

MITSUBISHI



General-Purpose AC Servo

MELSERVO-J2-A

Separate Specifications and Installation Guide

Thank you for choosing this product. This installation guide offers handling information and precautions for use of the HC-MF73 servo motors and HC-SF series servo motors connected to the servo amplifier (MR-J2-A).

To ensure safety, always read over this installation guide and the MELSERVO-J2-A Specifications and Installation Guide before using the equipment. For information not found in this installation guide, refer to the MELSERVO-J2-A Specifications and Installation Guide.

Please forward this installation guide and other appended documents to the end user. Also, they must be placed in safekeeping.

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1. MODELS

(1) Servo amplifiers

MR-J2- A

Series

Symbol	Applicable Servo Motor	
	HC-MF	HC-SF
10	053 . 13	x
20	23	x
40	43	x
60	x	52
70	73	x
100	x	102

(2) Servo motors

HC-MF

Series
HC-MF
HC-SF

Symbol	Compliance with Standard	HC-MF	HC-SF
None	Standard model (in Japan)		
-EC	EN		
Symbol	Shaft Type	HC-MF	HC-SF
None	Standard	o	o
T	Tapered shaft	x	o
K	(Note) With keyway	o 200W or more	o
D	D-cut shaft	o 100W or less	x
Note: HC-SF is without key.			
Symbol	Reduction Gear	HC-MF	HC-SF
None	No	o	o
G1	For general industrial machine	o	x
G2	For high precision	o	x
Symbol	Electromagnetic Brake	HC-MF	HC-SF
None	No	o	o
B	Yes	o	x
Symbol	Rated Speed [r/min]	HC-MF	HC-SF
2	2000	x	o
3	3000	o	x
Symbol	Rated Output [W]	HC-MF	HC-SF
05	50	o	x
1	100	o	x
2	200	o	x
3	300	x	x
4	400	o	x
5	500	x	o
6	600	x	x
7	750	o	x
8	850	x	x
10	1000	x	o

2. ENVIRONMENTAL CONDITIONS

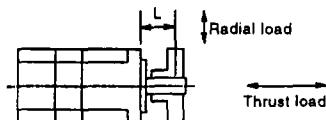
Environment	Conditions	
	Servo amplifier	Servo motor
Ambient temperature	0°C to +55°C (32 to 131°F) (non-freezing)	0°C to +40°C (32 to 104°F) (non-freezing)
Ambient humidity	90%RH or less (non-condensing)	80%RH or less (non-condensing)
Storage temperature	-20°C to +65°C (-4 to 149°F) (non-freezing)	-15°C to +70°C (5 to 158°F) (non-freezing)
Storage humidity	90%RH or less (non-condensing)	
Ambience	Indoors (no direct sunlight) Free from corrosive gas, flammable gas, oil mist, dust and dirt.	
Altitude	Max. 1000m (3280ft) above sea level	
Vibration	5.9m/s ² (19.4ft/s ²) (0.6G) or less	HC-MF
		HA-FF
		HC-SF

3. PERMISSIBLE LOAD AT SHAFT END

Permissible shaft end loads are indicated below:

Servo Motor	L [mm]	Permissible Radial Load		Permissible Thrust Load	
		[N]	[kgf]	[lb]	[N]
HC-MF 73	40	1.6	392	40.0	88.2
HC-SF 52 to 102	55	2.2	980	100.0	220.5

Note: For symbols in the list, see below:

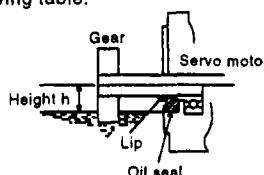


L: Distance between flange mounting surface and load center

4. PROTECTION FROM OIL AND WATER

When the servo motor is installed to a gear box, the shaft center height above the oil level should be at least the value indicated in the following table:

Servo Motor	Height above Oil Level h	
	[mm]	[in]
HC-SF 52 - 102	20	0.78



5. REGENERATIVE BRAKE OPTION

(1) Combination and regenerative power

CAUTION The regenerative brake option used with the servo amplifier must be as specified below. Otherwise, fire may occur.

Servo Amplifier Model	Regenerative Power [W]			Resistance Value [Ω]
	Built-in regenerative brake resistor	MR-RB12	MR-RB32	
MR-J2- 70	20	100	300	40
MR-J2-100	20	100	300	40

(2) Losses of servo motor and servo amplifier in regenerative mode

Efficiencies, etc. of the servo motor and servo amplifier in the regenerative mode are listed below:

Servo Motor	Inverse Efficiency [%]	C Charge [J]
HC-MF 73	80	18
HC-SF 52	70	11
HC-SF102	80	18

(3) Setting of parameter

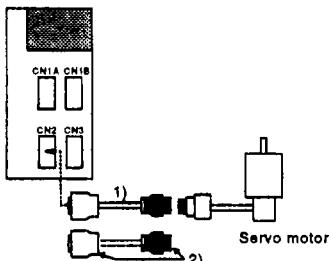
Parameter No. 0

Selection of regenerative brake option

- 0: No regenerative brake option
- 2: MR-RB032
- 3: MR-RB12
- 5: MR-RB32

6. ENCODER CABLE

For the HC-SF, use the encoder cable 1 after confirming the servo motor series and required wiring length. When fabricating the encoder cable, use the encoder connector set 2 and refer to the following connection diagram.



Name		Type	Description	
F CN2	1) High-flex, long-life encoder cable for HC-SF	MR-JHSCBL□M-H Cable length within □: 2, 5, 10, 20, 30 [m]	Servo amplifier side connector (3M make or equivalent) 10120-3000VE (Connector) 10320-52F0-008 (Shell kit)	Servo motor encoder side connector (Japan Aviation Electronics make) MS-3057-12A (Cable clamp) MS3106B20-29S (Straight plug)
	2) Encoder connector set for HC-SF	MR-J2CNS	Servo amplifier side connector (3M make or equivalent) 10120-3000VE (Connector) 10320-52F0-008 (Shell kit)	Servo motor encoder side connector (Japan Aviation Electronics make) MS-3057-12A (Cable clamp) MS3106B20-29S (Straight plug)

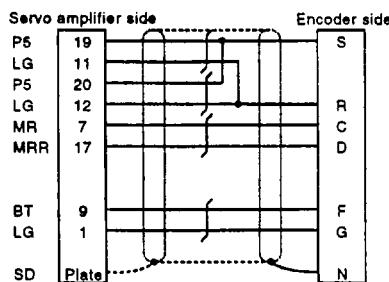
- Encoder cable connection diagram

△ CAUTION When fabricating the encoder cable, connect the cable correctly. Otherwise, misoperation or explosion may occur.

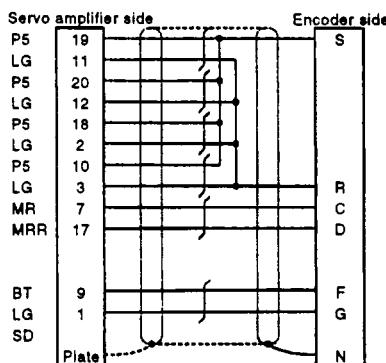
Fabricate the encoder cable as shown below:

MR-JHSCBL2M-H
MR-JHSCBL5M-H

MR-JHSCBL10M-H
MR-JHSCBL20M-H
MR-JHSCBL30M-H



Cable of less than 10m (32.8ft)



Cable of 10 to 50m (32.8 to 164.0ft)

7. OVERLOAD PROTECTION CHARACTERISTICS

The servo amplifier is equipped with an electronic thermal relay to protect the servo motor and servo amplifier from overload.

The electronic thermal relay's protection characteristics for the HC-MF73 motors and HC-SF series motors are as shown in Fig. 9-1 a in Section 9-1 of the MELSERVO-J2-A Specifications and Installation Guide.

8. LOSSES GENERATED IN SERVO AMPLIFIER

The following table lists losses generated during the servo amplifier's rated load operation, power supply capacity per axis at rated output, and generated heat.

Servo Amplifier	Servo Motor	Power Supply Capacity [kVA]	Servo Amplifier-Generated Heat		Area Required for Heat Dissipation	
			At rated torque [W]	At zero torque [W]	[m ²]	[ft ²]
MR-J2- 60A	HC-SF 52	1.0	40	15	0.5	5.4
MR-J2- 70A	HC-MF 73	1.3	50	15	1.0	10.8
MR-J2-100A	HC-SF102	1.7	50	15	1.0	10.8

Note: 1. Sufficient heat-related capacity (kVA) values are indicated for the power supply. However, since peak power 2 to 2.5 times higher than the rated will be required during servo motor acceleration, select a power supply with minimum voltage fluctuation so that the voltage range 180 to 253V may be attained at the servo amplifier terminals. Note that the power supply capacity will vary according to the power supply impedance.

- Determine the power current capacity according to the above table.
- When using multi-axes, add the power capacity per axis.
- Heat generated during regeneration is not included in the servo amplifier-generated heat. To calculate heat generated by the regenerative brake option, use Equation (6-1) in Section 6-1-1 of the MELSERVO-J2-A Specifications and Installation Guide.

9. ELECTROMAGNETIC BRAKE CHARACTERISTICS

CAUTION The electromagnetic brake is designed to hold a load and must not be used for braking.

The servo motor with electromagnetic brake is provided with the electromagnetic brake having the following characteristics:

Servo Motor		HC-MF Series
Item		73B
Type (Note 1)	Spring-loaded safety brake	
Rated voltage	24VDC	
Rated current at 20°C [A]	0.42	
Excitation coil resistance at 20°C [Ω]	57	
Capacity [W]	10	
ON current [A]	0.2	
OFF current [A]	0.12	
Static friction torque	[N m]	2.4
	[kgf · cm]	24.5
	[oz in]	340
(Note 2) Inertia moment	J	[kg · cm]
	GD ²	[kgf · cm]
	WK ²	[oz in]
(Note 3) Release delay time [S]	0.03	
Braking delay time (Note 3) [S]	AC off (Fig. a)	0.12
	DC off (Fig. b, c)	0.03
Permissible braking work	Per braking	[N m]
		[kgf · cm]
		[oz in]
	Per hour	[N m]
		[kgf · cm]
		[oz in]
Brake looseness at servo motor shaft [degrees]	0.1 to 0.8	
Brake life (Note 4)	Number of braking cycles [times]	20000
	[N · m]	32
	[kgf · cm]	327
	[oz in]	4535

- Note: 1. There is no manual release mechanism. When it is necessary to hand-turn the servo motor shaft for machine centering, etc., use a separate 24VDC power supply to release the brake electrically.
- This value is added to the inertia of the servo motor without a brake.
 - The value for initial ON gap at 20°C.
 - The brake gap will increase as the brake lining wears, but the gap is not adjustable. The brake life indicated is the number of braking cycles after which adjustment will be required.
 - The internal power output for interface (VDD) 24VDC cannot be used. Always use a separate power supply.
 - A leakage magnetic flux will occur at the shaft end of the servo motor equipped with electromagnetic brake.
 - Though the brake lining may rattle during low-speed operation, it poses no functional problem.

10. STANDARD SPECIFICATIONS

(1) Servo amplifiers

Item	Servo Amplifier	MR-J2-70A	MR-J2-100A
Power supply	Voltage/frequency Permissible voltage fluctuation Permissible frequency fluctuation	Three-phase, 200 to 230VAC/50, 60Hz Three-phase 170 to 253VAC ± 5%	
System		Sine-wave PWM control, current control system	
Dynamic brake		Built-in	
Protective functions		Overcurrent shut-off, regenerative overvoltage shut-off, overload shut-off (electronic thermal relay), servo motor overheat protection, encoder fault protection, regenerative fault protection, undervoltage, instantaneous power failure protection, overspeed protection, excessive error protection	
Speed/frequency response		250Hz or more	
Structure	[A]	Open (IP00)	
Environmental condition		Refer to Chapter 2.	
Weight	[kg] [lb]	1.5 3.3	1.5 3.3

(2) Servo motors

Item	Servo Motor	HC-MF Series (Ultralow Inertia, small capacity)	HC-FF Series (Middle inertia, middle capacity)
Applicable servo amplifier MR-J2-□		73	52
(Note 1) Continuous characteristics	Rated output [kw] Rated torque [N·m] [kg·cm] [oz·in]	0.75 2.4 24.4 340	0.5 2.39 24.4 339
Rated speed (Note 1)	[m/min]	3000	2000
Maximum speed	[m/min]	4500	3000
Permissible instantaneous speed	[m/min]	5175	3450
Maximum torque	[N·m] [kg·cm] [oz·in]	7.2 73.1 1020.3	7.16 73.1 1014.6
Power rate at continuous rated torque [kv/s]		94.43	8.7
(Note 6) Inertia moment	J [kg·cm ²] GD ² [kgf·cm ²] WK' [oz·in ²]	0.6 2.4 3.28	6.6 26.4 36.085
Recommended ratio of load inertia to servo motor shaft inertia (Note 6)		30 times or less	10 times or less
(Note 4) Regenerative brake duty [times/min]	Servo amplifier's built-in regenerative brake resistor MR-RB032 (30W) MR-RB12 (30W) MR-RB32 (300W)	400 600 2400 x	56 x 560 1880
(Note 3) Power supply capacity [kVA]		1.3	1
Rated current [A]		5.1	3.2
Maximum current [A]		18	9.6
Speed/position encoder		Encoder (resolution 8192 pulses/rev)	Encoder (resolution 16384 pulses/rev)
Accessories		Encoder	Encoder, oil seal
Structure		Totally-enclosed, self-cooled (Note 7) (protection type: IP44)	Totally-enclosed, self-cooled (protection type: IP65)
(Note 2) Environmental conditions		Refer to Chapter 2.	
(Note 6) Weight	[kg] [lb]	3.0 6.6	5.0 11.0

- Note: 1. When a power supply voltage drops, we cannot guarantee the output and rated speed.
 2. When the equipment is to be used in places where it is subjected to oil and/or water, such as on machine field sites, optional features apply to the equipment. Please contact.
 3. The power supply capacity depends on the power supply impedance.
 4. The regenerative brake duty indicated is the permissible duty when the servo motor running without load at the rated speed is decelerated to a stop. When a load is connected, the value in the table is multiplied by $1/(m + 1)$, where $m = \text{load inertia/motor inertia}$. At the speed higher than the rated, the permissible number of times is in inverse proportion to the square of (running speed/rated speed). When the running speed varies frequently or when the regenerative mode continues as in vertical feed, calculate regenerative heat generated during operation. Provisions must be made to keep this generated heat below the permissible value.
 5. If the load inertia ratio exceeds the indicated value, please consult us.
 6. When the servo motor is equipped with reduction gear or electromagnetic brake, refer to the corresponding outline dimension drawing.
 7. The shaft through-hole and connector are excluded.

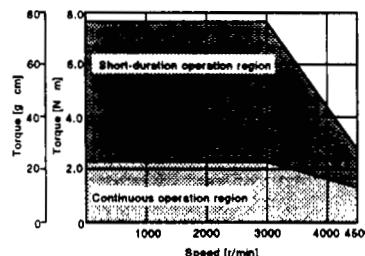
11. TORQUE CHARACTERISTICS

NOTICE

When the load is applied during a stop of the servo motor, use the servo motor at 70% of the rated torque.

(1) HC-MF series

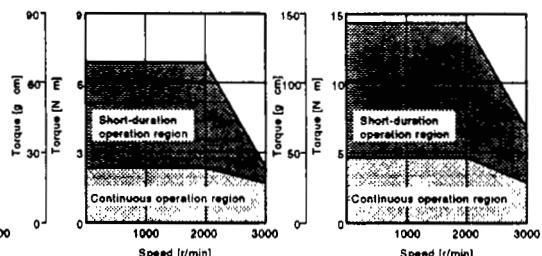
[HC-MF73]



(2) HC-SF series

[HC-SF62]

[HC-SF102]



12. SERVO MOTORS WITH REDUCTION GEARS

Servo motors are available with reduction gears designed for: 1) general industrial machines; and 2) precision applications.

Servo motors with electromagnetic brakes are also available.

(1) Manufacturing range of servo motor with reduction gear

Servo motors with reduction gears that may be manufactured are indicated by symbols (G1, G2) in the following table. G1 and G2 are symbols appended to the servo motor models. (Refer to (2) in Chapter 1).

Reduction Gear Series	1) For General Industrial Machines					2) For Precision Applications							
	1/5	1/10	1/12	1/20	1/30	1/5	1/8	1/10	1/15	1/20	1/25	1/28	1/45
Reduction ratio (Note) HC-MF053(B) to 73(B)	1/5	—	G1	G1	—	G2	G2	—	—	G2	—	G2	—

Note: Reduction ratios for general industrial machines are nominal values. For actual reduction ratios, refer to (2) in this chapter.

(2) HC-MF series

Reduction Gear Series	1) For General Industrial Machines (HC-MF(B)G1)			2) For Precision Applications (HC-MF(B)G2)				
	Mounting Method	Flange mounting			Mounting direction	In any directions		
Lubrication Recommended grease	Grease lubrication 50, 100W Mobilplex46/Mobil	200 to 750W Mobilplex81/Mobil			Grease lubrication LDR101BV/ American Oil Center Research			
Output shaft rotating direction With electromagnetic brake		Same as the servo motor output shaft direction.				Available		
Backlash	60 minutes or less at reduction gear output shaft				3 minutes or less at reduction gear output shaft			
Permissible load inertia ratio (at servo motor shaft)		25 times or less				25 times or less		
Permissible speed (at servo motor shaft)				3000 r/min				

The actual reduction ratios of the servo motors with reduction gears designed for general industrial machines are as listed below:

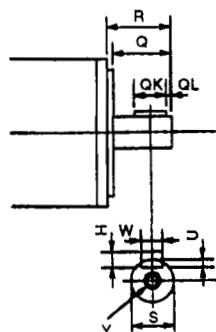
Servo Motor Nominal Reduction Ratio	HC-MF053(B)G1	HC-MF13(B)G1	HC-MF23(B)G1	HC-MF43(B)G1	HC-MF73(B)G1
1/5	9/44			19/96	1/5
1/12	49/576			25/288	525/6048
1/20	25/484			253/5000	625/12544

13. SERVO MOTOR WITH SPECIAL SHAFT

The standard shaft of the servo motor is straight without a keyway. A keyway shaft is also available.

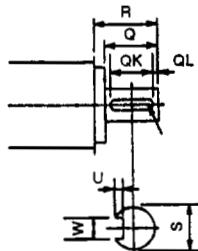
Machining dimension diagram

With key



Servo Motor Model	Variable Dimensions								[Unit: mm (in)]
	S	R	Q	W	QK	QL	U	H	
MC-MF73K	19hb (0.75)	40	37	6 (0.24)	25 (0.98)	5 (0.20)	3.5 (0.14)	6 (0.24)	M5 x 0.8 Depth 20 (0.787)

Keyway

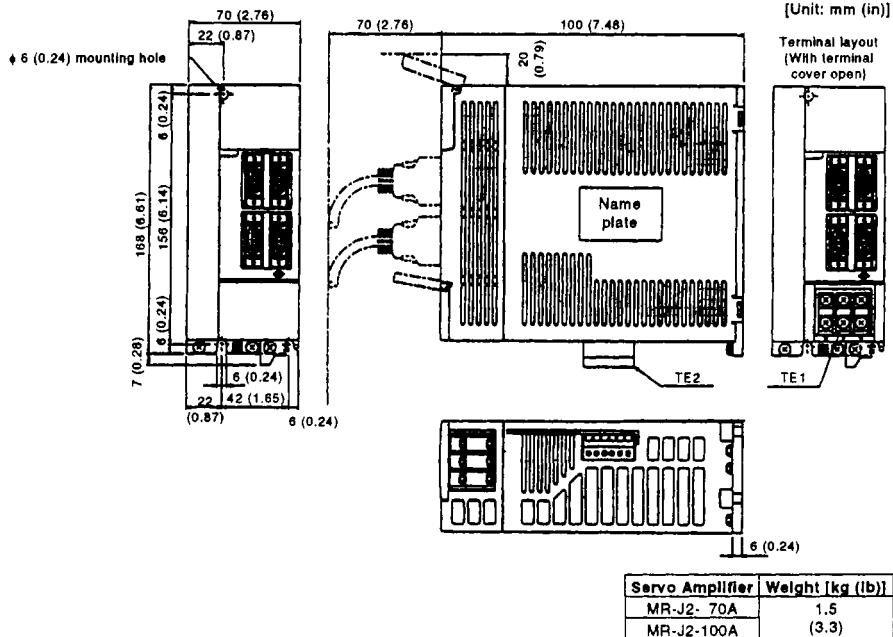


Servo Motor Model	Variable Dimensions								[Unit: mm (in)]
	S	R	Q	W	QK	QL	U	r	
HC-SF52K, 102K	24hb (0.94)	55	50	8.5 ± 0.034 $(0.315 \pm 1.42 \times 10^{-3})$	36	5 (1.42)	$4.5^{+0.2}_{-0.1}$ $(0.157^{+0.074}_{-0.04})$	4 (0.16)	

14. OUTLINE DIMENSION DRAWINGS

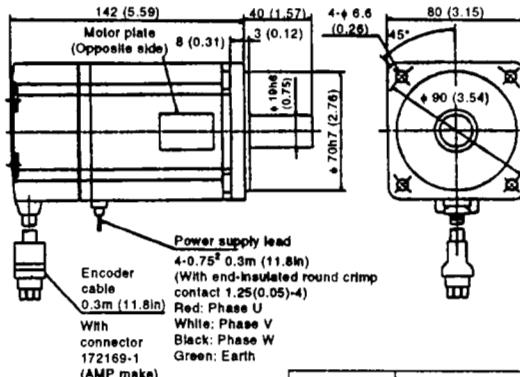
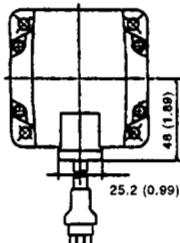
(1) Servo amplifiers

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



- (2) Servo motors
 1) HC-MF series
 a. Standard

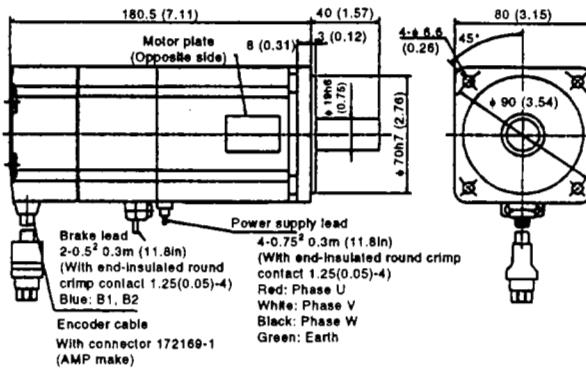
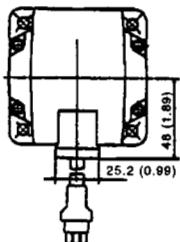
[Unit: mm (in)]



Servo Motor Model	Inertia Moment GD^2 [kgf · cm ² (oz · in ²)]	Weight [kg (lb)]
HC-MF73	2.4 (13.12)	3.0 (6.6)

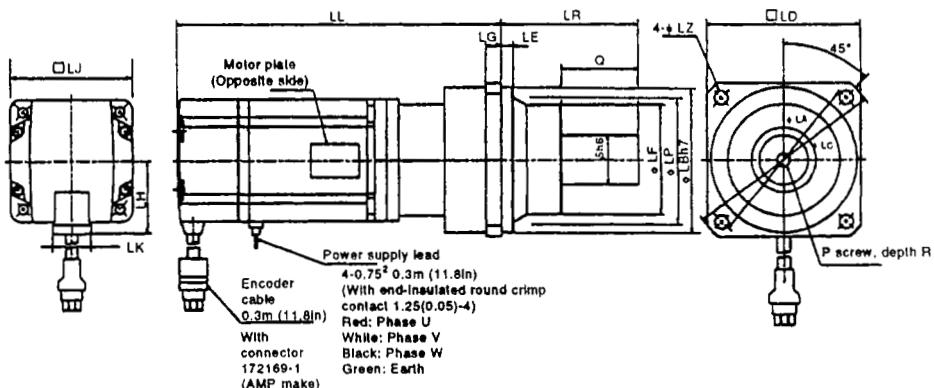
- b. With electromagnetic brake

[Unit: mm (in)]



Servo Motor Model	Inertia Moment GD^2 [kgf · cm ² (oz · in ²)]	Electromagnetic Brake Static Friction Torque [N · m ² (oz · in ²)]	Weight [kg (lb)]
HC-MF73B	2.9 (15.86)	2.4 (340)	4.0 (8.8)

c. With reduction gear for general industrial machine

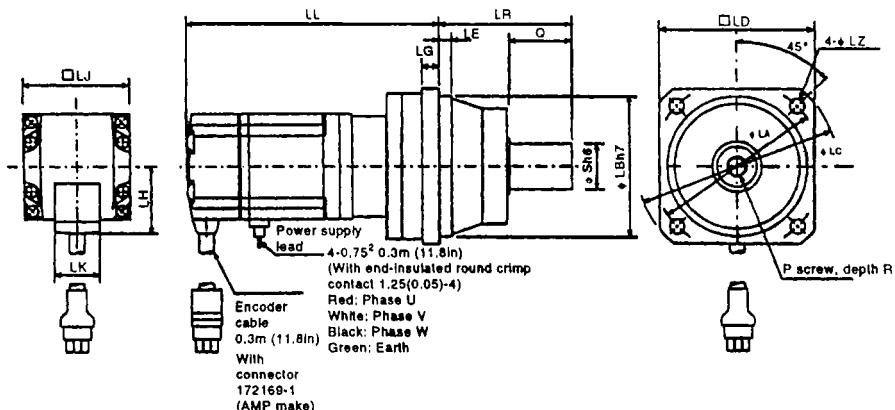


Servo Motor Model	Reduction Gear Model	Inertia Moment (Note 1) GD ² [kgf·cm ²]	Reduction Ratio (Note 2)	Variable Dimensions [mm] (Note 1)																Weight (Note 1) [kg]	
				LA	LB	LC	LD	LE	LG	LH	LJ	LK	LL	LP	LR	LZ	Q	S	P	R	
HC-MF43(B)G1	K10020	2610 (2803)	1/20	115	95	132	100	9	10	38	60	25.2	164.5 (189.5)	86	90	9	50	32	M8	16	5.5 (6.1)
	K10005	4080 (4580)	1/5	115	95	132	100	9	10	48	80	25.2	207 (242.5)	86	90	9	50	32	M8	16	6.2 (7.2)
HC-MF73(B)G1	K10012	6744 (7244)	1/12	115	95	132	100	9	10	48	80	25.2	229 (264.5)	86	90	9	50	32	M8	16	7.3 (8.3)
	K12020	7000 (7500)	1/20	140	115	160	120	12	15	48	80	25.2	242 (277.5)	104	106	14	60	40	M10	20	10.1 (11.1)
Servo Motor Model	Reduction Gear Model	Inertia Moment (Note 1) WK [oz·in ²]	Reduction Ratio (Note 2)	Variable Dimensions [in] (Note 1)																Weight (Note 1) [lb]	
				LA	LB	LC	LD	LE	LG	LH	LJ	LK	LL	LP	LR	LZ	Q	S	P	R	
HC-MF43(B)G1	K10020	14.27 (15.33)	1/20	4.53	3.74	5.20	3.94	0.35	0.39	1.50	2.36	0.99	6.48 (7.46)	3.39	3.54	0.35	1.97	1.26	M8	0.63	12.1 (13.4)
	K10005	22.31 (25.04)	1/5	4.53	3.74	5.20	3.94	0.35	0.39	1.89	3.15	0.99	8.15 (9.55)	3.39	3.54	0.35	1.97	1.26	M8	0.63	13.7 (15.9)
HC-MF73(B)G1	K10012	36.87 (39.61)	1/12	4.53	3.74	5.20	3.94	0.35	0.39	1.69	2.15	0.99	9.02 (10.41)	3.39	3.54	0.35	1.97	1.26	M8	0.63	16.1 (18.3)
	K12020	41.01 (41.01)	1/20	5.51	4.53	6.30	4.72	0.47	0.59	1.89	3.15	0.99	9.53 (10.93)	4.00	0.55	0.55	2.36	1.57	M10	0.79	22.3 (24.5)

Note: 1. Values in parentheses are those for the servo motors with electromagnetic brakes.

2. Nominal reduction ratios. For actual reduction ratios, refer to (2) in Chapter 2.

d. With reduction gear for precision application



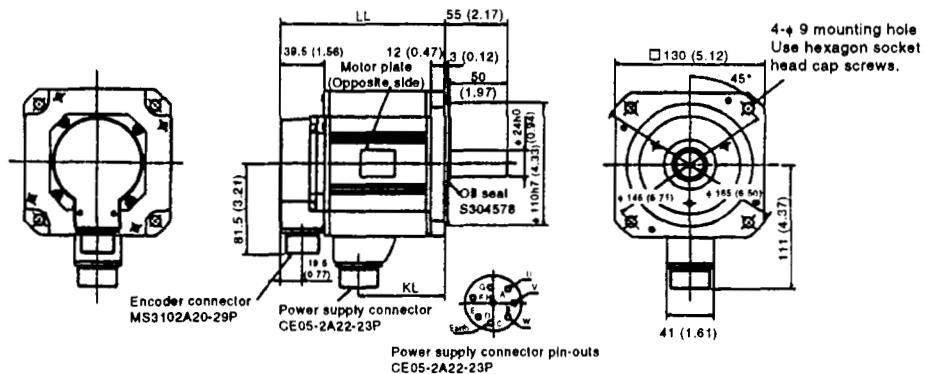
Servo Motor Model	Reduction Gear Model	Inertia Moment (Note) $\text{kg}^2 \text{ cm}^3$	Reduction Ratio	Variable Dimensions [mm] (Note)													Weight (Note) (kg)	
				LA	LB	LC	LD	LE	LG	LH	LJ	LK	LL	LR	LZ	Q	S	
HC-MF73(B)G2	BK3-05B-08MEKA	3.840 (4.390)	1/5	115	95	135	100	8	10	48	80	25.2	212	85	9	40	25	M6 12 6.3 (7.3)
	BK4-09B-08MEKA	3.918 (4.418)	1/9	135	110	155	115	8	12	48	80	25.2	248 (283.5)	100	11	50	32	M8 16 8.6 (9.6)
	BK5-20B-08MEKA	4.064 (4.564)	1/20	150	125	175	130	10	15	48	80	25.2	248 (283.5)	115	14	60	40	M10 20 12.0 (13.0)
	BK5-29B-08MEKA	3.389 (4.139)	1/29	150	125	175	130	10	15	48	80	25.2	248 (283.5)	115	14	60	40	M10 20 12.0 (13.0)

Servo Motor Model	Reduction Gear Model	Inertia Moment (Note) $\text{Wk}^2 \text{ oz in}^3$	Reduction Ratio	Variable Dimensions [in] (Note)													Weight (Note) (lb)	
				LA	LB	LC	LD	LE	LG	LH	LJ	LK	LL	LR	LZ	Q	S	
HC-MF73(B)G1	BK3-05B-08MEKA	21.27 (24.00)	1/5	6.10	3.74	5.31	3.94	0.31	0.39	1.89	3.15	0.99	8.35 (9.81)	3.35	0.35	1.57	0.98	M6 0.47 13.9 (16.1)
	BK4-09B-08MEKA	21.42 (24.16)	1/9	5.31	3.33	6.10	4.53	0.31	0.47	1.89	3.15	0.99	9.76 (11.16)	3.94	0.43	1.97	1.26	M8 0.63 19.0 (21.2)
	BK5-20B-08MEKA	22.22 (24.95)	1/20	5.91	4.92	6.89	5.12	0.39	0.59	1.89	3.15	0.99	9.76 (11.16)	4.53	0.55	2.36	1.57	M8 0.79 26.5 (28.7)
	BK5-29B-08MEKA	19.90 (22.63)	1/29	5.91	4.92	6.89	5.12	0.39	0.59	1.89	3.15	0.99	9.76 (11.16)	4.53	0.55	2.36	1.57	M10 0.79 26.5 (28.7)

Note: Values in parentheses are those for the servo motors with electromagnetic brakes.

2) HC-SF series
HC-SF52 to HC-SF102

[Unit: mm (in)]



Servo Motor Model	Inertia Moment GD^2 [kgf·cm ² (oz·in ²)]	Variable Dimensions		Weight [kg (lb)]
		LL	KL	
HC-SF 52	26.5 (144.89)	120 (4.72)	51.5 (2.03)	5.0 (11.0)
HC-SF102	54.8 (299.62)	145 (5.71)	76.7 (3.02)	7.0 (15.4)

REVISIONS

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