

# Chapter 7

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## Maintenance and Inspection

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### 7.1 Maintenance and Inspection


In the chapter, maintenance and inspection of servo motor and drive are explained.

#### 7.1.1 Caution

- ① When checking motor voltage: As the voltage applied to the motor from the servo amplifier is PWM controlled, wave form of pulse phase is displayed. There may be significant difference in indicator value depending on types of meters
- ② When checking motor current: The pulse wave form is smoothed to sine wave to a certain degree by the motor reactance. Connect and use a moving-iron type ampere meter.
- ③ When checking power: Use an electro-dynamics type 3-phase watt-meter
- ④ Other meters: Use oscilloscopes or digital voltmeter without letting them make contact with the ground. Use meters with input current of 1[mA] or less.

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### 7.1.2 Inspection Items

 Charged voltage may remain in the smoothing condenser creating an element of danger when inspecting drive. Turn off power and wait for approximately 10 minutes before starting inspection.

#### ① Maintaining of servo motor

Inspection items	Inspection Period	Method	Remark
Vibration And noise	Every month	With the sense of touch and the sense of hearing.	It should not be big (serious) compared to the normal condition.
External appearance	According to Contamination And damage	Clean it up with fabric or air	-
Insulation Resistor	Once a year At least	Disconnect with drive, and measure resistor with 500V mugger tester.  Normal is more than 10[MΩ].<Note1>	If resistance is less than 10[MΩ], inquire to service department
Change Oil seal	Once in 5,000 Hours at least	Detach from machine, and replace it.	Only for the motor which contains oil seal
Overall inspection	Once in 20,000 Hours or 5 years At least	Inquire to our service department	Customer is required not to disassemble the Servo motor and clean it by themselves.

(Note 1) Measure between one U,V,W and FG.

#### ② Maintaining Servo drive.

The Servo drive need not to be checked and maintained on a daily basis as it uses highly reliable parts, but check it at least once a year.

Inspection item	Period	Check for	Solution
Main body and circuit board	Once a year at least	Dust, Oil	Clean up with air or clothes.
Terminal screws for looseness	Once a year at least	Screws for connection terminal and connector are securely tightened	Tighten it
Parts for defects on main body and circuit board	Once a year at least	Discoloration caused by heat, damage or disconnection	Inquire to our service department

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### 8.1.3 Replacing Period of Parts

The following parts undergo aging process as time passes due to mechanical friction or the characteristics of the material used, leading to the deterioration of equipment performance or breakdown. Check the parts periodically and replace them, of necessary.

- 1 Smoothing : The characteristics become aged due to the effects of ripple current
 

The operating life of the condenser varies significantly depending on ambient temperature and operating conditions. When used continuously in normal environment, its standard life span is 10 years. The condenser becomes aged fast during a specific period. Inspect it at least once a year (It is desirable to conduct inspection semi-annually in case the life span is nearing the exhaustion point.)

※ For judgment criteria, visually check:

  - a. Case status: Check if the sides and bottom of the case are expanded.
  - b. Cover plate: Check if significant expansion, severe cracks or damage.
  - c. Explosion-proof valve: Check for significant expansion or wear
  - d. Check periodically the external condition for cracks, tear, discoloration and water leakage, If the rated capacity of the condenser drops to 85[%] or less, it indicates life span has exhausted.
- ② Relays: Inadequate contact may occur due to contact wear resulting from switching current. The really wear condition is affected by the power capacity. The standard life span is 100,000 accumulated switching (switching life) operations.
- ③ Motor bearing: Replace bearing when it is used for 20,000~30,000 hours under rated speed and rated load. The motor bearing condition is dependent upon the operating conditions. Replace the bearing if abnormal noise or vibration is discovered.

[Standard replacement period]

Parts	Standard replacement period	How to replace
Smoothing condenser	7~8 years	Replace with new parts (decide after check)
Relays	-	Decide after check
Fuses	10 years	Replace with new ones
Aluminum electrolytic Condenser on PCB	5 years	Replace with new PCB(Decide after check)
Cooling fan	4~5 years	Replace with new ones
Motor oil seal	-	Decide after check
Motor oil seal	5,000 hours	Replace with new ones

## 7.2 Fault Diagnosis and Corrective Actions

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In case an error occurs during operation, alarm display AL-□□ or Err□□ is displayed on the display window of loader. At this time, take the following steps. If taking such steps does not correct errors, contact our service center.

### 7.2.1 Servo motor

#### [Actions to taken in case of errors]

Symptom	Cause	Inspection	Corrective action
Motor Does not start	CCWLIM, CWLIM input is OFF	Refer to chapter 1.2.System Configuration	Turn "ON" the CCWLIM, CWLIM input
	Menu mis-set	Check menu of motor, encoder and encoder type control mode	Reset menu (refer to chapter 4)
	Motor defective	Check motor lead terminal with a tester(Resistance between each phase ; less than 10[Ω])	If voltage is correct, replace motor
	Screws loosened	Check the screws	Retighten loose screws
	External miswriting or cable disconnected	Check the motor and encoder wiring	Rewire, Replace cable
	Encoder defective	Check the output wave form	Replace encoder(Use A/S service)
Motor Running Unstable	Defective connection	Check connection of the motor lead terminal	Repair defective part
	Input voltage low	Check drive input voltage	Change power supply
	Overloaded	Check machine condition	Remove foreign material from the rotator and lubricate(or grease) it
Motor Over-Heated	Ambient temperature high	Check the motor ambient temperature(should be lower than 40°C)	Change heat-shield structure
	Motor surface stained	Check motor surface for attached Foreign materials	Clean the surface of the motor
	Overloaded	Check the load rate of the drive. Check acceleration/deceleration cycle.	Reduce load Increase Acceleration/deceleration time
	Magnetic power deteriorated	Check counter electromotive voltage	Replace motor
Abnormal noise	Defective coupling	Check the tightness of the coupling screws and the concentricity of joints.	Readjust coupling
	Defective bearing	Check the bearing for vibration or abnormal noise.	Contact our service center
	Parameter mis-set	Check control parameters	Refer to Chapter 4

### 7.2.2 Servo Drive

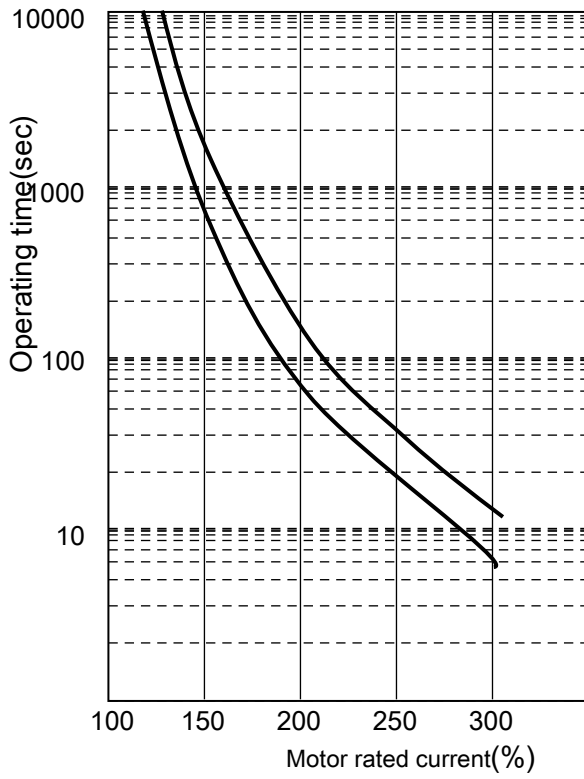
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### [Actions to taken in case of errors]

COD E	Name	Cause	Corrective Action
1	Emergency Stop	Be forcibly set by communication	Check PC communication program
2	Power Fail	Main power shut off	Check wiring of main power supply
3	Line Fail	Motor & Encoder mis-wiring	Check set values, CN2wiring, U,V,W wiring
4	Motor Output	Error of Output(U,V,W) open phase	U,V,W wiring, IPM module short
5	Encoder Pulse	No. of encoder pulse set error	Check set value[PE-204], CN2 wiring
6	Following Error	Position pulse following error	Check the [PE-502] position command pulse set value, wiring and Limit contact, gain set value
7	Not Used	Not Used	-
8	Over Current	Over current	Check the output terminal wiring motor. encoder set value, gain set, Replace drive if O.C. continues.
9	Over Load	Over load	Check Load condition, Brake operating condition, wiring, motor. encoder set value.
10	Over Voltage	Over voltage	Check input voltage, wiring of braking resistance, damage of braking resistance, excessive regenerative operation
11	Over Speed	Over speed	Check encoder set value, encoder wiring, gain set
12	Not Used	Not used	-
13	EPWR	Hardware error	[PE-203] set error
14	Flash Erase Fail	Deleting error of flash ROM data	Replace drive
15	Flash Write Fail	Writing error of flash ROM data	Replace drive
16	Data Init Error	Error of data initialization	Replace drive

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### [Overload characteristic curves of Servo Drive]



Rated current (%)	Overload operating time		
	Min.	Max.	Set value
100	∞		
120	∞		
150	600	1500	1200
200	60	150	90
250	20	35	25
300	6	15	9