



# MITSUBISHI ELECTRIC AC SERVO TECHNICAL BULLETIN

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[Issue No.] SV-A-0004-A  
[Title] Using a servo amplifier at an altitude exceeding 2000 m and up to 5000 m  
[Date of Issue] April 2024  
[Relevant Models] MELSERVO-J4 series and MELSERVO-J5 series

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Thank you for your continued support of Mitsubishi Electric AC servo products.

This bulletin explains precautions for when using the servo amplifier at an altitude exceeding 2000 m and up to 5000 m.

## 1. Summary

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Mitsubishi Electric servo amplifiers MELSERVO-J4 series/MELSERVO-J5 series are designed to be used at an altitude of up to 2000 m, and therefore using them at an altitude exceeding 2000 m is out of the specification.

We cannot guarantee the operation of the servo amplifiers in the environment at an altitude exceeding 2000 m.

Thank you for your understanding.

## 2. When Using the Servo Amplifier at an Altitude Exceeding 2000 m and up to 5000 m

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### (1) Precautions

Air density is lower at an altitude exceeding 2000 m than at an altitude of up to 2000 m. The heat-generating parts of the servo amplifiers are air-cooled to ensure withstand voltage. Therefore, note the following when using the servo amplifier in the air of low density.

- 1) Decrease in heat dissipation effects due to lower thermal conductivity
- 2) Decrease in withstand voltage

### (2) Actions to be taken

- 1) Decrease in heat dissipation effects due to lower thermal conductivity

As altitude increases, there is a concern about a decrease in heat dissipation effects due to lower thermal conductivity. The servo amplifier is designed to be used at an altitude of up to 2000 m regarding the temperature rise of the parts caused by the heat generated when the servo amplifier is driven.

The temperature rise of the parts will be significant at an altitude exceeding 2000 m, and therefore the ambient temperature of the servo amplifier must be decreased. Table 1 below indicates the ambient temperature for each altitude.

Table 1. Ambient temperature for each altitude

Altitude [m]	Ambient temperature [°C]	
	MELSERVO-J4 series	MELSERVO-J5 series
0	55	60
1000	55	60
2000	55	55
3000	50	50
4000	45	45
5000	40	40

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- 2) Decrease in withstand voltage  
IEC 60664-1 (INSULATION COORDINATION FOR LOW-VOLTAGE EQUIPMENT) defines the correction factor for clearance as shown below in Table 2, which takes an altitude of 2000 m as the reference.

Table 2. Correction factor for clearance

Altitude [m]	Standard atmospheric pressure [kPa]	Correction factor for clearance
2000	80.0	1.00
3000	70.0	1.14
4000	62.0	1.29
5000	54.0	1.48

Note) This table is an excerpt from IEC 60664-1 Table A.2.

[When an isolation transformer is inserted (recommended)]

At an altitude of 5000 m, the clearance needs to be corrected by 1.48 times according to the correction factor in Table 2. This means that withstand voltage decreases as altitude increases, and accordingly, the clearance needs to be expanded. Since it is difficult to expand the clearance inside the servo amplifier, an isolation transformer needs to be inserted between the servo amplifier and the input power supply to comply with the standard. Inserting an isolation transformer relaxes the clearance requirement because the applied overvoltage category in the standard will be changed. With an isolation transformer inserted, the servo amplifier can satisfy the clearance requirement at an altitude of up to 5000 m.

[When an isolation transformer cannot be inserted]

When it is difficult to insert an isolation transformer, insert the following surge protector or an equivalent product between the L1/L2/L3 of the servo amplifier and the grounding, and between L11/L21 of the servo amplifier and the grounding. This enables suppression of external surges, compensating for the decrease in withstand voltage caused by high altitude.

However, when inserting only a surge protector, please note that the servo amplifier does not comply with the standard and that decreasing the failure risk of the servo amplifier is not guaranteed.

■ Surge protector (recommended)

- 200 V class servo amplifier: RSPD-250-\_4 (Okaya Electric Industries Co., Ltd.)
- 400 V class servo amplifier: RSPD-500-\_4 (Okaya Electric Industries Co., Ltd.)

### 3. Input Power Supply Voltage and Replacement Frequency

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For the input power supply voltage of the servo amplifier, there will be no problem if the used voltage is within the specification. However, lowered withstand voltage due to high altitude is considered to accelerate aging compared to when the servo amplifier is used at an altitude of up to 2000 m. Therefore, replacement of the servo amplifier after approximately 6 years of use is recommended when the servo amplifier is used at an altitude exceeding 2000 m and up to 5000 m.