

Changes for the Better

General-Purpose AC Servo MELSERVO-J4 Series

Servo amplifier MR-J4W2-0303B6

MR-J4-03A6, MR-J4-03A6-RJ

Servo motor HG-AK_-S100

January 2015

New Product Release

SV1501-5E

Compact With High Performance

Introducing MELSERVO-J4 series servo amplifier compatible with our ultra-compact servo motor. The servo amplifiers are available with SSCNET III/H interface, general-purpose interface, or the built-in positioning function.

Flange size
25 x 25 mm



MR-J4W2-0303B6 (real scale)



HG-AK0136 (real scale)



MR-J4-03A6 (real scale)

Servo amplifier MR-J4W2-0303B6

- 48 V DC and 24 V DC are available for the main circuit power supply.
- The 2-axis integrated type reduces wiring and saves space.
- Compatible with the high-speed optical network SSCNET III/H.

Servo motor HG-AK_-S100

- With a vertical encoder cable lead

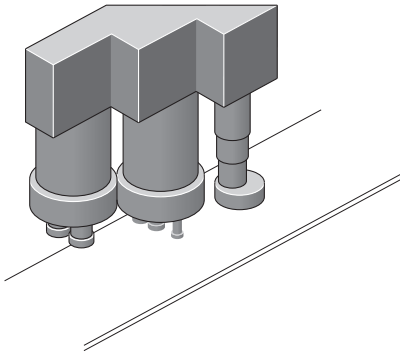
Servo amplifier MR-J4-03A6/MR-J4-03A6-RJ

- 48 V DC and 24 V DC are available for the main circuit power supply.
- Compatible with general-purpose interface
- Equipped with the positioning function (point table/program based/indexer (turret) methods)

Application Examples

- The ultra-compact servo motor with the flange size of 25 mm × 25 mm is suitable for small machines and machine heads.
- Servo amplifiers with SSCNET III/H interface, general-purpose interface, and the built-in positioning function are available to satisfy demands for a wide variety of applications.
- The high-performance servo amplifier enables shorter tact time.

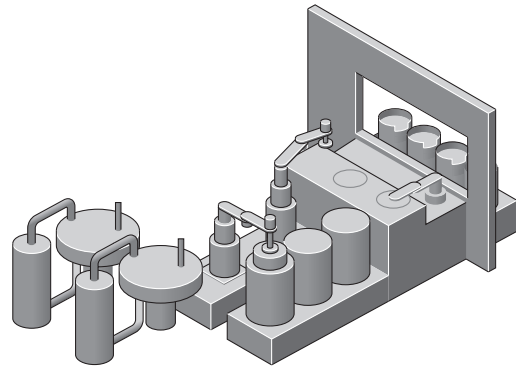
■ Mounters / bonders



Machine head

- Vibration suppression control suppresses machine vibrations, enabling shorter tact time.
- The high resolution encoder achieves high-accuracy positioning.

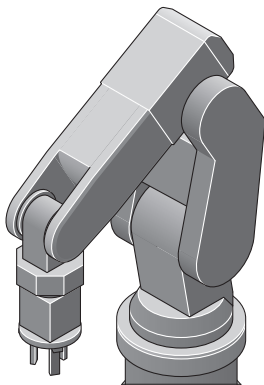
■ Semiconductor / LCD manufacturing systems



Compact machine handling axis

- The small-size servo amplifier and servo motor achieve compact machine.
- The high resolution encoder achieves high-accuracy positioning.

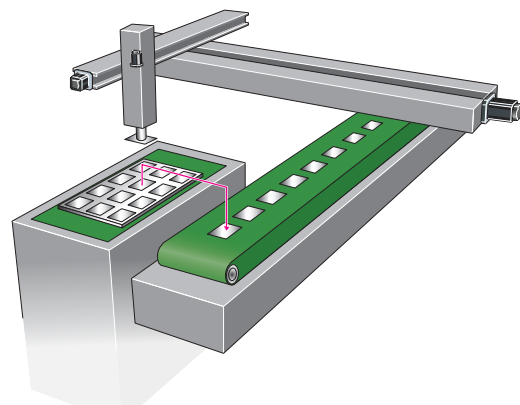
■ Compact robots



Compact robot joint drive and hand

- The 2-axis integrated servo amplifier is suitable for multiple-joint articulated robots.
- Vibration suppression control suppresses machine vibrations, enabling shorter tact time.

■ Electronic component manufacturing machines



Multi-point positioning

- Built-in positioning function allows easy control.
- Replacement of pneumatic equipment by servo contributes to energy savings.

■ Compact X-Y tables

■ Processing machines

■ Photovoltaic manufacturing systems

■ Screw tightening systems

■ Inspection systems

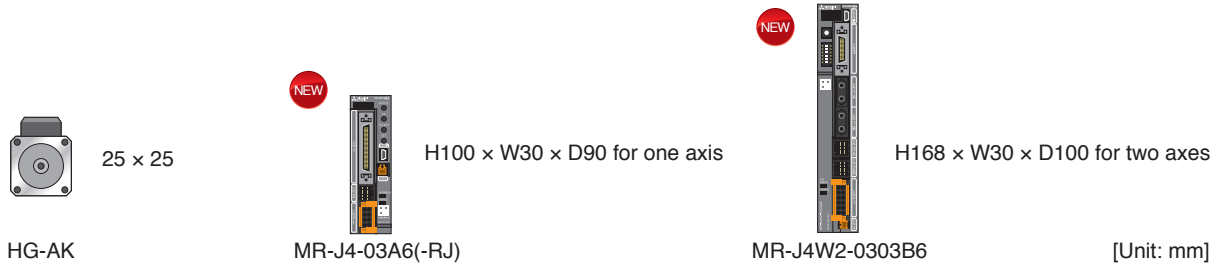
■ Electrical devices assembling systems

■ Compact actuators

■ Others

Compact Machines

Ultra-compact servo motors combined with ultra-small capacity servo amplifiers reduce the size of your machine. The servo amplifiers are available in three types: 2-axis with SSCNET III/H interface, general-purpose interface, and with the built-in positioning function. In addition, the servo amplifiers are able to be mounted on a 35 mm wide DIN rail, making it easy to install them in a cabinet.



Selectable Encoder Cable Leading Direction

The HG-AK_(B)-S100 servo motor with a vertical encoder cable lead is now available. Therefore, servo motors can be selected with the encoder cable leading direction either horizontal or vertical, as well as with/without electromagnetic brake.

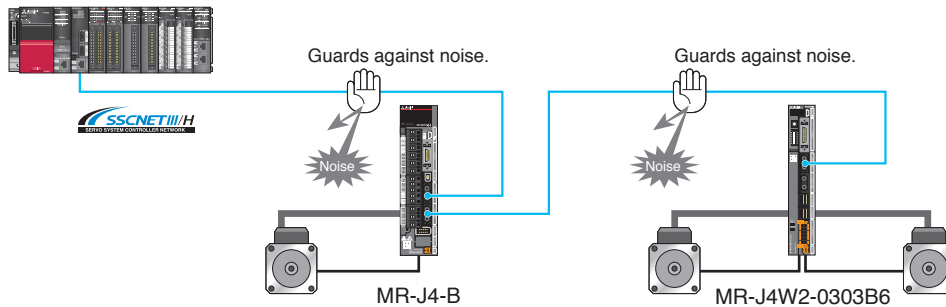


For Various Types of Machines

Select a servo amplifier best suited for your machine from using either a two-axis SSCNET III/H interface (MR-J4W2-0303B6), one-axis with general-purpose interface (MR-J4-03A6), or one with the built-in positioning function (MR-J4-03A6-RJ).

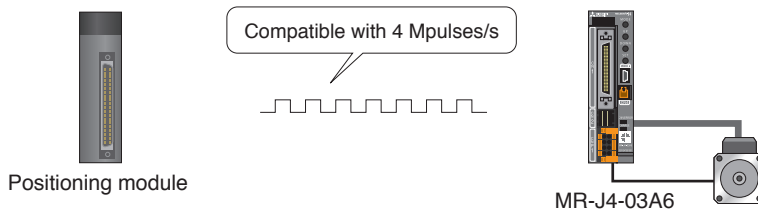
Two-axis servo amplifier with SSCNET III/H interface

SSCNET III/H allows complete synchronized communication and increases machine performance. The fiber-optic cables used for SSCNET III/H improve noise tolerance and reduce wiring.



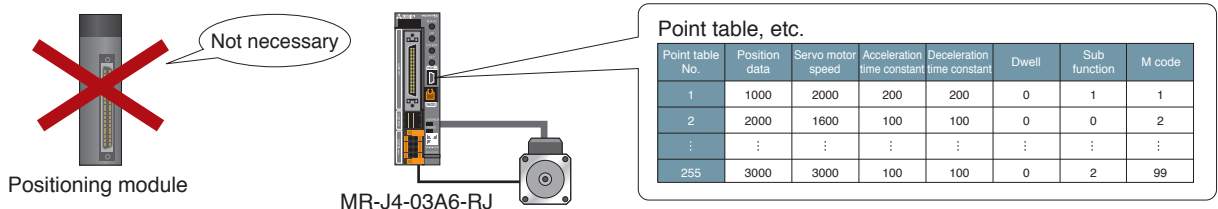
Servo amplifier with general-purpose interface

Position control with command pulses (by Positioning module), and speed/torque controls with analog command are available, with the controls that are switchable among position, speed, and torque.



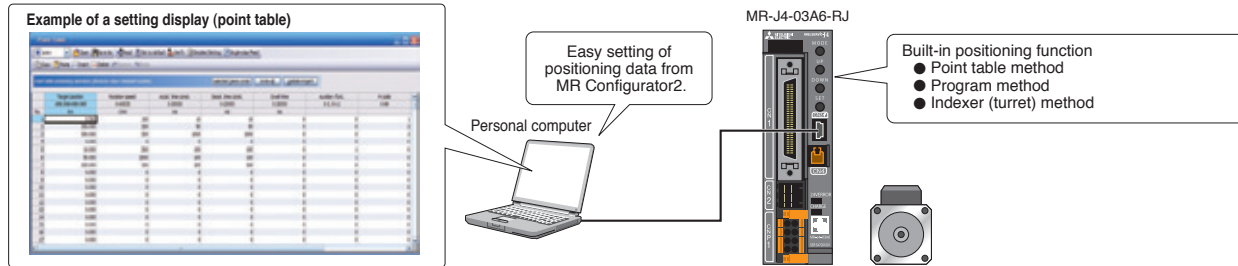
Servo amplifier with built-in positioning function

Configuring positioning system including point-to-point control is possible without a Positioning module. Point table, program based, and indexer (turret) methods are available.



Features of Servo Amplifiers with Built-in Positioning Function

MR-J4-03A6-RJ has a built-in positioning function and enables positioning operation with point table, program based, and indexer (turret) methods, allowing to configure positioning system without controller such as Positioning module. Positioning commands are executed with DI/O and RS-422 serial communication (maximum 32 axes). The positioning data can be set from MR Configurator2¹ easily.



*1. Be sure to update your MR Configurator2 to the latest version.

Point table method*

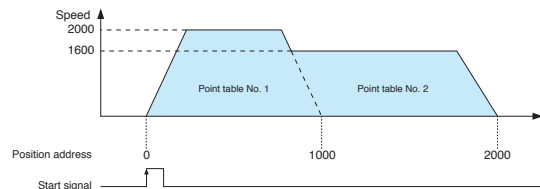
Setting position data (target position), servo motor speed, and acceleration/deceleration time constants in point table is as easy as setting a parameter. Up to 255 point tables are settable. The positioning operation is performed with a start signal after selecting the point table No.

Point table example

Point table No.	Position data	Servo motor speed	Acceleration time constant	Deceleration time constant	Dwell	Sub function	M code
1	1000	2000	200	200	0	1	1
2	2000	1600	100	100	0	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
255	3000	3000	100	100	0	2	99

* Up to 99 point tables are settable with the push buttons on the servo amplifier.

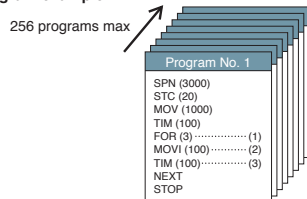
Operation



Program method*

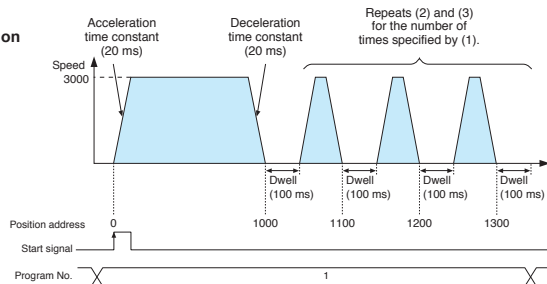
Create positioning programs with dedicated commands. The positioning operation is performed with a start signal after selecting the program No. The program method enables more complex positioning operation than the point table method. Maximum of 256 programs are settable. (The total number of steps of program: 640)

Program example



* MR Configurator2 is required to create programs.

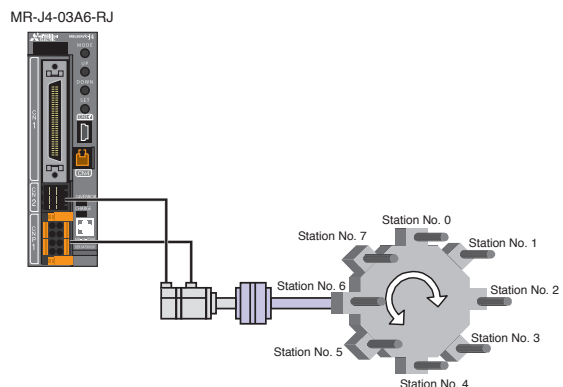
Operation



Indexer (turret) method*

Positioning operation is performed by specifying equally divided stations (up to 255 stations). By setting the number of teeth on load and motor sides and equally divided stations, the travel distance will be calculated automatically. The positioning operation is performed with a start signal after selecting the station position No.

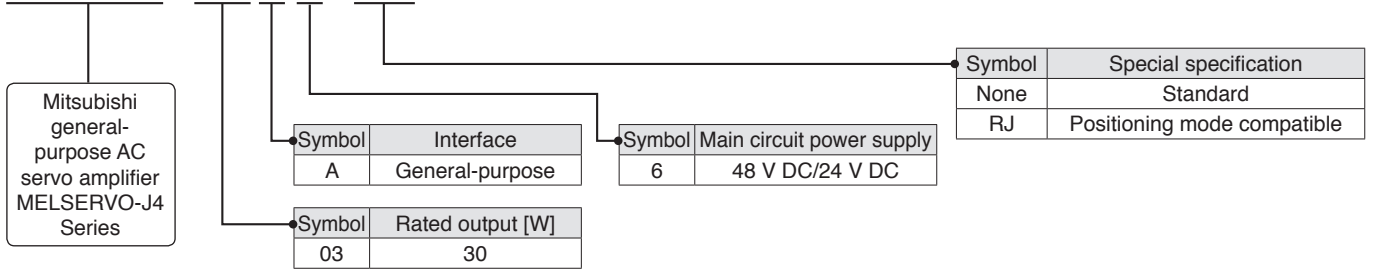
In addition to rotation direction specifying indexer and shortest rotating indexer, backlash compensation and override function are also available.



Model Designation for 1-Axis Servo Amplifier

A **A-RJ**

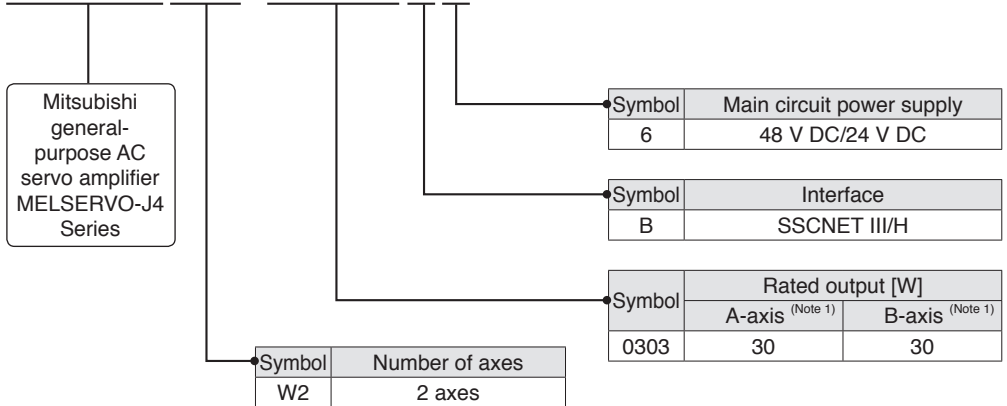
MR - J 4 - 0 3 A 6 -



Model Designation for 2-Axis Servo Amplifier

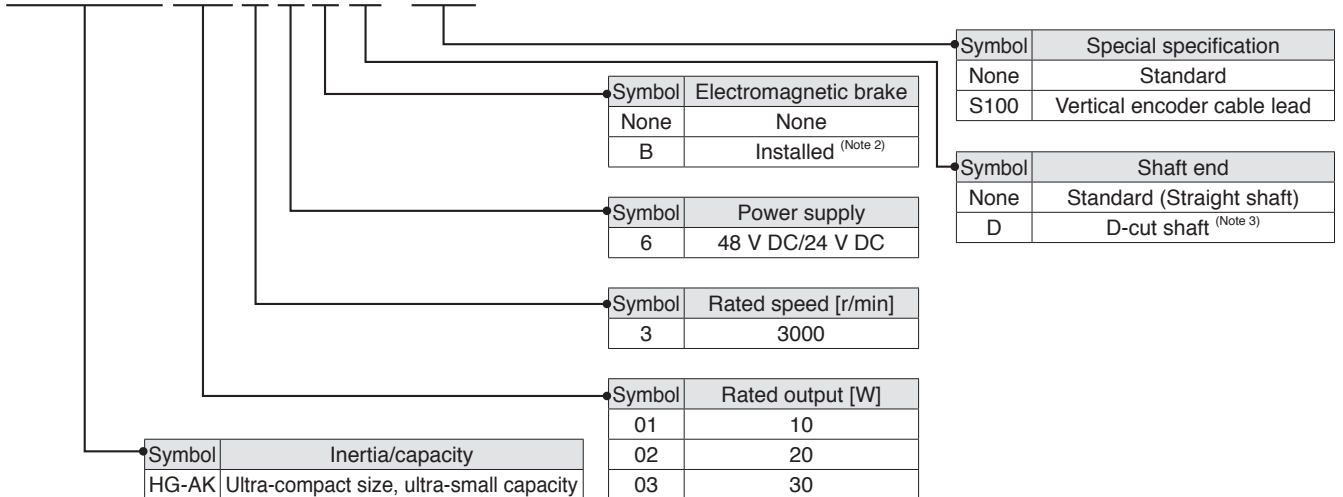
WB

MR - J 4 W 2 - 0 3 0 3 B 6



Model Designation for Servo Motor

HG - A K 0 1 3 6 B -



Notes: 1. A-axis and B-axis indicate names of axes of the 2-axis servo amplifier.
 2. Refer to "HG-AK Series Electromagnetic Brake Specifications" in this brochure for the available models and detailed specifications.
 3. Refer to "HG-AK Series Special Shaft End Specifications" in this brochure for details.

Combinations of Servo Amplifier and Servo Motor

Servo amplifier	Servo motor
MR-J4W2-0303B6 MR-J4-03A6/MR-J403A6-RJ	HG-AK0136, HG-AK0236, HG-AK0336

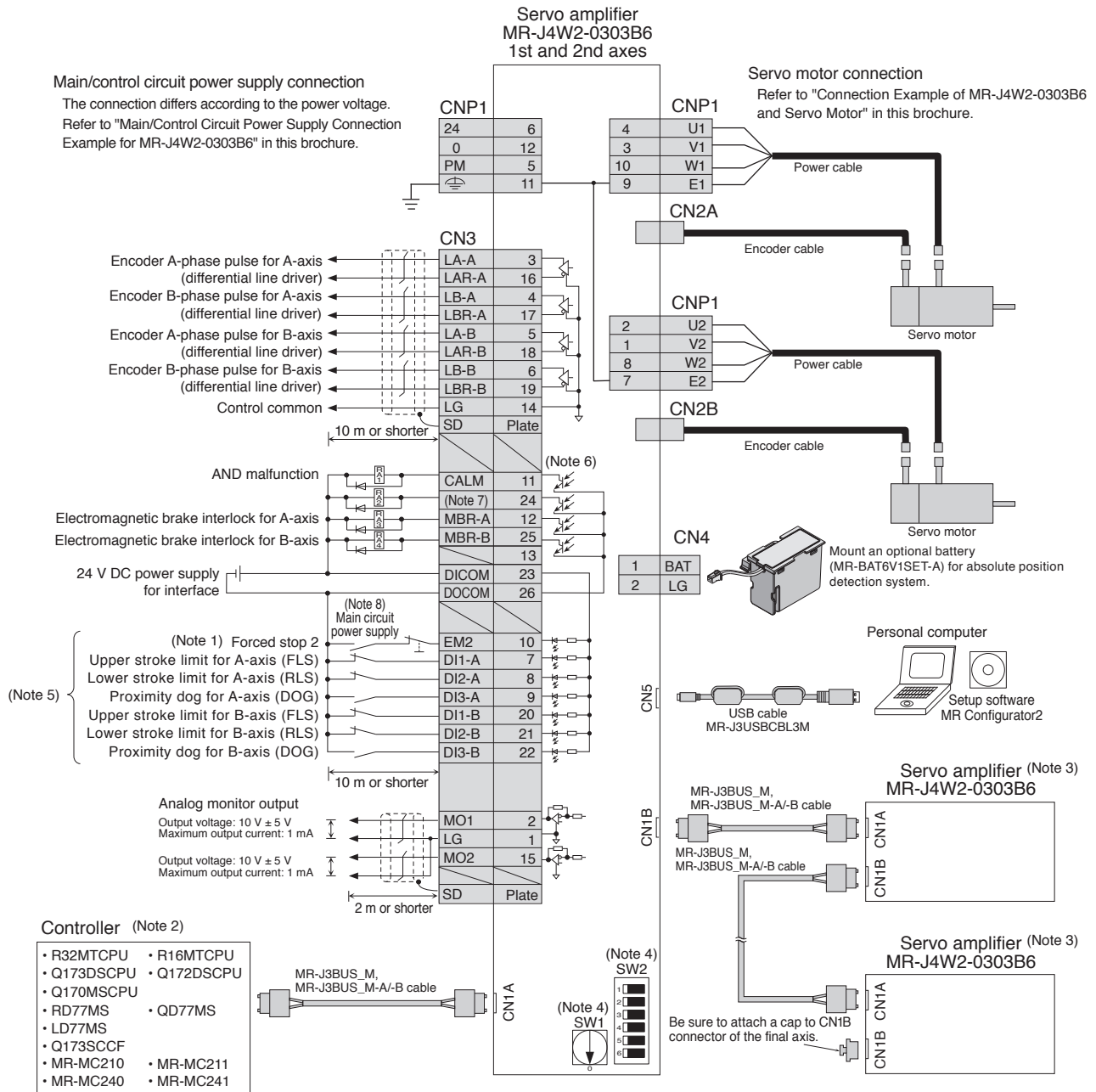
MR-J4W2-0303B6 (2-axis, SSCNET III/H Interface) Specifications

WB

Servo amplifier model		MR-J4W2-0303B6
Output	Rated voltage	3-phase 13 V AC
	Rated current (each axis) [A]	2.4
Main circuit power supply input	Voltage ^(Note 1)	48 V DC/24 V DC ^(Note 4)
	Rated current [A]	For 48 V DC: 2.4 A For 24 V DC: 4.8 A
	Permissible voltage fluctuation	For 48 V DC: 40.8 V DC to 55.2 V DC For 24 V DC: 21.6 V DC to 26.4 V DC
Control circuit power supply input	Voltage	24 V DC
	Rated current [A]	0.5
	Permissible voltage fluctuation	21.6 V DC to 26.4 V DC
	Power consumption [W]	10
Interface power supply		24 V DC ± 10% (required current capacity: 0.25 A)
Control method		Sine-wave PWM control/current control method
Capacitor regeneration	Reusable regenerative energy [J] ^(Note 2)	0.9
	Moment of inertia (J) equivalent to permissible charging amount ^(Note 3) [× 10 ⁻⁴ kg·m ²]	0.18
Tolerable regenerative power of the built-in regenerative resistor [W]		1.3
Dynamic brake		Built-in ^(Note 5, 6)
SSCNET III/H command communication cycle ^(Note 8)		0.222 ms, 0.444 ms, 0.888 ms
Communication function		USB: Connect a personal computer (MR Configurator2 compatible)
Encoder output pulse		Compatible (A/B-phase pulse)
Analog monitor		2 channels
Fully closed loop control		Not compatible
Servo function		Advanced vibration suppression control II, adaptive filter II, robust filter, auto tuning, one-touch tuning, vibration tough drive function, drive recorder function, tightening & press-fit control, machine diagnosis function, power monitoring function, J3 compatibility mode
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection
Compliance to global standards		Refer to "Conformity with Global Standards and Regulations" on p. 27 in this brochure.
Structure (IP rating)		Natural cooling, open (IP20)
Close mounting		Possible ^(Note 7)
DIN rail mounting (35 mm wide)		Possible
Environment	Ambient temperature	Operation: 0 °C to 55 °C (non-freezing), storage: -20 °C to 65 °C (non-freezing)
	Ambient humidity	Operation/storage: 90 %RH maximum (non-condensing)
	Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust
	Altitude	1000 m or less above sea level
	Vibration resistance	5.9 m/s ² at 10 Hz to 55 Hz (directions of X, Y and Z axes)
Mass [kg]		0.3

- Notes: 1. Rated output and speed of a servo motor are applicable when the servo amplifier, combined with the servo motor, is operated within the specified power supply voltage.
2. Reusable regenerative energy is equivalent to the energy that is generated when the machine, whose moment of inertia is equivalent to the permissible charging amount, decelerates from the rated speed to a stop.
3. This value is the moment of inertia when the rotary servo motor decelerates from the rated speed to a stop. When two axes are simultaneously decelerated, the permissible charging amount is equivalent to the total moments of inertia of the two axes. Otherwise, the permissible charging amount is equivalent to the moment of inertia of each axis.
4. Initial value is 48 V DC. For 24 V DC, set [Pr. PC05] to "_ 1 _ _". Servo motor characteristics vary depending whether the voltage is 48 V DC or 24 V DC. Refer to "HG-AK Series (Ultra-compact Size, Ultra-small Capacity) Specifications" and "HG-AK Series Torque Characteristics" in this brochure.
5. The dynamic brake is electronic. The electronic dynamic brake does not operate when the control circuit power is off. It may not operate depending on alarms and warnings. Refer to "MR-J4W2- _ B MR-J4W3- _ B MR-J4W2-0303B6 Servo Amplifier Instruction Manual" for details.
6. When using the built-in dynamic brake, refer to "MR-J4W2- _ B MR-J4W3- _ B MR-J4W2-0303B6" for the permissible load to motor inertia ratio.
7. When the servo amplifiers are closely mounted, keep the ambient temperature at 45 °C or lower, or keep the total load of the two axes at 45 W or lower.
8. The command communication cycle depends on the controller specifications and the number of axes connected.

MR-J4W2-0303B6 Standard Wiring Diagram Example



- Notes: 1. The forced stop signal is issued for two axes of the servo amplifier. For overall system, apply the emergency stop on the controller side.
 2. For details such as setting the controllers, refer to relevant controllers' programming manual or user's manual.
 3. Connections for the third and following axes are omitted.
 4. Up to 64 axes can be set by using a combination of an axis selection rotary switch (SW1) and auxiliary axis number setting switches (SW2-5 and SW2-6). Note that the number of the connectable axes depends on the controller specifications.
 5. Devices can be assigned for DI1-A/B, DI2-A/B and DI3-A/B with controller setting. Refer to the controller instruction manuals for details on setting.
 6. This is for sink wiring. Source wiring is also possible.
 7. C1NP (AND in-position) is assigned to this pin as default. Device for this pin can be changed by [Pr. PD08].
 8. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.



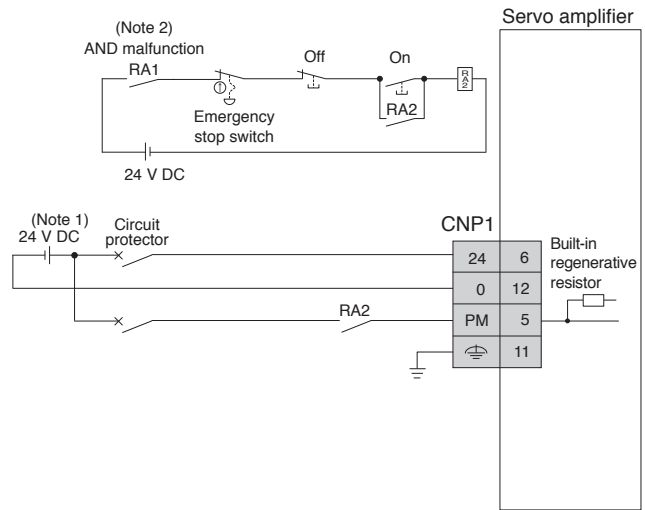
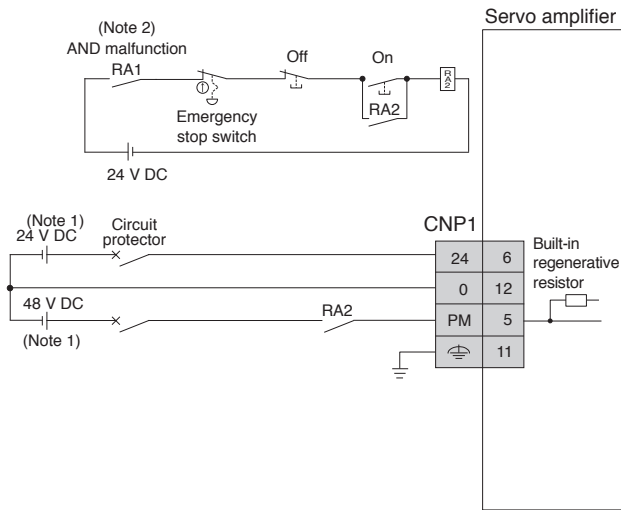
Be sure to read through Instruction Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

Main/Control Circuit Power Supply Connection Example for MR-J4W2-0303B6

WB

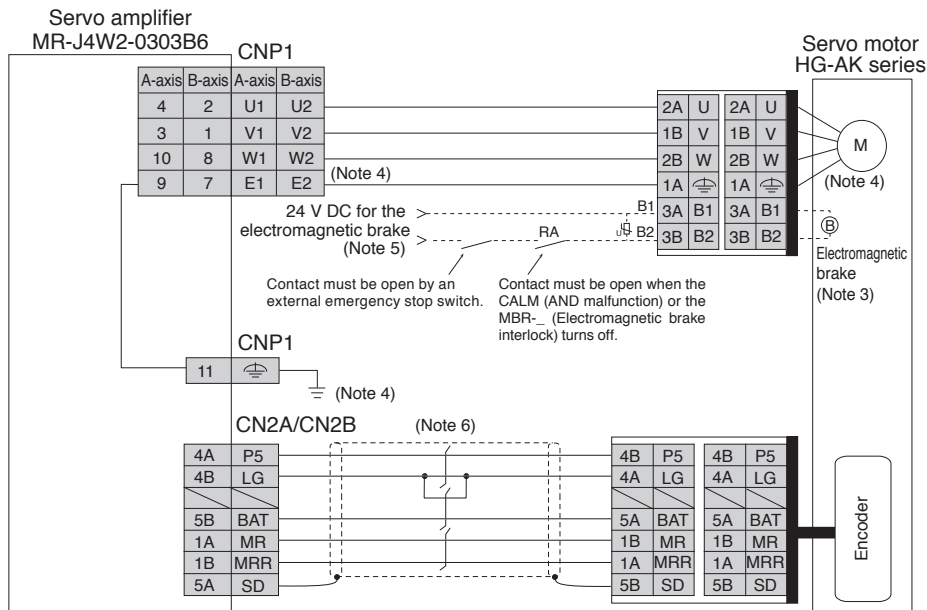
● For 48 V DC

● For 24 V DC



Connection Example of MR-J4W2-0303B6 and Servo Motor

WB



- Notes: 1. Use 24 V DC and 48 V DC power supplies with reinforced insulation, and connect the negative side wiring (0 V) to the power supply terminal.
2. Select either of the following functions for CALM (AND malfunction) with the controller.
- 1) The contact opens when an alarm occurs on one of the axes.
 - 2) The contact opens when an alarm occurs on all axes.
3. This is for the servo motor with electromagnetic brake. The electromagnetic brake terminals (B1, B2) do not have polarity.
4. Noiseless grounding (⏏) terminals are connected to E1 and E2 terminals in the servo amplifier. Connect the noiseless (⏏) terminals of CNP1 and the grounding terminal of the cabinet.
5. Do not use the 24 V DC interface power supply for the electromagnetic brake. Provide a dedicated power supply to the electromagnetic brake.
6. Encoder cable is available as an option. Refer to "Servo Motor Instruction Manual (Vol. 3)" when fabricating the cables.



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

MR-J4-03A6/MR-J4-03A6-RJ (General-purpose Interface) Specifications

A A-RJ

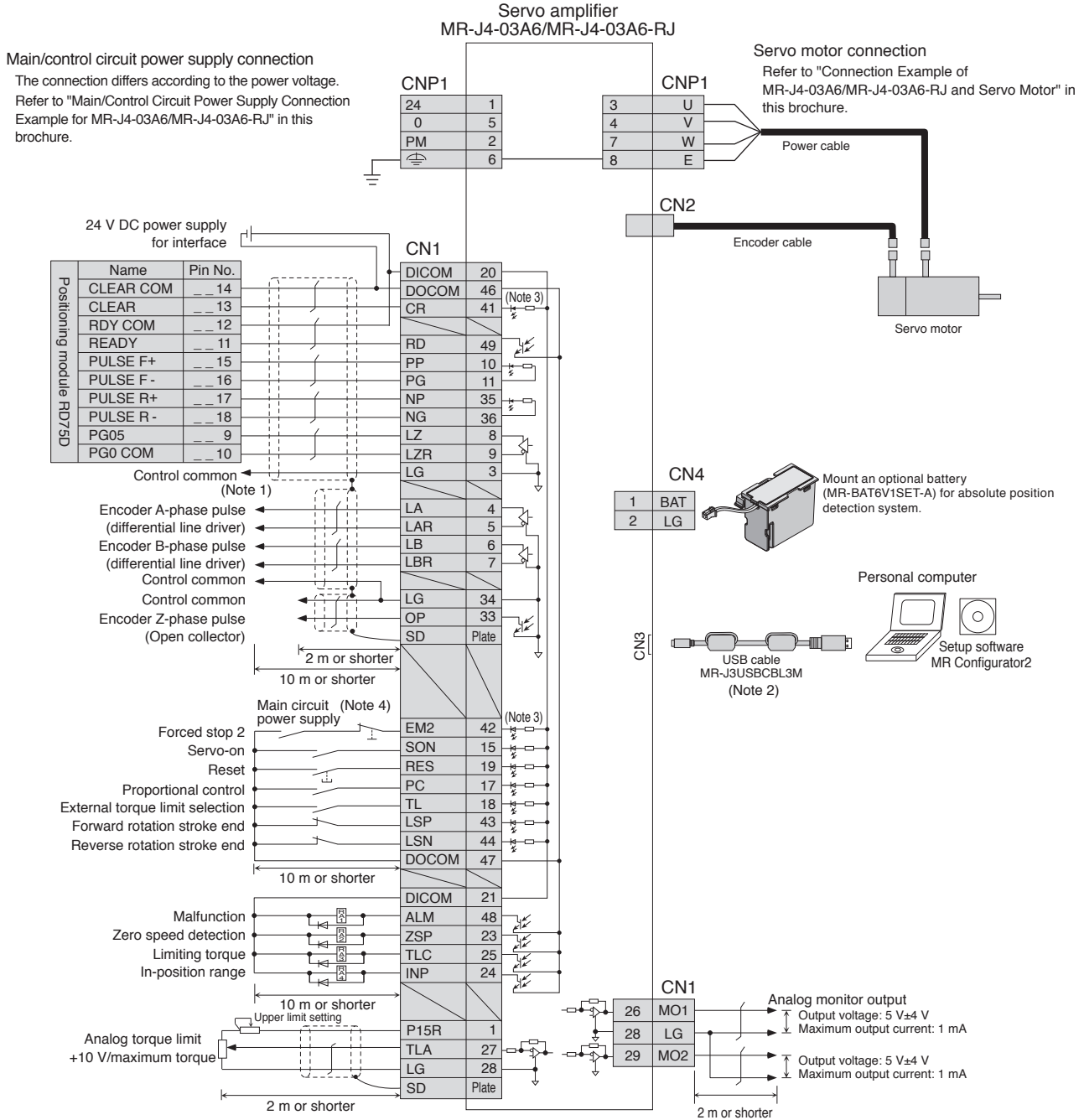
Servo amplifier model		MR-J4-03A6	MR-J4-03A6-RJ
Output	Rated voltage	3-phase 13 V AC	
	Rated current [A]	2.4	
Main circuit power supply input	Voltage ^(Note 1)	48 V DC/24 V DC ^(Note 2)	
	Rated current [A]	For 48 V DC: 1.2 A For 24 V DC: 2.4 A	
	Permissible voltage fluctuation	For 48 V DC: 40.8 V DC to 55.2 V DC For 24 V DC: 21.6 V DC to 26.4 V DC	
Control circuit power supply input	Voltage	24 V DC	
	Rated current [A]	0.2	
	Permissible voltage fluctuation	21.6 V DC to 26.4 V DC	
	Power consumption [W]	5.0	
Interface power supply		24 V DC \pm 10% (required current capacity: 0.3 A)	
Control method		Sine-wave PWM control/current control method	
Tolerable regenerative power of the built-in regenerative resistor [W]		0.7	
Dynamic brake		Built-in ^(Note 3, 4)	
Communication function		USB: Connect a personal computer (MR Configurator2 compatible)	
		RS-422: 1 : n communication (up to 32 axes)	
Encoder output pulse		Compatible (A/B/Z-phase pulse)	
Analog monitor		2 channels	
Position control mode	Maximum input pulse frequency	4 Mpulses/s (when using differential receiver), 200 kpulses/s (when using open collector)	
	Positioning feedback pulse	Encoder resolution: 18 bits	
	Command pulse multiplying factor	Electronic gear A/B multiple, A: 1 to 16777215, B: 1 to 16777215, 1/10 < A/B < 4000	
	Positioning complete width setting	0 pulse to \pm 65535 pulses (command pulse unit)	
	Error excessive	\pm 3 rotations	
	Torque limit	Set by parameters or external analog input (0 V DC to +10 V DC/maximum torque)	
Speed control mode	Speed control range	Analog speed command 1:2000, internal speed command 1:5000	
	Analog speed command input	0 V DC to \pm 10 V DC/rated speed (Speed at 10 V is changeable with [Pr. PC12].)	
	Speed fluctuation rate	\pm 0.01% maximum (load fluctuation: 0% to 100%), 0% (power fluctuation: \pm 10%) \pm 0.2% maximum (ambient temperature: 25 °C \pm 10 °C) only when using analog speed command	
	Torque limit	Set by parameters or external analog input (0 V DC to +10 V DC/maximum torque)	
Torque control mode	Analog torque command input	0 V DC to \pm 8 V DC/maximum torque (input impedance: 10 k Ω to 12 k Ω)	
	Speed limit	Set by parameters or external analog input (0 V DC to \pm 10 V DC/rated speed)	
Positioning mode		Not compatible	Point table method, program method, indexer (turret) method
Fully closed loop control		Not compatible	
Servo function		Advanced vibration suppression control II, adaptive filter II, robust filter, auto tuning, one-touch tuning, vibration drive function, drive recorder function, machine diagnosis function, power monitoring function	
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal), servo motor overheat protection, encoder error protection, regenerative error protection, undervoltage protection, instantaneous power failure protection, overspeed protection, error excessive protection	
Compliance to global standards		Refer to "Conformity with Global Standards and Regulations" on p. 27 in this brochure.	
Structure (IP rating)		Natural cooling, open (IP20)	
Close mounting		Possible ^(Note 5)	
DIN rail mounting (35 mm wide)		Possible	
Environment	Ambient temperature	Operation: 0 °C to 55 °C (non-freezing), storage: -20 °C to 65 °C (non-freezing)	
	Ambient humidity	Operation/storage: 90 %RH maximum (non-condensing)	
	Ambience	Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust	
	Altitude	1000 m or less above sea level	
	Vibration resistance	5.9 m/s ² at 10 Hz to 55 Hz (directions of X, Y and Z axes)	
Mass [kg]		0.2	

- Notes: 1. Rated output and speed of a servo motor are applicable when the servo amplifier, combined with the servo motor, is operated within the specified power supply voltage.
2. Initial value is 48 V DC. For 24 V DC, set [Pr. PC27] to "_ _ 1 _". Servo motor characteristics vary depending whether the voltage is 48 V DC or 24 V DC. Refer to "HG-AK Series (Ultra-compact Size, Ultra-small Capacity) Specifications" and "HG-AK Series Torque Characteristics" in this brochure.
3. The dynamic brake is electronic. The electronic dynamic brake does not operate when the control circuit power is off. It may not operate depending on alarms and warnings. Refer to "MR-J4- A (-RJ) MR-J4-03A6(-RJ) Servo Amplifier Instruction Manual" for details.
4. When using the built-in dynamic brake, refer to "MR-J4- A (-RJ) MR-J4-03A6(-RJ) Servo Amplifier Instruction Manual" for the permissible load to motor inertia ratio.
5. When the servo amplifiers are closely mounted, keep the ambient temperature within 0 °C to 45 °C.

MR-J4-03A6/MR-J4-03A6-RJ Standard Wiring Diagram Example: Position Control Operation

A A-RJ

Connecting to RD75D (position servo, incremental)



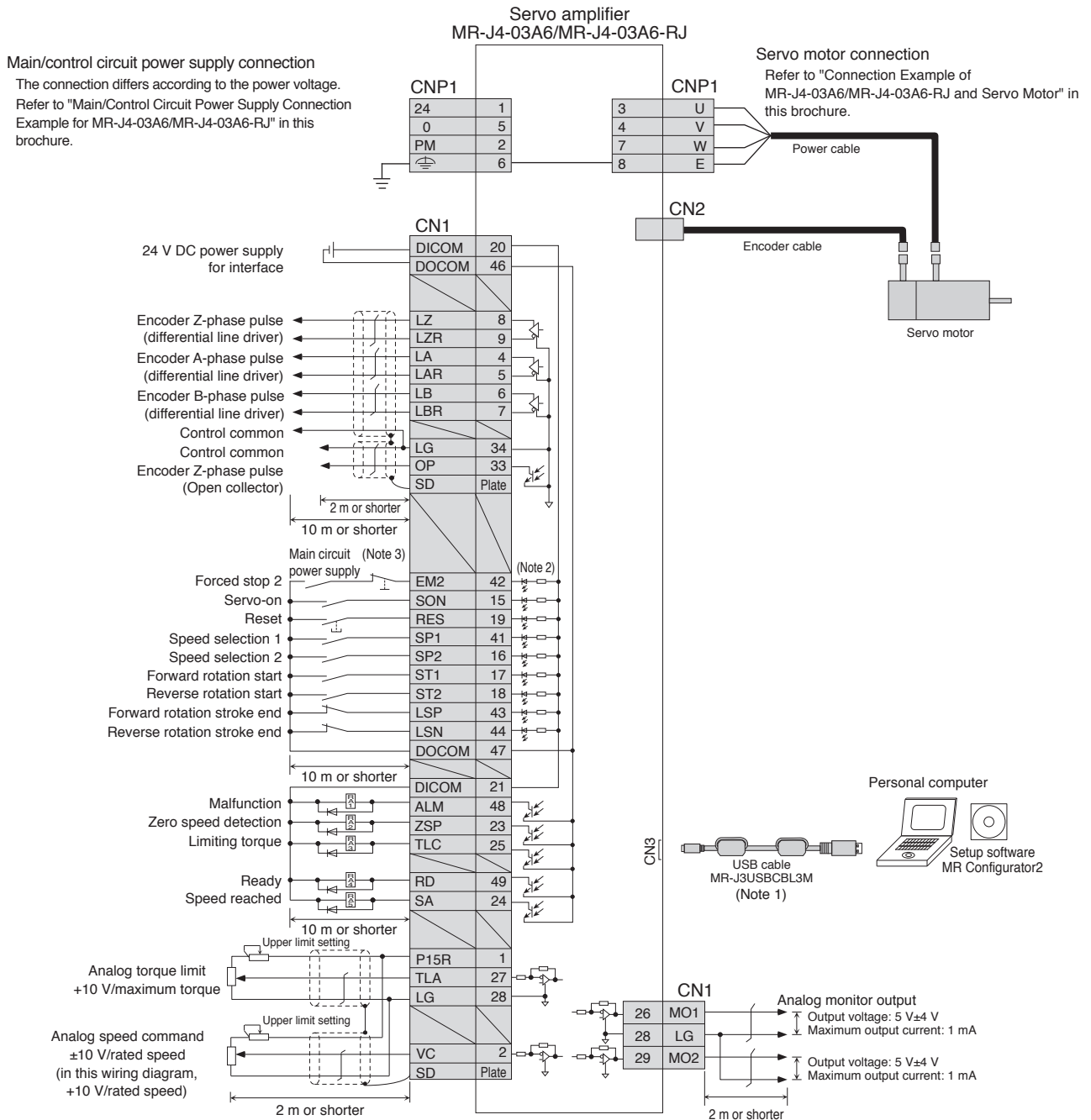
- Notes: 1. This connection is not necessary for RD75D Positioning module. Note that the connection between LG and control common terminal is recommended for some Positioning modules to improve noise tolerance.
2. USB communication function and RS-422 communication function are mutually exclusive. Do not use them at the same time.
3. This is for sink wiring. Source wiring is also possible.
4. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.



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

MR-J4-03A6/MR-J4-03A6-RJ Standard Wiring Diagram Example: Speed Control Operation

A A-RJ

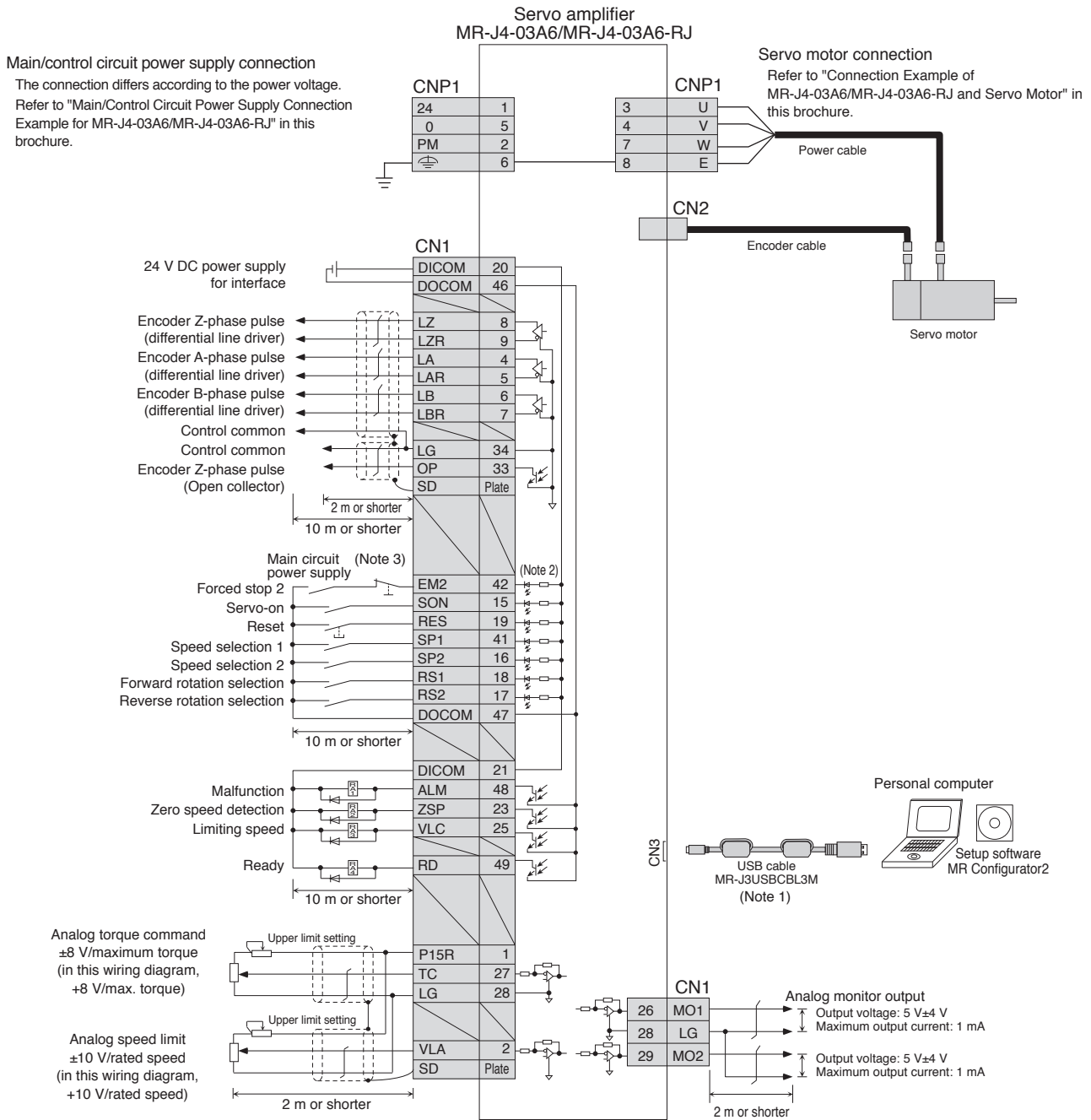


- Notes: 1. USB communication function and RS-422 communication function are mutually exclusive. Do not use them at the same time.
 2. This is for sink wiring. Source wiring is also possible.
 3. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.

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

MR-J4-03A6/MR-J4-03A6-RJ Standard Wiring Diagram Example: Torque Control Operation

A A-RJ



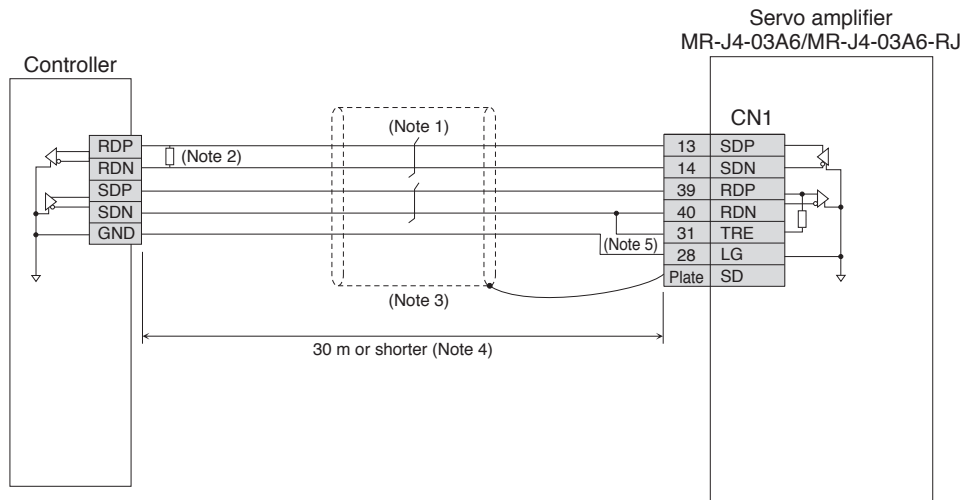
- Notes: 1. USB communication function and RS-422 communication function are mutually exclusive. Do not use them at the same time.
 2. This is for sink wiring. Source wiring is also possible.
 3. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.



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

RS-422 Serial Communication Connection Example

A A-RJ



- Notes: 1. Twist the wires from SDP and SDN together, and RDP and PDN together.
 2. Refer to the controller manual to connect a termination resistor. If a termination resistor is not specified, terminate with a 150 Ω resistor.
 3. Use of a shielded cable is recommended.
 4. The cable length must be 30 m or shorter in a low-noise environment. When connecting multiple axes, also keep the overall length within 30 m.
 5. Connect TRE and RDN for the servo amplifier of the final axis.

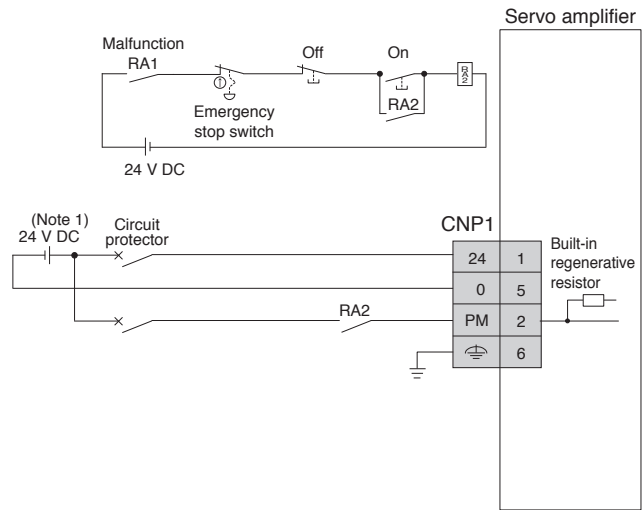
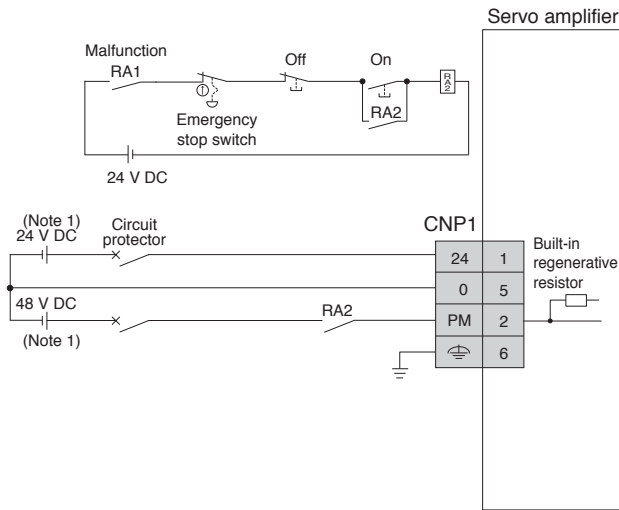


Be sure to read through Instruction Manual for the actual wiring and use. Use the equipment after you have a full knowledge of the equipment, safety information and instructions.

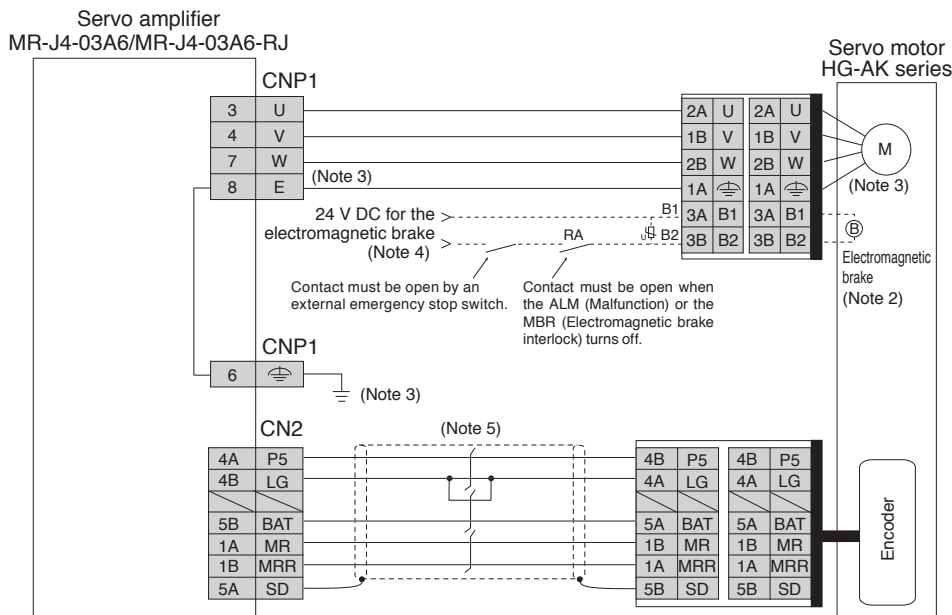
Main/Control Circuit Power Supply Connection Example for MR-J4-03A6/MR-J4-03A6-RJ A A-RJ

● For 48 V DC

● For 24 V DC



Connection Example of MR-J4-03A6/MR-J4-03A6-RJ and Servo Motor A A-RJ



- Notes:
1. Use 24 V DC and 48 V DC power supplies with reinforced insulation.
 2. This is for the servo motor with electromagnetic brake. The electromagnetic brake terminals (B1, B2) do not have polarity.
 3. Noiseless grounding (⏏) terminal is connected to E terminal in the servo amplifier. Connect the noiseless (⏏) terminal of CNP1 and the grounding terminal of the cabinet.
 4. Do not use the 24 V DC interface power supply for the electromagnetic brake. Provide a dedicated power supply to the electromagnetic brake.
 5. Encoder cable is available as an option. Refer to "Servo Motor Instruction Manual (Vol. 3)" when fabricating the cables.



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

MR-J4-03A6-RJ Positioning Function: Point Table Method

A-RJ

Positioning operation is executed by selecting the point table No. with a command interface signal according to the position and speed data set in the point table.

Item		Description	
Command method	Command interface	DIO (input: 11 points excluding EM2 (Forced stop 2), output: 6 points), RS-422 communication	
	Operating specification	Positioning by specifying the point table No. (255 points ^(Note 2))	
	Position command input ^(Note 1)	Absolute value command method	Set in the point table. Setting range of feed length per point: -999999 to 999999 [$\times 10^{\text{STM}}$ μm], -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch], -999999 to 999999 [pulse], Setting range of rotation angle: -360.000 to 360.000 [degree]
		Incremental value command method	Set in the point table. Setting range of feed length per point: 0 to 999999 [$\times 10^{\text{STM}}$ μm], 0 to 99.9999 [$\times 10^{\text{STM}}$ inch], 0 to 999999 [pulse], Setting range of rotation angle: 0 to 999.999 [degree]
	Speed command input	Set the acceleration/deceleration time constants in the point table. Set the S-pattern acceleration/deceleration time constants with [Pr. PC03].	
	System	Signed absolute value command method, incremental value command method	
	Analog override	0 V DC to ± 10 V DC/0% to 200%	
	Torque limit	Set by parameters or external analog input (0 V DC to +10 V DC/maximum torque)	
Operation mode	Automatic operation mode	Each positioning operation	Point table No. input, position data input method Each positioning operation is executed based on the position/speed commands.
		Automatic continuous positioning operation	Varying-speed operation (2 to 255 speeds), automatic continuous positioning operation (2 to 255 points)
	Manual operation mode	JOG operation	Inching operation is executed with DI or RS-422 communication function according to the speed command set with a parameter.
		Manual pulse generator operation	Manual feeding is executed with a manual pulse generator. Command pulse multiplication: select from $\times 1$, $\times 10$, and $\times 100$ with a parameter.
	Home position return mode	Dog type	Returns to home position upon Z-phase pulse after passing through proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Count type	Returns to home position upon the encoder pulse count after touching proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Data set type	Returns to home position without dog. Any position settable as a home position using manual operation, etc. Home position address settable
		Stopper type	Returns to home position upon hitting the stroke end. Home position return direction selectable, home position address settable
		Home position ignorance (servo-on position as home position)	Sets a home position where SON (Servo-on) signal turns on. Home position address settable
		Dog type rear end reference	Returns to home position with reference to the rear end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Count type front end reference	Returns to home position with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog cradle type	Returns to home position upon the first Z-phase pulse with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog type adjacent Z-phase reference	Returns to home position upon the last Z-phase pulse with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog type front end reference	Returns to home position to the front end of dog with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
	Dogless Z-phase reference	Returns to home position to Z-phase pulse with reference to the first Z-phase pulse. Home position return direction settable, home position shift distance settable, home position address settable	
	Automatic positioning to home position function	High-speed automatic positioning to a defined home position	
Other functions	Absolute position detection system, backlash compensation, overtravel prevention with external limit switches (LSP/LSN), teaching function, roll feed display function, software stroke limit, mark detection (current position latch), analog override function		

Notes: 1. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

2. Up to 99 point tables are settable with the push buttons on the servo amplifier. To set 100th or later point table, use MR Configurator2.

MR-J4-03A6-RJ Positioning Function: Point Table Method

A-RJ

Absolute value command method: travels to a specified address (absolute value) with reference to the home position

Item	Setting range	Description
Point table No.	1 to 255	Specify a point table in which a target position, servo motor speed, acceleration/deceleration time constants, dwell, and sub function will be set.
Target position (Note 1, 2) (position data)	-999999 to 999999 [$\times 10^{\text{STM}}$ μm] -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch] -360.000 to 360.000 [degree] -999999 to 999999 [pulse]	Set a travel distance. (1) When using as absolute value command method Set a target address (absolute value). (2) When using as incremental value command method Set a travel distance. Reverse rotation command is applied with a minus sign.
Servo motor speed	0 to permissible speed [r/min]	Set a command speed for the servo motor in positioning.
Acceleration time constant	0 to 20000 [ms]	Set a time period for the servo motor to reach the rated speed.
Deceleration time constant	0 to 20000 [ms]	Set a time period for the servo motor to decelerate from the rated speed to a stop.
Dwell	0 to 20000 [ms]	Set dwell. When the dwell is set, the position command for the next point table will be started after the position command for the selected point table is completed and the set dwell is passed. The dwell is disabled when 0 or 2 is set for the sub function. Varying-speed operation is enabled when 1, 3, 8, 9, 10, or 11 is set for the sub function and when 0 is set for the dwell.
Sub function	0 to 3, and 8 to 11	Set sub function. (1) When using as absolute value command method 0: Executes automatic operation for a selected point table. 1: Executes automatic continuous operation without stopping for the next point table. 8: Executes automatic continuous operation without stopping for the point table selected at the start. 9: Executes automatic continuous operation without stopping for the point table No. 1. (2) When using as incremental value command method 2: Executes automatic operation for a selected point table. 3: Executes automatic continuous operation without stopping for the next point table. 10: Executes automatic continuous operation without stopping for the point table selected at the start. 11: Executes automatic continuous operation without stopping for the point table No. 1.
M code	0 to 99	Set a code to be outputted when the positioning completes.

Notes: 1. Change the unit to $\mu\text{m}/\text{inch}/\text{degree}/\text{pulse}$ with [Pr. PT01].

2. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

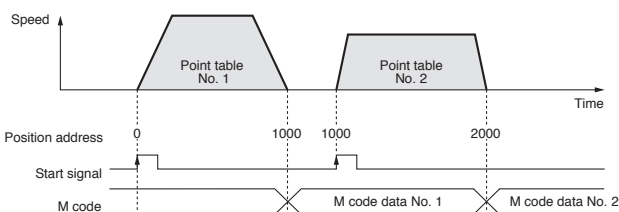
Example of setting point table data

Point table No.	Target position (position data) [$\times 10^{\text{STM}}$ μm] (Note 1)	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Sub function	M code
1	1000	2000	200	200	0	*	1
2	2000	1600	100	100	0	0	2
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
255	3000	3000	100	100	0	2	99

* The operation of the next point table is set with the sub function.

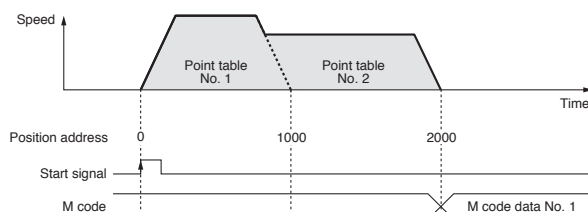
● When the sub function is set to 0:

Start signal is required for each point table.



● When the sub function is set to 1:

Automatic continuous operation is executed based on the point table.



Notes: 1. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

MR-J4-03A6-RJ Positioning Function: Point Table Method

A-RJ

Incremental value command method: travels from a current position according to the set position data

Item	Setting range	Description
Point table No.	1 to 255	Specify a point table in which a target position, servo motor speed, acceleration/deceleration time constants, dwell, and sub function will be set.
Target position ^(Note 1, 2) (position data)	0 to 999999 [$\times 10^{\text{STM}}$ μm] 0 to 99.9999 [$\times 10^{\text{STM}}$ inch] 0 to 999.999 [degree] 0 to 999999 [pulse]	Set a travel distance. Operation starts with ST1 (Forward rotation start) or ST2 (Reverse rotation start).
Servo motor speed	0 to permissible speed [r/min]	Set a command speed for the servo motor in positioning.
Acceleration time constant	0 to 20000 [ms]	Set a time period for the servo motor to reach the rated speed.
Deceleration time constant	0 to 20000 [ms]	Set a time period for the servo motor to decelerate from the rated speed to a stop.
Dwell	0 to 20000 [ms]	Set a dwell. When the dwell is set, the position command for the next point table will be started after the position command for the selected point table is completed and the set dwell is passed. The dwell is disabled when 0 is set for the sub function. Varying-speed operation is enabled when 1, 8, or 9 is set for the sub function and when 0 is set for the dwell.
Sub function	0, 1, 8, and 9	Set sub function. 0: Executes automatic operation for the selected point table. 1: Executes automatic continuous operation without stopping for the next point table. 8: Executes automatic continuous operation without stopping for the point table selected at the start. 9: Executes automatic continuous operation without stopping for the point table No. 1.
M code	0 to 99	Set a code to be outputted when the positioning completes.

Notes: 1. Change the unit to μm /inch/degree/pulse with [Pr. PT01].

2. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

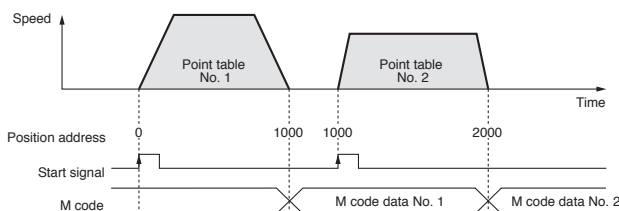
Example of setting point table data

Point table No.	Target position (position data) [$\times 10^{\text{STM}}$ μm] ^(Note 1)	Servo motor speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Sub function	M code
1	1000	2000	200	200	0	*	1
2	1000	1600	100	100	0	0	2
:	:	:	:	:	:	:	:
255	3000	3000	100	100	0	0	99

* The operation of the next point table is set with the sub function.

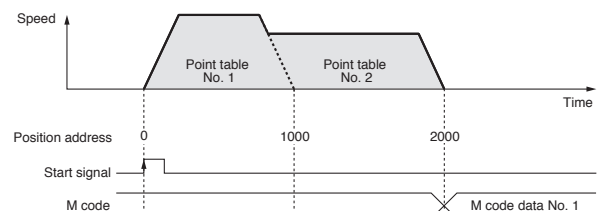
● When the sub function is set to 0:

Start signal is required for each point table.



● When the sub function is set to 1:

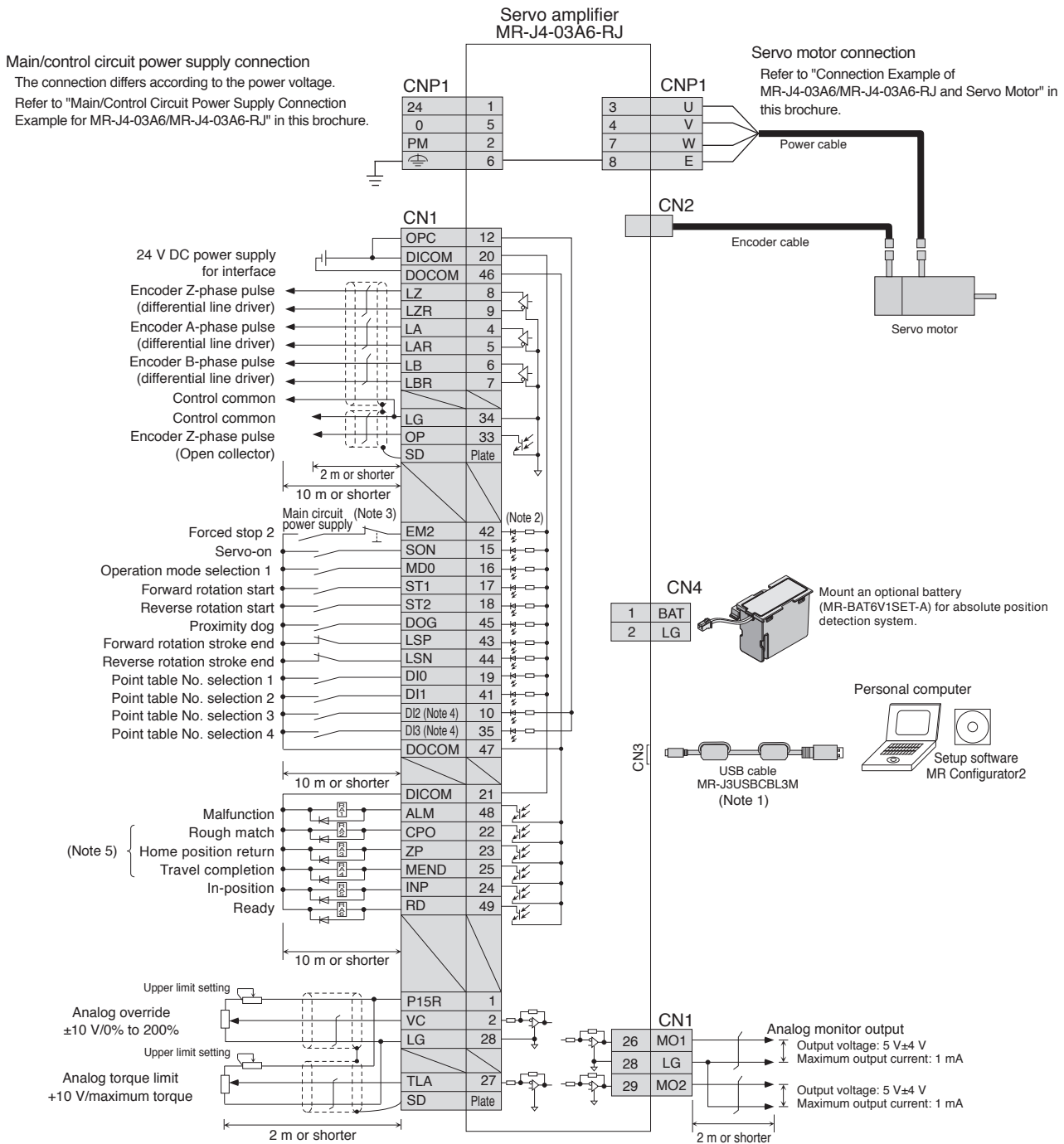
Automatic continuous operation is executed based on the point table.



Notes: 1. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

MR-J4-03A6-RJ Standard Wiring Diagram Example: Point Table Method

A-RJ



- Notes:
1. USB communication function and RS-422 communication function are mutually exclusive. Do not use them at the same time.
 2. This is for sink wiring. Source wiring is also possible. However, when input devices are assigned to CN1-10 pin and CN1-35 pin, be sure to use sink wiring. Source wiring is not possible in this case. In the positioning mode, input devices are assigned in the initial setting. Refer to "MR-J4_A-RJ MR-J4-03A6-RJ Servo Amplifier Instruction Manual (Positioning Mode)" for details.
 3. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.
 4. DI2 and DI3 are assigned to CN1-10 pin and CN1-35 pin respectively in the initial setting. Change them with [Pr.PD44] and [Pr.PD46] when using a manual pulse generator.
 5. Assign the output devices mentioned to CN1-22 pin, CN1-23 pin, and CN1-25 pin with [Pr. PD23], [Pr. PD24] and [Pr. PD26].



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

MR-J4-03A6-RJ Positioning Function: Program Method

A-RJ

Positioning operation is executed by selecting programs with command signals. The programs including position data, servo motor speed, acceleration/deceleration time constants and others need to be created beforehand. The program method enables more complex positioning operation than the point table method. MR Configurator2 is required to create programs.

Item		Description	
Command method	Command interface	DIO (input: 11 points excluding EM2 (Forced stop 2), output: 6 points), RS-422 communication	
	Operating specification	Program language (program with MR Configurator2) Program capacity: 640 steps (256 programs)	
	Position command input (Note 1)	Absolute value command method	Set with program language. Setting range of feed length: -999999 to 999999 [$\times 10^{\text{STM}}$ μm], -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch], -999999 to 999999 [pulse], Setting range of rotation angle: -360.000 to 360.000 [degree]
		Incremental value command method	Set with program language. Setting range of feed length: -999999 to 999999 [$\times 10^{\text{STM}}$ μm], -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch], -999999 to 999999 [pulse], Setting range of rotation angle: -999.999 to 999.999 [degree]
	Speed command input	Set servo motor speed, acceleration/deceleration time constants, S-pattern acceleration/deceleration time constants with program language. S-pattern acceleration/deceleration time constants are also settable with [Pr. PC03].	
	System	Signed absolute value command method/signed incremental value command method	
	Analog override	0 V DC to ± 10 V DC/0% to 200%	
	Torque limit	Set by parameters or external analog input (0 V DC to +10 V DC/maximum torque)	
Operation mode	Automatic operation mode	Program	Depends on the setting of the program language
	Manual operation mode	JOG operation	Inching operation is executed with DI or RS-422 communication function according to the speed command set with a parameter.
		Manual pulse generator operation	Manual feeding is executed with a manual pulse generator. Command pulse multiplication: select from $\times 1$, $\times 10$, and $\times 100$ with a parameter.
	Home position return mode	Dog type	Returns to home position upon Z-phase pulse after passing through proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Count type	Returns to home position upon the encoder pulse count after touching proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Data set type	Returns to home position without dog. Any position settable as a home position using manual operation, etc. Home position address settable
		Stopper type	Returns to home position upon hitting the stroke end. Home position return direction selectable, home position address settable
		Home position ignorance (servo-on position as home position)	Sets a home position where SON (Servo-on) signal turns on. Home position address settable
		Dog type rear end reference	Returns to home position with reference to the rear end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Count type front end reference	Returns to home position with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog cradle type	Returns to home position upon the first Z-phase pulse with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog type adjacent Z-phase reference	Returns to home position upon the last Z-phase pulse with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
		Dog type front end reference	Returns to home position to the front end of dog with reference to the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, automatic retract on dog back to home position, automatic stroke retract function
	Dogless Z-phase reference	Returns to home position to Z-phase pulse with reference to the first Z-phase pulse. Home position return direction settable, home position shift distance settable, home position address settable	
	Automatic positioning to home position function	High-speed automatic positioning to a defined home position	
Other functions	Absolute position detection system, backlash compensation, overtravel prevention with external limit switches (LSP/LSN), roll feed display function, software stroke limit, mark detection (current position latch), analog override function		

Notes: 1. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

MR-J4-03A6-RJ Positioning Function: Program Method

A-RJ

Command List

Command	Name	Setting range	Description
SPN(setting value) (Note 2)	Servo motor speed	0 to instantaneous permissible speed [r/min]	Set a command speed for the servo motor in positioning. Do not set a value exceeding the instantaneous permissible speed of the servo motor.
STA(setting value) (Note 2)	Acceleration time constant	0 to 20000 [ms]	Set acceleration time constant. The setting value is a time period that the servo motor reaches the rated speed from a stop.
STB(setting value) (Note 2)	Deceleration time constant	0 to 20000 [ms]	Set deceleration time constant. The setting value is a time period that the servo motor stops from the rated speed.
STC(setting value) (Note 2)	Acceleration/ deceleration time constants	0 to 20000 [ms]	Set acceleration and deceleration time constants. The setting value is a time period that the servo motor reaches the rated speed from a stop and stops from the rated speed.
STD(setting value) (Note 2)	S-pattern acceleration/ deceleration time constants	0 to 1000 [ms]	Set S-pattern acceleration/deceleration time constants.
MOV(setting value) (Note 4, 5)	Absolute value travel command	-999999 to 999999 [$\times 10^{\text{STM}}$ μm] -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch]	Travels according to the value set as an absolute value.
MOVA(setting value) (Note 4, 5)	Absolute value continuous travel command	-360.000 to 360.000 [degree] -999999 to 999999 [pulse]	Travels continuously according to the value set as an absolute value. Be sure to write this command after [MOV] command.
MOVI(setting value) (Note 4, 5)	Incremental value travel command	-999999 to 999999 [$\times 10^{\text{STM}}$ μm] -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch]	Travels according to the value set as an incremental value.
MOVIA(setting value) (Note 4, 5)	Incremental value continuous travel command	-999.999 to 999.999 [degree] -999999 to 999999 [pulse]	Travels continuously according to the value set as an incremental value. Be sure to write this command after [MOVI] command.
SYNC(setting value) (Note 1)	Waiting for external signal to switch on	1 to 3	Stops the next step until PI1 (Program input 1) to PI3 (Program input 3) turn on after SOUT (SYNC synchronous output) is outputted.
OUTON(setting value) (Note 1)	External signal on output	1 to 3	Turns on OUT1 (Program output 1) to OUT3 (Program output 3).
OUTOF(setting value) (Note 1)	External signal off output	1 to 3	Turns off OUT1 (Program output 1) to OUT3 (Program output 3) which were turned on with [OUTON] command.
TRIP(setting value) (Note 1, 4, 5)	Absolute value trip point specification	-999999 to 999999 [$\times 10^{\text{STM}}$ μm] -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch] -360.000 to 360.000 [degree] -999999 to 999999 [pulse]	Executes the next step after [MOV] or [MOVA] commands are started and then the servo motor moves for the travel amount set in [TRIP] command. Be sure to write this command after [MOV] or [MOVA] command.
TRIP I(setting value) (Note 1, 4, 5)	Incremental value trip point specification	-999999 to 999999 [$\times 10^{\text{STM}}$ μm] -99.9999 to 99.9999 [$\times 10^{\text{STM}}$ inch] -999.999 to 999.999 [degree] -999999 to 999999 [pulse]	Executes the next step after [MOVI] or [MOVIA] commands are started and then the servo motor moves for the travel amount set in [TRIP I] command. Be sure to write this command after [MOVI] or [MOVIA] command.
ITP(setting value) (Note 1, 3, 4, 5)	Interrupt positioning		Stops the operation after the servo motor moves for the travel amount set when the interrupt signal is inputted. Be sure to write this command after [SYNC] command.
COUNT(setting value) (Note 1)	External pulse count	-999999 to 999999 [pulse]	Executes the next step when the value of the pulse counter exceeds the count value set in [COUNT] command. [COUNT (0)] clears the pulse counter to zero.
FOR(setting value) NEXT	Step repeat command	0, and 1 to 10000 [number of times]	Repeats the steps between [FOR (setting value)] and [NEXT] commands for the number of times set. Repeats endlessly with [FOR (0) NEXT].
LPOS (Note 1)	Current position latch	-	Latches the current position with the rising edge of the LPS signal. The latched current position data can be read with the communication command.
TIM(setting value)	Dwell	1 to 20000 [ms]	Waits for the next step until the set time passes.
ZRT	Home position return	-	Executes a manual home position return.
TIMES(setting value)	Program count command	0, and 1 to 10000 [number of times]	Set the number of program execution by writing [TIMES (setting value)] command in the first line of the program. The setting is not required for executing once. Repeats endlessly with [TIMES (0)].
STOP	Program stop	-	Stops the program in execution. Be sure to write this command in the final line.

Notes: 1. [SYNC], [OUTON], [OUTOF], [TRIP], [TRIP I], [ITP], [COUNT], and [LPOS] commands are valid while the commands are outputted.

2. [SPN] command is valid while [MOV], [MOVA], [MOVI], or [MOVIA] command is in execution. [STA], [STB], [STC], and [STD] commands are valid while [MOV] or [MOVI] command is in execution.

3. [ITP] command will be skipped to the next step when the remaining distance equals to or less than the setting value, when the servo motor is not running, or when the servo motor is decelerating.

4. Change the unit to $\mu\text{m}/\text{inch}/\text{degree}/\text{pulse}$ with [Pr. PT01].

5. STM is the ratio to the setting value of the position data. STM can be changed with [Pr. PT03].

MR-J4-03A6-RJ Positioning Function: Program Method

A-RJ

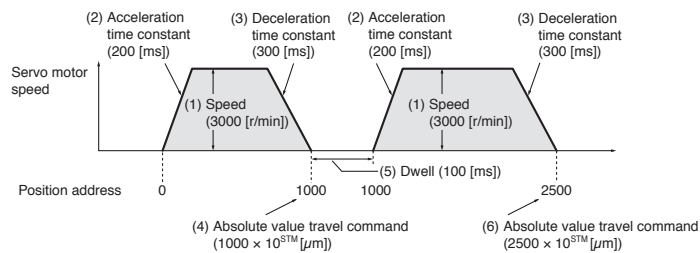
Command list

Command	Name	Setting range	Description
TLP(setting value)	Forward rotation torque limit	0, and 1 to 1000 [0.1%]	Limits the torque generated by the servo motor driving in CCW and regenerating in CW, as the maximum torque is 100%. The setting remains valid until the program is stopped. [TLP (0)] enables the setting of [Pr. PA11].
TLN(setting value)	Reverse rotation torque limit	0, and 1 to 1000 [0.1%]	Limits the torque generated by the servo motor driving in CW and regenerating in CCW, as the maximum torque is 100%. The setting remains valid until the program is stopped. [TLN (0)] enables the setting of [Pr. PA12].
TQL(setting value)	Torque limit	0, and 1 to 1000 [0.1%]	Limits the torque generated by the servo motor, as the maximum torque is 100%. The setting remains valid until the program is stopped. [TQL (0)] enables the settings of [Pr. PA11] and [Pr. PA12].

Program example 1

The following is an example of executing two types of operations with the same servo motor speed and acceleration/deceleration time constants but the different travel commands.

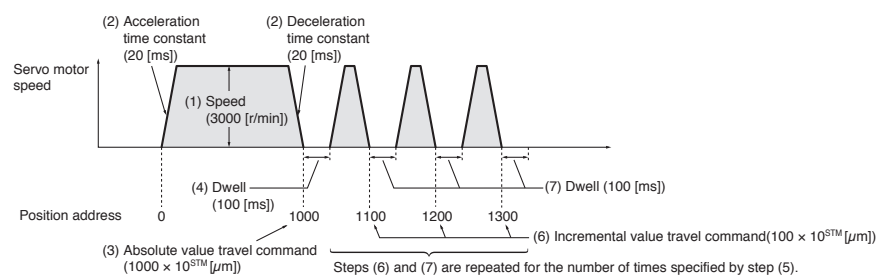
Step	Program ^(Note 1)	Description
(1)	SPN(3000)	Servo motor speed: 3000 [r/min]
(2)	STA(200)	Acceleration time constant: 200 [ms]
(3)	STB(300)	Deceleration time constant: 300 [ms]
(4)	MOV(1000)	Absolute value travel command: 1000 [$\times 10^{STM} \mu\text{m}$]
(5)	TIM(100)	Dwell: 100 [ms]
(6)	MOV(2500)	Absolute value travel command: 2500 [$\times 10^{STM} \mu\text{m}$]
(7)	STOP	Program stop



Program example 2

The following is an example of repeating the steps between [FOR (setting value)] and [NEXT] commands for the number of times set.

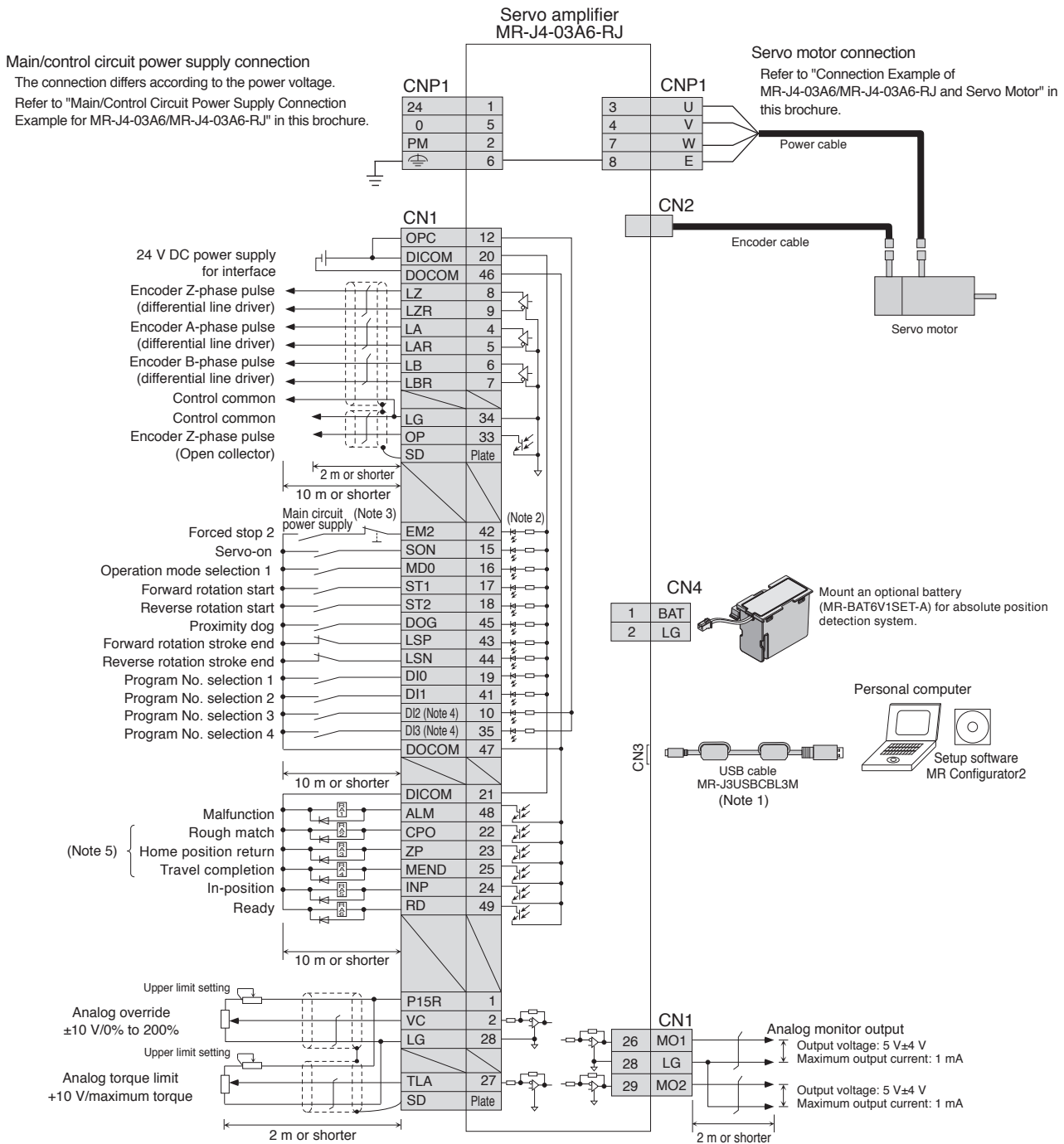
Step	Program ^(Note 1)	Description
(1)	SPN(3000)	Servo motor speed: 3000 [r/min]
(2)	STC(20)	Acceleration/deceleration time constants: 20 [ms]
(3)	MOV(1000)	Absolute value travel command: 1000 [$\times 10^{STM} \mu\text{m}$]
(4)	TIM(100)	Dwell: 100 [ms]
(5)	FOR(3)	Starting the step repeat command: 3 [number of times]
(6)	MOVI(100)	Incremental value travel command: 100 [$\times 10^{STM} \mu\text{m}$]
(7)	TIM(100)	Dwell: 100 [ms]
(8)	NEXT	Ending the step repeat command
(9)	STOP	Program stop



Notes: 1. The values in [SPN], [STA], [STB], and [STC] commands remains valid until they are reset. The values will not be initialized at the start of the program. The settings are also valid in other programs.

MR-J4-03A6-RJ Standard Wiring Diagram Example: Program Method

A-RJ



- Notes:
1. USB communication function and RS-422 communication function are mutually exclusive. Do not use them at the same time.
 2. This is for sink wiring. Source wiring is also possible. However, when input devices are assigned to CN1-10 pin and CN1-35 pin, be sure to use sink wiring. Source wiring is not possible in this case. In the positioning mode, input devices are assigned in the initial setting. Refer to "MR-J4_A_RJ MR-J4-03A6-RJ Servo Amplifier Instruction Manual (Positioning Mode)" for details.
 3. To prevent an unexpected restart of the servo amplifier, create a circuit to turn off EM2 (Forced stop 2) when the main circuit power is turned off.
 4. DI2 and DI3 are assigned to CN1-10 pin and CN1-35 pin respectively in the initial setting. Change them with [Pr.PD44] and [Pr.PD46] when using a manual pulse generator.
 5. Assign the output devices mentioned to CN1-22 pin, CN1-23 pin, and CN1-25 pin with [Pr. PD23], [Pr. PD24] and [Pr. PD26].



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

MR-J4-03A6-RJ Positioning Function: Indexer (Turret) Method

A-RJ

Positioning is executed by specifying stations (maximum of 255 stations).

Travel distance is automatically calculated with parameters by setting the numbers of stations.

Item		Description	
Command method	Command interface	DIO (input: 11 points excluding EM2 (Forced stop 2), output: 6 points), RS-422 communication	
	Operating specification	Positioning by specifying the station position The maximum number of divisions: 255	
	Speed command input	Selects the rotation speed and acceleration/deceleration time	
	System	Rotation direction specifying indexer, shortest rotating indexer	
	Digital override	Selects the override multiplying factor by DI	
	Torque limit	Set by parameters or external analog input (0 V DC to +10 V DC/maximum torque)	
Operation mode	Automatic operation mode	Rotation direction specifying indexer	Positions to the specified station. Rotation direction settable
		Shortest rotating indexer	Positions to the specified station. Rotates in the shorter direction from the current position.
	Manual operation mode	JOG operation	Decelerates to a stop regardless of the station
		Station JOG operation	Rotates in a direction specified by the rotation direction decision when the start signal turns on. Positions to the nearest station where the servo motor can decelerate to a stop when the start signal turns off.
	Home position return mode	Torque limit changing dog type	Returns to home position upon Z-phase pulse after passing through the front end of proximity dog. Home position return direction selectable, home position shift distance settable, home position address settable, torque limit automatic switching function
		Torque limit changing data set type	Returns to home position without dog. Any position settable as home position, home position address settable, torque limit automatic switching function
Other functions		Absolute position detection system, backlash compensation, overtravel prevention with external limit switches (LSP/LSN), digital override function	

MR-J4-03A6-RJ Positioning Function: Indexer (Turret) Method

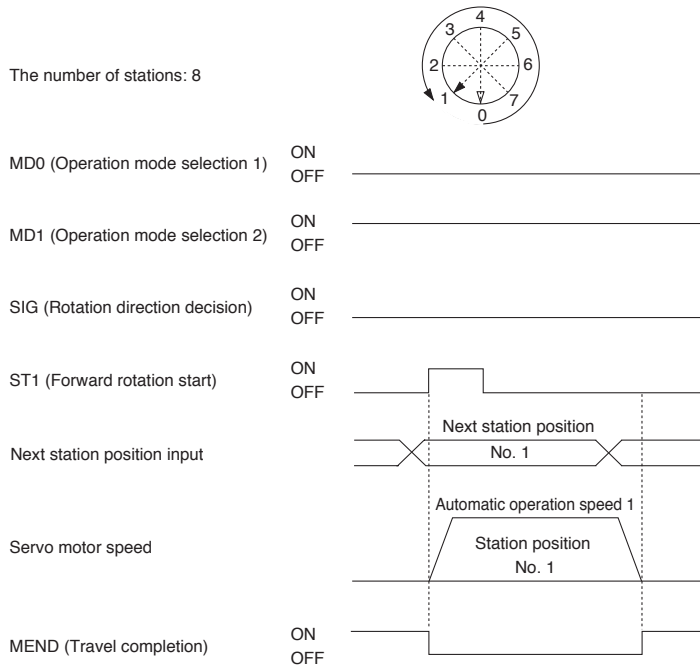
A-RJ

Rotation direction specifying indexer

In the rotation direction specifying indexer, the servo motor always rotates in a definite direction.

Turn off MD0 (Operation mode selection 1), and turn on MD1 (Operation mode selection 2). The servo motor moves in the station No. decreasing direction with SIG (Rotation direction decision) off, and in the increasing direction with SIG on. When ST1 (Forward rotation direction) turns on, the travel amount will be calculated from the current position and the next station position, and then the positioning will be executed to the direction specified by the rotation direction decision.

The following timing chart is an example of the operation executed from the station No. 0 where the servo motor is stopped at servo-on.

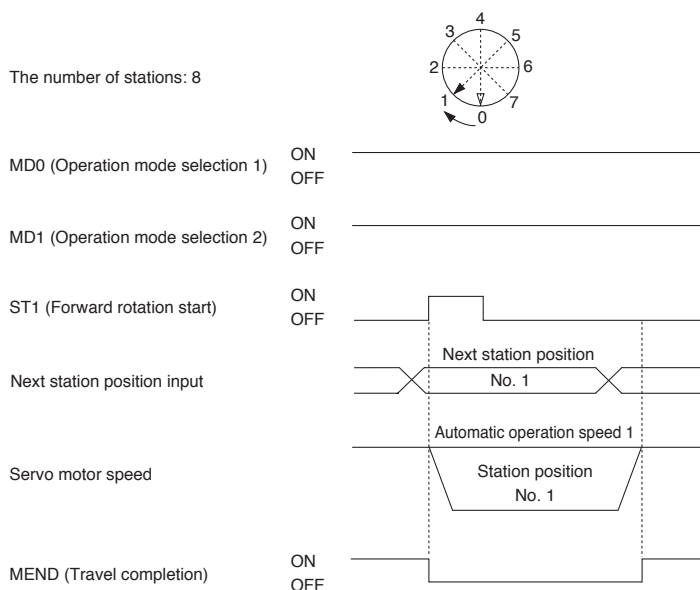


Shortest rotating indexer

In the shortest rotating indexer, the servo motor automatically rotates in the shorter direction.

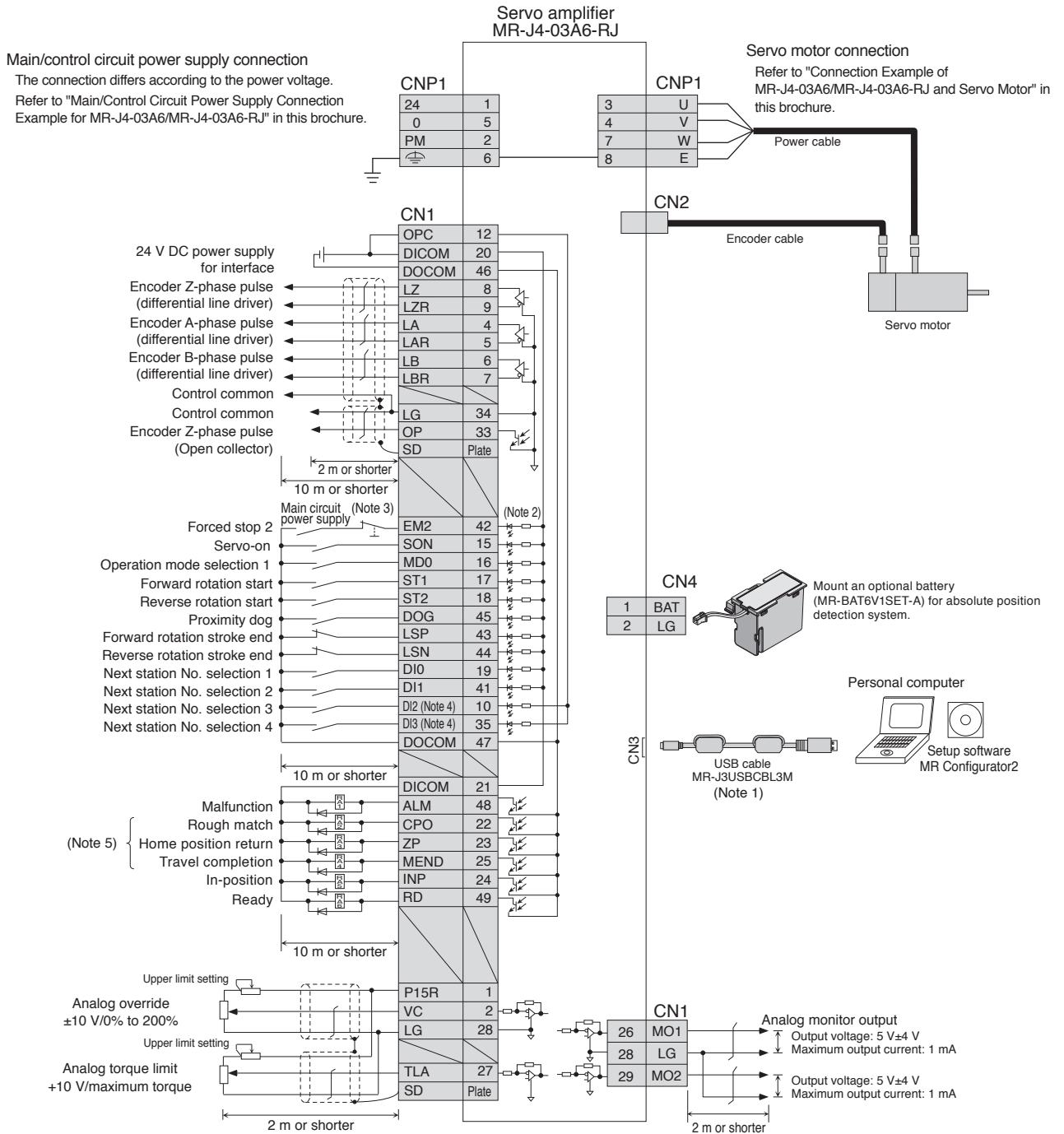
Turn on both MD0 (Operation mode selection 1) and MD1 (Operation mode selection 2). When ST1 (Forward rotation direction) turns on, the travel amount will be calculated from the current position and the next station position, and then the positioning will be executed in the shorter direction.

The following timing chart is an example of the operation executed from the station No. 0 where the servo motor is stopped at servo-on.



MR-J4-03A6-RJ Standard Wiring Diagram Example: Indexer (Turret) Method

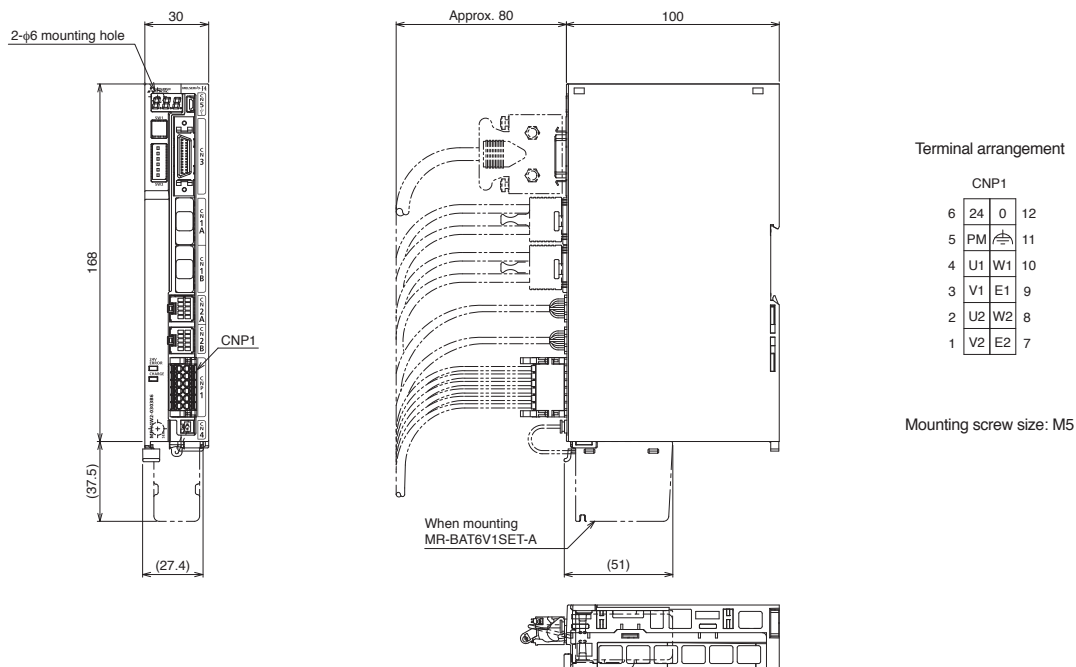
A-RJ



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

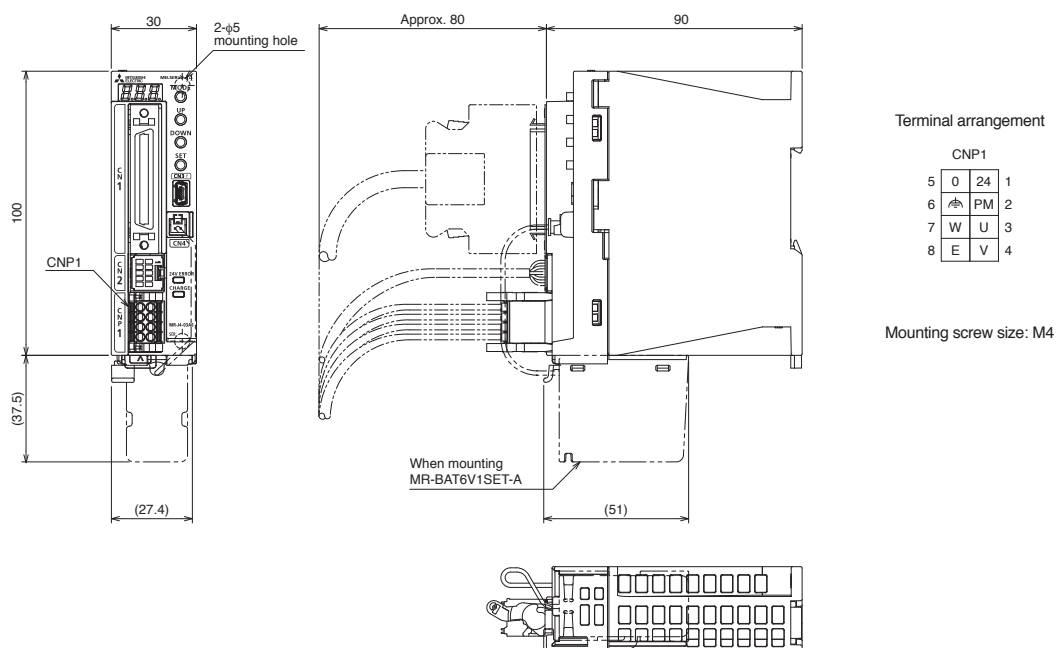
Servo Amplifier Dimensions

●MR-J4W2-0303B6



[Unit: mm]

●MR-J4-03A6/MR-J4-03A6-RJ



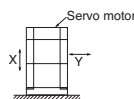
[Unit: mm]

HG-AK Series (Ultra-compact Size, Ultra-small Capacity) Specifications ^(Note 4)

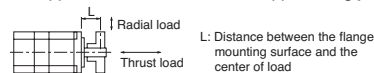
Servo motor model		HG-AK	0136(B)	0236(B)	0336(B)
Compatible servo amplifier model		MR-J4W2-0303B6/MR-J4-03A6/MR-J4-03A6-RJ			
Power supply capacity ^{*1}		[W]	230	360	480
Continuous running duty	Rated output	[W]	10	20	30
	Rated torque ^(Note 3)	[N·m]	0.032	0.064	0.095
Maximum torque		[N·m]	0.095	0.191	0.286
Rated speed		[r/min]	3000		
Maximum speed	48 V DC	[r/min]	6000		
	24 V DC	[r/min]	6000		5000
Permissible instantaneous speed	48 V DC	[r/min]	6900		
	24 V DC	[r/min]	6900		5750
Power rate at continuous rated torque	Standard	[kW/s]	3.54	9.01	14.95
	With electromagnetic brake	[kW/s]	2.41	6.99	12.32
Rated current		[A]	2.1	2.1	2.2
Maximum current		[A]	6.3	6.3	6.6
Regenerative braking frequency ^{*2}		[times/min]	1700	1200	900
Moment of inertia J	Standard	[$\times 10^{-4}$ kg·m ²]	0.0029	0.0045	0.0061
	With electromagnetic brake	[$\times 10^{-4}$ kg·m ²]	0.0042	0.0058	0.0074
Recommended load to motor inertia ratio ^(Note 1)			30 times or less		
Speed/position detector			Absolute/incremental 18-bit encoder (resolution: 262144 pulses/rev)		
Oil seal			None		
Insulation class			130(B)		
Structure			Totally enclosed, natural cooling (IP rating: IP55) ^(Note 2)		
Environment ^{*3}	Ambient temperature		Operation: 0 °C to 40 °C (non-freezing), storage: -15 °C to 70 °C (non-freezing)		
	Ambient humidity		Operation: 80 %RH maximum (non-condensing), storage: 90 %RH maximum (non-condensing)		
	Ambience		Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust		
	Altitude		1000 m or less above sea level		
Vibration resistance ^{*4}			X: 49 m/s ² Y: 49 m/s ²		
Vibration rank			V10 ^{*6}		
Compliance to global standards			Refer to "Conformity with Global Standards and Regulations" on p. 27 in this brochure.		
Permissible load for the shaft ^{*5}	L	[mm]	16	16	16
	Radial	[N]	34	44	49
	Thrust	[N]	14	14	14
Mass	Standard	[kg]	0.12	0.14	0.16
	With electromagnetic brake	[kg]	0.22	0.24	0.26

- Notes: 1. Contact your local sales office if the load to motor inertia ratio exceeds the value in the table.
2. The shaft-through portion, the connector, and the power cable leading part are excluded. Refer to the asterisk 7 of the following for the shaft-through portion.
3. When unbalanced torque is generated, such as in a vertical lift machine, keep the unbalanced torque of the machine under 70% of the servo motor rated torque.
4. Specifications of HG-AK_-S100 is the same as those of HG-AK_ except for the dimensions.

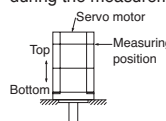
- *1. The power supply capacity varies depending on the DC power supply and the wiring impedance.
*2. The regenerative braking frequency shows the permissible frequency when the servo motor, without a load and a regenerative option, decelerates from the rated speed to a stop.
When a load is connected; however, the value will be the table value/(m+1), where m = Moment of inertia of load/Moment of inertia of servo motor.
When the operating speed exceeds the rated speed, the regenerative braking frequency is inversely proportional to the square of (operating speed/rated speed). Take measures to keep the regenerative power [W] during operation below the tolerable regenerative power [W] of the built-in regenerative resistor. Use caution, especially when the operating speed changes frequently or when the regeneration is constant (as with vertical feeds).
*3. In the environment where the servo motor is exposed to oil mist, oil and/or water, a standard specification servo motor may not be usable. Contact your local sales office for more details.
*4. The vibration direction is shown in the diagram to the right.
The value in the table indicates the maximum value of the component (commonly the bracket in the opposite direction of the servo motor shaft). Keep the vibration level at approximately a half of the permissible value because fretting tends to occur on the bearing when the servo motor stops.



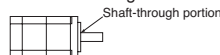
- *5. Refer to the diagram below for the permissible load for the shaft. Do not apply a load exceeding the value specified in the table on the shaft. The values in the table are applicable when each load is applied singly.



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



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



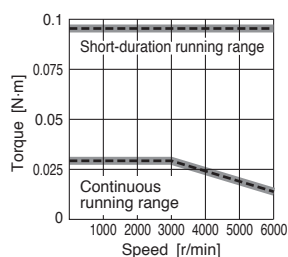
HG-AK Series Electromagnetic Brake Specifications ^(Note 1)

Model		HG-AK	0136B	0236B	0336B
Type		Spring actuated type safety brake			
Rated voltage		24 V DC $^{0}_{-10}\%$			
Power consumption [W] at 20 °C		1.8			
Electromagnetic brake static friction torque [N·m]		0.095			
Permissible braking work	Per braking [J]	4.6			
	Per hour [J]	46			
Electromagnetic brake life ^(Note 2)	Number of brakings [Times]	20000			
	Work per braking [J]	1			

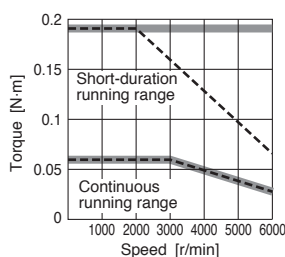
Notes: 1. The electromagnetic brake is for holding. It should not be used for deceleration applications.
2. Brake gap is not adjustable. Electromagnetic brake life is defined as the time period until the readjustment is needed.

HG-AK Series Torque Characteristics

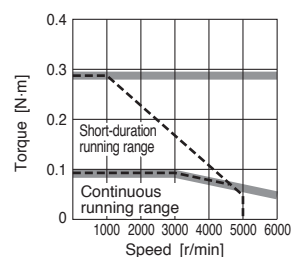
HG-AK0136(B) ^(Note 1, 2, 3, 4)



HG-AK0236(B) ^(Note 1, 2, 3, 4)



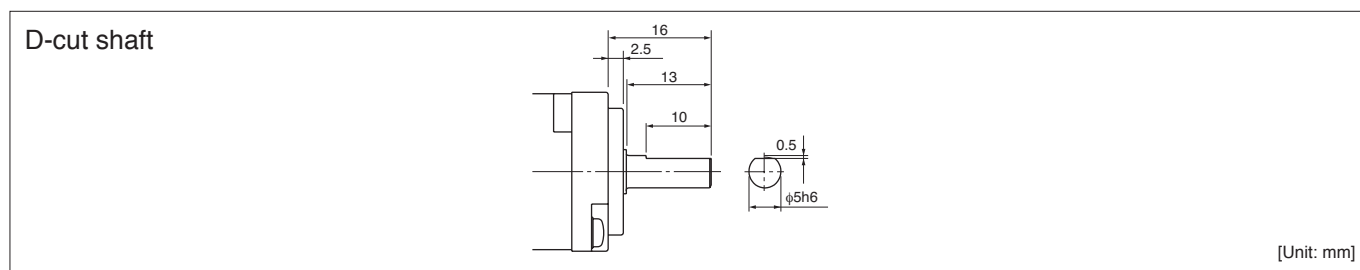
HG-AK0336(B) ^(Note 1, 2, 3, 4)



Notes: 1. —: For 48 V DC.
2. ---: For 24 V DC.
3. Torque drops when the power supply voltage is below the specified value.
4. The torque characteristics are applicable when optional MR-J4W03PWCBL5M-H or MR-J4W03PWBRCBL5M-H is used between the servo amplifier and the servo motor. When an option cable longer than 5 m is used, the torque characteristics in the short-duration running range may be lower because of voltage drop.

HG-AK Series Special Shaft End Specifications ^(Note 1)

Motors with the following specifications are also available.



Notes: 1. Specifications of HG-AK_-S100 is the same as those for HG-AK_ except for the dimensions.

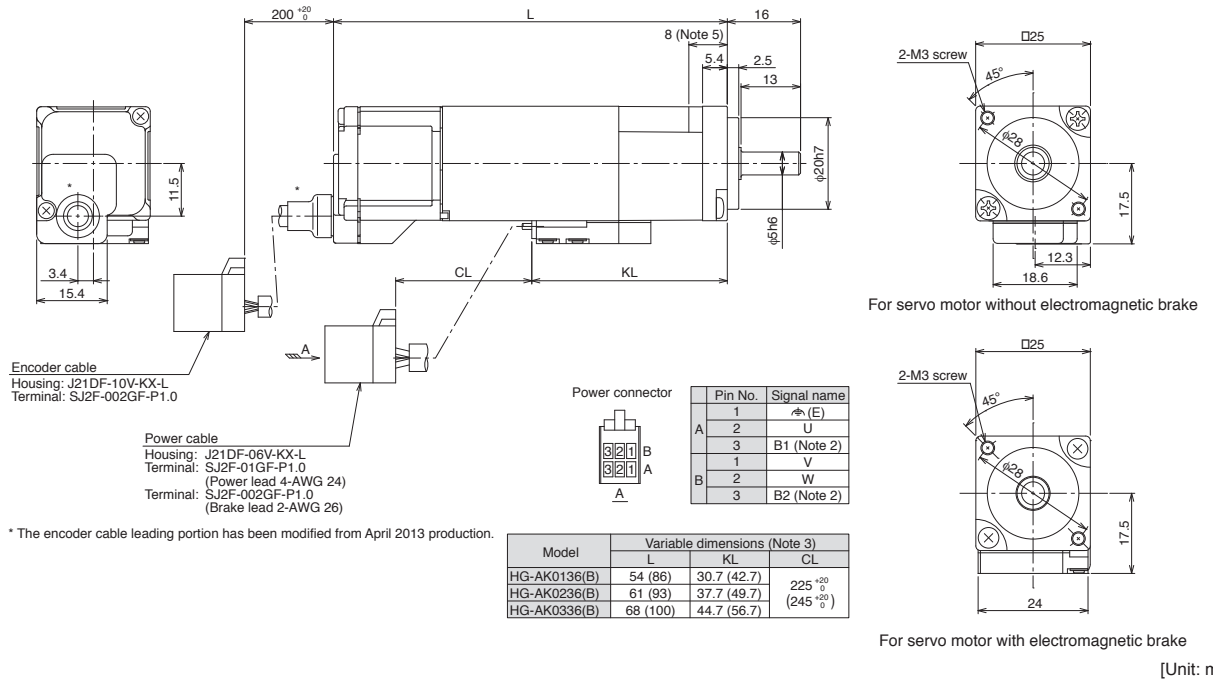
Conformity with Global Standards and Regulations ^(Note 1)

Available model		MR-J4W2-0303B6 MR-J4-03A6/MR-J4-03A6-RJ	HG-AK series
European EC directive	Low voltage directive	EN 61800-5-1	EN 60034-1/EN 60034-5
	EMC directive ^(Note 2)	EN 61800-3	EN 60034-1
	RoHS directive	Compliant	Compliant
UL standard		UL 508C (NMMS2)	UL 1004-1/UL 1004-6
CSA standard		CSA C22.2 No.14	CSA C22.2 No.100
Measures for Administration of the Pollution Control of Electronic Information Products (Chinese RoHS)		Compliant (optional cables and connectors)	Compliant (optional cables and connectors)
China Compulsory Certification (CCC)		N/A	N/A
Korea Radio Wave Law (KC)		Compliant	N/A

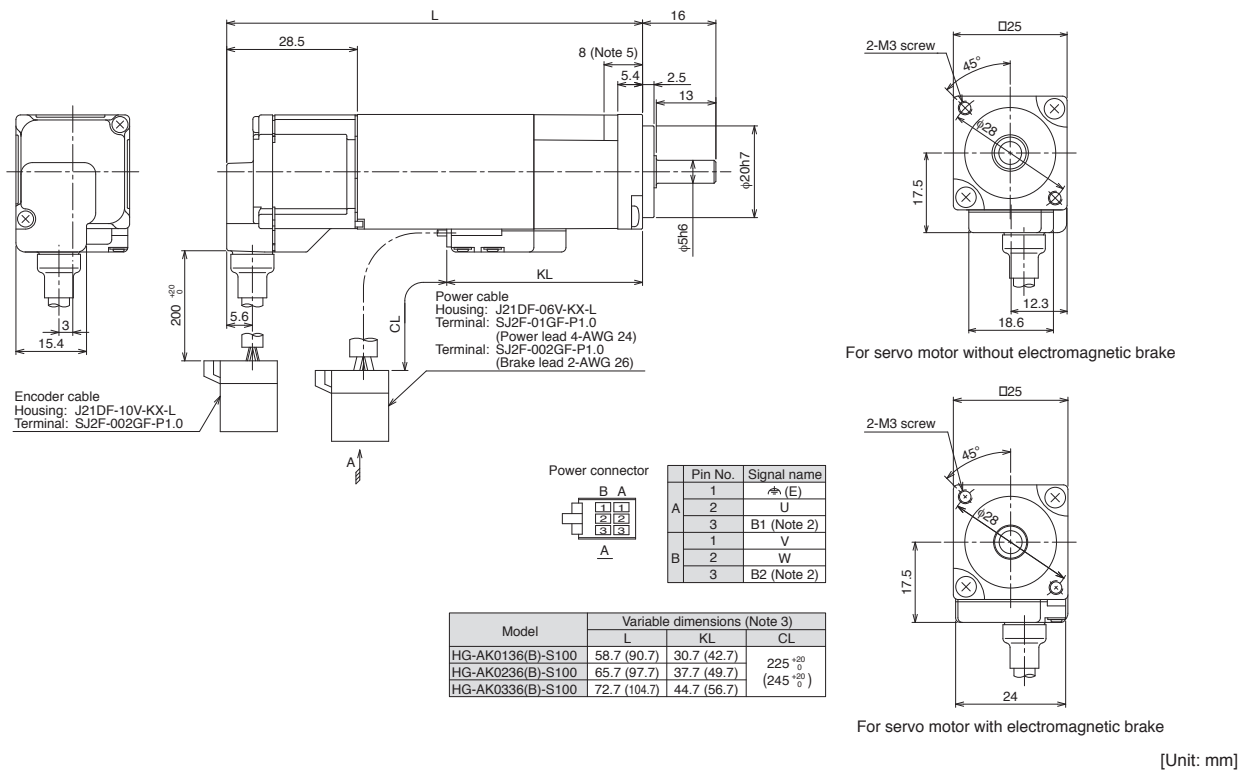
Notes: 1. When exporting the product, follow the local laws and regulations.
2. Refer to "Servo Amplifier Instruction Manual" and "EMC Installation Guidelines" when your system needs to meet the EMC directive.

Servo Motor Dimensions (Note 1, 4)

●HG-AK0136(B), HG-AK0236(B), HG-AK0336(B)



●HG-AK0136(B)-S100, HG-AK0236(B)-S100, HG-AK0336(B)-S100

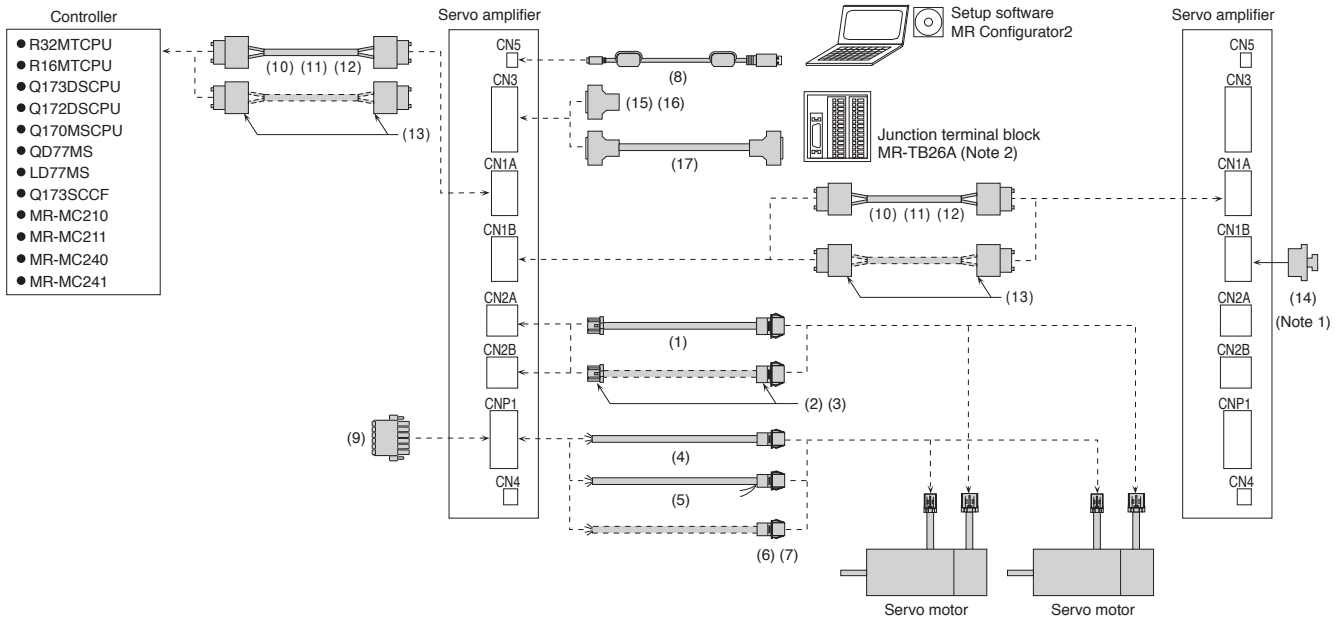


- Notes: 1. For dimensions without tolerance, general tolerance applies.
 2. The electromagnetic brake terminals (B1, B2) do not have polarity.
 3. Dimensions in brackets are for the models with electromagnetic brake.
 4. Use a friction coupling to fasten a load.
 5. Select a mounting screw whose length is within this dimension.

Configuration Example (Note 3)

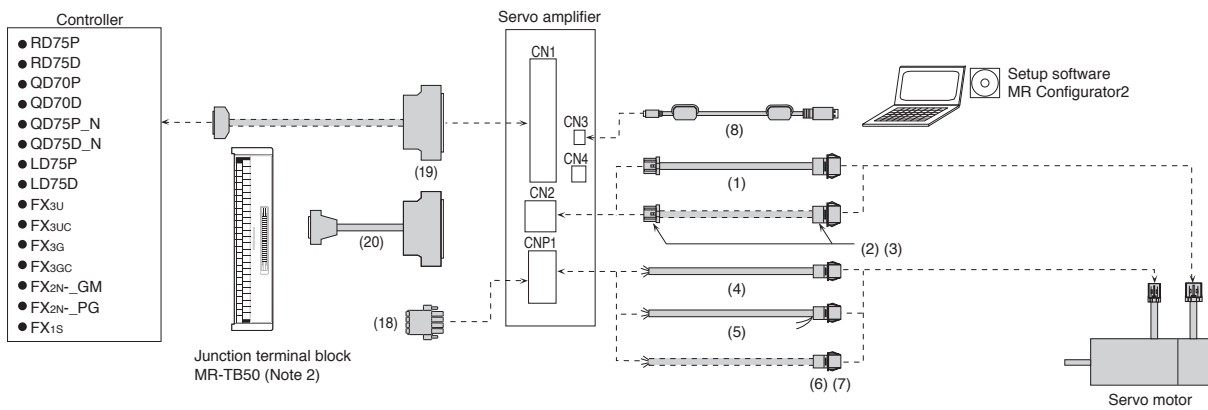
For MR-J4W2-0303B6

B



For MR-J4-03A6/MR-J4-03A6-RJ

A A-RJ









Notes: 1. Be sure to attach a cap to CN1B connector of the final axis.


2. Refer to "Junction Terminal Block" in "MELSERVO-J4 catalog (L(NA03058))."

3. Cables drawn with dashed lines need to be fabricated by user. Refer to relevant Servo Amplifier Instruction Manual and "Servo Motor Instruction Manual (Vol. 3)" for fabricating the cables.

Cables and Connectors for Servo Motor

Item	Model	Cable length	IP rating	Description
(1) Encoder cable	MR-J3W03ENCBL1M-A-H * ¹	1 m	-	Servo amplifier connector Receptacle housing: 1-1827862-5 Receptacle contact: 1827587-2 (TE Connectivity Ltd. Company)  Encoder connector Tab housing: J21DPM-10V-KX Tab contact: SJ2M-01GF-M1.0N (J.S.T. Mfg. Co., Ltd.)
	MR-J3W03ENCBL2M-A-H * ¹	2 m	-	
	MR-J3W03ENCBL5M-A-H * ¹	5 m	-	
	MR-J3W03ENCBL10M-A-H * ¹	10 m	-	
	MR-J3W03ENCBL20M-A-H * ¹	20 m	-	
	MR-J3W03ENCBL30M-A-H * ¹	30 m	-	
(2) Encoder connector set (Qty: 2 sets)	MR-J3W03CN2-2P * ²	-	-	Servo amplifier connector Receptacle housing: 1-1827862-5 Receptacle contact: 1827587-2 (TE Connectivity Ltd. Company)  Encoder connector Tab housing: J21DPM-10V-KX Tab contact: SJ2M-01GF-M1.0N (J.S.T. Mfg. Co., Ltd.) 
(3) Encoder connector set (Qty: 20 sets)	MR-J3W03CN2-20P * ²	-	-	Applicable cable Wire size: 0.2 mm ² to 0.38 mm ² (AWG 24 to 22) Insulator OD: 1.11 mm to 1.53 mm * Crimping tool (1762846-1) is required for the servo amplifier connector, and crimping tool (YRS-8861) is required for the encoder connector.
(4) Servo motor power cable (for standard servo motor)	MR-J4W03PWCBL1M-H * ¹	1 m	-	Power connector Tab housing: J21DPM-06V-KX Tab contact: BJ2M-21GF-M1.0N (J.S.T. Mfg. Co., Ltd.) 
	MR-J4W03PWCBL2M-H * ¹	2 m	-	
	MR-J4W03PWCBL5M-H * ¹	5 m	-	
	MR-J4W03PWCBL10M-H * ¹	10 m	-	
	MR-J4W03PWCBL20M-H * ¹	20 m	-	
	MR-J4W03PWCBL30M-H * ¹	30 m	-	
(5) Servo motor power cable (for the servo motor with electromagnetic brake)	MR-J4W03PWBCBL1M-H * ¹	1 m	-	Power connector Tab housing: J21DPM-06V-KX Tab contact: BJ2M-21GF-M1.0N (J.S.T. Mfg. Co., Ltd.) 
	MR-J4W03PWBCBL2M-H * ¹	2 m	-	
	MR-J4W03PWBCBL5M-H * ¹	5 m	-	
	MR-J4W03PWBCBL10M-H * ¹	10 m	-	
	MR-J4W03PWBCBL20M-H * ¹	20 m	-	
	MR-J4W03PWBCBL30M-H * ¹	30 m	-	
(6) Servo motor power connector set (Qty: 2 pcs)	MR-J4W03CNP2-2P * ²	-	-	Power connector Tab housing: J21DPM-06V-KX Tab contact: BJ2M-21GF-M1.0N (J.S.T. Mfg. Co., Ltd.) 
(7) Servo motor power connector set (Qty: 20 pcs)	MR-J4W03CNP2-20P * ²	-	-	Applicable cable Wire size: 0.34 mm ² to 0.75 mm ² (AWG 22 to 19) Insulator OD: 1.4 mm to 1.9 mm * Crimping tool (YRF-1120) is required for the power connector.


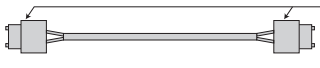






Cables and Connectors for MR-J4W2-0303B6/MR-J4-03A6/MR-J4-03A6-RJ

Item	Model	Cable length	IP rating	Description
(8) Personal computer communication cable (USB cable)	MR-J3USBCBL3M	3 m	-	Servo amplifier connector mini-B connector (5 pins) Personal computer connector A-connector  * Do not use this cable for SSCNET III(/H) compatible controller.




For unlisted lengths and fabricating cables

- *1. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS BUSINESS PROMOTION DIVISION (Email: osb.webmaster@melsc.jp)
*2. For fabricating encoder cables with these connectors, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS BUSINESS PROMOTION DIVISION (Email: osb.webmaster@melsc.jp)

Cables and Connectors for MR-J4W2-0303B6

Item	Model	Cable length	IP rating	Description
(9) Servo amplifier power connector	(Standard accessory)	-	-	 Power connector Connector: DFMC 1,5/ 6-ST-3,5-LR (Phoenix Contact) or an equivalent product Wire size: 0.2 mm ² to 1.5 mm ² (AWG 24 to 16) Insulator OD: up to 2.9 mm
(10) SSCNET III cable (standard cord inside cabinet) Compatible with SSCNET III(/H)	MR-J3BUS015M	0.15 m	-	 SSCNET III(/H) connector Connector: PF-2D103 (Japan Aviation Electronics Industry, Limited)
	MR-J3BUS03M	0.3 m	-	
	MR-J3BUS05M	0.5 m	-	
	MR-J3BUS1M	1 m	-	
	MR-J3BUS3M	3 m	-	
(11) SSCNET III cable (standard cable outside cabinet) Compatible with SSCNET III(/H)	MR-J3BUS5M-A * ¹	5 m	-	 SSCNET III(/H) connector Connector: CF-2D103-S (Japan Aviation Electronics Industry, Limited)
	MR-J3BUS10M-A * ¹	10 m	-	
	MR-J3BUS20M-A * ¹	20 m	-	
(12) SSCNET III cable (long distance cable, long bending life) Compatible with SSCNET III(/H)	MR-J3BUS30M-B * ¹	30 m	-	 SSCNET III(/H) connector Connector: CF-2D103-S (Japan Aviation Electronics Industry, Limited)
	MR-J3BUS40M-B * ¹	40 m	-	
	MR-J3BUS50M-B * ¹	50 m	-	
(13) SSCNET III connector set	MR-J3BCN1	-	-	 SSCNET III(/H) connector Connector: PF-2D103 (Japan Aviation Electronics Industry, Limited)
(14) SSCNET III connector cap	(Standard accessory)	-	-	 Connector: CF-2D103-S (Japan Aviation Electronics Industry, Limited)
(15) Connector set (Qty: 1 pc)	MR-J2CMP2	-	-	 Servo amplifier connector Connector: 10126-3000PE Shell kit: 10326-52F0-008 (3M) or an equivalent product
(16) Connector set (Qty: 20 pcs)	MR-ECN1	-	-	
(17) Junction terminal block cable	MR-TBNATBL05M	0.5 m	-	Servo amplifier connector Connector: 10126-6000EL Shell kit: 10326-3210-000 (3M) or an equivalent product
	MR-TBNATBL1M	1 m	-	Junction terminal block connector Connector: 10126-6000EL Shell kit: 10326-3210-000 (3M) or an equivalent product 

Cables and Connectors for MR-J4-03A6/MR-J4-03A6-RJ

Item	Model	Cable length	IP rating	Description
(18) Servo amplifier power connector	(Standard accessory)	-	-	 Power connector Connector: DFMC 1,5/ 4-ST-3,5-LR (Phoenix Contact) or an equivalent product Wire size: 0.2 mm ² to 1.5 mm ² (AWG 24 to 16) Insulator OD: up to 2.9 mm
(19) Connector set	MR-J3CN1	-	-	 Servo amplifier connector Connector: 10150-3000PE Shell kit: 10350-52F0-008 (3M) or an equivalent product
(20) Junction terminal block cable	MR-J2M-CN1TBL05M	0.5 m	-	Junction terminal block connector Connector: D7950-B500FL (3M)
	MR-J2M-CN1TBL1M	1 m	-	Servo amplifier connector Press bonding type Connector: 10150-6000EL Shell kit: 10350-3210-000 (3M) 

Notes: 1. Read carefully through the precautions enclosed with the options before use.

2. Dedicated tools are required. Contact your local sales office for more details.

3. Refer to "Products on the Market for Servo Amplifiers" in "MELSERVO-J4 catalog (L(NA)03056)" for cables over 50 m or with ultra-long bending life.

4. Solder type (connector: 10150-3000PE and shell kit: 10350-52F0-008) (3M) is also usable. Contact the manufacturer directly.

For unlisted lengths

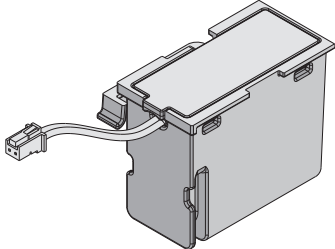
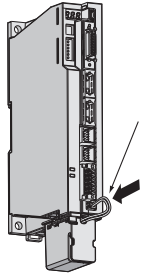
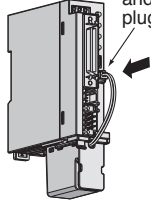
*1. For unlisted lengths of the cables, please contact Mitsubishi Electric System & Service Co., Ltd. OVERSEAS BUSINESS PROMOTION DIVISION (Email: osb.webmaster@melsc.jp)

Battery (MR-BAT6V1SET-A) ^(Note 1)

WB A A-RJ

The absolute position data can be retained by mounting the battery on the servo amplifier. MR-BAT6V1SET-A is reusable by replacing the built-in MR-BAT6V1 batteries.

MR-BAT6V1SET-A is not required for incremental system.

Appearance	Mounting method	
 <p>Model: MR-BAT6V1SET-A Nominal voltage: 6 V Nominal capacity: 1650 mAh Lithium content: 1.2 g Primary battery: 2CR17335A (CR17335A × 2 pcs. in series) Mass: 55 g</p>	For MR-J4W2-0303B6	For MR-J4-03A6/MR-J4-03A6-RJ
	 <p>Attach the battery, and then insert the plug to CN4 connector.</p>	 <p>Attach the battery, and then insert the plug to CN4 connector.</p>
<p>* MR-J3BAT battery cannot be used because of the difference in voltage.</p>		

Notes: 1. MR-BAT6V1SET-A is an assembled battery composed of lithium metal batteries of CR17335A. This battery is not subject to the dangerous goods (Class 9) of the UN Recommendations. To transport lithium metal batteries and lithium metal batteries contained in equipment by means of transport subject to the UN Recommendations, take actions to comply with the following regulations: the United Nations Recommendations on the Transport of Dangerous Goods, the Technical Instruction (ICAO-TI) by the International Civil Aviation Organization (ICAO), and the International Maritime Dangerous Goods Code (IMDG Code) by the International Maritime Organization (IMO). To transport the batteries, check the latest standards or the laws of the destination country and take actions. Contact your local sales office for more details.

Wires (Example of Selection for MR-J4W2-0303B6/MR-J4-03A6/MR-J4-03A6-RJ)

The following are examples of wire sizes when 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV wires) with a length of 30 m are used.

Servo amplifier model	Wire size	
	24, 0, PM, \oplus	U, V, W, E
MR-J4W2-0303B6 MR-J4-03A6/MR-J4-03A6-RJ	AWG 16 ^(Note 1)	AWG 19

Notes: 1. A voltage drop occurs by the current supplied to the servo amplifier according to the wiring impedance.

Selection Example in HIV Wires for Servo Motors

The following are examples of wire sizes when 600 V grade heat-resistant polyvinyl chloride insulated wires (HIV wires) with a length of 30 m are used.

Servo motor model	Wire size [mm ²]	
	For power and grounding (U, V, W, \oplus)	B1, B2
HG-AK series	0.75 (AWG 19) ^(Note 1, 2)	0.75 (AWG 19) ^(Note 3, 4)

Notes: 1. Use a fluorine resin wire of 0.75 mm² (AWG 19) for wiring to the servo motor power connector.
 2. This size is applicable for wiring length of 5 m or shorter. When an option cable longer than 5 m is used, the torque characteristics in the short-duration running range may be lower because of voltage drop.
 3. Use a fluorine resin wire of 0.75 mm² (AWG 19) when connecting to servo motor electromagnetic brake connector.
 4. This size is applicable for wiring length of 5 m or shorter. For over 5 m, extend the wire with HIV wire of 3.5 mm² (AWG 12).

Circuit Protector ^(Note 1)

Power supply specifications	MR-J4W2-0303B6	MR-J4-03A6/MR-J4-03A6-RJ
Control circuit power supply (24 V DC)	CP30-BA 1P 1-M 1A	CP30-BA 1P 1-M 1A
Main circuit power supply (48 V DC)	CP30-BA 1P 1-M 5A	CP30-BA 1P 1-M 3A
Control circuit power supply/main circuit power supply (24 V DC)	CP30-BA 1P 1-M 10A	CP30-BA 1P 1-M 5A

Notes: 1. Use the circuit protector whose operation characteristics is medium-speed type.

Refer to "MELSERVO-J4 catalog (L(NA)03058)" for the following options.

Junction Terminal Block (MR-TB26A)

Junction Terminal Block (MR-TB50)

Manual pulse generator (MR-HDP01)

Data Line Filter

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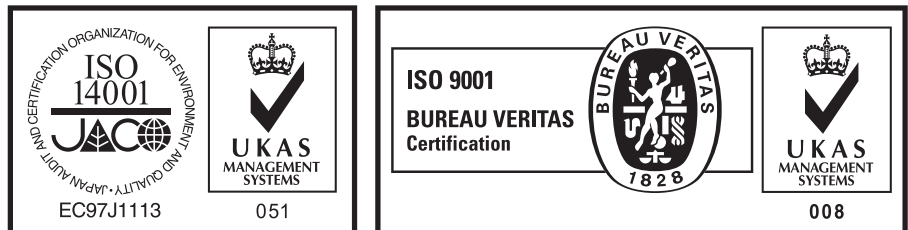


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