MITSUBISHI ELECTRIC

New Product Release

SV0603-2E

General-Purpose AC Servo
MELSERVO-J3

Fully Closed Loop Control Compatible AC Servo Amplifier MR-J3-B-RJ006 (B type)

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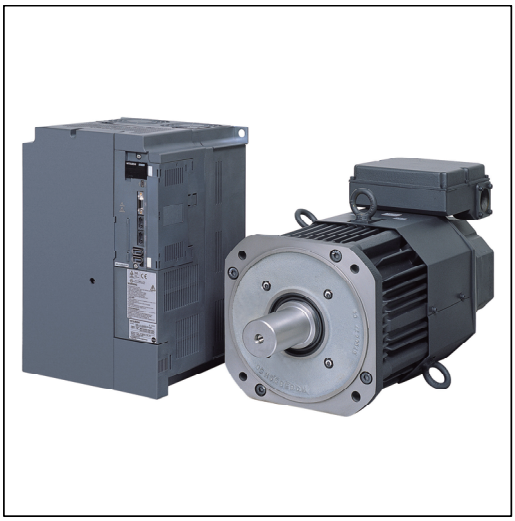
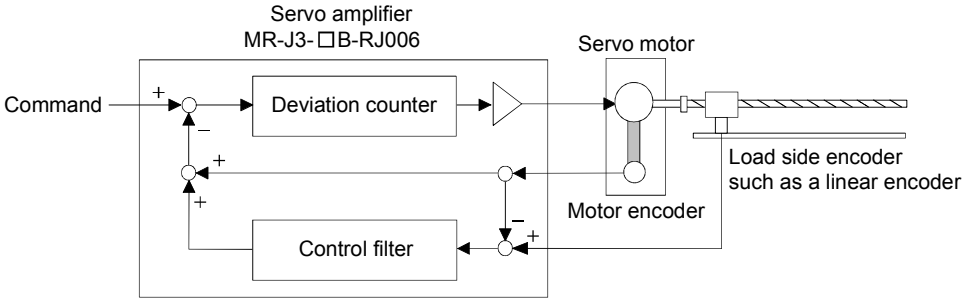
New, fully closed loop control compatible servo amplifier, MR-J3-B-RJ006 (0.05 to 22kW) has been added to MELSERVO-J3 SSCNET Ⅲ type.
Retaining the high performance, high functionality and usability of the MELSERVO-J3 Series, MR-J3-B-RJ006 is able to read position feedback signals from a load side encoder such as a linear encoder. MR-J3-B-RJ006 has realized less installation space and less wiring as compared to the existing MR-J2S Series.
Also, users can configure systems that meet their requirements with a wide variety of linear encoder models.



■ Features

- High accuracy position control is possible with the fully closed loop system.
- Dual feedback control provides the highest possible positioning response by using the position feedback signals from the motor encoder during high-speed rotation, and from the load side encoder, such as a linear encoder, when positioning (stopping).
- High-speed, high-accuracy and high-reliability system can be configured with a serial interface linear encoder for MELSERVO-J3 Series. (Refer to page 7 on this brochure for the serial interface linear encoders.)
- Absolute position detection system is easily structured without a battery by using a serial interface ABS type linear encoder.

<Simple overview of Dual feedback control block>
Refer to "MR-J3-□B-RJ006 SERVO AMPLIFIER INSTRUCTION MANUAL" for more details.



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■ Servo amplifier specifications (MR-J3-B type 100V/200V)

Servo amplifier model MR-J3-□-RJ006			10B	20B	40B	60B	70B	100B	200B	350B	500B	700B	11KB	15KB	22KB	10B1	20B1	40B1
Main circuit power supply	Voltage / frequency (Note 1)		3-phase 200 to 230VAC 50/60Hz or 1-phase 200 to 230VAC 50/60Hz					3-phase 200 to 230VAC 50/60Hz								1-phase 100 to 120VAC 50/60Hz		
	Permissible voltage fluctuation		For 3-phase 200 to 230VAC: 3-phase 170 to 253VAC For 1-phase 200 to 230VAC: 1-phase 170 to 253VAC					3-phase 170 to 253VAC								1-phase 85 to 132VAC		
	Permissible frequency fluctuation		±5% maximum															
Control circuit power supply	Voltage / frequency		1-phase 200 to 230VAC 50/60Hz													1-phase 100 to 120VAC 50/60Hz		
	Permissible voltage fluctuation		1-phase 170 to 253VAC													1-phase 85 to 132VAC		
	Permissible frequency fluctuation		±5% maximum															
	Power consumption (W)		30								45					30		
Interface power supply			24VDC ±10% (required current capacity: 150mA (Note 2))															
Load side encoder interface	Serial interface		Mitsubishi high-speed serial communication															
	Pulse train interface	Input signal	ABZ phase differential input signal															
		Minimum phase difference	200ns															
Regenerative resistor/ tolerable regenerative power (W)	With no option (Amplifier built-in resistor)		–	10	10	10	20	20	100	100	130	170	–	–	–	–	10	10
	With standard accessory (Note3, 4)		–	–	–	–	–	–	–	–	–	–	500 (800)	850 (1300)	850 (1300)	–	–	–
Control system			Sine-wave PWM control / current control system															
Dynamic brake			Built-in										External option			Built-in		
Safety features			Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servo motor 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)								Self-cooling open (IP00)		
Environment	Ambient temperature (Note5)		0 to 55°C (32 to 131°F) (non freezing), storage: -20 to 65°C (-4 to 149°F) (non freezing)															
	Ambient humidity		90% RH maximum (non condensing), storage: 90% RH maximum (non condensing)															
	Atmosphere		Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust															
	Elevation		1000m or less above sea level															
	Vibration		5.9m/s^2 maximum															
Mass (kg [lb])			0.8 (1.8)	0.8 (1.8)	1.0 (2.2)	1.0 (2.2)	1.4 (3.1)	1.4 (3.1)	2.3 (5.1)	2.3 (5.1)	4.6 (10)	6.2 (14)	18 (40)	18 (40)	19 (42)	0.8 (1.8)	0.8 (1.8)	1.0 (2.2)

Notes: 1. Rated output and rated speed of the servo motor used in combination with the servo amplifier are as indicated when using the power supply voltage and frequency listed. The torque drops when the power supply voltage is less than specified.
2. 150mA 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.
3. The values in ( ) indicate when cooling fans (approx. 1.0m^3/min, □92×2 units) are installed and the parameter No. PA02 is changed.
4. The servo amplifier (MR-J3-□KB-RZ006) without enclosed regenerative resistors is also available.
5. The MR-J3-350B-RJ006 or smaller servo amplifier can be installed closely. In this case, keep the ambient temperature within 0 to 45°C (32 to 113°F), or use them with 75% or less of the effective load rate.

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■ Servo amplifier specifications (MR-J3-B type 400V)

Servo amplifier model			MR-J3-11KB4-RJ006	MR-J3-15KB4-RJ006	MR-J3-22KB4-RJ006
Main circuit power supply	Voltage / frequency (Note 1)		3-phase 380 to 480VAC 50/60Hz		
	Permissible voltage fluctuation		3-phase 323 to 528VAC		
	Permissible frequency fluctuation		±5% maximum		
Control circuit power supply	Voltage / frequency		1-phase 380 to 480VAC 50/60Hz		
	Permissible voltage fluctuation		1-phase 323 to 528VAC		
	Permissible frequency fluctuation		±5% maximum		
	Power consumption (W)		45		
Interface power supply			24VDC ±10% (required current capacity: 150mA (Note 2))		
Load side encoder interface	Serial interface		Mitsubishi high-speed serial communication		
	Pulse train interface	Input signal	ABZ phase differential input signal		
		Minimum phase difference	200ns		
Regenerative resistor/ tolerable regenerative power (W)	With no option (Amplifier built-in resistor)		–	–	–
	With standard accessory (Note3, 4)		500 (800)	850 (1300)	850 (1300)
Control system			Sine-wave PWM control / current control system		
Dynamic brake			External option		
Safety features			Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servo motor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection		
Structure			Fan cooling open (IP00)		
Environment	Ambient temperature		0 to 55°C (32 to 131°F) (non freezing), storage: -20 to 65°C (-4 to 149°F) (non freezing)		
	Ambient humidity		90% RH maximum (non condensing), storage: 90% RH maximum (non condensing)		
	Atmosphere		Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist or dust		
	Elevation		1000m or less above sea level		
	Vibration		5.9m/s^2 maximum		
Mass (kg [lb])			18 (40)	18 (40)	19 (42)

Notes: 1. Rated output and rated speed of the servo motor used in combination with the servo amplifier are as indicated when using the power supply voltage and frequency listed. The torque drops when the power supply voltage is less than specified.
2. 150mA 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.
3. The values in ( ) indicate when cooling fans (approx. 1.0m^3/min, □92×2 units) are installed and the parameter No. PA02 is changed.
4. The servo amplifier (MR-J3-□KB4-RZ006) without enclosed regenerative resistors is also available.

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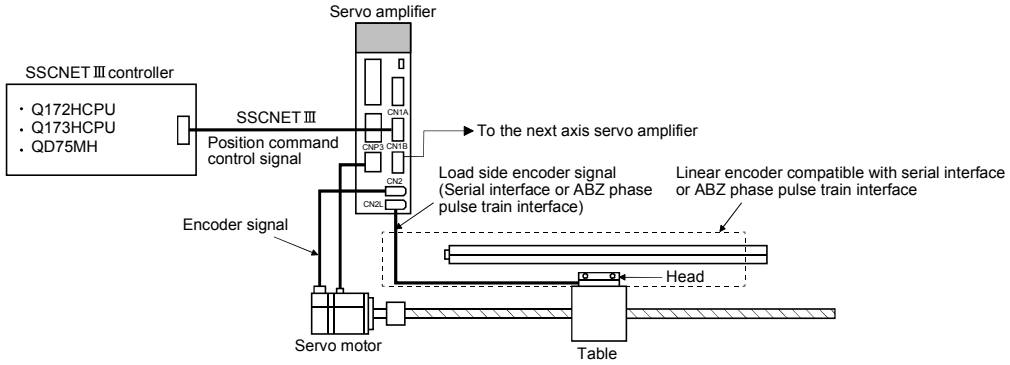
■ System configurations (MR-J3-B type)

Fully closed loop control system can be easily structured by connecting the encoder to the CN2L connector (load side encoder interface).

1. When using a linear encoder compatible with serial interface or ABZ phase pulse train interface:



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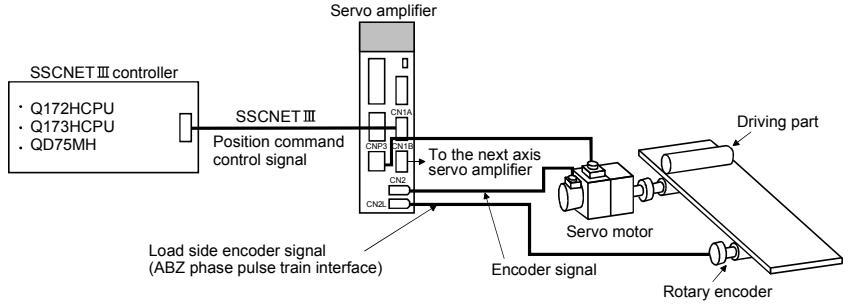
Notes: 1. Compatible with the absolute position detection system when an ABS type encoder is used. In this case, the battery (MR-J3BAT) is not required.
2. Select a load side encoder in accordance with the following:
$4096(2^{12}) \leq$ the number of the load side encoder pulses per servo motor rotation $\leq 67108864(2^{26})$

2. When using a rotary encoder compatible with ABZ phase pulse train interface:

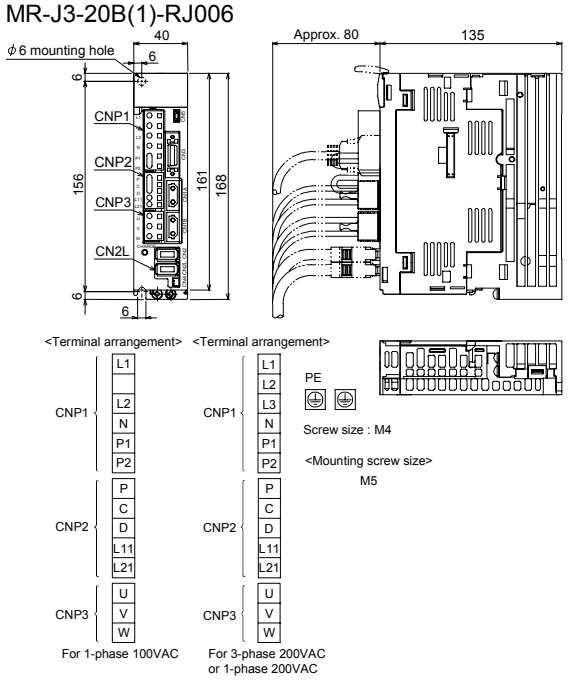


Notes: 1. Not compatible with the absolute position detection system.
2. Select a load side encoder in accordance with the following:
$4096(2^{12}) \leq$ the number of the load side encoder pulses per servo motor rotation $\leq 67108864(2^{26})$

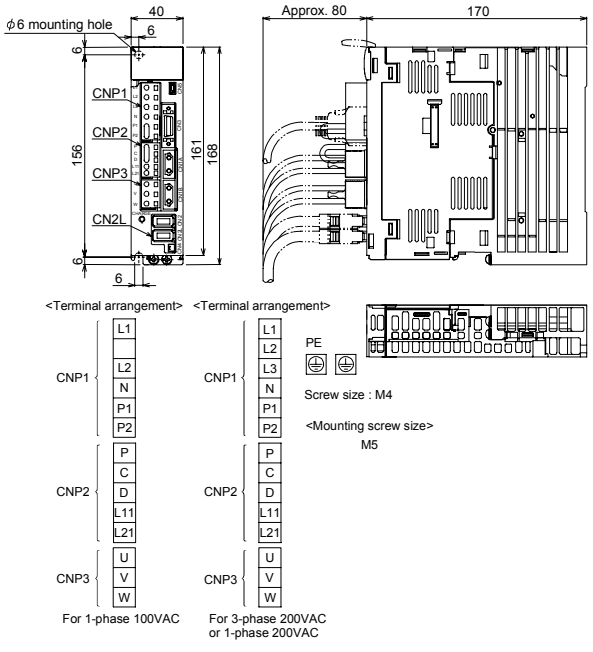
■ Servo amplifier dimensions

(Unit: mm)

● MR-J3-10B(1)-RJ006
● MR-J3-20B(1)-RJ006



● MR-J3-40B(1)-RJ006
● MR-J3-60B-RJ006



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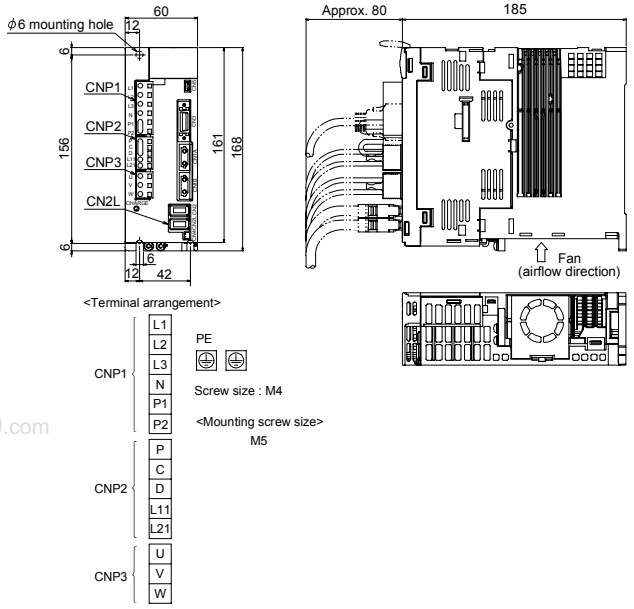
■ Servo amplifier dimensions

(Unit: mm)

● MR-J3-70B-RJ006
● MR-J3-100B-RJ006



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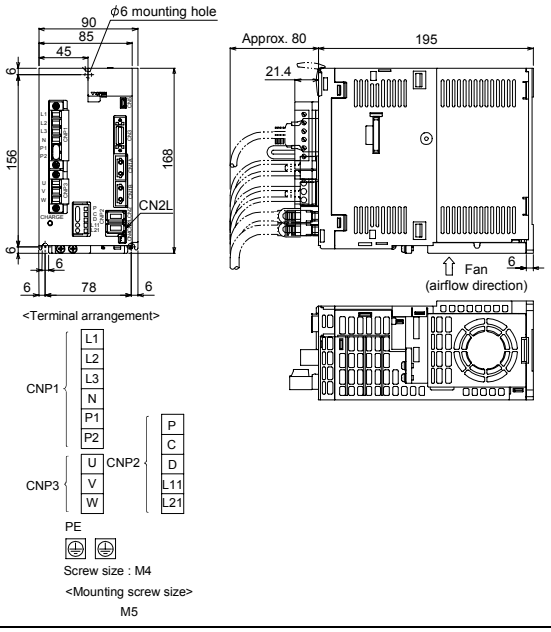
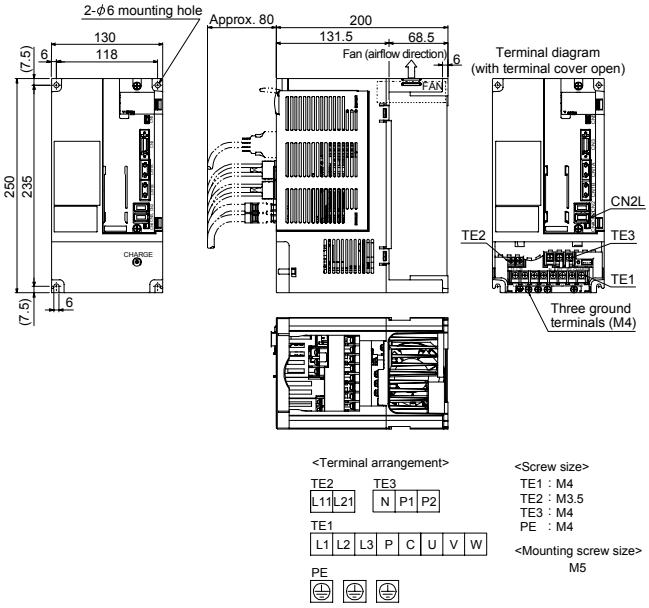
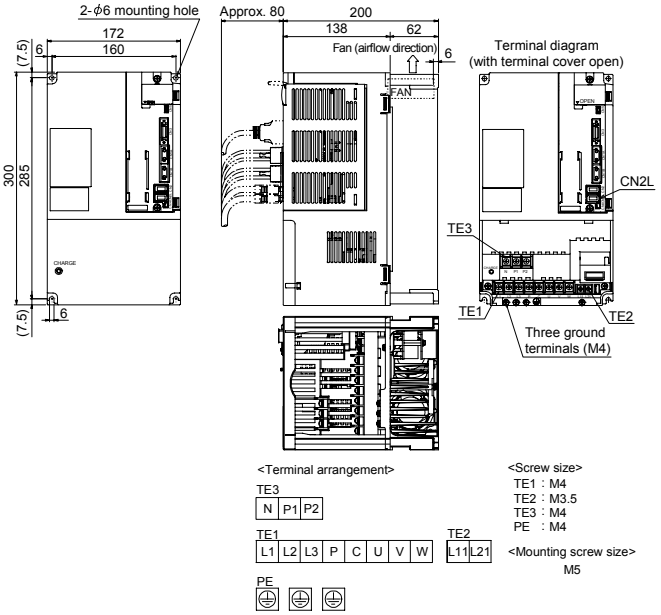
● MR-J3-200B-RJ006
● MR-J3-350B-RJ006



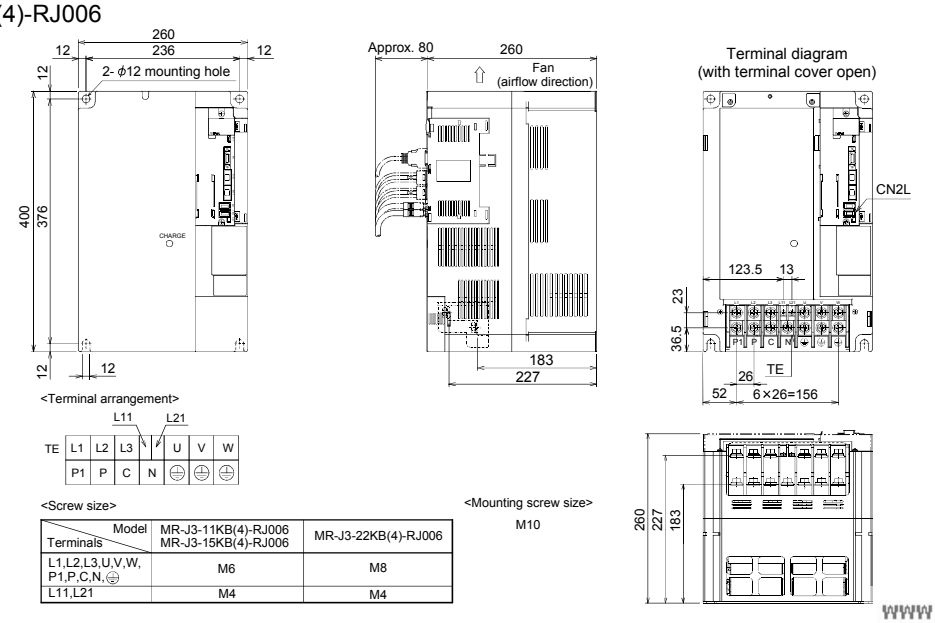
● MR-J3-500B-RJ006



● MR-J3-700B-RJ006



● MR-J3-11KB(4)-RJ006
● MR-J3-15KB(4)-RJ006
● MR-J3-22KB(4)-RJ006



<Screw size>

Terminals \ Model	MR-J3-11KB(4)-RJ006 MR-J3-15KB(4)-RJ006	MR-J3-22KB(4)-RJ006
L1,L2,L3,U,V,W, P1,P,C,N, ⏚	M6	M8
L11,L21	M4	M4

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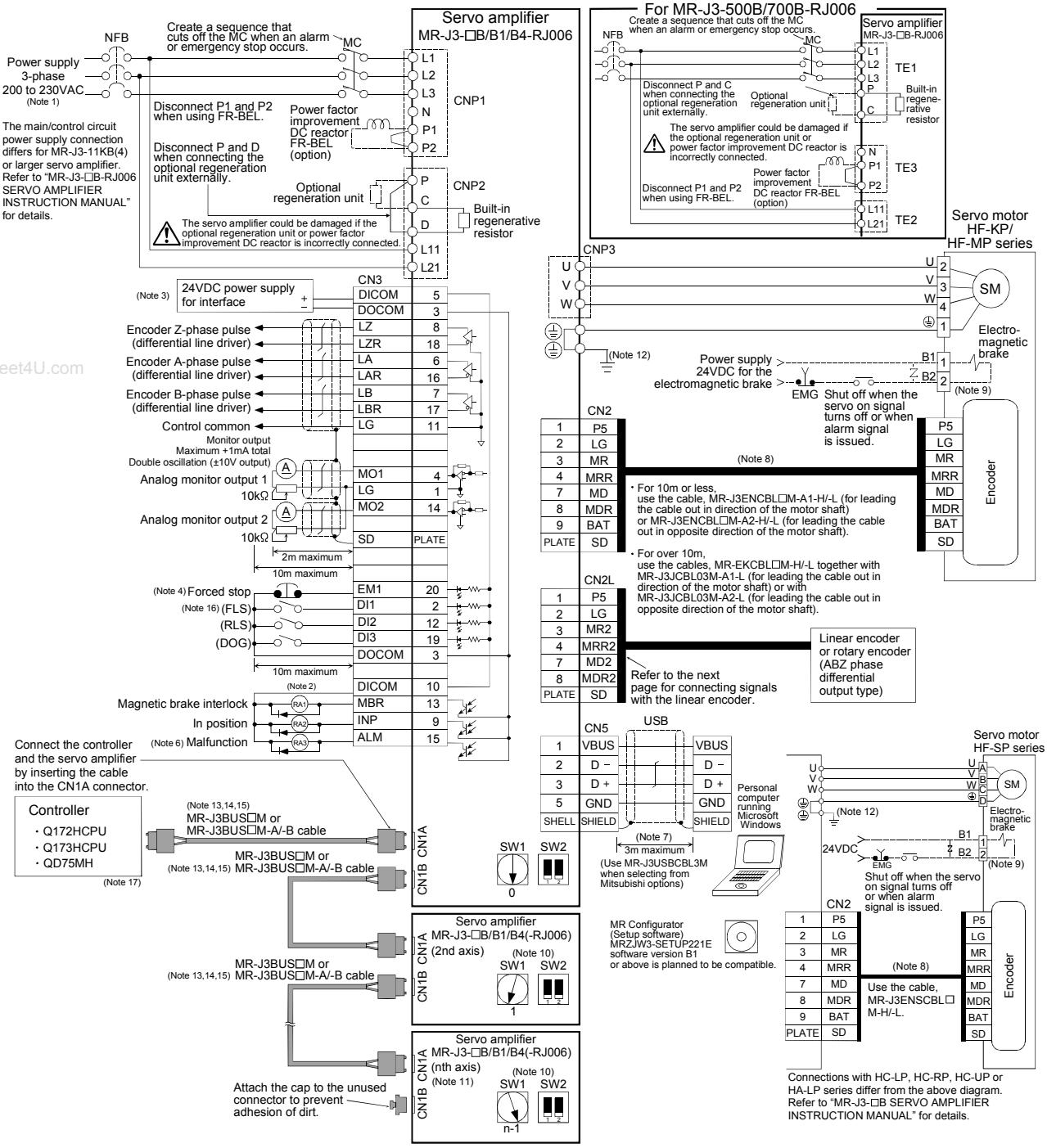
■ Standard wiring diagram (MR-J3-B type)



Notes: 1. When using a power supply, 1-phase 100 to 120VAC (for MR-J3-40B1-RJ006 or smaller) or 1-phase 200 to 230VAC (for MR-J3-70B-RJ006 or smaller), connect the power supply to the L1 and L2 terminals. Do not connect anything to L3.
2. Do not reverse the diode's direction. Connecting it backwards could cause the servo amplifier to malfunction that signals are not output, and emergency stop and other safety circuits are inoperable.
3. Use the power supply 24VDC±10% (required current capacity: 150mA). 150mA is the value when all of the input/output points are used. Note that the current capacity can be stepped down according to the number of input/output points in use. Refer to "MR-J3-□B SERVO AMPLIFIER INSTRUCTION MANUAL" for details.
4. The forced stop signal is issued for each axis' servo amplifier individually. Use this as necessary when Q172HCPU, Q173HCPU or QD75MH is connected. When not using, invalidate the forced stop input with the parameter No. PA04, or short-circuit EM1 and DOCOM in the connector. For overall system, apply the emergency stop on the controller side.
5. Connect the shield wire securely to the plate inside the connector (ground plate).
6. Malfunction signal (ALM) is turned on during normal operation when no alarms have been triggered.
7. The cable length up to 3m is possible in a low noise environment.
8. Refer to "MR-J3-□B SERVO AMPLIFIER INSTRUCTION MANUAL" for details on the connection. Change the parameter No. PC04 when using the 4-wire cable (MR-EKCBL30M-H/-L to MR-EKCBL50M-H) for the HF-KP/HF-MP series.
9. For the motor with an electromagnetic brake. The electromagnetic brake terminals (B1, B2) do not have the polarity.
10. The motor side connections for the second and following axes are omitted from the above diagram.
11. Up to 16 axes (n=1 to 16) can be connected, using the axis selection rotary switch (SW1).
12. For grounding, connect the ground wire to the control box's protection ground terminal via the servo amplifier's protection ground terminal.
13. Do not apply excessive tension when cabling.
14. The minimum bending radius is 25mm for MR-J3BUS□M and 50mm for MR-J3BUS□M-A/-B. Using these cables under the minimum bending radius cannot be guaranteed.
15. If the ends of the fiber-optic cable are dirty, the light will be obstructed and could result in malfunctions. Always clean the ends if dirty.
16. Signals with ( ) can be assigned with the settings of the controller (Q172HCPU, Q173HCPU or QD75MH). Refer to the instruction manuals for each controller for details on the setting method.
17. Refer to the following for the software versions of Q172HCPU and Q173HCPU compatible with the fully closed loop control servo amplifier.
    - Q172HCPU or Q173HCPU OS software (SW6RN-SV13□□/-SV22□□): Software version 00D or above
    - Integrated start-up support software MT Developer (SW6RNC-GSVPROE/-GSVSETE): Software version 00N or above is planned to be compatible

    Refer to the following for the product information of QD75MH compatible with the fully closed loop control servo amplifier.
    - QD75MH product information: 080320000000000-B or above

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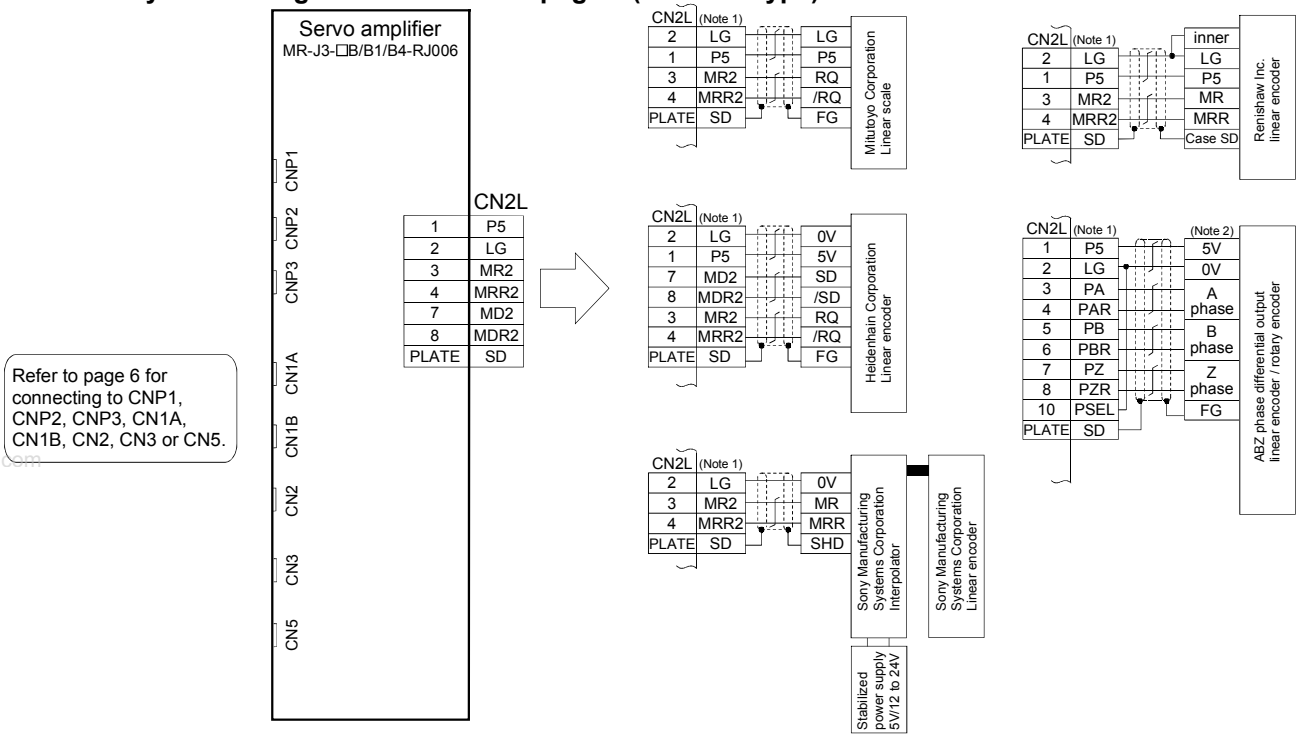
■ Connecting signals with the linear encoder

● For the system configurations 1 or 2 on page 4 (MR-J3-B type)



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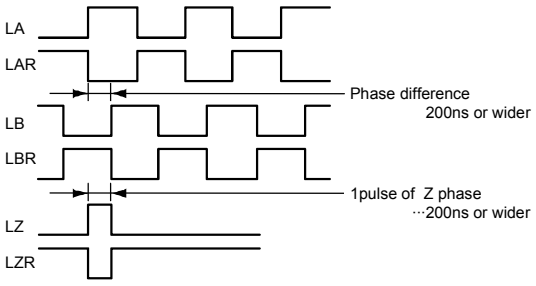
Notes: 1. When manufacturing the linear encoder connection cable, use the optional CN2L connector (MR-J3CN2). Refer to "MR-J3-□B-RJ006 SERVO AMPLIFIER INSTRUCTION MANUAL" for details on the wiring.
2. If the encoder's current consumption exceeds 350mA, supply power from an external source.

■ List of compatible linear encoders (Note1)

Linear encoder type		Manufacturer	Model	Resolution	Rated speed (Note 2)	Effective measurement length (maximum)	Communi-cation method	Absolute position system
Mitsubishi serial interface compatible	Absolute type	Mitutoyo Corporation	AT343A	0.05μm	2.0m/s	3000mm	2-wire type	Possible
			AT543A-SC		2.5m/s	2200mm		
			ST741A	0.5μm	4.0m/s	3000mm		
		Heidenhain Corporation	LC491M (Note 3)	0.05μm	2.0m/s	2040mm	4-wire type	Possible
	Incremental type	Sony Manufacturing Systems Corporation	SL710+ PL101-R/RH +MJ830 or MJ831	0.2μm (Note 4)	6.4m/s	3000mm	2-wire type	Impossible
			SH13 +MJ830 or MJ831	0.005μm (Note 4)	1.4m/s	1240mm		Impossible
		Renishaw Inc.	RGH26P	5μm	4.0m/s	70000mm	2-wire type	Impossible
			RGH26Q	1μm	3.2m/s			Impossible
			RGH26R	0.5μm	1.6m/s			Impossible
		Heidenhain Corporation	LIDA485+APE391M	0.005μm (20/4096μm)	4.0m/s	30040mm	4-wire type	Impossible
			LIDA487+APE391M			6040mm		
ABZ phase differential output type (Note 5)	Incremental type	Not designated	–	Within tolerable resolution range	Depends on linear encoder	Depends on linear encoder	Differential 3-pair type	Impossible

Notes: 1. Consult with each linear encoder manufacturer for details on the linear encoder's working environment and specifications such as ambient temperature, vibration resistance and protection level. Also, contact the manufacturer when using the linear encoder in a high electrostatic noise environment.
2. The indicated values are the linear encoder's rated speed when used in combination with the Mitsubishi fully closed loop control compatible servo amplifier. The values may differ from each manufacturer's specifications.
3. The linear encoder could malfunction if the ambient temperature is too high. Keep the linear encoder's ambient temperature within the temperature range specified by the manufacturer.
4. The resolution differs according to the setting value of the interpolator, MJ830/MJ831, made by Sony Manufacturing Systems Corporation.
5. Output the A-phase, B-phase and Z-phase signals in the differential line driver. The phase difference of A-phase pulse and B-phase pulse, and the width of Z-phase pulse must be 200ns or wider. Zero point return is not possible with a linear encoder which is not equipped with a Z phase.



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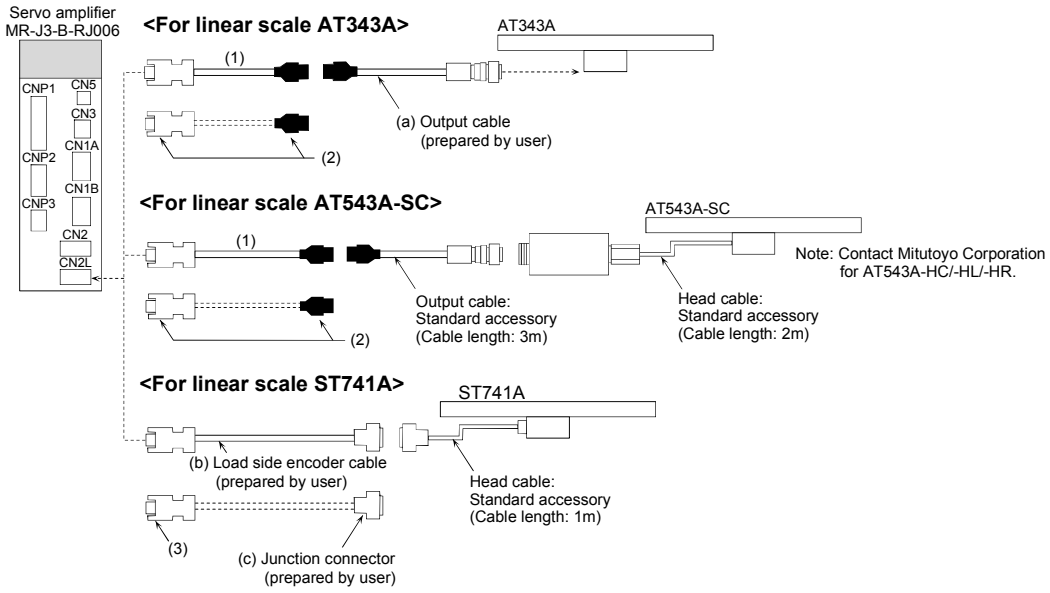
■ Options for CN2L connector

Refer to “MELSERVO-J3 Catalog” for details on options for the connectors other than CN2L.
Refer to “●Options available at Mitsubishi” on page 9 for the following (1) to (3).

1. Linear scales made by Mitutoyo Corporation



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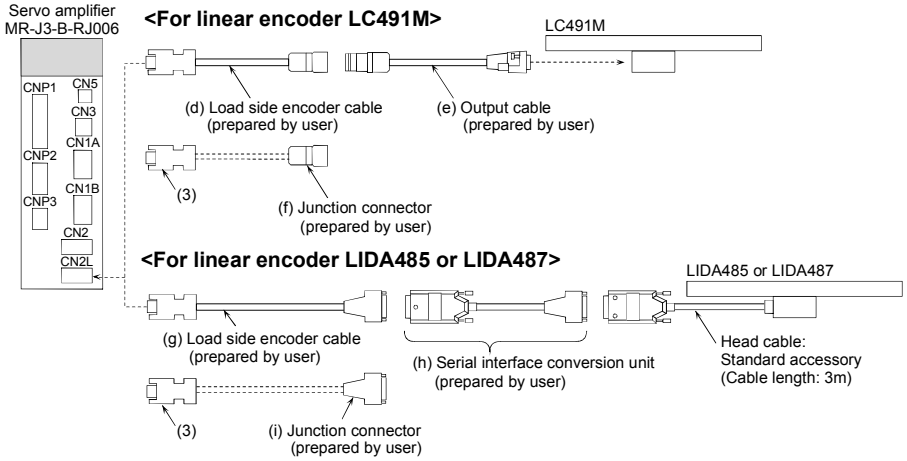
Contact Mitutoyo Corporation for (a) to (c).
(a) Part No. 09BAA598A: 0.2m, Part No. 09BAA598B: 2m or Part No. 09BAA598C: 3m, made by Mitutoyo Corporation
(b) Part No. 06ACF117A: 5m or Part No. 06ACF117B: 10m, made by Mitutoyo Corporation
(c) HDAB-15S (shell) and HDA-CTH (plug case), made by HIROSE ELECTRIC CO., LTD.

2. Linear encoders made by Heidenhain Corporation



Contact Heidenhain Corporation for (d) to (i).
(d) made by Heidenhain Corporation
(e) 337 439-XX···□m, made by Heidenhain Corporation
(f) 291697-26 (17-pin coupling, female), made by Heidenhain Corporation
(g) 366 419-XX···□m, made by Heidenhain Corporation
(h) APE391M (Cable length: 0.5m), made by Heidenhain Corporation
(i) D-SUB 15-pin (female)

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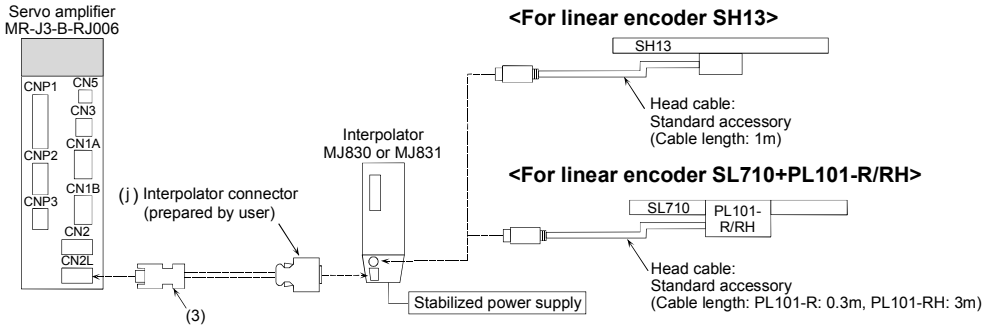
3. Linear encoders made by Sony Manufacturing Systems Corporation



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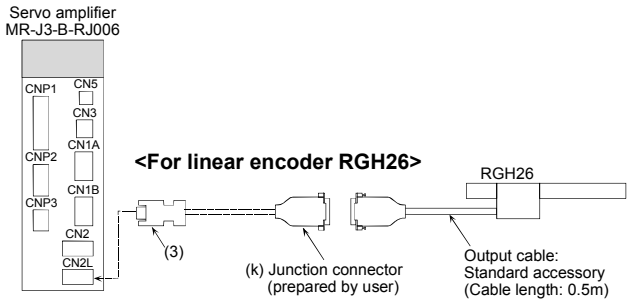
Contact Sony Manufacturing Systems Corporation for (j).
(j) 10114-3000VE (connector) and 10314-52F0-008 (shell kit), made by 3M or an equivalent product

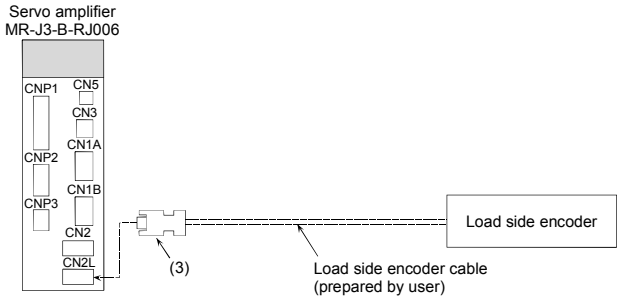
4. Linear encoder made by Renishaw Inc.

● For linear encoder RGH26P, RGH26Q or RGH26R



Contact Renishaw Inc. for (k).
(k) D-SUB 15-pin (female)

5. ABZ phase differential output type linear encoder or rotary encoder



● **Options available at Mitsubishi**

Item			Model	Description
Load side encoder cable	(1)	CN2L cable	MR-EKCBL□M-H □=cable length 2, 5,10m	Amplifier-side CN2L connector 36210-0100FD (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex) Junction connector (made by Tyco Electronics AMP) 1-172161-9 (housing) 170359-1 (connector pin) MTI-0002 (cable clamp, made by TOA ELECTRIC INDUSTRIAL)
	(2)	Connector set for CN2L	MR-ECNM	Amplifier-side CN2L connector 54599-1019 (connector set, Molex), or 36210-0100FD (receptacle, 3M) 36310-3200-008 (shell kit, 3M) Junction connector (made by Tyco Electronics AMP) 1-172161-9 (housing) 170359-1 (connector pin) MTI-0002 (cable clamp, made by TOA ELECTRIC INDUSTRIAL) <Applicable cable example> Wire size: 0.3mm² (AWG22) Completed cable outer diameter : ϕ8.2mm Crimping tool (91529-1) is required.
	(3)	CN2L connector	MR-J3CN2	Amplifier-side CN2L connector 36210-0100FD (receptacle, 3M) 36310-3200-008 (shell kit, 3M), or 54599-1019 (connector set, Molex)

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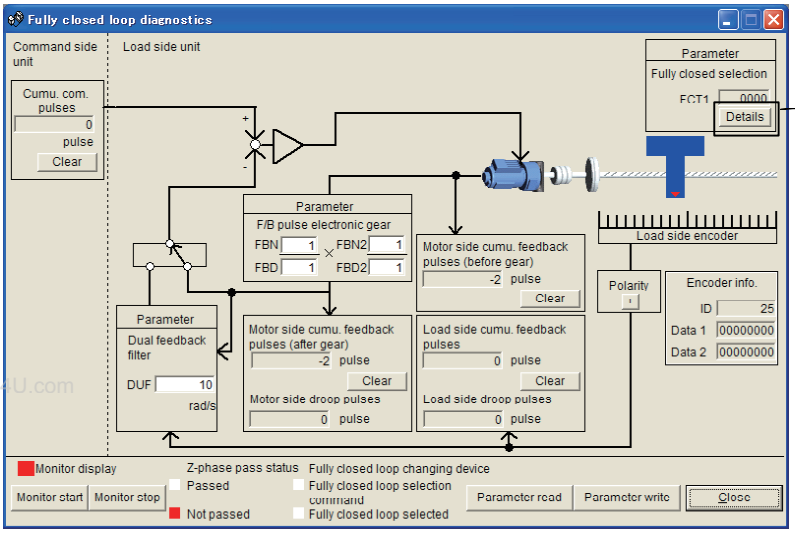
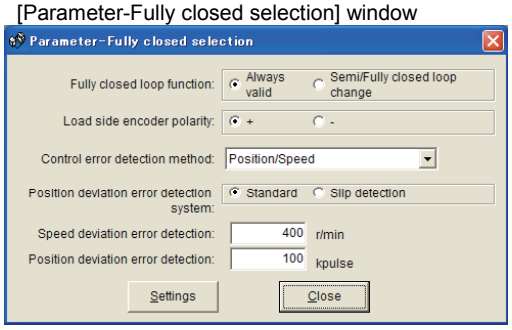
■ Fully closed loop diagnostic functions of MR Configurator (Setup software)

With the fully closed loop diagnostic functions, monitoring and reading/writing of parameters related to the fully closed loop function are possible.

[Fully closed diagnostics] window



[Parameter-Fully closed selection] window



Note: The screens shown on this page are for reference and may differ from the actual screens.

● Items displayed in the [Fully closed diagnostics] window

Item	Description
Cumu. com. pulses	Counts and displays the position command input pulses. Resets to 0 by pressing the “Clear” button.
Motor side cumu. feedback pulses (before gear)	Counts and displays the feedback pulses from the servo motor encoder. (Motor encoder unit) Resets to 0 by pressing the “Clear” button.
Motor side cumu. feedback pulses (after gear)	Counts and displays the feedback pulses from the servo motor encoder. (Load side encoder unit) Resets to 0 by pressing the “Clear” button.
Load side cumu. feedback pulses	Counts and displays the feedback pulses from the load side encoder. Resets to 0 by pressing the “Clear” button.
Motor side droop pulses	Displays the difference between the motor side position and the commanded position.
Load side droop pulses	Displays the difference between the load side position and the commanded position.
Polarity	Displays “+” or “-” according to the load side encoder polarity.
Encoder info.	Displays information about the load side encoder. The displayed items vary depending on the type of the load side encoder.
Z-phase pass status	Displays Z-phase pass status of the motor encoder when the fully closed loop system is “Invalid”. Displays Z-phase pass status of the load side encoder when the fully closed loop system is “Valid”.
Fully closed loop changing device	Displays only when “Semi closed loop control/Fully closed loop control changing” is selected for the fully closed loop system. Displays state of the Semi closed loop control/Fully closed loop control changing bit and internal state selected.
Monitor display	Starts monitoring by pressing the “Monitor start” button. Stops monitoring by pressing the “Monitor stop” button.
Parameter read	Reads all parameters displayed on the window from the servo amplifier and displays them.
Parameter write	Writes all parameters displayed on the window into the servo amplifier.

● Items displayed in the [Parameter-Fully closed selection] window

Displays the [Parameter-Fully closed selection] window by pressing the “Details” button in the [Fully closed diagnostics] window.

Item	Description
Fully closed loop function	Selects the fully closed loop function from “Always valid” or “Semi/Fully closed loop change”. When using this function, validate the fully closed loop system with the parameter No. PA01.
Load side encoder polarity	Selects the load side encoder polarity with “+” or “-”.
Control error detection method	Selects the fully closed loop control error detection method.
Position deviation error detection system	Selects the detection system regarding to the position deviation error of the fully closed loop control error detection function.
Speed deviation error detection	Specifies the speed deviation error detection level used in the fully closed loop control error detection function.
Position deviation error detection	Specifies the position deviation error detection level used in the fully closed loop control error detection function.

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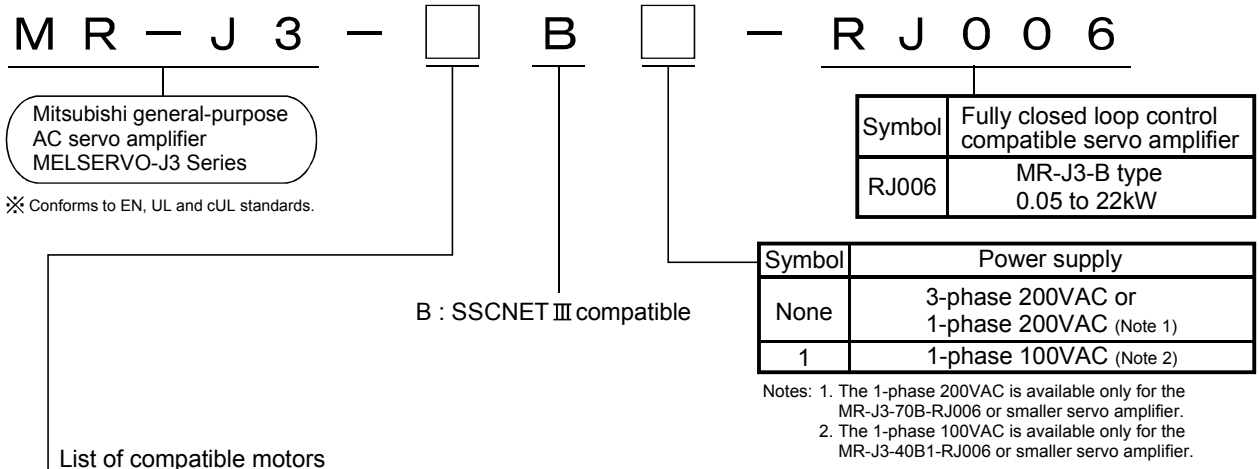
■ Model configurations

● For servo amplifier 100V/200V



Symbol	Fully closed loop control compatible servo amplifier
RJ006	MR-J3-B type 0.05 to 22kW

Symbol	Power supply
None	3-phase 200VAC or 1-phase 200VAC (Note 1)
1	1-phase 100VAC (Note 2)

Notes: 1. The 1-phase 200VAC is available only for the MR-J3-70B-RJ006 or smaller servo amplifier.
2. The 1-phase 100VAC is available only for the MR-J3-40B1-RJ006 or smaller servo amplifier.

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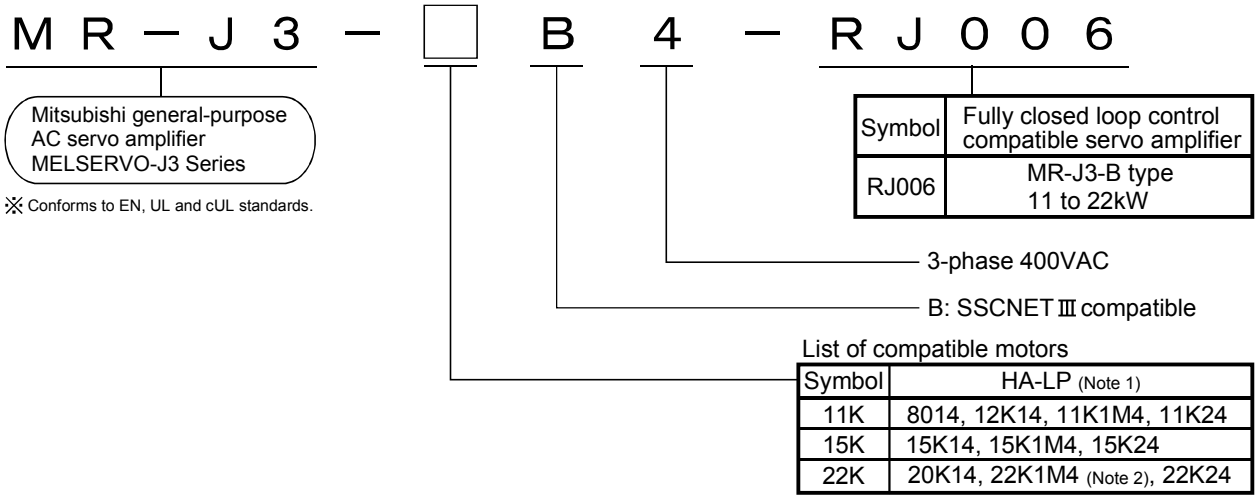
List of compatible motors

Symbol	HF-KP (Note 1)	HF-MP (Note 1)	HF-SP (Note 1)	HC-LP (Note 1)	HC-RP (Note 1)	HC-UP (Note 1)	HA-LP (Note 2)
10	053, 13	053, 13	–	–	–	–	–
20	23	23	–	–	–	–	–
40	43	43	–	–	–	–	–
60	–	–	51, 52	52	–	–	–
70	73	73	–	–	–	72	–
100	–	–	81, 102	102	–	–	–
200	–	–	121, 201, 152, 202	152	103, 153	152	–
350	–	–	301, 352	202	203	202	–
500	–	–	421, 502	302	353, 503	352, 502	502
700	–	–	702	–	–	–	601, 701M, 702
11K	–	–	–	–	–	–	801, 12K1, 11K1M, 11K2
15K	–	–	–	–	–	–	15K1, 15K1M, 15K2
22K	–	–	–	–	–	–	20K1, 25K1, 22K1M, 22K2

Notes: 1. The HF-KP, HF-MP, HF-SP, HC-LP, HC-RP or HC-UP series is compatible with any amplifier software version.
2. The HA-LP series is compatible with the following amplifier software version:
- HA-LP701M, 502, 702: Version A0 or above
- HA-LP601, 801, 12K1, 15K1, 20K1, 25K1, 11K1M, 15K1M, 22K1M, 11K2, 15K2, 22K2: Version B0 or above

● For servo amplifier 400V



Symbol	Fully closed loop control compatible servo amplifier
RJ006	MR-J3-B type 11 to 22kW

List of compatible motors

Symbol	HA-LP (Note 1)
11K	8014, 12K14, 11K1M4, 11K24
15K	15K14, 15K1M4, 15K24
22K	20K14, 22K1M4 (Note 2), 22K24

Notes: 1. The HA-LP series is compatible with the following amplifier software version:
- HA-LP8014, 12K14, 15K14, 20K14, 11K1M4, 15K1M4, 11K24, 15K24, 22K24: Version B0 or above
2. Contact your dealer for the delivery schedule of the servo motor and compatible servo amplifier software version.

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