for a greener tomorrow

MITSUBISHI ELECTRIC
Changes for the Better

FACTORY AUTOMATION

Mitsubishi Electric AC Servo System MELSERVO-JET

Innovate Together

MITSUBISHI ELECTRIC SERVO SYSTEM
MELSERVO-JET

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.

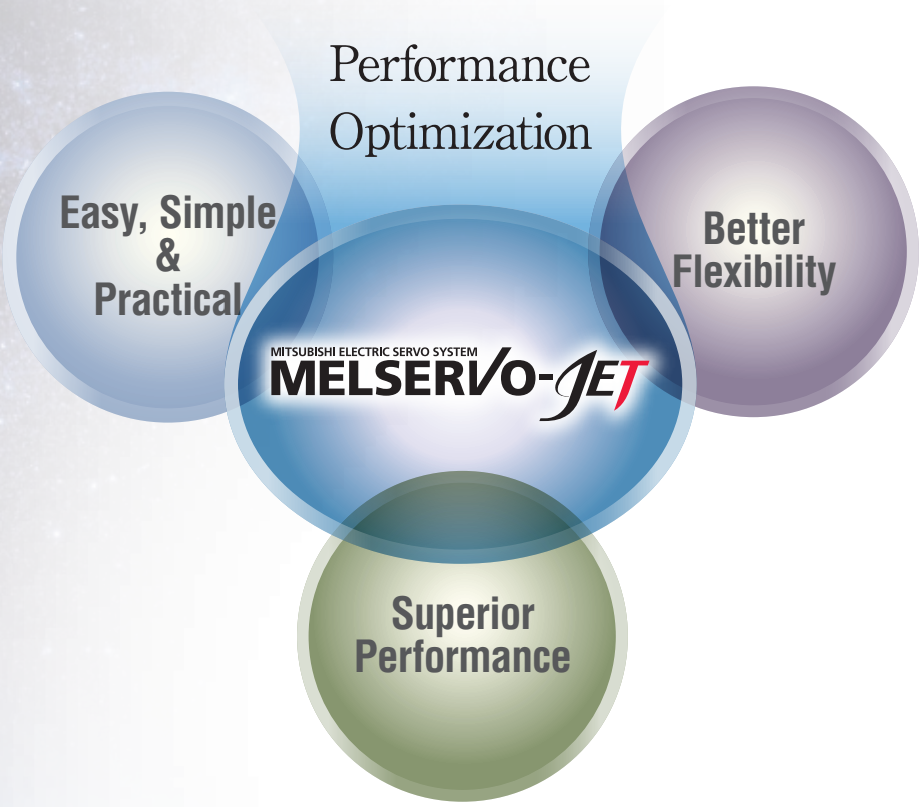
Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

OVERVIEW


MELSERVO-J4
MR-JET-10G
CHARGE

Create new value with MELSERVO-JET. Unlock performance with a total drive solution.

Optimize system performance



Easy, Simple & Practical

- Simple top & bottom wiring
- Quick tuning
- Unified height and depth across all servo amplifier capacities

Superior Performance

- Speed frequency response: 2.5 kHz
- Encoder resolution: 22 bit
- Maximum torque: 300 %

Better Flexibility

- Supports EtherCAT®
- Supports 400 V AC *
- Supports multi-voltage *

* Future support

Crafted from a different perspective, increase your productivity with a next

The MELSERVO-JET Series servo system performs basic functions at a high level, while its high-speed, high-precision capabilities help increase the productivity of your machines.

Motion module
RD78GH
Available soon

Motion module
RD78G

Motion Control Software
SWM78 Available soon

CC-Link IE TSN

CC-Link IE TSN supports TCP/IP communications and applies it to industrial architectures through its support of TSN enabling real-time communications. With its flexible system architecture and extensive setup and troubleshooting features make CC-Link IE TSN ideal for building an IIoT infrastructure across the manufacturing enterprise.
The communications speed is 1 Gbps.

* TSN: Time Sensitive Networking
* IIoT: Industrial Internet of Things

CC-Link IE TSN

Servo System Controllers

The servo system controller performs various types of motion control, including positioning, synchronous, cam, speed, and torque control. We offer two new types of servo system controllers: RD78GH/RD78G Motion modules and SWM78 Motion Control Software.

Motion Modules

RD78GH/RD78G Motion modules utilize a multi-core processor to achieve enhanced basic performance.

Motion Control Software

SWM78 Motion Control Software performs motion control by being installed on an industrial personal computer with a real-time operating system.

generation servo system

CC-Link IE TSN EtherCAT®

Servo amplifiers
MR-JET-G (CC-Link IE TSN)
MR-JET-G-N1 (EtherCAT®)

Speed frequency response	Command communication cycle
2.5 kHz	125 µs

Rotary servo motors
HG-KNS
HG-SNS

Encoder *1	Encoder resolution	Max. speed *2
Absolute position encoder	22 bit	6000 r/min

*1. A battery (available soon) is required when configuring an absolute position detection system.
*2. The servo motor speed varies by the models.

Servo Amplifiers

The MELSERVO-JET series high-performance servo amplifiers feature a unique control engine that is more powerful than ever before.
These servo amplifiers can connect to CC-Link IE TSN to perform high-speed, high-precision control.
EtherCAT® is supported by MR-JET-G-N1.

MITSUBISHI ELECTRIC SERVO SYSTEM
MELSERVO-JET

Rotary Servo Motors

The HG-KNS/HG-SNS series rotary servo motors are equipped with a 22-bit resolution absolute/incremental position encoder.
The servo motors have the same dimensions and use the same power and encoder cables as the prior HG series servo motors.

Innovate Together

CONTROLLER

Programmable Controllers

MELSEC iQ-R

CC-Link IE TSN-Compatible Motion Modules

Available soon

RD78G　　RD78GH

CC-Link IE TSN-Compatible Motion Control Software

Available soon

SWM78

INTERFACE

CC-Link IE TSN

EtherCAT®

SERVO AMPLIFIER

CC-Link IE TSN-Compatible Servo Amplifiers

MR-JET-G

EtherCAT®-Compatible Servo Amplifiers

MR-JET-G-N1

* Use an EtherCAT®-compatible master module.

SERVO MOTOR

Rotary Servo Motors

Small capacity, low inertia
HG-KNS Series
Capacity: 0.1 to 0.75 kW

Medium capacity, medium inertia
HG-SNS Series
Capacity: 0.5 to 3.0 kW*

* The servo motors of 1.5 kW to 3.0 kW are available soon.

SOFTWARE

MELSOFT GX Works3

MELSOFT EM78 SDK Available soon

MELSOFT MR Configurator2

Drive System Sizing Software Motorizer

Graphic Operation Terminals

GOT2000

LOW-VOLTAGE SWITCHGEAR

Molded-Case Circuit Breakers

WS-V

Magnetic Contactors

MS-T

Create new value with MELSERVO-JET.
Unlock performance with a total drive solution.

■Servo System Controllers

Servo system controllers		Number of control axes	Slots occupied	Features
Motion modules	RD78G	1 to 4 1 to 8 1 to 16 1 to 32 1 to 64	1	MELSEC iQ-R series CC-Link IE TSN-compatible Motion module • Performs motion control (positioning, synchronous, cam, speed, and torque control) • Maximum number of connectable stations: 64 stations • Minimum operation cycle: 62.5 [µs] (Note 3) (supported soon)
	RD78GH Available soon	1 to 128 (Note 2) 1 to 256 (Note 2)	2	MELSEC iQ-R series CC-Link IE TSN-compatible Motion module • Performs motion control (positioning, synchronous, cam, speed, and torque control) • Maximum number of connectable stations: 120 stations • Minimum operation cycle: 31.25 [µs] (Note 3)
Motion Control Software	SWM78 Available soon	1 to 16 1 to 32 1 to 64 1 to 128 (Note 2) 1 to 256 (Note 2)	–	CC-Link IE TSN-compatible Motion Control Software (Note 1) • Performs motion control (positioning, synchronous, cam, speed, and torque control) • Supports INtime (real-time operating system) for Windows® • Programming in Visual C++® • Maximum number of connectable stations: 120 stations

Notes: 1. An industrial personal computer, INtime, and Microsoft Visual Studio® are not included and must be prepared by the user.
2. When MR-JET-G servo amplifiers are used for all axes, the maximum number of the control axes is 120.
3. When an MR-JET-G is connected to the controller, the minimum operation cycle is 125 µs.

■Servo Amplifiers

●: Supported

Servo amplifiers	Power supply specifications	Rated output [kW] (Note 1)	Interface	Control mode		
				Position	Speed	Torque
MR-JET-G	200 V AC	0.1, 0.2, 0.4, 0.75, 1.0, 2.0, 3.0 (Note 2)	CC-Link IE TSN	●	●	●
MR-JET-G-N1			EtherCAT®			

Notes: 1. The value listed is the servo amplifier rated output. Refer to "Combinations of Rotary Servo Motors and Servo Amplifiers" for compatible servo motors.
2. The servo amplifiers of 2.0 kW and 3.0 kW are available soon.

■Rotary Servo Motors

●: Supported

Rotary servo motor series		Rated speed (maximum speed) [r/min]	Rated output [kW]	With electro-magnetic brake (B)	With oil seal (J)	IP rating (Note 1)	Features
Small capacity	HG-KNS series	3000 (6000)	0.1, 0.2, 0.4, 0.75	●	●	IP65	Low inertia 22-bit absolute position encoder (Note 4)
Medium capacity	HG-SNS series	2000 (3000/2500) (Note 2)	0.5, 1.0, 1.5, 2.0, 3.0 (Note 3)	●	●	IP67	Medium inertia 22-bit absolute position encoder (Note 4)

Notes: 1. The shaft-through portion is excluded.
2. The maximum speed of the servo motor of 3.0 kW is 2500 r/min.
3. The servo motors of 1.5 kW to 3.0 kW are available soon.
4. A battery (available soon) is required when configuring an absolute position detection system.

SOLUTION

e-F@ctory

We take full advantage of Mitsubishi Electric's technological capability that achieved development of FA devices, along with our connectivity technology which makes it possible to connect FA with IT.
e-F@ctory optimizes manufacturing overall by connecting all devices and equipment, and then analyzing and utilizing the vast amount of data collected.

Construct a high-performance servo system using our extensive product line

We understand that each system is different and has unique drive control requirements.
To meet these demands, we have expanded the product line for our next-generation servo system to offer engineering software, servo system controllers, servo amplifiers, servo motors, and a variety of other components.
Mitsubishi Electric is dedicated to satisfying all of our customers' needs.

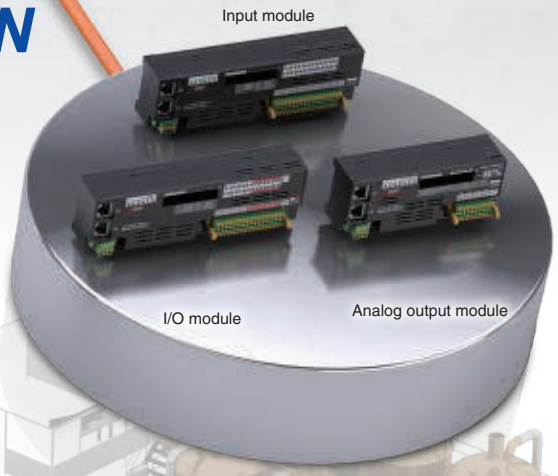
Simple programming

Collaborating with our extensive group of partners allows us to flexibly support your system needs

Servo systems are constructed using iQ Platform devices such as controllers, servo drivers, actuators, and sensors, and collaboration with our partner companies allows us to expand the number of possibilities available to customers. For example, partner products such as stepping motors, direct drive motors, vision systems, and various types of software are available to keep your equipment on the cutting edge.

Single network

CC-Link IE TSN

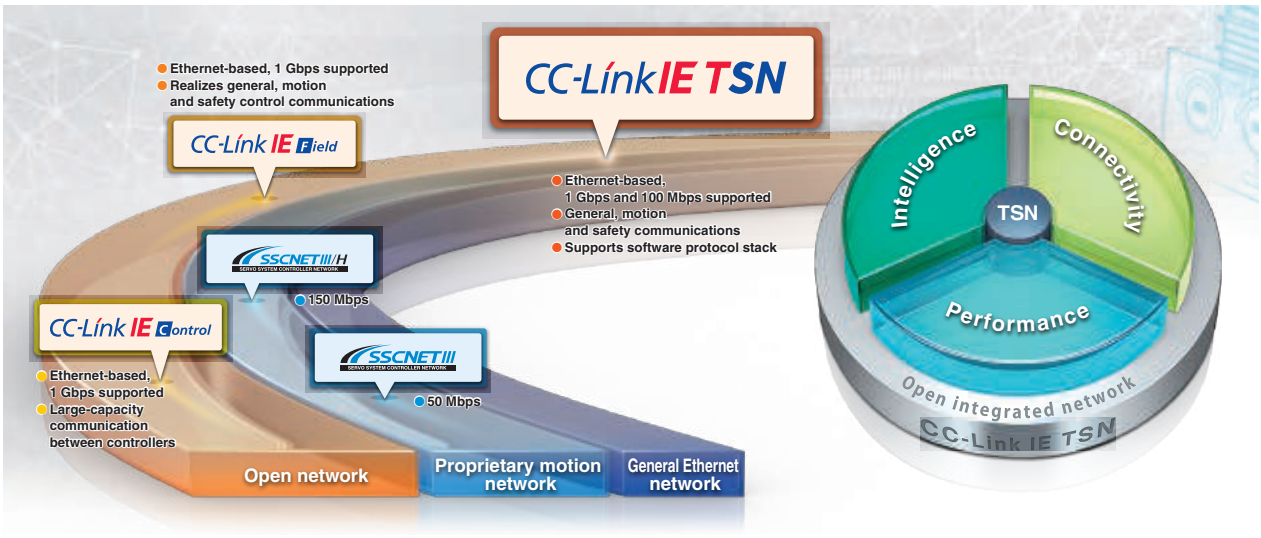


Open integrated networking across the manufacturing enterprise

CC-Link IE TSN

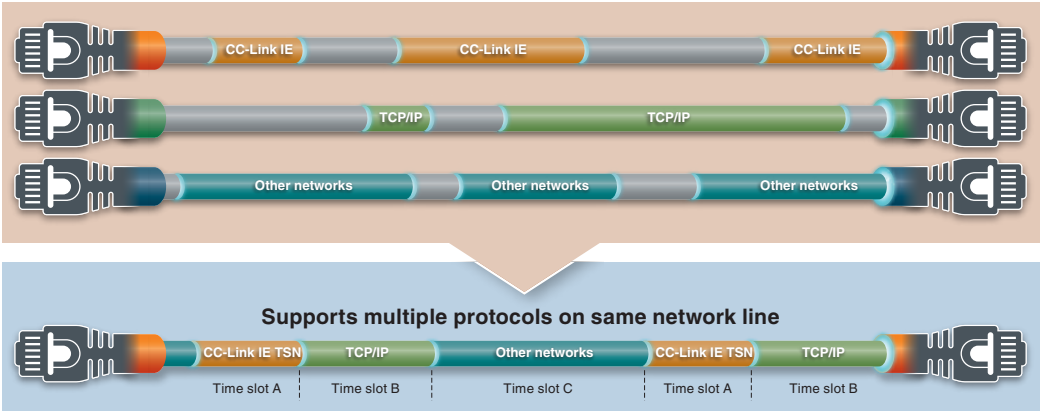
CC-Link IE TSN supports TCP/IP communications and applies it to industrial architectures through its support of TSN enabling real-time communications. With its flexible system architecture and extensive setup and troubleshooting features make CC-Link IE TSN ideal for building an IIoT infrastructure across the manufacturing enterprise.

* TSN: Time Sensitive Networking
* IIoT: Industrial Internet of Things



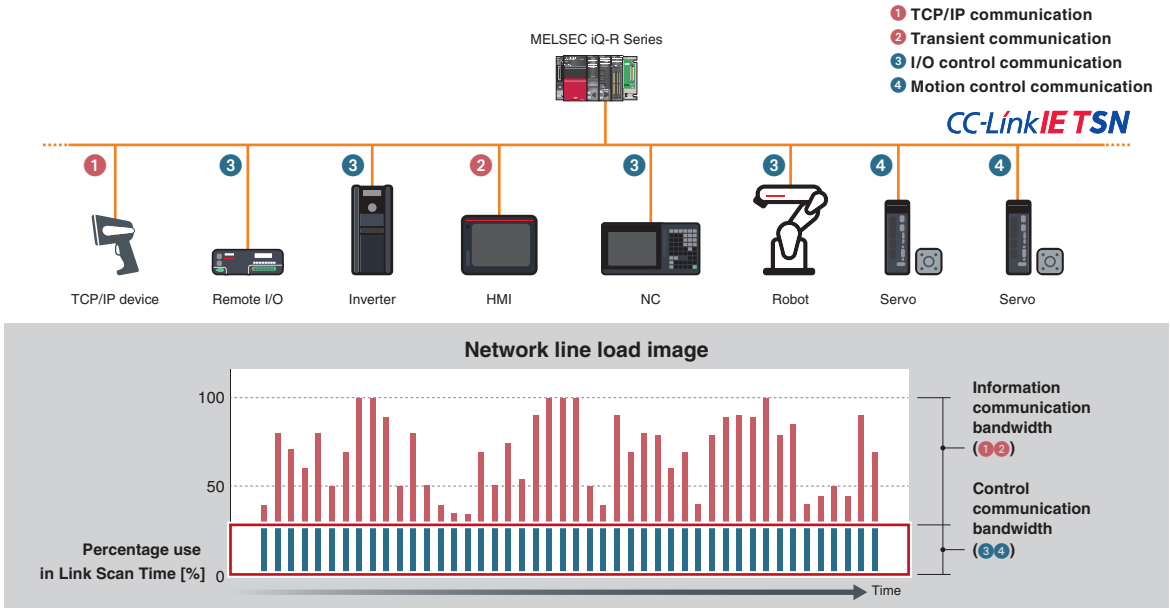
Real-Time Network Performance Even When Integrated with Information Data

TSN technology enables mixing of deterministic communications with IT system information data on the same network. Giving higher priority to CC-Link IE TSN cyclic communications and TCP/IP communications by allocating increased network bandwidth, devices using general Ethernet communications can be connected on the same network while maintaining real-time control communication performance.



Deterministic Control Even When Mixed with TCP/IP Communication

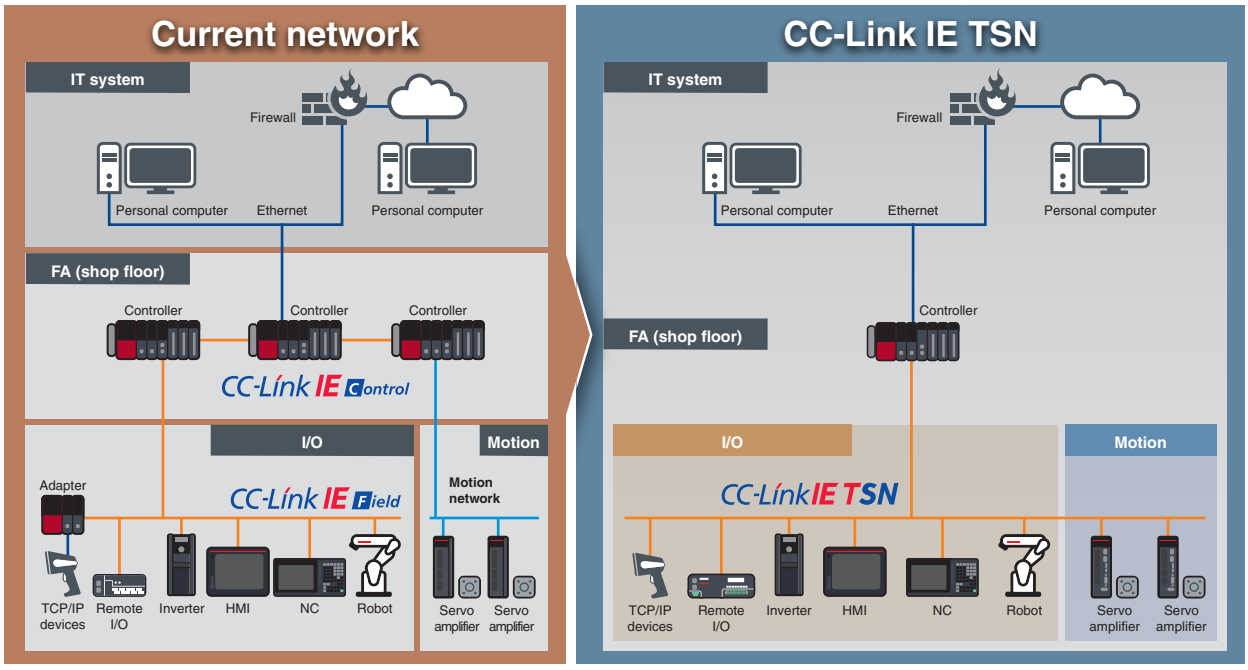
Deterministic performance of cyclic communication is maintained even when mixed with information data (non real-time). This enables TCP/IP communication devices to be used without affecting overall control.



Network configuration example (includes functions and products planned for future support/release.)

Integrated Network

Current network systems use multiple networks to enable communication between IT and control systems on the shop floor.
CC-Link IE TSN is a one-stop solution for integrating different networks, thereby realizing flexibility in topology and reducing wiring cost.

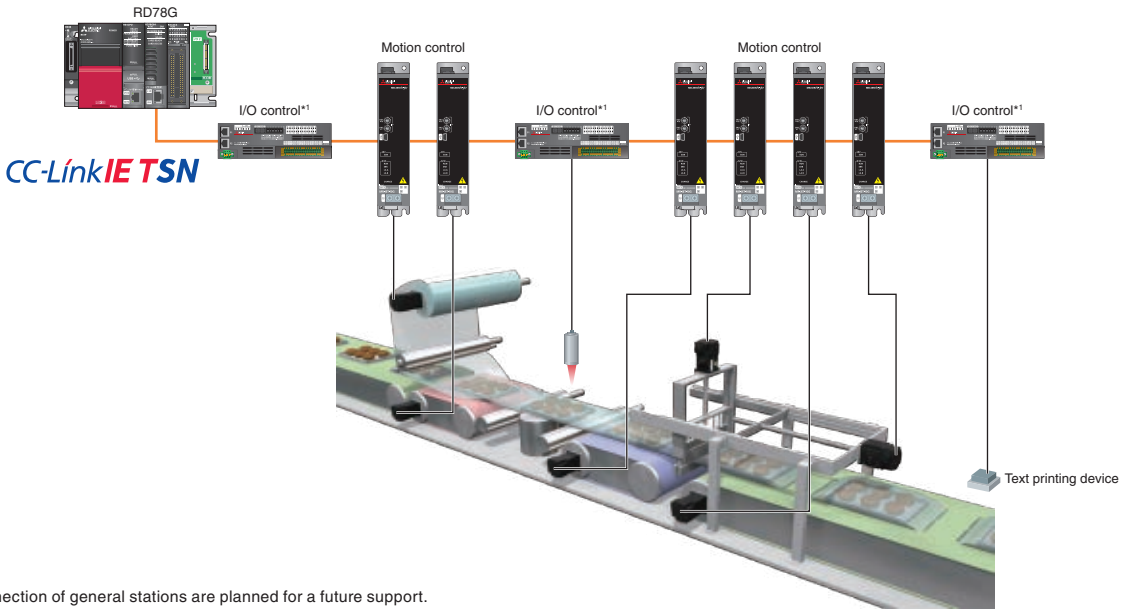


Network configuration example (includes functions and products planned for future support/release.)

High-Speed, High-Accuracy Motion Control

CC-Link IE TSN controls I/O modules while also maintaining high-speed motion control. The single network boosts machine performance.

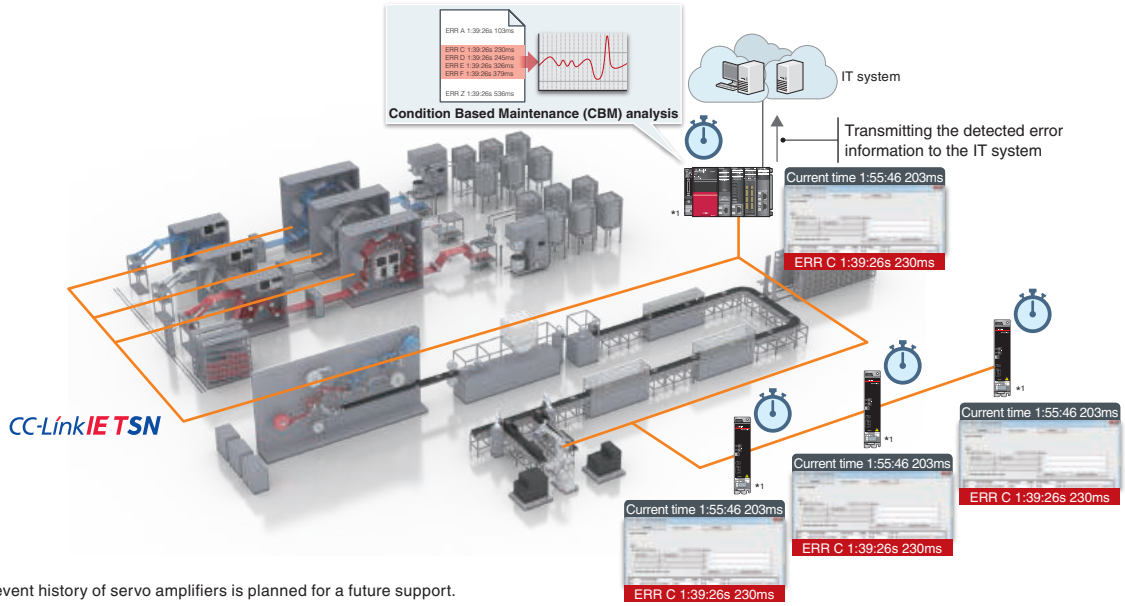
- Motion control (high-speed processing)
- I/O control (low-speed processing)



*1. The connection of general stations are planned for a future support.

Time Synchronization

Set time is completely synchronized among servo amplifiers, Motion modules, and PLC CPUs. This time synchronization enables accurate recording of the event history in chronological order, making it simple to identify the cause of errors.

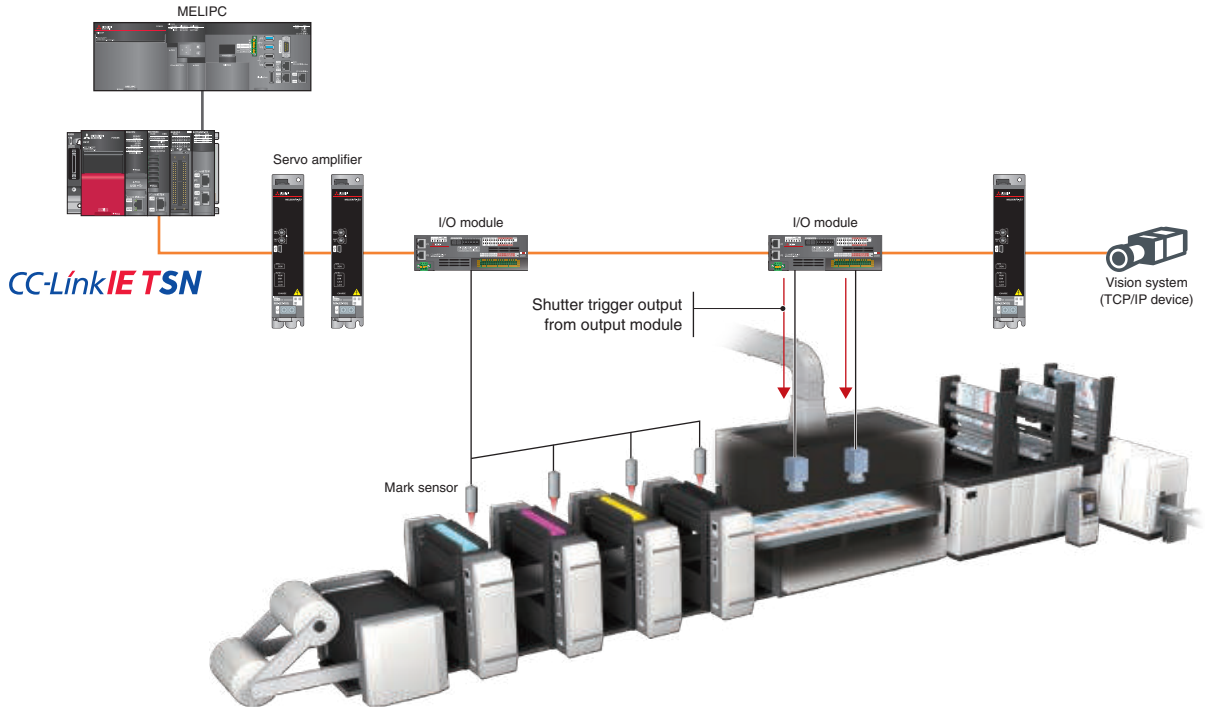


*1. The event history of servo amplifiers is planned for a future support.

Seamless Connectivity Between TCP/IP Devices and a Servo System

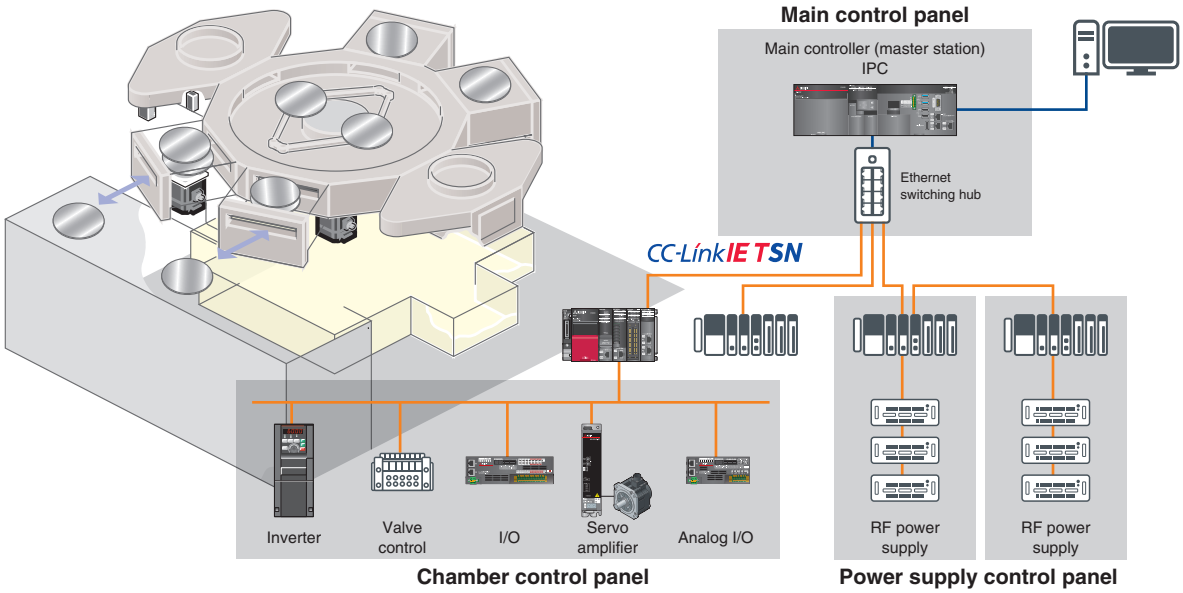
Future support planned

Various types of modules and devices, such as servo amplifiers, I/O modules, and TCP/IP devices, can all be connected to the CC-Link IE TSN. The configuration of these modules is highly flexible; for example, I/O modules can connect between servo amplifiers with high-speed communications.



Large-Capacity Data Communications

CC-Link IE TSN is a high-speed, large-capacity 1 Gbps communications network that is capable of sending and receiving large amounts of data, such as manufacturing, quality, and control data from the production process. The network can transmit large recipe data or traceability data at high speeds without degrading the performance of servo system communications. In addition, Ethernet supported devices can directly and seamlessly connect to controllers on the same network line.



Network configuration example (includes functions and products planned for future support/release.)

An engineering environment that provides common, consistent usability throughout all product development phases

Programmable Controller Engineering Software

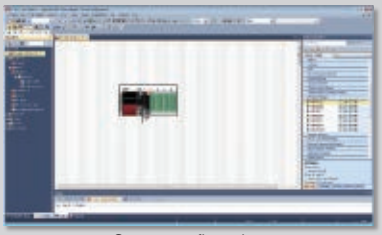
MELSOFT GX Works3

Program creation is largely dependent on the ability of the programmer; therefore, an enormous amount of time is often spent on creating a servo program where a high level of programming expertise is required.
"MELSOFT GX Works3" introduces a more intuitive, efficient, and user-friendly programming environment that revolutionizes the programming process and minimizes hassles.

Engineering Environment for Maximizing Your Machine Performance

● Mitsubishi Electric offers a complete, consistent engineering environment which covers all aspects of the product development cycle - from sizing motors all the way to programming with function blocks, startup, and maintenance.

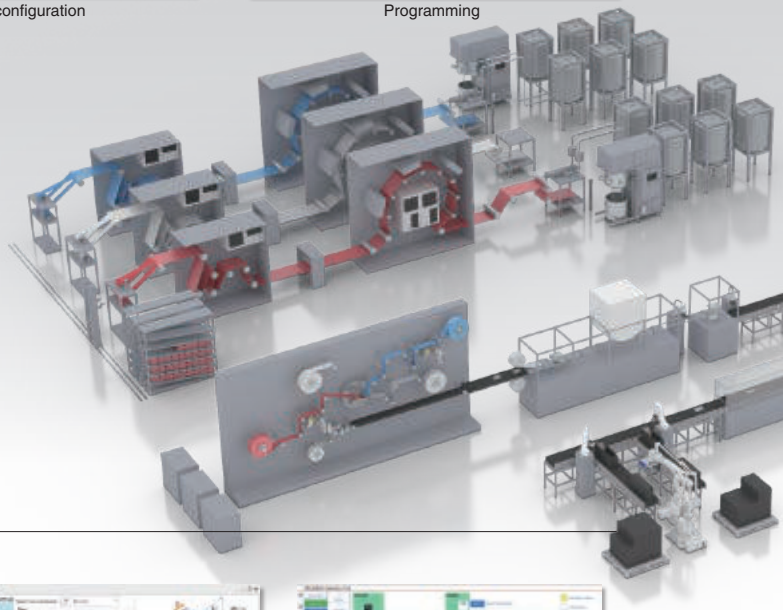
System Design → **Programming**


System configuration


Network configuration


Programming


e-Manual



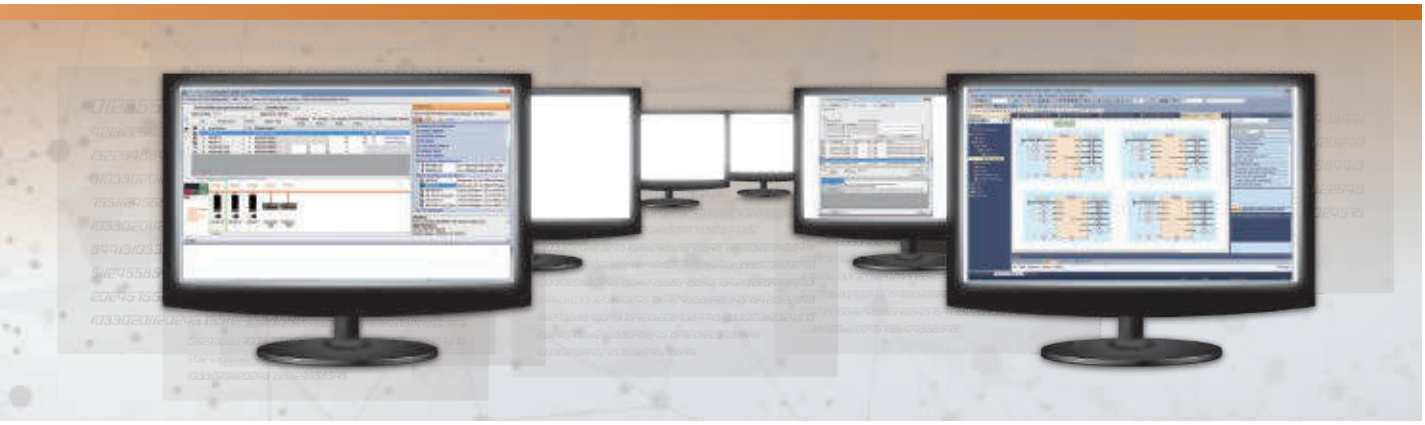
Useful Servo Software

[Drive system sizing software: "Motorizer"]
Our upgraded motor sizing software enables you to more flexibly select a suitable servo system for your machine. The upgraded features include expansion of selectable load mechanisms (12 types), multiple sizing results, and the ability to size a multi-axis system.

[Model selection software]
Servo amplifiers, servo motors, and indispensable options such as encoder cables can all be selected.

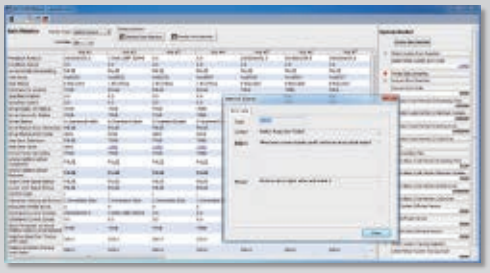

Motor sizing software


Model selection software



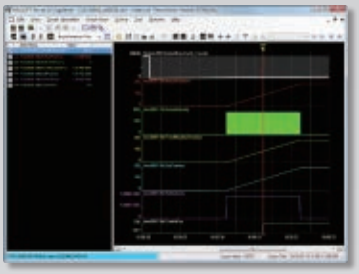
● All-in-one engineering platform MELSOFT GX Works3 allows you to set different modules in a single project, including the setting of a wide range of areas from servo amplifier parameters to PLC CPU data.

Debug



Monitor

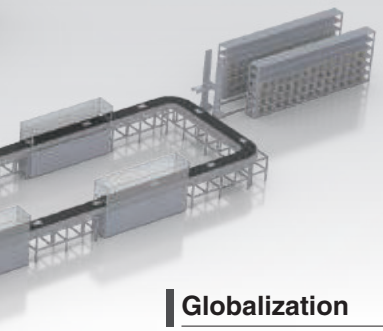
Maintenance



Real-time monitor*1

Servo adjustment

Event history



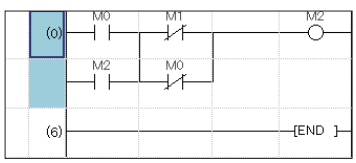
*1. This function will be supported by the Motion module in the future.

Globalization

[PLCopen® Motion Control FB]
PLCopen® Motion Control FB is a standardized interface, and therefore people other than the program designer can understand the programming, leading to reduced design and maintenance time.

[Conforms to IEC 61131-3]
MELSOFT GX Works3 realizes structured programming such as ladder and ST, making project standardization across multiple users even easier.

[Multi-language support for global operations]
To adhere to today's global production needs, MELSOFT GX Works3 supports multi-language features at various levels, from the multiple language software menu system to device comment language switching features.
Supported languages: English, Japanese, and Chinese.

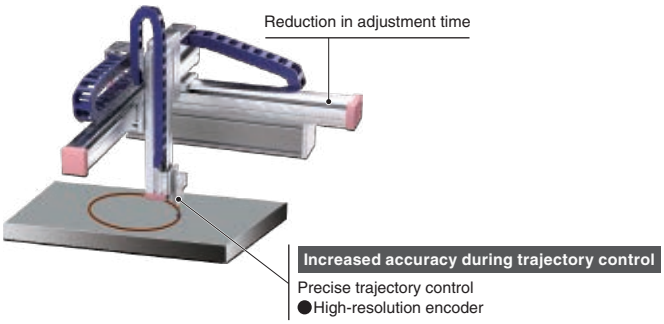


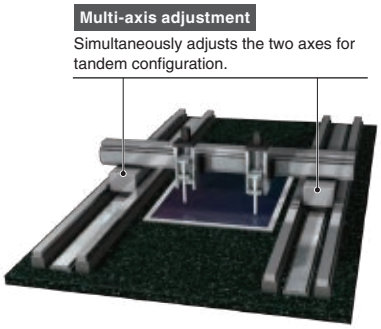
Build the future together with total drive solutions

Every industry and application requires different characteristics from a servo system. These systems must be flexible enough to meet more common requirements, like high speed and accuracy, while also fulfilling the specific operation requirements.
Our extensive servo product line is able to meet a wide range of automation needs by combining with a variety of FA (Factory Automation) products.

High-Speed, High-Accuracy Trajectory Control

Enabled by our high-resolution servo motor encoder, a smooth profile can be easily drawn on a workpiece by using a combination of linear interpolation, 2-axis circular interpolation, and trajectory control.
Servo adjustment time is also reduced through multi-axis adjustment, quick tuning, and one-touch tuning.





Applications

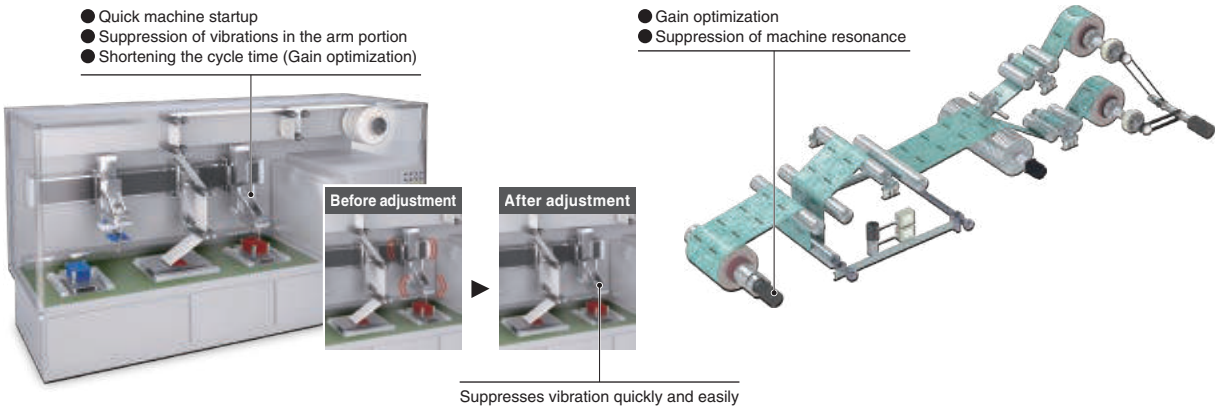
- Flat panel display (FPD) manufacturing equipment
- Wood processing equipment

Main functions

- High-resolution encoder
- Multi-axis adjustment Future support planned

Servo Adjustment

At machine startup, noise sometimes occurs due to resonance. With the quick tuning function, tuning is performed at servo ON and such noise is minimized.
In addition, the servo amplifiers offer various other types of servo adjustment functions that allow you to select the function that best suits your equipment.



Applications

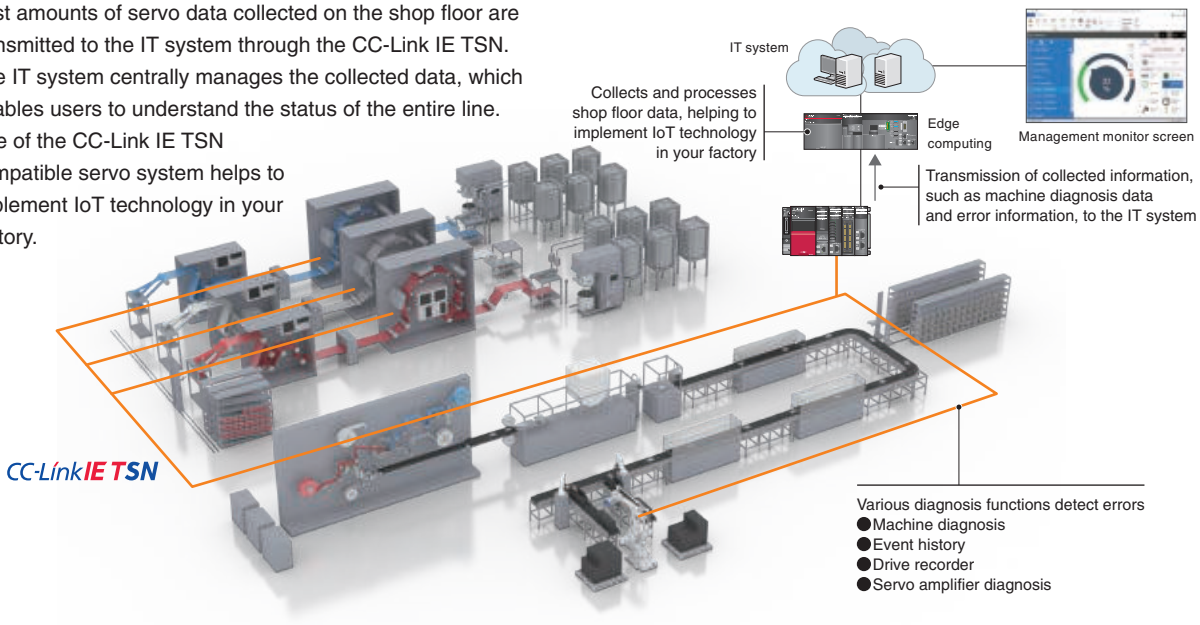
- Conveyor systems
- Converting machines
- Packing machines
- Robots

Main functions

- Quick tuning
- One-touch tuning
- Machine resonance suppression filter
- Advanced vibration suppression control II

Utilization of IoT Technology

Vast amounts of servo data collected on the shop floor are transmitted to the IT system through the CC-Link IE TSN. The IT system centrally manages the collected data, which enables users to understand the status of the entire line. Use of the CC-Link IE TSN compatible servo system helps to implement IoT technology in your factory.



Applications

- Lithium ion battery production lines
- Automotive assembly lines
- Semiconductor manufacturing lines
- Beverage filling machines

Unlock new system capabilities together with CC-Link IE TSN

CC-Link IE TSN
Motion Module

RD78GH Available soon
RD78G

These Motion modules with multiple-core processors enable to configure a high-speed, large system by supporting the CC-Link IE TSN real-time open network.

- Performs positioning control such as linear interpolation using function blocks. The programming is easy: users just need to set positioning data to the function blocks.
- Connects to various modules such as servo amplifiers and I/O modules via CC-Link IE TSN. This connectivity allows you to configure a servo system more flexibly.
- Supports a consistent engineering environment that is capable of handling tasks ranging from system design to debugging and maintenance.

Product Lines

RD78GH
RD78G

CC-Link IE TSN
MELSEC iQ-R series

RD78GHV Available soon
RD78GHW Available soon

- Maximum number of control axes *1:
  128 axes/module (RD78GHV)
  256 axes/module (RD78GHW)
- Minimum operation cycle *2: 31.25 µs
- ST language program capacity:
  Built-in ROM max. 64 MB
  + SD memory card

RD78GHV/RD78GHW are designed with a quad-core processor that enables higher-speed control. These Motion modules can be directly programmed to distribute load control with PLC CPUs.
This ensures that performance will not be degraded even when the number of axes is increased.

CC-Link IE TSN
MELSEC iQ-R series

RD78G4/RD78G8
RD78G16/RD78G32
RD78G64

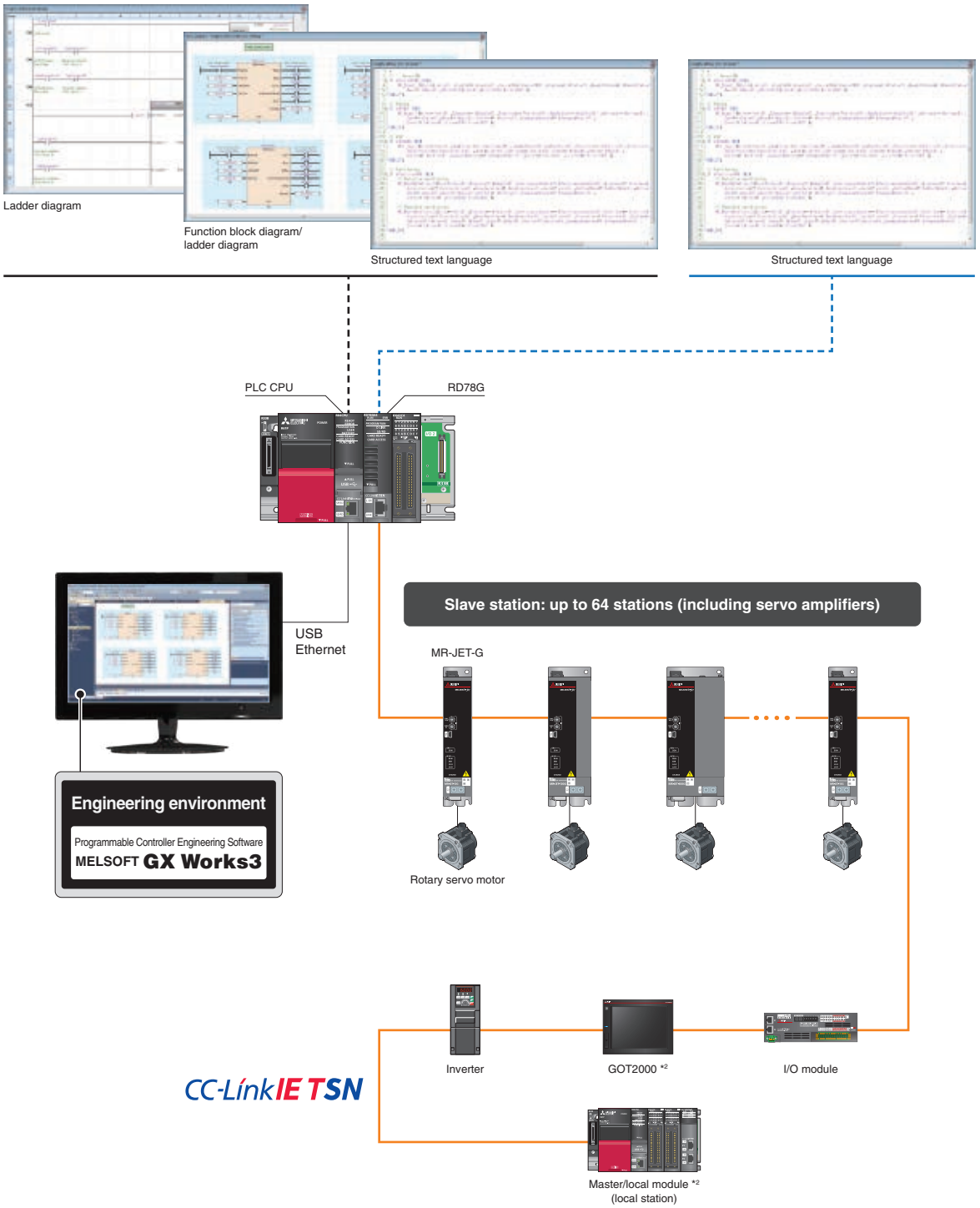
- Maximum number of control axes:
  64 axes/module (RD78G64)
- Minimum operation cycle *2:
  62.5 µs (supported soon)
- ST language program capacity:
  Built-in ROM max. 16 MB + SD memory card

RD78G4/RD78G8/RD78G16/RD78G32/RD78G64 are designed with a dual-core processor, and can be programmed to enable various types of control, such as positioning, synchronous, cam, speed, and torque control.

*1. When MR-JET-G servo amplifiers are used for all axes, the maximum number of the control axes is 120.
*2. When an MR-JET-G is connected to the controller, the minimum operation cycle is 125 µs.

System Configuration

The Motion Module provides functionality equivalent to a CC-Link IE TSN master/local module *1 and executes motion control while functioning as a master station. This dual functionality results in reduced system costs without sacrificing performance.



*1. Compared to the master/local module, the Motion modules are not provided with the following functions: sub-master station, safety communications, multi-master configuration, backup/restore function, and data communication function between general stations.
*2. Future support planned

Create new machines together by taking advantage of our innovative IPC environment

SWM78 Motion Control Software performs motion and network control through Visual C++®. To perform control, install the software on an industrial personal computer with a real-time operating system.

Product Lines

SWM78

- Creates a CC-Link IE TSN servo system by being installed on an industrial personal computer with a real-time operating system.
- Performs various types of motion control, such as positioning, synchronous, cam, speed, and torque control.
- Meets various application needs by utilizing the API library which has the same interface with PLCopen® Motion Control Function Blocks.

MELSOFT EM78 SDK

- SWM78 Motion Control Software
- API library
- EM Configurator2

CC-Link IE TSN
Motion Control Software

SWM78 Available soon

- Maximum number of control axes*1: 256 axes
- Minimum operation cycle: 250 µs
- Programming language: Visual C ++®

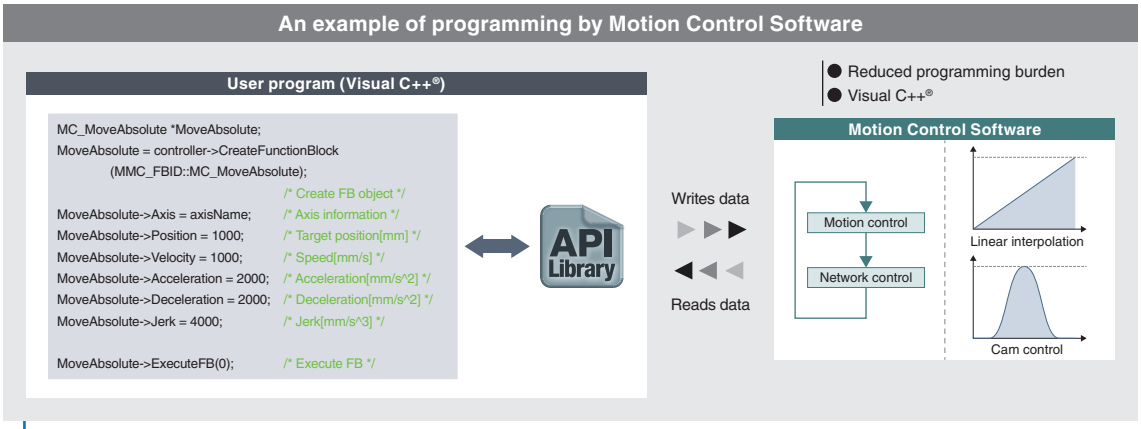
*1. When MR-JET-G servo amplifiers are used for all axes, the maximum number of the control axes is 120.

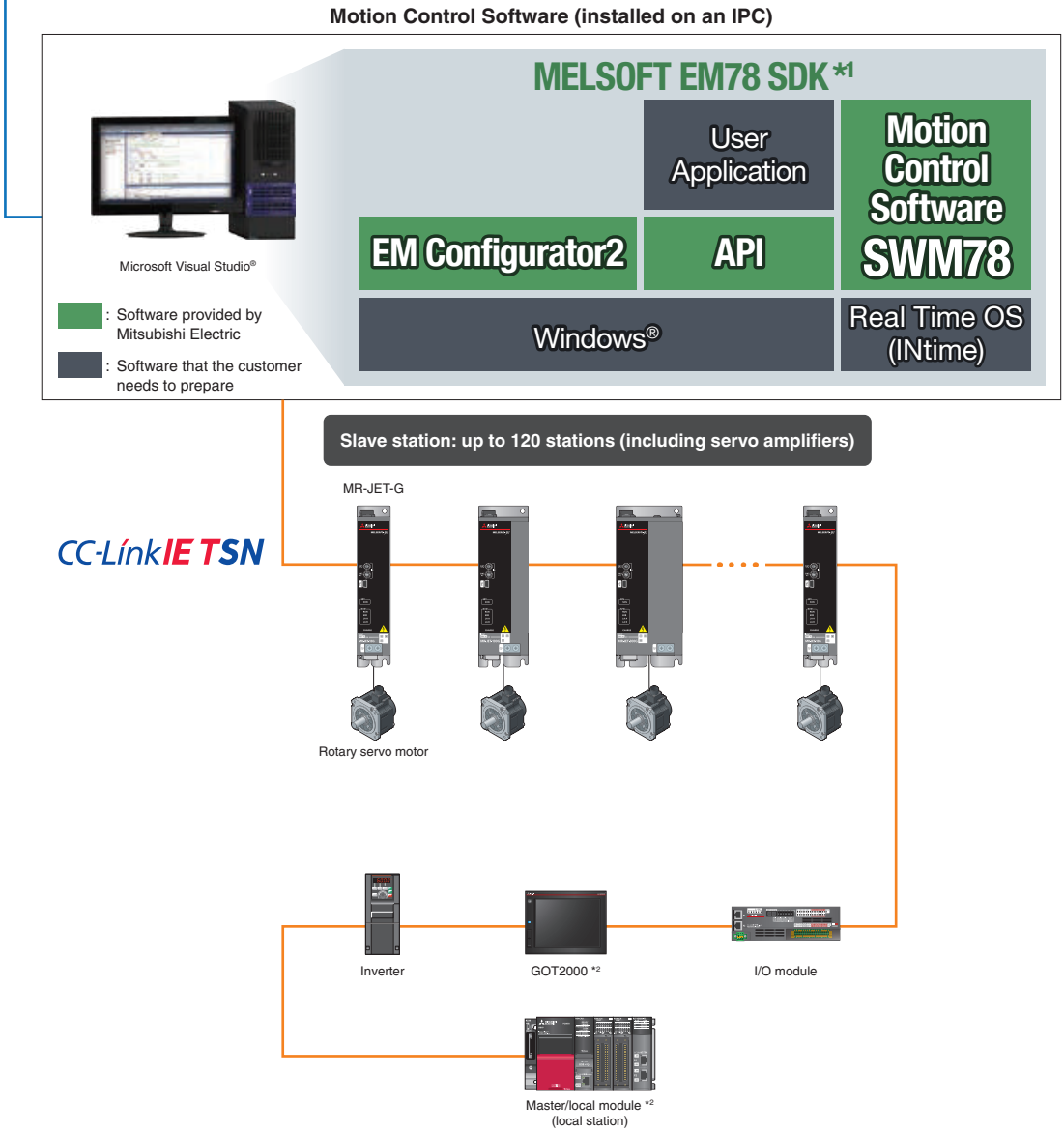
Operating Environment

- Supports INtime (real-time operating system).
- Operates on an industrial personal computer with the Intel I210 Ethernet Controller.

System Configuration

MELSOFT EM78 SDK API library adopts the same interface as the internationally standardized PLCopen® Motion Control Function Blocks. By calling the API library, a user program executes motion control.
The API library also boasts increased program readability by utilizing the class library format.





*1. To use Motion Control Software, prepare MELSOFT EM78 SDK and the USB key with license information.
*2. Future support planned

Function List

RD78GH RD78G SWM78

	Motion module		Motion Control Software
	MELSEC iQ-R series		
	RD78GH Available soon	RD78G	SWM78 Available soon
Maximum number of control axes	RD78GHV: 128 axes*1 RD78GHW: 256 axes*1	RD78G4: 4 axes RD78G8: 8 axes RD78G16: 16 axes RD78G32: 32 axes RD78G64: 64 axes	16 axes/32 axes/64 axes/ 128 axes*1/256 axes*1
Minimum operation cycle	31.25 [µs] *2	62.5 [µs] *2 (supported soon)	250 [µs]
Communications speed	1 Gbps		
Command interface	CC-Link IE TSN		
Engineering environment	MELSOFT GX Works3		MELSOFT EM Configurator2
Programming method	PLC CPU: Ladder, FBD/LD, ST language Motion module: ST language		Visual C++®
Control mode	Positioning control Torque control *3	Speed control *3	Synchronous control Cam control
Positioning control	Linear interpolation	Circular interpolation	
Acceleration/ deceleration process	Trapezoidal acceleration/ deceleration	Jerk acceleration/ deceleration	Acceleration/deceleration time fixed method
Manual control	JOG operation		
Functions that change the control details	Current value change Target position change	Torque limit value change Override *4	Speed change Acceleration/ deceleration time change
Homing method	Driver homing method	Data set method	
Auxiliary function	Forced stop Event history Touch probe *4	Servo ON/OFF Absolute position control Monitoring of servo data *4	Hardware stroke limit Data logging Software stroke limit Slave emulate

*1. When MR-JET-G servo amplifiers are used for all axes, the maximum number of the control axes is 120.
*2. When an MR-JET-G is connected to the controller, the minimum operation cycle is 125 µs.
*3. These are the functions of Motion modules.
*4. Future support planned

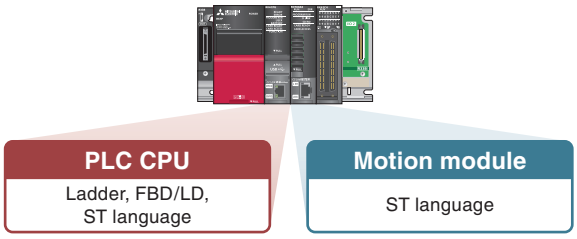
Control Load Distribution Realized by Flexible Programming

RD78GH
RD78G

Programming using the internationally standardized PLCopen® Motion Control FBs is possible.
Selectable programming languages vary depending on the controllers:

- Motion module: structured text language (ST)
- PLC CPU: ladder diagram (Ladder), function block diagram/ladder diagram (FBD/LD), and structured text language (ST).

Select the controller and programming language according to the necessity of high-speed operation and the complexity of the operation.



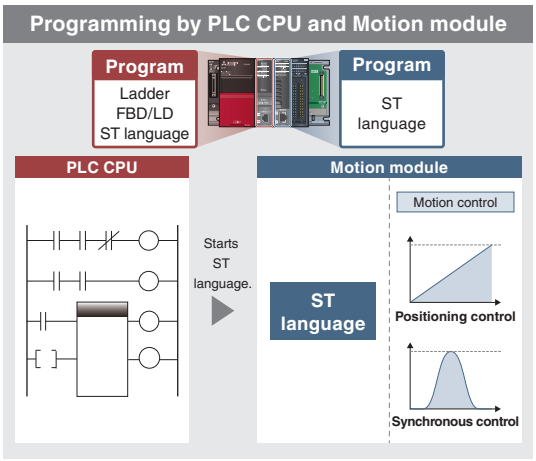
Programming by PLC CPU and Motion Modules

This programming method is perfect for demanding applications which require high-speed, complicated motion operation.

[Processing details]

- The PLC CPU starts Motion module programs.
- The Motion module performs operation of double precision floating-point numbers and polynomials.
- The Motion module performs motion control.

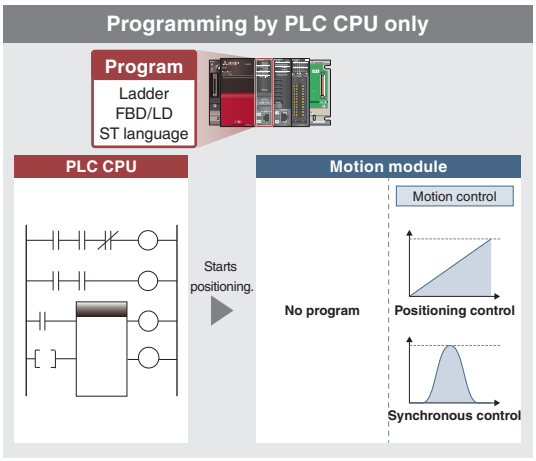
Motion modules can execute operations in place of the PLC CPUs. This reduces the operation burden on PLC CPUs and results in a shorter cycle time.



- Control load distribution
- Reduced cycle time

Programming by PLC CPU only

This programming method is perfect for users who prefer to use only PLC CPU programs.
A PLC CPU program starts operation of the Motion module, eliminating the need for users to create another program for the Motion module, reducing programming burden.
The PLC CPU program supports the internationally standardized PLCopen® Motion Control Function Blocks, and therefore people other than the program designer can understand the programming, leading to reduced design and maintenance time.



- Reduced programming burden

Positioning Control

RD78GH SWM78 RD78G

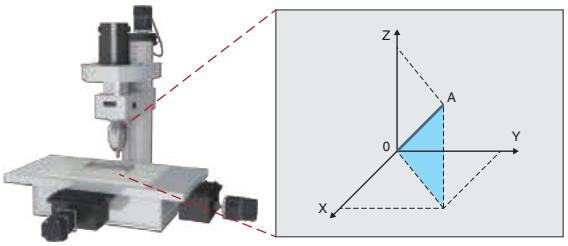
Two types of positioning control are available: single-axis and multi-axis positioning control.
This variety allows you to meet various control needs.

Item	Control types	
Single-axis control	Positioning	Absolute positioning
		Relative positioning
	Speed-position switching	Absolute speed-position switching*1
		Relative speed-position switching*1
	Homing	
	JOG operation	

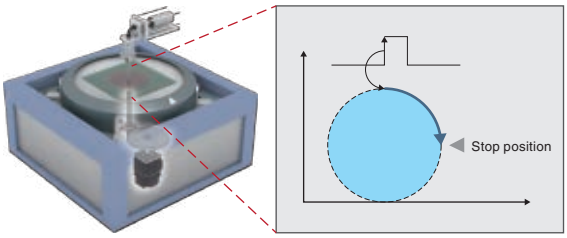
Item	Control types	
Multi-axis control	Linear interpolation	Absolute linear interpolation
		Relative linear interpolation
	Circular interpolation	Absolute circular interpolation
		Relative circular interpolation
	Helical interpolation	Absolute helical interpolation *1
		Relative helical interpolation *1
	Multi-axis path control *1	

Main Control

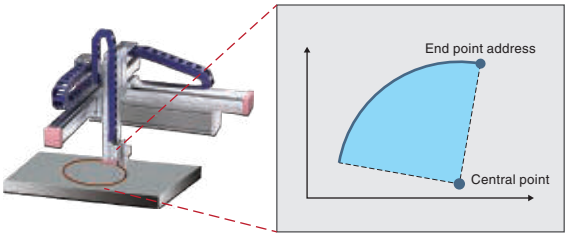
Linear interpolation



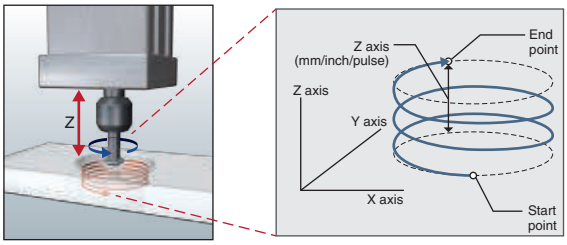
Speed-position switching *1



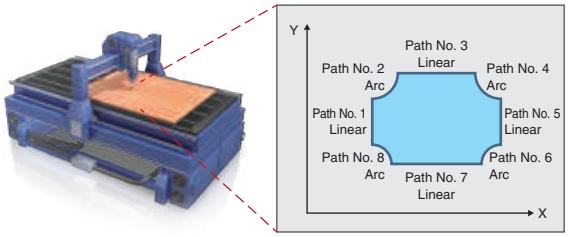
Circular interpolation



Helical interpolation *1



Multi-axis path control *1



*1. Future support is planned for these control types.

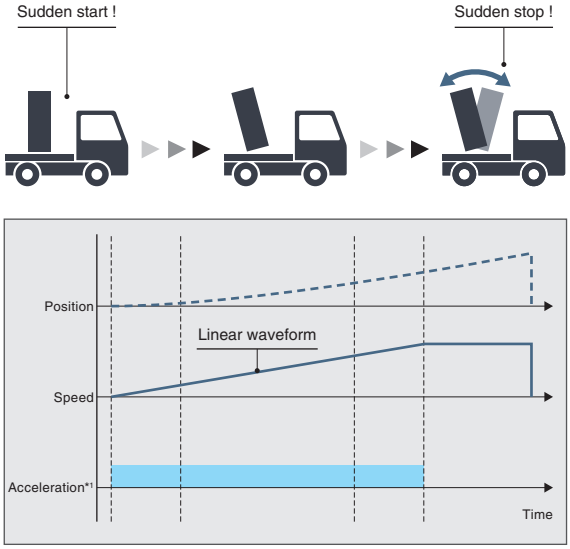
Acceleration/Deceleration Methods

RD78GH RD78G SWM78

Three types of acceleration/deceleration methods are available: trapezoidal acceleration/deceleration, jerk acceleration/deceleration, and acceleration/deceleration time fixed.

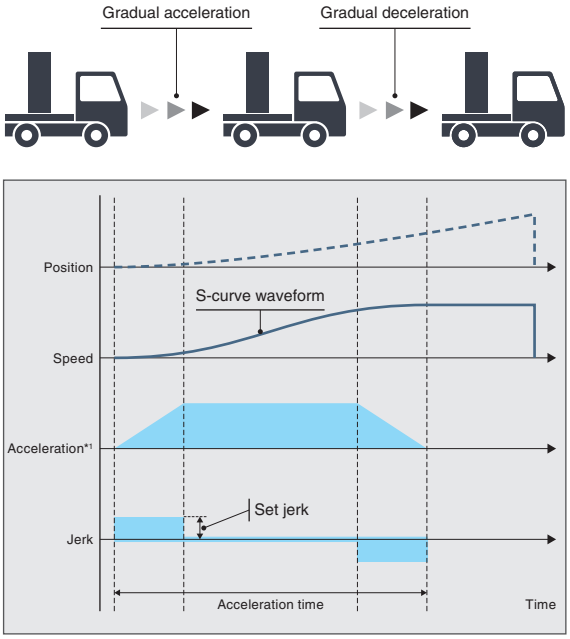
Trapezoidal acceleration/deceleration

After starting, maximum acceleration is maintained until the target speed is reached.
For example, when a vehicle loaded with a workpiece accelerates suddenly, the workpiece will swing back and forth due to the impact of the sudden acceleration.
To reduce impacts and vibrations in a case such as this, the vehicle must accelerate at a slower rate.
The speed creates a trapezoidal shape.



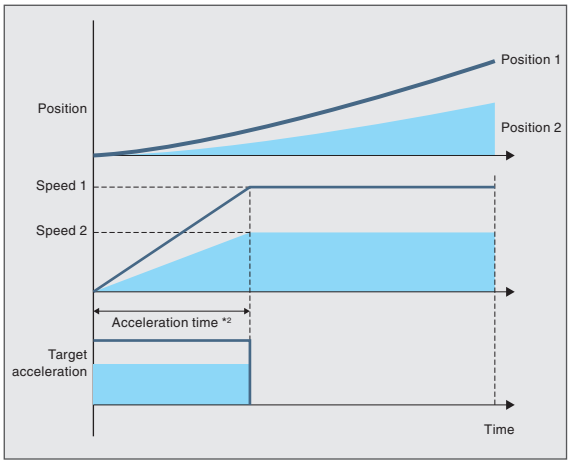
Jerk acceleration/deceleration

The acceleration changes gradually.
For example, when a vehicle loaded with a workpiece accelerates gradually, the load will not swing back and forth after acceleration.
The jerk is maintained during acceleration. When the vehicle has almost reached the target speed, the jerk is decelerated. Adjusting jerk in this way achieves smooth acceleration/deceleration while also shortening the time it takes to reach the target speed.
The speed creates a S-curve shape.



Acceleration/deceleration time fixed method

This method executes acceleration/deceleration based on the time specified, regardless of the commanded speed.



*1. Input acceleration.
*2. Specify acceleration time.

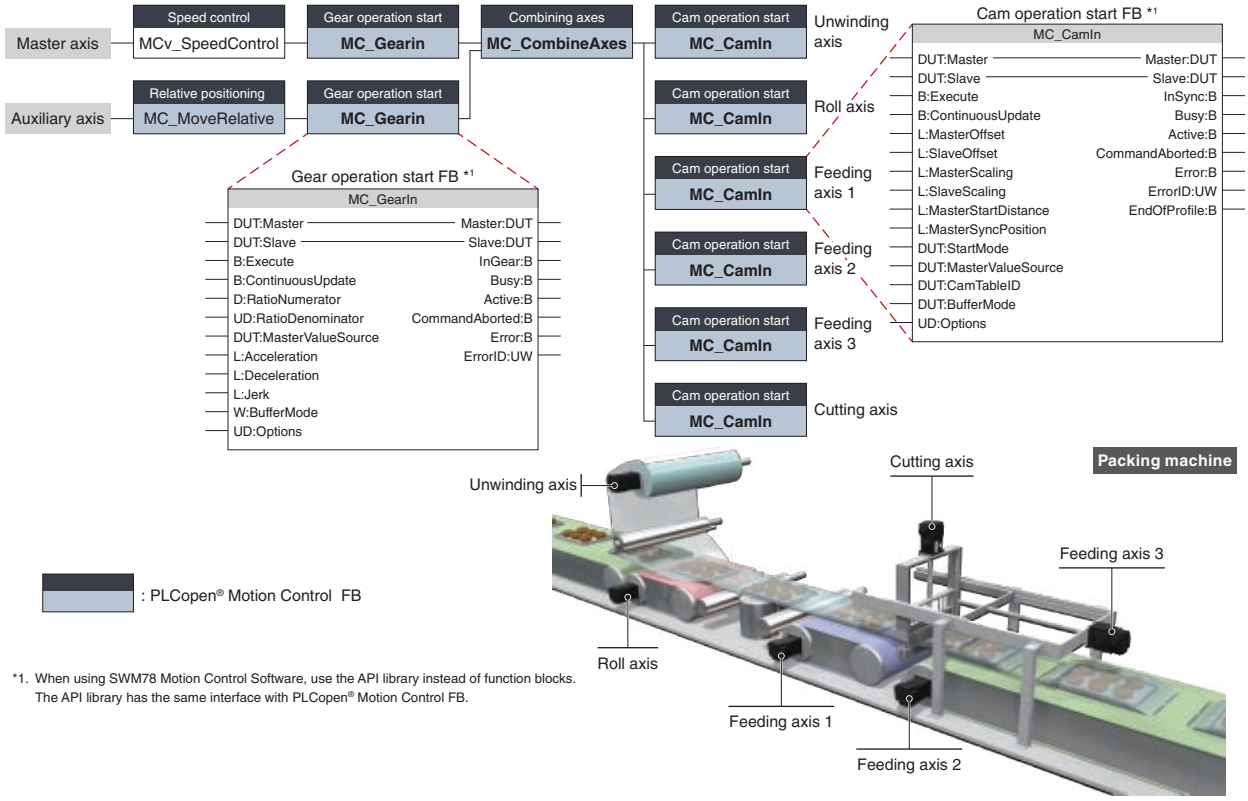
High Flexibility in Synchronous Control

RD78GH RD78G SWM78

Synchronous control is performed using function blocks that operate as software-based mechanical modules such as gear, shaft, clutch, speed change gear, and cam.

- The number and the combination of the synchronous modules are flexibly selected, achieving optimized operation.
- The following two types of cam data are available: cam data and cam data for a rotary knife
- Complex cam control is possible by flexibly switching cams.
- Positioning and synchronous control can be performed together in the same program.
- Cam for a rotary knife can be easily created in MELSOFT GX Works3 or by using function blocks.

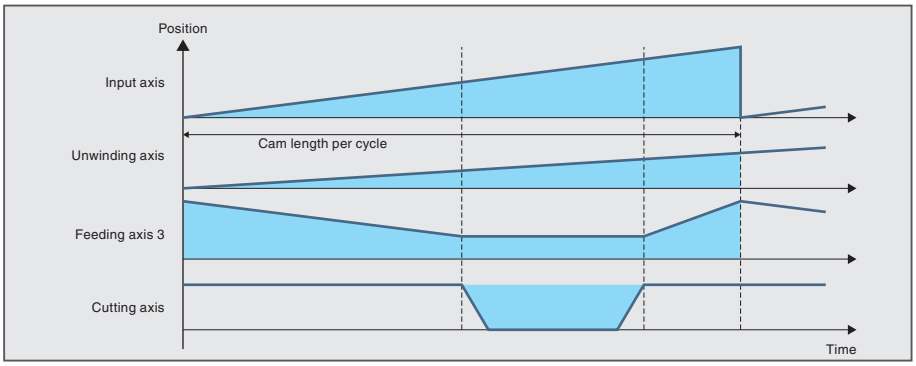
[An example of packing machine program]



*1. When using SWM78 Motion Control Software, use the API library instead of function blocks. The API library has the same interface with PLCopen® Motion Control FB.

[Time chart]

This program synchronizes all the axes, from the cutting axis through the unwinding axis, with the master axis. The following shows the time chart of the film cutting operation.



Touch Probe Function (Mark Detection Function)

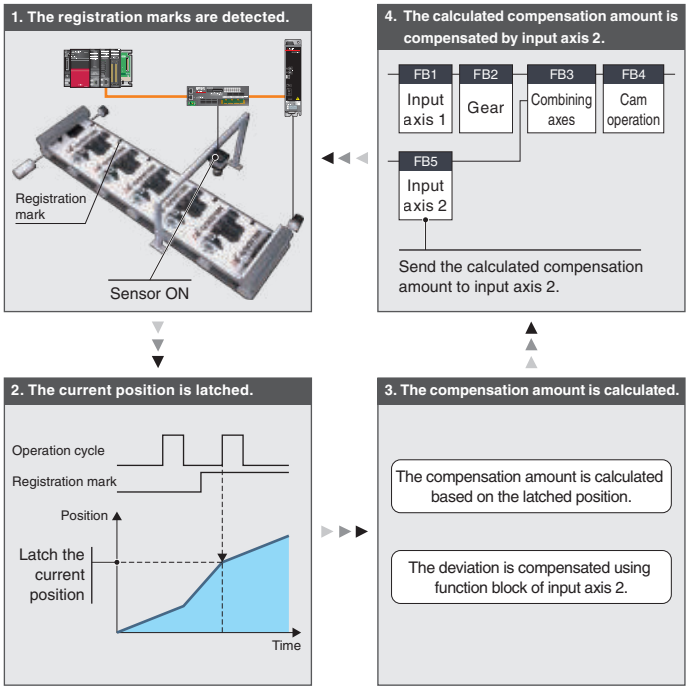
Future support planned | RD78GH | SWM78 | RD78G

This function latches data responding to a trigger signal input.
The trigger signal can be inputted to the controller using a remote I/O.

Compensation Based on Registration Marks

1. The registration marks are detected with the sensor.
2. The current position is latched.
3. The compensation amount is calculated from the latched data.
4. The deviation is compensated by the calculated amount using input axis 2.

*1. When using SWM78 Motion Control Software, use the API library instead of function blocks. The API library has the same interface with PLCopen® Motion Control FB.

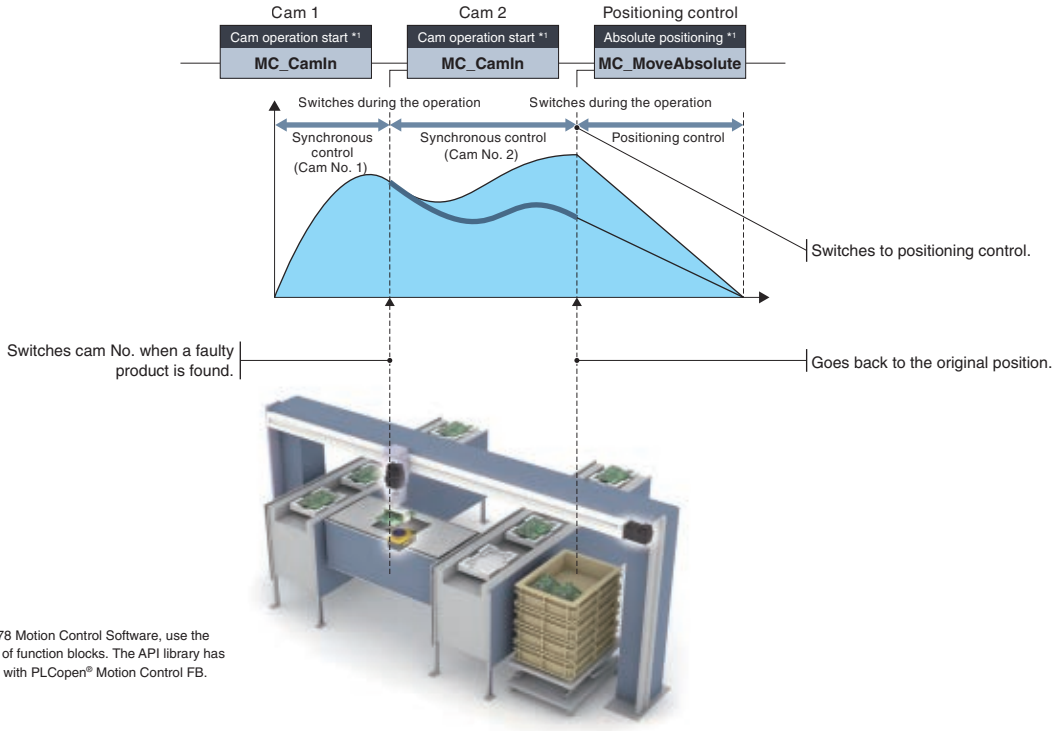


Cam Control

RD78GH | SWM78 | RD78G

Changing Cam No.

The cam being executed can be flexibly switched to another cam, and cam control can smoothly switch to positioning control without stopping the servo motor.



*1. When using SWM78 Motion Control Software, use the API library instead of function blocks. The API library has the same interface with PLCopen® Motion Control FB.

Cam Data

RD78GH RD78G SWM78

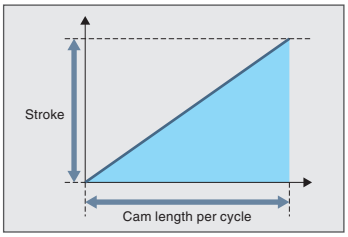
Create operation profile data*1 (cam data) according to your application. The created cam data is used to control output axis.
The following three cam operations are available: linear operation, two-way operation, and feed operation. Choose one according to your application.

*1. "Operation profile data" is a general name for waveform data, which is used for various applications.

Operation Profile Data (Cam Data)

Linear operation

The cam pattern is a linear line.
This pattern is used for a ball screw and a rotary table.

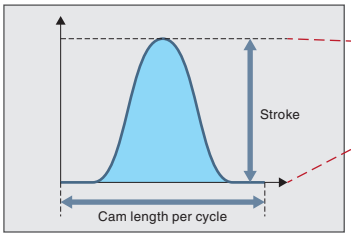


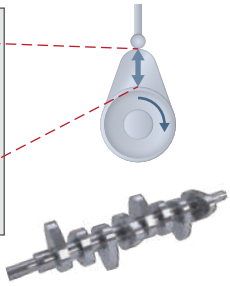
Ball screw [Unit: mm]

Rotary table [Unit: degree]

Two-way operation

The beginning and the end of the cam pattern are the same.
Mechanical cams fall into this category.

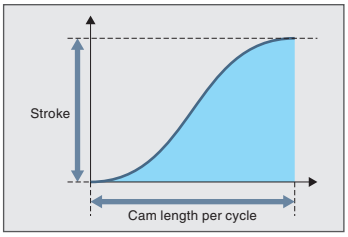




Crankshaft

Feed operation

The beginning and the end of the cam pattern differ.
This pattern is used for fixed-amount feed operations and intermittent operations.
Set the end point for the feed operation to a position of your choice.



Belt conveyor

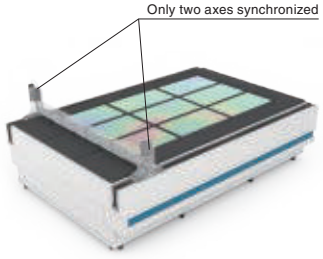
Rotary table [Unit: degree]

Application examples

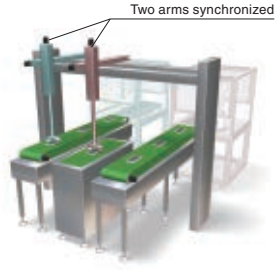
[Machine with all axes synchronized]

All the axes of the machine are in synchronization.

[Machine with only certain of the axes synchronized]



Only two axes are synchronized.
The other axes perform positioning operation while the two axes execute synchronous control.

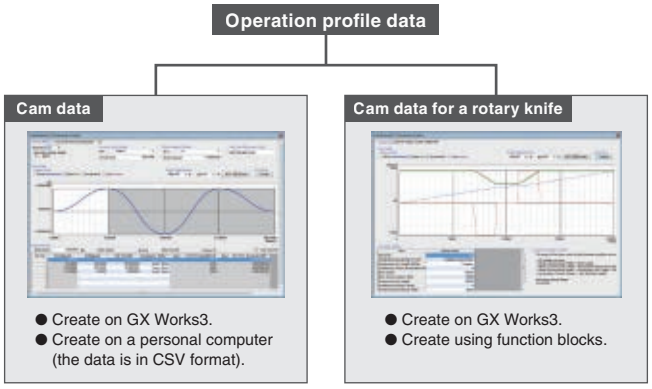


The two arms can avoid interference by synchronizing with each other, shortening the cycle time.

Operation Profile Data

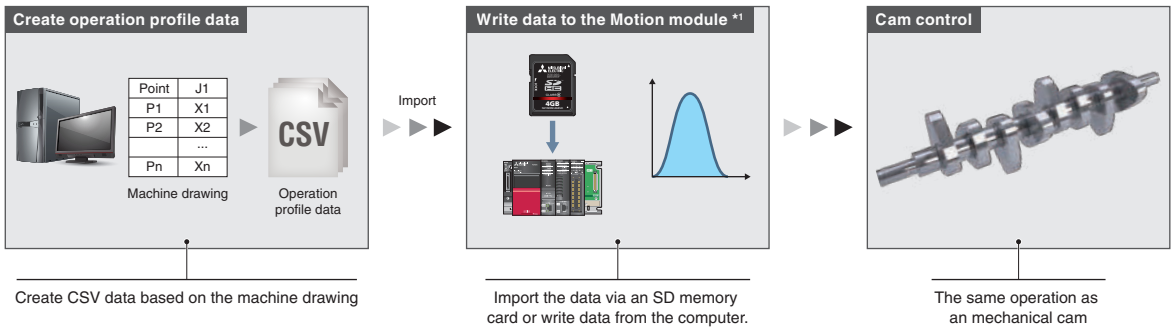
RD78GH RD78G SWM78

The operation profile data is divided into the following two types of cam data.



Importing Operation Profile Data in CSV Format

The operation profile data in a CSV format on a personal computer can be imported directly to a Motion module.

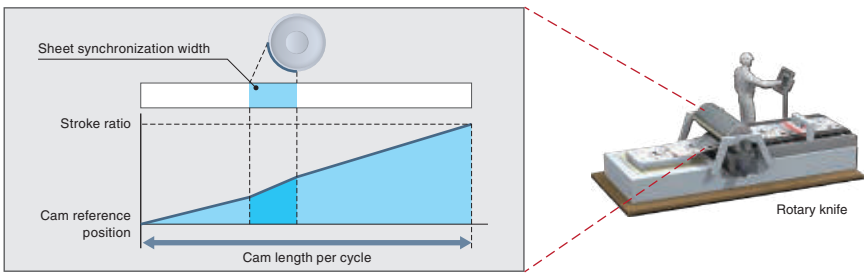


*1. When using SWM78 Motion Control Software, write data to an industrial computer.

Easy Cam Creation for a Rotary Knife

Cam data for a rotary knife is automatically generated with MELSOFT GX Works3 or by using a function block.

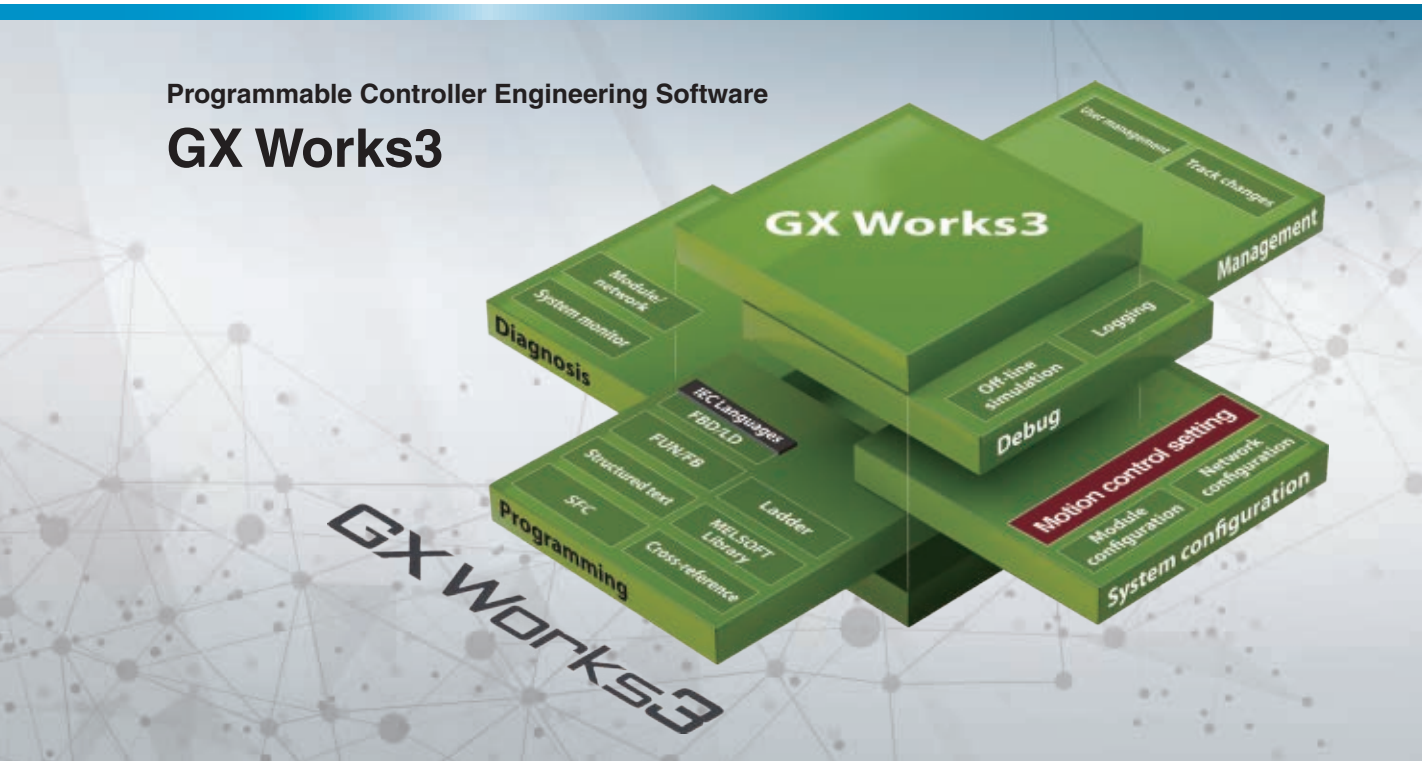
- (Using function block) The operation profile data (cam data) is created just by setting the sheet length and sheet synchronization width, etc., to the function block and starting it.
- (Using MELSOFT GX Works3) Set the sheet length and sheet synchronization width, etc., which automatically generates cam data for a rotary knife.



One software, many possibilities

Programmable Controller Engineering Software

GX Works3



MELSOFT GX Works3 has a variety of features which help users create programs and conduct maintenance more flexibly and easily. This software includes motion control setting to support all Motion module development stages - from setting parameters to programming, debugging, and maintenance.

Development Environment Designed for Ease of Use

This all-in-one software covers all aspects of the product development cycle, resulting in boosted efficiency in programming while also improving user-operability by providing a common interface across all the phases.

System Design → Programming → Debug → Maintenance

System Design

- Network configuration settings
- Automatic detection of network configuration

Programming

- Easy programming in ST language
- More intuitive programming, which eliminates the need to remember devices or buffer memory addresses
- Easy access to axis information
- Operation profile data

Debug

- Various monitor functions, such as axis monitor, and ST language program monitor
- A simulator*1 that debugs a program without an actual machine
- Real-time monitor*1 of GX LogViewer

Maintenance

- Various monitor functions, such as axis monitor, and event history

*1. This function will be supported by the Motion module in the future.

System Design | Programming | Debug | Maintenance

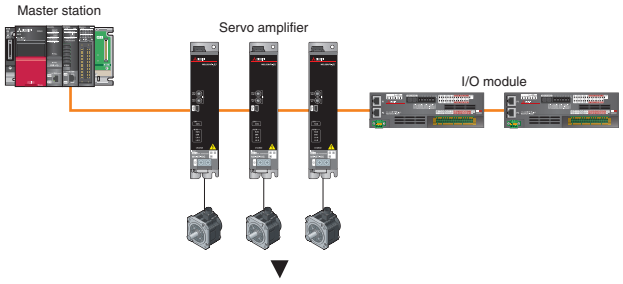
Network Configuration Settings

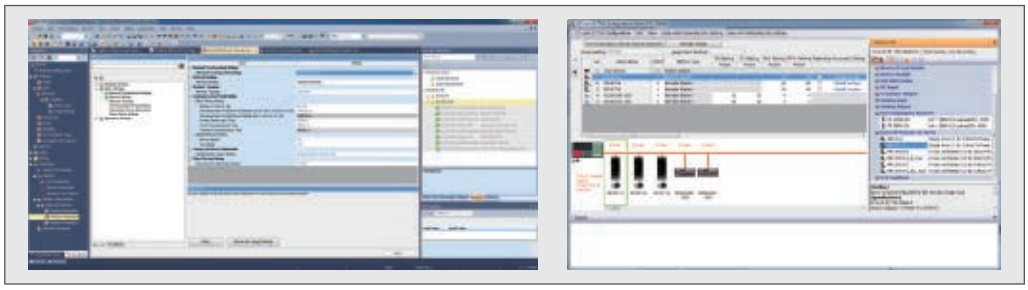
[Network configuration settings]

● Intuitive network settings with drag-and-drop operations and a graphical screen view

[Automatic detection]

● By clicking the [Connected/Disconnected Module Detection] button, the connection status of slave devices is automatically detected and the CC-Link IE TSN configuration screen is generated.

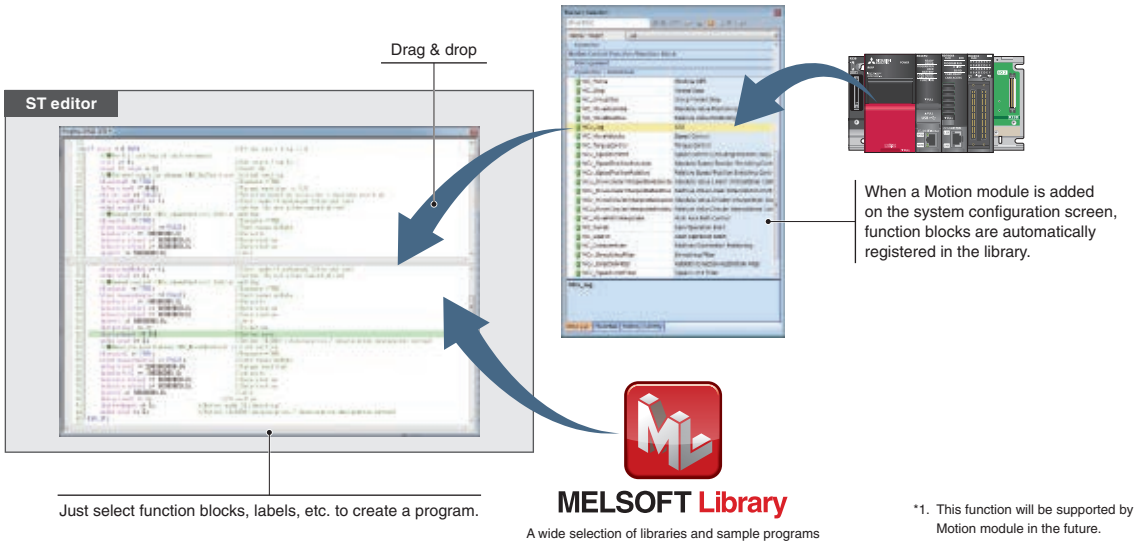




System Design | Programming | Debug | Maintenance

Easy Programming Through Structured Text Language

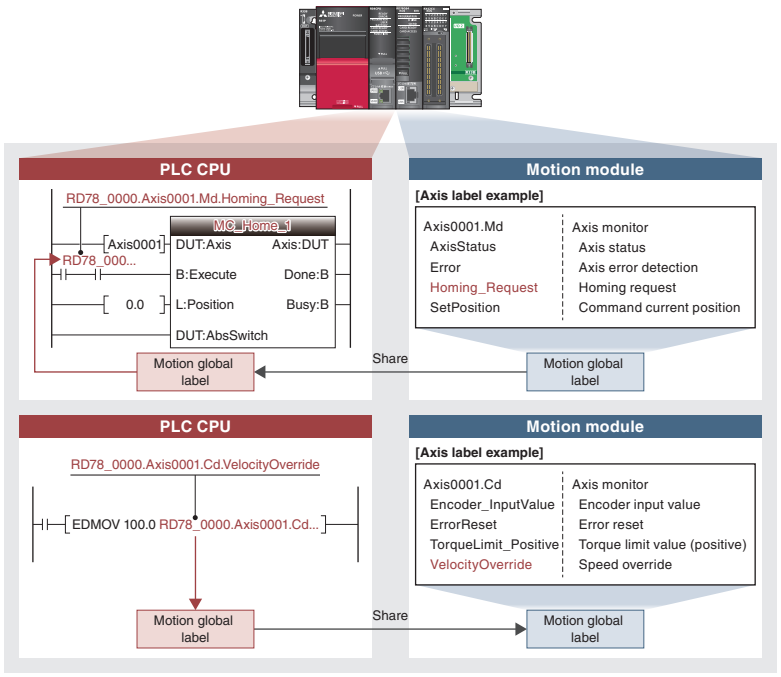
● Structured text programs are composed of function blocks, increasing program readability.
● Modularization of the programs increases their reusability.
● The consistent, common operability on a single engineering tool improves usability further.
● A wide selection of programming elements in the MELSOFT Library contributes to reducing programming time.
● The program is created by dragging & dropping programming elements, which simplifies the programming process.
● A startup time is reduced using the simulator*1 of MELSOFT GX Works3 that can debug a program without an actual machine.



*1. This function will be supported by the Motion module in the future.

Programming Using Labels

- The control axes of the Motion modules and I/O signals are defined as label variables, which enables easy reuse of programs and helps to improve programming efficiency.
- The global labels created in the Motion module project can be used in PLC CPUs. (future support planned)



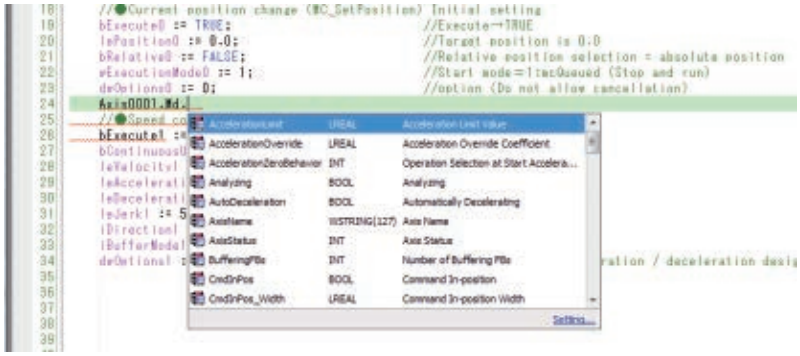
[Reading label data in Motion module]
The axis label data created in the Motion module can be read by the PLC CPU.

[Writing data to labels in Motion module]
Data in the PLC CPU program can be written to the axis labels in the Motion module.

Axis Information is Easily Accessible

- Axis label variables can be used as an argument to refer axes in positioning function blocks.
- IntelliSense® function reduces programming mistakes.
- Access by variable names increases readability.

[Structured text editor]

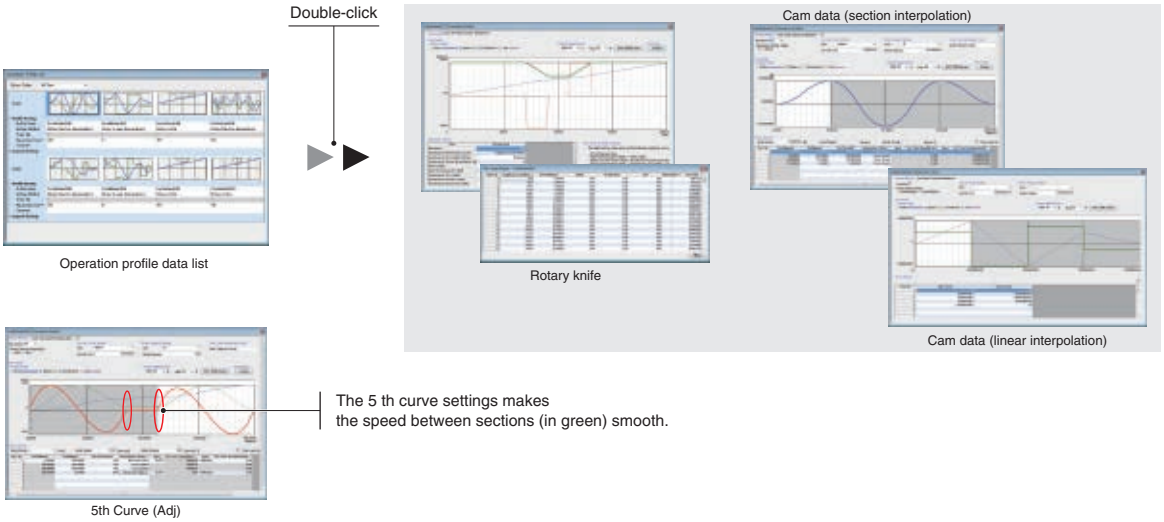


System Design Programming Debug Maintenance

Operation Profile Data with Simple Settings

Operation profile data, such as cam data and cam data for a rotary knife, is easily created.

- The cam graph can be flexibly and easily created through drag & drop. The waveform is changed according to the pointer's movement.
- Stroke, speed, acceleration, and jerk can be set while monitoring the changes on the graph.
- By setting "5th Curve (Adj)" for the cam curve types, the speed on a section border becomes smooth.
- Operation profile data for a rotary knife can be automatically generated by settings sheet length, synchronization width, cam resolution, etc.
- The created operation profile data can be checked on the list.



System Design Programming Debug Maintenance

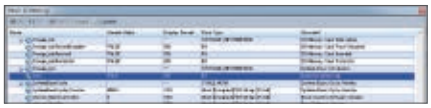
A Variety of Monitor Functions Make Troubleshooting Easy

Improve debug efficiency by customizing monitor items according to your machine.

Axis monitor

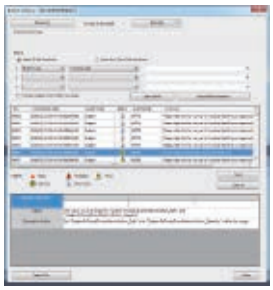
Debugging can be executed through both the program monitor and the watch window by using the common interface.

ST language program monitor

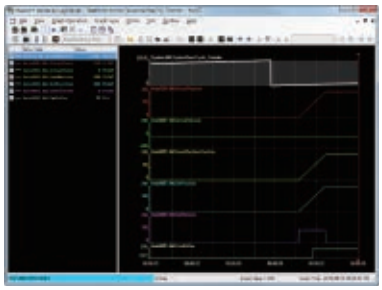


Watch window

Event history lists information about executed operations and errors that have occurred on each module in chronological order, which helps to conduct troubleshooting.



Debug efficiency is increased with the real-time monitor*1 of GX LogViewer that displays up to 32 collected motion system data in real time.



Real-time monitor of GX LogViewer

*1. This function will be supported by the Motion module in the future.

All-in-One World Class Servo

Servo amplifiers

MITSUBISHI ELECTRIC SERVO SYSTEM
MELSERVO-JET

CC-Link IE TSN
MR-JET-G

EtherCAT®
MR-JET-G-N1

Supports Ethernet-based CC-Link IE TSN, featuring high-speed, large-capacity communication (1 Gbps). Command communication cycle of ≥ 125 µs and speed frequency response of 2.5 kHz enable advanced motion control.
MR-JET-G-N1 servo amplifiers support EtherCAT®. (100 Mbps)

Product Lines

■ Servo amplifier

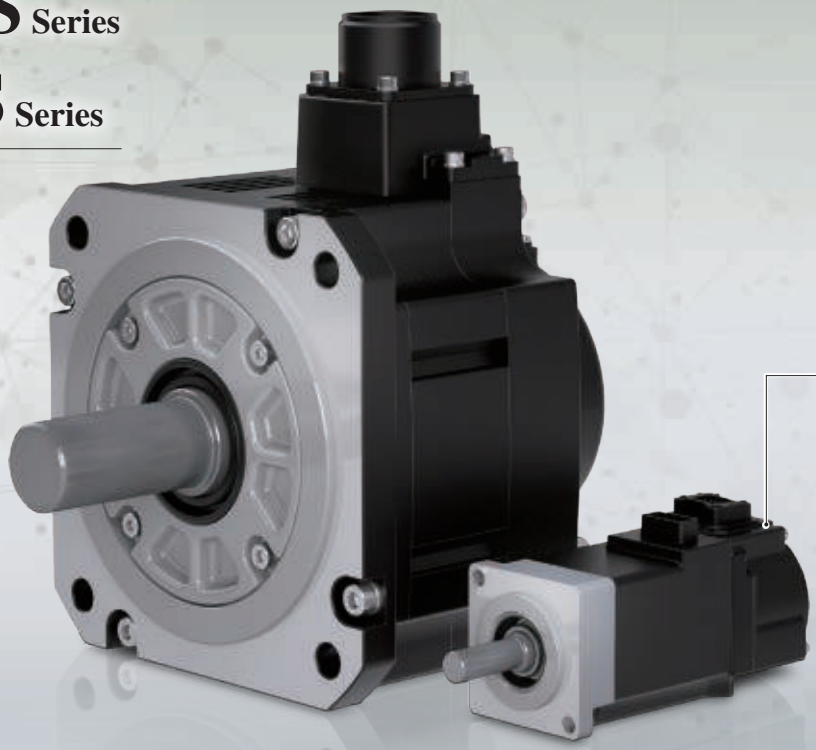
●: Supported

Model	Power supply specifications	Command interface	Rated output (Note 1)	Rotary servo motor	Control mode		
					Position	Speed	Torque
MR-JET-G	200 V AC	CC-Link IE TSN	0.1 kW to 3.0 kW	●	●	●	●
MR-JET-G-N1		EtherCAT®					

Notes: 1. The servo amplifiers of 2.0 kW and 3.0 kW are available soon.

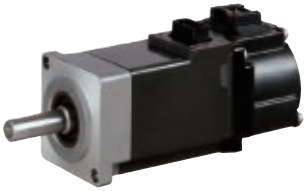
Rotary servo motors

HG-KNS Series
HG-SNS Series



Equipped with a 22-bit absolute position encoder.

* A battery (available soon) is required when configuring an absolute position detection system.



Small capacity, low inertia

HG-KNS Series

Servo motors with a 22-bit absolute position encoder
Rated speed: 3000 r/min
Maximum speed: 6000 r/min

Medium capacity, medium inertia

HG-SNS Series

Servo motors with a 22-bit absolute position encoder
Rated speed: 2000 r/min
Maximum speed: 3000 r/min

* The maximum speed varies by the models.

■ Rotary Servo Motors

* : Motor flange size [Unit: mm]

HG-KNS Series						HG-SNS Series (Note 1)			
40 x 40 *		60 x 60 *		80 x 80 *		130 x 130 *		176 x 176 *	
Model	Capacity [kW]	Model	Capacity [kW]	Model	Capacity [kW]	Model	Capacity [kW]	Model	Capacity [kW]
HG-KNS13J	0.1	HG-KNS23J	0.2	HG-KNS73J	0.75	HG-SNS52J	0.5	HG-SNS202J	2.0
		HG-KNS43J	0.4			HG-SNS102J	1.0	HG-SNS302J	3.0
						HG-SNS152J	1.5		

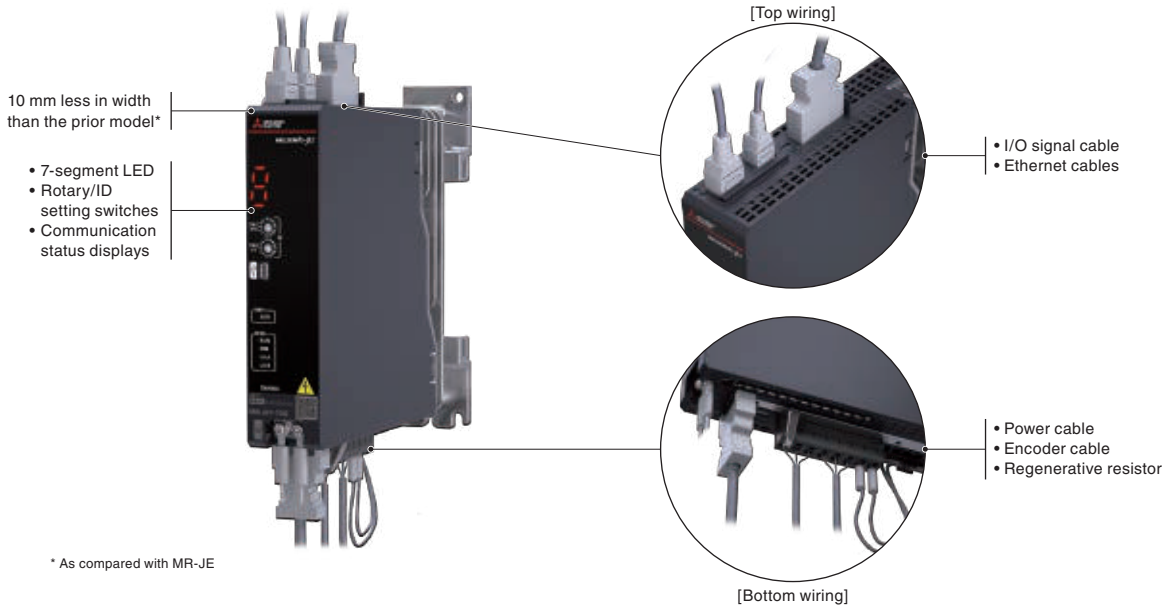
Notes: 1. The servo motors of 1.5 kW to 3.0 kW are available soon.

Compact Servo Amplifiers with Simple Wiring

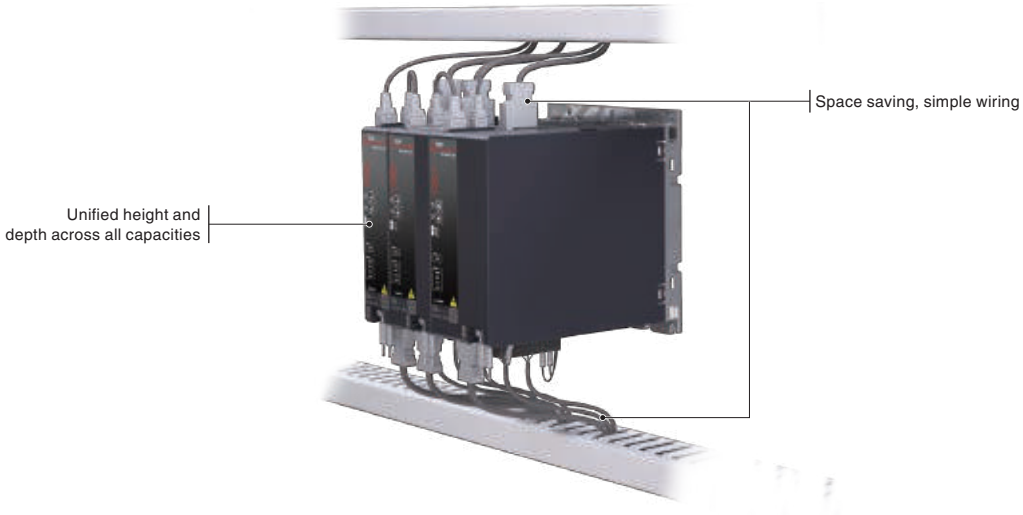
Simple, Efficient Wiring

Enhanced functions

The servo amplifier offers simple wiring by having connectors on the top and bottom surfaces, and allows all cables and wires to be routed through wiring ducts. LEDs and switches are located on the front surface of the servo amplifiers for easy operation.



* As compared with MR-JE



Servo Motors with High-Resolution Encoder

Equipped with a 22-bit Encoder

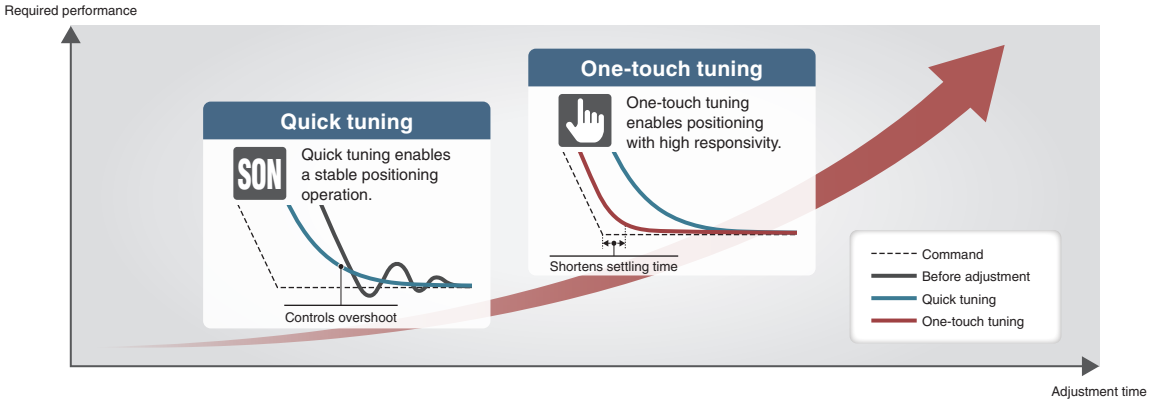
Enhanced functions

The HG-KNS/HG-SNS servo motors are equipped with a 22-bit absolute/incremental encoder and enable high-accuracy positioning and smooth rotation.*1 The HG-KNS/HG-SNS servo motors are fully compatible with the prior series as they have the same dimensions and use the same encoder and power cables.

*1. A battery (available soon) is required when configuring an absolute position detection system.

Tuning Functions

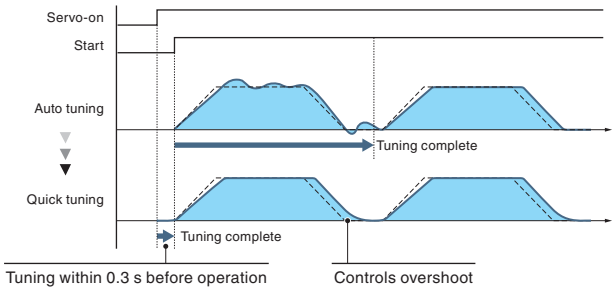
Use the tuning methods that are optimal for your machines.



Quick Tuning

Enhanced functions

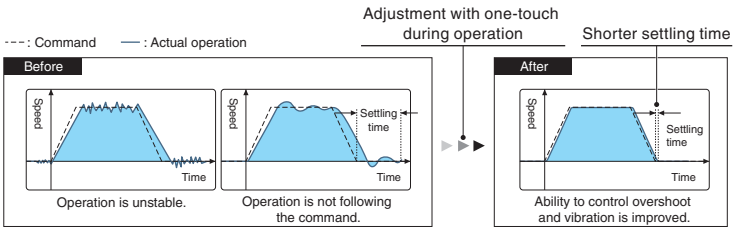
This function automatically performs easy-to-use auto tuning that controls vibration and overshoot just by turning on the servo-on command. Before normal operation, the servo amplifier sets speed loop gain and machine resonance suppression filters in 0.3 seconds by inputting torque to the servo motor automatically. After completing the setting, the servo amplifier starts operation normally.



One-Touch Tuning

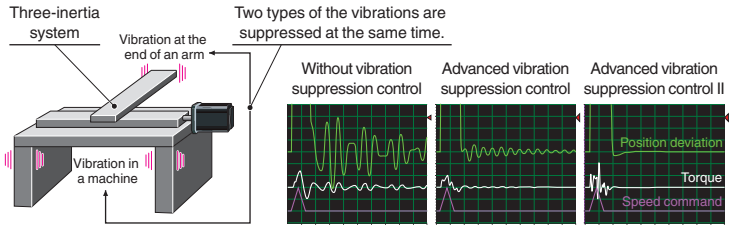
Enhanced functions

This function automatically completes servo gain adjustment according to the mechanical characteristics and reduces the settling time just by turning on the one-touch tuning. The servo gain adjustment includes the machine resonance suppression filter, advanced vibration suppression control II, and the robust filter. Controlling overshoot and vibration is improved, maximizing your machine performance.



Advanced Vibration Suppression Control II

This function 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.



Command Notch Filter

Enhanced functions

The frequency can be set close to the machine vibration frequency because the command notch filter has an applicable frequency range between approximately 1 Hz and 2000 Hz.

Machine Resonance Suppression Filter

Enhanced functions

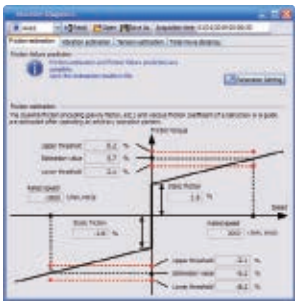
The expanded applicable frequency range is between 10 Hz and 8000 Hz. Five filters are simultaneously applicable, improving vibration suppression performance of a machine. The machine resonance frequency is detected by the machine analyzer function in MR Configurator2.

Preventive Maintenance

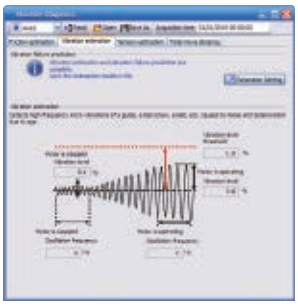
Machine Diagnosis Function

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

● Friction estimation function



● Vibration estimation function



Servo Amplifier Life Diagnosis

This function displays the cumulative energization time and the number of inrush relay on/off times. The data can be used to check life of the parts as a rough guide.

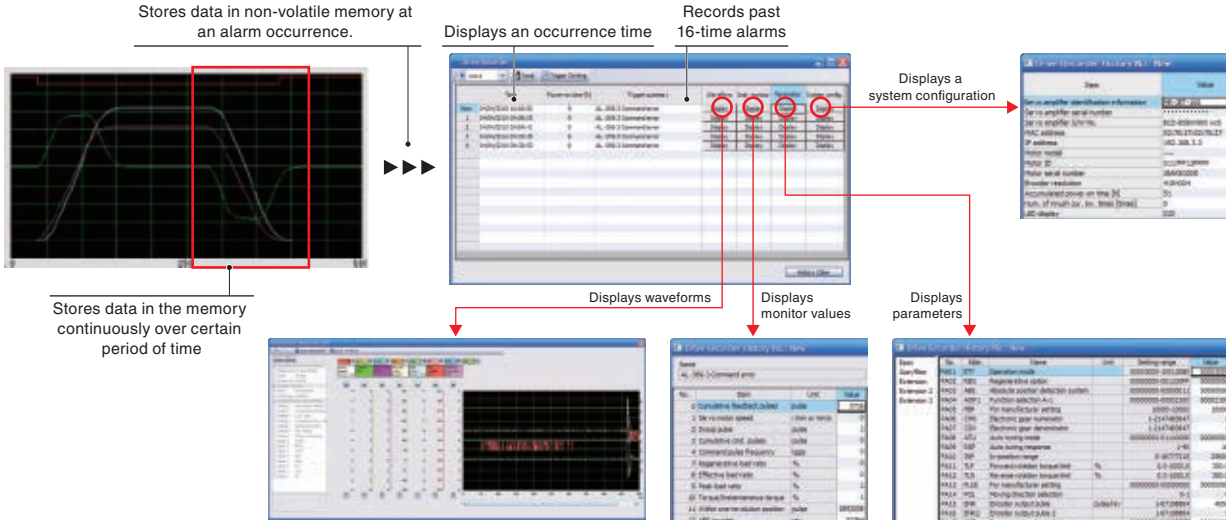
● Cumulative energization time (Smoothing condenser/cooling fan life span)
● The number of inrush relay on/off times (Inrush relay life)

Corrective Maintenance

Drive Recorder

Enhanced functions

This function continuously monitors the servo status and records the status transition such as a trigger condition before and after an alarm for a fixed period of time. Reading the servo data on MR Configurator2 helps you analyze the cause of the alarm. In addition to the monitor values and the waveform of the past 16-time alarms in the alarm history, the system configuration and the servo parameters are displayed. Alarm occurrence time is also displayed when the servo amplifier and the controller are normally in communication on CC-Link IE TSN.

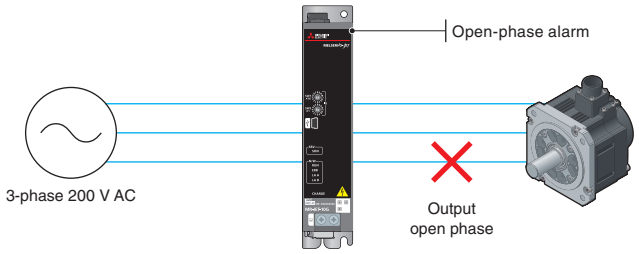


Connection/Communication Diagnosis

Disconnection Detection

Enhanced functions

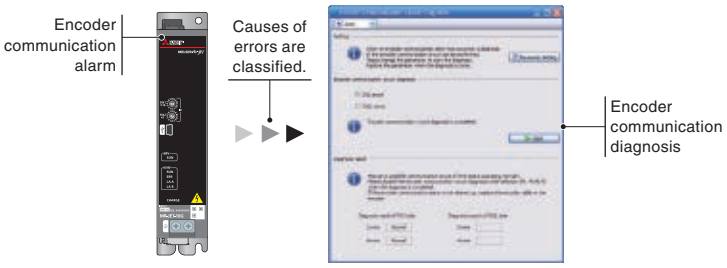
The servo amplifiers detect an open phase condition on the output side. The alarm can be distinguished from other alarms such as the overload alarm, reducing the time required to restore the system.



Encoder Communication Diagnosis

Enhanced functions

The encoder communication diagnosis checks the encoder communication circuit in the servo amplifier. This function is useful for classifying the cause of errors (such as disconnected encoder cables) when the encoder communication alarm occurs.

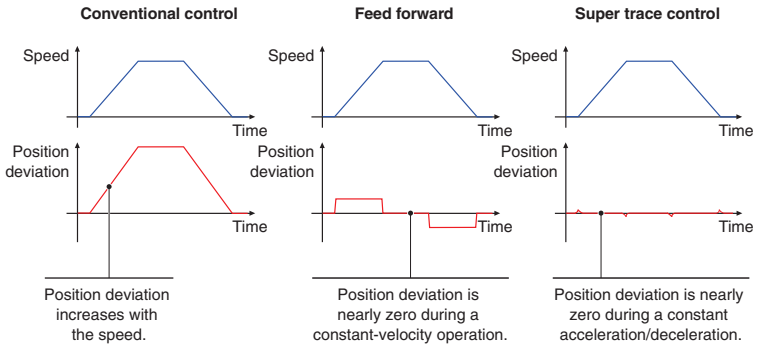


Path Control

Super Trace Control

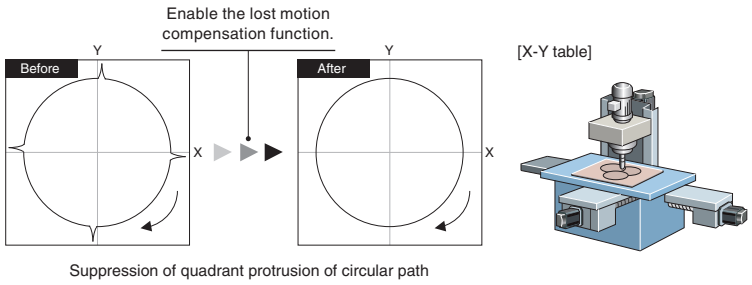
Enhanced functions

This function reduces a position deviation to nearly zero not only during constant-velocity operation, but also during constant acceleration/deceleration.
The path accuracy will be improved in high-rigidity machines.



Lost Motion Compensation

This function suppresses quadrant protrusion caused by friction and torsion generated when the servo motor rotates in a reverse direction. Therefore, the accuracy of circular path will be improved in path control used in XY table, etc.

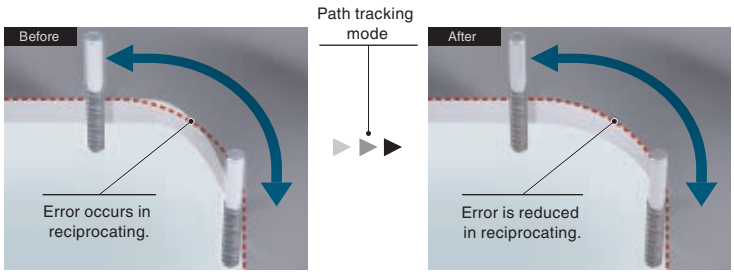


Suppression of quadrant protrusion of circular path

Path Tracking Model Adaptive Control

Enhanced functions

This function reduces path errors which occur when the servo motor reciprocates. Normally, when positioning control is executed, the model adaptive control adjusts the control to shorten a settling time. Instead, this function reduces overshooting to improve path accuracy, which is suitable for machines that require high-accuracy path control such as processing machines.

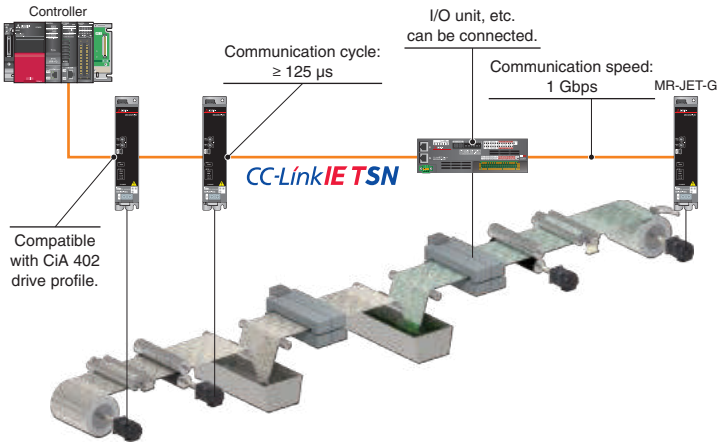


Command Interface

CC-Link IE TSN JET-G

Enhanced functions

The servo amplifiers drive the servo motors by receiving commands (position/speed/torque) at regular intervals in synchronous communication with the CC-Link IE TSN-compatible controller. When combined with a Motion module or Motion Control Software, the servo amplifiers enable exact synchronous operation of axes and machines through high-speed, high-precision time synchronization.



EtherCAT® JET-G-N1

Enhanced functions

Configure an EtherCAT® system with the high-performance MR-JET series servo amplifiers.
MR-JET-G-N1 servo amplifiers support EtherCAT®.

Communication specification	CANopen over EtherCAT® (CoE)
Drive profile	CiA 402
Communication cycle	125 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms
Control mode	Cyclic synchronous position mode (csp)
	Cyclic synchronous velocity mode (csv)
	Cyclic synchronous torque mode (cst)
	Homing mode (hm)

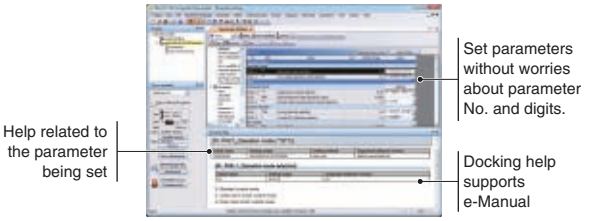
Servo Setup Software MR Configurator2

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

Parameter setting and docking help

Enhanced functions

Set parameters using the function display in the list without worries about the parameter No. and digits. Information related to the parameter being set is displayed in the docking help window. The latest e-Manual is also displayed in the docking help.

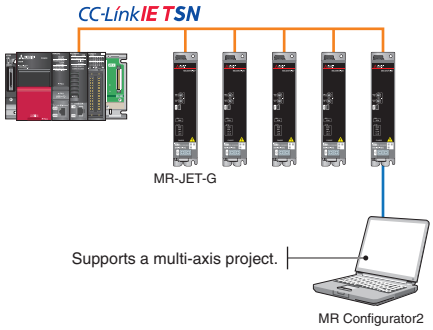


*1. e-Manuals for the MELSERVO-JET series are planned for a future release.

Supporting multi-axis project

Enhanced functions

Set parameters and monitor operation for multiple servo amplifiers through connecting to one of the servo amplifiers. Connecting via the Ethernet switching hub and the controller is also possible.



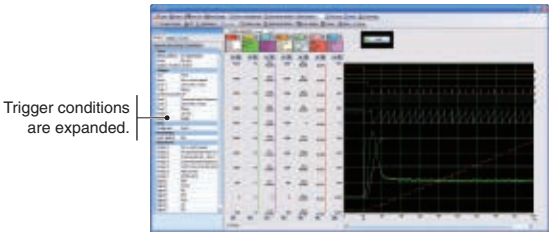
Tuning function

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

Graph function

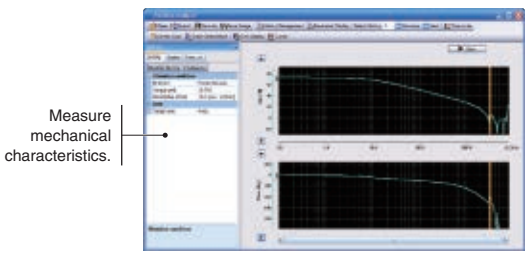
Enhanced functions

Obtain graphs of 7 channels for analog and 8 channels for digital. Various servo statuses are displayed in the waveform at one measurement, supporting setting and adjustment. Convenient functions such as [Overwrite] for overwriting multiple data and [Select history] for displaying graph history are available. Two types of signals can be used as a trigger signal with an OR/AND condition.



Machine analyzer function

Input random torque to the servo motor automatically and analyze frequency characteristics (0.1 Hz to 8 kHz) of a machine system just by clicking the [Start] button. This function supports setting of machine resonance suppression filter, etc.



Software reset

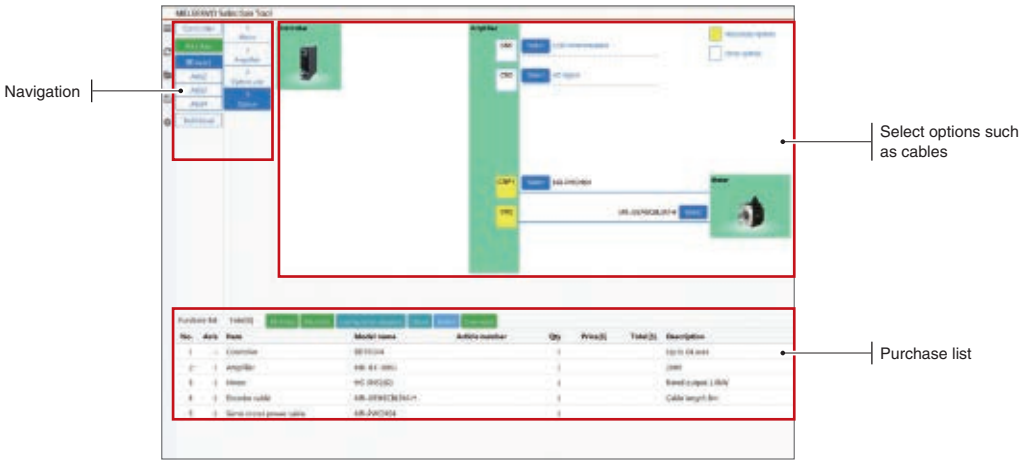
Enhanced functions

Reset the software for the servo amplifier with this new function. Setting switches and parameters is enabled without turning off the main circuit power supply of the servo amplifier.

Selecting Options (Model Selection)

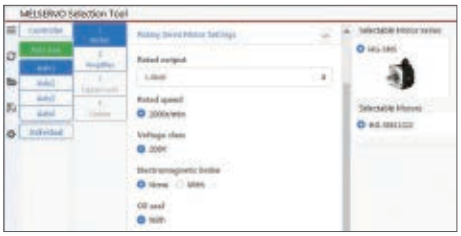
Enhanced functions

Select necessary options such as encoder cables.
Easily create system configuration diagrams and lists of necessary purchases to prevent mistakes when ordering.



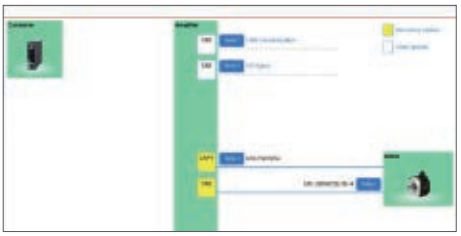
Selection of controllers/servo motors/servo amplifiers

● Select results from the drive system sizing software.



Selection of options

● Prevent selection mistakes.

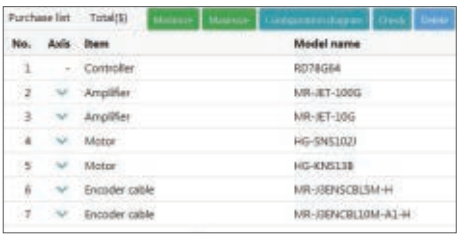


Configuration

● Check a configuration of each axis.

Purchase list

● Export to CSV file.



No.	Axis	Item	Model name
1	-	Controller	RD78GB4
2		Amplifier	MR-JET-100G
3		Amplifier	MR-JET-10G
4		Motor	HG-SN5102J
5		Motor	HG-KN513B
6		Encoder cable	MR-J3ENSCBL5M-H
7		Encoder cable	MR-J3ENCBL10M-A1-H

e-Manuals

Instruction manuals are available in e-Manual format. These manuals are linked with manuals for other products such as servo motors and controllers. e-Manuals let you obtain necessary information quickly and also allow you to keep an enormous number of manuals as one database.
Currently supported languages: English, Japanese, Chinese

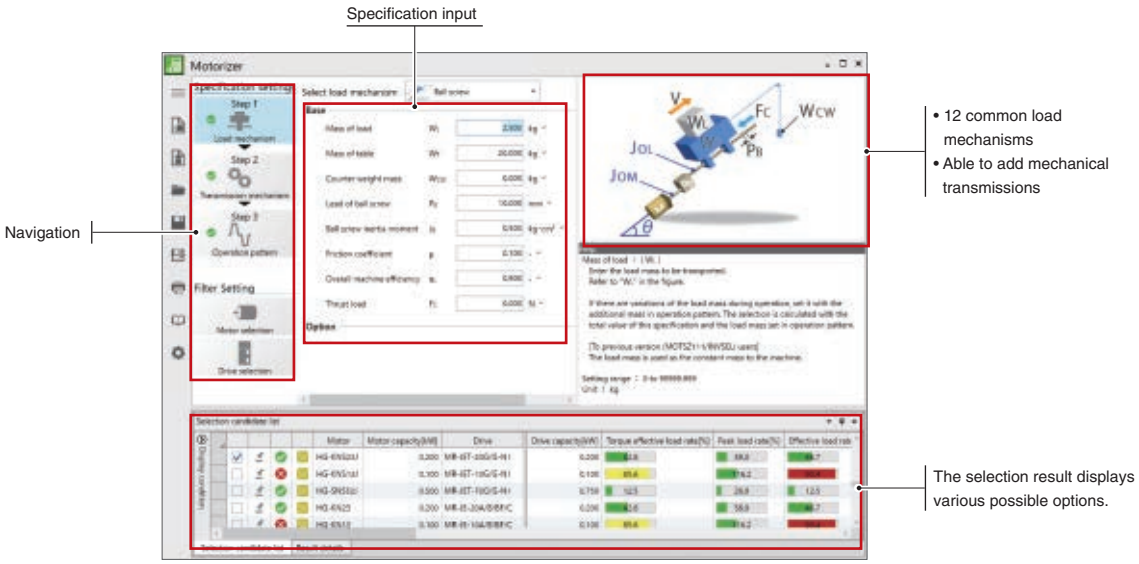
Features

● Use all necessary manuals as one database
● Download and use manuals in your local environment
● Use the e-Manual application on tablets
● Download and update manuals quickly and easily
● Search for desired information across multiple manuals

Drive System Sizing Software "Motorizer"

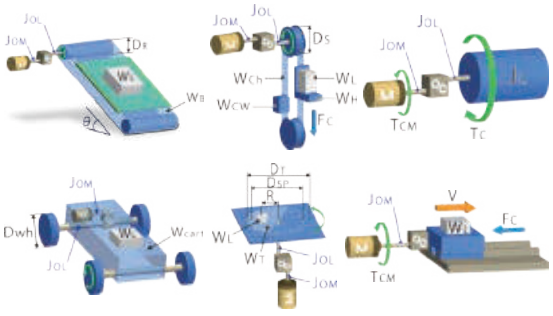
Enhanced functions

Select the most suitable servo motors, servo amplifiers, and regenerative options for your machine just by setting machine specifications and operation patterns. You can select a suitable combination from various results.
This software also supports multi-axis systems, enabling you to set operation patterns and select options for multiple axes.



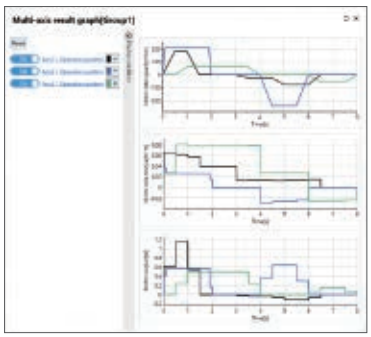
Flexible support for load mechanisms

- Select a load mechanism from 12 common types.
- Add transmission mechanisms such as a coupling.
- Set an inclination angle of the load mechanisms as desired.



Compatible with multi-axis systems

- Supports the multi-axis servo amplifiers and the converters.
- Set operation patterns for multiple axes.
- Select regenerative options for a multi-axis system.



Selection of several patterns

- Displays a list of load to motor inertia ratio, peak torque, etc., of each selection.
- Compatible with the expanded combinations of the servo amplifiers and the servo motors.
- Set threshold values for judgement.

Tutorial video

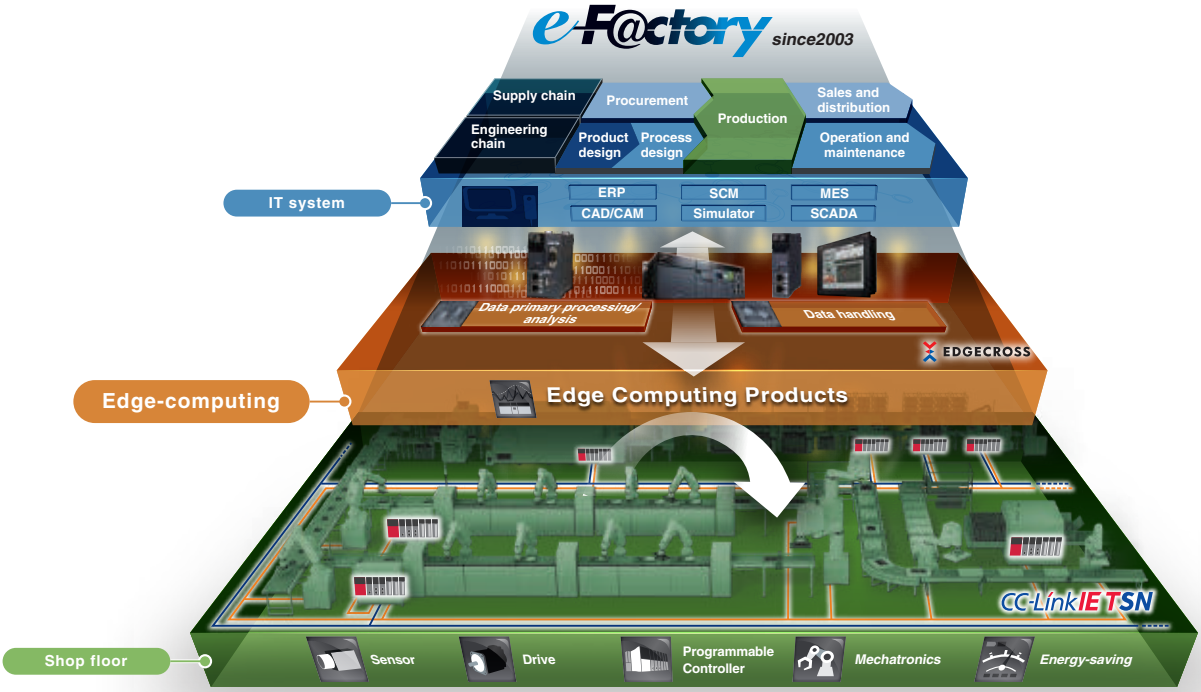
- Illustrates how to use the software and select drive systems in the video.

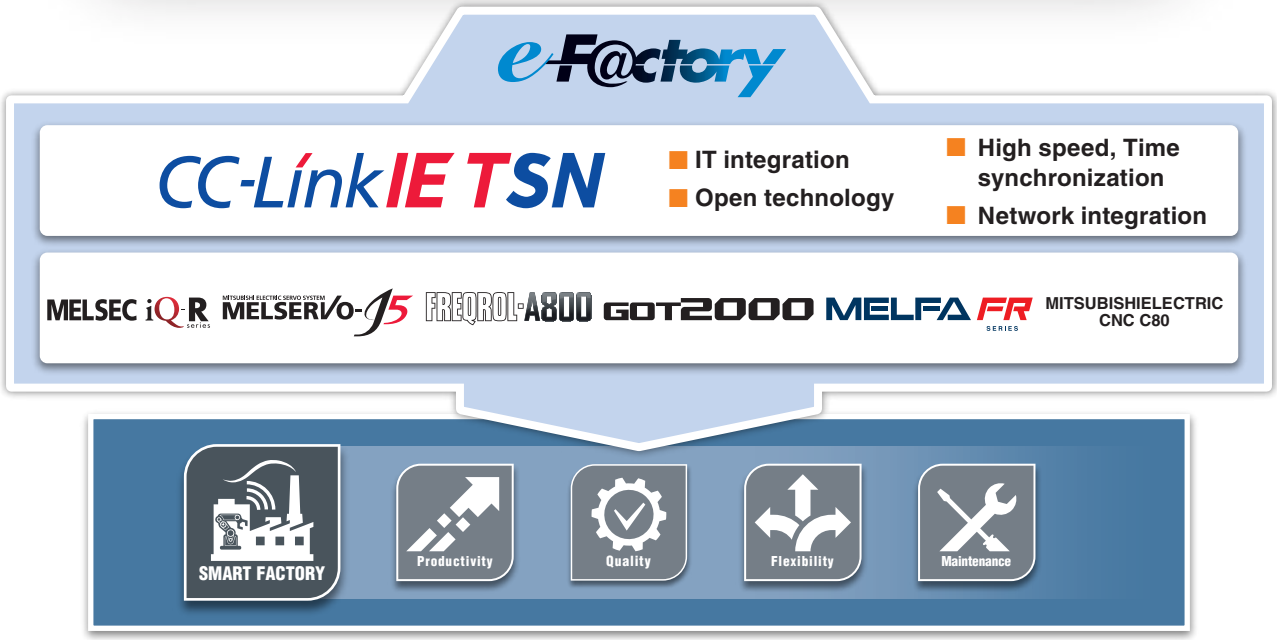
Mitsubishi Electric Solutions

e-F@ctory

Maximize productivity and reduce costs with an intelligent smart factory solution

Intelligent smart factories utilize high-speed networks with large data bandwidths to meet current manufacturing needs. The combination of CC-Link IE TSN and Mitsubishi Electric's e-F@ctory solution ensures robust integration between IT and factory automation systems, providing an intelligent smart factory solution that reduces total cost while improving operations, production yield, and efficient management of the supply chain. e-F@ctory is the Mitsubishi Electric solution for adding value across the manufacturing enterprise by enhancing productivity, thereby simultaneously reducing maintenance and operating costs, and enabling the seamless flow of information throughout the plant. e-F@ctory uses a combination of factory automation and IT technologies in combination with various best-in-class partner products through its alliance program.





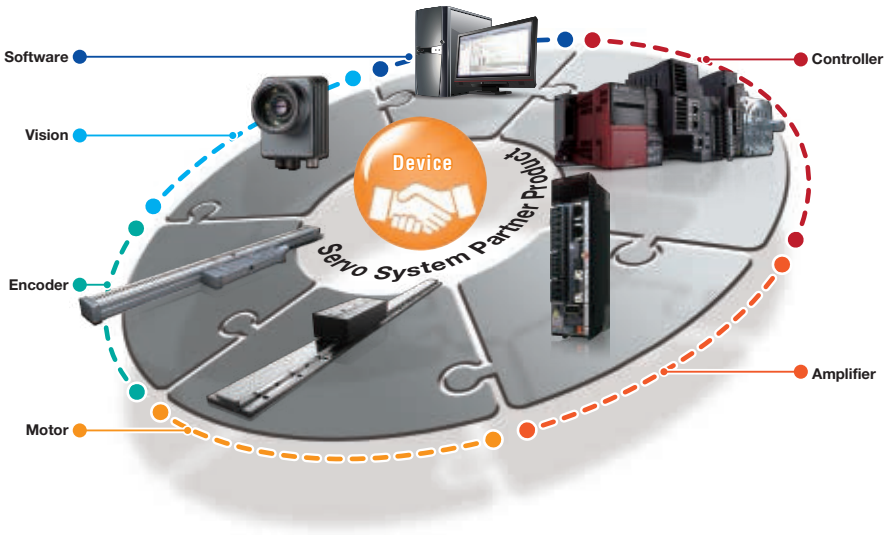
Mitsubishi Electric Partners

e-F@ctory Alliance

The e-F@ctory Alliance is a FA manufacturer partnering program that strongly links the connection compatibility of Mitsubishi Electric FA equipment utilizing excellent software and machinery offered by partners, thereby enabling systems to be built by systems integration partners and the proposal of optimal solutions to customers.

Mitsubishi Electric Servo System Partners

Servo system includes controllers, servo drivers, actuators, sensors, etc. The servo system takes a step further to accelerate the equipment revolution by collaborating with our partner companies. Now that a wide variety of partner products are available such as stepping motors, pressure-resistance, explosion-proof type motors, linear encoders, your system will be configured flexibly.
The Mitsubishi Electric Servo System Partner Association is a subcommittee of e-F@ctory Alliance.
Partner product lines supporting CC-Link IE TSN and MELSERVO will be expanded sequentially.



Mitsubishi Electric FA Global Website

Mitsubishi Electric Factory Automation provides a mix of services to support its customers worldwide, through a consolidated global website. It offers a selection of support tools and a window to its local Mitsubishi Electric sales and support network.

Global & Local Websites

Mitsubishi Electric Factory Automation
Global website
www.MitsubishiElectric.com/fa

Worldwide

Local websites

Global website

e-Manuals

Instruction manuals are available in e-Manual format.

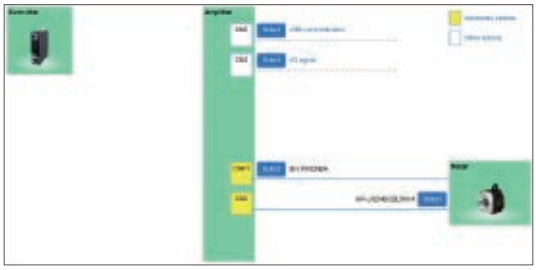
- Use the e-Manual application on tablets
- Download and update manuals quickly and easily
- Search for desired information across multiple manuals

Download on the App Store

GET IT ON Google Play

Model Selection Software

Model selection software is now available, so you can select options such as encoder cables and power cables which are required to use with controllers, servo motors, servo amplifiers, and regenerative options of your choice.
The result can be saved in a CSV format and can be used as a purchase list.



Model selection software

MEMO

1 Common Specifications

* MR-JET-200G_ and MR-JET-300G_ are available soon.
* HG-SNS152J, HG-SNS202J, and HG-SNS302J are available soon.
* Refer to p. 5-28 in this catalog for conversion of units.

Combinations of Rotary Servo Motors and Servo Amplifiers

○: Supported

Rotary servo motor		Servo amplifier MR-JET-						
		10G_	20G_	40G_	70G_	100G_	200G_ (Available soon)	300G_ (Available soon)
HG-KNS	HG-KNS13J	○	-	-	-	-	-	-
	HG-KNS23J	-	○	-	-	-	-	-
	HG-KNS43J	-	-	○	-	-	-	-
	HG-KNS73J	-	-	-	○	-	-	-
HG-SNS	HG-SNS52J	-	-	-	○	-	-	-
	HG-SNS102J	-	-	-	-	○	-	-
	HG-SNS152J (Available soon)	-	-	-	-	-	○	-
	HG-SNS202J (Available soon)	-	-	-	-	-	○	-
	HG-SNS302J (Available soon)	-	-	-	-	-	-	○

Environment

Motion module

Item	Operation	Storage
Ambient temperature	0 ˚C to 55 ˚C (when not using the extended temperature range base unit) 0 ˚C to 60 ˚C (when using the extended temperature range base unit)	-25 ˚C to 75 ˚C (non-freezing)
Ambient humidity	5 %RH to 95 %RH (non-condensing)	
Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust	
Altitude	2000 m or less	
Vibration resistance	Under intermittent vibration (directions of X, Y, and Z axes): 5 Hz to 8.4 Hz, displacement amplitude 3.5 mm 8.4 Hz to 150 Hz, acceleration amplitude 9.8 m/s^2 Under continuous vibration: 5 Hz to 8.4 Hz, displacement amplitude 1.75 mm 8.4 Hz to 150 Hz, acceleration amplitude 4.9 m/s^2	

Servo amplifier

Item	Operation	Transportation	Storage
Ambient temperature	0 ˚C to 55 ˚C (non-freezing) Class 3K3 (IEC 60721-3-3)	-25 ˚C to 70 ˚C (non-freezing) Class 2K3 (IEC 60721-3-2)	-25 ˚C to 70 ˚C (non-freezing) Class 1K3 (IEC 60721-3-1)
Ambient humidity	5 %RH to 95 %RH (non-condensing)		
Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust		
Altitude/atmospheric pressure	Altitude: 2000 m or less (Note 2)	Overland/sea transportation, or transporting on an airplane whose cargo compartment is pressurized at 700 hPa or higher	Atmospheric pressure: 700 hPa to 1060 hPa (Equivalent to altitudes from -400 m to 3000 m)
Vibration resistance	Under intermittent vibration: 10 Hz to 57 Hz, displacement amplitude 0.075 mm 57 Hz to 150 Hz, acceleration amplitude 9.8 m/s^2 Class 3M1 (IEC 60721-3-3) Under continuous vibration: 10 Hz to 55 Hz, acceleration amplitude 5.9 m/s^2	2 Hz to 8 Hz, displacement amplitude (single amplitude) 7.5 mm 8 Hz to 200 Hz, acceleration amplitude 20 m/s^2 Class 2M3 (IEC 60721-3-2)	2 Hz to 9 Hz, displacement amplitude (single amplitude) 1.5 mm 9 Hz to 200 Hz, acceleration amplitude 5 m/s^2 Class 1M2 (IEC 60721-3-1)

Rotary servo motor

Item	Operation	Storage
Ambient temperature	0 ˚C to 40 ˚C (non-freezing)	-15 ˚C to 70 ˚C (non-freezing)
Ambient humidity	10 %RH to 80 %RH (non-condensing)	10 %RH to 90 %RH (non-condensing)
Ambience (Note 1)	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust	
Altitude	2000 m or less (Note 2)	
Vibration resistance	Refer to the specifications of each rotary servo motor.	

Notes: 1. Do not use the rotary servo motors in the environment where the servo motors are exposed to oil mist, oil and/or water.
2. Refer to User's Manuals of each servo amplifier and servo motor for the restrictions when using the servo amplifiers and servo motors at an altitude exceeding 1000 m.

Compliance with Global Standards and Regulations

Motion module

Europe	Low voltage directive	-
	EMC directive	EN 61131-2
	Machine directive	-
	RoHS directive	EN 50581
North America	UL standard	UL 61010-1 / UL 61010-2-201
	CSA standard	CSA C22.2 No. 61010-1 / CSA C22.2 No. 61010-2-201
China	National Standard of the People's Republic of China (GB standards)	GB/T15969.2
	Measures for Administration of the Pollution Control of Electronic Information Products (China RoHS)	Article 13 (Names and the content of hazardous substances are described in User's Manuals.) Article 14 (Marking for the Restricted Use of Hazardous Substances is labeled.)
	China Compulsory Certification (CCC)	N/A
Korea	Korea Radio Wave Law (KC)	KN61000-6-2 / KN61000-6-4

Servo amplifier

Europe	Low voltage directive	EN 61800-5-1
	EMC directive	EN 61800-3 Category C2/C3 second environment
	RoHS directive	EN 50581
North America	UL standard	UL 61800-5-1
	CSA standard	CSA C22.2 No. 274
China	National Standard of the People's Republic of China (GB standards)	GB 12668.501, GB 12668.3
	Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (China RoHS)	Article 13 (Names and the content of hazardous substances are described in User's Manuals.) Article 14 (Marking for the Restricted Use of Hazardous Substances is labeled.)
	China Compulsory Certification (CCC)	N/A
Korea	Korea Radio Wave Law (KC)	KN 61800-3

Rotary servo motor

Europe	Low voltage directive	EN 60034-1
	EMC directive	EN 61800-3 Category C3
	RoHS directive	EN 50581
North America	UL standard	UL 1004-1 / UL 1004-6
	CSA standard	CSA C22.2 No. 100
China	National Standard of the People's Republic of China (GB standards)	GB 755
	Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products (China RoHS)	Article 13 (Names and the content of hazardous substances are described in User's Manuals.) Article 14 (Marking for the Restricted Use of Hazardous Substances is labeled.)
	China Compulsory Certification (CCC)	N/A
Korea	Korea Radio Wave Law (KC)	N/A

2 Servo System Controllers

* Refer to p. 5-28 in this catalog for conversion of units.

Motion Module/Motion Control Software

Control specifications

Item		Specifications		
		Motion module		SWM78 Motion Control
		RD78GH Available soon	RD78G	Software Available soon
Maximum number of control axes (Note 3)		RD78GHV: 128 axes RD78GHW: 256 axes	RD78G4: 4 axes RD78G8: 8 axes RD78G16: 16 axes RD78G32: 32 axes RD78G64: 64 axes	16 axes/32 axes/64 axes/ 128 axes/256 axes
Maximum number of connectable stations		120 stations	64 stations	120 stations
Operation cycle (operation cycle settings) (Note 1, 4) [µs]		31.25, 62.5, 125, 250, 500, 1000, 2000, 4000, 8000	62.5 (supported soon), 125, 250, 500, 1000, 2000, 4000, 8000	250, 500, 1000, 2000, 4000
Axis		Real drive axis, virtual drive axis, virtual linked axis		
	Axes group	0: Unset 1 or later: the axes group No. for the setting axis		
Interpolation function		Linear interpolation (2 to 4 axes), 2-axis circular interpolation		
Control method		Positioning control, direct control		
Acceleration/deceleration process		Trapezoidal acceleration/deceleration, jerk acceleration/deceleration, acceleration/deceleration time fixed method		
Compensation function		Driver unit conversion		
Synchronous control	Module	Master axis, cam, gear		
	Master axis	Real drive axis, virtual drive axis		
Operation profile (cam data)	Cam data	Cam data, cam for a rotary knife		
	Motion control FB (Cam auto-generation)	Cam for a rotary knife		
Control unit		Unit character string and decimal digit can be defined by users. (The following are given units: mm, inch, degree, pulse)		
Programming language		PLC CPU: ladder diagram, function block diagram/ladder diagram, structured text language Motion module: structured text language		C++ language
Backup		Parameters and programs can be saved on a flash ROM (batteryless backup)		Storage of IPC
Start/stop operation		Start, stop, restart, buffer mode, forced stop		
Homing	Homing method	Driver homing method (The homing method set in the driver is used.) Data set method		
Positioning control	Linear control	Linear interpolation (2 to 4 axes)		
	2-axis circular interpolation	Border point-specified, central point-specified, radius-specified circular interpolation		
Manual control		JOG operation		
Direct control	Speed control (Note 2)	Speed control not including position loop, speed control including position loop		
	Torque control (Note 2)	Torque control		
Absolute position system		Provided (batteryless)		
Functions that limit control	Speed limit	Speed command range		
	Torque limit	Torque limit value (positive/negative direction)		
	Forced stop	Valid/Invalid setting		
	Software stroke limit	Movable range check with an address of the set position or the feed machine position.		
	Hardware stroke limit	Provided		
Functions that change control details	Command speed change	Provided		
	Current value change	Provided		
	Acceleration/deceleration process change	Acceleration/deceleration, acceleration/deceleration time		
	Torque limit value change	Provided		
	Target position change	Target position change, movement distance change		
Other functions	History data	Event history		
	Logging	Data logging		
	Slave emulate	Provided		

Notes: 1. The number of controllable axes varies depending on the operation cycle.
2. These are the functions of Motion modules.
3. When MR-JET-G servo amplifiers are used for all axes, RD78GH and SWM78 control a maximum of 120 axes.
4. When an MR-JET-G is connected to RD78GH or RD78G, the minimum operation cycle is 125 µs.

Motion Module/Motion Control Software

CC-Link IE TSN

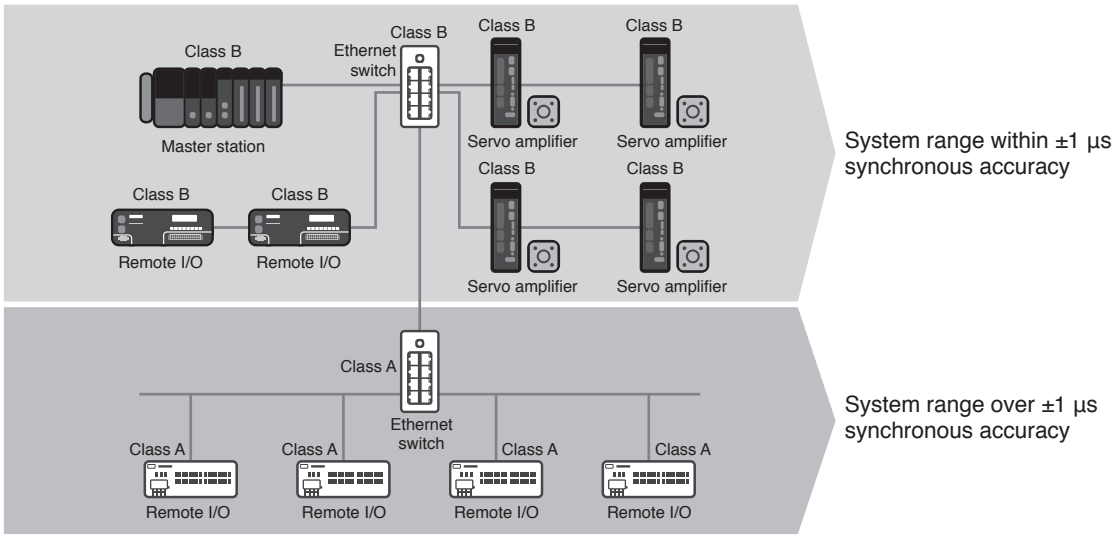
Item	Specifications		
	Motion module		SWM78 Motion Control Software Available soon
	RD78GH Available soon	RD78G	
Communications speed [bps]	1 G		
Maximum stations per network	121 stations (including the master station)	65 stations (including the master station)	121 stations (including the master station)
Connection cable	Ethernet cable (category 5e or higher, double shielded/STP) straight cable		
Maximum distance between stations [m]	100		
Maximum number of networks	239		
Topology (Note 1)	Line type, star type, line/star mixed type		
Communications methods	Time-sharing method		
Maximum transient transmission capacity	1920 bytes		

Notes: 1. Use a switching hub (authentication class: B) for star topology.

Certified Class

CC-Link IE TSN certifies nodes and switches to a specific class level according to its functionality and performance classification. Products can be classified as either class A or B. For the certified classification of each product, please check the CC-Link partner association website or the relevant product catalog or manual. Supported functions and system configuration may differ according to the certified class of products used. For example, products compatible with certified class B are necessary to configure a high-speed motion control system. For details of configuring systems with both class A and class B devices, please refer to relevant master product manual.

System configuration



- Synchronous accuracy of a system varies relative to the combination of connected devices and switches certification class
- Use class B devices when configuring a system within ±1 µs high-accuracy synchronization, connect class A devices to a separate branch line from class B devices (for details of system configuration, please refer to relevant master product manual)

Motion Module

Module specifications

Item	RD78GH Available soon	RD78G
Maximum number of control axes (Note 1)	RD78GHV: 128 axes RD78GHW: 256 axes	RD78G4: 4 axes RD78G8: 8 axes RD78G16: 16 axes RD78G32: 32 axes RD78G64: 64 axes
Maximum number of connectable stations	120 stations	64 stations
Servo amplifier connection method	CC-Link IE TSN	
Authentication class	B	
Maximum distance between stations [m]	100	
PERIPHERAL I/F	Via CPU module (USB, Ethernet)	
Extended memory	SD memory card	
Number of ports for CC-Link IE TSN	2 ports	1 port
Number of I/O points occupied	32 points + 16 points (empty slot)	32 points
Number of slots occupied	2 slots	1 slot
5 V DC internal current consumption [A]	2.33	1.93
Mass [kg]	0.44	0.26
Dimensions [mm]	106.0 (H) × 56.0 (W) × 110.0 (D)	106.0 (H) × 27.8 (W) × 110.0 (D)

Notes: 1. When MR-JET-G servo amplifiers are used for all axes, RD78GH controls a maximum of 120 axes.

Program specifications

Item		RD78GH Available soon	RD78G
Program capacity		Built-in ROM max. 64 [MB] + SD memory card	Built-in ROM max. 16 [MB] + SD memory card
Maximum program capacity memory		160 [MB]	96 [MB]
Variable memory	Label area	ST language program capacity and label memory capacity are settable.	
Data memory		Equivalent to program capacity	
Maximum number of files	Program	512 files (1 program definable per file)	
	FB/FUN	128 files (64 FBs/FUNs definable per file)	
	Global label	1 file (16384000 labels definable per file)	
Code size per program		Depends on the program memory	

Synchronous control specifications

FB	Description
MC_CamIn	Starts cam operation.
MC_GearIn	Starts gear operation.
MC_CombineAxes	Combines the motion of 2 axes.
MCv_ChangeCycle	Changes the current value per cycle.
MCv_SmoothingFilter	Enables smoothing filter.

Notes: 1. The number of usable function blocks depends on the program capacity.

Operation profile (cam) specifications

Item		RD78GH Available soon	RD78G
Memory capacity		Built-in ROM max. 64 [MB] + SD memory card	Built-in ROM max. 16 [MB] + SD memory card
Maximum number of cam registration		60000 (1024 out of 60000 can be set on engineering tool)	
Cam data	Cam type	Cam data, cam for a rotary knife	
	Interpolation method	Section interpolation, linear interpolation, spline interpolation	
	Profile ID	1 to 60000	
	Resolution	8 to 65535 (any resolution within the range)	
	Units for cam length per cycle	mm, inch, pulse, degree, or user-defined units	
	Units for stroke	%, mm, inch, pulse, degree, or user-defined units	
Cam auto-generation		Cam for a rotary knife	

Motion Module

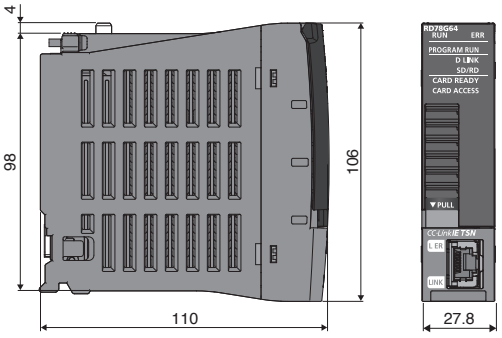
Function blocks (FB) list

Type	Name	Description
MCFB (motion)	MC_CamIn	Starts cam operation.
	MC_CombineAxes	Combines the motion of 2 axes.
	MC_GearIn	Starts gear operation.
	MC_GroupStop	Executes a forced stop for an axes group.
	MC_Home	Executes homing.
	MC_MoveAbsolute	Executes positioning (absolute).
	MC_MoveRelative	Executes positioning (relative).
	MC_MoveVelocity	Executes speed control.
	MC_Stop	Executes a forced stop.
	MC_TorqueControl	Executes torque control.
	MCv_Jog	Executes JOG operation.
	MCv_MoveCircularInterpolateAbsolute	Executes circular interpolation control (absolute).
	MCv_MoveCircularInterpolateRelative	Executes circular interpolation control (relative).
	MCv_MoveLinearInterpolateAbsolute	Executes linear interpolation control (absolute).
	MCv_MoveLinearInterpolateRelative	Executes linear interpolation control (relative).
	MCv_SmoothingFilter	Enables smoothing filter.
	MCv_SpeedControl	Executes speed control (including position loop).
MCFB (administrative)	MC_CamTableSelect	Selects cam tables.
	MC_GroupDisable	Disables an axes group.
	MC_GroupEnable	Enables an axes group.
	MC_Power	Controls the power stage (ON or OFF) for a single axis.
	MC_SetPosition	Changes the current position.
	MCv_AllPower	Controls the power stage (ON or OFF) for all axes.
	MCv_ChangeCycle	Changes the current value per cycle.
	MCv_SetTorqueLimit	Sets torque limits.
General FB	MCv_ReadProfileData	Reads profile data.
	MCv_WriteProfileData	Writes profile data.

Motion Module

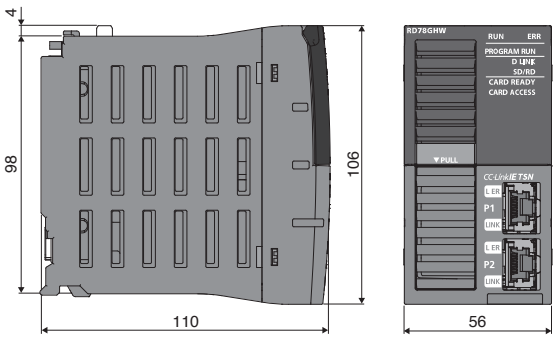
Dimensions

●RD78G4/RD78G8/RD78G16/
RD78G32/RD78G64



[Unit: mm]

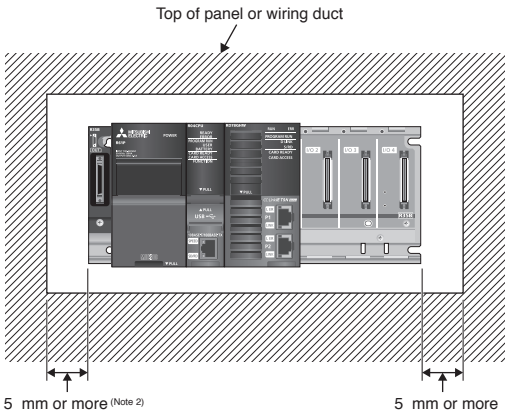
●RD78GHV/RD78GHW Available soon

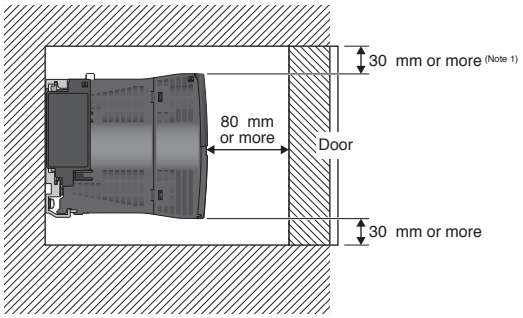


[Unit: mm]

Mounting

●RD78G4/RD78G8/RD78G16/RD78G32/RD78G64
RD78GHV/RD78GHW Available soon





Notes: 1. Provide clearance of 30 mm or more when the height of a wiring duct is 50 mm or less. In other cases, provide clearance of 40 mm or more.
2. Provide clearance of 20 mm or more when an extension cable is connected/removed without removing a power supply module.

SWM78 Motion Control Software (Note 1) Available soon

MELSOFT EM Configurator2 operating environment

Item		Description
Personal computer	Personal computer	Microsoft® Windows® supported personal computer
	OS	Microsoft® Windows® 10 (Home, Pro, Enterprise, Education, IoT) (64 bit/32 bit) Microsoft® Windows® 8.1 (64 bit/32 bit), Microsoft® Windows® 8.1 (Enterprise, Pro) (64 bit/32 bit) Microsoft® Windows® 7 (Enterprise, Ultimate, Professional, Home Premium, Starter) (64 bit/32 bit)
	CPU	Intel® Core™2 Duo Processor 2 GHz or more recommended
	Required memory	For 64-bit edition: 2 GB or more recommended For 32-bit edition: 1 GB or more recommended
Available hard disk capacity		For installation: 10 GB or more free hard disk capacity For operation: 512 MB or more free virtual memory capacity
Optical drive		DVD-ROM supported disk drive
Monitor		Resolution 1024 × 768 pixels or higher

Notes: 1. To use Motion Control Software, prepare MELSOFT EM78 SDK and the USB key with license information.

SWM78 Motion Control Software application development environment

Item		Description
User program OS	Windows®	Microsoft® Windows® 10 Home (64 bit/32 bit) Microsoft® Windows® 10 Enterprise (64 bit/32 bit) Microsoft® Windows® 10 Pro (64 bit/32 bit) Microsoft® Windows® 10 Education (64 bit/32 bit) Microsoft® Windows® 10 IoT (64 bit/32 bit) Microsoft® Windows® 8.1 (64 bit/32 bit) Microsoft® Windows® 8.1 Enterprise (64 bit/32 bit) Microsoft® Windows® 8.1 Pro (64 bit/32 bit) Microsoft® Windows® 7 Home Basic (64 bit/32 bit) Microsoft® Windows® 7 Home Premium (64 bit/32 bit) Microsoft® Windows® 7 Enterprise SP1 (64 bit/32 bit) Microsoft® Windows® 7 Ultimate SP1 (64 bit/32 bit) Microsoft® Windows® 7 Professional SP1 (64 bit/32 bit)
	INtime	INtime 6. 3. 18110. 7
Software development environment		Microsoft® Visual C++® 2017/2015/2013/2012/2010
API library		- DLL format - Supports programs compiled by C++ only
Servo amplifier connection method		CC-Link IE TSN
Authentication class		B

Partner products

INtime® TenAsys Corporation

Real-time motion control is realized by Windows® PC.

INtime is the real-time OS products which extend real-time performance for Windows® PC.
Real-time control is realizable only by installing in usual Windows® PC.
Since parallel operation is carried out with Windows®, both the Windows® side processings, such as HMI and log file save, and the machine control processings which needs real-time performance are able to be realized on one set of hardware.

An inquiry of a product

Micronet Company
URL : http://www.mnc.co.jp/index_E.htm
MAIL : bcd@mnc.co.jp

Engineering Software

MELSOFT GX Works3 operating environment (Note 1)

Item	Description
OS	Microsoft® Windows® 10 (Home, Pro, Enterprise, Education, IoT Enterprise 2016 LTSB (Note 2)) (64 bit/32 bit) Microsoft® Windows® 8.1 (64 bit/32 bit) , Microsoft® Windows® 8.1 (Enterprise, Pro) (64 bit/32 bit) Microsoft® Windows® 7 (Enterprise, Ultimate, Professional, Home Premium, Starter) (64 bit/32 bit)
Personal computer	Windows® supported personal computer
CPU	Intel® Core™2 Duo Processor 2 GHz or more recommended
Required memory	For 64-bit edition: 2 GB or more recommended For 32-bit edition: 1 GB or more recommended
Available hard disk capacity	For installation: 17 GB or more free hard disk capacity For operation: 512 MB or more free virtual memory capacity
Optical drive	DVD-ROM supported disk drive
Monitor	Resolution 1024 × 768 pixels or higher

Notes: 1. Refer to Installation Instructions for precautions and restrictions regarding the operating environment.
2. The 32-bit edition is not supported.

Engineering software list

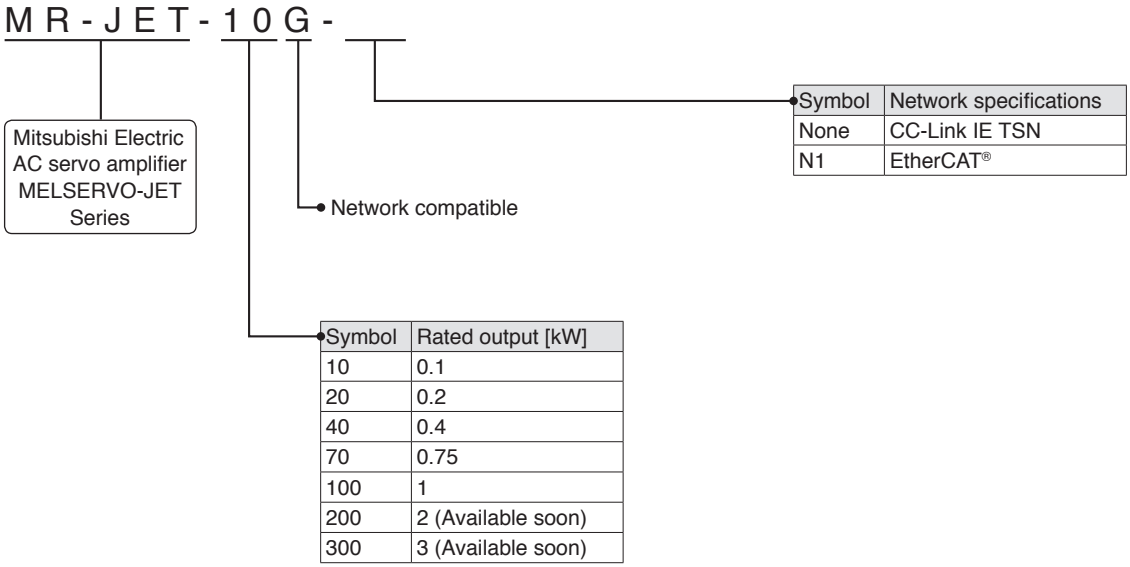
Item	Model	Description	
MELSOFT GX Works3	SW1DND-GXW3-E	• Programmable Controller Engineering Software [MELSOFT GX Works3 (Note 2), GX Works2, GX Developer, PX Developer]	DVD-ROM
MELSOFT iQ Works	SW2DND-IQWK-E	FA engineering software (Note 1) • System Management Software [MELSOFT Navigator] • Programmable Controller Engineering Software [MELSOFT GX Works3 (Note 2), GX Works2, GX Developer, PX Developer] • Motion Controller Engineering Software [MELSOFT MT Works2] • Screen Design Software [MELSOFT GT Works3] • Robot Programming Software [MELSOFT RT ToolBox3] • Inverter Setup Software [MELSOFT FR Configurator2] • MITSUBISHI ELECTRIC FA Library	DVD-ROM

Notes: 1. Refer to each product manual for the software supported by the model.
2. The MELSOFT GX Works3 menu is switchable between Japanese, English, and simplified Chinese.

3 Servo Amplifiers

* MR-JET-200G_ and MR-JET-300G_ are available soon.
* Refer to p. 5-28 in this catalog for conversion of units.

Model Designation

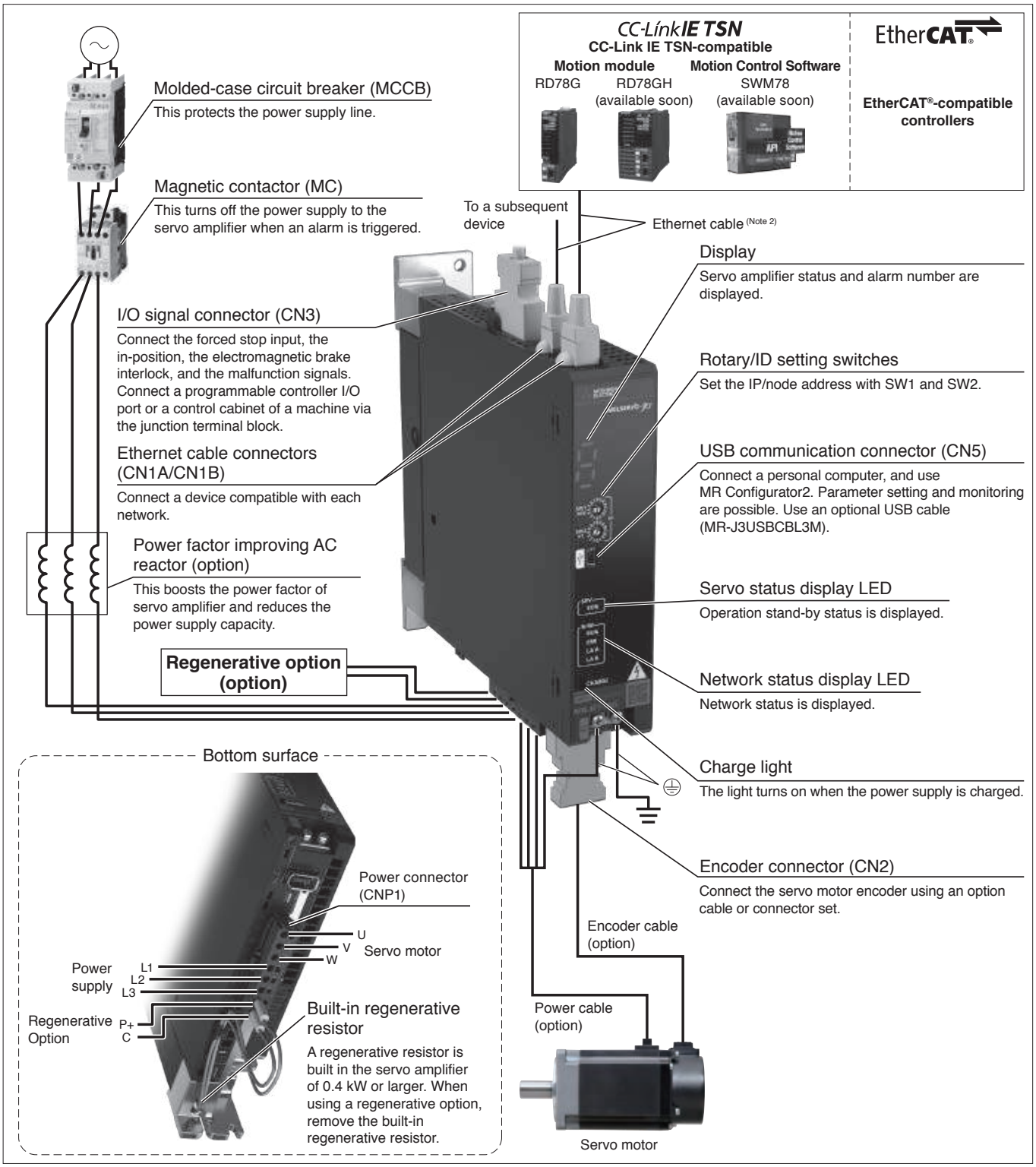


Symbol	Network specifications
None	CC-Link IE TSN
N1	EtherCAT®

Symbol	Rated output [kW]
10	0.1
20	0.2
40	0.4
70	0.75
100	1
200	2 (Available soon)
300	3 (Available soon)

MR-JET-G_ Connections with Peripheral Equipment (Note 1)

Peripheral equipment is connected to MR-JET-G_ as described below. Connectors, cables, options, and other necessary equipment are available so that users can set up the servo amplifier easily and start using it right away.



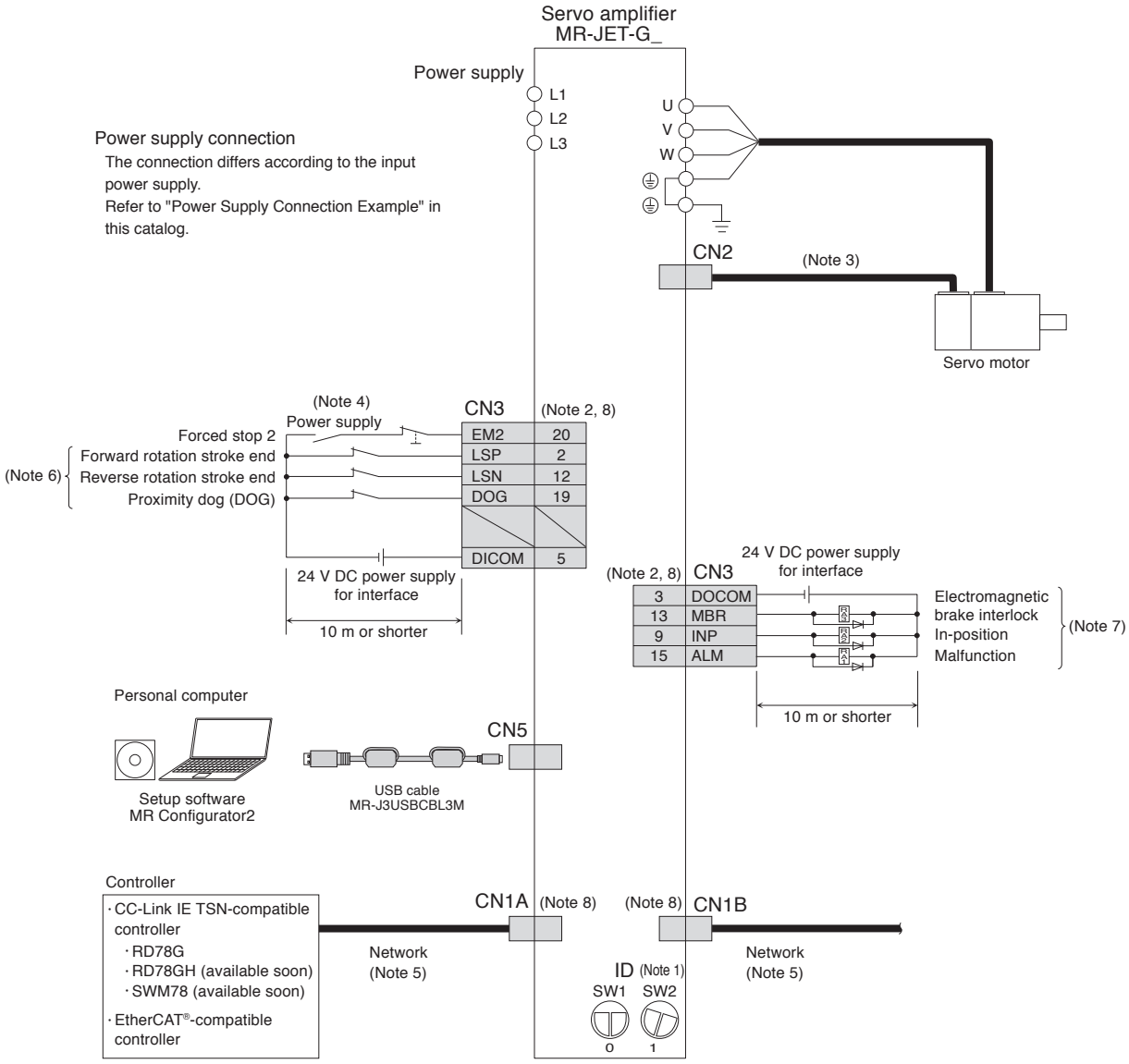
Notes: 1. Refer to "MR-JET User's Manual" for the actual connections.
2. For specifications of the Ethernet cable, refer to "Ethernet Cable Specifications" on p. 5-16 in this catalog.

MR-JET-G_ (Network Compatible) Specifications

Servo amplifier model MR-JET-_(-N1)			10G	20G	40G	70G	100G	200G (Available soon)	300G (Available soon)
Output	Voltage		3-phase 0 V AC to 240 V AC						
	Rated current	[A]	1.3	1.8	2.8	5.8	6.0	11.0	11.0
Power supply input	Voltage/frequency (Note 1)		3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz				3-phase or 1-phase 200 V AC to 240 V AC, 50 Hz/60 Hz (Note 6)		3-phase 200 V AC to 240 V AC, 50 Hz/60 Hz
	Rated current (Note 5)	[A]	0.9	1.5	2.6	3.8	5.0	10.5	14.0
	Permissible voltage fluctuation		3-phase or 1-phase 170 V AC to 264 V AC				3-phase or 1-phase 170 V AC to 264 V AC (Note 6)		3-phase 170 V AC to 264 V AC
	Permissible frequency fluctuation		±5 % maximum						
Interface power supply			24 V DC ± 10 % (required current capacity: 0.3 A)						
Control method			Sine-wave PWM control/current control method						
Permissible regenerative power of the built-in regenerative resistor (Note 2, 3)		[W]	-		10	30		100	
Dynamic brake (Note 4)			Built-in						
CC-Link IE TSN (MR-JET-G)	Communication cycle (Note 7)		125 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms						
	Authentication class		Class B						
EtherCAT® (MR-JET-G-N1)	Communication cycle (Note 7)		125 µs, 250 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms						
Communication function	USB		Connect a personal computer (MR Configurator2 compatible)						
Servo functions			Advanced vibration suppression control II, adaptive filter II, robust filter, quick tuning, auto tuning, one-touch tuning, tough drive function, drive recorder function, machine diagnosis function, power monitoring function, lost motion compensation function, super trace control						
Protective functions			Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection						
Structure (IP rating)			Natural cooling, open (IP20)					Force cooling, open (IP20)	
Close mounting	3-phase power supply input		Possible (Note 8)						
	1-phase power supply input		Possible (Note 8)				Not possible		-
Mass		[kg]	0.8		1.6			2.1	

Notes: 1. Rated output and speed of a rotary servo motor are applicable when the servo amplifier is operated within the specified power supply voltage and frequency.
2. Select the most suitable regenerative option for your system with our drive system sizing software Motorizer.
3. Refer to "Regenerative Option" in this catalog for the permissible regenerative power [W] when a regenerative option is used.
4. When using the dynamic brake, refer to "MR-JET User's Manual" for the permissible load to motor inertia ratio.
5. This value is applicable when a 3-phase power supply is used.
6. When a 1-phase 200 V AC to 240 V AC power supply is used, use the servo amplifiers at 75 % or less of the effective load ratio.
7. The command communication cycle depends on the controller specifications and the number of slaves connected.
8. When the servo amplifiers are closely mounted, keep the ambient temperature within 0 °C to 45 °C, or use the servo amplifiers at 75 % or less of the effective load ratio.

MR-JET-G_ Standard Wiring Diagram Example

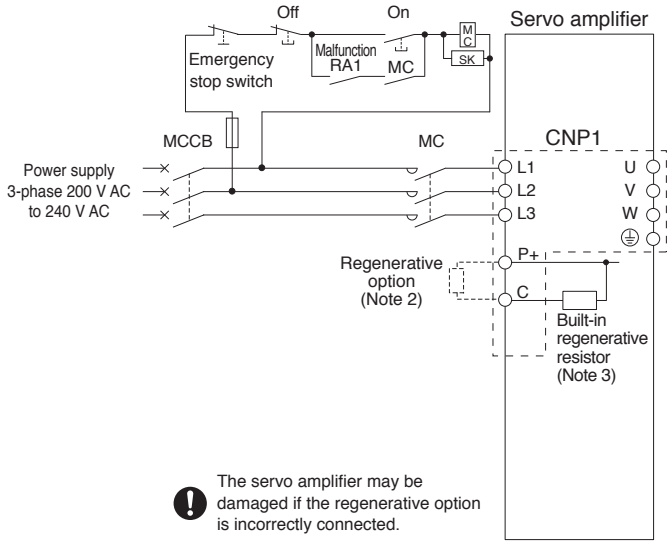


Notes:
1. The node address or the 4th octet of the IP address can be set to between 1 and 254 with a combination of the ID setting switches or the rotary switches (SW1 and SW2). Note that the number of the connectable slaves depends on the controller specifications.
2. This is for sink wiring. Source wiring is also possible.
3. A battery (available soon) is required when configuring an absolute position detection system.
4. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the power is turned off.
5. When branching off CC-Link IE TSN (synchronous communication function) with a switching hub, use a switching hub (Class B) recommended by CC-Link Partner Association. When a switching hub (Class A) is used, there are restrictions on the topologies to be used. Refer to "MELSEC iQ-R Motion Module User's Manual" for details.
6. Devices for these pins can be changed with [Pr. PD03], [Pr. PD04], and [Pr. PD05].
7. Devices for these pins can be changed with [Pr. PD07], [Pr. PD08], and [Pr. PD09].
8. Attach a cap to unused CN3/CN1A/CN1B connectors.

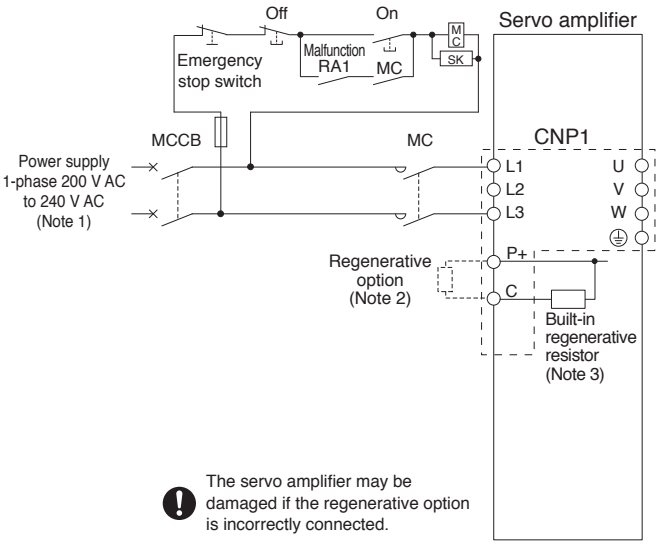
Be sure to read through User's Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

Power Supply Connection Example

●For 3-phase 200 V AC



●For 1-Phase 200 V AC



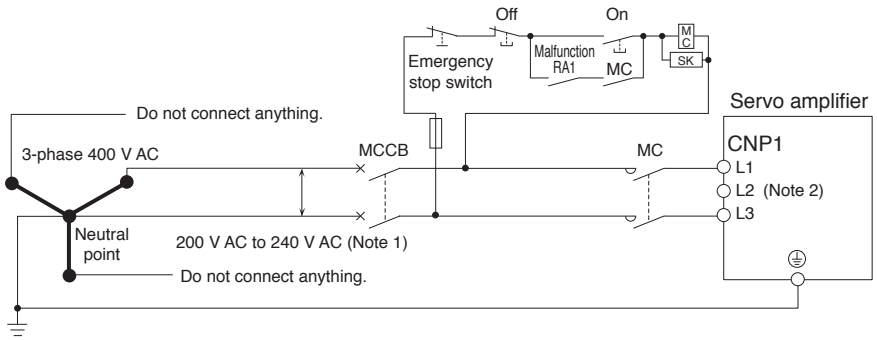
Notes: 1. For 1-phase 200 V AC to 240 V AC, connect the power supply to L1 and L3 terminals. Do not connect anything to L2.
2. When connecting a regenerative option externally, disconnect the wires for the built-in regenerative resistor (P+ and C), and then remove the resistor.
3. The servo amplifiers of 0.2 kW or smaller do not have a built-in regenerative resistor.

Be sure to read through User's Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

1-phase 200 V AC Class Power Supply Input Using a Neutral Point of 3-phase 400 V AC Class Power Supply

A 1-phase 200 V AC class power can be supplied with a use of a neutral point of a 3-phase 400 V AC class power supply. Use a step-down transformer as necessary to keep the power supply voltage between 200 V AC and 240 V AC.

Do not input a 3-phase 400 V AC class power supply directly to the 200 V class servo amplifier. Doing so may cause the servo amplifier to malfunction.

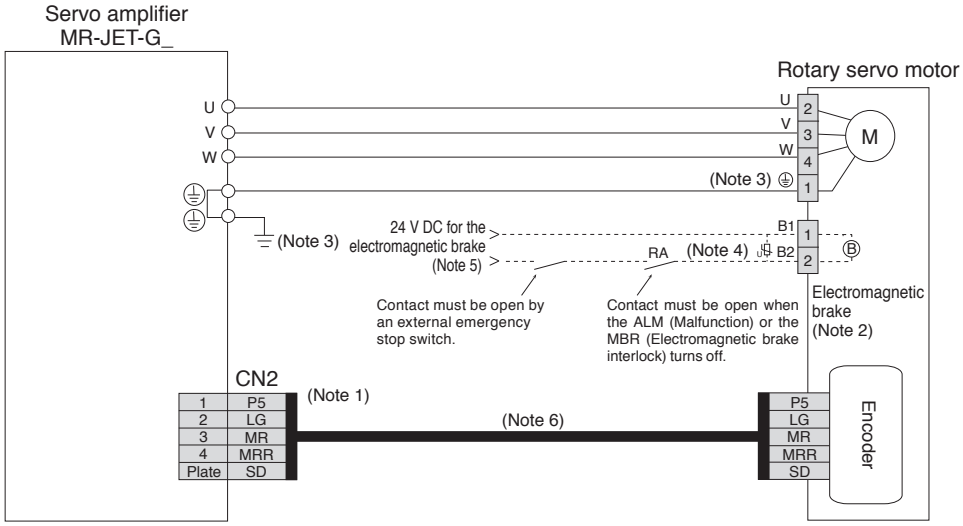


Notes: 1. Use a step-down transformer as necessary to keep the power supply voltage between 200 V AC and 240 V AC.
2. For 1-phase 200 V AC to 240 V AC, connect the power supply to L1 and L3 terminals. Do not connect anything to L2.

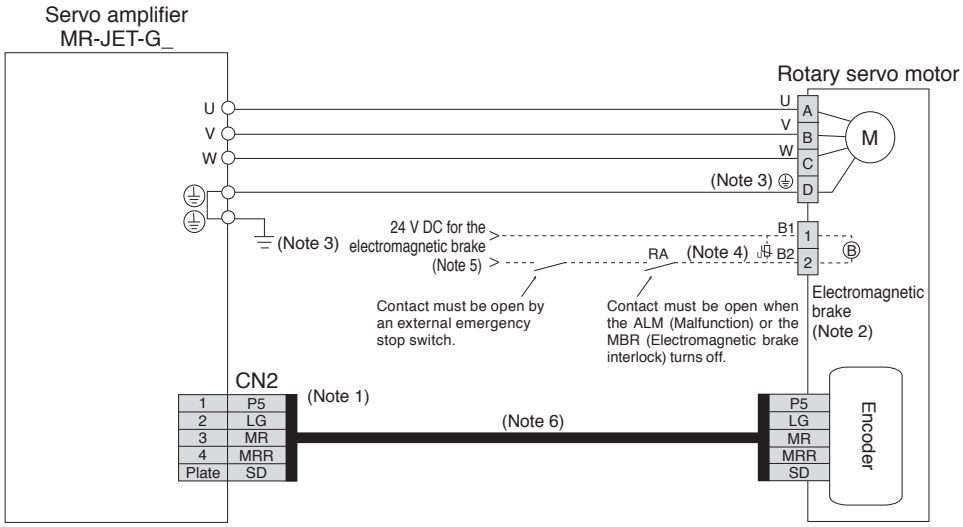
Be sure to read through User's Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

Servo Motor Connection Example

●For HG-KNS series



●For HG-SNS series

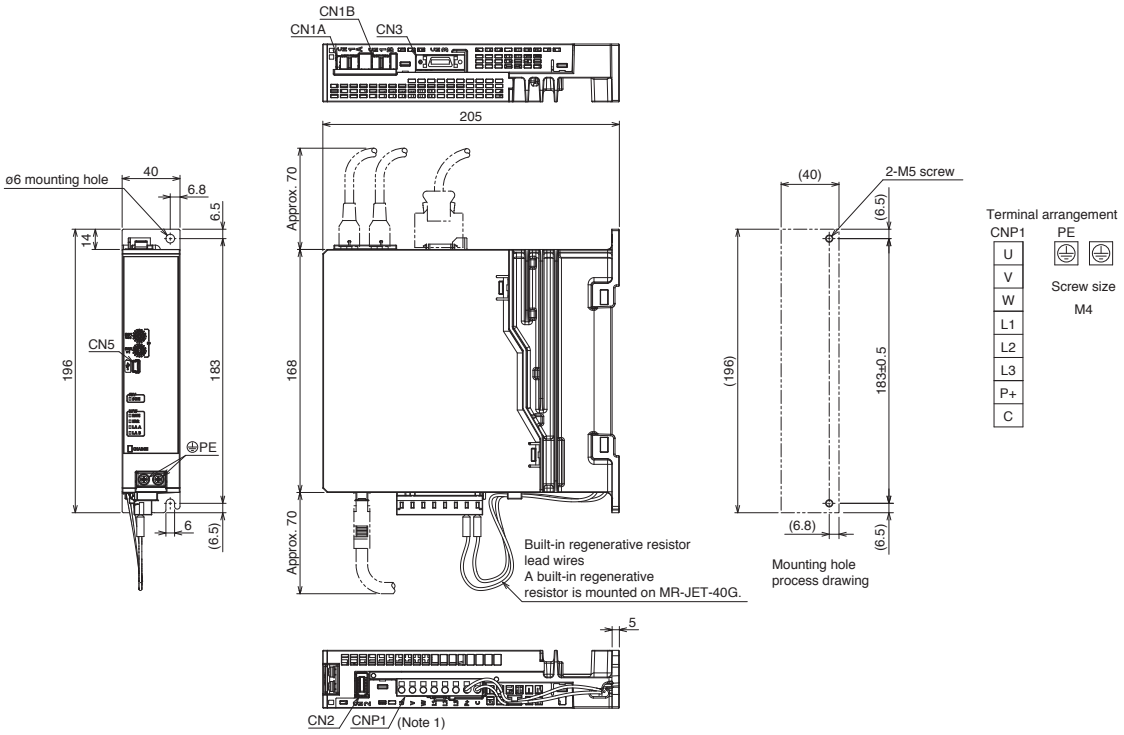


Notes: 1. The signals shown are applicable when a two-wire type encoder cable is used. A four-wire type is also compatible.
2. This is for the servo motors with an electromagnetic brake. The electromagnetic brake terminals (B1, B2) do not have polarity.
3. Connect the grounding wire to the cabinet protective earth (PE) terminal via the servo amplifier protective earth (PE) terminal for grounding.
4. Install a surge absorber between B1 and B2.
5. Do not use the 24 V DC interface power supply for the electromagnetic brake. Provide a dedicated power supply to the electromagnetic brake.
6. Encoder cables are available as an option. Refer to "Rotary Servo Motor User's Manual" when fabricating the cables.

Be sure to read through User's Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

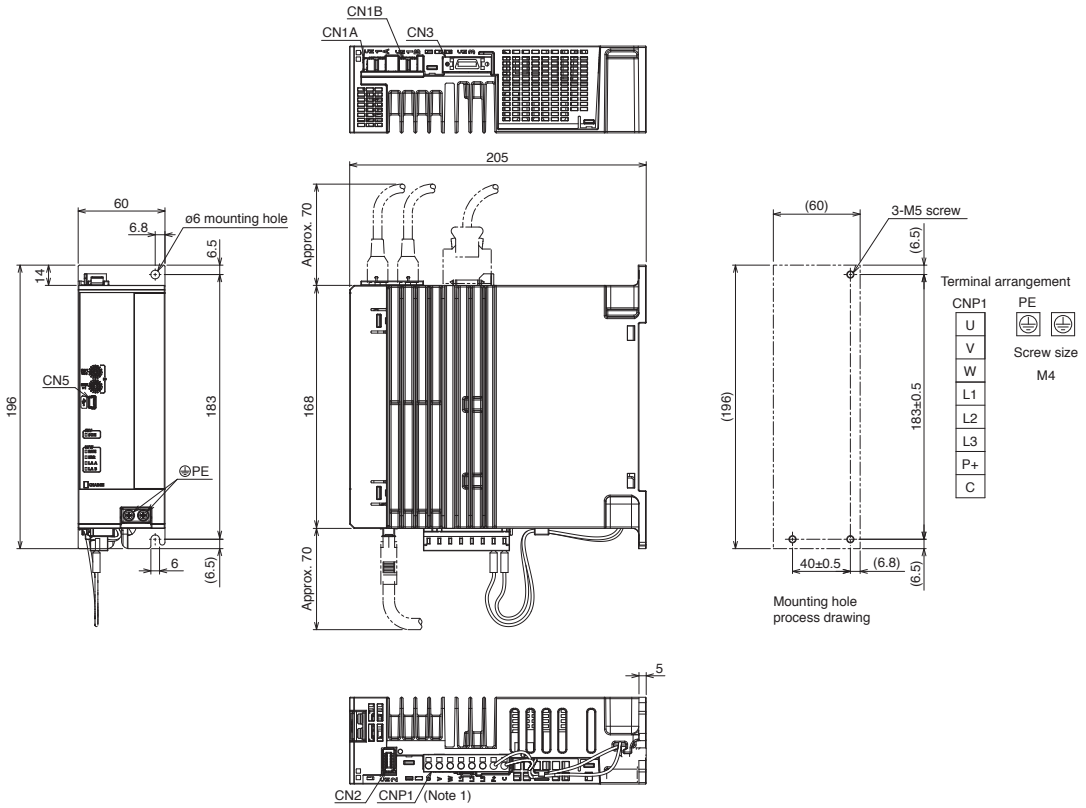
MR-JET-G_ Dimensions

●MR-JET-10G_
●MR-JET-20G_
●MR-JET-40G_



[Unit: mm]

●MR-JET-70G_
●MR-JET-100G_



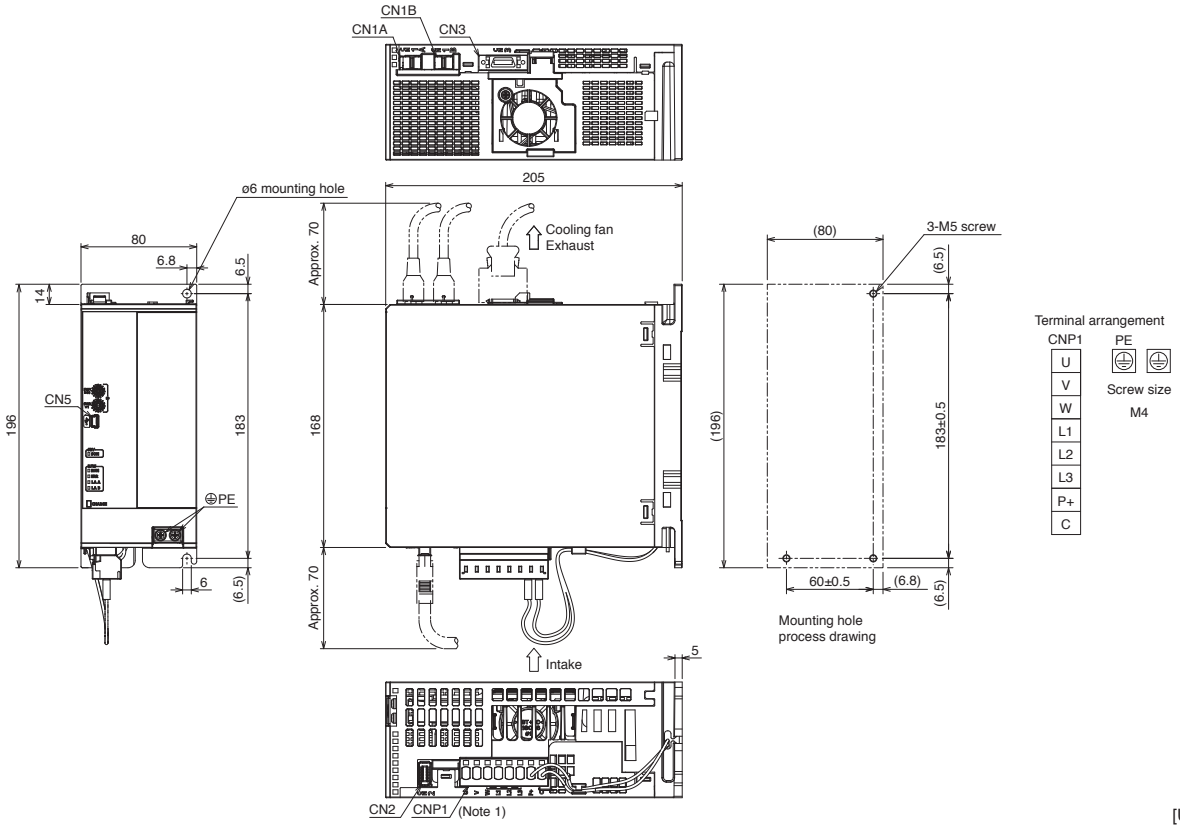
[Unit: mm]

Notes: 1. CNP1 connector is supplied with the servo amplifier.

MR-JET-G_ Dimensions

●MR-JET-200G_

●MR-JET-300G_



[Unit: mm]

Notes: 1. CNP1 connector is supplied with the servo amplifier.

4 Rotary Servo Motors

* HG-SNS152J, HG-SNS202J, and HG-SNS302J are available soon.
* Refer to p. 5-28 in this catalog for conversion of units.

Model Designation (Note 1)

H G - K N S 1 3 B J □

Symbol	Shaft shape
None	Standard (Straight shaft)
D	D-cut shaft (Note 2)
K	Key shaft (with a double round-ended key or without a key) (Note 2)

Symbol	Oil seal (Note 4)
J	Installed (Note 3)
None	None

Symbol	Electromagnetic brake
None	None
B	Installed

Symbol	Rated speed [r/min]
2	2000
3	3000

Symbol	Rated output [kW]
1	0.1
2	0.2
4	0.4
5	0.5
7	0.75
10	1.0
15	1.5 (Available soon)
20	2.0 (Available soon)
30	3.0 (Available soon)

Symbol	Inertia/capacity
HG-KNS	Low inertia, small capacity
HG-SNS	Medium inertia, medium capacity

Notes: 1. This section describes what each symbol in a model name indicates. Some combinations of symbols are not available.
2. Refer to the special shaft dimensions of each series in this catalog for the available models.
3. An oil seal is installed as a standard for all servo motors.
4. The dimensions of HG-KNS series vary depending on whether or not an oil seal is installed. Refer to the dimensions for details. Dimensions of the HG-SNS series are the same regardless of whether or not an oil seal is installed.

HG-KNS Series (Low Inertia, Small capacity) Specifications

Flange size		[mm]	40 × 40	60 × 60		80 × 80
Rotary servo motor model		HG-KNS	13J	23J	43J	73J
Continuous running duty (Note 4)	Rated output	[kW]	0.1	0.2	0.4	0.75
	Rated torque (Note 3)	[N•m]	0.32	0.64	1.3	2.4
Maximum torque		[N•m]	0.95	1.9	3.8	7.2
Rated speed (Note 4)		[r/min]	3000			
Maximum speed (Note 4)		[r/min]	6000			
Power rate at continuous rated torque	Standard	[kW/s]	12.9	18.0	43.2	44.5
	With electromagnetic brake	[kW/s]	12.0	16.4	40.8	41.0
Rated current		[A]	0.8	1.3	2.6	4.8
Maximum current		[A]	2.4	3.9	7.8	14
Moment of inertia J	Standard	[× 10^{-4} kg•m^2]	0.0783	0.225	0.375	1.28
	With electromagnetic brake	[× 10^{-4} kg•m^2]	0.0843	0.247	0.397	1.39
Recommended load to motor inertia ratio (Note 1)			15 times or less (Note 6)			
Speed/position detector			Absolute (Note 5)/incremental 22-bit encoder (resolution: 4,194,304 pulses/rev)			
Oil seal			Installed (Servo motors without an oil seal are available. (HG-KNS_))			
Electromagnetic brake			None (Servo motors with an electromagnetic brake are available. (HG-KNS_B))			
Thermistor			None			
Insulation class			130 (B)			
Structure			Totally enclosed, natural cooling (IP rating: IP65) (Note 2)			
Vibration resistance *1			X: 49 m/s^2 Y: 49 m/s^2			
Vibration rank			V10 *3			
Permissible load for the shaft *2	L	[mm]	25	30	30	40
	Radial	[N]	88	245	245	392
	Thrust	[N]	59	98	98	147
Mass (with oil seal)	Standard	[kg]	0.57	0.98	1.5	3.0
	With electromagnetic brake	[kg]	0.77	1.4	1.9	4.0
Mass (without oil seal)	Standard	[kg]	0.54	0.91	1.4	2.8
	With electromagnetic brake	[kg]	0.74	1.3	1.8	3.8

Notes: 1. Contact your local sales office if the load to motor inertia ratio exceeds the value in the table.
2. The shaft-through portion is excluded. Refer to asterisk 4 of "Annotations for Rotary Servo Motor Specifications" on p. 4-13 in this catalog for the shaft-through portion.
3. When unbalanced torque is generated, such as in a vertical lift machine, keep the unbalanced torque of the machine under 70 % of the servo motor rated torque.
4. The continuous running duty and the speed are not guaranteed when the power supply voltage is dropped.
5. A battery (available soon) is required when configuring an absolute position detection system.
6. For HG-KNS13J or HG-KNS23J, the recommended load to motor inertia ratio is for operating the servo motor at the rated speed. If operating the servo motor at a speed exceeding the rated speed, check the need for a regenerative option with the drive system sizing software Motorizer.

Refer to "Annotations for Rotary Servo Motor Specifications" on p. 4-13 in this catalog for details about asterisks 1 to 3.

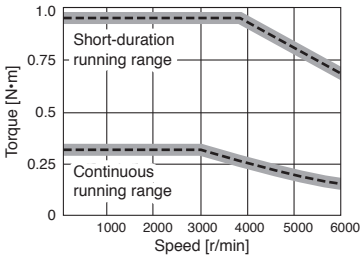
HG-KNS Series Electromagnetic Brake Specifications (Note 1)

Rotary servo motor model		HG-KNS	13BJ	23BJ	43BJ	73BJ
Type			Spring actuated type safety brake			
Rated voltage			24 V DC (-10 % to 0 %)			
Power consumption		[W] at 20 °C	6.3	7.9	7.9	10
Electromagnetic brake static friction torque		[N•m]	0.32 or higher	1.3 or higher	1.3 or higher	2.4 or higher
Permissible braking work	Per braking	[J]	5.6	22	22	64
	Per hour	[J]	56	220	220	640
Electromagnetic brake life (Note 2)	Number of braking times		20000	20000	20000	20000
	Work per braking	[J]	5.6	22	22	64

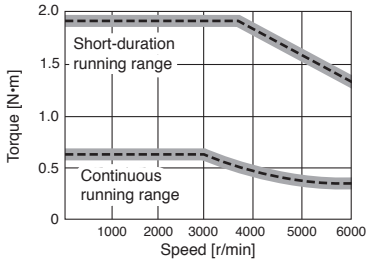
Notes: 1. The electromagnetic brake is for holding. It cannot be used for deceleration applications.
2. Brake gap is not adjustable. Electromagnetic brake life is defined as the time period until readjustment is needed.

HG-KNS Series Torque Characteristics

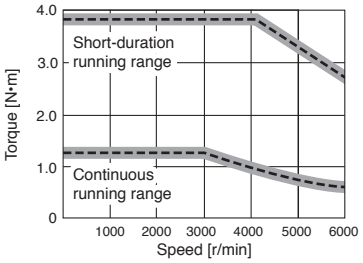
HG-KNS13J (Note 1, 2, 3)



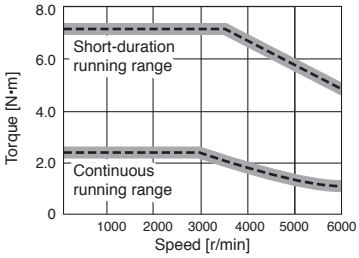
HG-KNS23J (Note 1, 2, 3)



HG-KNS43J (Note 1, 2, 3)



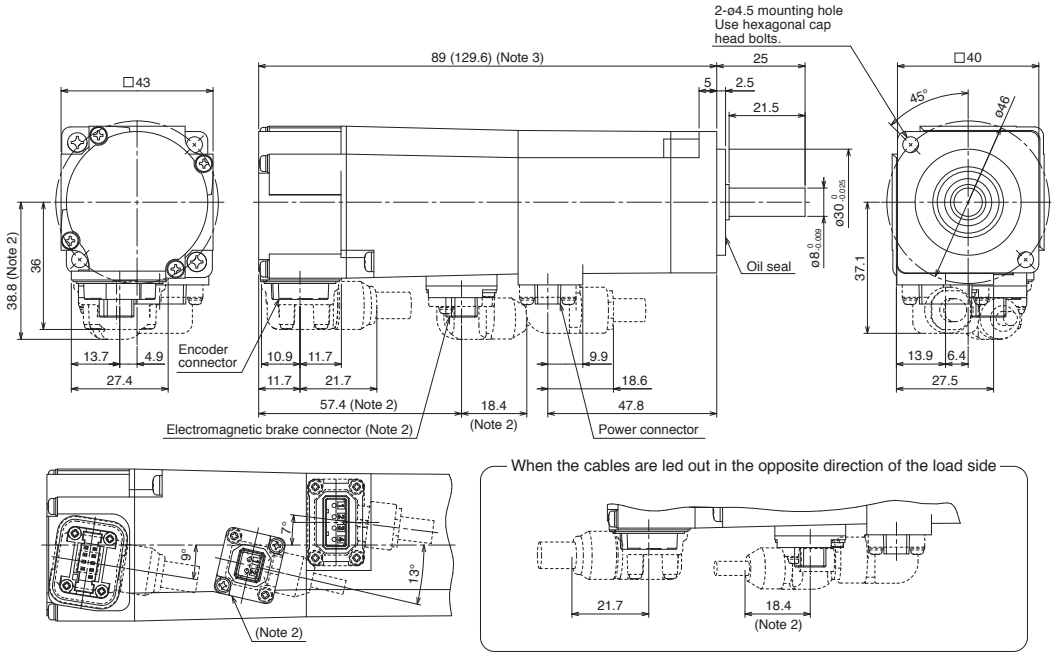
HG-KNS73J (Note 1, 2, 3)



Notes: 1. ▬▬ : For 3-phase 200 V AC
2. - - - - : For 1-phase 230 V AC
3. Torque drops when the power supply voltage is below the specified value.

HG-KNS Series Dimensions (Note 4)

HG-KNS13(B)J



Power connector

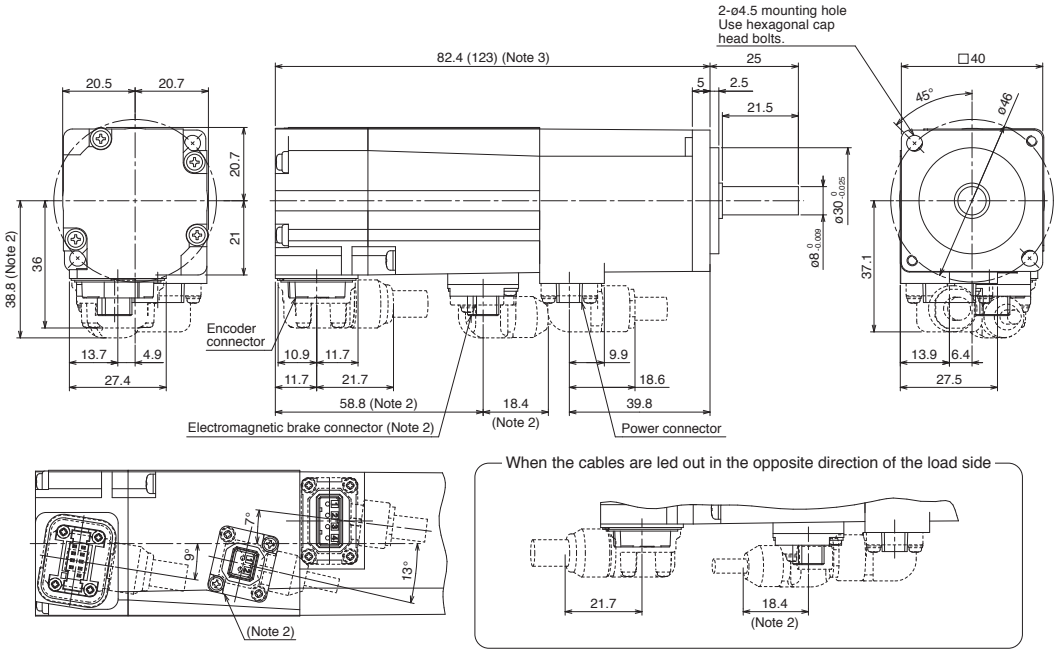
Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)

Pin No.	Signal name
1	B1
2	B2

[Unit: mm]

HG-KNS13(B)



Power connector

Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)

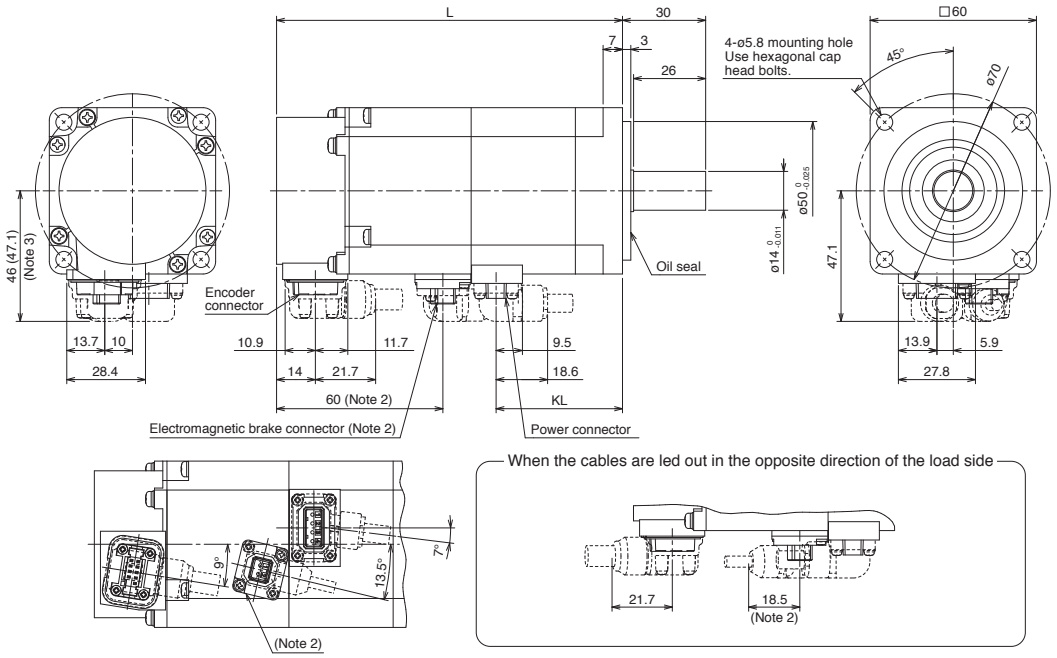
Pin No.	Signal name
1	B1
2	B2

[Unit: mm]

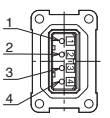
Notes: 1. The electromagnetic brake terminals (B1, B2) do not have polarity.
2. Only for the models with an electromagnetic brake.
3. Dimensions in brackets are for the models with an electromagnetic brake.
4. Use a friction coupling to fasten a load.

HG-KNS Series Dimensions (Note 4)

HG-KNS23(B)J, HG-KNS43(B)J

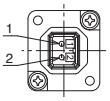


Power connector



Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)

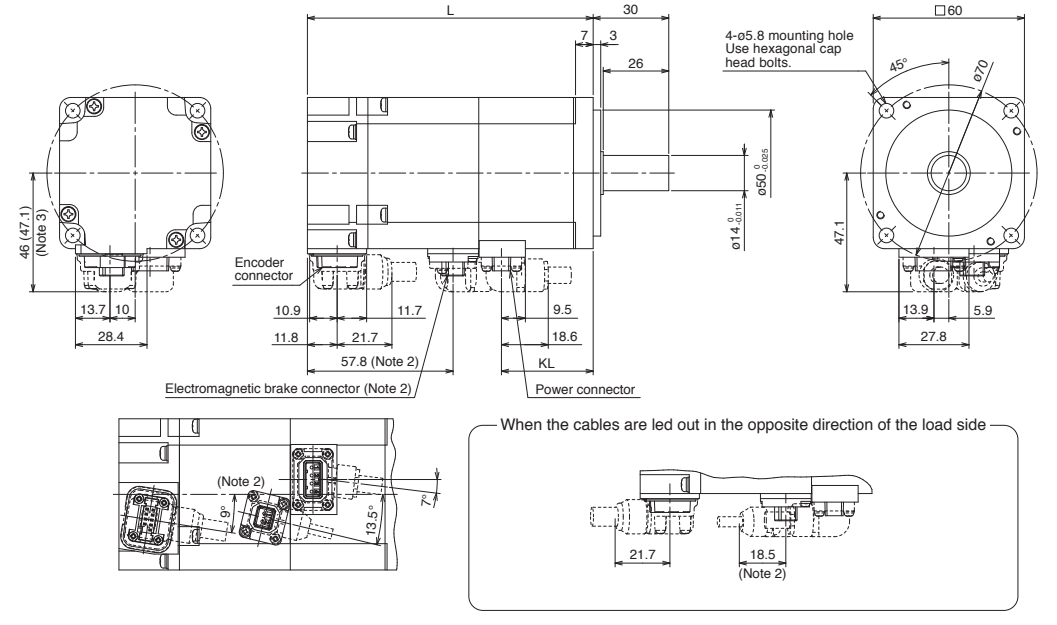


Pin No.	Signal name
1	B1
2	B2

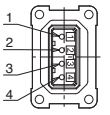
Model	Variable dimensions (Note 3)	
	L	KL
HG-KNS23(B)J	88 (124.8)	45.6
HG-KNS43(B)J	109.7 (146.5)	67.3

[Unit: mm]

HG-KNS23(B), HG-KNS43(B)

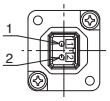


Power connector



Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)



Pin No.	Signal name
1	B1
2	B2

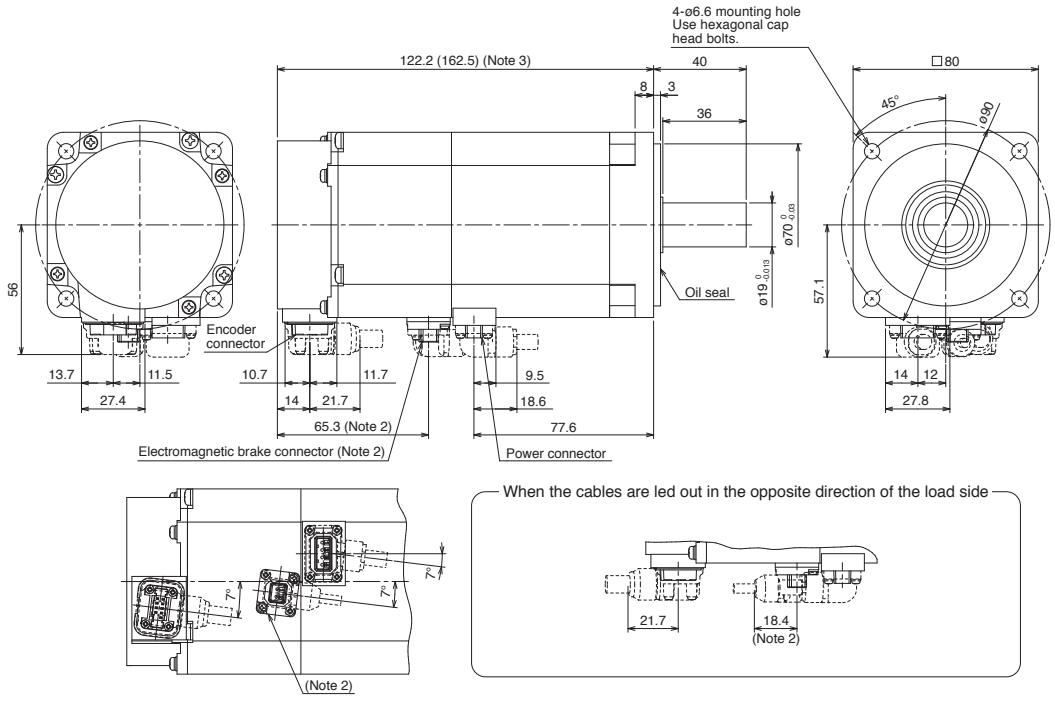
Model	Variable dimensions (Note 3)	
	L	KL
HG-KNS23(B)	76.6 (113.4)	36.4
HG-KNS43(B)	98.3 (135.1)	58.1

[Unit: mm]

Notes: 1. The electromagnetic brake terminals (B1, B2) do not have polarity.
2. Only for the models with an electromagnetic brake.
3. Dimensions in brackets are for the models with an electromagnetic brake.
4. Use a friction coupling to fasten a load.

HG-KNS Series Dimensions (Note 4)

HG-KNS73(B)J



Power connector

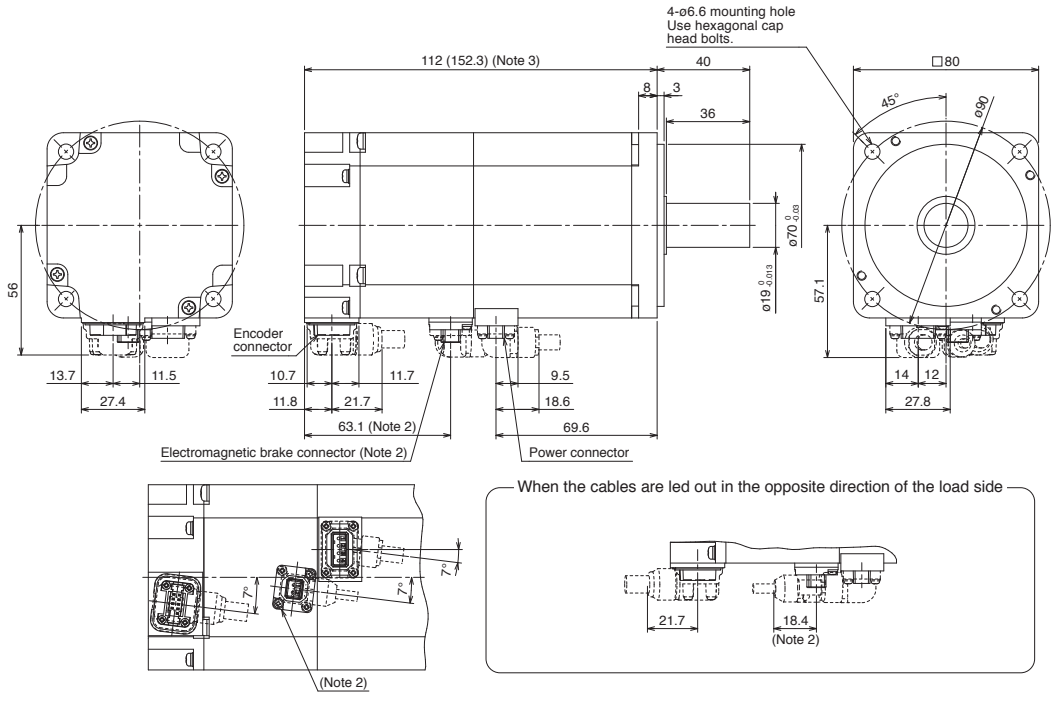
Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)

Pin No.	Signal name
1	B1
2	B2

[Unit: mm]

HG-KNS73(B)



Power connector

Pin No.	Signal name
1	⏚(PE)
2	U
3	V
4	W

Electromagnetic brake connector (Note 1)

Pin No.	Signal name
1	B1
2	B2

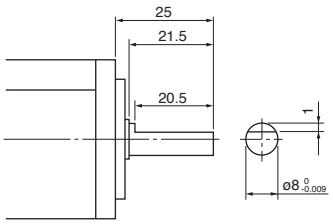
[Unit: mm]

Notes: 1. The electromagnetic brake terminals (B1, B2) do not have polarity.
2. Only for the models with an electromagnetic brake.
3. Dimensions in brackets are for the models with an electromagnetic brake.
4. Use a friction coupling to fasten a load.

HG-KNS Series with Special Shaft Dimensions

Servo motors with the following specifications are also available.

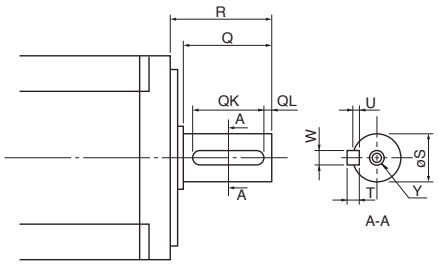
D: D-cut shaft (Note 1): 0.1 kW



[Unit: mm]

K: Key shaft (with a double round-ended key) (Note 1): 0.2 kW, 0.4 kW, and 0.75 kW

Model	Variable dimensions								
	T	S	R	Q	W	QK	QL	U	Y
HG-KNS23JK HG-KNS43JK	5	14 0 -0.011	30	26	5	20	3	3	M4 Screw depth: 15
HG-KNS73JK	6	19 0 -0.013	40	36	6	25	5	3.5	M5 Screw depth: 20



[Unit: mm]

Notes: 1. Do not use a servo motor with a D-cut shaft or a key shaft for frequent start/stop applications as this may cause the damage to the shaft.

HG-SNS Series (Medium Inertia, Medium Capacity) Specifications

Flange size		[mm]	130 × 130			176 × 176	
Rotary servo motor model		HG-SNS	52J	102J	152J (Available soon)	202J (Available soon)	302J (Available soon)
Continuous running duty (Note 4)	Rated output	[kW]	0.5	1.0	1.5	2.0	3.0
	Rated torque (Note 3)	[N•m]	2.39	4.77	7.16	9.55	14.3
Maximum torque		[N•m]	7.16	14.3	21.5	28.6	42.9
Rated speed (Note 4)		[r/min]	2000				
Maximum speed (Note 4)		[r/min]	3000				2500
Power rate at continuous rated torque	Standard	[kW/s]	7.85	19.7	32.1	19.5	26.1
	With electromagnetic brake	[kW/s]	6.01	16.5	28.2	16.1	23.3
Rated current		[A]	2.9	5.6	9.4	9.6	11
Maximum current		[A]	9.0	17	29	31	33
Moment of inertia J	Standard	[× 10^{-4} kg•m^2]	7.26	11.6	16.0	46.8	78.6
	With electromagnetic brake	[× 10^{-4} kg•m^2]	9.48	13.8	18.2	56.5	88.2
Recommended load to motor inertia ratio (Note 1)			15 times or less				
Speed/position detector			Absolute (Note 5)/incremental 22-bit encoder (resolution: 4,194,304 pulses/rev)				
Oil seal			Installed (Servo motors without an oil seal are available. (HG-SNS_))				
Electromagnetic brake			None (Servo motors with an electromagnetic brake are available. (HG-SNS_B))				
Thermistor			None				
Insulation class			155 (F)				
Structure			Totally enclosed, natural cooling (IP rating: IP67) (Note 2)				
Vibration resistance *1			X: 24.5 m/s^2 Y: 24.5 m/s^2			X: 24.5 m/s^2 Y: 49 m/s^2	
Vibration rank			V10 *3				
Permissible load for the shaft *2	L	[mm]	55	55	55	79	79
	Radial	[N]	980	980	980	2058	2058
	Thrust	[N]	490	490	490	980	980
Mass (with/without oil seal)	Standard	[kg]	4.8	6.2	7.3	11	16
	With electromagnetic brake	[kg]	6.7	8.2	9.3	17	22

Notes: 1. Contact your local sales office if the load to motor inertia ratio exceeds the value in the table.
2. The shaft-through portion is excluded. Refer to asterisk 4 of "Annotations for Rotary Servo Motor Specifications" on p. 4-13 in this catalog for the shaft-through portion.
3. When unbalanced torque is generated, such as in a vertical lift machine, keep the unbalanced torque of the machine under 70 % of the servo motor rated torque.
4. The continuous running duty and the speed are not guaranteed when the power supply voltage is dropped.
5. A battery (available soon) is required when configuring an absolute position detection system.

Refer to "Annotations for Rotary Servo Motor Specifications" on p. 4-13 in this catalog for details about asterisks 1 to 3.

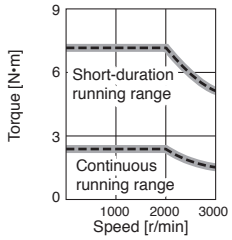
HG-SNS Series Electromagnetic Brake Specifications (Note 1)

Rotary servo motor model		HG-SNS	52BJ	102BJ	152BJ	202BJ	302BJ
Type			Spring actuated type safety brake				
Rated voltage			24 V DC (-10 % to 0 %)				
Power consumption		[W] at 20 °C	20	20	20	34	34
Electromagnetic brake static friction torque		[N•m]	8.5 or higher	8.5 or higher	8.5 or higher	44.0 or higher	44.0 or higher
Permissible braking work	Per braking	[J]	400	400	400	4500	4500
	Per hour	[J]	4000	4000	4000	45000	45000
Electromagnetic brake life (Note 2)	Number of braking times		20000	20000	20000	20000	20000
	Work per braking	[J]	200	200	200	1000	1000

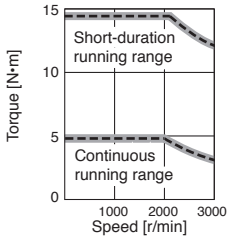
Notes: 1. The electromagnetic brake is for holding. It cannot be used for deceleration applications.
2. Brake gap is not adjustable. Electromagnetic brake life is defined as the time period until readjustment is needed.

HG-SNS Series Torque Characteristics

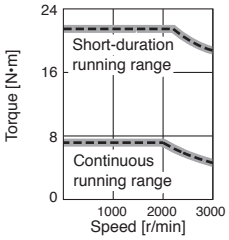
HG-SNS52J (Note 1, 2, 3)



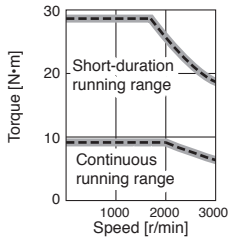
HG-SNS102J (Note 1, 2, 3)



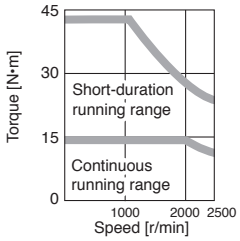
HG-SNS152J (Note 1, 2, 3)



HG-SNS202J (Note 1, 2, 3)



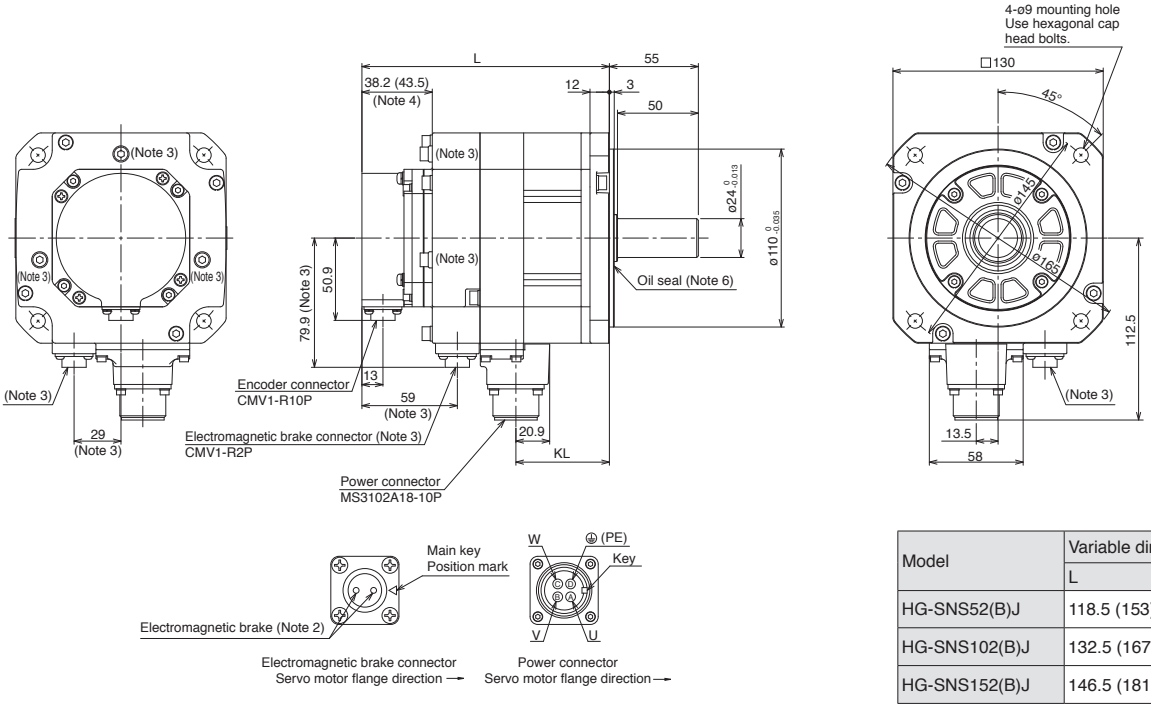
HG-SNS302J (Note 1, 3)



Notes: 1. ▬▬ : For 3-phase 200 V AC
2. - - - - : For 1-phase 230 V AC
3. Torque drops when the power supply voltage is below the specified value.

HG-SNS Series Dimensions (Note 1, 5)

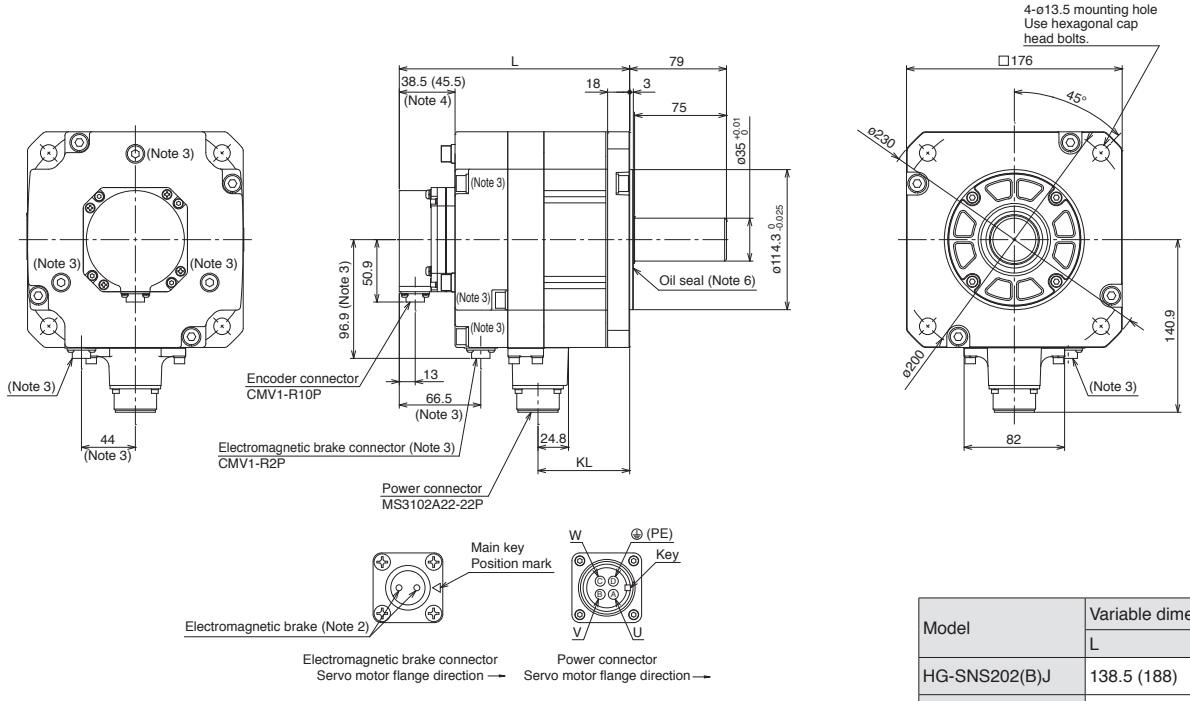
HG-SNS52(B)J, HG-SNS102(B)J, HG-SNS152(B)J



Model	Variable dimensions (Note 4)	
	L	KL
HG-SNS52(B)J	118.5 (153)	57.8
HG-SNS102(B)J	132.5 (167)	71.8
HG-SNS152(B)J	146.5 (181)	85.8

[Unit: mm]

HG-SNS202(B)J, HG-SNS302(B)J



Model	Variable dimensions (Note 4)	
	L	KL
HG-SNS202(B)J	138.5 (188)	74.8
HG-SNS302(B)J	162.5 (212)	98.8

[Unit: mm]

Notes: 1. Dimensions of the HG-SNS series are the same regardless of whether or not an oil seal is installed.
2. The electromagnetic brake terminals do not have polarity.
3. Only for the models with an electromagnetic brake.
4. Dimensions in brackets are for the models with an electromagnetic brake.
5. Use a friction coupling to fasten a load.
6. Only for the models with an oil seal.

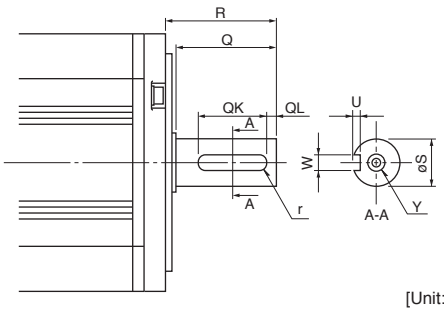
HG-SNS Series with Special Shaft Dimensions

Servo motors with the following specifications are also available.

K: Key shaft (without key) (Note 1, 2)

Model	Variable dimensions								
	S	R	Q	W	QK	QL	U	r	Y
HG-SNS52JK HG-SNS102JK HG-SNS152JK	$24^{0}_{-0.013}$	55	50	$8^{0}_{-0.036}$	36	5	$4^{+0.2}_{0}$	4	M8 Screw depth: 20
HG-SNS202JK HG-SNS302JK	$35^{+0.010}_{0}$	79	75	$10^{0}_{-0.036}$	55	5	$5^{+0.2}_{0}$	5	

Notes: 1. Do not use a servo motor with a key shaft for frequent start/stop applications as this may cause the damage to the shaft.
2. The servo motor is supplied without a key. The user needs to prepare a key.



[Unit: mm]

Power Supply Capacity

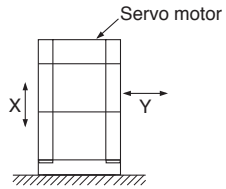
Rotary servo motor	Servo amplifier	Power supply capacity [kVA] (Note 1)
HG-KNS13J	MR-JET-10G_	0.3
HG-KNS23J	MR-JET-20G_	0.5
HG-KNS43J	MR-JET-40G_	0.9
HG-KNS73J	MR-JET-70G_	1.3

Rotary servo motor	Servo amplifier	Power supply capacity [kVA] (Note 1)
HG-SNS52J	MR-JET-70G_	1.0
HG-SNS102J	MR-JET-100G_	1.7
HG-SNS152J	MR-JET-200G_	2.5
HG-SNS202J		3.5
HG-SNS302J	MR-JET-300G_	4.8

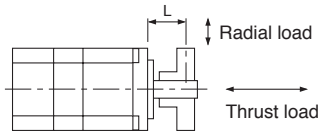
Notes: 1. The power supply capacity varies depending on the power supply impedance.

Annotations for Rotary Servo Motor Specifications

*1. The vibration direction is shown in the diagram below. The numerical value indicates the maximum value of the component (commonly the bracket in the opposite direction of the load side).
Fretting tends to occur on the bearing when the servo motor stops. Thus, maintain vibration level at approximately one-half of the allowable value.

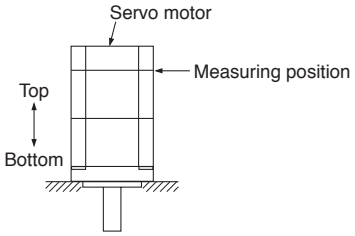


*2. Refer to the diagram below for the permissible load for the shaft. Ensure that loads applied on the shaft do not exceed the values specified in the table. The values in the table are applicable when each load is applied singly.

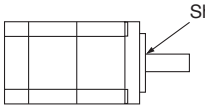


L: Distance between the flange mounting surface and the center of load

*3. V10 indicates that the amplitude of the servo motor itself is 10 μm or less. The following shows mounting orientation and measuring position of the servo motor during the measurement:



*4. Refer to the diagram below for the shaft-through portion.



MEMO

5 Options/Peripheral Equipment

* Options and peripheral equipment for servo amplifiers are the same regardless of the network. Refer to the servo amplifiers with the same rated capacity.
* MR-JET-200G_ and MR-JET-300G_ are available soon.
* HG-SNS152J, HG-SNS202J, and HG-SNS302J are available soon.
* Refer to p. 5-28 in this catalog for conversion of units.

Cable/Connector Selection Table for Servo Motors

Necessary option cables and connectors vary depending on the servo motor series.
Refer to the following tables for necessary options.

Selecting options for servo motor

Use the cables in the following tables.
For the cable descriptions, refer to the relevant letters in each list.

Capacity	Servo motor	Reference list		
		Encoder cable	Servo motor power cable	Electromagnetic brake cable (Note 1)
Small capacity	HG-KNS series	Column A in encoder cable list	Column A in servo motor power cable list	Column A in electromagnetic brake cable list
Medium capacity	HG-SNS series	Column B in encoder cable list	Column B in servo motor power cable list	Column B in electromagnetic brake cable list

Notes: 1. An electromagnetic brake cable is required only for servo motor with an electromagnetic brake.

Encoder cable list

	Cable length	IP rating (Note 1)	Cable direction	Bending life	Model	Reference	Note
A	10 m or shorter (direct connection type)	IP65	In direction of load side	Long bending life	MR-J3ENCBL_M-A1-H	p. 5-6	Select one from this list.
				Standard	MR-J3ENCBL_M-A1-L		
			In the opposite direction of the load side	Long bending life	MR-J3ENCBL_M-A2-H	p. 5-6	
				Standard	MR-J3ENCBL_M-A2-L		
	Over 10 m (junction type)	IP20	In direction of load side	Long bending life	Two types of cables are required: MR-J3JCBL03M-A1-L, MR-EKCBL_M-H	p. 5-6	
				Standard	Two types of cables are required: MR-J3JCBL03M-A1-L, MR-EKCBL_M-L		
			In the opposite direction of the load side	Long bending life	Two types of cables are required: MR-J3JCBL03M-A2-L, MR-EKCBL_M-H	p. 5-6	
				Standard	Two types of cables are required: MR-J3JCBL03M-A2-L, MR-EKCBL_M-L		
		IP65	In direction of load side	Long bending life	Two types of cables are required: MR-J3JSCBL03M-A1-L, MR-J3ENSCBL_M-H	pp. 5-6 and 5-7	
				Standard	Two types of cables are required: MR-J3JSCBL03M-A1-L, MR-J3ENSCBL_M-L		
			In the opposite direction of the load side	Long bending life	Two types of cables are required: MR-J3JSCBL03M-A2-L, MR-J3ENSCBL_M-H	pp. 5-6 and 5-7	
				Standard	Two types of cables are required: MR-J3JSCBL03M-A2-L, MR-J3ENSCBL_M-L		
B	2 m to 50 m	IP67	-	Long bending life	MR-J3ENSCBL_M-H	p. 5-7	Select one from this list.
	2 m to 30 m			Standard	MR-J3ENSCBL_M-L		

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.

Servo motor power cable list

	Cable length	IP rating (Note 1)	Cable direction	Bending life	Model	Reference	Note
A	10 m or shorter (direct connection type)	IP65	In direction of load side	Long bending life	MR-PWS1CBL_M-A1-H	p. 5-8	Select one from this list.
				Standard	MR-PWS1CBL_M-A1-L		
			In the opposite direction of the load side	Long bending life	MR-PWS1CBL_M-A2-H	p. 5-8	
				Standard	MR-PWS1CBL_M-A2-L		
	Over 10 m (junction type)	IP55	In direction of load side	Standard	Connect a user-fabricated cable to MR-PWS2CBL03M-A1-L (option cable).	p. 5-8	
			In the opposite direction of the load side		Connect a user-fabricated cable to MR-PWS2CBL03M-A2-L (option cable).	p. 5-8	

	IP rating (Note 1)	Compatible servo motor	Model	Reference	Note
B	IP67	HG-SNS52J, 102J, 152J	Fabricate a cable that fits to MR-PWCNS4 (option connector set).	p. 5-8	Select one that is compatible with the servo motor.
		HG-SNS202J, 302J	Fabricate a cable that fits to MR-PWCNS5 (option connector set).	p. 5-8	

Electromagnetic brake cable list

	Cable length	IP rating (Note 1)	Cable direction	Bending life	Model	Reference	Note
A	10 m or shorter (direct connection type)	IP65	In direction of load side	Long bending life	MR-BKS1CBL_M-A1-H	p. 5-9	Select one from this list.
				Standard	MR-BKS1CBL_M-A1-L		
			In the opposite direction of the load side	Long bending life	MR-BKS1CBL_M-A2-H	p. 5-9	
				Standard	MR-BKS1CBL_M-A2-L		
	Over 10 m (junction type)	IP55	In direction of load side	Standard	Connect a user-fabricated cable to MR-BKS2CBL03M-A1-L (option cable).	p. 5-9	
			In the opposite direction of the load side		Connect a user-fabricated cable to MR-BKS2CBL03M-A2-L (option cable).	p. 5-9	

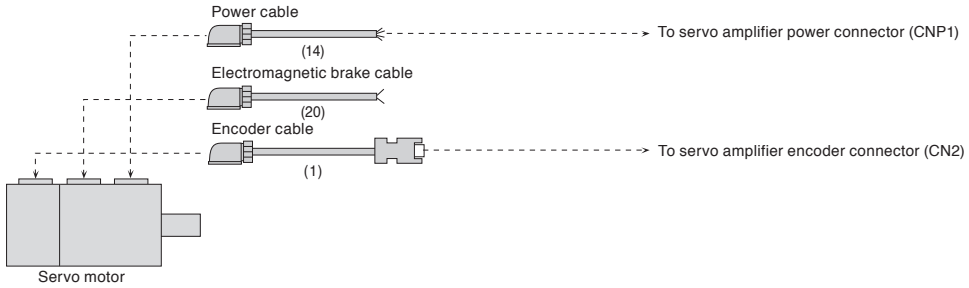
	IP rating (Note 1)	Compatible servo motor	Model	Reference	Note
B	IP67	HG-SNS series	Fabricate a cable that fits to MR-BKCNS1 or MR-BKCNS2 (option connector set) (straight type).	p. 5-9	Select one from this list.
			Fabricate a cable that fits to MR-BKCNS1A or MR-BKCNS2A (option connector set) (angle type).	p. 5-9	

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.

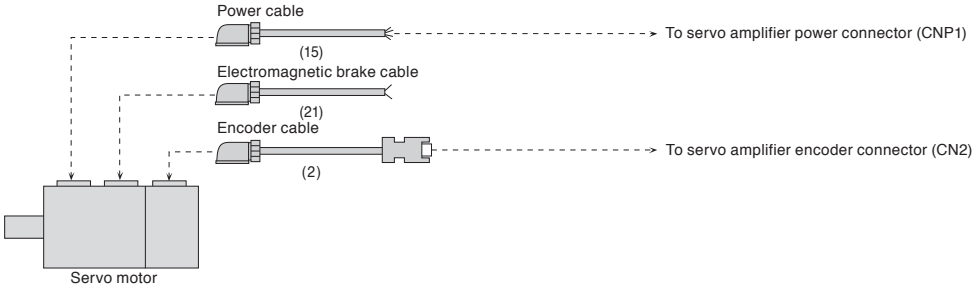
Configuration Example for Servo Motors

HG-KNS series: encoder cable length 10 m or shorter

●For leading the cables out in direction of load side (Note 1)



●For leading the cables out in the opposite direction of the load side (Note 1)

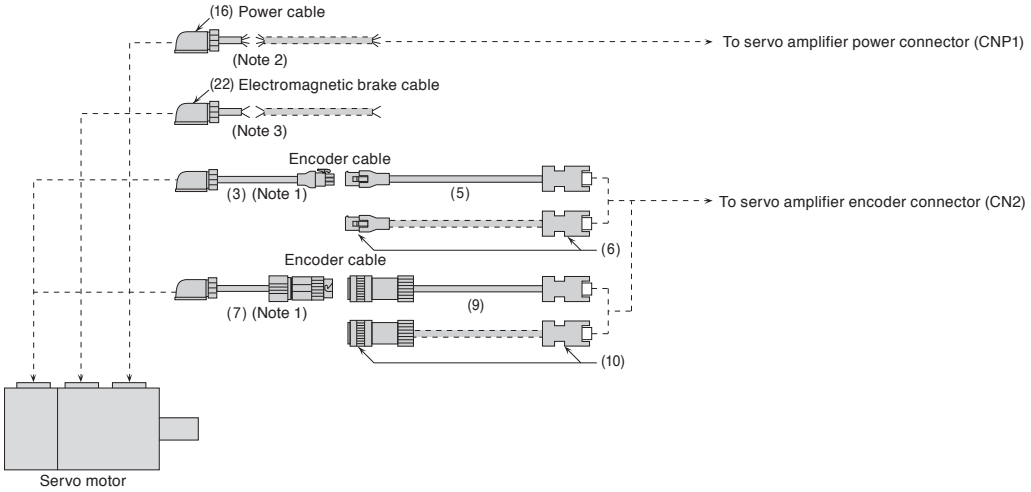


Notes: 1. Cables for leading two different directions may be used for one servo motor.

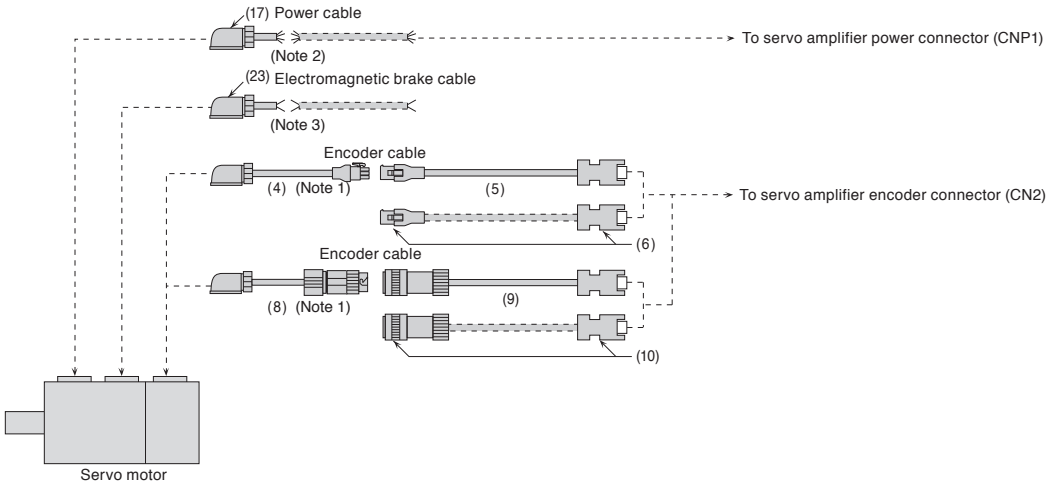
Configuration Example for Servo Motors (Note 5)

HG-KNS series: encoder cable length over 10 m

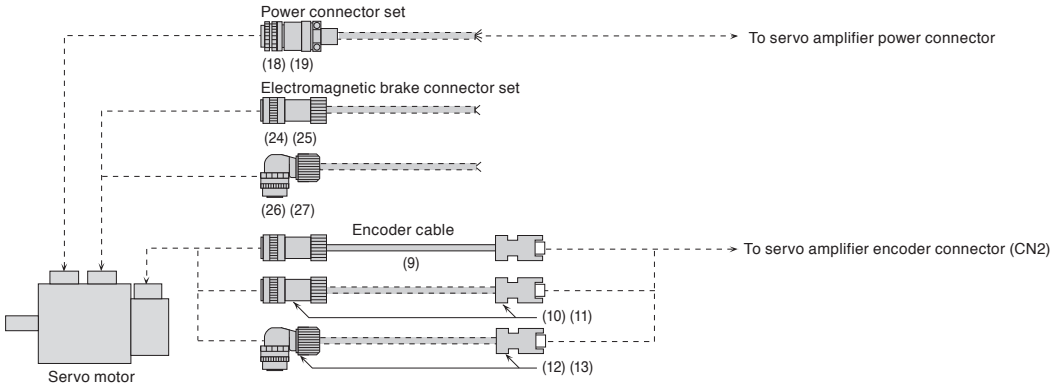
●For leading the cables out in direction of load side (Note 4)



●For leading the cables out in the opposite direction of the load side (Note 4)



HG-SNS series



Notes: 1. Secure this cable as it does not have a long bending life.
2. Relay a cable using MR-PWS2CBL03M-A1-L or MR-PWS2CBL03M-A2-L. Secure this cable as it does not have a long bending life.
3. Relay a cable using MR-BKS2CBL03M-A1-L or MR-BKS2CBL03M-A2-L. Secure this cable as it does not have a long bending life.
4. Cables for leading two different directions may be used for one servo motor.
5. Cables drawn with dashed lines need to be fabricated by users. Refer to "Rotary Servo Motor User's Manual" when fabricating the cables.

Cables and Connectors for Servo Motor Encoder

Refer to "Details of Option Connectors for Servo Motors" in this catalog for the detailed models.
Encoder cables are not subject to European Low Voltage Directive (50 V AC to 1000 V AC and 75 V DC to 1500 V DC).

	Item	Model	Cable length	IP rating (Note 1)	Application	Description
(1)	Encoder cable (Note 2, 6) (load-side lead)	MR-J3ENCBL2M-A1-H	2 m	IP65	For HG-KNS (direct connection type)	Encoder connector — Servo amplifier connector 
		MR-J3ENCBL5M-A1-H	5 m			
		MR-J3ENCBL10M-A1-H	10 m			
		MR-J3ENCBL2M-A1-L	2 m			
		MR-J3ENCBL5M-A1-L	5 m			
		MR-J3ENCBL10M-A1-L	10 m			
(2)	Encoder cable (Note 2, 6) (opposite to load-side lead)	MR-J3ENCBL2M-A2-H	2 m	IP65	For HG-KNS (direct connection type)	
		MR-J3ENCBL5M-A2-H	5 m			
		MR-J3ENCBL10M-A2-H	10 m			
		MR-J3ENCBL2M-A2-L	2 m			
		MR-J3ENCBL5M-A2-L	5 m			
		MR-J3ENCBL10M-A2-L	10 m			
(3)	Encoder cable (Note 2, 6) (load-side lead)	MR-J3JCBL03M-A1-L	0.3 m	IP20	For HG-KNS (junction type)	Encoder connector — Junction connector  Use this in combination with (5) or (6).
(4)	Encoder cable (Note 2, 6) (opposite to load-side lead)	MR-J3JCBL03M-A2-L	0.3 m	IP20	For HG-KNS (junction type)	
(5)	Encoder cable (Note 2, 6)	MR-EKCBL20M-H	20 m	IP20	For HG-KNS (junction type)	Junction connector — Servo amplifier connector  Use this in combination with (3) or (4).
		MR-EKCBL30M-H (Note 3)	30 m			
		MR-EKCBL40M-H (Note 3)	40 m			
		MR-EKCBL50M-H (Note 3)	50 m			
		MR-EKCBL20M-L	20 m			
		MR-EKCBL30M-L (Note 3)	30 m			
(6)	Encoder connector set	MR-ECNM	-	IP20	For HG-KNS (junction type)	Junction connector (Note 5) — Servo amplifier connector  Use this in combination with (3) or (4). Applicable cable Wire size: AWG 26 to 22 Cable OD: 7 mm to 9 mm
(7)	Encoder cable (Note 2, 6) (load-side lead)	MR-J3JSCBL03M-A1-L	0.3 m	IP65 (Note 4)	For HG-KNS (junction type)	Encoder connector — Junction connector  Use this in combination with (9) or (10).
(8)	Encoder cable (Note 2, 6) (opposite to load-side lead)	MR-J3JSCBL03M-A2-L	0.3 m	IP65 (Note 4)	For HG-KNS (junction type)	

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
3. This encoder cable is available in four-wire type. Servo parameter setting is required to use the four-wire type encoder cable. Refer to "MR-JET User's Manual" for details.
4. The encoder cable is rated IP65 while the junction connector itself is rated IP67.
5. The crimping tool (91529-1) manufactured by TE Connectivity Ltd. Company is required. Contact the manufacturer directly.
6. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)

Cables and Connectors for Servo Motor Encoder

Refer to "Details of Option Connectors for Servo Motors" in this catalog for the detailed models.
Encoder cables are not subject to European Low Voltage Directive (50 V AC to 1000 V AC and 75 V DC to 1500 V DC).

	Item	Model	Cable length	IP rating (Note 1)	Application	Description
(9)	Encoder cable (Note 2, 6)	MR-J3ENSCBL2M-H	2 m	IP67	For HG-KNS (junction type) For HG-SNS (direct connection type)	Junction connector or encoder connector / Servo amplifier connector  Use this in combination with (7) or (8) for HG-KNS series.
		MR-J3ENSCBL5M-H	5 m			
		MR-J3ENSCBL10M-H	10 m			
		MR-J3ENSCBL20M-H	20 m			
		MR-J3ENSCBL30M-H	30 m			
		MR-J3ENSCBL40M-H	40 m			
		MR-J3ENSCBL50M-H	50 m			
		MR-J3ENSCBL2M-L	2 m			
		MR-J3ENSCBL5M-L	5 m			
		MR-J3ENSCBL10M-L	10 m			
		MR-J3ENSCBL20M-L	20 m			
		MR-J3ENSCBL30M-L	30 m			
(10)	Encoder connector set (Note 5) (one-touch connection type)	MR-J3SCNS	-	IP67	For HG-KNS (junction type) For HG-SNS (direct connection type) (straight type)	Junction connector or encoder connector / Servo amplifier connector  Use this in combination with (7) or (8) for HG-KNS series. Applicable cable Wire size: 0.5 mm² (AWG 20) or smaller Cable OD: 5.5 mm to 9.0 mm (Note 3)
(11)	Encoder connector set (Note 4, 5, 7) (screw type)	MR-ENCNS2	-	IP67	For HG-SNS (direct connection type) (straight type)	Encoder connector / Servo amplifier connector  Applicable cable Wire size: 0.5 mm² (AWG 20) or smaller Cable OD: 5.5 mm to 9.0 mm (Note 3)
(12)	Encoder connector set (Note 5, 7) (one-touch connection type)	MR-J3SCNSA	-	IP67	For HG-SNS (angle type)	Encoder connector / Servo amplifier connector  Applicable cable Wire size: 0.5 mm² (AWG 20) or smaller Cable OD: 5.5 mm to 9.0 mm (Note 3)
(13)	Encoder connector set (Note 4, 5, 7) (screw type)	MR-ENCNS2A	-	IP67		

Notes:
1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
3. Cable clamps and bushings for cable OD of 5.5 mm to 7.5 mm and of 7.0 mm to 9.0 mm are included in the set.
4. A screw thread is cut on the encoder connector of HG-SNS series, and the screw type connector can be used.
5. The connector set contains a plug and contacts. Using contacts for other plugs may damage the connector. Use the enclosed contacts.
6. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)
7. For fabricating cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)

Cables and Connectors for Servo Motor Power

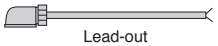
Refer to "Details of Option Connectors for Servo Motors" in this catalog for the detailed models.

	Item	Model	Cable length	IP rating (Note 1)	Application	Description
(14)	Power cable (Note 2, 4) (load-side lead)	MR-PWS1CBL2M-A1-H	2 m	IP65	For HG-KNS (direct connection type)	Power connector  Lead-out * The cable is not shielded.
		MR-PWS1CBL5M-A1-H	5 m			
		MR-PWS1CBL10M-A1-H	10 m			
		MR-PWS1CBL2M-A1-L (Note 3)	2 m			
		MR-PWS1CBL5M-A1-L (Note 3)	5 m			
		MR-PWS1CBL10M-A1-L (Note 3)	10 m			
(15)	Power cable (Note 2, 4) (opposite to load-side lead)	MR-PWS1CBL2M-A2-H	2 m	IP65	For HG-KNS (direct connection type)	
		MR-PWS1CBL5M-A2-H	5 m			
		MR-PWS1CBL10M-A2-H	10 m			
		MR-PWS1CBL2M-A2-L (Note 3)	2 m			
		MR-PWS1CBL5M-A2-L (Note 3)	5 m			
		MR-PWS1CBL10M-A2-L (Note 3)	10 m			
(16)	Power cable (Note 2) (load-side lead)	MR-PWS2CBL03M-A1-L	0.3 m	IP55	For HG-KNS (junction type)	Power connector  Lead-out * The cable is not shielded.
(17)	Power cable (Note 2) (opposite to load-side lead)	MR-PWS2CBL03M-A2-L	0.3 m	IP55	For HG-KNS (junction type)	
(18)	Power connector set (Note 5)	MR-PWCNS4	-	IP67	For HG-SNS52J, 102J, 152J	Power connector  Applicable cable Wire size: 2 mm^2 to 3.5 mm^2 (AWG 14 to 12) Cable OD: 10.5 mm to 14.1 mm
(19)	Power connector set (Note 5)	MR-PWCNS5	-	IP67	For HG-SNS202J, 302J	Power connector  Applicable cable Wire size: 5.5 mm^2 to 8 mm^2 (AWG 10 to 8) Cable OD: 12.5 mm to 16 mm

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
3. Shielded power cable MR-PWS3CBL_M-A_-L is also available. Contact your local sales office.
4. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)
5. For fabricating cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)

Cables and Connectors for Servo Motor Electromagnetic Brake

Refer to "Details of Option Connectors for Servo Motors" in this catalog for the detailed models.

	Item	Model	Cable length	IP rating (Note 1)	Application	Description
(20)	Electromagnetic brake cable (Note 2, 5) (load-side lead)	MR-BKS1CBL2M-A1-H	2 m	IP65	For HG-KNS (direct connection type)	Electromagnetic brake connector  Lead-out * The cable is not shielded.
		MR-BKS1CBL5M-A1-H	5 m			
		MR-BKS1CBL10M-A1-H	10 m			
		MR-BKS1CBL2M-A1-L	2 m			
		MR-BKS1CBL5M-A1-L	5 m			
		MR-BKS1CBL10M-A1-L	10 m			
(21)	Electromagnetic brake cable (Note 2, 5) (opposite to load-side lead)	MR-BKS1CBL2M-A2-H	2 m	IP65	For HG-KNS (direct connection type)	
		MR-BKS1CBL5M-A2-H	5 m			
		MR-BKS1CBL10M-A2-H	10 m			
		MR-BKS1CBL2M-A2-L	2 m			
		MR-BKS1CBL5M-A2-L	5 m			
		MR-BKS1CBL10M-A2-L	10 m			
(22)	Electromagnetic brake cable (Note 2) (load-side lead)	MR-BKS2CBL03M-A1-L	0.3 m	IP55	For HG-KNS (junction type)	Electromagnetic brake connector  Lead-out * The cable is not shielded.
(23)	Electromagnetic brake cable (Note 2) (opposite to load-side lead)	MR-BKS2CBL03M-A2-L	0.3 m	IP55	For HG-KNS (junction type)	
(24)	Electromagnetic brake connector set (Note 4, 6) (one-touch connection type)	MR-BKCNS1	-	IP67	For HG-SNS (straight type)	Electromagnetic brake connector  Applicable cable Wire size: 1.25 mm² (AWG 16) or smaller Cable OD: 9.0 mm to 11.6 mm
(25)	Electromagnetic brake connector set (Note 3, 4, 6) (screw type)	MR-BKCNS2	-	IP67		
(26)	Electromagnetic brake connector set (Note 4, 6) (one-touch connection type)	MR-BKCNS1A	-	IP67	For HG-SNS (angle type)	Electromagnetic brake connector  Applicable cable Wire size: 1.25 mm² (AWG 16) or smaller Cable OD: 9.0 mm to 11.6 mm
(27)	Electromagnetic brake connector set (Note 3, 4, 6) (screw type)	MR-BKCNS2A	-	IP67		

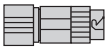
Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
3. A screw thread is cut on the encoder connector of HG-SNS series, and the screw type connector can be used.
4. The connector set contains a plug and contacts. Using contacts for other plugs may damage the connector. Use the enclosed contacts.
5. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)
6. For fabricating cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)

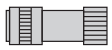
Details of Option Connectors for Servo Motors

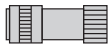
Model	Encoder connector	Servo amplifier connector
MR-J3ENCBL_M-A1-H (Note 2) MR-J3ENCBL_M-A1-L (Note 2) MR-J3ENCBL_M-A2-H (Note 2) MR-J3ENCBL_M-A2-L (Note 2)	 2174053-1 (TE Connectivity Ltd. Company)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

Model	Encoder connector	Junction connector
MR-J3JCBL03M-A1-L (Note 2) MR-J3JCBL03M-A2-L (Note 2)	 2174053-1 (TE Connectivity Ltd. Company)	 Contact: 1473226-1 (with ring) Housing: 1-172169-9 Cable clamp: 316454-1 (TE Connectivity Ltd. Company)

Model	Junction connector	Servo amplifier connector
MR-EKCBL_M-H MR-EKCBL_M-L MR-ECNM	 Housing: 1-172161-9 Connector pin: 170359-1 (TE Connectivity Ltd. Company) or an equivalent product Cable clamp: MTI-0002 (Toa Electric Industrial Co., Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

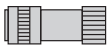
Model	Encoder connector	Junction connector
MR-J3JSCBL03M-A1-L (Note 2) MR-J3JSCBL03M-A2-L (Note 2)	 2174053-1 (TE Connectivity Ltd. Company)	 Cable receptacle: CM10-CR10P-M (DDK Ltd.)

Model	Encoder connector	Servo amplifier connector
MR-J3ENSCBL_M-H (Note 2) MR-J3ENSCBL_M-L (Note 2)	 For 10 m or shorter cable Straight plug: CMV1-SP10S-M1 Socket contact: CMV1-#22ASC-C1-100 For 20 m or longer cable Straight plug: CMV1-SP10S-M1 (long bending life) CMV1-SP10S-M2 (standard) Socket contact: CMV1-#22ASC-C2-100 (DDK Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

Model	Junction connector/encoder connector	Servo amplifier connector
MR-J3SCNS (Note 1, 2, 3)	 Straight plug: CMV1-SP10S-M2 Socket contact: CMV1-#22ASC-S1-100 (DDK Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

Notes: 1. Cable clamps and bushings for cable OD of 5.5 mm to 7.5 mm and of 7.0 mm to 9.0 mm are included in the set.
2. Some cables or connector sets may contain the connectors of different shapes. However, these connectors are all usable.
3. The connector set contains a plug and contacts. Using contacts for other plugs may damage the connector. Use the enclosed contacts.

Details of Option Connectors for Servo Motors

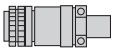
Model	Encoder connector	Servo amplifier connector
MR-ENCNS2 (Note 1, 3)	 Straight plug: CMV1S-SP10S-M2 Socket contact: CMV1-#22ASC-S1-100 (DDK Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

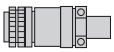
Model	Encoder connector	Servo amplifier connector
MR-J3SCNSA (Note 1, 2, 3)	 Angle plug: CMV1-AP10S-M2 Socket contact: CMV1-#22ASC-S1-100 (DDK Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

Model	Encoder connector	Servo amplifier connector
MR-ENCNS2A (Note 1, 3)	 Angle plug: CMV1S-AP10S-M2 Socket contact: CMV1-#22ASC-S1-100 (DDK Ltd.)	 Receptacle: 36210-0100PL Shell kit: 36310-3200-008 (3M) or Connector set: 54599-1019 (Molex, LLC)

Model	Power connector	
MR-PWS1CBL_M-A1-H (Note 2) MR-PWS1CBL_M-A1-L (Note 2) MR-PWS1CBL_M-A2-H (Note 2) MR-PWS1CBL_M-A2-L (Note 2)		Plug: KN4FT04SJ1-R Socket contact: ST-TMH-S-C1B-100-(A534G) (Japan Aviation Electronics Industry, Limited)

Model	Power connector	
MR-PWS2CBL03M-A1-L (Note 2) MR-PWS2CBL03M-A2-L (Note 2)		Plug: KN4FT04SJ2-R Socket contact: ST-TMH-S-C1B-100-(A534G) (Japan Aviation Electronics Industry, Limited)

Model	Power connector	
MR-PWCNS4		Plug: CE05-6A18-10SD-D-BSS (straight) Cable clamp: CE3057-10A-1-D (DDK Ltd.)

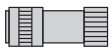
Model	Power connector	
MR-PWCNS5		Plug: CE05-6A22-22SD-D-BSS (straight) Cable clamp: CE3057-12A-1-D (DDK Ltd.)

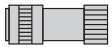
Notes: 1. Cable clamps and bushings for cable OD of 5.5 mm to 7.5 mm and of 7.0 mm to 9.0 mm are included in the set.
2. Some cables or connector sets may contain the connectors of different shapes. However, these connectors are all usable.
3. The connector set contains a plug and contacts. Using contacts for other plugs may damage the connector. Use the enclosed contacts.

Details of Option Connectors for Servo Motors

Model	Electromagnetic brake connector	
MR-BKS1CBL_M-A1-H MR-BKS1CBL_M-A1-L MR-BKS1CBL_M-A2-H MR-BKS1CBL_M-A2-L		Plug: JN4FT02SJ1-R Socket contact: ST-TMH-S-C1B-100-(A534G) (Japan Aviation Electronics Industry, Limited)

Model	Electromagnetic brake connector	
MR-BKS2CBL03M-A1-L MR-BKS2CBL03M-A2-L		Plug: JN4FT02SJ2-R Socket contact: ST-TMH-S-C1B-100-(A534G) (Japan Aviation Electronics Industry, Limited)

Model	Electromagnetic brake connector	
MR-BKCNS1 (Note 1, 2)		Straight plug: CMV1-SP2S-L Socket contact: CMV1-#22BSC-S2-100 (DDK Ltd.)

Model	Electromagnetic brake connector	
MR-BKCNS2 (Note 2)		Straight plug: CMV1S-SP2S-L Socket contact: CMV1-#22BSC-S2-100 (DDK Ltd.)

Model	Electromagnetic brake connector	
MR-BKCNS1A (Note 1, 2)		Angle plug: CMV1-AP2S-L Socket contact: CMV1-#22BSC-S2-100 (DDK Ltd.)

Model	Electromagnetic brake connector	
MR-BKCNS2A (Note 2)		Angle plug: CMV1S-AP2S-L Socket contact: CMV1-#22BSC-S2-100 (DDK Ltd.)

Notes: 1. Some cables or connector sets may contain the connectors of different shapes. However, these connectors are all usable.
2. The connector set contains a plug and contacts. Using contacts for other plugs may damage the connector. Use the enclosed contacts.

Products on the Market for Servo Motors

Contact the relevant manufacturers directly.
When fabricating a cable with the following connectors, refer to the relevant manufacturers' instruction manuals for wiring and assembling procedures.

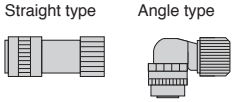
Encoder connector (servo amplifier-side)

Application	Connector (3M)
Servo amplifier CN2 connector	Receptacle: 36210-0100PL Shell kit: 36310-3200-008
	Connector (Molex, LLC)
	54599-1019 (gray)
	54599-1016 (black)

Encoder connector for HG-KNS series

Applicable servo motor	Feature (Note 1)	Connector (TE Connectivity Ltd. Company)	Crimping tool (TE Connectivity Ltd. Company)	Applicable cable example
HG-KNS	IP65	2174053-1	For ground clip: 1596970-1 For receptacle contact: 1596847-1	Wire size: 0.13 mm² to 0.33 mm² (AWG 26 to 22) Cable OD: 6.8 mm to 7.4 mm Wire example: Fluorine resin wire (Vinyl jacket cable TPE. SVP 70/0.08(AWG#22)-3P KB-2237-2 Bando Densen Co., Ltd. (Note 2) or an equivalent product)

Encoder connector for HG-SNS series



Applicable servo motor	Feature (Note 1)	Connector (DDK Ltd.)				Applicable cable example
		Type	Type of connection	Plug	Socket contact	Cable OD [mm]
HG-SNS	IP67	Straight	One-touch connection type	CMV1-SP10S-M1	Select from solder or press bonding type. (Refer to the table below.)	5.5 to 7.5
				CMV1-SP10S-M2		7.0 to 9.0
			Screw type	CMV1S-SP10S-M1		5.5 to 7.5
				CMV1S-SP10S-M2		7.0 to 9.0
		Angle	One-touch connection type	CMV1-AP10S-M1		5.5 to 7.5
				CMV1-AP10S-M2		7.0 to 9.0
			Screw type	CMV1S-AP10S-M1		5.5 to 7.5
				CMV1S-AP10S-M2		7.0 to 9.0

Contact	Socket contact (DDK Ltd.)	Wire size (Note 3)
Solder type	CMV1-#22ASC-S1-100	0.5 mm² (AWG 20) or smaller
Press bonding type	CMV1-#22ASC-C1-100	0.2 mm² to 0.5 mm² (AWG 24 to 20) Crimping tool (357J-53162T) is required.
	CMV1-#22ASC-C2-100	0.08 mm² to 0.2 mm² (AWG 28 to 24) Crimping tool (357J-53163T) is required.

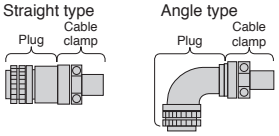
Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. Contact Toa Electric Industrial Co., Ltd.
3. The wire size shows wiring specifications of the connector.

Products on the Market for Servo Motors

Contact the relevant manufacturers directly.
When fabricating a cable with the following connectors, refer to the relevant manufacturers' instruction manuals for wiring and assembling procedures.

Power connector for HG-KNS series

Applicable servo motor	Feature (Note 1)	Connector (Japan Aviation Electronics Industry, Limited)	Crimping tool (Japan Aviation Electronics Industry, Limited)	Applicable cable example
HG-KNS	IP65	Plug: KN4FT04SJ1-R Socket contact: ST-TMH-S-C1B-100-(A534G)	For contactor: CT170-14-TMH5B	Wire size: 0.3 mm² to 0.75 mm² (AWG 22 to 18) Cable OD: 5.3 mm to 6.5 mm Wire example: Fluorine resin wire (Vinyl jacket cable RMFES-A (CL3X) AWG 19, 4 cores Dyden Corporation (Note 4) or an equivalent product)



Power connector for HG-SNS series

Applicable servo motor	Feature (Note 1)	Plug (with backshell) (DDK Ltd.)		Cable clamp (DDK Ltd.)	Applicable cable example	
		Type	Model	Model	Wire size (Note 3)	Cable OD [mm]
HG-SNS52J, 102J, 152J	IP67 EN compliant	Straight	CE05-6A18-10SD-D-BSS	CE3057-10A-2-D	2.2 mm² to 3.5 mm² (AWG 14 to 12)	8.5 to 11
				CE3057-10A-1-D		10.5 to 14.1
	General environment (Note 2)		D/MS3106B18-10S	D/MS3057-10A	2.2 mm² to 3.5 mm² (AWG 14 to 12)	14.3 or smaller (bushing ID)
HG-SNS202J, 302J	IP67 EN compliant		CE05-6A22-22SD-D-BSS	CE3057-12A-2-D	5.5 mm² to 8 mm² (AWG 10 to 8)	9.5 to 13
				CE3057-12A-1-D		12.5 to 16
	General environment (Note 2)		D/MS3106B22-22S	D/MS3057-12A	5.5 mm² to 8 mm² (AWG 10 to 8)	15.9 or smaller (bushing ID)
HG-SNS52J, 102J, 152J	IP67 EN compliant	Angle	CE05-8A18-10SD-D-BAS	CE3057-10A-2-D	2.2 mm² to 3.5 mm² (AWG 14 to 12)	8.5 to 11
				CE3057-10A-1-D		10.5 to 14.1
	General environment (Note 2)		D/MS3108B18-10S	D/MS3057-10A	2.2 mm² to 3.5 mm² (AWG 14 to 12)	14.3 or smaller (bushing ID)
HG-SNS202J, 302J	IP67 EN compliant		CE05-8A22-22SD-D-BAS	CE3057-12A-2-D	5.5 mm² to 8 mm² (AWG 10 to 8)	9.5 to 13
				CE3057-12A-1-D		12.5 to 16
	General environment (Note 2)		D/MS3108B22-22S	D/MS3057-12A	5.5 mm² to 8 mm² (AWG 10 to 8)	15.9 or smaller (bushing ID)

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. Not compliant with EN.
3. The wire size shows wiring specifications of the connector. Refer to "Selection Example in HIV Wires for Servo Motors" in this catalog for examples of wire size selection.
4. Contact Taisei Co., Ltd.

Products on the Market for Servo Motors

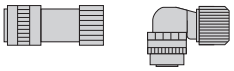
Contact the relevant manufacturers directly.
When fabricating a cable with the following connectors, refer to the relevant manufacturers' instruction manuals for wiring and assembling procedures.

Electromagnetic brake connector for HG-KNS series

Applicable servo motor	Feature (Note 1)	Connector (Japan Aviation Electronics Industry, Limited)	Crimping tool (Japan Aviation Electronics Industry, Limited)	Applicable cable example
HG-KNS	IP65	Plug: JN4FT02SJ1-R Socket contact: ST-TMH-S-C1B-100-(A534G)	For contactor: CT170-14-TMH5B	Wire size: 0.3 mm² to 0.5 mm² (AWG 22 to 20) Cable OD: 3.6 mm to 4.8 mm Wire example: Fluorine resin wire (Vinyl jacket cable RMFES-A (CL3X) AWG 20, 2 cores Dyden Corporation (Note 2) or an equivalent product)

Electromagnetic brake connector for HG-SNS series

Straight type Angle type

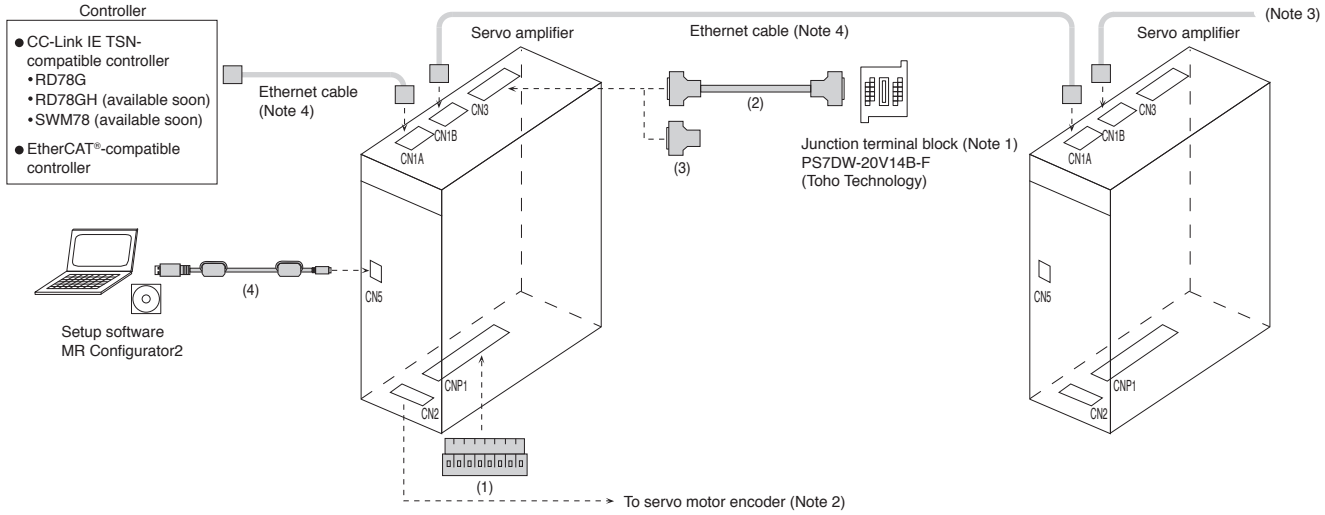


Applicable servo motor	Feature (Note 1)	Connector (DDK Ltd.)				Applicable cable example
		Type	Type of connection	Plug	Socket contact	Cable OD [mm]
HG-SNS	IP67	Straight	One-touch connection type	CMV1-SP2S-S	Select from solder or press bonding type. (Refer to the table below.)	4.0 to 6.0
				CMV1-SP2S-M1		5.5 to 7.5
				CMV1-SP2S-M2		7.0 to 9.0
				CMV1-SP2S-L		9.0 to 11.6
			Screw type	CMV1S-SP2S-S		4.0 to 6.0
				CMV1S-SP2S-M1		5.5 to 7.5
				CMV1S-SP2S-M2		7.0 to 9.0
				CMV1S-SP2S-L		9.0 to 11.6
		Angle	One-touch connection type	CMV1-AP2S-S		4.0 to 6.0
				CMV1-AP2S-M1		5.5 to 7.5
				CMV1-AP2S-M2		7.0 to 9.0
				CMV1-AP2S-L		9.0 to 11.6
			Screw type	CMV1S-AP2S-S		4.0 to 6.0
				CMV1S-AP2S-M1		5.5 to 7.5
				CMV1S-AP2S-M2		7.0 to 9.0
				CMV1S-AP2S-L		9.0 to 11.6

Contact	Socket contact (DDK Ltd.)	Wire size (Note 3)
Solder type	CMV1-#22BSC-S2-100	1.25 mm² (AWG 16) or smaller
Press bonding type	CMV1-#22BSC-C3-100	0.5 mm² to 1.25 mm² (AWG 20 to 16) Crimping tool (357J-53164T) is required.

Notes: 1. The IP rating indicated is for the connector's protection against ingress of dust and water when coupled to a servo motor. If the IP rating of the servo motor differs from that of these connectors, overall IP rating depends on the lowest of all.
2. Contact Taisei Co., Ltd.
3. The wire size shows wiring specifications of the connector. Refer to "Selection Example in HIV Wires for Servo Motors" in this catalog for examples of wire size selection.

Configuration Example for Servo Amplifiers



Notes: 1. Refer to "Junction Terminal Block" in this catalog.
2. A battery (available soon) is required when configuring an absolute position detection system.
3. When branching off CC-Link IE TSN (synchronous communication function) with a switching hub, use a switching hub (Class B) recommended by CC-Link Partner Association. When a switching hub (Class A) is used, there are restrictions on the topologies to be used. Refer to "MELSEC iQ-R Motion Module User's Manual" for details.
4. For specifications of the Ethernet cable, refer to "Ethernet Cable Specifications" in this catalog.

Ethernet Cable Specifications

Item		CC-Link IE TSN (Note 1, 2)	EtherCAT®
Ethernet Cable		Category 5e or higher, (double shielded/STP) straight cable	
	Standard	The cable must meet the following: • IEEE802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)	The cable must meet the following: • IEEE802.3 (100BASE-TX) • ANSI/TIA/EIA-568-B (Category 5e)
	Connector	RJ-45 connector with shield	

Notes: 1. Use wiring parts recommended by CC-Link Partner Association for wiring the CC-Link IE TSN.
2. Cables for CC-Link IE Controller Network cannot be used with CC-Link IE TSN.

Cables and Connectors for Servo Amplifiers

Refer to "Details of Option Connectors for Servo Amplifiers" in this catalog for the detailed models.

No.		Item	Application	Cable length	Model	Description
For CNP1	(1)	Servo amplifier power connector set	For MR-JET-100G or smaller	-	(Standard accessory)	CNP1 connector / Open tool  Applicable wire size (Note 1): AWG 18 to 14 Insulator OD: 3.9 mm or smaller
			For MR-JET-200G/ MR-JET-300G			CNP1 connector / Open tool  Applicable wire size (Note 1): AWG 16 to 10 Insulator OD: 4.7 mm or smaller
For CN3	(2)	Junction terminal block cable	For connecting MR-JET-_G and PS7DW-20V14B-F	0.5 m	MR-J2HBUS05M	Servo amplifier connector / Junction terminal block connector 
				1 m	MR-J2HBUS1M	
				5 m	MR-J2HBUS5M	
	(3)	Connector set	For MR-JET-_G	-	MR-CCN1	 Servo amplifier connector
For CN5	(4)	Personal computer communication cable (USB cable)	For MR-JET-_G	3 m	MR-J3USBCBL3M	Servo amplifier connector mini-B connector (5-pin) / Personal computer connector A connector 

Notes: 1. The wire size shows wiring specifications of the connector. Refer to "Selection Example in HIV Wires for Servo Motors" in this catalog for examples of wire size selection.

Details of Option Connectors for Servo Amplifiers

Model	CNP1 connector	Open tool
Servo amplifier power connector set For MR-JET-100G or smaller (standard accessory)	 1-2349815-2 (TE Connectivity Ltd. Company)	 1981045-1 (TE Connectivity Ltd. Company)

Model	CNP1 connector	Open tool
Servo amplifier power connector set For MR-JET-200G/ MR-JET-300G (standard accessory)	 1-2349825-8 (TE Connectivity Ltd. Company)	 2349891-1 (TE Connectivity Ltd. Company)

Model	Servo amplifier connector	Junction terminal block connector
MR-J2HBUS_M	 Connector: 52316-2019 Shell kit: 52370-2070 (Molex, LLC) or an equivalent product or Press bonding type (Note 2) Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M) or an equivalent product	 Connector: 52316-2019 Shell kit: 52370-2070 (Molex, LLC) or an equivalent product or Press bonding type (Note 2) Connector: 10120-6000EL Shell kit: 10320-3210-000 (3M) or an equivalent product

Model	Servo amplifier connector	
MR-CCN1		Solder type (Note 1) Connector: 10120-3000PE Shell kit: 10320-52F0-008 (3M) or an equivalent product

Notes: 1. The press bonding type (Connector: 10120-6000EL and shell kit: 10320-3210-000) (3M) is also usable. Contact the manufacturer directly.
2. The solder type (connector: 10120-3000PE and shell kit: 10320-52F0-008) (3M) is also usable. Contact the manufacturer directly.

Products on the Market for Servo Amplifiers

Ethernet Cable

Item		Model	Specifications	
Ethernet Cable	For indoor	SC-E5EW-S_M	_: cable length (100 m max., unit of 1 m)	Double shielded cable (Category 5e)
	For indoor and moving part	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, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS SERVICE SECTION. (Email: osb.webmaster@melsc.jp)

* When using CC-Link IE TSN, refer to the website of CC-Link Partner Association for cables on the market other than above.
https://www.cc-link.org/en/

Regenerative Option

Servo amplifier model	Permissible regenerative power [W] (Note 2)						
	Built-in regenerative resistor	Regenerative option					
		MR-RB					
		032	12	14	30	34	50 (Note 1)
		40 Ω	40 Ω	26 Ω	13 Ω	26 Ω	13 Ω
MR-JET-10G	-	30	-	-	-	-	-
MR-JET-20G	-	30	100	-	-	-	-
MR-JET-40G	10	30	100	-	-	-	-
MR-JET-70G	30	-	-	100	-	300	-
MR-JET-100G	30	-	-	100	-	300	-
MR-JET-200G	100	-	-	-	300	-	500
MR-JET-300G	100	-	-	-	300	-	500

Notes: 1. Cool the unit forcibly with a cooling fan (92 mm × 92 mm, minimum air flow: 1.0 m^3/min). The cooling fan must be prepared by users.
2. The power values in this table are resistor-generated powers, not rated powers.

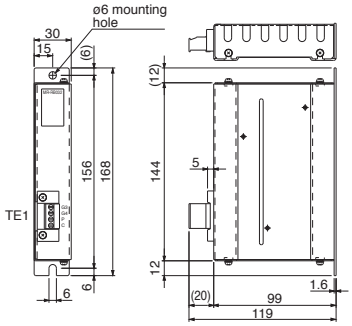
* Precautions when connecting the regenerative option

1. The regenerative option causes a temperature rise of 100 °C or higher relative to the ambient temperature. Fully examine heat dissipation, installation position, wires used before installing the unit. Use flame-retardant wires or apply flame retardant on wires, and keep the wires clear of the unit.
2. Use twisted wires for connecting the regenerative option to the servo amplifier, and keep the wire length to a maximum of 5 m.
3. Use twisted wires for connecting a thermal sensor so that the sensor does not fail to work properly because of inducted noise.

Regenerative Option

Dimensions [Unit: mm]

MR-RB032



Terminal arrangement

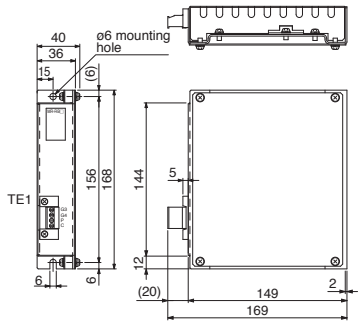
TE1

G3
G4
P
C

Applicable wire size (Note 3):
0.2 mm² to 2.5 mm² (AWG 24 to 12)
Mounting screw size: M5

Model	Mass [kg]
MR-RB032	0.5

MR-RB12, MR-RB14



Terminal arrangement

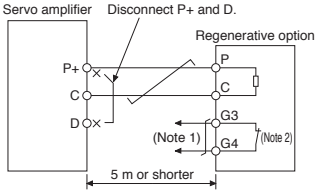
TE1

G3
G4
P
C

Applicable wire size (Note 3):
0.2 mm² to 2.5 mm² (AWG 24 to 12)
Mounting screw size: M5

Model	Mass [kg]
MR-RB12 MR-RB14	1.1

Connections

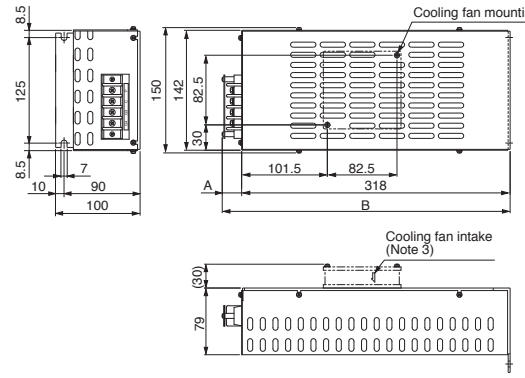


Notes: 1. Create a sequence circuit that turns off the magnetic contactor when abnormal overheating occurs.
2. G3 and G4 terminals are thermal sensor. G3-G4 opens when the regenerative option overheats abnormally.
3. The wire size shows wiring specifications of the connector. Refer to "Wires, Molded-Case Circuit Breakers, and Magnetic Contactors" in this catalog for examples of wire size selection.

Regenerative Option

Dimensions [Unit: mm]

MR-RB30, MR-RB34



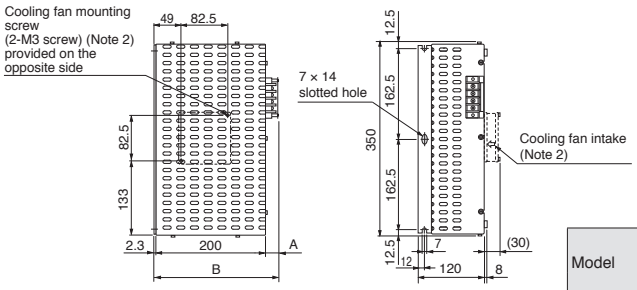
Terminal arrangement

P
C
G3
G4

Terminal screw size: M4
Mounting screw size: M6

Model	Variable dimensions		Mass [kg]
	A	B	
MR-RB30	17	335	2.9
MR-RB34			

MR-RB50



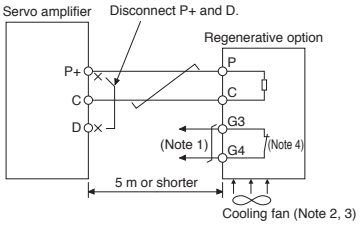
Terminal arrangement

P
C
G3
G4

Terminal screw size: M4
Mounting screw size: M6

Model	Variable dimensions		Mass [kg]
	A	B	
MR-RB50	17	217	5.6

Connections



Notes: 1. Create a sequence circuit that turns off the magnetic contactor when abnormal overheating occurs.
2. When using MR-RB50, cool the unit forcibly with a cooling fan (92 mm × 92 mm, minimum air flow: 1.0 m^3/min). The cooling fan must be prepared by users.
3. When MR-RB30 or MR-RB34 is used, it may be necessary to cool the unit forcibly with a cooling fan (92 mm × 92 mm, minimum air flow: 1.0 m^3/min), depending on the operating environment.
Refer to "MR-JET User's Manual" for details. The cooling fan must be prepared by users.
4. G3 and G4 terminals are thermal sensor. G3-G4 opens when the regenerative option overheats abnormally.

Replacement Fan Unit (MR-JET-FAN1) (available soon)

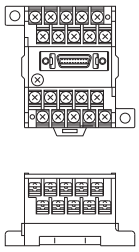
The cooling fan of the 2 kW and 3 kW servo amplifiers has a fan and a fan cover as a unit. Replace the fan unit when the fan needs to be replaced. Refer to "MR-JET User's Manual" for replacement of the cooling fan.

Servo amplifier model	Replacement fan unit model
MR-JET-200G MR-JET-300G	MR-JET-FAN1

[Products on the Market]

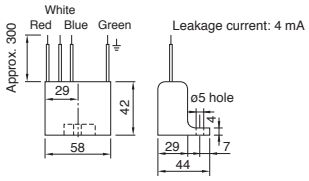
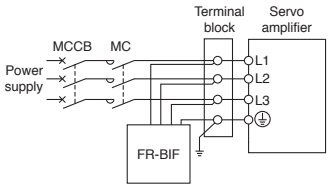
Junction Terminal Block (PS7DW-20V14B-F)

This terminal block is used for wiring signals.

External appearance
 Toho Technology Corp. Kyoto Factory Applicable wire: 1.25 mm² maximum

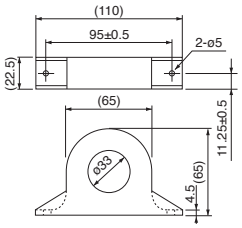
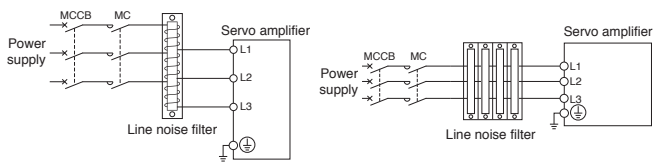
Radio Noise Filter (FR-BIF)

This filter suppresses noise from the power supply side of the servo amplifier, especially effective for the radio frequency bands of 10 MHz or lower. The FR-BIF is designed to be installed on the input side.

Dimensions [Unit: mm]	Connections
	Do not use the FR-BIF on the output side of the servo amplifier. Wiring should be as short as possible. Grounding is required. Insulate the unused wire when using the FR-BIF with a 1-phase power supply. 

Line Noise Filter (FR-BSF01)

This filter is effective in suppressing noise emitted from the power supply side or the output side of the servo amplifier, and also in suppressing high-frequency leakage current (zero-phase current), especially within 0.5 MHz to 5 MHz band.

Dimensions [Unit: mm]	Connections
FR-BSF01 For wire size of 3.5 mm² (AWG 12) or smaller 	The line noise filters can be mounted on lines of the power supply (L1, L2, and L3) and of the servo motor power (U, V, and W). Pass each of the wires through the line noise filter an equal number of times in the same direction. For wires of the power supply, the effect of the filter rises as the number of passes increases, but generally four passes would be appropriate. For the servo motor power lines, passes must be four times or less. Do not pass the grounding wire through the filter. Otherwise, the effect of the filter will drop. Wind the wires by passing through the filter to satisfy the required number of passes as shown in Example 1. If the wires are too thick to wind, use two or more filters to have the required number of passes as shown in Example 2. Place the line noise filters as close to the servo amplifier as possible for their best performance. Example 1 Example 2 

Data Line Filter

This filter is effective in preventing noise when attached to the motor encoder cable, etc.

Example) ESD-SR-250 (manufactured by TOKIN Corporation)
ZCAT3035-1330 (manufactured by TDK)
GRFC-13 (manufactured by Kitagawa Industries Co., Ltd.)
E04SRM563218 (manufactured by Seiwa Electric Mfg. Co., Ltd.)

Surge Killer

Attach surge killers to AC relays and AC valves around the servo amplifier. Attach diodes to DC relays and DC valves.

Example) Surge killer: CR-50500 (manufactured by Okaya Electric Industries Co., Ltd.)
Diode: A diode with breakdown voltage four or more times greater than the relay drive voltage, and with current capacity two or more times greater than the relay drive current.

EMC Filter

The following filters are recommended as a filter compliant with the EMC directive for the power supply of the servo amplifier.
A surge protector is separately required to use the filters. Refer to "EMC Installation Guidelines" for details.
Fulfill the following requirements when connecting several units of servo amplifiers to one EMC filter.

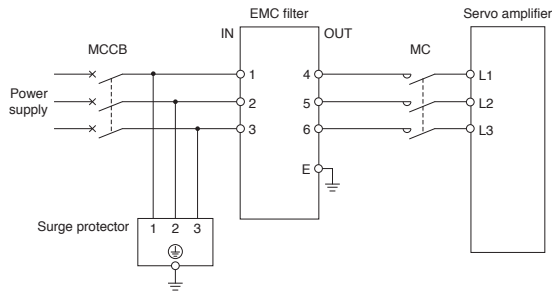
- Rated voltage [V] of EMC filter ≥ Rated input voltage [V] of servo amplifier
- Rated current [A] of EMC filter ≥ Total rated input current [A] of servo amplifiers connected to EMC filter

Operating environment	Length of servo motor power cable	EMC Filter						
		Model	Rated current [A]	Rated voltage [V AC]	Operating temperature [°C]	Mass [kg]	Fig.	Manufacturer
IEC/EN 61800-3 Category C2/C3 (Note 1)	50 m or shorter	FSB-10-254-HU	10	250	-40 to 85	1.8	A	COSEL Co., Ltd.
		FSB-20-254-HU	20					
		FSB-30-254-HU	30					
IEC/EN 61800-3 Category C3 (Note 1)	50 m or shorter (Note 2)	HF3010C-SZB	10	500	-20 to 50	0.9	B	Soshin Electric Co., Ltd.
		HF3020C-SZB	20			1.3		
		HF3030C-SZB	30					

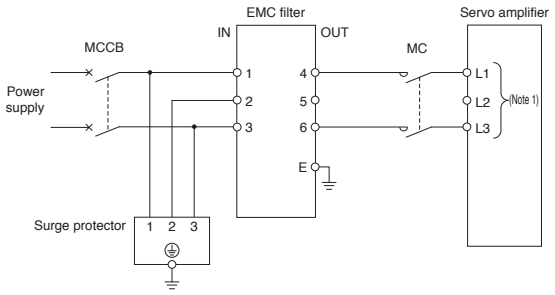
Notes: 1. Category C2: first environment (residential environment), second environment (commercial, light industrial, and industrial environments)
Category C3: second environment (commercial, light industrial, and industrial environments)
2. If the length of the power cable exceeds 20 m, install the radio noise filter (FR-BIF) on the input side of the servo amplifier.

Connections

3-phase 200 V AC



1-phase 200 V AC



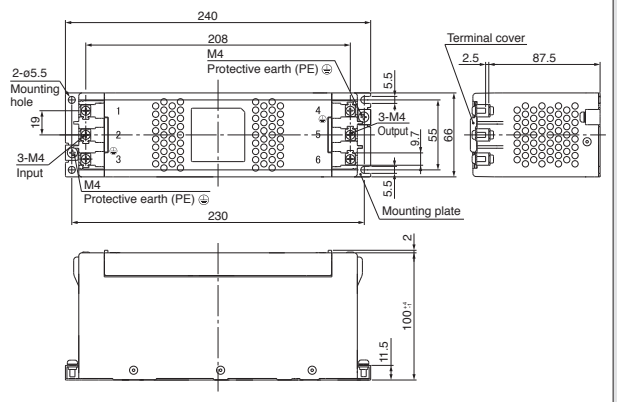
Notes: 1. Connect the power supply to L1 and L3 terminals. Do not connect anything to L2.

Dimensions

[Unit: mm]

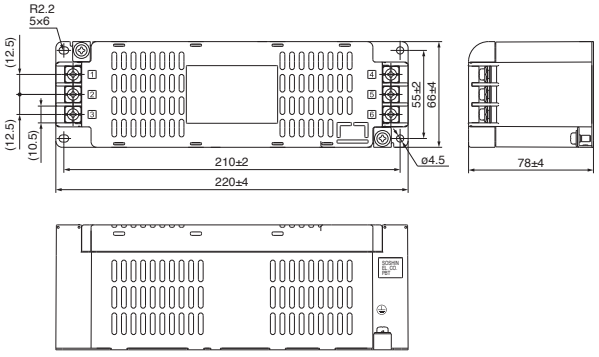
A

FSB-10-254-HU/FSB-20-254-HU/FSB-30-254-HU



B

HF3010C-SZB/HF3020C-SZB/HF3030C-SZB



Surge Protector

Attach surge protectors of RSPD series (manufactured by Okaya Electric Industries Co., Ltd.) or LT-CS-WS series (manufactured by Soshin Electric Co., Ltd.) to the servo amplifiers.

Power Factor Improving AC Reactor (FR-HAL)

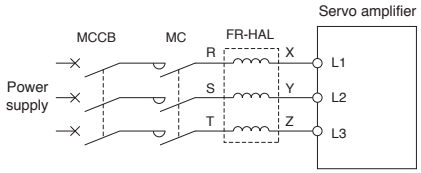
This boosts the power factor of servo amplifier and reduces the power supply capacity.

Servo amplifier model	Power factor improving AC reactor model (Note 1)
MR-JET-10G	FR-HAL-0.4K
MR-JET-20G	
MR-JET-40G	FR-HAL-0.75K
MR-JET-70G	FR-HAL-1.5K
MR-JET-100G (3-phase power supply input)	FR-HAL-2.2K
MR-JET-100G (1-phase power supply input)	FR-HAL-3.7K
MR-JET-200G (3-phase power supply input)	
MR-JET-200G (1-phase power supply input)	FR-HAL-5.5K
MR-JET-300G	

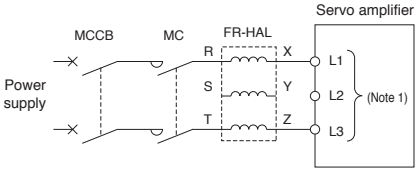
Notes: 1. When using the power factor improving AC reactor, install one reactor for each servo amplifier.

Connections

3-phase 200 V AC

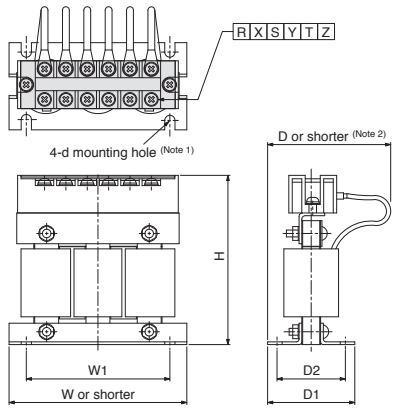


1-phase 200 V AC



Notes: 1. Connect the power supply to L1 and L3 terminals. Do not connect anything to L2.

Dimensions



Model	Variable dimensions [mm]							Mass [kg]	Terminal screw size
	W	W1	H	D	D1	D2	d		
FR-HAL-0.4K	104±2	84	99	72	51	40	M5	0.6	M4
FR-HAL-0.75K	104±2	84	99	74	56	44	M5	0.8	M4
FR-HAL-1.5K	104±2	84	99	77	61	50	M5	1.1	M4
FR-HAL-2.2K	115 (Note 2)	40	115	77	71	57	M6	1.5	M4
FR-HAL-3.7K	115 (Note 2)	40	115	83	81	67	M6	2.2	M4
FR-HAL-5.5K	115 (Note 2)	40	115	83	81	67	M6	2.3	M4

Notes: 1. Use this mounting hole for grounding.
2. This indicates the maximum dimension. The dimension varies depending on the bending degree of the input/output lines.

Servo Support Software

Drive System Sizing Software Motorizer

Specifications

Item	Description
Types of motor/drive	Servo, inverter, sensorless servo
Types of load mechanism	Ball screws, rack and pinions, roll feeds, rotary tables, carts, elevators/hoists, conveyors, fans, pumps, generic (rotary), generic (linear), linear servo
Types of transmission mechanism	Coupling, external gear reducer, V belt and pulley, toothed belt/roller chain
Operation pattern	Constant speed/pause, acceleration/deceleration, trapezoid, triangle, speed CSV file, MELSOFT GX LogViewer file
Types of input support of moment of inertia calculation function	Solid cylinder, hollow cylinder, disk, rectangular solid, truncated cone, sphere, generic
Sizing results	Result, motor type, motor, motor capacity, drive, drive capacity, effective torque, torque effective load rate, peak torque, peak load rate, effective torque at stop, effective load rate at stop, motor output, motor output rate, maximum speed, maximum speed rate, maximum load inertia moment, inertia moment ratio, regenerative power, regenerative load ratio, regenerative option, maximally increased torque, rated speed, brake, oil seal, structure specification, graph of motor side speed/motor side torque/motor output
Printing of output of results	Prints load mechanism, transmission mechanism, operation pattern, and sizing results.
Data saving	Load mechanism, transmission mechanism, operation pattern, motor selection, drive selection, and sizing results are saved with a file name.

Operating environment (Note 1)

Item	Description
OS	Microsoft® Windows® 10 (64-bit/32-bit)
	Microsoft® Windows® 8.1 (64-bit/32-bit)
	Microsoft® Windows® 7 (64-bit/32-bit) [Service Pack1 or later]
.NET Framework	.NET Framework 4.6 or later
CPU	Desktop PC: Intel® Celeron® processor 2.4 GHz or more recommended
	Laptop PC: Intel® Pentium® processor 1.9 GHz or more recommended
Memory	1 GB or more recommended (32-bit OS)
	2 GB or more recommended (64-bit OS)
Free hard disk space	For installation: 1 GB or more free hard disk capacity
	For operation: 512 MB or more free virtual memory capacity
Monitor	Resolution 1024 × 768 or more (XGA)
	Compatible with above personal computers

Notes: 1. This software may not run correctly on some personal computers.

Servo Support Software

MELSOFT

MR Configurator2 (SW1DNC-MRC2-E) (Note 1)

MR Configurator2 can be obtained by either of the following:

- Purchase MR Configurator2 alone.
- Purchase GX Works3, EM78 SDK (available soon), or MT Works2: MR Configurator2 is included in GX Works3, EM78 SDK, and MT Works2 with software version 1.34L or later.
- Download MR Configurator2: If you have MELSOFT iQ Works, GX Works3, GX Works2, MT Works2, EM Software Development Kit, or CW Configurator, MR Configurator2 is available for free download.

Specification (Note 2)

Item	Description
Project	New/Open/Save/Save As/Delete Project, Read Other Format, Write Other Format, System Setting, Print
Parameter	Parameter setting, axis name setting, parameter converter
Safety	Safety parameter setting, Change password, Initialize password
Positioning-data	Point Table, Program, Indirect Addressing, Cam Data
Monitor	Display All, I/O Monitor, Graph, ABS Data Display
Diagnosis	Alarm Display, Alarm Onset Data, Drive recorder, No Motor Rotation, System Configuration, Life Diagnosis, Machine Diagnosis, Linear Diagnosis, Fully Closed Loop Diagnosis, Gear Failure Prediction, Encoder Communication Diagnosis
Test Operation	JOG Operation, Positioning Operation, Motor-Less Operation, DO Forced Output, Program Operation, Single-Step Feed, Test Operation Information
Adjustment	One-Touch Tuning, Tuning, Machine Analyzer, Advanced Gain Search
Others	Servo Assistant, Update Parameter Setting Range, Machine Unit Conversion Setting, Switch Display Language, Help

Notes: 1. MELSERVO-JET series is supported by MR Configurator2 with software version 1.105K or later.
2. Supported items vary depending on the servo amplifiers. Refer to "MR Configurator2 SW1DNC-MRC2-E Installation Guide" for details.

Operating environment (Note 1)

Components	Description	
OS (Note 2)	Microsoft® Windows® 10 Education Microsoft® Windows® 10 Enterprise Microsoft® Windows® 10 Pro Microsoft® Windows® 10 Home Microsoft® Windows® 8.1 Enterprise Microsoft® Windows® 8.1 Pro Microsoft® Windows® 8.1 Microsoft® Windows® 8 Enterprise Microsoft® Windows® 8 Pro Microsoft® Windows® 8	Microsoft® Windows® 7 Enterprise Microsoft® Windows® 7 Ultimate Microsoft® Windows® 7 Professional Microsoft® Windows® 7 Home Premium Microsoft® Windows® 7 Starter Microsoft® Windows Vista® Enterprise Microsoft® Windows Vista® Ultimate Microsoft® Windows Vista® Business Microsoft® Windows Vista® Home Premium Microsoft® Windows Vista® Home Basic Microsoft® Windows® XP Professional, Service Pack3 Microsoft® Windows® XP Home Edition, Service Pack3
CPU (recommended)	Desktop PC: Intel® Celeron® processor 2.8 GHz or more Laptop PC: Intel® Pentium® M processor 1.7 GHz or more	
Memory (recommended)	512 MB or more (32-bit OS), 1 GB or more (64-bit OS)	
Free hard disk space	1 GB or more	
Monitor	Resolution 1024 × 768 or more, 16-bit high color, Compatible with above personal computers	
USB cable	MR-J3USBCBL3M	

Notes: 1. This software may not run correctly on some personal computers.
2. For 64-bit operating systems, this software is supported by Windows® 7 or later.

Unit Conversion Table

Quantity	SI (metric) unit	U.S. customary unit
Mass	1 [kg]	2.2046 [lb]
Length	1 [mm]	0.03937 [in]
Torque	1 [N•m]	141.6 [oz•in]
Moment of inertia	1 [(× 10^{-4} kg•m^2)]	5.4675 [oz•in^2]
Load (thrust load/axial load)	1 [N]	0.2248 [lbf]
Temperature	n [°C]	n × 9/5 + 32 [°F]

6 Low-Voltage Switchgear/ Wires

* Low-voltage switchgears/wires for servo amplifiers are the same regardless of the network. Refer to the servo amplifiers with the same rated capacity.
* MR-JET-200G_ and MR-JET-300G_ are available soon.
* HG-SNS152J, HG-SNS202J, and HG-SNS302J are available soon.
* Refer to p. 5-28 in this catalog for conversion of units.

Wires, Molded-Case Circuit Breakers, and Magnetic Contactors

The following are examples of wire sizes when 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV wires) are used. The wire size for U, V, W, and ⏚ varies depending on the servo motor. Refer to "Selection Example in HIV Wires for Servo Motors" in this catalog for details on wires for each servo motor.

Servo amplifier model	Molded-case circuit breaker (Note 4, 5, 6, 7)	Magnetic contactor (Note 2, 5)	Wire size [mm²] (Note 4)		
			L1, L2, L3, ⏚	P+, C	U, V, W, ⏚
MR-JET-10G	30 A frame 5 A (30 A frame 5 A)	S-T10	2 (AWG 14)	2 (AWG 14) (Note 1)	AWG 18 to 14 (Note 3)
MR-JET-20G	30 A frame 5 A (30 A frame 5 A)	S-T10			
MR-JET-40G	30 A frame 10 A (30 A frame 5 A)	S-T10			
MR-JET-70G	30 A frame 15 A (30 A frame 10 A)	S-T10			
MR-JET-100G (3-phase power supply input)	30 A frame 15 A (30 A frame 10 A)	S-T10			
MR-JET-100G (1-phase power supply input)	30 A frame 15 A (30 A frame 15 A)	S-T10			
MR-JET-200G (3-phase power supply input)	30 A frame 20 A (30 A frame 20 A)	S-T21			AWG 16 to 10 (Note 3)
MR-JET-200G (1-phase power supply input)	30 A frame 20 A (30 A frame 20 A)	S-T21	3.5 (AWG 12)		
MR-JET-300G	30 A frame 30 A (30 A frame 30 A)	S-T21			

Notes: 1. Keep the wire length to the regenerative option within 5 m.
2. Use a magnetic contactor with an operation delay time of 80 ms or less. The operation delay time is the time interval from current being applied to the coil until closure of contacts.
3. The wire size shows applicable size for the servo amplifier connector.
4. When complying with IEC/EN/UL/CSA standard, refer to "MELSERVO-JET Instructions and Precautions for AC Servos" enclosed with the servo amplifier. When complying with UL 61800-5-1 and CSA C22.2 No. 274, a fuse is required instead of a molded-case circuit breaker.
5. Install one molded-case circuit breaker and one magnetic contactor for each servo amplifier.
6. Use a molded-case circuit breaker having the operation characteristics equal to or higher than Mitsubishi Electric general-purpose products.
7. When using a power factor improving AC reactor, use a molded-case circuit breaker listed in the brackets.

Motor Circuit Breakers

A motor circuit breaker is a device integrating the functions of a molded-case circuit breaker and a thermal overload relay.

Servo amplifier	Rated input voltage AC [V]	Input phase (Note 2)	Motor circuit breaker (Note 3)			SCCR [kA] (Note 1)
			Model	Rated voltage AC [V]	Rated current [A] (Heater design)	
MR-JET-10G	200 to 240	3-phase	MMP-T32	240	1.6	50
MR-JET-20G					2.5	
MR-JET-40G					4	
MR-JET-70G					6.3	
MR-JET-100G					8	
MR-JET-200G					18	
MR-JET-300G					25	25

Notes: 1. The value is applicable when the motor circuit breaker is combined with the servo amplifier.
2. 1-phase power input is not supported.
3. Combine the motor circuit breaker with a UT-CV3 power side terminal cover and a UT-TU short circuit indicator unit.

Selection Example in HIV Wires for Servo Motors

The following are examples of wire sizes when 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV wires) with a length of 30 m are used. Refer to "Rotary Servo Motor User's Manual" when using cab-tire cables for supplying power (U, V, and W) to HG-SNS series.

Servo motor model	Wire size [mm^2]	
	For power and grounding (U, V, W, ⏚) (general environment)	For electromagnetic brake (B1, B2)
HG-KNS13J, 23J, 43J, 73J	0.75 (AWG 18) (Note 1, 2, 3)	0.5 (AWG 20) (Note 4, 6)
HG-SNS52J, 102J	1.25 (AWG 16) (Note 5)	1.25 (AWG 16)
HG-SNS152J, 202J	2 (AWG 14)	
HG-SNS302J	3.5 (AWG 12)	

Notes: 1. Use fluorine resin wires of 0.75 mm^2 (AWG 18) for wiring to the servo motor power supply.
2. This size is applicable for wiring length of 10 m or shorter. For over 10 m, use MR-PWS2CBL03M-A_-L and extend it with HIV wires of 1.25 mm^2 (AWG 16).
3. When complying with UL/CSA standard, use MR-PWS2CBL03M-A_-L and extend it with HIV wires of 2 mm^2 (AWG 14). When not using a power cable provided by Mitsubishi Electric or Mitsubishi Electric System & Service Co., Ltd., use an RHH, RHW, RHW-2, XHH, XHHW, or XHHW-2 cable with thermosetting insulation. These insulation types are defined in the NEC.
4. Use fluorine resin wires of 0.5 mm^2 (AWG 20) for wiring to the electromagnetic brake.
5. When complying with UL/CSA standard, use 2 mm^2 (AWG 14). Refer to "Rotary Servo Motor User's Manual" for details.
6. This size is applicable for wiring length of 10 m or shorter. For over 10 m, extend the wires with HIV wires of 1.25 mm^2 (AWG 16).

Product List

Servo system controllers

Item	Model	Application	
Motion module	RD78G4	Maximum number of control axes: 4 axes	CC-Link IE TSN master station
	RD78G8	Maximum number of control axes: 8 axes	CC-Link IE TSN master station
	RD78G16	Maximum number of control axes: 16 axes	CC-Link IE TSN master station
	RD78G32	Maximum number of control axes: 32 axes	CC-Link IE TSN master station
	RD78G64	Maximum number of control axes: 64 axes	CC-Link IE TSN master station
	RD78GHV (Available soon)	Maximum number of control axes: 128 axes (Note 1)	CC-Link IE TSN master station
	RD78GHW (Available soon)	Maximum number of control axes: 256 axes (Note 1)	CC-Link IE TSN master station

Notes: 1. When the controller is connected to MR-JET-G, the number of the maximum control axes is 120.

Engineering software

Item	Model	Application
MELSOFT iQ Works	SW2DND-IQWK-E	FA Engineering Software
MELSOFT GX Works3	SW1DND-GXW3-E	Programmable Controller Engineering Software (including motion control setting)

Servo amplifiers

Item	Model		Rated output	Power supply input
MR-JET-G	MR-JET-10G		0.1 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-20G		0.2 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-40G		0.4 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-70G		0.75 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-100G		1 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-200G	(Available soon)	2 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-300G	(Available soon)	3 kW	3-phase 200 V AC to 240 V AC
MR-JET-G-N1	MR-JET-10G-N1		0.1 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-20G-N1		0.2 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-40G-N1		0.4 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-70G-N1		0.75 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-100G-N1		1 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-200G-N1	(Available soon)	2 kW	3-phase or 1-phase 200 V AC to 240 V AC
	MR-JET-300G-N1	(Available soon)	3 kW	3-phase 200 V AC to 240 V AC

Rotary servo motors

Item	Model		Rated output	Rated speed
HG-KNS series With an oil seal B: With an electromagnetic brake	HG-KNS13(B)J		0.1 kW	3000 r/min
	HG-KNS23(B)J		0.2 kW	3000 r/min
	HG-KNS43(B)J		0.4 kW	3000 r/min
	HG-KNS73(B)J		0.75 kW	3000 r/min
HG-KNS series Without an oil seal B: With an electromagnetic brake	HG-KNS13(B)		0.1 kW	3000 r/min
	HG-KNS23(B)		0.2 kW	3000 r/min
	HG-KNS43(B)		0.4 kW	3000 r/min
	HG-KNS73(B)		0.75 kW	3000 r/min
HG-SNS series With an oil seal B: With an electromagnetic brake	HG-SNS52(B)J		0.5 kW	2000 r/min
	HG-SNS102(B)J		1.0 kW	2000 r/min
	HG-SNS152(B)J	(Available soon)	1.5 kW	2000 r/min
	HG-SNS202(B)J	(Available soon)	2.0 kW	2000 r/min
	HG-SNS302(B)J	(Available soon)	3.0 kW	2000 r/min
HG-SNS series Without an oil seal B: With an electromagnetic brake	HG-SNS52(B)		0.5 kW	2000 r/min
	HG-SNS102(B)		1.0 kW	2000 r/min
	HG-SNS152(B)	(Available soon)	1.5 kW	2000 r/min
	HG-SNS202(B)	(Available soon)	2.0 kW	2000 r/min
	HG-SNS302(B)	(Available soon)	3.0 kW	2000 r/min

Product List

Encoder cables/Junction cables

Item	Model	Length	Bending life	IP rating	Application
Encoder cable (load-side lead)	MR-J3ENCBL2M-A1-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL5M-A1-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL10M-A1-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL2M-A1-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL5M-A1-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL10M-A1-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Encoder cable (opposite to load-side lead)	MR-J3ENCBL2M-A2-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL5M-A2-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL10M-A2-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL2M-A2-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL5M-A2-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-J3ENCBL10M-A2-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Encoder cable (load-side lead)	MR-J3JCBL03M-A1-L (Note 1)	0.3 m	Standard	IP20	For HG-KNS (junction type)
Encoder cable (opposite to load-side lead)	MR-J3JCBL03M-A2-L (Note 1)	0.3 m	Standard	IP20	For HG-KNS (junction type)
Encoder cable	MR-EKCBL20M-H (Note 2)	20 m	Long bending life	IP20	For HG-KNS (junction type)
	MR-EKCBL30M-H (Note 2)	30 m	Long bending life	IP20	For HG-KNS (junction type)
	MR-EKCBL40M-H (Note 2)	40 m	Long bending life	IP20	For HG-KNS (junction type)
	MR-EKCBL50M-H (Note 2)	50 m	Long bending life	IP20	For HG-KNS (junction type)
	MR-EKCBL20M-L (Note 2)	20 m	Standard	IP20	For HG-KNS (junction type)
	MR-EKCBL30M-L (Note 2)	30 m	Standard	IP20	For HG-KNS (junction type)
Encoder cable (load-side lead)	MR-J3JSCBL03M-A1-L (Note 3)	0.3 m	Standard	IP65	For HG-KNS (junction type)
Encoder cable (opposite to load-side lead)	MR-J3JSCBL03M-A2-L (Note 3)	0.3 m	Standard	IP65	For HG-KNS (junction type)
Encoder cable	MR-J3ENSCBL2M-H (Note 4)	2 m	Long bending life	IP67	For HG-KNS (junction type), For HG-SNS (direct connection type)
	MR-J3ENSCBL5M-H (Note 4)	5 m	Long bending life	IP67	
	MR-J3ENSCBL10M-H (Note 4)	10 m	Long bending life	IP67	
	MR-J3ENSCBL20M-H (Note 4)	20 m	Long bending life	IP67	
	MR-J3ENSCBL30M-H (Note 4)	30 m	Long bending life	IP67	
	MR-J3ENSCBL40M-H (Note 4)	40 m	Long bending life	IP67	
	MR-J3ENSCBL50M-H (Note 4)	50 m	Long bending life	IP67	
	MR-J3ENSCBL2M-L (Note 4)	2 m	Standard	IP67	For HG-KNS (junction type), For HG-SNS (direct connection type)
	MR-J3ENSCBL5M-L (Note 4)	5 m	Standard	IP67	
	MR-J3ENSCBL10M-L (Note 4)	10 m	Standard	IP67	
	MR-J3ENSCBL20M-L (Note 4)	20 m	Standard	IP67	
	MR-J3ENSCBL30M-L (Note 4)	30 m	Standard	IP67	

Encoder connector sets/Junction connector sets

Item	Model	Description	IP rating	Application
Encoder connector set	MR-ECNM (Note 2)	Junction connector × 1 Servo amplifier connector × 1	IP20	For HG-KNS (junction type)
Encoder connector set (one-touch connection type)	MR-J3SCNS (Note 4)	Straight type Junction connector or encoder connector × 1 Servo amplifier connector × 1	IP67	For HG-KNS (junction type), For HG-SNS (direct connection type)
Encoder connector set (screw type)	MR-ENCNS2	Straight type Encoder connector × 1 Servo amplifier connector × 1	IP67	For HG-SNS
Encoder connector set (one-touch connection type)	MR-J3SCNSA	Angle type Encoder connector × 1 Servo amplifier connector × 1	IP67	For HG-SNS
Encoder connector set (screw type)	MR-ENCNS2A	Angle type Encoder connector × 1 Servo amplifier connector × 1	IP67	For HG-SNS

Notes: 1. Use this cable in combination with MR-EKCBL_M-H, MR-EKCBL_M-L, or MR-ECNM.
2. Use this cable or connector set in combination with MR-J3JCBL03M-A1-L or MR-J3JCBL03M-A2-L.
3. Use this cable in combination with MR-J3ENSCBL_M-H, MR-J3ENSCBL_M-L, or MR-J3SCNS.
4. When using this cable or connector set for HG-KNS series, use it in combination with MR-J3JSCBL03M-A1-L or MR-J3JSCBL03M-A2-L.

Servo motor power cables

Item	Model	Length	Bending life	IP rating	Application
Servo motor power cable (load-side lead, lead-out)	MR-PWS1CBL2M-A1-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL5M-A1-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL10M-A1-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL2M-A1-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL5M-A1-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL10M-A1-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Servo motor power cable (opposite to load-side lead, lead-out)	MR-PWS1CBL2M-A2-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL5M-A2-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL10M-A2-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL2M-A2-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL5M-A2-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-PWS1CBL10M-A2-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Servo motor power cable (load-side lead, lead-out)	MR-PWS2CBL03M-A1-L	0.3 m	Standard	IP55	For HG-KNS (junction type)
Servo motor power cable (opposite to load-side lead, lead-out)	MR-PWS2CBL03M-A2-L	0.3 m	Standard	IP55	For HG-KNS (junction type)

Servo motor power connector sets

Item	Model	Description	IP rating	Application
Servo motor power connector set EN compliant	MR-PWCNS4	Straight type Power connector × 1	IP67	For HG-SNS52J, 102J, 152J
	MR-PWCNS5	Straight type Power connector × 1	IP67	For HG-SNS202J, 302J

Electromagnetic brake cables

Item	Model	Length	Bending life	IP rating	Application
Electromagnetic brake cable (load-side lead, lead-out)	MR-BKS1CBL2M-A1-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL5M-A1-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL10M-A1-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL2M-A1-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL5M-A1-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL10M-A1-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Electromagnetic brake cable (opposite to load-side lead, lead-out)	MR-BKS1CBL2M-A2-H	2 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL5M-A2-H	5 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL10M-A2-H	10 m	Long bending life	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL2M-A2-L	2 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL5M-A2-L	5 m	Standard	IP65	For HG-KNS (direct connection type)
	MR-BKS1CBL10M-A2-L	10 m	Standard	IP65	For HG-KNS (direct connection type)
Electromagnetic brake cable (load-side lead, lead-out)	MR-BKS2CBL03M-A1-L	0.3 m	Standard	IP55	For HG-KNS (junction type)
Electromagnetic brake cable (opposite to load-side lead, lead-out)	MR-BKS2CBL03M-A2-L	0.3 m	Standard	IP55	For HG-KNS (junction type)

Electromagnetic brake connector sets

Item	Model	Description	IP rating	Application
Electromagnetic brake connector set (one-touch connection type)	MR-BKCNS1	Straight type Electromagnetic brake connector × 1	IP67	For HG-SNS
Electromagnetic brake connector set (screw type)	MR-BKCNS2	Straight type Electromagnetic brake connector × 1	IP67	For HG-SNS
Electromagnetic brake connector set (one-touch connection type)	MR-BKCNS1A	Angle type Electromagnetic brake connector × 1	IP67	For HG-SNS
Electromagnetic brake connector set (screw type)	MR-BKCNS2A	Angle type Electromagnetic brake connector × 1	IP67	For HG-SNS

Product List

Junction terminal block cables/Connector sets

Item	Model	Length	Application
Junction terminal block cable (For PS7DW-20V14B-F)	MR-J2HBUS05M	0.5 m	For connecting MR-JET-G(-N1) and PS7DW-20V14B-F (Toho Technology Corp.)
	MR-J2HBUS1M	1 m	For connecting MR-JET-G(-N1) and PS7DW-20V14B-F (Toho Technology Corp.)
	MR-J2HBUS5M	5 m	For connecting MR-JET-G(-N1) and PS7DW-20V14B-F (Toho Technology Corp.)
Connector set	MR-CCN1	-	For connecting MR-JET-G(-N1) and PS7DW-20V14B-F (Toho Technology Corp.)

Regenerative options

Item	Model	Specifications	Application
Regenerative option	MR-RB032	Permissible regenerative power: 30 W, resistance value: 40 Ω	For MR-JET-10G(-N1) to MR-JET-40G(-N1)
	MR-RB12	Permissible regenerative power: 100 W, resistance value: 40 Ω	For MR-JET-20G(-N1) and MR-JET-40G(-N1)
	MR-RB14	Permissible regenerative power: 100 W, resistance value: 26 Ω	For MR-JET-70G(-N1) and MR-JET-100G(-N1)
	MR-RB30	Permissible regenerative power: 300 W, resistance value: 13 Ω	For MR-JET-200G(-N1) and MR-JET-300G(-N1)
	MR-RB34	Permissible regenerative power: 300 W, resistance value: 26 Ω	For MR-JET-70G(-N1) and MR-JET-100G(-N1)
	MR-RB50	Permissible regenerative power: 500 W, resistance value: 13 Ω	For MR-JET-200G(-N1) and MR-JET-300G(-N1)

Replacement fan unit (available soon)

Item	Model	Application
Replacement fan unit	MR-JET-FAN1	For MR-JET-200G(-N1) and MR-JET-300G(-N1)

Peripheral cable

Item	Model	Length	Application
Personal computer communication cable (USB cable)	MR-J3USBCBL3M	3 m	For MR-JET-G(-N1)

Servo Support Software

Item	Model	Application
MR Configurator2	SW1DNC-MRC2-E	Servo setup software for AC servo

MEMO

For your safety

- To use the products given in this catalog safely, be sure to read the User's Manuals and the appended document prior to use.
- In this catalog, the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury.

Note that the CAUTION level may lead to a serious consequence depending on conditions.
Please follow the instructions of both levels because they are important to personnel safety.

Safety instructions

⚠WARNING

[Wiring]

- To prevent an electric shock, turn off the servo amplifier power and wait for 15 minutes or more before starting wiring and/or inspection.
- To prevent an electric shock, ground the servo amplifier.
- To prevent an electric shock, any person who is involved in wiring should be fully competent to do the work.
- To prevent an electric shock, mount the servo amplifier and the servo motor before wiring.
- To prevent an electric shock, connect the protective earth (PE) terminal (the terminal marked with the ⏚ symbol) of the servo amplifier to the protective earth (PE) of the cabinet.
- To prevent an electric shock, do not touch the conductive parts.
- To prevent an electric shock, do not operate the servo amplifier and the servo motor with wet hands.

[Operation]

- To prevent an electric shock, do not operate the servo amplifier and the servo motor with wet hands.

[Maintenance]

- To prevent an electric shock, any person who is involved in wiring should be fully competent to do the work.
- To prevent an electric shock, do not operate the servo amplifier and the servo motor with wet hands.

⚠CAUTION

[Transportation/installation]

- To prevent injury, transport the products correctly according to their mass.
- To prevent injury, do not touch the sharp edges of the servo motor, shaft keyway, or others with bare hands when handling the servo motor.

[Operation]

- To prevent injury, do not touch the rotor of the servo motor during operation.

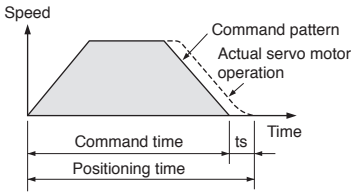
For proper use

- To use the products given in this catalog properly, be sure to read the User's Manuals and the appended document prior to use.
- In this catalog, instructions for incorrect handling which may cause physical damage, instructions for other functions, and so on are classified into "POINT".

POINT

[Model selection]

- Select a rotary servo motor which has the rated torque equal to or higher than the continuous effective torque.
- For the system where the unbalanced torque occurs, such as a vertical axis, the unbalanced torque of the machine should be kept at 70 % or lower of the rated torque.
- Create operation patterns by considering the settling time (ts) to complete positioning.
- Load to motor inertia ratio or load to mass ratio must be below the recommended ratio. If the ratio is too large, the expected performance may not be achieved, and the dynamic brake may be damaged.



- Use the servo motor with the specified servo amplifier.

[Transportation/installation]

- To prevent a malfunction, do not drop or strike the servo amplifier and servo motor.
- When fumigants that contain halogen materials, such as fluorine, chlorine, bromine, and iodine, are used for disinfecting and protecting wooden packaging from insects, they cause a malfunction when entering our products. Please take necessary precautions to ensure that any residual materials from fumigant do not enter our products, or perform disinfection and pest control using methods other than fumigation, such as heat treatment. Perform disinfection and pest control at timbering stage before packing the products.
- Do not get on or place heavy objects on the servo amplifier or the servo motor.
- The system must withstand high speeds and high acceleration/deceleration.
- To enable high-accuracy positioning, ensure the machine rigidity, and keep the machine resonance point at a high level.
- Install the servo amplifier and the servo motor on incombustible material. Installing them directly or close to combustibles will lead to smoke or a fire. In addition, the servo amplifier must be installed in a metal cabinet.
- The regenerative option becomes hot (the temperature rise of 100 °C or higher) with frequent use. Do not install within combustibles or objects subject to thermal deformation. Make sure that wires do not come into contact with the unit.
- Securely fix the servo motor onto the machine. If attached insecurely, the motor may come off during operation.
- Install electrical and mechanical stoppers at the stroke end.
- Mount the servo amplifier on a perpendicular wall in the correct vertical direction.
- To prevent a malfunction, do not block the intake and exhaust areas of the servo amplifier.
- When installing multiple servo amplifiers in a row in a sealed cabinet, leave space around the servo amplifiers as described in User's Manuals. To ensure the life and reliability of the servo amplifiers, prevent heat accumulation by keeping space as open as possible toward the top plate.
- Do not disassemble, repair, or modify the product.

[Environment]

- Use the servo amplifier and the servo motor in the designated environment.
- Avoid installing the servo amplifier and the servo motor in areas with oil mist or dust. When installing in such areas, be sure to enclose the servo amplifier in a sealed cabinet, and protect the servo motor by furnishing a cover or by taking similar measures.
- In the condition where cutting fluid or lubricating oil are constantly applied, and condensation occurs due to excessive humidity, continuous operation of the servo motor for a long period of time may result in the deterioration on the insulation of the servo motor. Provide measures such as oil proof, dust proof cover, and dew condensation prevention to protect the servo motor.

[Wiring]

- Faults such as a position mismatch may occur if the grounding is insufficient.
- Do not supply power to the output terminals (U/V/W) of the servo amplifier or the input terminals (U/V/W) of the servo motor. Doing so damages the servo amplifier and the servo motor.
- To prevent abnormal operation and malfunction, connect the servo amplifier power outputs (U/V/W) to the servo motor power inputs (U/V/W) directly. Do not connect a magnetic contactor and others between them.
- The phases (U/V/W) of the servo amplifier power outputs and the phases (U/V/W) of the servo motor power inputs should match with each other.
- Check the wiring and sequence program thoroughly before switching the power on.
- Carefully select the cable clamping method, and make sure that bending stress and the stress of the cable's own weight are not applied on the cable connection section.
- In an application where the servo motor moves, determine the cable bending radius based on the cable bending life and wire type.
- To prevent malfunction, avoid bundling the servo amplifier's power lines (input/output) and signal cables together or running them in parallel to each other. Separate the power lines from the signal cables.

[Initial settings]

- Set the control mode by the controller.
- When using the regenerative option, change [Pr. PA02.0-1]. The regenerative option is disabled as default.

[Operation]

- Do not use a product which is damaged or has missing parts. In that case, replace the product.
- Turn on the stroke limit signals (FLS and RLS), or the stroke end signals (LSP and LSN) in position or speed control mode. The servo motor will not start if the signals are off.
- When a magnetic contactor is installed on the primary side of the servo amplifier, do not perform frequent starts and stops with the magnetic contactor. Doing so may damage the servo amplifier.
- When an error occurs, the servo amplifier stops outputting the power with activation of the protective function, and the servo motor stops immediately with the dynamic brake.
- Do not use the dynamic brake to stop in a normal operation as it is the function to stop in emergency.
- For a machine operating at the recommended load to motor inertia ratio or less, the estimated number of usage times of the dynamic brake is 1000 times while the machine decelerates from the rated speed to a stop once in 10 minutes.
- If the protective functions of the servo amplifier activate, turn the power off immediately. Remove the cause before turning the power on again.
- The servo amplifier, the regenerative resistor, and the servo motor can be very hot during or after operation. Take safety measures such as covering them.

[Maintenance]

- When an error occurs, ensure safety by turning the power off, etc., before dealing with the error. Otherwise, it may cause an accident.
- Before wiring or inspection, turn off the power, wait for 15 minutes or more until the charge light turns off.
- In a maintenance inspection, make sure that the emergency stop circuit operates properly such that an operation can be stopped immediately and a power can be shut off by the emergency stop switch.

[Use of rotary servo motors]

- To prevent a malfunction on the encoder, do not apply shocks, e.g. hit with a hammer, when coupling the shaft end of the rotary drive motor.
- When mounting a pulley to the rotary servo motor with a key shaft, use the screw hole in the shaft end.
- When removing the pulley, use a pulley remover to protect the shaft from excessive load and impact.
- Do not apply a load exceeding the tolerable load onto the rotary servo motor shaft. The shaft or the rotor may break.
- When the rotary servo motor is mounted with the shaft vertical (shaft up), provide measures so that the servo motor is not exposed to oil and water entering from the machine side, gear box, etc.
- Mount the rotary servo motor in a direction described in "Rotary Servo Motor User's Manual".
- Do not use the 24 V DC interface power supply for the electromagnetic brake. To prevent malfunction, use the power supply designed exclusively for the electromagnetic brake.
- Do not apply the electromagnetic brake when the servo is on. Doing so may cause the servo amplifier overload or shorten the brake life. Apply the electromagnetic brake when the servo is off.
- Torque may drop due to temperature increase of the rotary servo motor. Be sure to use the motor within the specified ambient temperature.

Servo system controller

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]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
It can also be carried out by us or our service company upon your request and the actual cost will be charged.
However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
- (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
- (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
- (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
- (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
- (v) any replacement of consumable parts (battery, fan, smoothing 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 and Service, etc.

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

3. Service in overseas countries

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

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

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

(1) Damages caused by any cause found not to be the responsibility of Mitsubishi.

(2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

(3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

(4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

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

6. Application and use of the Product

(1) For the use of our Motion module, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Motion module, and a backup or fail-safe function should operate on an external system to Motion controller/Simple Motion module when any failure or malfunction occurs.

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

AC servo

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]

For terms of warranty, please contact your original place of purchase.

[Limitations]

(1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged. However, it will not be charged if we are responsible for the cause of the failure.

(2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

(3) Even during the term of warranty, the repair cost will be charged on you in the following cases;

(i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem

(ii) a failure caused by any alteration, etc. to the Product made on your side without our approval

(iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry

(iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced

(v) any replacement of consumable parts (battery, fan, smoothing 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 and Service, etc.

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

(2) Our AC Servo 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.

Extensive global support coverage providing expert help whenever needed

■ Global FA centers

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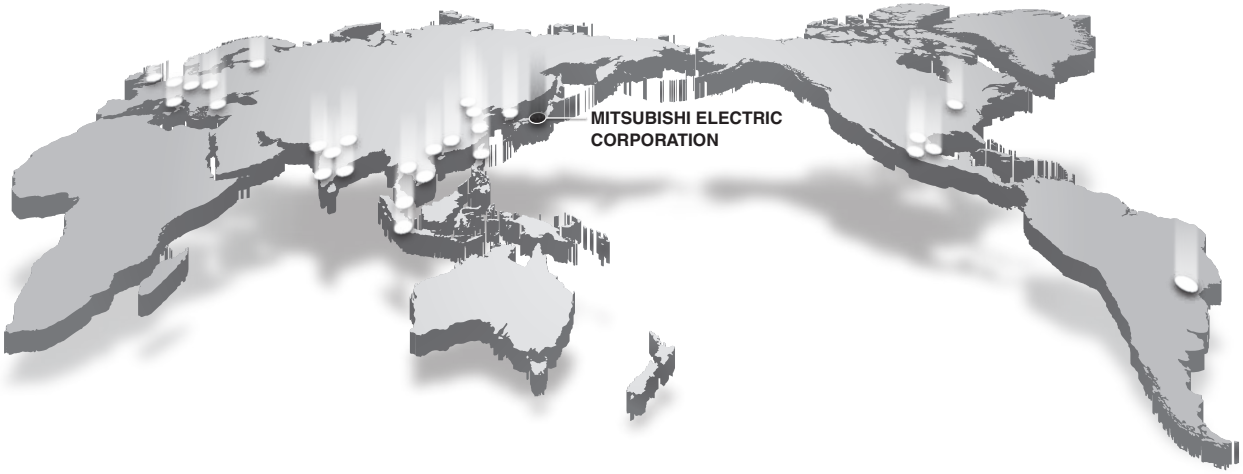

List of Instruction Manuals

Relevant manuals are listed below:

Servo System Controller

Manual name	Manual No.
MELSEC iQ-R Motion Module User's Manual (Startup)	IB-0300406ENG
MELSEC iQ-R Motion Module User's Manual (Application)	IB-0300411ENG
MELSEC iQ-R Motion Module User's Manual (Network)	IB-0300426ENG
MELSEC iQ-R Programming Manual (Motion Module Instructions, Standard Functions/Function Blocks)	IB-0300431ENG

Servo Amplifier

Manual name	Manual No.
MR-JET User's Manual (Hardware)	IB-0300453ENG
MR-JET User's Manual (Function)	IB-0300458ENG
MR-JET User's Manual (Adjustment)	IB-0300473ENG
MR-JET User's Manual (Trouble Shooting)	IB-0300483ENG
MR-JET-G User's Manual (Introduction)	IB-0300448ENG
MR-JET-G User's Manual (Communication Function)	IB-0300463ENG
MR-JET-G User's Manual (Object Dictionary)	IB-0300468ENG
MR-JET-G User's Manual (Parameters)	IB-0300478ENG
MR-JET-G-N1 User's Manual (Introduction)	IB-0300495ENG
MR-JET-G-N1 User's Manual (Communication Function)	IB-0300500ENG
MR-JET-G-N1 User's Manual (Object Dictionary)	IB-0300505ENG

Servo Motor

Manual name	Manual No.
Rotary Servo Motor User's Manual (HG-KNS/HG-SNS)	IB-0300488ENG

Others

Manual name	Manual No.
EMC Installation Guidelines	IB-67310

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions or other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; or any other duties.

⚠ For safe use

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- The products have been manufactured as general-purpose parts for general industries, and are not designed or manufactured to be incorporated in a device or system used in purposes related to human life.
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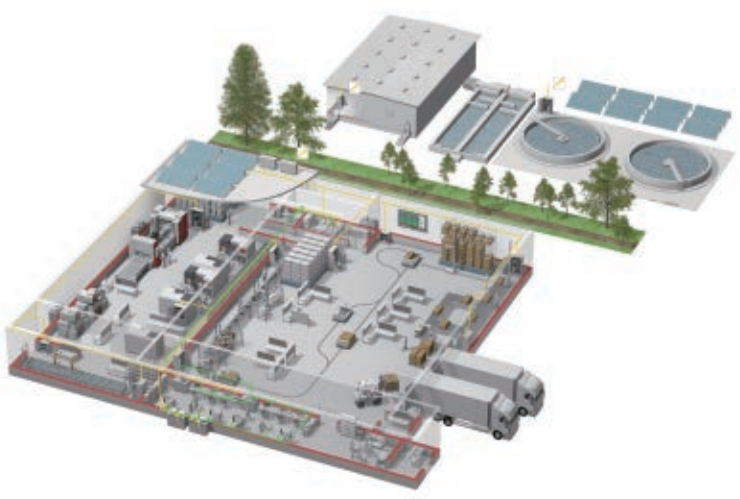
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

YOUR SOLUTION PARTNER



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

A NAME TO TRUST

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

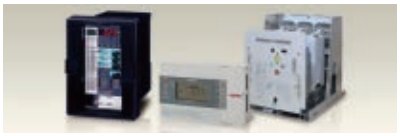
The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

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

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

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

Low voltage: MCCB, MCB, ACB



Medium voltage: VCB, VCC

Power monitoring, energy management

Compact and Modular Controllers

Inverters, Servos and Motors

Visualisation: HMIs

Numerical Control (NC)

Robots: SCARA, Articulated arm

Processing machines: EDM, Lasers, IDS

Transformers, Air conditioning, Photovoltaic systems

* Not all products are available in all countries.

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