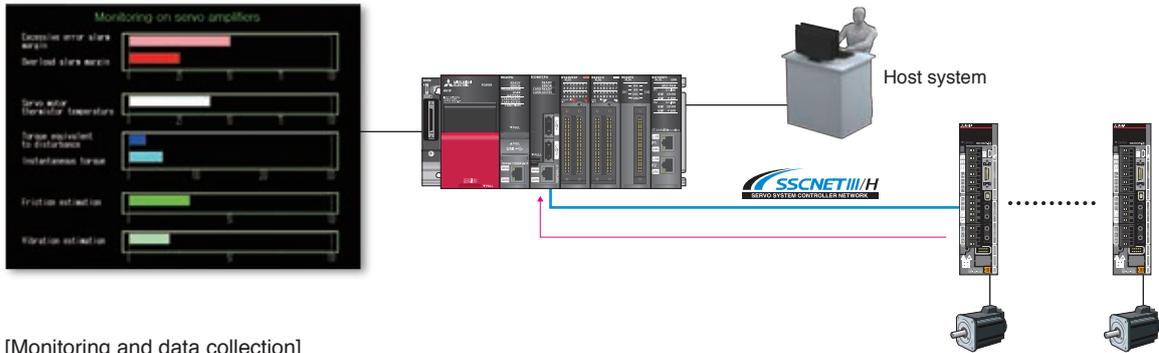


(Note-1): Contact your local sales office for details of the tool. In addition to conversion, it allows you to change the order of drawing. In order to edit the CAD data, CAD editing software is required.

### Monitoring of Servo Data



Servo operation can be monitored with extensive monitor data (selectable from up to 50 items). The monitor items can be flexibly changed during operation. The operation status of servo amplifiers and servo motors (including partner products) acquired via SSCNET III/H is transferred and displayed on the host system or on the GOT screen created by a customer.



[Monitoring and data collection]

Alarm history of servo amplifiers, Power consumption, 7-segment LED display status, Identification information of servo amplifiers and servo motors, Load ratio of servo motors, Speed, Temperature of various parts, etc.

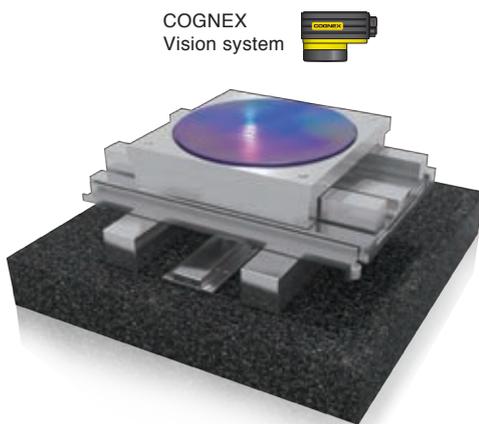
[Preventive maintenance]

Inrush relay ON/OFF number, Power ON cumulative time, Machine diagnosis information (the estimated friction value and the estimated vibration value), etc.

### Vision System

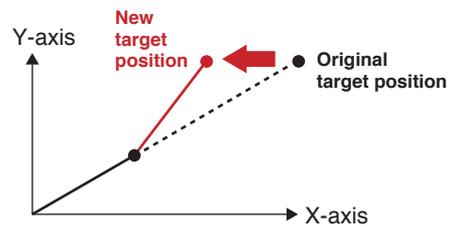


COGNEX Vision system is directly connected to the Motion CPU via Ethernet using the built-in PERIPHERAL I/F. Alignment time is reduced with the target position change function which uses the workpiece position data from the vision system for high-speed Motion control.



COGNEX Vision system

Operation Example of Target Position Change Function

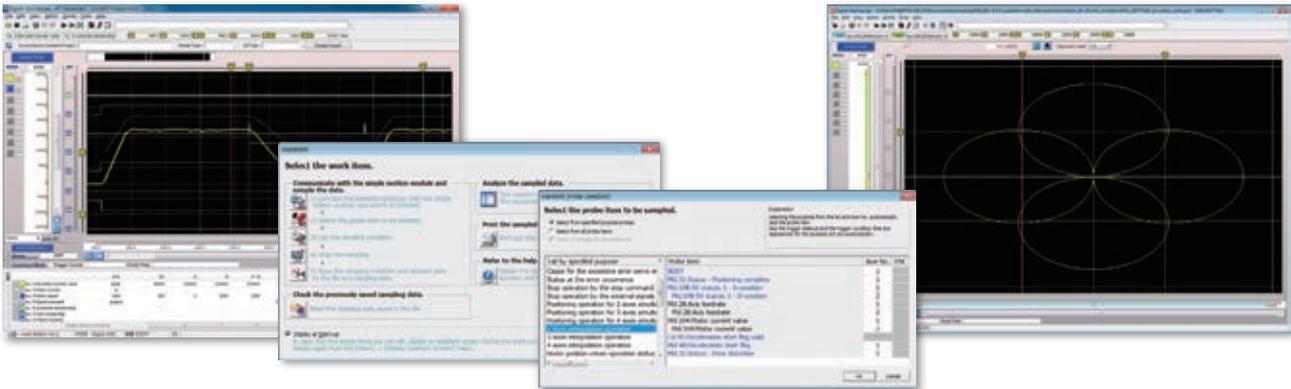


## Digital Oscilloscope Function



Data collection and waveform display which are synchronized to the Motion operation cycle greatly help you check operation and perform troubleshooting.

- Probe items can be set by selecting the purpose from the list.
- 16CH word and 16CH bit data can be sampled, of which, 8CH words and 8CH bits can be displayed in real time.
- Sampling can be performed without having to connect the personal computer to the machine.
- Sampled data which are saved on an SD card can be analyzed on a personal computer.
- Sampled data trajectory can be traced on 2-dimensional coordinate.



Set often-viewed data easily with the purpose-based probe setting by following instructions of the assistant function.

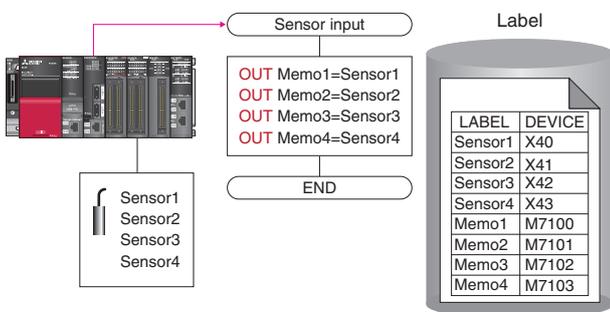
## Programming with Labels



MELSOFT MT Works2 allows you to program with easy-to-understand names (labels) instead of using device names or CPU buffer memory. This programming method enables an easy program reuse and standardization of projects.

### Example of using labels

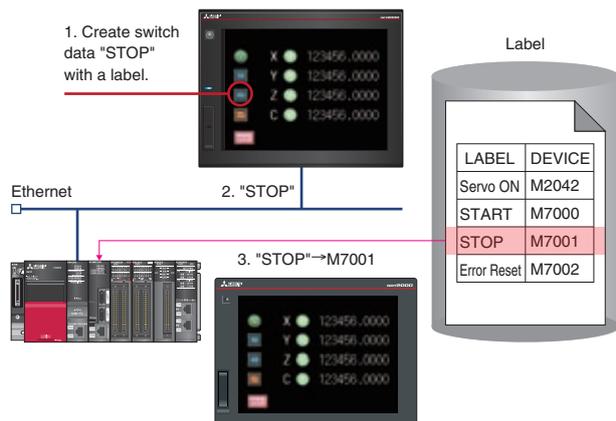
The use of labels removes the need to remember devices when programming.  
Also, labels allow a different model/product to be used with the same program.



### Using common labels with GOT

Since GOT uses common labels with the Motion controller, the screen can be designed with those labels without worries about devices. Additionally, when the device allocation is changed on the Motion controller side, there is no need to change a GOT project accordingly.

1. Create switch data using a label.
2. Access to the controller is requested via the label.
3. The label is converted to the corresponding device.



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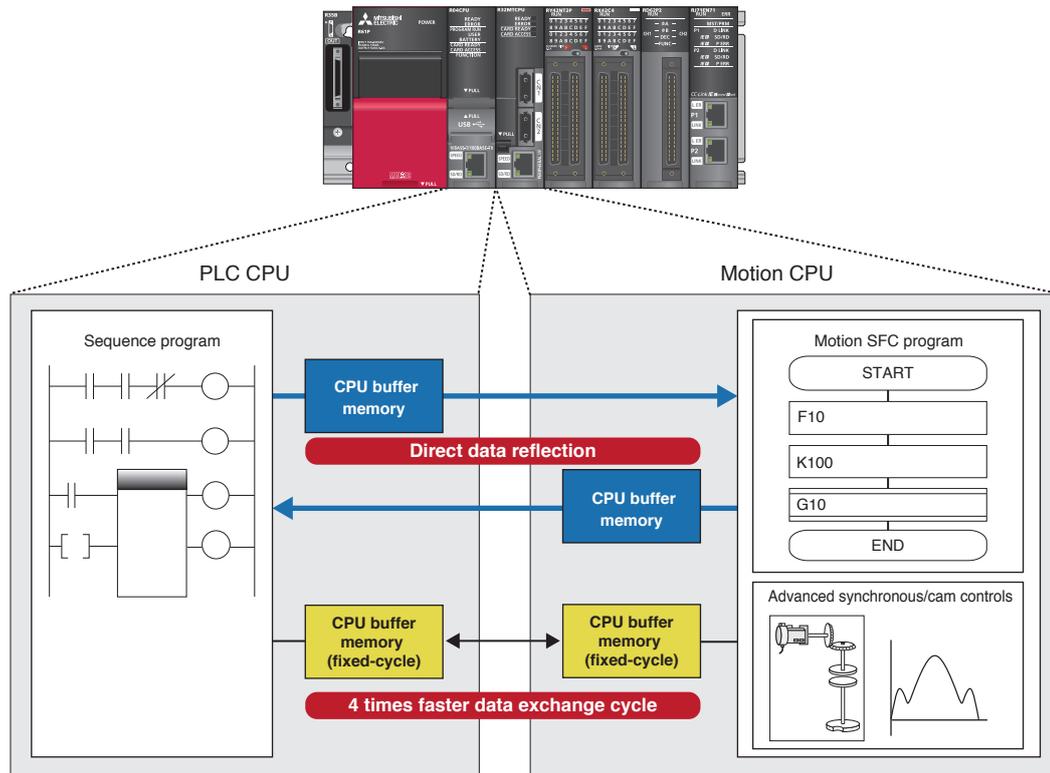
Servo Amplifiers

### Ease of Use Achieved by a State-of-art CPU Buffer Memory

The high-speed, high-capacity CPU buffer memory revolutionizes the data exchange between CPUs.

The PLC CPU and the Motion CPU each have a CPU buffer memory. And those buffer memories are efficiently utilized for two different purposes.

- The 2M words CPU buffer memory (Motion CPU side) is provided as standard, which is utilized for bulky data transmission and fast data updating.
- The CPU buffer memory (fixed-cycle communication area) allows 24 k words (4 CPUs in total) transmission between the PLC CPU and the Motion CPU every 0.222 ms. It is perfectly suited for receiving/transmitting highly synchronized data between multiple CPUs.



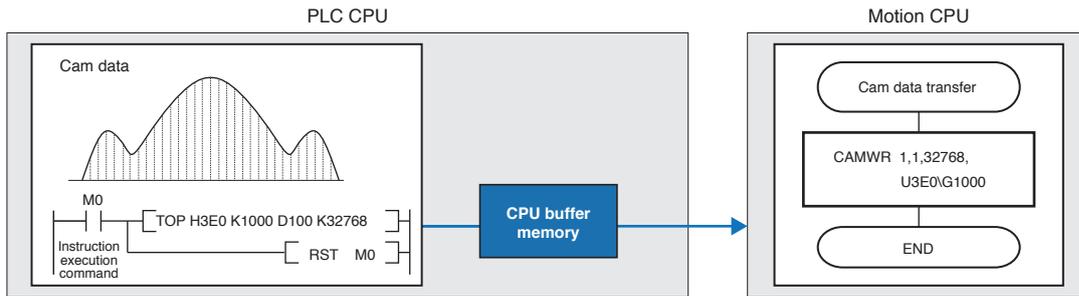
**CPU buffer memory**



The Motion CPU and the PLC CPU are equipped with 2M words and 512k words CPU buffer memories respectively. They allow for bulky data transmission and fast data update.

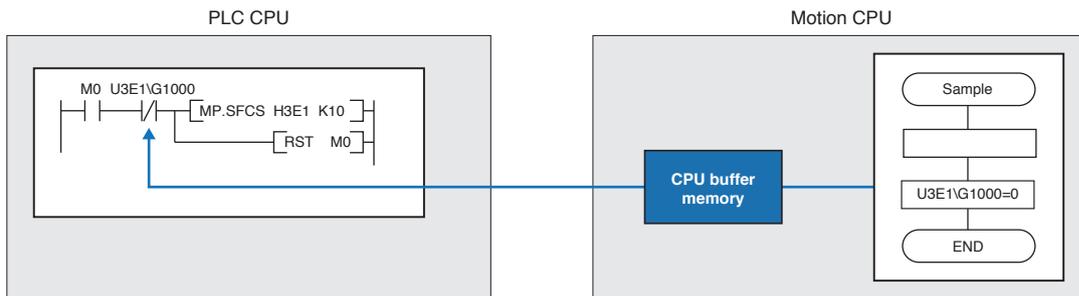
**Example of using PLC CPU buffer memory**

Bulky data such as cam data can be transferred by just a one-time transmission through the 512 k word buffer memory.



**Example of using Motion CPU buffer memory**

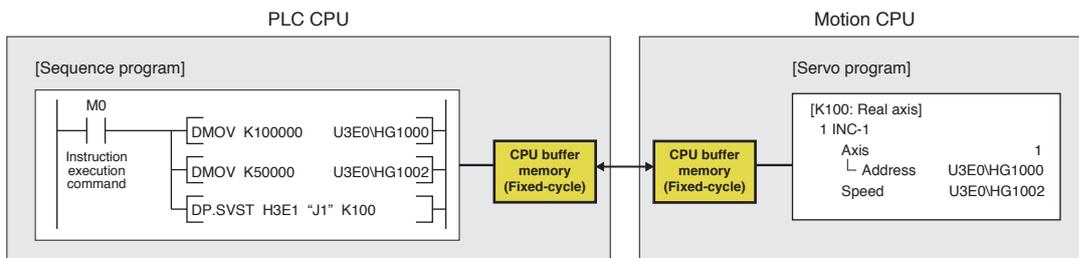
The data that is set on Motion CPU side can be reflected to the interlock in the sequence program without any delay.



**CPU buffer memory (Fixed-cycle communication area)**



Data can be transmitted every 0.222 ms between the PLC CPU and the Motion CPU. The CPU buffer memories (fixed-cycle communication area) are synchronized to the Motion control, optimizing the operation.



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### External Input of Motion CPU

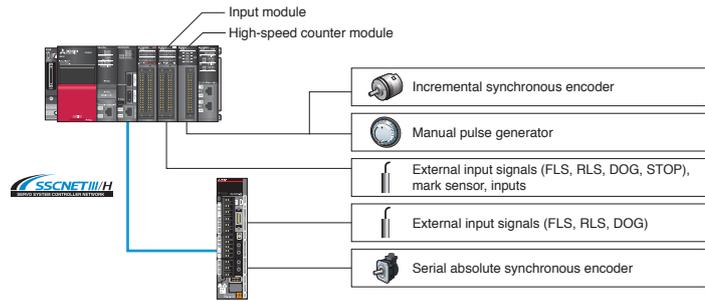


The Motion modules, previously required for the MELSEC-Q series system, are no longer needed since the functionality of those MELSEC-Q series Motion modules has been integrated into the MELSEC iQ-R series PLC CPU input modules.

For example, external signals are inputted via the PLC CPU input module, and input pulses from a manual pulse generator or a synchronous encoder are inputted via the high-speed counter module.

The PLC CPU input module can receive external input signals (FLS, RLS, DOG, STOP) and mark detection signals, in addition to general input signals.

- External input signals of the servo amplifier (FLS, RLS, DOG, STOP) are inputted via the PLC CPU input module or a servo amplifier.
- Pulses of the incremental synchronous encoder are inputted via the high-speed counter module.
- Pulses of the serial absolute encoder are inputted via MR-J4-B-RJ servo amplifier.

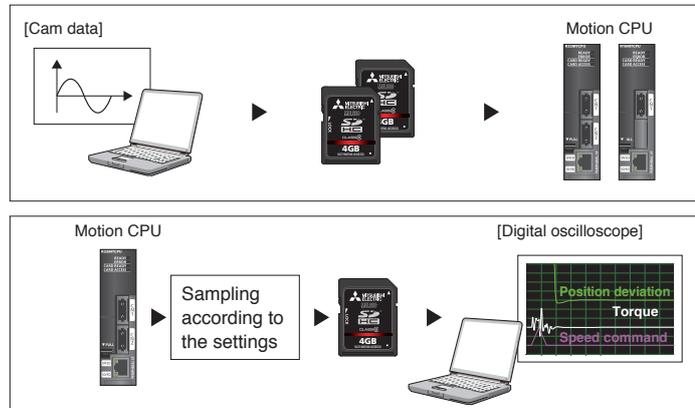


### SD Memory Card



Bulky data such as cam data or digital oscilloscope data can be stored in an SD memory card, significantly expanding the capacity of the Motion CPU built-in memory.

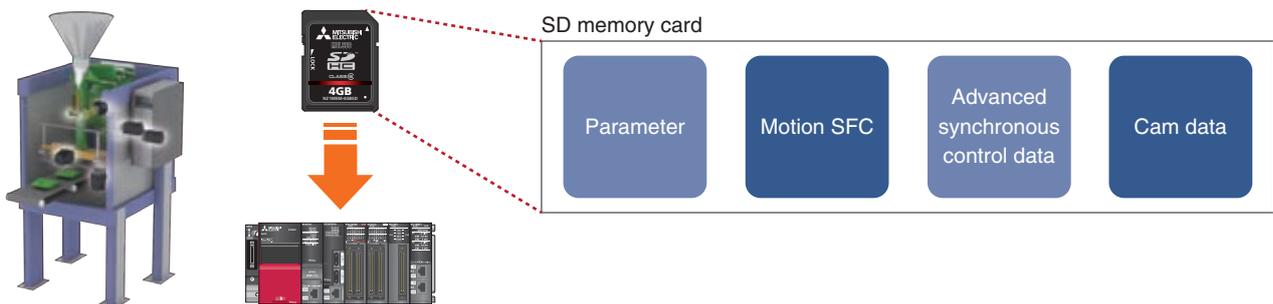
- Data that is created on MELSOFT MT Works2 can be used by multiple Motion CPUs by saving it to an SD memory card.
- The digital oscilloscope data that is sampled automatically by a Motion CPU can be saved on an SD memory card. For example, when an error occurs, the data is sampled automatically. You can check the data later on a personal computer.



### Boot operation with an SD memory card



Applications can be changed just by inserting an SD memory card, even at a manufacturing field where MELSOFT MT Works2 cannot be prepared.



## Various Functions



### Servo external input signals

The servo external input signals (FLS, RLS, DOG) can be controlled via a bit device in addition to via an input module and a servo amplifier. The logic and the validity of these signals can be set individually.

### Home position return methods

15 types of home position return methods are available, including the dogless home position return, which is newly available. Also, the retry function and the shift function are provided. Select any of these home position return methods that suits your machine type.

### Override

The override function changes the command speed for positioning control by a designated percentage. This is used for program and operation checks.

### Parameter change function/Servo parameter change function

Motion CPU parameters and servo parameters can be individually changed during control operation through the Motion SFC program etc., without having to connect to a personal computer.

### Phase compensation

In synchronous control with a synchronous encoder, the phase compensation function is used to compensate the delay time caused by a communication delay in the synchronous encoder data, etc.

### Safety system

The MR-D30 functional safety unit is used to achieve the functions (STO/SS1/SS2/SOS/SLS/SBC/SSM) according to IEC 61800-5-2:2007 without depending on a Motion controller in terms of performance or type. Those functions, provided with this unit, are compliant with "EN ISO 13849-1; Category 4 PL e" and "EN 62061; SIL CL 3" (Both EN ISO 13849-1 and EN 62061 are harmonized with European Machinery Directives).

### Battery-free data saving

Since parameters and Motion SFC programs are saved in the non-volatile memory, the Motion CPU can save data without a battery.

(Note): The PLC CPU requires a battery. If an absolute position system is configured, the servo amplifier needs a battery.

### Add-on function

The add-on library is installed to the Motion CPU to expand the functionality of the Motion controller such as "Machine control function (Note-1)" and "G-code control function (Note-2)".

(Note-1): For machine library, contact your local sales office.

(Note-2): For G-code control, the G-code control add-on library "SW10DND-GCD\_" (provided for a fee) is required.

### 4 million pulse synchronous encoder

The "Q171ENC-W8" 4 million (22-bit) pulse synchronous encoder, compatible with the controller as standard, greatly improves the synchronous operation accuracy. High-accuracy control is achieved when used with MR-J4-B (adapting 4 million (22-bit) pulses resolution motors as standard).

### Speed control with fixed position stop

A servo motor, rotating at the specified speed, can stop at the specified position when turning ON the command of Speed control with fixed position stop. Both the speed and the duration of acceleration/deceleration can be changed to any value during operation, which is suitable for a spinner operation, etc.

### Torque limit value change

The torque limit value during positioning or JOG operation is changed easily with the CHGT Motion dedicated instruction. The torque limit values for power running direction and regeneration direction can be set individually.

### Servo amplifier control mode switching function

Control mode switch commands of the gain switching function, PI-PID control and control loop (fully closed, semi-closed) can be executed to the servo amplifier.

### Target position change function

The target position can be changed during positioning, achieving shorter cycle time. The new target position can be specified by absolute address or movement amount from the current feed value when the target position change request is executed.

### Operation control program

A wide variety of functions are available: standard functions such as binary operation, bit operation, type conversion, and trigonometric in the Motion SFC; the command for the scaling function that is suitable for calculating coordinate conversions; the cam data reading/writing; the synchronous control dedicated instruction for cam auto generation; conditional branch control, such as IF and CASE, at an operation control step.

### Multiple CPU advanced synchronous control

A large system can be configured thanks to the advanced synchronous control that allows up to 192-axis synchronization with high accuracy by use of three R64MTCPUs.

### Control specification

Item		Specifications		
		R64MTCPU	R32MTCPU	R16MTCPU
Maximum number of control axes		64 axes	32 axes	16 axes
Number of SSCNET III/H lines		2 lines	2 lines	1 line
Operation cycle (Operation cycle settings)		0.222ms, 0.444ms, 0.888ms, 1.777ms, 3.555ms, 7.111ms		
Interpolation function		Linear interpolation (Up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)		
Control modes		Positioning control, Speed control, Fixed-pitch feed control, Continuous trajectory control, Position follow-up control, Speed control with fixed position stop, High-speed oscillation control, Cam control, Speed-torque control, Tightening & Press-fit control, Advanced synchronous control, Pressure control, Machine control		
Acceleration/deceleration process		Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration, Advanced S-curve acceleration/deceleration		
Compensation function		Backlash compensation, Electronic gear, Phase compensation		
Programming language		Motion SFC, Dedicated instruction, G-code <sup>(Note-1)</sup>		
Servo program capacity		64k steps		
Number of positioning points		6400 points (Positioning data can be set indirectly)		
Home position return	Home position return method	Proximity dog method (2 methods), Count method (3 methods), Data set method (3 methods), Dog cradle method, Stopper method (2 methods), Limit switch combined method, Scale home position signal detection method, Dogless home position signal reference method, Driver home position return method <sup>(Note-2)</sup>		
	Auxiliary functions	Home position return retry function, Home position shift function		
Positioning control	Linear control	Linear interpolation (Up to 4 axes) (Vector speed, Reference axis speed, Long-axis speed)		
	Fixed-pitch feed	Fixed-pitch feed control (Up to 3 axes)		
	2-axis circular interpolation	Auxiliary point-specified, central point-specified, and radius-specified circular interpolation		
	Speed control	Speed control for the specified axis		
	Speed-position switching	INC mode, Speed control with fixed position stop		
Manual control	Current value change	Provided		
	JOG operation	Provided		
Expansion control	Manual pulse generator	Possible to connect 3 modules (with use of the high-speed counter), Unit magnification (1 to 10000 times)		
	Speed-torque	Speed control without positioning loops, Torque control, Tightening & press-fit control		
Absolute position system		Made compatible by setting a battery to a servo amplifier (Possible to select the absolute method or incremental method for each axis)		
Synchronous encoder interface		Up to 12 CH (Via high-speed counter + Servo amplifier <sup>(Note-3)</sup> + Device+ multiple CPU advanced synchronous control)		
Functions that limit control	Speed limit	Speed limit value, JOG speed limit value		
	Override	0 to 300%		
	Torque limit	Torque limit value same setting, Torque limit value individual setting		
	Forced stop	Motion controller forced stop, Forced stop terminal of servo amplifier		
	Software stroke limit	Provided		
Functions that change control details	Hardware stroke limit	Provided		
	Speed change	Provided		
	Acceleration/deceleration time change	Provided		
	Torque change	Provided		
Other functions	Target position change	Target position address is changeable		
	M-code output	M-code output, M-code completion wait		
	Skip function	Provided		
All clear function		Delete all user data in Motion CPU		
External input signal setting function		Servo amplifier input (FLS, RLS, DOG), bit		
Event history function		Provided		
Amplifier-less operation function		Provided		
Mark detection function	Mark detection signal	Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode		
	Mark detection setting	High-speed input request (Bit device, Input signals of servo amplifiers (DI1 to DI3)) 64		
Optional data monitor function		Up to 14 data/axis (Communication data: Up to 6 points/axis)		
Driver communication function <sup>(Note-4)</sup>		Provided		
File transmission at boot function		Provided		
SSCNET connect/disconnect function		Provided		
Digital oscilloscope function		Motion buffering method (Real-time waveform can be displayed) Sampling data (Word 16CH, Bit 16CH), Offline sampling		
Limit switch output function	Number of output points	64 points × 2 sections		
	Watch data	Motion control data, Word device		
Parameter change function		Provided		
Servo parameter change function		Provided		
Servo amplifier control mode switching function		Gain switching function, PI-PID control, Control loop switching (semi closed loop control, fully closed loop control)		

**Control specification (continued)**

Item	Specifications		
	R64MTCPU	R32MTCPU	R16MTCPU
Number of I/O points	Total of 4096 points (I/O modules)		
Clock function	Provided		
Security function	File password, Password for each Motion SFC program, Software security key function		
Remote operation	Remote RUN/STOP		
Vibration suppression command filter	Provided		

(Note-1): The G-code control add-on library "SW10DND-GCD□" (provided for a fee) is required.  
 (Note-2): The home position return method set in a driver (a servo amplifier) is used.  
 (Note-3): Available with MR-J4\_B-RJ  
 (Note-4): Available with MR-J3\_B/MR-J4\_B

**Motion SFC performance specification**

Item	Specifications		
	R64MTCPU	R32MTCPU	R16MTCPU
Motion SFC program capacity	Code total (Motion SFC chart + Operation control +Transition) 8192k bytes		
Motion SFC program	Number of Motion SFC programs 512 (No.0 to 511)		
	Motion SFC chart size/program Up to 64k bytes (including Motion SFC chart comments)		
	Number of Motion SFC steps/program Up to 4094 steps		
	Number of selective branches/branch 255		
	Number of parallel branches/branch 255		
	Parallel branch nesting Up to 4 levels		
Operation control program (F/FS) / Transition program (G)	Number of operation control programs 4096 with F (Once execution type) and FS (Scan execution type) combined (F/FS0 to F/FS4095)		
	Number of transition programs 4096 (G0 to G4095)		
	Code size/program Up to approx. 128k bytes (65534 steps)		
	Number of blocks(line)/program Up to 8192 blocks (In the case of 8 steps (min)/block)		
	Number of characters/block Up to 1020 (Comment included)		
	Number of operand/block Up to 510 (Operand: Constants, Word devices, Bit devices)		
	( ) nesting/block Up to 32 levels		
Execute specification	Descriptive expression		
	Operation control program Calculation expression, Bit conditional expression, Branches/repetition processing		
	Transition program Calculation expression, Bit conditional expression, Comparison conditional expression		
	Number of multi executed programs Up to 512		
	Number of multi active steps Up to 1024 steps per all programs		
	Executed task		
Number of device points	IO (X/Y) 12,288 points		
	Internal relays (M) 49,152 points (Note-1)		
	Link relays (B) 8,192 points		
	Annunciators (F) 2,048 points		
	Special relays (SM) 4,096 points		
Number of device points	Data registers (D) 57,344 points (Note-1)		
	Link registers (W) 8,192 points		
	Special registers (SD) 4,096 points		
	Motion registers (#) 12,288 points		
	CPU buffer memory (U3E□\G) Up to 2,097,152 points		
	CPU buffer memory (fixed-cycle communication area)(U3E□\HG) Up to 12,288 points		
	Module access(U□\G) Up to 268,435,456 points		

(Note-1): Internal relays (M): 12,288 points, data registers (D): 20,480 points (when using the Q series Motion compatible device assignment with R32MTCPU and R16MTCPU)

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### Advanced synchronous control specifications

#### Synchronous control

Item		Number of settable axes		
		R64MTCPU	R32MTCPU	R16MTCPU
Input axis	Servo input axis	64 axes/module	32 axes/module	16 axes/module
	Command generation axis	64 axes/module	32 axes/module	16 axes/module
	Synchronous encoder axis	12 axes/module		
Composite main shaft gear		1/output axis		
Main shaft main input axis		1/output axis		
Main shaft sub input axis		1/output axis		
Main shaft gear		1/output axis		
Main shaft clutch		1/output axis		
Auxiliary shaft		1/output axis		
Auxiliary shaft gear		1/output axis		
Auxiliary shaft clutch		1/output axis		
Auxiliary shaft composite gear		1/output axis		
Speed change gear		2/output axis		
Output axis (Cam axis)		64 axes/module	32 axes/module	16 axes/module

#### Cam control

Item		Specifications									
		R64MTCPU			R32MTCPU			R16MTCPU			
Memory capacity	Storage file	Capacity of the standard ROM/SD memory card									
	Cam working area	16M bytes									
Number of registration		Up to 1024 program items (depending on memory capacity, cam resolution and number of coordinates)									
Comment		Up to 32 characters for each cam data									
Cam data	Stroke ratio data type	Number of cam registration	Cam resolution	256	512	1024	2048	4096	8192	16384	32768
			Maximum number of cam registration	1024			512	256	128		
		Stroke ratio	-214.7483648 to 214.7483647 [%]								
	Coordinate data type	Number of cam registration	Number of coordinates	512	1024	2048	4096	8192	16384	32768	65535
			Maximum number of cam registration	1024			512	256	128	64	32
		Coordinate data	Input value : 0 to 2147483647 Output value : -2147483648 to 2147483647								
Cam auto-generation		Cam for rotary knife, Easy stroke ratio cam, Advanced stroke ratio cam									

#### G-code control

Function	Command
Positioning	G00
Linear interpolation	G01
Circular interpolation	G02, G03
Dwell	G04
Exact stop check	G09, G61
Polar coordinate interpolation	G12.1, G13.1
Plane selection	G17, G18, G19
Tool radius compensation	G38, G39, G40, G41, G42
Normal line control	G40.1, G41.1, G42.1
Tool length compensation	G43, G44, G49
Local coordinate system setting	G52
Basic machine coordinate system selection	G53
Work coordinate system selection	G54, G55, G56, G57, G58, G59

Function	Command
High-accuracy control	G61.1
Automatic corner override	G62
Cutting mode	G64
Program coordinate rotation	G68, G69
Absolute value command	G90
Incremental value command	G91
Override	Specified with device
FIN signal wait function	G-code control device
Single block	G-code control device
Subprogram control	M98, M99
Variable command	Common variable
Operation command	=, +, -, *, /, SIN, COS, TAN, SQRT, ABS, etc.
Control command	IF - GOTO, IF - THEN - ELSE - ENDIF, WHILE - DO - END

## Module specification

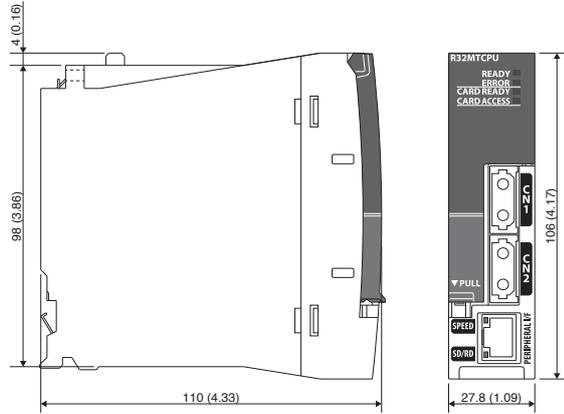
### Motion CPU module R64MTCPU/R32MTCPU/R16MTCPU



Item		Specifications		
		R64MTCPU	R32MTCPU	R16MTCPU
Number of control axes		Up to 64 axes	Up to 32 axes	Up to 16 axes
Servo amplifier connection method		SSCNET III/H (2 lines)		SSCNET III/H (1 line)
Maximum overall cable distance [m(ft.)]		3200 (10498.69)	1600 (5249.34)	
Maximum distance between stations [m(ft.)]		100 (328.08)		
SSCNET communications	Number of sensing module connection stations	Up to 8 stations (Up to 4 stations per line)		Up to 4 stations
	Number of SSCNET III/H head module connection stations			
PERIPHERAL I/F (Ethernet)	Data transmission speed	100Mbps/10Mbps		
	Transmission method	Base band		
	Cable length [m(ft.)]	Up to 30 (98.43)		
Memory card slot		SD/SDHC memory card compatible		
Memory capacity	Standard ROM	12 M bytes		
	SD memory card	Memory card capacity (Up to 32 G bytes)		
Extension base unit		Up to 7		
5 VDC internal current consumption [A]		1.20		
Mass [kg]		0.28		
Exterior dimensions [mm(inch)]		106.0 (4.17) (H) × 27.8 (1.09) (W) × 110.0 (4.33) (D)		

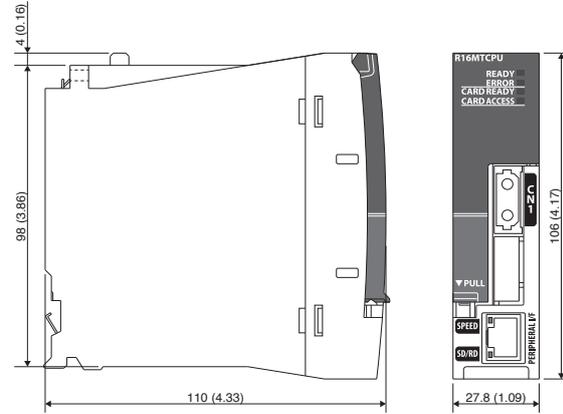
### Exterior Dimensions

#### R64MTCPU/R32MTCPU



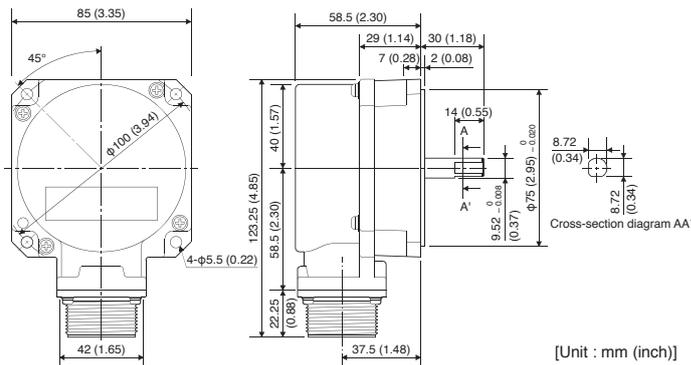
[Unit : mm (inch)]

#### R16MTCPU



[Unit : mm (inch)]

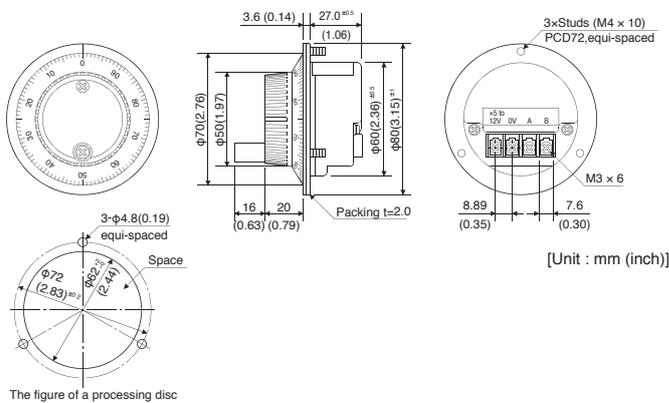
### Serial absolute synchronous encoder Q171ENC-W8



[Unit : mm (inch)]

Item	Specifications
Resolution	4,194,304pulse/rev
Direction of increasing addresses	CCW (viewed from end of shaft)
Protective construction	Dustproof/Waterproof (IP67: Except for the shaft-through portion)
Permitted axial loads	Radial load: Up to 19.6N Thrust load: Up to 9.8N
Permitted speed	3600r/min
Permitted angular acceleration	40000rad/s <sup>2</sup>
Ambient temperature	-5 to 55°C (23 to 131°F)
5 VDC consumption current	0.25A
Mass	0.6kg

### Manual pulse generator MR-HDP01



[Unit : mm (inch)]

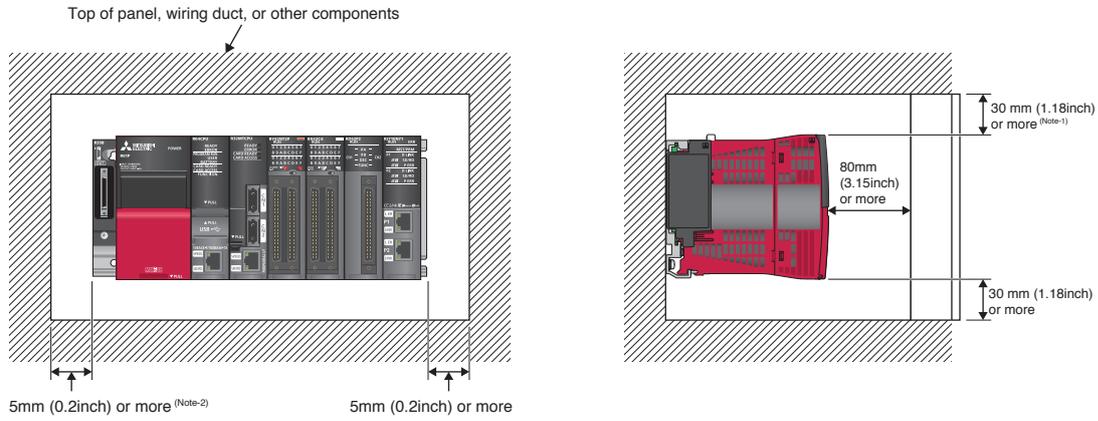
The figure of a processing disc

Item	Specifications
Pulse resolution	25Ppulse/rev (100pulse/rev after magnification by 4)
Phase A, Phase B Output voltage	Input voltage : -1V or more (Note)
Output method	Voltage output
Output current	Up to 20mA
Life time	1,000,000 revolutions or more (at 200r/min)
Permitted axial loads	Radial load: Up to 19.6N Thrust load: Up to 9.8N
Maximum rotation speed	600r/min (Instantaneous maximum), 200r/min (Normal rotation)
Ambient temperature	-10 to 60°C (14 to 140°F)
5 VDC consumption current	0.06A
Mass	0.4kg

(Note) When using an external power supply, use 5 VDC power supply.

■ Mounting

R64MTCPU/R32MTCPU/R16MTCPU



(Note-1): Provide clearance of 30mm (1.18inch) or more when the height of a wiring duct is 50mm (1.97inch) or less. In other cases, provide clearance of 40mm (1.57inch) or more.

(Note-2): Provide clearance of 20mm (0.79inch) or more when an extension cable is connected/removed without removing a power supply module.

### ■ Component

#### Motion controller R64MTCPU/R32MTCPU/R16MTCPU

Part	Model	Description		Standards	
Motion CPU module	R64MTCPU	Up to 64 axes, Operation cycle 0.222 ms or longer		CE, UL, KC, EAC	
	R32MTCPU	Up to 32 axes, Operation cycle 0.222 ms or longer		CE, UL, KC, EAC	
	R16MTCPU	Up to 16 axes, Operation cycle 0.222 ms or longer		CE, UL, KC, EAC	
SSCNET III cable <sup>(Note-1)</sup>	MR-J3BUS_M	<ul style="list-style-type: none"> <li>• Motion CPU module ↔ Servo amplifier</li> <li>• Servo amplifier ↔ Servo amplifier</li> </ul>	Standard code for inside panel	0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft)	—
	MR-J3BUS_M-A		Standard cable for outside panel	5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)	—
	MR-J3BUS_M-B <sup>(Note-2)</sup>		Long distance cable	30m (98.43ft.), 40m (131.23ft.), 50m (164.04ft.)	—
Serial absolute synchronous encoder	Q171ENC-W8	Resolution: 4,194,304pulse/rev, Permitted speed: 3600r/min		CE, UL, KC, EAC	
Serial absolute synchronous encoder cable	Q170ENCCBL2M-A	Serial absolute synchronous encoder Q171ENC-W8 ↔ MR-J4-B-RJ		2m (6.56ft.)	—
	Q170ENCCBL5M-A			5m (16.40ft.)	—
	Q170ENCCBL10M-A			10m (32.81ft.)	—
	Q170ENCCBL20M-A			20m (65.62ft.)	—
	Q170ENCCBL30M-A			30m (98.43ft.)	—
	Q170ENCCBL50M-A			50m (164.04ft.)	—
Manual pulse generator	MR-HDP01	Number of pulses per revolution: 25pulse/rev (100pulse/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation)		—	
Optical hub unit	MR-MV200	Three branches/unit, DC power supply connector enclosed		CE, UL, KC, EAC	

(Note-1): " \_ " indicates cable length (015: 0.15m (0.49ft.), 03: 0.3m (0.98ft.), 05: 0.5m (1.64ft.), 1: 1m (3.28ft.), 3: 3m (9.84ft.), 5: 5m (16.40ft.), 10: 10m (32.81ft.), 20: 20m (65.62ft.), 30: 30m (98.43ft.), 40: 40m (131.23ft.), 50: 50m (164.04ft.))

(Note-2): For a long distance cable of up to 100m (328.08ft.) or an ultra-long bending life cable, contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION (Email:osb.webmaster@melsc.jp)

#### [Manual pulse generator on the market]

Mitsubishi Electric has confirmed the operation of the following manual pulse generator. Contact the manufacturer for details.

Part	Model	Description	Manufacturer
Manual pulse generator	UFO-M2-0025-2Z1-B00E	Number of pulses per revolution: 25pulse/rev (100pulse/rev after magnification by 4), Permitted speed: 200r/min (Normal rotation)	Nemicon Corporation

#### Applicable CPU

PLC CPU module	R00CPU, R01CPU, R02CPU, R04CPU, R08CPU, R16CPU, R32CPU, R120CPU R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU R08PCPU, R16PCPU, R32PCPU, R120PCPU R12CCPU-V
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(Note): Depending on the combination of the modules, there are restrictions on the firmware version of the PLC CPU module. Refer to "MELSEC iQ-R Module Configuration Manual" for details.

#### Software for Motion controller

Part	Model name			Description
	R64MTCPU	R32MTCPU	R16MTCPU	
Operating system software	SW10DNC-RMTFW			Pre-installed before shipment
Machine Library	MCNTYP-R□□□			Contact your local sales office.
Operating system software add-on library (G-code control add-on library)	SW10DND-GCD01			Number of licenses: 1
	SW10DND-GCD05			Number of licenses: 5
	SW10DND-GCD10			Number of licenses: 10
	SW10DND-GCD20			Number of licenses: 20
	SW10DND-GCD50 <sup>(Note)</sup>			Number of licenses: 50

(Note): When requesting more than 50 licenses, contact your local sales office.

#### [G-code Control Add-on Library Packing List]

- DVD-ROM (Add-on library, manual PDF)
- USB key (for license activation)
- Before Using the Product
- License Certificate
- END-USER SOFTWARE LICENSE AGREEMENT



## Sensing Module **MR-MT2000** Series

High Speed and High Accuracy by  
Synchronization of I/O Signals with Motion Control

The sensing module MR-MT2000 series consists of one head module and four types of extension modules, the I/O module, pulse I/O module, analog I/O module, and encoder I/F module. The required extension modules can be selected according to your application.

- I/O with a fastest response time of 1 μs
- High-accuracy analog I/O
- Pulse I/O for synchronous control
- Supporting open standard encoder I/Fs



SSCNET III/H Head module **MR-MT2010**

- ▶ High-response input 12 points
- ▶ High-response output 2 points
- ▶ SSCNET III/H connection
- ▶ I/O synchronized with motion control
- ▶ Response time of 1 μs
- ▶ Timing-latch input with 0.1 μs precision

(Note-1): Up to two encoder I/F modules are connectable per Head module.



- High-accuracy mark detection
- High-accuracy shutter output

**I/O module**  
**MR-MT2100**

- ▶ **High-response input** 16 points
- ▶ **High-response output** 16 points
- ▶ I/O synchronized with motion control
- ▶ A fastest response time of 1  $\mu$ s
- ▶ Timing-latch input with 0.1  $\mu$ s precision

- Production line - Machine synchronization
- General-purpose pulse train drive
- High-accuracy shutter output

**Pulse I/O module**  
**MR-MT2200**

- ▶ **I/O** 2CH (selectable)
- ▶ Pulse command output
- ▶ General-purpose pulse input
- ▶ Pulse-coincidence output

- High-accuracy acceleration detection
- High-accuracy load control

**Analog I/O module**  
**MR-MT2300**

- ▶ **Input** 4CH
- ▶ **Output** 4CH
- ▶ High-resolution I/O 16 bits
- ▶ Voltage range switching function

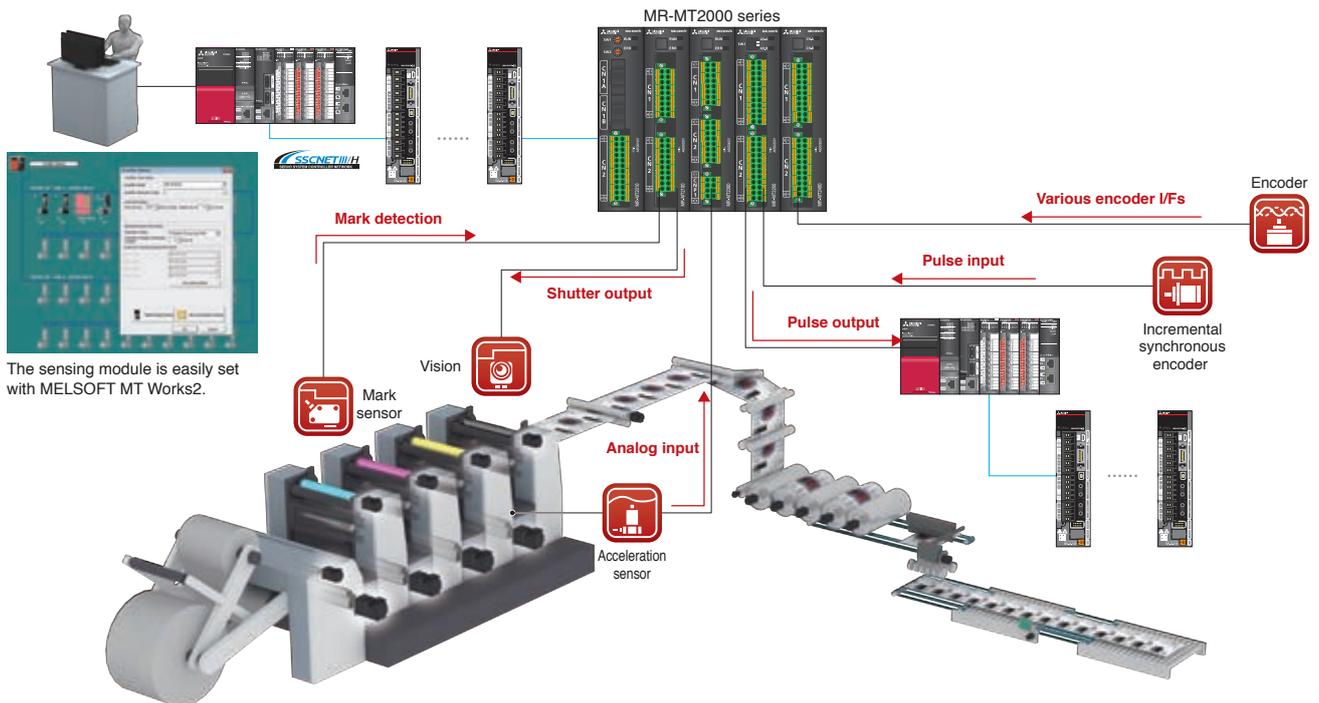
- Supporting various encoder I/Fs
- Fully closed loop control

**Encoder I/F module**  
**MR-MT2400**

- ▶ **Input** 2CH
- ▶ SSI
- ▶ Mitsubishi Electric serial I/F
- ▶ EnDat 2.2 Compatible in the future

**Application example in printing processes using sensing module**

Each I/O signal connected to the sensing module is synchronized with the Motion control cycle, enabling a processing with little variation to achieve high speed and high accuracy of equipment.



Application examples to increase speed and accuracy

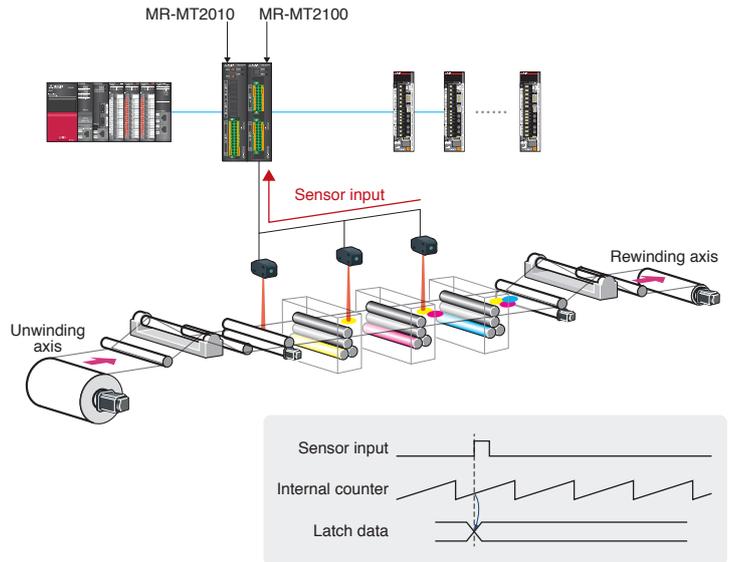
**Issue** High-accuracy mark detection on high-speed moving film

The sensing modules can read the current position using a highly accurate (within  $\pm 1 \mu\text{s}$ ) timing-latch input function, enabling high-accuracy, high-response mark detection. Input and output can be synchronized with the motion control cycle even with the Head module alone.

[Modules to be used]

- Head module MR-MT2010
- I/O module MR-MT2100

**Solution** High-response mark detection with I/O module



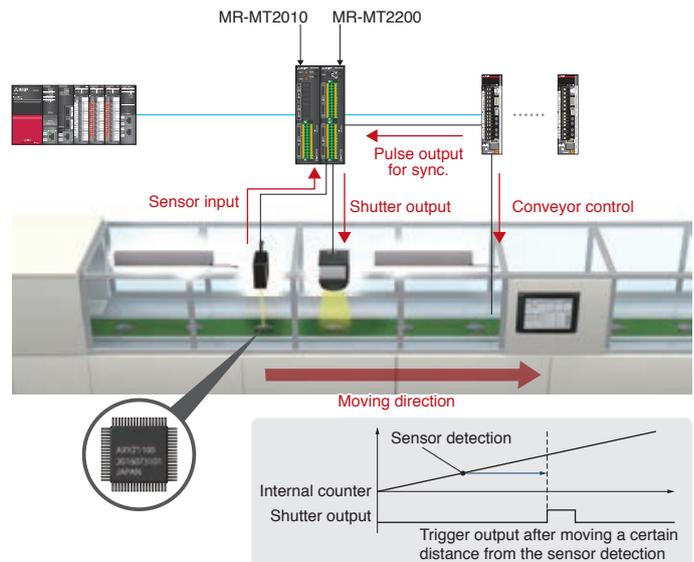
**Issue** High-accuracy imaging of high-speed moving workpieces

The sensing module triggers the shutter output based on the pulses counted from the sensor input, enabling an accurate, high-speed trigger control.

[Modules to be used]

- Head module MR-MT2010
- Pulse I/O module MR-MT2200

**Solution** Shutter output with little variation by using pulse I/O module



**Issue** High-accuracy imaging with little variation

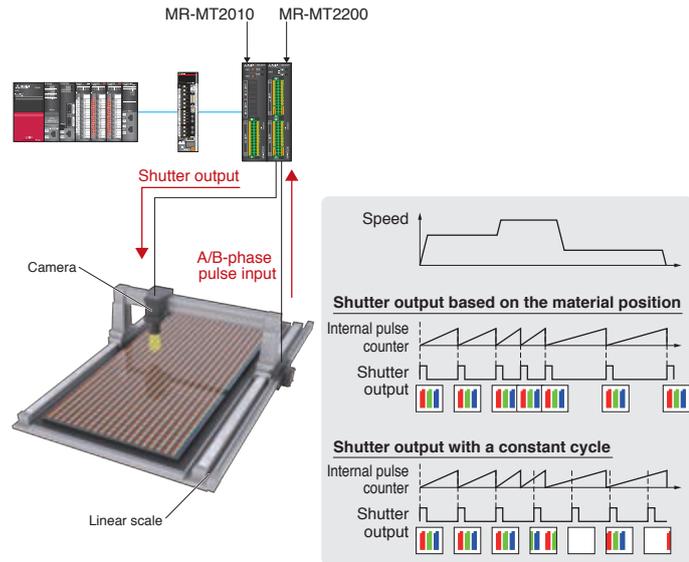
**Solution** Shutter output with little variation by using pulse I/O module Available in the future



Even when the speed of the conveyor fluctuates, an accurate imaging is possible because the pulse I/O module can output a signal based on the pulses counted up.

**[Modules to be used]**

- Head module MR-MT2010
- Pulse I/O module MR-MT2200



**Issue** Synchronization with post processes

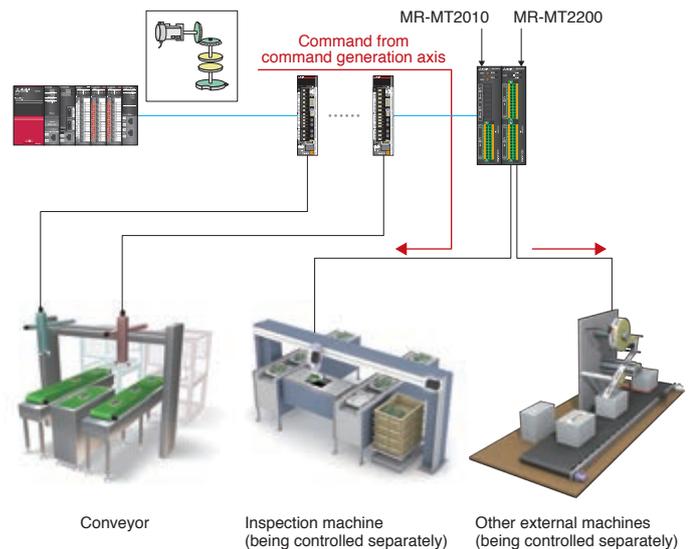
**Solution** Synchronization of machines in the entire system with pulse I/O module



The current feed value of a command generation axis can be transferred through link devices, and thus output pulses of the sensing module can be synchronized with the command generation axis. Post processes, such as an inspection machine and other external machines can be synchronized with a command generation axis even without a synchronous encoder.

**[Modules to be used]**

- Head module MR-MT2010
- Pulse I/O module MR-MT2200



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Simple Motion

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## Issue

### Use of drivers not supporting SSCNET III/H

Synchronous control is possible between the general-purpose pulse train driver and the servo amplifier by SSCNET III/H connection via the SSCNET III/H Sensing modules.

(The driver is counted as a servo amplifier axis.)

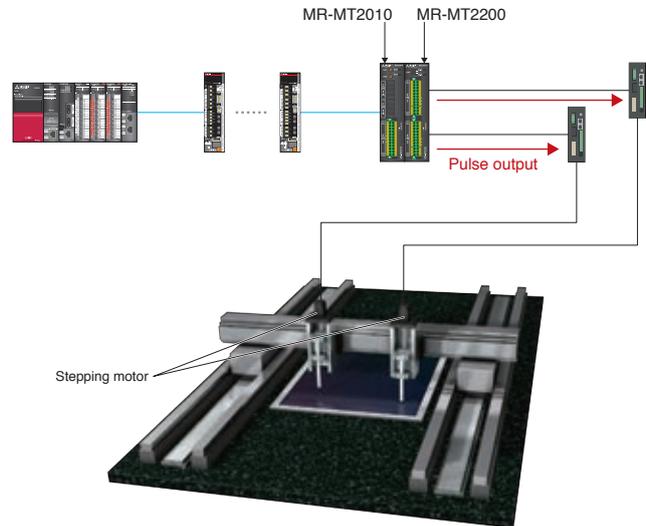
(Note): MR-MT2100/2300/2400 cannot be used together with MR-MT2010/2200 when the general-purpose pulse train driver is used.

#### [Modules to be used]

- Head module MR-MT2010
- Pulse I/O module MR-MT2200

## Solution

### Operating general-purpose pulse train drivers with pulse I/O module



## Issue

### Trigger output when the sensor input value exceeds the threshold value

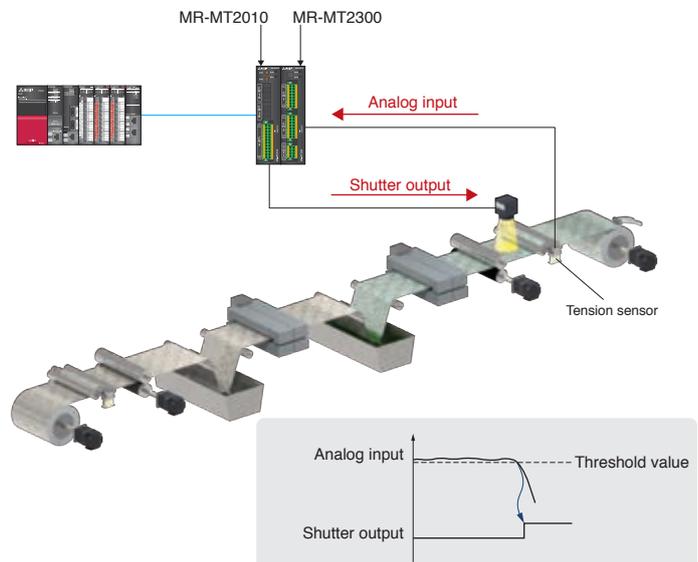
The Head module and the I/O module automatically output a digital signal when the input value of the analog I/O module exceeds the threshold value.

#### [Modules to be used]

- Head module MR-MT2010
- Analog I/O module MR-MT2300

## Solution

### Level output function by the Head module and I/O module



**Issue**

**Load control by high-accuracy pressure detection**

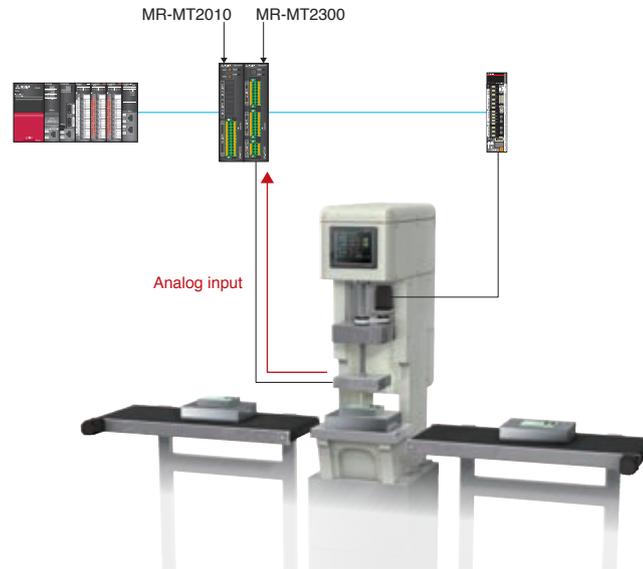
Reading pressure sensor data while synchronizing with the motion control cycle, enables I/Os with little variation and thus high-accuracy load control with a fully closed loop system.

**[Modules to be used]**

- Head module MR-MT2010
- Analog I/O module MR-MT2300

**Solution**

**High-accuracy load control with analog I/O module**



**Issue**

**Use of open standard encoders**

The encoder I/F module supports various encoder I/Fs, enabling data input of various different encoders and configuring a fully closed loop system.

**Encoder I/Fs**

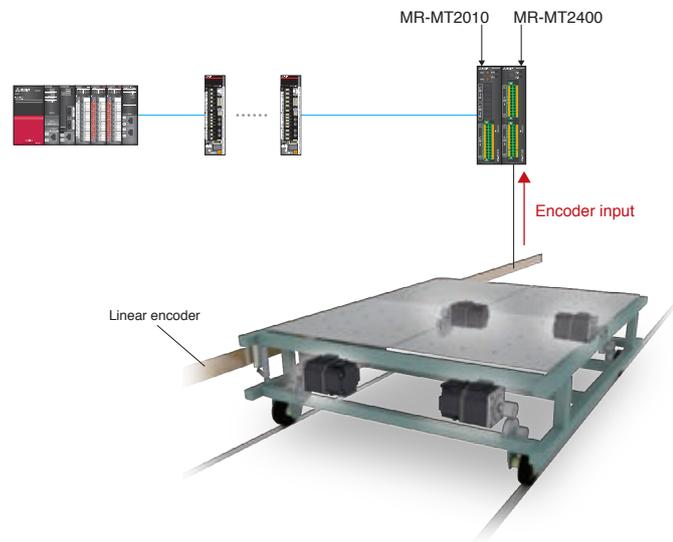
- SSI
- Mitsubishi Electric serial I/F
- EnDat 2.2 Compatible in the future

**[Modules to be used]**

- Head module MR-MT2010
- Encoder I/F module MR-MT2400

**Solution**

**Connecting various encoders with encoder I/F module**



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## Specifications

Name	Item		Specification	
SSCNET III/H Head module MR-MT2010	Control circuit power supply input	Voltage	24 V DC	
		Permissible voltage fluctuation	24 V DC $\pm$ 10 %	
		Current capacity	1.0 A	
	Communications interface		SSCNET III/H	
	DI	Number of input points		12 points
		Input method		Sink input/source input (photocoupler isolation)
		Input response time		ON to OFF: within 1 $\mu$ s/OFF to ON: within 1 $\mu$ s
	DO	Number of output points		2 points
		Output method		Sink output (photocoupler isolation)
		Output response time		ON to OFF: within 1 $\mu$ s/OFF to ON: within 1 $\mu$ s
Mass [kg]		0.2		
I/O module MR-MT2100	DI	Number of input points		16 points <sup>(Note-1)</sup>
		Input method		Sink input/source input (photocoupler isolation)
		Input response time		ON to OFF: within 1 $\mu$ s/OFF to ON: within 1 $\mu$ s
	DO	Number of output points		16 points <sup>(Note-1)</sup>
		Output method		Sink output/source output (photocoupler isolation)
		Output response time	Sink output	ON to OFF: within 1 $\mu$ s/OFF to ON: within 1 $\mu$ s
	Source output		ON to OFF: within 2 $\mu$ s/OFF to ON: within 1 $\mu$ s	
Mass [kg]		0.2		
Pulse I/O module MR-MT2200	Number of pulse I/O channels		Output 2CH, input 2CH, I/O 1CH each (selectable)	
	Pulse output	Output signal		Differential line driver output/open collector output
		Output method		Forward/reverse rotation pulse train, signed pulse train, A-phase/B-phase pulse train
		Maximum frequency	Differential line driver output	4M pulse/s (A-phase/B-phase pulse train 4 multiples)
			Open collector output	1M pulse/s (forward/reverse rotation pulse train, signed pulse train) 200k pulse/s (A-phase/B-phase pulse train 4 multiples) 50k pulse/s (forward/reverse rotation pulse train, signed pulse train)
	Pulse input	Input signal		Differential line driver input
		Input method		Forward/reverse rotation pulse train, signed pulse train, A-phase/B-phase pulse train
		Maximum frequency	Differential line driver input	4M pulse/s (A-phase/B-phase pulse train 4 multiples) 1M pulse/s (forward/reverse rotation pulse train, signed pulse train)
	DI		Number of input points	7 points per axis (total of 14 points)
	DO	Input method		Sink input/source input (photocoupler isolation)
		Number of output points		5 points per axis (total of 10 points) <sup>(Note-2)</sup>
	Output method		Sink output/source output (photocoupler isolation)	
	Mass [kg]		0.2	
Analog I/O module MR-MT2300	Analog input	Number of input channels		4CH
		Input voltage range		-10 to 10 V DC/-5 to 5 V DC (selectable)
		Resolution		$\pm$ 10 V range: 0.334 mV $\pm$ 5 V range: 0.167 mV
		Conversion accuracy		$\pm$ 0.1 % (at 25 °C) $\pm$ 0.3 % (at 0 °C to 60 °C)
	Analog output	Number of output channels		4CH
		Output voltage range		-10 to 10 V DC
		Resolution		$\pm$ 10 V range: 0.319 mV
		Conversion accuracy		$\pm$ 0.4 % (at 25 °C) $\pm$ 0.5 % (at 0 °C to 60 °C)
Mass [kg]		0.2		
Encoder I/F module MR-MT2400	Number of encoder channels		2CH <sup>(Note-3)</sup>	
	Supported encoder communications		SSI, Mitsubishi Electric serial I/F, EnDat 2.2 <sup>(Note-4)</sup>	
	Mass [kg]		0.2	

(Note-1): When the module is used at the temperature exceeding 55 °C and up to 60 °C, keep the number of points turned on simultaneously to be 14 or less for each DI and DO.

(Note-2): Two of the five points and the pulse output (open collector output) are mutually exclusive.

(Note-3): Different encoder interfaces cannot be inputted for each channel. The same encoder interface should be used for both two channels.

(Note-4): Will be compatible in the future.

## Applicable controllers

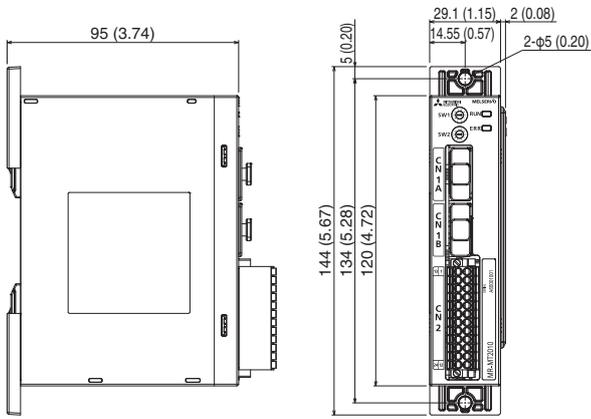
Motion CPU module	R64MTCPU, R32MTCPU, R16MTCPU
Position board	MR-MC200 series, MR-MC341

## Components

Part	Model	Description	Standards
SSCNET III/H Head module	MR-MT2010	SSCNET III/H, input: 12 points, output: 2 points	UL, CE, KC, EAC
I/O module	MR-MT2100	Input 16 points, output 16 points	UL, CE, KC, EAC
Pulse I/O module	MR-MT2200	Total pulse I/O: 2CH	UL, CE, KC, EAC
Analog I/O module	MR-MT2300	Analog input: 4CH, analog output: 4CH	UL, CE, KC, EAC
Encoder I/F module	MR-MT2400	Encoder I/F: 2CH	UL, CE, KC, EAC

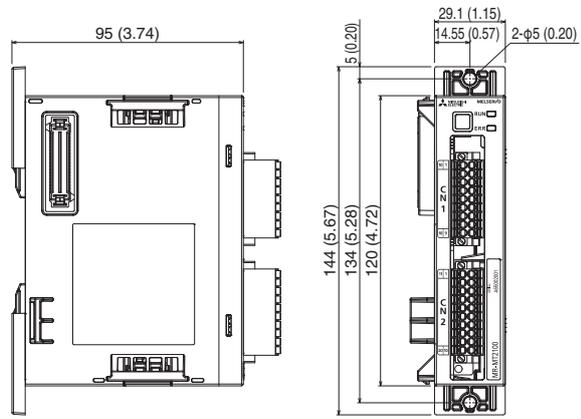
■ Exterior Dimensions

SSCNET III/H Head module MR-MT2010



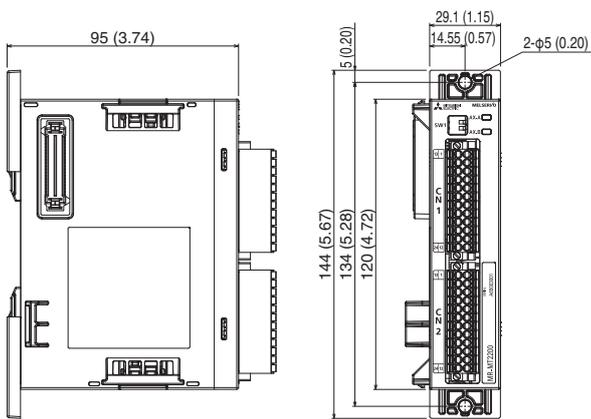
[Unit: mm (inch)]

I/O module MR-MT2100



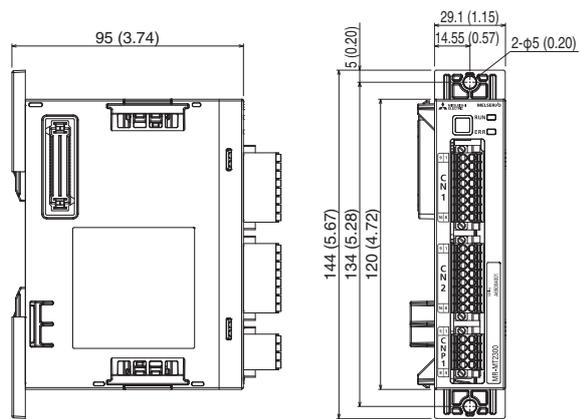
[Unit: mm (inch)]

Pulse I/O module MR-MT2200



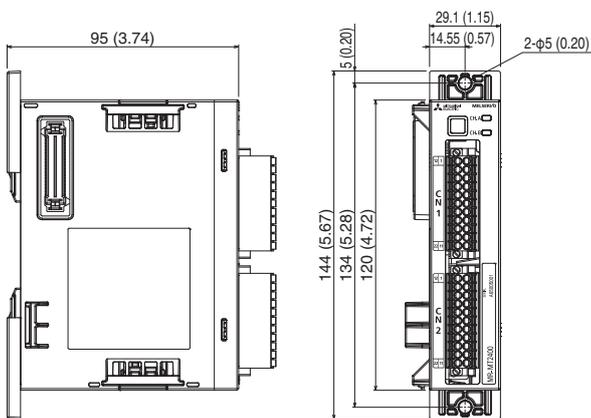
[Unit: mm (inch)]

Analog I/O module MR-MT2300



[Unit: mm (inch)]

Encoder I/F module MR-MT2400



[Unit: mm (inch)]

Outline

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Fully supporting all your needs from model selection, system design, startup to maintenance with diverse software

**Motion Controller Engineering Software**  
**MELSOFT MT Works2**

**Comprehensively supporting Motion controller design and maintenance**

With features including Motion SFC programming, parameter settings, and the digital oscilloscope function, this software supports the engineering process -from system configuration and programming through debugging and maintenance of the Motion controller.

**Programmable Controller Engineering Software**  
**MELSOFT GX Works3**

**All-in-one tool for quick and easy startup**

This software supports the engineering process - from creation of a sequence program, parameter settings of the Simple Motion module, and creation of a positioning data table and cam data through startup, debugging, and maintenance.

Motion Controller Engineering Software  
Programmable Controller Engineering Software

**MELSOFT MT Works2**  
**MELSOFT GX Works3**



**System Design**

**System configuration**



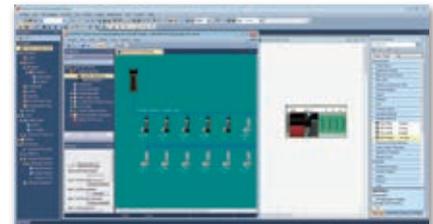
Servo amplifiers and modules are set easily with the graphical system setting screen.



**Module configuration**



Each parameter is set from the module configuration screen.

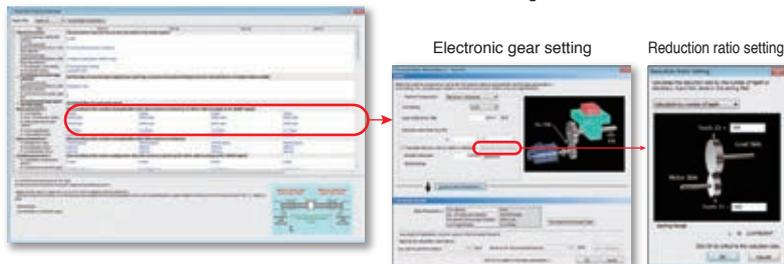


**Servo data setting**



One-point help allows you to set parameters without manuals.

Entering just the machine specifications (reduction ratio, ball screw pitch, etc.) sets the electric gear.



**CC-Link IE Field configuration**



Parameters for CC-Link IE Field Network are easy to be set.





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**Programming**

**Positioning data setting**

MT Works2  
GX Works3

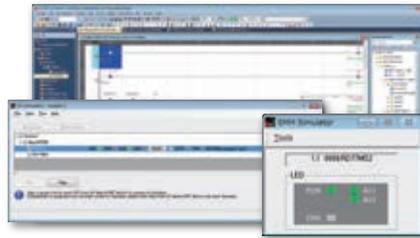
Functions, such as Data setting assistant and Automatic calculation of auxiliary arc, simplify the setting input process of positioning data.



**Simulation**

MT Works2  
GX Works3

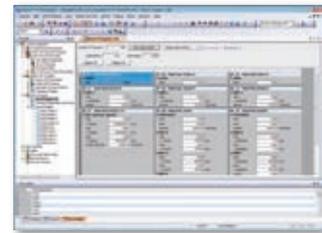
Simulation can be executed without an actual machine during the debugging process.



**Programming**

MT Works2

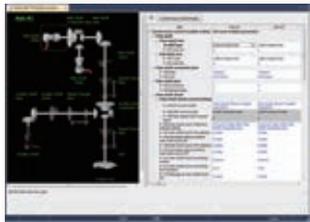
User-friendly functions make Motion controller program development easier.



**Synchronous control parameter**

MT Works2  
GX Works3

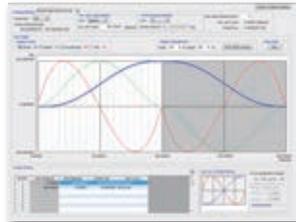
The synchronous control parameter is easily set using software instead of controlling mechanically with physical gears, shafts, speed change gears or cams.



**Cam data creation**

MT Works2  
GX Works3

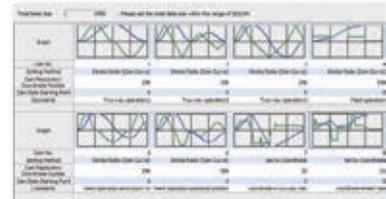
Various cam patterns are created more freely and flexibly.



**Cam data list**

MT Works2  
GX Works3

The created cam data are easily viewed as thumbnails.

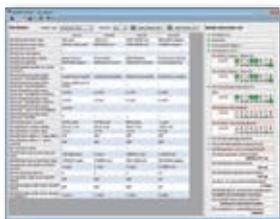


**Startup and Adjustment**

**Monitor**

MT Works2  
GX Works3

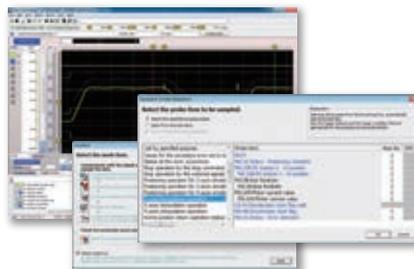
The required items and axes are selected from various monitoring information.



**Digital oscilloscope**

MT Works2  
GX Works3

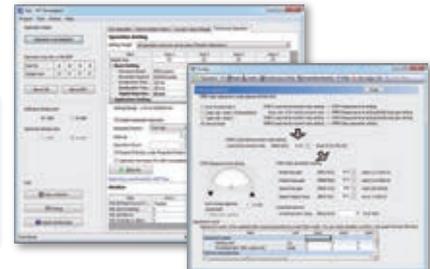
Data collection and waveform display which are synchronized with the Motion operation cycle greatly help you check operation and perform troubleshooting.



**Multi-axis adjustment**

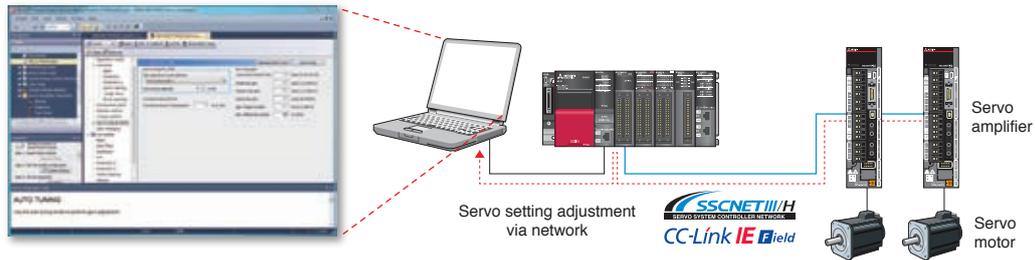
MT Works2  
GX Works3

The multi-axis adjustment function enables easy servo adjustment and quick startup for machines executing multi-axis simultaneous operation, such as a tandem configuration.



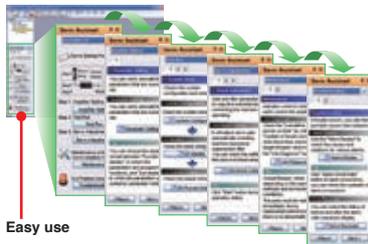
## Startup and Adjustment of Servo Amplifier

MT Works2 GX Works3



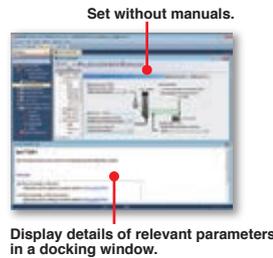
### ■ Servo assistant function

Complete setting up the servo amplifier just by following guidance displays.



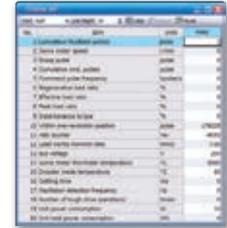
### ■ Parameter setting function

Display parameter setting in list or visual formats, and set parameters by selecting from the drop down list.



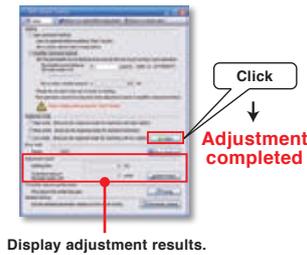
### ■ Monitor function

Monitor the operation information on the [Display all] window. No measurement equipment is necessary to monitor power consumption since the power consumption is monitored and displayed on the window.



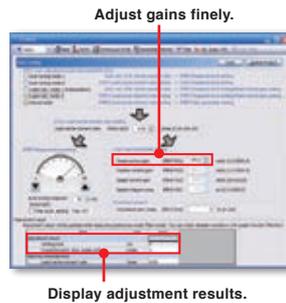
### ■ One-touch tuning function

With the ease of clicking the start button, adjustments including estimating load to motor inertia ratio, adjusting gain, and suppressing machine resonance are automatically performed for the maximum servo performance.



### ■ Tuning function

Adjust control gain finely on the [Tuning] window manually for further performance after the one-touch tuning.



### ■ Alarm display

In MR-J4 series, servo alarms are displayed in three digits. Troubleshooting at alarm occurrence is easy.



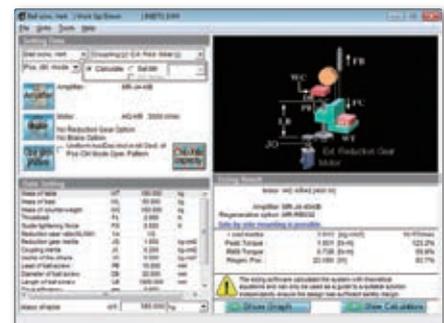
Select the most suitable motor for your machine

### Capacity selection software MRZJW3-MOTSZ111E

Select the most suitable servo motor, servo amplifier, and regenerative option for your machine, just by setting machine specifications and operation pattern.

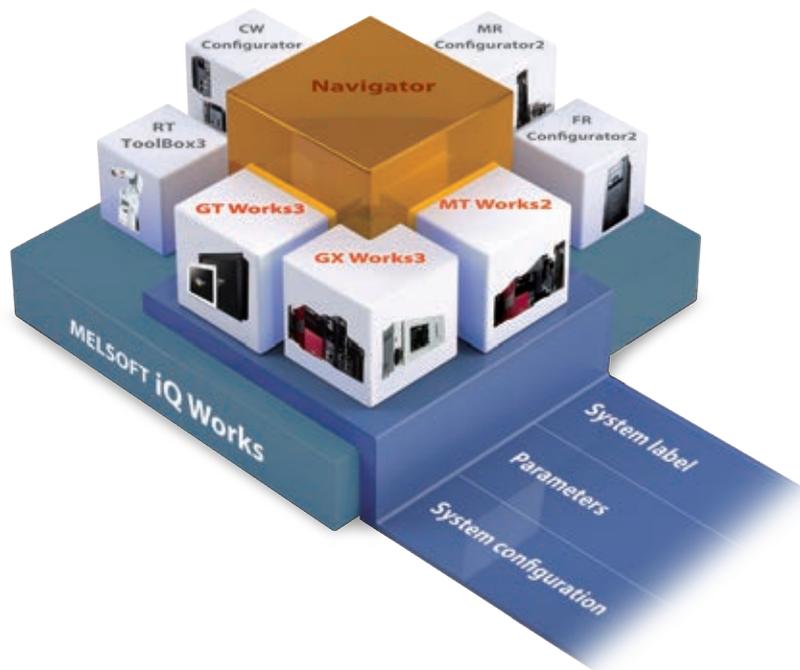
Select the operation pattern from either position control mode or speed control mode. The capacity selection software is available for free download.

Contact your local sales office for more details.



## FA Integrated Engineering Software MELSOFT iQ Works

MELSOFT iQ Works is an integrated software suite consisting of GX Works3, MT Works2, GT Works3, RT ToolBox3, FR Configurator2, MR Configurator2 and CW Configurator, which are programming software for each respective product. Integration is further enhanced with MELSOFT Navigator as the central system configuration incorporating an easy-to-use, graphical user interface with additional project-sharing features such as system labels and parameters. The advantages of this powerful integrated software suite are that system design is made much easier with a substantial reduction in repetitious tasks, cutting down on errors while helping to reduce the overall TCO.



### System management software MELSOFT Navigator

System level graphic-based configuration tool that simplifies the system design by providing a visual representation of the system. System management features such as system-wide parameterization, labels and block reading of project data are also included.

### Programmable controller engineering software MELSOFT GX Works3

GX Works3 is the latest generation of programming and maintenance software offered by Mitsubishi Electric specifically designed for the MELSEC iQ-R series control system. It includes many new features such as graphic-based system configuration, integrated motion control setup, multiple language support, providing an intuitive engineering environment solution.

### HMI/GOT screen design software MELSOFT GT Works3

This graphic operation terminal (GOT) screen creation software is designed with three main features—simplicity, graphics design and operation ease—that help to create graphic screens in fewer steps.

### Motion controller engineering software MELSOFT MT Works2

This motion control design and maintenance software includes intuitive graphic-based programming together with a digital oscilloscope simulator.

### Servo setup software MELSOFT MR Configurator2

Tuning, monitor display, diagnosis, reading/writing parameters, and test operations are easily performed on a personal computer. This powerful software tool supports a stable machine system and optimum control, and moreover, shortens setup time.

#### ■ Robot engineering software MELSOFT RT ToolBox3

#### ■ Inverter setup software MELSOFT FR Configurator2

#### ■ C Controller setting and monitoring tool MELSOFT CW Configurator

## ■ Operating environment

### MELSOFT MT Works2

Item	Description
OS	Microsoft® Windows® 10 (Home, Pro, Enterprise, Education, IoT Enterprise 2016 LTSP <sup>(Note-1)</sup> ) (64bit/32bit) <span style="float: right;">(Note-1): 32-bit is not supported.</span> Microsoft® Windows® 8.1 (64bit/32bit), Microsoft® Windows® 8.1 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 8 (64bit/32bit), Microsoft® Windows® 8 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 7 (Enterprise, Ultimate, Professional, Home Premium, Starter) (64bit/32bit) Microsoft® Windows Vista® (Enterprise, Ultimate, Business, Home Premium, Home Basic) (32bit) Microsoft® Windows® XP (Professional SP3, Home Edition SP3) (32bit)
CPU	Desktop: Intel® Celeron® Processor 2.8 GHz or more recommended Laptop: Intel® Pentium® M Processor 1.7 GHz or more recommended
Required memory	For 64-bit edition: 2GB or more recommended For 32-bit edition: 1GB or more recommended
Available hard disk capacity	When installing MT Developer2: HDD available capacity is 13GB or more. When operating MT Developer2: Virtual memory available capacity is 512MB or more.
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 x 768 dots or higher

(Note): Refer to Installation Instructions for precautions and restrictions regarding the operating environment.

### MELSOFT GX Works3

Item	Description
OS	Microsoft® Windows® 10 (Home, Pro, Enterprise, Education, IoT Enterprise 2016 LTSP <sup>(Note-1)</sup> ) (64bit/32bit) <span style="float: right;">(Note-1): 32-bit is not supported.</span> Microsoft® Windows® 8.1 (64bit/32bit), Microsoft® Windows® 8.1 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 8 (64bit/32bit), Microsoft® Windows® 8 (Enterprise, Pro) (64bit/32bit) Microsoft® Windows® 7 (Enterprise, Ultimate, Professional, Home Premium, Home Basic) (64bit/32bit) Microsoft® Windows Vista® (Enterprise, Ultimate, Business, Home Premium, Home Basic) (32bit) Microsoft® Windows® XP (Professional SP3, Home Edition SP3) (32bit)
CPU	Intel® Core™2 Duo Processor 2 GHz or more recommended
Required memory	For 64-bit edition: 2GB or more recommended For 32-bit edition: 1GB or more recommended
Available hard disk capacity	For installation: 17GB or more free hard disk capacity For operation: 512MB or more free virtual memory capacity
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 x 768 dots or higher

(Note): Refer to Installation Instructions for precautions and restrictions regarding the operating environment.

## ■ Engineering software list

Product	Model	Description	
MELSOFT GX Works3	SW1DND-GXW3-E	Sequence program creation, Simple Motion module parameter settings	DVD-ROM
MELSOFT MT Works2	SW1DND-MTW2-E	Parameter settings and program creation for Motion controllers	DVD-ROM
MELSOFT iQ Works	SW2DND-IQWK-E	FA Engineering Software <sup>(Note-1)</sup> • System Management Software [MELSOFT Navigator] • Programmable Controller Engineering Software [MELSOFT GX Works3] • Motion Controller Engineering Software [MELSOFT MT Works2] • Screen Design Software [MELSOFT GT Works3] • Robot Total Engineering Support Software [MELSOFT RT ToolBox2 mini] • Inverter Setup Software [MELSOFT FR Configurator2]	DVD-ROM

(Note-1): Refer to each product manual for software needed for the model.



# CC-Link IE

## All-in-One Network



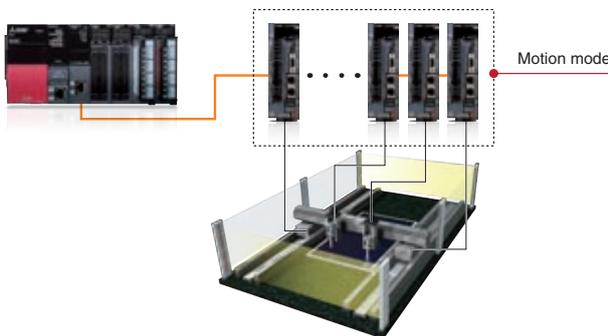
CC-Link IE Field Network is a single network which combines the versatility of Ethernet and highly accurate synchronous operation for Motion control. With the single network, various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules, are connected flexibly.

## All-in-One Engineering Software



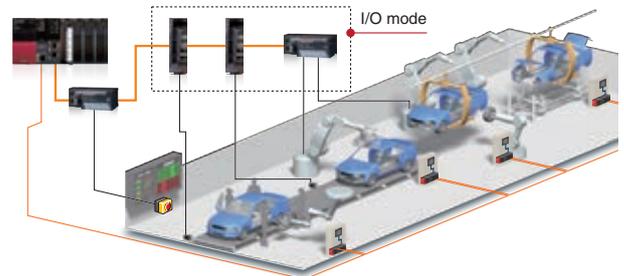
Various tasks, such as Simple Motion parameter settings, servo adjustment, and debugging as well as creating a sequence program, such as a function block (FB), are performed only with this all-in-one engineering software.

## Synchronous control up to $\mu$ sec precision with Motion mode



Motion mode enables advanced motion control functions, such as positioning for multi-axis interpolation, synchronous control, and speed-torque control in combination with the Simple Motion module.

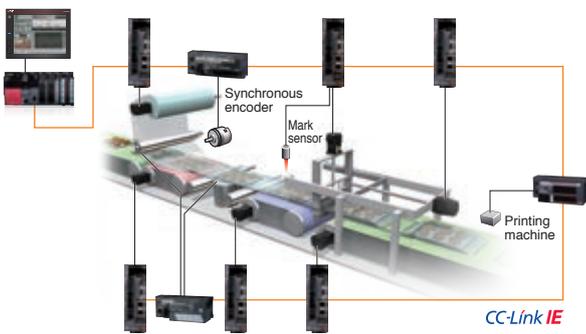
## Positioning control with I/O mode



I/O mode easily drives a belt conveyor, a rotary table, a ball screw mechanism, etc. by using the built-in positioning function in a servo amplifier.

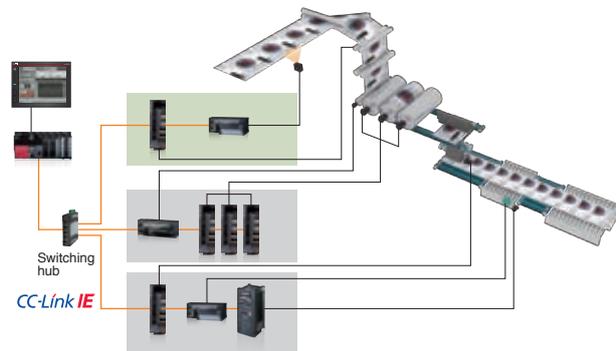
Seamless integration of Mitsubishi Electric Servo System into CC-Link IE Field brings vast possibilities to the world of Industrial Automation.

Synchronization of inputs and outputs with servo control



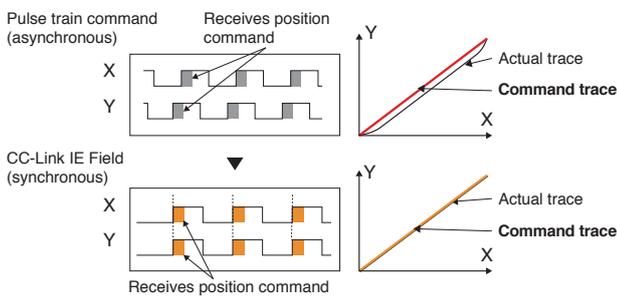
Various data, such as synchronous encoder values, sheet tension values, and text data, are inputted and outputted in accordance with the servo command communication cycle, enabling a wide range of Motion control applications.

Flexible network topology



With a switching hub, multiple network topologies are supported including star, line, ring, star and line combinations. This flexibility allows additional equipment to be simply connected to any available port, with little concern for restrictions.

Superior performance by synchronous communication



The CC-Link IE Field Network is equipped with Motion function in the cyclic communication bandwidth. Synchronous communication with the servo amplifiers becomes possible, offering high-speed and high-accuracy positioning, synchronous control, and cam control.

Outline

Simple Motion

Motion Controllers

Sensing Modules

Engineering Environment

Networks

Servo Amplifiers

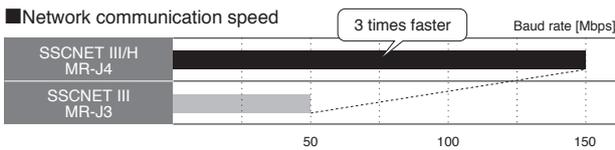


The blazingly fast speed

## High-response System Achieved with SSCNET III/H

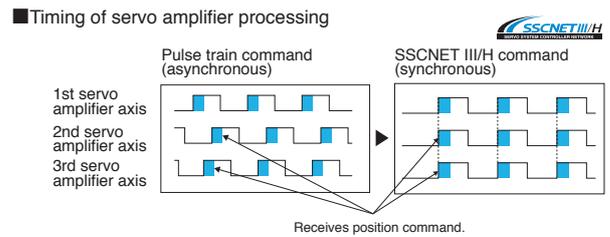
### Three Times Faster Communication Speed Industry-leading levels

Communication speed is increased to 150 Mbps full duplex (equivalent to 300 Mbps half duplex), three times faster than the conventional speed. System response is dramatically improved.



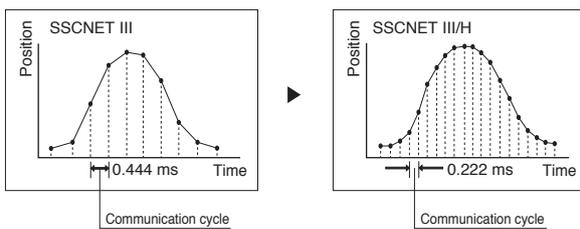
### Synchronous Communication

Synchronous communication is achieved with SSCNET III/H, offering technical advantages for machines in printing and food processing industry that require deterministic control.



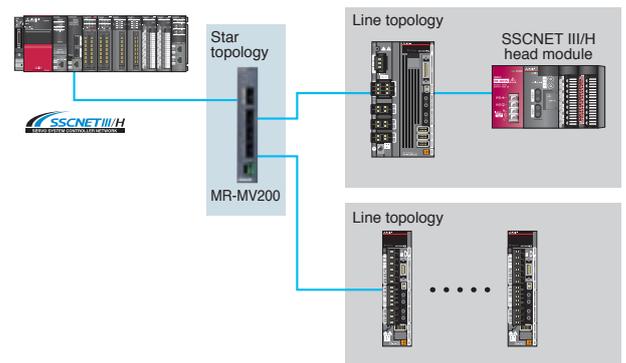
### Cycle Time as Fast as 0.222 ms Industry-leading levels

Smooth control of a machine is possible using high-speed serial communication with a cycle time of 0.222 ms.



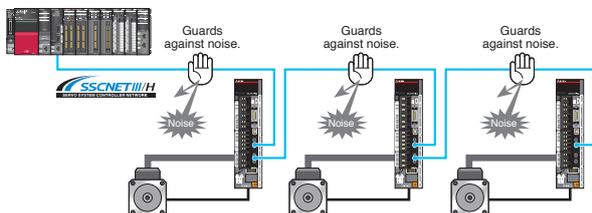
### Network Topology

Star and line topologies are available with MR-MV200 optical hub unit through SSCNET III/H for a network configuration. Maintenance can be executed without stopping the whole system, and thus the machine availability will be increased.



### Improved noise tolerance by optical communication

The fiber-optic cables thoroughly shut out noise that enters from the power cable or external devices. Noise tolerance is dramatically improved as compared to metal cables.



and response of 150 Mbps full-duplex baud rate SSCNET III/H optical networking

Outline

Simple Motion

Motion Controllers

Sensing Modules

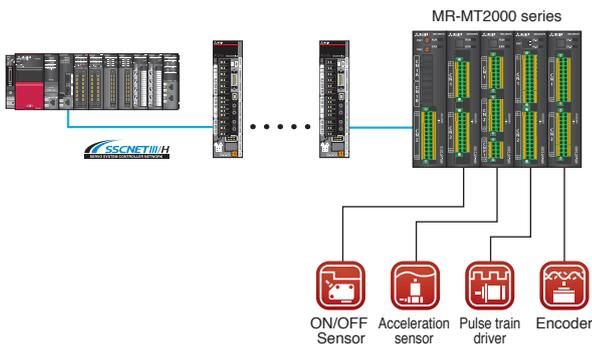
Engineering Environment

Networks

Servo Amplifiers

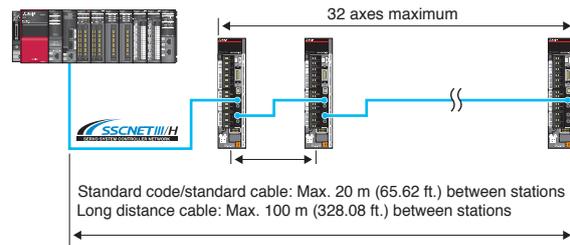
**I/O Signals Synchronized with Motion Control**

MR-MT2000 series sensing modules including the I/O module, analog I/O module, pulse I/O module, and encoder I/F module are connected to SSCNET III/H. These various modules enable a faster, more accurate machine operation by synchronizing the I/Os of a general-purpose pulse train driver, sensor, and SSI encoder with the motion control.



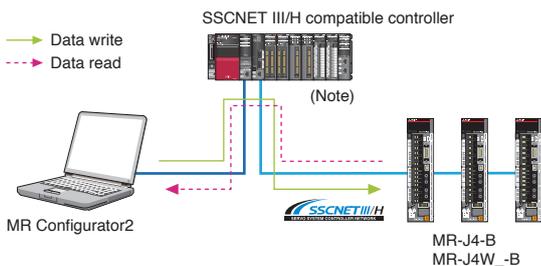
**Long Distance Wiring up to 3200 m (10498.69 ft.)**

Long distance wiring is possible up to 3200 m (10498.69 ft.) per system (maximum of 100 m (328.08 ft.) between stations x 32 axes), suitable for large-scale systems.



**Central Control with Network**

Large amounts of servo data are exchanged in real-time between the controller and the servo amplifier. Using MR Configurator2 on a personal computer that is connected to the Motion controller or the Simple Motion module helps consolidate information, such as parameter settings and monitoring for the multiple servo amplifiers.

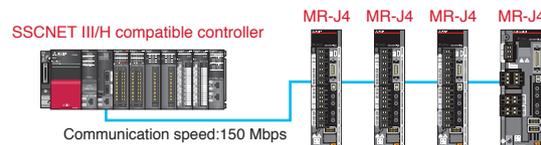


(Note): Reconnecting cables is not required.

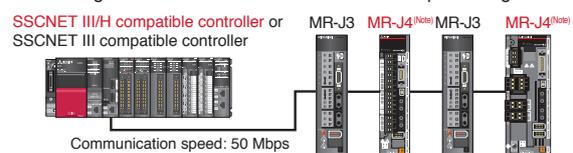
**SSCNET III/H Compatible and SSCNET III Compatible Products Connected in a Same System**

SSCNET III/H compatible and SSCNET III compatible servo amplifiers can be used together.

■ When using MR-J4 series servo amplifiers



■ When using MR-J4 series + MR-J3 series servo amplifiers together



(Note): The function and the performance become equivalent to those of MR-J3 when the SSCNET III compatible products are used together in the same system.

Servos in harmony with man, machine and the environment

MITSUBISHI SERVO AMPLIFIERS & MOTORS

# MELSERVO J4



### Servo Amplifier

Compatible with the CC-Link IE Field Network and the SSCNET III/H, these servo amplifiers operate rotary/linear servo motors or direct drive motors as standard <sup>(Note)</sup>.

Multi-axis servo amplifiers are also available, achieving energy conservation, space-saving, and reduced wiring.

(Note): MR-J4-B-RJ010 servo amplifiers are compatible only with rotary servo motors.



SSCNET III/H compatible servo amplifier  
**MR-J4-B**  
MR-J4-B-RJ



SSCNET III/H compatible 2-axis servo amplifier  
**MR-J4W2-B**



SSCNET III/H compatible 3-axis servo amplifier  
**MR-J4W3-B**



CC-Link IE Field Network compatible servo amplifier  
**MR-J4-GF**  
MR-J4-GF-RJ

### Servo Motor

A variety of models are available to match various applications. These include rotary servo motors for high-torque output during high speed, linear servo motors for highly accurate tandem synchronous control, and direct drive motors for compact and rigid machine, and high-torque operations.

#### Rotary servo motor



Small capacity, low inertia  
**HG-KR** series  
Capacity: 50 to 750 W



Small capacity, ultra-low inertia  
**HG-MR** series  
Capacity: 50 to 750 W



Medium capacity, medium inertia  
**HG-SR** series  
Capacity: 0.5 to 7 kW



Medium/large capacity, low inertia  
**HG-JR** series  
Capacity: 0.5 to 55 kW



Medium capacity, ultra-low inertia  
**HG-RR** series  
Capacity: 1 to 5 kW



Ultra-compact size, ultra-small capacity  
**HG-AK** series  
Capacity: 10 to 30 W



Medium capacity, flat type  
**HG-UR** series  
Capacity: 0.75 to 5 kW



Ultra-large capacity **NEW**  
**HG-JR** series  
Capacity: 110 to 220 kW



Large capacity, ultra-low inertia **Available in the future**  
**HG-RR** series  
Capacity: 11 to 22 kW

#### Linear servo motor



Core type  
**LM-H3** series  
Rating: 70 to 960 N



Core type (natural/liquid cooling)  
**LM-F** series  
Rating: 300 to 3000 N (natural cooling)  
Rating: 600 to 6000 N (liquid cooling)



Core type with magnetic attraction counter-force  
**LM-K2** series  
Rating: 120 to 2400 N



Coreless type  
**LM-U2** series  
Rating: 50 to 800 N

#### Direct drive motor

**NEW**



Low-profile flange type  
**TM-RG2M** series  
Low-profile table type  
**TM-RU2M** series  
Rating: 2.2 to 9 N·m



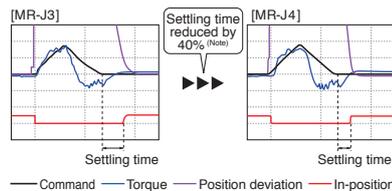
**TM-RFM** series  
Rating: 2 to 240 N·m

# Machine

## Industry-Leading Level of Servo Amplifier Basic Performance Industry-leading levels

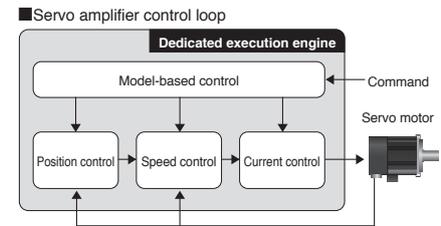
Speed frequency response of 2.5 kHz is achieved by applying our original high-speed servo control architecture evolved from the conventional two-degrees-of-freedom model adaptive control to the dedicated execution engine. Together with a high-resolution absolute position encoder of 4,194,304 pulses/rev, fast and accurate operation is enabled. The performance of the high-end machines is utilized to the fullest.

[Settling time comparison with the prior model]



(Note): The result is based on our evaluation condition.

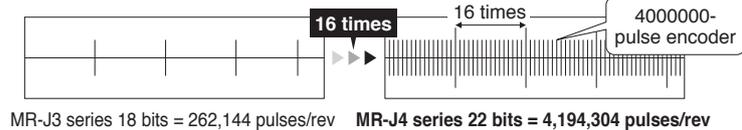
[Dedicated execution engine]



## Improving Machine Performance with High-Performance Servo Motors Industry-leading levels

With improved processing speed, the rotary servo motors equipped with a high-resolution encoder enables high-accuracy positioning and smooth rotation.

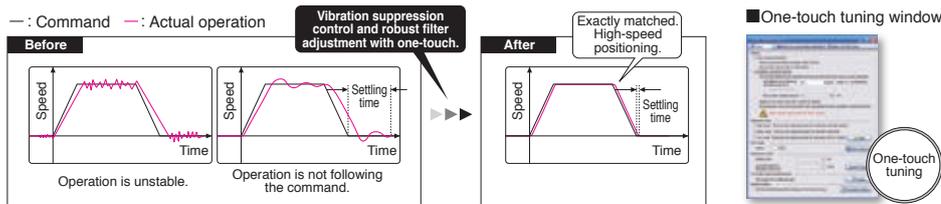
[Resolution comparison with the prior model]



## One-Touch Tuning Function Enhanced functions

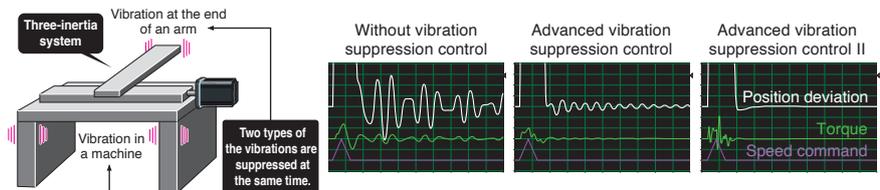
Just turn on the one-touch tuning function to complete servo gain adjustment automatically, including machine resonance suppression filter, advanced vibration suppression control II (Note-1), and robust filter for maximizing your machine performance. This function also sets responsivity automatically, while the real-time auto tuning requires manual setting. Moreover, a new method (Note-2) allows to create an optimum tuning command inside the servo amplifier.

(Note-1): The advanced vibration suppression control II automatically adjusts one frequency.  
 (Note-2): This new method is supported by MR-J4-B/MR-J4W\_-B.



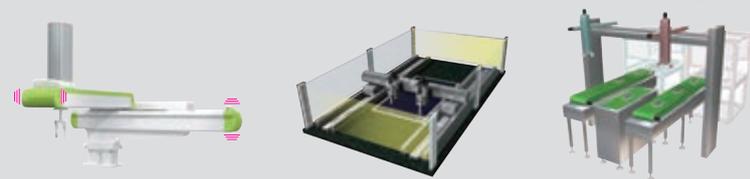
## Advanced Vibration Suppression Control II Patented Enhanced functions

The advanced vibration suppression control II suppresses two types of low-frequency vibrations, owing to vibration suppression algorithm which supports three-inertia system. This function is effective in suppressing residual vibration with relatively low frequency of approximately 100 Hz or less generated at the end of an arm and in a machine, enabling a shorter settling time.



### Application examples

- [Pick and place robots]
- [Automatic assembly equipment]
- [Material handling systems]



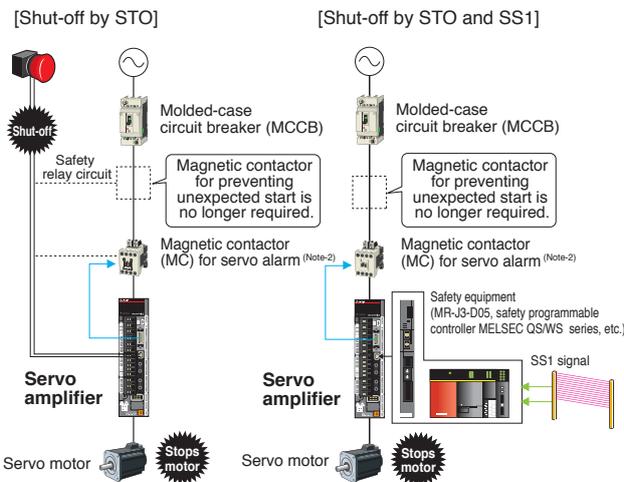
Outline  
Simple Motion  
Motion Controllers  
Sensing Modules  
Engineering Environment  
Networks  
Servo Amplifiers

## Man

### Functions Compliant with IEC/EN 61800-5-2

STO (Safe torque off) and SS1 <sup>(Note-1)</sup> (Safe stop 1) are integrated as standard, enabling the safety system to be configured easily in a machine.

- By using STO, it is not necessary to turn off the control power of the servo amplifier, resulting in a shorter restart time and eliminating the necessity of home position return.
- A magnetic contactor for preventing unexpected motor start is not needed. <sup>(Note-2)</sup>
- The safety level of STO is increased to SIL 3 from SIL 2. <sup>(Note-3)</sup>

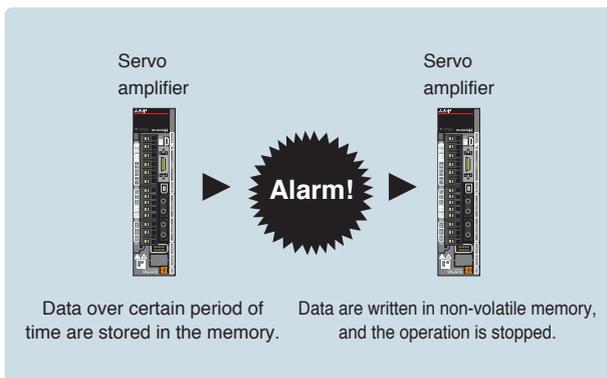


- (Note-1): Safety equipment (MR-J3-D05, safety programmable controller MELSEC QS/WS series, etc.) is required.
- (Note-2): For MR-J4 series servo amplifier, magnetic contactors are not required to meet the STO requirements. However, this illustration has a magnetic contactor installed to prevent servo alarms and electric shock.
- (Note-3): For Category 3 PL e, SIL 3, use compatible safety equipment and set the parameters. When MR-J3-D05 is used, safety level is Category 3 PL d, SIL 2.

### Large Capacity Drive Recorder

Patented Enhanced functions

- Servo data such as motor current and position command before and after the alarm occurrence are stored in non-volatile memory of the servo amplifier. Reading the servo data on MR Configurator2 helps you analyze the cause of the alarm.
- Check the waveform ((analog 16 bits × 7 channels + digital 8 channels) × 256 points) of the past 16-time alarms in the alarm history.

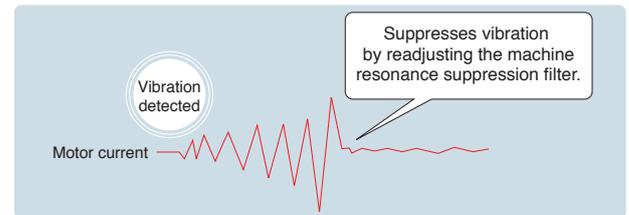


### Tough Drive Function

Enhanced functions

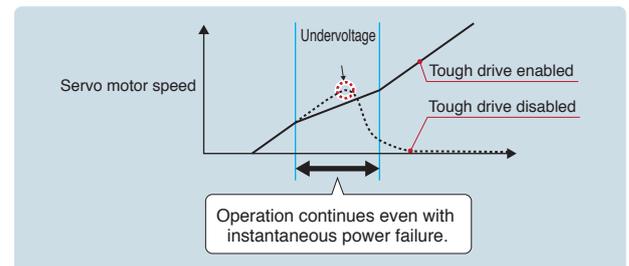
#### Vibration tough drive

Machine resonance suppression filter is automatically readjusted when a change in machine resonance frequency is detected by the servo amplifier, reducing unplanned machine downtime caused by age-related degradation.



#### Instantaneous power failure tough drive

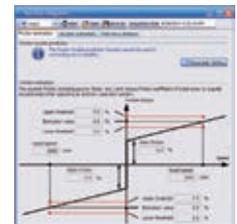
When an instantaneous power failure is detected, this function allows the servo amplifier to use the electric energy charged in the main circuit capacitor in the servo amplifier to avoid an alarm occurrence, increasing the machine availability even with an unstable power supply.



### Machine Diagnosis Function

Patented

This function detects changes in mechanical parts (ball screw, guide, bearing, belt, etc.) by analyzing changes in machine friction, load moment of inertia, unbalanced torque, and vibration components from the data inside a servo amplifier, supporting timely maintenance of these parts.



Machine diagnosis window

Servo setup software

### MELSOFT MR Configurator2

Tuning, monitor display, diagnosis, reading/writing parameters, and test operations are easily performed on a personal computer. This powerful software tool supports a stable machine system and optimum control, and moreover, shortens setup time.



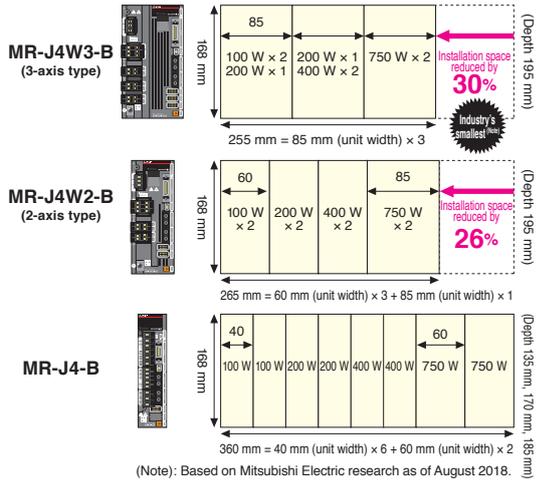
Graph window

# The Environment

## Space-Saving with Industry's Smallest<sup>(Note)</sup> 3-axis Type

2-axis servo amplifier MR-J4W2-B requires 26% less installation space than two units of MR-J4-B. 3-axis servo amplifier MR-J4W3-B requires 30% less installation space than three units of MR-J4-B.

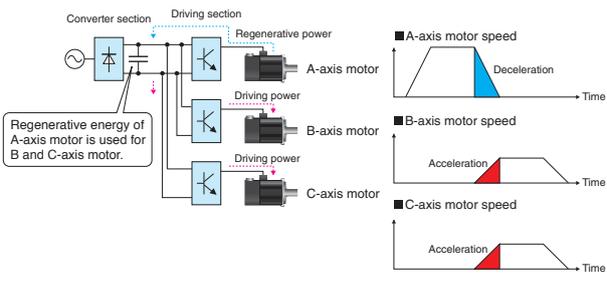
[Example of installation space for two units of each 100 W, 200 W, 400 W, and 750 W]



## Energy-Conservation with Common DC Bus Connection

When multiple servo amplifiers and drive units are connected to the MR-CV power regeneration converter unit by a common DC bus connection, the regenerative energy of one axis is used for driving other axes, contributing to energy-conservation.

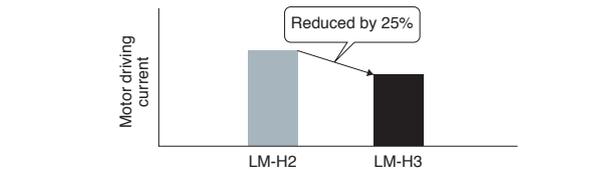
The multi-axis servo amplifier has the same effect.



## Energy-Conservation Achieved by LM-H3 Linear Servo Motor Series

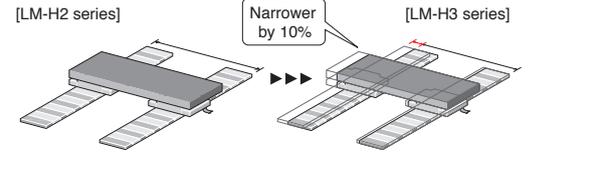
### Reduced motor driving power

LM-H3 has achieved a reduction of 25%<sup>(Note)</sup> in motor driving current due to a new magnetic design with optimized magnet form, contributing to power conservation for machines. The motor coil is lighter by approximately 12%<sup>(Note)</sup> as compared to the prior model, which also contributes to saving energy for driving the moving part.



### Space saving

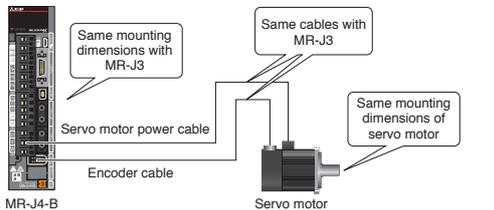
For LM-H3, widths of the motor coil and the magnet are reduced by 10% from the prior model. Increased thrust to current ratio results in using the servo amplifier in smaller capacity, contributing to more compact machine (the reduction of materials).



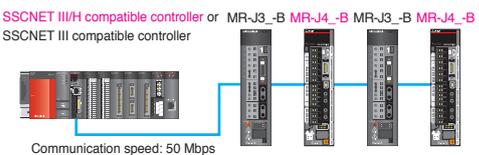
# Heritage

- MR-J4-B has the same mounting dimensions<sup>(Note-1)</sup> with MR-J3-B. HG rotary servo motor series has the same mounting dimensions<sup>(Note-2)</sup> and uses the same option cables for the power, the encoder<sup>(Note-3)</sup>, and the electromagnetic brake as HF series or HC-RP/HC-UP series.

(Note-1): Mounting dimensions are smaller for servo amplifiers rated 200 V 5 kW, 400 V 3.5 kW, 200 V/400 V 11 kW, and 200 V/400 V 15 kW.  
 (Note-2): For replacing HA-LP series to HG-JR series, contact your local sales office.  
 (Note-3): HG-JR series of 11 kW to 55 kW uses a different encoder cable from HF-JP series.



- SSCNET III/H compatible and SSCNET III compatible servo amplifiers can be used together.



(Note): The function and the performance become equivalent to those of MR-J3 when the SSCNET III compatible products are used together in the same system.

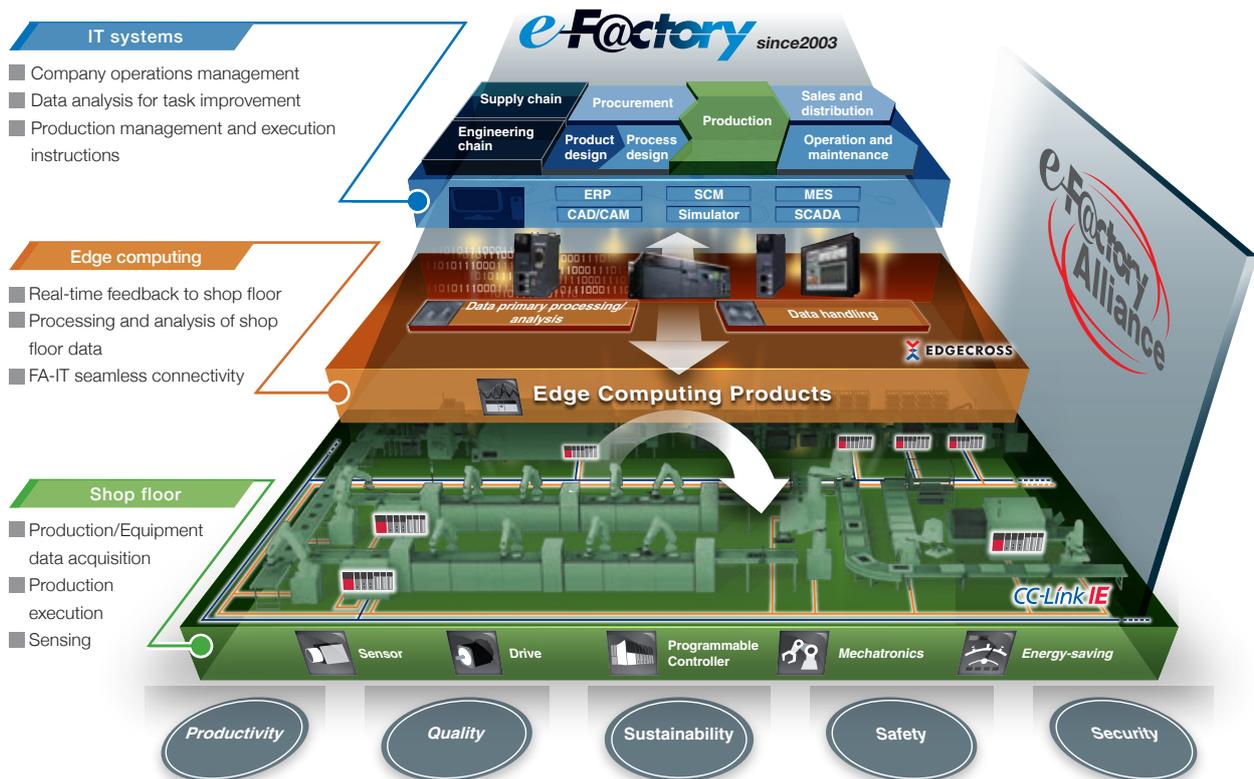
- Parameters are automatically converted by changing MR-J3-B to MR-J4-B with MELSOFT MT Works2<sup>(Note-1)</sup>.
- (Note-1): Update your MT Works2 to the latest version.

- Outline
- Simple Motion
- Motion Controllers
- Sensing Modules
- Engineering Environment
- Networks
- Servo Amplifiers

# e-F@ctory creates “Smart Factories” through IoT-based Big Data utilization

e-F@ctory optimizes manufacturing overall by connecting all devices and equipment involved in development, manufacturing, logistics, etc., and then analyzing and utilizing the vast amount of data collected.

By taking full advantage of Mitsubishi Electric’s technological capability that achieved development of FA devices, along with our connectivity technology which makes it possible to connect FA with IT, we will create next-generation manufacturing encompassing elements such as mass customization, preventive maintenance and traceability.



## Powerful Alliances with Over 450 Partner Companies\*

### e-F@ctory Alliance

In order to propose optimal solutions to our customers, e-F@ctory works in collaboration with many partner manufacturers. Through powerful alliances between Mitsubishi Electric, who boasts a broad-ranging product appeal in the FA domain, and partners that participate in the FA partnership program (e-F@ctory Alliance) promoted by Mitsubishi Electric, we will achieve new business creation and new monozukuri never before imaginable.

\*As of October 2017



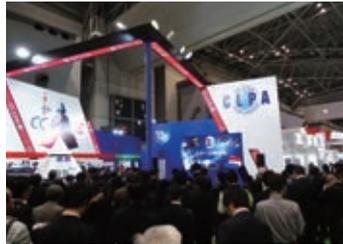
# CC-Link Partner Association (CLPA) - Actively promoting worldwide adoption of CC-Link networks

## Proactively supporting CC-Link, from promotion to specification development

The CC-Link Partner Association (CLPA) was established to promote the worldwide adoption of the CC-Link open-field network. By conducting promotional activities such as organizing trade shows and seminars, conducting conformance tests, and providing catalogs, brochures and website information, CLPA activities are successfully increasing the number of CC-Link partner manufacturers and CC-Link-compatible products. As such, CLPA is playing a major role in the globalization of CC-Link.



Seminar



Trade show



Conformance testing lab

Visit the [CLPA website](http://www.cc-link.org) for the latest CC-Link information.

URL: [www.cc-link.org](http://www.cc-link.org)

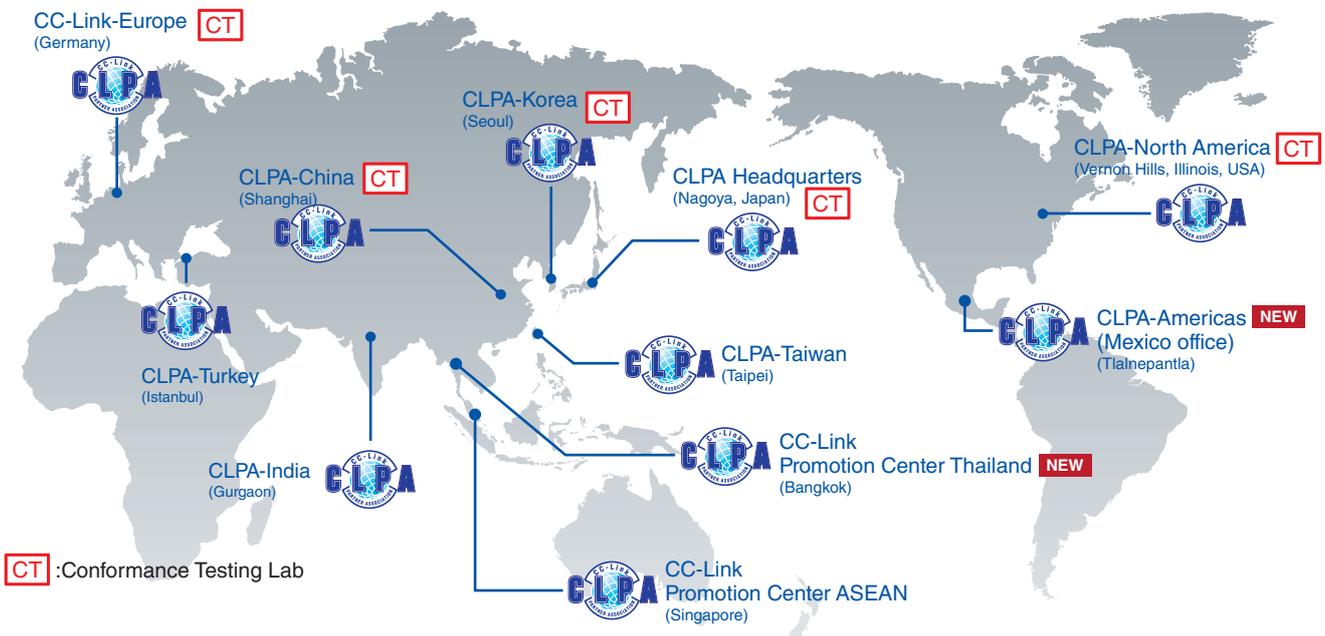


6F Ozone Front Bldg. 3-15-58 Ozone  
 Kita-ku, Nagoya 462-0825, JAPAN  
 TEL: +81-52-919-1588 FAX: +81-52-916-8655  
 E-mail: [info@cc-link.org](mailto:info@cc-link.org)



## Global influence of CC-Link continues to spread

CC-Link is supported globally by CLPA. With offices throughout the world, support for partner companies can be found locally. Each regional CLPA office undertakes various support and promotional activities to further the influence of CC-Link/CC-Link IE in that part of the world. For companies looking to increase their presence in their local area, CLPA is well placed to assist these efforts through offices in all major regions.



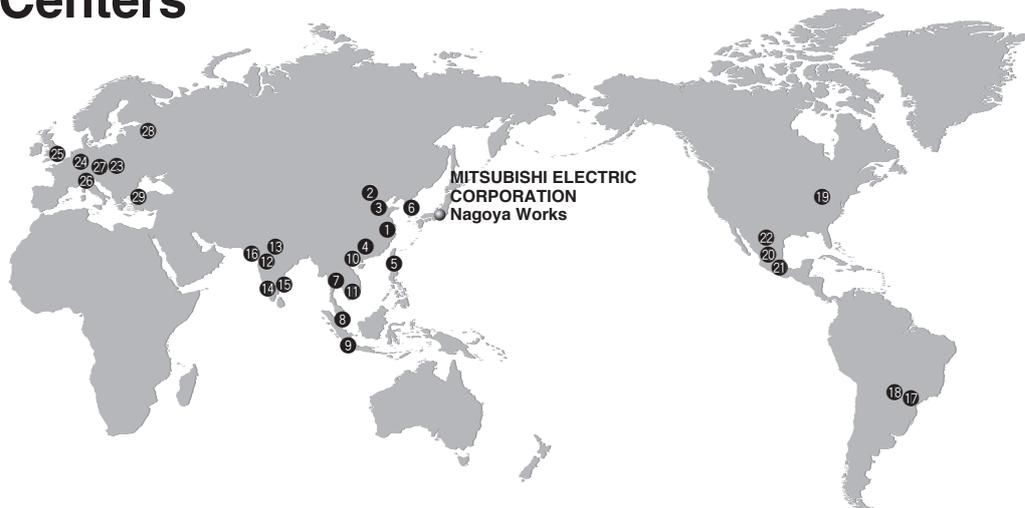
# The Mitsubishi Electric Servo System Partner Association, promoting Mitsubishi Electric Servo System globally

The Mitsubishi Electric Servo System consists of controllers with our cutting-edge iQ platform technology, servo drivers, actuators, sensors, etc., taking one step further to accelerate machine innovation by collaborating with our partner companies. Now that a wide variety of partner products are available such as stepping motors, direct drive motors, vision system, and software, you can configure your system more flexibly than ever before.

The Mitsubishi Electric Servo System Partner Association is a subcommittee of e-F@ctory Alliance.



# Global FA Centers



## China

### ① Shanghai FA Center

**Mitsubishi Electric Automation (China) Ltd.**  
**Shanghai FA Center**

Mitsubishi Electric Automation Center, No.1386  
Hongqiao Road, Shanghai, China  
Tel: +86-21-2322-3030

### ② Beijing FA Center

**Mitsubishi Electric Automation (China) Ltd.**  
**Beijing FA Center**

5/F, ONE INDIGO, 20 Jiuxianqiao Road  
Chaoyang District, Beijing, China  
Tel: +86-10-6518-8830

### ③ Tianjin FA Center

**Mitsubishi Electric Automation (China) Ltd.**  
**Tianjin FA Center**

Room 2003 City Tower, No.35, Youyi Road, Hexi District,  
Tianjin, China  
Tel: +86-22-2813-1015

### ④ Guangzhou FA Center

**Mitsubishi Electric Automation (China) Ltd.**  
**Guangzhou FA Center**

Room 1609, North Tower, The Hub Center, No.1068,  
Xingang East Road, Haizhu District, Guangzhou, China  
Tel: +86-20-8923-6730

## Taiwan

### ⑤ Taipei FA Center

**SETSUYO ENTERPRISE CO., LTD.**

3F, No.105, Wugong 3rd Road, Wugu District,  
New Taipei City 24889, Taiwan  
Tel: +886-2-2299-9917

## Korea

### ⑥ Korea FA Center

**Mitsubishi Electric Automation Korea Co., Ltd.**

8F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro,  
Gangseo-Gu, Seoul 07528, Korea  
Tel: +82-2-3660-9630

## Thailand

### ⑦ Thailand FA Center

**Mitsubishi Electric Factory Automation**  
**(Thailand) Co., Ltd.**

12th Floor, SV.City Building, Office Tower 1, No. 896/19  
and 20 Rama 3 Road, Kwaeng Bangpongpan, Knet  
Yannawa, Bangkok 10120, Thailand  
Tel: +66-2682-6522 to 31

## ASEAN

### ⑧ ASEAN FA Center

**Mitsubishi Electric Asia Pte. Ltd.**

307 Alexandra Road, Mitsubishi Electric Building,  
Singapore 159943  
Tel: +65-6470-2480

## Indonesia

### ⑨ Indonesia FA Center

**PT. Mitsubishi Electric Indonesia**  
**Cikarang Office**

Jl. Kenari Raya Blok G2-07A Delta Silicon 5, Lippo  
Cikarang - Bekasi 17550, Indonesia  
Tel: +62-21-2961-7797

## Vietnam

### ⑩ Hanoi FA Center

**Mitsubishi Electric Vietnam Company Limited**  
**Hanoi Branch Office**

6th Floor, Detech Tower, 8 Ton That Thuyet Street, My  
Dinh2 Ward, Nam Tu Liem District, Hanoi, Vietnam  
Tel: +84-4-3937-8075

### ⑪ Ho Chi Minh FA Center

**Mitsubishi Electric Vietnam Company Limited**

Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton  
Street, District 1, Ho Chi Minh City, Vietnam  
Tel: +84-8-3910-5945

## India

### ⑫ India Pune FA Center

**Mitsubishi Electric India Pvt. Ltd.**  
**Pune Branch**

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411026, Maharashtra, India  
Tel: +91-20-2710-2000

### ⑬ India Gurgaon FA Center

**Mitsubishi Electric India Pvt. Ltd.**  
**Gurgaon Head Office**

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DLF Phase - III, Gurgaon - 122002, Haryana, India  
Tel: +91-124-463-0300

### ⑭ India Bangalore FA Center

**Mitsubishi Electric India Pvt. Ltd.**  
**Bangalore Branch**

Prestige Emerald, 6th Floor, Municipal No.2, Madras  
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Tel: +91-80-4020-1600

### ⑮ India Chennai FA Center

**Mitsubishi Electric India Pvt. Ltd.**  
**Chennai Branch**

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Srinivasa Nagar, Chetpet, Chennai - 600031, Tamil  
Nadu, India  
Tel: +91-4445548772

### ⑯ India Ahmedabad FA Center

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**Ahmedabad Branch**

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Prahaldnagar, Satellite, Ahmedabad - 380015, Gujarat,  
India  
Tel: +91-7965120063

## Brazil

### ⑰ Brazil FA Center

**Mitsubishi Electric do Brasil Comercio e Servicos**  
**Ltda.**

Avenida Adelino Cardana, 293, 21 andar, Bethaville,  
Barueri SP, Brazil  
Tel: +55-11-4689-3000

### ⑱ Brazil Votorantim FA Center

**MELCO CNC do Brasil Comercio e Servicos S.A.**

Avenida Gisele Constantino, 1578, Parque Bela  
Vista-Votorantim-SP, Brazil  
Tel: +55-15-3023-9000

## Americas

### ⑲ North America FA Center

**Mitsubishi Electric Automation, Inc.**

500 Corporate Woods Parkway, Vernon Hills, IL 60061,  
U.S.A.  
Tel: +1-847-478-2100

### ⑳ Mexico City FA Center

**Mitsubishi Electric Automation, Inc.**  
**Mexico Branch**

Mariano Escobedo #69, Col.Zona Industrial,  
Tlalnepanitla Edo. Mexico, C.P.54030  
Tel: +52-55-3067-7511

### ㉑ Mexico FA Center

**Mitsubishi Electric Automation, Inc.**  
**Queretaro Office**

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Carretera Estatal 431, Km 2 200, Lote 91 Modulos  
1 y 2 Hacienda la Machorra, CP 76246, El Marques,  
Queretaro, Mexico  
Tel: +52-442-153-6014

### ㉒ Mexico Monterrey FA Center

**Mitsubishi Electric Automation, Inc.**  
**Monterrey Office**

Plaza Mirage, Av. Gonzalitos 460 Sur, Local 28,  
Col. San Jeronimo, Monterrey, Nuevo Leon, C.P. 64640,  
Mexico  
Tel: +52-55-3067-7521

## Europe

### ㉓ Europe FA Center

**Mitsubishi Electric Europe B.V. Polish Branch**

ul. Krakowska 48, 32-083 Balice, Poland  
Tel: +48-12-347-65-81

### ㉔ Germany FA Center

**Mitsubishi Electric Europe B.V. German Branch**

Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany  
Tel: +49-2102-486-0

### ㉕ UK FA Center

**Mitsubishi Electric Europe B.V. UK Branch**

Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, U.K.  
Tel: +44-1707-27-8780

### ㉖ Italy FA Center

**Mitsubishi Electric Europe B.V. Italian Branch**

Centro Direzionale Colleoni - Palazzo Sirio,  
Viale Colleoni 7, 20864 Agrate Brianza (MB), Italy  
Tel: +39-039-60531

### ㉗ Czech Republic FA Center

**Mitsubishi Electric Europe B.V. Czech Branch**

Pekarska 621/7, 155 00 Praha 5, Czech Republic  
Tel: +420-255 719 200

### ㉘ Russia FA Center

**Mitsubishi Electric (Russia) LLC St.**  
**Petersburg Branch**

Piskarevsky pr. 2, bld 2, lit "Sch", BC "Benua", office  
720; 195027, St. Petersburg, Russia  
Tel: +7-812-633-3497

### ㉙ Turkey FA Center

**Mitsubishi Electric Turkey A.S. Umraniye Branch**

Serifali Mahallesi Nutuk Sokak No:5, TR-34775  
Umraniye / Istanbul, Turkey  
Tel: +90-216-526-3990

## Conformity with Global Standards and Regulations

Mitsubishi Electric servo system conforms to global standards.

(Note-1): Our servo system products are not subject to China Compulsory Certification (CCC).

(Note-2): Refer to relevant manuals and "EMC Installation Guidelines" when your system needs to meet the EMC directive.

(Note-3): Refer to "MELSERVO-J4 Series Catalog" for details of MR-J4 series conformity with global standards and regulations.

(Note-4): For corresponding standards and models, contact your local sales office.



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- To use the products given in this publication properly, always read the relevant manuals before beginning operation.
- The products have been manufactured as general-purpose parts for general industries, and are not designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger-carrying vehicles, consult with Mitsubishi Electric.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

# Warranty

## 1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit is repaired or replaced.

### [Term]

The term of warranty for Product is thirty six (36) months after your purchase or delivery of the Product to a place designated by you or forty two (42) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

### [Limitations]

- (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.  
It can also be carried out by us or our service company upon your request and the actual cost will be charged.  
However, it will not be charged if we are responsible for the cause of the failure.
- (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.
- (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
  - (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  - (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
  - (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
  - (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  - (v) any replacement of consumable parts (battery, fan, etc.)
  - (vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
  - (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
  - (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

## 2. Term of warranty after the stop of production

- (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.
- (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

## 3. Service in overseas countries

Our regional FA Center in overseas countries will accept the repair work of the Product. However, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA Center for details.

## 4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

- (1) Damages caused by any cause found not to be the responsibility of Mitsubishi.
- (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.
- (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.
- (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

## 5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

## 6. Application and use of the Product

- (1) For the use of our Motion controller/Simple Motion module, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Motion controller/Simple Motion module, and a backup or fail-safe function should operate on an external system to Motion controller/Simple Motion module when any failure or malfunction occurs.
- (2) Our Motion controller/Simple Motion module are designed and manufactured as general purpose product for use at general industries.  
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.  
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.  
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

CC-Link IE

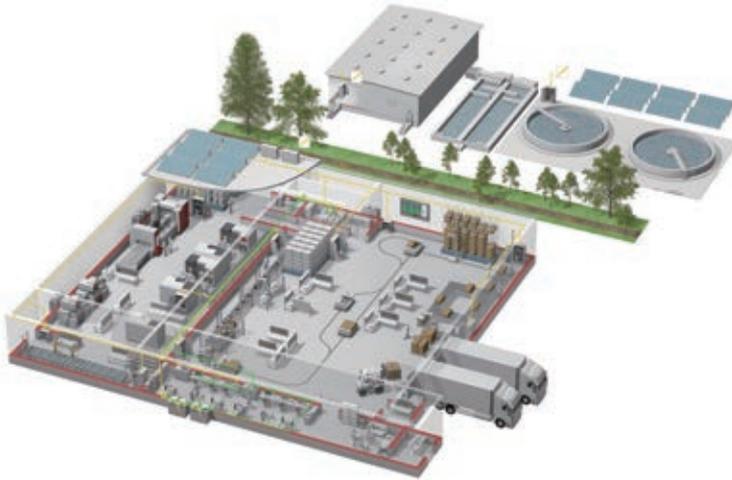


MELSEC iQ-R series

MELSEC iQ-F series

MELSOFT

# YOUR SOLUTION PARTNER



Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

## A NAME TO TRUST

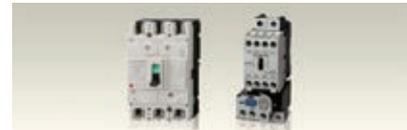
Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over \$40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.



Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC



Power monitoring, energy management



Compact and Modular Controllers



Inverters, Servos and Motors



Visualisation: HMIs



Numerical Control (NC)



Robots: SCARA, Articulated arm



Processing machines: EDM, Lasers, IDS



Transformers, Air conditioning, Photovoltaic systems

\* Not all products are available in all countries.

# SERVO SYSTEM CONTROLLERS MELSEC iQ-R SERIES/MELSEC iQ-F SERIES

Country/Region	Sales office	Tel
USA	Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100
Mexico	Mitsubishi Electric Automation, Inc. Mexico Branch Boulevard Miguel de Cervantes Saavedra 301, Torre Norte Piso 5, Ampliacion Granada, Miguel Hidalgo, Ciudad de Mexico, Mexico, C.P.11520	Tel : +52-55-3067-7512
Brazil	Mitsubishi Electric do Brasil Comercio e Servicos Ltda. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000
Germany	Mitsubishi Electric Europe B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Direzionale Colleoni - Palazzo Sirio, Viale Colleoni 7, 20864 Agrate Brianza (MB), Italy	Tel : +39-039-60531
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi, 76-80-Apdo. 420, E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-935-65-3131
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68
Czech Republic	Mitsubishi Electric Europe B.V. Czech Branch, Prague Office Pekarska 621/7, 155 00 Praha 5, Czech Republic	Tel : +420-255-719-200
Poland	Mitsubishi Electric Europe B.V. Polish Branch ul. Krakowska 50, 32-083 Balice, Poland	Tel : +48-12-347-65-00
Russia	Mitsubishi Electric (Russia) LLC St. Petersburg Branch Piskarevsky pr. 2, bld 2, lit "Sch", BC "Benua", office 720; 195027 St. Petersburg, Russia	Tel : +7-812-633-3497
Sweden	Mitsubishi Electric Europe B.V. (Scandinavia) Fjellievagen 8, SE-22736 Lund, Sweden	Tel : +46-8-625-10-00
Turkey	Mitsubishi Electric Turkey A.S. Umraniye Branch Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye / Istanbul, Turkey	Tel : +90-216-526-3990
UAE	Mitsubishi Electric Europe B.V. Dubai Branch Dubai Silicon Oasis, P.O.BOX 341241, Dubai, U.A.E.	Tel : +971-4-3724716
South Africa	Adroit Technologies 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100
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Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 7F to 9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9529
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308
Thailand	Mitsubishi Electric Factory Automation (Thailand) Co., Ltd. 12th Floor, SV.City Building, Office Tower 1, No. 896/19 and 20 Rama 3 Road, Kwaeng Bangpongpan, Khet Yannawa, Bangkok 10120, Thailand	Tel : +66-2682-6522 to 6531
Indonesia	PT. Mitsubishi Electric Indonesia Gedung Jaya 8th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461
Vietnam	Mitsubishi Electric Vietnam Company Limited Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton Street, District 1, Ho Chi Minh City, Vietnam	Tel : +84-28-3910-5945
India	Mitsubishi Electric India Pvt. Ltd. Pune Branch Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune - 411026, Maharashtra, India	Tel : +91-20-2710-2000
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777

## MITSUBISHI ELECTRIC CORPORATION

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NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN