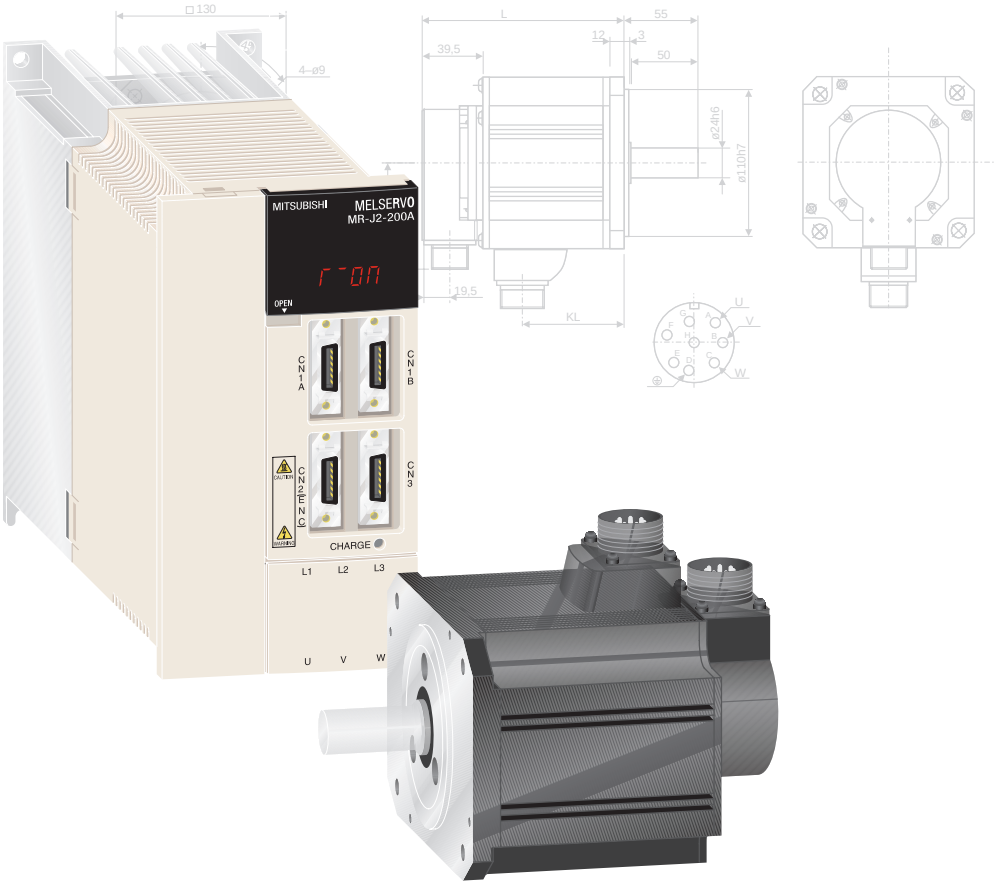
MITSUBISHI ELECTRIC

Servo Amplifiers
& Motors

MELSERVO
MR-J2-A



Technical Catalogue

1999/2000

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The new general-purpose AC Servo MR-J2

The new servo motors of the MELSERVO MR-J2 series by MITSUBISHI ELECTRIC feature a very low moment of inertia and a high positioning accuracy at very compact dimensions. An absolute encoder is integrated as standard equipment.

The provided servo amplifiers can be connected to 3-phase 200 – 230 V AC (50/60 Hz) and up to 0.75 kW to 1-phase 230 V AC (50/60 Hz).

Further Publications within the Factory Automation Range

Technical Catalogues

Technical catalogue AnU, QnA

Product catalogue for programmable logic controllers and accessories for the MELSEC A and Q series (art. no. 61747)

Technical catalogue AnS, QnAS

Product catalogue for programmable logic controllers and accessories for the MELSEC AnS and QnAS series (art. no. 59085)

Technical catalogue FX0S, FX0N, FX2N

Product catalogue for programmable logic controllers and accessories for the MELSEC FX0S, FX0N, and FX2N series (art. no. 68544)

Technical catalogue HMI

Product catalogue for operator terminals, process visualisation and programming software as well as accessories (art. no. 68542)

Technical catalogues inverter

Product catalogues for frequency inverters FR-A 540 (L) EC and FR-E 500 EC, control panels and accessories

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TÜV CERT DIN ISO 9001 / EN 29001

CE

About this product catalogue

This catalogue is periodically updated due to product range enlargement, technical changes or new or changed features.
For actual information about updates, changes, news or even support matters please contact the MITSUBISHI MEL-FAX faxback system (fax: +49 2102 486-485 or -790) or have a look at the MITSUBISHI ELECTRIC web pages under www.mitsubishi-automation.com.
Both media are nearly daily updated and available in two languages.

Texts, figures and diagrams shown in this product catalogue are intended exclusively for explanation and assistance in planning and ordering the servo motors and amplifiers of the MELSERVO series and the associated accessories.
Only the manuals supplied with the units are relevant for installation, commissioning and handling of the units and the accessories.
The information given in this documentation must be read before installation and commissioning of the units or software.

Should questions arise with regard to the planning of devices described in this product catalogue, do not hesitate to contact MITSUBISHI ELECTRIC EUROPE B.V. in Ratingen (Germany) or one of its distributors (see cover page).

SERVO AMPLIFIERS MELSERVO MR-J2 AND SERVO MOTORS

SYSTEM DESCRIPTION

SERVO MOTORS

SERVO AMPLIFIERS

OPTIONS AND PERIPHERAL EQUIPMENT

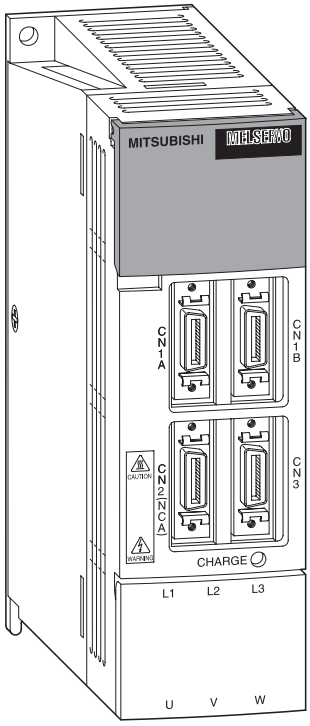
DIMENSIONS

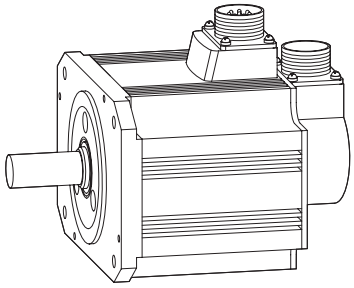
APPENDIX

MELSERVO J2-A Servo Motors and Amplifiers

The long-awaited MELSERVO MR-J2:

Embodying an ever more exacting pursuit of higher performance and ease of use. The culmination of Mitsubishi servo technology is realized in the new J2 general-purpose AC servo. In addition to being a global product that satisfies EN, UL, and other global industrial standards, the J2's wide range of applications elevates the AC servo playing field to a new plane. The J2 is suited for use in high-power-rate, ultra-low-inertia, high-frequency applications and comes with an absolute encoder as standard equipment. It is fully equipped with the latest advanced features, including Mitsubishi's unique servo lock anti-microvibration function, real-time auto-tuning, and automatic motor recognition.
With its enhanced features and ease of use, the J2 was well worth waiting for - pointing the way towards a new vision of the future.





Enhanced Safety and Ability to withstand Environmental Hazards

Satisfies overseas industrial standards

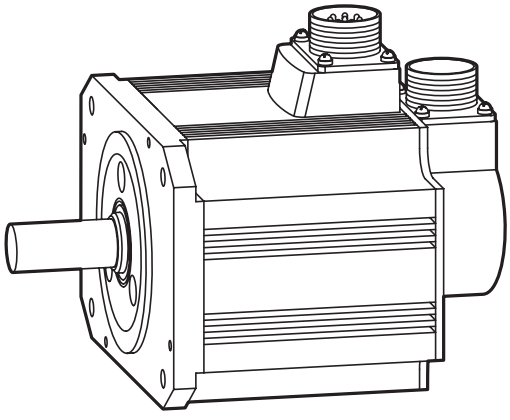
The units in this series can be used in confidence knowing they are in conformity with overseas industrial standards.

An EMC filter (optional) is available for meeting EN-standard EMC directives. The MELSERVO MR-J2 units meet low-voltage directives (LVD), UL and cUL [1].

[1] Standards:
Under the UL-CSA agreement, products certified under cUL standards are considered equivalent to products certified under CSA standards.

IP65 is standard equipment (HC-SF, HC-RF series)

The HC-SF and HC-RF series of servo motors come with IP65 as standard equipment, enhancing their ability to withstand any environment.



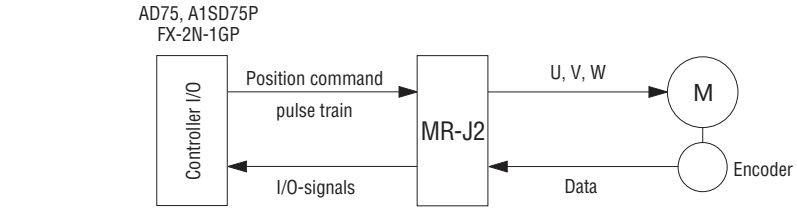
Functionality

Absolute encoder as standard equipment

Inclusion of an absolute encoder as standard equipment eliminates the need for a homing sequence, approximate DOG and other sensors, helping to reduce time and enhance reliability. In addition, users can switch easily from incremental to absolute positioning.

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

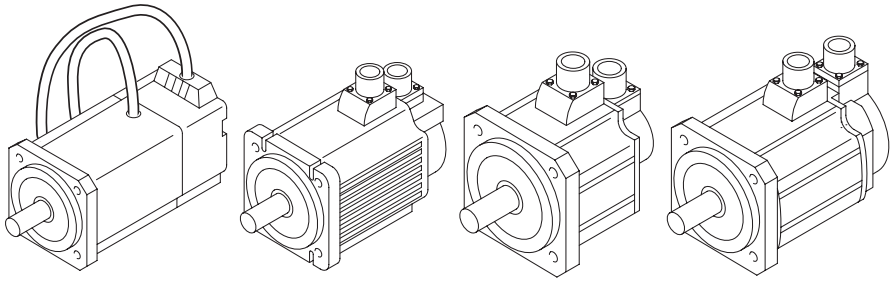
Once the amplifier power has been turned ON, it causes absolute data to be sent to the position controller at Servo ON.



Design achievement

Through a molding process that uses newly developed high thermal conductivity resins, the HC-MF series of servo motors achieves enhanced motor cooling performance and an ultra-compact design.

This makes it well suited to ultra-low-inertia, high-frequency applications.



Control Functions

Separate wiring for the control power supply

Wiring of the control power supply is separated from that for the main circuit power supply. When an alarm is triggered, the main circuit power supply can be turned off and the control power supply left on, making it possible to confirm the alarm message and operate the unit with confidence.

Torque control function

The J2 comes equipped with a torque control function. In addition, users can switch between control modes: position/speed and speed/torque.

Stop-state anti-vibration function

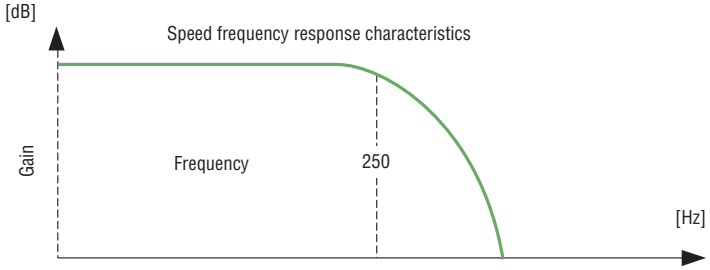
Microvibrations in the servo-lock state are suppressed through a unique method developed by Mitsubishi, providing the construction of stable systems.

Real-time auto-tuning and high responsiveness

With real-time auto-tuning, the unit is automatically adjusted to the optimal setting without any need for the gain adjustment unique to servomotors.

The sensitivity of the real-time auto-tuning can be changed in accordance with machine rigidity, enabling the J2 to accommodate an even wider range of machinery. (Response setting selection)

Model adaptive control provides the realisation of a highly responsive and stable system.

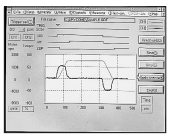


User-friendly Features

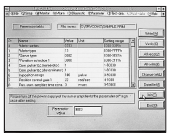
Personal computer interface

The J2 comes with RS232C serial communications as a standard feature, enabling users to connect a personal computer to the J2.

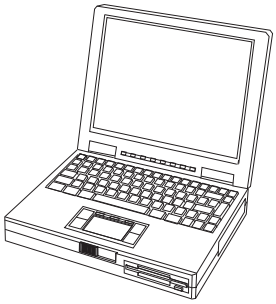
Using the setup software provided, users can display a variety of monitoring data, perform batch entry and saving of parameters, use graph functions, and perform test operation.



Graph display window

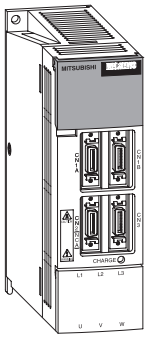


Parameter view window



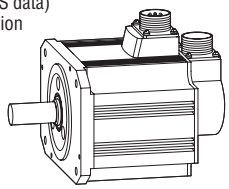
Automatic motor recognition feature

Incorporating motor identification information into the encoder means that the servo amplifier can automatically recognise the drive motor. When the servo amplifier detects a mismatch, an alarm is triggered, eliminating the possibility of an error and the need for setting parameters.

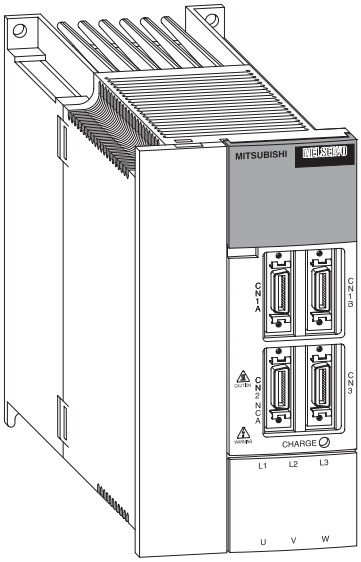


Serial communication

Feedback pulse
Motor capacity
Positioning data (ABS data)
Magnetic pole detection
Alarm information



Servo Amplifiers MELSERVO J2-A

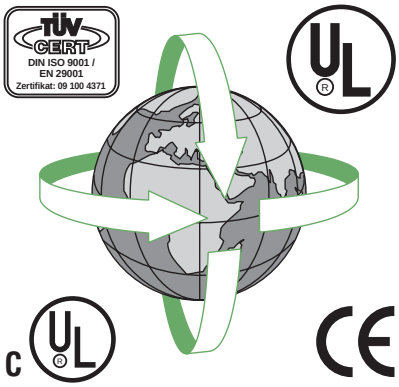


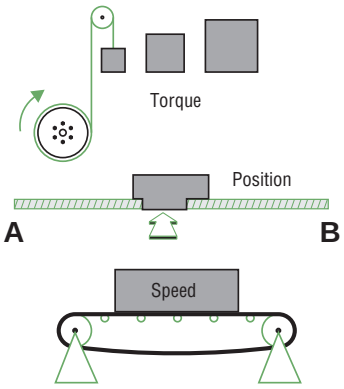
Features

MELSERVO amplifiers can be used for global applications for superb operation in the toughest environments.

- Satisfies global industrial standards
- Separate wiring of the control power supply
- Real-time auto-tuning and high responsiveness
- Torque control function
- Servo-lock anti-vibration function
- Personal computer interface
- Automatic motor recognition

Overview of Features





Compliant and safe

Satisfies global industrial standards

The J2 can be used with the confidence of knowing it satisfies global industrial standards, including EN and UL.

Enhanced ability to withstand environmental hazards

HC-SF and HC-RF series are rated IP65 as standard equipment.

Separate wiring for the control power supply

The control power supply of the servo amplifier is wired separately, facilitating to turn OFF the main circuit only, when an alarm is triggered. This also makes it easier to handle EN-standard mechanical directives.

Compact and flexible

More compact servo motors

Mitsubishi´s servo motors keep getting smaller:
The ultra-compact HC-MF series, the low-inertia HC-RF series, and the medium-inertia HC-SF series.

A wide variety of motors including models with brakes

A broad line-up of servo motors including models with brakes is available. Users can choose the motor series that best suits the machine being used.

Fully equipped

Absolute encoder is standard equipment

The J2 can be easily switched to absolute encoding, which requires no return to home, by merely adding a battery to the servo amplifier and without changing the servo motor.

Personal computer interface is standard equipment

The J2 comes with an RS232C serial communications connector as standard equipment, enabling users to connect a personal computer to the J2 to perform setup and to enter parameters. Special setup software is available.

Integrated dynamic brake

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

Integrated regenerative resistor

Regenerative resistor is integrated, eliminating the need for an external regeneration unit during normal operation.

Easy operation

Model adaptive control

Because the J2 operates in quick response to commands, it offers highly responsive and stable operation, unaffected by machine systems.

Servo-lock anti-microvibration function

Microvibrations in the servo-lock state are suppressed, providing the construction of stable systems.

Automatic servo motor recognition

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

Encoder serial communications

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

Real-time auto-tuning

The servo makes automatic gain adjustments even when the load´s inertia changes.

Switch between torque control mode and other control modes

Switching between torque, speed, and position control modes is supported for the first time.

Control signal assignment feature (A type)

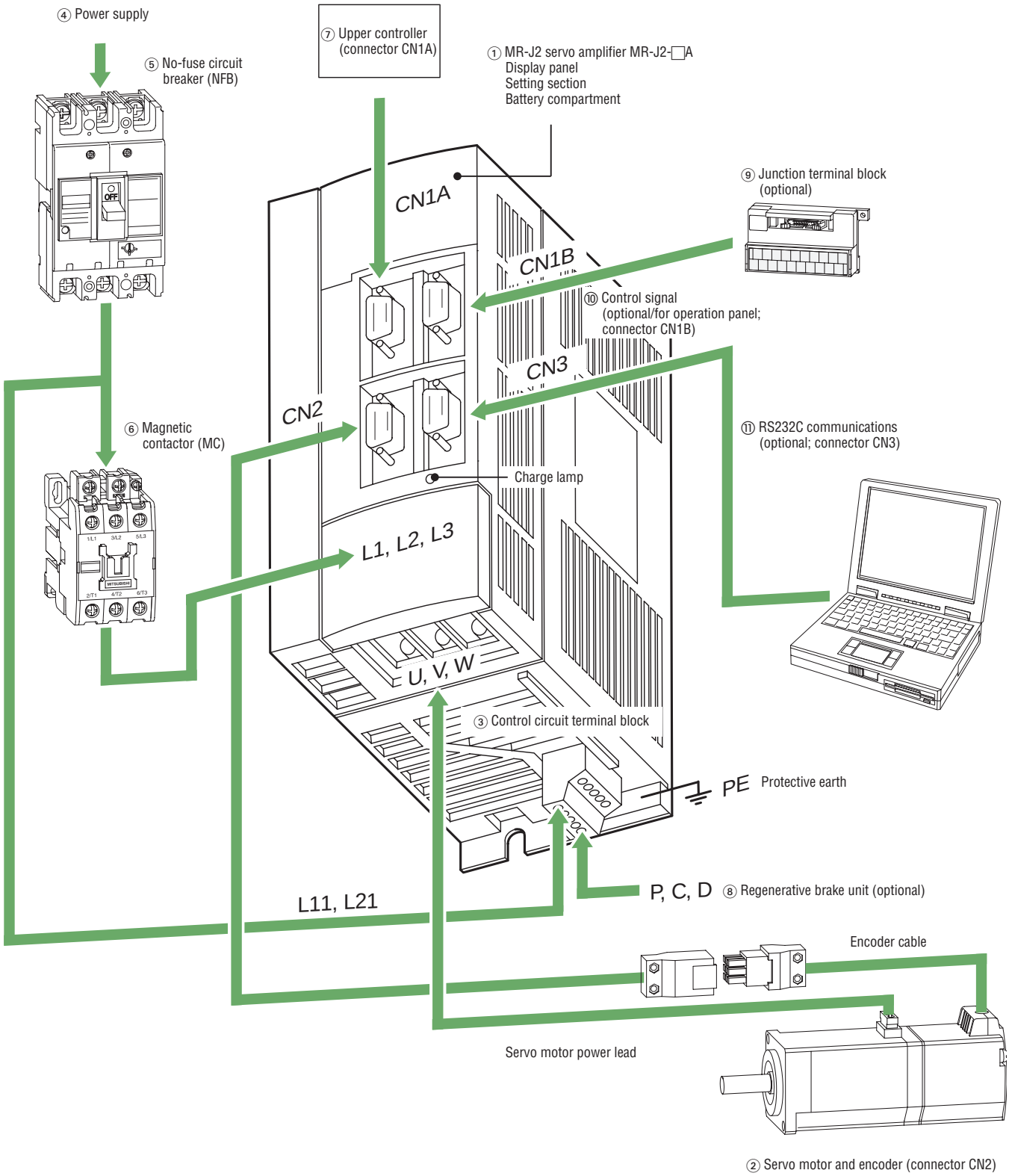
Control signals necessary for operation can be freely assigned to connector pins within a predetermined range, enabling more flexible operation.

Command pulse train types (A type)

The J2 handles three command types: Encoder signals, pulse and direction, and CW/ CCW pulse train.

Connections with Peripheral Equipment

Peripheral equipment is connected to the MR-J2-A as shown below. Connectors, options, and other necessary equipment are available to allow users to easily setup the J2-A and begin using it right away.



① MR-J2 servo amplifier MR-J2-□A

- **Display panel**
  Displays monitoring data, parameters, and alarms.
- **Setting section**
  Parameter settings are performed with push buttons, and monitoring data is displayed.
- **Charge lamp**
  Goes on when the main circuit power supply is on. Do not plug/ unplug power lines when this light is on.
- **Battery compartment (optional)**
  A battery (A6BAT) is installed in the holder if used as an absolute system. Not required if used as an incremental system.

② Servo motor and encoder (connector CN2)

③ Control circuit terminal block

Used to connect the control circuit power supply and the regenerative brake option.

④ Power supply

3~, 200–230 V AC
1~, 230 V AC for Servo Drives ≤ 750 W

⑤ No-fuse circuit breaker (NFB)

Used to protect the power supply line.

⑥ Magnetic contactor (MC)

Used to turn OFF the power of the servo amplifier when an alarm has been triggered.

⑦ Upper controller (connector CN1A)

The J2 can be connected to any pulse train output controller (e.g. FX2N-1PG, AD75□/ A1SD75P□).

⑧ Regeneration brake unit (optional)

Install this unit as necessary in situations involving frequent regeneration and large load completion moments.

⑨ Junction terminal block (optional)

All signals can be connected at this junction terminal block.

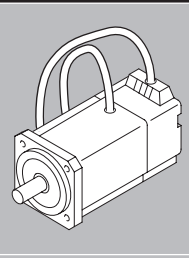
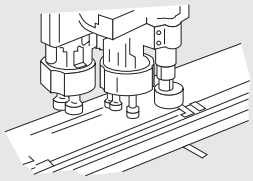
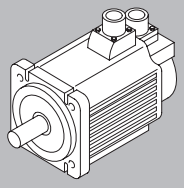
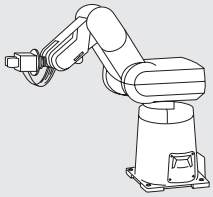
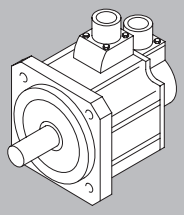
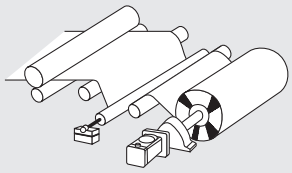
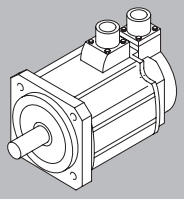
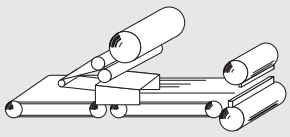
⑩ Control signal (optional/ for operation panel; connector CN1B)

Connects to the I/O port of the PLC or to the operation panel of the machine.

⑪ RS232C communications (optional; connector CN3)

Connects the unit to a personal computer, enabling the user to perform monitoring, batch parameter entry and saving, graph display, and test operation. Dedicated cables and setup software are also available.

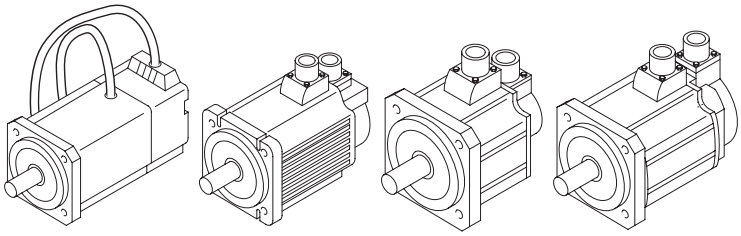
Applications and Motor Models

Model designation	Features	Application example	
M 	● Ultra-low inertia, low capacity Ultra-low inertia design makes this unit well suited for high-frequency positioning applications. High resolution positioning feedback pulse (8192P/rev). ● Enhanced power rate	● Inserters, mounters, bonders ● Printed board hole openers ● In-circuit testers ● Label printers ● Knitting and embroidery machinery ● Ultra-small robots and robot tips	 Inserters, mounters, bonders
F 	● Low inertia, low capacity High resolution positioning feedback pulse (8192P/rev). Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications.	● LCD and conveyors ● Food preparation machinery ● Printers ● Small loaders and unloaders ● Small robots and component assembly devices ● Small X-Y tables ● Small press feeders	 Small robots
S 	● Medium inertia, medium capacity High resolution positioning feedback pulse (16384P/rev). Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications. ● Enhanced power rate ● IP65 Designed to withstand environmental hazards.	● Conveyor machinery ● Specialised machinery ● Robots ● Loaders and unloaders ● Winders and tension devices ● Turrets ● X-Y tables ● Test devices	 Winders and tension devices
R 	● Low inertia, medium capacity Low inertia design makes this unit well suited to high-frequency positioning applications. High resolution positioning feedback pulse (16384P/rev). ● High power rate ● IP65 Designed to withstand environmental hazards.	● Roll feeders ● Loaders and unloaders ● High-frequency conveyor machinery	 Wrapping machinery

Servo Motor Features and Amplifier Models

Motor series	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type: With electromagnetic brake (B) and absolute encoder	Protective structure	Amplifier pairing MR-J2: 10A	20A	40A	60A	70A	100A	200A	350A
HC-MF M	3000	0.05	HC-MF053	●	IP44	●							
		0.1	HC-MF13			●							
		0.2	HC-MF23				●						
		0.4	HC-MF43					●					
		0.75	HC-MF73							●			
HA-FF F	3000	0.05	HA-FF053	●	IP54	●							
		0.1	HA-FF13			●							
		0.2	HA-FF23				●						
		0.3	HA-FF33					●					
		0.4	HA-FF43					●					
		0.6	HA-FF63						●				
HC-SF S	2000	0.5	HA-SF52	●	IP65				●				
		1.0	HA-SF102								●		
		1.5	HA-SF152									●	
		2.0	HA-SF202									●	
		3.5	HA-SF352										●
HC-RF R	3000	1.0	HC-RF103	●	IP65							●	
		1.5	HC-RF153									●	
		2.0	HC-RF203										●

Model Designation of Servo Motors



Series HC-MF | Series HA-FF | Series HC-SF | Series HC-RF

HC - MF □ □ □ □ C-UE

Compliance with EN- and UL- (UL/cUL*) standard

Series
HC-MF
HA-FF
HC-SF
HC-RF

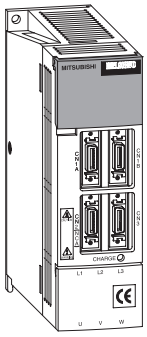
Code	Rated output [W]	Code	Rated output [W]
05	50	6	600
1	100	7	750
2	200	10	1000
3	300	15	1500
4	400	20	2000

Code	Rated speed [rpm]
2	2000
3	3000

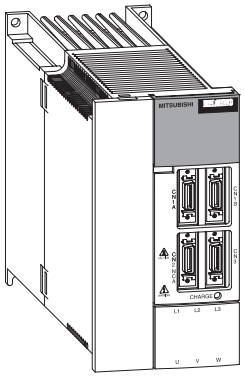
Code	Electromagnetic brake
—	—
B	●

* The motor series HC-SF/HC-RF comply generally to the EN and UL/cUL standards.

Model Designation of Servo Amplifiers



MR-J2-100A or less



MR-J2-200A / 350A

MR - J2 - □ A

Series
MR-J2

Code	Compatible Servo Motors			
	HC-MF □	HA-FF □	HC-SF □	HC-RF □
10	053 / 13	053 / 13	—	—
20	23	23	—	—
40	43	33 / 43	—	—
60	—	63	52	—
70	73	—	—	—
100	—	—	102	—
200	—	—	152 / 202	103 / 153
350	—	—	352	203

Code	Type
A	Standard General-purpose AC servo

HC-MF UE Series Servo Motor Specifications (Low Capacity, Ultra-low Inertia)

Servo motor model		HC-MF053 UE	HC-MF13 UE	HC-MF23 UE	HC-MF43 UE	HC-MF73 UE
Servo amplifier model		MR-J2-10A	MR-J2-10A	MR-J2-20A	MR-J2-40A	MR-J2-70A
Power facility capacity [kVA] ①		0.3	0.3	0.5	0.9	1.3
Continuous characteristics	Rated output [W]	50	100	200	400	750
	Rated torque [Nm]	0.16	0.32	0.64	1.3	2.4
Maximum torque [Nm]		0.48	0.95	1.9	3.8	7.2
Rated rotation speed [rpm]		3000	3000	3000	3000	3000
Maximum rotation speed [rpm]		4500	4500	4500	4500	4500
Permissible instantaneous rotation speed		5175	5175	5175	5175	5175
Power rate [kW/s]		13.47	34.13	46.02	116.55	94.43
Rated current [A]		0.85	0.85	1.5	2.8	5.1
Maximum current [A]		2.6	2.6	5.0	9.0	18.0
Regeneration braking frequency [1/min] ②	With no options	● ③	● ③	● ③	1010	400
	MR-RB032 (30 W)	—	—	—	3000	—
	MR-RB12 (100 W)	—	—	—	● ③	2400
Moment of inertia (units with B) J [10^{-4} kg m^2]		0.019 (0.022)	0.03 (0.032)	0.088 (0.136)	0.143 (0.191)	0.6 (0.725)
Recommended load/ motor inertia ratio		30 times the maximum moment of inertia of the servo motor				
Speed/ position detector		Encoder, resolution per servo motor revolution: 8192 P/rev				
Attachments		Encoder				
Structure		Totally enclosed, non-ventilated (protection degree: IP44) ④				
Environment	Ambient temperature	Operation: 0 – 40 °C (no freezing). Storage: -15 – 70 °C (no freezing).				
	Ambient humidity	Operation: 80 % RH max. (no condensation). Storage: 90 % RH max. (no condensation).				
	Atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust				
	Elevation/ vibration	1000 m or less above sea level; axial: 19.6 m/s^2 (2 G), radial: 19.6 m/s^2 (2 G)				
Weight [kg] ⑤		0.5	0.6	1.2	1.7	3.1
Order information	Art. no. ⑤	70414	70415	70416	70417	70418

① The power facility capacity varies depending on the impedance of the power supply.

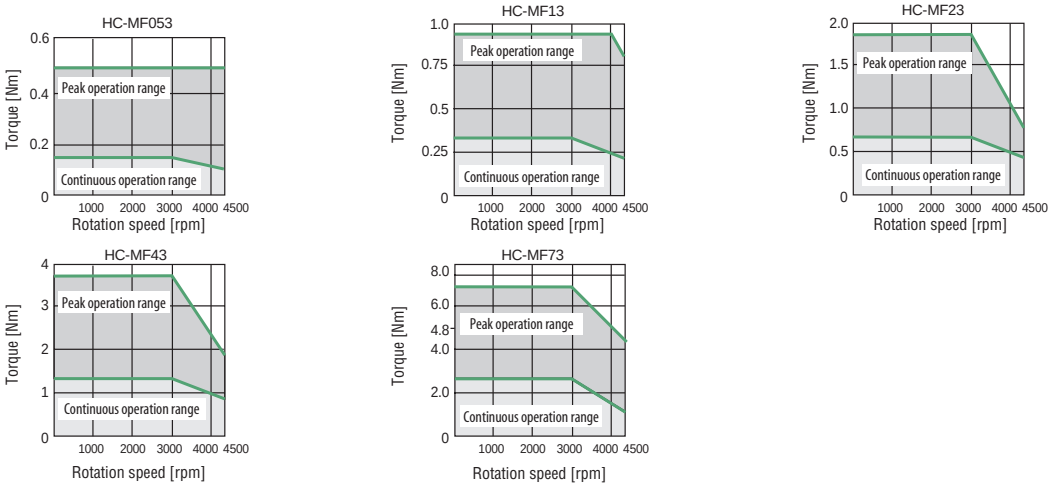
② The figures for the regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, the regeneration braking frequency is 1/(m+1) of the figure in the table (m = moment of inertia of load/moment of inertia of motor). When the rated rotation speed is exceeded, braking frequency is in inverse proportion to the square of operating speed divided by rated speed. When the operating rotation speed is frequently changing, or when a continuous regeneration condition exists, such as during vertical feed, assess the regeneration heat (W) generated during operation and make sure that it does not exceed the permissible range.

③ There are no limits on regeneration frequency as long as the effective torque is within the rated torque range. However, the load/motor inertia ratio must be 30 or less.

④ Excluding the shaft-through section and connectors.

⑤ Refer to page 17 for the article number and the weight of motors with electromagnetic brake.

HC-MF Series Servo Motor Torque Characteristics



HA-FF C-UE Series Servo Motor Specifications (Low Capacity, Low Inertia)

Servo motor model		HA-FF053 C-UE	HA-FF13 C-UE	HA-FF23 C-UE	HA-FF33 C-UE	HA-FF43 C-UE	HA-FF63 C-UE
Servo amplifier model		MR-J2-10A	MR-J2-10A	MR-J2-20A	MR-J2-40A	MR-J2-40A	MR-J2-60A
Power facility capacity [kVA] ①		0.3	0.3	0.5	0.9	0.9	1.1
Continuous characteristics	Rated output [W]	50	100	200	300	400	600
	Rated torque [Nm]	0.16	0.32	0.64	0.95	1.3	1.9
Maximum torque [Nm]		0.48	0.95	1.9	2.9	3.8	5.7
Rated rotation speed [rpm]		3000	3000	3000	3000	3000	3000
Maximum rotation speed [rpm]		4000	4000	4000	4000	4000	4000
Permissible instantaneous rotation speed		4600	4600	4600	4600	4600	4600
Power rate [kW/s]		4.0	10.2	11.7	18.1	17.2	30.1
Rated current [A]		0.6	1.1	1.3	1.9	2.5	3.6
Maximum current [A]		1.8	3.3	3.9	5.7	7.5	10.8
Regeneration braking frequency [1/min] ②	With no options	● ③	● ③	● ③	320	150	120
	MR-RB032 (30 W)	—	—	—	950	450	360
	MR-RB12 (100 W)	—	—	—	1800	1250	1200
Moment of inertia (units with B) J [10^{-4} kg m^2]		0.063 (0.08)	0.1 (0.113)	0.35 (0.483)	0.50 (0.633)	0.98 (1.325)	1.20 (1.55)
Recommended load/ motor inertia ratio		10 times the maximum moment of inertia of the servo motor					
Speed/ position detector		Encoder, resolution per servo motor revolution: 8192 P/rev					
Attachments		Encoder, V-ring					
Structure		Totally enclosed, non-ventilated (protection degree: IP54)					
Environment	Ambient temperature	Operation: 0 – 40 °C (no freezing). Storage: -15 – 70 °C (no freezing).					
	Ambient humidity	Operation: 80 % RH max. (no condensation). Storage: 90 % RH max. (no condensation).					
	Atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust					
	Elevation/ vibration	1000 m or less above sea level; axial: 19.6 m/s^2 (2 G), radial: 19.6 m/s^2 (2 G)					
Weight [kg] ④		1.8	2	2.6	2.9	4.7	5.3
Order information	Art. no. ④	70425	70426	70427	70428	70429	70430

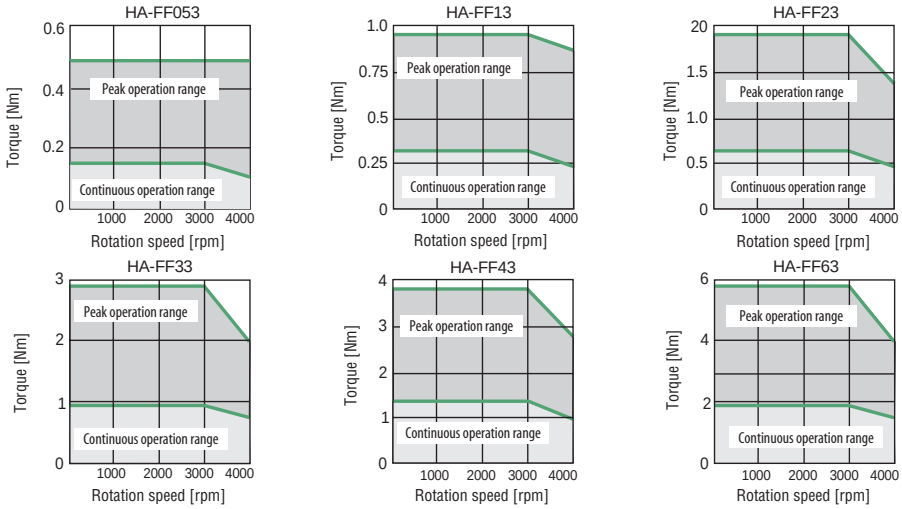
① The power facility capacity varies depending on the impedance of the power supply.

② The figures for the regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, the regeneration braking frequency is 1/(m+1) of the figure in the table (m = moment of inertia of load/moment of inertia of motor). When the rated rotation speed is exceeded, braking frequency is in inverse proportion to the square of operating speed divided by rated speed. When the operating rotation speed is frequently changing, or when a continuous regeneration condition exists, such as during vertical feed, assess the regeneration heat (W) generated during operation and make sure that it does not exceed the permissible range.

③ There are no limits on regeneration frequency as long as the effective torque is within the rated torque range. However, the load/motor inertia ratio must be 10 or less.

④ Refer to page 17 for the article number and the weight of motors with electromagnetic brake.

HA-FF Series Servo Motor Torque Characteristics



HC-SF Series Servo Motor Specifications (Medium Capacity, Medium Inertia)

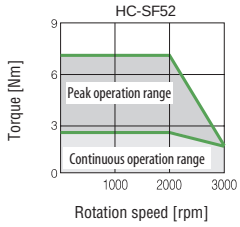
Servo motor model		HC-SF52	HC-SF102	HC-SF152	HC-SF202	HC-SF352
Servo amplifier model		MR-J2-60A	MR-J2-100A	MR-J2-200A	MR-J2-200A	MR-J2-350A
Power facility capacity [kVA] ①		1.0	1.7	2.5	3.5	5.5
Continuous characteristics	Rated output [kW]	0.5	1.0	1.5	2.0	3.5
	Rated torque [Nm]	2.39	4.78	7.16	9.55	16.7
Maximum torque [Nm]		7.16	14.4	21.6	28.5	50.1
Rated rotation speed [rpm]		2000	2000	2000	2000	2000
Maximum rotation speed [rpm]		3000	3000	3000	2500	2500
Permissible instantaneous rotation speed		3450	3450	3450	2850	2850
Power rate [kW/s]		8.7	16.7	25.6	21.5	34.1
Rated current [A]		3.2	6	9	11	17
Maximum current [A]		9.6	18	27	33	51
Regeneration braking frequency [1/min] ②	With no options	56	54	185	53	31
	MR-RB12 (100 W)	560	270	—	—	—
	MR-RB32 (300 W)	1680	810	—	—	—
	MR-RB30 (300 W)	—	—	560	160	95
	MR-RB50 (500 W)	—	—	925	266	158
Moment of inertia (units with B) J [10^{-4} kg m^2]		6.6 (8.3)	13.7 (15.4)	20 (21.7)	42.5 (52.5)	82 (92)
Recommended load/ motor inertia ratio		15 times the maximum moment of inertia of the servo motor				
Speed/ position detector		Encoder, resolution per servo motor revolution: 16384 P/rev				
Attachments		Encoder, oil seal				
Structure		Totally enclosed, non-ventilated (protection degree: IP65)				
Environment	Ambient temperature	Operation: 0 – 40 °C (no freezing). Storage: -15 – 70 °C (no freezing).				
	Ambient humidity	Operation: 80 % RH max. (no condensation). Storage: 90 % RH max. (no condensation).				
	Atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust				
	Elevation/ vibration	1000 m or less above sea level; axial: 9.8 m/s^2 (1 G), radial: 24.5 m/s^2 (2.5 G)			1000 m or less above sea level; axial: 19.6 m/s^2 (2 G), radial: 49 m/s^2 (5 G)	
Weight [kg] ③		5	7	9	12	19
Order information	Art. no. ③	61369	61370	65831	65828	65830

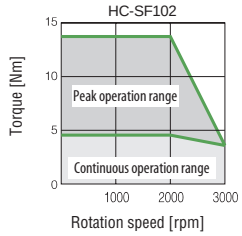
① The power facility capacity varies depending on the impedance of the power supply.

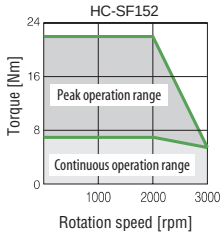
② The figures for the regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, the regeneration braking frequency is 1/(m+1) of the figure in the table (m = moment of inertia of load/moment of inertia of motor). When the rated rotation speed is exceeded, braking frequency is in inverse proportion to the square of operating speed divided by rated speed. When the operating rotation speed is frequently changing, or when a continuous regeneration condition exists, such as during vertical feed, assess the regeneration heat (W) generated during operation and make sure that it does not exceed the permissible range.

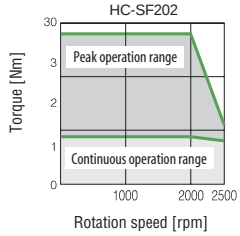
③ Refer to page 17 for the article number and the weight of motors with electromagnetic brake.

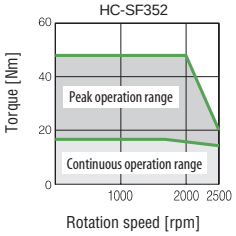
HC-SF Series Servo Motor Torque Characteristics











HC-RF Series Servo Motor Specifications (Low Inertia)

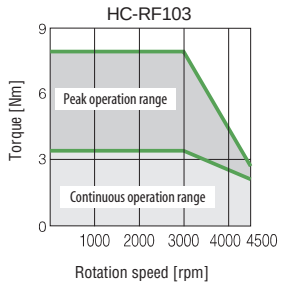
Servo motor model ③		HC-RF103	HC-RF153	HC-RF203
Servo amplifier model		MR-J2-200A/B	MR-J2-200A/B	MR-J2-350A/B
Power facility capacity [kVA] ①		1.7	2.5	3.5
Continuous characteristics	Rated output [W]	1	1.5	2
	Rated torque [Nm]	3.18	4.78	6.37
Maximum torque [Nm]		7.95	11.9	15.9
Rated rotation speed [rpm]		3000	3000	3000
Maximum rotation speed [rpm]		4500	4500	4500
Permissible instantaneous rotation speed		5175	5175	5175
Power rate [kW/s]		67.4	120	176
Rated current [A]		6.1	8.8	14
Maximum current [A]		18.4	23.4	37
Regeneration braking frequency [1/min]	With no options	1090	860	710
	MR-RB30 (300 W)	3270	2580	2130
Moment of inertia (units with B) J [10^{-4} kg m^2]		1.5 (1.85)	1.9 (2.25)	2.3 (2.65)
Recommended load/ motor inertia ratio		5 times the maximum moment of inertia of the servo motor		
Speed/ position detector		Encoder, resolution per servo motor revolution: 16384 P/rev		
Attachments		Encoder, oil seal		
Structure		Totally enclosed, non-ventilated (protection degree: IP65)		
Environment	Ambient temperature	Operation: 0 – 40 °C (no freezing). Storage: -15 – 70 °C (no freezing).		
	Ambient humidity	Operation: 80 % RH max. (no condensation). Storage: 90 % RH max. (no condensation).		
	Atmosphere	Indoors (no direct sunlight); no corrosive gas, no inflammable gas, no oil mist, no dust		
	Elevation/ vibration	1000 m or less above sea level; axial: 9.8 m/s^2 (1G), radial: 24.5 m/s^2 (2.5 G)		
Weight [kg] ③		3.9	5.0	6.2
Order information	Art. no.	68915	68953	68955

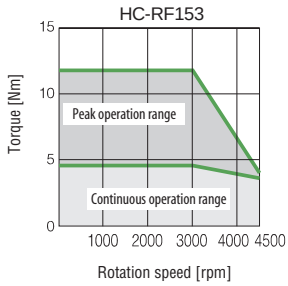
① The power facility capacity varies depending on the impedance of the power supply.

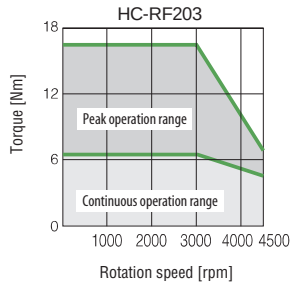
② The figures for the regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, the regeneration braking frequency is 1/(m+1) of the figure in the table (m = moment of inertia of load/moment of inertia of motor). When the rated rotation speed is exceeded, braking frequency is in inverse proportion to the square of operating speed divided by rated speed. When the operating rotation speed is frequently changing, or when a continuous regeneration condition exists, such as during vertical feed, assess the regeneration heat (W) generated during operation and make sure that it does not exceed the permissible range.

③ Refer to page 17 for motors with electromagnetic brake.

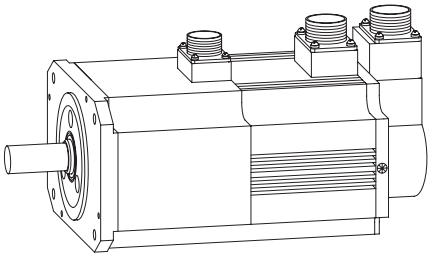
HC-RF Series Servo Motor Torque Characteristics







Electromagnetic Brake Specifications



For applications requiring the motor shaft to be hold in a specific position (e.g. vertical lift applications), all offered motors are available with an electromagnetic brake.

The wide variety of servo motors allows the user to choose a motor that suits best the according task.

Motor model		HC-MF . . . B-UE					HA-FF . . . CB-UE						HC-SF . . . B					HC-RF . . . B		
		053	13	23	43	73	053	13	23	33	43	63	52	102	152	202	352	103	153	203
Type		Spring-action safety brake					Spring-action safety brake						Spring-action safety brake					Spring-action safety brake		
Rated voltage		24 V DC					24 V DC						24 V DC					24 V DC		
Static friction torque [Nm]		0.32	0.32	1.3	1.3	2.4	0.39	0.39	1.18	1.18	2.3	2.3	8.3	8.3	8.3	43.1	43.1	6.8	6.8	6.8
Rated current at 20 °C [A]		0.26	0.26	0.33	0.33	0.42	0.22	0.22	0.31	0.31	0.46	0.46	0.8	0.8	0.8	1.4	1.4	0.8	0.8	0.8
Coil resistance at 20 °C [Ω]		91	91	73	73	57	111	111	78	78	52	52	29	29	29	16.8	16.8	30	30	30
Power consumption at 20 °C [W]		6.3	6.3	7.9	7.9	10	7	7	7.4	7.4	11	11	19	19	19	34	34	19	19	19
Mass [kg] ①		0.75	0.89	1.6	2.1	4.0	1.6	1.8	2.9	3.2	5.0	5.6	7	9	11	18	25	6	7	8.3
Moment of inertia J [10^{-4} kg m^2] ②		0.022	0.032	0.136	0.191	0.725	0.08	0.113	0.483	0.633	1.325	1.55	8.3	15.4	21.7	52.5	92	1.85	2.25	2.65
Permissible braking volume	per revolution [Nm]	5.6	5.6	22	22	64	3.9	3.9	18	18	46	46	400	400	400	4500	4500	400	400	400
	per hour [Nm]	56	56	220	220	640	39	39	180	180	460	460	4000	4000	4000	45000	45000	4000	4000	4000
Brake life [h] ③		20000					30000						20000					20000		
(Brake volume per brake action [Nm])		4	4	15	15	32	4	4	18	18	47	47	200	200	200	1000	1000	200	200	200
Order information	Art. no.	70419	70420	70422	70423	70424	70431	70432	70433	70434	70435	70436	69825	68947	68946	68948	67768	on request		

① Total mass of motor with electromagnetic brake.

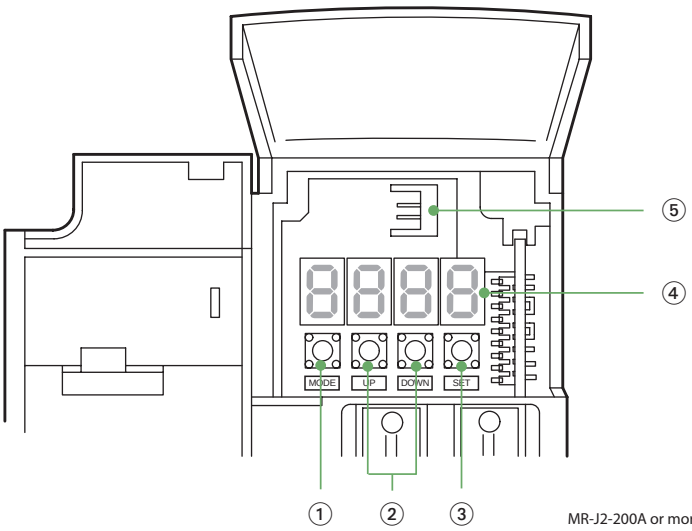
② Total moment of inertia of motor with electromagnetic brake.

③ Brake gap cannot be adjusted. Brake life is defined as the interval of time until braking requires readjustment.

Operating Elements

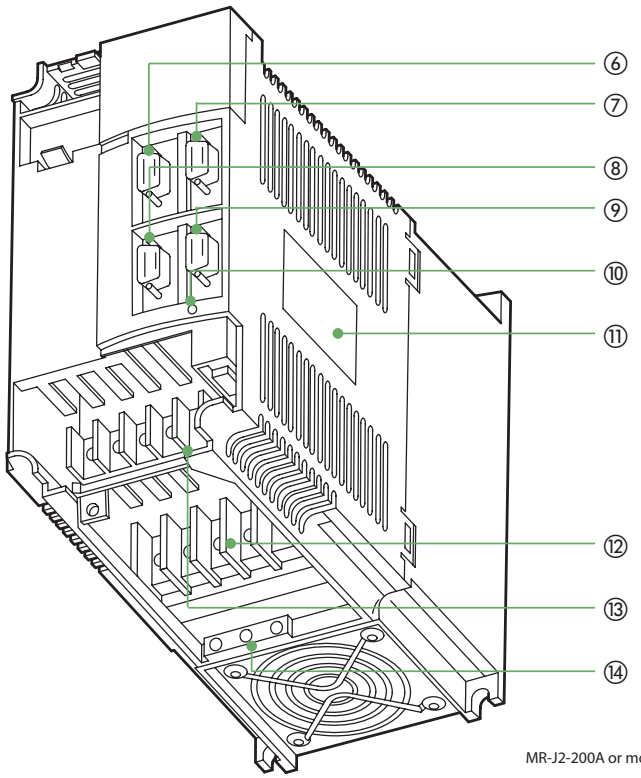
Easier to operate than ever before

The display and setting sections are easy to operate. And with the advanced features it encorporates, the J2 is easy to start up.



MR-J2-200A or more

① Mode:
Used to switch between display modes
② Up/ Down:
Used to change display content and re-enter parameter data
③ Set:
Used to set parameters for auto-tuning and for switching to the test screen
④ Display:
4-digit, 7-segment display panel. Displays operating status, parameters, etc.
⑤ Battery holder/ connector:
Using to connect the battery for absolute position data backup.

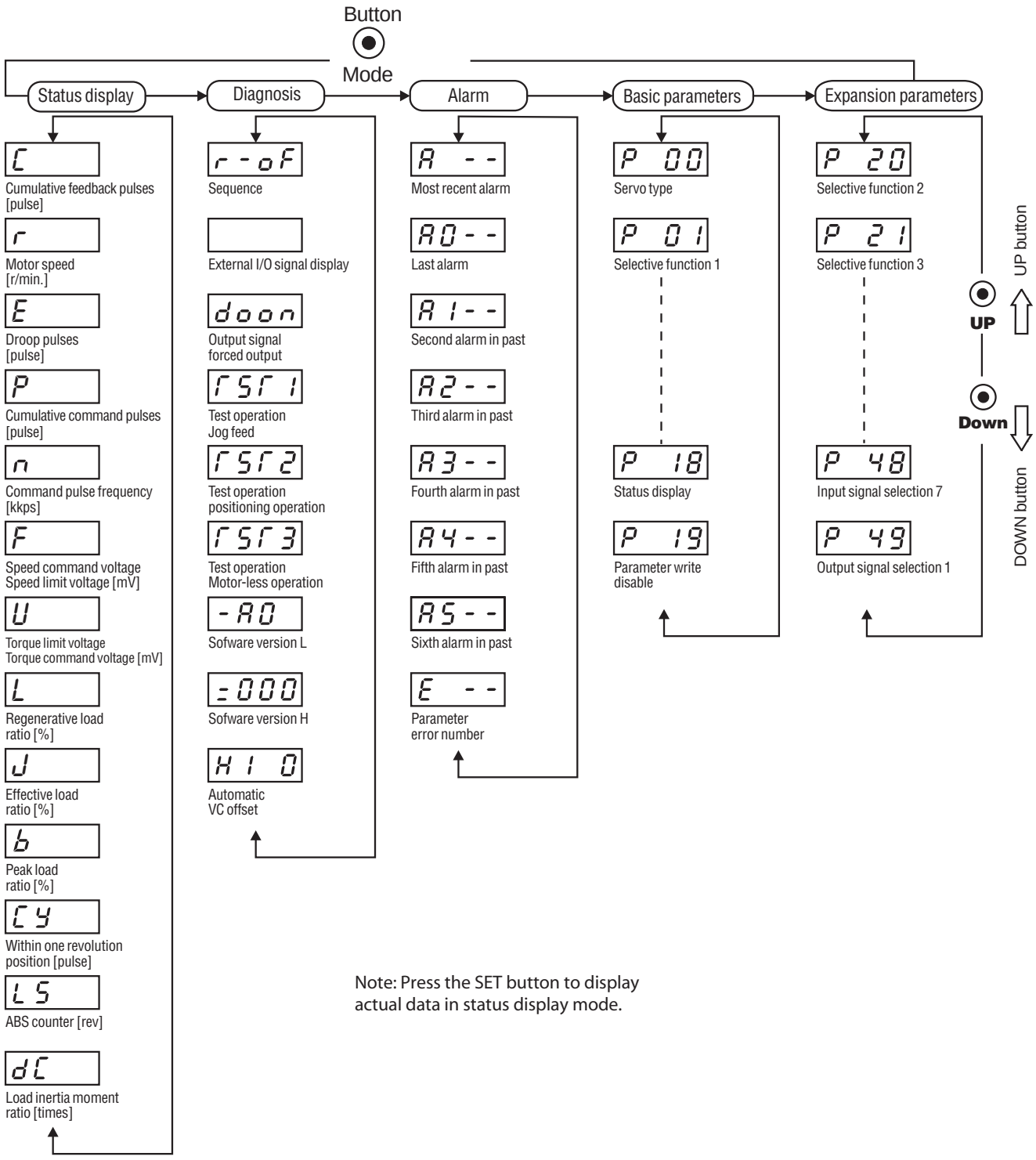


MR-J2-200A or more

⑥ I/O signal connector (CN1A):
Used to connect digital I/O signals
⑦ I/O signal connector (CN1B):
Used to connect digital I/O signals
⑧ Encoder connector (CN2):
Used to connect the servo motor/ encoder
⑨ Communication connector (CN3):
Used to connect a personal computer or as analog monitor output
⑩ Charge lamp:
Lit to indicate that the main circuit is charged. While this lamp is lit, do not reconnect the cables.
⑪ Name plate
⑫ Main circuit terminal block (TE1):
Used to connect the input power supply and servo motor
⑬ Control circuit terminal block (TE2):
Used to connect the control circuit power supply and regenerative brake option.
⑭ Protective earth terminal (PE):
Ground terminal

Operation / Menu Guide to the Display

Pressing the MODE button causes the display mode to change one step at a time in the sequence illustrated below.



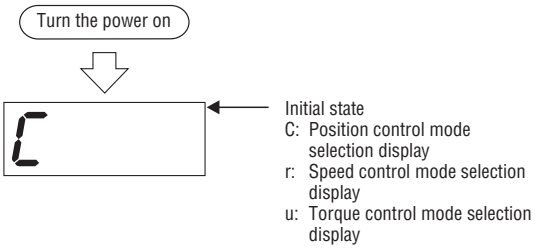
Note: Press the SET button to display actual data in status display mode.

A complete Lineup of Features to make Setup easy

User-friendly, from the way you turn ON the power to how connection checks and parameter settings are performed.

Turning the power ON and displaying the present status

Approximately five seconds after you turn ON the power, the status display mode screen appears. You can display the desired operating parameter by pressing the UP or DOWN button.

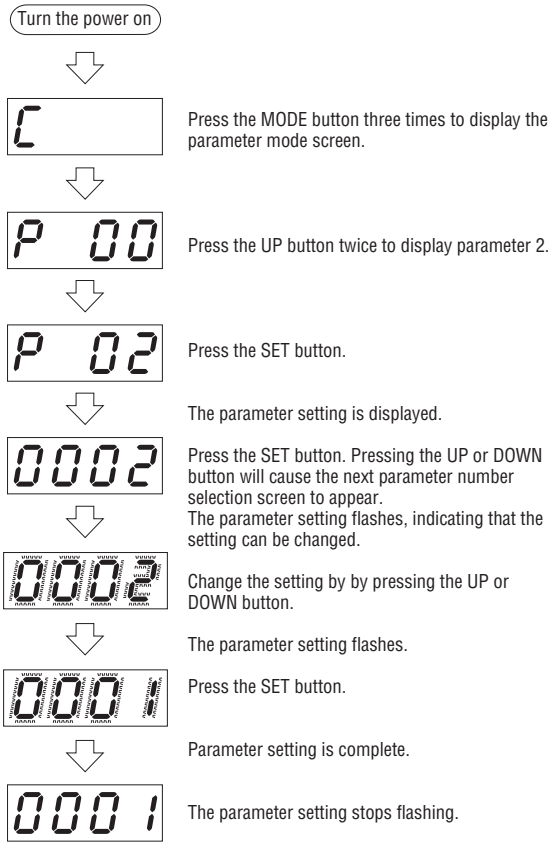


Setting parameters

Basic parameters are set as illustrated below:

- 4-digit parameter settings

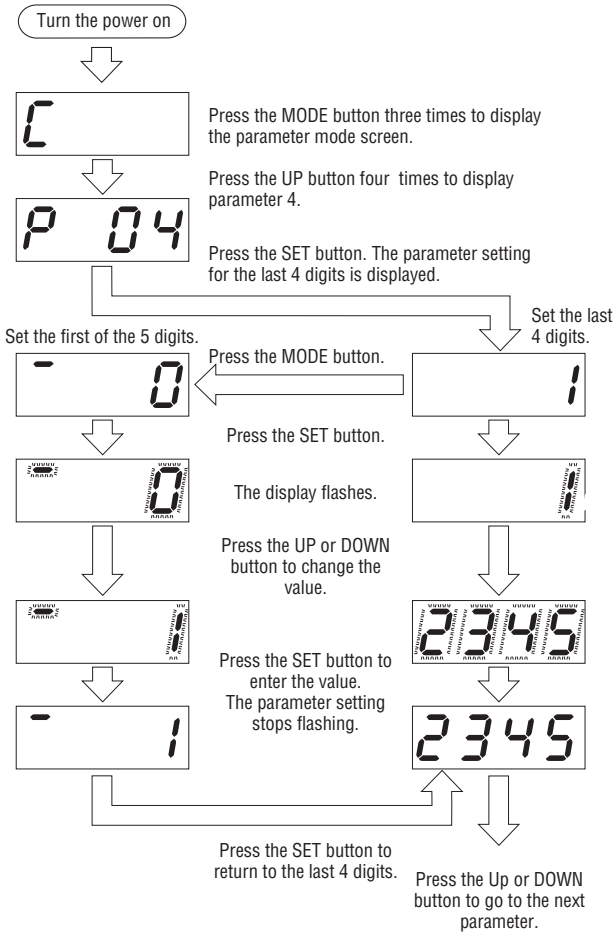
Example: The auto-tuning setting



Note: The mode cannot be changed by pressing the MODE button at this point.To change modes, press the UP or DOWN button, and after reaching the parameter display screen, press the MODE button.

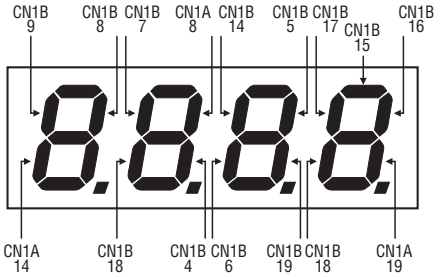
- 5-digit parameter settings

Example: Changing the electronic gear denominator (parameter No 4) into "1234"



External signal display

The status of the external input/output signals is displayed in segments. The upper portion of each segment´s vertical line indicates the input signal, while the lower portion indicates the output signal.



Test Operation Mode

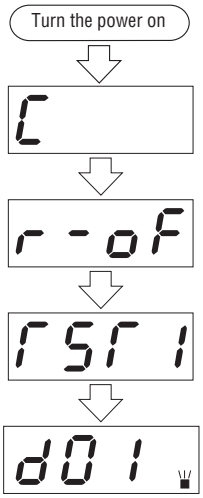
The operation of the servo amplifier and servo motor can be checked before wiring the signal wires.

● **Test operation mode 1:** Operation without commands

The motor can be operated even without speed/position commands, start signals, or other external signals. This enables users to test the servo alone, prior to the fabrication of a control panel, and to confirm the operation of the machine.

1. JOG operation

The motor will run as long as the UP or DOWN button is being pressed.



Press the MODE button once to display the diagnostic mode screen.

Press the UP button three times to display the test operation (JOG) screen.

Press the SET button for 2 seconds.

On the test operation screen, the buttons have the following functions.

MODE: Used to change the test operation status display screen.
UP: While this button is being pressed, the motor rotates 200 rpm in the forward (CCW) direction.
DOWN: While this button is being pressed, the motor rotates 200 rpm in the reverse (CW) direction.

Press the SET button for more than 2 seconds to exit the the test operation mode.

2. Positioning operation

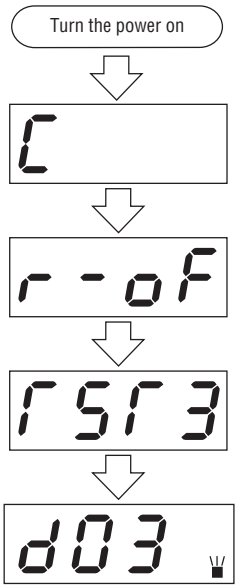
The motor moves just the number of pulses set and is positioned. This is an easy way to check the amount of machine movement. Positioning operation can only be performed with the setup software.

The servo-amp screen when the unit has been set to positioning operation mode with setup software.

The servo-amp screen when the unit has been taken out of positioning operation mode with setup software.

● **Test operation mode 2:** Operation without a motor

The servo amplifiers can be checked without connecting them to a motor. This is convenient when you want to confirm a command or peripheral sequence before operating the actual machine. You can monitor the simulated rotation speed and command status of the motor on the display screen of the amplifier as you would during normal operation.



Press the MODE button once to display the diagnostic mode screen.

Press the UP button five times to display the test operation (no motor) screen.

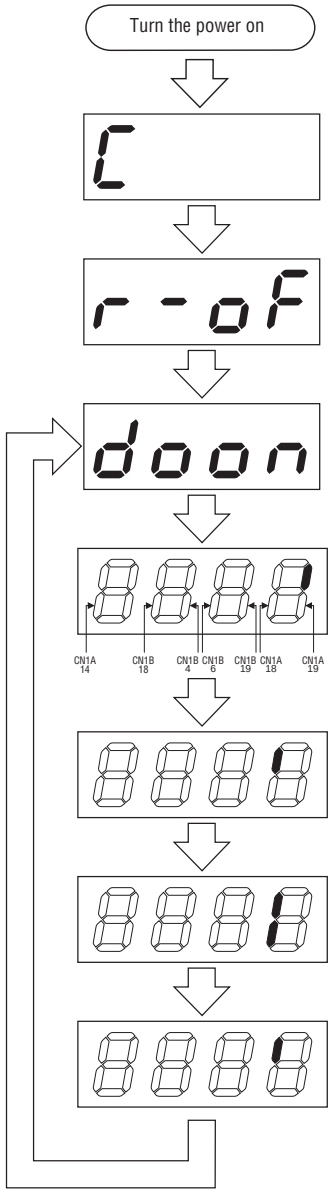
After turning the servo off, press the SET button for 2 seconds.

On the test operation screen, the buttons have the following functions.

MODE: Used to change the test operation status display screen.
UP/DOWN: Invalid.
To exit test operation mode, turn the power off and on again.

Output Signal forced Output

Forcing output signals ON or OFF, such as alarm and ready signals, makes it easy to perform external wiring and sequence checks.



Press the MODE button once to display the diagnostic mode screen.

Press the UP button twice to display the DO forced output screen (DO = digital output).

Press the SET button for 2 seconds.

Switch on/off the signal below the lit segment.

Indicates the ON/OFF status of the output signal. The correspondence between segments and signals are as in the output signals of the external I/O signal display. (Lit: ON, extinguished: OFF.)

Press the MODE button.

The segment above the CN1A-pin is lit

Press the UP button twice.

The CN1A-pin 18 is switched on.

Press the DOWN button once.

The CN1A-pin 18 is switched off.

Press the SET button for more than 2 seconds to exit the forced output mode.

Basic Parameters

The basic parameters are listed below. For parameters marked with an asterisk *, turn the power OFF after setting and turn the power back ON to complete the setting.

Parameter	Meaning	Symbol	Description	Default setting	Setting range
0 *	Control mode/ regeneration selection	STY	Used to select the control mode and regeneration option	0000	0000 – 0805h
1 *	Function selection 1	OP1	Used to select servo-type options	0000	0000 – 3112h
2	Auto-tuning	ATU	Used to select the auto-tuning function	0102	0001 – 0215h
3	Electronic gear (command pulse magnification numerator)	CMX	Used to set the multiplier for the command pulse input	1	1 – 32767
4	Electronic gear (command pulse magnification denominator)	CDV	Used to set the divisor for the command pulse input	1	1 – 32767
5	In-position range	INP	Used to set the range for the standing pulse, which sends in-position output	100 [pulse]	0 – 10000
6	Position control gain 1	PG1	Used to set the model position loop gain	36 [rad/s]	4 – 1000
7	Position acceleration / deceleration time constant (smoothing)	PST	Used to set the time constant when using a delayed filter for the position command	3 [ms]	0 – 20000
8	Internal speed command 1	SC1	Used to set the first speed of the internal speed command	100 [rpm]	0 – permissible speed
9	Internal speed command 2	SC2	Used to set the second speed of the internal speed command	500 [rpm]	0 – permissible speed
10	Internal speed command 3	SC3	Used to set the third speed of the internal speed command	1000 [rpm]	0 – permissible speed
11	Speed acceleration time constant	STA	Used to set the acceleration time from stop until the attainment of rated rotation speed for the speed command	0 [ms]	0 – 20000
12	Speed deceleration time constant	STB	Used to set the deceleration time from rotation speed until stop for the speed command	0 [ms]	0 – 20000
13	S-time constant	STC	Used to set the time for the circular portion of S acceleration / deceleration	0 [ms]	0 – 1000
14	Torque command time constant	TQC	Used to set the time constant when using a delayed filter for the torque command	0 [ms]	0 – 20000
15	Spare			0	
16 *	Communications baud rate selection / alarm history clear	BPS	Used to set the RS232C baud rate and to clear the alarm history	0000	0000 – 0011h
17	Analog monitor output	MOD	Used to make the settings related to analog monitor output	0100	0000 – 0A0Ah
18 *	Status display selection	DMD	Used to make the settings related to status display	0000	0000 – 001Ch
19 *	Parameter entry prohibition	BLK	Used to select the parameter reference range and entry range	0000	0000 – 000Ch

Protective Functions/ Safety Features/ Alarms and Warnings

The J2 servo amplifier possesses the safety features described below. In order to protect the unit when a safety circuit is activated, the output is suspended by cutting OFF the power to the transistor base. When this happens, the dynamic brake is activated and stops the motor. An alarm number is displayed on the servo amplifier or personal computer. After eliminating the cause, close the reset terminal (RES) or turn OFF the control power and reset.

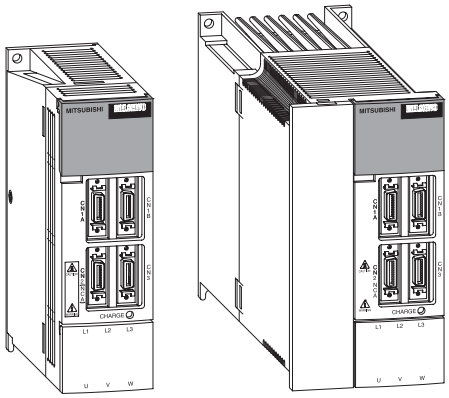
	LED display	Meaning	Description
Alarms	A.10	Insufficient voltage	Is activated, if the voltage of the power supply falls below a certain level or if a sudden power outage of more than 15 ms occurs.
	A.11	Board error 1	Is activated, if an error is detected in the printed board.
	A.12	Memory error 1	Is activated, if an error is detected in the memory of the printed board.
	A.13	Clock error	Is activated, if an error is detected in the printed board.
	A.15	Memory error 2	Is activated, if an error is detected in the memory of the printed board.
	A.16	Encoder error 1	Is activated, if a different type of encoder is detected and communication with the encorder cannot be performed accurately.
	A.17	Board error 2	Is activated, if an error is detected in a board component of the servo amplifier.
	A.18	Board error 3	Is activated, if an error is detetcted in the printed board.
	A.20	Encoder error 2	Is activated, if an error is detected in the encoder or encoder cable.
	A.25	ABS data loss	Is activated, if the voltage of the battery falls and absolute data is lost.
	A.30	Regeneration error	Is activated, if an error is detected in the regeneration circuit or when there is an excess load on the regeneration brake resistor due to excess regeneration brake frequency.
	A.31	Excess speed	Is activated, if the motor rotation speed is detected to have exceeded the permissible rotation speed.
	A.32	Excess current	Is activated, if an excess current is detected.
	A.33	Excess voltage	Is activated, if an excess converter voltage is detected.
	A.35	Command pulse error	Is activated, if an excess frequency command pulse is input.
	A.37	Parameter error	Is activated, if parameters are detected to be outside the setting range through a parameter check performed when the power is turned ON.
	A.46	Motor overheat	Is activated by the thermal protector inside the encoder due to motor overheating.
	A.50	Overload 1	Is activated, if an overload is detected in the motor or servo amplifier.
	A.51	Overload 2	Is activated, if an overload is detected in the motor or servo amplifier.
	A.52	Excess error	Is activated, if the difference between the input pulse and return pulse is detected to have exceeded 80 k pulses when operating in position control mode.
	A.8E	RS232C communications error	Is activated, if an error occurs in RS232C communications.
Warnings	A.92	Battery disconnection error	Is activated, if the battery wire connected to the encoder becomes disconnected or if the battery voltage falls.
	A.96	Origin set error	Is activated, if the origin is not set.
	A.9F	Battery warning	Is activated, if the battery voltage falls.
	A.E0	Excess regeneration warning	Is activated, if the load of the regeneration resistor reaches 85 % of the alarm level.
	A.E1	Overload warning	Is activated, if the unit reaches 85 % of the overload alarm level.
	A.E3	ABS data counter warning	Is activated, if there is an error in the backup data of the absolute data counter.
	A.E5	ABS time-out warning	Is activated, if there is a time-out error during the forwarding of absolute data.
	A.E6	Servo emergency stop	Is activated, if an external emergency stop signal has been lifted.
	A.E9	Main circuit OFF warning	Is activated, if the main circuit voltage (P-N) is below 215 V when the servo ON signal (SON) is turned ON.
	A.EA	ABS servo ON warning	Is activated, if the servo ON signal does not go ON within 1 second after the ABS forwarding mode (D13) is turned ON.
	8888	System error (watchdog)	Is activated, if a system error is detected.

Notes:

1. The state under which the regeneration error (alarm A30) and overload 1 and 2 (alarms A50 and A51) were activated is maintained inside the servo amplifier after the safety circuit is activated. Memory contents are cleared when the control voltage is turned OFF, but maintained by turning the RES terminal ON.
2. Resetting the unit repeatedly by turning the control power supply OFF and ON after the alarms A30, A50, and A51 have been triggered can damage the components through overheating. Resume operation after definitely eliminating the cause of the alarm.
3. When an alarm has been triggered, the details can be output in 3-bit data. This depends on the setting of parameter 49.

Specifications of Servo Amplifiers MR-J2-A

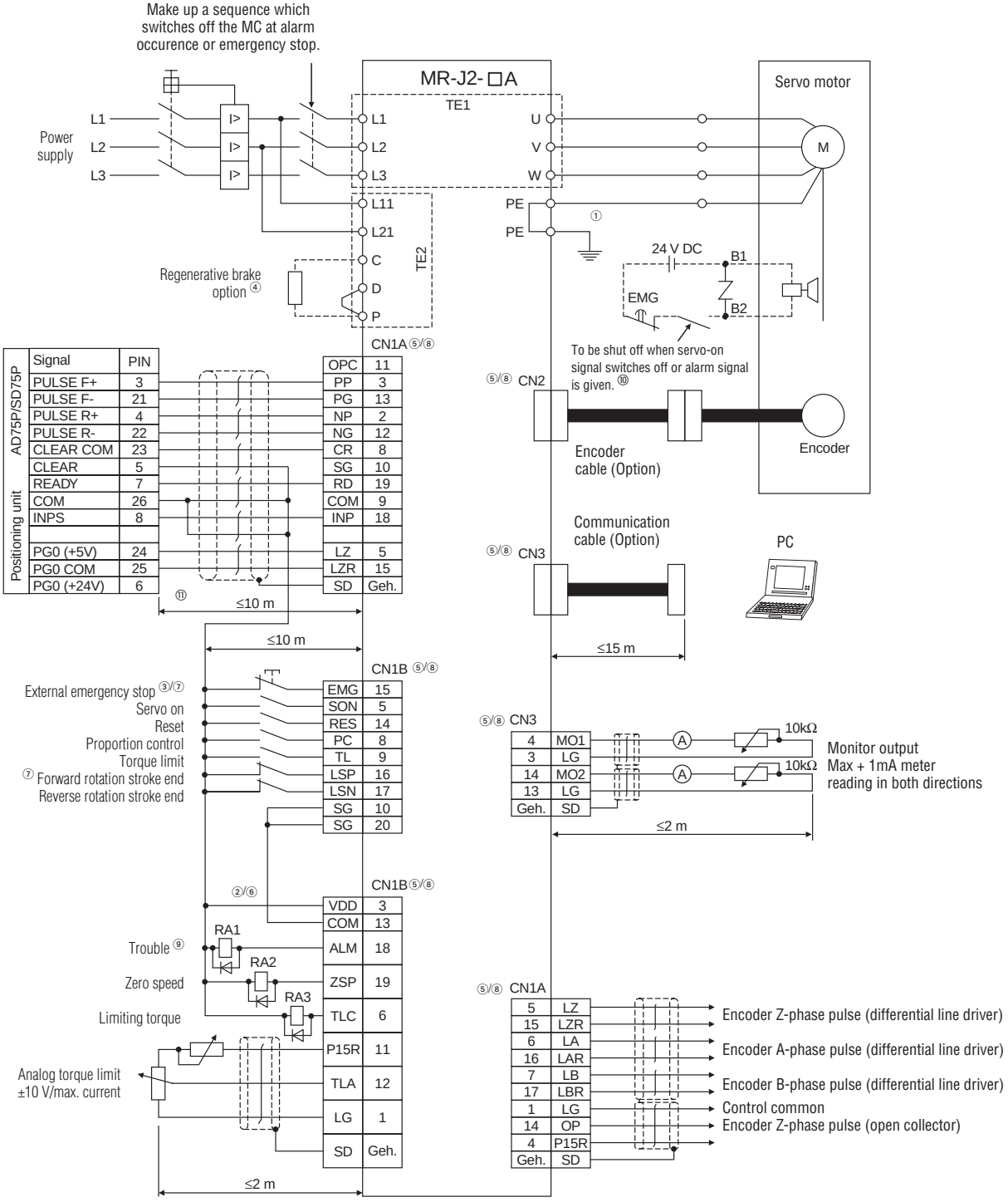
The following table provides a complete overview on all servo amplifieres.



Servo amplifier model		MR-J2-	10A	20A	40A	60A	70A	100A	200A	350A
Power supply	Voltage / frequency ①		3-phase 200 – 230 V AC, 50 / 60 Hz; 1-phase 230 V AC, 50 / 60 Hz					3-phase 200 – 230 V AC, 50 / 60 Hz		
	Permissible voltage fluctuation		3-phase 200 – 230 V AC: 170 – 253 V AC, 1-phase 230 V AC: 207 – 253 V AC					3-phase 170 – 253 V AC		
	Permissible frequency fluctuation		± 5 %							
Control system			Sinusoidal PWM control / current control system							
Speed frequency response			250 Hz or more							
Protective functions			Excess current shutdown, regeneration excess voltage shutdown, excess load shutdown (electronic thermal), servo motor overheat protection, encoder error protection, regeneration error protection, insufficient voltage / sudden power outage protection, excess speed protection, excess error protection.							
Torque limit input			0 – ± 10 V DC / maximum torque							
Position control specifications	Maximum input pulse frequency		400 kpps (when using differential receiver), 200 kpps (when using open collector)							
	Positioning feedback pulse		Resolution per servo motor rotation (see "Speed / position decoder" in the servo motor specifications							
	Command pulse multiple		Electronic gear A/B multiple; A, B: 1 – 32767, 1/50 < A/B < 50							
	Positioning complete width setting		0 – ±10000 pulses							
	Excess error		±80 k pulses							
Speed control specifications	Speed control range		External speed 1:1000, internal speed 1:5000							
	Speed command input		0 – ± 10 V DC / maximum speed							
	Speed fluctuation rate		–0.03 % max. (load fluctuation 0 – 100 %) ±0.02 % max. (power fluctuation ±10 %) ±0.02 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed							
Torque control specifications	Torque command input		0 – ±8 V DC / maximum torque							
Structure			Open (IP00)							
Environment	Ambient temperature		Operation: 0 – 55 °C (no freezing), storage: –20 – 65 °C (no freezing)							
	Ambient humidity		Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)							
	Atmosphere		Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust							
	Elevation		1000 m or less above sea level							
	Oscillation		5.9 m/s² (0.6 G) max.							
Weight [kg]			0.7	0.7	1.1	1.1	1.7	1.7	2.0	2.0
Order information		Art. no.	55555	61381	55556	55557	61382	61383	65826	65829

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

Position Control Mode/ Connection to AD75P (position servo, incremental)



① To prevent an electric shock, always connect the protective earth (PE) terminal of the servo amplifier to the protective earth of the control box.

② Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output and emergency stop and other safety circuits are inoperable.

③ The emergency stop switch must be installed.

④ When using the regenerative brake option, always remove the lead from across D-P.

⑤ CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a fault.

⑥ Make sure that the sum of current flowing to external relays does not exceed 80 mA. If it exceeds 80 mA, supply interface power from an external source.

⑦ When starting operation, always switch on the external emergency stop signal (EMG) and forward/reverse rotation stroke end signal (LSN/LSP) (normally closed contacts).

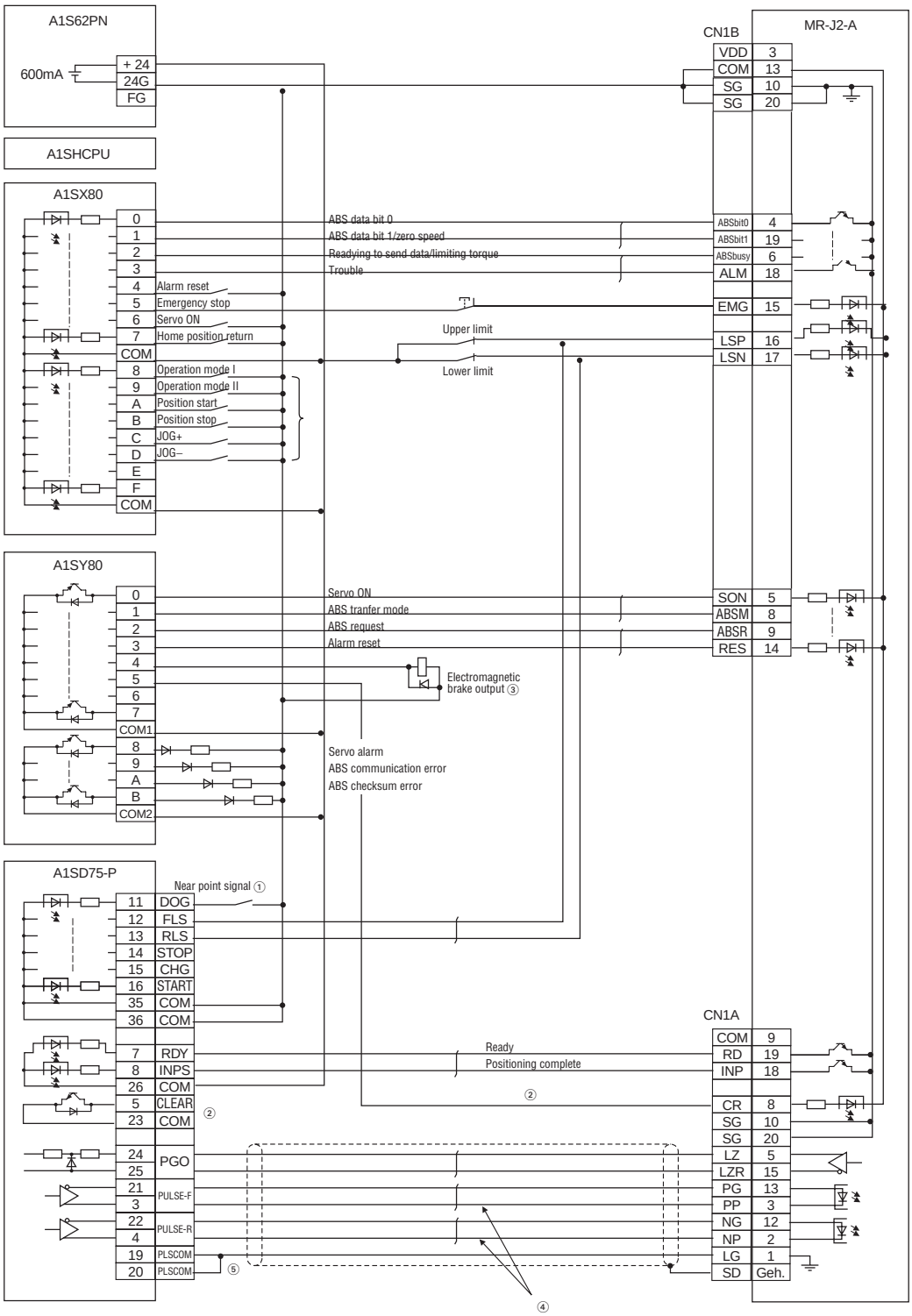
⑧ The pins with the same signal name are connected in the servo amplifier.

⑨ The trouble (ALM) signal is on when there is no alarm, i.e. in the normal state. When the signal is switched off (at occurence of an alarm), the output of the controller should be stopped by the sequence program.

⑩ Only for motors with electomagnetic brake.

⑪ This length applies to the command pulse train input in the differential line driver system. The lenght is 2 m or less in the open collector system.

Position Control Mode/ Connection to A1SD75P (position servo, absolute)



① For dog type home position return. Do not connect when home position return is of the data set type.

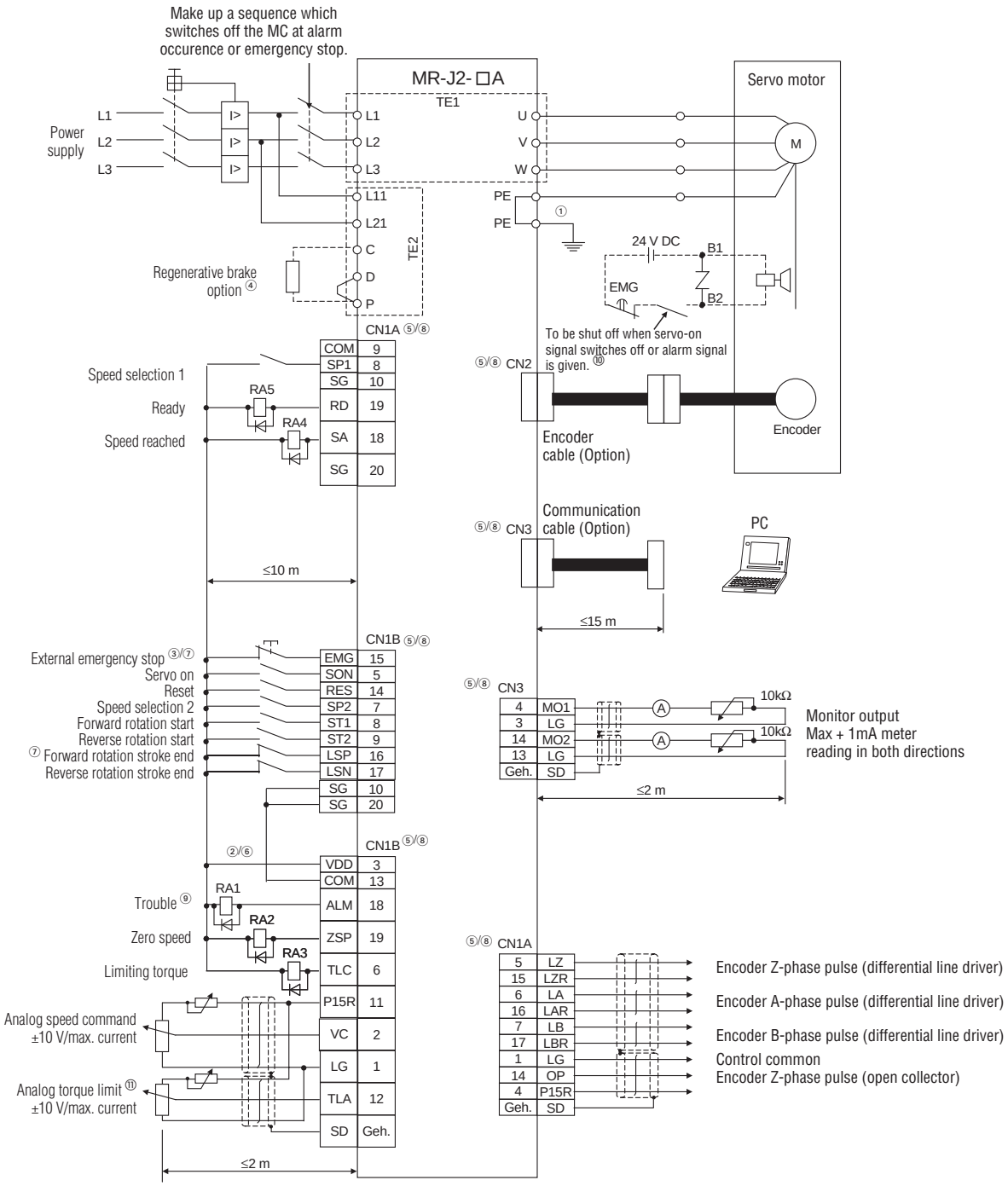
② Starting up when the servomotor is above the zero signal causes the A1SD75 (AD75) deviation clear signal to be output. Therefore, do not wire the MR-J2-A clear signal to theA1SD75 (AD75) side, but to the sequencer output unit.

③ The electromagnetic brake output should be controlled via a relay connected to the programmable controller output.

④ Use the differential line driver system for pulse input. Do not use the the open collector system.

⑤ To reinforce noise suppression, connect LG and pulse output COM.

Speed Control Mode



① To prevent an electric shock, always connect the protective earth (PE) terminal of the servo amplifier to the protective earth of the control box.

② Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output and emergency stop and other safety circuits are inoperable.

③ The emergency stop switch must be installed.

④ When using the regenerative brake option, always remove the lead from across D-P.

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⑦ When starting operation, always switch on the external emergency stop signal (EMG) and forward/reverse rotation stroke end signal (LSN/LSP) (normally closed contacts).

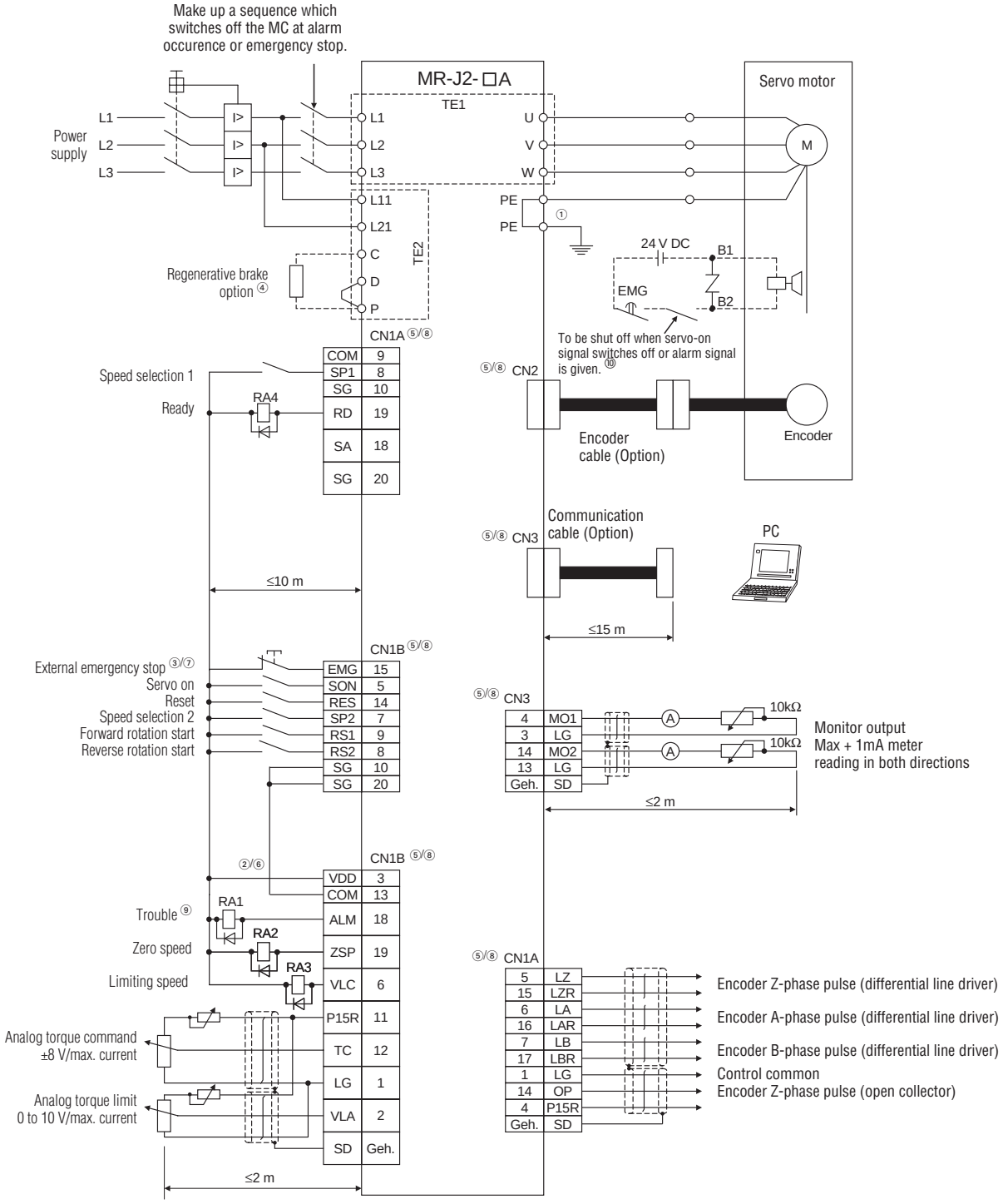
⑧ The pins with the same signal name are connected in the servo amplifier.

⑨ The trouble (ALM) signal is on when there is no alarm, i.e. in the normal state. When the signal is switched off (at occurence of an alarm), the output of the controller should be stopped by the sequence program.

⑩ Only for motors with electomagnetic brake.

⑪ TLA can be used by setting any of parameters No. 43 to 48 to make TL available.

Torque Control Mode



① To prevent an electric shock, always connect the protective earth (PE) terminal of the servo amplifier to the protective earth of the control box.

② Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output and emergency stop and other safety circuits are inoperable.

③ The emergency stop switch must be installed.

④ When using the regenerative brake option, always remove the lead from across D-P.

⑤ CN1A, CN1B, CN2 and CN3 have the same shape. Wrong connection of the connectors will lead to a fault.

⑥ Make sure that the sum of current flowing to external relays does not exceed 80 mA. If it exceeds 80 mA, supply interface power from an external source.

⑦ When starting operation, always switch on the external emergency stop signal (EMG).

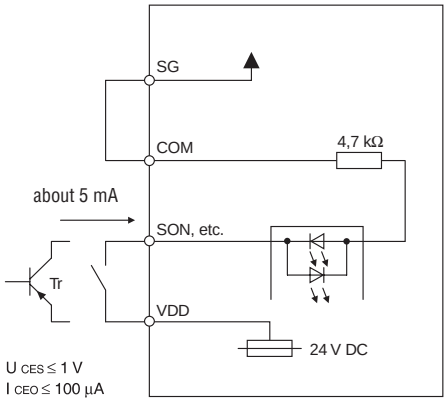
⑧ The pins with the same signal name are connected in the servo amplifier.

⑨ The trouble (ALM) signal is on when there is no alarm, i.e. in the normal state. When the signal is switched off (at occurence of an alarm), the output of the controller should be stopped by the sequence program.

⑩ Only for motors with electomagnetic brake.

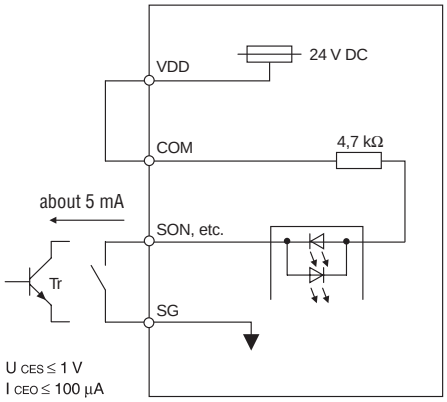
1a. Digital input interface DI-1 (source logic)

Supply signal with a miniature relay or an open collector transistor (Tr).



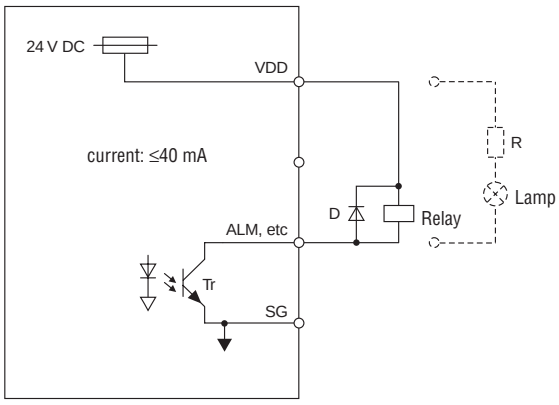
1b. Digital input interface DI-1 (sink logic)

Supply signal with a miniature relay or an open collector transistor (Tr).



2. Digital output interface DO-1

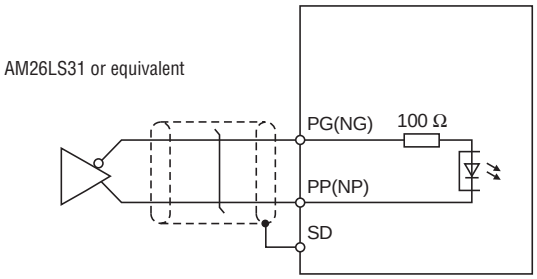
Can drive a lamp, relay or photocoupler



Note: For an induction load install a surge suppressor (D); for a lamp load install an incoming current suppression resistor (R).

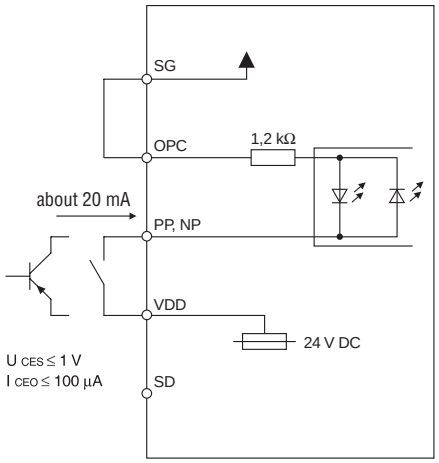
3a. Pulse train input interface DI-2

Differential mode (max. 400 kpps)



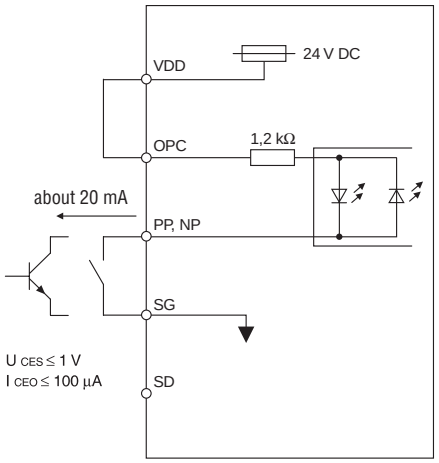
3b. Pulse train input interface DI-2 (source logic)

Open collector mode (max. 200 kpps)



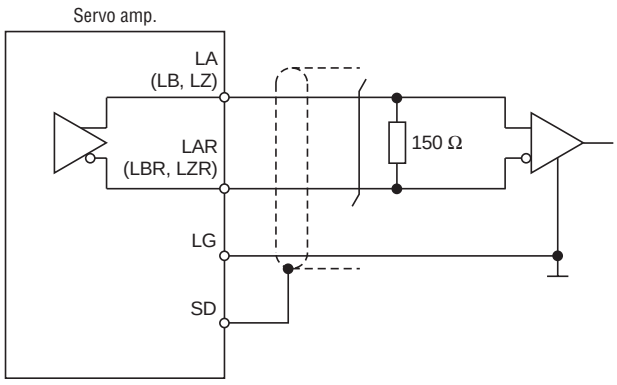
3c. Pulse train input interface DI-2 (sink logic)

Open collector mode (max. 200 kpps)



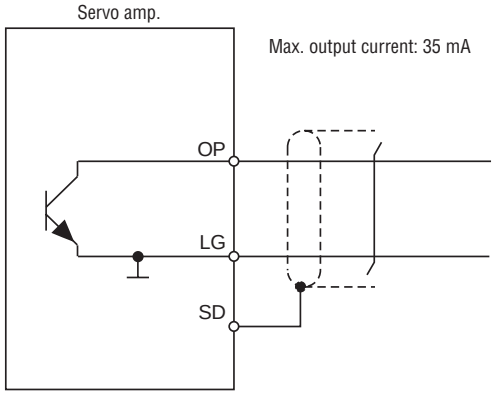
4a. Encoder pulse train output interface DO-2

Differential mode

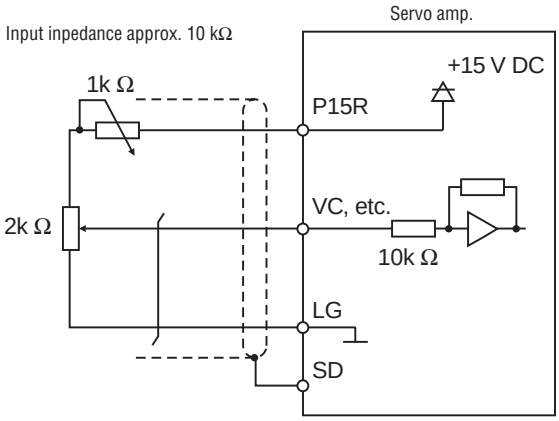


4b. Encoder pulse train output interface DO-2

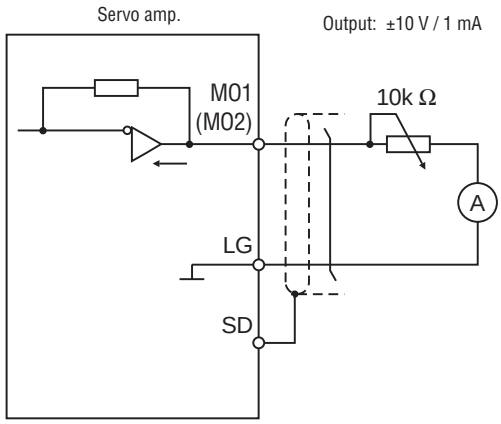
Open collector mode



5. Analog input interface



6. Analog output interface



Terminal Assignment

Terminal block

Signal	Symbol	Terminal	Description
AC power supply	L1, L2, L3	TE1	Connect to a 3-phase 200 – 230 V 50/60 Hz or 1-phase 230 V 50/60 Hz (≤ 750 W) commercial power supply.
	L11, L21	TE2	Connect to a 1-phase 200 – 230 V 50/60 Hz commercial power supply. Supply power from the same source as that for L1, L2, and L3. Turn ON before or simultaneously with L1, L2, and L3. Turn OFF simultaneously with or after L1, L2, and L3.
Motor output	U, V, W	TE1	Connect to the U,V, and W terminals of the motor power supply. The motor will not rotate properly, if an error is made in the phase sequence.
Regeneration brake resistor	P, C, D	TE2	When using the optional regeneration unit, remove the wires connecting P and D, and connect the optional regeneration unit between P and C.
Ground	PE	Chassis	Ground with the motor at one point. Connected to the chassis.

Connector CN1A (default settings)

Control mode	Signal	Symbol	Connector number	Description	I/O category
Same for position, speed, and torque control modes	Common terminal	COM	9	Common terminal for digital interface. COM are all connected inside.	Power supply
	Digital interface common	SG	10, 20	24 V common, insulated from LG	Common
	15 V DC power output	P15R	4	15 V power supply. Maximum permissible current is 30 mA.	Power output
	Control common	LG	1	Control signal common terminal.	DO-2
	Encoder A-phase pulse	LA	6	Encoder A-/B-phase pulse signal output terminal.	
		LAR	16		
	Encoder B-phase pulse	LB	7		
		LBR	17		
	Encoder Z-phase pulse	LZ	5	Encoder Z-phase pulse signal output terminal. One pulse is output for each motor rotation. Minimum pulse width is 400 µs. Set speed to 100 rpm or less when using this pulse. LZ/LZR is differential line driver output; OP is open collector output.	
		LZR	15		
		OP	14		
	Ready	RD	19	Ready signal output terminal. RD and SG are connected after the servo is turned ON when there are no malfunctions and the unit is operable.	DO-1
	Shield	SD	Plate	Connect one end of the shield wire.	
Position control mode	Open collector power input	OPC	11	Open collector power input terminal.	Power input
	Forward pulse train	PP	3	Forward pulse train signal input terminal. Compatible with both open collector and differential modes.	DI-2
		PG	13		
	Reverse pulse train	NP	2	Reverse pulse train signal input terminal. Compatible with both open collector and differential modes.	DI-2
		NG	12		
	Clear	CR	8	Clear signal input terminal. Switching of CR will cause the number of drop pulses (position error) to be cleared at startup. Level clear can be chosen through the parameter settings. With the ABS method, when the number of drop pulses (position error) is cleared, origin data is simultaneously set in non-volatile memory.	DI-1
	Positioning complete	INP	18	Positioning complete signal output terminal. Connection between INP and SG is made when the standing pulse is smaller than the parameter-set in-position range. Not output when the base is turned OFF.	Do-1
Speed control mode	Speed selection 1	SP1	8	Speed selection 1 signal input terminal. Runs at parameter-set speed.	DI-1
	Speed attained	SA	18	Speed attained signal output terminal. When the motor rotation speed exceeds the command speed range of ±20 rpm, a signal is output at terminal SA. There is no output when the base or start signal is turned off.	DO-1
Torque control mode	Speed selection 1	SP1	8	Speed limit selection 1 signal input terminal. Runs within the limitations of the parameter-set speed when SP1 signal is switched.	DI-1

Connector CN3 (default settings)

Control mode	Signal	Symbol	Connector number	Description	I/O category
Same for position, speed, and torque control modes	Monitor output	MO1	4	Monitor output signal terminal. Analog output of the parameter-set data.	Analog output
		MO2	14		
	Monitor common	LG	3.13	Control common is used for monitor common.	Analog common
	Shield	SD	Plate	Connect one end of shield wire.	

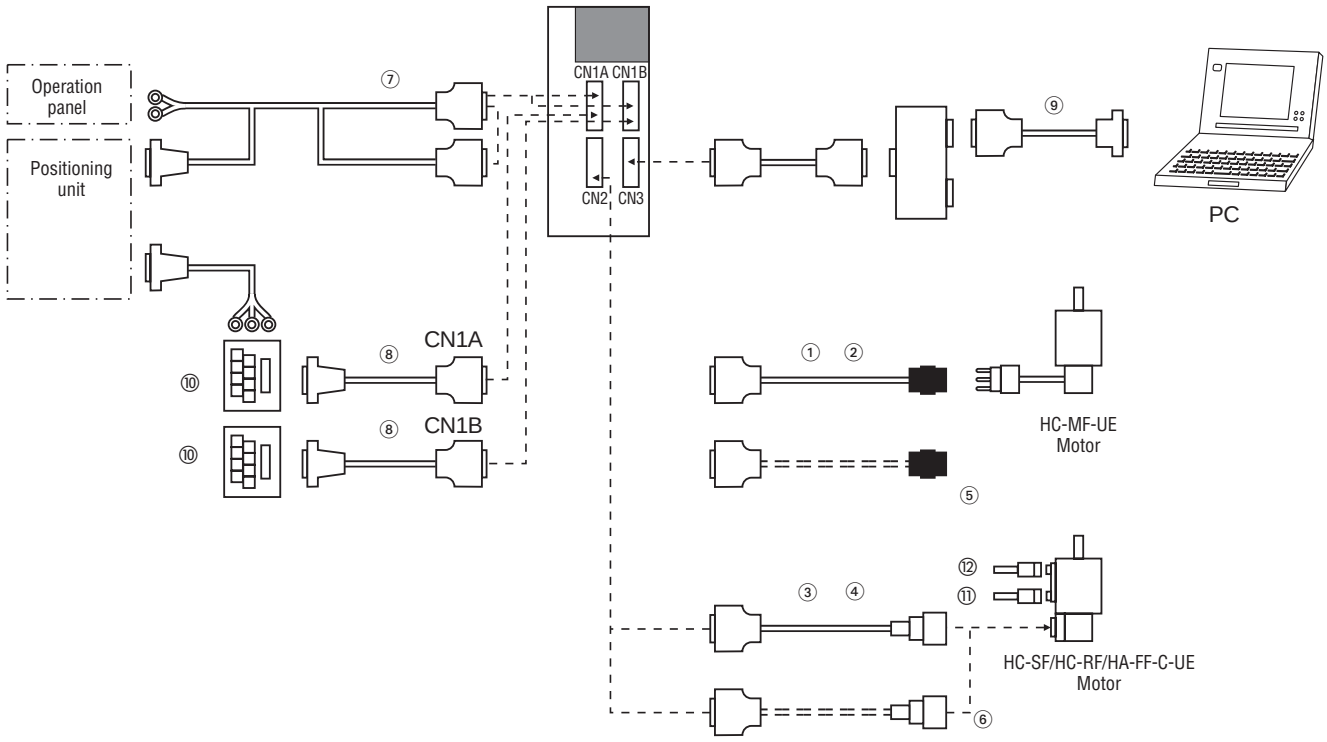
Connector CN1B (default settings)

Control mode	Signal	Symbol	Connector number	Description	I/O category
Same for position (ABS method), speed, and torque control modes	Common terminal	COM	13	Common terminal for digital interface. COM are all connected inside.	Power supply
	Internal power supply output for interface	VDD	3	Driver power output terminal for digital interface. Outputs +24 V ±10 % between 24 V commons. Do not allow the sum of current for the command unit and input/output relay drive to exceed 80 mA.	
	Digital interface common	SG	10,20	24 V common, insulated from LG	Common
	15 V DC power output	P15R	11	15 V power supply. Maximum permissible current is 30 mA.	Power supply
	Control common	LG	1	Control signal common terminal	Analog common
	External emergency stop	EMG	15	Emergency stop signal input terminal. Switching EMG off puts the unit in emergency stop state; power to the base is cut off and the dynamic brake is activated. Switching EMG on in the emergency stop state causes the unit to automatically exit the emergency stop state.	DI-1
	Servo ON	SON	5	Preparation for operation signal input terminal. Switching SON on places the unit in an operable state. Switching SON off these terminals causes power to the base to be cut off and the servo motor to enter a free running position. This can be set to automatic ON with the parameter settings.	DI-1
	Reset	RES	14	Alarm reset signal input terminal. Switching RES on causes the malfunction to be reset. While the alarm is being reset, power to the base is cut off. Malfunctions related to regeneration errors and overloading cannot be reset with the alarm reset signal immediately after their occurrence.	DI-1
	Malfunction output	ALM	18	Malfunction signal output terminal. When the power is turned OFF the protective circuit is activated, and when power to the base is cut off, the ALM-SG connection cannot be made. If everything is normal when the power is turned ON, the connection is made. Configure a sequence for cutting off the input MC when a malfunction occurs.	DO-1
	Zero speed detection (ABS data bit 1)	ZSP (ABS bit 1)	19	Zero speed signal output terminal. When the motor rotation speed is less than the speed set in the zero speed parameter setting, the connection between ZSP and SG is made. (ABS data bit 1 signal output terminal. The upper bit of the two-bit data is forwarded to the command unit from the servo amplifier.)	DO-1
	Shield	SD	Plate	Connect to one end of the shield wire.	
Same for position (ABS method) and speed control	Analog limit	TLA	12	Analog torque limit signal input terminal. Input an external analog torque limit. (0– ±10 V/maximum torque)	Analog input
	Torque limit in effect (forwarding data being prepared)	TLC (ABS busy)	6	Torque limit in effect signal output terminal. When the set torque limit is reached, the connection between TLC and SG is made. Not output when the base is turned off. (Forwarding data being prepared signal output terminal. Indicates that forwarding data being prepared.)	DO-1
	Forward stroke end	LSP	16	Forward/reverse stroke end signal input terminal. Switching off LSP makes the unit inoperable in a CCW direction, but operable in a CW direction. To operate in a CCW direction, switch LSP signal on with a limit switch. Switching off LSN makes the unit inoperable in a CW direction, but operable in a CCW direction. To operate in a CW direction, switch LSN on with a limit switch. This can be set to go on automatically with the parameter settings.	DI-1
	Reverse stroke end	LSN	17		

Connector CN1B (default settings)

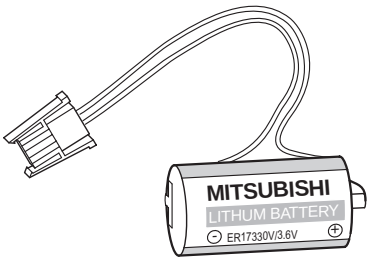
Control mode	Signal	Symbol	Connector number	Description	I/O category
Position control mode (ABS method)	Proportional control (ABS forwarding mode)	PC (ABSM)	8	Proportional control signal input terminal. Switch PC signal on when you want to suppress microvibration when the servo-lock is on. (ABS forwarding mode signal input terminal. Switching ABSM on puts the unit in ABS forwarding mode.)	DI-1
	External torque limit (ABS data request)	TL (ABSR)	9	External torque limit signal input terminal. Switching the TL signal on limits the torque to the TLA level. (ABS data request signal input terminal. Switching the ABSR signal on generates a request for ABS data.)	DI-1
	Proportional control (ABS data bit 0)	ABS bit 0	4	ABS data bit 0 signal output terminal. The lower bit of the two-bit data forwarded to the command unit from the servo-amp.	DO-1
Speed control mode	Speed selection 2	SP2	7	Speed selection 2 signal input terminal. Runs at parameter set speed.	DI-1
	Forward start	ST1	8	Forward start signal input terminal. Switching ST1 on causes the motor to rotate in a CCW direction.	DI-1
	Reverse start	ST2	9	Reverse start signal input terminal. Switching ST2 on causes the motor to rotate in a CW direction. Simultaneously connecting or disconnecting ST1 and ST2 causes the motor to decelerate and stop, the position control to fall below zero speed, and the servo to enter a locked state.	DI-1
	Analog speed command	VC	2	Analog speed command signal input terminal. Input an external analog speed command. (0– ±10 V/maximum rotation speed)	Analog input
Torque control mode	Speed selection 2	SP2	7	Speed selection 2 signal input terminal. Switching SP2 on limits operation to the parameter-set speed.	DI-1
	Reverse selection	RS2	8	Reverse power torque generation input terminal. Select the direction of the torque to be generated. Switching ST1 on causes the torque to be generated in reverse power/forward regeneration direction.	DI-1
	Forward selection	RS1	9	Forward power torque generation input terminal. Select the direction of the torque to be generated. Switching ST2 on causes the torque to be generated in forward power/reverse regeneration direction.	DI-1
	Analog speed limit	VLA	2	Analog speed command signal input terminal. Input an external analog speed limit.	Analog input
	Speed limit in effect	VLC	6	Speed limit signal output terminal. When the set torque limit is reached, the connection between VLC and SG is made. Not output when the base is turned off.	DO-1
	Analog torque command	TC	12	Analog torque command signal input terminal. Input an external analog torque command. (0– ±8 V/maximum torque)	Analog input

■ Cables and Connectors



Item		Description	Model	Length	Art. no.
For CN2	①	Standard encoder cable for HC-MF-UE	MR-JCCBL□M-L Cable lenght in □: 2, 5, 10, 20, 30 m	2 m 5 m 10 m 20 m 30 m	61732 55550 61332 61373 61374
	②	Long flexing-life encoder cable for HC-MF-UE	MR-JCCBL□M-H Cable lenght in □: 2, 5, 10, 20, 30 m	2 m 5 m 10 m 20 m 30 m	61375 55551 61376 61377 61378
	③	Standard encoder cable for HC-SF/HC-RF/HA-FF-C-UE	MR-JHSCBL□M-L Cable lenght in □: 2, 5, 10, 20, 30 m	2 m 5 m 10 m 20 m 30 m	61380 61191 61194 61195 61197
	④	Long flexing-life encoder cable for HC-SF/HC-RF/HA-FF-C-UE	MR-JHSCBL□M-H Cable lenght in □: 2, 5, 10, 20, 30 m	2 m 5 m 10 m 20 m 30 m	61198 61199 61201 61215 61211
	⑤	Encoder connector set for HC-MF-UE	MR-J2CNM		61212
	⑥	Encoder connector set for HC-SF/HC-RF/HA-FF-C-UE	MR-J2CNS		61213
For CN1A CN1B	⑦	Control signal connector (set with 2 pcs.)	MR-J2CN1		55912
	⑧	Junction terminal block	MR-J2TBL□M Cable lenght in □: 0,5, 1 m	0.5 m 1 m	61216 61218
For CN3	⑨	Communication cable for PC	MR-CPCATCBL3 Cable lenght: 3 m		55910
	⑩	Junction terminal block	MR-TB20		Refer to page 36
For TE1	⑪	Power supply connector for HC-SF52–152/HC-RF103–153-C-UE	MR-PWCNS1		64036
		Power supply connector for HC-SF202–352-C-UE	MR-PWCNS2		64035
		Power supply connector for HA-FF-C-UE	MR-PWCNF		64037
For TE2	⑫	Electomagnetic brake connector for HA-FF-CB-UE	MR-BKCN		64034

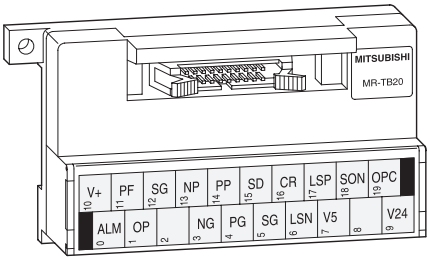
■ Battery (MR-BAT/A6BAT)



The servomotor's absolute value can be maintained by installing either the MR-BAT or the A6-BAT battery in the servo amp. There is no need to install the battery when using the servomotor in incremental mode.

Battery	Application	Art. no.
MR-BAT	Buffering amp data	103862
A6-BAT	Buffering amp data	4077

■ Junction Terminal Block (MR-TB20)

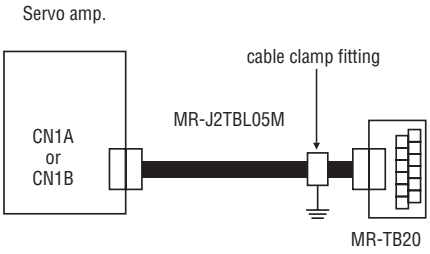


All signals can be wired to this junction terminal block without a connection to CN1. Always use the junction terminal block with the junction terminal block cable (MR-J2TBL☐M). A connection example is shown below.

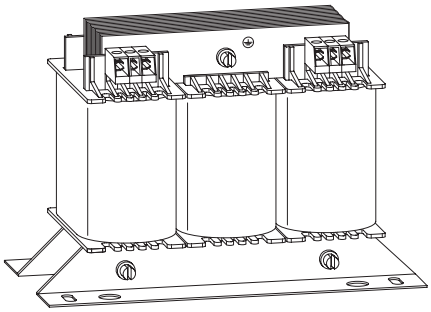
Ground the junction terminal block cable on the junction terminal block side with a standard cable clamp fitting.

The junction terminal block has three terminal labels which indicate signal arrangement.

Junction terminal block	Art. no.
MR-TB20	61390
MR-J2TBL05M	61216
MR-J2TBL1M	61218



■ Transformer

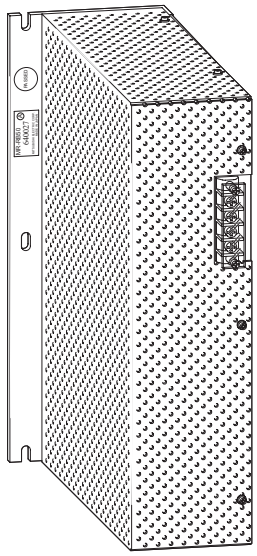


This auto transformer is used to adapt the servo amplifier to a 3~ 400 V power supply.

The input voltage is 400 V, the output voltage is 230 V.

Transformer	Power capacity [kVA]	ED [%]	Input curent [A]	Output current [A]	Power dissipation [W]	Weight [kg]	Art. no.
MT 01364023	1.3 1.7	60 30	2.02 2.69	3.26 4.27	103 167	7.0	87099
MT 01764023	1.7 2.5	60 30	2.61 3.89	4.27 6.28	110 199	10.7	87100
MT 02564023	2.5 3.5	60 30	3.80 5.42	6.28 8.78	155 282	16.5	87101
MT 03564023	3.5 5.5	60 30	5.30 8.41	8.78 13.80	170 330	22.0	87102
MT 05564023	5.5	60	8.26	13.80	243	22.0	87104

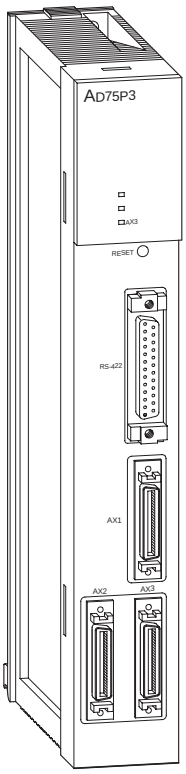
■ Optional Regeneration Unit



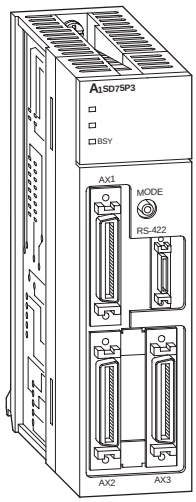
If the regenerative power exceeds the power of the built-in brake resistor, one of the following optional regeneration units is used.

Servo Amplifier	Regenerative Power [W]					
	Built-in regenerative resistor	MR-RB032 (40 Ω)	MR-RB12 (40 Ω)	MR-RB32 (40 Ω)	MR-RB30 (13 Ω)	MR-RB50 (13 Ω)
MR-J2-10A	—	30	—	—	—	—
MR-J2-20A	10	30	100	—	—	—
MR-J2-40A	10	30	100	—	—	—
MR-J2-60A	10	30	100	—	—	—
MR-J2-70A	20	30	100	300	—	—
MR-J2-100A	20	30	100	300	—	—
MR-J2-200A	100	—	—	—	300	500
MR-J2-350A	100	—	—	—	300	500
Order information Art. no.	—	62877	55911	104275	45945	46348

■ Positioning Units



AD75P



A1SD75P

Positioning units AD75P/A1SD75P

The following positioning controllers are available for the MR-J2-A series servo-amps. Choose the unit that best fits your operating objectives and system size.

All units are compatible with the A and QnA series PLC's. A high precision, highly functional positioning unit that uses a 32-bit RISC chip.

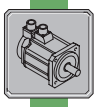
Special Features

- Control of up to three axes with linear and circular interpolation.
- Storage of up to 600 positional data (flash ROM).
- Units of travel can be defined in pulses, mm, inches or degrees.
- Configuration and presetting of positional data is carried out by means of the PLC program or with the aid of the MS-DOS software SW1IVD-AD75PE.

	AD75P1 A1SD75P1	AD75P2 A1SD75P2	AD75P3 A1SD75P3
Number of control axes	1	2 simultaneous 2 independent	3 simultaneous 3 independent
Interpolation functions	—	2-axes straight-line interpolation 2-axes circular interpolation	2-axes straight-line interpolation 2-axes circular interpolation
Control mode	PTP control, locus control, speed control, speed position control		
Command mode	Incremental, absolute		
Max. number of output pulses	±2147483648		
Max. pulse frequency	Differential output: 400 kpps, open collector: 200 kpps		
Positioning pattern	600 pattern/shaft (100 patterns from ladder)		
Input/output duty points	32		
Acceleration/deceleration pattern	4, automatic trapezoid, S-acceleration/deceleration		

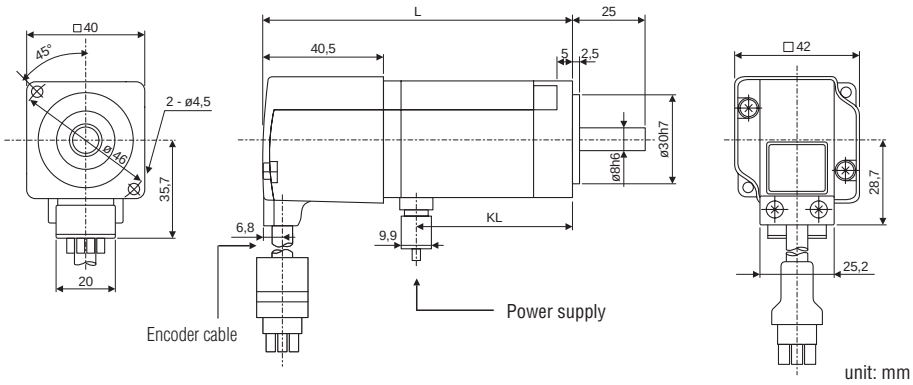
Order information	Art. no. AD75	54927	54928	54929
Order information	Art. no. A1SD75	65028	65029	65030


MR-J
BASICS



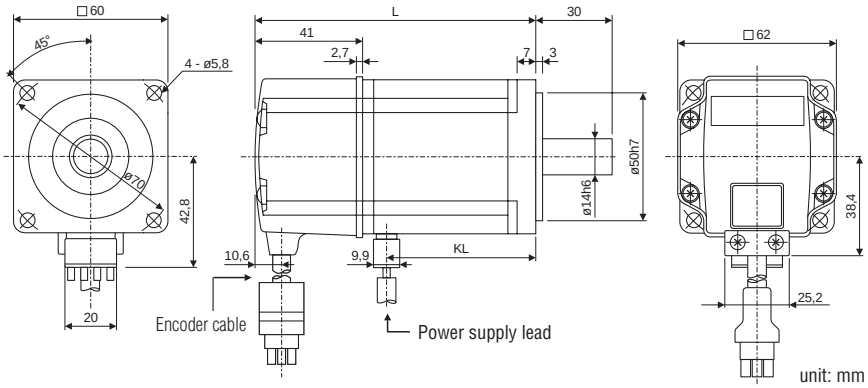
Servo Motors HC-MF Series

HC-MF053-UE, HC-MF13-UE



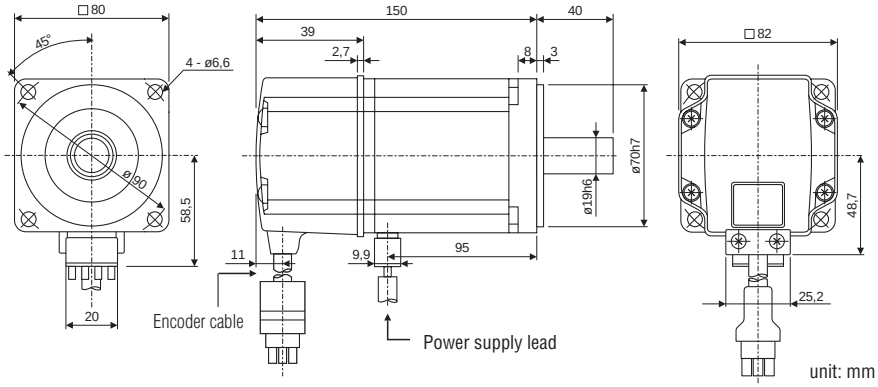
Model	L [mm]	KL [mm]
HC-MF053-UE	89.5	37.5
HC-MF13-UE	104.5	52.5

HC-MF23-UE, HC-MF43-UE

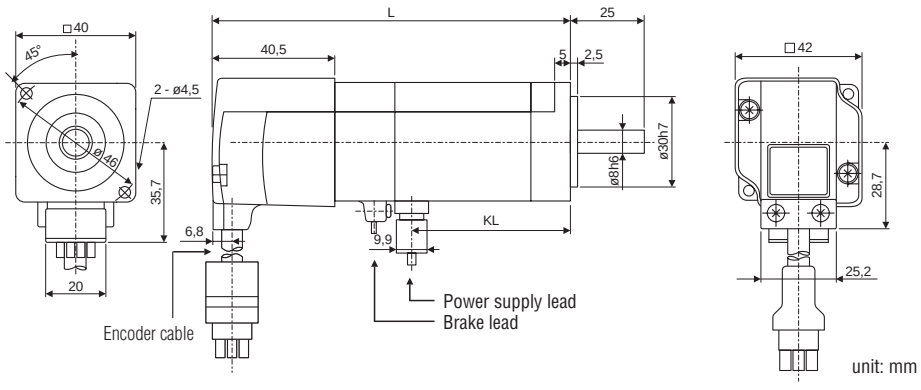


Model	L [mm]	KL [mm]
HC-MF23-UE	108.5	58
HC-MF43-UE	133.5	81

HC-MF73-UE

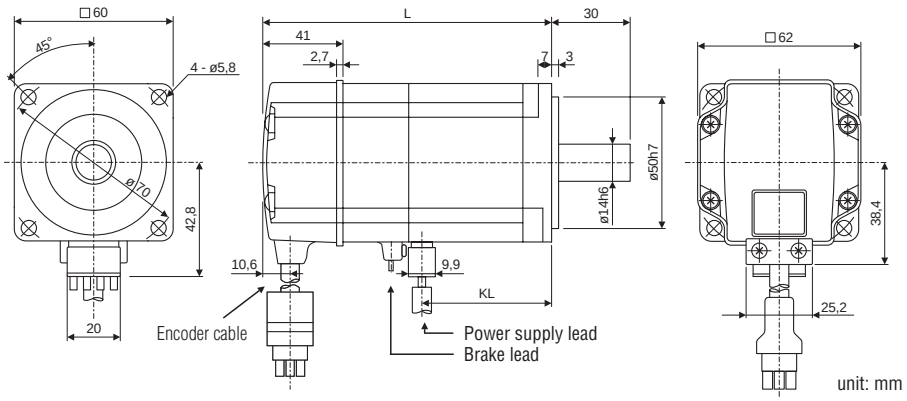


HC-MF053B-UE, HC-MF13B-UE with electromagnetic brake



Model	L [mm]	KL [mm]
HC-MF053B-UE	117.5	37.5
HC-MF13B-UE	132.5	52.5

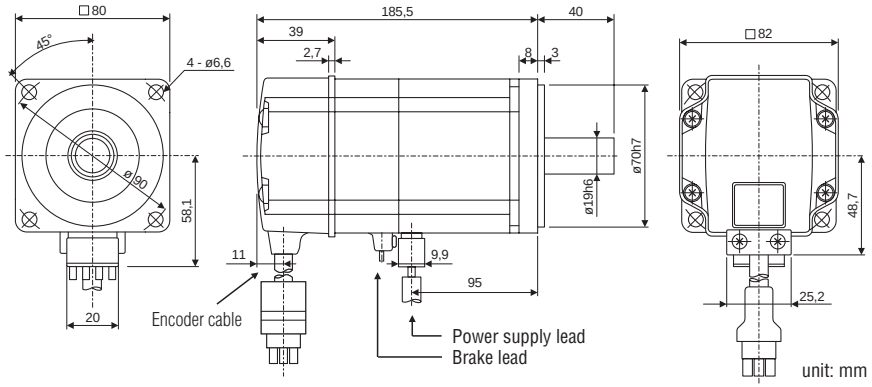
HC-MF23B-UE, HC-MF43B-UE with electromagnetic brake



unit: mm

Model	L [mm]	KL [mm]
HC-MF23B-UE	140.5	58
HC-MF43B-UE	165.5	81

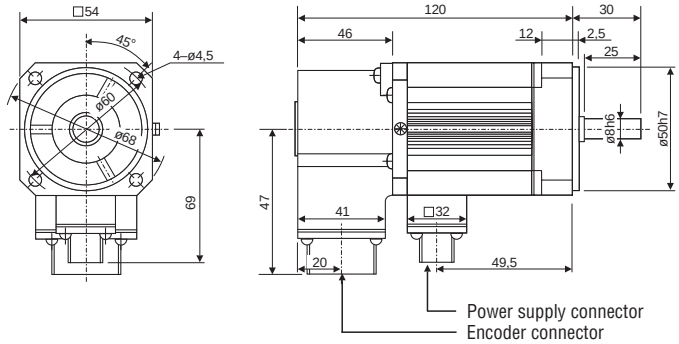
HC-MF73B-UE with electromagnetic brake



unit: mm

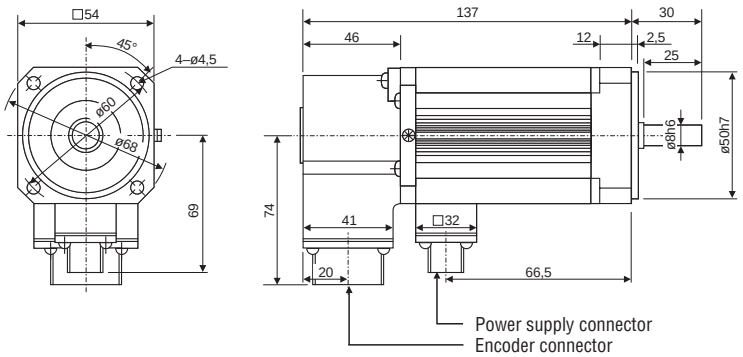
Servo Motors HA-FF Series

HA-FF053-C-UE



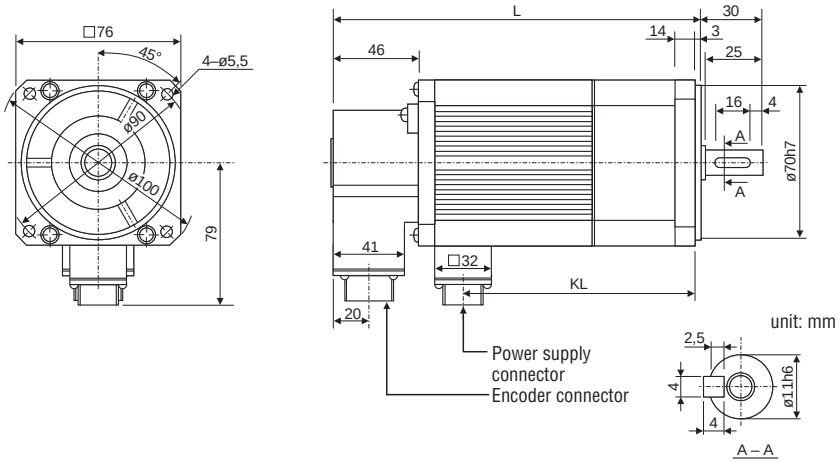
unit: mm

HA-FF13-C-UE



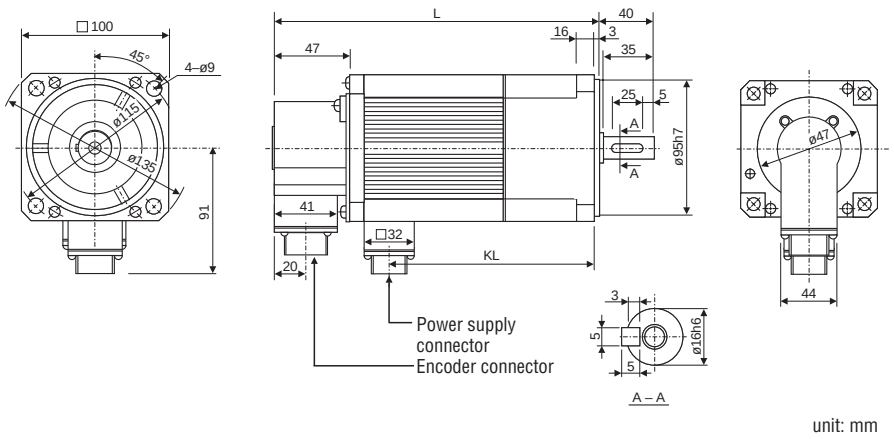
unit: mm

HA-FF23-C-UE, HA-FF33-C-UE



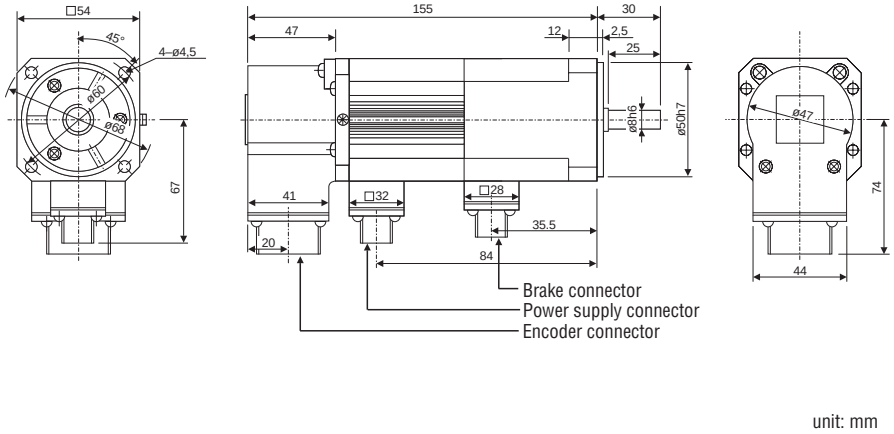
Model	L [mm]	KL [mm]
HA-FF23-C-UE	145	71,5
HA-FF33-C-UE	162	89

HA-FF43-C-UE, HA-FF63-C-UE

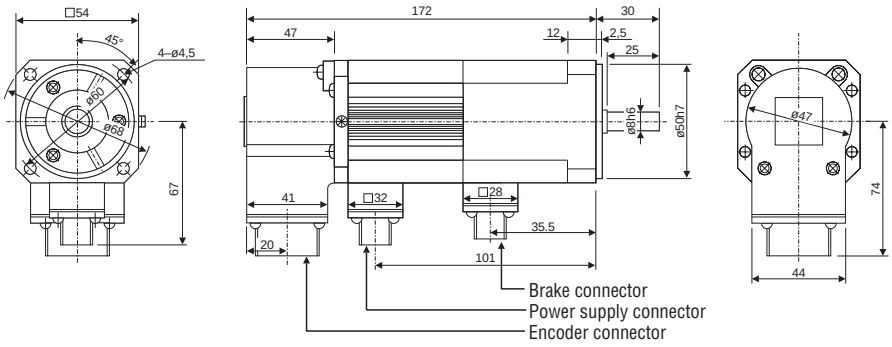


Model	L [mm]	KL [mm]
HA-FF43-C-UE	169	93
HA-FF63-C-UE	184	108

HA-FF053CB-UE with electromagnetic brake

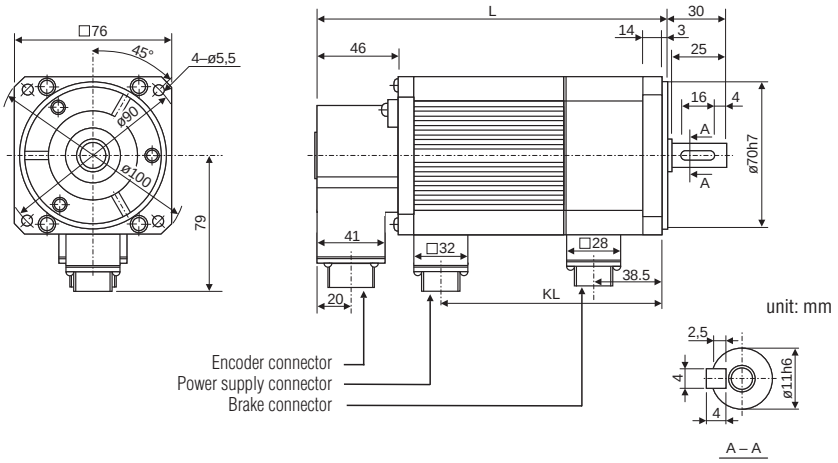


HA-FF13CB-UE with electromagnetic brake



unit: mm

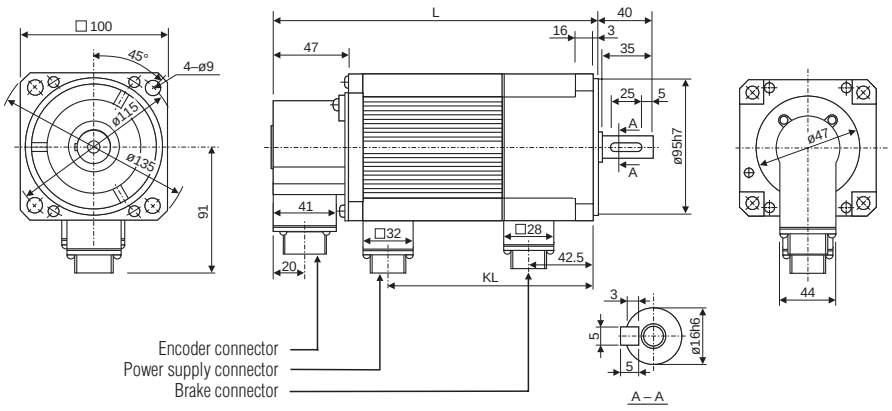
HA-FF23CB-UE, HA-FF33CB-UE with electromagnetic brake



unit: mm

Model	L [mm]	KL [mm]
HA-FF23CB-UE	182	109
HA-FF33CB-UE	200	127

HA-FF43CB-UE, HA-FF63CB-UE with electromagnetic brake

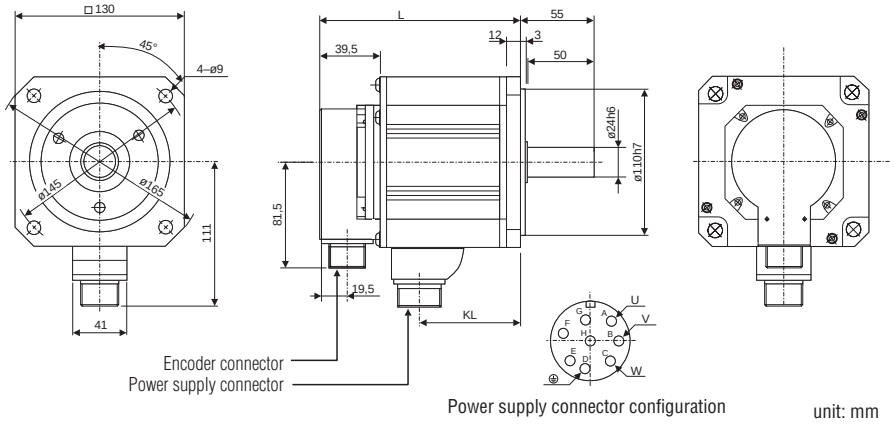


unit: mm

Model	L [mm]	KL [mm]
HA-FF43CB-UE	206	130
HA-FF63CB-UE	221	145

Servo Motors HC-SF-Series

HC-SF52, HC-SF102, HC-SF152

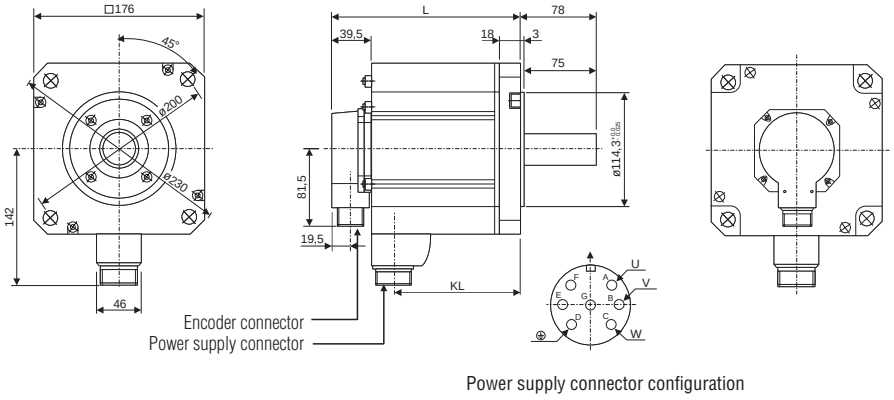


Power supply connector configuration

unit: mm

Model	L [mm]	KL [mm]
HC-SF52	120	51,5
HC-SF102	145	76,5
HC-SF152	170	101,5

HC-SF202, HC-SF352

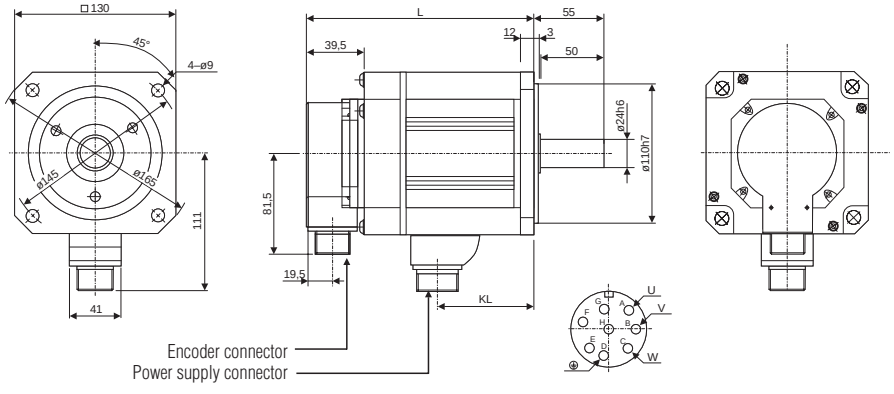


Power supply connector configuration

unit: mm

Model	L [mm]	KL [mm]
HC-SF202	145	68,5
HC-SF352	187	110,5

HC-SF52B, HC-SF102B, HC-SF152B with electromagnetic brake

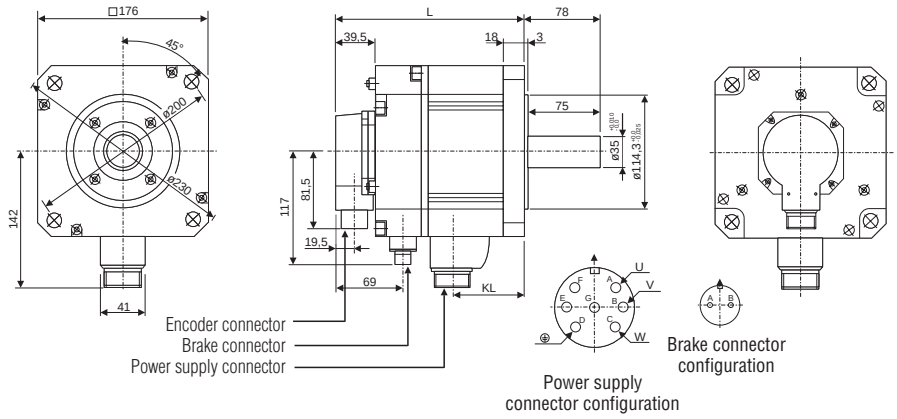


Power supply connector configuration
G, H: Brake

unit: mm

Model	L [mm]	KL [mm]
HC-SF52B	153	51,5
HC-SF102B	178	76,5
HC-SF152B	203	101,5

HC-SF202B, HC-SF352B with electromagnetic brake

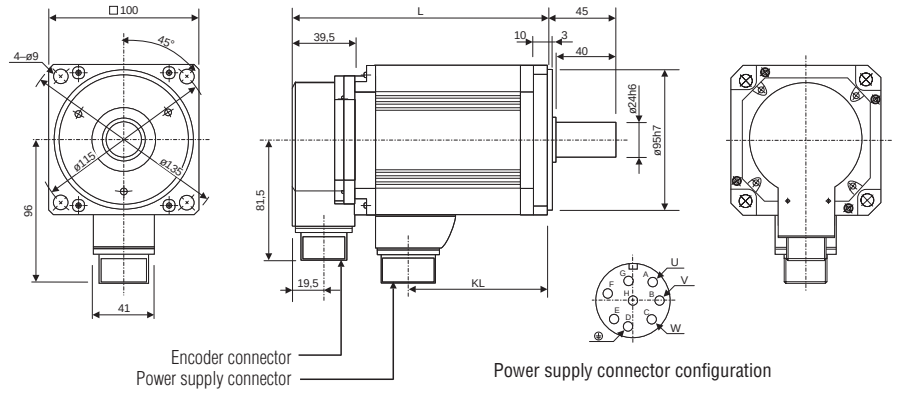


Model	L [mm]	KL [mm]
HC-SF202B	193	68,5
HC-SF352B	235	110,5

unit: mm

Servo Motors HC-RF-Series

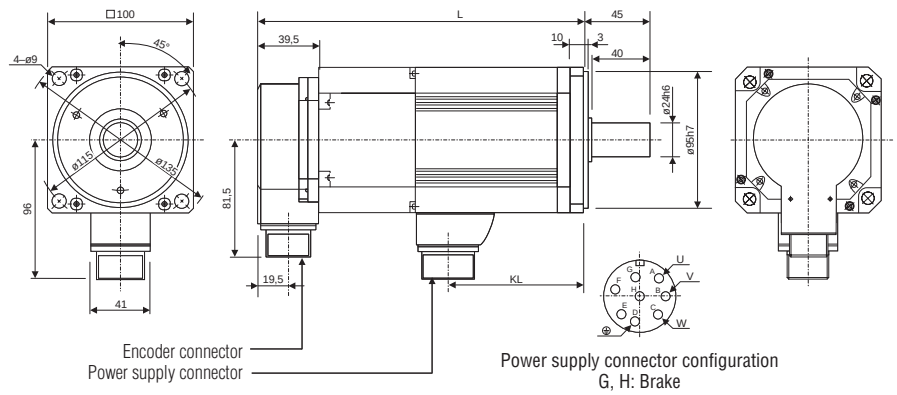
HC-RF103, HC-RF153, HC-RF203



Model	L [mm]	KL [mm]
HC-RF103	147	71
HC-RF153	172	96
HC-RF203	197	121

unit: mm

HC-RF103B, HC-RF153B, HC-RF203B

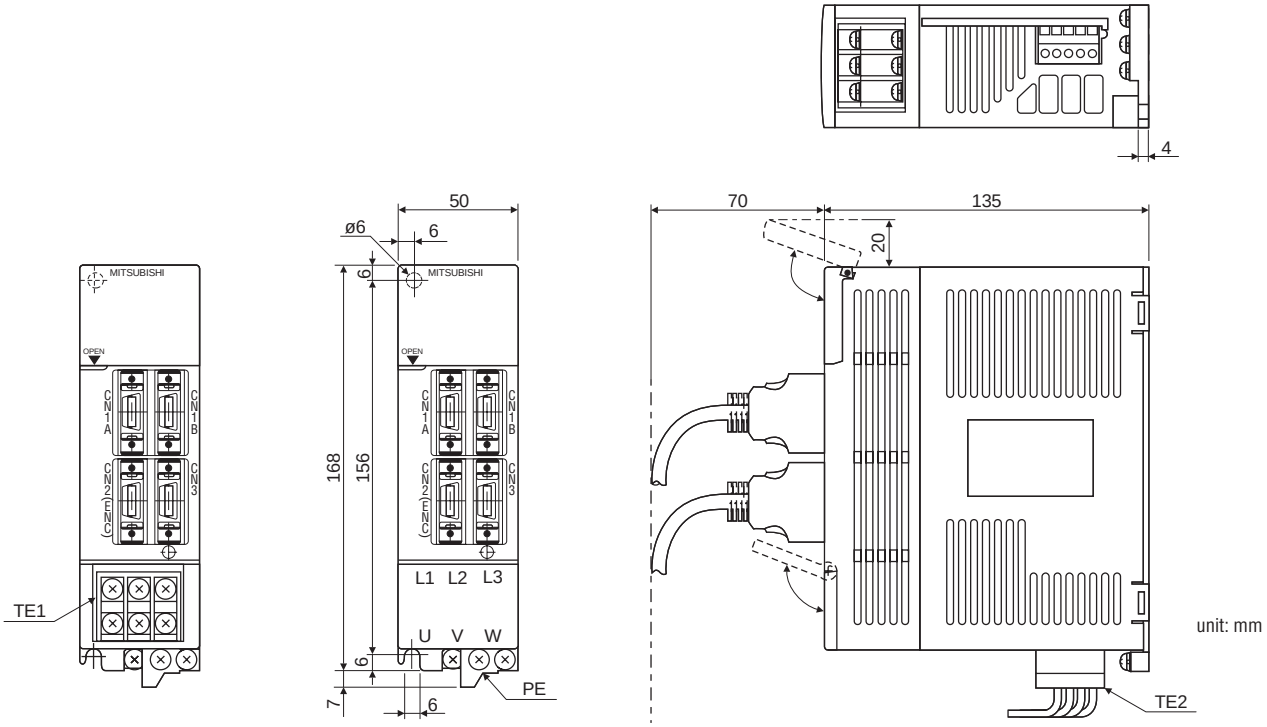


Model	L [mm]	KL [mm]
HC-RF103B	185	71
HC-RF153B	210	96
HC-RF203B	235	121

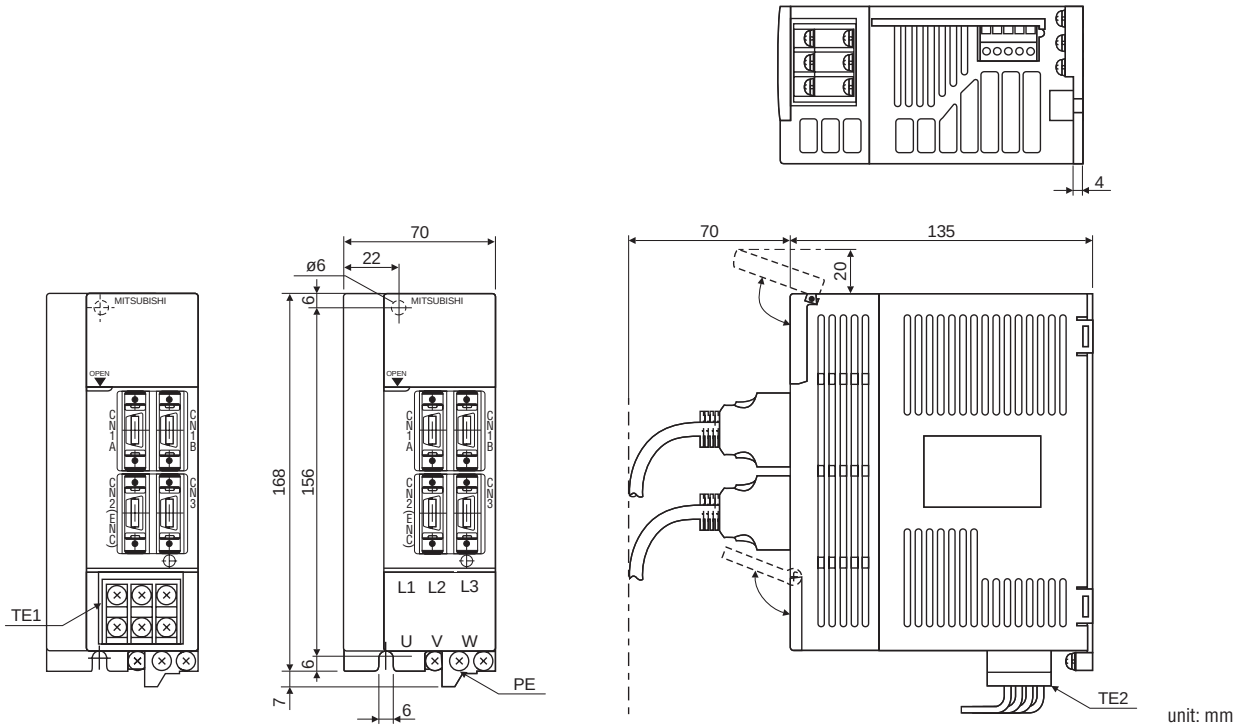
unit: mm

Servo Amplifiers

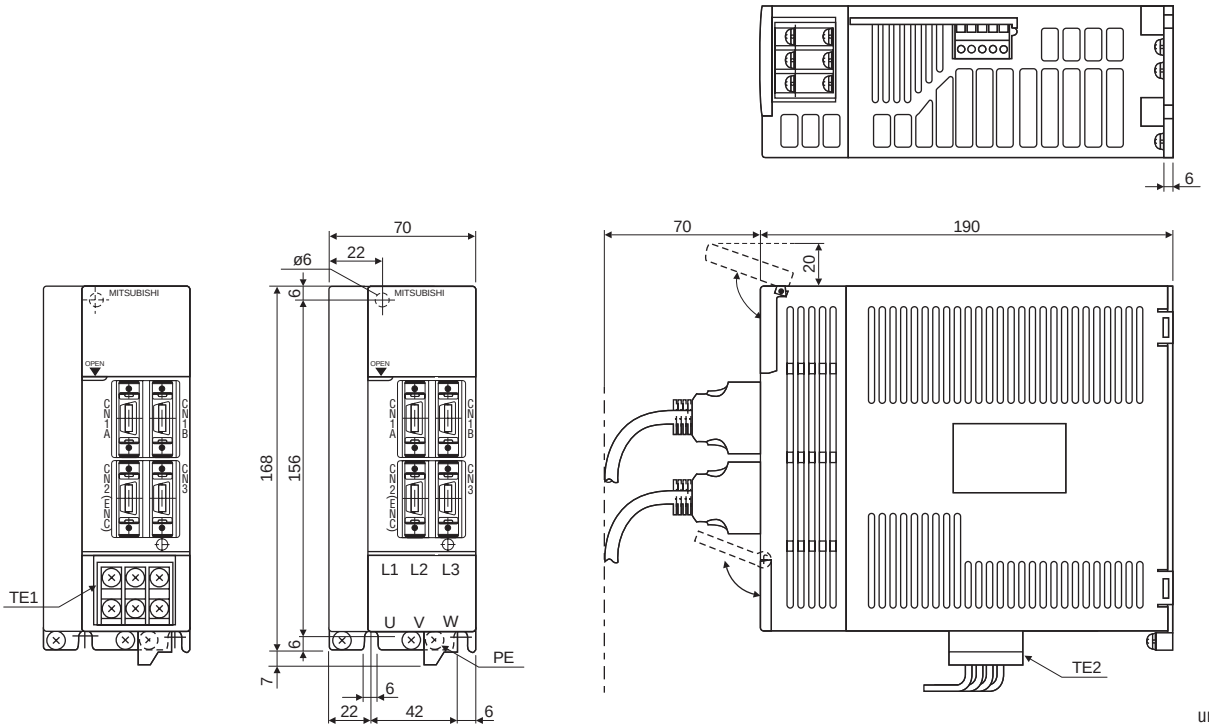
MR-J2-10A, MR-J2-20A



MR-J2-40A, MR-J2-60A

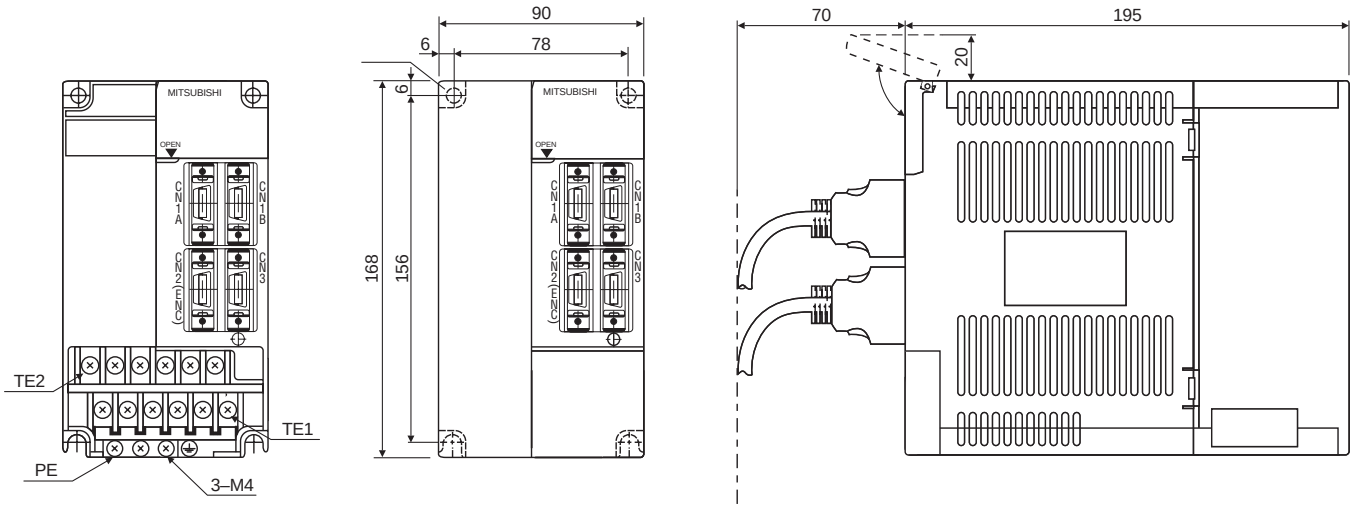


MR-J2-70A, MR-J2-100A



unit: mm

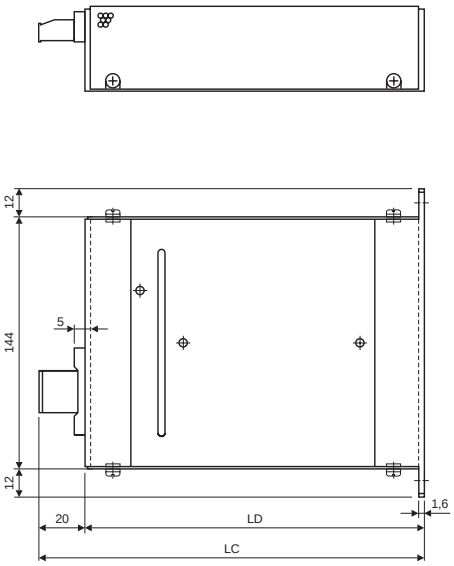
MR-J2-200A, MR-J2-350A



unit: mm

Brake Units

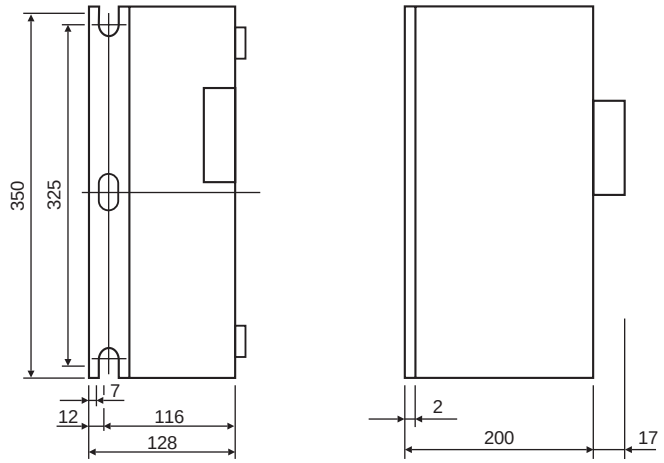
MR-RB032, MR-RB12



Type	LA [mm]	LB [mm]	LC [mm]	LD [mm]
MR-RB032	30	15	119	99
MR-RB12	40	15	169	149

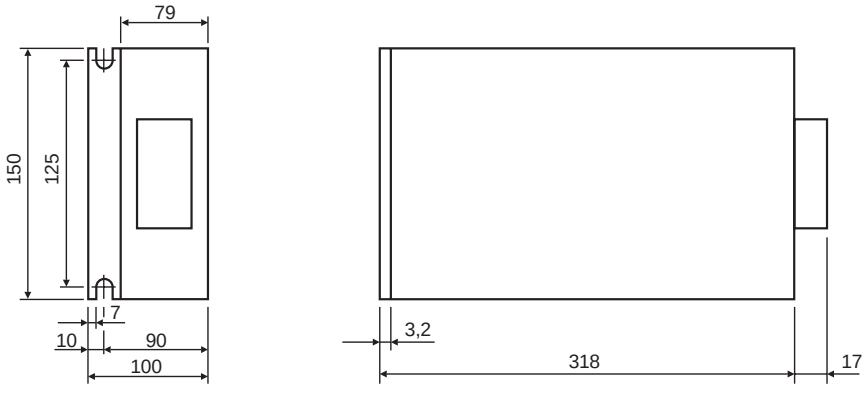
unit: mm

MR-RB32, MR-RB30



unit: mm

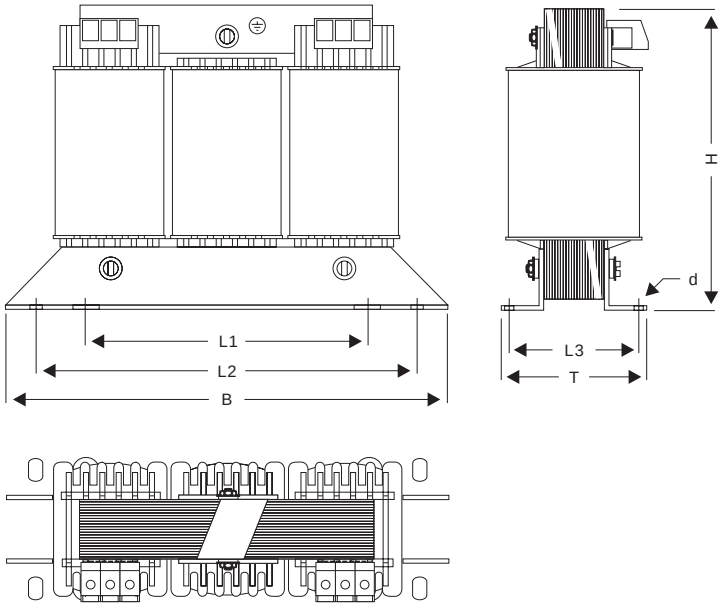
MR-RB50



unit: mm

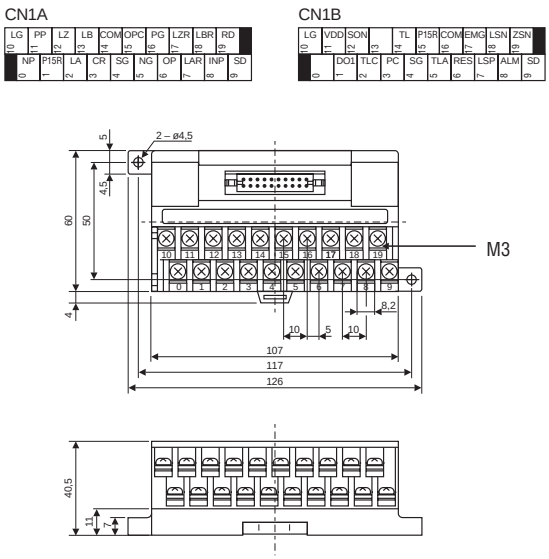
Transformer

UI : UA = 400 V :230 V



Type	Power capacity [kVA]	∅ Terminal [mm²]	B [mm]	T [mm]	H [mm]	L1 [mm]	L2 [mm]	L3 [mm]	d [mm²]	Weight [kg]
MT 01364023	1.3 1.7	2.5 2.5	219	105	163	136	201	71	7 x 12	7.0
MT 01764023	1.7 1.5	2.5 2.5	219	125	163	136	201	91	7 x 12	10.7
MT 02564023	2.5 3.5	2.5 2.5	267	115	202	176	249	80	7 x 12	16.5
MT 03564023	3.5 5.5	4 4	267	139	202	176	249	104	7 x 12	22.0
MT 05564023	5.5	4	267	139	202	175	249	104	7 x 12	22.0

Junction Terminal Block MR-TB20



unit: mm

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