

Environmental Conditions

Item		Conditions
Ambient temperature *1		0 °C to 40 °C (free from freezing)
Ambient humidity		20 % to 85 % RH (free from condensation)
Storage temperature *2		-20 °C to 65 °C (Max.temperature guarantee: 80 °C for 72 hours free from condensation*5)
Storage humidity		20 % to 85 % RH (free from condensation*5)
Vibration	Motor only	5.0 kW or less, MGME 3.0 kW or less: Lower than 49 m/s ² (5 G) at running, 24.5 m/s ² (2.5 G) at stall 6.0 kW or more, MGME 4.5 kW or more: Lower than 24.5 m/s ² (2.5 G) at running, 24.5 m/s ² (2.5 G) at stall
Impact	Motor only	Lower than 98 m/s ² (10 G)
Enclosure rating (Motor only)	IP65 *3	MSMD, MHMD, MSMJ, MHMJ (except rotating portion of output shaft and readwire end.)
		M * ME (IP65 motor: 0.9 kW or more) (except rotating portion of output shaft and connecting pin part of the motor connector and the encoder connector)
	IP67 *3*4	M * ME IP67 motor (except rotating portion of output shaft and connecting pin part of the motor connector and the encoder connector)
Altitude		Lower than 1000 m

*1 Ambient temperature to be measured at 5 cm away from the motor.

*2 Permissible temperature for short duration such as transportation.

*3 These motors conform to the test conditions specified in EN standards (EN60529, EN60034-5). Do not use these motors in application where water proof performance is required such as continuous wash-down operation.

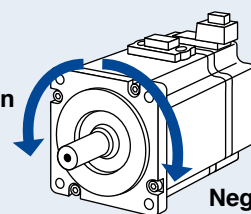
*4 This condition is applied when the connector mounting screw are tightened to the recommended tightening torque.

*5 Air containing water vapor will become saturated with water vapor as the temperature falls, causing dew.

<Note>

Initial setup of rotational direction:
positive = CCW and negative = CW.
Pay an extra attention.

Positive direction
(CCW)



Negative direction
(CW)

Notes on [Motor specification] page

Note) 1. [At AC100 V of power voltage]

Regenerative brake frequency represents the frequency of the motor's stops from the rated speed with deceleration without load.

- If the load is connected, frequency will be defines as $1/(m+1)$, where m =load moment of inertia/rotor moment of inertia.
- When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
- Power supply voltage is AC115 V (at 100 V of the main voltage).
If the supply voltage fluctuates, frequency is in inverse proportion to the square of (Running supply voltage/115) relative to the value in the table.
- When regeneration occurs continuously such cases as running speed frequently changes or vertical feeding, consult us or a dealer.

[At AC200 V of power voltage]

Regenerative brake frequency represents the frequency of the motor's stops from the rated speed with deceleration without load.

- If the load is connected, frequency will be defines as $1/(m+1)$, where m =load moment of inertia/rotor moment of inertia.
- When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
- Power supply voltage is AC230 V (at 200 V of the main voltage).
If the supply voltage fluctuates, frequency is in inverse proportion to the square of (Running supply voltage/230) relative to the value in the table.
- When regeneration occurs continuously such cases as running speed frequently changes or vertical feeding, consult us or a dealer.

[At AC400 V of power voltage]

Regenerative brake frequency represents the frequency of the motor's stops from the rated speed with deceleration without load.

- If the load is connected, frequency will be defined as $1/(m+1)$, where m =load moment of inertia/rotor moment of inertia.
- When the motor speed exceeds the rated speed, regenerative brake frequency is in inverse proportion to the square of (running speed/rated speed).
- Power supply voltage is AC460 V (at 400 V of the main voltage).
If the supply voltage fluctuates, frequency is in inverse proportion to the square of (Running supply voltage/460) relative to the value in the table.
- When regeneration occurs continuously such cases as running speed frequently changes or vertical feeding, consult us or a dealer.

Note) 2. If the effective torque is within the rated torque, there is no limit in generative brake.

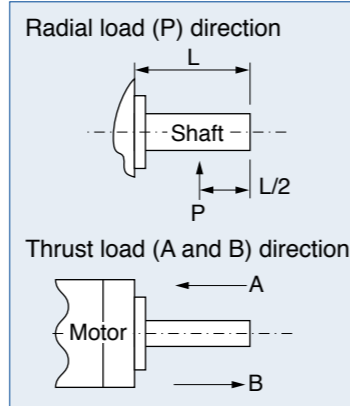
Note) 3. Consult us or a dealer if the load moment of inertia exceeds the specified value.

Note) 4. Releasing time values represent the ones with DC-cutoff using a varistor.

Note) 5. The 17-bit absolute encoder can also be used as a 17-bit incremental encoder.

Permissible Load at Output Shaft

The radial load is defined as a load applied to the output shaft in the right-angle direction. This load is generated when the gear head is coupled to the machine using a chain, belt, etc., but not when the gear head is directly connected to the coupling. As shown in the right figure, the permissible value is determined based on the load applied to the $L/2$ position of the output shaft. The thrust load is defined as a load applied to the output shaft in the axial direction.



Because the radial load and thrust load significantly affect the life of the bearing, take care not to allow the load during operation to exceed the permissible radial load and thrust load shown in the table below.

Built-in Holding Brake

In the applications where the motor drives the vertical axis, this brake would be used to hold and prevent the work (moving load) from falling by gravity while the power to the servo is shut off.

Use this built-in brake for "Holding" purpose only, that is to hold the stalling status. Never use this for "Brake" purpose to stop the load in motion.

• Output Timing of BRK-OFF Signal

- For the brake release timing at power-on, or braking timing at Servo-OFF/Servo-Alarm while the motor is in motion, refer to the Operating Instructions (Overall).
- With the parameter, Pr4.38 (Setup of mechanical brake action while the motor is in motion), you can set up a time between when the motor enters to a free-run from energized status and when BRK-OFF signal turns off (brake will be engaged), when the Servo-OFF or alarm occurs while the motor is in motion. For details, download a copy of the instruction manual from our website.

<Note>

1. The lining sound of the brake (chattering and etc.) might be generated while running the motor with built-in brake, however this does not affect any functionality.
2. Magnetic flux might be generated through the motor shaft while the brake coil is energized (brake is open). Pay an extra attention when magnetic sensors are used nearby the motor.

• Specifications of Built-in Holding Brake

Motor series	Motor output	Static friction torque N·m	Rotor inertia $\times 10^{-4}$ kg·m ²	Engaging time ms	Releasing time ms	Exciting current DC A (at cool-off)	Releasing voltage DC V / Exciting voltage DC V	Permissible work (J) per one braking	Permissible total work $\times 10^3$ J	Permissible angular acceleration rad/s ²	
MSMD	50 W, 100 W	0.29 or more	0.002	35 or less	20 or less	0.3	1 V or more	39.2	4.9	30000	
	200 W, 400 W	1.27 or more	0.018	50 or less	15 or less	0.36	24 \pm 1.2	137	44.1		
	750 W	2.45 or more	0.075	70 or less	20 or less	0.42		196	147		
MSME	50 W, 100 W	0.29 or more	0.002	35 or less	20 or less	0.3	1 V or more	39.2	4.9	30000	
	200 W, 400 W	1.27 or more	0.018	50 or less	15 or less	0.36	24 \pm 1.2	137	44.1		
	750 W(200 V)	2.45 or more	0.075	70 or less	20 or less	0.42		196	147		
	750 W(400 V)	2.5 or more	0.33	50 or less	15 or less (100)	0.7	2 V or more	392	490	10000	
	1.0 kW, 1.5 kW, 2.0 kW	7.8 or more				0.81					24 \pm 2.4
	3.0 kW	11.8 or more	80 or less	50 or less (130)	0.9	1470	2200				
4.0 kW, 5.0 kW	16.2 or more	1.35	110 or less	50 or less (130)	0.9	1470	2200				
MDME	400 W(400 V), 600 W(400 V)	2.5 or more	1.35	50 or less	15 or less	0.7	2 V or more	392	490		10000
	1.0 kW	4.9 or more		80 or less	70 or less (200)	0.59		588	780		
	1.5 kW, 2.0 kW	13.7 or more		100 or less	50 or less (130)	0.79		1176	1500		
	3.0 kW	16.2 or more	110 or less	0.9	24 \pm 2.4	1470	2200				
	4.0 kW, 5.0 kW	24.5 or more	4.7	80 or less	25 or less (200)	1.3	2 V or more	1372	2900	5440	
	7.5 kW	58.8 or more		150 or less	50 or less	1.4		5000			
11.0 kW, 15.0 kW	100 or more	300 or less		140 or less	1.08	2000		4000	3000		
MFME	1.5 kW	7.8 or more	4.7	80 or less	35 or less	0.83	2 V or more	1372	2900	10000	
	2.5 kW	21.6 or more	8.75	150 or less	100 or less	0.75	24 \pm 2.4	1470	1500		
	4.5 kW	31.4 or more						2200			
MGME	0.9 kW	13.7 or more	1.35	100 or less	50 or less (130)	0.79	2 V or more	1176	1500	10000	
	2.0 kW	24.5 or more	4.7	80 or less	25 or less (200)	1.3		24 \pm 2.4	1372	2900	5440
	3.0 kW	58.8 or more		150 or less	50 or less (130)	1.4					
	4.5 kW, 6.0 kW				50 or less	1.4					
MHMD	200 W, 400 W	1.27 or more	0.018	50 or less	15 or less	0.36	1 V or more	137	44.1	30000	
MSMJ	750 W	2.45 or more	0.075	70 or less	20 or less	0.42	24 \pm 1.2	196	147		
MHMJ											
MHME	1.0 kW	4.9 or more	1.35	80 or less	70 or less (200)	0.59	2 V or more	588	780	10000	
	1.5 kW	13.7 or more		100 or less	50 or less (130)	0.79		1176	1500		
	2.0 kW~5.0 kW	24.5 or more	4.7	80 or less	25 or less (200)	1.3		24 \pm 2.4	1372	2900	5440
	7.5 kW	58.8 or more		150 or less	50 or less	1.4					5000

- Releasing time values represent the ones with DC-cutoff using a varistor. Values in () represent those measured by using a diode (V03C by Hitachi, Ltd.)
- Above values (except static friction torque, releasing voltage and excitation current) represent typical values.
- Backlash of the built-in holding brake is kept $\pm 1^\circ$ or smaller at ex-factory point.
- Service life of the number of acceleration/deceleration with the above permissible angular acceleration is more than 10 million times. (Life end is defined as when the brake backlash drastically changes.)