

MR-J3

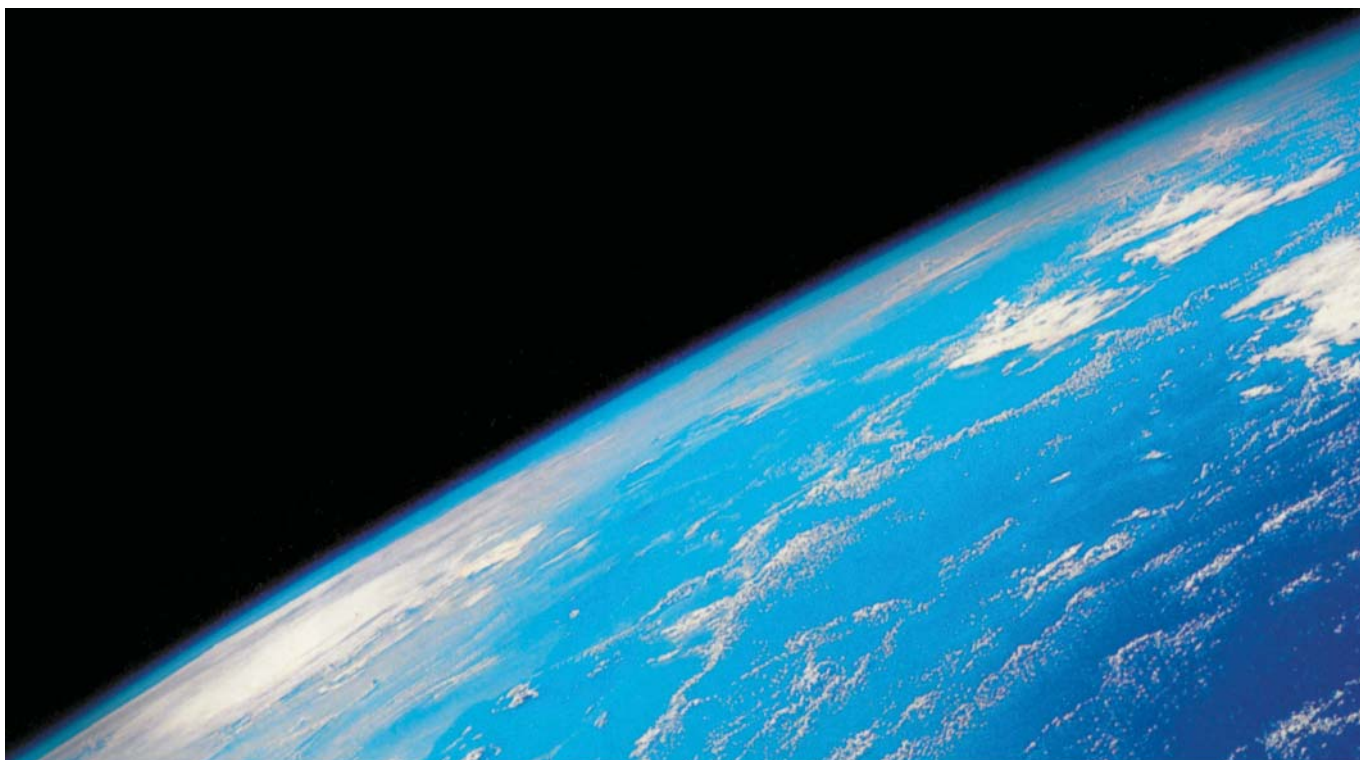
Servo Amplifiers and Motors

Advanced Servo Technology for ultimate positioning control



**Industry leading performance /// Reliable /// High-Speed ///
User-Friendly /// SSCNET III Capable /// Flexible ///**

Use tomorrow's technology today



High-speed high-precision control that adapts itself to mechanical characteristics

Maximized to the best advantage for the machinery

Mitsubishi Electric servo systems are globally renowned and respected. Offering a perfect combination of high-end performance and ease of use, they are now found in a huge range of applications throughout all branches of industry – from single and multiple axis systems in mechanical engineering and other metal-working sectors to complex, fully-synchronised solutions in the semiconductor and motor industries.

Manufactured at the highest standards

Mitsubishi automation products enjoy a global reputation for outstanding quality and reliability. The process starts at the design stage, where quality is designed into even the smallest components. Our systematic pursuit of "best practice" means that Mitsubishi products readily comply with product directives and global standards.

Meeting global norms and standards

Mitsubishi Electric's servo amplifiers and motors meet all the standards and specifications laid down in the EU Low Voltage Directive 73/23/EEC and the Machinery Directive 98/37/EC. Needless to say, all systems carry the CE mark and are certified as conforming to UL, cUL and GOST.

Contents

What makes a good servo system	4-5	
Servo system overview	6	
Servo amplifiers	7	
Safety first	8	
The convincing reasons	9-10	
The best motors	11	
Plug and play positioning solutions	12	
MR-MQ100/Q170MCPU	13	
Software	14	
Applications	15	

What makes a good servo system



Cost effectiveness

Industry leading performance gives faster production cycles and reduced material wastage



Plug and play

The availability of pre-made cables of different length means that connecting a servo motor to an amplifier or any other combination is quick and error free.



Simple networking

High-speed servo and motion applications need special high-speed networking. Mitsubishi's Sevo System Controller Network (SSCNET III) provides these system capabilities.

Advanced and evolving tuning functions

The built-in display panel indicates servo amplifier status and alarm numbers.



Automatic servo motor recognition

Absolute high-resolution encoder as standard equipment

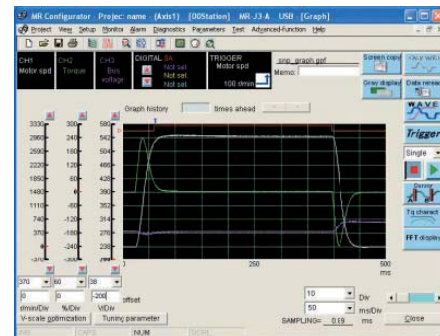
High speed, high performance Motion Bus system SSCNET III

Position and speed data, etc. can be set via CC-Link communication.



USB interface for convenient and fast setup with a PC

CC-Link compatible built-in positioning function



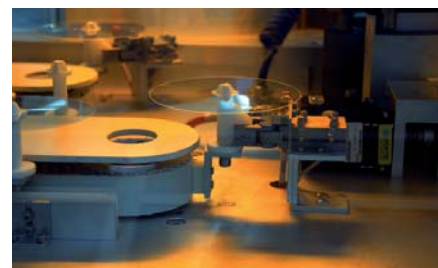
Simple setup and tuning

The new setup software MR Configurator allows for easy set up and tuning the servo system with a personal computer.



Functionality

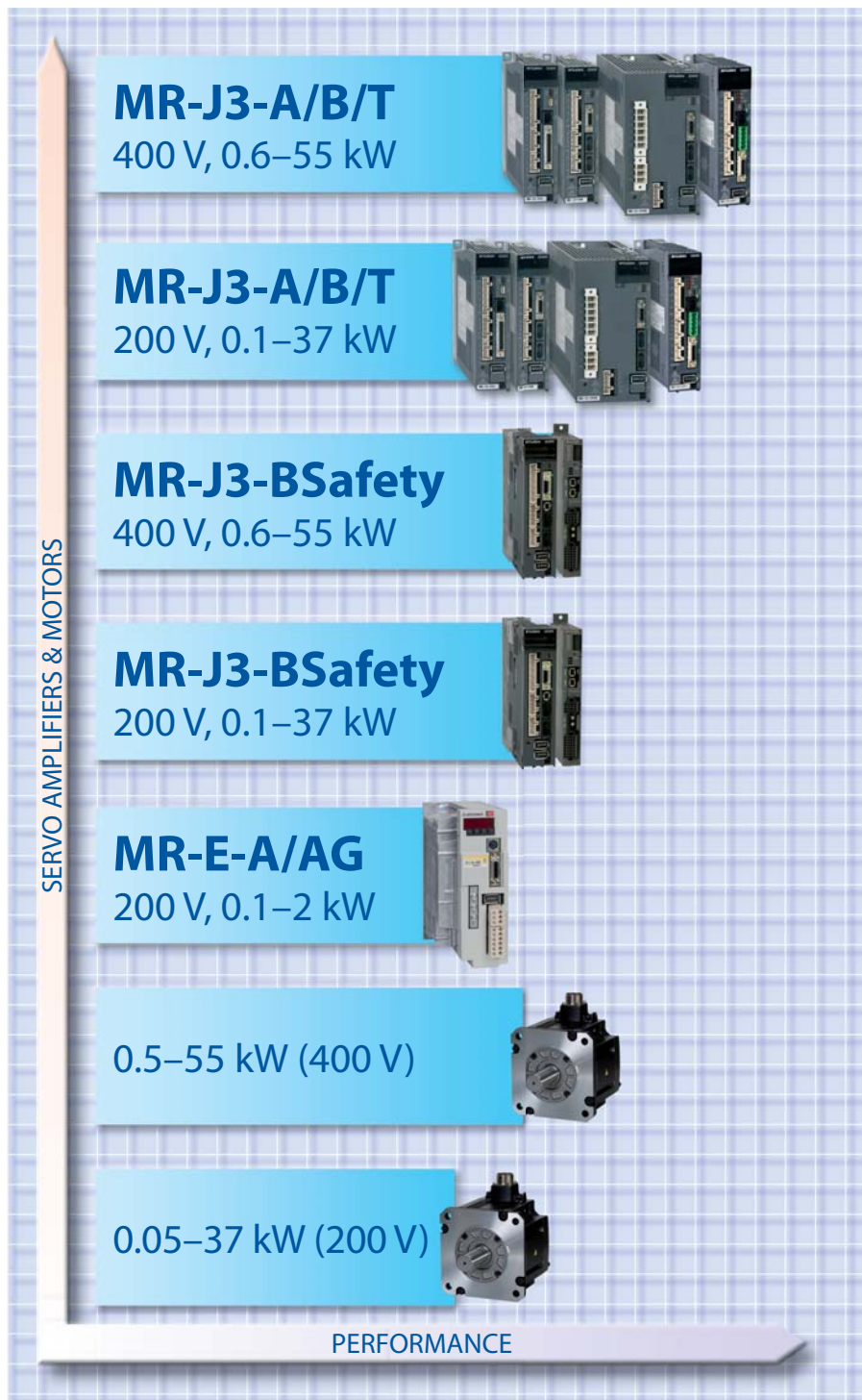
The MR-J3 series has incorporated advanced control capabilities, that are able to maximize the best advantage from the machinery.



Compact & flexible

Mitsubishi's servo systems are both compact and flexible. The reduced component size means more flexibility for installation and reduced enclosure sizes.

The right solution every time



"Plug & play" technology

A solution for every application

Mitsubishi Electric always has the right servo system for straightforward and complex applications alike. With so many motor types, different amplifier output performances and features, the right servo solution is available for every conceivable positioning requirement.

The new MR J3 series is Mitsubishi Electric's latest generation of servo amplifiers and motors for industrial automation applications, that are small, precise and easy to integrate, supporting a host of new features.

The powerful amplifiers and motors are significantly smaller than previous generations, reducing the need for costly cubicle space and allowing the motors to fit easily and neatly into small recesses of the machine. From simple single-axis drives for point-to-point positioning, to complex systems with 96 fully synchronised axes, the new MR-J3 series can reduce more than just your stress levels.

A diverse product range helps you make the right product choice.

The ever-evolving new generation servo



Handling systems require exceptional precision and dynamic response.



Plug and play minimises wiring errors and speeds up installation

Powerful amplifiers

The new MR-J3 generation of servo drives delivers state-of-the-art technology and simple operation in a very compact package. New functions like the advanced vibration suppression system and the further improved real-time autotuning ensure maximum precision, very short positioning times and simple installation.

Mitsubishi offers a wide spectrum of servo amplifiers to meet the demands of all types of applications. The MR-J3-A models are suitable for drive systems with conventional control and are designed for regulating speed, torque and position control tasks. The MR-J3-B models are specified for complex, multi-axis movement sequences and for use in networked automation systems. The MR-J3-T series is a compact and cost effective servo solution with integrated positioning control functionality and CC-Link communications capability.

The units configure themselves by Plug & Play for Mitsubishi Electric's motion control and positioning control systems, to which they are connected via the high-speed optical SSCNET III network, which has a cycle period of just 0.44 milliseconds.

The MR-J3 is currently available with outputs from 50 W to 55 kW. Units with higher outputs are being added to the range at regular intervals.

Integrated positioning

This CC-Link enabled version of Mitsubishi Electric's latest generation of servo amplifiers makes it easier than ever to build truly integrated automation systems. The powerful amplifier and motors are significantly smaller than previous generations, reducing the need for costly cubicle space and allowing the motors to fit easily and neatly into small recesses of the machine.

MR-J3 Servos at a glance

Power range

MR-J3-A/B:	0.1–37 kW
MR-J3-BS:	0.1–37 kW
MR-J3-A4/B4:	0.6–55 kW
MR-J3-BS4:	0.6–55 kW
MR-J3-T/T4:	0.1–55 kW
MR-E-A/AG:	0.1–2 kW

Input

MR-J3-A/B/BS/T and MR-E-A/AG:	200–230 V AC (50/60 Hz)
MR-J3-A4/B4/BS4/T4:	380–480 V AC (50/60 Hz)

Speed frequency response

Up to 2100 Hz

Control functions with enhanced tuning technology

Real-Time Auto-tuning and Model Adaptive Control;
Advanced Vibration Suppression

Integrated interfaces

RS-422

Network links

MR-J3-B: SSCNET III
MR-J3-T: CC-Link

Safety Solutions

According to EN IEC 61800-5-2
Safe Torque Off (STO)
Safe Stop1 (SS1) (only with MR-J3-D05)

Safety option card

MR-J3-D05

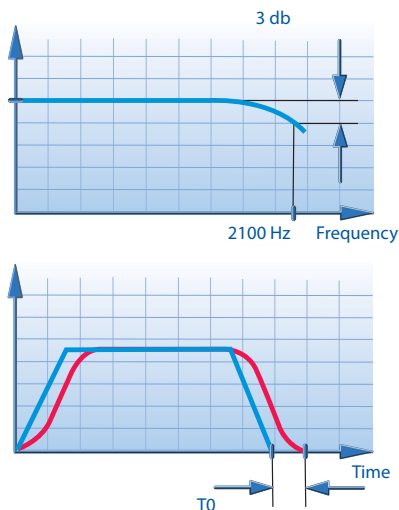
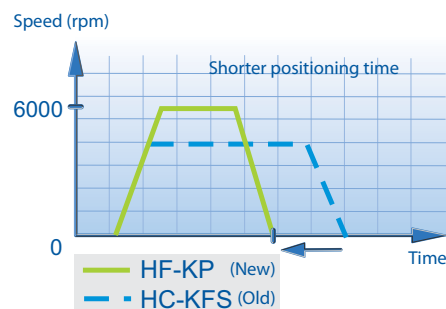
The power to perform



Bottle filling with increased productivity by decreased cycle times thanks to short settling time.

Increased response speed

The MR-J3's 2100 Hz speed-frequency response rate is over 70 % faster than existing models. For users this means faster operation, greater precision, faster retooling in production, less wastage and better product quality.



High speed response of 2100 Hz offers shortest settling times resulting in short cycle times.

Intelligent functions for any application

Every detail of the MR-J3 series is designed for performance and reliability, from the intelligent drive electronics to the robust mechanical components. These next-generation servo systems are both compact and flexible, featuring Plug & Play functionality, fibre-optics technology and optical feedback systems.

Reduced component size

The reduced component size is critically important to machine designers who are often called upon to squeeze all of the control solutions they need into the smallest deliverable package. The MR-J3 series boasts an intelligent design that has reduced amplifier sizes by up to 40 % and motor lengths by almost a quarter. This means machine designers don't have to make as many compromises to get the right motor and deliver the right power in the right place. These servos' compact dimensions enable flexible installation and economical design, which helps you to keep your costs down and be more competitive in the global economy.

Firmware that delivers performance

All MR-J3 servo amplifiers use the very latest regulation and control technologies. These systems ensure fast installation and setup and make it possible to configure stable systems with very short response times – no matter what’s your application.

■ Real-Time Auto-tuning

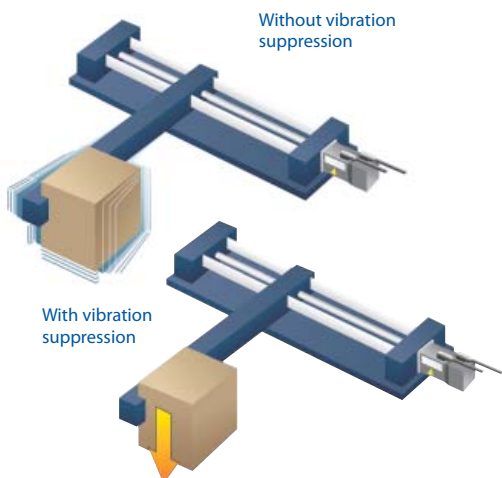
The real-time auto-tuning function sets the servo’s control parameters automatically, eliminating the need to calibrate the system for each individual application. But that’s not all – auto-tuning also works continuously while the system is in operation, making constant adjustments to cater for applications with fluctuating moments of inertia. This makes it possible to use these servos in a much wider range of applications.

Precise tuning functions

■ Advanced suppression of mechanical vibration

Advanced vibration suppress control is designed to suppress the vibrations in Category 2 and above. It is effective in suppressing residual vibrations at the time of settling during positioning operation.

The primary control method of the MR-J3 is Model Adaptive Control. In this method, the motor is driven in such a manner that the tip of the given machinery moves together with the reference model applied.

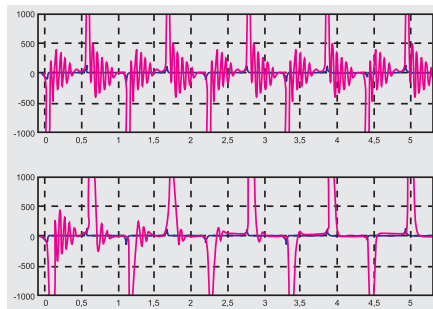


In applications with extreme load vibrations this function significantly improves both performance and system response.

Under Advanced vibration suppress control, it uses a mechanical vibration model from reference model to generate a drive pattern that prevents the tip of machinery from vibrating, thereby suppressing any residual vibration. Advanced vibration suppress control can extract vibration components from actual motor movements. It identifies the vibration characteristics of the machinery in real time, and automatically makes adjustment to the mechanical vibration model.

■ Adaptive filtering

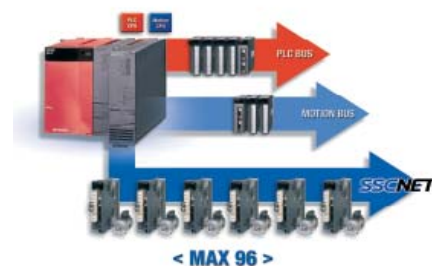
The optimum machine resonance suppression filter is automatically set to suppress resonance without even measuring the machine system’s (drive shaft) frequency characteristics. The adaptive frequency range has been increased compared to the prior models, so resonance at the drive shaft can also be suppressed.



Adaptive filter (upper figure) to suppress drive shaft vibrations such as in a ball screw

When a given machine has a mechanical resonance at a high frequency (in the range of several hundred Hz and above), increased control gain will cause the control system to oscillate in this vibration mode and subsequently lose control. In order to overcome the mechanical resonance, it is common practice to insert a machine resonance suppression filter into the control loop to prevent oscillation. Adaptive filter II is a function that automatically sets this machine resonance suppression filter in real time.

SSCNET III – The benchmark standard



In addition to conventional pulse train positioning, the MR-J3 series also supports the SSCNET III high-speed motion control network. The SSCNET III is a high-speed synchronous network using an optical fiber cable. The MR-J3-B servo amplifier is connected to a control device with SSCNET III interface (e.g QD75MH positioning module, MR-MQ100/Q170MPCPU/Q172D/Q173DCPU Motion Controller or FX3U-20SSC-H interface module). As for the communication specifications of SSCNET III, it can control up to 32 axes per master interface with the transmission rate of 50 Mbps and command communication period of 0.4 ms.

Since long-distance wiring has become possible, it is possible to locate the controller’s control panel and drive units far apart and spread widely in a large-scale facility or a large-scale production line. This, in turn, will shorten the cable between amplifier and motor in machines where there is a relatively large amount of wiring.

As for the servo adjustments, a servo setting and support tool, MT Developer2 can be used over SSCNET III, just simply connect a personal computer to the motion controller makes it possible to perform controller settings and servo parameters of all the connected axes to SSCNET III.

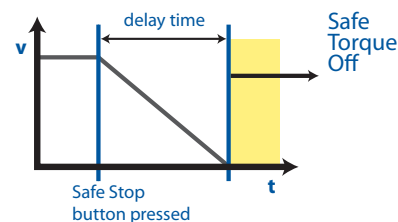
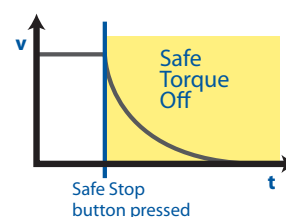
Safety first



Maintain machine performance while meeting required safety standards

Comprehensive safety functions

Together, these devices offer a comprehensive motion safety solution. Implement safety functions using just the amplifier, or with both units, depending on system requirements. The MR-J3-BSafety amplifier by itself offers a Safe Torque Off (STO) function according to EN 60204-1 that prevents an unexpected re-start. Since STO allows the motor to coast to a halt, if a controlled stop is required, the MR-J3-D05 provides a Safe Stop 1 (SS1) function according to EN 60204-1. An Emergency Off (EMG Off) and Emergency Stop 1 (EMG Stop 1) are also provided by the D05. Hence system designers can select an economical solution that provides only the functions they need.



Maintain safe control of motor behaviour even in emergency situations

The safe choice for motion

Mitsubishi's MR-J3 family has become the leading choice for motion applications world wide. Industry leading performance, the SSCNET III motion network, and patented technology like vibration suppression has led to a significant global installed base. Mitsubishi now takes this success one step further by adding safety functions to the MR-J3 line up with the MR-J3-BSafety amplifier and MR-J3-D05 safety option card.

Standards compliance

The MR-J3 motion safety solution is fully certified by third party accreditation organizations like TÜV. It complies with both EN 13849-1 for machine safety and ISO 61508 for functional safety. Hence specifying this solution in a motion system assists engineering staff to meet the requirements of mandatory certifications such as the EU Machinery Directive (2006/42/EC).

Servo motors to add movement



Speed, accuracy and control, whenever you need it.



HF-KP motors – IP65 standard protection

Motor solutions for all

Featuring the most advanced concentrated winding techniques and the latest technology, Mitsubishi servo motors are among the most compact in the market.

Motors are available in a range of options from 50 W to 55 kW in different designs, including specialised motors such as hollow shaft and direct drive motors that suit most application needs.

All Mitsubishi servo motors provide integrated ABS encoders. Additional return-to-origin routines, limit switches, or other sensors are not required.

Moreover, Mitsubishi's low, ultra low and medium inertia designs allow users to select the best motor characteristics for their application.

Advanced features

■ Increased motor speed

MR-J3 motors lead the market, combining speeds of up to 6,000 rpm with high torques. This makes it easier for designers to select the motors they need to meet tough performance criteria.

■ Increased encoder resolution

All MR-J3 encoders are 18 bit, delivering industry-leading 262,144 pulses per revolution. This high resolution makes it possible to detect and suppress mechanical vibrations. The non-volatile absolute encoder system has a backup battery, eliminating the need for time-wasting zero-point calibration routines.

■ Improved motor IP ratings

All MR-J3 motors are IP65 as standard (all 400 V motors are IP67). This means that MR-J3 systems can be used in heavy-duty industrial environments.



Linear motors are available optionally.

Plug & play positioning solutions

Using the right positioning solution can help increase the accuracy of the work process, reduce waste and rework as well as provide a higher quality of production.

The MR-J3 series together with SSCNET III support a very broad spectrum of applications with between 2 and 96 axes. Components with a variety of different PLC and positioning systems for a modular and fully-scalable configuration can be combined. This gives the user full control over the system and complete cost transparency, combined with the dependable controller performance of the MELSEC FX series or the MELSEC System Q series with motion controllers.

The range starts from simple pulse train positioning controllers over dedicated motion cards to most complex applications with System Q motion CPUs.



Fast, high-precision positioning

Positioning modules

■ MELSEC FX positioning modules

High-speed counter and single axis positioning modules are available, which can be used in combination with the FX series PLCs. This provides a cost effective solution for small servo/motion applications.

■ SSCNET III connection

The SSCNET module FX3U-20SSC-H can be used in combination with a FX3U PLC to achieve a cost effective solution for high precision, high speed positioning.

■ System Q positioning modules

For a wide range of applications the System Q offers their QD75MH positioning module series – from stand-alone configurations for single-axis tasks to the coordinated movement of up to 4 axes per module.

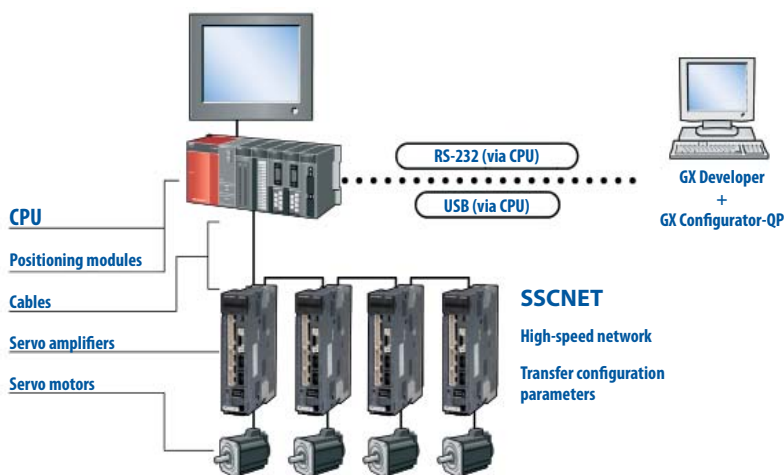
When MR-J3-B servo amplifiers are used the QD75MH can be connected via the SSCNET III motion control network.

Motion Control and PLC in perfect harmony

Motion control systems have huge potential for optimising production processes and improving product quality. To control these systems, System Q offers solutions ranging from individual motion/positioning cards to advanced motion CPUs capable of synchronised operation across many axes.

System Q's unique design allows users to select and use different combinations of CPUs from the same platform. For example, motion CPUs can be employed independently or in tandem with PLC, PC or process CPUs.

Thanks to the dedicated motion control network SSCNET III, each motion CPU can connect up to 32 servo axes. In addition, three motion CPUs can be used in a single System Q solution to bring advanced motion control to 96 axes.



SSCNET configuration

A whole solution for Motion Control



Apply the MR-MQ100 in a wide variety of motion applications.

Only use what you need

For most applications, a complete control platform of a PLC and motion controller will do the job. However, for smaller systems, this may not address competitive cost pressures. The MR-MQ100 allows a single axis to be completely controlled and synchronised to a separate encoder or virtual axis with no additional controller hardware. Hence applications such as rotary cutters, flying saws and labelling can be economically accomplished without exceeding a tight control budget.

Limit cost, not options

While the MR-MQ100 is an economical solution, this doesn't mean lacking in features. A complete range of essential functions are available, including encoder and virtual axis synchronization, registration, point to point positioning and user defined cam profiles. In addition, the hardware complements these powerful software features with built-in I/O and SSCNET III motion networking capability as well as an Ethernet port.

Reduced wiring

The MR-MQ100 also helps keep system costs down with its use of SSCNET III, Mitsubishi's simple but rugged optical fiber motion network. A single fiber connection is all that's needed to provide full communication and control over all functions of the MR-J3B servo amplifier regardless of capacity. A standard Ethernet connection is also provided to link the MR-MQ100 to the MT Developer2 software.

Fully integrated

The Q170M offers the ability to provide a complete automation solution with a single, compact device. Its main strength is the ability to control up to 16 axes over a single SSCNET connection. However, rather than just being a simple motion controller, a comprehensive PLC capability is also built in. Hence the Q170MCPU offers the ability to address a range of applications such as more sophisticated packaging machinery, labeling and material handling applications.

Flexibility

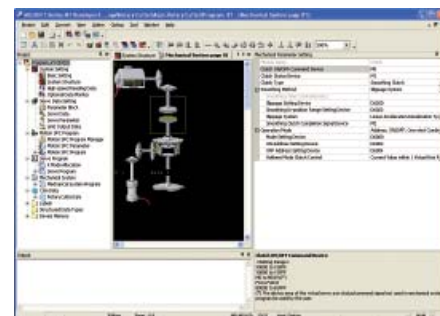
Most motion systems offer sophisticated axis control functions. However, the Q170MCPU also opens up a huge range of PLC application possibilities by being compatible with over 100 of the System Q I/O modules. This means application challenges such as analogue I/O, high density digital I/O, networking and others can easily be tackled by the Q170MCPU. For companies already using System Q, spare parts will be common to their other systems, reducing cost and administration tasks.



Choose from over 100 System Q I/O modules

Fast, easy system set-up

High performance is less valuable if it's hard to use. The MR-MQ100 and Q170MCPU avoids this with the intuitive MT Developer2 software that replaces abstract programming with graphical models of the actual mechanical system. It's easy to create virtual clutches, gears and cam profiles by simple drag and drop selection.



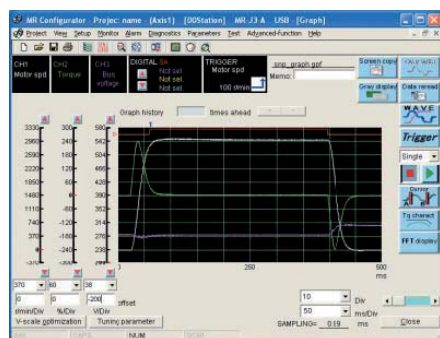
Program by creating virtual mechanical systems

Servo setting and support software

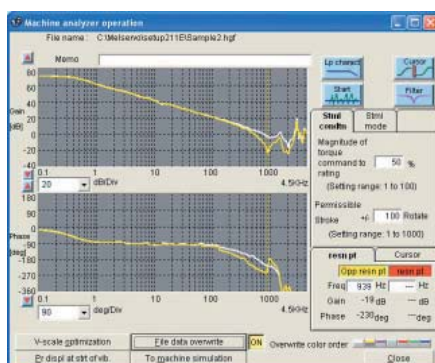
MR Configurator – a complete engineering environment



The MR Configurator software package makes configuration and diagnostics quick and easy and includes powerful graphical machine analysis and simulation functions. Machine analysis enables determination of the frequency response of the connected drive train without any additional instruments. If necessary, you can then make design changes or install filters to achieve better machine performance. The system can be connected to a personal computer with a standard USB (Universal Serial Bus) port.



Selecting a variety of waveforms is possible in a Graph window.



Monitoring and checking with the diagnostics features

A wide range of automatic configuration assistants make it easy to set up your new servo systems correctly, even for less experienced users. The strong benefits are:

■ Easy set up

MR Configurator allows for easy set up and tuning the servo system with a standard personal computer.

■ Multiple monitor functions

Graphic display functions are provided to display the servo motor status with the input signal triggers, such as the command pulse, droop pulse and speed.

■ Test operations with a personal computer

Test operation of the servo motors can be performed with a personal computer using multiple test mode menus.

■ Advanced functions

Further advanced tuning is possible with the improved advanced functions.

Powerful new functions

■ Selecting a variety of waveforms is now possible

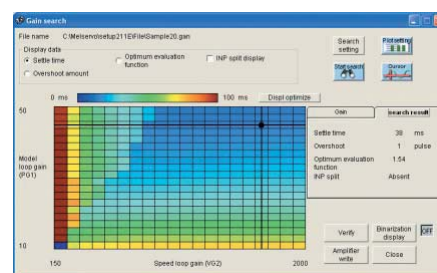
Powerful graph functions with 3 analog channels and 4 digital channels support tuning. User-friendly functions and a diverse waveform selection powerfully support user's work.

The speed-torque characteristic diagram of the motor in operation can be displayed. Since the current operation status can be displayed on the screen, the status of a servo system can be checked in real-time.

■ Improved accuracy

When the Start button is pressed, the servo motor is automatically oscillated, and the machine system's frequency characteristics are displayed.

The frequency characteristics that could previously only be analyzed in a range between 0.1 and 1 kHz can now be analyzed in a range between 0.1 and 4.5 kHz. This can also be used as a tool to comprehend the machine system's characteristics. In addition, data can be overwritten.



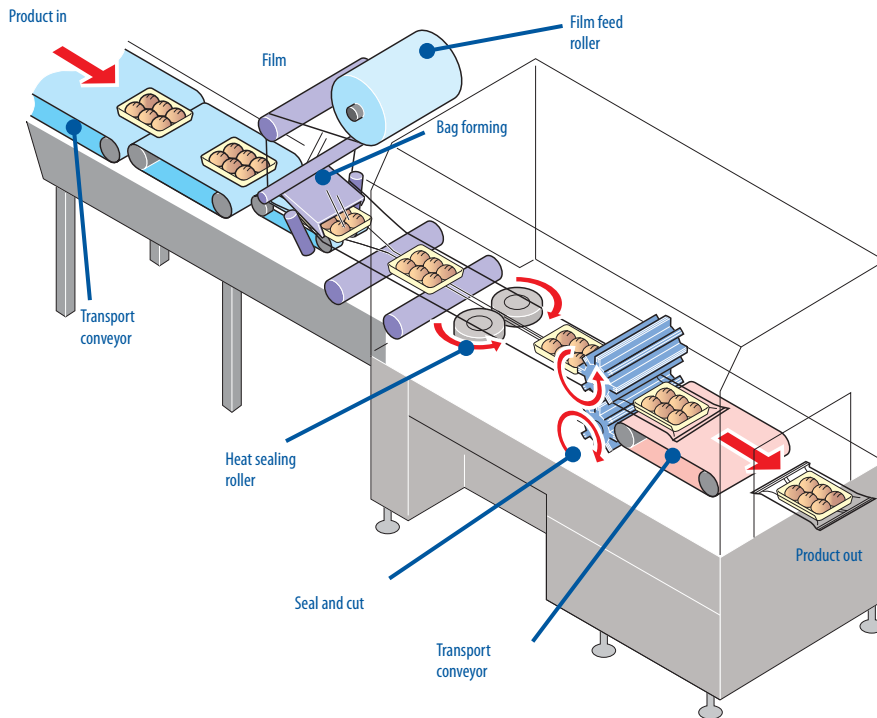
Gain search window

■ Improved usability

While automatically fluctuating the gain, the setup software MR Configurator searches for values with the shortest settling time and lowest overshooting or vibration.

Basic setting parameters can be easily set in a selection format. Settings in the list format are also possible.

Horizontal and vertical pillow



System Q is ideal for such applications as programming can be kept simple with the Q CPU logic controller, high accuracy maintained with the Q motion controller easily integrated with an efficient user interface such as the GOT1000. Hence these products are combined into a truly total solution.

■ Phase compensation is the key

The high accuracy demands of this type of machine are not a problem for the Q motion controller and MR-J3 series of servo drives together with SSCNET III servo network. As mentioned with bottle filling, a cam profile can be very easily designed and implemented by using software based tools. In addition to this, the Q motion controller incorporates a phase compensation algorithm which ensures that the encoder phase angle and cam phase angle are precisely in synchronization. In general this means that the packaging cutters can be precisely synchronised with the feed of the conveyor, hence providing an accurate cut at high speed.

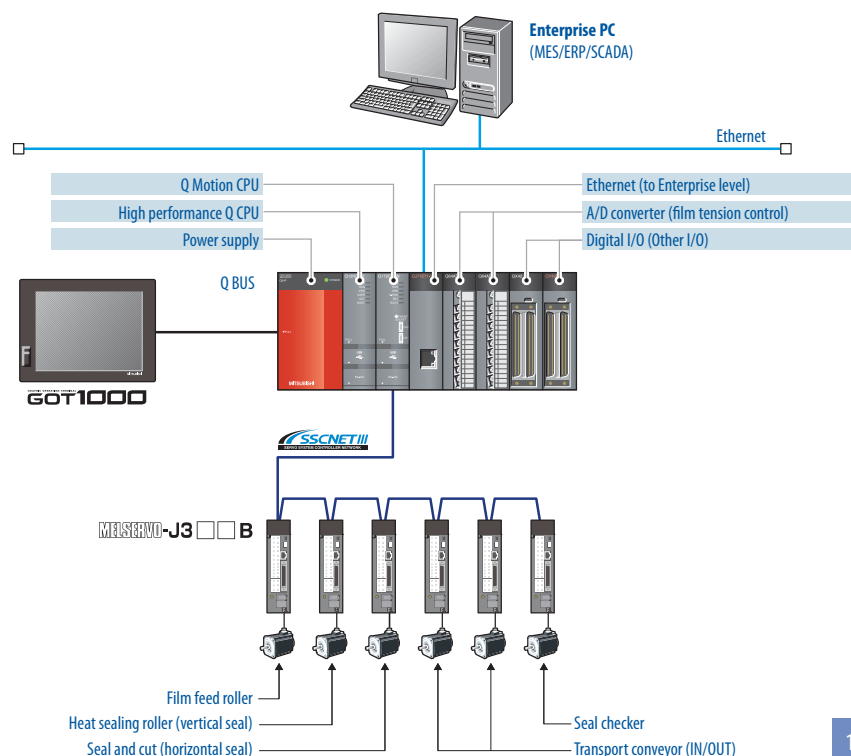
Sealing packaging solutions

■ From tubes to pillows

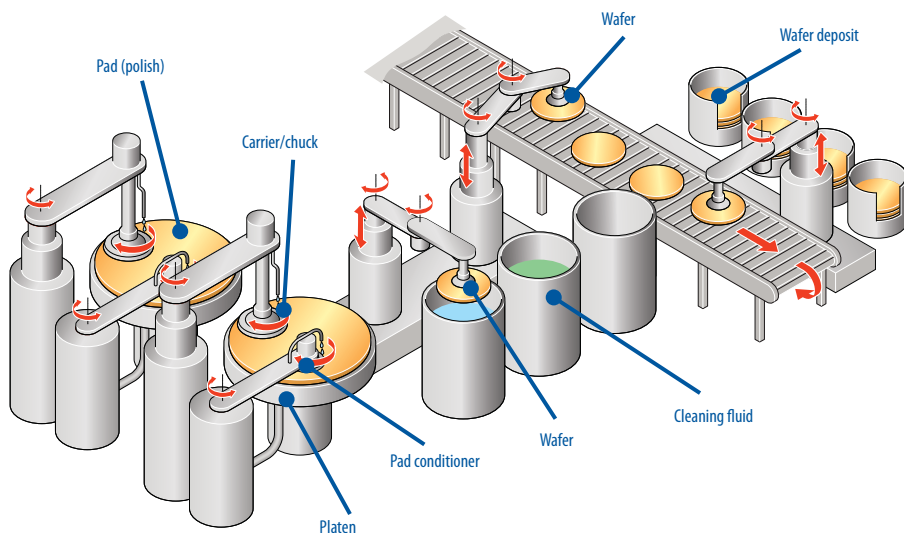
Probably the most common type of packaging machines are the pillow type machines used to package a whole host of products. These machine types are known as “pillow” because of the distinct shape of the packaging film being formed around the product to be packaged. There is often a variance of 2 or 3 specific sealing points which are then cut to individually package the product ready for shipping. The products are fed into the machine in a number of different ways using conveyors, hoppers, rotating arms etc.

The inline feed of the product is synchronised with the film packaging which is fed from the feed roller into a forming station which forms the packaging around the product. The package is then sealed and cut away from the film train, resulting in a completely packaged product ready for boxing or other packaging processes.

Various processes need to be synchronised with this application as it requires a high level of flexibility to cater for a diverse range of shapes and sizes.



Semiconductor fabrication



The exceptionally dynamic performance of the servo motors enables faster handling, increasing the throughput of the entire system.

As processing progresses the wafers get thinner and their diameters simultaneously increase, making them increasingly fragile. The movements executed by the wafer handling drives must thus be fast but very smooth, without any sudden shocks or vibrations. The positioning precision of the axes that move the polishing pads must be very high to prevent unnecessary stresses on the wafers. In addition to this the polishing pads above must be perfectly synchronised with the wafer platens below to meet the exacting specifications of the polishing process. The servo components from Mitsubishi Electric pass all these tests with flying colours.

World wide market challenges with productronic

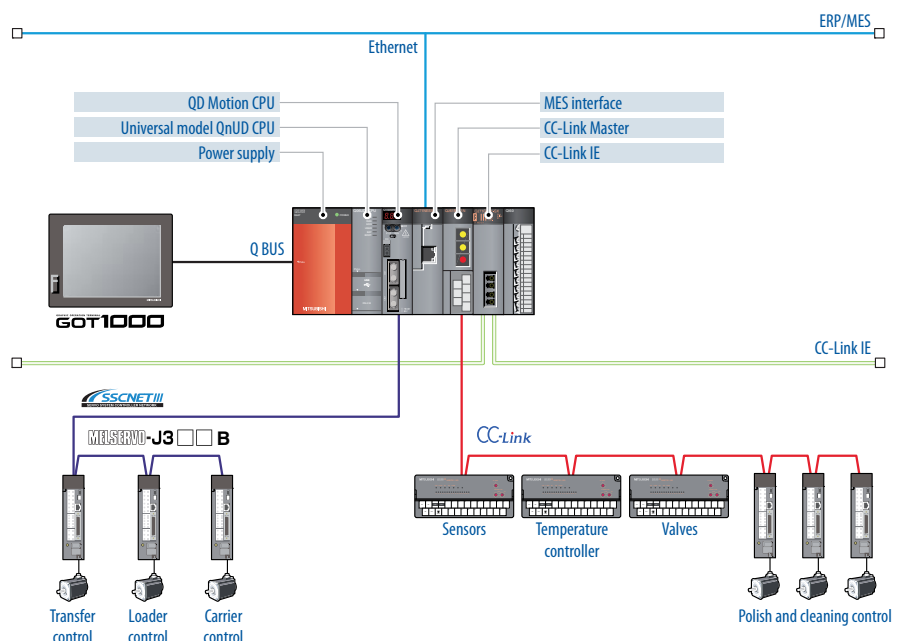
Today electronic is an important part of our daily life. It helps to make our life more convenient, safe and ensure the energy supply for tomorrow. Faster smaller and cheaper components will lead the trend of penetrating our world even more than today. In order to do so, an enormous pressure for extremely fast development of technology and integration is not only the challenge for the electronic developer but also for the designer of the production facilities. Needless to say that such facilities can be build only with the necessary know how and automation components which are outstanding in performance and quality.

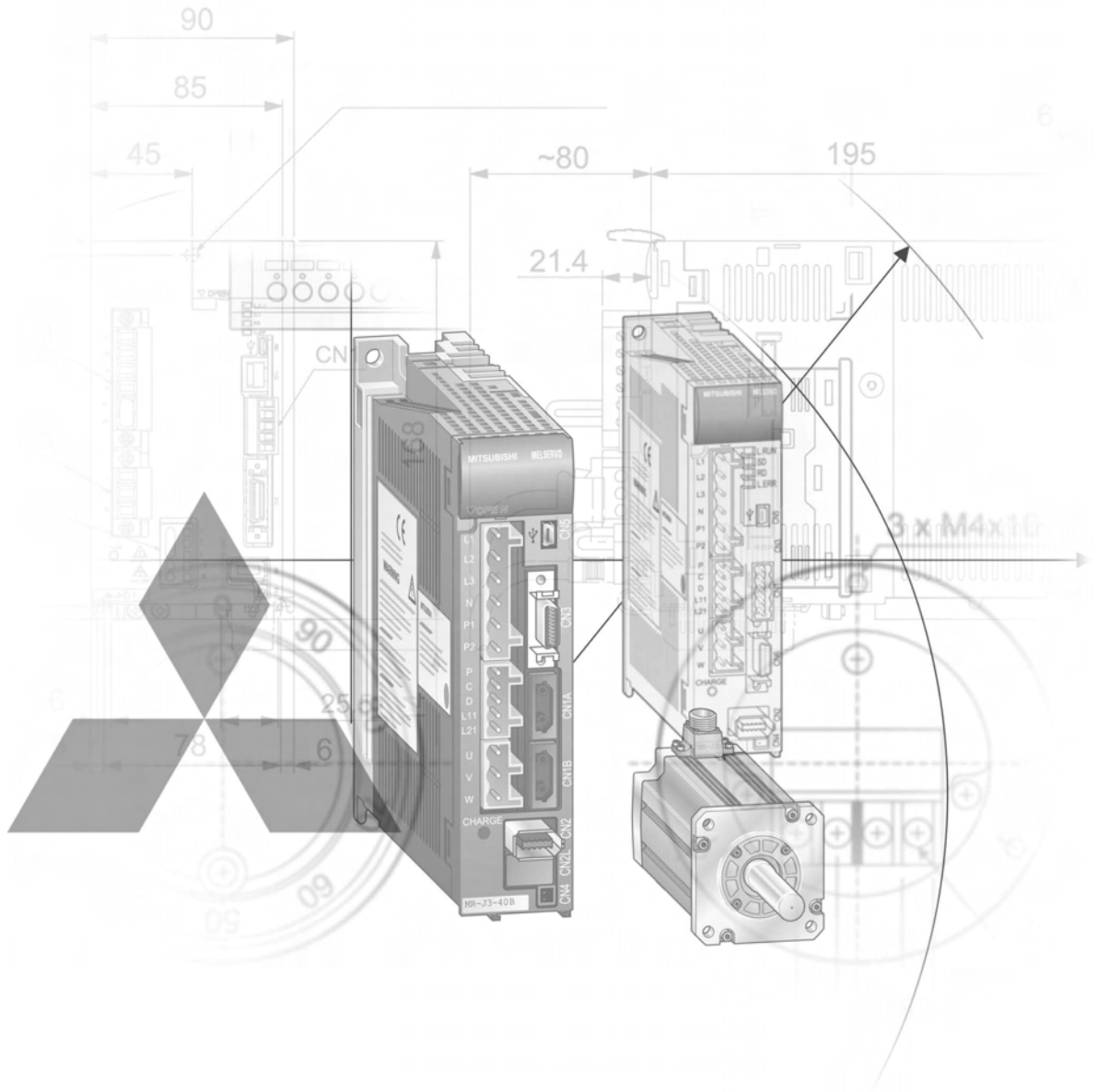
Mitsubishi Electric is the market leader in the area where electronic production is established. As one of the target markets Mitsubishi offers as well the know how as the products for reliable, stable and high efficiency productronic systems.

Chemical mechanical polishing (CMP)

In the sample application shown above Mitsubishi servo motors rotate the polishing pads and wafer platens, and they are also used in the handling devices and the axes that move the polishing pads.

Systems of this kind are installed in clean rooms, which means that the size of the system is a key factor in the total cost of operation (TCO). The Mitsubishi components are so compact that the switchgear cabinet can be integrated in the machine bed, saving valuable space. Quick and easy wiring and an optimum price-performance ratio are added benefits.





Technical Catalogue

More information?

This product catalogue is designed to give an overview of the extensive range of MELSERVO amplifiers and motors. If you cannot find the information you require in this catalogue, there are a number of ways you can get further details on configuration and technical issues, pricing and availability.

For technical issues visit the www.mitsubishi-automation.com website.

Our website provides a simple and fast way of accessing further technical data and up to the minute details on our products and services.

Manuals and catalogues are available in several different languages and can be downloaded for free.

For technical, configuration, pricing and availability issues contact our distributors and partners.

Mitsubishi partners and distributors are only too happy to help answer your technical questions or help with configuration building.

For a list of Mitsubishi partners please see the back of this catalogue or alternatively take a look at the "contact us" section of our website.

About this product catalogue

This catalogue is a guide to the range of products available. For detailed configuration rules, system building, installation and configuration the associated product manuals must be read. You must satisfy yourself that any system you design with the products in this catalogue is fit for purpose, meets your requires and conforms to the product configuration rules as defined in the product manuals.

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1 System Description

- ◆ Servo and motion systems 4
- ◆ Introduction to the MELSERVO series and description of the MR-J3 servo amplifiers 5
- ◆ Overview of general MR-J3 Features 6
- ◆ Control functions and enhanced tuning technology 7
- ◆ Servo motor and servo amplifier model designations 8

2 Servo Motors

- ◆ Description of the servo motors 11
- ◆ Servo motor specifications and matching amplifiers 12
- ◆ Specifications and torque characteristics 13
- ◆ Braked motor specifications 22

3 Servo Amplifiers

- ◆ Specifications MR-ES 24
- ◆ Specifications MR-J3-A/B 25
- ◆ Specifications MR-J3-BSafety 27
- ◆ Specifications MR-J3-D05 29
- ◆ Specifications MR-J3-T 30
- ◆ Overview of MR-J3-T Commands and Operation Modes 31
- ◆ MR-J3-A Servo Amplifier Connections with Peripheral Equipment 32
- ◆ MR-J3-B Servo Amplifier Connections with Peripheral Equipment 33
- ◆ MR-E Super Servo Amplifier Connections with Peripheral Equipment 34

4 Options And Peripheral Equipment

- ◆ Connections with peripheral equipment 35
- ◆ Cables and Connectors for Servo amplifier (general) 40
- ◆ Cables and Connectors for servo amplifier (type specific) 43
- ◆ Battery, special cables and terminal blocks 46
- ◆ Pulse generator, parameter unit and software 47
- ◆ Noise filters and brake resistors 48
- ◆ MELSEC FX Positioning Units 49
- ◆ MELSEC System Q Positioning Units 50
- ◆ Motion Controller 51
- ◆ MELSEC System Q Motion CPUs 53

5 Applications

- ◆ Configuration of a SSCNET III System 54
- ◆ X-Y Table System Configurations 55

6 Dimensions

- ◆ Servo motors 56
- ◆ Servo amplifiers 59
- ◆ Noise Filters 67
- ◆ Brake resistors 68
- ◆ Safety option card MR-J3-D05, Extension I/O unit MR-J3-D01 69

Appendix

- ◆ Index 70

SERVO AND MOTION SYSTEMS

Mitsubishi Electric offers a variety of Servo and Motion system products providing solutions for applications covering point-to-point and synchronised systems. Systems can be built using a single axis or multi axes, for example when using a System Q Motion CPU solution up to 96 axes can be controlled.

With both standard pulse type output modules and SSCNET bus modules specific application needs are easy to meet.

The Servo motors and amplifiers takes Mitsubishi Motion Control to new levels of precision with a wide range of motors (all MR-ES series motors are fitted with 131072 pulse-per-revolution encoders,

and all MR-J3 series motors are fitted with 262144 pulse-per-revolution encoders) and wide amplifier range (up to 110 kW).

All Mitsubishi Servo and Motion system hardware is complimented by a range of software packages allowing easy programming and set-up of the units.

What are the Components of a Servo System?

Servo motors

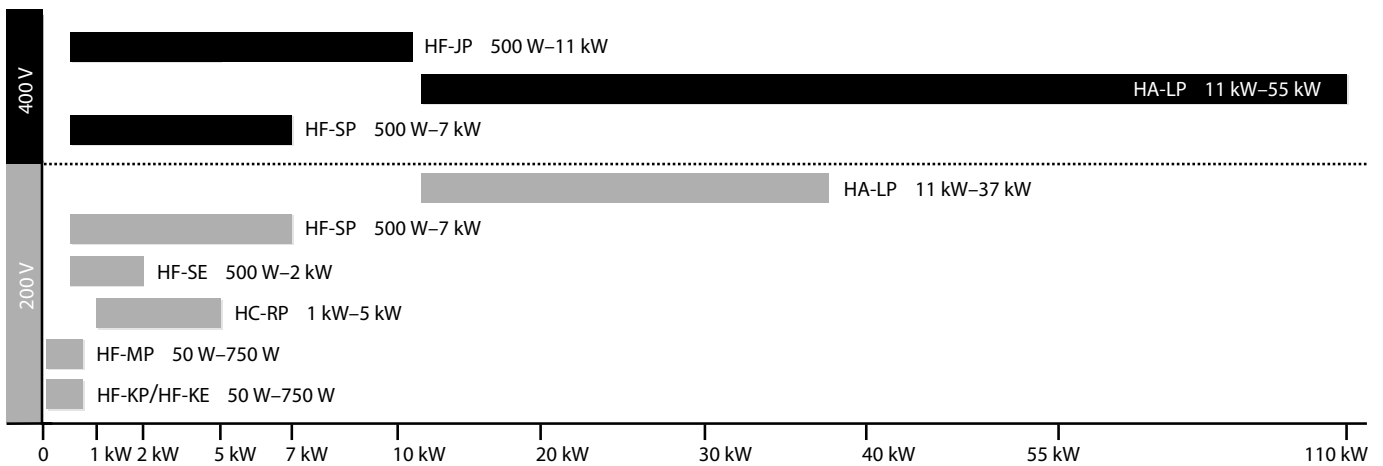
Utilising the most advanced concentrated winding techniques and latest technology, these brushless servo motors are among the most compact on the market.

Mitsubishi Servo Motors are made to high standards and offer a wide range of power, speed and inertia ratings providing a motor for

all applications. With a range from 50 W to 110 kW and with specialist motor types (flat "pancake" motors) a complete line-up of products can be offered by Mitsubishi Electric.

Also, all motors in the MR-J3 Series are fitted with absolute encoders as standard. Therefore, an absolute system can be created by simply

providing power to Servo amplifier via a battery. Once this has been done the super capacitor inside the motor and back-up battery allow the Servomotor position to be constantly monitored.

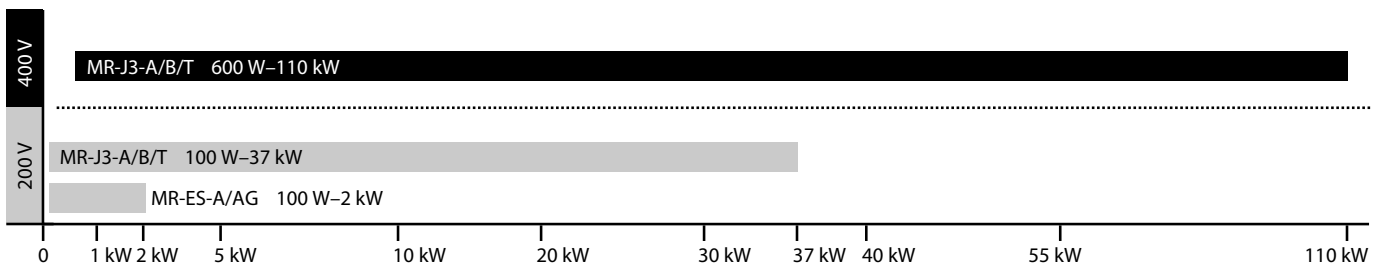


Servo amplifiers

Mitsubishi offers a wide range of Servo amplifiers to meet the demands of all types of applications. From standard digital pulse and analogue controlled amplifiers through to dedicated SSCNET bus type amplifiers, there is a product for all circumstances.

Real Time Adaptive Tuning (RTAT) is a unique Mitsubishi technology, enabling the servo to deliver maximum dynamic performance, even if the load keeps changing, by automatically tuning online (during operation) to the application.

The digital pulse-train and analogue units of the MR-ES and MR-J3 series range from 100 W units through to 110 kW. The SSCNET bus type amplifiers (type B) offer the user ease of connectivity, via SSCNET.



Positioning controllers

For the compact, cost effective, FX range of PLCs, the FX2N-10PG unit provides single-axis control with built-in positioning tables, fast external start and an output pulse rate of up to 1 MHz. The module FX3U-20SSC-H is a positioning module for the MR-J3-B series. This module provides a quick and easy, but efficient positioning control system for simpler applications.

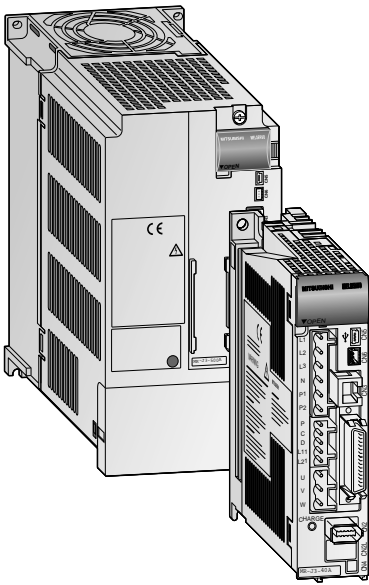
For larger, more complex applications the new powerful Qn PLC range offers three QD75 series modules (one, two and four axes).

These are: open-collector output type (QD75P series), Differential output type (QD75D series) and SSCNET III bus type (QD75MH series). Using the SSCNET system can provide much improved, easier to use positioning systems, with reduced wiring and better noise immunity. All QD75 series controllers can provide functionality such as interpolation and speed-position operation etc.

Motion Controllers

For specialist applications requiring the highest level of control and precision, the dynamic servo technology provided by the Q-Motion CPU is combined with the powerful processing power of the Q series PLC CPU, creating a completely new generation of motion controller products. This fully integrated and flexible system has the capability to control up to 96 axes using SSCNET, which is more than capable for handling any motion application.

MELSERVO MR-J3 Servo Amplifiers



MELSERVO

The MR-J3 servo drive systems from Mitsubishi Electric combine extremely dynamic response with ultra-fast positioning. In addition the servo amplifiers are also very simple to use and their advanced functionality make it possible to achieve maximum performance very quickly, even for users without special experience in calibrating drive applications. The significantly improved auto-tuning function reduces the need for the time-consuming trial-and-error approach. In combination with the setup software package (MR Configurator) the MR-J3 series can be used to detect application mechanical critical frequencies. This enables notch filters to be set to avoid resonant frequencies enabling vibration-free operation.

When using amplifiers of competitors the controller response level has to be reduced for the entire operation range.

The MR-J3 servo amplifiers can be used for global applications with superb operation in the toughest environments.

Features

- High-performance CPU
- Integrated Positioning Functions (MR-J3-T only)
- Adaptive vibration suppression control function for compensation for resonance up to two resonance frequencies
- Advanced vibration suppression control for compensation of motion overshoot
- Separate wiring of the control power supply
- High responsiveness
- Real-Time Auto-Tuning (RTAT)
- Torque control function (MR-J3-A/B)
- Servo-lock anti-vibration function
- RS-422/USB personal computer interface
- Automatic motor recognition
- Network capability
- Complies with global industrial standards
- Integrated safety functions (MR-J3-BSafety only)

Differences Between the Four MELSERVO Servo Amplifier Series

MR-J3-A (standard type)

The MR-J3-A series is ideal for servo applications using conventional control systems. The servo amplifiers have two analog inputs and numerous digital inputs for activating internal application functions (i.e. pulse train positioning). Using the digital pulse train method eliminates the problems inherent in analog control, such as offset shifts caused by temperature fluctuations and drifting when the system is at rest.

The MR-J3-A series can be used in torque, speed or position control mode.

Highlights

- 2 analog inputs
- 1 digital pulse train input
- 7 preset speeds
- Supports three different types of pulse train signals: standard encoder signals (line driver or open collector); pulse and direction; pulse train for right and left rotation

MR-J3-B (SSCNET III bus type)

The MR-J3-B series supports connection to Mitsubishi motion control and positioning control systems. The drive systems are connected to these controllers via SSCNET III, a high-speed motion control enabling high precision synchronization and advanced interpolation. The minimum cycle time of just 0.44 ms increases responsiveness and reduces tact cycle of machine due to fast data exchange. Setting up this plug-and-play network couldn't be easier; you just have to select the axis address and connect the preconfigured bus cable, which also makes wiring errors impossible.

Highlights

- Plug-and-play SSCNET III network
- Motor brake can be controlled directly by the amplifier

- Emulated encoder outputs for connection of conventional slave drive systems
- Amplifier replacement is fast and simple because data management is performed by superior controller.
- Automatic position detection on power-up thanks to absolute position detection system (multi-turn absolute positioning is realised by optional back-up battery)
- MR-J3-BSafety only: Safety functions according to EN IEC 61800-5-2: Safe Torque Off (STO) and additionally with safety option card MR-J3-D05 Safe Stop 1 (SS1)

MR-J3-T (integrated positioning type)

The MR-J3-T series is a compact and cost effective servo solution with integrated positioning control functionality and CC-Link communications capability. By setting position and speed data by using simple point tables in the servo amplifier, positioning operation is possible with a simple start signal from the positioning controller which is input by any standard controller.

It is possible to store up to 256 position steps in the amplifier. The positioning tasks can be started by simply inputting digital signals.

Highlights

- Position and speed data, etc. can be set via CC-Link or RS422 communication
- CC-Link interface can be also used for transmitting positioning data to the amplifier without using the internal point table. Hence centralised data management inside of a machine control can be realised, too.
- Positioning by serial communication (RS-422) for simple applications without fieldbus interfaces
- Parameter unit, MR-PRU03 (optional), makes parameter setting and operation monitoring easier

MR-E Super (general purpose type)

The servo system MR-E Super can perform operation in different control modes, e.g. position/internal speed control. It fits a wide range of applications such as precision positioning and smooth speed control of machine tools and general industrial machines (e.g. packaging, processing or labelling machines).

External analog speed command or torque command are implemented to use this servo system for applications in which speed or torque has to be smoothly controlled.

Up to 1 Mpps high-speed pulse train is used to control the speed and direction of the motor and execute precision positioning also taking advantage of the high encoder revolution of 131072 pulses/rev.

Highlights

- The compact dimensions enable flexible installation and economical design
- With an output range of 100 W–2 kW the system is suitable for any kind of application
- The system allows high accuracy positioning thanks to the integrated high resolution encoder (131072 pls/rev)
- It is a well-priced product for cost-effective and economical servo solutions
- Auto-tuning and diagnostic tools are available for easy and time-saving installation

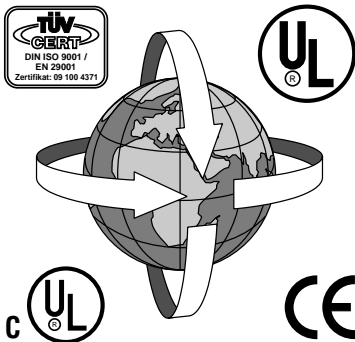
Overview of MR-J3 Features

Compliant and Safe

Complies with global industrial standards

The entire product range can be used in confidence knowing it is in conformity with overseas industrial standards.

An EMC filter (optional) is available for complying with European EMC directives. Effective EMC is only ensured if the suitable filter is selected for the particular system and installed in accordance with the Mitsubishi EMC recommendations. The MELSERVO MR-J3 devices comply with all important standards (CE, UL and cUL).



Enhanced ability to withstand environmental hazards

The HF-SP motor series are equipped with IP67 as standard enhancing their ability to withstand environmental hazards.

The HF-MP and HF-KP series meet IP65 standard protection.

Separate wiring for the control power supply

The control power supply of the servo amplifier is wired separately, ensuring diagnostics and maintenance without connecting all power connecting cables.

Compact and flexible

More compact servo motors

Mitsubishi servo motors keep getting smaller:

- Ultra low-inertia HF-MP series
- Ultra low-inertia HC-RP series (increased capacity)
- Low-inertia HF-KP/HF-JP series
- Medium-inertia HF-SP series

A wide variety of motors

A broad line-up of servo motors is available. Users can choose the motor series that best suits the needs of the application.

Fully Equipped

Absolute detection as standard

The MR-J3 can be easily set to absolute system, which requires no return to home, by merely adding a battery to the servo amplifier and without changing the servo motor.

Dynamic brake function

With an integrated dynamic brake, the servo motor can be stopped quickly in a power failure, emergency case or when an alarm has been triggered.

Integrated regenerative resistor

A brake resistor is already integrated in standard amplifiers, eliminating the need for external optional brake resistors or brake units.

Control signal assignment feature (MR-J3-A)

Control signals necessary for operation can be freely assigned to control terminals within a predetermined range, enabling more flexible operation.

Personal computer interface is standard

The MR-J3 comes with an integrated USB interface as standard equipment, enabling users to connect a personal computer to the MR-J3 to perform setup diagnostics and maintenance by MR Configurator.

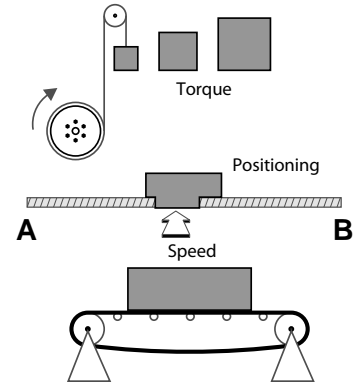
This powerful software tool contains numerous support functions for optimising and analysing the servo system:

- Software oscilloscope
- Machine analyser for detecting mechanical resonance points
- Control signal monitoring
- Encoder and servo system diagnostics
- Versatile test functions
- Gain search wizard for manual tuning and many further useful functionalities

Special Features

Model adaptive control

As the MR-J3 operates in quick response to commands, it offers highly responsive and stable operation, unaffected by machine systems.



Automatic servo motor recognition

Once the encoder cable has been connected, the servo amplifier can determine, as soon as its power is turned ON, which servo motor is connected.

When the servo amplifier detects a mismatch, an alarm is triggered, eliminating the possibility of an error and the need for setting parameters.

Encoder serial communications

The encoder uses serial communications, so there are fewer signal wires to connect.

Real-Time Auto-Tuning (RTAT)

The servo performs automatic gain adjustments even when the load changes.

Safety functions (STO, SS1)

The servo amplifier MR-J3-BSafety has integrated Safe Torque OFF (STO). When the option card MR-J3-D05 is used, further safety features such as Safe Stop1 (SS1), Emergency OFF and Emergency STOP can be achieved. Complying with the standards EN13849-1 for machine safety and ISO 61508 for functional safety, these products assist OEMs and system integrators to meet the requirements of the new Machinery Directive EWG 2006/42/EG. The new directive takes effect from December 29th 2009.

Control Functions with Enhanced Tuning Technology

Real-Time Auto-Tuning (RTAT) and Model Adaptive Control

The powerful Auto Tuning function automatically and periodically adjusts all parameters of position, speed and current controller in the background during operation.

The controller concept is unique due to separate control loops for compensation of control deviations caused by disturbances

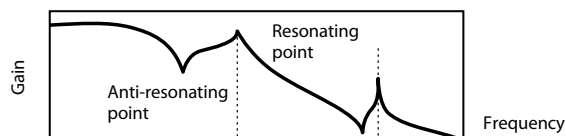
or changing command values. Therefore manual controller adjustment is not required.

Adaptive Vibration Suppression and Mechanical Resonance Suppression Function

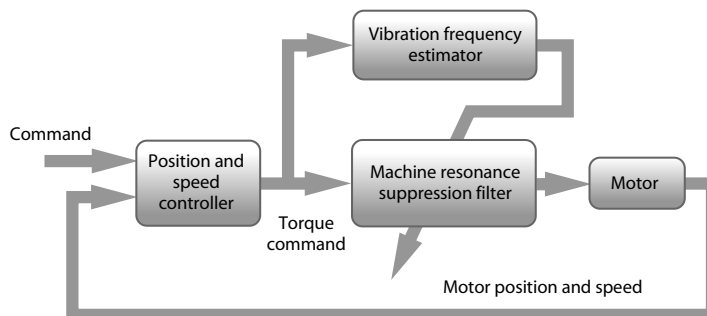
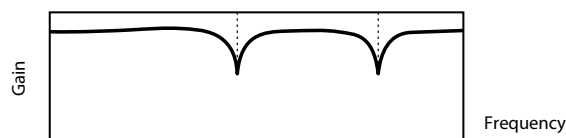
Mechanical constructions often have inherent resonance points in an upper frequency range of several hundred Hertz. Increased control gain settings of servo controller loops can cause to instable operation due to generation of oscillations and vibrations.

The automatic compensation of mechanical resonances is realised by a so-called Adaptive Filter II. This filter is implemented as a notch filter, detects resonance frequencies and reduces the controller settings (gains) within a certain band width of the resonance point.

(Machine resonance characteristics)



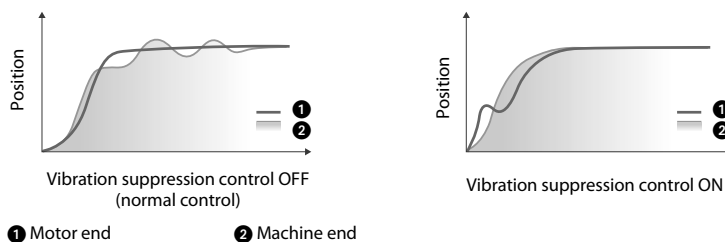
(Machine resonance suppression filter characteristics)



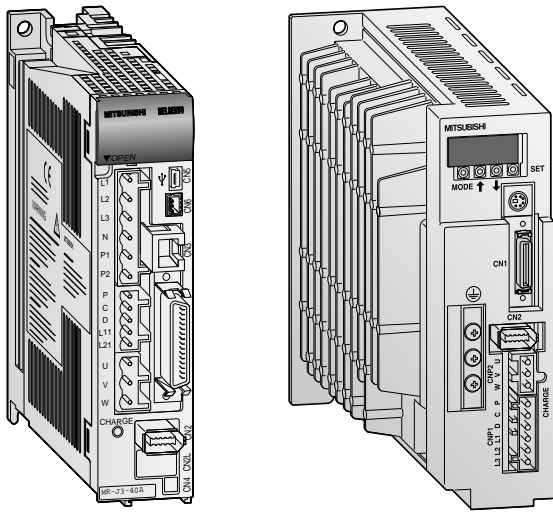
Advanced Vibration Suppression

Advanced Vibration Suppression control is designed to eliminate residual vibrations at the settling time during positioning operation.

The basic control method is to use a mechanical vibration model from command model in order to generate a motion pattern that prevent large overshoot during settling time of positioning operation and so avoid any vibrations.



Servo Amplifiers Model Designation



Servo Amplifiers 200 V

MR-J3 - A

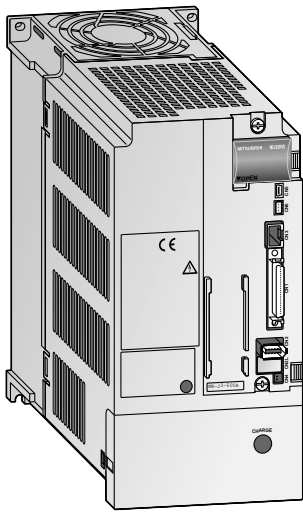
Series	Compatible servomotors				Code	Type	
MR-J3	Code	HC-RP <input type="checkbox"/>	HF-MP <input type="checkbox"/>	HF-KP <input type="checkbox"/>	HF-SP <input type="checkbox"/>	Code	Type
	10	—	053/13	053/13	—	A	Standard general-purpose AC servo
	20	—	23	23	—	B	SSCNET III compatible
	40	—	43	43	—	BS	Safety functions
	60	—	—	—	52	T	CC-Link compatible built-in positioning function
	70	—	73	73	—		
	100	—	—	—	102		
	200	103/153	—	—	152/202	—	200–230 V AC power supply
	350	203	—	—	352		
	500	353/503	—	—	502		
	700	—	—	—	702		

All amplifiers conform to the following standards: CE, UL, cUL

MR-E - A

Series	Compatible servo motors		Code	Type	
MR-E	Code	HF-KE <input type="checkbox"/> W1-S100	HF-SE <input type="checkbox"/> KW1-S100	Code	Type
	10	13	—	A	Pulse train interface
	20	23	—	AG	Analog input interface
	40	43	—		
	70	73	52		
	100	—	102		
	200	—	152/202	—	200–230 V AC power supply

All amplifiers conform to the following standards: CE, UL, cUL



Servo Amplifiers 400 V

MR-J3 - A 4

Series
MR-J3

Code	Compatible servo motors		
	HA-LP <input type="checkbox"/>	HF-JP <input type="checkbox"/>	HF-SP <input type="checkbox"/>
60	—	534	524
100	—	734 ^① /1034	1024
200	—	1534/2034	1524/2024
350	—	3534	3524
500	—	5034	5024
700	—	—	7024
11K	11K24	11K1M4	—
15K	15K24	15K1M4	—
22K	22K24	—	—

^① The servo motor HF-JP734 can be used only for 400 V servo amplifier version (MR-J3-100S4)

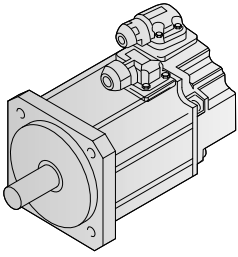
Code	Type
A	Standard general-purpose AC servo
B	SSCNET III compatible
BS	Safety functions
T	CC-Link compatible built-in positioning function

Code	Type
4	380–480 V AC power supply

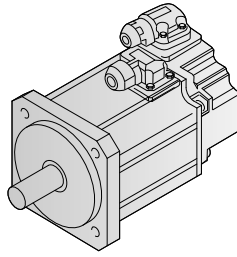
All amplifiers conform to the following standards: CE, UL, cUL

Servo Motors Model Designation

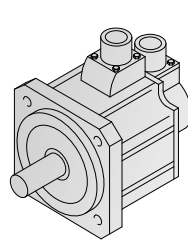
HF-MP series



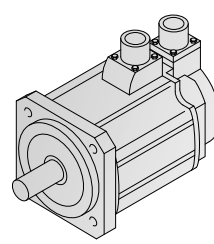
HF-KP series



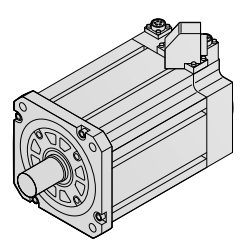
HF-SP series



HC-RP series



HF-JP series



Servo Motors 200 V

HF-KP



additional coding for HF-KE and HF-SE motors

Symbol	Motor series	Code	Rated output [W]	Code	Rated output [W]	Code	Rated speed [rpm]	Code	Electromagnetic brake
HC-RP	Ultra-low inertia, medium capacity	05	50	10	1000	2	2000	—	None
HF-KE	Low inertia, small capacity	1	100	15	1500	3	3000	B	●
HF-KP	Low inertia, small capacity	4	400	35	3500				
HF-MP	Ultra-low inertia, small capacity	5	500	50	5000				
HF-SE	Medium inertia, medium capacity	7	750	70	7000				
HF-SP	Medium inertia, medium capacity								

All motors conform to the following standards:
CE, UL, cUL

Example: HF-MP 05 3 B = Ultra-low inertia type with small capacity; 0.05 kW; 3000 rpm; 200 V; with electromagnetic brake

Servo Motors 400 V

HF-SP



Symbol	Motor series	Code	Rated output [W]	Code	Rated output [W]	Code	Rated speed [rpm]	Code	Rated speed [rpm]	Code	Electromagnetic brake
HF-JP	Low inertia, medium capacity	5	500	50	5000	1M	1500	4	400 V type	—	None
HF-SP	Medium inertia, medium capacity	10	1000	70	7000	2	2000	B	●		
HA-LP	Medium-inertia, high capacity	15	1500	11k	11000	3	3000				
		20	2000	15k	15000						
		35	3500	22k	22000						

All motors conform to the following standards:
CE, UL, cUL

Example: HF-SP 70 2 4B = Medium inertia type with medium capacity; 7 kW; 2000 rpm; 400 V; with electromagnetic brake

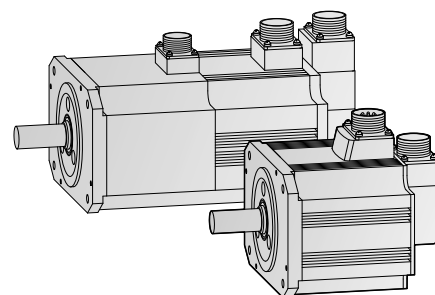
General note: The above tables show the motor model name break-down. Not all combinations are possible. Please refer to the motor specifications table on page 13ff

Servo Motor Features and Typical Applications

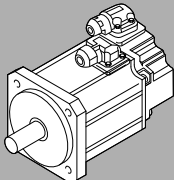
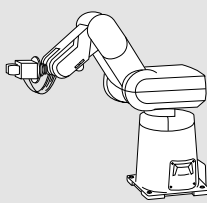
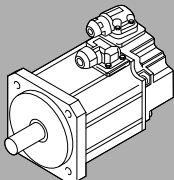
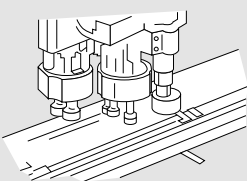
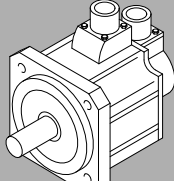
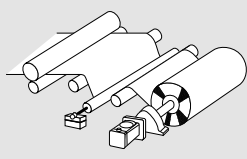
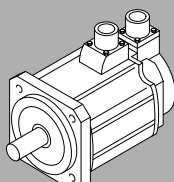
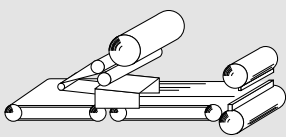
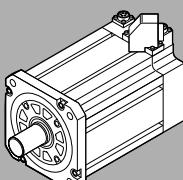
Absolute high-resolution encoder as standard equipment

Inclusion of an absolute position detection system eliminates the need for a homing sequence, approximate DOG and other sensors, helping to reduce time and enhance reliability. With these motors high performance and safety at low speed is ensured.

With Mitsubishi's original absolute mode, an absolute system can be configured using conventional I/O even with pulse-train control.



Overview

Model designation	Features	Application example
K 	Low inertia Larger motor inertia moment makes this unit well suited for machines with fluctuating load inertia moment or machines with low rigidity such as conveyors.	<ul style="list-style-type: none"> ● Conveyors ● Food preparation machinery ● Printers ● Small loaders and unloaders ● Small robots and component assembly devices ● Small X-Y tables ● Small press feeders  <p>Small robots</p>
M 	Ultra low inertia Small motor inertia moment makes this unit well suited for high-dynamic positioning operations with extra small cycle times.	<ul style="list-style-type: none"> ● Inserters, mounters, bonders ● Printed board hole openers ● In-circuit testers ● Label printers ● Knitting and embroidery machinery ● Ultra-small robots and robot tips  <p>Inserters, mounters, bonders</p>
S 	Medium inertia Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications (e.g. direct connection to ball screw components).	<ul style="list-style-type: none"> ● Conveyor machinery ● Specialised machinery ● Robots ● Loaders and unloaders ● Winders and tension devices ● Turrets ● X-Y tables ● Test devices  <p>Winders and tension devices</p>
R 	Low inertia A compact sized low-inertia moment model with medium capacity. Well suited for high-frequency operation.	<ul style="list-style-type: none"> ● Roll feeders ● Loaders and unloaders ● High-frequency conveyor machinery  <p>Wrapping machinery</p>
J 	Low Inertia (400 V) A 400 V Servo Motor for the MELSERVO-J3 Series for a power range up to 5 kW with low inertia and high speed. It has a compact size, is equipped with high resolution encoder and is compatible to global standards.	<ul style="list-style-type: none"> ● Food and Packaging ● Printing machine ● Pick up robot for Injection molding machine ● Palletizing machine ● General machine which require High speed and High frequency <p>Wrapping machinery</p>

Note: Other types of motors are available on request.

Servo Motor Specifications and Matching Amplifiers

The possible combinations of servo amplifiers and servo motors are listed in the table below.

Details of the braked version motors is given on page 22. The detailed specifications of all servo motors are listed on the following pages.

Motors for MR-ES series servo amplifiers

Motor series	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type		Amplifier pairing MR-E						Reference page	
				Voltage	Protective structure	10A 10AG	20A 20AG	40A 40AG	70A 70AG	100A 100AG	200A 200AG		
K	3000	0.1	HF-KE13W1-S100	200 V AC	IP55	●							13
		0.2	HF-KE23KW1-S100				●						
		0.4	HF-KE43KW1-S100					●					
		0.75	HF-KE73KW1-S100						●				
S	2000	0.5	HF-SE2KW1-S100	200 V AC	IP65				●			14	
		1.0	HF-SE102KW1-S100						●				
		1.5	HF-SE152KW1-S100							●			
		2.0	HF-SE202KW1-S100							●			

Motors for MR-J3 series servo amplifiers

Motor series 200 V	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type		Amplifier pairing MR-J3										Reference page
				Voltage	Protective structure	10A/B 10T	20A/B 20T	40A/B 40T	60A/B 60T	70A/B 70T	100A/B 100T	200A/B 200T	350A/B 350T	500A/B 500T	700A/B 700T	
K	3000	0.05	HF-KP053	200 V AC	IP65	●										15
		0.1	HF-KP13			●										
		0.2	HF-KP23				●									
		0.4	HF-KP43					●								
		0.75	HF-KP73						●							
M	3000	0.05	HF-MP053	200 V AC	IP65	●									16	
		0.1	HF-MP13			●										
		0.2	HF-MP23				●									
		0.4	HF-MP43					●								
		0.75	HF-MP73						●							
R	3000	2.0	HC-RP103	200 V AC	IP65							●			17	
		2.0	HC-RP153								●					
		3.5	HC-RP203									●				
		5.0	HC-RP353										●			
		5.0	HC-RP503										●			
S	2000	0.5	HF-SP52	200 V AC	IP67				●						18	
		1.0	HF-SP102							●						
		1.5	HF-SP152								●					
		2.0	HF-SP202								●					
		3.5	HF-SP352									●				
		5.0	HF-SP502										●			

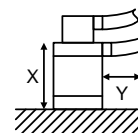
Motor series 400 V	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type		60A4/B4 60T4	100A4/B4 100T4	200A4/B4 200T4	350A4/B4 350T4	500A4/B4 500T4	700A4/B4 700T4	11KA4/B4 11KT4	15KA4/B4 15KT4	22KA4/B4 22KT4	Reference page
				Voltage	Protective structure										
S	2000	0.5	HF-SP524	400 V AC	IP67	●									19
		1.0	HF-SP1024				●								
		1.5	HF-SP1524					●							
		2.0	HF-SP2024						●						
		3.5	HF-SP3524							●					
		5.0	HF-SP5024								●				
J	1500	11	HF-JP11K1M4	400 V AC	IP67						● ^①			20	
		15	HF-JP15K1M4								● ^①				
L	2000	0.5	HF-JP534	400 V AC	IP67	●								21	
		0.75	HF-JP734				●								
		1.0	HF-JP1034					●							
		1.5	HF-JP1534						●						
		2.0	HF-JP2034							●					
		3.3<3.5>	HF-JP3534								●				

① Use a dedicated servo amplifier MR-J3-11KA4/B4/T4-LR or MR-J3-15KA4/B4/T4-LR with an enclosed regenerative resistor for HF-JP11K1M4 or HF-JP15K1M4. These servo motors cannot be used with any other servo amplifier without "LR". Note: Other types of motors are available on request.

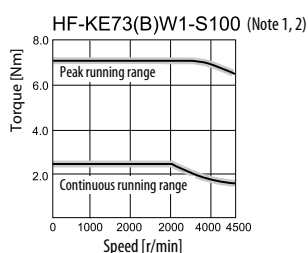
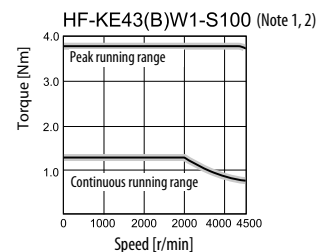
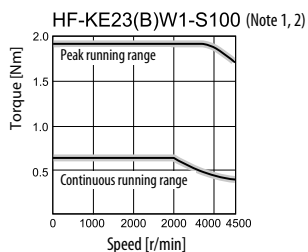
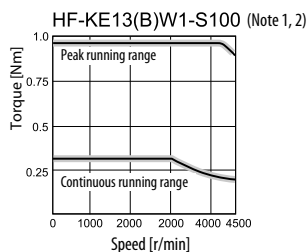
HF-KE(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HF-KE13(B)W1-S100 ^⑥	HF-KE23(B)W1-S100 ^⑥	HF-KE43(B)W1-S100 ^⑥	HF-KE73(B)W1-S100 ^⑥	
Servo amplifier model	MR-E-10A/AG-QW003	MR-E-20A/AG-QW003	MR-E-40A/AG-QW003	MR-E-70A/AG-QW003	
Power facility capacity [kVA] ^①	0.3	0.5	0.9	1.3	
Continuous characteristics	rated output [kW]	0.1	0.2	0.4	0.75
	rated torque [Nm]	0.32	0.64	1.3	2.4
Maximum torque [Nm]	0.95	1.9	3.8	7.2	
Rated rotation speed [rpm]	3000	3000	3000	3000	
Maximum rotation speed [rpm]	4500	4500	4500	4500	
Permissible instantaneous rotation speed [rpm]	5175	5175	5175	5175	
Power rate at continuous rated torque [kW/s]	11.5	16.9	38.6	39.9	
Rated current [A]	0.8	1.4	2.7	5.2	
Maximum current [A]	2.4	4.2	8.1	15.6	
Moment of inertia J [$\times 10^{-4}$ kg m ²]	standard	0.088	0.24	0.42	1.43
	with electromagnetic brake	0.090	0.31	0.50	1.63
Regeneration braking frequency [1/min] ^{② ③}	④	④	249	140	
Recommended load/motor inertia ratio	Less than 15 times the servo motor's inertia moment ^⑤				
Speed/position detector	Incremental encoder (resolution servo motor rotation: 131072 p/rev.)				
Structure	Totally enclosed, non-ventilated (protection rating: IP55) ^⑦				
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: –15–70 °C (no freezing)			
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)			
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust			
	elevation/vibration ^⑧	1000 m or less above sea level; X: 49 m/s ² , Y: 49 m/s ²			
Weight [kg]	standard motor ^⑥	0.56	0.94	1.5	2.9
Order information	(without brake) Art. no.	210940	213081	213082	213083

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ The regenerative braking frequency of the 600 W or smaller servo amplifier may fluctuate due to the affect of the power voltage since the energy charged by the electrolytic capacitor in the servo amplifier is large.
- ④ There are no limits on regeneration frequency as long as the effective torque is within the rated torque range. However, the load/motor of inertia moment ratio must be 15 times or less.
- ⑤ Contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.
- ⑦ The shaft-through portion and connector for cable terminal are excluded.
- ⑧ The vibration direction is shown in the right-side diagram. The numeric value indicates the maximum value of the component (commonly the bracket in the opposite direction of the motor shaft). Fretting of the bearing occurs easily when the motor stops, so maintain vibration at approximately one-half of the allowable value.



HF-KE Series Servo Motor Torque Characteristics

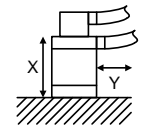


- Notes:
 1. ——— : For 3-phase 200 V AC.
 2. - - - - : For 1-phase 230 V AC.

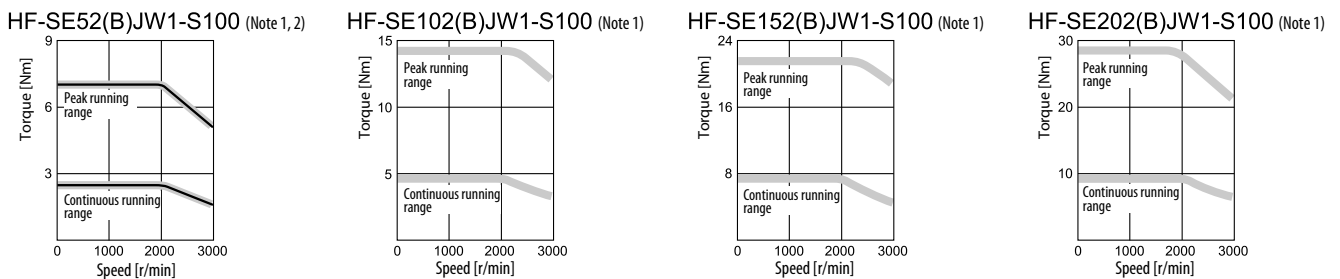
HF-SE(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HF-SE52(B)JW1-S100 [®]	HF-SE102(B)JW1-S100 [®]	HF-SE152(B)JW1-S100 [®]	HF-SE202(B)JW1-S100 [®]	
Servo amplifier model	MR-E-70A/AG-QW003	MR-E-100A/AG-QW003	MR-E-200A/AG-QW003	MR-E-200A/AG-QW003	
Power facility capacity [kVA] ^①	1.0	1.7	2.5	3.5	
Continuous characteristics	rated output [kW]	0.5	1.0	1.5	2.0
	rated torque [Nm]	2.39	4.77	7.16	9.55
Maximum torque [Nm]	7.16	14.3	21.5	28.6	
Rated rotation speed [rpm]	2000	2000	2000	2000	
Maximum rotation speed [rpm]	3000	3000	3000	3000	
Permissible instantaneous rotation speed [rpm]	3450	3450	3450	3450	
Power rate at continuous rated torque [kW/s]	9.34	19.2	28.8	23.8	
Rated current [A]	2.9	5.3	8.0	10	
Maximum current [A]	8.7	15.9	24	30	
Moment of inertia J [$\times 10^{-4}$ kg m ²]	standard	6.1	11.9	17.8	38.3
	with electromagnetic brake	8.3	14.0	20.0	47.9
Regeneration braking frequency [1/min] ^{②③}	120	62	152	71	
Recommended load/motor inertia ratio	Less than 15 times the servo motor's inertia moment ^④				
Speed/position detector	Incremental encoder (resolution servo motor rotation: 131072 p/rev.)				
Structure	Totally enclosed, non-ventilated (protection rating: IP65) ^⑤				
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)			
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)			
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust			
	elevation/vibration ^⑦	1000 m or less above sea level; X: 24.5 m/s ² , Y: 24.5 m/s ²		1000 m or less above sea level; X: 24.5 m/s ² , Y: 49 m/s ²	
Weight [kg]	standard motor ^⑥	4.8	6.5	8.3	12
Order information	(without brake) Art. no.	213084	213085	213086	213087

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ The regenerative braking frequency of the 600 W or smaller servo amplifier may fluctuate due to the affect of the power voltage since the energy charged by the electrolytic capacitor in the servo amplifier is large.
- ④ Contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table.
- ⑤ The shaft-through portion is excluded.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.
- ⑦ The vibration direction is shown in the right-side diagram. The numeric value indicates the maximum value of the component (commonly the bracket in the opposite direction of the motor shaft). Fretting of the bearing occurs easily when the motor stops, so maintain vibration at approximately one-half of the allowable value.



HF-SE Series Servo Motor Torque Characteristics

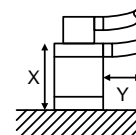


Notes:
 1. — : For 3-phase 200 V AC.
 2. — : For 1-phase 230 V AC.

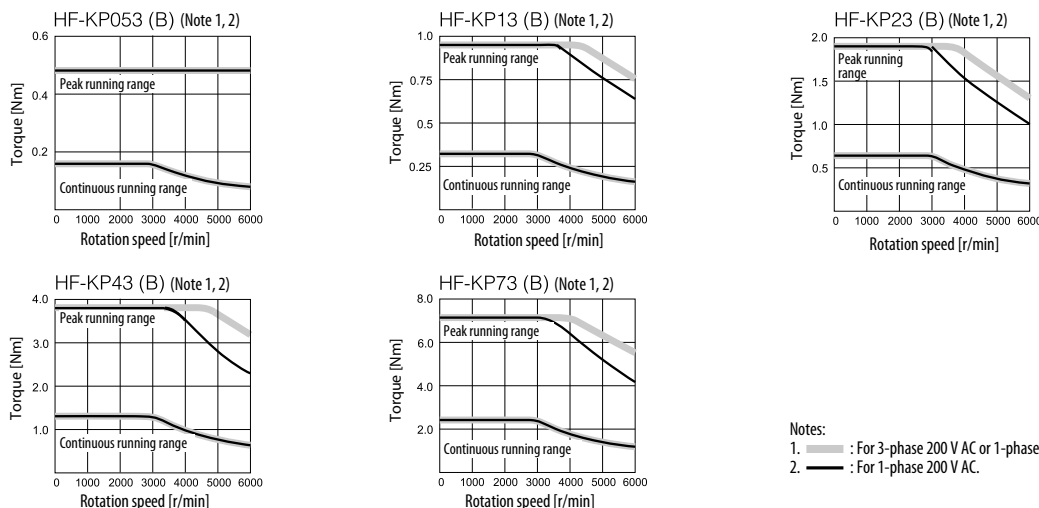
HF-KP(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HF-KP053(B) ⑥	HF-KP13(B) ⑥	HF-KP23(B) ⑥	HF-KP43(B) ⑥	HF-KP73(B) ⑥	
Servo amplifier model	MR-J3-10A/B/T	MR-J3-10A/B/T	MR-J3-20A/B/T	MR-J3-40A/B/T	MR-J3-70A/B/T	
Power facility capacity [kVA] ①	0.3	0.3	0.5	0.9	1.3	
Continuous characteristics	rated output [kW]	0.05	0.1	0.2	0.4	0.75
	rated torque [Nm]	0.16	0.32	0.64	1.3	2.4
Maximum torque [Nm]	0.48	0.95	1.9	3.8	7.2	
Rated rotation speed [rpm]	3000	3000	3000	3000	3000	
Maximum rotation speed [rpm]	6000	6000	6000	6000	6000	
Permissible instantaneous rotation speed [rpm]	6900	6900	6900	6900	6900	
Power rate at continuous rated torque [kW/s]	4.87	11.5	16.9	38.6	39.9	
Rated current [A]	0.9	0.8	1.4	2.7	5.2	
Maximum current [A]	2.7	2.4	4.2	8.1	15.6	
Moment of inertia J [$\times 10^{-4}$ kg m ²] ②	standard	0.052	0.088	0.24	0.42	1.43
	with electromagnetic brake	0.054	0.090	0.31	0.50	1.63
Regeneration braking frequency [1/min]	② (a)	② (b)	448	249	140	
Recommended load/motor inertia ratio ③	15	15	24	22	15	
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)					
Structure	Totally enclosed, non-ventilated (protection rating: IP65) ④					
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)				
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)				
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust				
	elevation/vibration ⑤	1000 m or less above sea level; X: 49 m/s ² , Y: 49 m/s ²				
Weight [kg]	standard motor ⑥	0.35	0.56	0.94	1.5	2.9
Order information	(without brake) Art. no.	161507	160211	161508	161509	161510

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- (a)/(b) When a motor decelerates to a stop from the rated speed, the regenerative frequency will not be limited if the effective torque is within the rated torque range. When a motor decelerates to a stop from the maximum speed, the regenerative frequency will not be limited if the load inertia moment is (a) 26-fold (b) 15-fold or less and the effective torque is within the rated torque range.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.



HF-KP Series Servo Motor Torque Characteristics

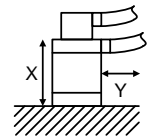


- Notes:
 1. — : For 3-phase 200 V AC or 1-phase 230 V AC.
 2. — : For 1-phase 200 V AC.

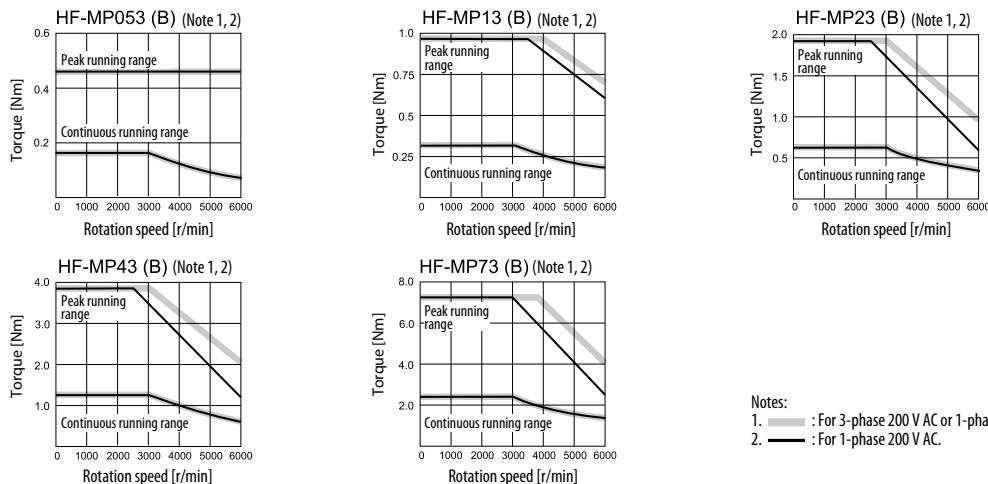
HF-MP(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HF-MP053(B) ⑥	HF-MP13(B) ⑥	HF-MP23(B) ⑥	HF-MP43(B) ⑥	HF-MP73(B) ⑥	
Servo amplifier model	MR-J3-10A/B/T	MR-J3-10A/B/T	MR-J3-20A/B/T	MR-J3-40A/B/T	MR-J3-70A/B/T	
Power facility capacity [kVA] ①	0.3	0.3	0.5	0.9	1.3	
Continuous characteristics	rated output [kW]	0.05	0.1	0.2	0.4	0.75
	rated torque [Nm]	0.16	0.32	0.64	1.3	2.4
Maximum torque [Nm]	0.48	0.95	1.9	3.8	7.2	
Rated rotation speed [rpm]	3000	3000	3000	3000	3000	
Maximum rotation speed [rpm]	6000	6000	6000	6000	6000	
Permissible instantaneous rotation speed [rpm]	6900	6900	6900	6900	6900	
Power rate at continuous rated torque [kW/s]	13.3	31.7	46.1	111.6	95.5	
Rated current [A]	1.1	0.9	1.6	2.7	5.6	
Maximum current [A]	3.2	2.8	5.0	8.6	16.7	
Moment of inertia J [$\times 10^{-4}$ kg m ²] ②	standard	0.019	0.032	0.088	0.15	0.60
	with electromagnetic brake	0.025	0.039	0.12	0.18	0.70
Regeneration braking frequency [1/min]	② (a)	② (b)	1570	920	420	
Recommended load/motor inertia ratio	Less than 30 times the servo motors inertia moment ③					
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)					
Structure	Totally enclosed, non-ventilated (protection rating: IP65) ④					
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)				
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)				
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust				
	elevation/vibration ⑤	1000 m or less above sea level; X: 49 m/s ² , Y: 49 m/s ²				
Weight [kg]	standard motor ⑥	0.35	0.56	0.94	1.5	2.9
Order information	(without brake) Art. no.	161515	161516	161517	161518	161519

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- (a)/(b) When a motor decelerates to a stop from the rated speed, the regenerative frequency will not be limited if the effective torque is within the rated torque range. When a motor decelerates to a stop from the maximum speed, the regenerative frequency will not be limited if the load inertia moment is (a) 26-fold (b) 15-fold or less and the effective torque is within the rated torque range.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.



HF-MP Series Servo Motor Torque Characteristics

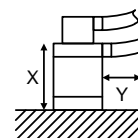


Notes:
 1. — : For 3-phase 200 V AC or 1-phase 230 V AC.
 2. — : For 1-phase 200 V AC.

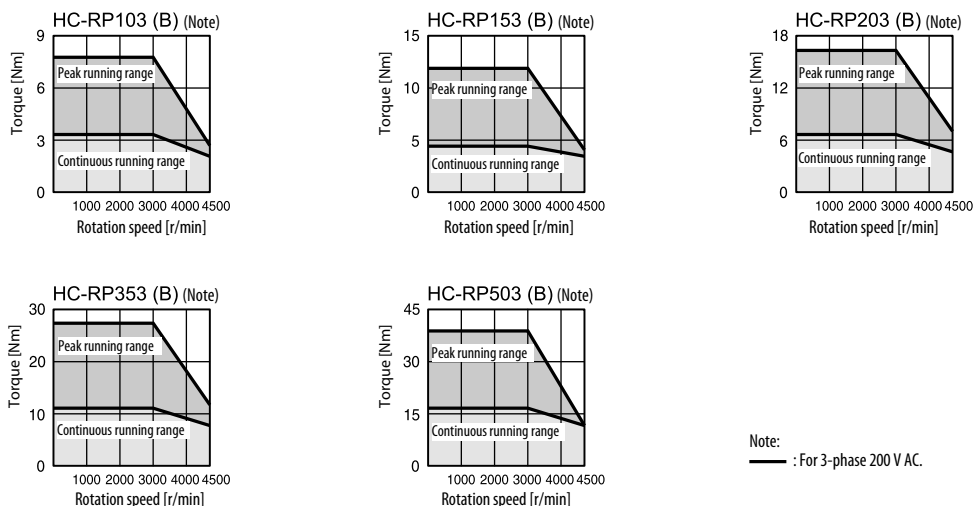
HC-RP(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HC-RP103(B) ⑥	HC-RP153(B) ⑥	HC-RP203(B) ⑥	HC-RP353(B) ⑥	HC-RP503(B) ⑥		
Servo amplifier model	MR-J3-200A/B/T	MR-J3-200A/B/T	MR-J3-350A/B/T	MR-J3-500A/B/T	MR-J3-500A/B/T		
Power facility capacity [kVA] ①	1.7	2.5	3.5	5.5	7.5		
Continuous characteristics	rated output [kW]	1	1.5	2	3.5	5.0	
	rated torque [Nm]	3.18	4.78	6.37	11.1	15.9	
Maximum torque [Nm]	7.95	11.9	15.9	27.9	39.7		
Rated rotation speed [rpm]	3000	3000	3000	3000	3000		
Maximum rotation speed [rpm]	4500	4500	4500	4500	4500		
Permissible instantaneous rotation speed [rpm]	5175	5175	5175	5175	5175		
Power rate at continuous rated torque [kW/s]	67.4	120	176	150	211		
Rated current [A]	6.1	8.8	14	23	28		
Maximum current [A]	18	23	37	58	70		
Regeneration braking frequency [1/min] ②	1090	860	710	174	125		
Moment of inertia J [$\times 10^{-4}$ kg m ²] ②	1.5	1.9	2.3	8.3	12		
Recommended load/motor inertia ratio	Less than 5 times the servo motors inertia moment ③						
Speed/position detector	Resolution per encoder/servo motor rotation: 262144 p/rev (18-bit)						
Structure	Totally enclosed, non-ventilated (protection degree: IP65) ④						
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)					
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)					
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust					
	elevation/ vibration ⑤ ③	1000 m or less above sea level; X: 24.5 m/s ² , Y: 24.5 m/s ²					
Weight [kg]	standard motor ⑥	3.9	5.0	6.2	12	17	
Order information	(without brake)	Art. no.	168667	168668	168669	168670	168671

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table.
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.



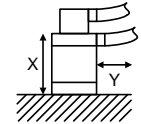
HC-RP Series Servo Motor Torque Characteristics



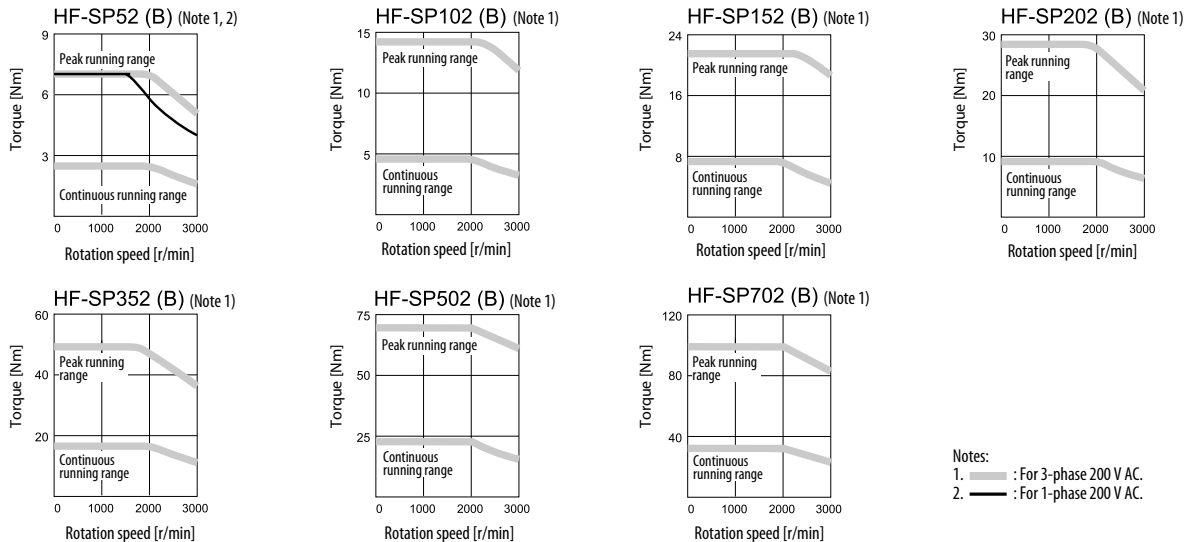
HF-SP(B) Series Servo Motor Specifications (200 V Type)

Servo motor model	HF-SP52(B) ①	HF-SP102(B) ①	HF-SP152(B) ①	HF-SP202(B) ①	HF-SP352(B) ①	HF-SP502(B) ①	HF-SP702(B) ①		
Servo amplifier model	MR-J3-60A/B/T	MR-J3-100A/B/T	MR-J3-200A/B/T	MR-J3-200A/B/T	MR-J3-350A/B/T	MR-J3-500A/B/T	MR-J3-700A/B/T		
Power facility capacity [kVA] ①	1.0	1.7	2.5	3.5	5.5	7.5	10		
Continuous characteristics	rated output [kW]	0.5	1.0	1.5	2.0	3.5	7.0		
	rated torque [Nm]	2.39	4.77	7.16	9.55	16.7	33.4		
Maximum torque [Nm]	7.16	14.3	21.5	28.6	50.1	71.6	100		
Rated rotation speed [rpm]	2000	2000	2000	2000	2000	2000	2000		
Maximum rotation speed [rpm]	3000	3000	3000	3000	3000	3000	3000		
Permissible instantaneous rotation speed [rpm]	3450	3450	3450	3450	3450	3450	3450		
Power rate at continuous rated torque [kW/s]	9.34	19.2	28.8	23.8	37.2	58.8	72.5		
Rated current [A]	2.9	5.3	8.0	10	16	24	33		
Maximum current [A]	8.7	15.9	24	30	48	72	99		
Moment of inertia J [$\times 10^{-4}$ kg m ²] ②	standard	6.1	11.9	17.8	38.3	75.0	154		
	with electromagnetic brake	8.3	14.0	20.0	47.9	84.7	164		
Regeneration braking frequency [1/min]	60	62	152	71	33	37	31		
Recommended load/ motor inertia ratio	Less than 15 times the servo motors inertia moment ③								
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)								
Structure	Totally enclosed, non-ventilated (protection rating: IP67) ④								
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)							
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)							
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust							
	elevation/vibration ⑤	1000 m or less above sea level; X: 24.5 m/s ² , Y: 24.5 m/s ²		1000 m or less above sea level; X: 24.5 m/s ² , Y: 49 m/s ²		1000 m or less above sea level; X: 24.5 m/s ² , Y: 29.4 m/s ²			
Weight [kg]	standard motor ⑥	4.8	6.5	8.3	12	19	22	32	
Order information	(without brake)	Art. no.	161525	161526	161527	161528	161529	161530	161531

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.



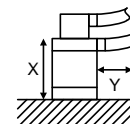
HF-SP Series Servo Motor Torque Characteristics



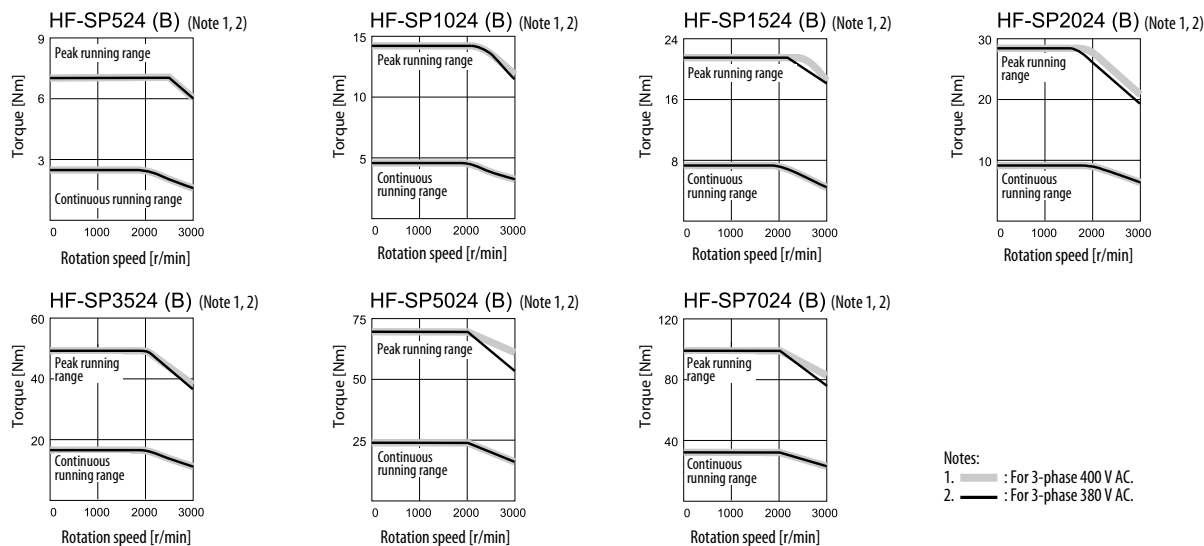
HF-SP(B) Series Servo Motor Specifications (400 V Type)

Servo motor model	HF-SP524(B) ⑥	HF-SP1024(B) ⑥	HF-SP1524(B) ⑥	HF-SP2024(B) ⑥	HF-SP3524(B) ⑥	HF-SP5024(B) ⑥	HF-SP7024(B) ⑥
Servo amplifier model	MR-J3-60A4/B4/T4	MR-J3-100A4/B4/T4	MR-J3-200A4/B4/T4	MR-J3-200A4/B4/T4	MR-J3-350A4/B4/T4	MR-J3-500A4/B4/T4	MR-J3-700A4/B4/T4
Power facility capacity [kVA] ①	1.0	1.7	2.5	3.5	5.5	7.5	10
Continuous characteristics	rated output [kW]	0.5	1.0	1.5	2.0	3.5	7.0
	rated torque [Nm]	2.39	4.77	7.16	9.55	16.7	33.4
Maximum torque [Nm]	7.16	14.3	21.5	28.6	50.1	71.6	100
Rated rotation speed [rpm]	2000	2000	2000	2000	2000	2000	2000
Maximum rotation speed [rpm]	3000	3000	3000	3000	3000	3000	3000
Permissible instantaneous rotation speed [rpm]	3450	3450	3450	3450	3450	3450	3450
Power rate at continuous rated torque [kW/s]	9.34	19.2	28.8	23.8	37.2	58.8	72.5
Rated current [A]	1.5	2.9	4.1	5	8.4	12	16
Maximum current [A]	4.5	8.7	12	15	25	36	48
Moment of inertia J [$\times 10^{-4}$ kg m ²] ②	standard	6.1	11.9	17.8	38.3	75.0	154
	with electromagnetic brake	8.3	14.0	20.0	47.9	84.7	164
Regeneration braking frequency [1/min]	90	46	154	72	37	34	28
Recommended load/ motor inertia ratio	Less than 15 times the servo motors inertia moment ③						
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)						
Structure	Totally enclosed, non-ventilated (protection rating: IP67) ④						
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)					
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)					
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust					
	elevation/vibration ⑤	1000 m or less above sea level; X: 24.5 m/s ² , Y: 24.5 m/s ²		1000 m or less above sea level; X: 24.5 m/s ² , Y: 49 m/s ²		1000 m or less above sea level; X: 24.5 m/s ² , Y: 29.4 m/s ²	
Weight [kg]	standard motor ⑥	4.8	6.7	8.5	13	19	32
	Order information (without brake) Art. no.	192042	192043	192054	192055	192056	192057

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.



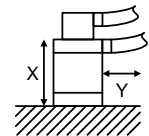
HF-SP Series Servo Motor Torque Characteristics



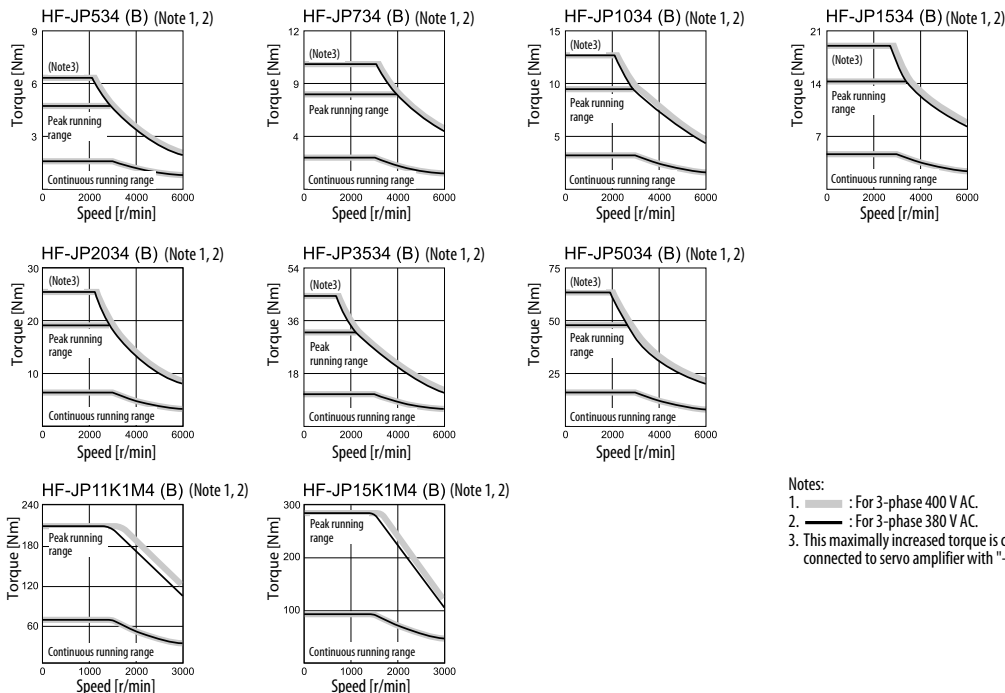
HF-JP(B) Series Servo Motor Specifications (400 V Type)

Servo motor model	HF-JP534(B) ⑥	HF-JP734(B) ⑥	HF-JP1034(B) ⑥	HF-JP1534(B) ⑥	HF-JP2034(B) ⑥	HF-JP3534(B) ⑥	HF-JP5034(B) ⑥	HF-JP11K1M4 (B) ⑥	HF-JP15K1M4 (B) ⑥	
Servo amplifier model	MR-J3-60A4/B4/T4	MR-J3-100A4/B4/T4	MR-J3-100A4/B4/T4	MR-J3-200A4/B4/T4	MR-J3-200A4/B4/T4	MR-J3-350A4/B4/T4	MR-J3-500A4/B4/T4	MR-J3-11KA4/B4/T4-LR	MR-J3-15KA4/B4/T4-LR	
Power facility capacity [kVA] ①	1.0	1.3	1.7	2.5	3.5	5.5	7.5	16	22	
Continuous characteristics ②	rated output [kW]	0.5	0.75	1.0	1.5	2.0	3.3	5.0	11	
	rated torque [Nm]	1.59	2.39	3.18	4.77	6.37	10.5	15.9	70	
Maximum torque [Nm] ②	4.77	7.16	9.55	14.3	19.1	32.0	47.7	210	286	
Rated rotation speed [rpm]	3000	3000	3000	3000	3000	3000	3000	1500	1500	
Maximum rotation speed [rpm]	6000	6000	6000	6000	6000	6000	6000	3000	3000	
Permissible instantaneous rotation speed [rpm]	6900	6900	6900	6900	6900	6900	6900	3450	3450	
Power rate at continuous rated torque [kW/s]	16.7	27.3	38.2	60.2	82.4	83.5	133	223	290	
Rated current [A] ②	1.5	2.8	2.8	5.4	5.4	8.3	14	32	38	
Maximum current [A]	4.5	8.4	8.4	17	17	26	41	100	123	
Moment of inertia J [$\times 10^{-4}$ kg m ²]	standard	1.52	2.09	2.65	3.79	4.92	13.2	19.0	220	
	with electromagnetic brake	2.02	2.59	3.15	4.29	5.42	15.4	21.2	240	
Regenerative braking frequency [1/min] ② ⑦	99	72	56	265	203	75	68	143	162	
Recommended load/motor inertia ratio	Less than 10 times the servo motor's inertia moment ③									
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)									
Structure	Totally enclosed, non-ventilated (protection rating: IP67) ④									
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)								
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)								
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust								
	elevation/vibration ⑤	1000 m or less above sea level; X: 24.5 m/s ² , Y: 24.5 m/s ²								
Weight [kg]	standard motor ⑥	3.0	3.7	4.5	5.9	7.5	13	18	62	86
Order information	(without brake) Art. no.	227015	227016	227017	227018	227019	227020	227021	229565 ⑧	229566 ⑧

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table.
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.
- ⑦ The maximum torque of the HF-JP534(B)–HF-JP5034(B) motors can be increased from 300 % to 400 % by increasing the amplifier capacity by one rank.
- ⑧ The item has longer delivery time. Please contact your Mitsubishi representative.



HF-JP Series Servo Motor Torque Characteristics

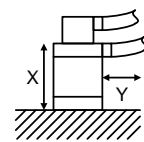


- Notes:
1. : For 3-phase 400 V AC.
 2. : For 3-phase 380 V AC.
 3. This maximally increased torque is calculated value when connected to servo amplifier with "U□".

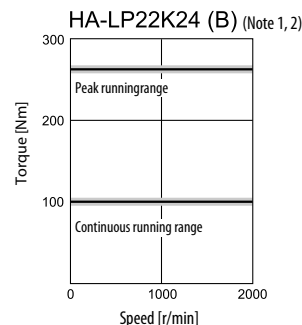
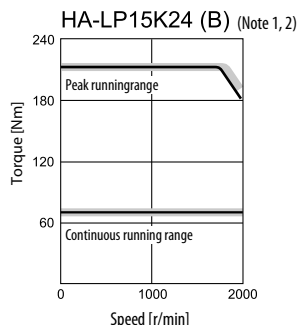
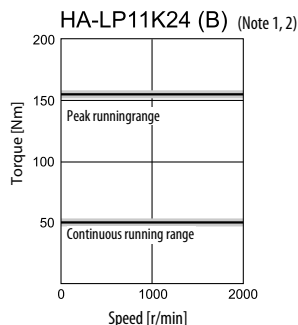
HA-LP(B) Series Servo Motor Specifications (400 V Type)

Servo motor model	HA-LP11K24(B) ⑥	HA-LP15K24(B) ⑥	HA-LP22K24(B) ⑥	
Servo amplifier model	MR-J3-11KA4/B4/T4	MR-J3-15KA4/B4/T4	MR-J3-22KA4/B4/T4	
Power facility capacity [kVA] ①	16	22	33	
Continuous characteristics	rated output [kW]	15	22	
	rated torque [Nm]	52.5	71.6	
Maximum torque [Nm]	158	215	263	
Rated rotation speed [rpm]	2000	2000	2000	
Maximum rotation speed [rpm]	2000	2000	2000	
Permissible instantaneous rotation speed [rpm]	2300	2300	2300	
Power rate at continuous rated torque [kW/s]	263	233	374	
Rated current [A]	32	40	57	
Maximum current [A]	96	120	143	
Moment of inertia J [$\times 10^{-4}$ kg m ²]	standard	105	295	
	with electromagnetic brake	113	293	
Regeneration braking frequency [1/min] ②	186 ⑦	144 ⑦	107 ⑦	
Recommended load/motor inertia ratio	Less than 10 times the servo motor's inertia moment ③			
Speed/position detector	18-bit encoder (resolution per encoder/servo motor rotation: 262144 p/rev.)			
Structure	Totally enclosed, non-ventilated (protection rating: IP44) ④			
Environment	ambient temperature	Operation: 0–40 °C (no freezing); Storage: -15–70 °C (no freezing)		
	ambient humidity	Operation: 80 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)		
	atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust		
	elevation/vibration ⑤	1000 m or less above sea level; X: 11.7 m/s ² , Y: 29.4 m/s ²		
Weight [kg]	standard motor	55	95	
Order information	(without brake) Art. no.	200982 ⑥	200983 ⑥	200984 ⑥

- ① The power facility capacity varies depending on the power supply's impedance.
- ② The regenerative braking frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertia moment divided by the motor inertia moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (operating speed/rated speed). When the operating speed varies frequently or when regeneration is constant (as with vertical feeds), find the regeneration heat generated (W) while operating. The heat should not exceed the tolerable regenerative power (W). Refer to the section "OPTIONS AND PERIPHERAL EQUIPMENT" in this catalog for details on the tolerable regenerative power (W). Optimal regenerative resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.
- ③ Please contact Mitsubishi if the load/motor of inertia moment ratio exceeds the value in the table.
- ④ The shaft-through portion is excluded.
- ⑤ The vibration direction is shown in the right side diagram. The numeric value indicates the maximum value of the component (commonly the bracket on the antiload side). Fretting of the bearing occurs easily when the motor stops, so please maintain vibration to approximately one-half the allowable value.
- ⑥ For servo motors with electromagnetic brake please refer to page 22.
- ⑦ The value is applicable when the external regenerative resistors, GRZG400-□□□ (standard accessory) are used with cooling fans (2 units of 92x92mm, minimum air flow: 1.0 m³/min). Note that change in parameter No. PA02 is required.
- ⑧ The item has longer delivery time. Please contact your Mitsubishi representative.

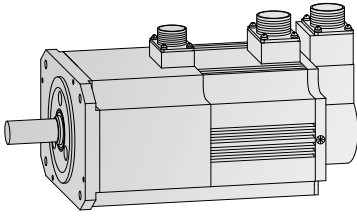


HA-LP Series Servo Motor Torque Characteristics



- Notes:
 1. — : For 3-phase 400 V AC.
 2. — : For 3-phase 380 V AC.

Braked Motor Specifications



For applications requiring the motor shaft to be held in position (e.g. vertical lift applications), all offered motors are available with an electro-

magnetic brake. The wide variety of servo motors allows the user to choose a motor, which suits best according to the task.

Motor model (200 V)	HF-KE□W1-S100				HF-SE□KW1-S100				HF-KP					
	013B	023B	043B	073B	052B	102B	152B	202B	053B	13B	23B	43B	73B	
Type	Spring-loaded safety brake				Spring-loaded safety brake				Spring-loaded safety brake					
Rated voltage	24 V DC				24 V DC				24 V DC					
Static friction torque [Nm]	0.32	1.3	1.3	2.4	8.5	8.5	8.5	44	0.32	0.32	1.3	1.3	2.4	
Rated current at 20 °C [A]	0.26	0.33	0.33	0.42	0.8	0.8	0.8	1.4	0.26	0.26	0.33	0.33	0.42	
Coil resistance at 20 °C [Ω]	91	73	73	57	29	29	29	16.8	91	91	73	73	57	
Power consumption at 20 °C [W]	6.3	7.9	7.9	10	20	20	20	34	6.3	6.3	7.9	7.9	10	
Moment of inertia J [10 ⁻⁴ kg m ²] ^②	0.09	0.31	0.50	1.63	8.3	14	20	47.9	0.054	0.09	0.31	0.50	1.63	
Permissible braking volume [J]/time	5.6	22	22	64	400	400	400	4500	5.6	5.6	22	22	64	
[J]/hour	56	220	220	640	4000	4000	4000	45000	56	56	220	220	640	
Brake life [times] ^③	20000				20000				20000					
Brake volume per brake action [J]	5.6	22	22	64	200	200	200	1000	5.6	5.6	22	22	64	
Weight [kg] ^①	0.86	1.6	2.1	3.9	6.7	8.5	11.0	18.0	0.75	0.86	1.6	2.1	4.0	
Order information	Art. no.	210944	213088	213089	213090	213091	213092	213093	213094	160213	161511	161512	161513	161514

^① Total mass of motor with electromagnetic brake ^② Total moment of inertia of motor with electromagnetic brake ^③ Brake gap cannot be adjusted.

Motor model (200 V)	HF-MP					HC-RP					HF-SP							
	053B	13B	23B	43B	73B	103B	153B	203B	353B	503B	52B	102B	152B	202B	352B	502B	702B	
Type	Spring-loaded safety brake					Spring-loaded safety brake					Spring-loaded safety brake							
Rated voltage	24 V DC					24 V DC					24 V DC							
Static friction torque [Nm]	0.32	0.32	1.3	1.3	2.4	7	7	7	23	23	8.5	8.5	8.5	44	44	44	44	
Rated current at 20 °C [A]	0.26	0.26	0.33	0.33	0.42	0.8	0.8	0.8	0.96	0.96	0.8	0.8	0.8	1.4	1.4	1.4	1.4	
Coil resistance at 20 °C [Ω]	91	91	73	73	57	30	30	30	25	25	29	29	29	16.8	16.8	16.8	16.8	
Power consumption at 20 °C [W]	6.3	6.3	7.9	7.9	10	19	19	19	23	23	20	20	20	34	34	34	34	
Moment of inertia J [10 ⁻⁴ kg m ²] ^②	0.025	0.039	0.12	0.18	0.70	1.85	2.25	2.65	11.8	15.5	8.3	14	20	47.9	84.7	107	164	
Permissible braking volume [J]/time	5.6	5.6	22	22	64	400	400	400	400	400	400	400	400	4500	4500	4500	4500	
[J]/hour	56	56	220	220	640	4000	4000	4000	4000	4000	4000	4000	4000	45000	45000	45000	45000	
Brake life [times] ^③	20000					20000					20000							
Brake volume per brake action [J]	5.6	5.6	22	22	64	200	200	200	200	200	200	200	200	1000	1000	1000	1000	
Weight [kg] ^①	0.75	0.89	1.6	2.1	4.0	6	7	8.3	15	21	7	9	11	18	25	29	38	
Order information	Art. no.	161520	161521	161522	161523	161524	168644	168645	168664	168665	168666	161532	161533	161534	161535	161536	161537	161538

^① Total mass of motor with electromagnetic brake ^② Total moment of inertia of motor with electromagnetic brake ^③ Brake gap cannot be adjusted.

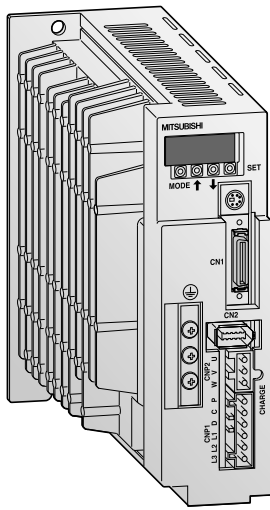
Motor model (400 V)	HF-SP							HF-JP									
	524B	1024B	1524B	2024B	3524B	5024B	7024B	534B	734B	1034B	1534B	2034B	3534B	5034B	11K1M4B	15K1M4B	
Type	Spring-loaded safety brake							Spring-loaded safety brake									
Rated voltage	24 V DC							24 V DC									
Static friction torque [Nm]	8.5	8.5	8.5	44	44	44	44	6.6	6.6	6.6	6.6	6.6	16	16	127	127	
Rated current at 20 °C [A]	0.8	0.8	0.8	1.4	1.4	1.4	1.4	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.3	1.3	
Coil resistance at 20 °C [Ω]	29	29	29	16.8	16.8	16.8	16.8	49	49	49	49	49	25	25	18	18	
Power consumption at 20 °C [W]	20	20	20	34	34	34	34	11.7	11.7	11.7	11.7	11.7	23	23	32	32	
Moment of inertia J [10^{-4} kg m ²] ^②	8.3	14	20	47.9	84.7	107	164	2.02	2.59	3.15	4.29	5.42	15.4	21.2	240	336	
Permissible braking volume	[J]/time		[J]/hour		[J]/time		[J]/hour		[J]/time		[J]/hour		[J]/time		[J]/hour		
	400	400	400	4500	4500	4500	4500	64	64	64	64	64	400	400	5000	5000	
	4000	4000	4000	45000	45000	45000	45000	640	640	640	640	640	4000	4000	45200	45200	
Brake life [times] ^③	20000							5000									
Brake volume per brake action [J]	200	200	200	1000	1000	1000	1000	64	64	64	64	64	400	400	400	400	
Weight [kg] ^①	7	9	11	18	25	29	38	4.4	5.1	5.9	7.3	8.9	15	20	74	97	
Order information	Art. no.	200975	200976	200977	200978	200979	200980	200981	227022	227023	227024	227025	227026	227027	227028	229569 ^④	229570 ^④

- ^① Total mass of motor with electromagnetic brake ^② Total moment of inertia of motor with electromagnetic brake ^③ Brake gap cannot be adjusted.
^④ The item has longer delivery time. Please contact your Mitsubishi representative.

Motor model (400 V)	HA-LP			
	11K24B	15K24B	22K24B	
Type	Spring-loaded safety brake			
Rated voltage	24 V DC			
Static friction torque [Nm]	82	160.5	160.5	
Rated current at 20 °C [A]	1.3	1.9	1.9	
Coil resistance at 20 °C [Ω]	19	13	13	
Power consumption at 20 °C [W]	30	46	46	
Moment of inertia J [10^{-4} kg m ²] ^②	113	293	369	
Permissible braking volume	[J]/time		[J]/hour	
	3000	5000	5000	
	30000	50000	50000	
Brake life [times] ^③	20000			
Brake volume per brake action [J]	1000	3000	3000	
Weight [kg] ^①	70	130	150	
Order information	Art. no.	200985 ^④	200986 ^④	200987 ^④

- ^① Total mass of motor with electromagnetic brake ^② Total moment of inertia of motor with electromagnetic brake
^③ Brake gap cannot be adjusted. ^④ The item has longer delivery time. Please contact your Mitsubishi representative.

MR-ES Servo Amplifier Specifications



The servo amplifier of the series ME-E Super combines unique functions with very compact dimensions. With its high positioning accuracy and high responsiveness the MR-E Super is suitable for applications from 100 W to 2 kW. Available functions of the drive are e.g. position/internal speed control mode, speed/torque control mode and Mitsubishi's well known real-time auto-tuning. The compact size helps designers, to fit all control components needed for an automation system into the smallest space.

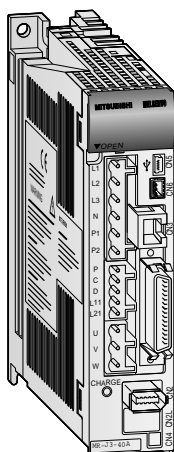
For a fast, easy and secure wiring all connectors are located on the front of the servo amplifier. The powerful software package SETUP154E makes set up and diagnostics of the system quick and comfortable.

Servo amplifier MR-E-A/AG ^①	10A 10AG	20A 20AG	40A 40AG	70A 70AG	100A 100AG	200A 200AG
Power supply	3phase 200–230 V AC, 50/60 Hz; 1phase 200–230 V AC, 50/60 Hz				3phase 200–230 V AC, 50/60 Hz	
Control system	Sinusoidal PWM control/current control system					
Dynamic brake	Built-in					
Protective functions	Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection					
Structure/protection	Self-cooling, open (IP00); 200A/AG fan-cooling, open (IP00)					
Environment	ambient temperature					
	ambient humidity					
	others					
Weight	kg	0.7	0.7	1.1	1.7	2.0
Dimensions (WxHxD)	mm	50x168x135	50x168x135	70x168x135	70x168x190	70x168x195
Order information						
A type	Art. no.	213069	213070	213071	213072	213073
AG type	Art. no.	213075	213076	213077	213078	213079

^① Type A: pulse train interface, type AG: analog input interface

Servo amplifier		MR-E-A	MR-E-AG
Position control mode	max. input pulse frequency	1 Mpps (differential receiver), 200 kpps (open collector)	—
	positioning feedback pulse	131072 pulses per servo motor rotation	—
	torque limit	Set by parameters	—
Speed control mode	control range	Internal speed command 1:5000	Analog speed command 1:2000, internal speed command 1:5000
	fluctuation rate	±0.01 % max. (load fluctuation 0–100 %)	±0.01 % max. (load fluctuation 0–100 %)
	torque limit	Set by parameters	Set by parameters or external analog input (0 to ±10 V DC/max. torque)
Torque control mode	command input	—	0 to ±8 V DC/max. torque
	speed limit	—	Set by parameters or external analog input (0 to ±10 V DC/rated speed)

MR-J3 Servo Amplifier Specifications (200 V Type)



The **MR-J3-A** are general purpose servo amplifiers with analog inputs and pulse train interface as a standard. The range covers 100 W units (MR-J3-10A) up to 7 kW (MR-J3-700A).

The **MR-J3-B** (SSCNET III bus type) servo amplifiers are designed for use with the Mitsubishi motion controllers of the MELSEC System Q series. The motion controllers and servo amplifiers can be linked via the high speed SSCNET III network.

Connecting the amplifiers to SSCNET III guarantees reliable operation and eliminates the need for complex wiring.

The range also covers 100 W units (MR-J3-10B) up to 7 kW (MR-J3-700B). MR-J3-A/B servo amplifiers of increased capacity (up to 55 kW) are available on request only.

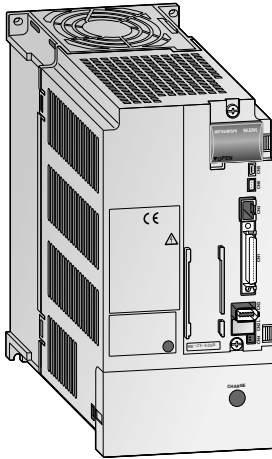
Common specifications MR-J3-A/B		10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B	
Power supply	voltage/frequency ^①	3-phase 200–230 V AC, 50/60 Hz; 1-phase 230 V AC, 50/60 Hz					3-phase 200–230 V AC, 50/60 Hz					
	permissible voltage fluctuation	3-phase 200–230 V AC: 170–253 V AC, 1-phase 230 V AC: 207–253 V AC					3-phase 170–253 V AC					
	permissible frequency fluctuation	± 5 %										
Control system		Sinusoidal PWM control/current control system										
Dynamic brake		Built-in										
Speed frequency response		900Hz										
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.										
Structure		Self-cooling, open (IP00)					Fan-cooling, open (IP00)					
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: –20–65 °C (no freezing)										
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)										
	atmosphere	Inside control panel; no corrosive gas, no flammable gas, no oil mist, no dust										
	elevation	1000 m or less above sea level										
	oscillation	5.9 m/s ² (0.6 G) max.										
Weight	kg	0.8	0.8	1.0	1.0	1.4	1.4	2.3	2.3	4.6	6.2	
Dimensions (WxHxD)	mm	40x168x135	40x168x135	40x168x170	40x168x170	60x168x185	60x168x185	90x168x195	90x168x195	130x250x200	172x300x200	
Order information												
A type	Art. no.	160210	161485	161486	161487	161488	161489	161490	161491	161492	161493	
B type	Art. no.	161497	161498	161499	161500	161501	161502	161503	161504	161505	161506	

^① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

Control specifications MR-J3-A		10A	20A	40A	60A	70A	100A	200A	350A	500A	700A	
Position control mode	maximum input pulse frequency	1000 kpps (when using differential receiver), 200 kpps (when using open collector)										
	positioning feedback pulse	Resolution per encoder/servo motor rotation (262144 pulses/revolution)										
	command pulse multiple	Electronic gear A/B multiple; A: 1–1048576, B: 1–1048576, 1/10 < A/B < 2000										
	positioning complete width setting	0 – ±10000 Impulse (command pulse unit)										
	excess error	±3 rotations (position control)										
Speed control mode	torque limit input	Set by parameters or external analog input (0–+ 10 V DC/maximum torque)										
	speed control range	Analog speed command 1:2000, internal speed command 1:5000										
	analog speed command input	0–± 10 V DC/rated speed										
	speed fluctuation rate	±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command										
Torque control specifications	torque limit	Set by parameters or external analog input (0–+ 10 V DC/maximum torque)										
	torque command input	0–±8 V DC/maximum torque (input impedance 10–12 kΩ)										
	speed limit	Set by parameters or external analog input (0–± 10 V DC, rated speed)										

Control specifications MR-J3-B (SSCNET III)		10B	20B	40B	60B	70B	100B	200B	350B	500B	700B	
Position and speed control		SSCNET III control										
Communication speed		50 Mbps										

MR-J3 Servo Amplifier Specifications (400 V Type)



Mitsubishi's 400 V range of servo amplifiers provides the same industry leading functionality as the 200 V range.

The 400 V servo amplifiers are available over a wide range from 600 W rating to the very powerful 55 kW rating. Suitable for all types of automation solutions, the 400 V servo amplifiers also provide sink/source logic selectability.

For amplifiers larger than 22 kW please contact your nearest Mitsubishi representative.

MR-J3-A/B servo amplifiers of increased capacity (up to 55 kW) are available on request only.

Common specifications MR-J3-A4/B4		60A4 60B4	100A4 100B4	200A4 200B4	350A4 350B4	500A4 500B4	700A4 700B4	11KA4(-LR) 11KB4(-LR)	15KA4(-LR) 15KB4(-LR)	22KA4 22KB4	
Power supply	voltage/frequency ^①	3-phase 380–480 V AC, 50/60 Hz ^②									
	permissible voltage fluctuation	3-phase 323–528 V AC, 50/60 Hz									
	permissible frequency fluctuation	± 5 % max.									
Control system		Sinusoidal PWM control/current control system									
Dynamic brake		Built-in							External option		
Speed frequency response		900 Hz									
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection.									
Structure		Self-cooling, open (IP00)				Fan cooling					
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: –20–65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrosive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s ² (0.6 G) max.									
Weight	kg	1.7	1.7	2.1	4.6	4.6	6.2	18	18	19	
Dimensions (WxHxD)	mm	90x168x195	90x168x195	90x168x195	130x250x200	130x250x200	180x350x200	260x400x260	260x400x260	260x400x260	
Order information											
A type	Art. no.	205081	205082	205083	205084	205085	205086	210572 (229577) ^③	210573 (229578) ^③	210574 ^③	
B type	Art. no.	192036	192037	192038	192039	192040	192041	208820 (229579) ^③	208821 (229580) ^③	208822 ^③	

^① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed.

Output and speed cannot be guaranteed when the power supply voltage is less than specified.

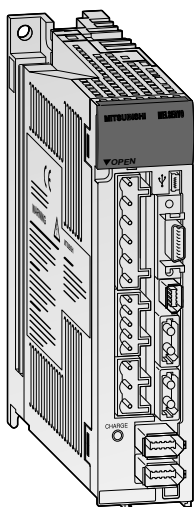
^② For torque characteristics when combined with a servo motor manual.

^③ The item has longer delivery time. Please contact your Mitsubishi representative.

Control specifications MR-J3-A4		60A4	100A4	200A4	350A4	500A4	700A4	11KA4	15KA4	22KA4
Position control mode	maximum input pulse frequency	1 Mpps (when using differential receiver), 200 kpps (when using open collector)								
	positioning feedback pulse	Resolution per encoder/servo motor rotation (262144 pulses/revolution)								
	command pulse multiple	Electronic gear A/B multiple; A: 1–1048576 or 131072, B: 1–1048576, 1/10 < A/B < 2000								
	positioning complete width setting	0–±10000 Impulse (command pulse unit)								
	excess error	±3 rotations (position control)								
Speed control mode	torque limit input	Set by parameters or external analog input (0–+10 V DC/maximum torque)								
	speed control range	Analog speed command 1:2000, internal speed command 1:5000								
	analog speed command input	0–±10 V DC/rated speed								
	speed fluctuation rate	±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command								
Torque control specifications	torque limit	Set by parameters or external analog input (0–+10 V DC/maximum torque)								
	torque command input	0–±8 V DC/maximum torque (input impedance 10–12 kΩ)								
	speed limit	Set by parameters or external analog input (0–+10 V DC, rated speed)								

Control specifications MR-J3-B4 (SSCNET III)		60B4	100B4	200B4	350B4	500B4	700B4	11KB4	15KB4	22KB4
Position and speed control		SSCNET III control								
Communication speed		50 Mbps								

MR-J3-BSafety Servo Amplifier Specifications (200 V Type)



The MR-J3-BSafety servo amplifiers offer among the standard functions of the MR-J3-B, additional safety functions for a comprehensive protection of machinery and workers. In combination with the Safety Option Card MR-J3-D05, these devices represent a perfect safety solution. MR-J3-BSafety and MR-J3-D05 are certified according IEC/EN 61508 SIL 2, EN 62061 SIL CL2 and EN ISO 13849-1 PL d (Category 3).

The servo amplifier MR-J3-BSafety itself offers the Safety function "Safe Torque Off" (STO) according EN 61800-5-2.

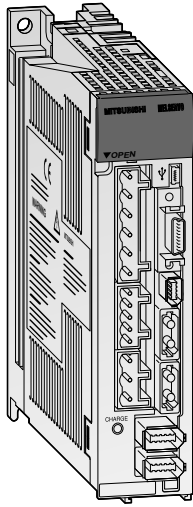
This "Safe Torque Off" function disconnects the power from the motor and prevents an unexpected re-start. Thereupon the motor coasts to a halt. Compared to the traditional technology with contactors, this integrated Safety function reduces the effort in hardware, wiring and maintenance and offers higher performance and lifetime.

Common specifications MR-J3-BSafety		10BS	20BS	40BS	60BS	70BS	100BS	200BS	350BS	500BS	700BS
Power supply	voltage/frequency	3-phase 200–230 V AC, 50/60 Hz; 1-phase 230 V AC, 50/60 Hz					3-phase 200–230 V AC, 50/60 Hz				
	permissible voltage fluctuation	3-phase 200–230 V AC: 170–253 V AC, 1-phase 230 V AC: 207–253 V AC					3-phase 170–253 V AC				
	permissible frequency fluctuation	± 5 %									
Control system	Sinusoidal PWM control/current control system										
Dynamic brake	Built-in										
Speed frequency response	900 Hz										
Protective functions	Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.										
Structure	Self-cooling, open (IP00)					Fan-cooling, open (IP00)					
Environment	ambient temperature	Operation: 0–55 °C (no freezing) ①, storage: –20–65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrosive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s ² (0.6 G) max.									
Position and speed control	Possible using SSCNET III control										
Communication speed	50 Mbps										
Standards	CE (LVD: EN50178, EMC: EN61800-3), UL: UL508C										
Weight	kg	0.8	0.8	1.0	1.0	1.4	1.4	2.1	2.3	4.6	6.2
Dimensions (WxHxD)	mm	40x168x135	40x168x135	40x168x170	40x168x170	60x168x185	60x168x185	90x168x195	90x168x195	130x250x200	172x300x200
Order information	Art. no.	229316	229317	229318	229319	227373	227374	227485	229320	229321	229322

① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

Safety specifications MR-J3-BSafety	MR-J3-□S
Safety standards	EN ISO 13849-1 PL d/EN 61508 SIL 2/EN 62061 SIL CL 2
MTTFd Expectation of the average time for a dangerous failure to occur	100 years
DC Diagnostic Coverage (DC) is the effectiveness of fault monitoring of a system or subsystem	90 %
PFH Average probability of dangerous failure taking place during one (1) hour	1.01x10 ⁻⁷ 1/h
Response time	8 ms or less for Safe Torque Off (STO)

MR-J3-BSafety Servo Amplifier Specifications (400 V Type)



Mitsubishi's 400 V range of safety servo amplifiers provides the same industry leading functionality as the 200 V range. The 400 V safety servo amplifiers are available over a wide range from 600 W rating to the powerful 7 kW rating. Suitable for all types of automation solutions, the 400 V safety servo amplifiers also

provide sink/source logic selectability, safety functions and can be connected to the Safety Option Card MR-J3-D05. For amplifiers larger than 7 kW please contact your nearest Mitsubishi office.

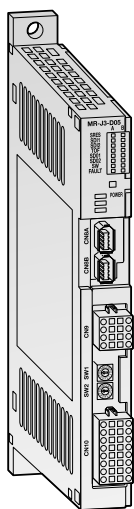
Common specifications MR-J3-BSafety		60BS4	100BS4	200BS4	350BS4	500BS4	700BS4	11KBS4	15KBS4	22KBS4
Power supply	voltage/frequency	3-phase 380–480 V AC, 50/60 Hz								
	permissible voltage fluctuation	3-phase 323–528 V AC, 50/60 Hz								
	permissible frequency fluctuation	± 5 % max.								
Control system		Sinusoidal PWM control/current control system								
Dynamic brake		Built-in							External option	
Speed frequency response		900 Hz								
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.								
Structure		Self-cooling, open (IP00)			Fan cooling (IP00)					
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: –20–65 °C (no freezing)								
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)								
	atmosphere	Inside control panel; no corrosive gas, no flammable gas, no oil mist, no dust								
	elevation	1000 m or less above sea level								
	oscillation	5.9 m/s ² (0.6 G) max.								
Position and speed control		Possible using SSCNET III control								
Communication speed		50 Mbps								
Standards		CE (LVD: EN50178, EMC: EN61800-3) UL: UL508C								
Weight	kg	1.7	1.7	2.1	4.6	4.6	6.2	18	18	19
Dimensions (WxHxD)	mm	60x168x195	60x168x195	90x168x195	130x250x200	130x250x200	172x300x200	260x400x260	260x400x260	260x400x260
Order information	Art. no.	229328	229329	229330	229331	229332	229333	229334 ^②	229335 ^②	229336 ^②

① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

② The item has longer delivery time. Please contact your Mitsubishi representative.

Safety specifications MR-J3-BSafety	MR-J3-□S4
Safety standards	EN ISO 13849-1 PL d/EN 61508 SIL 2/EN 62061 SIL CL 2
MTTFd Expectation of the average time for a dangerous failure to occur	100 years
DC Diagnostic Coverage (DC) is the effectiveness of fault monitoring of a system or subsystem	90 %
PFH Average probability of dangerous failure taking place during one (1) hour	1.01x10 ⁻⁷ 1/h
Response time	8 ms or less for Safe Torque Off (STO)

MR-J3-D05 Safety Logic Unit



The function of the Safety Option Card MR-J3-D05 can be compared with a programmable Safety relay. In combination with MR-J3-BSafety additional Safety functions according EN 61800-5-2 and additional Emergency Stop functions according EN IEC 60204-1 are available. Among "Safe Torque Off" (STO) also "Safe Stop" (SS1) is possible.

With SS1 the connected motor will be stopped "by control" in a fixed time. When the minimum speed is reached, the Safety function STO will be activated preventing the re-start of the motor by disconnecting the motor power supply.

Emergency Stop functions like EMG OFF (Emergency Off) and EMG STOP (Emergency Stop) according EN IEC 60204-1 can be realised with an appropriate wiring. One unit of MR-J3-D05 supports save operation of 2 axes.

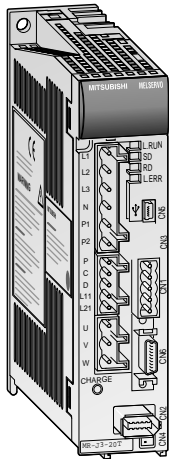
Common specifications		MR-J3-D05
Control power supply	voltage /frequency	24 V DC
	permissible voltage fluctuation	24 V DC 10 %
	power supply capacity	500 mA ^① ^②
Connectable axes		2 axes, independtly controlled
Shut-off input (Safety devices)		4 points (2 points x 2 axis), source/sink logic compatible
Shut-off release input (restart devices)		2 points (1 points x 2 axis), source/sink logic compatible
Response time		20 ms or less for Safe Torque Off (STO)
Delay time setting		0 s, 1.4 s, 2.8 s, 9.8 s, 30.8 s, w2 % (additional for axis A: 5.6 s)
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: –20–65 °C (no freezing)
	ambient humidity	Operation: 90 % RH or less (no condensation), storage: 90 % RH or less (no condensation)
	atmosphere	Inside control panel; no corrosive gas, no flammable gas, no oil mist, no dust
	elevation	1000 m or less above sea level
	oscillation	5.9 m/s ² or less at 10 to 55Hz (directions of X, Y and Z axes)
Weight	kg	0.15
Dimensions (WxHxD)	mm	22.5x192x86
Order information		Art. no. 227486

^① Inrush current of approximately 1.5mA flow instantaneously when turning the control power supply on. Select an appropriate power supply considering the inrush current.

^② Number of turning the power on is 100000.

Safety specifications	MR-J3-D05
Safety functions	<ul style="list-style-type: none"> ● Safe Torque Off (STO) acc. to EN IEC 61800-5-2 ● Safe Stop 1 (SS1) acc. to EN IEC 61800-5-2 ● EMG STOP, EMG OFF acc. to EN IEC 60204-1
Response time	10 ms or less for Safe Torque Off (STO)
Safety standards	EN ISO 13849-1 PL d/EN 61508 SIL 2/EN 62061 SIL CL 2
MTTFd Expectation of the average time for a dangerous failure to occur	100 years
DC Diagnostic Coverage (DC) is the effectiveness of fault monitoring of a system or subsystem	90 %
PFH Average probability of dangerous failure taking place during one (1) hour	1.01x10 ⁻⁷ 1/h
Delay time setting	0s, 1.4 s, 2.8 s, 9.8 s, 30.8 s, ±2 % (additional for axis A: 5.6 s)

MR-J3-T Servo Amplifier Specifications



The MR-J3-T servo amplifiers are a further development of MR-J3-A. In addition to the features of the MELSERVO series these amplifiers have an integrated positioning controller for one axis.

Point to point positioning operation can be performed just by setting position data (target positions), servo motor speeds, and acceleration/ deceleration time constant, etc. in the point tables as if setting them in parameters. An additional highlight of the servo amplifier MR-J3-T is the **"turret function"**. Main focus of this function is positioning on different stations, which are equally placed on a circle. Typical applications are:

- Tool changer
- Rotary table systems

CC-Link interface can be also used for transmitting positioning data to the amplifier without using the internal point table. Hence centralised data management inside of a machine control can be realised, too.

For simple servo application without any fieldbus components internal point table entries can be activated by serial RS-422 communication.

The table below provides an overview of all the MR-J3-T servo amplifiers and their special features.

MR-J3-T (200 V type)		10T	20T	40T	60T	70T	100T	200T	350T	500T	700T	
Main circuit power supply	voltage/frequency ^①	3-phase 200–230 V AC, 50/60 Hz; 1-phase 230 V AC, 50/60 Hz					3-phase 200–230 V AC, 50/60 Hz					
	perm. voltage fluctuation	3-phase 200–230 V AC: 170–253 V AC, 1-phase 230 V AC: 207–253 V AC					3-phase 170–253 V AC					
	perm. frequency fluctuation	± 5 %										
Control circuit power supply	voltage/frequency	1-phase 200–230 V AC, 50/60 Hz,					1-phase 200–230 V AC, 50/60 Hz					
	perm. voltage fluctuation	1-phase 170–253 V AC, 50/60 Hz										
	perm. frequency fluctuation	± 5 %										
Regenerative brake resistor/ tolerable regenerative power [W] ^②		—	10	10	10	20	20	100	100	130	170	
Weight [kg]		0.8	0.8	1.0	1.0	1.4	1.4	2.3	2.3	4.6	6.2	
Order information		Art. no.	190647	190648	190649	190650	190651	190652	190653	190654	190655	190656

MR-J3-T (400 V type)		60T4	100T4	200T4	350T4	500T4	700T4	11KT4	15KT4	22KT4	
Main circuit power supply	voltage/frequency ^①	3-phase 380–480 V AC, 50/60 Hz									
	perm. voltage fluctuation	3-phase 323–528 V AC									
	perm. frequency fluctuation	± 5 %									
Control circuit power supply	voltage/frequency	1-phase 380–480 V AC, 50/60 Hz									
	perm. voltage fluctuation	1-phase 323–528 V AC, 50/60 Hz									
	perm. frequency fluctuation	± 5 %									
Regenerative brake resistor/ tolerable regenerative power [W] ^②		15	15	100	100	130 ^⑥	170 ^⑥	—	—	—	
Weight [kg]		1.7	1.7	2.1	4.6	4.6	6.2	18	18	19	
Order information		Art. no.	212524	212525	212526	212527	212528	212529	225237 ^⑦	225238 ^⑦	225239 ^⑦

MR-J3-D01 Specifications	
Power supply for interface	24 V DC ± 10% (required current capacity: 0.8 A) ^⑧ ^⑨
Digital input	30 points, photocoupler insulation, sink/source compatible
Digital output	16 points, photocoupler insulation, sink/source compatible
Analog input	2ch, 0–±10 V DC (input impedance: 10–12 kΩ)
Analog output	2ch, 0–±12 V DC
Order information	Art. no. 190657

MR-J3-T General specifications	
Interface power supply	24 V DC ± 10 % (required current capacity: 150 mA) ^③
Control system	Sine-wave PWM control, current control system
Dynamic brake	Built-in ^④
Protective functions	Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder error protection, regenerative brake error protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection
Cooling/protection	MR-J3-10T–60T; MR-J3-60T4–MR-J3-100T4: Self-cooling, open (IP00); MR-J3-70T–700T, MR-J3-200T4–700T4: Fan cooling, open (IP00)
Environment	ambient temperature ^⑤
	ambient humidity
	atmosphere
	elevation
	vibration

^① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Torque and speed cannot be guaranteed when the power supply voltage is less than specified.

^② Optimal brake resistor varies for each system. Select the most suitable regenerative resistor by using the capacity selection software.

^③ 150 mA is the value when all of the input/output points are used. The current capacity can be stepped down according to the number of input/output points in use. Refer to the MR-J3 servo instruction manual for details.

^④ Special specification models without a dynamic brake are available on request.

^⑤ The MR-J3-350T or smaller servo amplifier can be installed closely. In this case, keep the ambient temperature within 0 to 40 °C or use the servo amplifier with 75 % or less of the effective load rate.

^⑥ The amplifier built-in resistor is compatible with the maximum torque deceleration when the motor is used within the rated speed and the recommended load/motor inertia moment ratio.

^⑦ The item has longer delivery time. Please contact your Mitsubishi representative.

^⑧ 0.8 A is the value when all of the input/output points are used. The current capacity can be stepped down according to the number of input/output points in use. Refer to "MR-J3-MT MR-J3-D01 SERVO AMPLIFIER INSTRUCTION MANUAL" for details.

^⑨ A 24 VDC power supply for input/output signals can be shared by the servo amplifier and MR-J3-D01. In this case, secure the power supply capacity corresponding to the points of the input/output signals to be used.

Overview of MR-J3-T Commands and Operation Modes

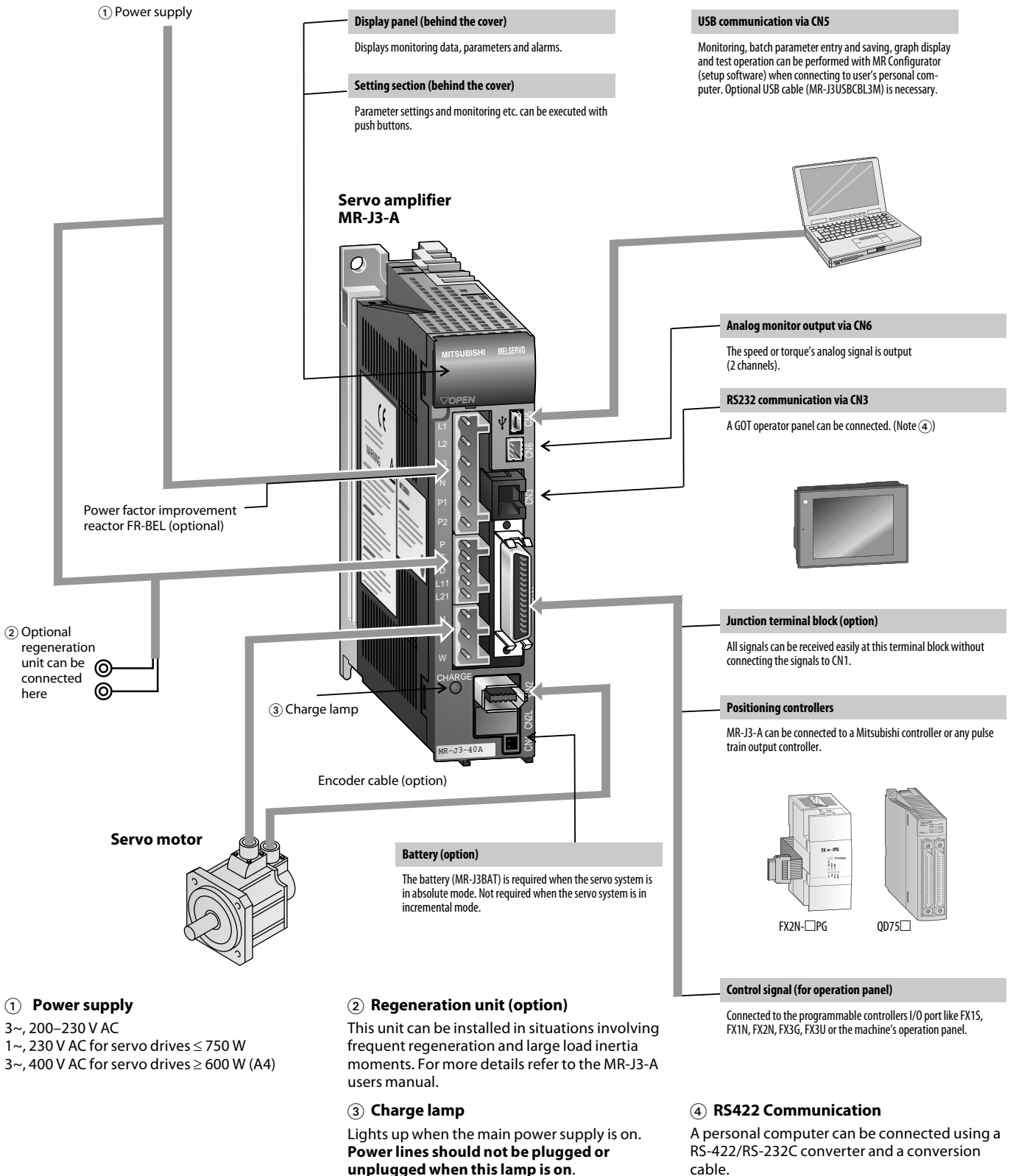
Servo amplifier model MR-J3-T		
Command interface	CC-Link communication (Ver.1.10), DIO command (extension IO unit MR-J3-D01 is required) or RS-422 communication	
Command control	Remote register	Possible with CC-Link communication when 2 stations are occupied. Position command input: position command data is set with the remote register; Feed length input setting range at 1 point: ± 1 [μm] to ± 999.999 [mm]; Speed command input: speed command data (rotating speed) is set with the remote register.
	Point table no. input	Possible with CC-Link communication, DIO command or RS-422 communication. CC-Link communication (when 1 station occupied): 31 points; CC-Link communication (when 2 stations occupied): 255 points; DIO command: 255 points (extension IO unit MR-J3-D01 is required.); RS-422 communication: 255 points; Position command input: selects from the point table; Feed length input setting range at 1 point: ± 1 [μm] to ± 999.999 [mm]; Speed command input: selects speed and acceleration/deceleration time constant from the point table.
	Station position command input	Possible with CC-Link communication, DIO command or RS-422 communication. CC-Link communication (when 1 station occupied): 31 stations; CC-Link communication (when 2 stations occupied): 255 stations; DIO command: 255 stations (extension IO unit MR-J3-D01 is required.); RS-422 communication: 255 stations
	Speed command input with remote register	Possible with CC-Link communication when 2 stations occupied. Sets speed command data (rotating speed) with the remote register.
	Speed command input with speed no. input	Selects speed and acceleration/deceleration time constant from the point table.
Automatic operation mode	Point table	Point table no. input or point table data input system. Each positioning operation based on position and speed data. Speed changing operation (2 to 255 speeds). Automatic continuous positioning operation (2 to 255 points). Roll feed display is selectable. Clearing droop pulses with the clear (CR) signal is settable.
	Rotating direction specified	Positions to the specified station. Rotating direction is settable.
	Shortest rotating direction	Positions to the specified station. Shorter rotating direction from the current point is selected.
Manual operation mode	JOG operation	Inches upon contact input, CC-Link communication or RS-422 communication based on speed data set by a parameter
	Index JOG operation	Rotates in a direction specified by rotating direction evaluation when the start signal (ST1) turns ON. Positions to a nearest station where deceleration to a stop is possible when the start signal (ST1) turns OFF.
	Manual pulse generator	Manual feed with the manual pulse generator. Command pulse multiplication: 1, 10, 100 is selectable with parameter
Manual home position return mode	DOG type	Home position return is made starting with Z-phase pulse after passage of proximity dog. Home position address may be set. Direction for return to home position selectable. Home position shift amount and home position address settable. Automatic retreat on dog back to home position and automatic stroke retreat function.
	Count type	Home position return is made by counting encoder pulses after contact with proximity dog. Direction for return to home position selectable. Home position shift amount and home position address settable. Automatic retreat on dog back to home position and automatic stroke retreat function.
	Data setting type	Returns to home position without dog. Sets any position as home position using manual operation, etc. Home position address settable.
	Stopper type	Returns to home position upon hitting end of stroke. Direction for return to home position selectable. Home position address settable.
	Home position ignorance	Position where servo-on (SON) is switched on is defined as home position. Home position address may be set.
	Dog type rear end reference	Home position return is made with respect to the rear end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return, Automatic stroke return function
	Count type front end reference	Home position return is made with respect to the front end of a proximity dog. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return, Automatic stroke return function
	Dog cradle type	Home position return is made with respect to the front end of a proximity dog by the first Z-phase pulse. Home position address may be set. Home position shift value may be set. Home position return direction may be set. Automatic at-dog home position return, Automatic stroke return function
	Dog type adjacent Z-phase reference	Returns to home position upon the Z-phase pulse right before a near-point dog with respect to the front end of a near-point dog. Direction for return to home position selectable. Home position shift amount and home position address settable. Automatic retreat on dog back to home position and automatic stroke retreat function.
	Dog type front end reference	Returns to home position to the front end of a point dog with respect to the front end of a near-point dog. Direction for return to home position selectable. Home position shift amount and home position address settable. Automatic retreat on dog back to home position and automatic stroke retreat function.
	Dog less Z-phase reference	Returns to home position to the first Z-phase pulse with respect to the first Z-phase pulse. Direction for return to home position selectable. Home position shift amount and home position address settable
	Dog type torque limit	Returns to home position upon Z-phase pulse count after passing through near-point dog. Direction for return to home position selectable. Home position shift amount and home position address settable. Automatic retreat on dog back to home position and automatic stroke retreat function. Torque limit settable.
	Data set type torque limit	Returns to home position without dog. Sets any position as home position by manual movement. Home position address and torque limit settable.
	Automatic positioning to home position function	High-speed automatic positioning to a defined home position

MR-J3-A Servo Amplifier Connections with Peripheral Equipment

Peripheral equipment is connected to the MR-J3-A as shown below. To ensure fast, efficient configuration and reliable operation

always use only the connecting cables, expansion options and other accessories supplied or recommended by Mitsubishi.

A complete overview with detailed specifications of all cables and accessories can be found in the next chapter.



MR-J3-B Servo Amplifier Connections with Peripheral Equipment

Peripheral equipment is connected to the MR-J3-B as shown below. Connectors, cables, options, and other necessary equipment are available so that users can set up MR-J3-B easily and begin using it right away.

Through its SSCNET III-compatible simple connections (optical fibre bus, 50 Mbps), the MR-J3-B series reduce wiring time and chances of wiring errors.

A complete overview with detailed specifications of all cables and accessories can be found in the next chapter.

Motion Controller MELSEC System Q:

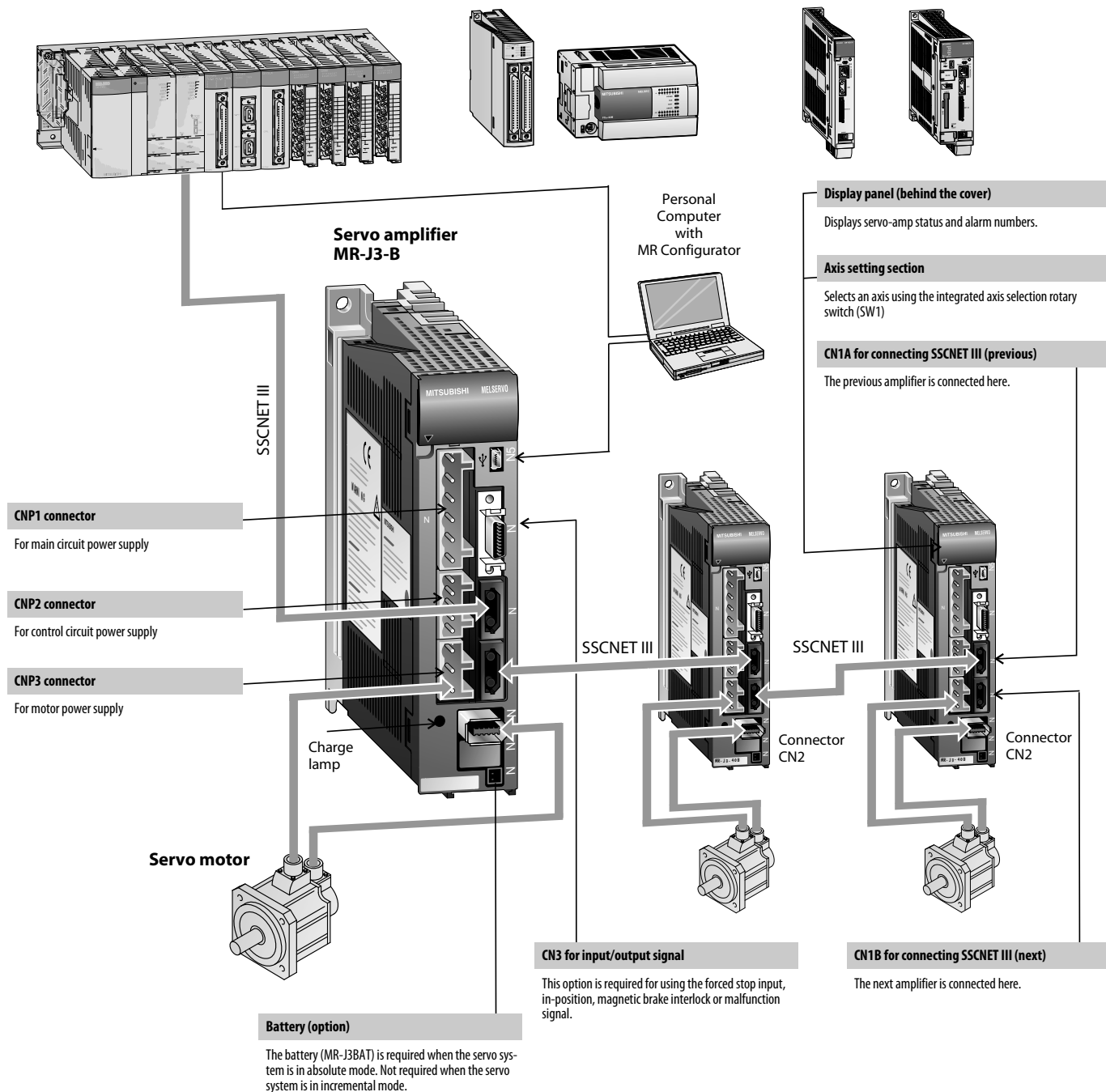
Q172H/Q172DCPU (for max. 8 axes control)
Q173H/Q173DCPU (for max. 32 axes control)

Motion-/ Positioning modules

MELSEC FX: e.g. FX3U-SSC-H
MELSEC System Q: e.g. QD75MH

Single Axis Motion Controller
MR-MQ100

Standalone Motion Controller
Q170MCPUCPU



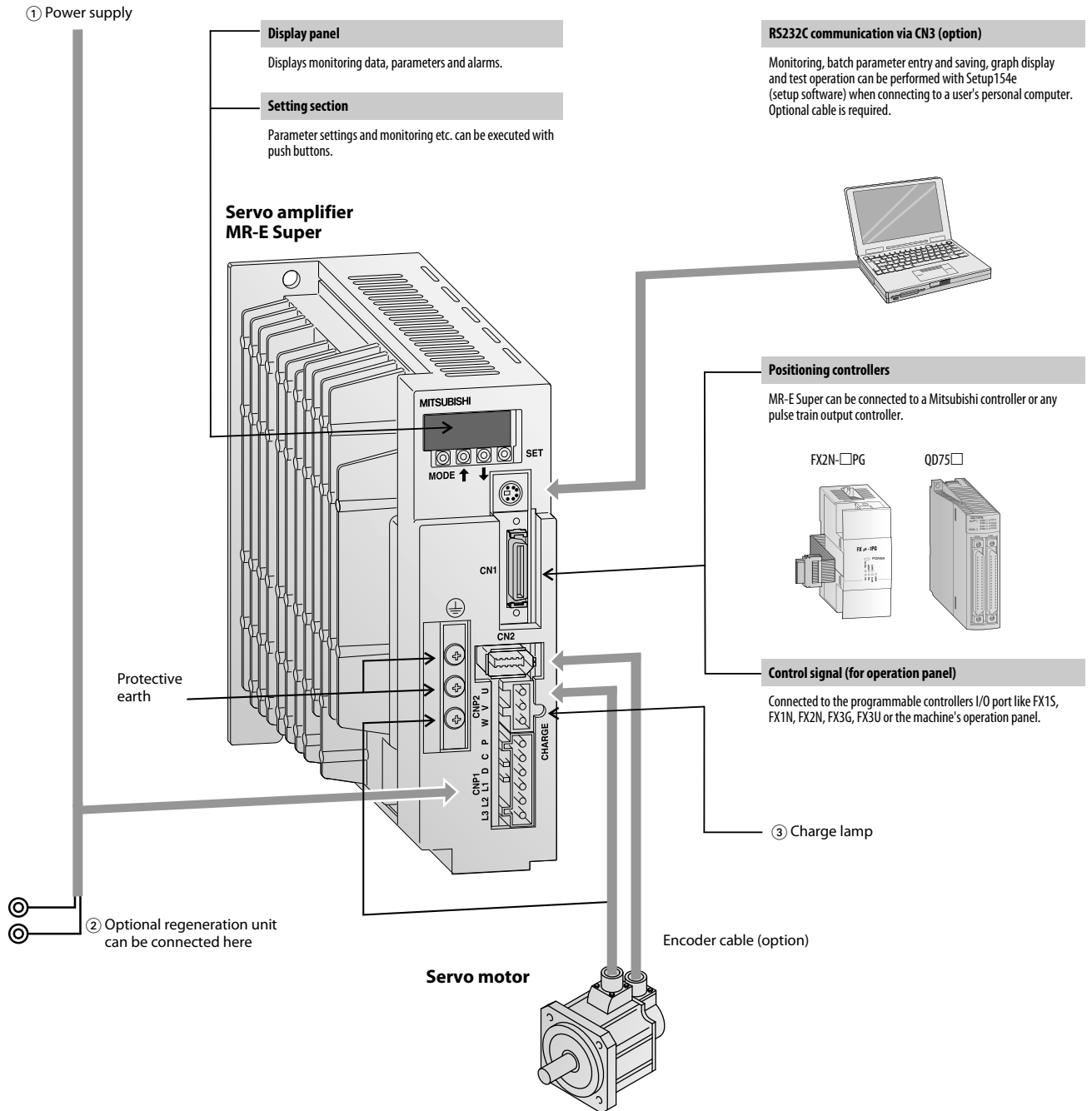
Battery (option)
The battery (MR-J3BAT) is required when the servo system is in absolute mode. Not required when the servo system is in incremental mode.

MR-E Super Servo Amplifier Connections with Peripheral Equipment

Peripheral equipment is connected to the MR-E as shown below. To ensure fast, efficient configuration and reliable operation always use

only the connecting cables, expansion options and other accessories supplied or recommended by Mitsubishi.

A complete overview with detailed specifications of all cables and accessories can be found in the next chapter.

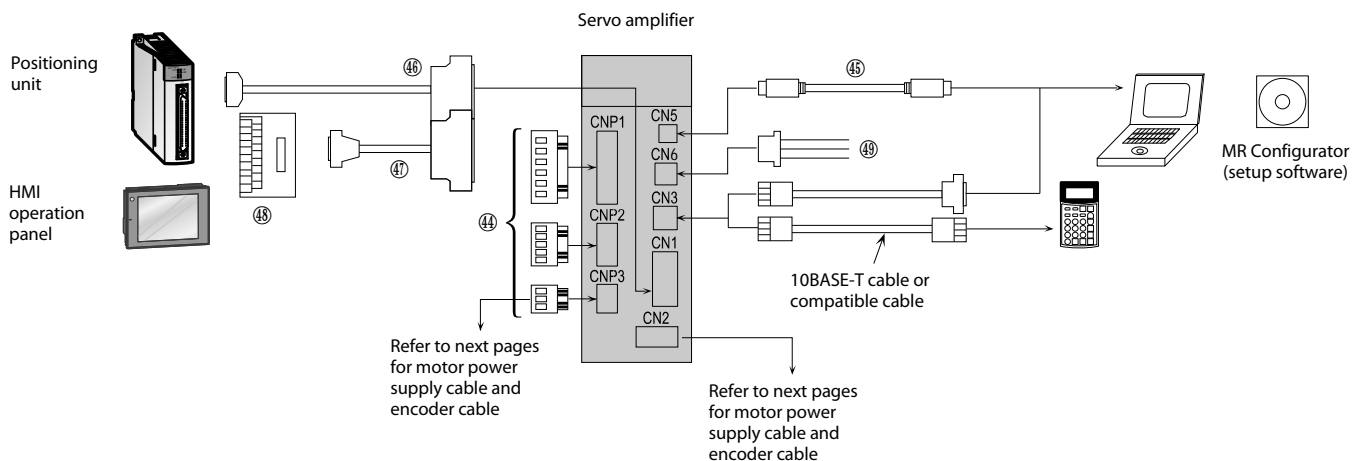


① Power supply
 3~, 200–230 V AC
 1~, 230 V AC for servo drives ≤ 750 W

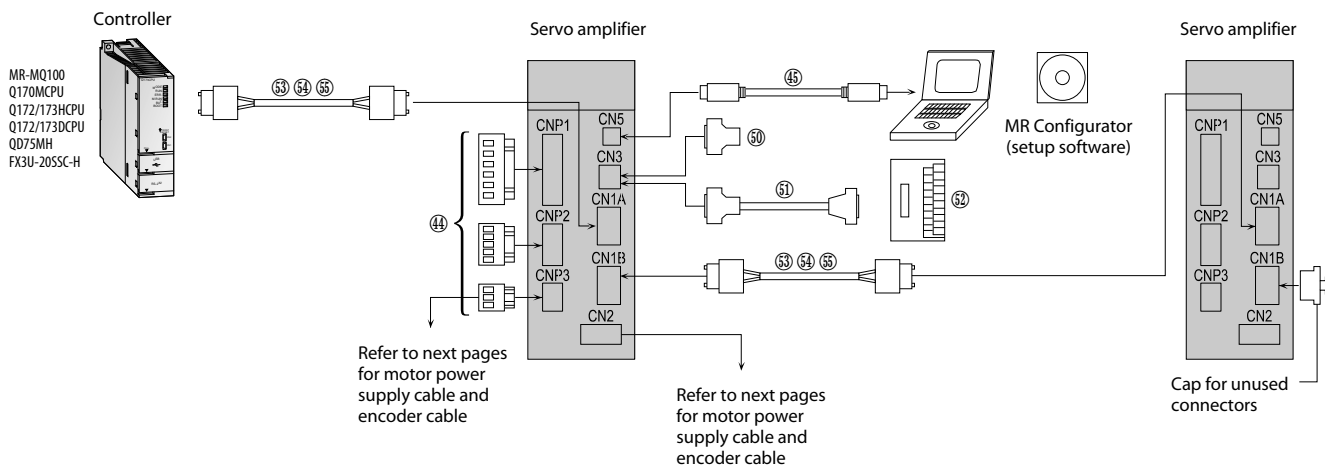
② Regeneration unit (option)
 This unit can be installed in situations involving frequent regeneration and large load inertia moments. For more details refer to the MR-E-□A/AG-QW003 Instruction manual.

③ Charge lamp
 Lights up when the main power supply is on. **Power lines should not be plugged or unplugged when this lamp is on.**

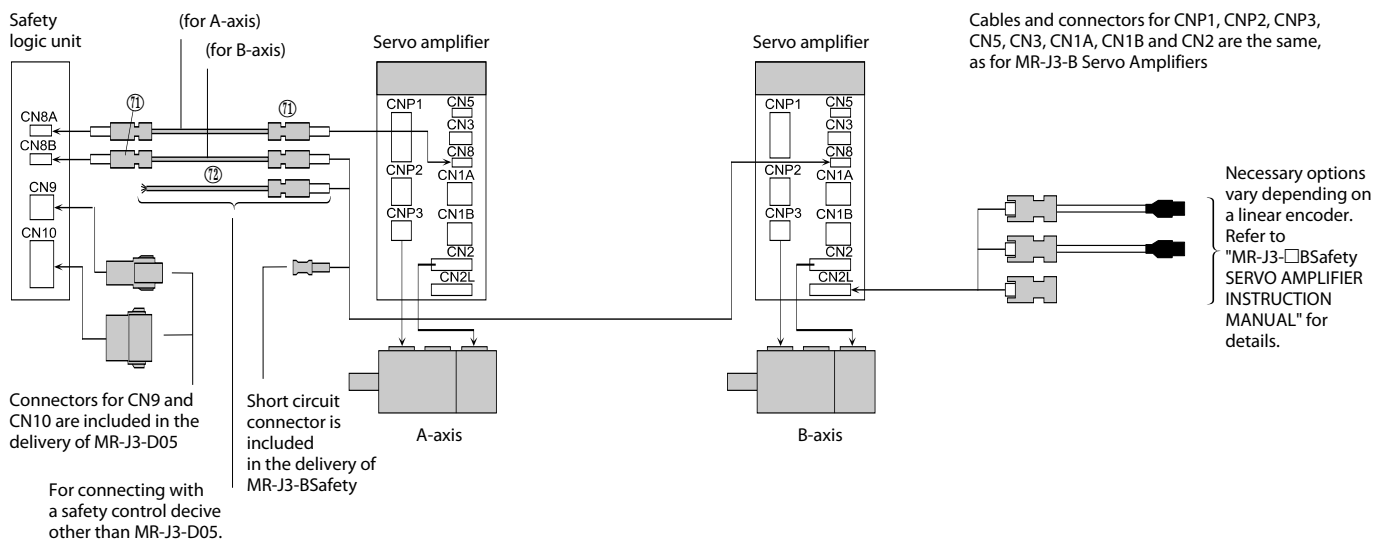
Cables and Connectors for MR-J3-A Servo Amplifiers



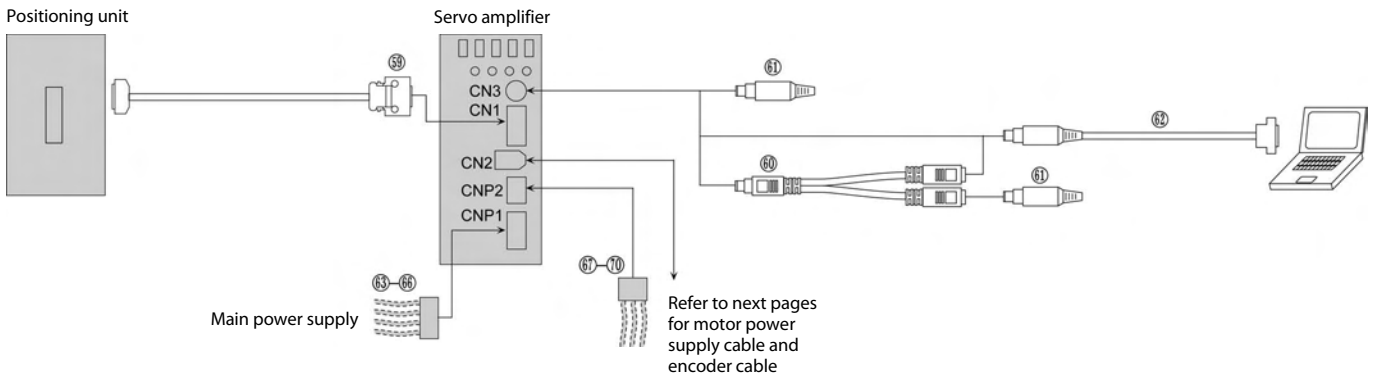
Cables and Connectors for MR-J3-B Servo Amplifiers



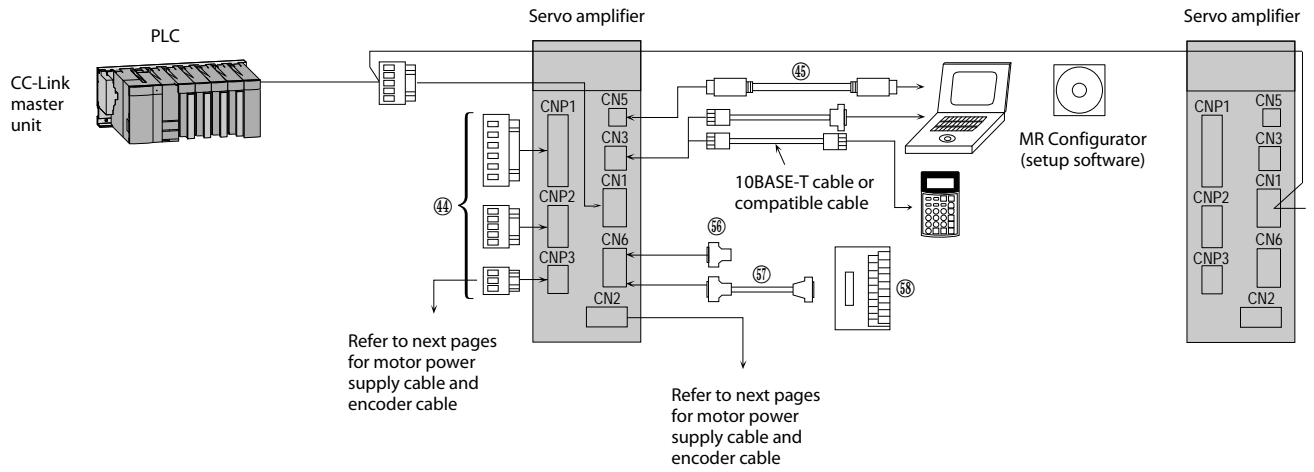
Cables and Connectors for MR-J3-BSafety and MR-J3-D05



■ Cables and Connectors for MR-E-□A/AG-QW003 Servo Amplifiers



■ Cables and Connectors for MR-J3-T Servo Amplifiers

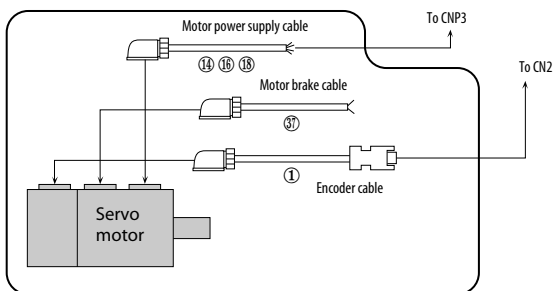


4 OPTIONS AND PERIPHERAL EQUIPMENT

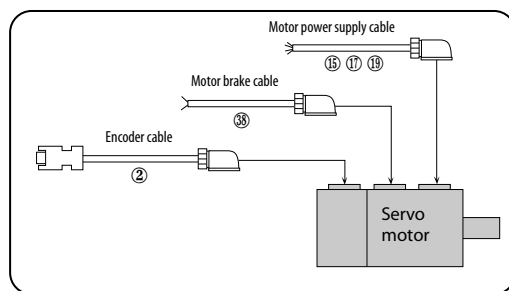
Cables and Connectors for Servo Motors

For HF-KE servo motor series: encoder cable length ≤ 10 m

Cables leading in the direction of the motor shaft

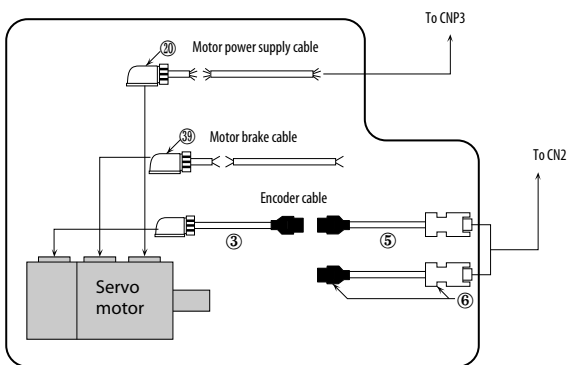


Cables leading in the opposite direction of the motor shaft

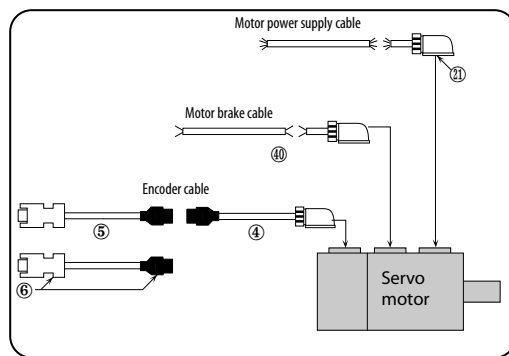


For HF-KE servo motor series: encoder cable length > 10 m

Cables leading in the direction of the motor shaft

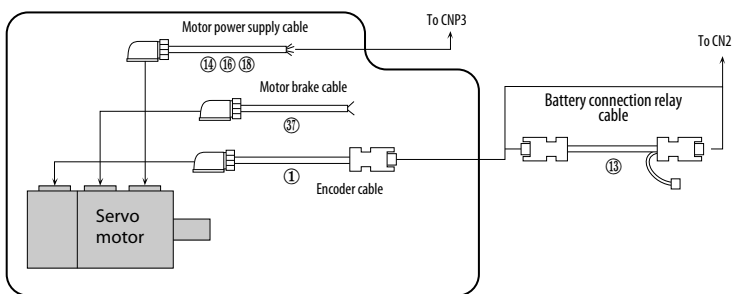


Cables leading in the opposite direction of the motor shaft

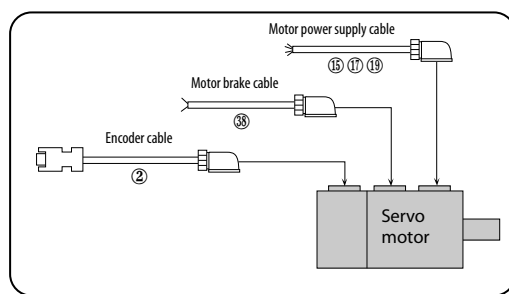


For HF-KP/HF-MP servo motor series: encoder cable length ≤ 10 m

Cables leading in the direction of the motor shaft

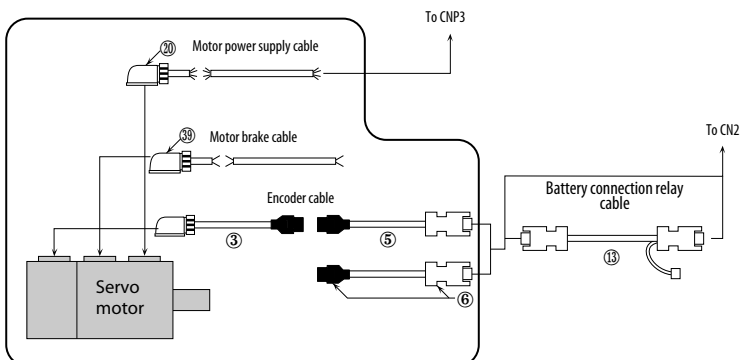


Cables leading in the opposite direction of the motor shaft

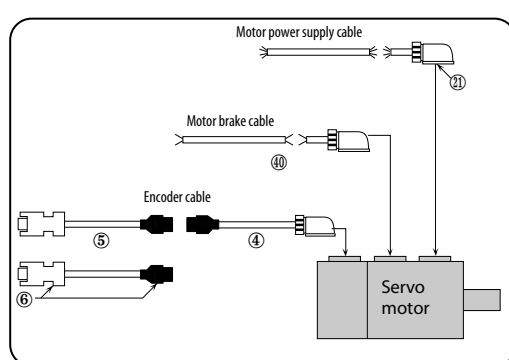


For HF-KP/HF-MP servo motor series: encoder cable length > 10 m

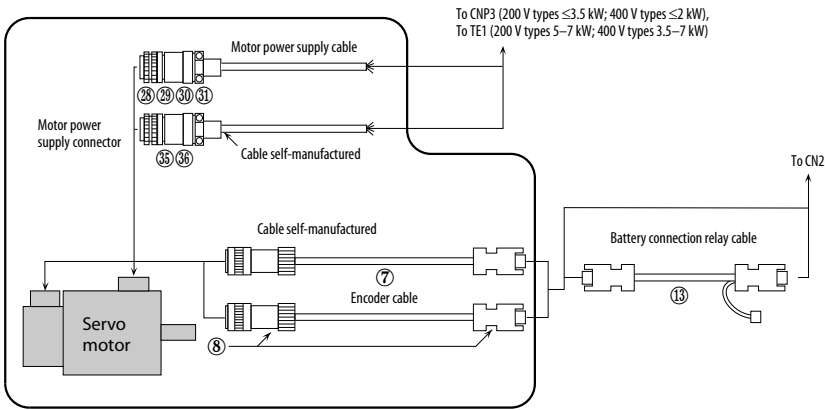
Cables leading in the direction of the motor shaft



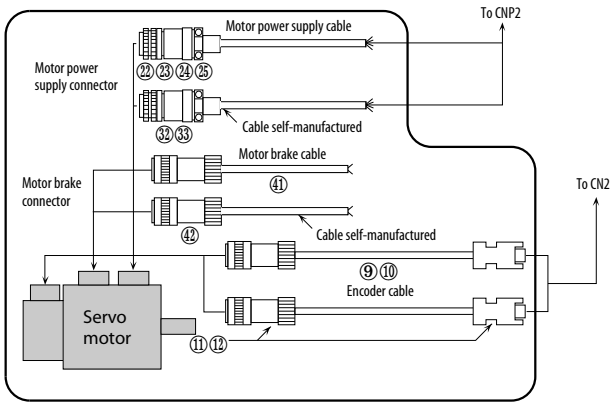
Cables leading in the opposite direction of the motor shaft



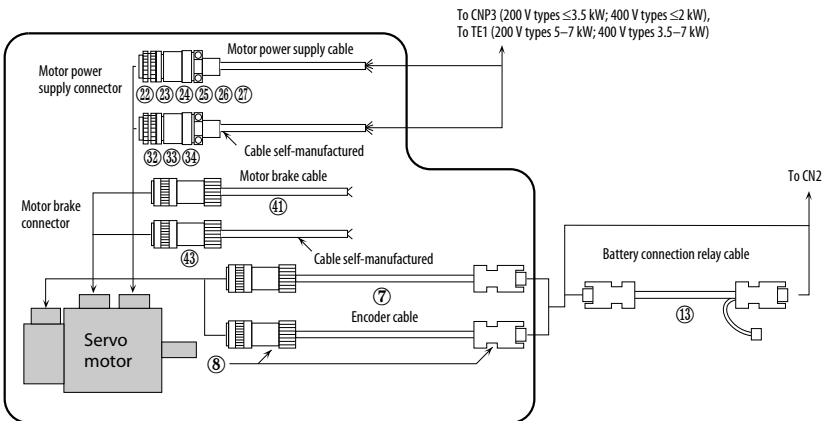
For HC-RP servo motor series



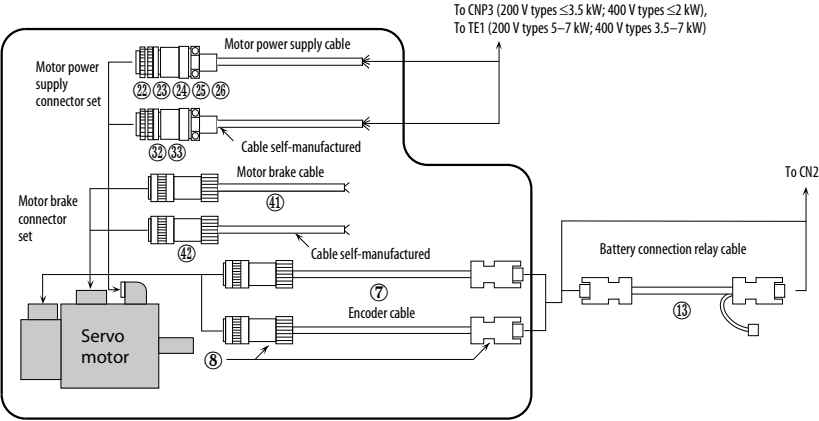
For HF-SE motor series



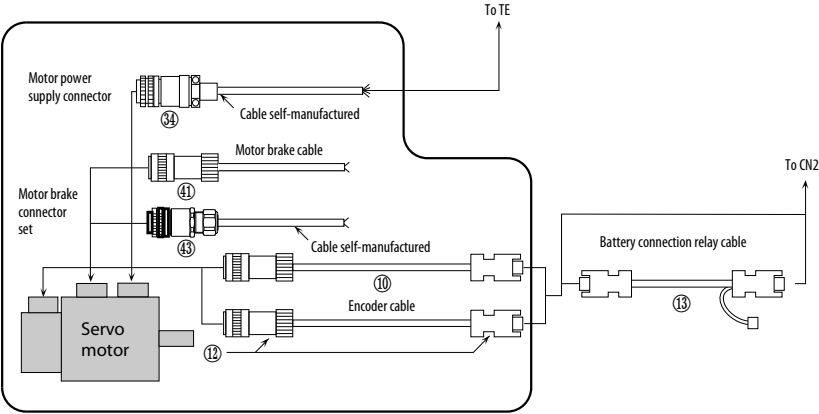
For HF-SP servo motor series



For HF-JP servo motor series ≤ 5 kW



For HF-JP servo motor series 11 kW and 15 kW





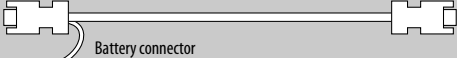

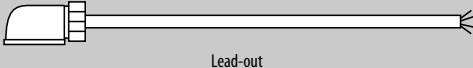
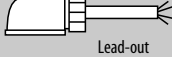
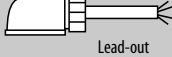




Cables and Connectors for Servo amplifier (general)

Item	Description	Model	Protection	Length	Art. no.		
①	Encoder cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft	Encoder connector (Tyco Electronics AMP) 1674320-1	Amplifier connector 36210-0100PL (receptacle, 3 M) 36310-3200-008 (shell kit, 3 M), or 54599-1019 (connector set, Molex)	MR-J3ENCBL□M-A1-H □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	160312 161547 161548
				MR-J3ENCBL□M-A1-L □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161549 161550 161551
②	Encoder cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft			MR-J3ENCBL□M-A2-H □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	160230 161552 161553
				MR-J3ENCBL□M-A2-L □=cable length: 2, 5, 10 m ①			
③	Motor-side encoder cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft	Encoder connector (Tyco Electronics AMP) 1674320-1	Junction connector (Tyco Electronics AMP) 1473226-1 (with ring) (contact) 1-172169-9 (housing) 316454-1 (cable clamp)	MR-J3JCBLO3M-A1-L Cable length: 0.3 m ①	IP20	0.3 m	161557
④	Motor-side encoder cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft			MR-J3JCBLO3M-A2-L Cable length: 0.3 m ①	IP20	0.3 m	154367
⑤	Amplifier-side encoder cable for HF-KP/HF-MP/HF-KE series	Junction connector (Tyco Electronics AMP) 1-172161-9 (housing) 170359-1 (connector pin) MTI-0002 (cable clamp, TOA ELECTRIC INDUSTRIAL)	Amplifier connector 36210-0100PL (receptacle, 3 M) 36310-3200-008 (shell kit, 3 M), or 54599-1019 (connector set, Molex)	MR-EKCB□M-H □=cable length: 20, 30 m ①	IP20	20 m 30 m	161559 161560
				MR-EKCB□M-L □=cable length: 20, 30 m ①			
⑥	Junction connector, amplifier connector ② for HF-KP/HF-MP/HF-KE series	Junction connector (Tyco Electronics AMP) 1-172161-9 (housing) 170359-1 (connector pin) MTI-0002 (cable clamp, TOA ELECTRIC INDUSTRIAL)	Amplifier connector 54599-1019 (connector set, Molex), or 36210-0100PL (receptacle, 3 M) 36310-3200-008 (shell kit, 3 M)	MR-ECNM	IP20	—	161572
⑦	Encoder cable for HF-SP/HF-RP/HF-JP/HA-LP series	Encoder connector (DDK) <For 10 m or shorter cable> CM10-SP10S-M (straight plug) CM10-#225C(C1)-100 (socket contact)	Amplifier connector 36210-0100PL (receptacle, 3 M) 36310-3200-008 (shell kit, 3 M), or 54599-1019 (connector set, Molex)	MR-J3ENSCL□M-H □=cable length: 2, 5, 10, 20, 30 m ①	IP67	2 m 5 m 10 m 20 m 30 m	160226 161563 161564 161565 161566
				MR-J3ENSCL□M-L □=cable length: 2, 5, 10, 20, 30 m ①			
⑧	Encoder connector set for HF-SP/HF-RP/HF-JP/HA-LP series	Encoder connector (DDK) CM10-SP10S-M (straight plug) CM10-#225C(S1)-100 (socket contact)	Amplifier connector 36210-0100PL (receptacle, 3 M) 36310-3200-008 (shell kit, 3 M), or 54599-1019 (connector set, Molex)	MR-J3SCNS	IP67	—	161576
⑨	Encoder cable for HF-SE series	Encoder connector (DDK) D/MS3057-12A (cable clamp) D/MS3106B20-29S (straight plug)	Amplifier connector 36210-0100PL (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex)	MR-ESCL□M-H □=cable length 2, 5, 10, 20, 30 m ①	IP20	2 m 5 m 10 m 20 m 30 m	210952 210953 210954 210955 210956
				MR-ESCL□M-L □=cable length 2, 5, 10, 20, 30 m ①			
⑩	Encoder cable for HF-SE series	Encoder connector (DDK) D/MS3106A-29S (D190) (plug) CE02-20BS-S-D (backshell, straight) CE3057-12A-3-D (cable clamp)	Amplifier connector 36210-0100PL (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex)	MR-ENECBL□M-H □=cable length 2, 5, 10, 20, 30 m ①	IP67	2 m 5 m 10 m 20 m 30 m	210961 210962 210963 210964 210965






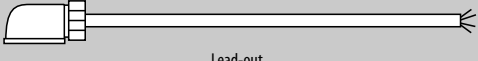
Notes:
 ① -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
 ② Refer to the MR-J3 users manual for details on manufacturing the cable.

Cables and Connectors for Servo amplifier (general)

Item	Description	Model	Protection	Length	Art. no.	
Select one for connecting the encoder to CN2	⑪ Encoder connector set for HF-SE series Encoder connector (DDK) D/MS3057-12A (cable clamp) /MS3106B20-29S (straight plug) 	Amplifier connector 36210-0100PL (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex) 	MR-ECNS	IP20	—	210138
	⑫ Encoder connector (DDK) D/MS3106A-29S (D190) (plug) CE02-20BS-S-D (backshell, straight) CE3057-12A-3-D (cable clamp) 	Amplifier connector 36210-0100PL (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex) 	MR-ENECNS	IP65 IP67	—	210966
	⑬ Battery connection relay cable Amplifier CN2 connector ② (3 M or an equivalent product) 36210-0100PL (receptacle) 36310-3200-008 (shell kit)  Battery connector (HIROSE ELECTRIC)DF3-2EP-2C (plug) DF3-EP2428PCA (Crimping terminal for plug) 2 pcs. Not required when the servo system is used in incremental mode. Refer to the section "Battery and special cables" for details.	Junction connector (3 M) 36110-3000FD (plug) 36310-F200-008 (shell kit) 	MR-J3BTCBL03M Cable length: 0.3 m	—	0.3 m	160327
Select one for the motor power supply	⑭ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft, unshielded.		MR-PWS1CBL□M-A1-H □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	160227 161592 161593
	⑮ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft, unshielded.		MR-PWS1CBL□M-A1-L □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161594 161595 161596
	⑯ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft, shielded.		MR-PWS1CBL□M-A2-H □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	160228 161597 161598
	⑰ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft, shielded.	 Lead-out	MR-PWS1CBL□M-A2-L □=cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161599 161600 161601
	⑱ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft, shielded, power chain.		PWS007N-□.0-A1 □=cable length: 2, 5, 10 m	IP65	2 m 5 m 10 m	220009 220010 220012
	⑲ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft, shielded, power chain.		PWS007N-□.0-A2 □=cable length: 2, 5, 10 m	IP65	2 m 5 m 10 m	220002 220005 220007
	⑳ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft.	Motor power supply connector (Japan Aviation Electronics Industry) JN4FT04SJ1-R (plug) ST-TMH-S-C1B-100-(A534G) (socket contact)  Lead-out	MR-PWS2CBL03M-A1-L Cable length: 0.3 m ①	IP55	0.3 m	161602
	㉑ Power supply cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft.	 Lead-out	MR-PWS2CBL03M-A2-L Cable length: 0.3 m ①	IP55	0.3 m	161603
	㉒ Power supply cable for HF-SE52, HF-SP52, HF-SP524-1524, HF-JP53-73, HF-JP534-1034	Motor power supply connector (DDK) CE05-6A18-10SD-D-BSS (straight plug) CE3057-10A-1-D (cable clamp) 	PCS015N-□.0-0C4 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202275 202276 202277 202278 202279
	㉓ Power supply cable for HF-SE102, HF-SP102, HF-JP103-203, HF-JP1534-3534	 Lead out	PCS025N-□.0-0C4 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202280 202281 202282 202283 202294
㉔ Power supply cable for HF-SE152, HF-SP152, HF-JP5034		PCS040N-□.0-0C4 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202295 202296 202297 202298 202299	

Notes:
 ① -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
 ② The battery connection relay cable has a built-in diode. **Only this cable must be used.**

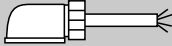





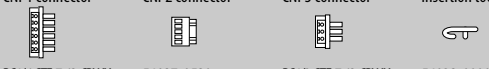


Cables and Connectors for Servo amplifier (general)

Item	Description	Model	Protection	Length	Art. no.	
Select one for the motor power supply	②5 Power supply cable for HF-SE202, HF-SP202, HF-SP3524, HF-JP353	PCS040N-□-0-0C5 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202300 202301 202302 202303 202304	
	②6 Power supply cable for HF-SP352-502, HF-SP5024, HF-JP503	PCS060N-□-0-0C5 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202468 202469 202470 202471 202472	
	②7 Power supply cable for HF-SP702, HF-SP7024	PCS100N-□-0-0C3 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	150771 150772 150819 150821 150822	
	②8 Power supply cable for HC-RP103-203	PCS040N-□-0-0C1 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	150734 150735 150737 150738 150739	
	②9 Power supply cable for HC-RP353-503	PCS060N-□-0-0C2 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	150757 150758 150760 150761 150762	
	③0 Power supply cable with integrated brake cable for HC-RP103B-203B ③	PCS040B-□-0-C1 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	150741 150742 150744 150745 150746	
	③1 Power supply cable with integrated brake cable for HC-RP353B-503B ③	PCS060B-□-0-C2 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	150764 150765 150766 150767 150768	
	③2 Motor power supply connector set (motor side) for HF-SE52-152, HF-SP52-152, HF-SP524-1024, HF-JP53-203, HF-JP534-5034	 Motor power supply connector (DDK) CE05-6A18-10SD-D-BSS (plug) (straight) CE3057-10A-1-D (cable clamp) <Applicable cable example> Wire size: 2 mm ² (AWG14) to 3.5 mm ² (AWG12) Completed cable outer diameter: φ 10.5 to 14.1 mm	MR-PWCNS4 (Straight type)	IP67	—	161573
	③3 Motor power supply connector set (motor side) for HF-SE202, HF-SP202-502, HF-SP2024-5024, HF-JP353-503	 Motor power supply connector (DDK) CE05-6A22-22SD-D-BSS (plug) (straight) CE3057-12A-1-D (cable clamp) <Applicable cable example> Wire size: 5.5 mm ² (AWG10) to 8 mm ² (AWG8) Completed cable outer diameter: φ 12.5 to 16 mm	MR-PWCNS5 (Straight type)	IP67	—	161574
	③4 Motor power supply connector set (motor side) for HP-SP702, HF-SP7024	 Motor power supply connector (DDK) CE05-6A32-17SD-D-BSS (plug) (straight) CE3057-20A-1-D (cable clamp) <Applicable cable example> Wire size: 14 mm ² (AWG6) to 22 mm ² (AWG4) Completed cable outer diameter: φ 22 to 23.8 mm	MR-PWCNS3 (Straight type)	IP67	—	136358
③5 Motor power supply connector set (motor side) for HC-RP103-203	 Motor power supply connector (DDK) CE05-6A22-23SD-D-BSS (plug) (straight) CE3057-12A-2-D (cable clamp) <Applicable cable example> Wire size: 2 mm ² (AWG14) to 3.5 mm ² (AWG12) Completed cable outer diameter: φ 9.5 to 13 mm	MR-PWCNS1 (Straight type)	IP67	—	64036	
③6 Motor power supply connector set (motor side) for HC-RP353-503	 Motor power supply connector (DDK) CE05-6A24-10SD-D-BSS (plug) (straight) CE3057-16A-2-D (cable clamp) <Applicable cable example> Wire size: 5.5 mm ² (AWG10) to 8 mm ² (AWG8) Completed cable outer diameter: φ 13 to 15.5 mm	MR-PWCNS2 (Straight type)	IP67	—	64035	
Select one for the motor electro-magnetic brake	③7 Brake cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft.	Motor power supply connector (Japan Aviation Electronics Industry) JN4FT04S11-R (plug) ST-TMH-S-C1B-100-(A534G) (socket contact)	MR-BKS1CBL□M-A1-H□ =cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161604 161605 161606
		MR-BKS1CBL□M-A1-L□ =cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161607 161608 161609	
	③8 Brake cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft.	 Lead-out	MR-BKS1CBL□M-A2-H□ =cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	160311 161610 161611
		MR-BKS1CBL□M-A2-L□ =cable length: 2, 5, 10 m ①	IP65	2 m 5 m 10 m	161612 161613 161614	

Notes:

- ① -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
- ② The connector type terminal blocks are available for 200 V 3.5 kw or smaller and 400 V 2 kw or smaller servo amplifiers. For 200 V 5 kw or larger and 400 V 3.5 kw or larger, screw type connector blocks are used.
- ③ The HC-RP motors with brake don't have an additional connector for brake. The contacts for brake are inside the power connector.

Cables and Connectors for Servo amplifier (type specific)

Item	Description	Model	Protection	Length	Art. no.	
Select one for the motor electro-magnetic brake	39 Brake cable for HF-KP/HF-MP/HF-KE series Lead out in direction of motor shaft 	Motor power supply connector (Japan Aviation Electronics Industry) JN4FT04S11-R (plug) ST-TMH-S-C1B-100-(A534G) (socket contact)	MR-BKS2CBL03M-A1-L Cable length: 0.3 m ①	IP55	0.3 m	161615
	40 Brake cable for HF-KP/HF-MP/HF-KE series Lead out in opposite direction of motor shaft 	Lead-out	MR-BKS2CBL03M-A2-L Cable length: 0.3 m ①	IP55	0.3 m	161616
	41 Brake cable for HF-SE/HF-SP/HF-JP series 	Motor brake connector (DDK) (soldered type) CM10-SP2S-L (straight plug), CM10-#22SC (S2)-100 (socket contact)	BCS015S-□.0-BKS1 □=cable length: 2, 5, 10, 20, 30 m	IP67	2 m 5 m 10 m 20 m 30 m	202249 202250 202251 202252 202253
	42 Brake connector for HF-SE/HF-SP/HF-JP series 	Motor brake connector (DDK) (soldered type) CM10-SP2S-L (straight plug), CM10-#22SC (S2)-100 (socket contact) <Applicable cable example> Wire size: 1.25 mm ² (AWG16) or smaller Completed cable outer diameter: φ 9.0 to 11.6 mm	MR-BKCN51 (Straight type)	IP67	—	161575
	43 Brake connector for HA-LP11K24B, 15K24B, 22K24B, HF-JP11K1M4B, 15K1M4B 	Motor brake connector D/MS3106A10SL-4S (D190) (plug, DDK) YS010-5 to 8 (cable connector (straight), Daiwa Dengyo) <Applicable cable example> Wire size: 0.3 mm ² (AWG22) to 1.25 mm ² (AWG16) Completed cable outer diameter: φ 5 to 8.3 mm	MR-BKCN (Straight type)	IP65	—	64034
For CNP1, CNP2, CNP3	For 1 kW or smaller (200 VAC) 	CNP1 connector 54928-0670 (connector) (Molex or an equivalent product) CNP2 connector 54927-0520 (connector) (Molex or an equivalent product) CNP3 connector 54928-0370 (connector) (Molex or an equivalent product) Insertion tool 54932-0000 (Molex or an equivalent product)	(Standard accessory: Insertion type) ②	—	on request	
	For 2 kW, 3.5 kW (200 VAC) 	CNP1 connector PC4/6-STF-7.62-CRWH (connector) (PHOENIX or an equivalent product) CNP2 connector 54927-0520 (connector) (Molex or an equivalent product) CNP3 connector PC4/3-STF-7.62-CRWH (connector) (PHOENIX or an equivalent product) Insertion tool 54932-0000 (Molex or an equivalent product)				
	For 2 kW or smaller (400 VAC) 	CNP1 connector 721-207/026-000 (plug) (WAGO or an equivalent product) CNP2 connector 721-205/026-000 (plug) (WAGO or an equivalent product) CNP3 connector 721-203/026-000 (plug) (WAGO or an equivalent product) Insertion tool 231-131 (WAGO or an equivalent product)				
For CNS	45 USB cable 	Amplifier connector mini-B connector (5 pins) Personal computer connector A connector	MR-J3USBCBL3M Cable length: 3 m	—	3 m	160229

Notes:

- ① -H and -L indicate a bending life. -H indicates a long bending life, and -L indicates a standard bending life.
- ② The connector type terminal blocks are available for 200 V 3.5 kW or smaller and 400 V 2 kW or smaller servo amplifiers. For 200 V 5 kW or larger and 400 V 3.5 kW or larger, screw type connector blocks are used.

Cables and Connectors for Servo amplifier (type specific)




















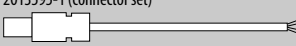
Item	Description	Model	Protection	Length	Art. no.		
Servo amplifier series MR-J3-A							
④⑥	CN1 connector	Amplifier connector (3 M or an equivalent product) 10150-3000PE (connector) 10350-52F0-008 (shell kit)	—	—	160225		
For CN1	④⑦ Cable for junction terminal block TB-50-EG	Amplifier connector (3 M or an equivalent product) 10150-6000EL (connector) 10350-3210-000 (shell kit) ③	Junction terminal block connector (3 M) D7950-B500FL (connector)	MR-J2M-CN1TBL□M □=cable length: 0.5, 1m	—	0.5 m 1 m	146794 189864
	④⑧ Junction terminal block			TB-50-EG	—	—	212033
For CN6	④⑨ Monitor cable			MR-J3CN6CBL1M cable length: 1 m	—	1 m	161578
Servo amplifier series MR-J3-B							
⑤⑩	Input/output signal connector	Amplifier connector (3M or an equivalent product) 10120-3000PE (connector) 10320-52F0-008 (shell kit) ④		MR-J2CN1	—	—	55912
For CN3	⑤⑪ Cable for junction terminal block TB-20-EG	Amplifier connector (3M or an equivalent product) 10120-3000PE (connector) 10320-52F0-008 (shell kit) ④	Junction terminal block connector (3 M) 3421-6020 (connector)	MR-J3TBL-CN3-□M-EG □=cable length: 0.5, 1 m	—	0.5 m 1 m	212096 212095
	⑤⑫ Junction terminal block			TB-20-EG	—	—	212032
For CN1A For CN1B	⑤⑬ SSCNET III cable (standard)	Connector: PF-2D103 (Japan Aviation Electronics Industry)	Connector: PF-2D103 (Japan Aviation Electronics Industry)	MR-J3BUS□M □=cable length: 0.15, 0.3, 0.5, 1, 3 m	—	0.15 m 0.3 m 0.5 m 1 m 3 m	161579 161580 161581 161582 161583
	⑤⑭ SSCNET III cable (long flex)			MR-J3BUS□M-A □=cable length: 5, 10, 20 m	—	5 m 10 m 20 m	161584 161585 161586
				MR-J3BUS□M-B □=cable length: 30, 40, 50 m	—	30 m 40 m 50 m	161587 161588 161589
Servo amplifier series MR-J3-T							
⑤⑮	CN6 connector	Amplifier connector (3 M or an equivalent product) 10126-3000PE (connector) 10326-52F0-008 (shell kit)		MR-J2CMP2	—	—	149764
For CN6	⑤⑯ Cable for junction terminal block TB-26-EG	Amplifier connector (3 M or an equivalent product) 10126-3000PE (connector) 10326-52F0-008 (shell kit)	Junction terminal block connector (3 M) 3399-6030 (connector)	MR-ESTBL-CN1-□M-EG □=cable length: 0.5, 1 m	—	0.5 m 1 m	215135 215137
	⑤⑰ Junction terminal block			TB-26-EG	—	—	215134
For CN20 ⑤	⑤⑲ Input/output signal connector	Amplifier connector (3 M or an equivalent product) 10120-3000PE (connector) 10320-52F0-008 (shell kit) ④		MR-J2CN1	—	—	55912
	⑤⑳ Cable for junction terminal block TB-20-EG	Amplifier connector (3M or an equivalent product) 10120-3000PE (connector) 10320-52F0-008 (shell kit) ④	Junction terminal block connector (3 M) 3421-6020 (connector)	MR-J3TBL-CN3-□M-EG □=cable length: 0.5, 1 m	—	0.5 m 1 m	212096 212095
	⑤㉑ Junction terminal block			TB-20-EG	—	—	212032
For CN10 ⑤	④⑥ Input/output signal connector	Amplifier connector (3 M or an equivalent product) 10150-3000PE (connector) 10350-52F0-008 (shell kit)		MR-J3CN1	—	—	160225
	④⑦ Cable for junction terminal block TB-50-EG	Amplifier connector (3 M or an equivalent product) 10150-6000EL (connector) 10350-3210-000 (shell kit) ③	Junction terminal block connector (3 M) D7950-B500FL (connector)	MR-J2M-CN1TBL□M □=cable length: 0.5, 1 m	—	0.5 m 1 m	146794 189864
	⑤⑳ Junction terminal block			TB-50-EG	—	—	212032

Notes:

- ③ The connector and the shell kit are press bonding type. Models for soldered type are 10120-3000PE (connector) and 10350-52F0-008 (shell kit).
- ④ The connector and the shell kit are soldered type. Models for press bonding type are 10120-6000EL (connector) and 10320-3210-000 (shell kit).
- ⑤ CN10 and CN20 are only available with extension I/O unit MR-J3-D01.

Encoder cables, battery connection relay cable, power supply cables, brake cables, USB cable and servo amplifier power supply connector set from ① to ④⑤ are same for the servo amplifier series MR-ES, MR-J3-A, MR-J3-B and MR-J3-T.

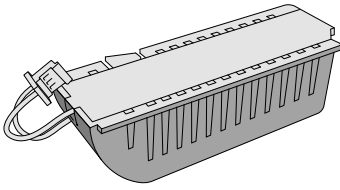
Cables and Connectors for Servo amplifier (type specific)

Item	Description	Model	Protection	Length	Art. no.
Servo amplifier series MR-E Super					
For CN1	⑤⑨ CN1 connector 	Amplifier-side connector (3M or an equivalent product) 10126-3000PE (connector) 10326-52F0-008 (shell kit)	MR-ECN1 (Unit: 20 pcs/box) MR-J2CMP (Unit: 1pcs/box)	—	— — 170158 149764
	⑥⑩ Analog monitor/ RS-232C branch cable 	RS-232C option connector (Marushin electric mfg. or an equivalent product) MP371/6 (connector) (mini-DIN 6-pin male) Analog monitor connector (Marushin electric mfg. or an equivalent product) MJ372/6 (connector) (mini-DIN 6-pin female)	MR-E3CBL15-P	—	— — 210968
For CN3	⑥① Analog monitor RS-232C connector 	Analog monitor, RS-232C option connector (Marushin electric mfg. or an equivalent product) MP371/6 (connector) (mini-DIN 6-pin male)	MR-ECN3 (Unit: 20 pcs/box)	—	— — 210967
	⑥② Personal computer communication cable 	RS-232C option connector (Marushin electric mfg. or an equivalent product) MP371/6 (connector) (mini-DIN 6-pin male) DOS/V personal computer connector (Japan Aviation Electronics Industry) DE-9SF-N (connector) DE-C1-J6-S6R (case)	QC30R2 Cable length: 3m	—	3 m — 128424
Amplifier power supply connectors (for CNP1)	⑥③ Amplifier power supply connector set (press bonding type) for MR-E-10A/AG to 100A/AG-QW003 	Connector 51240-0600 (Molex or an equivalent product) Terminal 56125-0128 (Molex or an equivalent product) 	MR-ECNP1-A (Unit: 20 pcs/box)	—	— — 170159
	⑥④ Amplifier power supply connector (insertion type) for MR-E-10A/AG to 100A/AG-QW003 	Connector 54927-0610 (Molex or an equivalent product)	MR-ECNP1-B (Unit: 20 pcs/box)	—	— — 210612
	⑥⑤ Amplifier power supply connector set (press bonding type) for MR-E-200A/AG-QW003 	Connector 54241-0600 (Molex or an equivalent product) Terminal 56125-0128 (Molex or an equivalent product) 	MR-ECNP1-A1 (Unit: 20 pcs/box)	—	— — 210613
	⑥⑥ Amplifier power supply connector (insertion type) for MR-E-200A/AG-QW003 	Connector 54928-0610 (Molex or an equivalent product)	MR-ECNP1-B1 (Unit: 20 pcs/box)	—	— — 210624
Motor power supply connectors (for CNP2)	⑥⑦ Motor power supply connector set (amplifier side) for MR-E-10A/AG to 100A/AG-QW003 (press bonding type) 	Connector 51240-0300 (Molex or an equivalent product) Terminal 56125-0128 (Molex or an equivalent product) 	MR-ECNP2-A (Unit: 20 pcs/box)	—	— — 213133
	⑥⑧ Motor power supply connector (amplifier side) for MR-E-10A/AG to 100A/AG-QW003 (insertion type) 	Connector 54927-0310 (Molex or an equivalent product)	MR-ECNP2-B (Unit: 20 pcs/box)	—	— — 210969
	⑥⑨ Motor power supply connector set (amplifier side) for MR-E-200A/AG-QW003 (press bonding type) 	Connector 54241-0300 (Molex or an equivalent product) Terminal 56125-0128 (Molex or an equivalent product) 	MR-ECNP2-A1 (Unit: 20 pcs/box)	—	— — 210970
	⑦⑩ Motor power supply connector (amplifier side) for MR-E-200A/AG-QW003 (insertion type) 	Connector 54928-0310 (Molex or an equivalent product)	MR-ECNP2-B1 (Unit: 20 pcs/box)	—	— — 210140
⑥④ + ⑥⑧	MR-E-10A/AG to 100A/AG 	Connector Set CNP1 + CNP2 (insertion type)	MR-ECNP-SET-B	—	— — 217356
⑥⑥ + ⑦⑩	MR-E-200A/AG 		MR-ECNP-SET-B1	—	— — 217357
Safety option card MR-J3-D05					
For CN8	⑦① STO cable (for MR-J3-D05) 	Safety logic unit connector (Tyco Electronics) 2013595-1 (connector set) Amplifier connector (Tyco Electronics) 2013951-1 (connector set)	MR-D05UDL□M □ = cable length: 0.3, 1, 3 m	—	0.3 m 1 m 3 m 227983 227984 227985
	⑦② STO cable (for safety control device other than MR-J3-D05) 	Safety logic unit connector (Tyco Electronics) 2013595-1 (connector set)	MR-D05UDL3M-B Cable length: 3 m	—	3 m — 227986

Note:

- ① Use this STO cable (MR-D05UDL3M-B) when connecting with a safety control device other than MR-J3-D05.

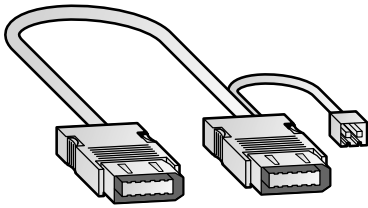
■ Buffer Battery



The servomotor's absolute value can be maintained by mounting the MR-J3BAT battery on the servo amplifier. The battery is not required when the servo system is used in incremental mode.

Battery	Application	Art. no.
MR-J3BAT	Buffering absolute positioning data	160224

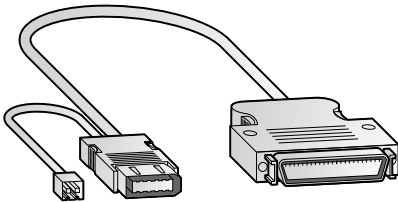
■ Battery Connection Relay Cable



This relay cable is used to hold the absolute value if the servo amplifier has to be removed from a machine for shipping. The servo motor does not have a super capacitor (for holding an absolute value for short time) in the encoder. When this optional cable is used, the absolute value can be held even when the encoder cable is disconnected from the servo amplifier, making it easy to do maintenance on the servo amplifier.

Cable	Application	Art. no.
MR-J3BTCBLO3M	Buffering absolute value	160327

■ Diagnostic Cable

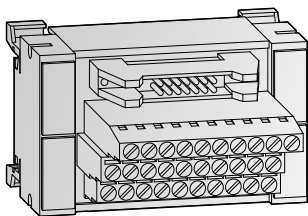


This cable is required when using the amplifier diagnostic function of MR Configurator (Setup software).

Can be used only in combination with an MR-J3-A servo amplifier.

Cable	Application	Art. no.
MR-J3ACHECK	MR Configurator diagnostic function	161577

■ Terminal Blocks

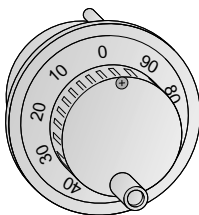


These terminal blocks TB-20-EG/TB-26-EG/TB-50-EG are adapter modules that simplify the wiring of the inputs and outputs of the servo amplifiers.

In addition preconfigured system cabling is available for all of these terminal blocks.

Specifications	TB-20-EG	TB-26-EG	TB-50-EG
Terminal block type	Input/output block	Input/output block	Input/output block
Channels	8/16	26	50
Design	20 pin terminal module	26 pin terminal module	50 pin terminal module
Connection type	Screw terminals	Screw terminals	Screw terminals
Application	Servoamplifier MR-J3-B Extension I/O unit MR-J3-D01	Servoamplifier MR-ES/MR-J3-T	Servoamplifier MR-J3-A Motion controller MR-MQ100, Q170MCP Extension I/O unit MR-J3-D01
Dimensions (WxHxD)	mm 75x45x52	73x81x58	102x81x80
Order information	Art. no. 212032	215134	212033
Connection cables	MR-J3TBL-CN3-05M-EG; length 0.5 m; Art. no.: 212096, MR-J3TBL-CN3-1M-EG; length 1 m; Art. no.: 212095	MR-ESTBL-CN1-05M-EG; length 0.5 m; Art. no.: 215135 MR-ESTBL-CN1-1M-EG; length 1 m; Art. no.: 215137	MR-J2M-CN1TBL05M; length 0.5 m; Art. no.: 146794 MR-J2M-CN1TBL1M; length 1 m; Art. no.: 189864

Manual Pulse Generator

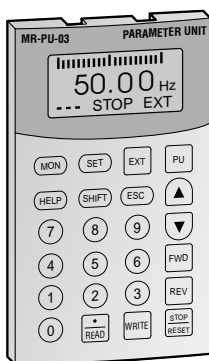


MR-HDP01

By this serial handwheel an external incremental setting value can be generated.

Specifications	MR-HDP01
Resolution	25 pls/rev (100 pls/rev at magnification of 4)
Output voltage	Input voltage > 1 V
Consumption current	Max. 60 mA
Weight	kg 0.4
Order information	Art. no. 128728

Parameter Unit



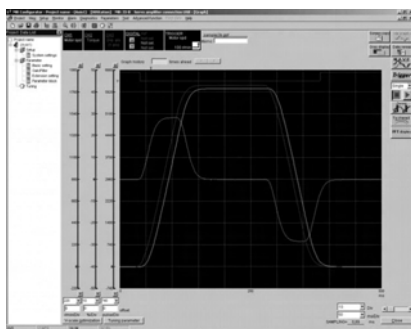
The parameter unit MR-PRU03 with a 16 characters x 4 lines LCD display, is available as an option.

By connecting the parameter unit to the servo amplifier, data setting, test operation, parameter setting, etc. can be performed without using MR Configurator.

The parameter unit can be used with a MR-J3-□□□ servo amplifier.

Functions	MR-PRU03
Parameter mode	Basic setting parameters, gain/filter parameters, extension setting parameters, input/output setting parameters
Monitor Mode	MR-J3-□□□ Current position, command position, command remaining distance, point table No., cumulative feedback pulses, droop pulses, regenerative load ratio, effective load ratio, peak load ratio, instantaneous torque, within one revolution position, ABS counter, servo motor speed, bus voltage, load inertia moment ratio
Diagnosis mode	External input/output display, motor information
Alarm mode	Current alarm, alarm history
Test operation mode	JOG operation, positioning operation, DO forced output, motor-less operation, single-step feed
Point table mode	Position data, servo motor speed, acceleration/deceleration time constant, dwell time, auxiliary function, M code
Order information	Art. no. 208805

Setup Software (MR Configurator)

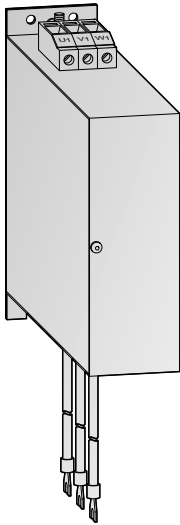


The comfortable setup software for Windows based personal computers allows perfect tuning of the servo amplifiers and the connected servo motors.

The software makes it easy to read and write parameters, monitor, diagnose and test the servo system via a personal computer.

Functions	MR Configurator
Monitor	Batch display, input/output I/F display, high speed monitor, graph display
Parameters	Parameter setting, device setting, tuning, display of change list, display of detailed information, converter, parameter copy
Diagnostics	Rotation failure reason display, system information display, tuning data display, absolute data display, axis name setting, amplifier diagnostic
Alarms	Alarm display, alarm history, display of data that generated alarm
Test operations	JOG operation, positioning operation, operation without motor, forced digital output, program operation using simple language
Advanced function	Machine analyser, gain search, machine simulation
Others	Automatic operation, help display, project and data administration
Order information	Art. no. 217710

■ Noise Filters



For complying with the EMC directives of the European Community regarding the electromagnetic compatibility, the servo amplifiers have to be equipped with a noise filter across the input circuit. Additionally it has to be installed and wired according to the EMC directives.

The filter units are designed to reduce mains conducted RFI emissions to meet the European standard EN 61800-3.

More details are enclosed in the installation sheet of the MR-J3 filters.

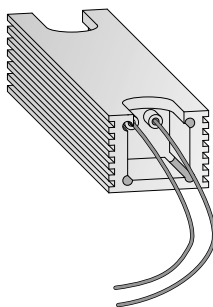
Filter ^①	Servo amplifier	Power loss [W]	Rated current [A]	Leakage current ^② [mA]	Weight [kg]	Art. no.
MF-2F230-006.230MFa	MR-J3-10A/B/T–MR-J3-60A/B/T	10	6	< 26	0.45	189332
MF-2F230-006.230MFb	MR-J3-70A/B/T	10	6	< 26	0.45	189331
MF-3F480-010.233MF	MR-J3-60A4/B4/T4, MR-J3-100A/B/T and MR-J3-100A4/B4/T4	9	10	< 7	1.0	208775
MF-3F480-015.230MF3	MR-J3-200A/B/T and MR-J3-200A4/B4/T4	12	15	< 4 ^②	1.5	200463
MF-3F480-015.233MF	MR-J3-350A4/B4/T4	16	15	< 20	2.0	208776
MF-3F480-025.230MF3 ^③	MR-J3-350A/B/T, MR-J3-500A4/B4/T4 and MR-J3-700A4/B4/T4	20	25	< 4	3.0	203854
MF-3F480-035.230	MR-J3-11KA4/B4/T4 and MR-J3-15KA4/B4/T4	40	50	< 12	4.0	189329
MF-3F480-050.230MF3	MR-J3-500A/B/T, MR-J3-700A/B/T and MR-J3-22KA4/B4/T4	40	50	< 4 ^②	4.0	203855
FMR-ES-3A-RS1-FP	MR-E-10A/AG-QW003–MR-E-20A/AG-QW003	1	3	< 3.5	0.32	219207
FMR-ES-6A-RS1-FP	MR-E-40A/AG-QW003–MR-E-70A/AG-QW003	4.4	6	< 3.5	0.37	219208
MF-3F230-011.230	MR-E-100A/AG-QW003–MR-E-200A/AG-QW003	8	11	< 6	1.0	221468

① All filters can provide conformity with the limits for environment 1, restricted distribution up to 50 m or environment 1, unrestricted distribution up to 20 m.

② At normal operation: voltage difference between 2 phases < 3 %/at fault occurrence (value in brackets) : 2 dead phases (worst case)

③ No foot print filter

■ Brake Resistors



If the regenerative power exceeds the power of the built-in resistor, the following listed optional brake resistors can be used.

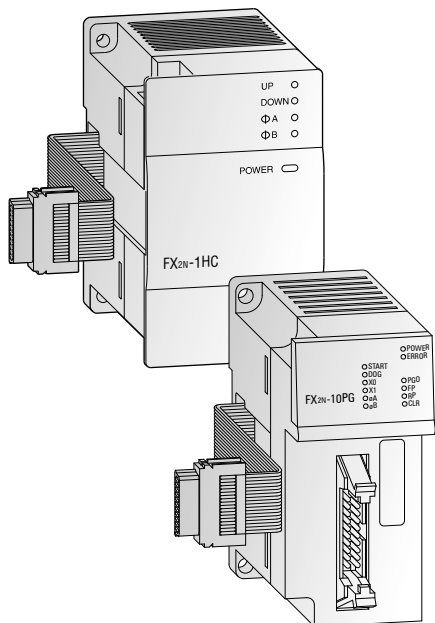
Resistor	Servo amplifier	Power capacity [W]	Resistance (Ω)	Weight [kg]	Dimensions (WxHxD) [mm]	Art. no.
MR-RFH75-40	MR-J3-10A/B/T–MR-J3-60A/B/T, MR-J3-70A/B/T, MR-J3-100A/B/T and MR-E-10A/AG-QW003–MR-E-100A/AG-QW003	150	40	0.16	36x27x90	137279
MR-RFH220-40	MR-J3-70A/B/T and MR-J3-100A/B/T	400	40	0.42	36x27x200	137278
MR-RFH400-13	MR-J3-200A/B/T, MR-J3-350A/B/T, MR-J3-500A/B/T and MR-E-200A/AG-QW003	600	13	0.73	36x27x320	137277
MR-RFH400-6.7	MR-J3-700A/B/T	600	6.7	0.73	36x27x320	137275
MR-PWR-R T 400-120	MR-J3-60A4/B4/T4 and MR-J3-100A4/B4/T4	400	120	0.4	36x27x200	154746
MR-PWR-R T 600-47	MR-J3-200A4/B4/T4 and MR-J3-350A4/B4/T4	600	47	0.64	36x27x320	154751
MR-PWR-R T 600-26	MR-J3-500A4/B4/T4 and MR-J3-700A4/B4/T4	600	26	0.64	36x27x320	154752

Note: The MR-J3-11KA4/B4/T4–MR-J3-22KA4/B4/T4 have the external brake resistors included.

MELSEC FX Positioning Units

The high-speed counter and single axis positioning modules described below can be used in combination with the FX series PLCs. This

provides a cost effective solution for small servo/motion applications.



High speed counter and pulse train modules

These high speed modules provide additional counting and pulse train output features to the FX3U/FX3UC PLC. The high speed counters allow 1- or 2-phase pulses with counting speeds up to a maximum of 50 kHz for the FX2N-1HC and 200 kHz for the FX3U modules.

The FX3U-2HSY-ADP pulse train output module can provide pulse streams up to 200 kHz for use in basic positioning applications.

The MR-ES-A and MR-J3-A series amplifiers can be directly driven by these units.

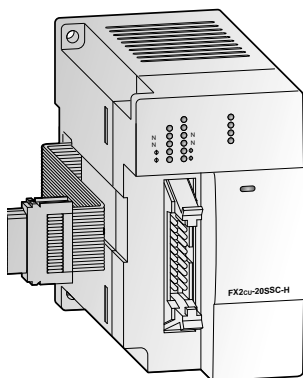
Single-axis positioning module

The positioning modules FX2N-1PG-E and FX2N-10PG are extremely efficient single-axis positioning modules for controlling servo drives like MR-ES-A and MR-J3-A (by external controller) with a pulse train. It is very suitable for achieving accurate positioning in combination with the MELSEC FX series.

The configuration and allocation of the position data are carried out directly via the PLC program.

A very wide range of manual and automatic functions are available to the user.

Specifications	FX2N-1PG-E	FX2N-10PG
Accessible axes	1	1
Output frequency pulse/s	10–100 000	1–1 000 000
Signal level for digital inputs	24 V DC/40 mA	5 V DC/100 mA; 24 V DC/70 mA
Power supply	5 V DC 24 V DC	55 mA (from base unit) 120 mA (from base unit)
Related I/O points	8	8
Dimensions (WxHxD)	mm 43x90x87	43x90x87
Order information	Art. no. 65583	140113



SSCNET III module FX3U-20SSC-H

The SSCNET module FX3U-20SSC-H can be used in combination with a FX3U programmable controller to achieve a cost effective solution for high precision, high speed positioning. The plug-and-play fiber optic SSCNET III cabling reduces setup time and increases control distance for positioning operations in a wide range of applications.

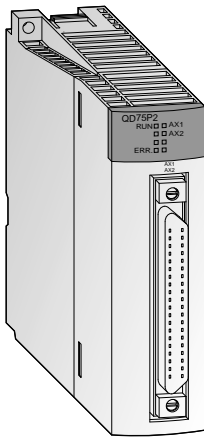
Servo parameters and positioning information for the FX3U-20SSC-H are easily set up with an FX3U base unit and a personal computer. For parameter setting, monitoring and testing the easy programming software FX Configurator-FP is available.

For further specifications please refer to the MELSEC FX technical catalogue.

Specifications	FX3U-20SSC-H
Accessible axes	2 (independent or interpolation) via SSCNET III (MR-J3-B series servo amplifiers)
Output frequency	1 Hz to 50 MHz
Communications speed	50 Mbps
Starting time ms	1.6 (+1.7 SSCNET cycle time)
Max. to PLC connectable modules	Up to 8 can be connected to the FX3U PLC
Power supply	5 V DC 24 V DC
Related I/O points	8
Dimensions (WxHxD)	mm 55x90x87
Order information	Art. no. 206189

Note: The FX3U-20SSC-H can only be used in combination with a FX3U series base unit. For applicable servo amplifiers and motors please refer to the MR-J3 servo section of this catalogue.

MELSEC System Q Positioning Units



The MELSEC System Q offers three different positioning module series for control of up to four axes:

- Open-collector output type (QD75P series)
- Differential output type (QD75D series)
- SSCNET III bus type (QD75MH series)

The open-collector and differential output controllers can be used with standard type servo amplifiers (MR-ES-A/MR-J3-A), whilst the QD75MH series controllers should be used with the MR-J3-B (SSCNET III bus type) Servo amplifiers. Using the SSCNET III system can provide much improved, easier to use positioning systems, with reduced wiring and better noise immunity.

All QD75 series positioning modules can provide functionality such as interpolation and speed-position operation etc.

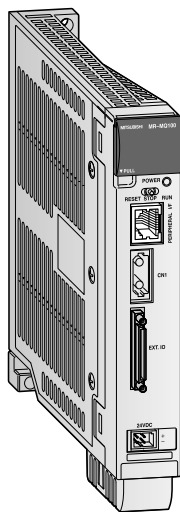
The open-collector output type modules provide positioning with open loop control. The modules generate the travel command via the pulse chain. The speed is proportional to the pulse frequency and the distance travelled is proportional to the pulse length.

The differential output type modules are suitable for bridging long distances between the module and the drive system due to the fact that the output allows large motor cable lengths.

Specifications	QD75D1	QD75P1	QD75D2	QD75P2	QD75D4	QD75P4
Number of control axes	1	1	2	2	4	4
Interpolation	—	—	2 axis linear and circular interpolation		2, 3, or 4 axis linear and 2 axis circular interpolation	
Positioning data itmes	600 per axis					
Output type	Differential driver	Open collector	Differential driver	Open collector	Differential driver	Open collector
Output signal	Pulse chain		Pulse chain		Pulse chain	
method	PTP control: absolute data and/or incremental; speed/position switching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental					
units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 474 836 648 – 21 474 836 647 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree		Incremental method: -2 147 483 648 – 2 147 483 647 pulse -21 474 836 648 – 21 474 836 647 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree		Speed/position switching control: 0 – 2 147 483 647 pulse 0 – 21 474 836 647 µm 0 – 21 474.83647 inch 0 – 21 474.83647 degree	
Positioning speed	1 – 1 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 200 000 000.00 degree/min 0.001 – 200 000 000.00 inch/min					
acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration					
acceleration and deceleration time	1–8388608 ms (4 patterns, each can be set)					
rapid stop deceleration time	1–8388608 ms					
I/O points	32	32	32	32	32	32
Dimensions (WxHxD)	mm 27.4x98x90					
Order information	Art. no. 129675	132581	129676	132582	129677	132583
Accessories	40-pin connector and ready to use connection cables and system terminals; Programming software: GX Configurator QP, art. no.: 132219					

Specifications	QD75MH1	QD75MH2	QD75MH4
Number of control axes	1	2	4
Interpolation	—	2 axis linear and circular interpolation	
Positioning data itmes	600 per axis		
Output type	SSCNET III		SSCNET III
Output signal	BUS		BUS
method	PTP control: absolute data and/or incremental; speed/position switching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental		
units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 474 836 648 – 21 474 836 647 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree		Incremental method: -2 147 483 648 – 2 147 483 647 pulse -21 474 836 648 – 21 474 836 647 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree
Positioning speed	1 – 50 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 2 000 000 000.00 degree/min 0.001 – 2 000 000 000.00 inch/min		
acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration		
acceleration and deceleration time	1–8388608 ms (4 patterns, each can be set)		
rapid stop deceleration time	1–8388608 ms		
I/O points	32	32	32
Dimensions (WxHxD)	mm 27.4x98x90		
Order information	Art. no. 165761	165762	165763
Accessories	40-pin connector and ready to use connection cables and system terminals; Programming software: GX Configurator QP, art. no.: 132219		

Single Axis Motion Controller MR-MQ100



The MR-MQ100 allows a single axis to be completely controlled and synchronised to a separate encoder or virtual axis with no additional controller hardware like a PLC. Applications such as rotary cutters, flying saws and labelling can be realized cost-effectively. A complete range of essential functions are available, including encoder and virtual axis synchronization, registration, point to point positioning and user defined cam profiles. In addition, the hardware complements these powerful software features with built-in I/O and SSCNET III motion networking capability as well as an Ethernet port. The MR-MQ100 uses Mitsubishi's simple but rugged optical fiber motion network SSCNET III. A single fiber connection is all that's needed to provide full communication and control over all functions of the MR-J3-B servo amplifier regardless of

capacity. A standard Ethernet connection is also provided to link the MR-MQ100 to the MT Developer2 software and to the control system.

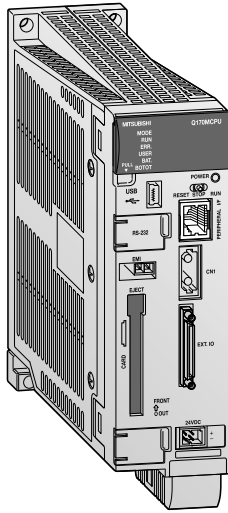
- Stand-alone Motion Control System only with servo amplifier without additional hardware
- Optical high-speed SSCNET III network
- Ethernet interface 100/10 Mbps
- High speed inputs for mark sensors
- External encoder input for axis synchronisation
- MC protocol Ethernet communication
- Extension I/O unit MR-J3-D01 can be connected to the MR-J3-BSafety amplifier series to increase the number of in- and outputs
- Integrated serial interface (RS422) for communication with HMI

Items	MR-MQ100	
Power supply	24 V DC $\pm 10\%$ (required current capacity: 400 mA)	
Digital inputs (mark sensors)	4 inputs (24 V DC)	
Digital outputs	2 outputs (24 V DC)	
Synchronous encoder	signal type	A/B phase pulse train input
	voltage input/open-collector type (5 V DC)	Up to 800 kpps (after magnification by 4), up to 10 m
	differential input type	Up to 4 Mpps (after magnification by 4), up to 30 m
Peripheral interface	100 Mbps/10 Mbps Ethernet (for programming and additional options) SSCNET III (for connection to MR-J3-B series servo amplifier with optical cable)	
Positioning	method	(PTP (Point to Point) control, Speed control/Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22))
	acceleration/deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration
	compensation	Backlash compensation, Electronic gear, Phase compensation
Servo program capacity	16 k steps	
Number of positioning points	3200	
Number of control axis	1 axis	
Operation cycle	0.44 ms	
Servo amplifier	MR-J3-B servo amplifier (over SSCNET III)	
Programming language	Motion SFC, dedicated instruction, mechanical support language (SV22)	
Memory back up (included)	Q6BAT	
Cam function	number of cams	Up to 256 cam profiles may be stored internally.
	resolution per cycle	256, 512, 1024, 2048
	stroke resolution	32767
	control mode	Two-way cam, feed cam
Weight [kg]	0.7	
Dimensions (WxHxD)	mm 30x168x135 ^①	
Order information	Art. no. 217705	

^① H without battery (Height with battery = 178 mm)

Accessories	Q170MCPUI-EXTIO-05M-EG	Q170MCPUI-EXTIO-1M-EG	Q170MCPUI-EXTIO-3M
Application	Cable between Q170MCPUI IO I/F and TB-50-EG	Cable between Q170MCPUI IO I/F and TB-50-EG	Cable for Q170MCPUI IO I/F with open ends
Length	m 0.5	1	3
Order information	Art. no. 217705	229276	229277

■ Stand-Alone Motion-Controller Q170MCPU



The Q170MCPU combines a PLC CPU, a Motion CPU and a power supply module into one compact unit. No base unit is required, although an extension base unit with standard PLC modules can be connected if required. An encoder interface is included as standard, enabling multiple axis synchronization with an external encoder.

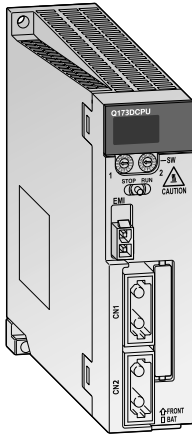
The well-reputed mechanical support language (SV13, SV22) from the System Q Motion Controller is incorporated.

- Small size
- Controls up to 16 axes
- Communication with the MR-J3-B series servo amplifier via high-speed network SSCNET III and a communication speed up to 50 Mbps.
- Programming and configuration is performed using the familiar software GX (IEC Developer und MT Developer2).
- Expandable with an extension base unit (up to 5 slots) and I/O modules, intelligent modules, and network-related modules.
- MC protocol Ethernet communication

Specifications		Q170MCPU
Motion-CPU	number of controllable axes	16
	operation cycle (using SV13)	0.44 ms (1st to 6th axis), 0.88 ms (7th to 16th axis)
	acceleration/deceleration system	Trapezoidal, S-curve
	programming languages	Motion SFC, dedicated instruction, mechanical support language (SV22)
	servo program capacity	16 k steps
	interfaces	Ethernet 100 Mbps/10 Mbps (for programming and additional options) SSCNET III (for connection to MR-J3-B series servo amplifier with optical cable) USB, RS232
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes
PLC CPU	number of I/O points	512 (Maximum of 320 points is available with modules on extension base unit)
	programming languages	Ladder, instruction list, SFC, structured text
	program capacity	20 k steps
	processing speed	0.02 μs (LD-Anweisung); 0.04 μs (MOV-Anweisung)
	total number of instructions	764 (including real number operation instruction)
Positioning	method	(PTP (Point to Point) control, Speed control/Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22))
	acceleration/deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration
	compensation	Backlash compensation, Electronic gear, Phase compensation
Memory card interface		1 slot for memory card for MELSEC System Q
Cam function	number of cams	Up to 256 cam profiles may be stored internally.
	resolution per cycle	256, 512, 1024, 2048
	stroke resolution	32767
	control mode	Two-way cam, feed cam
Dimensions (WxHxD)	mm	52x178x135
Order information	Art. no.	221835

Accessories		Q170MCPU-EXTIO-05M-EG	Q170MCPU-EXTIO-1M-EG	Q170MCPU-EXTIO-3M
Application		Cable between Q170MCPU IO I/F and TB-50-EG	Cable between Q170MCPU IO I/F and TB-50-EG	Cable for Q170MCPU IO I/F with open ends
Length	m	0.5	1	3
Order information	Art. no.	217705	229276	229277

MELSEC System Q Motion CPUs



The Q-Motion controller CPU controls and synchronises the connected servo amplifiers and servo motors. A motion system besides the controller CPU, also includes a PLC CPU. Only after combining a highly dynamic positioning control CPU and a PLC, an innovative motion control system is created.

While the Motion CPU controls large-scale servo movements the PLC CPU is responsible for the machine control and the communication.

- Using multiple CPUs to distribute the load improves the overall performance of the whole system
- Use of up to 3 motion CPUs within one system
- Large scale control system for up to 96 axes per system
- Interpolation of 4 axes simultaneously
- Electronic cam control
- Virtual and real master axes
- Integration in the high-speed SSCNET network for communication with high-performance MR-J3-B servo amplifiers at up to 50 Mbps

Specifications	Q172HCPU	Q173HCPU	Q172DCPU	Q173DCPU
Type	Motion CPU	Motion CPU	Motion-CPU	Motion-CPU
I/O points	8192	8192	8192	8192
No. of control axes	8	32	8	32
Interpolation functions	Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes			
Positioning	method	PTP (point to point), speed control/speed-position control, fixed pitch feed, constant speed control, position follow-up control, speed switching control, high-speed oscillation control, synchronous control (SV22)		
	acceleration/deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration		
	compensation	Backlash compensation, electronic gear		
Programming language	Motion SFC, dedicated instructions, software for conveyor assembly (SV13), virtual mechanical support language (SV22)			
Servo program capacity	16 k steps			
No. of positioning points	3200			
Interfaces	USB, RS232C, SSCNET III		SSCNET III (USB, RS232C via PLC-CPU) SSCNET III (USB, RS232C via PLC-CPU)	
Real I/O points (PX/PY)	256 (these I/Os can be allocated directly to the motion CPU)			
Dimensions (WxHxD)	mm	27.4x98x114.3	27.4x98x119.3	27.4x98x119.3
Order information	Art. no.	162417	162416	209788
				209787

MELSEC System Q Motion System Modules

Servo external signals interface module Q172LX/Q172DLX

The Q172LX/Q172DLX input module is used in conjunction with a Q Motion CPU to capture external servo signals.

Up to 8 axes can be evaluated per module. In this way, proximity dog sensor, upper/lower limit switch, stop signal input and operating mode switching input can be easily incorporated into the system.

- 32 address points for 8 axes for each 4 inputs
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photocoupler
- Shortest response time of < 0.4 ms
- Modular extension possible

Serial absolute synchronous encoder interface module Q172EX-S2/Q172DEX

The serial absolute synchronous encoder interface module Q172EX-S2/Q172DEX is a Motion system module for receiving and evaluating up to two serial absolute-value encoders (Incremental encoders cannot be connected). Via an external encoder (Q170ENC) it is possible to feed a setpoint source to the Motion system, which in turn is programmed as a master axis.

In addition to the interfaces for the signals of two absolute-value encoders, the Q172EX-S2/Q172DEX has two digital inputs with ultra-rapid responsetimes.

- Transfer rate of 2.5 Mbit per second
- Resolution of 18 Bit with Q170ENC
- Voltage-failure security of the absolute values by means of built-in buffer battery
- Shortest response times of < 0.4 ms
- Modular extension possible

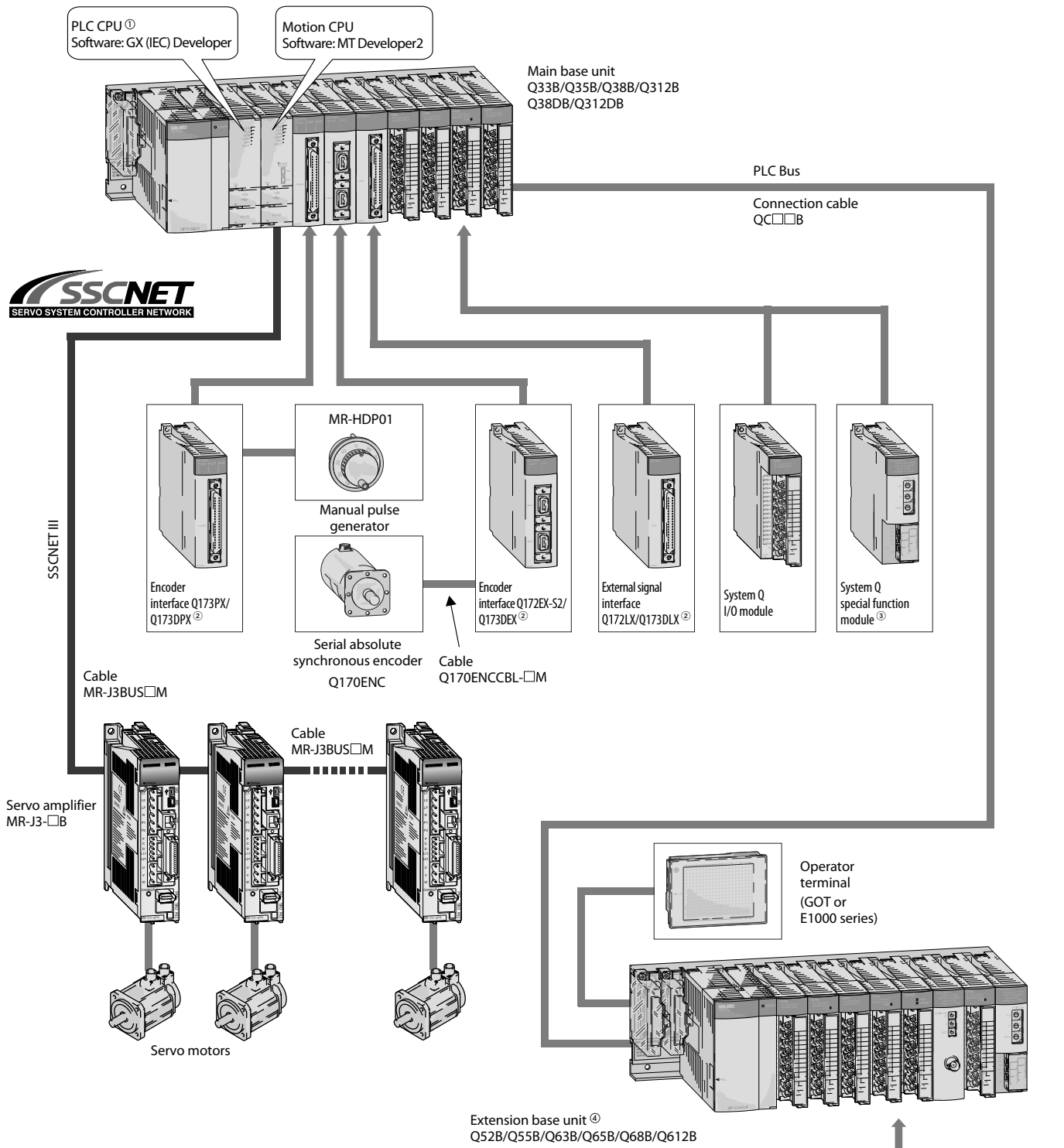
Manual pulse generator interface module Q173PX/Q173DPX

The Manual pulse generator interface module Q173PX is used in a Motion system to receive the signals of up to 3 external incremental encoders or manual impulse generators (hand wheels).

In addition to the inputs for the encoders, the Q173PX/Q173DPX has three digital inputs with which the encoder signal counting procedure can be started (Encoder start signal).

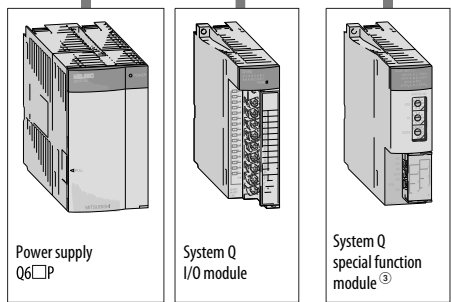
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photo coupler
- Shortest response times of < 0.4 ms
- Modular extension possible

■ Configuration of a SSCNET III System



Notes:

- ① The first CPU on the main base unit must always be a PLC CPU, e.g. Q02/Q02H/Q06H/Q12H/Q25H/QnUD(H) series.
- ② In a multi CPU system only one Motion CPU can access the Q Motion system modules. These modules can be mounted at any desired location on the main or extension base units.
- ③ A Motion CPU cannot access special function modules or network modules.
- ④ The Q52B and Q55B extension base units do not have a slot for a power supply unit.



X-Y Table System Configurations

An X-Y table is a typical two axes servo application, commonly used in industry for pick and place systems such as PCB component insertion machines through to welding machines.

The following information provides two examples of possible X-Y table system configurations, using Mitsubishi automation equipment.

The first is a FX3G-24MT/ESS based system and the second is a more complex interpolating QD75MH (SSCNET III) based system.

System 1: FX3G PLC based system

Products	Function
FX3G-24MT/ESS	PLC with integrated positioning control
MR-E-10A-QW003	Servo Amplifier
HF-KE13W1-S100	Motor
MR-E-70A-QW003	Servo Amplifier
HF-SES2KW1-S100	Motor

The FX3G is a compact PLC for comprehensive machine control. It combines the functions of a PLC with positioning functions. In this configuration the FX3G-24MT/ESS is used to control the X and Y axes. Via the transistor open collector outputs the PLC provides the Servo amplifiers of the MR-ES-A Series with pulse train signals for controlling the two axes. The setting of the system can be done with the GX Developer. GX Developer has a special section for the general positioning parameter setup and for the setup of each positioning command in a easy to use table. This table for each axis can contain 100 instructions with the frequency and

number of pulses stored in the user data area and can be manipulated and uploaded for setting into operation of the machine.

For expanding the system, the FX3G is also connectable to the majority of existing FX2N and FX3U Special Function Blocs.

- User friendly positioning
- Easy setting in GX Developer
- Cost effective
- Simple functionality

System 2: QD75MH based system

Products	Function
Q00J	Q PLC
QD75-MH2	Positioning Controller
MR-J3-10B	Servo Amplifier
HF-KP13	Motor
MR-J3-40B	Servo Amplifier
HF-SP52	Motor
MR-BAT	Servo Amplifier Battery

The QD75MH based system uses the powerful modular Qn PLC Series, providing greater functionality and expandability options. The QD75MH system is connected using SSCNET III (Servo System Controller Network), which is Mitsubishi's dedicated motion control network. SSCNET III simplifies the set-up of the system and reduces the wiring required. SSCNET III systems are created by simply plugging an amplifier into the main controller (QD75MH) and then "daisy-chaining" each additional axis that is added. SSCNET III connectivity requires MR-J3-B type amplifiers to be used.

Furthermore, as the Servo amplifiers are connected by a bus system, all Servo data, such as current position, torque etc. can all be monitored back at the main controller (Q00J PLC) as the data is automatically updated on the QD75MH module.

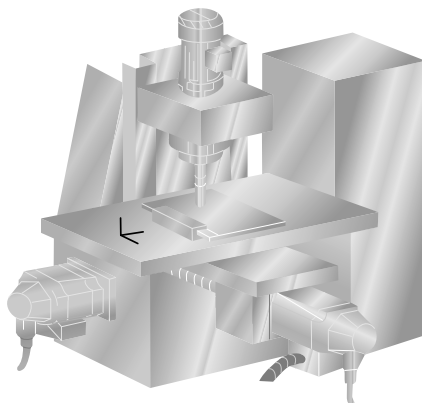
Also, all of the internal Servo parameters can be set from the PLC, again due to the bus system used.

The bus system also means that position data is sent serially, therefore reducing any possible interference due to noise.

Finally, as both axes are controlled from one high function module (QD75MH), interpolation between the two axes is possible.

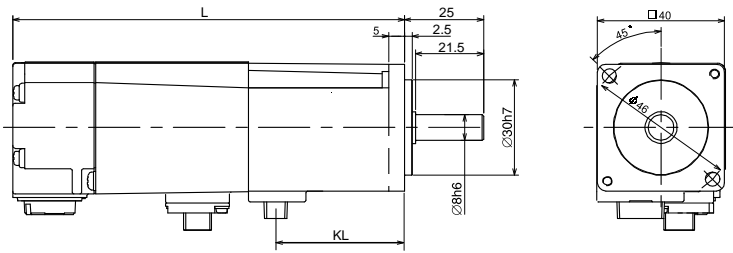
- SSCNET III capability
- Easy of set-up
- High functionality
- Expandability
- Module Options
- Reduced Wiring

X-Y table control



Servo motors

HF-KE13(B)W1-S100, HF-KP053(B), HF-KP13(B), HF-MP053(B), HF-MP13(B)

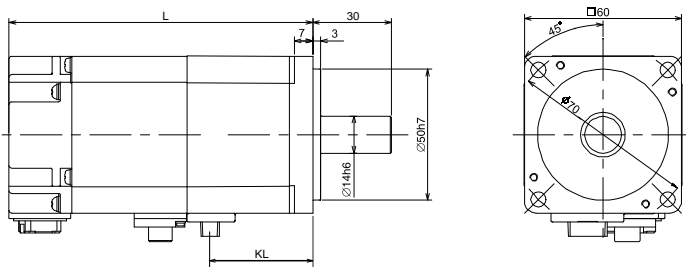


Type	L [mm]	KL [mm]
HF-KE13(B)W1-S100	82.4 (123.5)	40.5
HF-KP053(B)	66.4 (107.5)	24.5
HF-KP13(B)	82.4 (123.5)	40.5
HF-MP053(B)	66.4 (107.5)	24.5
HF-MP13(B)	82.4 (123.5)	40.5

Dimensions for motors with brake in brackets ().

Unit: mm

HF-KE23(B)KW1-S100, HF-KE43(B)KW1-S100, HF-KP23(B), HF-KP43(B), HF-MP23(B), HF-MP43(B)



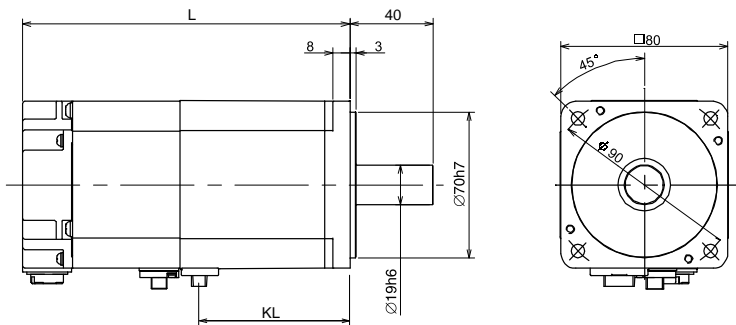
Type	L [mm]	KL [mm]
HF-KE23(B)KW1-S100 ^①	76.6 (116.1)	39.3
HF-KE43(B)KW1-S100 ^①	98.5 (138.0)	61.2
HF-KP23(B)	76.6 (116.1)	39.3
HF-KP43(B)	98.5 (138.0)	61.2
HF-MP23(B)	76.6 (116.1)	39.3
HF-MP43(B)	98.5 (138.0)	61.2

Dimensions for motors with brake in brackets ().

^① Motor with keyway shaft. (A key is supplied with the motor).

Unit: mm

HF-KE73(B)KW1-S100, HF-KP73(B), HF-MP73(B)



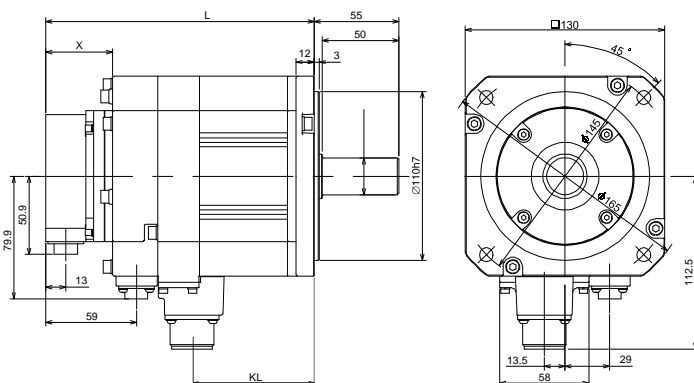
Type	L [mm]	KL [mm]
HF-KE73(B)KW1-S100 ^①	113.8 (157.0)	72.3
HF-KP73(B)	113.8 (157.0)	72.3
HF-MP73(B)	113.8 (157.0)	72.3

Dimensions for motors with brake in brackets ().

^① Motor with keyway shaft. (A key is supplied with the motor).

Unit: mm

HF-SE52(B)KW1-S100, HF-SE102(B)KW1-S100, HF-SE152(B)KW1-S100, HF-SP52(B), HF-SP102(B), HF-SP152(B)



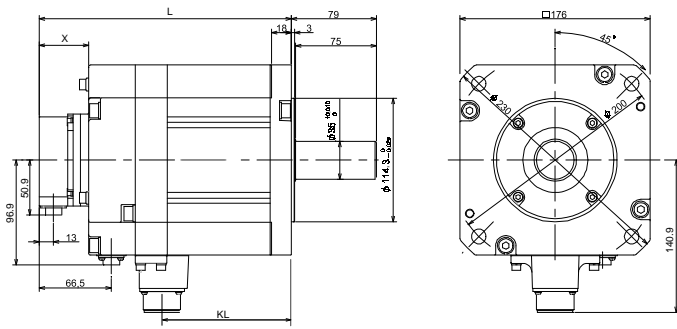
Type	L [mm]	KL [mm]	X [mm]
HF-SE52(B)KW1-S100 ^①	120 (154.5)	57.8	39.7 (45.0)
HF-SE102(B)KW1-S100 ^①	142 (176.5)	79.8	39.7 (45.0)
HF-SE152(B)KW1-S100 ^①	164 (198.5)	101.8	39.7 (45.0)
HF-SP52(B)	118.5 (153.0)	57.8	38.2 (43.5)
HF-SP102(B)	140.5 (175.0)	79.8	38.2 (43.5)
HF-SP152(B)	162.5 (197.0)	101.8	38.2 (43.5)

Dimensions for motors with brake in brackets ().

^① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

HF-SE202(B)KW1-S100, HF-SP202 (B), HF-SP352 (B), HF-SP502 (B), HF-SP702 (B)

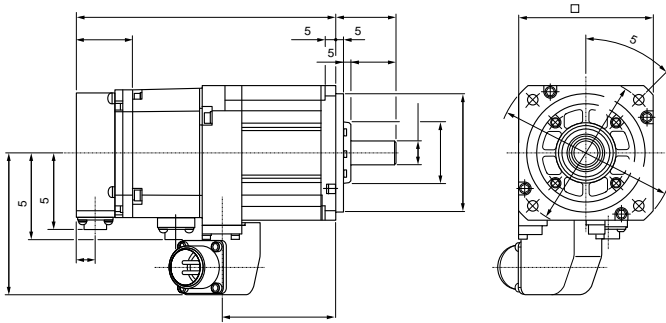


Type	L [mm]	KL [mm]	X [mm]
HF-SE202(B)KW1-S100 ^①	145 (194.5)	79.8	40.0 (47.0)
HF-SP202(B)	143.5 (193.0)	79.8	38.5 (45.5)
HF-SP352(B)	183.5 (233.0)	119.8	38.5 (45.5)
HF-SP502(B)	203.5 (253.0)	139.8	38.5 (45.5)
HF-SP702(B)	263.5 (313.0)	191.8	38.5 (45.5)

Dimensions for motors with brake in brackets ().
^① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

HF-JP534(B), HF-JP734(B), HF-JP1034(B), HF-JP1534(B), HF-JP2034(B)

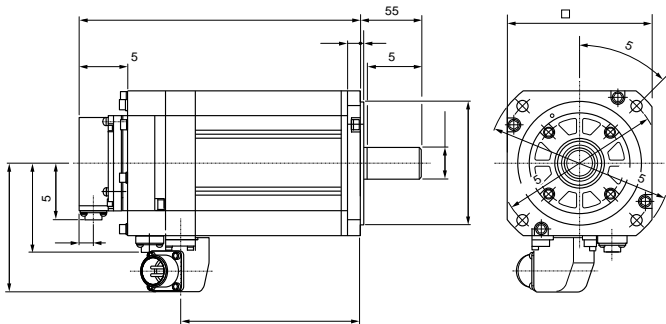


Type	L [mm]	KL [mm]
HF-JP534(B)	127.5 (173)	76
HF-JP734(B)	145.5 (191)	94
HF-JP1034(B)	163.5 (209)	112
HF-JP1534(B)	199.5 (245)	148
HF-JP2034(B)	235.5 (281)	184

Dimensions for motors with brake in brackets ().

Unit: mm

HF-JP3534(B), HF-JP5034(B)

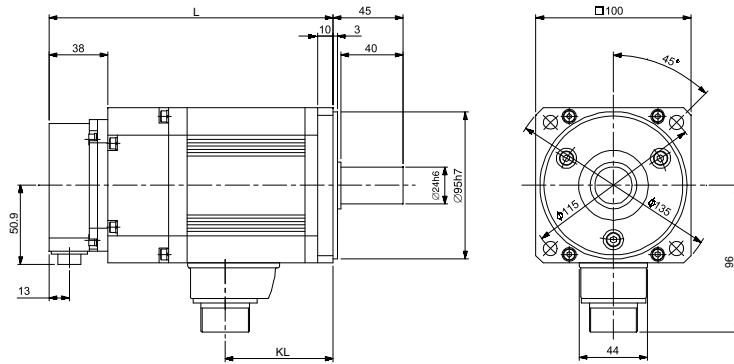


Type	L [mm]	KL [mm]
HF-JP3534(B)	213 (251.5)	161
HF-JP5034(B)	267 (305.5)	215

Dimensions for motors with brake in brackets ().

Unit: mm

HC-RP103(B), HC-RP153(B), HC-RP203(B)

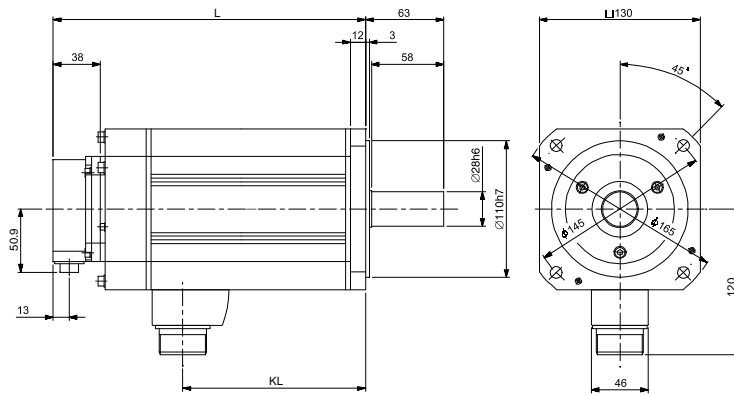


Type	L [mm]	KL [mm]
HC-RP103(B)	145.5 (183.5)	69.5
HC-RP153(B)	170.5 (208.5)	94.5
HC-RP203(B)	195.5 (233.5)	119.5

Dimensions for motors with brake in brackets ().

Unit: mm

HC-RP353(B), HC-RP503(B)

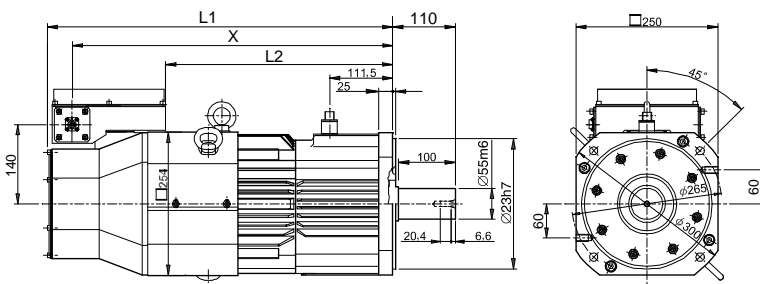


Type	L [mm]	KL [mm]
HC-RP353(B)	215.5 (252.5)	148
HC-RP503(B)	272.5 (309.5)	205

Dimensions for motors with brake in brackets ().

Unit: mm

HA-LP11K24(B), HA-LP15K24(B), HA-LP22K24(B)



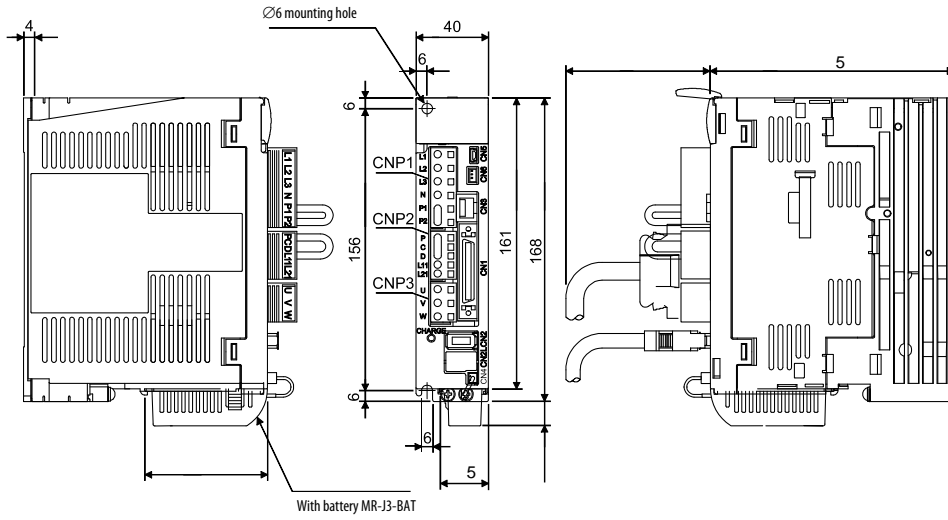
Type	L1 [mm]	L2 [mm]	X
HA-LP11K24(B)	480 (550)	262 (334)	426 (498)
HA-LP15K24(B)	495 (610)	289 (400)	454 (565)
HA-LP22K24(B)	555 (670)	346 (457)	511 (622)

Dimensions for motors with brake in brackets ().

Unit: mm

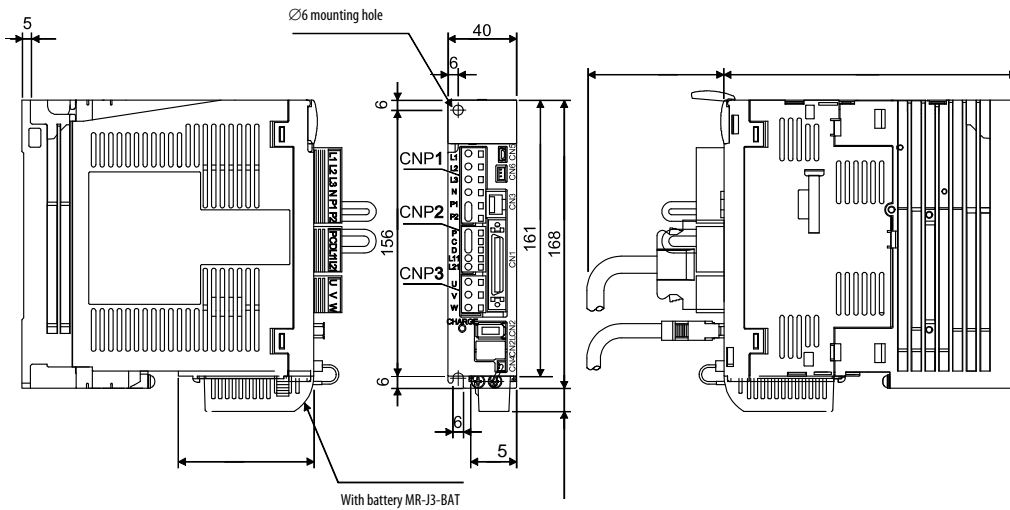
■ Servo amplifiers MR-J3-A/B/BS

MR-J3-10A/B/BS and MR-J3-20A/B/BS



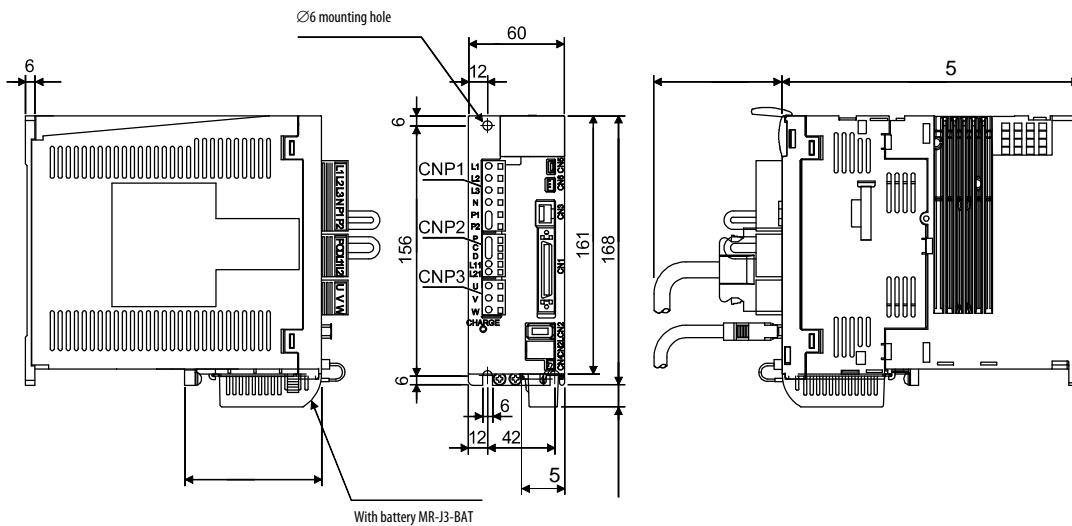
Unit: mm

MR-J3-40A/B/BS and MR-J3-60A/B/BS



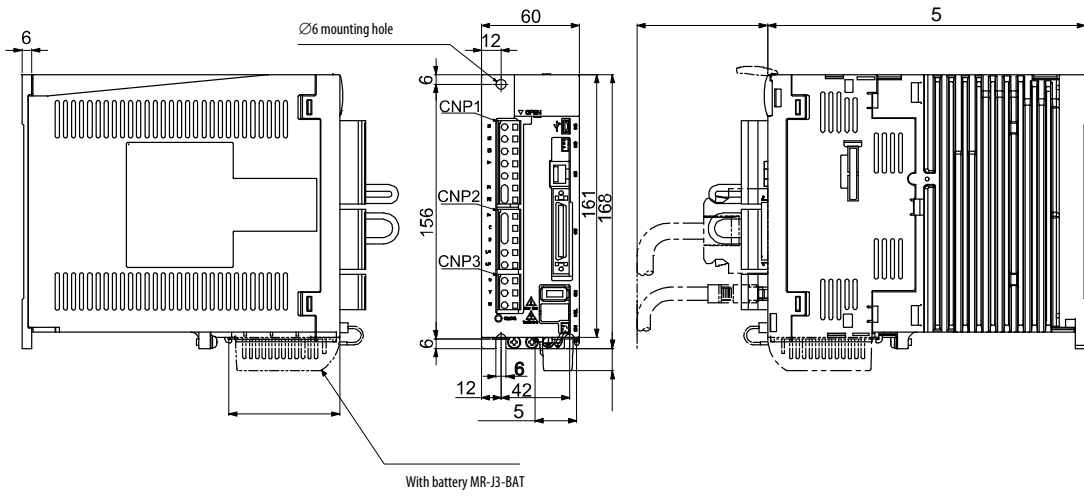
Unit: mm

MR-J3-A-70A/B/BS and MR-J3-100A/B/BS



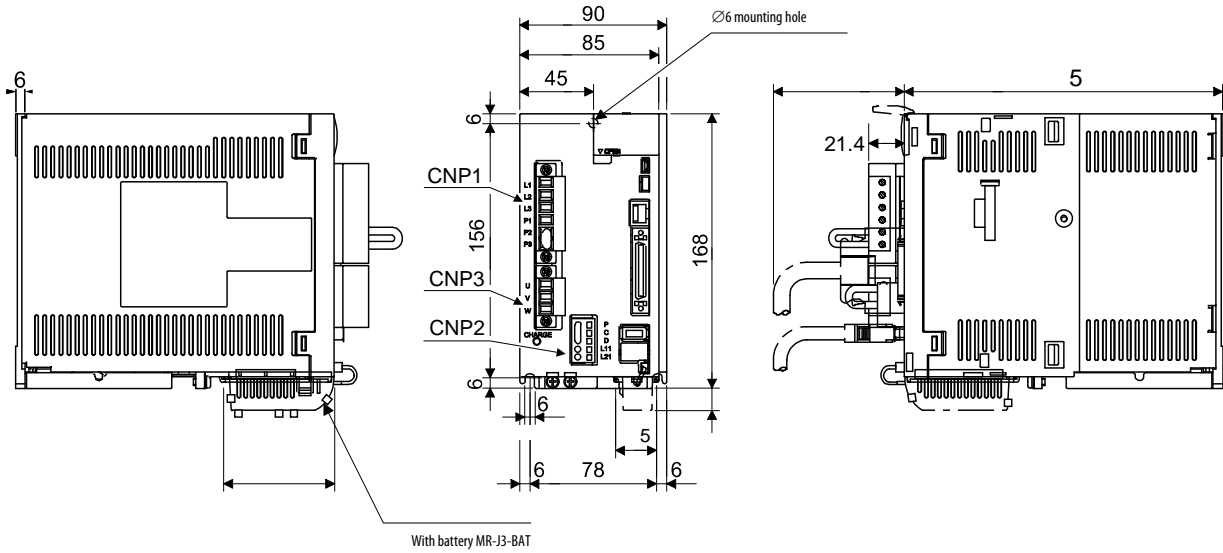
Unit: mm

MR-J3-60A4/B4/BS4 and MR-J3-100A4/B4/BS4



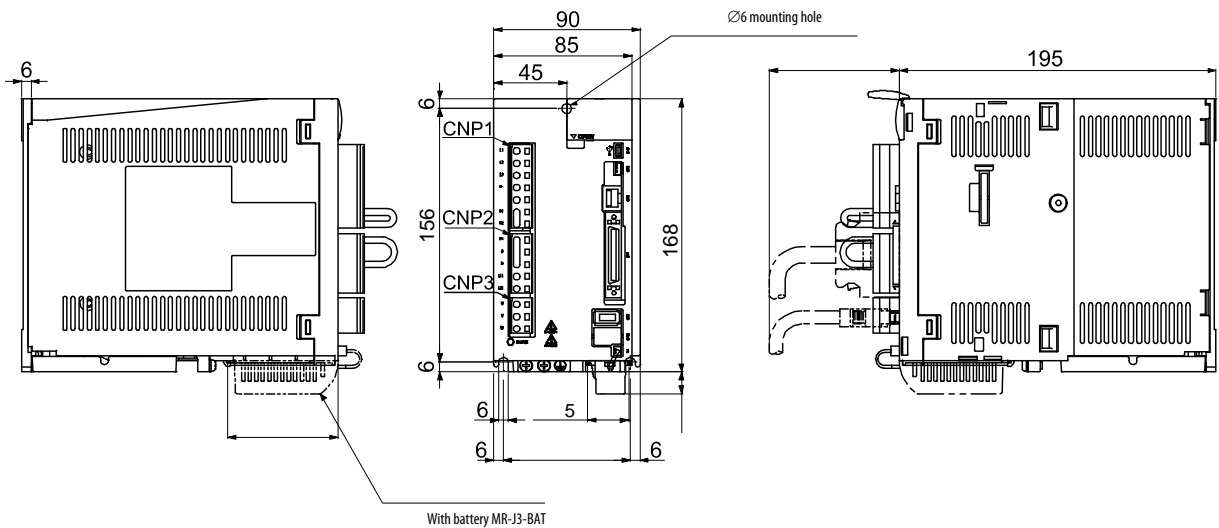
Unit: mm

MR-J3-200A/B/BS and MR-J3-350A/B/BS



Unit: mm

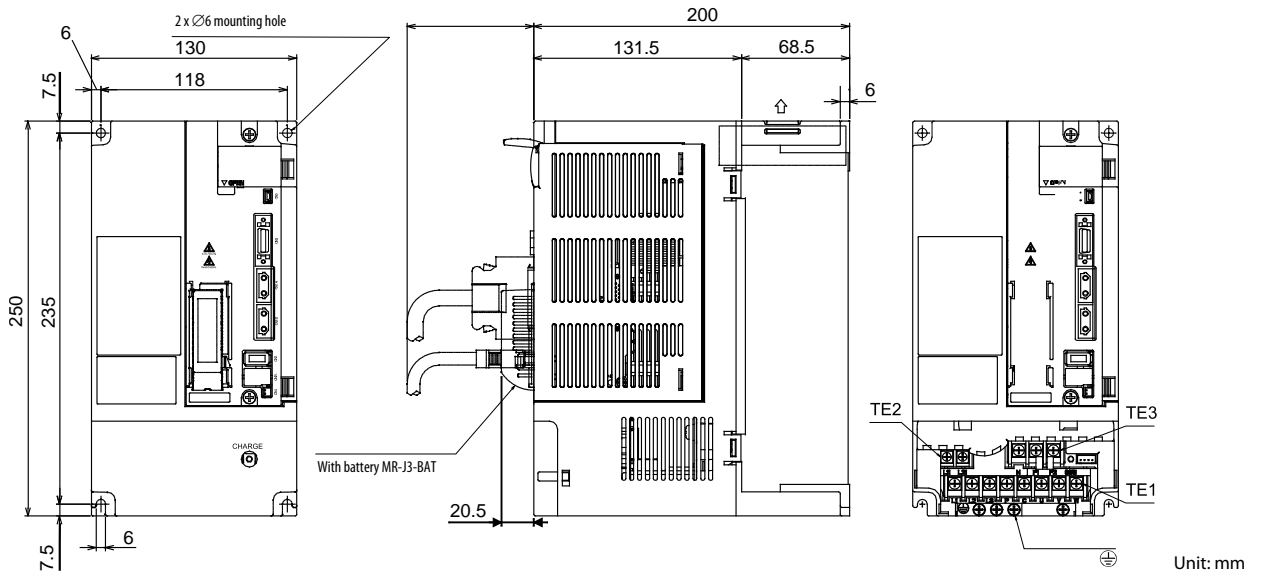
MR-J3-200A4/B4/BS4



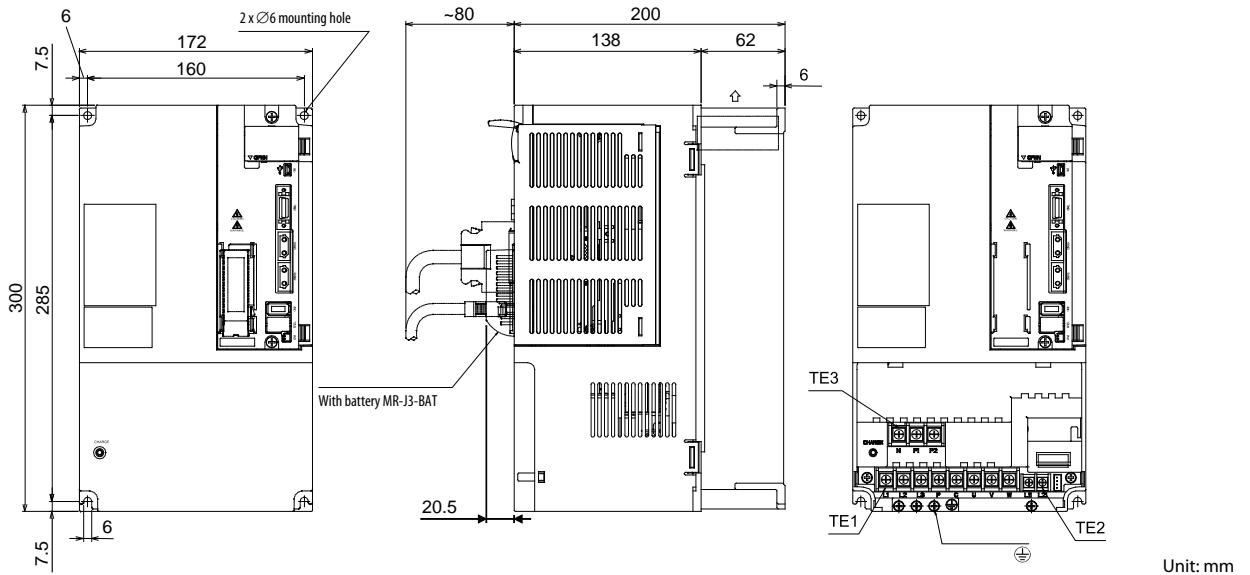
Unit: mm

DIMENSIONS 6

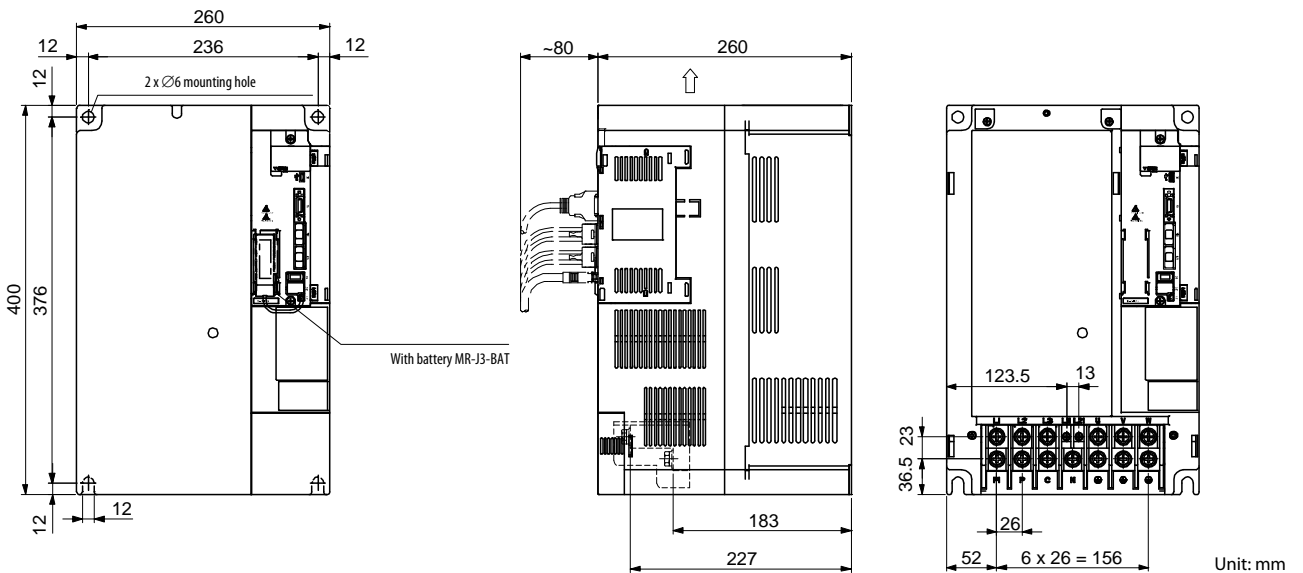
MR-J3-500A/B/BS4, MR-J3-350A4/B4/BS4 and MR-J3-500A4/B4/BS4



MR-J3-700A/B/BS4 and MR-J3-700A4/B4/BS4

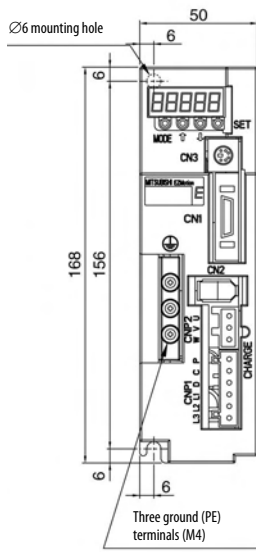


MR-J3-11KB/BS to MR-J3-22KB/BS and MR-J3-11KB4/BS4 to MR-J3-22KB4/BS4

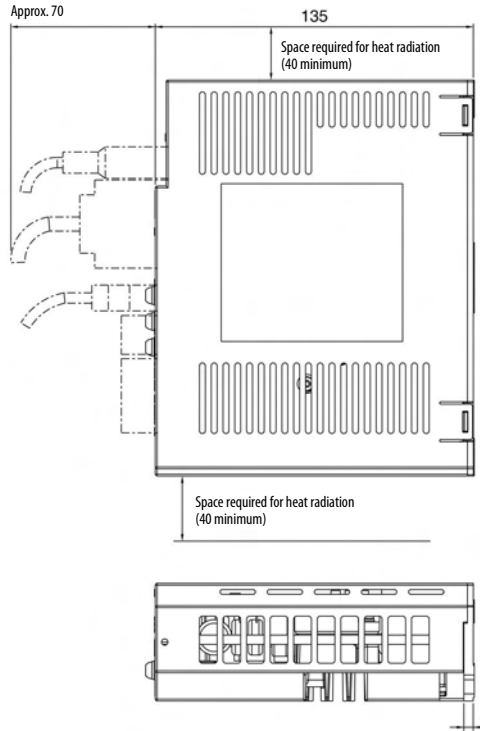


Servo amplifiers MR-E Super

MR-E-10A/AG-QW003, MR-E-20A/AG-QW003

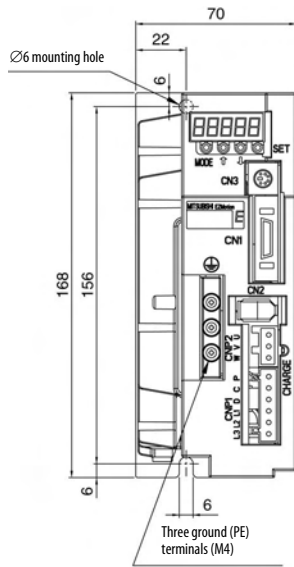


Mounting screw size: M5

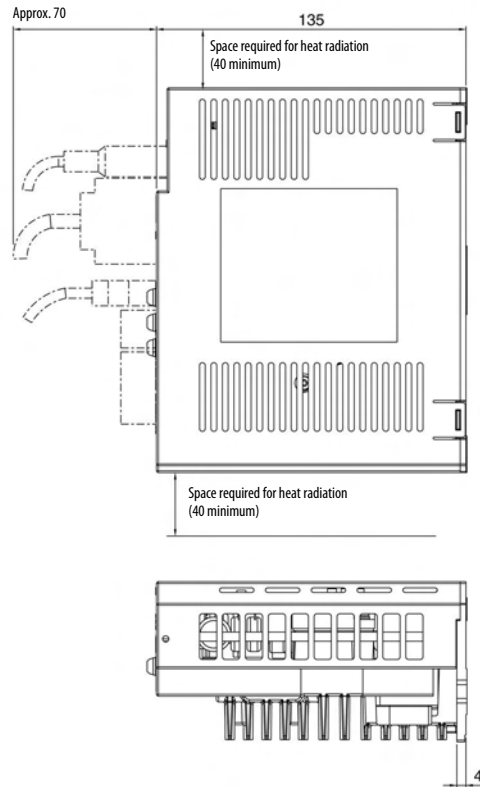


Unit: mm

MR-E-40A/AG-QW003

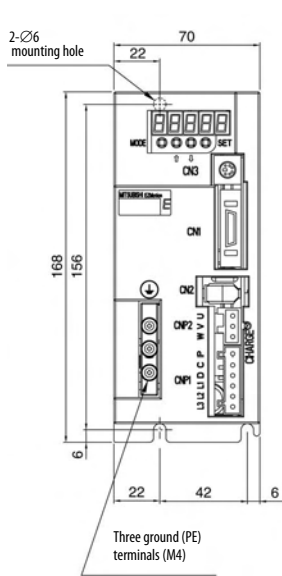


Mounting screw size: M5



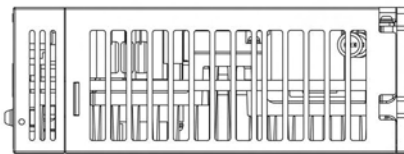
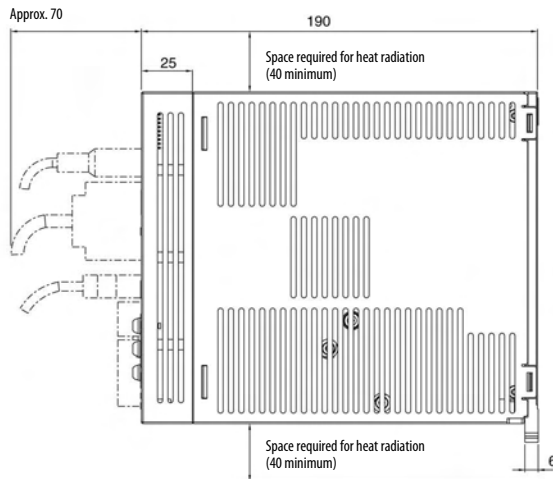
Unit: mm

MR-E-70A/AG-QW003, MR-E-100A/AG-QW003



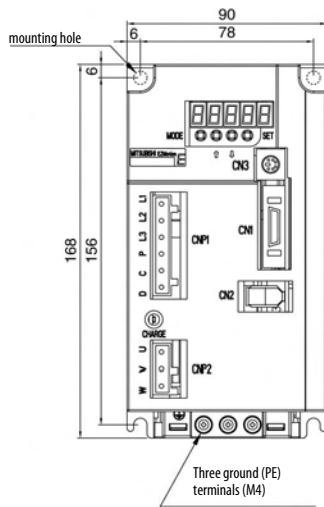
Three ground (PE) terminals (M4)

Mounting screw size: M5



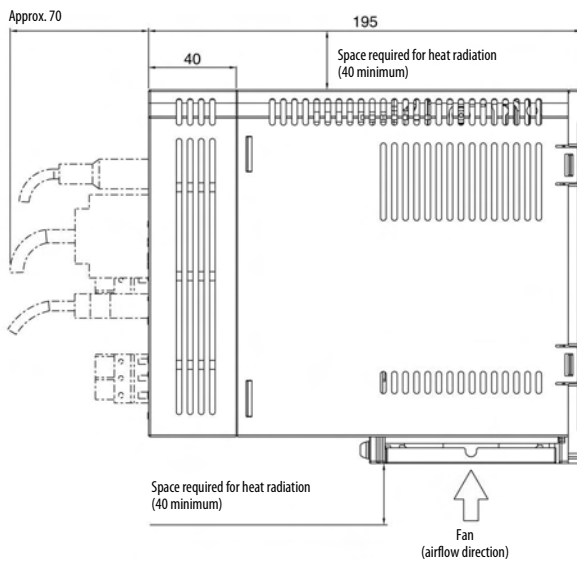
Unit: mm

MR-E-200A/AG-QW003



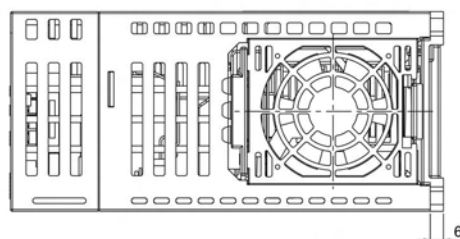
Three ground (PE) terminals (M4)

Mounting screw size: M5



Space required for heat radiation (40 minimum)

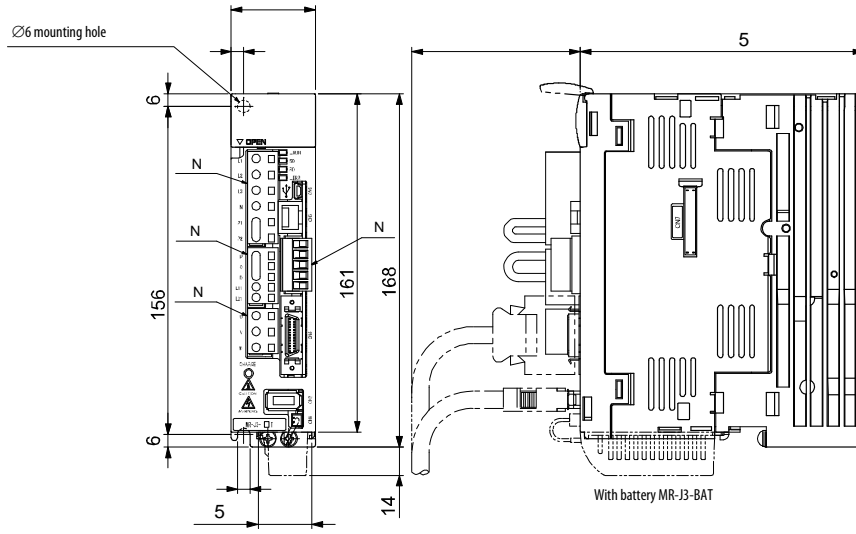
Fan (airflow direction)



Unit: mm

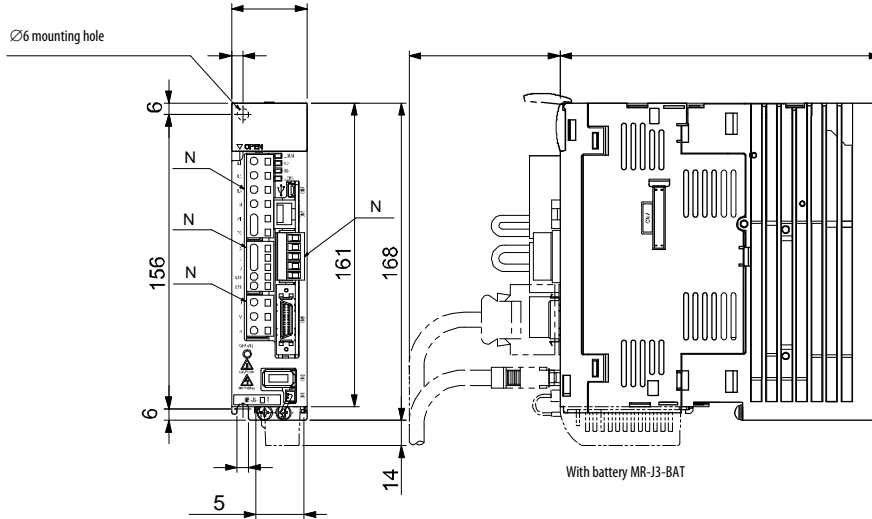
Servo amplifiers MR-J3-T

MR-J3-10T and MR-J3-20T



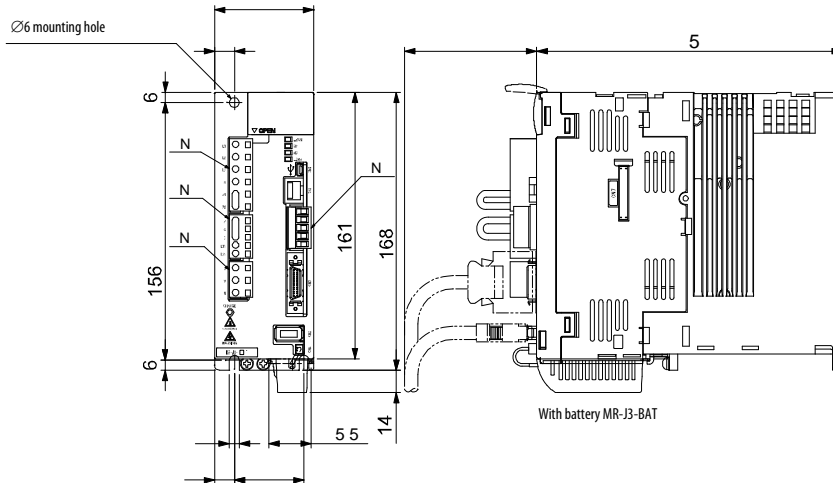
Unit: mm

MR-J3-40T and MR-J3-60T



Unit: mm

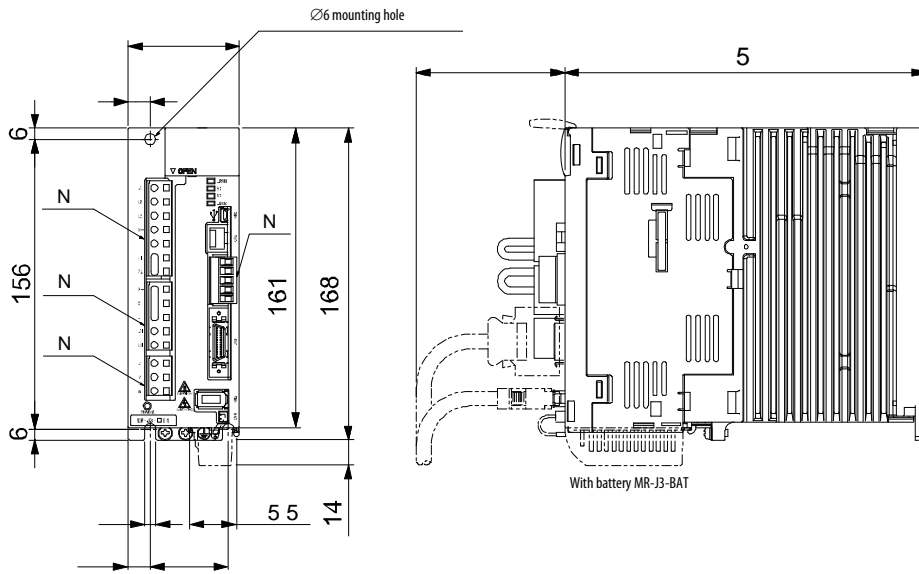
MR-J3-70T and MR-J3-100T



Unit: mm

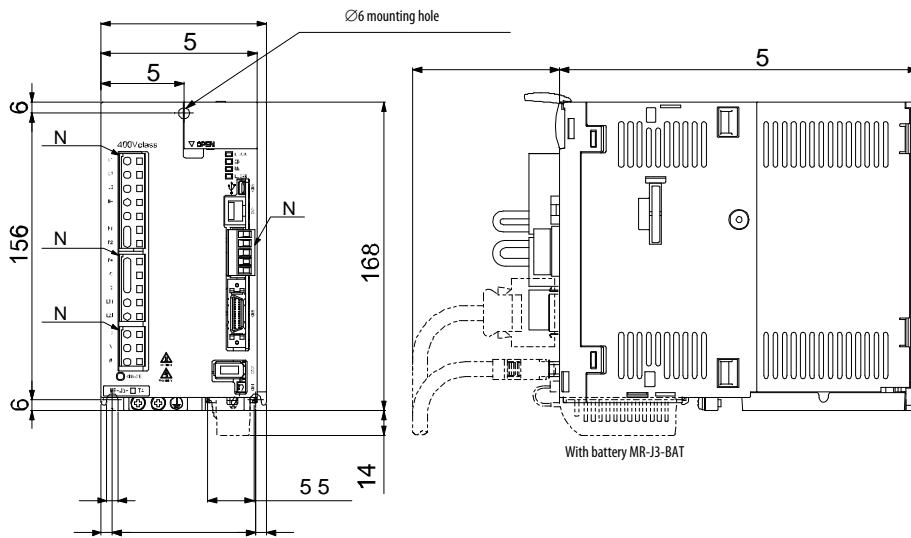
6 DIMENSIONS

MR-J3-60T4 and MR-J3-100T4



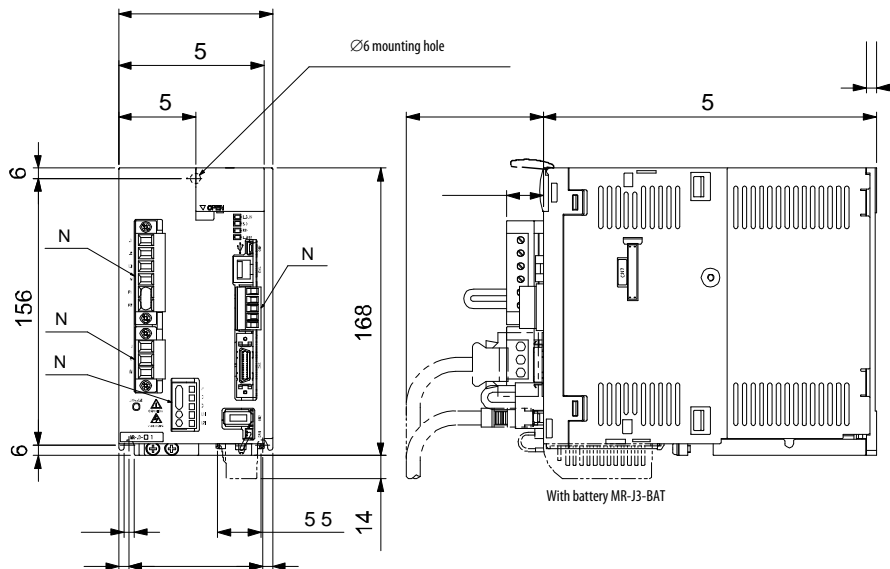
Unit: mm

MR-J3-200T(4)



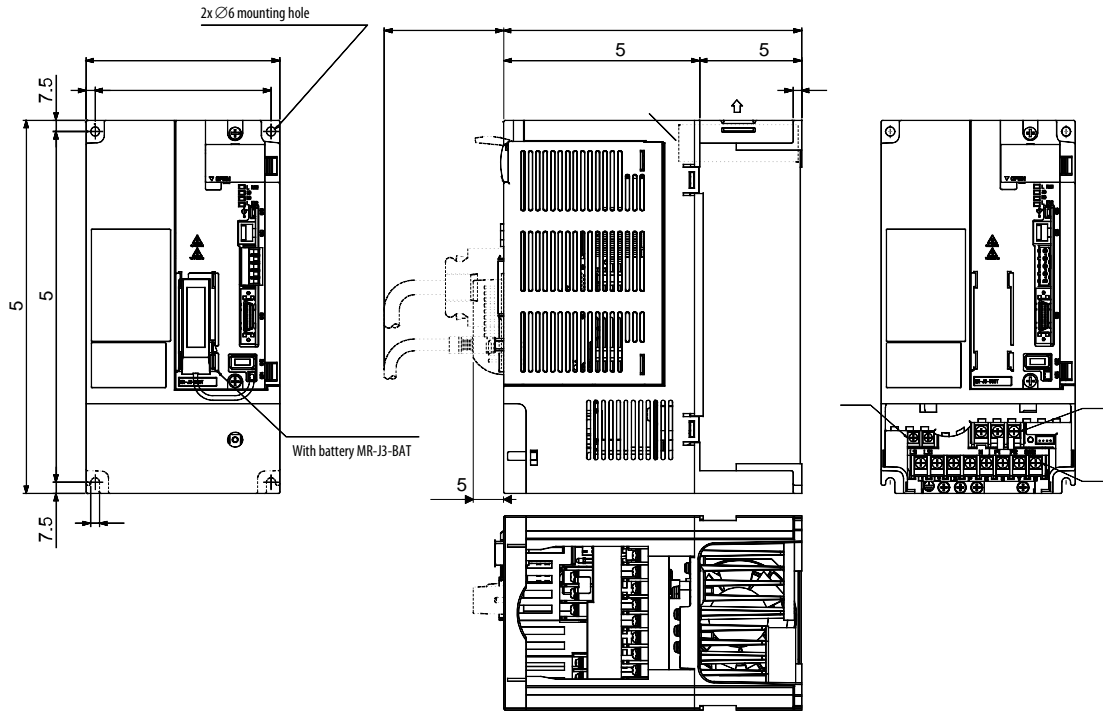
Unit: mm

MR-J3-350T



Unit: mm

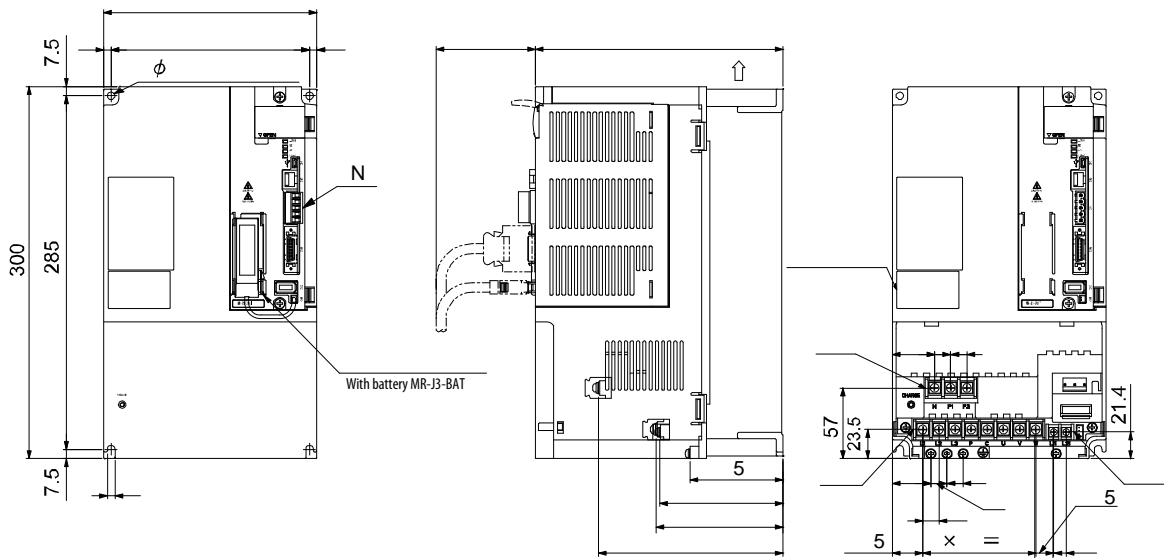
MR-J3-350T4 and MR-J3-500T(4)



Unit: mm

6

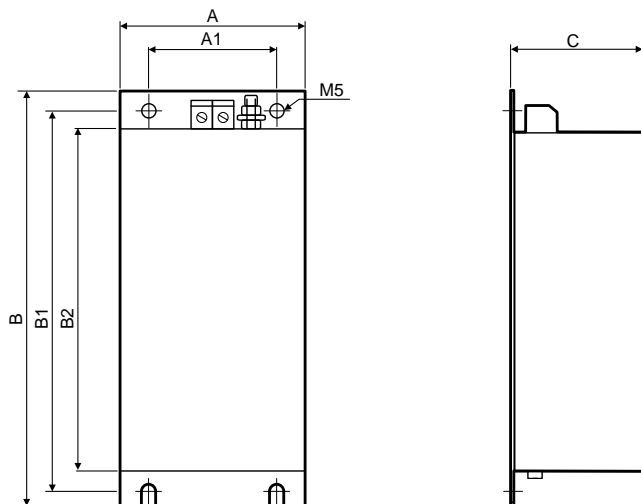
MR-J3-700T(4)



Unit: mm

■ Noise Filters

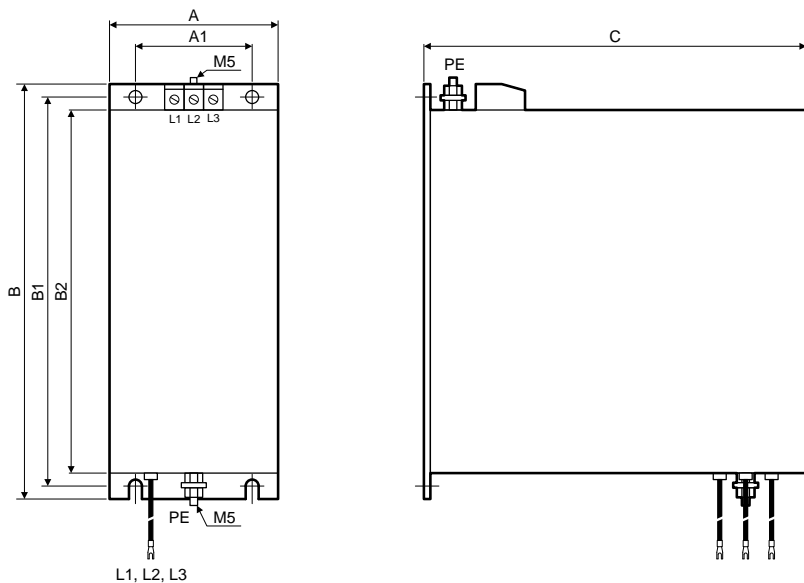
MF-2F230-006.230MFa to MF-3F480-015.230MF3 and MF-3F480-035.230



Type	A	A1	B	B1	B2	C
MF-2F230-006.230MFa	40	28	200	190	170	40
MF-2F230-006.230MFb	60	42	200	190	170	40
MF-3F480-015.233MF	130	118	282	270	—	66
MF-3F480-010.233MF	60	42	202	192	172	55
MF-3F480-015.230MF3	90	78	204	192	172	55
MF-3F480-035.230	75	60	168	156	140	195

Unit: mm

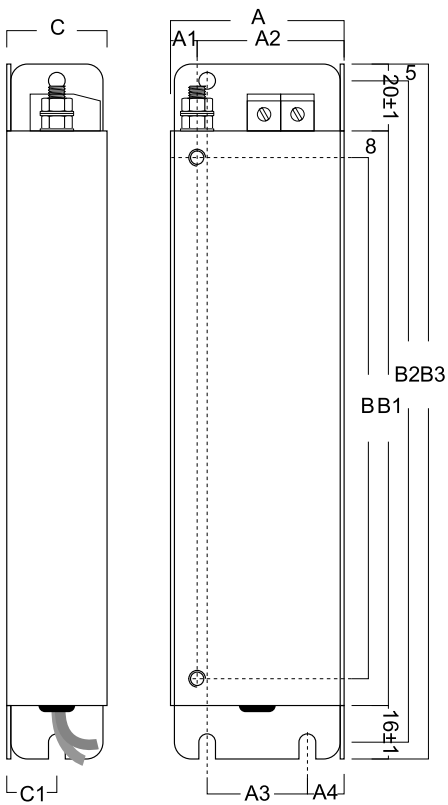
MF-3F230-011.230, MF-3F480-025.230MF3, MF-3F480-050.230MF3



Type	A	A1	B	B1	B2	C
MF-3F230-011.230	45	36	168	156	140	135
MF-3F480-025.230MF3	76	60	168	156	140	195
MF-3F480-050.230MF3	75	45	250	235	220	200

Unit: mm

FMR-ES-3A-RS1-FP, FMR-ES-6A-RS1-FP



Type	A	A1	A2	A3	A4	B	B1	B2	B3	C	C1
FMR-ES-3A-RS1-FP	52±1	8	44	30	11	156	172±1	198	208±1	30	15
FMR-ES-6A-RS1-FP	72±1	—	42	50	11	156	172±1	198	208±1	30	15

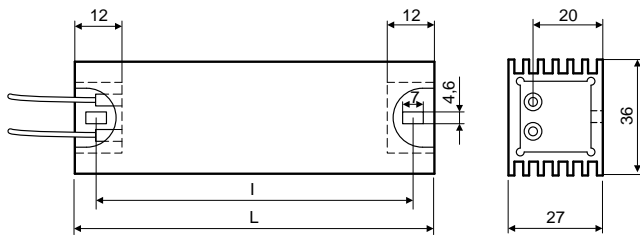
Unit: mm

6

DIMENSIONS

■ Brake Resistors

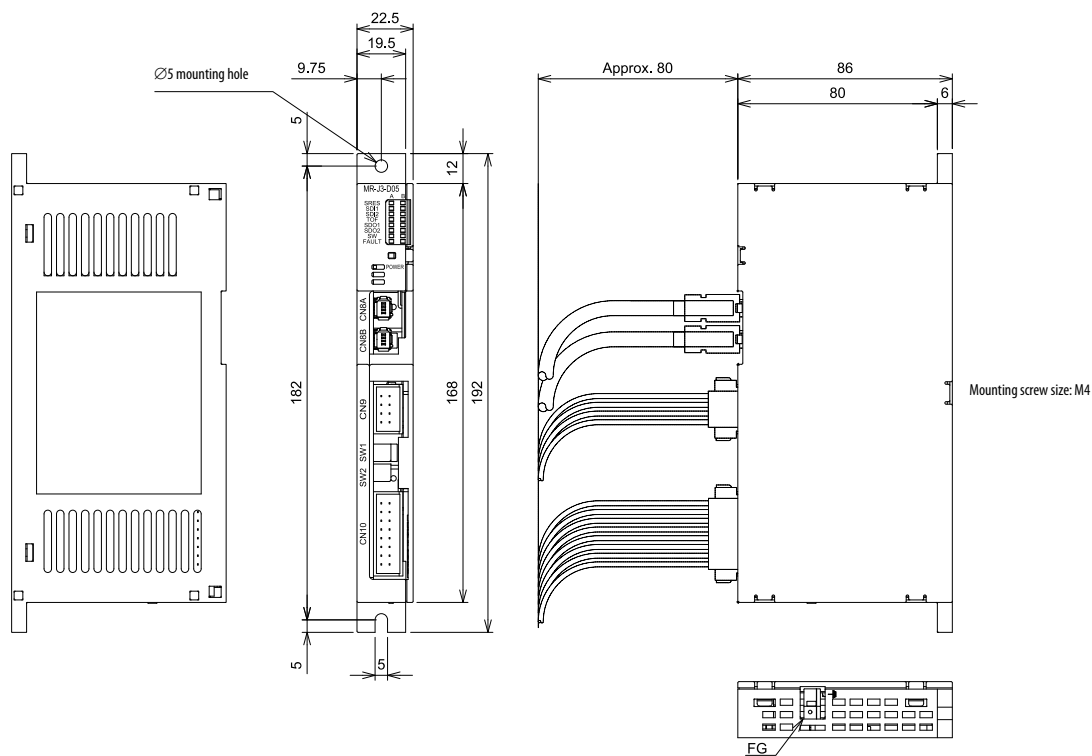
MR-RFH, MR-PWR-R



Type	L	l
MR-RFH75-40	90	79
MR-RFH220-40	200	189
MR-RFH400-13	320	309
MR-RFH400-6.7	320	309
MR-PWR-R T 400-120	200	189
MR-PWR-R T 600-47	320	309
MR-PWR-R T 600-26	320	309

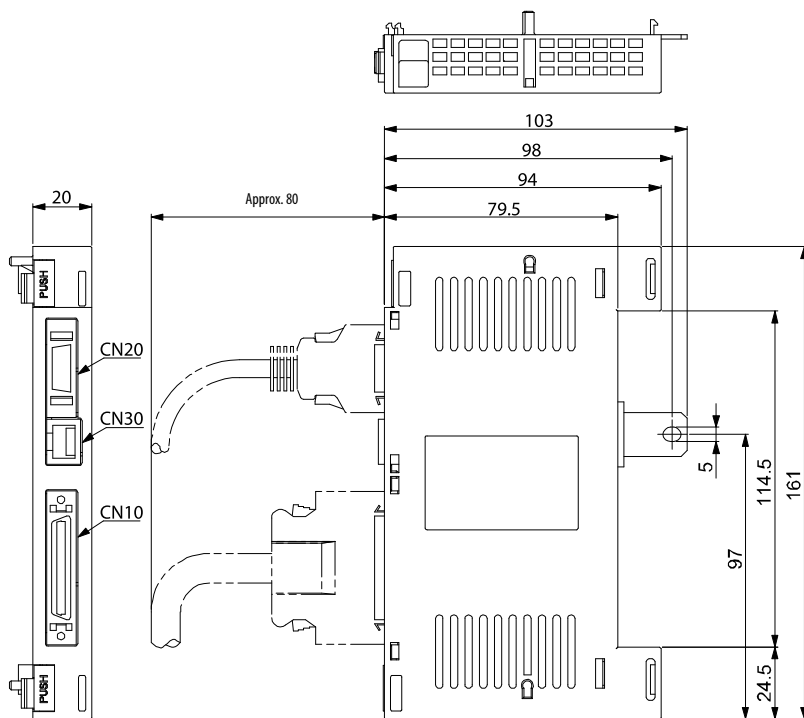
Unit: mm

■ Safety option card MR-J3-D05



Unit: mm

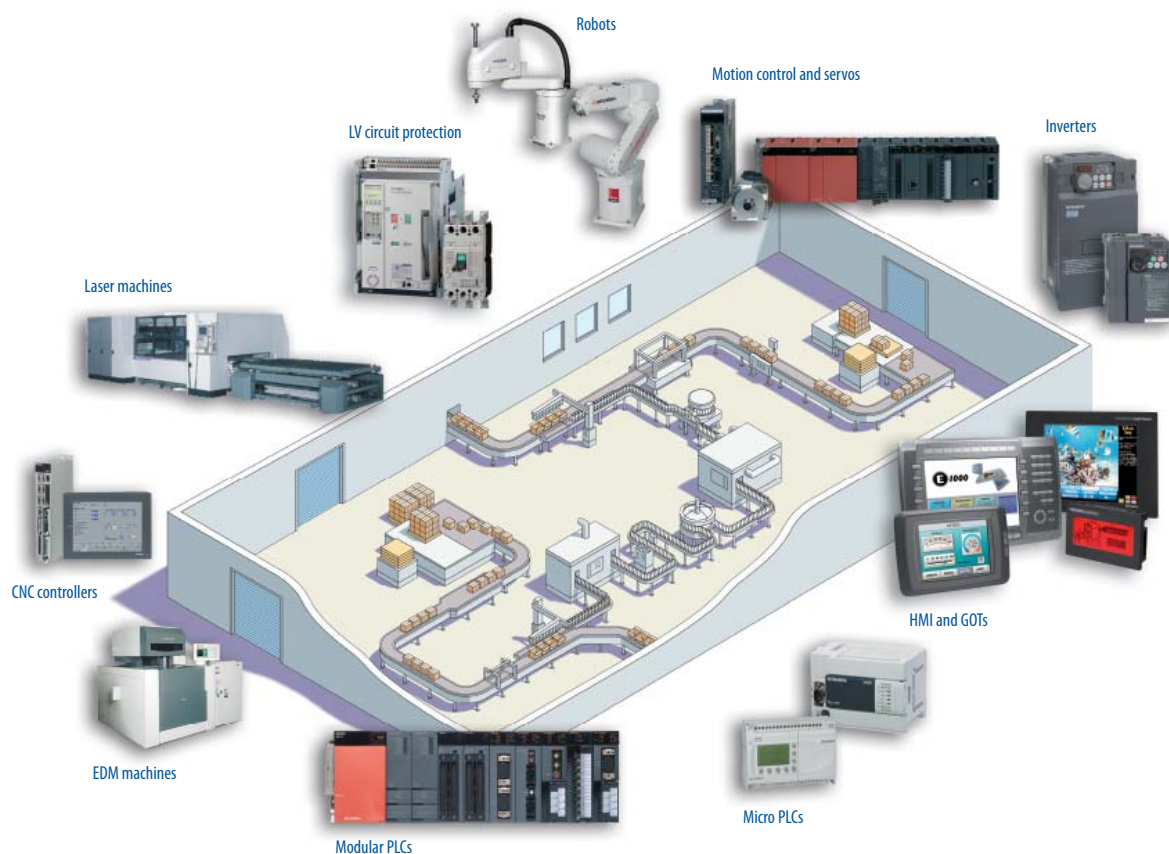
■ Extension I/O unit MR-J3-D01



Unit: mm

A		S	
Adaptive Vibration Suppression	7	Servo Amplifiers	
Auto-Tuning	7	Connections with Peripheral Equipment	32
B		Features	6
Battery	46	Model Designation	8
Battery Connection Cable	46	Specifications	24
Brake Resistors	48	MR-ES	24
Braked Motors	22	MR-J3-A/B (200 V Type)	25
C		MR-J3-A/B (400 V Type)	26
Cables and Connectors		MR-J3-BSafety (200 V Type)	27
Servo amplifier	35	MR-J3-BSafety (400 V Type)	28
Servo motors	37	MR-J3-T	30
Commands and Operation Modes MR-J3-T	31	System Description	4
Configuration of a SSCNET III System	54	Types	5
Connection		Servo Motors	
Cables and Connectors	35	Features and Applications	11
MR-E Super	34	Matching Amplifiers	12
MR-J3-A	32	Model Designation	10
MR-J3-B	33	Motors with electromagnetic Brake	22
SSCNET III	54	Specifications	12
Control Functions	7	HA-LP(B) Series (400 V Type)	21
D		HC-RP(B) Series (200 V Type)	17
Diagnostic Cable	46	HF-JP(B) Series (400 V Type)	20
Dimensions		HF-KE(B) Series (200 V Type)	13
Brake resistors	68	HF-KP(B) Series (200 V Type)	15
Extension I/O unit MR-J3-D01	69	HF-MP(B) Series (200 V Type)	16
Noise filters	67	HF-SE(B) Series (200 V Type)	14
Safety option card MR-J3-D05	69	HF-SP(B) Series (200 V Type)	18
Servo amplifier	59	HF-SP(B) Series (400 V Type)	19
Servo motors	56	Servo and Motion Systems	4
E		Components	4
Electromagnetic Brake	22	Single Axis Motion Controller	51
F		MR-MQ100	51
FX Positioning Units	49	Software (MR Configurator)	47
FX2N-10PG	49	Specifications	
FX2N-1PG-E	49	Braked Motors	22
FX3U-20SSC-H	49	Safety Logic Unit	29
Features	6	Servo Amplifiers	24
M		Servo Motors	16
Manual Pulse Generator	47	Stand-Alone Motion-Controller	52
Model Designation	8	Q170MCPU	52
Motion CPUs	53	System Q Positioning Units	50
Q172DCPU	53	QD75D1	50
Q172HCPU	53	QD75D2	50
Q173DCPU	53	QD75D4	50
Q173HCPU	53	QD75MH1	50
Motion System Modules	53	QD75MH2	50
Motors	11	QD75MH4	50
N		QD75P1	50
Noise Filters	48	QD75P2	50
P		QD75P4	50
Parameter Unit	47	T	
R		Terminal Blocks	46
Real-Time Auto-Tuning	7	X	
		X-Y Table System Configurations	55

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