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MITSUBISHI

SERVO AMPLIFIERS & MOTORS

# MELSERVO J2

## Simplified Operation with Advanced Capabilities




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# A New Vision of the Future

## The long-awaited MELSERVO-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 IP65 compatible and 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 toward a new vision of the future.

*Due for UL, cUL certification.





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# Main Features

## 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 servo-amps meet low-voltage directives (LVD) in their standard configuration, as do the HC-SF and HC-RF servomotors. HC-MF and HA-FF servomotors that conform to the LVD are also available.
- UL, cUL standards:

  Under the UL-CSA agreement, products certified under cUL standards are considered equivalent to products certified under CSA standards.

  The servo-amps meet these standards in their standard configuration, and servomotors that do so are also available.

TÜV Rheinland



### ■ IP65 is standard equipment (HC-SF, HC-RF and HC-UF series)

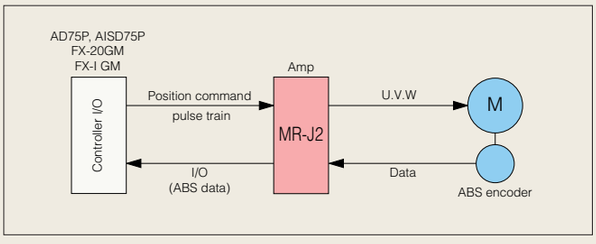
- The HC-SF, HC-RF and HC-UF series of servomotors come with IP65 as standard equipment, enhancing their ability to withstand any environment.

## Loaded with flexible functions

### ■ Absolute encoder is 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 amp's power has been turned on, servo amplifier causes absolute data to be sent to the motion controller at Servo ON.




### ■ Achievement of an ultra-compact design

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

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





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## Handy control functions

### ■ Separate wiring for the control power supply

•Wiring of the control power supply is separate 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. This also makes it easier to handle EN-standard mechanical directives.

### ■ 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

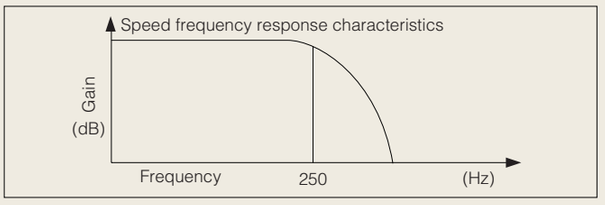
•Microvibrations in the servo-lock state are suppressed through a unique method developed by Mitsubishi, making possible the construction of stable systems.

### ■ 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 makes possible the realization of a highly responsive and stable system.




## User-friendly features

### ■ Personal computer interface is standard equipment

•The J2 comes with RS-232C serial communications as a standard feature, enabling users to connect a personal computer to the J2.

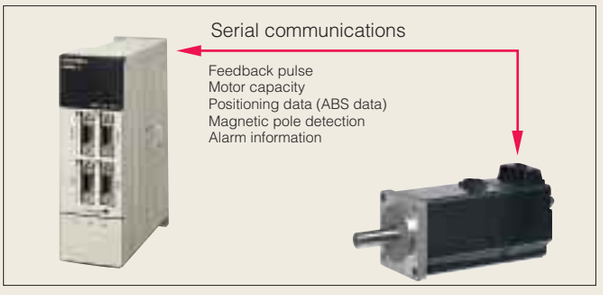
•Using the setup software provided, users can display a variety of monitoring data, perform batch entry and saving of parameters, use graph functions, and perform test operation.

Model: MRZJW3-SETUP51E and above.




### ■ Automatic motor recognition feature

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

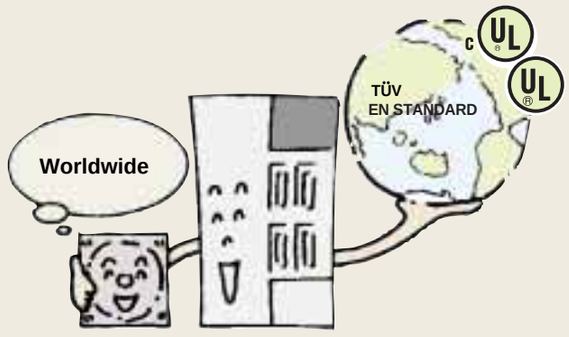




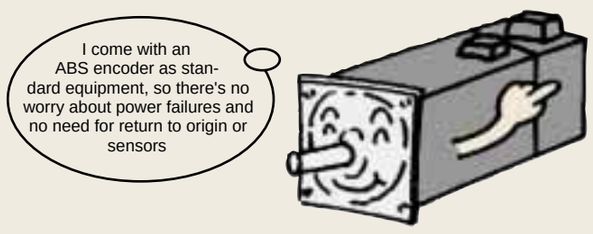

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# An Array of Handy Functions

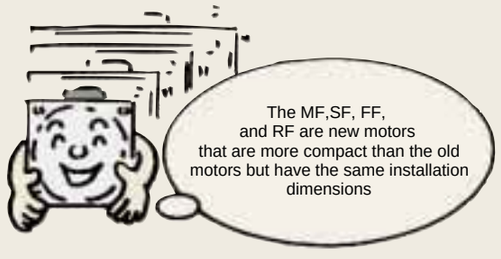
**Satisfies global industrial standards**
The J2 can be used with the confidence of knowing it satisfies global industrial standards, including EN and UL.



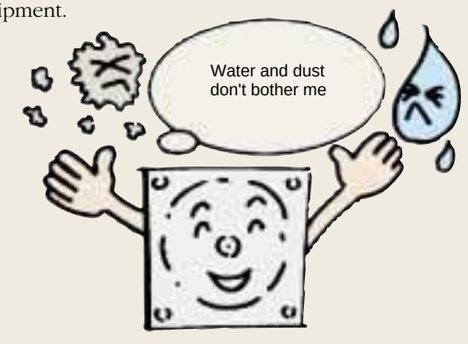

**Absolute encoder is standard equipment**
The J2 can be easily switched to absolute encoding, which requires no return to home, by merely adding a battery to the servo-amp and without changing the servomotor.



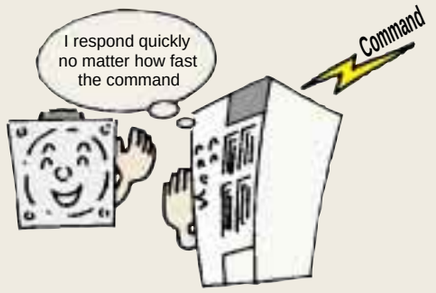

**More compact servomotors**
Mitsubishi's servomotors keep getting smaller: The ultra-compact HC-MF series, the low inertia HC-RF series, the medium inertia HC-SF series and flat type HC-UF series.



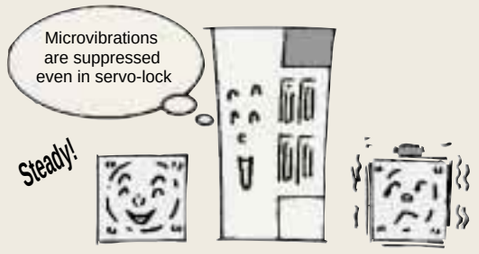

**Enhanced ability to withstand environmental hazards**
HC-SF, HC-RF and HC-UF series are rated IP65 as standard equipment.



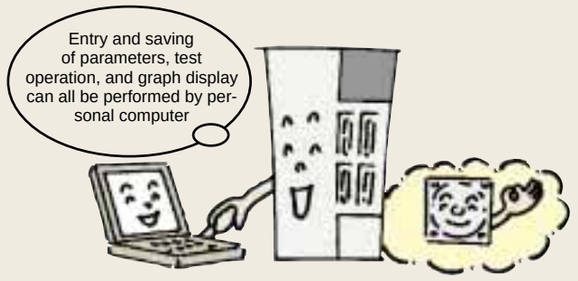

**Model adaptive control**
Because the J2 operates in quick response to commands, it offers highly responsive and stable operation, unaffected by machine systems.



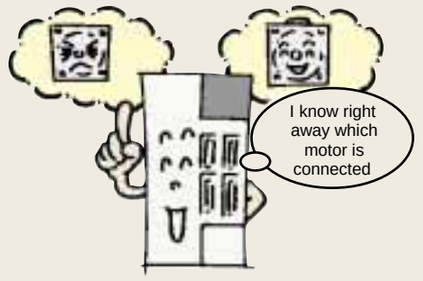

**Servo-lock anti-microvibration function**
Microvibrations in the servo-lock state are suppressed, making possible the construction of stable systems.




**Personal computer interface is standard equipment**
The J2 comes with an RS-232C 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.




**Automatic servomotor recognition**
Once the encoder cable has been connected, the servo-amp can determine, as soon as its power is turned on, which servomotor is connected.

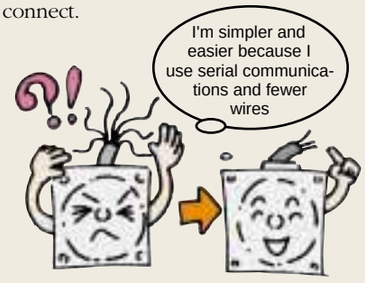





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# An Array of Handy Functions

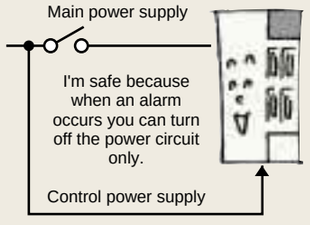
**Encoder serial communications**
The encoder uses serial communications, so there are fewer signal wires to connect.



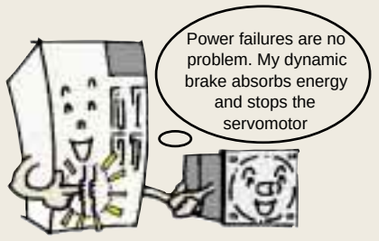

**Real-time auto-tuning**
The servo makes automatic gain adjustments even when the load's inertia changes.



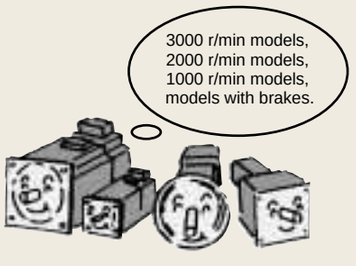

**Separate wiring for the control power supply**
The servo-amp's control power supply is wired separately, making it possible to turn off the main circuit only, when an alarm is triggered. This also makes it easier to handle EN-standard mechanical directives.




**Built-in dynamic brake**
With a built-in dynamic brake, the servomotor can be stopped immediately in a power failure or when an alarm has been triggered.

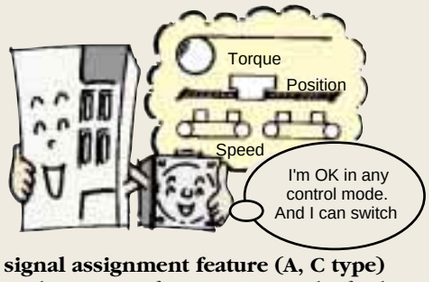



**A wide variety of motors, including models with brakes**
A broad lineup of servomotors including with brakes. Users can choose the motor series that best suits the machine being used.

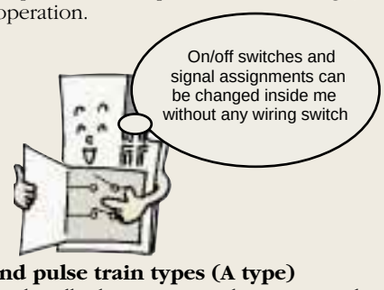



**Built-in regenerative resistor**
Regenerative resistor is built in, eliminating the need for an external regeneration unit during normal operation.

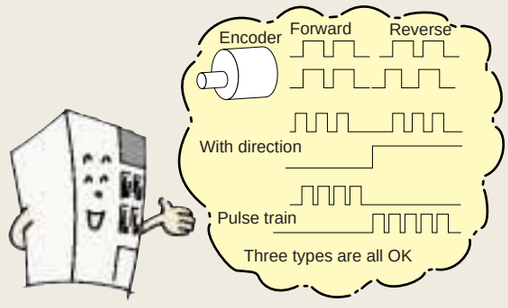
**Switch between torque control mode and other control modes**
Switching between torque, speed, and position control modes is possible for the first time.



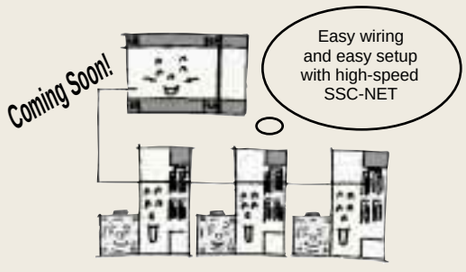

**Control signal assignment feature (A, C type)**
Control signals necessary for operation can be freely assigned to connector pins within a predetermined range, enabling more flexible operation.




**Command pulse train types (A type)**
The J2 can handle three command types: encoder signals, pulse and direction, and CW/CCW pulse train.



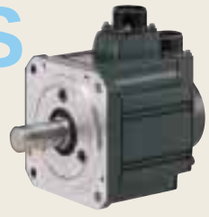

**SSC-NET compatible (B type)**
The controller is connected to each servo-amp through a high-speed serial bus, enabling users to issue commands to, and confirm the status of, the servo-amps with the motion controller. And fewer wires reduce the chances of a wiring error.






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# Servomotor Features and Amplifier Models

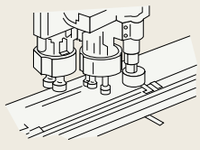
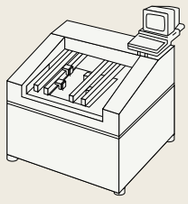
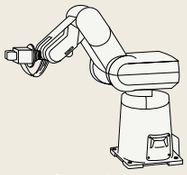
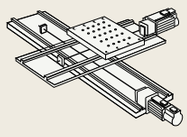
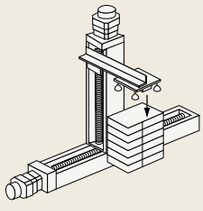
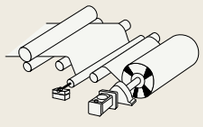
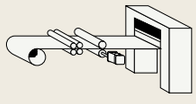
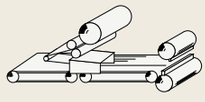
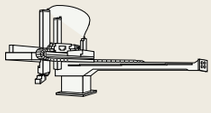
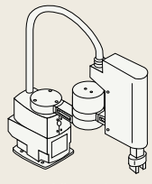
| Motor series | Rated speed (maximum) (r/min) | Rated output capacity (kW) | Servo motor model | Servomotor type | | | Amp pairing MR-J2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | With electro-magnet-ic brake (B) | With absolute encoder | Protec-tive structure | 10A 10B 10C | 20A 20B 20C | 40A 40B 40C | 60A 60B 60C | 70A 70B 70C | 100A 100B 100C | 200A 200B 200C | 350A 350B 350C |
| **HC-MF series** M  | 3000 (4500) | 0.05 | HC-MF053 | ○ | ○ | IP44 | ○ | | | | | | | |
| | | 0.1 | HC-MF13 | ○ | ○ | IP44 | ○ | | | | | | | |
| | | 0.2 | HC-MF23 | ○ | ○ | IP44 | | ○ | | | | | | |
| | | 0.4 | HC-MF43 | ○ | ○ | IP44 | | | ○ | | | | | |
| | | 0.75 | HC-MF73 | ○ | ○ | IP44 | | | | | ○ | | | |
| **HA-FF series** F  | 3000 (4000) | 0.05 | HA-FF053 | ○ | ○ | IP44 | ○ | | | | | | | |
| | | 0.1 | HA-FF13 | ○ | ○ | IP44 | ○ | | | | | | | |
| | | 0.2 | HA-FF23 | ○ | ○ | IP44 | | ○ | | | | | | |
| | | 0.3 | HA-FF33 | ○ | ○ | IP44 | | | ○ | | | | | |
| | | 0.4 | HA-FF43 | ○ | ○ | IP44 | | | ○ | | | | | |
| | | 0.6 | HA-FF63 | ○ | ○ | IP44 | | | | ○ | | | | |
| **HC-SF series** S  | 1000 (1500: 0.85kW 1200: 1.2~3kW) | 4-type 0.85, 1.2, 2.0, 3.0 | HC-SF 81/121/201/301 | ○ | ○ | IP65 (IP67) | | | | | | ○ | ○ | ○ |
| | 2000 (3000: 0.5~1.5kW 2500: 2~3.5kW) | 5-type 0.5, 1.0, 1.5, 2.0, 3.5 | HC-SF 52/102/152/ 202/352 | ○ | ○ | IP65 (IP67) | | | | ○ | | ○ | ○ | ○ |
| | 3000 (3000) | 5-type 0.5, 1.0, 1.5, 2.0, 3.5 | HC-SF 53/103/153/ 203/353 | ○ | ○ | IP65 (IP67) | | | | ○ | | ○ | ○ | ○ |
| **HC-RF series** R  | 3000 (4500) | 1.0 | HC-RF103 | ○ | ○ | IP65 | | | | | | | ○ | |
| | | 1.5 | HC-RF153 | ○ | ○ | IP65 | | | | | | | ○ | |
| | | 2.0 | HC-RF203 | ○ | ○ | IP65 | | | | | | | | ○ |
| **HC-UF series** U  | 2000 (3000) | 3-type 0.75, 1.5, 2.0 | HC-UF 72/152/202 | ○ | ○ | IP65 | | | | | ○ | | ○ | ○ |
| | 3000 (4500) | 4-type 0.1, 0.2, 0.4, 0.75 | HC-UF 13/23/43/73 | ○ | ○ | IP65 except connector (note 1) | ○ | ○ | ○ | | ○ | | | |

Note: Models within the production range and servo-amp compatible models.



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# Applications and Motor Models

| Feature | Application examples |
|---|---|
| • **Ultra-low inertia, low capacity**<br>Interchangeable with existing model (HA-ME).<br>Ultra-low inertia design makes this unit well suited for high-frequency positioning applications.<br>Higher resolution positioning feedback pulse (8192 P/rev).<br>• **Enhanced power rate**<br>Power rate is 1.2 times that of existing models. | • Inserters, mounters, bonders<br>• Printed board hole openers<br>• In-circuit testers<br>• Label printers<br>• Knitting and embroidery machinery<br>• Ultra-small robots and robot tips<br> Inserters, mounters, bonders<br> In-circuit testers |
| • **Low inertia, low capacity**<br>Interchangeable with existing model (HA-FE).<br>Higher resolution positioning feedback pulse (8192 P/rev).<br>Stable control can be performed from low to high speeds, enabling this unit to handle a wide range of applications. | • LCD and conveyors<br>• Food preparation machinery<br>• Printers<br>• Small loaders and unloaders<br>• Small robots and component assembly devices<br>• Small X-Y tables<br>• Small press feeders<br> Small robots<br> Small X-Y table devices |
| • **Medium inertia, medium capacity**<br>Interchangeable with existing model (HA-SE).<br>Higher resolution positioning feedback pulse (16384 P/rev).<br>Stable control can be performed from low to high speeds, enabling this unit to handle a wide range of applications.<br>• **Enhanced power rate**<br>Power rate is 1.5 times that of existing models.<br>• **IP65**<br>Designed to withstand environmental hazards. | • Conveyor machinery<br>• Specialized machinery<br>• Robots<br>• Loaders and unloaders<br>• Winders and tension devices<br>• Turrets<br>• X-Y tables<br>• Test devices<br> Conveyor machinery<br> Winders and tension devices |
| • **Low inertia, medium capacity**<br>Low inertia design makes this unit well suited to high-frequency positioning applications.<br>Higher resolution positioning feedback pulse (16384 P/rev).<br>• **High power rate**<br>Power rate is approximately 3 times that of HA-LH.<br>• **IP65**<br>Designed to withstand environmental hazards. | • Roll feeders<br>• Loaders and unloaders<br>• High-frequency conveyor machinery<br> Roll feeders<br> Wrapping machinery |
| • **Flat low capacity, medium capacity**<br>Enable stable control from low speeds to high, making them suitable for a wide range of applications. Flat design produces slimmer machine profiles.<br>Resolution is higher for the positioning feedback pulse (low capacity: 8192 P/rev; Medium capacity: 16384 P/rev).<br>• **IP65**<br>Environmentally sensitive design. | • Robots<br>• Conveyor machines<br>• Food processing machines<br>• Winder and tension devices<br> AC robot<br> Micro robot |



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# Model Configurations

## ■Servo-amp

**MR-J2-10A1**

**Mitsubishi servo-amp series name**

**A: Standard**
**B: SSC-NET**
**C: With built-in positioning function**

| Symbol | Power supply |
|---|---|
| None | 3-phase AC 200V or single-phase AC 100V |
| 1 | Single-phase AC 100V |

**Compatible motor output capacity (kW)**

| Symbol | HC-MF | HA-FF | HC-SF | | | HC-RF | HC-UF | |
|---|---|---|---|---|---|---|---|---|
| | | | 1000 r/min | 2000 r/min | 3000 r/min | | 2000 r/min | 3000 r/min |
| 10 | 053, 13 | 053, 13 | — | — | — | — | — | 13 |
| 20 | 23 | 23 | — | — | — | — | — | 23 |
| 40 | 43 | 33, 43 | — | — | — | — | — | 43 |
| 60 | — | 63 | — | 52 | 53 | — | — | — |
| 70 | 73 | — | — | — | — | — | 72 | 73 |
| 100 | — | — | 81 | 102 | 103 | — | — | — |
| 200 | — | — | 121, 201 | 152, 202 | 153, 203 | 103, 153 | 152 | — |
| 350 | — | — | 301 | 352 | 353 | 203 | 202 | — |

## ■Servomotor

**HC-MF 05 3 □ B □ - □**

**Mitsubishi AC servomotors**
**HC-MF series**
**HA-FF series**
**HC-SF series**
**HC-RF series**
**HC-UF series**

| Symbol | Rated output capacity (kW) |
|---|---|
| 05 | 0.05 |
| 1 to 7 | 0.1 to 0.75 |
| 10 to 35 | 1.0 to 3.5 |

| Symbol | Rated (r/min) |
|---|---|
| 1 | 1000 |
| 2 | 2000 |
| 3 | 3000 |

Note: Make a specific enquiry regarding whether specially developed products meet standards.

(HC-MF and -UF3000 r/min series)

| Symbol | Input supply format |
|---|---|
| None | Lead |
| C | — |

(HA-FF series)

| | Input supply format | |
|---|---|---|
| Symbol | HA-FF | HA-FF-UE |
| None | Lead | — |
| C | — | Canon connector |

(HC-SF, -RF, and -UF2000 r/min series)

| Symbol | Input supply format |
|---|---|
| None | Canon connector |
| C | — |

| Symbol | Electromagnetic brake |
|---|---|
| None | — |
| B | Installed |

| Symbol | Axial end |
|---|---|
| None | Standard*1 |
| K | Key way*3 |
| D | D-cut*2 |

Notes:
1. A key way is standard on the HA-FF23 through HA-FF63. All others have a straight shaft as standard.
2. The D-cut works only with the HC-MF and HA-FF models of 100W or less.
3. HC-MF□K and HC-UF□K (3000 r/min) have key.

(HC-MF, HA-FF series)

| Symbol | Non-Japanese standard compatibility |
|---|---|
| None | Standard product. Japanese compatibility |
| UE | Meet EN and UL/cULstandard |

Note: The standard specifications of the HC-SF, HC-RF, and HC-UF model series meet EN and UL/cUL standards.



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# SERVO MOTORS HA/HC -MF/FF/SF/RF/UF

## Servomotors High torque in Super-Compact Dimensions

- Satisfies global industrial standards
- IP65 is standard equipment (SF, RF and UF motors)
- Absolute encoder is standard equipment
- Ultra-compact design





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# Specifications and Characteristics

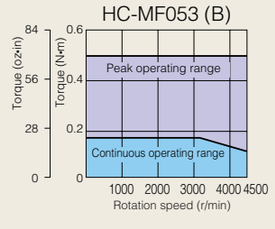
## HC-MF series servomotor specifications

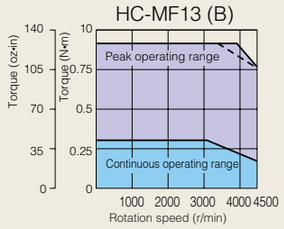
| Servomotor series | | | HC-MF series (low capacity, ultra-low inertia) | | | | |
|---|---|---|---|---|---|---|---|
| Models / Specifications | | Servomotor model HC- | MF053 (B) | MF13 (B) | MF23 (B) | MF43 (B) | MF73 (B) |
| | | Servo-amp model | MR-J2-10A/A1/B/C | | MR-J2-20A/A1/B/C | MR-J2-40A/A1/B/C | MR-J2-70A/B/C |
| Servomotor | Power facility capacity (kVA) (note 1) | | 0.3 | 0.3 | 0.5 | 0.9 | 1.3 |
| | Continuous characteristics | Rated output (W) | 50 | 100 | 200 | 400 | 750 |
| | | Rated torque (N·m [oz·in]) | 0.16 (22.7) | 0.32 (45.3) | 0.64 (90.6) | 1.3 (184.1) | 2.4 (339.8) |
| | Maximum torque (N·m [oz·in]) | | 0.48 (68.0) | 0.95 (134.5) | 1.9 (269.0) | 3.8 (538.1) | 7.2 (1019.5) |
| | Rated rotation speed (r/min) | | 3000 | | | | |
| | Maximum rotation speed (r/min) | | 4500 | | | | |
| | Permissible instantaneous rotation speed (r/min) | | 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 |
| | Regeneration braking frequency (times/min) (note 2) | With no options | (note 3) | (note 3) | (note 3) | 1010 | 400 |
| | | MR-RB032 (30W) | – | – | – | 3000 | 600 |
| | | MR-RB12 (100W) | – | – | – | (note 3) | 2400 |
| | Moment of inertia (figures inside parentheses indicate units with B) | J ($\times 10^{-4}$ kg·m$^2$) | 0.019 (0.022) | 0.03 (0.032) | 0.088 (0.136) | 0.143 (0.191) | 0.6 (0.725) |
| | | J (oz·in$^2$) | 0.104 (0.120) | 0.164 (0.175) | 0.481 (0.744) | 0.782 (1.05) | 3.28 (3.97) |
| | Recommended load/motor inertia ratio | | 30 times the servomotor's moment of inertia max. (note 4) | | | | |
| | Speed/position detector | | Resolution per encoder/servomotor rotation: 8192 P/rev<br>(Can handle up to 32768 P/rev with special specifications. The amp is made to order.) | | | | |
| | Attachments | | Encoder | | | | |
| | Structure | | Totally Enclosed non ventilated (protection degree: IP44) (note 6) | | | | |
| | Environment | Ambient temperature | 0 to 40°C (32 to 104°F) (non freezing), storage: –15 to 70°C (5 to 158°F) (non freezing) | | | | |
| | | Ambient humidity | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | |
| | | Atmosphere | Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, or dust | | | | |
| | | Elevation/vibration (note 5) | 1000 meters or less above sea level; X: 19.6 m/s$^2$ (2 G), Y: 19.6 m/s$^2$ (2 G) | | | | |
| | Weight kg (lb) | | 0.4 (0.9) | 0.53 (1.2) | 0.99 (2.2) | 1.45 (3.2) | 3.0 (6.7) |

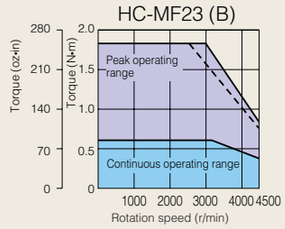
Notes:
1. The power facility capacity varies depending on the power supply's impedance.
2. The figures for regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, regeneration braking frequency is 1/(m+1) of the figure in the table (m = load's moment of inertia/motor's moment of inertia). 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 of inertia ratio must be 30 or less.
4. Contact Mitsubishi if the load/motor of inertia ratio exceeds the figure in the table.
5. The vibration direction is shown in this diagram.
6. Excluding the shaft-through section and connectors.

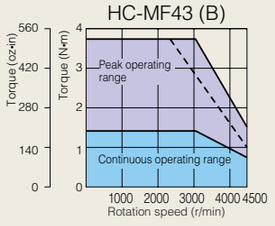


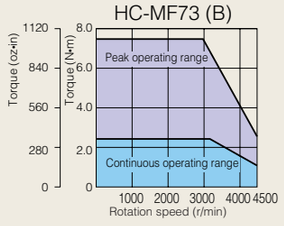

## HC-MF series servomotor torque characteristics




*Remarks: Broken lines shows peak operating range paired with 100V, single-phased amplifier.



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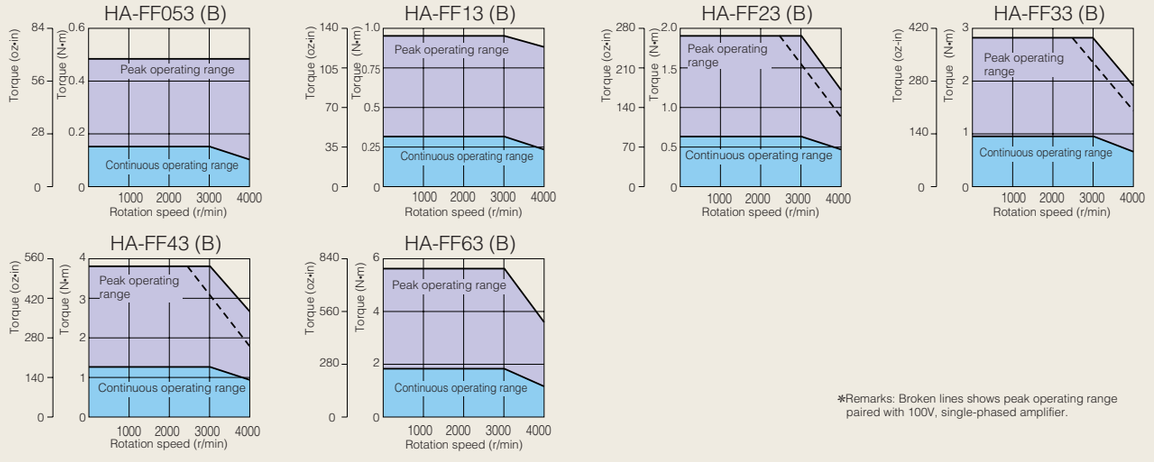
## HA-FF series servomotor specifications

| Servomotor series | | | HA-FF series (low capacity, low inertia) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Specifications \ Models | | Servomotor model HA- | FF053 (B) | FF13 (B) | FF23 (B) | FF33 (B) | FF43 (B) | FF63 (B) |
| | | Servo-amp model | MR-J2-10A/A1/B/C | | MR-J2-20A/A1/B/C | MR-J2-40A/A1/B/C | | MR-J2-60A/B/C |
| Servomotor | Power facility capacity (kVA) (note 1) | | 0.3 | 0.3 | 0.5 | 0.7 | 0.9 | 1.1 |
| | Continuous characteristics | Rated output (W) | 50 | 100 | 200 | 300 | 400 | 600 |
| | | Rated torque (N·m [oz·in]) | 0.16 (22.7) | 0.32 (45.3) | 0.64 (90.6) | 0.95 (134.5) | 1.3 (184.1) | 1.9 (269.0) |
| | Maximum torque (N·m [oz·in]) | | 0.48 (68.0) | 0.95 (134.5) | 1.9 (269.0) | 2.9 (410.6) | 3.8 (538.1) | 5.7 (807.1) |
| | Rated rotation speed (r/min) | | 3000 | | | | | |
| | Maximum rotation speed (r/min) | | 4000 | | | | | |
| | Permissible instantaneous rotation speed (r/min) | | 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 (times/min) (note 2) | With no options | (note 3) | (note 3) | (note 3) | 320 | 150 | 120 |
| | | MR-RB032 (30W) | – | – | – | 950 | 450 | 360 |
| | | MR-RB12 (100W) | – | – | – | 3200 | 1500 | 1200 |
| | Moment of inertia (figures inside parentheses indicate units with B) | J (×10$^{-4}$ kg·m$^2$) | 0.063 (0.08) | 0.095 (0.113) | 0.35 (0.483) | 0.50 (0.633) | 0.98 (1.325) | 1.20 (1.55) |
| | | J (oz·in$^2$) | 0.344 (0.438) | 0.520 (0.618) | 1.915 (2.641) | 2.74 (3.461) | 5.36 (7.24) | 6.56 (8.47) |
| | Recommended load/motor of inertia ratio | | 10 times the servomotor's moment of inertia max. (note 3) | | | | | |
| | Speed/position detector | | Resolution per encoder/servomotor rotation: 8192 P/rev<br>(Can handle up to 32768 P/rev with special specifications. The amp is made to order.) | | | | | |
| | Attachments | | Encoder, V-ring | | | | | |
| | Structure | | Totally Enclosed non ventilated (protection degree: IP44) | | | | | |
| | Environment | Ambient temperature | 0 to 40°C (32 to 104°F) (non freezing), storage: –15 to 70°C (5 to 158°F) (non freezing) | | | | | |
| | | Ambient humidity | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | |
| | | Atmosphere | Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, or dust | | | | | |
| | | Elevation/vibration (note 4) | 1000 meters or less above sea level; X: 19.6 m/s$^2$ (2 G), Y: 19.6 m/s$^2$ (2 G) | | | | | |
| | Weight kg (lb) | | 1.3 (2.9) | 1.5 (3.3) | 2.3 (5.1) | 2.6 (5.8) | 4.2 (9.3) | 4.8 (10.7) |

Notes:
1. The power facility capacity varies depending on the power supply's impedance.
2. The figures for regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. When load is applied, regeneration braking frequency is 1/(m+1) of the figure in the table (m = load's moment of inertia/motor's moment of inertia). 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. Contact Mitsubishi if the load/motor of inertia ratio exceeds the figure in the table.
4. The vibration direction is shown in this diagram.




## HA-FF series servomotor torque characteristics




*Remarks: Broken lines shows peak operating range paired with 100V, single-phased amplifier.



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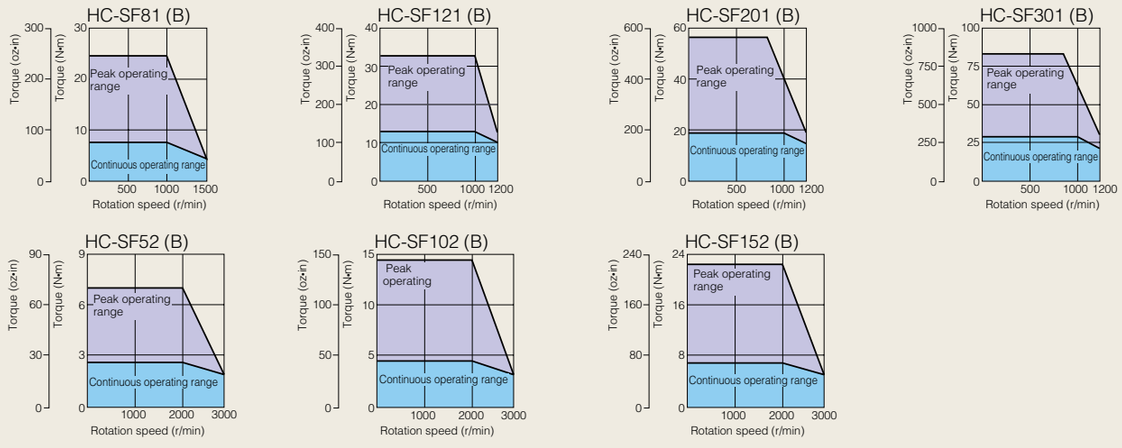
# Specifications and Characteristics

## HC-SF series servomotor specifications

| Servomotor series | | | HC-SF1000 r/min series (medium inertia, medium capacity) | | | | HC-SF2000 r/min series | |
|---|---|---|---|---|---|---|---|---|
| Type / Specifications | | Servomotor model HC- | SF81 (B) | SF121 (B) | SF201 (B) | SF301 (B) | SF52 (B) | SF102 (B) |
| | | Servo-amp model MR- | J2-100A/B/C | J2-200A/B/C | | J2-350A/B/C | J2-60A/B/C | J2-100A/B/C |
| Servomotor | Power facility capacity (kVA) (note 1) | | 1.5 | 2.1 | 3.5 | 4.8 | 1.0 | 1.7 |
| | Continuous characteristics | Rated output (kW) | 0.85 | 1.2 | 2.0 | 3.0 | 0.5 | 1.0 |
| | | Rated torque (N·m [oz·in]) | 8.12 (1149.8) | 11.5 (1628.4) | 19.1 (2704.5) | 28.6 (4049.4) | 2.39 (338.4) | 4.78 (676.8) |
| | Mxiumum torque (N·m [oz·in]) | | 24.4 (3455.0) | 34.4 (4871.0) | 57.3 (8113.5) | 85.9 (12163.2) | 7.16 (1013.8) | 14.4 (2039.0) |
| | Rated rotation speed (r/min) | | 1000 | | | | 2000 | |
| | Maximum rotation speed (r/min) | | 1500 | 1200 | | | 3000 | |
| | Permissible instantaneous rotation speed (r/min) | | 1725 | 1380 | | | 3450 | |
| | Power rate (kW/s) | | 32.9 | 30.9 | 44.5 | 81.3 | 8.7 | 16.7 |
| | Rated current (A) | | 5.1 | 7.1 | 9.6 | 16.0 | 3.2 | 6 |
| | Maximum current (A) | | 15.3 | 21.3 | 28.8 | 48.0 | 9.6 | 18 |
| | Regeneration braking frequency (items/min) (note 2) | With no options | 140 | 240 | 100 | 84 | 56 | 54 |
| | | MR-RB032 (30W) | 220 | — | — | — | 165 | 80 |
| | | MR-RB12 (100W) | 740 | — | — | — | 560 | 270 |
| | | MR-RB32 (300W) | 2220 | — | — | — | 1680 | 810 |
| | | MR-RB30 (300W) | — | 730 | 330 | 250 | — | — |
| | | MR-RB50 (500W) | — | 1216 | 550 | 430 | — | — |
| | Moment of inertia (figures inside parentheses indicate units with B) | J ($\times 10^{-4}$ kg·m$^2$) | 20.0 (22.0) | 42.5 (52.5) | 82.0 (92) | 101 (111) | 6.6 (8.6) | 13.7 (15.7) |
| | | J (oz·in$^2$) | 109.0 (120.0) | 232 (287) | 448 (503) | 552 (607) | 36.1 (47.0) | 74.9 (85.8) |
| | Recommended load/motor of inertia ratio | | 15 times the servomotor's moment of inertia max. (note 3) | | | | | |
| | Speed/position encoder | | Encoder, Resolution per servomotor revolution: 16384 P/rev | | | | | |
| | Attachments | | Encoder, oil seal | | | | | |
| | Structure | | Totally Enclosed non ventilated (protection degree: IP65) (note 5) | | | | | |
| | Environment | Ambient temperature | 0 to 40°C (32 to 104°F) (non freezing), storage: −15 to 70°C (5 to 158°F) (non freezing) | | | | | |
| | | Ambient humidity | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | |
| | | Atmosphere | Indoors (no direct sunlight); no corrosive gas, flammable gas, oil mist, or dust | | | | | |
| | | Elevation | 1000 meters or less above sea level | | | | | |
| | | Vibration (note 4) | X: 9.8m/s$^2$ (1G) Y: 24.5m/s$^2$ (2.5G) | X: 19.6m/s$^2$ (2G) Y: 49m/s$^2$ (5G) | | X: 11.7m/s$^2$ (1.2G) Y: 29.4m/s$^2$ (3G) | X: 9.8m/s$^2$ (1G) Y: 24.5m/s$^2$ | |
| | Weight kg (lb) | | 9 (19.8) | 12 (26.5) | 19 (41.9) | 23 (50.7) | 5 (11.0) | 7 (15.4) |

Notes:
1. The power supply capacity varies with the power supply impedance.
2. The regenerative brake frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertial moment divided by the motor inertial moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (Operating speed/rated speed). When the operating rpm varies with the frequency or when regeneration is constant (as with vertical feeds), find the regenera-tion heat generated (W) while operating and do not exceed the permissible value.

## HC-SF series servomotor torque characteristics





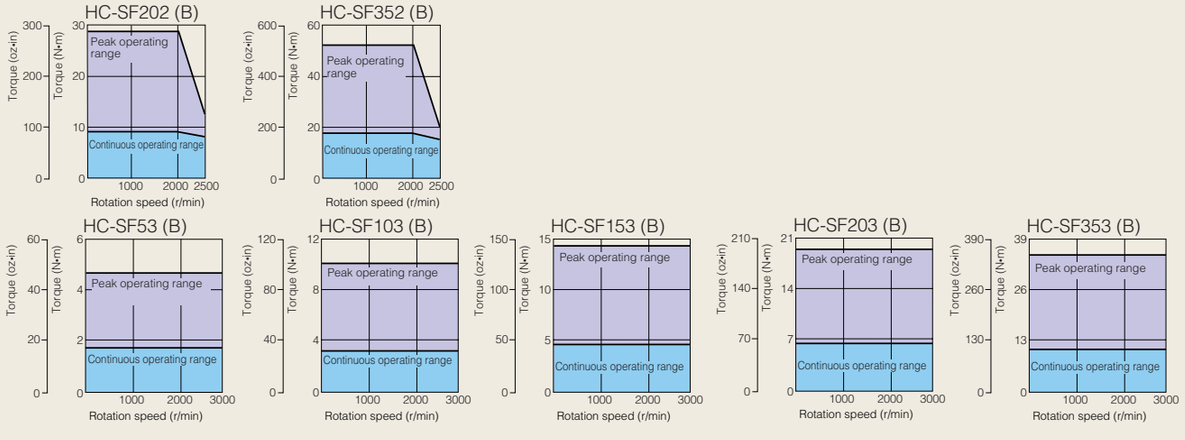

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| | (medium inertia, medium capacity) | | | HC-SF3000 r/min series (medium inertia, medium capacity) | | | | |
|---|---|---|---|---|---|---|---|---|
| | SF152 (B) | SF202 (B) | SF352 (B) | SF53 (B) | SF103 (B) | SF153 (B) | SF203 (B) | SF353 (B) |
| | J2-200A/B/C | | J2-350A/B/C | J2-60A/B/C | J2-100A/B/C | J2-200A/B/C | | J2-350A/B/C |
| | 2.5 | 3.5 | 5.5 | 1.0 | 1.7 | 2.5 | 3.5 | 5.5 |
| | 1.5 | 2.0 | 3.5 | 0.5 | 1.0 | 1.5 | 2.0 | 3.5 |
| | 7.16 (1013.8) | 9.55 (1352.3) | 16.7 (2364.7) | 1.59 (225.1) | 3.18 (450.3) | 4.78 (676.8) | 6.37 (901.9) | 11.1 (1571.6) |
| | 21.6 (3058.5) | 28.5 (4035.5) | 50.1 (7094.0) | 4.77 (675.4) | 9.55 (1352.3) | 14.3 (2024.8) | 19.1 (2704.5) | 33.4 (4729.3) |
| | 2000 | | | 3000 | | | | |
| | 3000 | 2500 | | 3000 | | | | |
| | 3450 | 2850 | | 3450 | | | | |
| | 25.6 | 21.5 | 34.1 | 3.8 | 7.4 | 11.4 | 9.5 | 15.1 |
| | 9 | 11 | 17 | 3.2 | 5.3 | 8.6 | 10.4 | 16.4 |
| | 27 | 33 | 51 | 9.6 | 15.9 | 25.8 | 31.2 | 49.2 |
| | 185 | 53 | 31 | 25 | 24 | 82 | 24 | 14 |
| | — | — | — | 73 | 36 | — | — | — |
| | — | — | — | 250 | 120 | — | — | — |
| | — | — | — | 750 | 360 | — | — | — |
| | 560 | 160 | 95 | — | — | 250 | 70 | 42 |
| | 920 | 260 | 150 | — | — | 410 | 110 | 70 |
| | 20 (22) | 42.5 (52.5) | 82 (92) | 6.6 (8.6) | 13.7 (15.7) | 20 (22) | 42.5 (52.5) | 82 (92) |
| | 109 (120) | 232 (287) | 448 (503) | 36.1 (47.0) | 74.9 (85.8) | 109 (120) | 232 (287) | 448 (503) |
| | 15 times the servomotor's moment of inertia max. (note 3) | | | | | | | |
| (Can handle 131072 P/rev with special specifications. The amp is made to order.) (note 6) | | | | | | | | |
| | Encoder, oil seal | | | | | | | |
| | Totally Enclosed non ventilated (protection degree: IP65) (note 5) | | | | | | | |
| | 0 to 40°C (32 to 104°F) (non freezing), storage: −15 to 70°C (5 to 158°F) (non freezing) | | | | | | | |
| | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | | | |
| | Indoors (no direct sunlight); no corrosive gas, flammable gas, oil mist, or dust | | | | | | | |
| | 1000 meters or less above sea level | | | | | | | |
| (2.5G) | X: 19.6m/s² (2G) Y: 49m/s² (5G) | | | X: 9.8m/s² (1G) Y: 24.5m/s² (2.5G) | | | X: 19.6m/s² (2G) Y: 49m/s² (5G) | |
| | 9 (19.8) | 12 (26.5) | 19 (41.9) | 5 (11.0) | 7 (15.4) | 9 (19.8) | 12 (26.5) | 19 (41.9) |

3. Contact Mitsubishi if you must exceed the stated load inertial moment ratio.
4. The directions of vibration are as follows.




5. Cannot be used with model MR-J2-C. Contact Mitsubishi for details.






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# Specifications and Characteristics

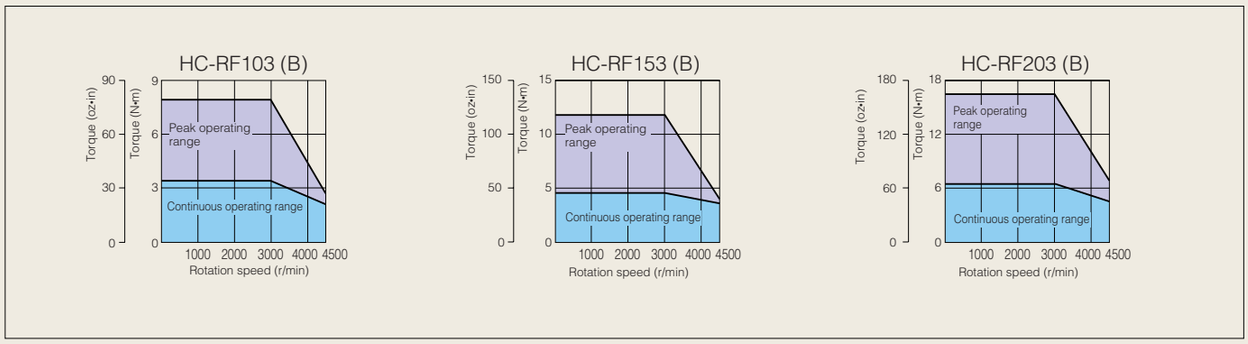
## HC-RF series servomotor specifications

| Servomotor series | | | HC-RF series (low inertia) | | |
|---|---|---|---|---|---|
| Specifications \ Models | | Servomotor model HC- | RF103 (B) | RF153 (B) | RF203 (B) |
| | | Servo-amp model | MR-J2-200A/B/C | | MR-J2-350A/B |
| Servomotor | Power facility capacity (kVA) (note 1) | | 1.7 | 2.5 | 3.5 |
| | Continuous characteristics | Rated output (kW) | 1.0 | 1.5 | 2.0 |
| | | Rated torque (N·m [oz·in]) | 3.18 (450.3) | 4.78 (676.8) | 6.37 (902.0) |
| | Maximum torque (N·m [oz·in]) | | 7.95 (1125.7) | 11.9 (1685.0) | 15.9 (2251.4) |
| | Rated rotation speed (r/min) | | 3000 | | |
| | Maximum rotation speed (r/min) | | 4500 | | |
| | Permissible instantaneous rotation speed (r/min) | | 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 (times/min) (note 2) | With no options | 1090 | 860 | 710 |
| | | MR-RB30 (300W) | 3270 | 2580 | 2130 |
| | | MR-RB50 (500W) | 5450 | 4300 | 3550 |
| | Moment of inertia (figures inside parentheses indicate units with B) | J ($\times 10^{-4}$ kg·m$^2$) | 1.5 (1.85) | 1.9 (2.25) | 2.3 (2.65) |
| | | J (oz·in$^2$) | 8.20 (10.1) | 10.4 (12.3) | 12.6 (14.5) |
| | Recommended load/moment of inertia ratio | | 5 times the servomotor's moment of inertia max. (note 3) | | |
| | Speed/position encoder | | Resolution per encoder/servomotor rotation: 16384 P/rev<br>(Can handle up to 131072 P/rev with special specifications. The amp is made to order.) | | |
| | Attachments | | Encoder, oil seal | | |
| | Structure | | Totally Enclosed non ventilated (protection degree: IP65) | | |
| | Environment | Ambient temperature | 0 to 40°C (32 to 104°F) (non freezing), storage: –15 to 70°C (5 to 158°F) (non freezing) | | |
| | | Ambient humidity | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | |
| | | Atmosphere | Indoors (no direct sunlight); no corrosive gas, inflammable gas, oil mist, or dust | | |
| | | Elevation/vibration (note 4) | 1000 meters or less above sea level; X: 9.8 m/s$^2$ (1 G), Y: 24.5 m/s$^2$ (2.5 G) | | |
| | Weight kg (lb) | | 3.9 (8.7) | 5.0 (11.1) | 6.2 (13.8) |

Notes:
1. The power facility capacity varies depending on the power supply's impedance.
2. The figures for regeneration braking frequency indicate the permissible frequency when the motor alone decelerates to a stop from the rated rotation speed. Below 200, there are no limits on regeneration as long as the effective torque is within the rated torque range. When load is applied, regeneration braking frequency is 1/(m+1) of the figure in the table (m = load's moment of inertia/motor's moment of inertia). When the rated rotation speed is exceeded, the permissible number of times 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 up/down feed, the regeneration heat generated during operation must be assessed and measures taken to make sure that it does not exceed the permissible range.
3. Contact Mitsubishi if the load/motor of inertia ratio exceeds the figure in the table.
4. The vibration direction is shown in this diagram.




## HC-RF series servomotor torque characteristics






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## HC-UF series servomotor specifications

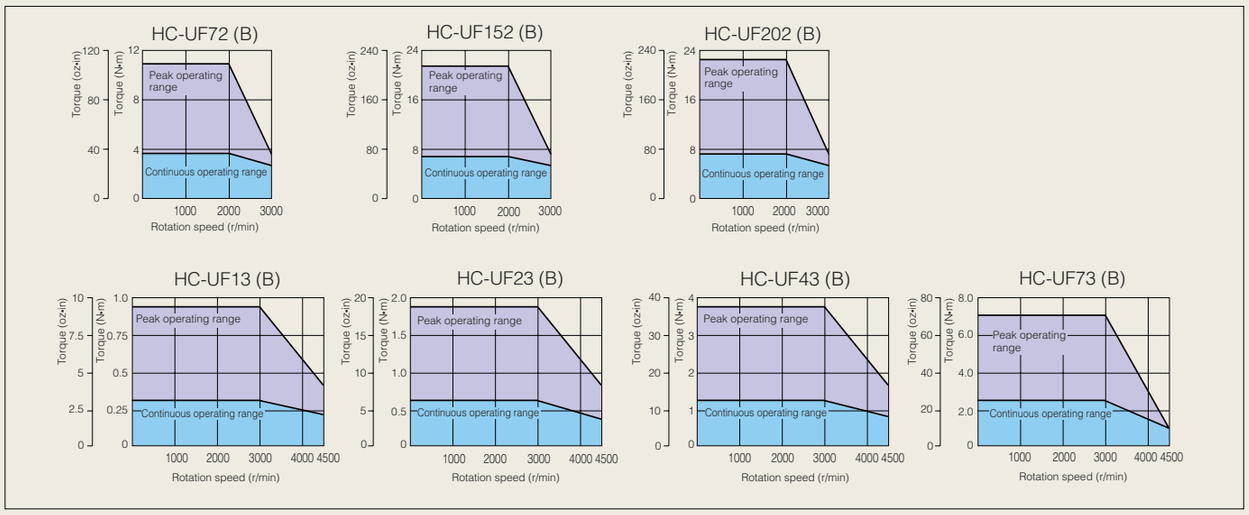
| Servomotor series | | | HC-UF2000 r/min series (flat model, medium capacity) | | | HC-UF3000 r/min series (flat model, low capacity) | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type / Specifications | | Servomotor model HC- | UF72 (B) | UF152 (B) | UF202 (B) | UF13 (B) | UF23 (B) | UF43 (B) | UF73 (B) |
| | | Servo-amp model MR- | J2-70A/B/C | J2-200A/B/C | J2-350A/B/C | J2-10A/A1/B/C | J2-20A/A1/B/C | J2-40A/A1/B/C | J2-70A/B/C (note 8) |
| Servomotor | Power facility capacity (kVA) (note 1) | | 1.3 | 2.5 | 3.5 | 0.3 | 0.5 | 0.9 | 1.3 |
| | Continuous characteristics | Rated output (kW) | 0.75 | 1.5 | 2.0 | 0.1 | 0.2 | 0.4 | 0.75 |
| | | Rated torque (N·m [oz·in]) | 3.58 (506.9) | 7.16 (1013.8) | 9.55 (1352.3) | 0.32 (45.3) | 0.64 (90.6) | 1.3 (184.1) | 2.4 (339.8) |
| | Mxiumum torque (N·m [oz·in]) | | 10.7 (1515.1) | 21.6 (3058.5) | 28.5 (4035.5) | 0.95 (134.5) | 1.9 (269.0) | 3.8 (538.1) | 7.2 (1019.5) |
| | Rated rotation speed (r/min) | | 2000 | | | 3000 | | | |
| | Maximum rotation speed (r/min) | | 3000 | | | 4500 | | | |
| | Permissible instantaneous rotation speed (r/min) | | 3450 | | | 5175 | | | |
| | Power rate (kW/s) | | 12.3 | 23.2 | 23.9 | 15.5 | 19.2 | 47.7 | 9.66 |
| | Rated current (A) | | 5.4 | 9.7 | 14 | 0.76 | 1.5 | 2.8 | 4.3 |
| | Maximum current (A) | | 16.2 | 29.1 | 42 | 2.5 | 4.95 | 9.24 | 12.9 |
| | Regeneration braking frequency (items/min) (note 2) | With no options | 73 | 130 | 89 | (note 6) | (note 6) | 410 | 41 |
| | | MR-RB032 (30 W) | 109 | — | — | — | — | 1230 | 62 |
| | | MR-RB12 (100 W) | 365 | — | — | — | — | 4100 | 206 |
| | | MR-RB32 (300 W) | 1090 | — | — | — | — | — | — |
| | | MR-RB30 (300 W) | — | 390 | 260 | — | — | — | — |
| | | MR-RB50 (500 W) | — | 650 | 440 | — | — | — | — |
| | Moment of inertia (figures inside parentheses indicate units with B) | J ($\times 10^{-4}$ kg·m$^2$) | 10.4 (12.4) | 22.1 (24.1) | 38.2 (46.8) | 0.066 (0.074) | 0.241 (0.323) | 0.365 (0.447) | 5.90 (6.10) |
| | | J (oz·in$^2$) | 56.8 (67.8) | 120.8 (131.7) | 209 (255.7) | 0.361 (0.404) | 1.315 (1.762) | 1.994 (2.445) | 32.2 (33.3) |
| | Recommended load/motor of inertia ratio | | 15 times the servomotor's moment of inertia max. (note 3) | | | | | | |
| | Speed/position encoder | | Encoder, Resolution per servomotor revolution: 16384 P/rev (Can handle 131072 P/rev with special specifications. The amp is made to order.) (note 7) | | | Encoder, Resolution per servomotor revolution: 8192 P/rev (Can handle 32768 P/rev with special specifications. The amp is made to order.) (note 7) | | | |
| | Attachments | | Encoder, oil seal | | | | | | |
| | Structure | | Totally Enclosed non ventilated (protection degree: IP65) (note 5) | | | | | | |
| | Environment | Ambient temperature | 0 to 40°C (32 to 104°F) (non freezing), storage: −15 to 70°C (5 to 158°F) (non freezing) | | | | | | |
| | | Ambient humidity | 80% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | | |
| | | Atmosphere | Indoors (no direct sunlight); no corrosive gas, flammable gas, oil mist, or dust | | | | | | |
| | | Elevation | 1000 meters or less above sea level | | | | | | |
| | | Vibration (note 4) | X: 9.8 m/s$^2$ (1G) Y: 24.5 m/s$^2$ (2.5G) | | X: 19.6 m/s$^2$ (2G) Y: 49 m/s$^2$ (5G) | X, Y: 19.6 m/s$^2$ (2G) | | | |
| | Weight kg (lb) | | 8.0 (17.6) | 11.0 (24.3) | 16.0 (35.3) | 0.8 (1.8) | 1.5 (3.3) | 1.7 (3.7) | 5.0 (11.0) |

Notes:
1. The power supply capacity varies with the power supply impedance.
2. The regenerative brake frequency shown is the permissible frequency for decelerating a stand-alone motor from rated rpm to a stop. When under load, however, the value becomes the table value divided by (m+1) where m is the load inertial moment divided by the motor inertial moment. When the rated rpm is exceeded, the regenerative brake frequency is inversely proportional to the square of (Operating speed/rated speed). When the operating rpm varies with the frequency or when regeneration is constant (as with vertical feeds), find the regenera-tion heat generated (W) whle operating and do not exceed the permissible value.
3. Contact Mitsubishi if you must exceed the stated load inertial moment ratio.
4. The directions of vibration are as follows.




5. Regeneration frequency is not restricted if the effective torque is within the rated torque range.
6. Cannot be used with model MR-J2-C. Contact Mitsubishi for details.
7. The MR-J2-A series currently covers the HC-UF73 with model MR-J2-70A-A030.

## HC-UF series servomotor torque characteristics



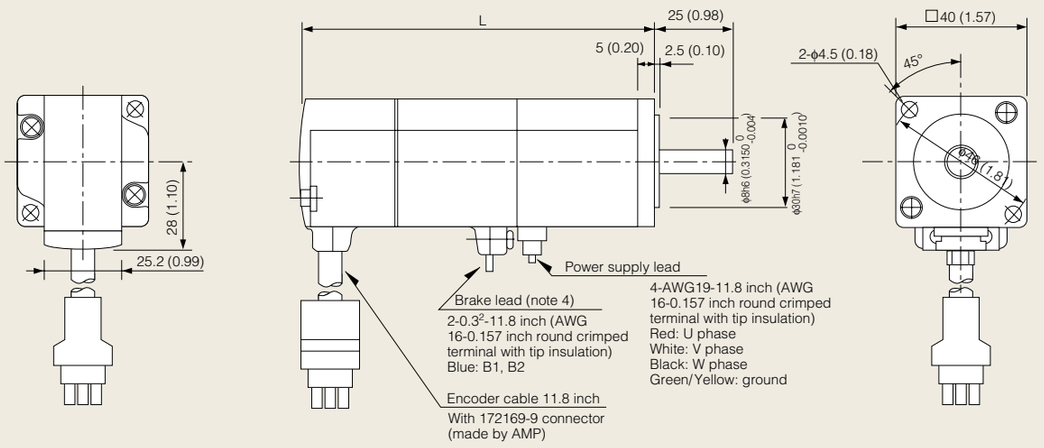



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# Motor Dimensions

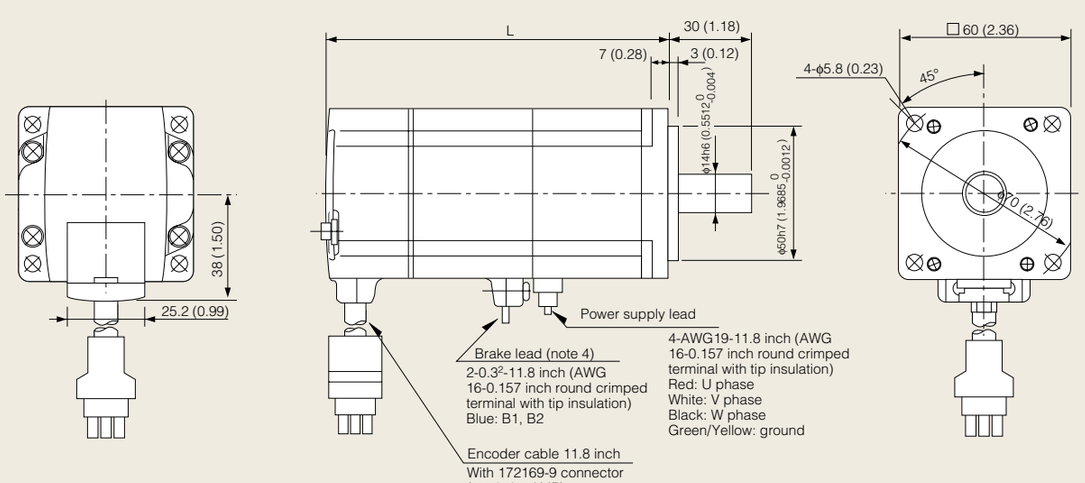
● HC-MF053 (B), HC-MF13 (B)

Unit: mm (inch)




| Model | Variable dimensions L |
|---|---|
| HC-MF053 (B) | 81.5 (3.21) <109.5 (4.30)> |
| HC-MF13 (B) | 96.5 (3.80) <124.5 (4.90)> |

● HC-MF23 (B), HC-MF43 (B)




| Model | Variable dimensions L |
|---|---|
| HC-MF23 (B) | 99.5 (3.92) <131.5 (5.18)> |
| HC-MF43 (B) | 124.5 (4.90) <156.5 (6.16)> |

Notes:
1. When mounting the servomotor horizontally we recommend encoder connector to be mounted downward.
2. Use a friction coupling to fasten the load.
3. Dimensions inside < > are for models with electromagnetic brakes.
4. Only for models with electromagnetic brakes.

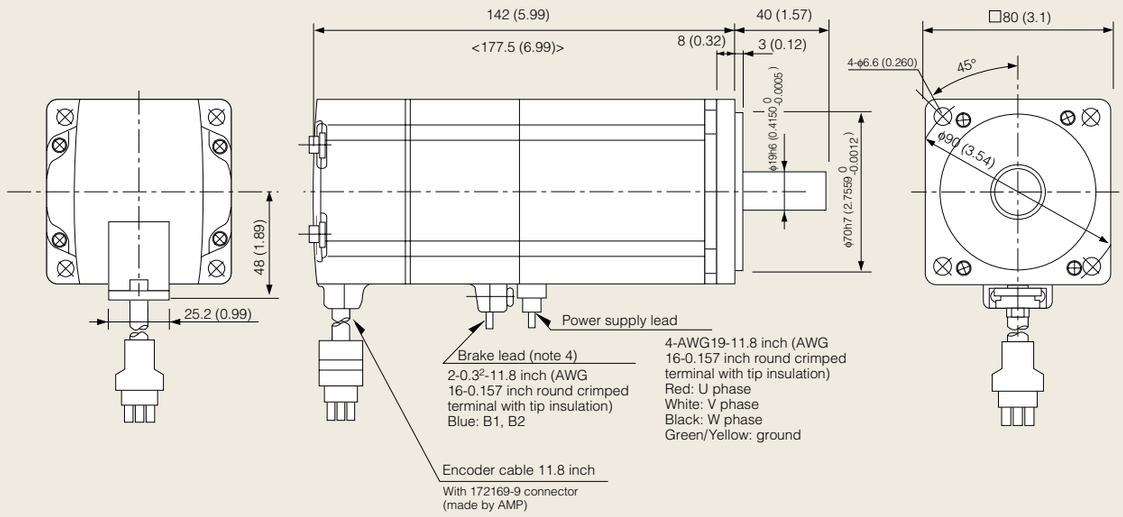


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# Motor Dimensions

● HC-MF73 (B)

Unit: mm (inch)




Notes:
1. When mounting the servomotor horizontally we recommend encoder connector to be mounted downward.
2. Use a friction coupling to fasten the load.
3. Dimensions inside < > are for models with electromagnetic brakes.
4. Only for models with electromagnetic brakes.

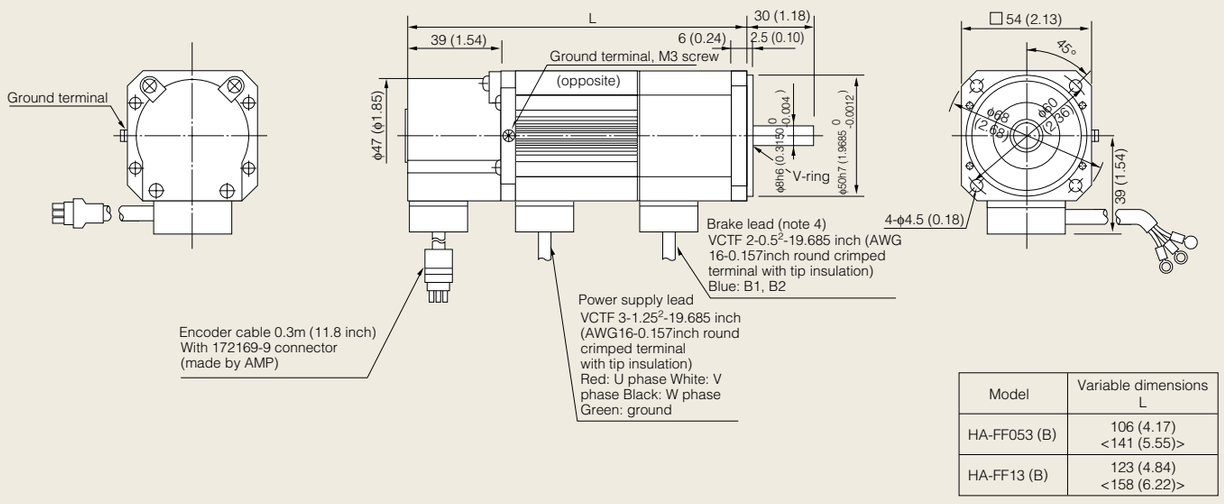


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# Motor Dimensions

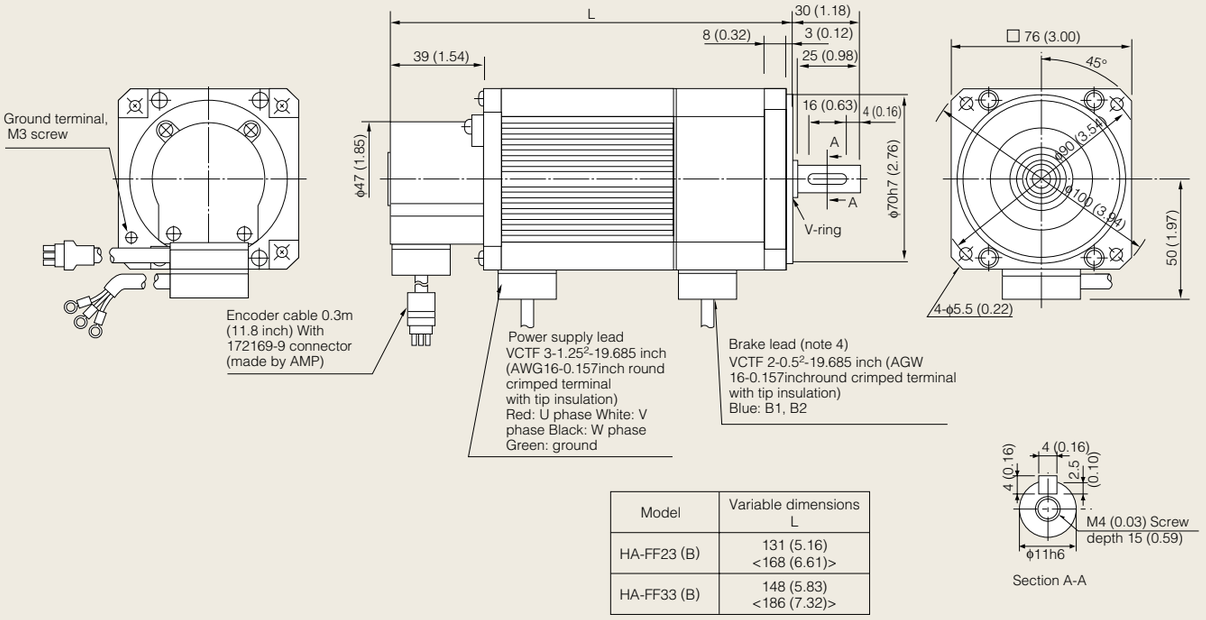
● HA-FF053 (B), HA-FF13 (B)

Unit: mm (inch)




| Model | Variable dimensions L |
|---|---|
| HA-FF053 (B) | 106 (4.17)<br><141 (5.55)> |
| HA-FF13 (B) | 123 (4.84)<br><158 (6.22)> |

● HA-FF23 (B), HA-FF33 (B)




| Model | Variable dimensions L |
|---|---|
| HA-FF23 (B) | 131 (5.16)<br><168 (6.61)> |
| HA-FF33 (B) | 148 (5.83)<br><186 (7.32)> |

Notes:
1. When mounting the servomotor horizontally we recommend encoder connector to be mounted downward.
2. Use a friction coupling to fasten the load.
3. Dimensions inside < > are for models with electromagnetic brakes.
4. Only for models with electromagnetic brakes.

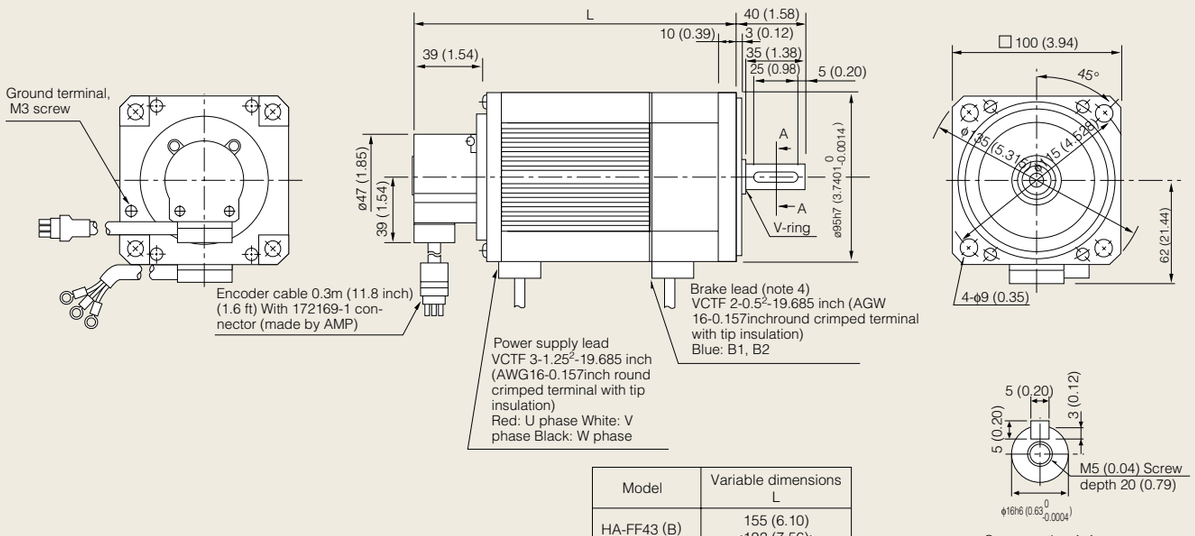


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# Motor Dimensions

● HA-FF43 (B), HA-FF63 (B)

Unit: mm (inch)




| Model | Variable dimensions L |
|---|---|
| HA-FF43 (B) | 155 (6.10) <192 (7.56)> |
| HA-FF63 (B) | 170 (6.69) <207 (8.15)> |

Notes:
1. When mounting the servomotor horizontally we recommend encoder connector to be mounted downward.
2. Use a friction coupling to fasten the load.
3. Dimensions inside < > are for models with electromagnetic brakes.
4. Only for models with electromagnetic brakes.

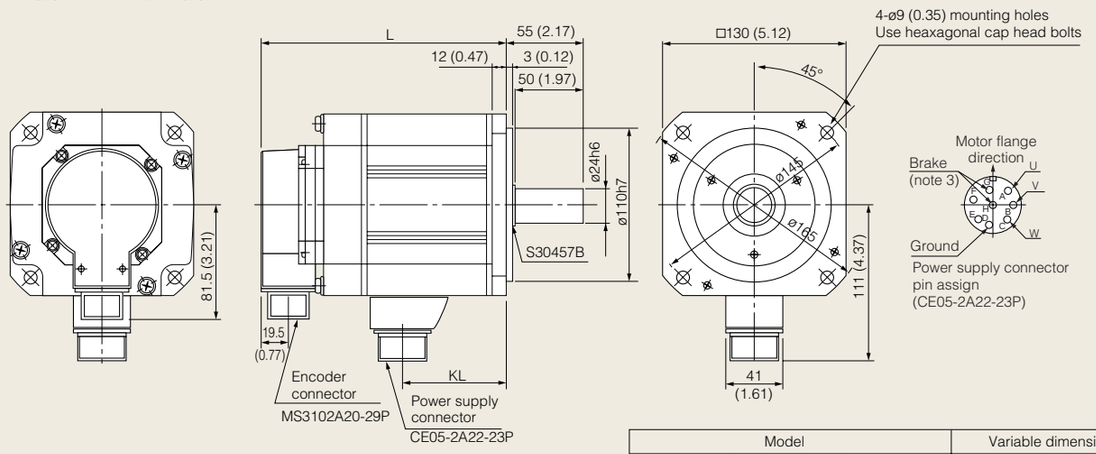


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# Motor Dimensions

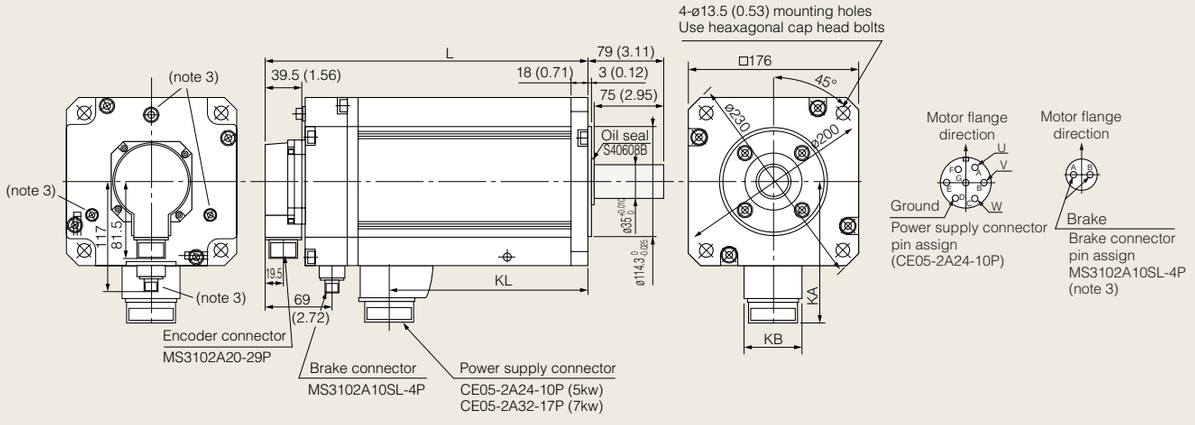
- HC-SF81(B)
- HC-SF52(B)~HC-SF152(B)
- HC-SF53(B)~HC-SF153(B)

Unit: mm (inch)




| Model | | | Variable dimensions | |
|---|---|---|---|---|
| 1000 r/min | 2000 r/min | 3000 r/min | L | KL |
| — | HC-SF52 (B) | HC-SF53 (B) | 120 (4.72)<br><153 (6.03)> | 51.5 (2.03) |
| — | HC-SF102 (B) | HC-SF103 (B) | 145 (5.71)<br><178 (7.01)> | 76.5 (3.01) |
| HC-SF81 (B) | HC-SF152 (B) | HC-SF153 (B) | 170 (6.69)<br><203 (7.99)> | 101.5 (4.00) |

- HC-SF121(B)~HC-SF301(B)
- HC-SF202(B)~HC-SF352(B)
- HC-SF203(B)~HC-SF353(B)




| Model | | | Variable dimensions | | | |
|---|---|---|---|---|---|---|
| 1000 r/min | 2000 r/min | 3000 r/min | L | KL | KA | KB |
| HC-SF121 (B) | HC-SF202(B) | HC-SF203 (B) | 145 (5.71)<br><193 (7.60)> | 68.5 (2.70) | 142 (5.60) | 46 (1.81) |
| HC-SF201 (B) | HC-SF352 (B) | HC-SF353 (B) | 187 (7.36)<br><235 (9.25)> | 110.5 (4.35) | 142 (5.60) | 46 (1.81) |
| HC-SF301 (B) | — | — | 208 (8.19)<br><256 (10.08)> | 131.5 (5.18) | 142 (5.60) | 46 (1.81) |

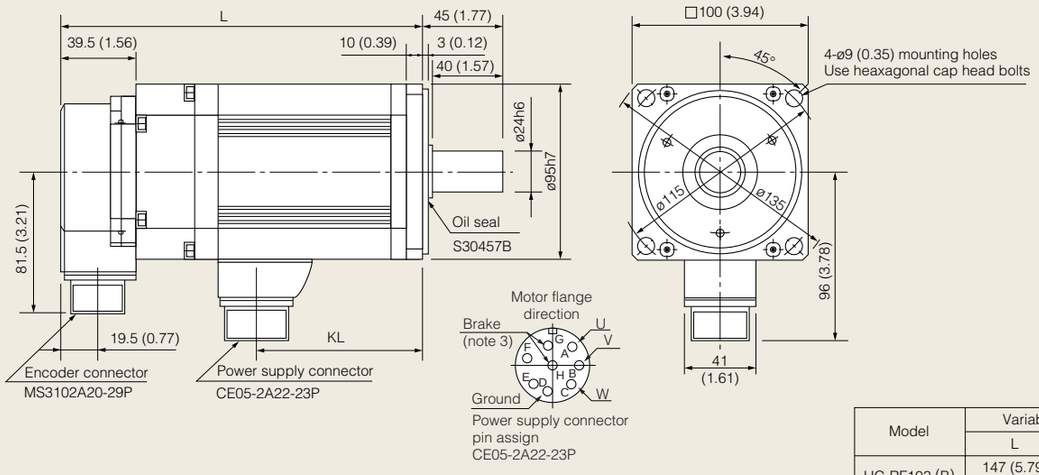
Notes:
1. Use a friction coupling to fasten the load.
2. Dimensions inside < > are for models with electromagnetic brakes.
3. Only for models with electromagnetic brakes.
4. The inertial moment value in the table is the motor axis conversion value (motor+decelerator).



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● HC-RF103 (B), HC-RF153 (B), HC-RF203 (B)

Unit: mm (inch)




| Model | Variable dimensions | |
|---|---|---|
| | L | KL |
| HC-RF103 (B) | 147 (5.79)<br><185 (7.28)> | 71 (2.80) |
| HC-RF153 (B) | 172 (6.77)<br><210 (8.27)> | 96 (3.78) |
| HC-RF203 (B) | 197 (7.76)<br><235 (9.25)> | 121 (4.76) |

Notes:
1. Use a friction coupling to fasten the load.
2. Dimensions inside < > are for models with electromagnetic brakes.
3. Only for models with electromagnetic brakes.

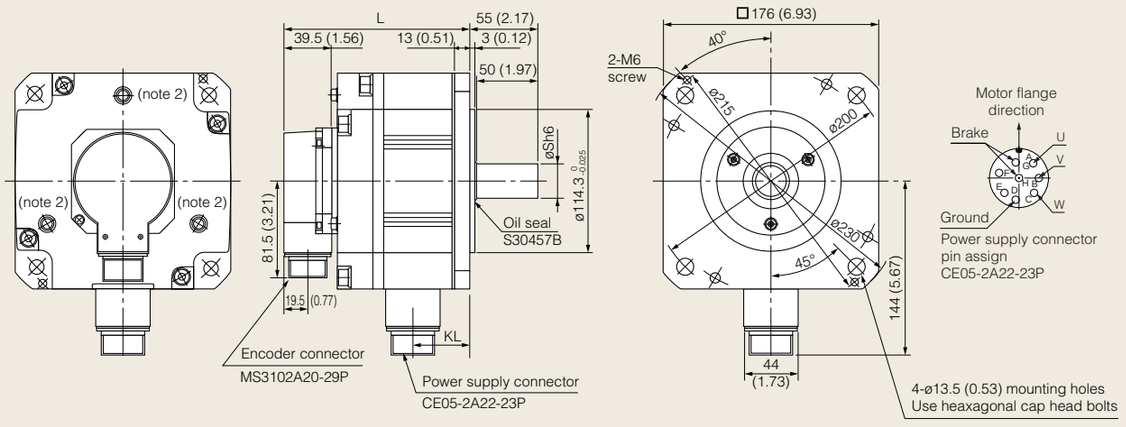


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# Motor Dimensions

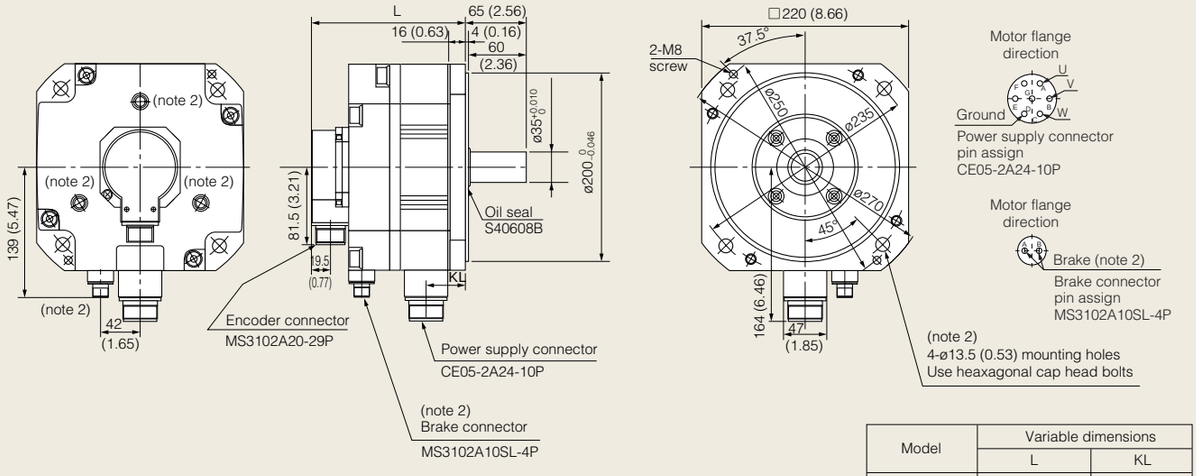
● HC-UF72 (B), HC-UF152 (B)

Unit: mm (inch)




| Model | Variable dimensions | | |
|---|---|---|---|
| | L | KL | S |
| HC-UF72 (B) | 110.5 (4.35)<br><144 (5.67)> | 38 (1.50) | 22 (0.87) |
| HC-UF152 (B) | 120 (4.72)<br><153.5 (6.04)> | 47.5 (1.87) | 28 (1.10) |

● HC-UF202 (B)




| Model | Variable dimensions | |
|---|---|---|
| | L | KL |
| HC-UF202 (B) | 118 (0.04)<br><161 (6.34)> | 42.5 (1.67) |

Notes:
1. Use a friction coupling to fasten the load.
2. Dimensions inside < > are for models with electromagnetic brakes.
3. Only for models with electromagnetic brakes.

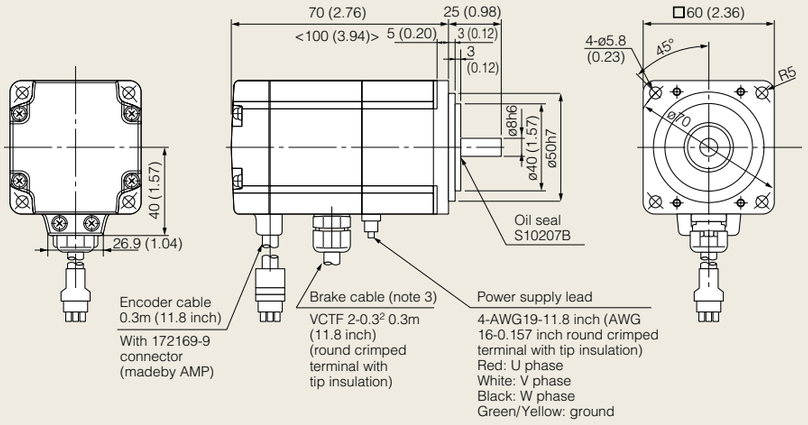


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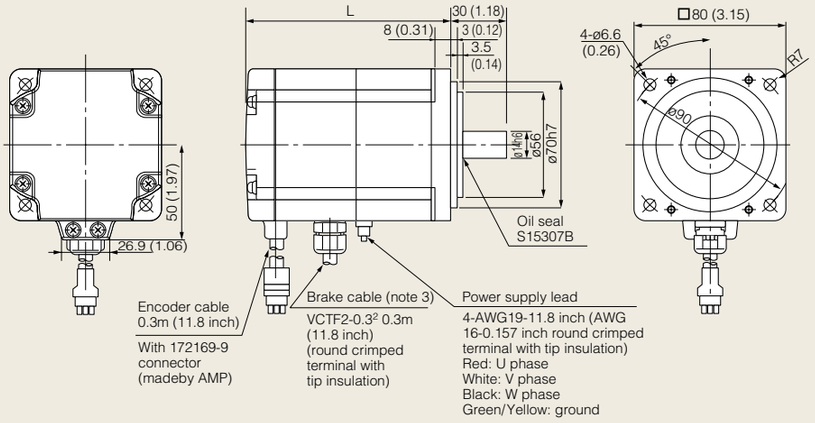
# Motor Dimensions

● HC-UF13 (B)

Unit: mm (inch)

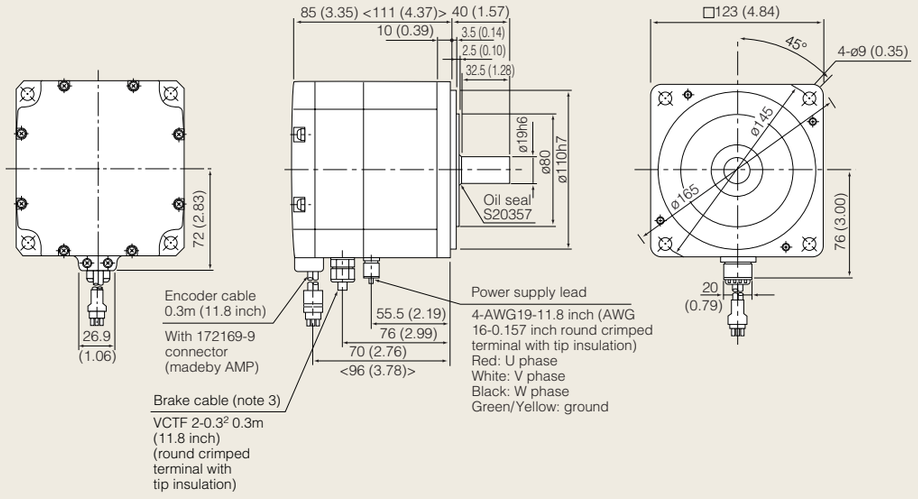



● HC-UF23 (B), HC-UF43 (B)




| Model | Variable dimensions |
|---|---|
| | L |
| HC-UF23 (B) | 75 (2.95)<br><109 (4.29)> |
| HC-UF43 (B) | 90 (3.54)<br><124 (4.88)> |

● HC-UF73 (B)




Notes:
1. Use a friction coupling to fasten the load.
2. Dimensions inside < > are for models with electromagnetic brakes.
3. Only for models with electromagnetic brakes.



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# Special Specifications

## Electromagnetic brake specifications

| Motor model | | HC-MF | | | | | HA-FF | | | | | | HC-SF1000 r/min | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 053B | 13B | 23B | 43B | 73B | 053B | 13B | 23B | 33B | 43B | 63B | 81B | 121B | 201B | 301B |
| Type | | Spring-action safety brake | | | | | Spring-action safety brake | | | | | | Spring-action safety brake | | | |
| Rated voltage | | DC24V$_{-10}^{0}$% | | | | | DC24V$_{-10}^{0}$% | | | | | | DC24V$_{-10}^{0}$% | | | |
| Static friction torque (N·m) | | 0.32 | 0.32 | 1.3 | 1.3 | 2.4 | 0.39 | 0.39 | 1.18 | 1.18 | 2.3 | 2.3 | 8.3 | 43.1 | 43.1 | 43.1 |
| Rated current (A) at 20°C | | 0.26 | 0.26 | 0.33 | 0.33 | 0.42 | 0.22 | 0.22 | 0.31 | 0.31 | 0.46 | 0.46 | 0.8 | 1.4 | 1.4 | 1.4 |
| Coil resistance (Ω) at 20°C | | 91 | 91 | 73 | 73 | 57 | 111 | 111 | 78 | 78 | 52 | 52 | 29 | 16.8 | 16.8 | 16.8 |
| Power consumption (W) at 20°C | | 6.3 | 6.3 | 7.9 | 7.9 | 10 | 7 | 7 | 7.4 | 7.4 | 11 | 11 | 19 | 34 | 34 | 34 |
| Permissible braking volume | (N·m)/time | 5.6 | 5.6 | 22 | 22 | 64 | 3.9 | 3.9 | 18 | 18 | 46 | 46 | 400 | 4500 | 4500 | 4500 |
| | (N·m)/hour | 56 | 56 | 220 | 220 | 640 | 39 | 39 | 180 | 180 | 460 | 460 | 4000 | 45000 | 45000 | 45000 |
| Brake life (note 1) (Brake volume per braking action) | | 20000 (4N·m) | 20000 (4N·m) | 20000 (15N·m) | 20000 (15N·m) | 20000 (32N·m) | 30000 (4N·m) | 30000 (4N·m) | 30000 (18N·m) | 30000 (18N·m) | 30000 (47N·m) | 30000 (47N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) |

| Motor model | | HC-SF2000 r/min | | | | | HC-SF3000 r/min | | | | | HC-RF | | | HC-UF2000 r/min | | | HC-UF3000 r/min | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 52B | 102B | 152B | 202B | 352B | 53B | 103B | 153B | 203B | 353B | 103B | 153B | 203B | 72B | 152B | 202B | 13B | 23B | 43B | 73B |
| Type | | Spring-action safety brake | | | | | Spring-action safety brake | | | | | Spring-action safety brake | | | Spring-action safety brake | | | Spring-action safety brake | | | |
| Rated voltage | | DC24V$_{-10}^{0}$% | | | | | DC24V$_{-10}^{0}$% | | | | | DC24V$_{-10}^{0}$% | | | DC24V$_{-10}^{0}$% | | | DC24V$_{-10}^{0}$% | | | |
| Static friction torque (N·m) | | 8.3 | 8.3 | 8.3 | 43.1 | 43.1 | 8.3 | 8.3 | 8.3 | 43.1 | 43.1 | 6.8 | 6.8 | 6.8 | 8.3 | 8.3 | 43.1 | 0.32 | 1.3 | 1.3 | 2.4 |
| Rated current (A) at 20°C | | 0.8 | 0.8 | 0.8 | 1.4 | 1.4 | 0.8 | 0.8 | 0.8 | 1.4 | 1.4 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 1.4 | 0.26 | 0.33 | 0.33 | 0.42 |
| Coil resistance (Ω) at 20°C | | 29 | 29 | 29 | 16.8 | 16.8 | 29 | 29 | 29 | 16.8 | 16.8 | 30 | 30 | 30 | 29 | 29 | 16.8 | 91 | 73 | 73 | 57 |
| Power consumption (W) at 20°C | | 19 | 19 | 19 | 34 | 34 | 19 | 19 | 19 | 34 | 34 | 19 | 19 | 19 | 19 | 19 | 34 | 6.3 | 7.9 | 7.9 | 10 |
| Permissible braking volume | (N·m)/time | 400 | 400 | 400 | 4500 | 4500 | 400 | 400 | 400 | 4500 | 4500 | 400 | 400 | 400 | 400 | 400 | 4500 | 5.6 | 22 | 22 | 64 |
| | (N·m)/hour | 4000 | 4000 | 4000 | 45000 | 45000 | 4000 | 4000 | 4000 | 45000 | 45000 | 4000 | 4000 | 4000 | 4000 | 4000 | 45000 | 56 | 220 | 220 | 640 |
| Brake life (note 1) (Brake volume per braking action) | | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (1000N·m) | 20000 (1000N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (1000N·m) | 20000 (1000N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (200N·m) | 20000 (1000N·m) | 20000 (4N·m) | 20000 (15N·m) | 20000 (15N·m) | 20000 (32N·m) |

Notes:
1. The brake gap cannot be adjusted, so the brake life is the time until readjustment by braking needed.
2. The electromagnetic brake is for holding. It cannot be used for braking applications.

## Special shaft end specifications

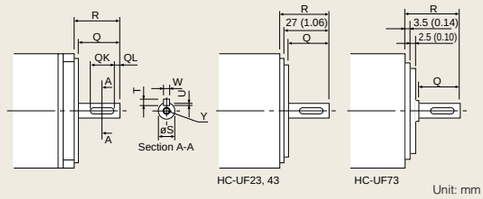
We can manufacture shaft ends to order meeting the following specifications.

### HC-MF, UF3000r/min series

● With key (200, 400, 750W) Variable dimension table

| Motor series | Capacity (kW) | Variable dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | T | S | R | Q | W | QK | QL | U | Y |
| HC-MF | 200, 400 | 5 (0.20) | 14h6 | 30 (1.18) | 27 (1.06) | 5 (0.20) | 20 (0.79) | 3 (0.12) | 3 (0.12) | M4 (0.028) screws Depth: 15mm (0.59 inch) |
| | 750 | 6 (0.24) | 19h6 | 40 (1.57) | 37 (1.46) | 6 (0.24) | 25 (0.98) | 5 (0.20) | 3.5 (0.14) | M5 (0.035) screws Depth: 20mm (0.79 inch) |
| HC-UF | 200, 400 | 5 (0.20) | 14h6 | 30 (1.18) | 23.5 (0.93) | 5 (0.20) | 20 (0.79) | 3 (0.12) | 3 (0.12) | M4 (0.028) screws Depth: 15mm (0.59 inch) |
| | 750 | 6 (0.24) | 19h6 | 40 (1.57) | 32.5 (1.28) | 6 (0.24) | 25 (0.98) | 5 (0.20) | 3.5 (0.14) | M5 (0.035) screws Depth: 20mm (0.79 inch) |

(note 1)

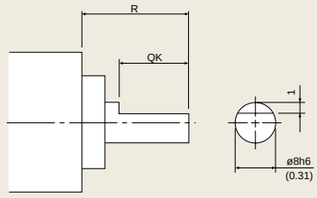



Unit: mm (inch)

● D-cut (50, 100W)
Variable dimension table

| Motor series | Capacity (kW) | Variable dimensions | |
|---|---|---|---|
| | | R | Q |
| HC-MF | 50, 100 | 25 (0.98) | 20.5 (0.81) |
| HC-UF | 100 | 25 (0.98) | 17.5 (0.69) |

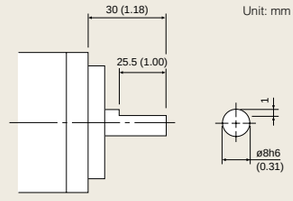
(note 1)




Unit: mm (inch)

### HA-FF series

● D-cut (50, 100W)



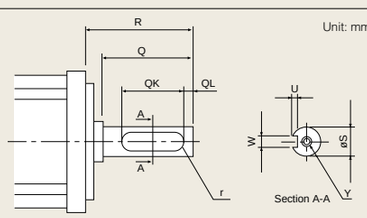

Unit: mm (inch)

### HC-SF, RF, UF2000r/min series

● Key way Variable dimension table

| Motor series | Capacity (kW) | Variable dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | S | R | Q | W | QK | QL | U | r | Y |
| HC-SF (note 3) | 0.5~1.5 | 24h6 | 55 (2.17) | 50 (1.97) | 8 (0.31) $^{0}_{-0.036}$ | 36 (1.42) | 5 (0.20) | 4 (0.16) $^{+0.2}_{0}$ | 4 (0.16) | M8 (0.056) screws Depth: 20mm (0.79 inch) |
| | 2~3.5 | 35 $^{+0.01}_{0}$ | 79 (3.11) | 75 (2.95) | 10 (0.39) $^{0}_{-0.036}$ | 55 (2.17) | 5 (0.20) | 5 (0.20) $^{+0.2}_{0}$ | 5 (0.20) | |
| HC-RF | 1, 1.5, 2 | 24h6 | 45 (1.77) | 40 (1.57) | 8 (0.31) $^{0}_{-0.036}$ | 25 (0.98) | 5 (0.20) | 4 (0.16) $^{+0.2}_{0}$ | 4 (0.16) | |
| HC-UF | 0.75 | 22h6 | 55 (2.17) | 50 (1.97) | 6 (0.24) $^{0}_{-0.030}$ | 42 (1.65) | 3 (0.12) | 3.5 (0.14) $^{+0.2}_{0}$ | 3 (0.12) | |
| | 1.5 | 28h6 | 55 (2.17) | 50 (1.97) | 8 (0.31) $^{0}_{-0.036}$ | 45 (1.77) | 5 (0.20) | 4 (0.16) $^{+0.2}_{0}$ | 4 (0.16) | |
| | 2 | 35h6 | 65 (2.56) | 60 (2.36) | 10 (0.39) $^{0}_{-0.030}$ | 55 (2.17) | 5 (0.20) | 5 (0.20) $^{+0.2}_{0}$ | 5 (0.20) | |

(note 2)




Unit: mm (inch)

Notes:
1. Cannot be used in applications that involve high frequency. We make no guarantees regarding shaft damage caused by rattling of keys, so use a friction coupling, [illegible] ring, or the like.
2. Keys are not installed. Keys are installed by the purchaser.
3. The HC-SF121 is the same as the lower row (2-3.5kW).



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# SERVO AMPLIFIERS MELSERVO J2-A

## 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 as standard
- Automatic motor recognition



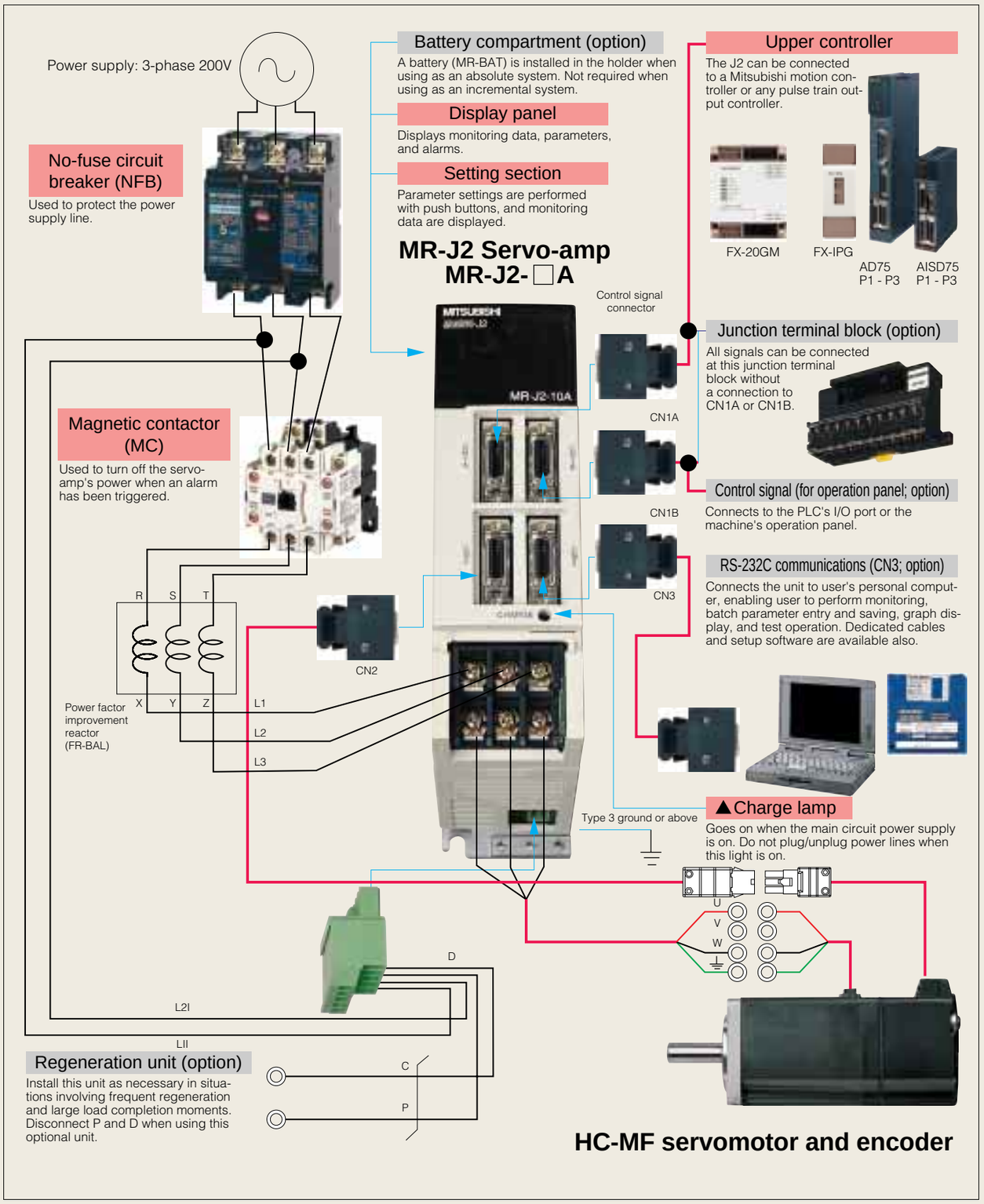



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# Peripheral Equipment

## Connections with peripheral equipment

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






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# Operation

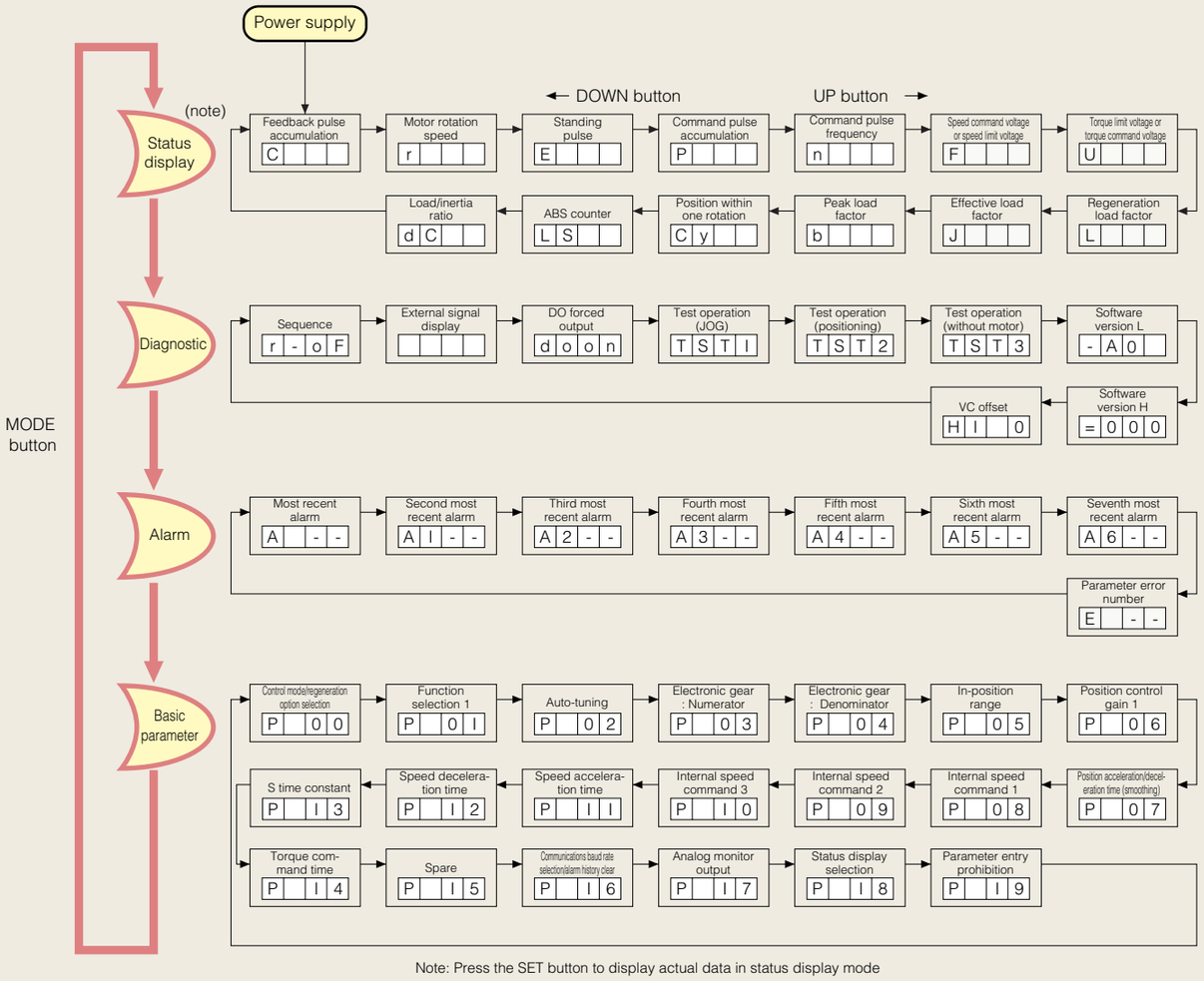
## Easier to operate than ever before

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




### Explanation of 7-segment display device

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



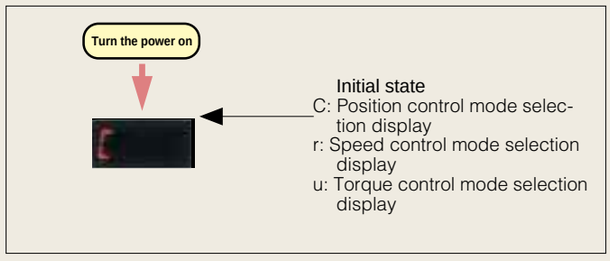
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# Setup and Testing

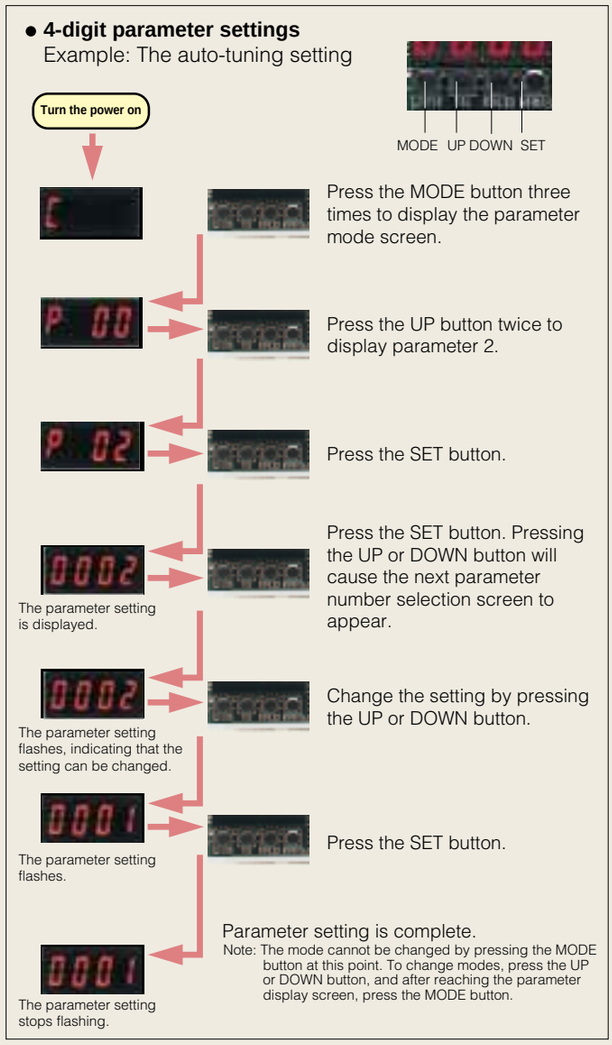
## A complete lineup of features to make setup easy

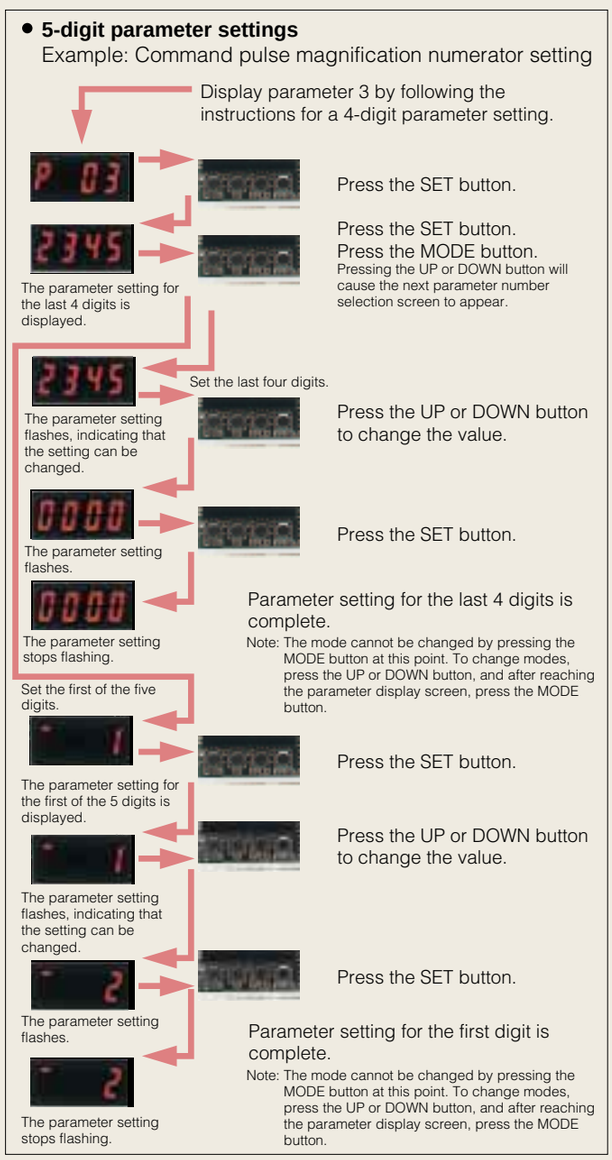
User-friendly, from the way you turn on the power to how connection checks and parameter settings are performed.

**Turning the power on and displaying the present status**
Approximately five seconds after you turn the power on, the status display mode screen appears. You can display the desired operating parameter by pressing the UP or DOWN button.

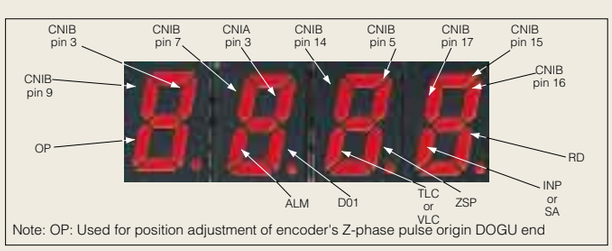



**Setting parameters**
Basic parameters are set as illustrated below.




**External signal display**
External input/output signals' on/off status 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.



Note: OP: Used for position adjustment of encoder's Z-phase pulse origin DOGU end



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**Test operation mode**

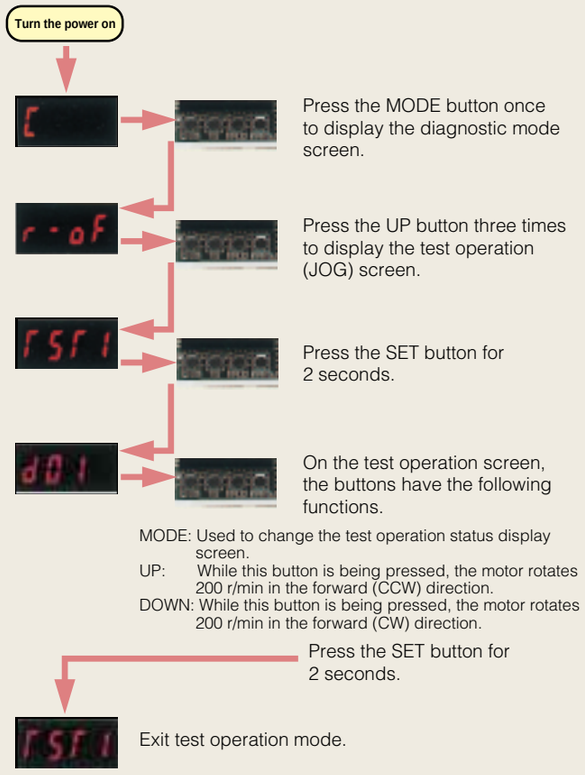
The operation of the servo-amp and servomotor can be checked before wiring the signal wires.

- **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 machine's operation.

(1) JOG operation

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




(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.



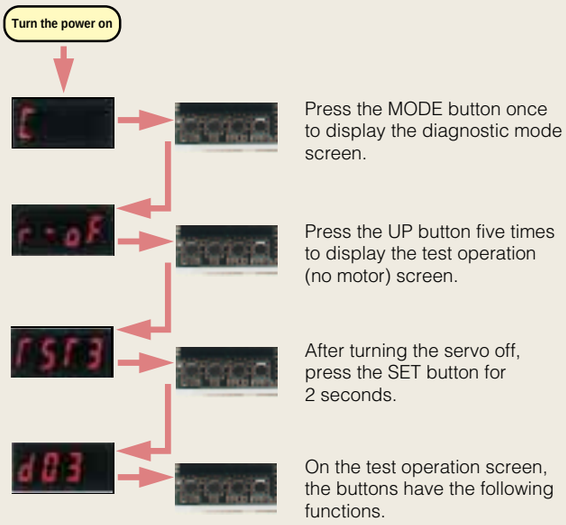
The servo-amp screen when the unit has been set to positioning operation mode with the setup software.



The servo-amp screen when the unit has been taken out of positioning operation mode with the 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 motor's simulated rotation speed and command status on the amp's display screen just as you would during normal operation.



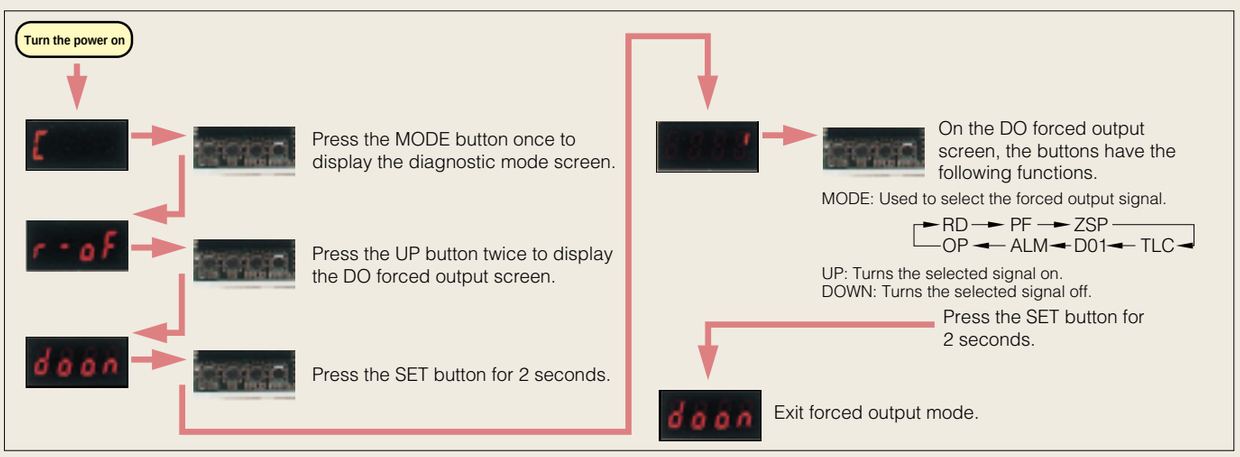

To exit test operation mode, turn the power off and on again.



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# Setup and Parameters

**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.




**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 number | Name | Abbreviation | Description | Factory setting | Setting range |
|---|---|---|---|---|---|
| *0 | Control mode/regeneration selection | STY | Used to select the control mode and regeneration option | 0000 | 0000 ~ 0605h |
| *1 | Function selection 1 | OP1 | Used to select servo-type options | 0000 | 0000 ~ 1012h |
| 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 (msec) | 0 ~ 20000 |
| 8 | Internal speed command 1 | SC1 | Used to set the first speed of the internal speed command | 100 (r/min) | 0 ~ permissible rotation speed |
| 9 | Internal speed command 2 | SC2 | Used to set the second speed of the internal speed command | 500 (r/min) | 0 ~ permissible rotation speed |
| 10 | Internal speed command 3 | SC3 | Used to set the third speed of the internal speed command | 1000 (r/min) | 0 ~ permissible rotation 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 (msec) | 0 ~ 20000 |
| 12 | Speed deceleration time constant | STB | Used to set the deceleration time from the rated rotation speed until stop for the speed command | 0 (msec) | 0 ~ 20000 |
| 13 | S-time Constant | STC | Used to set the time for the circular portion of S acceleration/deceleration | 0 (msec) | 0 ~ 1000 |
| 14 | Torque command time constant | TQC | Used to set the time constant when using a delayed filter for the torque command | 0 (msec) | 0 ~ 20000 |
| 15 | Spare | | | 0 | |
| *16 | Communications baud rate selection/alarm history clear | BPS | Used to set the RS-232C 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 |



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# Servo-amp Specifications

| Servo-amp model MR-J2- | | | 10A | 20A | 40A | 60A | 70A | 100A | 200A | 350A | 101A | 20A1 | 40A1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Servo-amp | Power supply | Voltage/frequency (note) | 3-phase 200 to 230V AC 50/60Hz | | | | | | | | 1-phase 100 to 120V AC 50/60Hz | | |
| | | Permissible voltage fluctuation | 3-phase 170 to 253V AC 50/60Hz | | | | | | | | 1-phase 85 to 127V AC 50/60Hz | | |
| | | Permissible frequency fluctuation | ±5% max. | | | | | | | | | | |
| | Control system | | Sinusoidal PWM control/current control system | | | | | | | | | | |
| | Speed frequency response | | 250Hz or more | | | | | | | | | | |
| | Safety features | | Excess current shutdown, regeneration excess voltage shutdown, excess load shutdown (electronic thermal), servomotor overheat protection, encoder error protection, regeneration error protection, insufficient voltage/sudden power outage protection, excess speed protection, excess error protection | | | | | | | | | | |
| | Torque limit input | | 0 to ±10V 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 servomotor rotation (see "Speed/position encoder" in the servomotor specifications) | | | | | | | | | | |
| | | Command pulse multiple | Electronic gear A/B multiple; A, B: 1-32767 1/50<A/B<50 | | | | | | | | | | |
| | | Positioning complete width setting | 0 to ±10000 pulses | | | | | | | | | | |
| | | Excess error | ±80k pulses | | | | | | | | | | |
| | Speed control specifications | Speed control range | External speed 1:1000, internal speed 1:5000 | | | | | | | | | | |
| | | Speed command input | 0 to ± 10V DC/maximum speed | | | | | | | | | | |
| | | Speed fluctuation rate | −0.03% max. (load fluctuation 0 to 100%)<br>±0.02% max. (power fluctuation ± 10%)<br>±0.02% max. (ambient temperature 25°C ±10°C (77°F±50°F)), when using external analog speed | | | | | | | | | | |
| | Torque control specifications | Torque command input | 0 to ±8V DC/maximum torque | | | | | | | | | | |
| | Structure | | Self-cooling, open (IP00) | | | | | | | | | | |
| | Environment | Ambient temperature | 0 to 55°C (32 to 131°F) (non freezing), storage: −20 to 65°C (−4 to 149°F) (non freezing) | | | | | | | | | | |
| | | Ambient humidity | 90% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | | | | | | |
| | | Atmosphere | Inside control panel; no corrosive gas, flammable gas, oil mist, or dust | | | | | | | | | | |
| | | Elevation | 1000 meters or less above sea level | | | | | | | | | | |
| | | Oscillation | 5.9 m/s² (0.6G) max. | | | | | | | | | | |
| | Weight kg (lb) | | 0.7 (1.5) | 0.7 (1.5) | 1.1 (2.4) | 1.1 (2.4) | 1.7 (3.7) | 1.7 (3.7) | 2.0 (4.4) | 2.0 (4.4) | 0.7 (1.5) | 0.7 (1.5) | 1.1 (2.4) |

Note: Rated output capacity and rated rotation speed of the servomotor used in combination with the servo-amp are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply's voltage is less than specified.



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# Signal Terminal Descriptions

## ● Terminal block

| Signal | Abbreviation | Terminal | Description of function/application |
|---|---|---|---|
| Alternating circuit power supply | L1, L2, L3 | TE1 | Connect to a 3-phase 200-230V 50/60Hz commercial power supply. There are no phase sequence limitations. |
| | L11, L21 | TE2 | Connect to a single-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's 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 (Factory settings)

Same for position, speed, and torque control modes

| Signal | Abbreviation | Connector number | Description of function/application | I/O category |
|---|---|---|---|---|
| Digital interface power input | Vin | 9 | Driver's power input terminal for digital interface. Vin are all connected inside. Supply 24 V DC power to this terminal when using an external power supply. | 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's A-/B-phase pulse signal output terminal. Differential line driver output. Output pulse can be changed through the parameter setting. | |
| | LAR | 16 | | |
| Encoder B-phase pulse | LB | 7 | | |
| | LBR | 17 | | |
| Encoder 2-phase pulse | LZ | 5 | Encoder's Z-phase pulse signal output terminal. One pulse is output for each motor rotation. Minimum pulse width is 400 µs. Set speed to 100 r/min 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. Connect this terminal to VDD when inputting pulse train in open collector mode. Supply 24 V DC power to this terminal when using an external power supply. | Power input |
| Forward pulse train | PP | 3 | Forward pulse train signal input terminal. Compatible with both open collector and differential modes. Connect PP and SG when using open collector mode. | DI-2 |
| | PG | 13 | | |
| Reverse pulse train | NP | 2 | Reverse pulse train signal input terminal. Compatible with both open collector and differential modes. Connect NP and SG when using open collector mode. | DI-2 |
| | NG | 12 | | |
| Clear | CR | 8 | Clear signal input terminal. Short circuiting CR and SG 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 nonvolatile 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 r/min, the connection between SA and SG is made. Not 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 SPI and SG are short circuited. | DI-1 |

## ● Connector CN3 (Factory settings)

Same for position, speed, and torque control modes

| Signal | Abbreviation | Connector number | Description of function/application | I/O category |
|---|---|---|---|---|
| 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. | |



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# Signal Terminal Descriptions

## ● Connector CN1B (Factory settings)

### Same for position (ABS method), speed, and torque control modes

| Signal | Abbreviation | Connector number | Description of function/application | I/O category |
|---|---|---|---|---|
| Digital interface power input | Vin | 13 | Driver's power output terminal for digital interface. Supply power for the digital input/output signal (DI-I, DO-I) from external power supply: VDD or 24 V DC power. | Power supply |
| Internal power supply output for interface | VDD | 3 | Driver's power output terminal for digital interface. Outputs +24 V ±10% between 24 V commons. Connect to Vin when not using an external power supply. 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 | 24V common, insulated from LG | Common |
| 15 V DC power output | P15R | 11 | 15V 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. Disconnecting EMG and SG puts the unit in emergency stop state; power to the base is cut off and the dynamic brake is activated. Short circuiting EMG and SG 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. Short circuiting SON and SG places the unit in an operable state. Disconnecting these terminals causes power to the base to be cut off and the servomotor to enter a free running condition. This can be set to automatic on with the parameter settings. | DI-1 |
| Reset | RES | 14 | Alarm reset signal input terminal. Short circuiting RES and SG 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 bit1) | 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-amp.) | DO-1 |
| Shield | SD | Plate | Connect to one end of the shield wire. | |

### Same for position (ABS method) and speed control modes

| | | | | |
|---|---|---|---|---|
| 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 is being prepared.) | DO-1 |
| Forward stroke end | LSP | 16 | Forward/reverse stroke end signal input terminal. Disconnecting LSP and SG makes the unit inoperable in a CCW direction, but operable in a CW direction. To operate in a CCW direction, connect between LSP and SG with a limit switch. Disconnecting LSN and SG makes the unit inoperable in a CW direction, but operable in a CCW direction. To operate in a CW direction, circuit between LSN and SG with a limit switch. This can be set to go on automatically with the parameter settings. | DI-1 |
| Reverse stroke end | LSN | 17 | | |

### Position control mode (ABS method)

| | | | | |
|---|---|---|---|---|
| Proportional control (ABS forwarding mode) | PC(ABSM) | 8 | Proportional control signal input terminal. Connect between PC and SG when you want to suppress microvibrations when the servo lock is on. (ABS forwarding mode signal input terminal. Connecting ABSM and SG puts the unit in ABS forwarding mode.) | DI-1 |
| External torque limit (ABS data request) | TL(ABSR) | 9 | External torque limit signal input terminal. Connecting TL and SG limits the torque to the TLA level. (ABS data request signal input terminal. Connecting ABSR and SG generates a request for ABS data.) | DI-1 |
| Proportional control (ABS data bit 0) | ABS bit0 | 4 | ABS data bit0 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. Connecting ST1 and SG causes the motor to rotate in a CCW direction. | DI-1 |
| Forward start | ST2 | 9 | Reverse start signal input terminal. Connecting ST2 and SG 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. Connecting SP2 and SG limits operation to the parameter-set speed. | DI-1 |
| Reverse selection | ST1 | 8 | Reverse power torque generation signal input terminal. Select the direction of the torque to be generated. Connecting ST1 and SG causes torque to be generated in reverse power/forward regeneration direction. | DI-1 |
| Forward selection | ST2 | 9 | Forward power torque generation signal input terminal. Select the direction of the torque to be generated. Connecting ST2 and SG causes 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 |

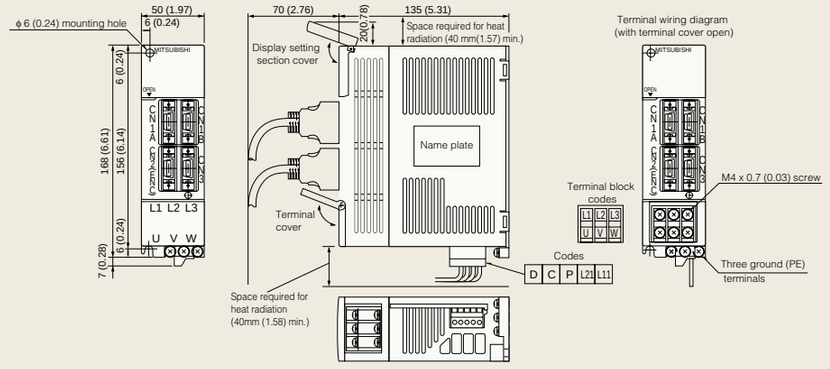


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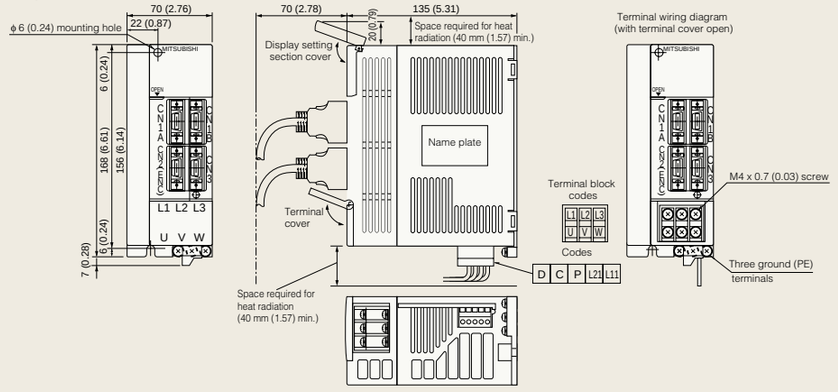
# Amplifier Dimensions

Unit: mm (inch)

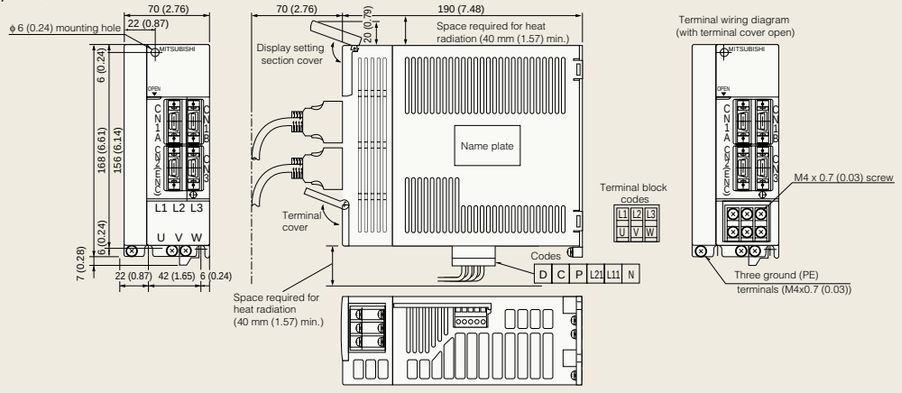
● MR-J2-10A1, 20A1, 10A/B/C, 20A/B/C



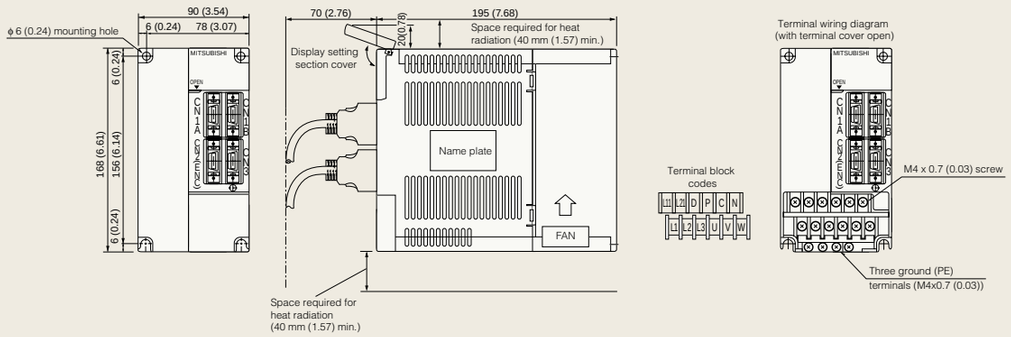

● MR-J2-40A1, 40A/B/C, 60A/B/C




● MR-J2-70A/B/C, 100A/B/C




● MR-J2-200A/B/C, 350A/B/C



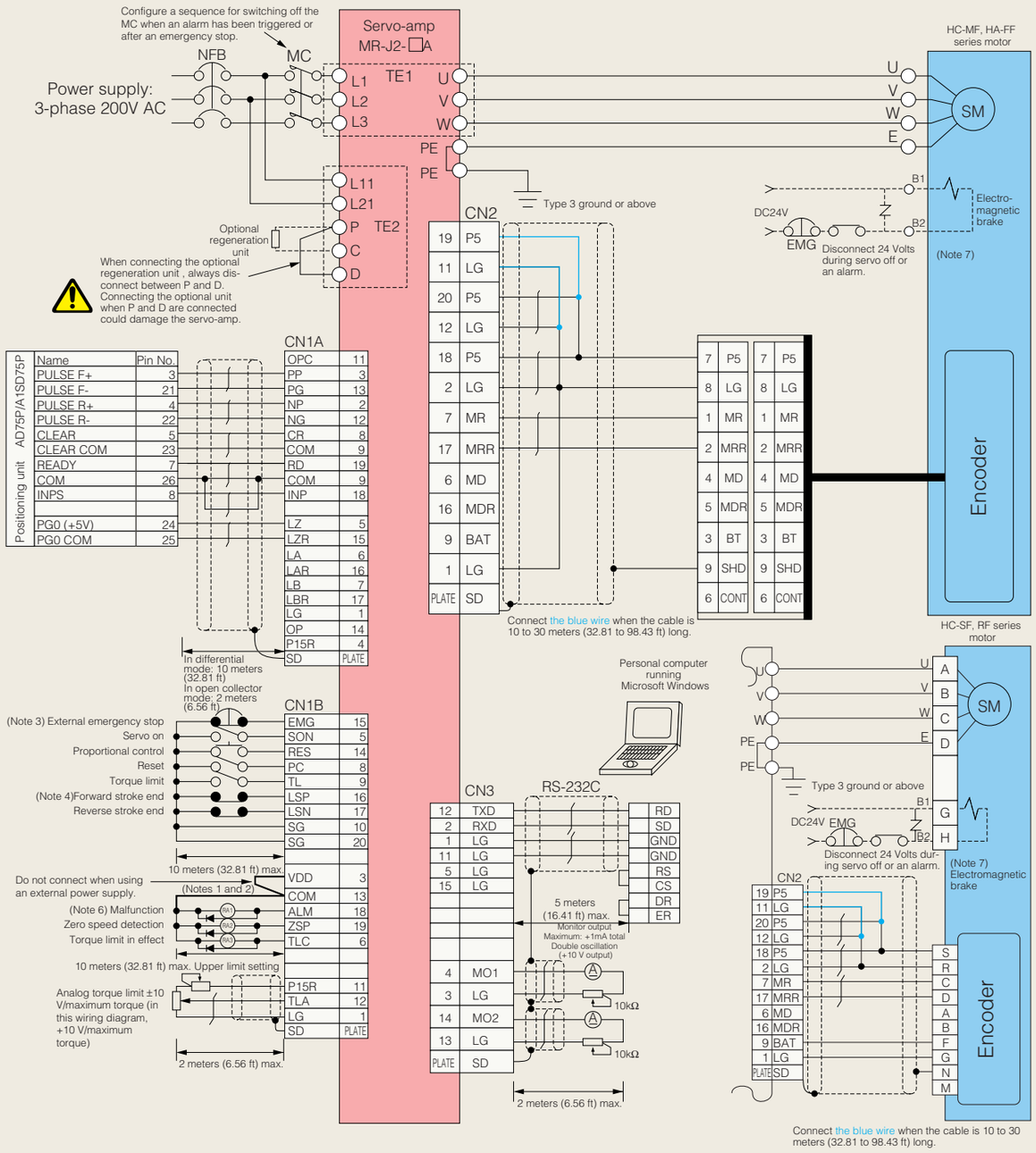



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# Standard Wiring Diagram

## Position control operation

● **Connection to AD75P□/A1SD75P□ (position servo, incremental)**



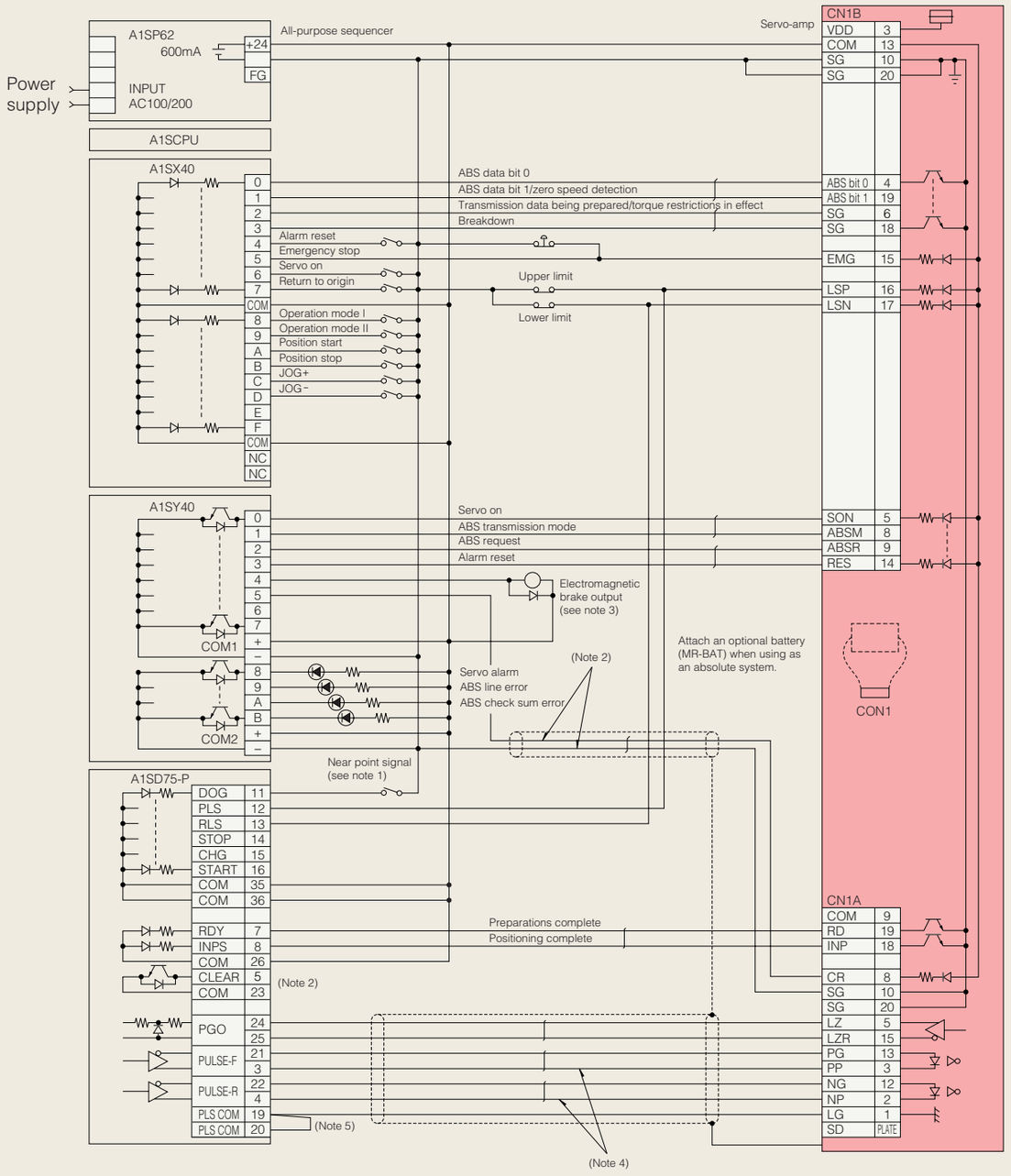

Notes:
1. Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output and emergency stop and other safety circuits are inoperable.
2. Make sure that the sum of current flowing to external relays does not exceed 80 mA. If it exceeds 80 mA, supply interface power from an external source.
3. Always connect an EMG external emergency stop. (b contact) The unit cannot be operated unless one is connected.
4. Provide normally closed inputs for LSP, LSN.
5. Signals with the same name are connected inside.
6. Malfunction (ALM) signals are turned on during normal operation when no alarms have been triggered.
7. When using a motor with electromagnetic brake. Polarity of power supply connected to electromagnetic brake's lead (compressed terminals' sleeve is blue) is unimportant.
8. Connect shield wire securely to plate inside the connector (ground plate).
9. Connect between LG and pulse output COM to strengthen noise.
10. Always use a shielded multicore cable; up to a maximum of 15 meters is possible in a good noise environment.



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# Standard Wiring Diagram

## ● Connection to AD75P□/A1SD75P□ (position servo, absolute)

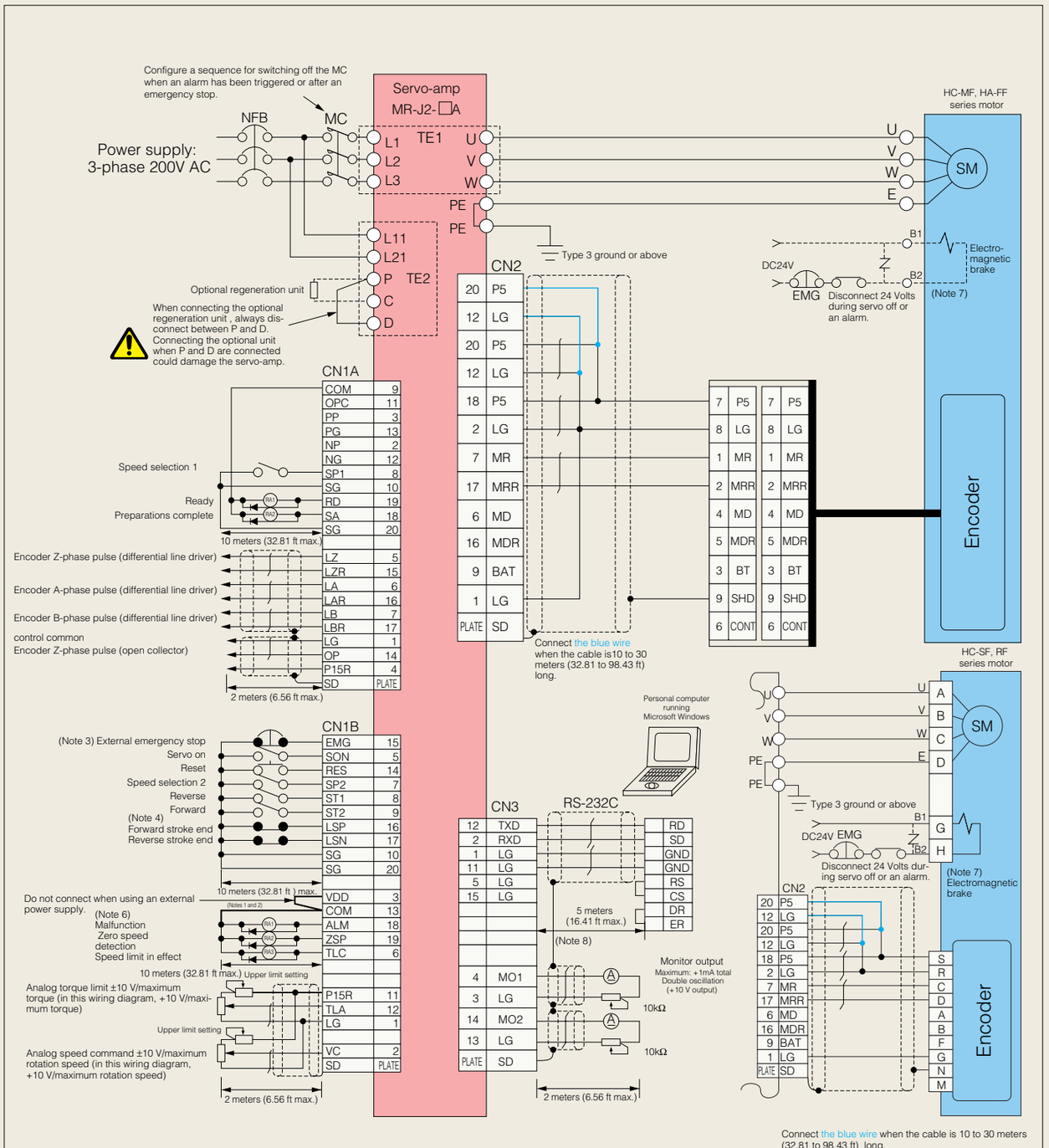



Notes:
1. For [DOGU]-style return to origin. Do not connect for data set return to origin.
2. Starting up when the servomotor is above the zero signal causes the AISD75 (AD75) deviation clear signal to be output. Therefore, do not wire the MR-J2-A clear signal to the AISD75 (AD75) side but to the sequencer output unit.
3. Control the electromagnetic brake output through a relay to the programmable controller's output.
4. Use a differential line driver method of pulse input. An open collector method can be used also, but a differential line driver method, which is not greatly affected by external noise, is recommended.
5. Connect the LG and pulse output COM to boost noise.
6. With models AD75M and AISD75M, an absolute system can be constructed with reduced wiring by combining these models with MR-J2-B.
7. Refer to the previous page for the connections with the power supply, servomotor, and computer.
8. Refer to the MELSERVO-J2-A Absolute Positioning System User's Manual for details about absolute systems.



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## Speed control operation



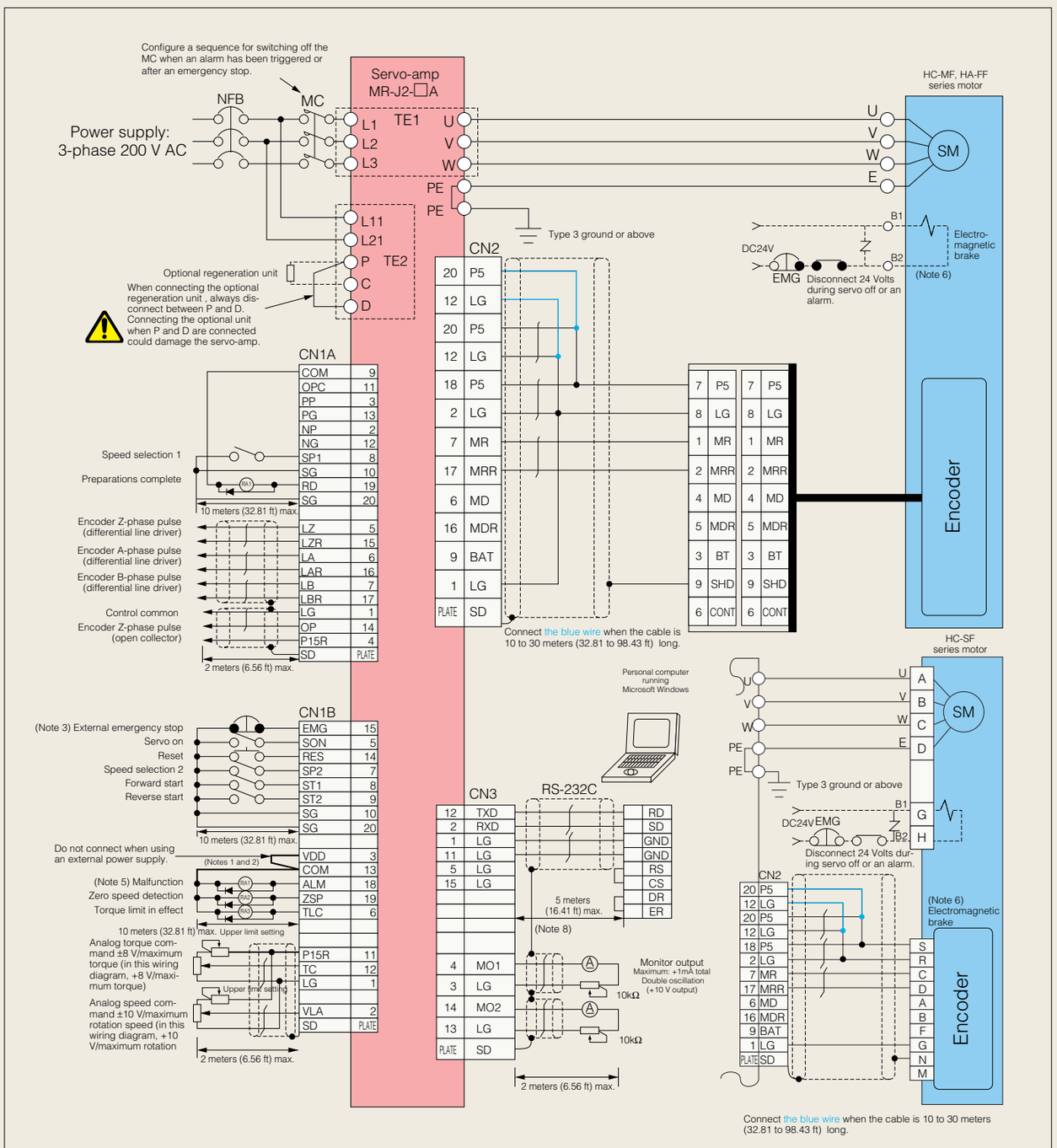

Notes:
1. Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output and emergency stop and other protection circuits are inoperable.
2. Make sure that the sum of current flowing to external relays does not exceed 80 mA. If it exceeds 80 mA, supply interface power from an external source.
3. Always connect an EMG external emergency stop. (b contact) The unit cannot be operated unless one is connected.
4. Provide normally closed inputs for LSP, LSN.
5. Signals with the same name are connected inside.
6. Malfunction (ALM) signals are turned on during normal operation when no alarms have been triggered.
7. When using a motor with electromagnetic brake. Polarity of power supply connected to electromagnetic brake's lead (compressed terminals' sleeve is blue) is unimportant.
8. Connect shield wire securely to plate inside the connector (ground plate).
9. Always use a shielded multicore cable; up to a maximum of 15 meters is possible in a good noise environment.



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# Standard Wiring Diagram

## Torque control operation




Notes:
1. 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 protection circuits are inoperable.
2. 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.
3. Always connect an EMG external emergency stop. (b contact) The unit cannot be operated unless one is connected.
4. Signals with the same name are connected inside.
5. Malfunction (ALM) signals are turned on during normal operation when no alarms have been triggered.
6. When using a motor with electromagnetic brake. Polarity of power supply connected to electromagnetic brake's lead (compressed terminals' sleeve is blue) is unimportant.
7. Connect shield wire securely to plate inside the connector (ground plate).
8. Always use a shielded multicore cable; up to a maximum of 15 meters is possible in a good noise environment.

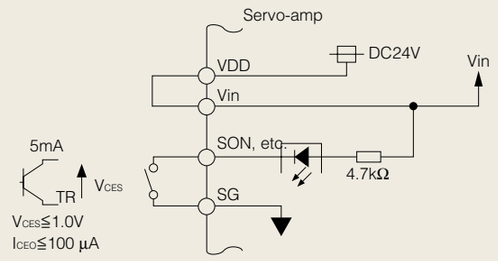


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# Interfaces

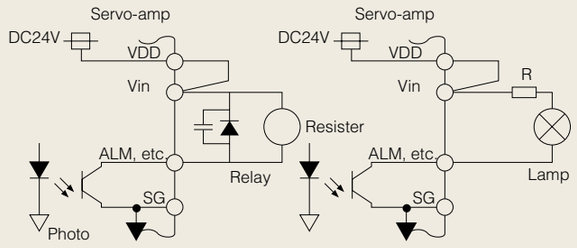
### Digital input interface DI-1

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




### Digital output interface DO-1

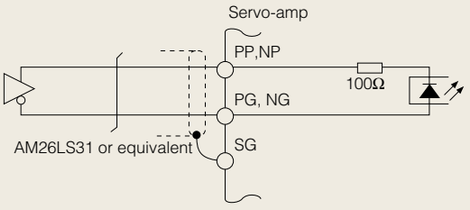
Can drive a lamp, relay, or photocoupler.



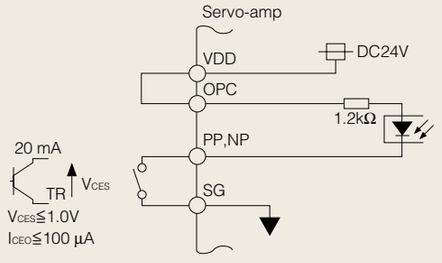

Note: For an induction load install a surge suppressor (DC) ; for a lamp load install an incoming current suppression resistor (R).

### Pulse train input interface DI-2

●Differential mode

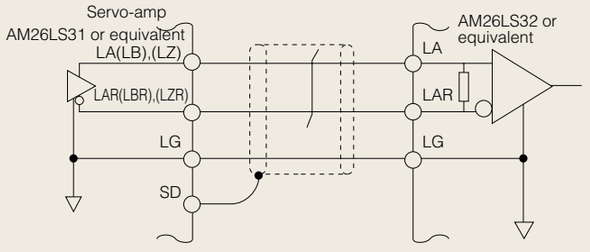



●Open collector mode

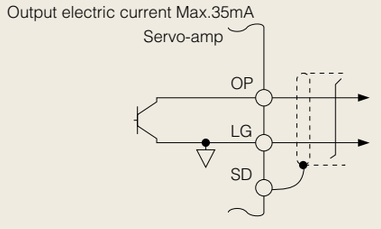



### Encoder pulse train input interface DO-2

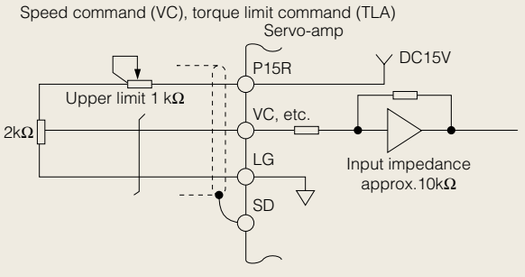
●Differential mode



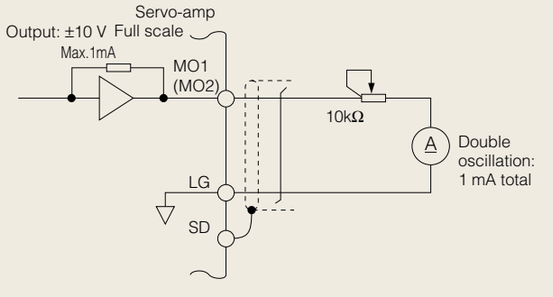

●Open collector mode




### Analog input interface




### Analog output interface






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# Safety Features

The J2 servo-amp possesses the safety features described below. To protect the unit, when a safety circuit is activated output is suspended by cutting off 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-amp or personal computer. After eliminating the cause, close the reset terminal (RES) or turn off the control power and reset.

| | Alarm LED display | Safety feature name | Description |
|---|---|---|---|
| Alarm | A.10 | Insufficient voltage | Is activated when the power supply's voltage falls below a certain level or when a sudden power outage of more than 15 milliseconds occurs. |
| | A.11 | Board error 1 | Is activated when an error is detected in the printed board. |
| | A.12 | Memory error 1 | Is activated when an error is detected in the printed board's memory. |
| | A.13 | Clock error | Is activated when an error is detected in the printed board. |
| | A.15 | Memory error 2 | Is activated when an error is detected in the printed board's memory. |
| | A.16 | Encoder error 1 | Is activated when a different type of encoder is detected and communication with encoder cannot be performed normally. |
| | A.17 | Board error 2 | Is activated when an error is detected in a servo-amp board component. |
| | A.18 | Board error 3 | Is activated when an error is detected in the printed board. |
| | A.20 | Encoder error 2 | Is activated when an error is detected in the encoder or encoder cable. |
| | A.24 | Motor output ground fault | Activates when servo-amp servomotor output produces a ground fault. |
| | A.25 | ABS data loss | Is activated when the battery's voltage falls and absolute data is lost. |
| | A.30 | Regeneration error | Is activated when an error is detected in the regeneration circuit or when there is an excess load on the regeneration brake resistor due to excess regeneration frequency. |
| | A.31 | Excess speed | Is activated when the motor rotation speed is detected to have exceeded the permissible rotation speed. |
| | A.32 | Excess current | Is activated when excess current is detected. |
| | A.33 | Excess voltage | Is activated when excess converter voltage is detected. |
| | A.35 | Command pulse error | Is activated when an excess frequency command pulse is input. |
| | A.37 | Parameter error | Is activated when 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 when activation, due to motor overheating, of the thermal protector inside the encoder is detected. |
| | A.50 | Overload 1 | Is activated when an overload is detected in the motor or servo-amp. |
| | A.51 | Overload 2 | Is activated when an overload is detected in the motor or servo-amp. |
| | A.52 | Excess error | Is activated when the difference between the input pulse and return pulse is detected to have exceeded 80k pulses when operating in position control mode. |
| | A.8E | RS-232C communications error | Is activated when an error occurs in RS-232C communications. |
| Warning | A.92 | Battery disconnection error | Is activated when the battery wire connected to the encoder becomes disconnected or when the battery's voltage falls. |
| | A.96 | Origin set error | Is activated when the origin is not set following the input of a CR (clear) signal in an absolute system. |
| | A.9F | Battery warning | Is activated when the battery's voltage falls. |
| | A.E0 | Excess regeneration warning | Is activated when the regeneration resistor's load reaches 85% of the alarm level. |
| | A.E1 | Overload warning | Is activated when the unit reaches 85% of the overload alarm level. |
| | A.E3 | ABS data counter warning | Is activated when there is an error in the absolute data counter's backup data. |
| | A.E5 | ABS time-out warning | Is activated when there is a time-out error during the forwarding of absolute data. |
| | A.E6 | Servo emergency stop | Is activated when an external emergency stop signal has been lifted. |
| | A.E9 | Main circuit off warning | Is activated when the main circuit's voltage (P-N) is below 215 V when the servo on (SON) signal is turned on. |
| | A.EA | ABS servo on warning | Is activated when the servo on signal does not go on within 1 second after ABS forwarding mode (D13) is turned on. |
| | | | |
| | 8888 | System error (watchdog) | Is activated when a system error is detected. |
| | | | |

Notes:
1. The state under which regeneration error (alarm A30) and overload 1 and 2 (alarms A50 and A51) were activated is maintained inside the servo-amp 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 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 50.



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# SERVO AMPLIFIERS MELSERVO J2-B

## For use with the High Speed "SSC-Net Bus".

**Single Touch Connection with "SSC-Net" (High Speed Bus Connection) results in reduced wiring. Monitoring of status, interpolation, synchronous control etc. is simply performed with the SSC-Net Controller.**






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# Peripheral Equipment

Peripheral equipment is connected to the MR-J2-B unit as described below.
Connectors, cables, options, and other necessary equipment are available so that users can set up the MR-J2-B easily and begin using it right away. Through its SSC-NET-compatible one-touch connections, the MELSERVO-J2-B series reduces the number of wires and the chances of wiring errors.




The SSC-NET command unit is shown at left.
Choose the unit that fits the size of your system.

**Battery compartment**

A battery (MR-BAT) is installed in the holder when using as an absolute system.

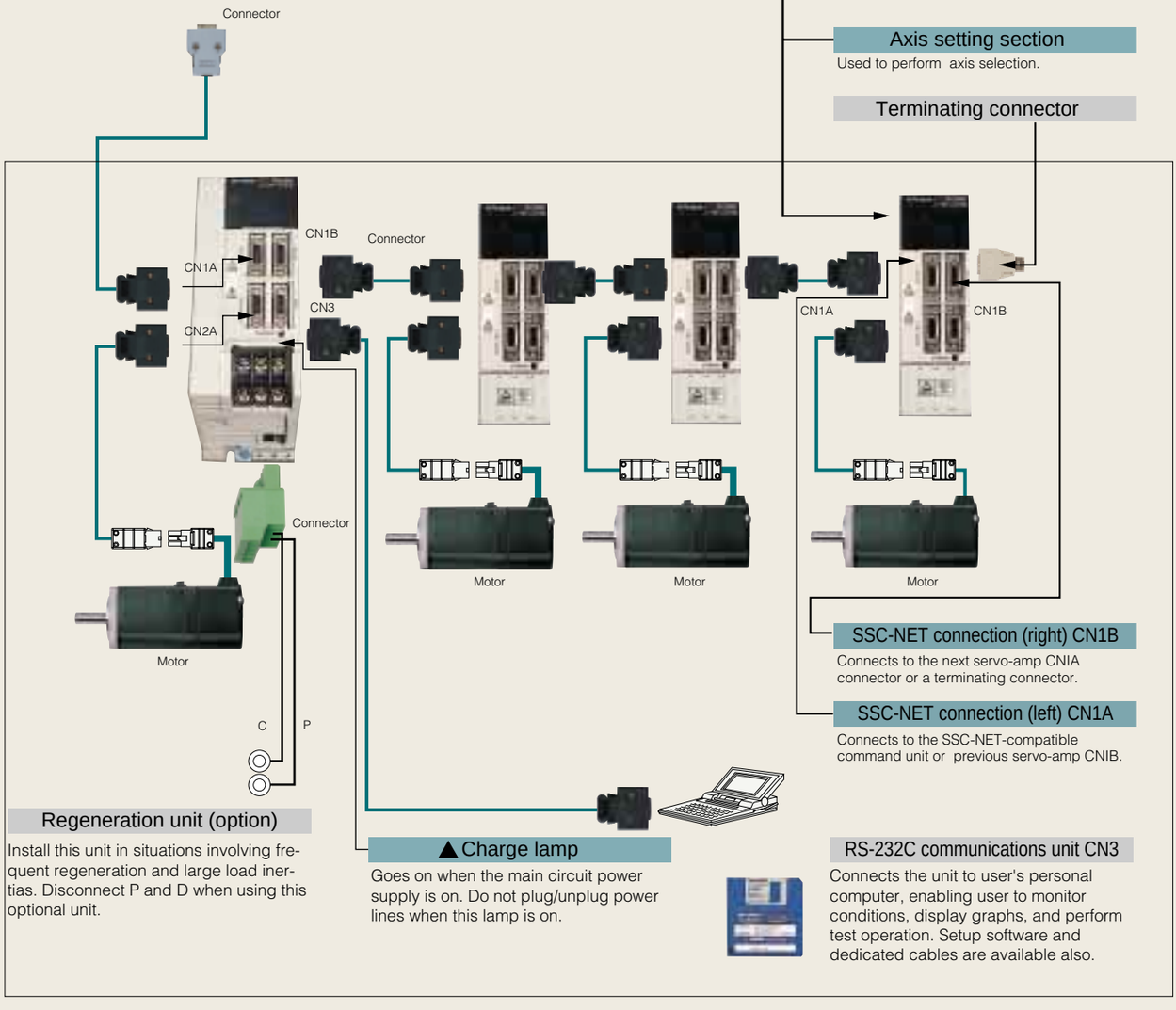
**Display panel**

Displays servo-amp status and alarm numbers.

**Axis setting section**

Used to perform axis selection.

**Terminating connector**




**SSC-NET connection (right) CN1B**

Connects to the next servo-amp CNIA connector or a terminating connector.

**SSC-NET connection (left) CN1A**

Connects to the SSC-NET-compatible command unit or previous servo-amp CNIB.

**Regeneration unit (option)**

Install this unit in situations involving frequent regeneration and large load inertias. Disconnect P and D when using this optional unit.

**▲Charge lamp**

Goes on when the main circuit power supply is on. Do not plug/unplug power lines when this lamp is on.

**RS-232C communications unit CN3**

Connects the unit to user's personal computer, enabling user to monitor conditions, display graphs, and perform test operation. Setup software and dedicated cables are available also.

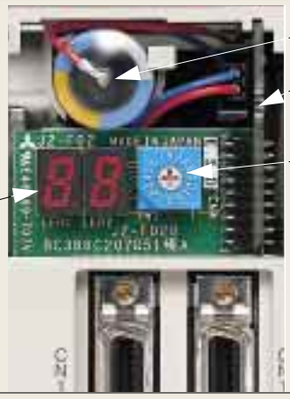


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# Setting and Two-Segment Display

## Simple operation by setting the axis number with the axis selection switch

Simply connect the SSC-NET cable in one simple motion No troublesome wiring or setting. The SSC-NET-compatible command unit takes care of all the parameter settings, etc.



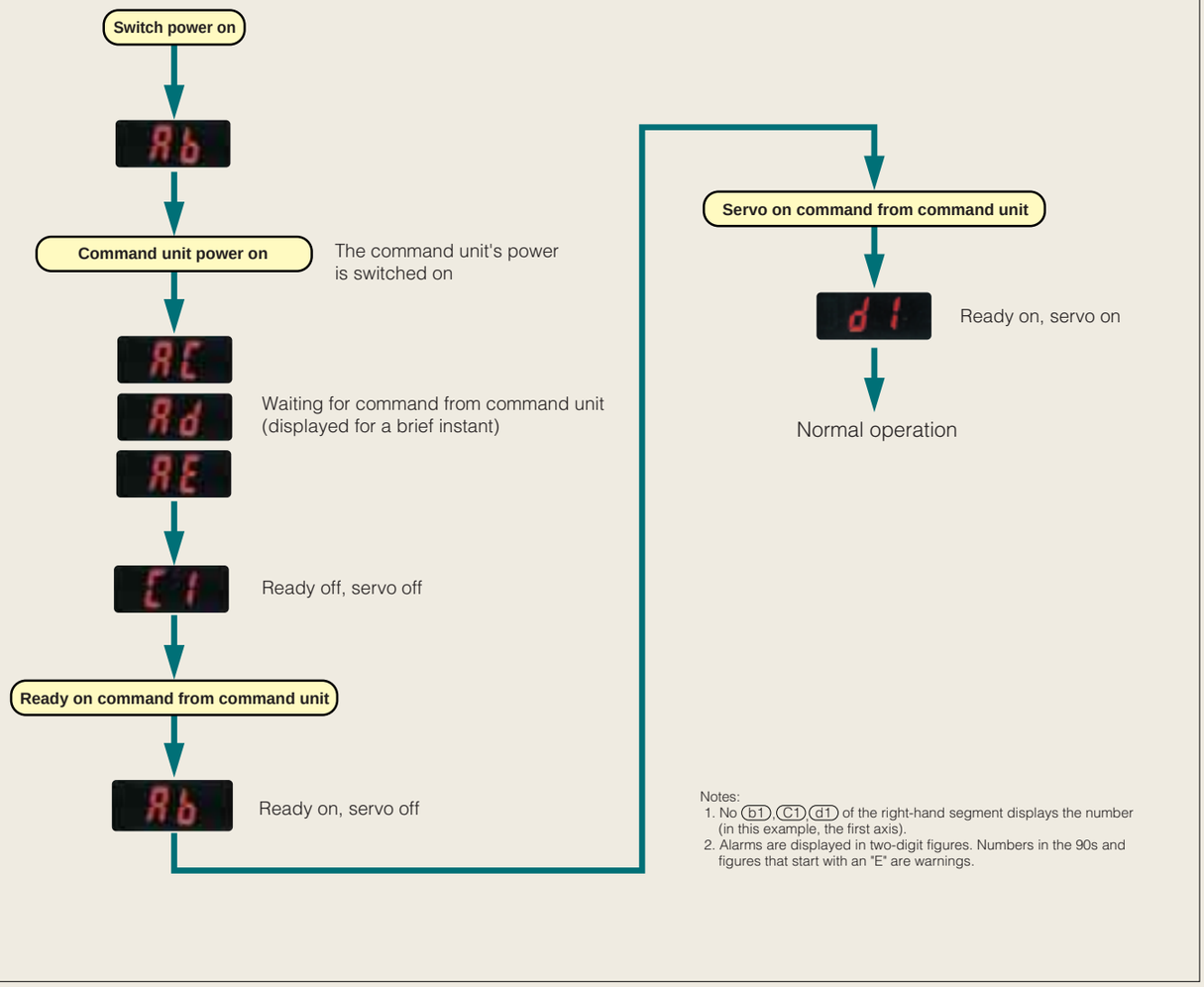
Optional battery

Optional battery connecter

} Attach the optional battery when using as an absolute system.

Axis selection switch
Set the axis number that corresponds to the controller's axis setting.

2-digit 7-segment display
Displays the servo-amp's status and alarms.




Notes:
1. No (b1), (C1), (d1) of the right-hand segment displays the number (in this example, the first axis).
2. Alarms are displayed in two-digit figures. Numbers in the 90s and figures that start with an "E" are warnings.



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# Specifications and Display Messages

## Servo-amp specifications

| Servo-amp model MR-J2- | | | 10B | 20B | 40B | 60B | 70B | 100B | 200B | 350B |
|---|---|---|---|---|---|---|---|---|---|---|
| Servo-amp | Power supply | Voltage/frequency (note) | 3-phase 200 to 230V AC 50/60 Hz | | | | | | | |
| | | Permissible voltage range | 3-phase 170 to 253V AC | | | | | | | |
| | | Permissible frequency fluctuation | ±5% max. | | | | | | | |
| | Control system | | Sinusoidal PWM control/current control system | | | | | | | |
| | Dynamic brake | | Built-in | | | | | | | |
| | Speed frequency response | | 250Hz min. | | | | | | | |
| | Safety features | | Excess current shutdown, regeneration excess voltage shutdown, excess load shutdown (electronic thermal), servomotor overheat protection, encoder error protection, regeneration error encoder, insufficient voltage/ sudden power outage protection, excess speed protection, large error protection | | | | | | | |
| | Environment | Ambient temperature | 0 to 55°C (32 to 131°F) (non freezing), storage: −20 to 65°C (−4 to 149°F) (non freezing) | | | | | | | |
| | | Ambient humidity | 90% RH max. (non condensing), storage: 90% RH max. (non condensing) | | | | | | | |
| | | Atmosphere | Inside control panel; no corrosive gas, flammable gas, oil mist, or dust | | | | | | | |
| | | Elevation | 1000 meters or less above sea level | | | | | | | |
| | | Vibration | 5.9 m/s² (0.6G) max. | | | | | | | |
| | Weight kg (lb) | | 0.7 (1.5) | 0.7 (1.5) | 1.1 (2.4) | 1.1 (2.4) | 1.7 (3.7) | 1.7 (3.7) | 2.0 (4.4) | 2.0 (4.4) |

Note: Rated output capacity and rated rotation speed of the servomotor used in combination with the servo-amp are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply's voltage drops.

## Explanation of display messages

The servo's status is displayed on the seven segments on the front of the servo-amp. Alarm numbers are displayed here also when an alarm has been triggered.

| Display | Description |
|---|---|
| AA | Initializing, waiting for motion controller power to switch on (when motion controller power has been switched off) |
| Ab | Initializing, waiting for motion controller power to switch on (when motion controller power is off because the amp's power has been switched on) |
| AC | Initializing, between motion controller and amp begins communicating |
| Ad | Initializing, initial parameter reception complete |
| AE | Initialization completed |
| b# | Ready off |
| C# | Initialization completed, Servo off, controller side servo off. Issuing command. |
| d# | Servo on |
| E* | Warning |
| ** | Alarm |
| • • | CPU error |
| ☼ | Decimal point flashes. Test operation mode |

Note: #: Axis number (1 to 8: Axis numbers, 0: test operation)

## Amp dimensions

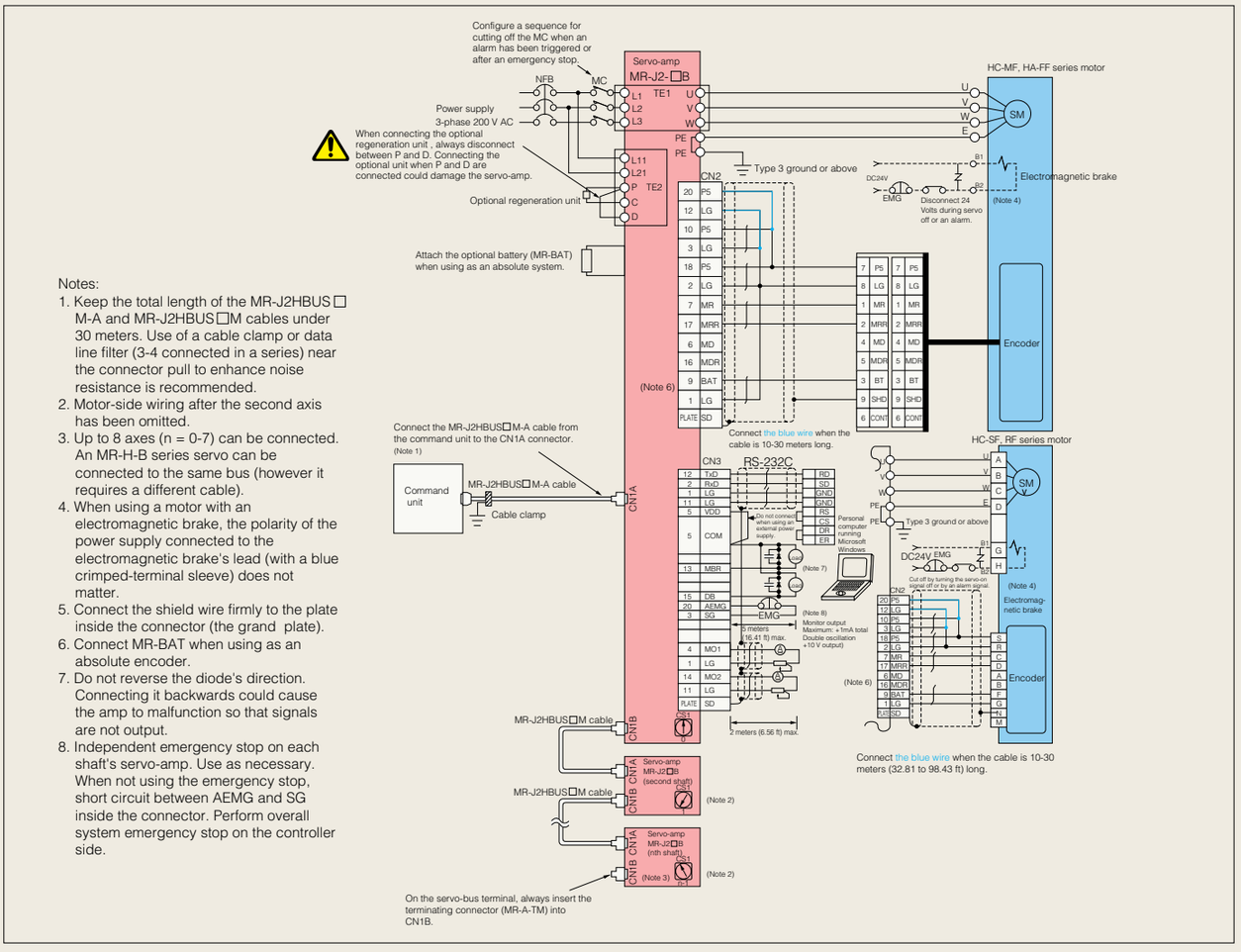
Same as MR-J2-A: Refer to diagram for A series.



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# Standard Wiring Diagram and Terminal Descriptions

## Serial bus version (available soon)




Notes:

1. Keep the total length of the MR-J2HBUS□M-A and MR-J2HBUS□M cables under 30 meters. Use of a cable clamp or data line filter (3-4 connected in a series) near the connector pull to enhance noise resistance is recommended.
2. Motor-side wiring after the second axis has been omitted.
3. Up to 8 axes (n = 0-7) can be connected. An MR-H-B series servo can be connected to the same bus (however it requires a different cable).
4. When using a motor with an electromagnetic brake, the polarity of the power supply connected to the electromagnetic brake's lead (with a blue crimped-terminal sleeve) does not matter.
5. Connect the shield wire firmly to the plate inside the connector (the grand plate).
6. Connect MR-BAT when using as an absolute encoder.
7. Do not reverse the diode's direction. Connecting it backwards could cause the amp to malfunction so that signals are not output.
8. Independent emergency stop on each shaft's servo-amp. Use as necessary. When not using the emergency stop, short circuit between AEMG and SG inside the connector. Perform overall system emergency stop on the controller side.

## Explanation of terminals

### ● Terminal block

| Signal | Abbreviation | Terminal block | Description of function/application |
|---|---|---|---|
| Alternating power supply | L1, L2, L3 | TE1 | Connect to a 3-phase 200 to 230V 50/60Hz commercial power supply. There are no phase sequence limitations. |
| | L11, L21 | TE2 | Connect to a single-phase 200 to 230V 50/60Hz 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's 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. |

### ● Connectors – Serial bus version (available soon)

| Connector | Signal | Description of function/application |
|---|---|---|
| CN1A | Bus cable previous axis connection | Connector for bus cable previous axis connection. Connect to controller or previous axis servo-amp. |
| CN1B | Bus cable succeeding axis connection | Connector for bus cable succeeding axis connection. Connect to succeeding axis servo-amp, terminating connector, or absolute position maintenance battery unit. |
| CN2 | Encoder signal | Connect to motor encoder. |
| CN3 | Serial interface | Connect to personal computer. |



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# Safety Features

The servo-amp possesses the following safety features for complete protection of itself and the servomotor. To protect the unit, when a safety circuit is activated output is suspended by cutting off power to the transistor base. When this happens, the dynamic brake is activated and stops the motor. An alarm number is displayed on the motion controller or servo-amp's LED display. After eliminating the cause, turn off the control power and reset.
When a warning (92 and below) has been triggered operation will not stop. But if the condition is not resolved, an alarm will be triggered. Identify and eliminate the cause immediately.

| | Alarm LED display | Safety feature name | Description |
|---|---|---|---|
| Alarm code | 10 | Insufficient voltage | Is activated when the power supply's voltage falls below a certain level or when a sudden power outage of more than 15 milliseconds occurs. |
| | 11 | Board error 1 | Is activated when an error is detected in the printed board. |
| | 12 | Memory error 1 | Is activated when an error is detected in the printed board's memory. |
| | 13 | Clock error | Is activated when an error is detected in the printed board. |
| | 15 | Memory error 2 | Is activated when an error is detected in the printed board's memory. |
| | 16 | Encoder error 1 | Is activated when an error is detected in the printed board's memory.Is activated when a different type of encoder is detected and communication with encoder cannot be performed normally. |
| | 17 | Board error 2 | Is activated when an error is detected in a servo-amp board component. |
| | 18 | Board error 3 | Is activated when an error is detected in the printed board. |
| | 20 | Encoder error 2 | Is activated when an error is detected in the encoder or encoder cable. |
| | 24 | Output side ground fault | Activates when the servo-amp output phases U, V. |
| | 25 | ABS data loss | Is activated when the battery's voltage falls and absolute data is lost. |
| | 30 | Regeneration error | Is activated when an error is detected in the regeneration circuit or when there is an excess load on the regeneration brake resistor due to excess regeneration frequency. |
| | 31 | Excess speed | Is activated when the motor rotation speed is detected to have exceeded the permissible rotation speed. |
| | 32 | Excess current | Is activated when excess current is detected. |
| | 33 | Excess voltage | Is activated when excess converter voltage is detected. |
| | 34 | CRC error | Is activated when a communications error is detected in the bus cable (MR-J2BUS□M). |
| | 35 | Command pulse error | Is activated when an excess frequency command pulse is input. |
| | 36 | Transfer error | Is activated when an error is detected in the motion network cable or the printed board. |
| | 37 | Parameter error | Is activated when parameters are detected to be outside the setting range through a parameter check performed when the power is turned on. |
| | 46 | Motor overheat | Is activated when activation, due to motor overheating, of the thermal protector inside the encoder is detected. |
| | 50 | Overload 1 | Is activated when an overload is detected in the motor or servo-amp. |
| | 51 | Overload 2 | Is activated when an overload is detected in the motor or servo-amp. |
| | 52 | Excess error | Is activated when the difference between the input pulse and return pulse is detected to have exceeded 80k pulses when operating in position control mode. |
| | 88 | Watchdog | Is activated when the CPU fails. |
| Warning | 92 | Battery disconnection error | Is activated when the battery wire connected to the encoder becomes disconnected (the ABS data is not lost). |
| | 96 | Origin set error | Is activated when the origin is not set following the input of a CR (clear) signal in an absolute system. |
| | E0 | Over regeneration warning | Regenerative resistor load has reached 85% of the alarm level. |
| | E1 | Overload warning | Overload has reached 85% of the alarm level. |
| | E3 | ABS data counter warning | Error in the absolute encoder pulse. |
| | E4 | Parameter warning | Is activated when the unit reaches 85% of the overload alarm level. |
| | E6 | Servo emergency stop | External emergency stop signal is released. |
| | E7 | Battery warning | Is activated when the battery's voltage falls. |
| | E9 | Main circuit off warning | Activates when the main circuit voltage (P-N) is under 215V with the SERVO ON (SON) signal at ON. |

Notes:
1. The state under which regeneration error (alarm 30) and overload 1 and 2 (alarms 50 and 51) were activated is maintained inside the controller 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 alarms 30, 50, and 51 have been triggered can damage the components through overheating. Resume operation after definitely eliminating the cause of the alarm.



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# SERVO AMPLIFIERS MELSERVO J2-C

## Built-in Single Axis Amplifier

**Positioning and speed data can be easily set by parameters so a positioning program is not required. Multidrop operation up to 32 axes is possible with the RS485 (422) interface.**



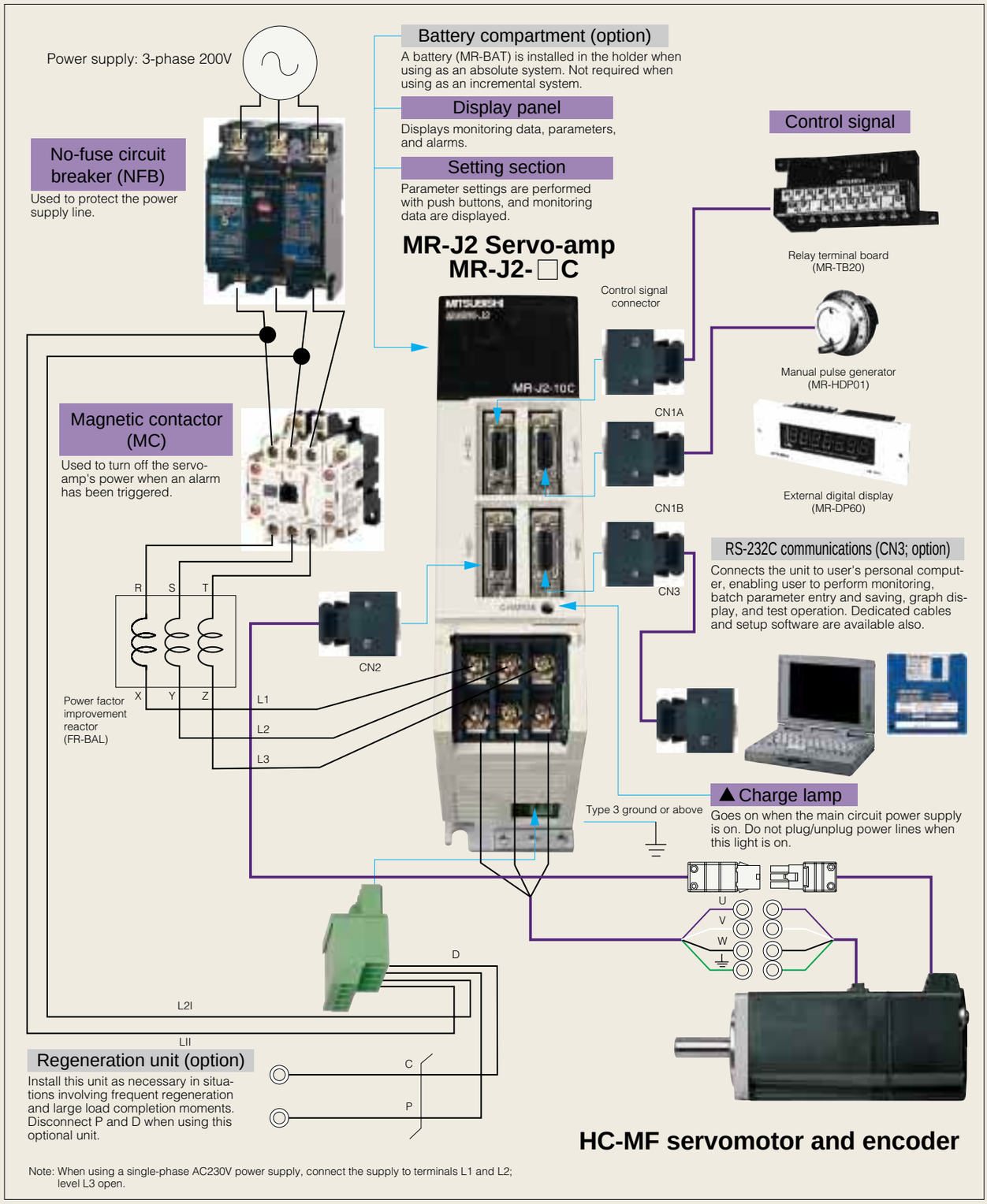



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# Peripheral Equipment

## Connections with peripheral equipment

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




Note: When using a single-phase AC230V power supply, connect the supply to terminals L1 and L2; level L3 open.



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# Features

## With built-in positioning function

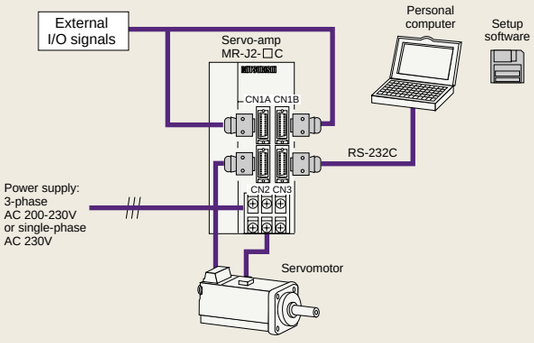
### Features

- Settings such as positioning data (target positions), motor RPM, and acceleration/deceleration times can be set in a point table with the feel of parameters.
- You can position using DI/O for simple, programless positioning.
- Allows multi-drop operation (up to 32 axes) using RS-485 serial communications.
- Highly responsive. The servo motor starts running a maximum of 3 ms after the start signal is input.

### System configuration

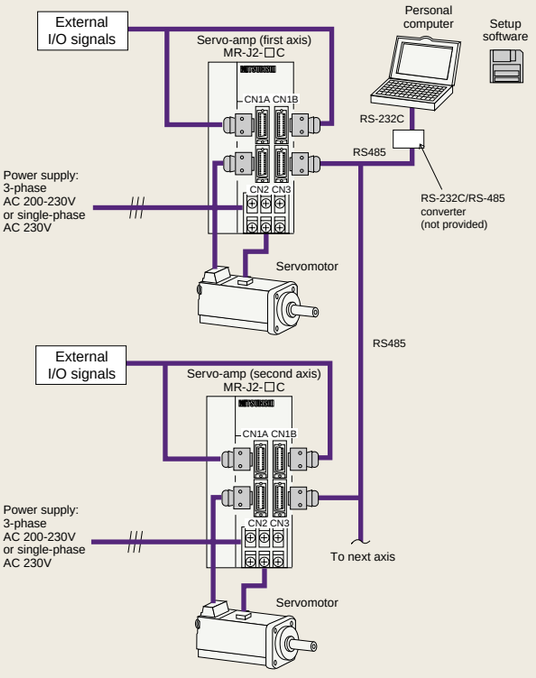
**Operate by external signal input**

This configuration diagram illustrates a setup that uses external input and output signals. The personal computer requires software for setting, changing, and monitor display of parameters and point tables.



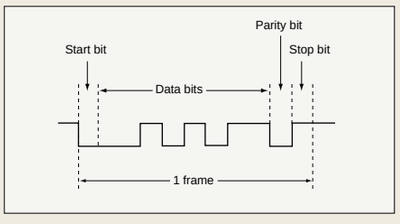

**Operate by serial communications**

Connect multiple servo amps (up to 32) to a personal computer through an RS-485 connection.




**Communications specifications**

- The RS-485 (RS-232C) specifications are as follows.
- Baud rate: 4800, 9600, or 19200 asynchronous.
- Transfer code: 1 start bit, 8 data bits, 1 parity bit, 1 stop bit.
- Transfer protocol: Character system, half-duplex communication.




**Point table**

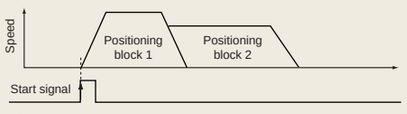
| Item | Setting range | Unit | Description |
|---|---|---|---|
| Target position | -999999~999999 | ×10$^{STM}$μm | Moves the set value. STM is the ratio to the data. |
| Motor (r/min) | 0 to permissible | r/min | Sets the command rpm for the servomotor used for positioning. |
| Acceleration time constant | 0~20000 | msec | Sets the acceleration time constant. |
| Deceleration time constant | 0~20000 | msec | Sets the deceleration time constant. |
| Dwell time | 0~20000 | msec | Runs the next point table after the set dwell time. |
| Auxiliary function | 0~1 | — | 0: Positions and stops (waits for start signal).<br>1: Continues operation for the next positioning block without stopping. |

**Sample data settings**

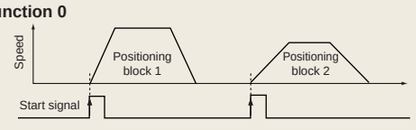
| Point No. | Target position | Motor (r/min) | Acceleration time constant | Deceleration time constant | Dwell time | Auxiliary functions |
|---|---|---|---|---|---|---|
| 1 | 1000 | 2000 | 200 | 200 | 0 | 1 |
| 2 | 2000 | 1600 | 50 | 60 | 0 | 0 |
| : | : | : | : | : | : | : |
| 15 | 999999 | 3000 | 100 | 110 | 0 | 0 |

Note: Set the auxiliary function for point No.1 to 1 to get auxiliary function 1 as shown in the figure below. Set the auxiliary function for point No.1 to 0 to get auxiliary function 0 as shown in the figure below, which requires a start signal.

**Auxiliary function 1**




**Auxiliary function 0**






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# Servo-amp Specifications

| Servo-amp model MR-J2- | | | | 10C | 20C | 40C | 60C | 70C | 100C | 200C | 350C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Servo-amp | Power supply | Voltage/requency | | 3-phase AC 200-230V at 50/60Hz or single-phase AC 230V at 50/60Hz (note 3) | | | | | 3-phase AC 200-230V at 50/60Hz | | |
| | | Permissible voltage fluctuation | | 3-phase AC 200-230V: AC 170-253 at 50/60Hz<br>Single-phase AC 230V: AC 207-253 at 50/60Hz | | | | | 3-phase AC 170-253V at 50/60Hz | | |
| | | Permissible frequency fluctuation | | ±5% max. | | | | | | | |
| | Control method | | | Sine wave PWM control and current control methods | | | | | | | |
| | Dynamic brake | | | Built-in (note 2) | | | | | | | |
| | Protection functions | | | Overcurrent breaking, regenerative overvoltage breaking, overload breaking (electronic thermal), servo motor overheating protection, sensor malfunction protection, regenerative malfunction protection, insufficient voltage, power outage protection, overspeed protection, protection against exceeding tolerances. | | | | | | | |
| | Speed frequency response | | | 250Hz min. | | | | | | | |
| | Command method | Input point table number | Operating specification | Positions according to the specification of the point table No. (15 points. Three points set when shipped.) | | | | | | | |
| | | | Input positioning command | Set in point table. Feed for 1 point settable between ±1μm and ±999.999 mm. | | | | | | | |
| | | | Input speed command | Set in point table. Acceleration/deceleration time set in point table. S-curve acceleration/deceleration constant set by parameter 14. | | | | | | | |
| | | | System | Signed absolute value commands, increment value commands. | | | | | | | |
| | | Input position data | Operating specification | Positioning by RS-485 (RS-232C) communications data. | | | | | | | |
| | | | Input positioning command | Positioning by RS-485 (RS-232C) communications. Feed for 1 point settable between ±1μm and ±999.999 mm. | | | | | | | |
| | | | Input speed command | Positioning by RS-485 (RS-232C) communications. Acceleration/deceleration time also set by RS-485 (RS-232C) communications. S-curve acceleration/deceleration constant set by parameter 14. | | | | | | | |
| | | | System | Signed absolute value commands, increment value commands. | | | | | | | |
| | Operating mode | Automatic operation mode | Point table | Point table number input and position data input system. Each positioning operation based on position and speed commands. | | | | | | | |
| | | | Automatic continuous operation | Speed changing operation (2 speeds to 15 speeds), automatic continuous positioning operation (2 to 15 points) | | | | | | | |
| | | Manual operation mode | JOG | Inches upon contact input or RS-485 (RS-232C) communications based on speed commands set by parameter. | | | | | | | |
| | | | Manual pulse generator | Manual feed by manual pulse generator. Command pulse ratio: Use parameter to select ×1, ×10, or ×100. | | | | | | | |
| | | Manual homing mode | Dog system (find rear end) | Returns to origin upon Z phase pulse after passing through near-point dog. Settable origin address, settable origin shift, and selectable direction for return to origin. Automatic retreat on dog back to origin and automatic stroke retreat function. | | | | | | | |
| | | | Count system (find front end) | Returns to origin upon sensor pulse count after touching near-point dog. Settable origin address, settable origin shift, and selectable direction for return to origin. Automatic retreat on dog back to origin and automatic stroke retreat function. | | | | | | | |
| | | | Data set system | Returns to origin without dog. Set any position as the origin using manual operation or the like. Settable origin address. | | | | | | | |
| | | | Impact system | Returns to origin upon hitting end of stroke. Settable origin address. Selectable direction for return to origin. | | | | | | | |
| | | | Ignore origin (SON position origin) | Uses position where SON signal becomes ON as origin. Settable origin address. | | | | | | | |
| | Other functions | | | Absolute position detection and backlash compensation. Overtravel prevented by external limit switch. Software stroke limit and override via external analog. | | | | | | | |
| | Structure | | | Open (IP00) | | | | | | | |
| | Environment | Ambient temperature | | 0 to 55°C (non freezing). Storage –20 to 65°C (non freezing) | | | | | | | |
| | | Ambient humidity | | 90% RH max. (non condensing). Storage 90% RH max. (non condensing) | | | | | | | |
| | | Atmosphere | | No corrosive gases, combustible gases, oil mist, or dust within control panel. | | | | | | | |
| | | Maximum altitude | | 1000 meters or less above sea level. | | | | | | | |
| | | Maximum vibration | | 5.9 m/s$^2$ [0.6G] max. | | | | | | | |
| | Weight kg (lb) | | | 0.7 (1.5) | 0.7 (1.5) | 1.1 (2.4) | 1.1 (2.4) | 1.7 (3.7) | 1.7 (3.7) | 2.0 (4.4) | 2.0 (4.4) |

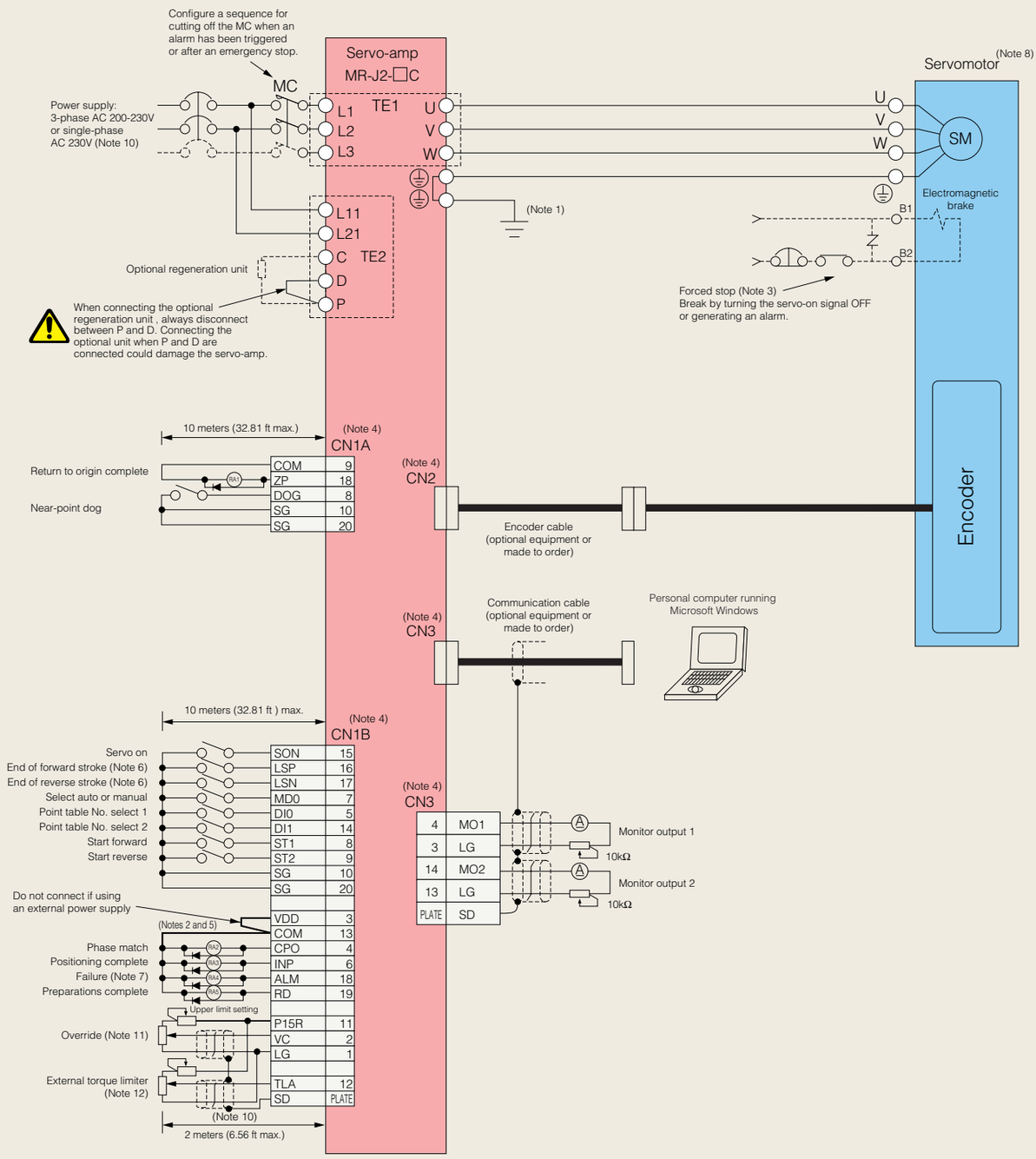
Notes: 1. The rated output capacity and rated RPM of the servomotor when assembled is for the stated supply voltage and frequency. No guarantees are made for lowered supply voltages.
2. Models without dynamic brakes (MR-J2-□□D) can also be handled using special specifications.
3. The torque characteristics when combined with a servomotor are for single phase AC 230V.



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# Standard Wiring Diagram

## Sample connections for MR-J2-C




Notes:

1. Always connect the servo-amp protection ground (PE) (for preventing shocks) to the control board's protection ground (PE).
2. Make sure you have the correct diode orientation. Connecting it backwards will damage the servo-amp, prevent output of signals, and prevent protection circuits such as forced stops from operating.
3. Always install a forced stop switch.
4. CN1A, CN1B, CN2 and CN3 are all the same shape. Connecting them wrong can cause damage. See the MELSERVO-J2-C Servo-Amp Technical Documents Collection for details.
5. Keep the sum total of current flowing through the external relays to 80 mA or less. To exceed 80 mA you must supply an external power supply for the interface.
6. During operation, be sure to short the forward and reverse stroke ends (LSN and LSP) to SG.
7. Make ALM conductive to COM during normal operation with no alarm.
8. Connection methods differ in different servomotor series. See the MELSERVO-J2-C Servo-Amp Technical Documents Collection for details.
9. Connect signals of the same name within the servo-amp.
10. When using a single-phase AC 230 V power supply, connect the supply to terminals L1 and L2; leave L3 open.
11. If using an override (VC), make it so an override selection (OVR) device can be used.
12. If using a torque limiter (TLA), make it so an external torque limit selector (TL) device and an internal torque limit selector (TL2) device can be used



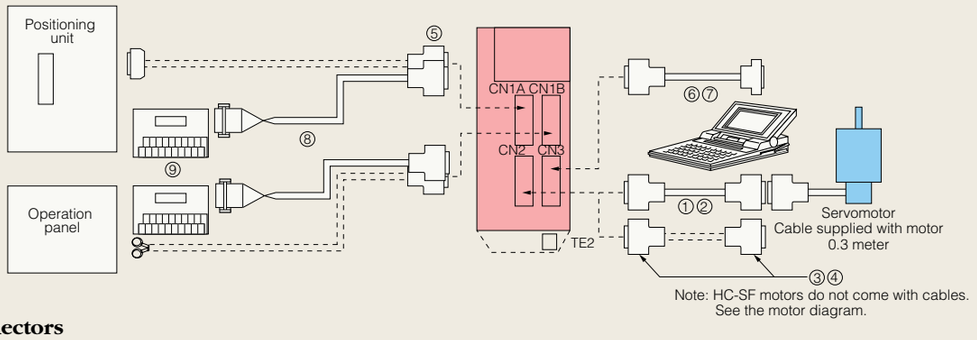
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# Options

## Options

### ● Cables and connectors (MR-J2-A series)

Cable and connector options are shown in the diagram below.




### ● Cables and connectors

| | | Item | Model | Description |
|---|---|---|---|---|
| Select one for use with CN2 | ① | Encoder cable for use with HC-MF, UF3000r/min and HA-FF series motors | MR-JCCBL□M-H□ (note 1, 3) | Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Junction connector (made by AMP) 1-172161-9 (black connector housing); Encoder |
| | | | MR-JCCBL□M-L□ (note 1,3) | |
| | ② | Encoder cable for use with HC-SF series motors and HC-RF, UF2000r/min | MR-JHSCBL□M-H□ (note 3) | Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Junction connector (made by Japan Aviation Electronics Industry) MS-3057-12A (cable clamp) MS3106B20-29S (straight plug); Encoder |
| | | | MR-JHSCBL□M-L□ (note 3) | |
| | ③ | Encoder connector set for use with HC-MF and HA-FF series motors, HC-UF3000r/min | MR-J2CNM | Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Junction connector (made by AMP) 1-172161-9 (black connector housing) 170363-1 (connector pin); (note 2) |
| | ④ | Encoder connector set for use with HC-SF series motors and HC-RF, HC-UF2000r/min | MR-J2CNS | Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Junction connector (made by Japan Aviation Electronics Industry) MS-3057-12A (cable clamp) MS3106B20-29S (straight plug) |
| Select one for use with CN1 | ⑤ | CN1 connector | MR-J2CNI | Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit) |
| | ⑧ | Junction terminal block cable | MR-J2TBL□M (note 3) | Junction terminal block-side connector HIF3BA-20D-2.54R (connector); Amp-side connector (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit) |
| For use with CN3 | ⑥ | PC98 communications cable | MR-CPC98CBL3M | Connector for optional RS-232C unit (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Connector to PC98 series personal computer GM-25LM (made by Honda Tsushin) |
| | ⑦ | DOS/V communications cable | MR-CPCATCBL3M | Connector for optional RS-232C unit (made by 3M, or an equivalent product) 10120-3000VE (connector) 10320-52F0-008 (shell kit); Connector to DOS/V personal computer GM-9LM (made by Honda Tsushin) |
| | ⑨ | Junction terminal block | MR-TB20 | |

Notes:
1. -H and -L indicate bending life. -H products have a long bending life.
2. AMP 172161 (white) can also be used for the connector housing.
3. □Enter 5 or 10 in box for cable length in meters.

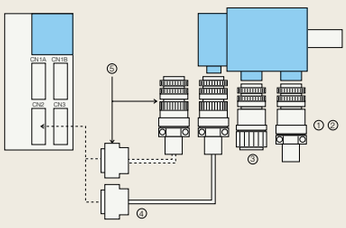


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# Options

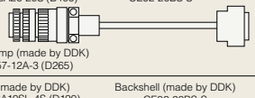
## ● Cables and connectors (for the HC-SF, RF and UF series)

All of these connectors satisfy IP65 and EN standards.




## ● List of cables and connectors (for the HC-SF, RF and UF series)

All of these connectors satisfy IP65 and EN standards.

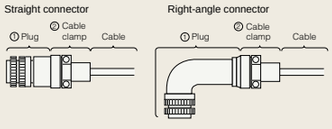
| Item | | Model | Details | Servomotor pairing |
|---|---|---|---|---|
| ① | Connector set for power source | MR-PWCNS1 (straight model) | Plug (made by DDK) CE05-6A22-23SD-B-BSS  Cable clamp (straight, made by DDK) CE3057-12A-2 (D265)  | HC-SF52, 102, 152 HC-RF103, 153, 203 |
| ② | | MR-PWCNS2 (straight model) | Plug (made by DDK) CE05-6A22-23SD-B-BSS  Cable clamp (straight, made by DDK) CE3057-12A-2 (D265)  | HC-SF202, 352 |
| ③ | Connector set for electromagnetic brake | MR-BKCN (straight model) | Plug (made by DDK) MS3106A10SL-4S (D190)  Cable connector (straight, made by [Daiwa Dengyo]) YOS10-5-8  | HC-SF202, 352 |
| ④ | Encoder cable (note) | MR-ENCB□M-H □=cable length: 2, 5, 10, 20, 30m | Plug (made by DDK) MS3106A20-29S (D190) Backshell (made by DDK) CE02-20BS-S  Connect for amp (3M or similar product) 10120-3000VF (connector) 10320-52F0-008 (shell kit) Cable clamp (made by DDK) CE3057-12A-3 (D265) | HC-SF, RF and UF series |
| ⑤ | Encoder cable (note) | MR-ENCNS | Plug (made by DDK) MS3106A10SL-4S (D190)  Backshell (made by DDK) CE02-20BS-S  Straight cable clamp (made by DDK) CE3057-12A-3 (D265)  Connect for amp (3M or similar product) 10120-3000VF (connector) 10320-52F0-008 (shell kit)  | HC-SF, RF and UF series |

Note: The encoder cable is not oil-resistant.

# Ordering information for customers

## ● Servomotor power connectors

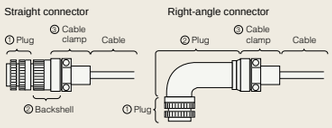
The motors are not provided with power connectors. Please order options from us, or choose from among the following recommended products. To order the following recommended products, customers should contact the relevant manufacturer directly.



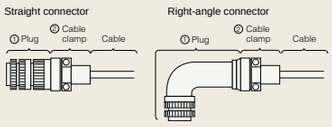

| Motor model | Application | ① Plug (made by DDK) | | ② Cable clamp (made by DDK) | |
|---|---|---|---|---|---|
| | | Type | Model | Cable diameter | Model |
| HC-SF52, 102, 152 HC-RF103, 153, 203 | Satisfy IP65, EN standards | Straight connector | CE05-6A22-23SD-B-BSS | 9.5~13 | CE3057-12A-2 (D265) |
| | | | | 12.5~16 | CE3057-12A-1 (D265) |
| | | Right-angle connector | CE05-6A22-23SD-B-BSS | 9.5~13 | CE3057-12A-2 (D265) |
| | | | | 12.5~16 | CE3057-12A-1 (D265) |
| | Normal environment | Straight connector | MS3106B22-23S | 15.9 (Inner diameter of bushing) | MS-3057-12A |
| | | Right-angle connector | MS3108B22-23S | | MS-3057-12A |
| HC-SF202, 352 | Satisfy IP65, EN standards | Straight connector | CE05-8A24-10SD-B-BAS | 13~15.5 | CE3057-16A-2 (D265) |
| | | | | 15~19.1 | CE3057-16A-1 (D265) |
| | | Right-angle connector | CE05-8A24-10SD-B-BAS | 13~15.5 | CE3057-16A-2 (D265) |
| | | | | 15~19.1 | CE3057-16A-1 (D265) |
| | Normal environment | Straight connector | MS3106B24-10S | 15.9 & 19.1 (Inner diameter of bushing) | MS-3057-16A |
| | | Right-angle connector | MS3108B24-10S | | MS-3057-16A |

## ● Encoder connectors

The motors are not provided with encoder connectors. Please order options from us, or choose from among the following recommended products. To order the following recommended products, customers should contact the relevant manufacturer directly.



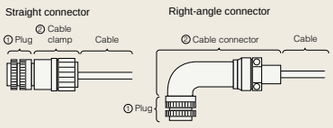

| Motor model | Application | ① Plug (made by DDK) | ② Backshell (made by DDK) | | ③ Cable clamp (made by DDK) | |
|---|---|---|---|---|---|---|
| | | | Type | Model | Cable diameter | Model |
| HC-SF series HC-RF series | Satisfy IP65, EN standards | MS3106A20-29S (D190) | Straight connector | CE02-20BS-S | 6.8-10 | CE3057-12A-3 |
| | | | Right-angled connector | CE-20BA-S | | |



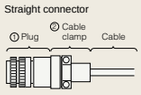

| Motor model | Application | ① Plug (made by DDK) | | ② Cable clamp (made by DDK) | |
|---|---|---|---|---|---|
| | | Type | Model | Cable diameter | Model |
| HC-SF series HC-RF series | Normal environment | Straight connector | MS3106B20-29S | 15.9 (Inner diameter of bushing) | MS3057-12A |
| | | Right-angled connector | MS3108B20-29S | | |

## ● Electromagnetic brake connectors

The motors are not provided with electromagnetic brake connectors. Please order options from us, or choose from among the following recommended products. To order the following recommended products, customers should contact the relevant manufacturer directly.




| Motor model | Application | ① Plug (made by DDK) | ② Cable clamp (made by DDK) | | | |
|---|---|---|---|---|---|---|
| | | Model | Type | Cable diameter | Model | Manufacturer |
| HC-SF202, 352 | Satisfy IP65, EN standards | MS3106A10SL-4S (D190) | Straight connecto | 4~8 | ACS-08RL-MS10F | Nippon Flex |
| | | | | 8~12 | ACS-12RL-MS10F | |
| | | | | 5~8.3 | YSO10-5~8 | Daiwa Dengyo |
| | | | Right-angled connector | 4~8 | ACA-08RL-MS10F | Nippon Flex |
| | | | | 8~12 | ACA-12RL-MS10F | |
| | | | | 5~8.3 | YLO10-5~8 | Daiwa Dengyo |




| Motor model | Application | ① Plug (made by DDK) | | ② Cable clamp (made by DDK) | |
|---|---|---|---|---|---|
| | | Type | Model | Cable diameter | Model |
| HC-SF202,352 | Normal environment | Straight connector | MS3106A10SL-4S | 5.6 (Inner diameter of bushing) | MS3057-4A |

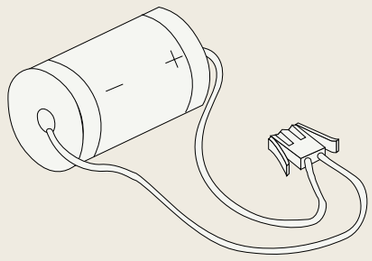


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# Options and Peripheral Equipment

**● Battery (MR-BAT)**

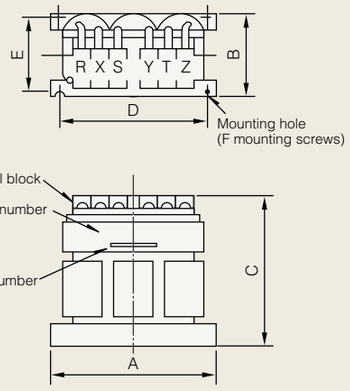
The servomotor's absolute value can be maintained by installing a battery in the servo-amp.
There is no need to install the battery when using the servomotor in incremental mode.
Note: A6BAT can be used also.



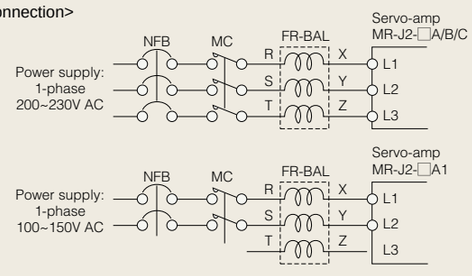
**● Power factor enhancing reactor (FR-BAL)**

This reactor enables users to boost the servo-amp's power factor and reduce its power capacity. It can also be used, when it is connected directly under the power transformer (500 kVA or above, wire length of 10 meters or less), to suppress current surges that occur when the power is turned on.

**External dimensions**




<Connection>




Unit: mm (inch)

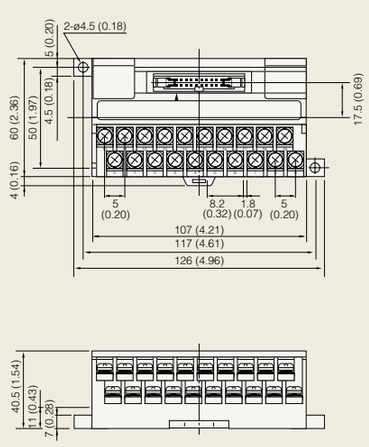
| Model | Dimensions | | | | | | Weight (kg (lb)) |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | |
| FR-BAL-0.4K | 135 (5.31) | 64 (2.51) | 120 (4.72) | 120 (4.72) | 45 (1.77) | M4 | 2 (4.4) |
| FR-BAL-0.75K | 135 (5.31) | 74 (2.91) | 120 (4.72) | 120 (4.72) | 57 (2.24) | M4 | 2 (4.4) |
| FR-BAL-1.5K | 160 (6.30) | 76 (2.99) | 145 (5.71) | 145 (5.71) | 55 (2.17) | M4 | 4 (8.8) |
| FR-BAL-2.2K | 160 (6.30) | 96 (3.78) | 145 (5.71) | 145 (5.71) | 75 (2.95) | M4 | 6 (13.2) |
| FR-BAL-3.7K | 220 (8.66) | 95 (3.74) | 200 (7.87) | 200 (7.87) | 70 (2.76) | M5 | 8.5 (18.7) |
| FR-BAL-7.5K | 220 (8.66) | 125 (4.92) | 205 (8.07) | 200 (7.87) | 100 (3.94) | M5 | 14.5 (32.0) |

**● Junction terminal block (MR-TB20)**

All signals can be wired to this junction terminal block without a connection to CN1.

**External dimensions**

Unit: mm (inch)



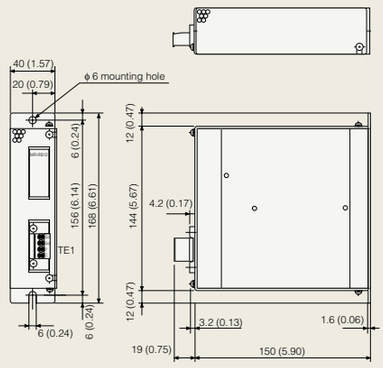

Compatible wire: 2 mm² max. (compressed terminal width: 8.1 mm max.)
Terminal block screw size :M3.5



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## ● Optional regeneration unit

Unit: mm (inch)



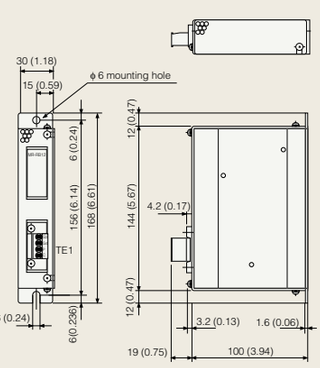

Terminals for wiring

TE1: G3, G4, P, C

Weight

| Type | Weight (kg) | Weight (lb) |
|---|---|---|
| MR-RB12 | 0.5 | 1.1 |

MR-RB12



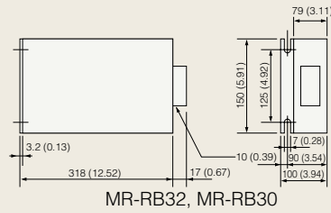

Terminals for wiring

TE1: G3, G4, P, C

Weight

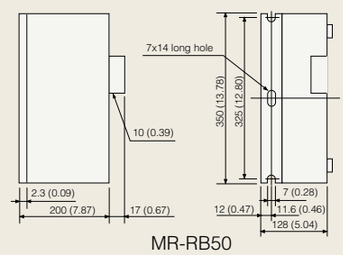
| Type | Weight (kg) | Weight (lb) |
|---|---|---|
| MR-RB032 | 1 | 2.2 |

MR-RB032




MR-RB32, MR-RB30

| Type | Weight (kg) | Weight (lb) |
|---|---|---|
| MR-RB32 | 2.9 | 7.0 |
| MR-RB30 | 2.9 | 7.0 |




MR-RB50

| Type | Weight (kg) | Weight (lb) |
|---|---|---|
| MR-RB50 | 5.6 | 12.3 |

| Servo-amp | Internal regeneration resistance | Optional regeneration unit | | | | | |
|---|---|---|---|---|---|---|---|
| | | MR-RB032 | MR-RB012 | MR-RB32 | MR-RB30 | MR-RB50 | Resistance value |
| MR-J2-10A/A1/B | None | 30W | – | – | – | – | 40 |
| MR-J2-20A/A1/B | 10W | 30W | 100W | – | – | – | 40 |
| MR-J2-40A/B | 10W | 30W | 100W | – | – | – | 40 |
| MR-J2-60A/B | 10W | 30W | 100W | – | – | – | 40 |
| MR-J2-70A/B | 20W | 30W | 100W | 300W | – | – | 40 |
| MR-J2-100A/B | 20W | 30W | 100W | 300W | – | – | 40 |
| MR-J2-200A/B | 100W | – | – | – | 300W | 500W | 13 |
| MR-J2-350A/B | 100W | – | – | – | 300W | 500W | 13 |

Notes: 1. When using the regeneration resistance option, be sure to disconnect the servo-amp's built-in regeneration resis (short-circuit wiring between Pand D)
2. Permissible watts in table differ from rated watts for regeneration resistance.

# Selection of peripheral equipment

## ● Electric wires, no-fuse circuit breakers, magnetic contactors

| Servo-amp | No-fuse circuit breaker | Magnetic contactor | Electric wire size (mm²) | | | | Power factor enhancing reactor |
|---|---|---|---|---|---|---|---|
| | | | L1, L2, L3 | U, V, W ⏚ | L11, L21 | P, C, D | |
| MR-J2-10A/A1/B/C | 5A NF-30 | S-N10 | 2 | 1.25 | 1.25 | 2 | FR-BAL-0.4K |
| MR-J2-20A/B/C | 5A NF-30 | S-N10 | 2 | 1.25 | 1.25 | 2 | FR-BAL-0.4K |
| MR-J2-40A/B/20A1/C | 10A NF-30 | S-N10 | 2 | 1.25 | 1.25 | 2 | FR-BAL-0.75K |
| MR-J2-60A/B/40A1/C | 15A NF-30 | S-N10 | 2 | 1.25 | 1.25 | 2 | FR-BAL-1.5K |
| MR-J2-70A/B/C | 15A NF-30 | S-N10 | 2 | 2 | 1.25 | 2 | FR-BAL-1.5K |
| MR-J2-100A/B/C | 15A NF-30 | S-N10 | 2 | 2 | 1.25 | 2 | FR-BAL-2.2K |
| MR-J2-200A/B/C | 20A NF-30 | S-N18 | 3.5 | 3.5 | 1.25 | 2 | FR-BAL-3.7K |
| MR-J2-350A/B/C | 30A NF-30 | S-N20 | 5.5 | 5.5 (3.5 Note 2) | 1.25 | 2 | FR-BAL-7.5K |

Notes: 1. Assuming use of a 600V polyvinyl chloride insulated wire, with wires in table having a length of 30 meters.
2. When connecting to servomotor HC-RF203 use a 3.5mm² electric wire.

### ● Surge suppressor

Attach surge suppressors to the servo-amp and signal cable's AC relays, AC valves, and AC power supply brake. Attach diodes to the DC relays and DC valves.

Sample configuration
Surge suppressor: 972A-2003 504 11 (rated 200V, made by Matsuo Denki)
Diode: A diode with resisting pressure 4 or more times greater than the relay's drive voltage/current, and 2 or more times greater than the current.

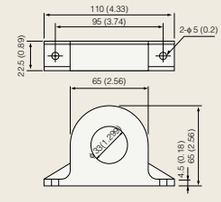
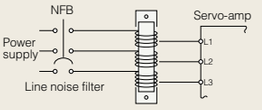
### ● Data line filter

Attaching a data line filter to the pulse output cable or motor encoder cable of the pulse train command unit (AD75, etc.) is effective in preventing noise penetration.

Sample configuration
Data line filter: ESD-SR-25 (made by Tokin), ZCAT3035-1330 (made by TDK)

### ● Line noise filter FR-BSF01

Effective in suppressing radio noise emitted from the servo-amp's power supply side or output side and high-frequency current leakage (zero-phase current). Especially effective in the 0.5 MHz to 5 MHz band. The greater the number of coils, the more effective this filter is.

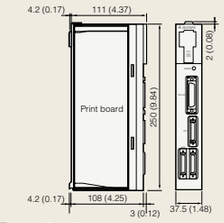
| External dimensions | Connections |
|---|---|
|   Unit: mm (inch) | The servo-amp's input-side cable is wound three or more times in the same direction jointly for each phase. When winding the output-side cable, do not wind more than three times. When the cable is too thick to wind three times, use two or more filters in a row and reduce the number of winds proportionately.   |

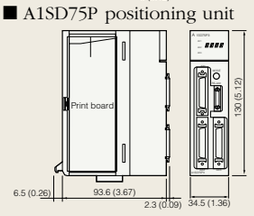


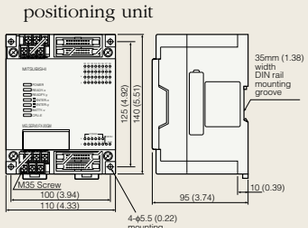
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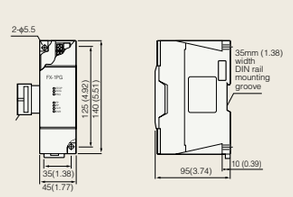
# Command Unit

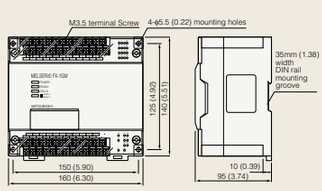
The following positioning controllers are available for the MR-J2-A series servo-amps. Choose the unit that best fits your operating objectives and system size.

<table>
<tr><th>Name</th><th>Specification/application overview</th><th>External dimensions</th></tr>
<tr>
<td>MELSEC-A, MELSEC-QnA series compatible<br>AD75P<br>A1SD75P<br><br>AD75P A1SD75P</td>
<td>All of the units have been made more compact: 1 slot for 1 to 3 axes. And they are compatible with the A and QnA series PLC's.<br>A high-precision, highly functional positioning unit that uses a 32-bit RISC chip.
<table>
<tr><th>Item \ Model</th><th>AD75P1<br>A1SD75P1</th><th>AD75P2<br>A1SD75P2</th><th>AD75P3<br>A1SD75P3</th></tr>
<tr><td>Number of control axes</td><td>1</td><td>2 simultaneous<br>2 independent</td><td>3 simultaneous<br>3 independent</td></tr>
<tr><td>Interpolation functions</td><td>None</td><td>2-axes linear interpolation<br>2-axes circular interpolation</td><td>2-axes linear interpolation<br>2-axes circular interpolation</td></tr>
<tr><td>Control mode</td><td colspan="3">PTP control, locus control, speed control, speed position control</td></tr>
<tr><td>Command mode</td><td colspan="3">Incremental, absolute</td></tr>
<tr><td>Maximum number of output pulses</td><td colspan="3">±2147483648</td></tr>
<tr><td>Maximum pulse frequency</td><td colspan="3">Differential output: 400 kpps, open collector: 200 kpps</td></tr>
<tr><td>Positioning pattern</td><td colspan="3">600 patterns/shaft (100 patterns from ladder)</td></tr>
<tr><td>Input/output duty points</td><td colspan="3">32</td></tr>
<tr><td>Acceleration/deceleration patterns</td><td colspan="3">4, automatic trapezoid, S-acceleration/deceleration</td></tr>
</table>
</td>
<td>■ AD75P positioning unit<br>

■ A1SD75P positioning unit<br>

Unit: mm (inch)</td>
</tr>
<tr>
<td>MELSEC-F series-compatible 2-axis positioning units<br>FX-20GM<br>E-20GM<br><br>FX-20GM<br><br>E-20GM</td>
<td>Users can choose either the FX-20GM alone or coupled with an FX PLC. This units offer a broad range of uses, from interpolation operation to high-frequency feed operation.
<table>
<tr><th>Item \ Model</th><th>FX-20GM / E-20GM<br>(language-equipped model)</th></tr>
<tr><td>Number of control axes</td><td>2 simultaneous, 2 independent</td></tr>
<tr><td>Interpolation functions</td><td>Linear interpolation, circular interpolation</td></tr>
<tr><td>Compatible PLC</td><td>Stand-alone use</td></tr>
<tr><td>Command mode</td><td>Incremental, absolute</td></tr>
<tr><td>Absolute position encoder</td><td>Can be used with MR-H model servo with ABS function</td></tr>
<tr><td>Maximum number of output pulses</td><td>C ±2,147,483,648</td></tr>
<tr><td>Maximum pulse frequency</td><td>Open collector: 200 kpps, during interpolation operation: 100 kpps</td></tr>
<tr><td>Program memory</td><td>Built-in 7.8 k step RAM</td></tr>
</table>
</td>
<td>■ FX-20GM/E-20GM 2-axis positioning unit<br>

Unit: mm (inch)</td>
</tr>
<tr>
<td>MELSEC-F series-compatible 1-axis positioning units<br>FX-1PG<br>FX-1GM<br><br>FX-1PG<br>1-axis pulse output block<br><br>FX-1GM<br>pulse output block unit</td>
<td>The FX-1PG can be expanded for up to 8 axis, is available as FX-sequencer special-unit blocks. The units can be used for simple positioning applications.
<table>
<tr><th>Item \ Model</th><th colspan="2">FX-1PG / FX-1GM</th></tr>
<tr><td>Number of control axes</td><td colspan="2">1</td></tr>
<tr><td>Compatible sequencer</td><td>Stand-alone use, FX2/FX2C</td><td>FX2/FX2C series</td></tr>
<tr><td>Command mode</td><td colspan="2">Incremental, absolute</td></tr>
<tr><td>Maximum number of output pulses</td><td colspan="2">±2,147,483,648</td></tr>
<tr><td>Maximum pulse frequency</td><td colspan="2">Open collector: 100 kpps</td></tr>
<tr><td>Program memory</td><td colspan="2">Communication with PLC</td></tr>
</table>
</td>
<td>■ FX-1PG 1-axis pulse output block<br>

■ FX-1GM 1-axis positionning units<br>

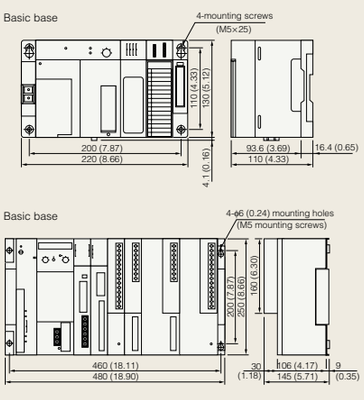
Unit: mm (inch)</td>
</tr>
</table>



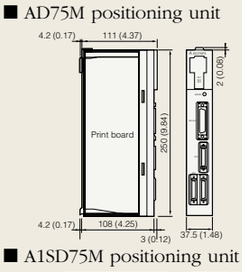
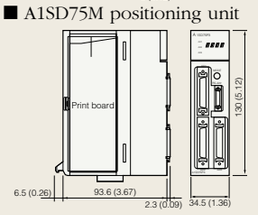
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# Command Unit

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

| Name | Specification/application overview | External dimensions |
|---|---|---|
| A171SH/A172SH<br>Motion controller<br><br>A273UH<br>Motion controller<br> | Combination of a servo-controller with the MELSEC-A high-performance all-purpose PLC allows motion and sequence control with one single controller. This previously required two separate controllers. Four software packages are available for different applications.<br>Conveyor and assembly software (SV13)<br>Automated unit software (SV22, CAMP)<br>Machine tool peripheral software (SV43)<br>Dedicated robot software (SV51) | <br>Unit: mm (inch) |

| Item \ Model | A171SH | A172SH | A273UH |
|---|---|---|---|
| Number of control axis | 4 | 8 | 32 |
| Interpolation functions | Linear interpolation (max. 4-axes) / Circular interpolation (2-axes) | | |
| Control mode | PTP control, speed control, synchronous control, fixed distance feed speed & position control, CP control, speed switch control | | |
| Acceleration/deceleration pattern | Automatic trapezoid, S-acceleration / deceleration | | |
| Maximum inputs & outputs | 512 | 1024 | 2048 |
| Servo-amp | External | | External (max. 22kW) Internal (max. 600W) |

| Name | Specification/application overview | External dimensions |
|---|---|---|
| AD75M<br>A1SD75M<br><br>AD75M A1SD75M | All of the units have been made more compact: 1 slot for 1 to 3 axes. And they are compatible with the A and QnA series PLC's.<br>A high-precision, highly functional positioning unit that uses a 32-bit RISC chip. | ■ AD75M positioning unit<br><br>■ A1SD75M positioning unit<br><br>Unit: mm (inch) |

| Item \ Model | AD75M1<br>A1SD75M1 | AD75M2<br>A1SD75M2 | AD75M3<br>A1SD75M3 |
|---|---|---|---|
| Number of control axes | 1 | 2 simultaneous<br>2 independent | 3 simultaneous<br>3 independent |
| Interpolation functions | None | 2-axes linear interpolation<br>2-axes circular interpolation | 2-axes linear interpolation<br>2-axes circular interpolation |
| Control mode | PTP control, locus control, speed control, speed position control | | |
| Command mode | Incremental, absolute | | |
| Maximum number of output pulses | ±2147483648 | | |
| Positioning pattern | 600 patterns/shaft (100 patterns from ladder) | | |
| Input/output duty points | 32 | | |
| Acceleration/deceleration patterns | 4, automatic trapezoid, S-acceleration/deceleration | | |



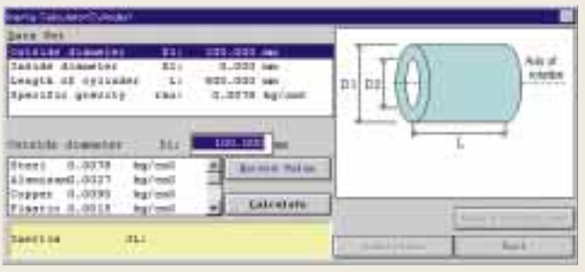
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# Using Personal Computers

## ■ Capacity selection software MRZJW3-MOTSZ□□

A user-friendly design facilitates selection of the optimum servo-amp, servomotor (including brake and decelerator), and optional regenerative devices when you enter constants into machine-specific screens.





### Features

(1) Windows 3.1 and Windows 95 (note 1) Compatible
Works on computers running Windows 3.1 or Windows 95. Requires at least 4 MB of memory and 1 MB of hard disk space.

(2) Provides numerous structural options. Handles ball screws, rack and pinions, roll feeds, rotating tables, dollies, elevators, conveyors, and other (direct inertial input) devices.

(3) Easy to convert units. It's easy to calculate and convert in SI, MKS mass, and inch/pound units.

### Specifications

| Parameter | | Description |
|---|---|---|
| Types of structural machine elements | | Nine types: Horizontal ball screws, vertical ball screws, rack and pinions, roll feeds, rotating tables, dollies, elevators, conveyors, and other (direct inertial input) devices. |
| Output of results | Parameters | Selected servo-amp name, selected servomotor name, selected regenerative resistor name, load inertial moment, load inertial moment ratio, peak torque ratio, effective torque, effective torque ratio, regenerative power, and regenerative power ratio. |
| | Printing | Prints the input parameters, calculation process, and selected results. |
| | Data storage | Gives the input parameters a file name and saves them to a floppy. |
| Inertial moment calculation function | | Five types: centrifugal cylinder, off-axis square shaft, linear motion, hanging, and decelerator. |

Notes:
1. Windows is a registered trademark of the Microsoft Corporation.
2. This software may not run correctly on all personal computers.
3. The MRZJW3-MOTSZ41 capacity selection software does not work for MR-J2-C. It will after the next upgrade. Version 41 will work with HC-MF, HA-FF, HC-SF, UF 2000 r/min, and HC-RF series motors.

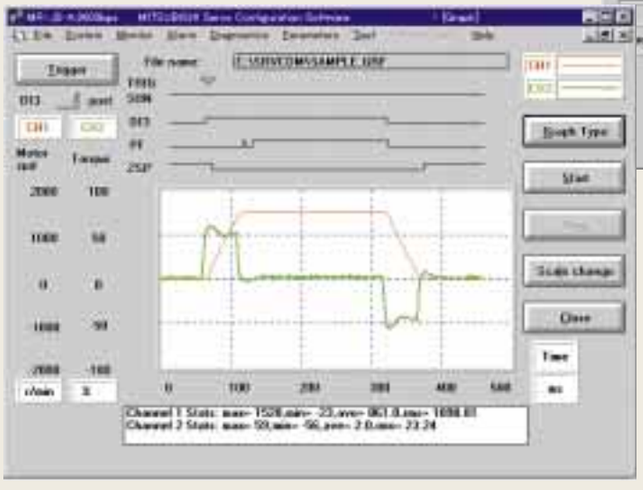


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## ■ Setup Software
**MRZJW3-SETUP□□**

This software makes it easy to do monitor display, diagnosis, reading and writing of parameters, and test operations from the setup using a personal computer.





### Features

(1) Windows 3.1 and Windows 95 (note 1) Compatible
Works on computers running Windows 3.1 or Windows 95. Can be setup using a personal computer instead of the parameter unit. Requires at least 4 MB of memory and 1 MB of hard disk space. Uses a serial port.

(2) Provides numerous monitor functions. Provides graph display function that enables display of servomotor status upon input signal triggers such as command pulses, accumulated pulses, and r/min.

(3) Run Tests from a Personal Computer
Allows servo motors to be tested easily from a personal computer.
Specifications (Items in parentheses do not work with the MR-J2)

**Specifications** (Items in parentheses do not work with the MR-J2)

| Parameter | Description |
|---|---|
| Monitors | Batch display, fast display, and graph display. |
| Alarms | Alarm display, alarm history, display of data that generated alarm, and (pre-alarm graph display). |
| Diagnosis | DI/DO display, display of reason motor is not running, (display of recovery time), display of cumulative time power is on, switch number display, tuning data display, ABS data display, and automatic VC offset display. (note 2) |
| Parameters | Data setting, list displays, display of change lists, display of detailed information, (feed system selection), and device setting.(note 3) |
| Test operations | JOG operation, positioning operation, operation without motor, forced DO output, program operation using simple language, and (one-step feed (note 3)). |
| Point data (note 3) | (Position/speed block data batch display, data setting, teaching), and point table.(note 3) |
| File operation | Data reading, storage, and printing. |
| Other | Automatic operation and help display. |

Notes:
1. Windows is a registered trademark of the Microsoft Corporation.
2. Automatic VC offset display works only with the MR-J2-A series.
3. MR-J2-C compatible.
4. This software may not run correctly on some PCs.



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# Cautions Concerning Use

## To ensure safe use

- To ensure the safe and proper use of the product, we ask that you read the instruction manual prior to its use.
- These products are not designed or manufactured for use in machinery and systems where people's safety is at stake.
- When considering the product for use in such special applications as equipment or systems employed in passenger transportation, medicine, aerospace, nuclear power generation, or underwater relays, please contact our sales representative.
- This product has been manufactured to the most rigorous quality standards. However, we ask that you employ safety devices when using the product in equipment in which any failure on its part can be expected to cause a serious accident or loss.

## Cautions concerning use

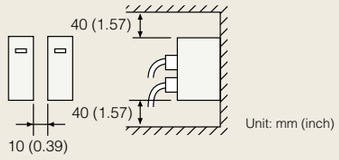
### Transport and installation of motor

- Protect the motor from impact during handling. When installing pulleys and couplings, do not hammer on the shaft. Impact can damage the encoder. Use a pulley extractor when taking off the pulley.



### Installation

- Avoid installation in an environment in which oil mist, dust, etc. are in the air. When using in such an environment, enclose the servo-amp in an airtight panel. Protect the motor by furnishing a cover for it or taking similar measures.
- Mount the amp vertically on a wall.
- When installing multiple amps inside an airtight panel, leave at least 10 millimeters between amps. Leave at least 40 millimeters of space above and below the amp. When installing multiple amps, leave 100 millimeters of space or install a fan to ensure that heat is not trapped inside the panel.




- While installing a single motor, the motor can be installed horizontally or vertically. When installing vertical (upside the shaft) take measures on the machine side to ensure that oil from the gear box does not get into the motor.
- The optional regeneration unit becomes hot (temperature rise of 100°C or more) with frequent use. Do not install within flammable objects or objects subject to thermal deformation. Take care to ensure that electric wires do not come into contact with the main unit.

### Wiring

- A power supply to the amp's output terminal (U, V, W) will damage the amp. Before switching the power on, perform thorough wiring and sequence checks to ensure that there are no wiring errors, etc.
- Connecting wall out-let onto the motor's input terminal (U, V, W) will burn out the motor. Connect the motor to the amp's output terminal (U, V, W).
- Match the phase of the motor input terminal (U, V, W) to the output terminal (U, V, W) before connecting. If they are not the same, motor control cannot be performed.
- In position control mode, connect the stroke end signal (LSP, LSN) to the common terminal (SG). If it is not connected, the motor will not rotate.

### Factory settings

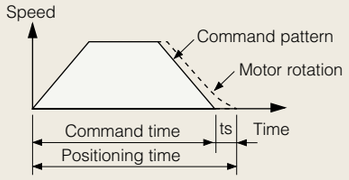
- All possible motor and amp combinations are predetermined. Confirm the model of the motor and amp to be used before installation.
- Position, speed, and torque control modes are selected with parameter 0. The factory setting is position control mode. For speed operation, change this setting.
- When using the optional regeneration unit, change parameter 0. The factory setting is for no optional regeneration unit. Therefore, if this parameter is not changed, the unit's capacity will not be increased.

### Operation

- When a magnetic contactor (MC) is installed on the amp's primary side, do not perform frequent starts and stops with the MC. Doing so could cause the amp to fail.
- When an error occurs, the amp's safety features are activated, halting output, and the dynamic brake instantly stops the motor. If free run is required, contact Mitsubishi about solutions involving servo-amps where the dynamic brake is not activated.
- When using a motor with an electromagnetic brake, do not apply the brake when the servo is on. Doing so could cause an amp overload or shorten brake life. Apply the brake when the servo is off.

### Cautions concerning model selection

- Select a motor with a rated torque above the continuous effective load torque.
- Design the operation pattern so that positioning can be completed, taking into account the setting time (ts).



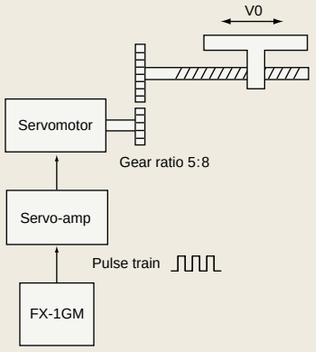

- Use the unit with the load's inertia set below the recommended load/inertia ratio of the motor being used. If it is too large, desired performance may not be attainable.



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# Example of Selection

## Example of selection




| | | | |
|---|---|---|---|
| Speed of moving parts during fast forward: | $V_0$=30000mm/min | $D_B$ = Ball screw diameter: | 20 mm (0.78 inch) |
| Feed per pulse: | $\Delta\ell$ =0.005mm (0.0002 inch) | $L_B$ = Ball screw length: | 500 mm (19.69 inch) |
| Feed per rotation: | $\ell$ =400mm (15.75 inch) | $D_{G1}$ = Gear diameter (motor axis): | 25 mm (0.98 inch) |
| Positioning time: | $t_0$ = 0.9 sec or less | $D_{G2}$ = Gear diameter (load axis): | 40 mm (1.57 inch) |
| Number of feeds: | 40/min | $L_G$ = Gear tooth thickness: | 10 mm (0.39 inch) |
| (Operating period: | $t_1$ = 1.5 sec) | | |
| Gear ratio: | n=8/5 | | |
| Weight of moving parts: | W=60kg (132 lb) | | |
| Drive system efficiency: | $\eta$=0.8 | | |
| Friction coefficient: | $\mu$=0.2 | | |
| Ball screw lead: | $P_B$=16mm (0.63 inch) | | |

**(1) Select control parameters**

a. Set electronic gear (pulse multiplication denominator and numerator)
The following relationship is established between the multiplication setting and the amount of movement Dl per input pulse.

$$\Delta\ell = \frac{\text{Ball screw lead}}{8192\times(\text{Gear ratio})}\times\left(\frac{CMX}{CDV}\right)$$

Substituting the machine specifications given above into this equation:

$$\frac{CMX}{CDV} = 0.005\times\frac{8192\times 8/5}{16} = \frac{512}{125}$$

OK if the ratio $\frac{CMX}{CDV}$ is between 1/50 and 50.

b. Input pulse string frequency $f_0$ during fast forward

$$f_0 = \frac{V_0}{60\times\Delta\ell} = \frac{30000}{60\times 0.005} = 100000 \text{ pps}$$

OK if $f_0$ is 200 kpps or less

**(2) Motor speed**

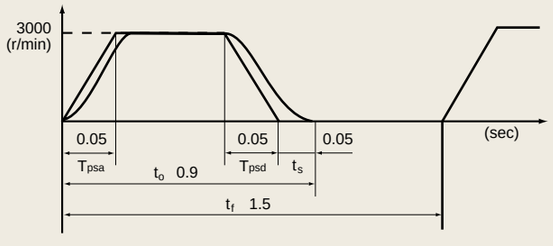
$$N_0 = \frac{V_0}{P_B}\cdot n = 3000 \text{ r/min}$$

**(3) Acceleration/Deceleration time constant**

$$Tpsa = Tpsd = t_0 - \frac{\ell}{V_0/60} - ts = 0.05 \text{ sec.}$$

* ts is the stop recovery time. Estimated here at 0.05 sec for fast response.

**(4) Operating pattern**




**(5) Load torque (motor axis equivalent)**

Amount of movement per motor rotation

$$\Delta S = P_B\times\frac{1}{n} = 10\text{mm (0.39 inch)}$$

$$T_L = \frac{\mu\cdot W\cdot g\cdot\Delta S}{2\times 10^3\,\pi\,\eta} = 0.23\text{N}\cdot\text{m}$$

For conventional unit system

$$T_L = \frac{\mu W\cdot\Delta S}{20\,\pi\,\eta} = 2.4 \text{ kgf}\cdot\text{cm}$$

**(6) Load inertial moment (motor axis equivalent)**

Moving parts

$$J_{L1} = W\cdot\left(\frac{\Delta S}{20\,\pi}\right)^2 = 1.52 \text{ kg}\cdot\text{cm}^2$$

Ball screw

$$J_{L2} = \frac{\pi\cdot\rho\cdot L}{32}\cdot D^2\cdot\left(\frac{1}{n}\right)^2 = 0.24 \text{ kg}\cdot\text{cm}^2$$

* $\rho$ = 7.8 • 10 kg • cm$^2$ (Iron)

Gear (motor axis)

$$J_{L3} = \frac{\pi\cdot\rho\cdot L}{32}\cdot D^3 = 0.03 \text{ kg}\cdot\text{cm}^2$$

Gear (load axis)

$$J_{L4} = \frac{\pi\cdot\rho\cdot L}{32}\cdot D^4\cdot\left(\frac{1}{n}\right)^2 = 0.08 \text{ kg}\cdot\text{cm}^2$$

Total load inertial moment (motor axis equivalent)

$$J_L = J_{L1} + J_{L2} + J_{L3} + J_{L4} = 1.9 \text{ kg}\cdot\text{cm}^2$$

For conventional unit system

$$GD_L^2 = 4\times J = 7.6 \text{ kgf}\cdot\text{cm}^2$$

**(7) Provisional motor selection**

Selection conditions. HC-MF23 (200 W) provisionally selected from:
1) Load torque < Rated motor torque
2) Load inertial moment < 30 × motor inertial moment

**(8) Acceleration and deceleration torque**

Required motor torque during acceleration

$$T_{Ma} = \frac{(J_L + J_M)\times N_0}{9.55\times 10^4\times T_{psa}} + T_L = 1.48\text{N}\cdot\text{m}$$

For conventional unit system

$$T_{Ma} = \frac{(GD_L^2 + GD_M^2)\times N_0}{37500\times T_{psa}} + T_L = 15.1 \text{ kgf}\cdot\text{cm}$$

Required motor torque during deceleration

$$T_{Md} = \frac{(J_L + J_M)\times N_0}{9.55\times 10^4\times T_{psd}} + T_L = 1.02\text{N}\cdot\text{m}$$

$$T_{Md} = \frac{(GD_L^2 + GD_M^2)\times N_0}{37500\times T_{psd}} + T_L = -10.3 \text{ kgf}\cdot\text{cm}$$

The required motor torque during acceleration and deceleration shall be at or below maximum motor torque.

**(9) Continuous effective load torque**

$$Trms = \sqrt{\frac{T_{Ma}^2\times T_{psa} + T_L^2\times t_c\times T_{Md}^2\times T_{psd}}{t_f}} = 0.37\text{N}\cdot\text{m}$$

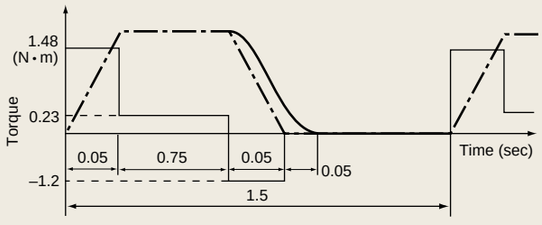
For conventional unit system

3.7 kgf • cm

* $t_c = t_0 - t_s - 2\times T_{psa}$

The continuous effective load torque shall be at or below maximum torque.

**(10) Torque pattern**




**(11) Selection results**

From the above, servomotor HF-MF23 is selected.
Servo-amp MR-J2-20A

a. Parameter settings

| | |
|---|---|
| Command pulse multiplication numerator (CMX) | 512 |
| Command pulse multiplication denominator (CDV) | 125 |

b. During fast forward
- Motor r/min: $N_0$ = 3000 r/min
- Input pulse string frequency $f_0$ = 100 kpps

c. Acceleration/deceleration time constant
$T_{psa} = T_{psd}$ = 0.05 sec



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