eco Changes **for a greener tomorrow**

▲ MITSUBISHI ELECTRIC
Changes for the Better

FACTORY AUTOMATION

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

e-F@ctory

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

Outline

Simple Motion

Motion Controllers

Engineering Environment

Networks

Servo Amplifiers

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

- New high-speed system bus realizing shorter production cycle
- Utilize the sophisticated Motion control for extensive applications
- Advanced servo amplifiers and motors offering industry leading level of performance
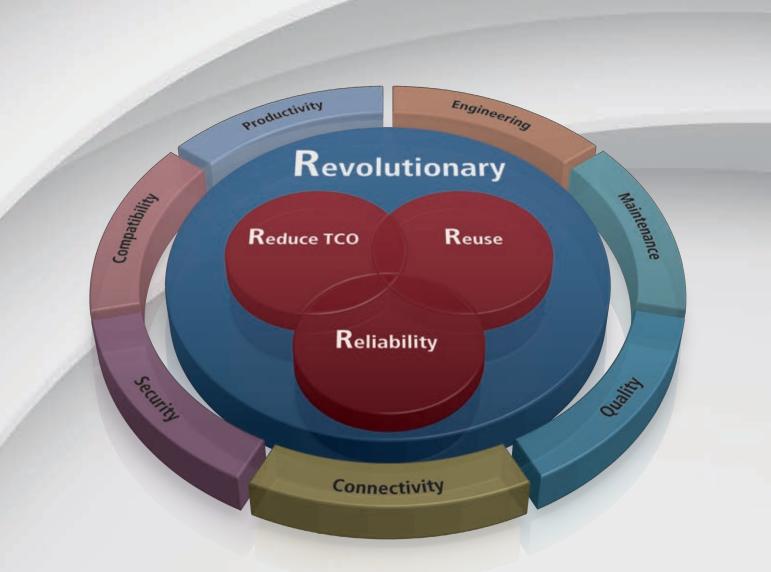
Engineering

- Intuitive engineering environment covering the product development cycle
- All-in-one engineering package reducing product development time
- Easy debugging, from controllers to servo amplifiers

Maintenance

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

Quality

- Improve and maintain actual manufacturing quality
- Ease of use realized with Universal Design
- Conforms to main international standards

Revolutionary

Reduce TCO   Reuse

Reliability

Productivity   Engineering   Maintenance   Quality   Connectivity   Security   Compatibility

SERVO SYSTEM CONTROLLER

Connectivity

- 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

Security

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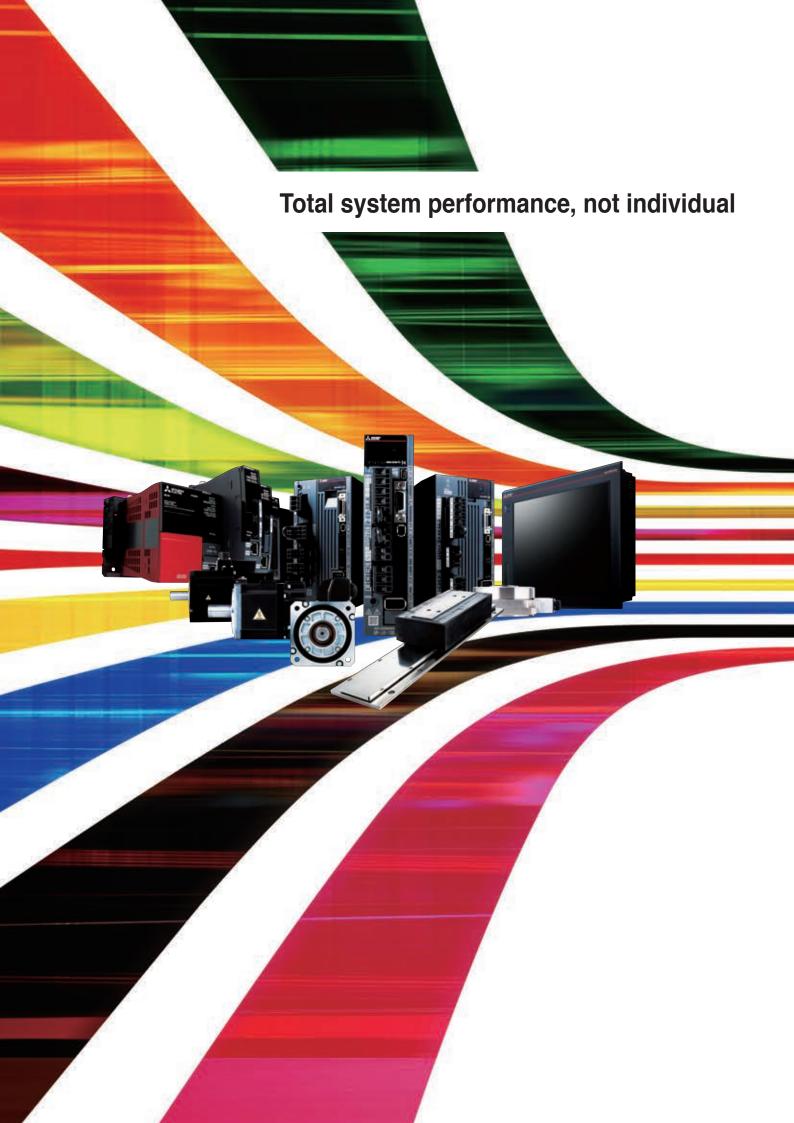- Unauthorized access protection across distributed control network

Compatibility

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

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

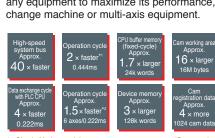### Faster Startup with Intuitive Operation

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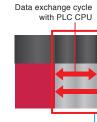
Change Up

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.

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

*1 Simple Motion module
*2 Motion controller

(Compared to previous model)

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.

High-speed system bus

Speed frequency response of servo amplifier
2.5kHz

SSCNET III/H communication speed
150Mbps

(Compared to previous model)

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

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)

Asahi Engineering Co.,Ltd   GHC   Harmonic Drive Systems Inc.

HOKUYO   IAI   muratec   NIKKI DENSO   IKO

NVD   Orientalmotor   SANYO DENKI   ShinMaywa

TESSERA   THK   MITSUBISHI ELECTRIC ENGINEERING

CLPA

CC-Link Partner Association

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
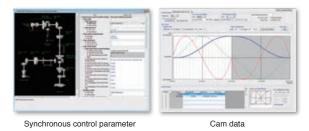
MELSOFT GX Works3

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.

Servo parameter

System configuration

CC-Link IE Field configuration
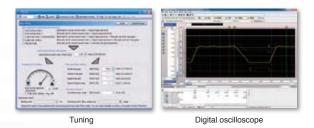

Synchronous control parameter

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.

Tuning

Digital oscilloscope

Japanese

English

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 Switching

The language can be switched to Japanese, English, and Chinese, supporting engineering staff working 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	Preventive maintenance	Preventive maintenance
Easily managing individual data of CPU modules and Simple Motion modules	**Being Informed of the lifespan of the capacitor and relay in a servo amplifier**	**Being Informed of the lifespan of the machine with a huge load and frequent acceleration**

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.

Servo Amplifier Life Diagnosis Function Preventing System Downtime in Advance
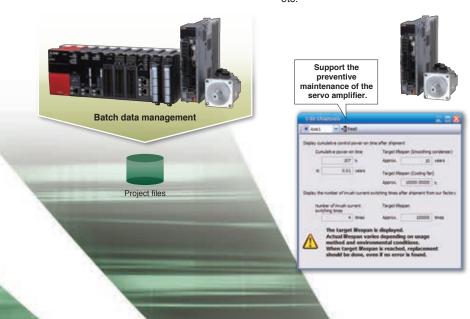
This function displays:
- Cumulative power-on time
- Number of inrush current switching times
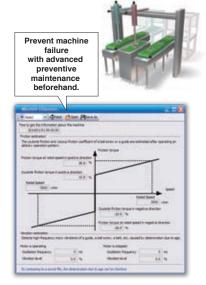- Target lifespan of capacitor and relay, etc.

Utilizing Machine Aging Information for Preventive Maintenance

- Estimated machine friction and vibration are displayed.
- Machine aging is displayed by comparing the initial machine operation data with that after years of usage.

Batch data management

Project files

Support the preventive maintenance of the servo amplifier.

Prevent machine failure with advanced preventive maintenance beforehand.

easier maintenance features

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

Quickly locating causes that stop the machine
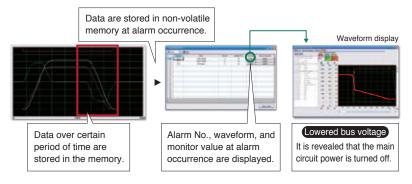
Digital Oscilloscope Function Performing Cause Analysis

- 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.

Data are stored in non-volatile memory at alarm occurrence.

Waveform display

Data over certain period of time are stored in the memory.

Alarm No., waveform, and monitor value at alarm occurrence are displayed.

Lowered bus voltage
It is revealed that the main circuit power is turned off.

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.
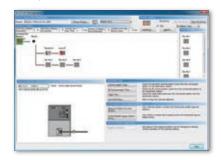- Errors that have been made by mistake can be quickly detected.

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

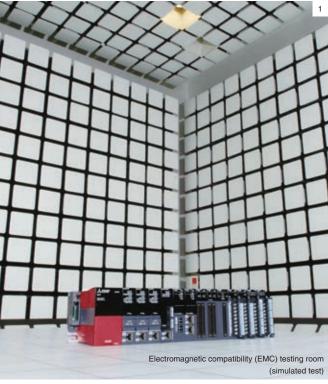# Reliable and trusted MELSEC product quality

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 [Note-1].

(Note-1): Please contact your local Mitsubishi Electric office or representative for further details.

Ease of use in quality

The front face has a wide and open design with an easy-to-use front cover, which helps you reduce wiring errors and contributes to more efficient work.

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.
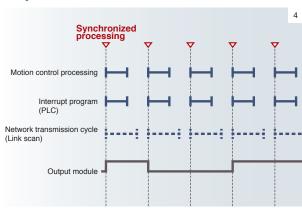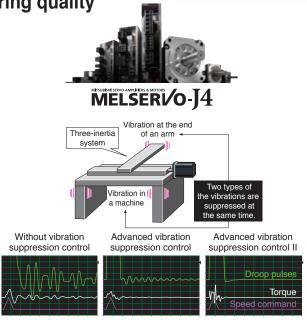
Improve and maintain actual manufacturing quality

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.

MELSERVO-J4

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 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.
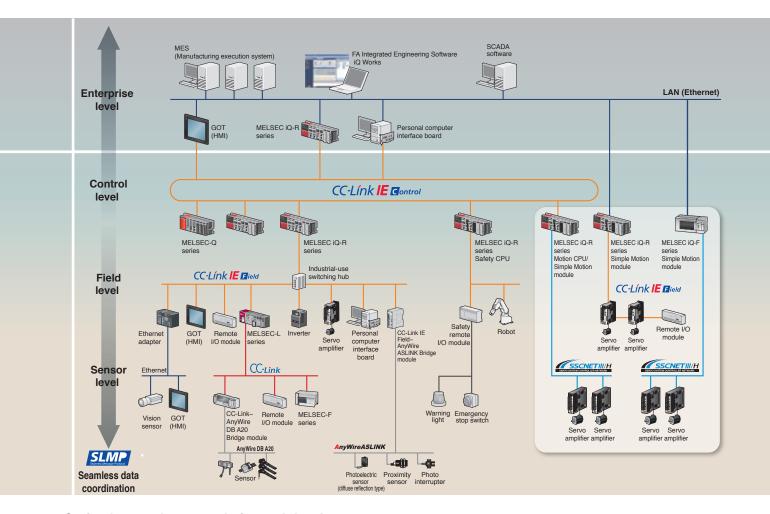Vibration can be minimized with the advanced servo adjustment function, maintaining the product quality.

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.

Enterprise level

- MES (Manufacturing execution system)
- FA Integrated Engineering Software iQ Works
- SCADA software
- LAN (Ethernet)
- GOT (HMI)
- MELSEC iQ-R series
- Personal computer interface board

Control level

CC-Link IE Control

- MELSEC-Q series
- MELSEC iQ-R series
- MELSEC iQ-R series Safety CPU
- MELSEC iQ-R series Motion CPU/Simple Motion module
- MELSEC iQ-R series Simple Motion module
- MELSEC iQ-F series Simple Motion module

Field level

CC-Link IE Field

- Industrial-use switching hub
- Ethernet adapter
- GOT (HMI)
- Remote I/O module
- MELSEC-L series
- Inverter
- Servo amplifier
- Personal computer interface board
- CC-Link IE Field–AnyWire ASLINK Bridge module
- Safety remote I/O module
- Robot

CC-Link IE Field

- Servo amplifier
- Servo amplifier
- Remote I/O module

SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK

- Servo amplifier
- Servo amplifier

Sensor level

- Ethernet
- Vision sensor
- GOT (HMI)

CC-Link

- CC-Link–AnyWire DB A20 Bridge module
- Remote I/O module
- MELSEC-F series
- Warning light
- Emergency stop switch

SLMP Seamless Message Protocol

Seamless data coordination

AnyWire DB A20
- Sensor

AnyWireASLINK
- Photoelectric sensor (diffuse reflection type)
- Proximity sensor
- Photo interrupter

Optimal network proposals for each level

SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK

SSCNET III/H is a dedicated high-speed, high-performance, highly reliable servo system control network that offers flexible long-distance wiring capabilities based on optical-fiber cable topology.

CC-Link IE Control

CC-Link IE Control is a high-reliability distributed control network designed to handle very large data communications (128 K word) over a high-speed (1Gbps) dual-loop optical cable topology.

CC-Link IE Field

CC-Link IE Field is a versatile gigabit Ethernet-based network integrating controller, I/O control, safety control, and motion control in a flexible wiring topology supporting star, ring, and line configurations.

CC-Link CC-Link Safety CC-Link/LT

CC-Link is a high-speed and highly reliable deterministic I/O control network that realizes reduced wiring while offering multi-vendor compatible products.

AnyWire

AnyWire is a sensor level distributed control network that is designed to reduce installation costs by utilizing general-purpose wiring and robot cables.
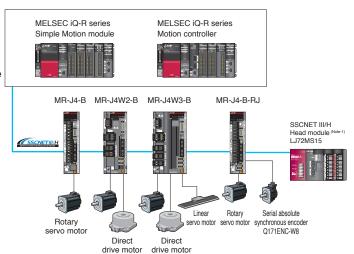
Optical network "SSCNET III/H" accelerating system response

"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 at 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)

MELSEC iQ-R series Simple Motion module

MELSEC iQ-R series Motion controller

MR-J4-B   MR-J4W2-B   MR-J4W3-B   MR-J4-B-RJ

SSCNET III/H

SSCNET III/H Head module (Note-1) LJ72MS15

Rotary servo motor

Direct drive motor

Direct drive motor

Linear servo motor

Rotary servo motor

Serial absolute synchronous encoder Q171ENC-W8

(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*[1] 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, there is no need to re-register the security key, making replacement easier.
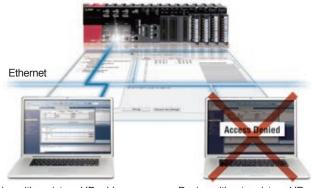When using Motion CPU, the security key is registered on Motion CPU.

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[Note-1] 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.

Ethernet

Device with registered IP address
(access permitted)

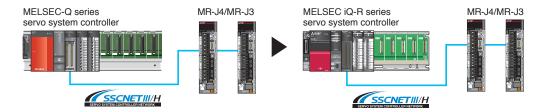Device without registered IP address
(access denied)

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.

MELSEC-Q series servo system controller — MR-J4/MR-J3 — MELSEC iQ-R series servo system controller — MR-J4/MR-J3

SSCNETIII/H SERVO SYSTEM CONTROLLER NETWORK

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.

MELSOFT GX Works2

MELSOFT GX Works3

Read

Projects of Simple Motion Module Setting Tool

Next-generation, Compact Servo System Controller with Extensive Built-in Functions
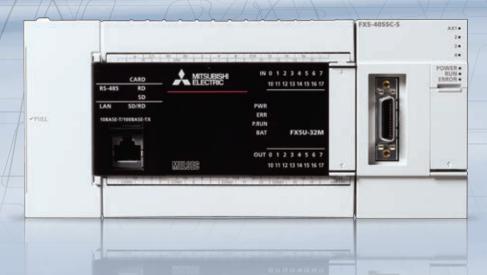
MELSEC iQ-F series

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

MELSOFT **GX Works3**

The next level of industry

MELSEC iQ-F series

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

SERVO SYSTEM CONTROLLER

Productivity

- 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 tact time

Engineering

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

Connectivity

- 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" of providing high response and high reliability

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.

ERP (Enterprise resource planning)
MES (Manufacturing execution system)

PAC & HMI
Integration of automation controller and HMI

Network
Integrated network through seamless connectivity

Engineering
Centralized engineering environment

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

Responding to expanding applications such as semiconductor and LCD manufacturing, packing machines, and cap tightening machines, 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.

HUMAN MACHINE I/F

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

SERVO SYSTEM CONTROLLER

Simple Motion module

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

RD77GF32 [NEW]
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

CC-Link IE Field

SSCNET III/H

SERVO AMPLIFIER

LOW-VOLTAGE SWITCHGEAR

Servo amplifier

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

MR-J4-GF
MR-J4-GF-RJ

SSCNET III/H compatible
servo amplifier

MR-J4-B
MR-J4-B-RJ

SERVO MOTOR

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
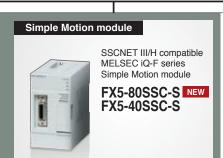**HG-RR series**
Capacity: 1 to 5 kW

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

iQ Platform

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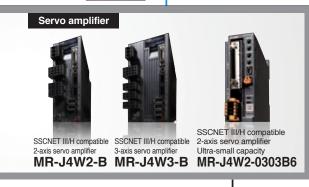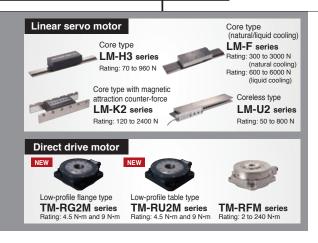
Programmable controller

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 NEW
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

Magnetic contactor

MS-T

Molded-case circuit breaker

WS-V

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: 4.5 N•m and 9 N•m

NEW
Low-profile table type
TM-RU2M series
Rating: 4.5 N•m and 9 N•m

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

CASE 1 **Vertical Form, Fill & Seal**

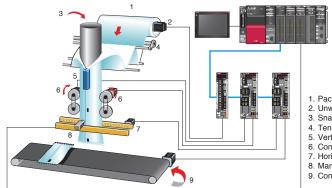Advanced Sync. | Cam Auto-Generation | Mark Detection

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

1. Packing film
2. Unwinding axis
3. Snacks, sauce
4. Tension control
5. Vertical sealer
6. Conveying roller axis
7. Horizontal sealer & cutter
8. Mark sensor
9. Conveyor

CASE 2 **Liquid Filling Machines**

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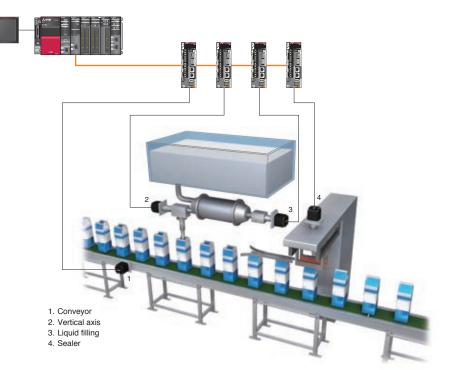
The machine can adjust the speed of the nozzle's vertical motion according to the liquid level to be filled in the bottle by using advanced synchronous and cam controls. Different bottle shapes can be filled on the same conveyor line, enabling more efficient use of production equipment.

Main functions

· Advanced synchronous control
· Speed control
· Cam control

Application examples

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

1. Conveyor
2. Vertical axis
3. Liquid filling
4. Sealer

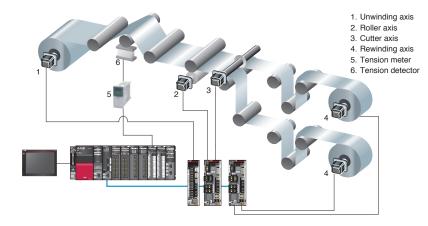## CASE 3 — Converting Machines

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

1. Unwinding axis
2. Roller axis
3. Cutter axis
4. Rewinding axis
5. Tension meter
6. Tension detector

CASE 4 — Screw Tightening Machines

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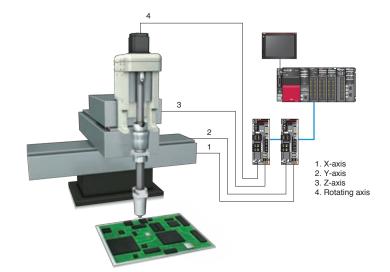
The machine tightens screws by using speed-torque control (tightening & press-fit control). Since the current position is controlled even after switching from the position control to the speed-torque control, positioning based on the absolute position coordinates is possible when switching back to the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

Main functions

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

Application examples

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

1. X-axis
2. Y-axis
3. Z-axis
4. Rotating axis

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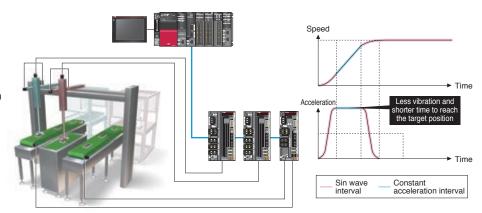Machine vibration is minimized and a shorter tact time is achieved by setting the smooth acceleration period (Sin wave interval) and maximum acceleration period (Constant acceleration interval) with the advanced S-curve acceleration/deceleration function.

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

Speed

Time

Acceleration

Less vibration and shorter time to reach the target position

Time

Sin wave interval — Constant acceleration interval

CASE 6 | **Sealing** | Positioning | Linear Interpolation | Circular Interpolation | Contin. Trajectory
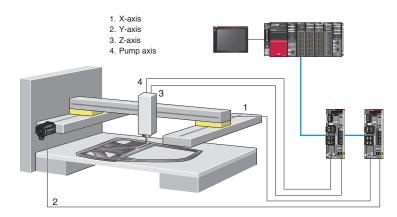
The machine can coat the workpiece by using a combination of linear interpolation, 2-axis circular interpolation, and continuous trajectory control.
A smooth trajectory can be traced with the S-curve acceleration/deceleration function.

Main functions

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

Application examples

・ Sealing
・ Dispensers

1. X-axis
2. Y-axis
3. Z-axis
4. Pump axis

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

1. Paper feeding axis
2. Roller axis
3, 5, 7, 9. Ink roller axes
4, 6, 8, 10. Printing axes
11. Roller axis

CASE 8 — Alignment Systems

Positioning **Vision**
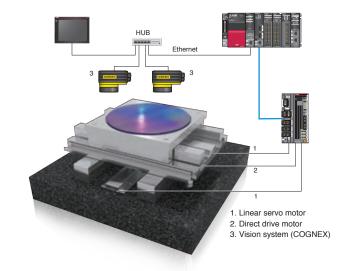
The alignment time can be reduced by the system changing the target position during positioning, and starting positioning for the new target position with the workpiece data from the vision system.
High-speed and high-accuracy positioning can be achieved, with the Motion controller and the vision system 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

HUB
Ethernet

1. Linear servo motor
2. Direct drive motor
3. Vision system (COGNEX)

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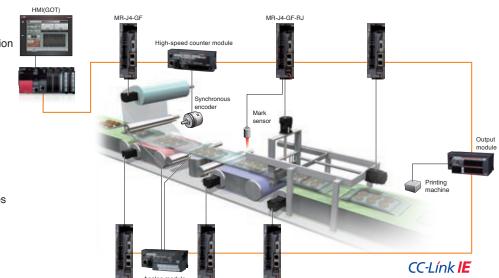**CASE 9** — **Synchronization of Input and Output with Servo Control**

In a single network, input and output are synchronized with the command communication cycle of the servo amplifier.
For example, input from a synchronous encoder and output to a printing machine are synchronized in the same network.
CC-Link IE Field Network enables 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

HMI(GOT)
MR-J4-GF
High-speed counter module
MR-J4-GF-RJ
Synchronous encoder
Mark sensor
Output module
Printing machine
Analog module

CC-Link IE

CASE10 — **Flexible network topology**
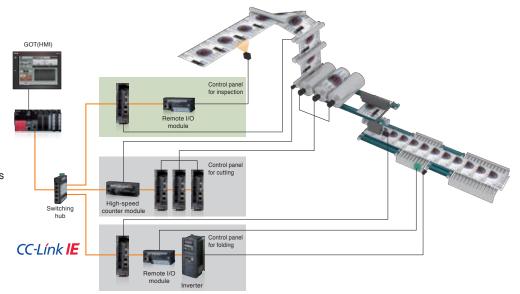
Star, line, and star/line mixed topologies are available for a network configuration with a switching hub. An easy topology created only by a cable being connected to a free port of the switching hub allows field devices to be added to the system more flexibly.

Main functions

· Line topology
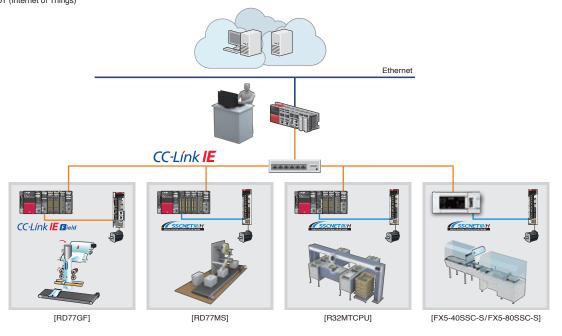· Star topology
· Star/line mixed topology

Application examples

· Packagiing machines
· Filling machines
· Labeling machines
· Packing machines
· Material handling machines

GOT(HMI)
Control panel for inspection
Remote I/O module
Switching hub
High-speed counter module
Control panel for cutting
Control panel for folding
Remote I/O module
Inverter

CC-Link IE

CASE11   Data Transmission to IT System

Data of servo amplifiers and servo motors are collected via CC-Link IE Field Network. The status of the entire product line can be visualized by batch management of the collected data the at host system, supporting to build IoT[Note-1] for your machine.
(Note-1): IoT (Internet of Things)

Ethernet

CC-Link IE

CC-Link IE Field   SSCNET Ⅲ/H   SSCNET Ⅲ/H   SSCNET Ⅲ/H

[RD77GF]   [RD77MS]   [R32MTCPU]   [FX5-40SSC-S / FX5-80SSC-S]

CASE12   Monitoring of Servo Data

Monitoring and modifying servo data of up to 50 monitoring items successively during operation is possible. The operation status of servo amplifiers and servo motors (including partner products) acquired via CC-Link IE Network and SSCNET III/H (including partner products) are transferred to the host system or to any GOT screens created by customers, and are displayed.

Monitoring items
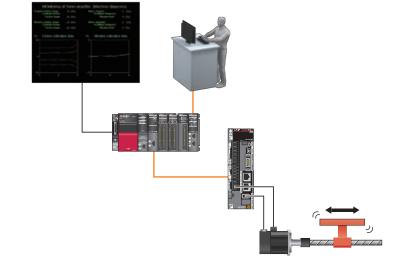
[Monitoring and data collection]
  ・ Alarm history of servo amplifiers
  ・ Identification information of servo amplifiers
    and servo motors
  ・ Power consumption
  ・ 7-segment LED display status
  ・ Load ratio of servo motors   ・ Speed
  ・ Temperature of various parts

[Preventive maintenance]
  ・ Inrush relay ON/OFF number
  ・ Power ON cumulative time
  ・ Machine diagnosis information (the estimated
    friction value and the estimated vibration value)

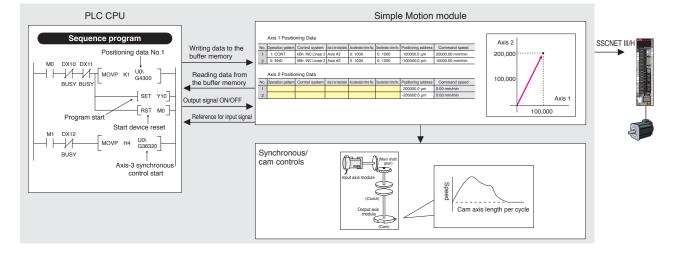(Note): Monitoring items and its specifications vary by model type.

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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 [NEW]
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
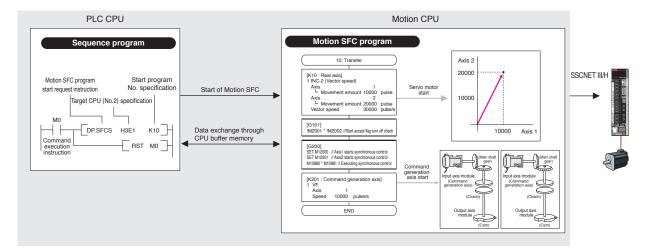
MELSEC iQ-F series — SSCNET III/H

SSCNET III/H
compatible
MELSEC iQ-F series

FX5-80SSC-S [NEW]
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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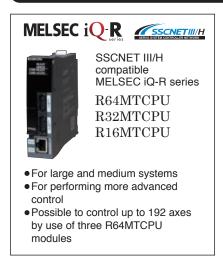Engineering Environment

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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
SERVO SYSTEM CONTROLLER NETWORK

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)(Note-1) 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 Rotary servo motor	Rotary servo motor / Linear servo motor / Direct drive motor		
Command interface	CC-Link IE	SSCNETⅢ/H SERVO SYSTEM CONTROLLER NETWORK		SSCNETⅢ/H SERVO SYSTEM CONTROLLER NETWORK		
	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		Speed control / Tightening & press-fit control / Cam 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 / Machine control / Cam auto-generation / Vibration Suppression Command Filter

(Note-1): Available only with RD77MS and FX5-40SSC-S/FX5-80SSC-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 FX5-40SSC-S/FX5-80SSC-S

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Servo Amplifiers

MELSEC iQ-R series — SSCNET III/H compatible MELSEC iQ-R series | MELSEC iQ-F series — SSCNET III/H compatible MELSEC iQ-F series
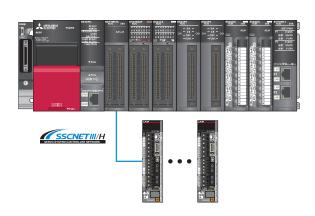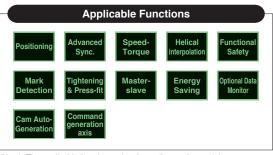
Simple Motion Modules

- 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

Applicable Functions

Positioning	Advanced Sync.	Speed-Torque	Helical interpolation	Functional Safety
Mark Detection	Tightening & Press-fit	Master-slave	Energy Saving	Optional Data Monitor
Cam Auto-Generation	Command generation axis			

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

Stacking cranes

Positioning

Packing machines

Advanced Sync. | Mark Detection

Liquid crystal manufacturing device

Advanced Sync.

Cutting machine

Cam Auto-Generation | Advanced Sync.

Screw tightening machines

Tightening & Press-fit

Labeling machines

Advanced Sync. | Positioning

Pressing machines

Tightening & Press-fit | Master-slave

Converting machines

Speed-Torque
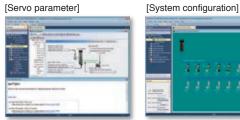
All-in-one Engineering Software

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]

Easy programming

Simple point-and-click programming

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

[Sequence program]

Module label

Module FB

System Design   **Programming**   **Debug**   **Maintenance**

Easy motion control

[Synchronous control parameter]

[Positioning data]

Easy startup

[One-touch tuning]   [Network diagnostics]
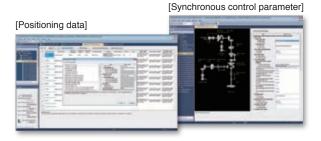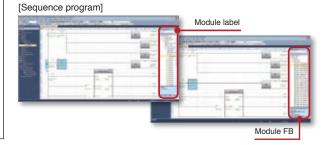
Increased usability in synchronous/positioning control settings

- 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.

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.

Outline | Simple Motion | Motion Controllers | Engineering Environment | Networks | Servo Amplifiers

MELSEC iQ-R series

SSCNET III/H compatible
MELSEC iQ-R series Simple Motion module
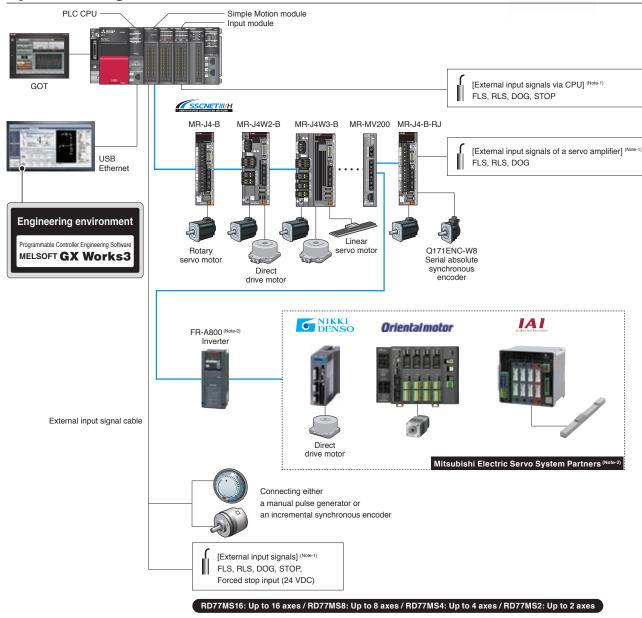
RD77MS16/RD77MS8/RD77MS4/RD77MS2

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

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

System configuration

PLC CPU

Simple Motion module
Input module

GOT

[External input signals via CPU] (Note-1)
FLS, RLS, DOG, STOP

USB
Ethernet

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MR-J4-B   MR-J4W2-B   MR-J4W3-B   MR-MV200   MR-J4-B-RJ

[External input signals of a servo amplifier] (Note-1)
FLS, RLS, DOG

Engineering environment

Programmable Controller Engineering Software
MELSOFT GX Works3

Rotary
servo motor

Direct
drive motor

Linear
servo motor

Q171ENC-W8
Serial absolute
synchronous
encoder

FR-A800 (Note-2)
Inverter

NIKKI DENSO   *Oriental motor*   IAI
Quality and Innovation

External input signal cable

Direct
drive motor

Mitsubishi Electric Servo System Partners (Note-2)

Connecting either
a manual pulse generator or
an incremental synchronous encoder

[External input signals] (Note-1)
FLS, RLS, DOG, STOP,
Forced stop input (24 VDC)

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

(Note-1): An input destination of external input signals (FLS, RLS, DOG, STOP) is changed by parameters.
(Note-2): 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 [NEW] /FX5-40SSC-S

Cutting-edge motion control packed
in a compact module

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

System configuration

CPU module — Simple Motion module

GOT

Ethernet

Engineering environment

Programmable Controller Engineering Software
MELSOFT **GX Works3**

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MR-JE-B/
MR-J4-B   MR-J4W2-B   MR-J4-B-RJ

[External input signals of a servo amplifier] (Note-1)
FLS, RLS, DOG

Rotary
servo motor
Direct
drive motor
Linear
servo motor
Q171ENC-W8
Serial absolute
synchronous
encoder

[External input signals via CPU] (Note-1)
FLS, RLS, DOG, STOP

Connecting either
a manual pulse generator or
an incremental synchronous encoder

External input signals (4 points) (Note-1)
Forced stop input (24 V DC)

FR-A800 (Note-2)
Inverter

NIKKI DENSO   Orientalmotor   IAI
Quality and Innovation

Direct
drive motor

Mitsubishi Electric Servo System Partners (Note-2)

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

(Note-1): An input destination of external input signals (FLS, RLS, DOG, STOP) is changed by parameters.
(Note-2): When using a partner product or the inverter FR-A800, use one whose version supports the Simple Motion module.

Outline

Simple
Motion

Motion
Controllers

Engineering
Environment

Networks

Servo Amplifiers

MELSEC iQ-R series

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

RD77GF32 NEW /RD77GF16/RD77GF8/RD77GF4

Synchronous control up to μsec precision,
suitable for high-accuracy positioning

CC-Link IE Field

System configuration

PLC CPU   Safety   RD77GF
           CPU

GOT

CC-Link IE Field

MR-J4-GF
MR-J4-GF-RJ   Motion mode: Up to 32 axes

MR-J4-GF-RJ (Note-2)
+MR-D30

USB
Ethernet

External input
signals of a servo
amplifier (Note-1)
FLS, RLS, DOG

Safety remote I/O

Engineering environment

Programmable Controller Engineering Software
MELSOFT **GX Works3**

Rotary   Linear   Direct
servo motor   servo motor   drive motor

Servo motor/servo motor
with functional safety

MR-J4-GF   MR-J4-GF-RJ (Note-2)
MR-J4-GF-RJ   +MR-D30

External input signal (Note-1)

Head   HMI   Inverter Remote I/O Local   Analog   CC-Link IE   High-speed Bridge
module   (GOT)   module   station module   Field-AnyWire   counter   module
                                                          ASLINK   module
                                                          Bridge module

CC-Link   CC-Link   Servo motor/
                                                                     servo motor
                                                                     with functional safety

Remote I/O   Inverter CC-Link-AnyWire   Remote I/O   Sensor   **I/O mode**
module   DB A20 Bridge module module

Anywire DB A20   **AnyWireASLINK**
Anywire Bitty

Sensor   Photoelectric   Proximity Photo
                        sensor   sensor   interrupter
                        (diffuse reflection type)

(Note-1): An input destination of external input signals (FLS, RLS and DOG) is changed by parameters.
(Note-2): GX Work3 is required for safety communications. Available soon

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

CC-Link IE Field Compatible Functions

Preventive maintenance
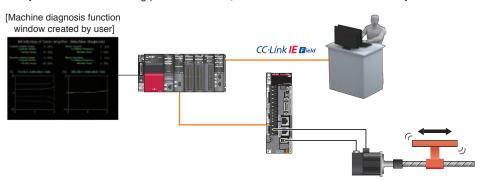
RD77GF Productivity Maintenance
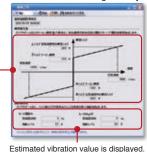
Machine diagnosis function detects changes of mechanical parts (ball screw, guide, bearing, belt, etc.) by analyzing machine friction, load moment of inertia, unbalanced torque, and changes in vibration components using the data inside a servo amplifier, supporting timely maintenance of driving parts. 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]

Estimated vibration value is displayed.
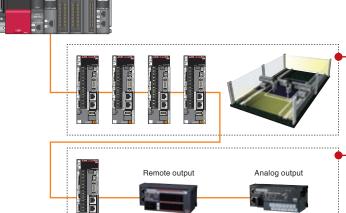
Estimated friction value is displayed.

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
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.
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, are connected with no restriction.
Maximum number of control stations : 120 stations
(Including the number of motion mode compatible servo amplifiers)

Remote output   Analog output

CC-Link IE Field Network master station

RD77GF

Simple Motion
module

Master/local
module

CC-Link IE Field Network
Simple Motion module

The CC-Link IE Field Network compatible Simple Motion module is equipped with functions as a link device and a master station equivalent to a CC-Link IE field Network master/local module. (Note-1)
Suppressing the cost of a system configuration is possible since this module is used not only for Motion control, but also as a master station of the network.
(Note-1): The sub-master function is not supported.

■ Maximum link points per network
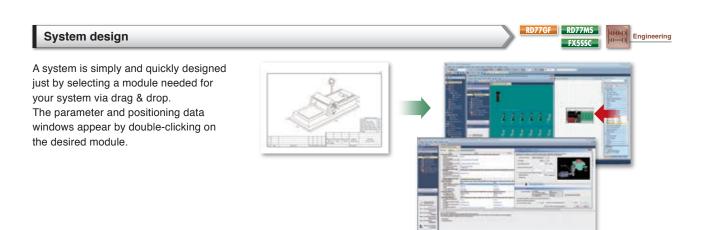
Item	RD77GF	Master module
Remote input (RX)/Remote output (RY)	16k points each (16384 points, 2k byte)	16k points each (16384 points, 2k byte)
Remote register (RWw, RWr)	8k points each (8192 points, 16k byte)	8k points each (8192 points, 16k byte)

Outline

Simple
Motion

Motion
Controllers

Engineering
Environment

Networks

Servo Amplifiers

Programming Environment

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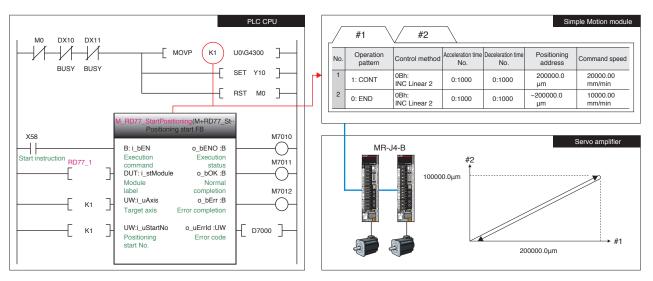
There are many works with software in the processes from machine design through its operation - system design, programming, debug, to maintenance. MELSOFT GX Works3 is equipped with various features that simplify those works.

System design → Programming → Debug → Maintenance

System design

RD77GF | RD77MS | FX5SSC | Engineering

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

RD77GF | RD77MS | FX5SSC | Productivity | Engineering

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.

PLC CPU

```
M0   DX10  DX11
─┤/├──┤/├──┤/├──────────[ MOVP  K1   U0\G4300 ]
       BUSY  BUSY
                          [ SET   Y10 ]
                          [ RST   M0  ]
```

```
X58
─┤├──────────         M_RD77_StartPositioning(M+RD77_St··
                            Positioning start FB
Start instruction  RD77_1
              ─┤ ├─      B: i_bEN          o_bENO :B ────(M7010)
                         Execution         Execution
                         command           status
                         DUT: i_stModule   o_bOK :B ─────(M7011)
                         Module            Normal
                         label             completion
              ─┤K1├─     UW:i_uAxis        o_bErr :B ────(M7012)
                         Target axis       Error completion
              ─┤K1├─     UW:i_uStartNo     o_uErrId :UW ─[ D7000 ]
                         Positioning       Error code
                         start No.
```

Simple Motion module

No.	Operation pattern	Control method	Acceleration time No.	Deceleration time No.	Positioning address	Command speed
1	1: CONT	0Bh: INC Linear 2	0:1000	0:1000	200000.0 μm	20000.00 mm/min
2	0: END	0Bh: INC Linear 2	0:1000	0:1000	−200000.0 μm	10000.00 mm/min

Servo amplifier

MR-J4-B

#2
100000.0μm

#1
200000.0μm

PLCopen® Motion Control FB

RD77GF RD77MS Productivity Engineering

Simple Motion modules and servo amplifiers with a built-in positioning function are used to execute Motion control, and programming according to devices to be used, is required and hence a long design time and high costs to understand usage and programming of the devices.

The PLCopen® Motion Control FB has a standardized interface providing the following benefits;
● The time and costs are suppressed by the burden reduction of programming.
● A maintenance time can be reduced since the program is easily understood by any person other than a programming designer.

**PLCopen®
motion
control**

Conforms to IEC 61131-3
GX Works3 realizes structured programming such as ladder and ST, making project standardization across multiple users even easier.
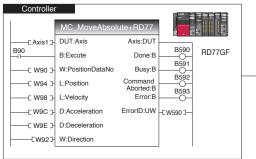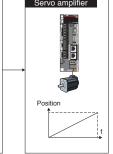
■Programming examples
The PLCopen® Motion Control FB enables positioning of devices requiring different control methods with the same programming.

[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.

Controller

MC_MoveAbsolute+RD77

Axis1	DUT:Axis	Axis:DUT
B90	B:Excute	Done:B	B590	RD77GF
W90	W:PositionDataNo	Busy:B	B591
W94	L:Position	Command Aborted:B	B592
W98	L:Velocity	Error:B	B593
W9C	D:Acceleration	ErrorID:UW	W590
W9E	D:Deceleration
W92	W:Direction

Servo amplifier

Position

t
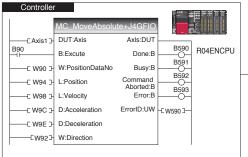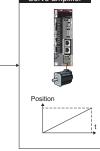
[When using the servo amplifier with the built-in positioning function]
  Devices : R04ENCPU + MR-J4-GF
  FB   : MC_ MoveAbsolute + J4GFIO
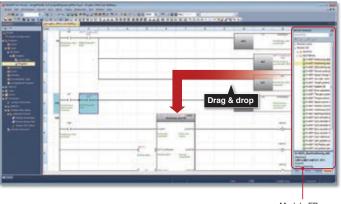
  Positioning starts after transferring data of a target position and speed from a master station to the servo amplifier with the built-in positioning function.

Controller

MC_MoveAbsolute+J4GFIO

Axis1	DUT:Axis	Axls:DUT
B90	B:Excute	Done:B	B590	R04ENCPU
W90	W:PositionDataNo	Busy:B	B591
W94	L:Position	Command Aborted:B	B592
W98	L:Velocity	Error:B	B593
W9C	D:Acceleration	ErrorID:UW	W590
W9E	D:Deceleration
W92	W:Direction

Servo amplifier

Position

t

Module Function Block (Module FB)

RD77MS FX5SSC Productivity Engineering

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.

Drag & drop

Module FBs

Simple Motion Modules

Simulation

RD77GF RD77M5 Engineering
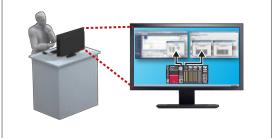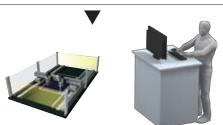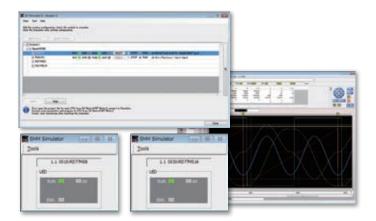
The MELSOFT GX Works3 simulation enables a program operation to be checked without an actual machine even during the debugging process and hence a shorter startup time. In addition, this simulation function can be used for several Simple Motion modules.

Debugging by simulating program on PC

Operation check by axis monitor and digital oscilloscope

Startup and adjustment by actual machine

Event history

RD77GF RD77M5 Engineering Maintenance
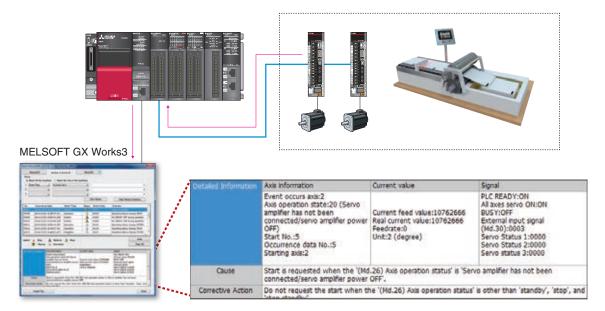
For the MELSEC iQ-R series, events occurred on each module and servo amplifiers can be stored to the CPU module. "WRITE" operation to the program, error information, and written data to the flash ROM, etc. are listed chronologically, which makes error cause investigation and restoration work smoother and quicker

MELSOFT GX Works3

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

Positioning Control

Productivity
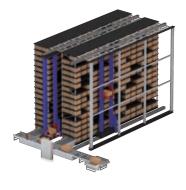
Positioning control is easily executed using a Motion profile table.

Basic positioning control

`RD77GF` `RD77MS` `FX5SSC` Productivity

- To respond to various application needs, the Simple Motion module offers various control functions, 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, are available.

Speed-position switching control

`RD77GF` `RD77MS` `FX5SSC` Productivity
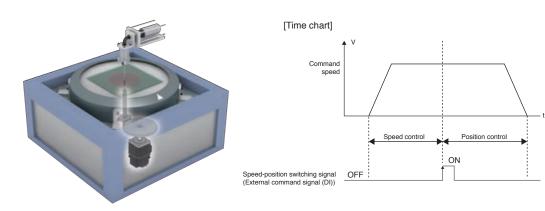
The servo motor, rotating at the specified speed in the speed control, stops at the specified position when turning ON the speed-position switching signal.

[Time chart]

Command speed

Speed control   Position control

ON

Speed-position switching signal
(External command signal (DI))   OFF

Helical interpolation

`RD77GF` `RD77MS` Productivity
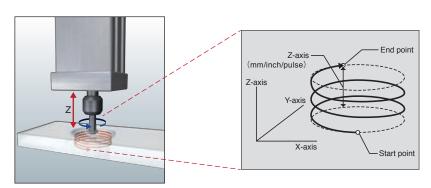
Helical interpolation draws a helical path by a linear interpolation axis (Z-axis) following to 2-axis circular interpolation control (X-axis and Y-axis). For applications that require the boring of deep, large holes, usually the helical interpolation of the three axes must be taken into consideration.

- 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.

Z-axis
（mm/inch/pulse）
Z-axis
Y-axis
X-axis
End point
Start point

Outline

Simple Motion

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Target position change function
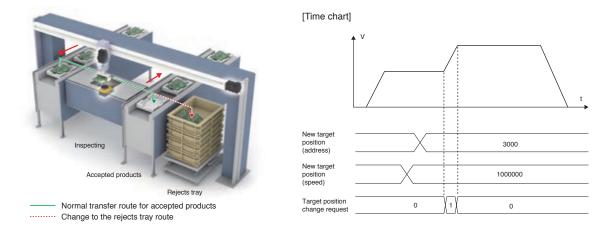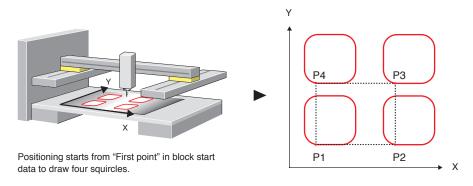
RD77GF RD77MS FX5SSC   Productivity

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 rejects.

Inspecting

Accepted products

Rejects tray

——— Normal transfer route for accepted products
········· Change to the rejects tray route

[Time chart]

New target position (address)	3000
New target position (speed)	1000000
Target position change request	0 1 0

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.
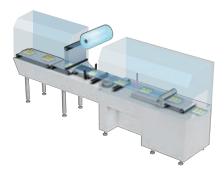
Setting example of block start data

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

Productivity   Engineering
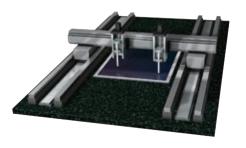
The advanced synchronous control is software-based synchronous control as an alternative to mechanical control, such as gear, shaft, clutch, speed change gear and cam. In addition, cam control becomes even easier with cam auto-generation function. The synchronous control can be simply started/ended for 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 Packaging machines, printing machines, diaper manufacturing machines, tire molder, etc.
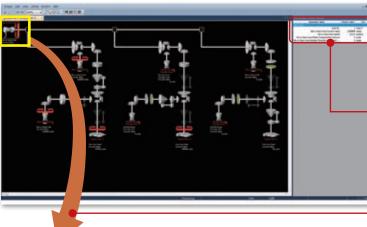
Only two axes are in synchronization. The other axes are in positioning control.

Application Tandem configuration, etc.

Module configuration of synchronous control

RD77GF RD77MS FX5SSC   Engineering

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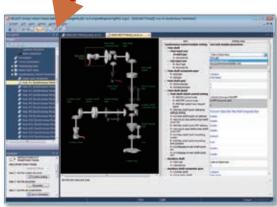
- All the output axes that are connected to the main shaft main input axes modules can be displayed in the monitoring screen.
- Monitoring on each module can be performed, and parameter settings can be made.

Monitoring on the selected module can be performed.

Double click the module to open the parameter setting screen.
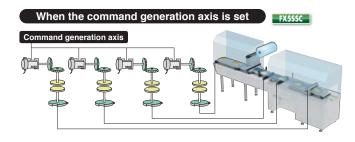
- Synchronous control is easily achieved just by setting parameters.

Outline

Simple Motion

Motion Controllers

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Input axis module

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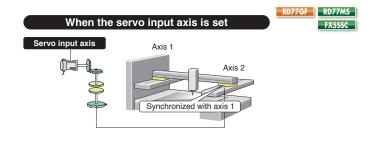
A command generation axis, a servo input axis under control, or a synchronous encoder axis, can be set as an input axis module for synchronous control according to your application.
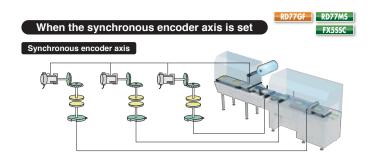
When the command generation axis is set

`FX5SSC`

Command generation axis

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` `FX5SSC`

Servo input axis

Axis 1

Axis 2

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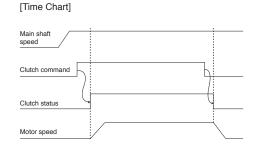
The master axis (Axis 1) of tandem operation is set as the input axis module of the synchronous control axis (Axis 2). Axis 2 is synchronously operated with Axis 1 by the commands given to Axis 1.

When the synchronous encoder axis is set

`RD77GF` `RD77MS` `FX5SSC`

Synchronous encoder axis

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` `FX5SSC` **Productivity**

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]

Main shaft speed

Clutch command

Clutch status

Motor speed

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

RD77GF   RD77MS
FX5SSC   Productivity   Engineering
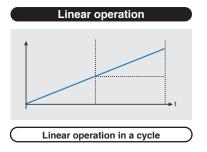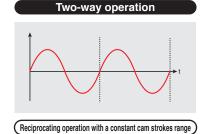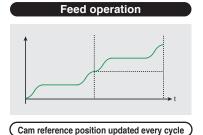
The output axis for synchronous control is operated with a cam.
The following three operations can be performed with the cam functions: Linear operation, Two-way operation, and Feed operation; therefore any of the three can be selected to suit your application.

Linear operation	Two-way operation	Feed operation

Linear operation in a cycle	Reciprocating operation with a constant cam strokes range	Cam reference position updated every cycle

You can set any position as the end point of the feed operation

Ball screw   Rotary table
(Unit: mm)   (Unit: degree)

Two-way cam
(Setting range: -214 to 214%)

Belt conveyor   Rotary table
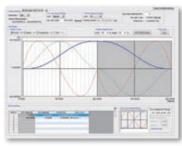
Cam pattern creation
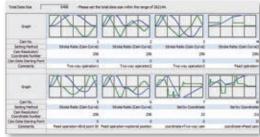
A wide variety of cam patterns can be easily created with GX Works3.

[Cam Data Creation Screen]

- 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.

[Cam Data List]

- 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.
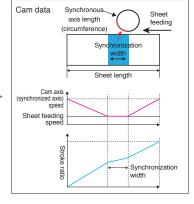
Cam auto-generation

Cam data for a rotary knife can be automatically generated by input of the sheet length, synchronization width, cam resolution, etc. to the specified device memory.

User-created GOT screen

Parameter settings, including items like sheet length, etc.

Cam data

Synchronous axis length (circumference)
Sheet feeding
Synchronization width
Sheet length

Cam axis (synchronized axis) speed
Sheet feeding speed

Stroke ratio
Synchronization width

Rotary knife

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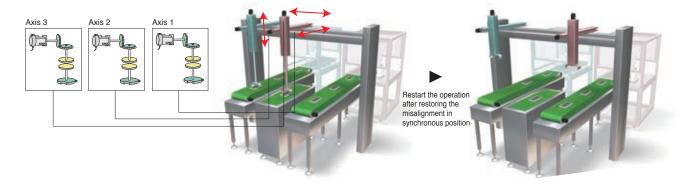
Restarting synchronous control

RD77GF RD77MS FX5SSC Productivity
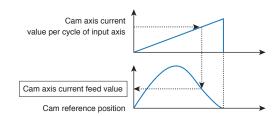
In case that the synchronous position becomes misaligned after an emergency stop, etc., a new synchronous position is calculated from each axis position to restore the misalignment, and then the synchronous control can be restarted at the specified position based on the calculation.

Axis 3   Axis 2   Axis 1

▶

Restart the operation after restoring the misalignment in synchronous position

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.

Cam axis current value per cycle of input axis

Cam axis current feed value

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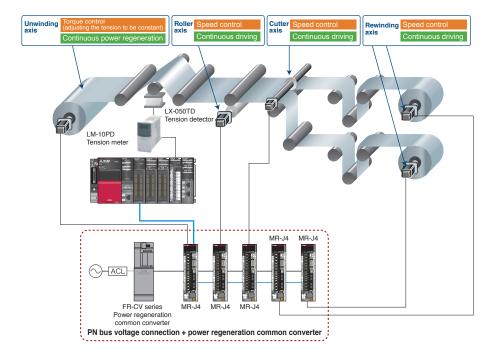
2. The output axes perform positioning based on those updated current feed values.
3. Turn OFF the synchronous control analysis mode, and turn ON the axes to perform synchronous control.

Speed-torque Control

RD77GF RD77MS
FX5SSC
Productivity

Speed control follows a speed command to control speed constant, and torque control follows a torque command to control 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.
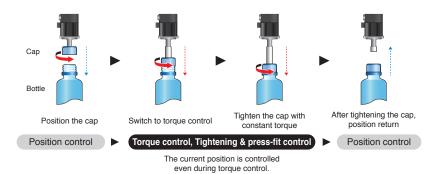
Unwinding axis Torque control (adjusting the tension to be constant)
Continuous power regeneration

Roller axis Speed control
Continuous driving

Cutter axis Speed control
Continuous driving

Rewinding axis Speed control
Continuous driving

LX-050TD
Tension detector

LM-10PD
Tension meter

MR-J4 MR-J4

FR-CV series
Power regeneration
common converter

MR-J4 MR-J4 MR-J4

ACL

PN bus voltage connection + power regeneration common converter

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

RD77MS
FX5SSC
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.

Cap

Bottle

Position the cap

Switch to torque control

Tighten the cap with constant torque

After tightening the cap, position return

Position control ▶ **Torque control, Tightening & press-fit control** ▶ Position control

The current position is controlled even during torque control.

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Mark Detection Function

`RD77GF` `RD77MS` `FX5SSC` | Productivity | Quality

The actual position of the servo motor can be obtained based on the inputs from the sensor that detects the registration marks printed on the high-speed moving film. By compensating the cutter axis position errors based on those inputs from the sensor, the film can be cut at the constant cutting position.

The sensor ON

Registration mark

Capture the current feed value, etc. with the mark sensor ON. (Mark Detection Function)

Calculate the compensation amount from the current feed value.

Start the auxiliary axis to compensate the error by adjusting the rotary knife.

Ladder	Description
M0 — DMOVP U0\G54962 U0\G7106	Position compensation data setting
MOVP K11 U0\G4400	Set start No. for auxiliary axis 2
DX11 (BUSY) — SET Y11	Virtual servo axis 2 start
M1 DX11 — RST Y11	Start signal reset

Monitoring of Servo Data

`RD77GF` `RD77MS` `FX5SSC` | Productivity | Maintenance

Monitoring and modifying the servo data of up to 50 monitoring items successively during operation is possible. The operation status of servo amplifiers and servo motors (including partner products) acquired via SSCNET III/H is transferred to the host system or to the GOT screen created by a customer, and are displayed.

Host system

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

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

(Note): Available only with RD77GF

Master-slave Operation Function

RD77MS
FX5SSC

Productivity

More than two 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.

Master axis
Speed control

Slave axis
Torque control

Slave axis
Torque control

Slave axis
Torque control

SSCNETⅢ/H
SERVO SYSTEM CONTROLLER NETWORK

Slave axis
Torque control

Master axis
Speed control
Position control

Multi-axis Adjustment Function

RD77MS

Quality   Maintenance
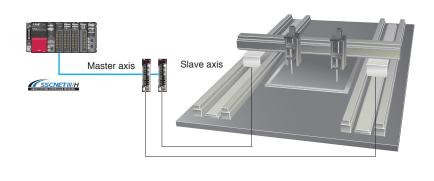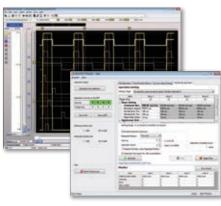
The multi-axis adjustment function enables simpler servo adjustment and quicker startup for machines executing multi-axis simultaneous operation, such as a tandem configuration.
● Multi-axis simultaneous JOG operation by specifying speed and acceleration/deceleration time
● Multi-axis simultaneous positioning
● Multi-axis simultaneous tuning by the same settings

SSCNETⅢ/H
SERVO SYSTEM CONTROLLER NETWORK

Master axis   Slave axis

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Functional Safety

Productivity   Quality
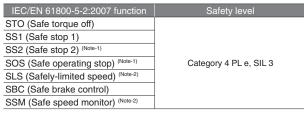
Achieving Category 4 PL e, SIL 3

■By wiring to MR-D30 functional safety unit

RD77GF   RD77MS   FX5SSC
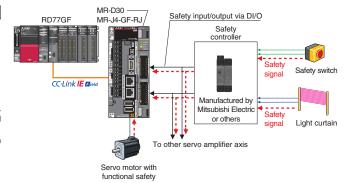
Category 4 PL e, SIL 3 is achieved when the safety signals are inputted directly to MR-D30 functional safety unit [Note-3].
The safety observation function is operated on the MR-D30 by parameter setting, and therefore expansion of the safety observation function is possible independent of controllers.

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

(Note-1): SS2 and SOS are achievable with the use of the servo motor with functional safety.
(Note-2): The safety level would be Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.
(Note-3): Use MR-D30 with software version A1 or later.

■By CC-Link IE Field Network   Available soon
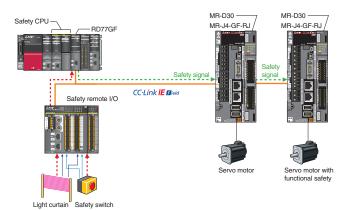
RD77GF

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)	
SS1 (Safe stop 1)	
SS2 (Safe stop 2) [Note-1]	
SOS (Safe operating stop) [Note-1]	Category 4 PL e, SIL 3
SLS (Safely-limited speed) [Note-2]	
SBC (Safe brake control)	
SSM (Safe speed monitor) [Note-2]	

(Note-1): SS2 and SOS are achievable with the use of the servo motor with functional safety.
(Note-2): The safety level would be Category 3 PL d, SIL 2 when the servo motor with functional safety is not used.
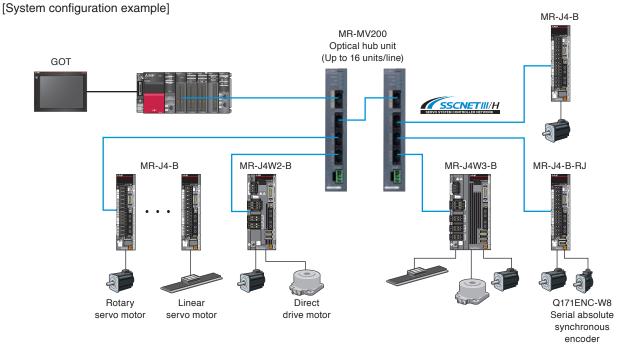
Distribution by the Optical Hub Unit

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]

GOT

MR-MV200
Optical hub unit
(Up to 16 units/line)

MR-J4-B

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MR-J4-B   MR-J4W2-B   MR-J4W3-B   MR-J4-B-RJ

Rotary
servo motor

Linear
servo motor

Direct
drive motor

Q171ENC-W8
Serial absolute
synchronous
encoder

(Note): Be sure to confirm that "SSCNET III/H" is selected in the system setting when introducing the optical hub unit.

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Various Functions

RD77GF RD77M5 FX5SSC Productivity

JOG operation

While the JOG start signal is ON, the workpiece moves in the designated direction.
JOG operation can be used 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 instructions 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 will be unnecessary to carry out 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 carries out 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.

MEMO

Specifications

■ 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) (Note-1)									
Control modes		Positioning control, Trajectory control (Linear, arc, and helical), Speed control, Speed-torque control, Tightening & Press-fit control (Note-2)									
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 (Note-3)				Proximity dog method, Count method 1, Count method 2, Data set method, Scale home position signal detection method, Driver home position return (Note-3)					
	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) (Note-4) (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, Start No. for a current value changing									
	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)									
		Link device				Via internal interface					
Expansion control	Speed-torque	Speed control without positioning loops, Torque control, Tightening & press-fit control (Note-2)									
Absolute position system		Made compatible by setting a battery to 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)					
		(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									
	Hardware stroke limit	Provided									
Functions that change control details	Speed change	Provided									
	Override	0 to 300 [%]								1 to 300 [%]	
	Acceleration/deceleration time change	Provided									
	Torque change	Provided									
	Target position change	Target position address and speed are changeable									
Other functions	M-code output	WITH mode/AFTER mode									
	Step function	Deceleration unit step, Data No. unit step									
	Skip function	Via PLC CPU, Via external command signal									
	Teaching function	Provided									
Parameter initialization function		Provided									
External input signal setting function	Internal interface	—				Provided				—	
	Via CPU (buffer memory)	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 (Note-5)	Up to 16 points (Note-5)			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 (Note-6)	Bit data	16CH									
	Word data	16CH									

(Note-1): Available only with RD77GF and RD77MS
(Note-2): Available only with RD77MS and FX5-40SSC-S/FX5-80SSC-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	2 modules/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		3 M bytes				256k bytes				128k bytes	64k bytes
	Cam working area		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	—	
		Stroke ratio	–214.7483648 to 214.7483647 [%]									
	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^2)			
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^2)			
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	R04CPU, R08CPU, R16CPU, R32CPU, R120CPU R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU R08PCPU, R16PCPU, R32PCPU, R120PCPU R08SFCPU-SET, R16SFCPU-SET, R32SFCPU-SET, R120SFCPU-SET R12CCPU-V

(Note): 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 (Note-1))			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 mm²)	
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 mm²)	
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	
		Cable length	Up to 30 m (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	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

(Note): Refer to "MELSEC iQ-R Module Configuration Manual" for details.

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	R04CPU, R08CPU, R16CPU, R32CPU, R120CPU R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, R120ENCPU R08PCPU, R16PCPU, R32PCPU, R120PCPU R08SFCPU-SET, R16SFCPU-SET, R32SFCPU-SET, R120SFCPU-SET

(Note): 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 (Note-1) (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 (Note-2)	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: • IEEE802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)
	Connector	RJ-45 connector with shield

Optical hub unit MR-MV200
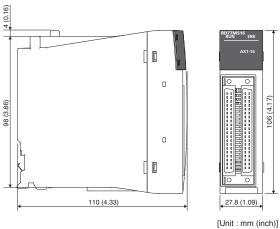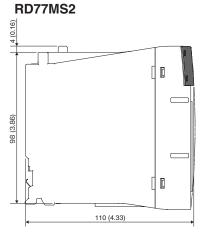
Item		Specifications
		MR-MV200
Input power supply	Input voltage [V]	21.6 to 26.4 V DC (24 V DC±10%)
	Input current [A]	0.2
Consumption power [W]		4.8
Mass [kg]		0.2
Mounting method		Directly mounted to the control panel or with DIN rail
Cable length [m(ft.)]		Up to 100 (328.08)
Number of optical hub units		Up to 16 units/line
Number of servo amplifiers (Note-1)		Up to 16 axes/line
Exterior dimensions [mm(inch)]		168.0 (6.61) (H) × 30.0 (1.18) (W) × 100.0 (3.94) (D)
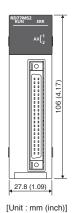
(Note-1): MR-J4-B, MR-J4W2-B, and MR-J4W3-B are 1-axis, 2-axis and 3-axis amplifiers, respectively.

■ Exterior Dimensions

RD77MS16/RD77MS8/RD77MS4

[Unit : mm (inch)]

RD77MS2

[Unit : mm (inch)]
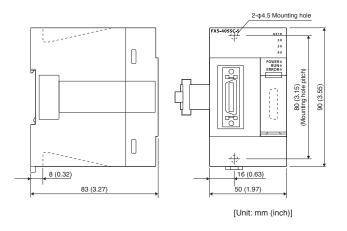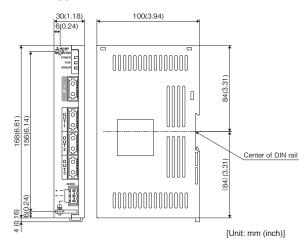
RD77GF32/RD77G16/RD77GF8/RD77GF4

[Unit: mm (inch)]

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

[Unit: mm (inch)]

MR-MV200

[Unit: mm (inch)]
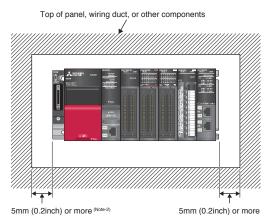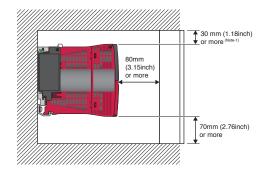
■Mounting
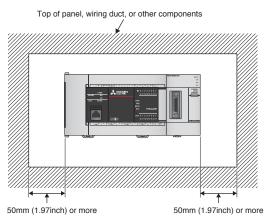
RD77MS16/RD77MS8/RD77MS4/RD77MS2
RD77GF32/RD77GF16/RD77GF8/RD77GF4
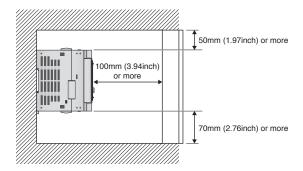
Top of panel, wiring duct, or other components

30 mm (1.18inch) or more (Note-1)

80mm (3.15inch) or more

70mm (2.76inch) or more

5mm (0.2inch) or more (Note-2)

5mm (0.2inch) or more

(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

50mm (1.97inch) or more

100mm (3.94inch) or more

70mm (2.76inch) or more

50mm (1.97inch) or more

50mm (1.97inch) or more

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■ Components

Simple Motion module

Part	Model	Description			Standards
Simple Motion module	RD77MS16 (Note-1)	Up to 16 axes			CE, UL, KC, EAC
	RD77MS8 (Note-1)	Up to 8 axes			CE, UL, KC, EAC
	RD77MS4 (Note-1)	Up to 4 axes			CE, UL, KC, EAC
	RD77MS2 (Note-1)	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 (Note-2)	MR-J3BUS_M	• Simple Motion module⇔Servo amplifier • Servo amplifier⇔Servo amplifier	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 (Note-3)		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 (Note-4)	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.
        [Sales office] FA PRODUCT DIVISION mail: osb.webmaster@melsc.jp
(Note-4): Use this connector set for FX5-40SSC-S/FX5-80SSC-S.

■ Products on the market

Manual pulse generator on the market
Mitsubishi Electric has confirmed the operation of the following manual pulse generators. Contact each 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		Note
Ethernet cable	For indoor	SC-E5EW-S_M	_: cable length (100 m max., unit of 1 m)	Double shielded cable (Category 5e)
	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)	

For details, contact Mitsubishi Electric System & Service Co., Ltd.
[Sales office] FA PRODUCT DIVISION mail: osb.webmaster@melsc.jp

MEMO

Motion Controllers

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

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

| 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)

| Packing machines | Alignment systems | Converting machines | Simple industrial robots |
| Advanced Sync. / Mark Detection | Vision | Speed-Torque / Advanced Sync. / Energy Saving | Machine control |

| Tandem configuration | Printing machines | Screw tightening machines | Pressing machines |
| Advanced Sync. / Tandem operation | Speed-Torque / Advanced Sync. | Tightening & Press-fit | Driver Communication / Master-slave |

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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.
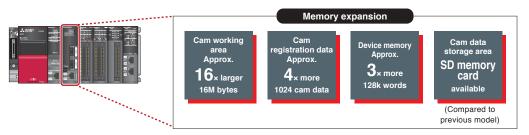
Multiple CPU system

PLC CPU

Sequence program

CPU buffer memory

Direct data reflection

CPU buffer memory

CPU buffer memory (fixed-cycle)

4 times faster data exchange cycle

Motion CPU

Motion SFC program

START
F10
K100
G10
END

Advanced synchronous/cam controls

CPU buffer memory (fixed-cycle)

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. SD card is also available for storing cam data.
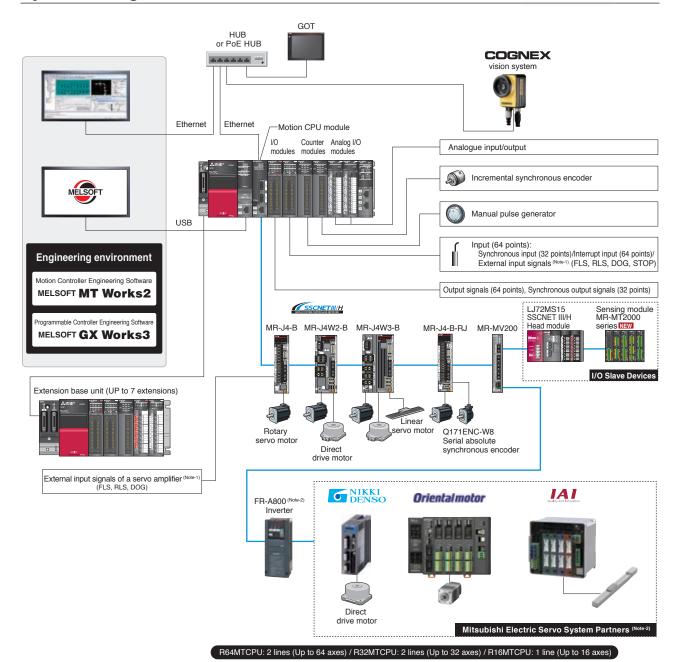
Memory expansion

Cam working area Approx.	Cam registration data Approx.	Device memory Approx.	Cam data storage area
$16_{×}$ larger 16M bytes	$4_{×}$ more 1024 cam data	$3_{×}$ more 128k words	SD memory card available

(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

- HUB or PoE HUB
- GOT
- COGNEX vision system
- Ethernet
- Ethernet
- Motion CPU module
- I/O modules
- Counter modules
- Analog I/O modules
- Analogue input/output
- Incremental synchronous encoder
- USB
- Manual pulse generator
- Input (64 points): Synchronous input (32 points)/Interrupt input (64 points)/ External input signals (Note-1) (FLS, RLS, DOG, STOP)
- Output signals (64 points), Synchronous output signals (32 points)

Engineering environment

Motion Controller Engineering Software
MELSOFT MT Works2

Programmable Controller Engineering Software
MELSOFT GX Works3

- SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK
- MR-J4-B
- MR-J4W2-B
- MR-J4W3-B
- MR-J4-B-RJ
- MR-MV200
- LJ72MS15 SSCNET III/H Head module
- Sensing module MR-MT2000 series NEW
- **I/O Slave Devices**

- Extension base unit (UP to 7 extensions)
- Rotary servo motor
- Direct drive motor
- Linear servo motor
- Q171ENC-W8 Serial absolute synchronous encoder

- External input signals of a servo amplifier (Note-1) (FLS, RLS, DOG)

- FR-A800 (Note-2) Inverter
- NIKKI DENSO
- Oriental motor
- IAI Quality and Innovation
- Direct drive motor
- **Mitsubishi Electric Servo System Partners (Note-2)**

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

(Note-1): An input destination of external input signals (FLS, RLS, DOG) is changed by parameters.
(Note-2): When using a partner product or the inverter FR-A800, use one whose version supports the Motion controller. (Refer to MELSEC iQ-R Motion Controller User's Manual.)

Motion SFC Program

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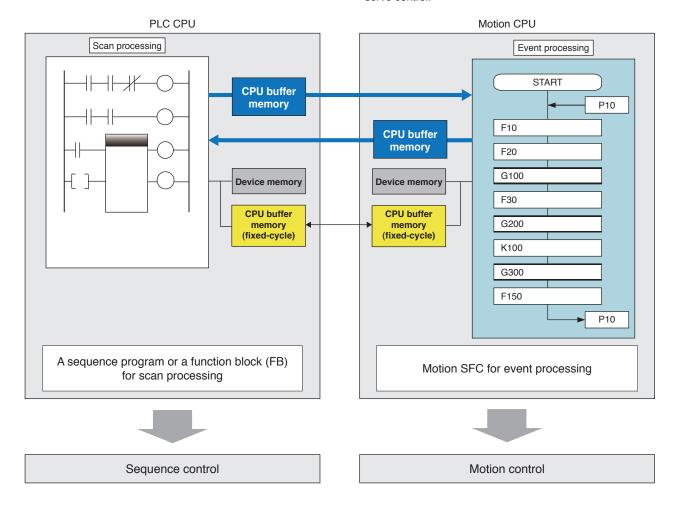
The Motion SFC format program is suitable for event processing and allows the Motion CPU to perform batch control of multiple sequential machine operations, pursuing high event responsiveness.

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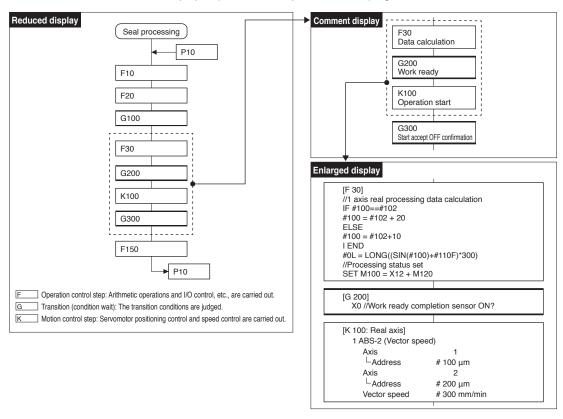
- Servo control, I/O control, and operation commands can be combined in the Motion SFC program.
- Motion SFC program can execute servo control by itself, eliminating the need of creating the sequence program for servo control.

PLC CPU

Scan processing

CPU buffer memory

CPU buffer memory

Device memory

CPU buffer memory (fixed-cycle)

A sequence program or a function block (FB) for scan processing

Sequence control

Motion CPU

Event processing

START

P10

F10

F20

G100

F30

G200

K100

G300

F150

P10

Device memory

CPU buffer memory (fixed-cycle)

Motion SFC for event processing

Motion control

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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.

Reduced display

Seal processing

P10

F10

F20

G100

F30

G200

K100

G300

F150

P10

F	Operation control step: Arithmetic operations and I/O control, etc., are carried out.
G	Transition (condition wait): The transition conditions are judged.
K	Motion control step: Servomotor positioning control and speed control are carried out.

Comment display

F30
Data calculation

G200
Work ready

K100
Operation start

G300
Start accept OFF confirmation

Enlarged display

[F 30]
//1 axis real processing data calculation
IF #100==#102
#100 = #102 + 20
ELSE
#100 = #102+10
I END
#0L = LONG((SIN(#100)+#110F)*300)
//Processing status set
SET M100 = X12 + M120

[G 200]
　　X0 //Work ready completion sensor ON?

[K 100: Real axis]
　　1 ABS-2 (Vector speed)
　　　　Axis　　　　　　　　　1
　　　　　└Address　　　　　# 100 μm
　　　　Axis　　　　　　　　　2
　　　　　└Address　　　　　# 200 μm
　　　　Vector speed　　　　# 300 mm/min

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

```
X0
 ┤├───────────────────────────[ PLS   M100 ]
M100
 ┤├───────────────────────────[ SET   M101 ]
M101   U3E1\G516.0
 ┤├────────┤/├──────[ MP.SVST  H3E1 "J1" K11 ]
                     ───────────[ RST   M101 ]
                     ───────────[ SET   M102 ]
M102   U3E1\G516.1
 ┤├────────┤/├──────[ MP.SVST  H3E1 "J2" K12 ]
                     ───────────[ RST   M102 ]
                     ───────────[ SET   M103 ]
M103   U3E1\G516.1
 ┤├────────┤/├──────────────────[ SET   Y8 ]
                     ───────────[ RST   M103 ]
```

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

21: Work piece movement control

[G 1]
X0 // Waiting for Start (X0) ON

[K 11]
1 INC
Axis　　　　　　　　　　　1
　　Movement amount　　#200 μm
Speed　　　　　　　　　#202 mm/min

[G 2]
X1 // Waiting for completion (X1) ON

[K 12]
1 INC
Axis　　　　　　　　　　　2
　　Movement amount　　#204 μm
Speed　　　　　　　　　#206 mm/min

[G 2]
X2 // Waiting for completion (X2) ON

[F 1]
SET Y8 // Completion signal (Y8) ON

END

Positioning Control

Productivity

A variety of positioning controls, such as PTP control, position follow-up, and continuous trajectory control are available with the Motion controller.
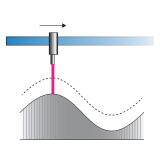
Basic positioning control
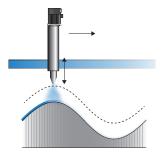
- To respond to various applications, the Motion controller offers various control methods such as PTP control, speed control, speed-position switching control, continuous trajectory control, position follow-up control, Speed control with fixed position stop, and high-speed oscillation control, etc.
- 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.
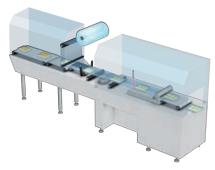
Based on the measurement result, calculate the distance between the spraying nozzle and the workpiece. Set the data to the specified device memory for the position follow-up.

Outline

Simple Motion

Motion Controllers

Engineering Environment

Networks

Servo Amplifiers

Advanced Synchronous Control

Productivity   Engineering

The advanced synchronous control can be achieved using software instead of controlling mechanically with physical gears, shafts, clutches, speed change gears or cams etc. Additionally, a cam is easily created with the 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.
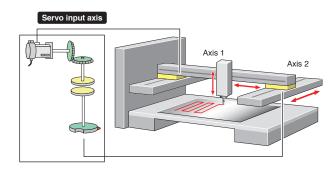
All axes are synchronized using a synchronous encoder axis or a servo input axis.

Application examples

・ Packing machines
・ Printing machines
・ Diaper manufacturing machines
・ Tire molder
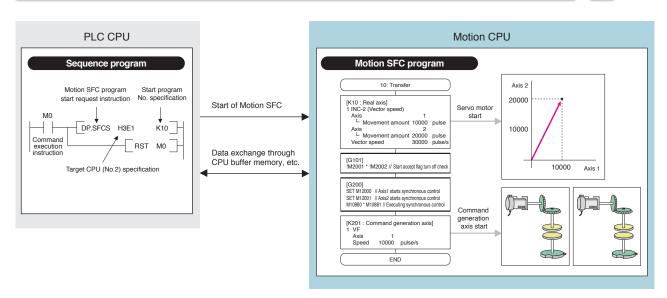
Only two axes are in synchronization. Axis 2 is set as to synchronize to axis 1. The other axes are in positioning control.

Application example

・ Tandem configuration

Control flow

Engineering
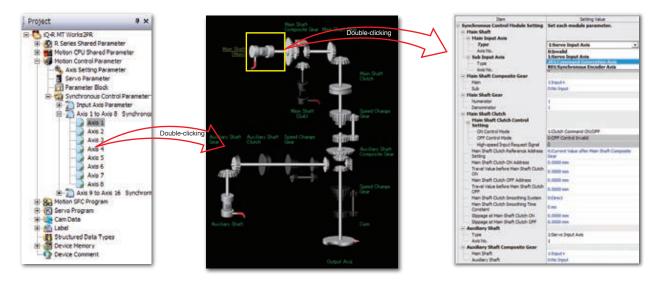
Synchronous control parameters
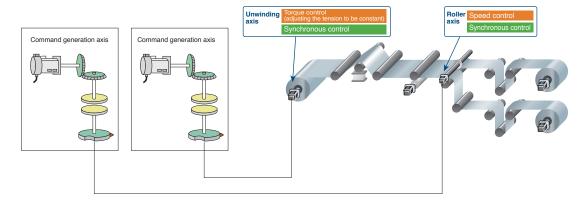
● The synchronous control is easily executed just by setting parameters.
● One of the following three can be set as the input axis: Synchronous encoder axis, Command generation axis, or Servo input axis.
● "Command generation axis" is not counted as a control axis; therefore all the control axes can 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.

Double-clicking

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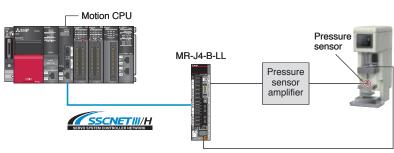
With the Motion controller, the corresponding output axis in the advanced synchronous control can perform the speed-torque control simultaneously. This control can be applied to unwinding/rewinding equipment, which needs synchronized operation.

Command generation axis

Command generation axis

Unwinding axis — Torque control (adjusting the tension to be constant) / Synchronous control

Roller axis — Speed control / Synchronous control

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Advanced Pressure Control

Productivity

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.

Motion CPU

MR-J4-B-LL

Pressure sensor amplifier

Pressure sensor

SSCNETIII/H
SERVO SYSTEM CONTROLLER NETWORK
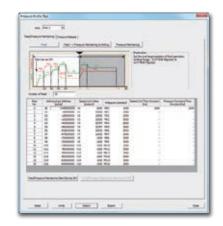
Application examples

• 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

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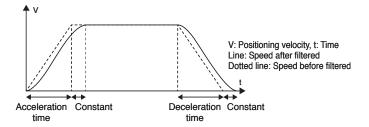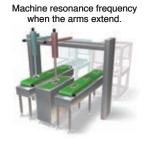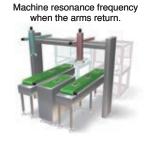
The filter function is used to suppress the vibration at the end of the workpiece and the machine frame vibration during positioning control. This filter is effective even for low-frequency vibration that cannot be suppressed by the machine resonance suppression filter or for when the frequency changes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

V

V: Positioning velocity, t: Time
Line: Speed after filtered
Dotted line: Speed before filtered

t

Acceleration time   Constant   Deceleration time   Constant

For example, when the machine resonance frequency differs when 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 NEW

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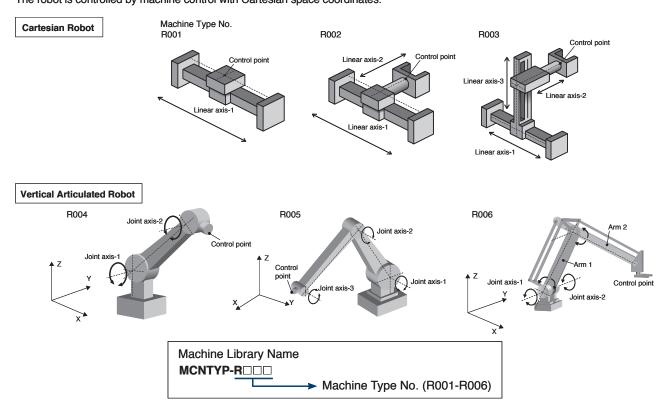
The Motion controller controls a simple industrial robot by installing an add-on library "Machine Library".
The robot is controlled by machine control with Cartesian space coordinates.

Cartesian Robot

Machine Type No.
R001

Control point

Linear axis-1

R002

Linear axis-2   Control point

Linear axis-1

R003

Control point

Linear axis-3

Linear axis-2

Linear axis-1

Vertical Articulated Robot

R004

Joint axis-2

Control point

Joint axis-1

Z
Y
X

R005

Joint axis-2

Control point

Joint axis-3

Joint axis-1

Z
X
Y

R006

Arm 2

Arm 1

Control point

Joint axis-1

Joint axis-2

Z
Y
X

Machine Library Name
MCNTYP-R□□□

Machine Type No. (R001-R006)

Direct Positioning Start Instruction (MP.SVSTD)

Engineering

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

```
M0   U3E1\G516.0
                    MP.SVSTD  H3E1  D100  W0  ""  M0
Command   Axis 1
execution  start                        RST   M0
instruction  accept
```

[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		

Outline
Simple Motion
Motion Controllers
Engineering Environment
Networks
Servo Amplifiers

Monitoring of Servo Data

Productivity Maintenance

Monitoring and modifying the servo data of up to 50 monitoring items successively during operation is possible. The operation status of servo amplifiers and servo motors (including partner products) acquired via SSCNET III/H is transferred to the host system or to the GOT screen created by a customer, and are displayed.

Host system

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

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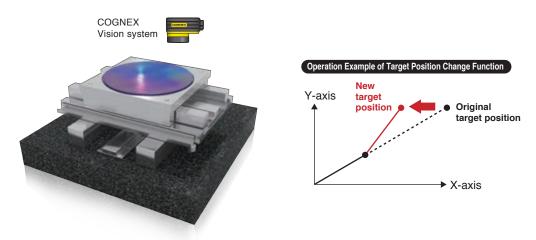
[Preventive maintenance]
Inrush relay ON/OFF number, Power ON cumulative time, Machine diagnosis information
(the estimated friction value and the estimated vibration value), etc.

Vision System

Productivity Quality

COGNEX Vision system is directly connected to the Motion CPU via Ethernet using the built-in PERIPHRAL 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

Y-axis

New
target
position

Original
target position

X-axis
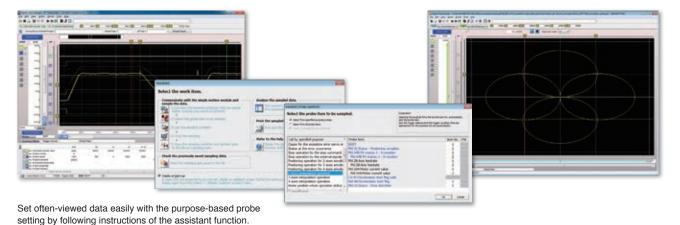
Digital Oscilloscope Function

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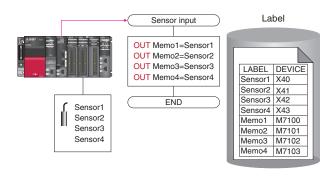
MELSOFT MT Works2 allows you to program with easy-to-understand names (labels) instead of using device names or CPU buffer memory. This programming method enables an easy program reuse and standardization of projects.

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.
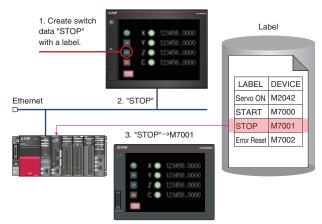
Sensor input

OUT Memo1=Sensor1
OUT Memo2=Sensor2
OUT Memo3=Sensor3
OUT Memo4=Sensor4

END

LABEL	DEVICE
Sensor1	X40
Sensor2	X41
Sensor3	X42
Sensor4	X43
Memo1	M7100
Memo2	M7101
Memo3	M7102
Memo4	M7103

Sensor1
Sensor2
Sensor3
Sensor4

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.

1. Create switch data "STOP" with a label.

Ethernet   2. "STOP"

3. "STOP"→M7001

LABEL	DEVICE
Servo ON	M2042
START	M7000
STOP	M7001
Error Reset	M7002
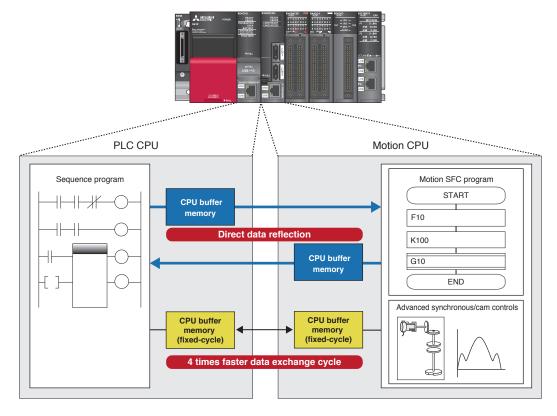
Ease of Use Achieved by a State-of-art CPU Buffer Memory

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

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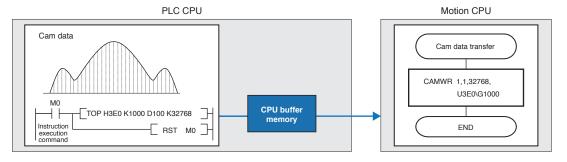
The Motion CPU and the PLC CPU are equipped with 2M words and 512k words CPU buffer memories respectively.
They allow for bulky data transmission and fast data update.
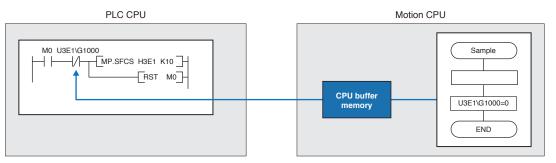
Example of using PLC CPU buffer memory

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

PLC CPU

Cam data

M0
├──┤ ├──────── TOP H3E0 K1000 D100 K32768 ──┤
Instruction
execution   RST   M0
command

CPU buffer
memory

Motion CPU

Cam data transfer

CAMWR 1,1,32768,
U3E0\G1000

END

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.

PLC CPU

M0 U3E1\G1000
├──┤ ├──┤/├──────── MP.SFCS H3E1 K10 ──┤
                       RST   M0

CPU buffer
memory

Motion CPU

Sample

U3E1\G1000=0

END

CPU buffer memory (Fixed-cycle communication area)

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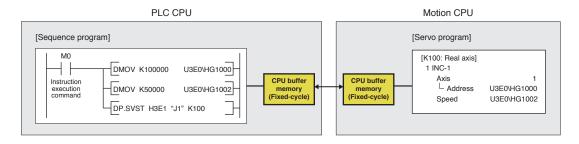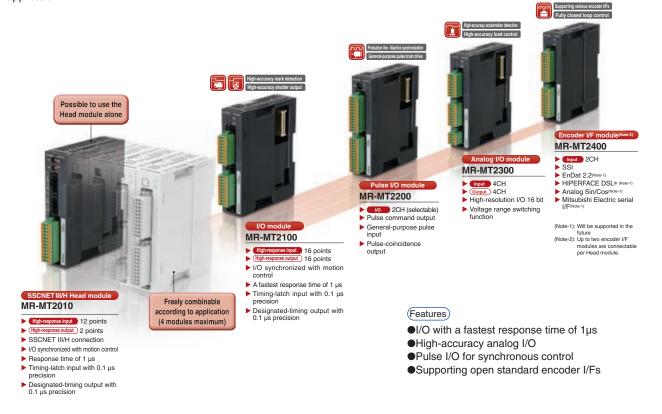
Data can be transmitted every 0.222 ms between the PLC CPU and the Motion CPU. The CPU buffer memories (fixed-cycle communication area) are synchronized to the Motion control, optimizing the operation.

PLC CPU

[Sequence program]

M0
├──┤ ├──────── DMOV K100000   U3E0\HG1000 ──┤
Instruction
execution   DMOV K50000   U3E0\HG1002
command
               DP.SVST H3E1 "J1" K100

CPU buffer
memory
(Fixed-cycle)

Motion CPU

[Servo program]

[K100: Real axis]
 1 INC-1
   Axis   1
   └ Address   U3E0\HG1000
   Speed   U3E0\HG1002

CPU buffer
memory
(Fixed-cycle)

Outline

Simple
Motion

Motion
Controllers

Engineering
Environment

Networks

Servo Amplifiers
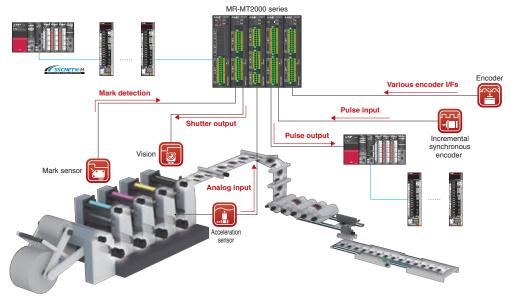
MR-MT2000 Series SSCNET III/H Sensing Module `NEW`

Productivity   Maintenance

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.

Possible to use the Head module alone

Supporting various encoder I/Fs
Fully closed loop control

High-accuracy acceleration detection
High-accuracy load control

Production line - Machine synchronization
General-purpose pulse train drive

High-accuracy mark detection
High-accuracy shutter output

Encoder I/F module(Note-2)
MR-MT2400
▶ `Input` 2CH
▶ SSI
▶ EnDat 2.2(Note-1)
▶ HIPERFACE DSL® (Note-1)
▶ Analog Sin/Cos(Note-1)
▶ Mitsubishi Electric serial I/F(Note-1)

(Note-1): Will be supported in the future
(Note-2): Up to two encoder I/F modules are connectable per Head module.

Analog I/O module
MR-MT2300
▶ `Input` 4CH
▶ `Output` 4CH
▶ High-resolution I/O 16 bit
▶ Voltage range switching function

Pulse I/O module
MR-MT2200
▶ `I/O` 2CH (selectable)
▶ Pulse command output
▶ General-purpose pulse input
▶ Pulse-coincidence 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 μs
▶ Timing-latch input with 0.1 μs precision
▶ Designated-timing output with 0.1 μs precision

Freely combinable according to application (4 modules maximum)

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
▶ Designated-timing output with 0.1 μs precision

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

Application example

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.

MR-MT2000 series

SSCNET III/H

Various encoder I/Fs   Encoder

Mark detection

Shutter output

Pulse input

Pulse output   Incremental synchronous encoder

Mark sensor

Vision

Analog input

Acceleration sensor
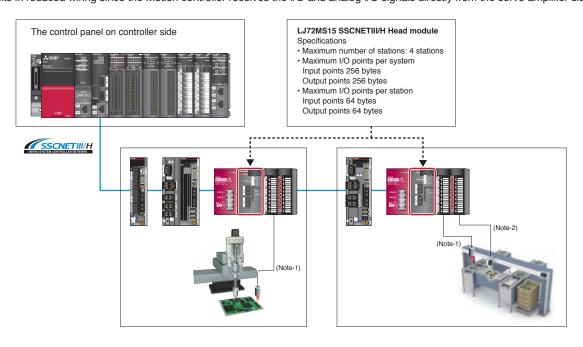
[Application example in printing processes]

LJ72MS15 SSCNET III/H Head Module

Productivity

The SSCNET III/H Head module allows the controller to connect remotely with various modules (I/O, analog, high-speed counter, etc.) via SSCNET III/H. Those remotely connected modules serve as the Motion CPU remote stations, transmitting the input/output. This results in reduced wiring since the Motion controller receives the I/O and analog I/O signals directly from the servo amplifier side.

The control panel on controller side

LJ72MS15 SSCNETIII/H Head module
Specifications
• Maximum number of stations: 4 stations
• Maximum I/O points per system
  Input points 256 bytes
  Output points 256 bytes
• Maximum I/O points per station
  Input points 64 bytes
  Output points 64 bytes

(Note-2)
(Note-1)
(Note-1)

(Note-1): Sensor input/output signals for inspection devices, etc. can be read/written via the Head module.
(Note-2): Outputs the hand open/close signals.

SSCNET III/H Field Devices

Productivity   **Maintenance**

SSCNET III/H field devices include the sensing module MR-MT2000 series and the MELSEC-L series SSCNET III/H head module.
The sensing module MR-MT2000 series increase speed and accuracy of equipment by using high-response I/O synchronized with a motion control cycle.
The MELSEC-L series SSCNET III/H head module is suitable for equipment with many I/O points because various modules of a programmable controller can be connected to the MELSEC-L series SSCNET III/H head module.
Different types of field devices are prepared and selectable according to customer's needs.

Name	Sensing module	MELSEC-L series SSCNET III/H head module
Module		
Connection method	SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK	SSCNET III/H SERVO SYSTEM CONTROLLER NETWORK

Features	• High-response I/O
	  Mark sensor
	  Acceleration sensor
	  Shutter output, etc.
	• Synchronization with motion control cycle
		• Connection with various modules
		  I/O module
		  Analog module
		  Temperature input module, etc.

Outline

Simple Motion

Motion Controllers

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Servo Amplifiers

External Input of Motion CPU

Productivity **Maintenance**
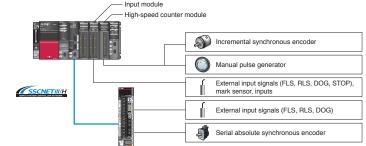
The Motion modules, previously required for the MELSEC-Q series system, are no longer needed since the functionality of those MELSEC-Q series Motion modules has been integrated into the MELSEC iQ-R series PLC CPU input modules.
For example, external signals are inputted via the PLC CPU input module, 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.
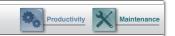
- External input signals of the servo amplifier (FLS, RLS, DOG, STOP) are inputted via the PLC CPU input module or a servo amplifier.
- Pulses of the incremental synchronous encoder are inputted via the high-speed counter module.
- Pulses of the serial absolute encoder are inputted via MR-J4-B-RJ servo amplifier.

Input module
High-speed counter module

SSCNETⅢ/H
SERVO SYSTEM CONTROLLER NETWORK

| Incremental synchronous encoder |
| Manual pulse generator |
| External input signals (FLS, RLS, DOG, STOP), mark sensor, inputs |
| External input signals (FLS, RLS, DOG) |
| Serial absolute synchronous encoder |

SD Memory Card

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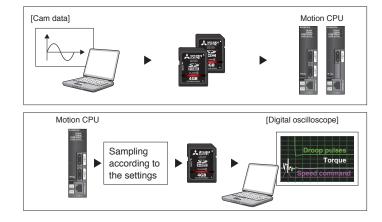
Bulky data such as cam data or digital oscilloscope data can be stored in a SD memory card, significantly expanding the capacity of the Motion CPU built-in memory.

- Data that is created on MELSOFT MT Works2 can be used by multiple Motion CPUs by saving it to a SD memory card.

[Cam data]   Motion CPU

- The digital oscilloscope data that is sampled automatically by a Motion CPU can be saved on a SD memory card. For example, when an error occurs, the data is sampled automatically. You can check the data later on a personal computer.

Motion CPU   [Digital oscilloscope]

Sampling according to the settings

Droop pulses
Torque
Speed command
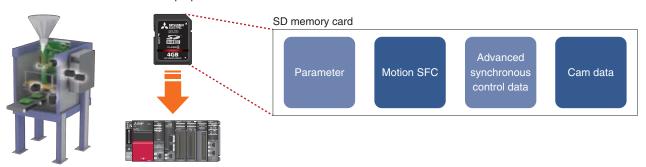
Boot operation with a SD memory card

Productivity **Maintenance**

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

SD memory card

| Parameter | Motion SFC | Advanced synchronous control data | Cam data |

Various Functions

Productivity

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 make up 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): Contact your local Mitsubishi Electric office for the add-on library.

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 tact 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.

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■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		
Servo program capacity		32k 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 (Note-1)		
	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		
	Current value change	Provided		
Manual control	JOG operation	Provided		
	Manual pulse generator	Possible to connect 3 modules (with use of the high-speed counter), Unit magnification (1 to 10000 times)		
Expansion control	Speed-torque	Speed control without positioning loops, Torque control, Tightening & press-fit control		
Absolute position system		Made compatible by setting a battery to 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 (Note-2) + 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		
	Hardware stroke limit	Provided		
Functions that change control details	Speed change	Provided		
	Acceleration/deceleration time change	Provided		
	Torque change	Provided		
	Target position change	Target position address is changeable		
Other functions	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		Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode		
	Mark detection signal	High-speed input request (Bit device, Input signals of servo amplifiers (DI1 to DI3))		
	Mark detection setting	64		
Optional data monitor function		Up to 14 data/axis (Communication data: Up to 6 points/axis)		
Driver communication function (Note-3)		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)		
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 home position return method set in a driver (a servo amplifier) is used.
(Note-2): Available with MR-J4-_B-RJ
(Note-3): 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		
	Descriptive expression — Operation control program	Calculation expression, Bit conditional expression, Branches/repetition processing		
	Descriptive expression — Transition program	Calculation expression, Bit conditional expression, Comparison conditional expression		
Execute specification	Number of multi executed programs	Up to 512		
	Number of multi active steps	Up to 1024 steps per all programs		
	Executed task — Normal task	Executed in Motion main cycle		
	Executed task — Event task (Execution can be masked.) — Fixed cycle	Executed in fixed cycle (0.222 ms, 0.444 ms, 0.888 ms, 1.777 ms, 3.555 ms, 7.111 ms, 14.222 ms)		
	Executed task — Event task (Execution can be masked.) — External interrupt	Executes when the input set to the event task factor in the input module controlled by the Motion CPU (16 points) turns ON.		
	Executed task — Event task (Execution can be masked.) — PLC interrupt	Executed with interrupt instruction (D(P).GINT, M(P).GINT) from PLC CPU		
	Executed task — NMI task	Executes when the input set to the NMI task factor in the input module controlled by the Motion CPU (16 points) turns ON.		
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		
	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		

■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)		

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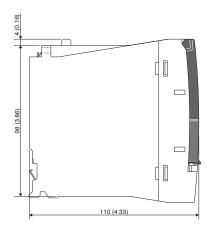
Sensing module MR-MT2000 series

Name	Item			Specification
SSCNETIII/H Head module MR-MT2010	Control circuit power supply input	Voltage		24 V DC
		Permissible voltage fluctuation		24 V DC ± 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 µs/OFF to ON: within 1 µs
	DO	Number of output points		2 points
		Output method		Sink output (photocoupler isolation)
		Output response time		ON to OFF: within 1 µs/OFF to ON: within 1 µs
	Mass [kg]			0.2
I/O module MR-MT2100	DI	Number of input points		16 points [Note-1]
		Input method		Sink input/source input (photocoupler isolation)
		Input response time		ON to OFF: within 1 µs/OFF to ON: within 1 µs
	DO	Number of output points		16 points [Note-1]
		Output method		Sink output/source output (photocoupler isolation)
		Output response time	Sink output	ON to OFF: within 1 µs/OFF to ON: within 1 µs
			Source output	ON to OFF: within 2 µs/OFF to ON: within 1 µs
	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) 1M pulse/s (forward/reverse rotation pulse train, signed pulse train)
			Open collector output	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)
		Input method		Sink input/source input (photocoupler isolation)
	DO	Number of output points		5 points per axis (total of 10 points) [Note-2]
		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		± 10 V range: 0.334 mV ± 5 V range: 0167 mV
		Conversion accuracy		± 0.1 % (at 25 °C)/± 0.3 % (at 0 °C to 60 °C)
	Analog output	Number of output channels		4CH
		Output voltage range		-10 to 10 V DC
		Resolution		± 10 V range: 0.319 mV
		Conversion accuracy		± 0.4 % (at 25 °C)/± 0.5 % (at 0 °C to 60 °C)
	Mass [kg]			0.2
Encoder I/F module MR-MT2400	Number of encoder channels			2CH [Note-3]
	Supported encoder communications			SSI, EnDat 2.2 [Note-4], HIPERFACE DSL® [Note-4], Analog Sin/Cos [Note-4], Mitsubishi Electric serial I/F [Note-4]
	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 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 supported in the future.
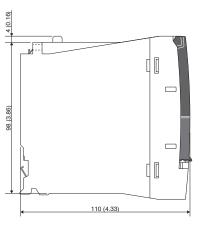
■ Exterior Dimensions

R64MTCPU/R32MTCPU

[Unit : mm (inch)]
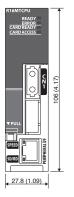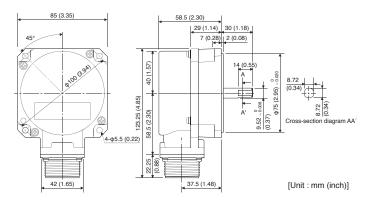
R16MTCPU

[Unit : mm (inch)]

Serial absolute synchronous encoder Q171ENC-W8

Cross-section diagram AA´

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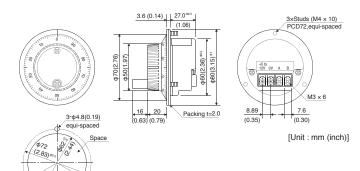
Item	Specifications
Resolution	4,194,304pulse/rev
Direction of increasing addresses	CCW (viewed from end of shaft)
Protective construction	Dustproof/Waterproof (IP67: Except for the shaft-through portion)
Permitted axial loads	Radial load: Up to 19.6N
	Thrust load: Up to 9.8N
Permitted speed	3600r/min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

Manual pulse generator MR-HDP01
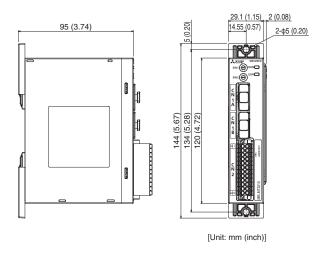
The figure of a processing disc

[Unit : mm (inch)]
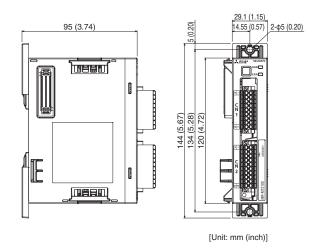
Item	Specifications
Pulse resolution	25Ppulse/rev (100pulse/rev after magnification by 4)
Phase A, Phase B Output voltage	Input voltage : -1V or more (Note)
Output method	Voltage output
Output current	Up to 20mA
Life time	1,000,000 revolutions or more (at 200r/min)
Permitted axial loads	Radial load: 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.
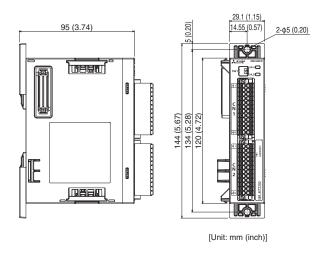
SSCNET III/H Head module MR-MT2010
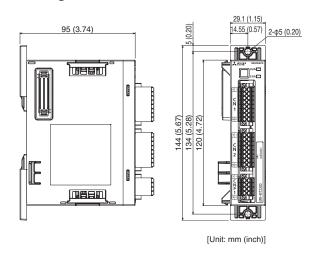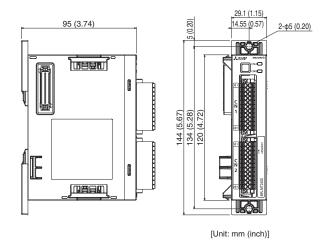
95 (3.74)

29.1 (1.15) 2 (0.08)
14.55 (0.57)
2-φ5 (0.20)
5 (0.20)

144 (5.67)
134 (5.28)
120 (4.72)

[Unit: mm (inch)]

I/O module MR-MT2100

95 (3.74)

29.1 (1.15)
14.55 (0.57) 2-φ5 (0.20)
5 (0.20)

144 (5.67)
134 (5.28)
120 (4.72)

[Unit: mm (inch)]

Pulse I/O module MR-MT2200

95 (3.74)

29.1 (1.15)
14.55 (0.57) 2-φ5 (0.20)
5 (0.20)

144 (5.67)
134 (5.28)
120 (4.72)

[Unit: mm (inch)]

Analog I/O module MR-MT2300

95 (3.74)

29.1 (1.15)
14.55 (0.57) 2-φ5 (0.20)
5 (0.20)

144 (5.67)
134 (5.28)
120 (4.72)

[Unit: mm (inch)]

Encoder I/F module MR-MT2400

95 (3.74)

29.1 (1.15)
14.55 (0.57) 2-φ5 (0.20)
5 (0.20)

144 (5.67)
134 (5.28)
120 (4.72)

[Unit: mm (inch)]
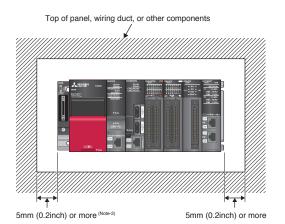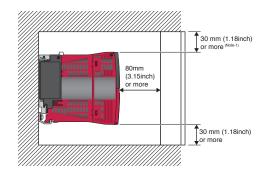
■Mounting

R64MTCPU/R32MTCPU/R16MTCPU

Top of panel, wiring duct, or other components

30 mm (1.18inch) or more (Note-1)

80mm (3.15inch) or more

30 mm (1.18inch) or more

5mm (0.2inch) or more (Note-2)

5mm (0.2inch) or more

(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.

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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 (Note-1)	MR-J3BUS_M	• Motion CPU module⇔Servo amplifier • Servo amplifier⇔Servo amplifier	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 (Note-2)		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.
[Sales office] FA PRODUCT DIVISION mail: osb.webmaster@melsc.jp

Sensing module MR-MT2000 series

Part	Model	Description	Standards
SSCNET III/H Head module	MR-MT2010	SSCNET III/H communications, input: 12points, 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

[Manual pulse generator on the market]
Mitsubishi Electric has confirmed the operation of the following manual pulse generators. Contact each 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	R04CPU, R08CPU, R16CPU, R32CPU, R120CPU, R08PCPU, R16PCPU, R32PCPU, R120PCPU R12CCPU-V

(Note): 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 Mitsubishi Electric office.

MEMO

MEMO

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

Motion Controller Engineering Software
MELSOFT MT Works2

Comprehensibly 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 **MELSOFT MT Works2**
Programmable Controller Engineering Software **MELSOFT GX Works3**

iQ Platform   MELSOFT
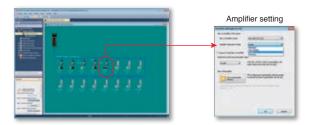
System Design

■System configuration

`MT Works2` `GX Works3`

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

Amplifier setting

■Module configuration

`GX Works3`

Each parameter is set from the module configuration screen.
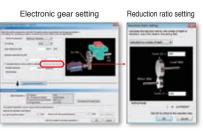
■Servo data setting

`MT Works2` `GX Works3`

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.

Electronic gear setting   Reduction ratio setting

■CC-Link IE configuration

`GX Works3`

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

Programming

■Positioning data setting `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`

The MELSOFT GX Works3 can simulate the program on a personal computer 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`
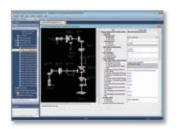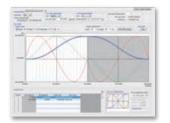
Various cam patterns are created more freely and flexibly.

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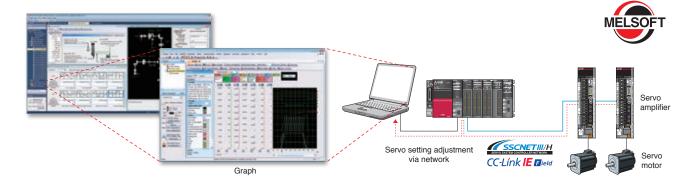
The multi-axis adjustment function enables easy servo adjustment and quick startup for machines executing multi-axis simultaneous operation, such as a tandem configuration.

Startup and Adjustment of Servo Amplifier

MT Works2 | GX Works3

MELSOFT

Graph

Servo setting adjustment via network

SSCNETIII/H
SERVO SYSTEM CONTROLLER NETWORK

CC-Link IE Field

Servo amplifier

Servo motor

■Servo assistant function

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

Easy use

■Parameter setting function

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

Set without manuals.

Display details of relevant parameters in a docking window.

■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.

Click

Adjustment completed

Display adjustment results.

■Tuning function

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

Adjust gains finely.

Display adjustment results.

■Alarm display

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

10.1

Select the most suitable motor for your machine

Capacity selection software **MRZJW3-MOTSZ111E**

Select the most suitable servo amplifier, servo motor, 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.

iQ Platform

MELSOFT
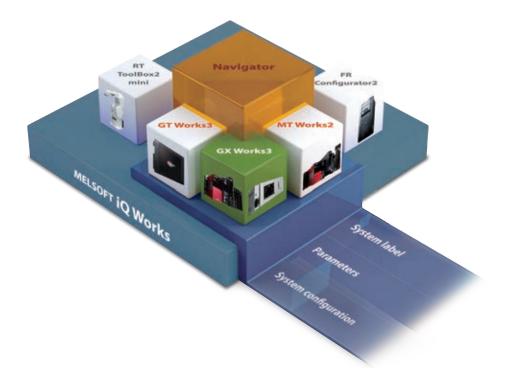
FA Integrated Engineering Software **MELSOFT iQ Works**

MELSOFT iQ Works is an integrated software suite consisting of GX Works3, MT Works2, GT Works3, RT ToolBox2 mini and FR Configurator2, 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.

Robot engineering software
MELSOFT RT ToolBox2 mini

This robot setup software supports various steps from programming, to commissioning, evaluation, and maintenance. In addition, improved preventative maintenance is realized through the use of an integrated 3D robot simulator.

Inverter setup software
MELSOFT FR Configurator2

This software simplifies the setup and maintenance of AC Inverters. Parameters can be registered easily and distributed to multiple inverters when replacing, and activation of the PLC function all from one setup screen.

■Operating environment
MELSOFT MT Works2

Item	Description
OS	Microsoft® Windows® 10 (Home, Pro, Enterprise, Education) (64bit/32bit) 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 Service Pack3 (Professional, Home Edition) (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 32-bit edition: 1GB or more recommended For 64-bit edition: 2GB or more recommended
Available hard disk capacity	When installing MT Developer2: HDD available capacity is 3GB or more. When operating MT Developer2: Virtual memory available capacity is 512MB or more.
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 × 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) (64bit/32bit) 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 Service Pack3 (Professional, Home Edition) (32bit)
CPU	Intel® Core™2 Duo Processor 2 GHz or more recommended
Required memory	For 32-bit edition: 1GB or more recommended For 64-bit edition: 2GB or more recommended
Available hard disk capacity	When installing MELSOFT GX Works3: HDD available capacity is 5GB or more.
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 × 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 (Note-1) • 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.

MEMO

All-in-One Network
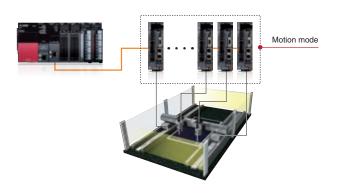
CC-Link IE Field Network is a single network which combines the versatility of Ethernet and highly accurate synchronous operation for Motion control. With the single network, various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules, are connected with no restriction.

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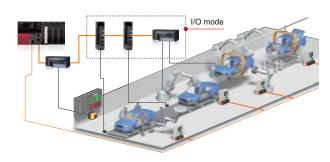
Various tasks, such as Simple Motion parameter settings, servo adjustment, and debugging as well as creating a sequence program, such as a function block (FB), are performed only with this All-in-One engineering software.

Synchronous control up to μsec precision with Motion mode

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
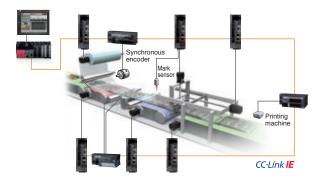
I/O mode easily drives a belt conveyor, a rotary table, a ball screw mechanism, etc. by using the built-in positioning function in a servo amplifier.
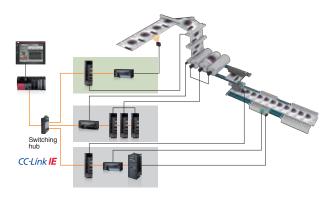
Seamless integration of Mitsubishi Electric Servo System into CC-Link IE Field brings vast possibilities to the world of Industrial Automation.

Synchronization of inputs and outputs with servo control

Synchronous encoder

Mark sensor

Printing machine

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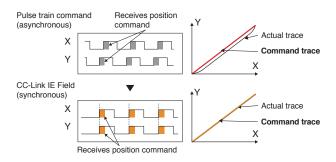
Various data, such as synchronous encoder values, sheet tension values, and text data, are inputted and outputted in accordance with the servo command communication cycle, enabling a wide range of Motion control applications.

Flexible network topology

Switching hub

CC-Link IE

Star, line, and star/line mixed topologies are available for a network configuration with a switching hub. An easy topology created only by a cable being connected to a free port of the switching hub allows field devices to be added to the system more flexibly.

Superior performance by synchronous communications

Pulse train command (asynchronous)

Receives position command

X

Y

Y

Actual trace

Command trace

X

CC-Link IE Field (synchronous)

X

Y

Y

Actual trace

Command trace

X

Receives position command

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

The blazingly fast speed
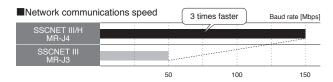
High-response System Achieved with SSCNET III/H

Three Times Faster Communications Speed `Industry-leading levels`
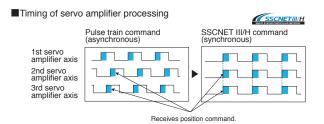
Communications speed is increased to 150 Mbps full duplex (equivalent to 300 Mbps half duplex), three times faster than the conventional speed. System response is dramatically improved.

■Network communications speed

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

Smooth control of a machine is possible using high-speed serial communications with a cycle time of 0.222 ms.
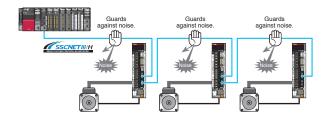
Improved noise tolerance by optical communications

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.

Synchronous Communications

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

■Timing of servo amplifier processing

Network Topology

Star, line, and star/line mixed topologies are available for a network configuration with a switching hub.

103

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

Dramatically Reduced Wiring

The SSCNET III/H Head module allows the controller to connect remotely with various modules (I/O, analog, high-speed counter, etc.) via SSCNET III/H.
This results in reduced wiring since the Motion controller receives the I/O and analog I/O signals directly from the servo amplifier side.

The control panel on controller side   The control panel on servo amplifier side

SSCNET III/H Head module
LJ72MS15
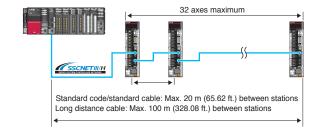
[Specifications]
・ Maximum number of stations: 4 stations
・ Maximum I/O points per system   ・ Maximum I/O points per station
　Input points　　256 bytes　　　　　　Input points　　64 bytes
　Output points　256 bytes　　　　　　Output points　64 bytes

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 × 32 axes), suitable for large-scale systems.
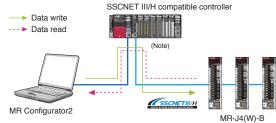
(Note): Available when all axes are connected via SSCNET III/H

32 axes maximum

Standard code/standard cable: Max. 20 m (65.62 ft.) between stations
Long distance cable: Max. 100 m (328.08 ft.) between stations

Central Control with Network

Large amounts of servo data are exchanged in real-time between the controller and the servo amplifier.
Using MELSOFT 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.

→ Data write
---→ Data read

SSCNET III/H compatible controller

(Note)

MR Configurator2

MR-J4(W)-B
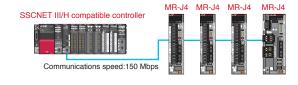
(Note): Replacing a cable is not required.
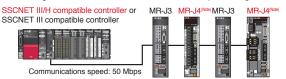
SSCNET III/H Compatible and SSCNET III Compatible Products Connected in a Same System

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

■When using MR-J4 series servo amplifiers

SSCNET III/H compatible controller   MR-J4 MR-J4 MR-J4 MR-J4

Communications speed:150 Mbps

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

SSCNET III/H compatible controller or
SSCNET III compatible controller   MR-J3 MR-J4 (Note) MR-J3 MR-J4(Note)

Communications speed: 50 Mbps

(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 advanced high-speed Motion network "SSCNET III/H", these servo amplifiers operate rotary/linear servo motors or direct drive motors as standard [Note]. 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 servo amplifier with Motion
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

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
Low-profile table type
TM-RG2M series
TM-RU2M series
Rating: 4.5 N·m and 9 N·m

TM-RFM series
Rating: 2 to 240 N·m

Machine

Industry-leading Level of Servo Amplifier Basic Performance
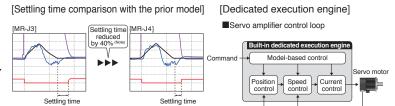
Our original high-speed servo control architecture is evolved from the conventional two-degrees-of-freedom model adaptive control and applied to the dedicated execution engine. **Speed frequency response is increased to 2.5 kHz.** Compatible servo motors are equipped with **a high-resolution absolute position encoder of 4,194,304 pulses/rev (22-bit)**, enabling high-speed and high-accuracy operation. The performance of the high-end machine is utilized to the fullest.

[Settling time comparison with the prior model]

[MR-J3]

Settling time reduced by 40% (Note)

[MR-J4]

▶▶▶

Settling time

Settling time

— Command — Torque — Droop pulses — In-position

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

[Dedicated execution engine]

■Servo amplifier control loop

Built-in dedicated execution engine

Command

Model-based control

Position control | Speed control | Current control

Servo motor
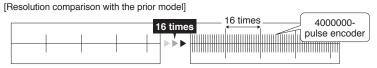
Improving Machine Performance with High-performance Servo Motors

Rotary servo motors achieve high-accuracy positioning and smooth rotation with a high-resolution encoder and improved processing speed.

[Resolution comparison with the prior model]

16 times

16 times

4000000-pulse encoder

▶▶▶
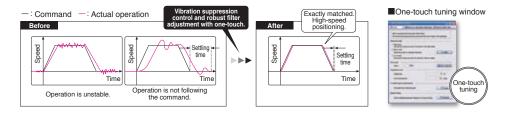
MR-J3 series 18 bits = 262,144 pulses/rev   **MR-J4 series 22 bits = 4,194,304 pulses/rev**

Advanced One-touch Tuning Function
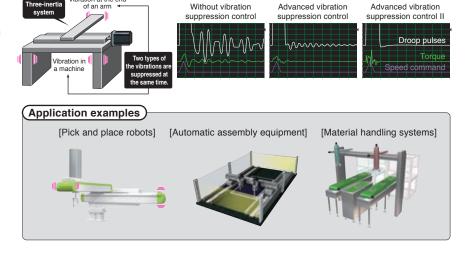
Servo gain adjustment is complete just by turning on the one-touch tuning function. With this function, machine resonance filter, advanced vibration suppression control II (Note), and robust filter are automatically adjusted to maximize your machine performance. This function also sets responsivity automatically while the real-time auto tuning requires manual setting.

(Note): The advanced vibration suppression control II automatically adjusts one frequency.

— : Command   — : Actual operation

Before

Speed

Time

Operation is unstable.

Speed

Time

Settling time

Operation is not following the command.

Vibration suppression control and robust filter adjustment with one-touch.

▶▶▶

After

Exactly matched. High-speed positioning.

Speed

Time

Settling time

■One-touch tuning window

One-touch tuning

Advanced Vibration Suppression Control II

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. Adjustment is easily performed on MR Configurator2.

Three-inertia system

Vibration at the end of an arm

Vibration in a machine

Two types of the vibrations are suppressed at the same time.

Without vibration suppression control

Advanced vibration suppression control

Advanced vibration suppression control II

Droop pulses
Torque
Speed command

Application examples

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

Outline

Simple Motion

Motion Controllers

Engineering Environment

Networks

Servo Amplifiers

Man

Functions According to IEC/EN 61800-5-2

STO (Safe torque off) and SS1 [Note-1] (Safe stop 1) are integrated as standard, enabling the safety system to be configured easily in the machine. (SIL 2)

- Turning off the control power of servo amplifier is not required, cutting out the time for restart. Additionally, home position return is not required.
- Magnetic contactor for preventing unexpected motor start is not required. [Note-2]

(Note-1): Safety equipment (MR-J3-D05, safety programmable controller MELSEC QS/WS series, etc.) is required.
(Note-2): MR-J4 series servo amplifiers do not require a magnetic contactor to satisfy the requirements of STO;
however, the figure shows a magnetic contactor installed to prevent servo alarms and a risk of electric shock.

[Shut-off by STO]

Shut-off
Safety relay circuit
Molded-case circuit breaker (MCCB)
Magnetic contactor for preventing unexpected start is no longer required.
Magnetic contactor (MC) for servo alarm [Note-2]
Servo amplifier
Servo motor
Stops motor
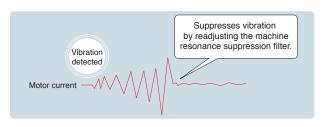
[Shut-off by STO and SS1]

Molded-case circuit breaker (MCCB)
Magnetic contactor for preventing unexpected start is no longer required.
Magnetic contactor (MC) for servo alarm [Note-2]
Safety equipment (MR-J3-D05, safety programmable controller MELSEC QS/WS series, etc.)
Servo amplifier
Servo motor
Stops motor
SS1 signal

Large Capacity Drive Recorder

<small>Patent pending</small> <small>Enhanced functions</small>

- 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. The data read on MELSOFT MR Configurator2 during restoration are used for cause analysis.
- Check the waveform ((analog 16 bits × 7 channels + digital 8 channels) × 256 points) of 16 alarms in the alarm history and the monitor value.

Servo amplifier
Servo amplifier
Alarm!

Data over certain period of time are stored in RAM.
Data are written in non-volatile memory, and the operation is stopped.

Tough Drive Function

<small>Enhanced functions</small>

Vibration tough drive

Machine resonance suppression filter is automatically readjusted when a change in machine resonance frequency is detected by the servo amplifier. Losses from the machine stop due to age-related deterioration are reduced.

Vibration detected
Motor current
Suppresses vibration by readjusting the machine resonance suppression filter.

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.

Servo motor speed
Undervoltage
Tough drive enabled
Tough drive disabled
Operation continues even with instantaneous power failure.

Machine Diagnosis Function

<small>Patent pending</small>

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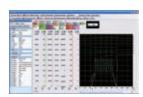
Machine diagnosis window

Servo setup software

MELSOFT MR Configurator2

Tuning, monitor display, diagnosis, reading/writing parameters, and test operations are easily performed on a personal computer. This start-up support tool achieves a stable machine system, optimum control, and short setup time.
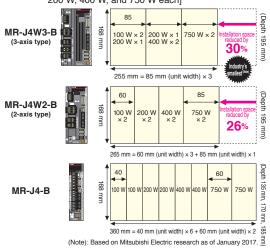
Graph window

The Environment

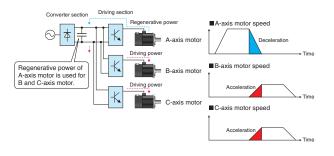## Space-saving with Industry's Smallest (Note) 3-axis Type

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.

[Installation space: Configuration example of installing two units of 100 W, 200 W, 400 W, and 750 W each]

MR-J4W3-B (3-axis type)
168 mm | 85 | 100 W × 2 / 200 W × 1 | 200 W × 1 / 400 W × 2 | 750 W × 2 | Installation space reduced by **30%** | (Depth 195 mm)
255 mm = 85 mm (unit width) × 3
Industry's smallest (Note)

MR-J4W2-B (2-axis type)
168 mm | 60 | 100 W × 2 | 200 W × 2 | 400 W × 2 | 85 | 750 W × 2 | Installation space reduced by **26%** | (Depth 195 mm)
265 mm = 60 mm (unit width) × 3 + 85 mm (unit width) × 1

MR-J4-B
168 mm | 40 | 100 W | 100 W | 200 W | 200 W | 400 W | 400 W | 60 | 750 W | 750 W | (Depth 135 mm, 170 mm, 185 mm)
360 mm = 40 mm (unit width) × 6 + 60 mm (unit width) × 2

(Note): Based on Mitsubishi Electric research as of January 2017.

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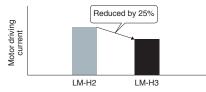
When multiple servo amplifiers and drive units are connected to the MR-CV power regeneration converter unit by a common DC bus connection, the regenerative power of one axis is used for driving other axes, contributing to energy-conservation.

Energy-conservation Achieved by LM-H3 Linear Servo Motor Series
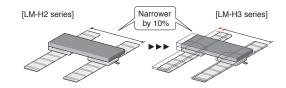
Reduced motor driving power

LM-H3 has achieved a reduction of 25% (Note) 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 as compared to the prior model, which also contributes to saving energy for driving the moving part.
(Note): For 720 N rated linear servo motor

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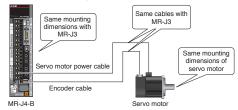
For LM-H3, widths of the motor coil and the magnet are reduced by 10% from the prior model. Increased thrust to current ratio results in using the servo amplifier in smaller capacity, contributing to more compact machine (the reduction of materials).
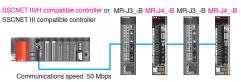
Heritage

- MR-J4-B has the same mounting dimensions (Note-1) with MR-J3-B. HG rotary servo motor series has the same mounting dimensions (Note-2) and uses the same optional cables for the power, the encoder (Note-3), and the electromagnetic brake as HF series or HC-RP/HC-UP series.
  (Note-1): Mounting dimensions are smaller for 200 V 5 kW, 400 V 3.5 kW, 200 V/400 V 11 kW, and 200 V/400 V 15 kW servo amplifiers.
  (Note-2): For a replacement of HA-LP series with HG-JR series, contact your local sales office.
  (Note-3): An encoder cable is incompatible with HG-JR series of 11 kW to 55 kW.

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

Communications speed: 50 Mbps
(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 (Note-1).
  (Note-1): Update your MT Works2 to the latest version.

Maximizing productivity and reducing costs across the entire enterprise

e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise by enhancing productivity, and reducing the maintenance and operations costs together with seamless information flow throughout the plant. e-F@ctory uses a combination of factory automation and IT technologies, offering solutions to reduce the total cost of development, production, and maintenance by supporting advanced *Monozukuri**.

e-F@ctory helps to reduce overall costs and is achieved in the following four areas:

* Monozukuri is an initiative started in Japan for promoting its unique manufacturing style for continuous improvement in production processes and operations. The word is derived by combining the words "*mono*", the thing that is manufactured, and "*zukuri*", the process of manufacturing

Reduce energy costs

e&eco-F@ctory (energy saving solution)

Modern manufacturing depends much on reducing energy costs as a way to realize an efficient manufacturing enterprise. e-F@ctory supports this by allowing visualization of real-time energy usage, helping to reduce the overall energy consumption.

Reduce development, production, and maintenance costs

iQ Platform

The iQ Platform minimizes costs at all phases of the automation life cycle by improving development times, enhancing productivity, reducing maintenance costs, and making information more easily accessible. Integration is at the heart of the iQ Platform, with a highly intelligent controller platform as the core, combined with a seamless communication network and an integrated engineering environment.

iQ Platform

Integrate FA and IT systems at low cost

Connecting enterprise with the shop floor

e-F@ctory solutions provide direct connectivity from the shop floor to enterprise, such as Manufacturing Execution System (MES) without requiring a gateway computer. This enables leaner operations, improved yield, and efficient management of the supply chain.
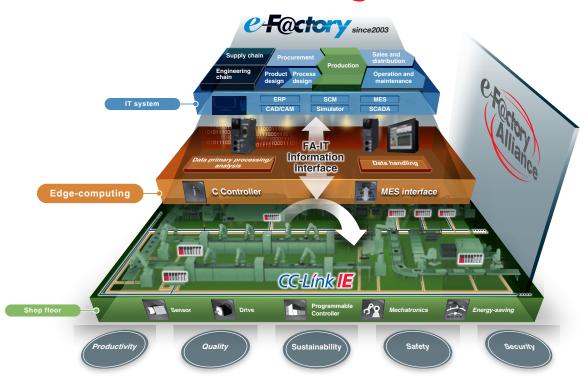
Reduce setup and maintenance costs

iQ Sensor Solution

Easily setup and maintain various types of sensors. Maintenance and design costs can be reduced as compatible iQSS partner sensors can be managed together.

iQSS

Best-in-class solutions across the ecosystem

e-F@ctory Alliance

The e-F@ctory Alliance is an ecosystem offering best-in-class solutions by combining products between Mitsubishi Electric and its various partners. Close collaboration with such partners broaden the choices for the customer and realize the best solution possible.

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 for the latest CC-Link information.
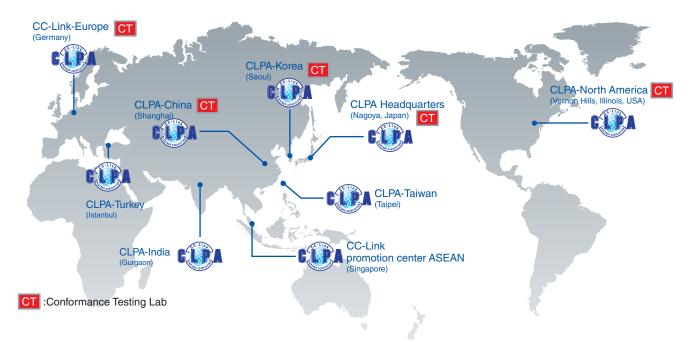
URL:http://www.cc-link.org

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

CC-Link
Partner Association

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 the network in that part of the world. For companies looking to increase their presence in Asia, CLPA is well placed to assist these efforts through offices in all major Asian regions.

CC-Link-Europe CT
(Germany)

CLPA-Korea CT
(Seoul)

CLPA-North America CT
(Vernon Hills, Illinois, USA)

CLPA-China CT
(Shanghai)

CLPA Headquarters
(Nagoya, Japan) CT

CLPA-Taiwan
(Taipei)

CLPA-Turkey
(Istanbul)

CLPA-India
(Gurgaon)

CC-Link
promotion center ASEAN
(Singapore)

CT :Conformance Testing Lab
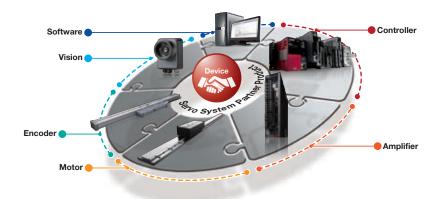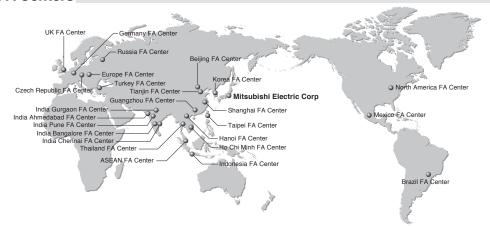
The Mitsubishi Electric Servo System Partner Association, promoting Mitsubishi Electric Servo System globally

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

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 Fax: 86-21-2322-3000 (9611#)

Beijing FA Center
Mitsubishi Electric Automation (China) Ltd. Beijing FA Center
Unit 901, Office Tower 1, Henderson Centre,
18 Jianguomennei Avenue, Dongcheng District,
Beijing, China
Tel: 86-10-6518-8830 Fax: 86-10-6518-2938

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 Fax: 86-22-2813-1017

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 Fax: 86-20-8923-6715

Taiwan

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 Fax: 886-2-2299-9963

Korea

Korea FA Center
Mitsubishi Electric Automation Korea Co., Ltd.
7F-9F, Gangseo Hangang Xi-tower A, 401,
Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea
Tel: 82-2-3660-9605 Fax: 82-2-3664-0475

Thailand

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 Bangpongpang, Khet Yannawa, Bangkok
10120, Thailand
Tel: 66-2682-6522 to 6531 Fax: 66-2682-6020

ASEAN

ASEAN FA Center
Mitsubishi Electric Asia Pte. Ltd.
307 Alexandra Road, Mitsubishi Electric Building,
Singapore 159943
Tel: 65-6470-2475 Fax: 65-6476-7439

Indonesia

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 Fax: 62-21-2961-7794

Vietnam

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 Fax: 84-4-3937-8076

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 Fax: 84-8-3910-5947

India

India Pune FA Center
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 Fax: 91-20-2710-2100

India Gurgaon FA Center
Mitsubishi Electric India Pvt. Ltd. Gurgaon Head Office
2nd Floor, Tower A & B, Cyber Greens, DLF
Cyber City, DLF Phase - III, Gurgaon - 122002,
Haryana, India
Tel: 91-124-463-0300 Fax: 91-124-463-0399

India Bangalore FA Center
Mitsubishi Electric India Pvt. Ltd. Bangalore Branch
Prestige Emerald, 6th Floor, Municipal No.2,
Madras Bank Road, Bangalore - 560001,
Karnataka, India
Tel: 91-80-4020-1600 Fax: 91-80-4020-1699

India Chennai FA Center
Mitsubishi Electric India Pvt. Ltd. Chennai Branch
Citilights Corporate Centre No. 1,
Vivekananda Road, Srinivasa Nagar, Chetpet,
Chennai – 600031, Tamil Nadu, India
Tel: 91-4445548772 Fax: 91-4445548773

India Ahmedabad FA Center
Mitsubishi Electric India Pvt. Ltd. Ahmedabad Branch
B/4, 3rd Floor, SAFAL Profitaire, Corporate Road,
Prahaladnagar, Satellite, Ahmedabad - 380015,
Gujarat, India
Tel: 91-7965120063 Fax: -

America

North America FA Center
Mitsubishi Electric Automation, Inc.
500 Corporate Woods Parkway, Vernon Hills,
IL 60061, U.S.A.
Tel: 1-847-478-2100 Fax: 1-847-478-2253

Mexico

Mexico FA Center
Mitsubishi Electric Automation, Inc. Mexico Branch
Mariano Escobedo #69, Col.Zona Industrial,
Tlalnepantla Edo. Mexico, C.P.54030
Tel: 52-55-3067-7511 Fax: -

Brazil

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 Fax: 55-11-4689-3016

Europe

Europe FA Center
Mitsubishi Electric Europe B.V. Polish Branch
ul. Krakowska 50, 32-083 Balice, Poland
Tel: 48-12-347-65-00 Fax: 48-12-630-47-01

Germany FA Center
Mitsubishi Electric Europe B.V. German Branch
Gothaer Strasse 8, D-40880 Ratingen, Germany
Tel: 49-2102-486-0 Fax: 49-2102-486-1120

UK FA Center
Mitsubishi Electric Europe B.V. UK Branch
Travellers Lane, Hatfield, Hertfordshire, AL10
8XB, U.K.
Tel: 44-1707-27-8780 Fax: 44-1707-27-8695

Czech Republic FA Center
Mitsubishi Electric Europe B.V. Czech Branch
Avenir Business Park, Radlicka 751/113e,
158 00 Praha5, Czech Republic
Tel: 420-251-551-470 Fax: 420-251-551-471

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 Fax: 7-812-633-3499

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 Fax: 90-216-526-3995

Conformity with Global Standards and Regulations

Servo system controllers conform to global standards.

(Note-1): This product is 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): For corresponding standards and models, contact your local sales office.

Complies with EN, UL, CSA (c-UL) standards, and Korea Radio Wave Law (KC).

Conformity with Restriction of Hazardous Substances Directive (RoHS)

Human and environment-friendly Mitsubishi Electric servo system controllers are compliant with RoHS Directive.

< About RoHS directive >

RoHS Directive requires member nations to guarantee that new electrical and electronic equipment sold in the market after July 1, 2006 do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. <G> mark indicating RoHS Directive compliance is printed on the package.

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

Our optional cables and connectors comply with "Measures for Administration of the Pollution Control of Electronic Information Products" (Chinese RoHS).

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, electrolytic capacitor, 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 & Service, etc.

（2） Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas

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 Servo System Controller, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Servo System Controller, and a backup or fail-safe function should operate on an external system to Servo System Controller when any failure or malfunction occurs.

（2） Our Servo System Controller is designed and manufactured as a 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.

YOUR SOLUTION PARTNER

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

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

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.

* Not all products are available in all countries.

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

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100 Fax : +1-847-478-2253
Mexico	Mitsubishi Electric Automation, Inc. Mexico Branch Mariano Escobedo #69, Col.Zona Industrial, Tlalnepantla Edo. Mexico, C.P.54030	Tel : +52-55-3067-7500 Fax : –
Brazil	Mitsubishi Electric do Brasil Comercio e Servicos Ltda. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
Germany	Mitsubishi Electric Europe B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780 Fax : +44-1707-27-8695
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 Fax : +39-039-6053-312
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi, 76-80-Apdo. 420, 08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-935-65-3131 Fax : +34-935-89-1579
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68 Fax : +33-1-55-68-57-57
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