

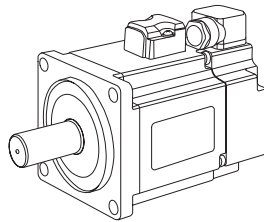
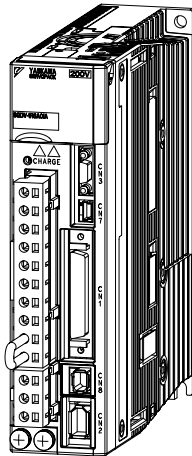


YASKAWA

# AC Servodrive $\Sigma$ -V Series USER'S MANUAL Setup

## Rotational Motor

SGMJV/SGMAV/SGMGV/SGMCS Servomotors  
SGDV SERVOPACK



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# About this Manual

This manual describes procedures required for installation, wiring, and connecting  $\Sigma$ -V Series servodrives, including trial operation for servomotors not connected to machinery.

Be sure to refer to this manual and perform setup operations correctly.

Keep this manual in a location where it can be accessed for reference whenever required.

## ■ Description of Technical Terms

The following table shows the meanings of terms used in this manual.

Term	Meaning
Servomotor	$\Sigma$ -V Series SGMJV, SGMAV, SGMGV, or SGMCS (Direct Drive) servomotor
SERVOPACK	$\Sigma$ -V Series SGD V SERVOPACK
Servodrive	A set including a servomotor and SERVOPACK (i.e., a servo amplifier)
Servo System	A servo control system that includes the combination of a servodrive with a host controller and peripheral devices
Parameter	A switch or numeric data for a SERVOPACK
Analog pulse model	Analog voltage and pulse-train reference used for SERVOPACK interface.
M-II model	MECHATROLINK-II communications reference used for SERVOPACK interface.

## ■ IMPORTANT Explanations

The following icon is displayed for explanations requiring special attention.



- Indicates important information that should be memorized, as well as precautions, such as alarm displays, that do not involve potential damage to equipment.

## ■ Notation Used in this Manual

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following example:

Example

$\overline{S-ON}$  = /S-ON

## ■ Manuals Related to the $\Sigma$ -V Series

Refer to the following manuals as required.

Name	Selecting Models and Peripheral Devices	Ratings and Specifications	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual Setup Rotational Motor (SIEPS80000043)				✓	✓		
$\Sigma$ -V Series SGM $\square$ V/SGDV Catalog (KAEPS80000042)	✓	✓					
$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual Design and Maintenance Rotational Motor/ Analog Voltage and Pulse Train Reference (SIEPS80000045)		✓	✓	✓		✓	✓
$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual Design and Maintenance Rotational Motor/ MECHATROLINK-II Communications Reference (SIEPS80000046)		✓	✓	✓		✓	✓
$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual Operation of Digital Operator (SIEPS80000055)					✓	✓	✓
$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual MECHATROLINK-II Command (SIEP80000054)			✓		✓	✓	

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(cont'd)

Name	Selecting Models and Peripheral Devices	Ratings and Specifications	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
$\Sigma$ -V Series AC SERVOPACK SGDV Safety Precautions (TOBPC71080010)							✓
$\Sigma$ Series Digital Operator Safety Precautions (TOBPC73080000)							✓
AC SERVOMOTOR Safety Precautions (TOBPC23020000)							✓

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## ■ Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.



**WARNING**

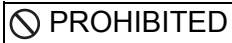
Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.



**CAUTION**


Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

In some situations, the precautions indicated could have serious consequences if not heeded.



**PROHIBITED**

Indicates prohibited actions that must not be performed. For example, this symbol would be used to

indicate that fire is prohibited as follows: 



**MANDATORY**

Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to

indicate that grounding is compulsory: 

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# Safety Precautions

These safety precautions are very important. Read them before performing any procedures such as checking products on delivery, storage and transportation, installation, wiring, operation and inspection, or disposal. Be sure to always observe these precautions thoroughly.

## WARNING

- Never touch any rotating motor parts while the motor is running.  
Failure to observe this warning may result in injury.
- Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.  
Failure to observe this warning may result in injury or damage to the product.
- Never touch the inside of the SERVOPACKS.  
Failure to observe this warning may result in electric shock.
- Do not remove the cover of the power supply terminal block while the power is ON.  
Failure to observe this warning may result in electric shock.
- Do not touch terminals for five minutes after the power is turned OFF.  
Residual voltage may cause electric shock.
- Do not touch terminals for five minutes after a voltage resistance test.  
Residual voltage in the SERVOPACK may cause electric shock. When voltage has been completely discharged, the CHARGE lamp will turn OFF. Be sure to check the CHARGE lamp before performing the next operation.
- Follow the procedures and instructions provided in this manual for trial operation.  
Failure to do so may result not only in faulty operation and damage to equipment, but also in personal injury.
- The multi-turn output range for the  $\Sigma$ -V Series absolute position detecting system is different from that of earlier systems (15-bit and 12-bit encoders). In particular, change the system to configure the  $\Sigma$  series infinite-length positioning system with the  $\Sigma$ -V Series.
- The multi-turn limit value need not be changed except for special applications.  
Changing it inappropriately or unintentionally can be dangerous.
- If the Multi-turn Limit Disagreement alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.  
If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting in a dangerous situation where the machine will move to unexpected positions.
- Do not remove the front cover, cables, connectors, or optional items from the upper front of the SERVOPACK while the power is ON.  
Failure to observe this warning may result in electric shock.
- Do not damage, press, exert excessive force on, or place heavy objects on the cables.  
Failure to observe this warning may result in electric shock, stopping operation of the product, or fire.

## WARNING

- Provide an appropriate stopping device on the machine side to ensure safety. The holding brake on a servomotor with a brake is not a stopping device for ensuring safety.  
Failure to observe this warning may result in injury.
- The person who designs a system using the safety function (Hard Wire Baseblock function) must have full knowledge of the related safety standards and full understanding of the instructions in *Σ-V Series SGM4V/SGDV User's Manual Design and Maintenance (SIEPS8000045/46)*.  
Failure to observe this warning may result in injury.
- Do not come close to the machine immediately after resetting a momentary power loss. The machine may restart unexpectedly. Take appropriate measures to ensure safety against an unexpected restart.  
Failure to observe this warning may result in injury.
-  • Connect the ground terminal according to local electrical codes (100 Ω or less for a SERVOPACK with a 200 V power supply. 10 Ω or less for a SERVOPACK with a 400 V power supply.)  
Improper grounding may result in electric shock or fire.
-  • Installation, disassembly, or repair must be performed only by authorized personnel.  
Failure to observe this warning may result in electric shock or injury.

## ■ Storage and Transportation

## CAUTION

- Do not store or install the product in the following locations.  
Failure to observe this caution may result in fire, electric shock, or damage to the product.
  - Locations subject to direct sunlight
  - Locations subject to temperatures outside the range specified in the storage/installation temperature conditions
  - Locations subject to humidity outside the range specified in the storage/installation humidity conditions
  - Locations subject to condensation as the result of extreme changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust, salts, or iron dust
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Do not hold the product by the cables or motor shaft while transporting it.  
Failure to observe this caution may result in injury or malfunction.
- Do not place any load exceeding the limit specified on the packing box.  
Failure to observe this caution may result in injury or malfunction.



## ■ Installation

### CAUTION

- Never use the product in an environment subject to water, corrosive gases, inflammable gases, or combustibles.  
Failure to observe this caution may result in electric shock or fire.
- Do not step on or place a heavy object on the product.  
Failure to observe this caution may result in injury.
- Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product.  
Failure to observe this caution may cause internal elements to deteriorate resulting in malfunction or fire.
- Be sure to install the product in the correct direction.  
Failure to observe this caution may result in malfunction.
- Provide the specified clearances between the SERVOPACK and the control panel or with other devices.  
Failure to observe this caution may result in fire or malfunction.
- Do not apply any strong impact.  
Failure to observe this caution may result in malfunction.

## ■ Wiring

### CAUTION

- Do not connect a commercial power supply to the U, V, or W terminals for the servomotor connection.  
Failure to observe this caution may result in injury or fire.
- Securely connect the main circuit power supply terminal screws and servomotor connection terminal screws.  
Failure to observe this caution may result in fire.
- Do not bundle or run the main circuit cables together with the input/output signal cables or the encoder cables in the same duct. Keep them separated by at least 30 cm.  
Failure to do so may result in malfunction.
- Use shielded twisted-pair wires or multi-core shielded twisted-pair wires for input/output signal cables and the encoder cables.
- I/O signal cables must be no longer than 3 m, encoder cables must be no longer than 20 m, and control power supply (+24 V, 0 V) cables for a 400 V input SERVOPACK must be no longer than 20 m.
- Do not touch the power terminals for 5 minutes after turning power OFF because high voltage may still remain in the SERVOPACK. Make sure the charge indicator is out first before starting an inspection.

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## CAUTION

- Observe the following precautions when wiring main circuit terminals.
  - Do not turn ON the power to the SERVOPACK until all wiring has been completed, including the main circuit terminals.
  - Remove detachable main circuit terminals from the SERVOPACK prior to wiring.
  - Insert only one main circuit cable per opening in the main circuit terminals.
  - Make sure that no part of the core wire comes into contact with (i.e., short-circuit) adjacent wires.
- Install a battery at either the host controller or the battery unit of the encoder, but not both.  
It is dangerous to install batteries at both ends simultaneously, because that sets up a loop circuit between the batteries.
- Be sure to wire correctly and securely.  
Failure to observe this caution may result in motor overrun, injury, or malfunction.
- Always use the specified power supply voltage.  
An incorrect voltage may result in fire or malfunction.
- Take appropriate measures to ensure that the input power supply is supplied within the specified voltage fluctuation range. Be particularly careful in places where the power supply is unstable.  
An incorrect power supply may result in damage to the product.
- Install external breakers or other safety devices against short-circuiting in external wiring.  
Failure to observe this caution may result in fire.
- Take appropriate and sufficient countermeasures for each form of potential interference when installing systems in the following locations.
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong electromagnetic fields and magnetic fields
  - Locations subject to possible exposure to radioactivity
  - Locations close to power suppliesFailure to observe this caution may result in damage to the product.
- Do not reverse the polarity of the battery when connecting it.  
Failure to observe this caution may result in damage to the battery, the SERVOPACK, or cause an explosion.
- Wiring or inspection must be performed by a technical expert.

## ■ Operation

### CAUTION

- Always use the servomotor and SERVOPACK in one of the specified combinations.  
Failure to observe this caution so may result in fire or malfunction.
- Conduct trial operations on the servomotor alone, with the motor shaft disconnected from the machine to avoid accidents.  
Failure to observe this caution may result in injury.
- Before starting operation with a machine connected, change the settings to match the parameters of the machine.  
Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
- Do not frequently turn power ON and OFF. Do not turn power ON or OFF more than once per minute.  
Since the SERVOPACK has a capacitor in the power supply, a high charging current flows when power is turned ON. Frequently turning power ON and OFF causes main power devices like capacitors and fuses to deteriorate, resulting in unexpected problems.
- The dynamic brake function using reverse overtravel and forward overtravel does not work during JOG operations using utility function Fn002 and origin search operations using utility function Fn003.
- When using the servomotor for a vertical axis, install safety devices to prevent workpieces from falling due to alarms or overtravels. Set the servomotor so that it will stop in the zero clamp state when overtravel occurs.  
Failure to observe this caution may cause workpieces to fall due to overtravel.
- Be sure to set the correct moment of inertia ratio in the following cases.
  - When not using tuning-less function
  - When not setting a moment of inertia ratio (Pn103)
  - When using one-parameter tuningSetting an incorrect moment of inertia ratio may cause vibration.
- Do not touch the SERVOPACK heatsinks, regenerative resistor, or servomotor while power is ON or soon after the power is turned OFF.  
Failure to observe this caution may result in burns due to high temperatures.
- Do not make any extreme adjustments or setting changes of parameters.  
Failure to observe this caution may result in injury or damage to the product due to unstable operation.
- When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation.  
Failure to observe this caution may result in damage to the product, fire, or injury.
- Do not use the brake of the servomotor for braking.  
Failure to observe this caution may result in malfunction.
- An alarm or warning may be generated if communications are executed with the host controller during operation using SigmaWin+ or the digital operator.  
If an alarm or warning is generated, the process currently being executed may be aborted and the system may stop.

## ■ Maintenance and Inspection

### CAUTION



- Do not disassemble the SERVOPACK.  
Failure to observe this caution may result in electric shock or injury.
- Do not attempt to change wiring while the power is ON.  
Failure to observe this caution may result in electric shock or injury.
- When replacing the SERVOPACK, resume operation only after transferring the previous SERVOPACK parameters to the new SERVOPACK.  
Failure to observe this caution may result in damage to the product.

## ■ Disposal

### CAUTION

- When disposing of the products, treat them as ordinary industrial waste.

## ■ General Precautions

### Observe the following general precautions to ensure safe application.

- The products shown in illustrations in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual.
- The drawings presented in this manual are typical examples and may not match the product you received.
- This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as a next edition. The edition number appears on the front and back covers.
- If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.
- Yaskawa will not take responsibility for the results of unauthorized modifications of this product.  
Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modification.

# Applicable Standards

■ North American Safety Standards (UL)



	Model	UL * Standards (UL File No.)
SERVO-PACK	• SGD V	UL508C (E147823)
Servo-motor	• SGMJV • SGMAV • SGMGV	UL1004 (E165827)

\* Underwriters Laboratories Inc.

■ European Standards



	Model	Low Voltage Directive	EMC Directive	
			EMI	EMS
SERVO-PACK	• SGD V	EN50178	EN55011 class A group 1	EN61800-3
Servo-motor	• SGMJV • SGMAV • SGMGV	IEC60034-1 IEC60034-5 IEC60034-8 IEC60034-9	EN55011 class A group 1	EN61800-3

\* TÜV Product Services GmbH

Note: Because SERVOPACKs and servomotors are built into machines, certification is required after installation in the final product.

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# 1 Overview of Setup

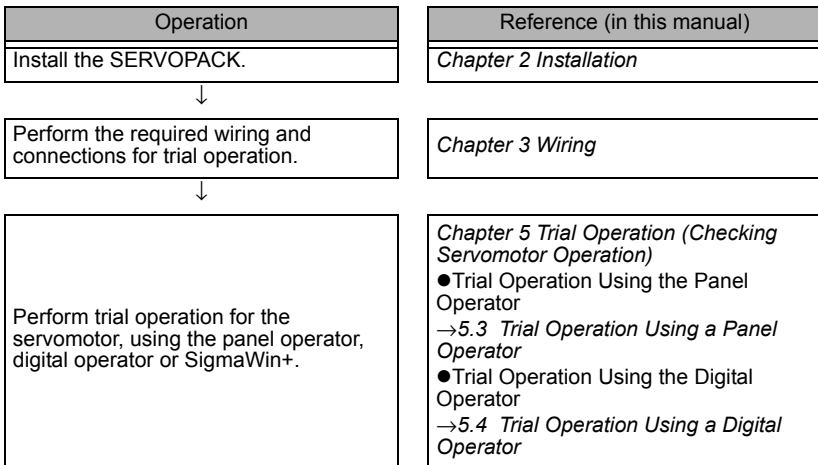
This chapter describes the flow of the setup procedure from installation through trial operation. The setup procedure depends on whether the SERVOPACK is an analog pulse (SGDV-□□□□01A) or M-II (SGDV-□□□□11A) model. It also depends on whether operations are executed using the panel operator (included with SERVO-PACK), the digital operator (option), or SigmaWin+ (an engineering tool using a PC, option).

⚠ CAUTION
<ul style="list-style-type: none"><li>An alarm or warning may be generated if communications are executed with the host controller during operation using SigmaWin+ or the digital operator. If an alarm or warning is generated, the process currently being executed may be aborted and the system may stop.</li></ul>

 IMPORTANT	Be sure to read <i>5.2 Inspection and Checking before Trial Operation</i> when using the analog pulse or M-II SERVOPACK.
--	--

## 1.1 Setup Procedure for SGDV-□□□□01A SERVOPACKs (Analog Pulse Models)

The setup procedure for analog pulse SERVOPACKs is given below.





## 1.2 Setup Procedure for SGD□-□□□□11A SERVOPACKs (M-II Models)

The setup procedure for M-II SERVOPACKs is given below.

Operation	Reference
Install the SERVOPACK.	<i>Chapter 2 Installation</i>
↓	
Perform the required wiring and connections for trial operation.	<i>Chapter 3 Wiring</i>
↓	
Perform trial operation for the servomotor using MECHATROLINK-II communications, the digital operator, or SigmaWin+.	<i>Chapter 5 Trial Operation (Checking Servomotor Operation)</i> <ul style="list-style-type: none"> <li>● Trial Operation Using M-II communications →Σ-V Series SGM□□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference</li> <li>● Trial Operation Using the Digital Operator →5.4 Trial Operation Using a Digital Operator</li> </ul>

# 1.3 Setup Using SigmaWin+

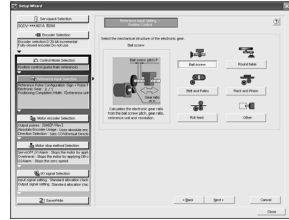
SigmaWin+ is a Yaskawa Engineering Tool used to set up AC servodrives on a PC, and to provide tuning.

Trial motor operation can be performed easily using SigmaWin+. Its main functions are introduced below.

Note: The SigmaWin+ is available for purchase. Please contact your Yaskawa representative for details.

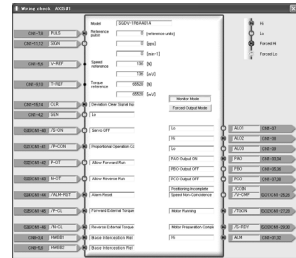
## (1) Setup Wizard

The setup wizard is a function which carries out the setting of parameters using a dialog method. By following instructions on the screen to select operation mode, machine specifications, and I/O signal, those settings which are necessary for an operation are automatically completed.



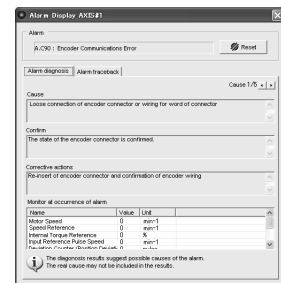
## (2) Wiring Check

Wiring check is a function which monitors I/O signal status between the SERVOPACK and the host controller, or the SERVOPACK and peripheral devices. Also, you can monitor the operating status for the host controller or peripheral devices by changing the output signal in the maintenance output mode.



## (3) Alarm Diagnosis

The alarm diagnosis function identifies a possible cause of the alarm by referencing alarm latch data saved immediately before the alarm occurred, and then displays the corrective action.



## 2 Installation

This chapter describes how to install the SERVOPACK.

Heed the following warnings and be sure to perform the installation correctly.

### WARNING

- Do not touch terminals for five minutes after a voltage resistance test. Residual voltage in the SERVOPACK may cause electric shock. When voltage has been completely discharged, the CHARGE lamp will turn OFF. Be sure to check the CHARGE lamp before performing the next operation.

### CAUTION

- Be sure to wire correctly and securely. Failure to observe this caution may result in motor overrun, injury, or malfunction.

## 2.1 Installation Environment and Applicable Standards

The SERVOPACK installation environment and the standards to which it must conform are given below.

### 2.1.1 Installation Environment

- Operating temperature: 0 to 55°C
- Operating humidity: 90% max. (with no condensation)
- Vibration/shock resistance: 4.9 m/s<sup>2</sup> / 19.6 m/s<sup>2</sup>
- Elevation: 1,000 m max.

#### ■ Installation Precautions

- Mounting in a Control Panel

To prevent the temperature around the SERVOPACK from exceeding 55°C, take into account the size of the control panel, the layout of the SERVOPACK, and the cooling method. For details, refer to 2.4 *Mounting Standards*.

- Mounting Near a Heating Unit

To prevent the temperature around the SERVOPACK from exceeding 55°C, suppress radiant heat from the heating unit and temperature rise due to convection.

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- **Mounting Near a Vibration Source**

To prevent vibration from being transmitted to the SERVOPACK, install a vibration isolator underneath the SERVOPACK.

- **Mounting to a Location Exposed to Corrosive Gas**

Take measures to prevent exposure to corrosive gas. Corrosive gases will not immediately affect the SERVOPACK, but will eventually cause electronic components and contactor-related devices to malfunction.

- **Other Locations**

Do not mount the SERVOPACK in locations subject to high temperatures, high humidity, dripping water, cutting oil, dust, iron filings, or radiation.

<Supplemental Information>

When storing the SERVOPACK with the power OFF, store it in an environment with the following temperature and humidity:

- -20 to 85°C, 90%RH max. (with no condensation)

## **2.1.2 Standards**

- **Overvoltage category: III**

- **Pollution degree: 2**

- **Protection class: 1X**

The SERVOPACK conforms to the following standards.

- EN50178
- UL508C (Refer to 2.2 *Installation Conditions of EMC Directive.*)
- EN55011 group 1 class A (Refer to 2.2 *Installation Conditions of EMC Directive.*)
- EN61800-3 (Refer to 2.2 *Installation Conditions of EMC Directive.*)
- EN61800-5-1\*

\* For details, refer to 3.4.1 *Molded-case Circuit Breaker and Fuse Capacity.*

## 2.2 Installation Conditions of EMC Directive

To adapt a combination of a SGM□V servomotor and a SGD V SERVOPACK to EMC Directives (EN55011 group 1 class A, EN61800-3), the following recommended conditions must be satisfied.

However, because this product is built-in, check that the following conditions are still met after being installed in the final product.

### 2.2.1 EMC Installation Conditions

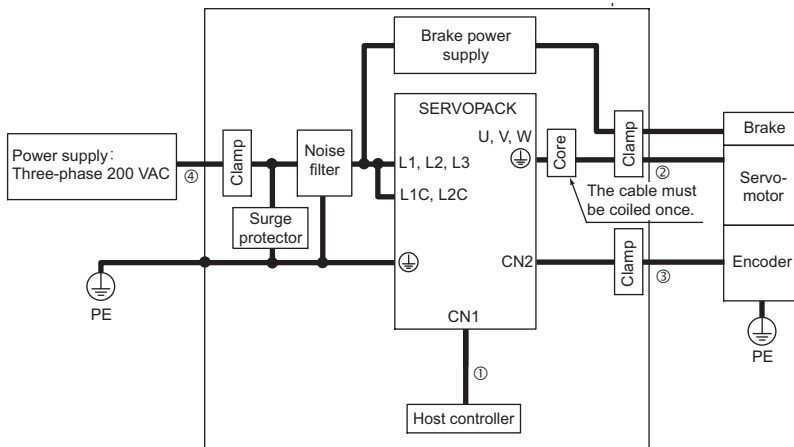
This section describes the recommended installation conditions that satisfy EMC guidelines for each model of the SGD V SERVOPACK. The conditions required for the standard type (base mounted) of SERVOPACK are described. Refer to this section for other SERVOPACK models such as the rack mounted types as well.

This section describes the EMC installation conditions satisfied in test conditions prepared by Yaskawa. The actual EMC level may differ depending on the actual system's configuration, wiring, and other conditions.

## ■ SGDV-□□□□01A (Analog Pulse Model)

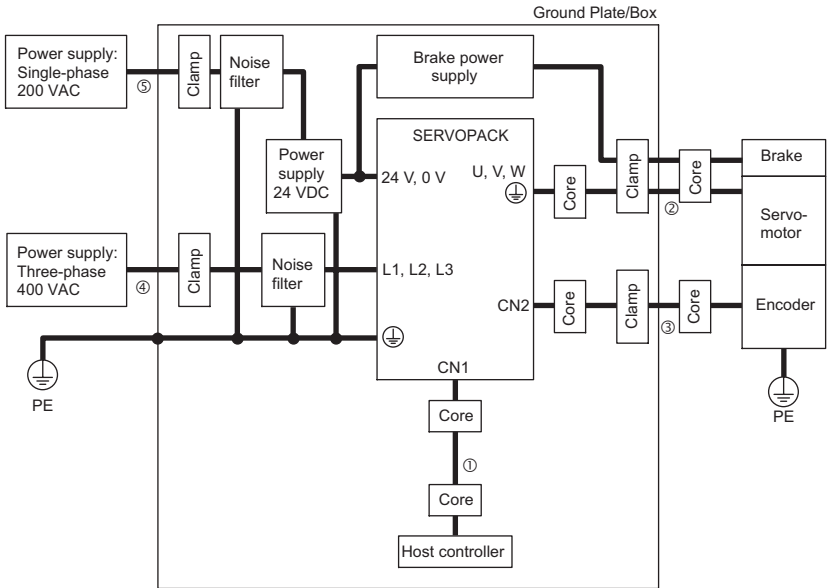
- Three-phase 200 V:

SGDV-□□□A01A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Motor main circuit cable	Shield cable
③	Encoder cable	Shield cable
④	Main circuit cable	Shield cable

- Three-phase 400 V:  
SGDV-□□□D01A

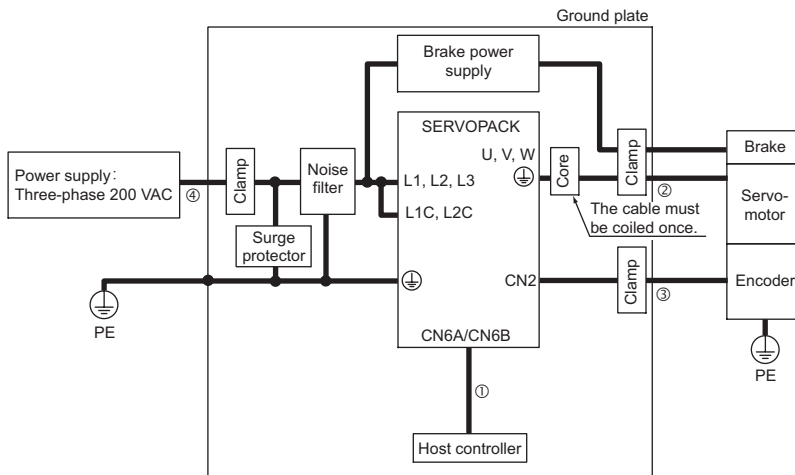


Symbol	Cable Name	Specifications
①	I/O signal cable	Shield cable
②	Motor main circuit cable	Shield cable
③	Encoder cable	Shield cable
④	Main circuit cable	Shield cable
⑤		Shield cable

## ■ SGDV-□□□□11A (M-II Model)

- Three-phase 200 V:

SGDV-□□□A11A

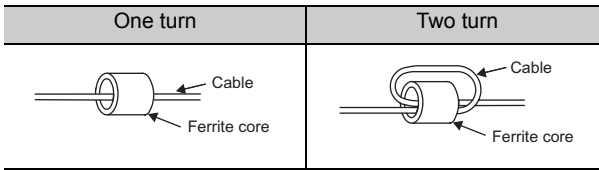


Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Motor main circuit cable	Shield cable
③	Encoder cable	Shield cable
④	Main circuit cable	Shield cable





## ■ Attaching the Ferrite Core



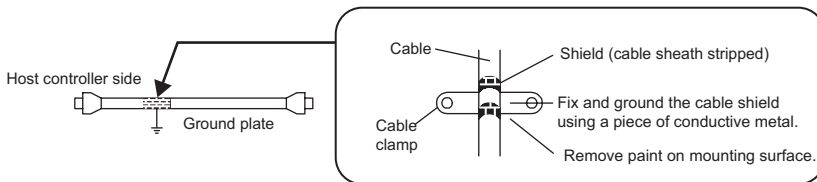
## ■ Recommended Ferrite Core

Cable Name	Ferrite Core Model	Manufacturer
Servomotor main circuit cable	ESD-SR-25	NEC TOKIN Corp.

## ■ Fixing the Cable

Fix and ground the cable shield using a piece of conductive metal.

- Example of Cable Clamp



## ■ Shield Box

A shield box, which is a closed metallic enclosure, should be used for shielding magnetic interference. The structure of the box should allow the main body, door, and cooling unit to be attached to the ground. The box opening should be as small as possible.

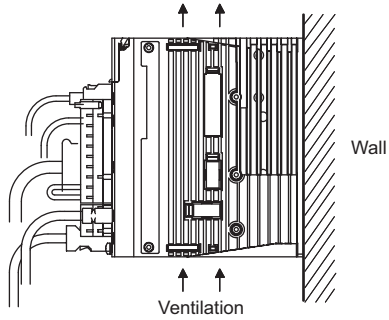
### 2.2.2 Digital Operator and Analog Monitor Cable

Do not connect the digital operator and the analog monitor cable to the SERVOPACK during operations. Connect them only when the machinery is stopped during maintenance.

## 2.3 Mounting Orientation

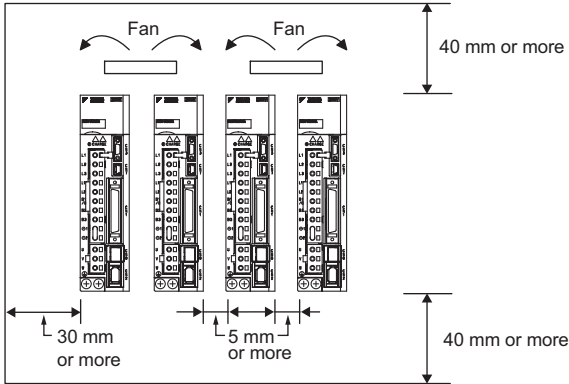
The SERVOPACK is available in models that are base-mounted, models that are rack-mounted, and models that are duct-mounted. In any case, mount the SERVOPACK with a vertical orientation.

Firmly secure the SERVOPACK to the mounting surface, using either two or four mounting holes depending on the SERVOPACK capacity.



## 2.4 Mounting Standards

Observe the standards for mounting SERVOPACKs in control panels, including those for the mounting of multiple SERVOPACKs side by side in one control panel as shown in the following illustration.



- **SERVOPACK Mounting Orientation**

Mount the SERVOPACK vertically to the wall, with the front panel (the side with the panel operator display) facing out.

- **Cooling**

Refer to the above diagram and leave sufficient space for cooling by fans and natural convection.

- **Mounting Multiple SERVOPACKs Side by Side in a Control Panel**

Leave at least 5 mm of space on each side and 40 mm of space at the top and bottom of each SERVOPACK. Also install cooling fans above the SERVOPACKs to disperse local pockets of warmer air around the SERVOPACKs.

- **Environment Inside the Control Panel**

Temperature around the SERVOPACKs: 0 to 55°C

Humidity: 90%RH max. (with no condensation)

Vibration: 4.9 m/s<sup>2</sup> max.

There must be no freezing or condensation. To ensure long-term reliability, a maximum ambient operating temperature of 45°C is recommended.

## 2.5 Servomotor Installation Environment

The servomotor installation environment tolerances are described below.

- Ambient temperature: 0 to 40°C (32 to 104° F)
- Ambient humidity: 80%RH or less (with no condensation)
- Altitude: 1, 000 m or less
- Vibration resistance: 49 m/s<sup>2</sup> at servomotor flange  
(In three directions: Vertical, side to side, and front to back)
- Impact resistance: 490 m/s<sup>2</sup> at servomotor flange
- Installation site: An environment that satisfies the following conditions
  - Indoors and free of corrosive or explosive gases
  - Well-ventilated and free of dust and moisture
  - Facilitates inspection and cleaning

## 2.6 Servomotor Protective Structure

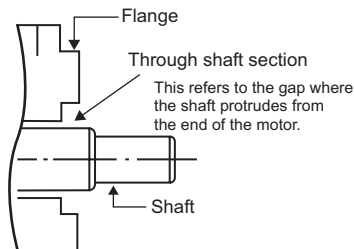
The servomotor protective structure is described below.

- SGMV, SGMJV: IP65 (with gears: IP44)
- SGMGV: IP67
- SGMCS: IP42

Except through shaft section

When the through shaft section is subject to oil exposure, refer to *2.10 Other Precautions*.

For SGMV and SGMJV servomotors, the protective structure specifications can be satisfied only when using a specified cable.



## 2.7 Servomotor Orientation

Servomotors can be installed either horizontally or vertically.

Servomotors with gears can be installed only horizontally, depending on gear lubrication conditions. Refer to  $\Sigma$ -V Series SGM□V/SGDV Catalog (KAEPS8000042) for details.

---

## 2.8 Servomotor Installation

The motor rated specifications (rated output, rated torque, and rated speed) are the continuous allowable values at an ambient temperature of 40°C when servomotors are installed with the following heat sinks.

- SGMAV/SGMJV-A5, -01 : 200 × 200 × 6 (mm), aluminum plate
- SGMAV/SGMJV-C2 to -08 : 250 × 250 × 6 (mm), aluminum plate
- SGMAV-10 : 300 × 300 × 12 (mm), aluminum plate
- SGMGV-03 to -13 : 400 × 400 × 20 (mm), iron plate
- SGMGV-20 to -44 : 550 × 550 × 30 (mm), iron plate
- SGMCS-□□B : 350 × 350 × 12 (mm), iron plate
- SGMCS-□□C : 450 × 450 × 12 (mm), iron plate
- SGMCS-□□D : 550 × 550 × 12 (mm), iron plate
- SGMCS-□□E : 650 × 650 × 12 (mm), iron plate

When a motor is mounted on a small surface, the motor temperature may rise considerably because of the limited heat radiating abilities of the surface. To restrict the temperature rise, you should either mount a heat sink or limit the electrical, thermal, and mechanical stress on the motor (derating). Refer to  $\Sigma$ -V Series SGM□V/SGDV Catalog (KAEPS80000042) for the relation between heat sink size and derating. The data in the catalog is given only for reference, as the actual temperature rise depends on how the heat sink (motor mounting section) is fixed on the installation surface and what material is used for the motor mounting section. Always check the actual motor temperature.

If the servomotor is covered, or if a heating element is installed near the servomotor, the motor temperature may rise considerably. In this case, take following counter-measures.

- Reduce the load ratio.
- Reconsider the motor heating conditions.
- Install a cooling fan.

## 2.9 Connecting Servomotor to Machine

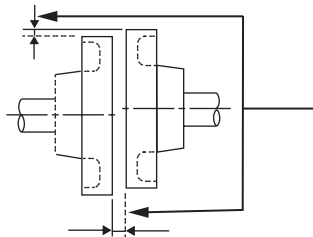
The end of the motor shaft is coated with anticorrosive paint. Thoroughly remove the paint prior to installation.

Align the shaft of the servomotor with the shaft of the machine, and then couple the shafts. Install the servomotor so that alignment accuracy falls within the following range. Vibration will damage the bearings or encoders if the shafts are not properly aligned.

Do not allow direct impact to be applied to the shafts when installing the coupling as the encoder mounted on the opposite end of the shaft may be damaged.

### Alignment Accuracy

Measure this distance at four different positions on the circumference. The difference between the maximum and minimum measurements must be 0.03 mm or less.  
(Turn together with coupling.)



---

## 2.10 Other Precautions

### ■ Handling Oil and Water

If the servomotor is used in a location that is subject to water or oil mist, use a servomotor with an oil seal to seal the through shaft section. Precautions on using a servomotor with an oil seal are described below.

- Put the oil surface under the oil seal lip.
- Use an oil seal in favorably lubricated condition.
- When using a servomotor with its shaft upward direction, be sure that oil will not stay in the oil seal lips.

### ■ Cable Stress

Make sure there are no bends or tension on the motor main circuit cables and encoder cables.

Be especially careful to wire encoder cables so that they are not subject to stress because the core wires are very thin at only 0.2 to 0.3 mm.

### ■ Connectors

Observe the following precautions:

- Make sure there is no foreign matters such as dust and metal chips in the connector before connecting.
- When the connectors are connected to the motor, be sure to connect the end of motor main circuit cables before connecting the encoder cable's end.  
If the encoder cable's end is connected, the encoder may break because of the voltage differences between FG.
- Make sure of the pin arrangement.
- Do not apply shock to resin connectors. Otherwise, they may be damaged.
- When handling a servomotor with its cables connected, hold the servomotor or the connectors and cables will be damaged.
- Fix the connector to SGM $\square$ V or SGMJ $\square$ V with screws. Make sure that the connector is securely fixed with screws.  
If not, the protective construction specifications may not be satisfied.
- Be sure not to apply stress on the connector. The connector may be damaged by stress.

### ■ Radial and Thrust loads

Design the mechanical system so thrust and radial loads applied to the servomotor shaft end during operation fall within the allowable ranges of each motor. Refer to  $\Sigma$ -V Series SGM $\square$ V/SGDV Catalog (KAEPS8000042) for the allowable ranges.



## 3 Wiring

This chapter describes how to set up the wiring and connections required for trial operation.

To connect to the host controller or peripheral devices, refer to the following manuals.

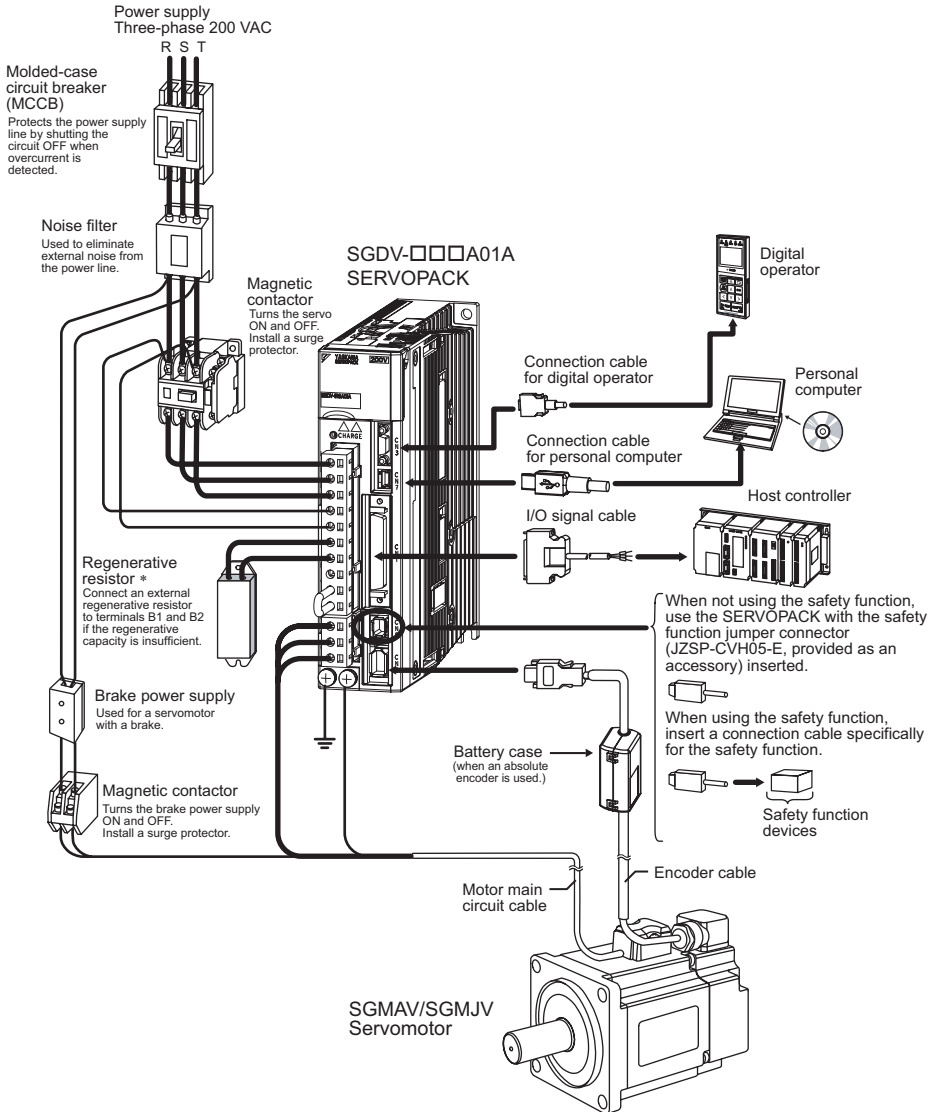
- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS80000045)
- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/ MECHATROLINK-II Communications Reference (SIEPS80000046)

### CAUTION

- Do not bundle or run the main circuit cables together with the input/output signal cables or the encoder cables in the same duct. Keep them separated by at least 30 cm.  
Failure to do so may result in malfunction.
- Use shielded twisted-pair wires or multi-core shielded twisted-pair wires for input/output signal cables and the encoder cables.
- I/O signal cables must be no longer than 3 m, encoder cables must be no longer than 20 m, and control power supply (+24 V, 0 V) cables for a 400 V input SERVOPACK must be no longer than 20 m.
- Do not touch the power terminals for 5 minutes after turning power OFF because high voltage may still remain in the SERVOPACK. Make sure the charge indicator is out first before starting an inspection.

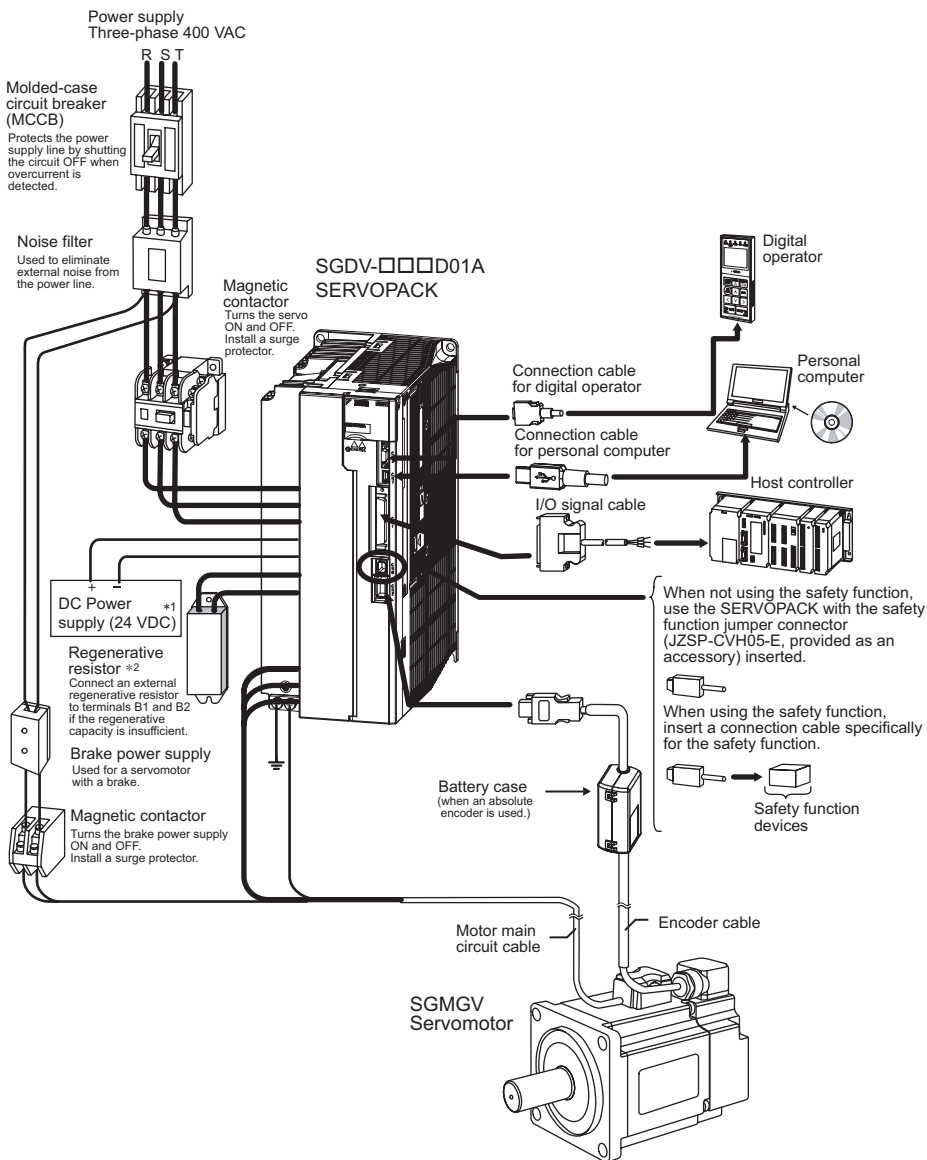
# 3.1 System Configuration Diagram

## ■ Connecting to SGDV-□□□A01A SERVOPACK




\* Remove the lead wire between the terminals B2 and B3 on the SERVOPACK before connecting an external regenerative resistor to the SERVOPACK.

## ■ Connecting to SGDV-□□□D01A SERVOPACK



- \*1. Use a 24 VDC power supply. (Must be prepared by the user.)
- \*2. Remove the lead wire between the terminals B2 and B3 on the SERVOPACK before connecting an external regenerative resistor to the SERVOPACK.

### 3.1.1 SERVOPACK Main Circuit Wire Size

 <b>IMPORTANT</b>	<ol style="list-style-type: none"> <li>1. Wire sizes are selected for three cables per bundle at 40°C (104°F) ambient temperature with the rated current.</li> <li>2. Use a cable with a minimum withstand voltage of 600 V for the main circuit.</li> <li>3. If cables are bundled in PVC or metal ducts, take into account the reduction of the allowable current.</li> <li>4. Use a heat-resistant cable under high ambient or panel temperatures, where normal vinyl cables will rapidly deteriorate.</li> <li>5. Use the cable within the allowable moment of inertia.</li> <li>6. Do not use the cable in a continuous regenerative state.</li> </ol>
---	---

#### ■ Cable Types

Cable Type		Allowable Conductor Temperature °C (°F)
Symbol	Name	
PVC	Normal vinyl cable	–
IV	600 V vinyl cable	60 (140)
HIV	Heat-resistant vinyl cable	75 (167)

The following table shows the wire sizes and allowable currents for three cables. Use cables with specifications equal to or less than those shown in the table.

#### • 600 V Heat-resistant Vinyl Cable (HIV)

Nominal Cross Section Diameter (mm <sup>2</sup> )	AWG Size	Allowable Current at Ambient Temperature (A)		
		30°C	40°C	50°C
0.5	20	6.6	5.6	4.5
0.75	-	8.8	7.0	5.5
0.9	18	9.0	7.7	6.0
1.25	16	12.0	11.0	8.5
2.0	14	23	20	16
3.5	12	33	29	24
5.5	10	43	38	31
8.0	8	55	49	40
14.0	6	79	70	57
22.0	4	91	81	66

Note: The values in the table are for reference only.

### ■ Three-phase 200 V

Cable	Connection Terminal Symbol	SERVOPACK Model SGD-					
		R70A	R90A	1R6A	2R8A	3R8A	5R5A
Main circuit cable	L1, L2, L3	HIV1.25			HIV2.0		
Motor main circuit cable	U, V, W	HIV1.25			HIV2.0		
Control power cable	L1C, L2C	HIV1.25					
External regenerative resistor cable	B1, B2	HIV1.25					
Ground cable	⊕	HIV2.0 or more					

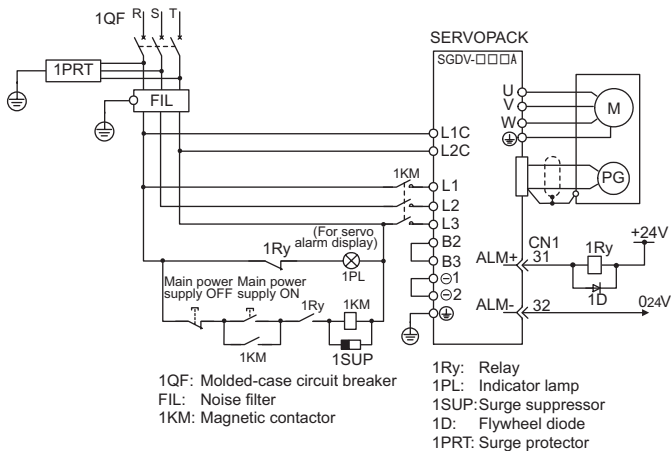
### ■ Three-phase 400 V

Cable	Connection Terminal Symbol	SERVOPACK Model SGD-					
		1R9D	3R5D	5R4D	8R4D	120D	170D
Main circuit cable	L1, L2, L3	HIV1.25			HIV2.0		HIV3.5
Motor main circuit cable	U, V, W	HIV1.25			HIV2.0		HIV3.5
Control power cable	24 V, 0 V	HIV1.25					
External regenerative resistor cable	B1, B2	HIV1.25					HIV2.0
Ground cable	⊕	HIV2.0 or more					

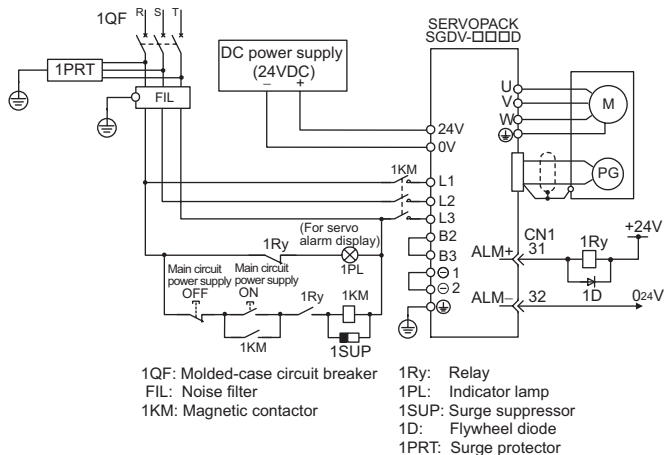
## ■ Typical Main Circuit Wiring Examples

The following wiring examples show the  $\Sigma$ -V Series SGD<sub>V</sub> SERVOPACK.

### • Three-phase 200 V



### • Three-phase 400 V



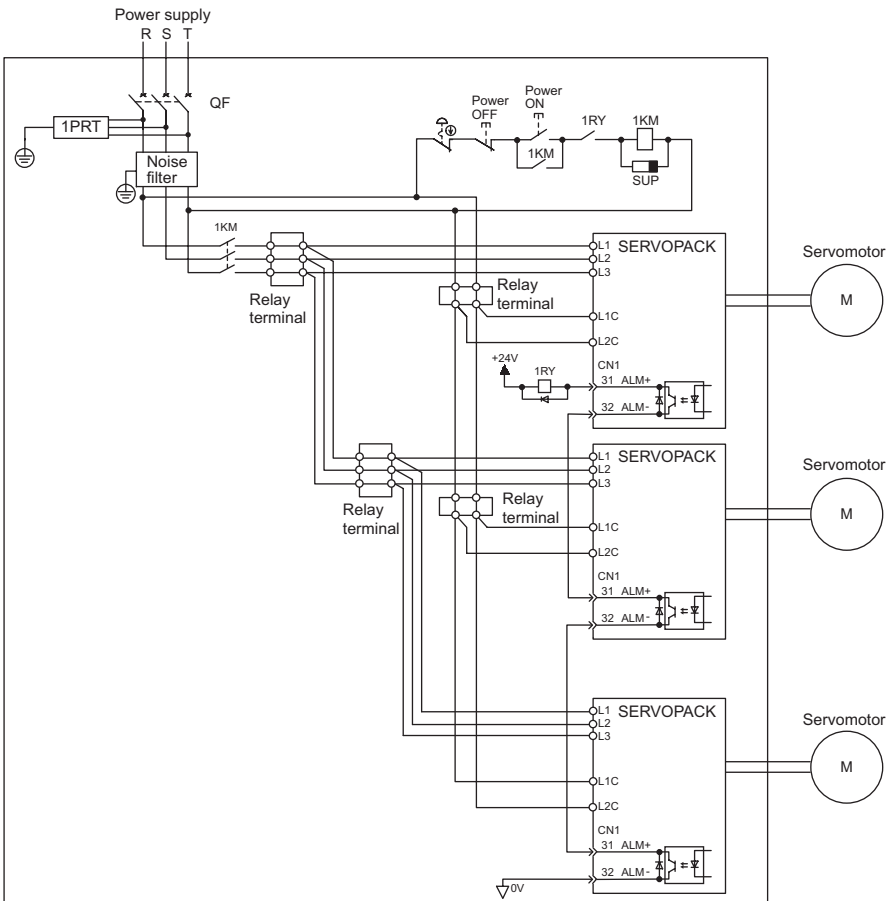
## ■ Using More Than One SERVOPACK

The following diagram is an example of the wiring when more than one SERVOPACK is used.

Connect the alarm output (ALM) terminals for the three SERVOPACKs in series to enable alarm detection relay 1RY to operate.

When the alarm occurs, the ALM output signal transistor is turned OFF.

Multiple servos can share a single molded-case circuit breaker (QF) or noise filter. Always select a QF or noise filter that has enough capacity for the total power capacity (load conditions) of those servos. For details, refer to *3.4.1 Molded-case Circuit Breaker and Fuse Capacity*.



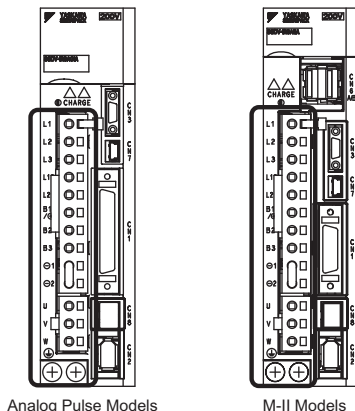
- 
- When either of the following special power supply environments or SERVOPACK configurations are to be used, refer to the manuals (listed below) for the appropriate wiring, connections, and required settings.
    - Using a SERVOPACK with DC power supply inputs
    - Using a SERVOPACK with a 400 V class power supply voltage (double voltage)
  - $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS80000045)
  - $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/ MECHATROLINK-II Communications Reference (SIEPS80000046)



## 3.2 Main Circuit Wiring


The names, specifications, and functions of the main circuit terminals required for trial operation are given below.

### 3.2.1 Names and Functions of Main Circuit Terminals



Analog Pulse Models

M-II Models

Terminal Symbol	Name	Main Circuit Power Supply Voltage (V)	Functions
L1, L2, L3	Main circuit power supply input terminal	200	Three-phase 200 to 230 VAC <sup>+10%</sup> , -15% (50/60 Hz)
		400	Three-phase 380 to 480VAC <sup>+10%</sup> , -15% (50/60 Hz)
U, V, W	Servomotor connection terminals	–	Connects to the servomotor.
L1C, L2C	Control circuit power supply input terminal	200	Single-phase 200 to 230 VAC <sup>+10%</sup> , -15% (50/60 Hz)
24V, 0V		400	24 VDC (±15%)
	Ground terminals	–	Connects to the power supply ground terminals and servomotor ground terminal.

(cont'd)


Terminal Symbol	Name	Main Circuit Power Supply Voltage (V)	Functions
B1, B2	External regenerative resistor connection terminal	200	Normally not connected. Connect an external regenerative resistor (provided by customer) between B1 and B2 if the regenerative capacity is insufficient.
B1, B2, B3		200	Normally short B2 and B3 (for an internal regenerative resistor).
		400	Remove the wire between B2 and B3 and connect an external regenerative resistor (provided by customer) between B1 and B2 if the capacity of the internal regenerative resistor is insufficient.
⊕1, ⊕2	DC reactor for harmonic suppression terminal	200	Normally short ⊕1 and ⊕2.
		400	If a countermeasure against power supply harmonic waves is needed, connect a DC reactor between ⊕1 and ⊕2.
⊖	Main circuit minus terminal	–	Normally not connected.

### 3.2.2 Wiring the Main Circuit Terminal Block (Spring Type)

The main circuit terminal block consists of the main circuit terminals and the control power terminals.

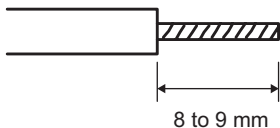
- SERVOPACKs with a detachable main circuit terminal block:  
SGDV- R70A, -R90A, -1R6A, -2R8A, -3R8A, -5R5A, 1R9D, -3R5D, -5R4D
- SERVOPACKs with a fixed main circuit terminal block:  
SGDV-8R4D, -120D, -170D

How to wire the main circuit terminal block is described below.

 CAUTION
<ul style="list-style-type: none"><li>• Observe the following precautions when wiring main circuit power supply terminal blocks.<ul style="list-style-type: none"><li>• Do not turn ON the power to the SERVOPACK until all wiring has been completed, including the main circuit terminal blocks.</li><li>• Remove detachable main circuit terminal blocks from the SERVOPACK prior to wiring.</li><li>• Insert only one main circuit cable per opening in the main circuit terminal block.</li><li>• Make sure that no part of the core wire comes into contact with (i.e., short-circuit) adjacent wires.</li></ul></li></ul>

### ■ Wiring Procedure

1. If the main circuit terminal block is detachable, remove it from the SERVOPACK.
2. Strip the end of the wires.



Applicable wire sizes:  
Refer to 3.1.1 *SERVOPACK*  
Main Circuit Wire Size.

3. Open the wire terminal on the terminal block housing with a tool, using the method shown in Figure A or Figure B. (Either method can be used to open the wire terminal.)

### ■ Figure A Method

Use the spring opener provided with the SERVOPACK to open the wire terminal as shown in the diagram.

Note: The spring opener (1981045-1) made by Tyco Electronics AMP K.K. can also be used.

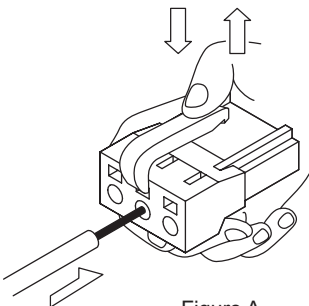


Figure A

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## ■ Figure B Method

Use a commercially available flat-blade screwdriver with a blade width of 3.0 to 3.5 mm. Insert the screwdriver into the slot and press down firmly to open the wire terminal.

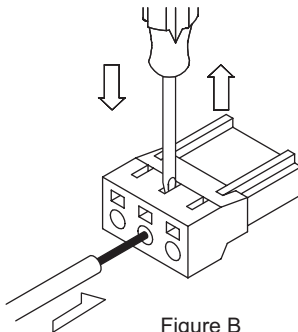


Figure B

4. Insert the wire core into the opening, and then close the opening by releasing the lever or removing the screwdriver.
5. Make all the required connections in the same way.
6. Attach the connector to the SERVOPACK.

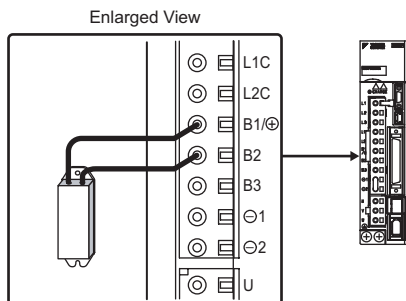
## 3.3 Connecting Regenerative Resistors

This section describes how to connect regenerative resistors and set the regenerative resistor capacity. To learn how to select a regenerative resistor, and for detailed specifications, refer to  $\Sigma$ -V Series SGM□V/SGDV Catalog (KAEPS8000042).

### 3.3.1 Connecting Regenerative Resistor

The procedures for connecting Regenerative Resistors are given below.

Disconnect the cable between the SERVOPACK's B2 and B3 terminals and connect an external regenerative resistor between the SERVOPACK's B1/⊕ and B2 (or B1 and B2) terminals.



### ⚠ CAUTION

- Use the correct connection terminals or cables for wiring a regenerative resistor. Failure to observe this caution may result in fire, burn injury, or damage to the product.

## 3.4 Model and Capacity of Peripheral Device

### 3.4.1 Molded-case Circuit Breaker and Fuse Capacity

Main Circuit Power Supply	Maximum Applicable Servomotor Capacity (kW)	SERVO PACK Model SGDV-	Power Supply Capacity per SERVO PACK (kVA)	Current Capacity		Inrush Current	
				Main Circuit (Arms)	Control Circuit (Arms)	Main Circuit (A0-p)	Control Circuit (A0-p)
Three-phase 200 V	0.05	R70A	0.2	1.0	0.2	33	70
	0.1	R90A	0.3	1.0			
	0.2	1R6A	0.6	2.0			
	0.4	2R8A	1	3.0			33
	0.5	3R8A	0.9	3.0			
	0.75	5R5A	1.6	6.0			
Three-phase 400 V	0.5	1R9D	1.1	1.4	1.2	17	-
	1.0	3R5D	2.3	2.9			
	1.5	5R4D	3.5	4.3			
	2.0	8R4D	4.5	5.8	1.4	34	
	3.0	120D	7.1	8.6			
	5.0	170D	11.7	14.5			

Note: To conform to a low voltage directive, be sure to install a fuse or molded-case circuit breaker on the input side to prevent the SERVOPACK from being damaged if a short-circuit occurs.

### 3.4.2 Noise Filters, Magnetic Contactors, Surge Protectors, and DC Reactors

Main Circuit Power Supply	SERVO PACK Model	Recommended Noise Filter		Magnetic Contactor	Surge Protector	DC Reactor
	SGDV-	Type	Specifications			
Three-phase 200 V	R70A	FN258L-7/07	Three-phase 480 VAC, 7 A	SC-03 (20 A)	R·C·M-601BUZ-4	–
	R90A					X5071
	1R6A					X5070
	2R8A					X5069
	3R8A					
	5R5A	FN258L-16/07	Three-phase 480 VAC, 16 A			X5061
Three-phase 400 V	1R9D	FN258L-7/07	Three-phase 480 VAC, 7 A	SC-4-1 (35 A)	Built-in	X5074
	3R5D					X5075
	5R4D					
	8R4D	FN258L-16/07	Three-phase 480 VAC, 16 A	SC-5-1 (35 A)		X5076
	120D					
	170D	FMAC-0934-5010	Three-phase 480 VAC, 35 A	SC-1N (50 A)		X5077

- Note: 1. If several SERVOPACKs are wired at the same time, select the proper magnetic contactors according to the total capacity.
2. When an RoHS-compliant device is required, contact the manufacture of each device to confirm that the device conforms to the RoHs directive.
3. The following table shows the manufacturers of each device.

Peripheral Device	Manufacturer
Noise Filter	FN, FS type: Schaffner Electronic
	FMAC type: SCHURTER AG
Magnetic Contactor	Fuji Electric FA Components & Systems Co., Ltd.
Surge Protector	Okaya Electric Industries Co., Ltd.
DC Reactor	Yaskawa Controls Co., Ltd.

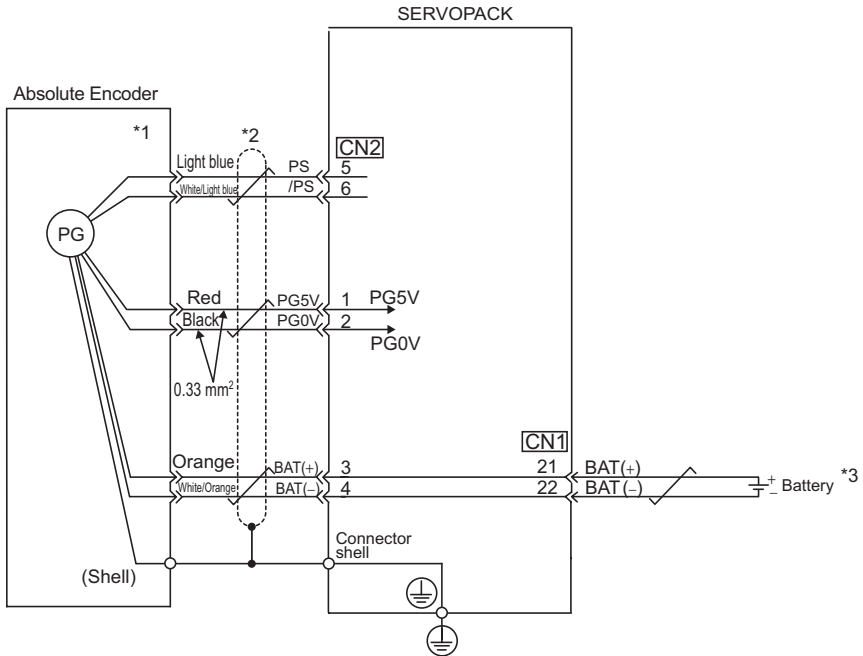
#### ■ Noise Filter for Brake Power Supply

Use an FN2070-6/07 made by SCHAFFNER for a servomotor of 400 W or less.






### 3.5.3 Absolute Encoder Connection Example



\*1. The pin numbers for the connector wiring depend on the servomotor used.

\*2.  represents shielded twisted-pair wires.

\*3. When using an absolute encoder, provide power by connecting a JZSP-BA01 Battery Unit to either the encoder cable (for example: JZSP-CSP05-□□-E) or the host controller.

### 3.5.4 Encoder Connector (CN2) Terminal Layout

1	PG5V	PG power supply +5 V	2	PG 0 V	PG power supply 0 V
3	BAT (+)	Battery (+) (for an absolute encoder)	4	BAT (-)	Battery (-) (for an absolute encoder)
5	PS	PG serial signal input	6	/PS	PG serial signal input
Shell	Shield	-			

---

## 3.6 MECHATROLINK-II Wiring

This section describes the wiring required for using MECHATROLINK-II commands to perform trial operation for M-II SERVOPACKs (SGDV-□□□□11A).

Refer to the following manuals as required for details on MECHATROLINK-II.

*Σ-V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference (SIEPS80000046)*

MECHATROLINK System User's Manual (SIE-S800-26.1)

MECHATROLINK Servo Command User's Manual (SIE-S800-26.2)

MECHATROLINK-II System User's Manual (SIEPS800000020)

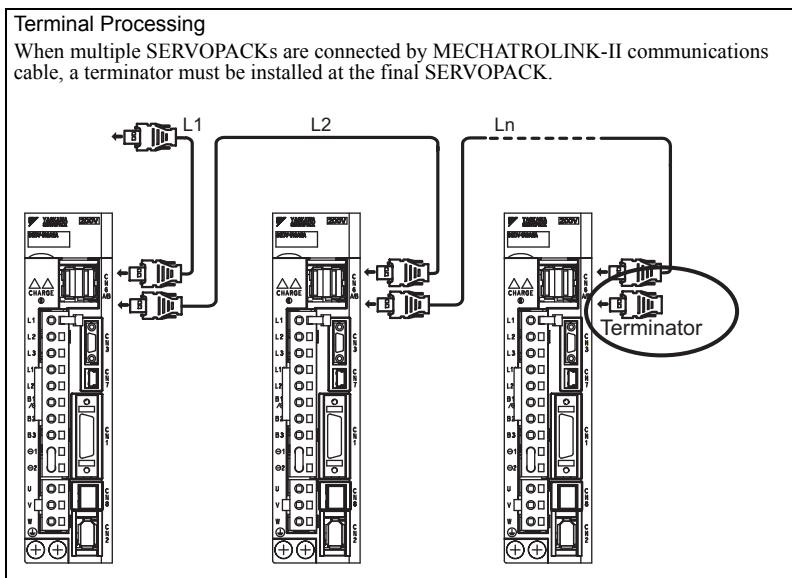
MECHATROLINK-II Servo Command User's Manual (SIEPS800000022)

### 3.6.1 Connecting MECHATROLINK-II Communications Cable

The SERVOPACK is connected to MECHATROLINK devices using a MECHATROLINK communications cable. For communications cable and other cable specifications, refer to  $\Sigma$ -V Series SGM□V/SGDV Catalog (KAEPS8000042).

#### ■ Connection Procedure

1. Connect the MECHATROLINK-II communications cable to the SERVOPACK's MECHATROLINK-II communications connectors (CN6A, CN6B).

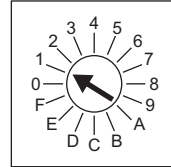


### 3.6.2 Setting MECHATROLINK-II Communications

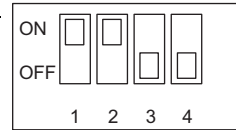
This section describes the switch settings required for MECHATROLINK-II communications. The rotary switch (SW1) and DIP switch (SW2), which are located near the top under the front cover on the SERVOPACK, are used as shown below to set the MECHATROLINK-II communications specifications.

1. Set the DIP switch (SW2) based on the following table.


SW2	Function	Setting	Description	Factory setting
Pin 1	Sets the baud rate.	OFF	4 Mbps (MECHATROLINK-I)	ON
		ON	10 Mbps (MECHATROLINK-II)	
Pin 2	Sets the number of transmission bytes.	OFF	17 bytes	ON
		ON	32 bytes	
Pin 3	Sets the station address.	OFF	Station address = 40H + SW1	OFF
		ON	Station address = 50H + SW1	
Pin 4	Reserved. (Do not change.)	OFF	–	OFF



SW1 (factory setting)



SW2 (factory settings)

 <b>IMPORTANT</b>	<ul style="list-style-type: none"> <li>When connecting to a MECHATROLINK-I network, turn OFF pins 1 and 2.</li> <li>The following combination cannot be used: Baud rate: 4 Mbps; Transmission bytes: 32 (pin 1: OFF, pin 2: ON)</li> </ul>
---	--

The transmission cycles and the number of stations that can be set are given below.

Transmission bytes	Transmission cycle								
	0.25 ms <sup>*</sup>	0.5 ms	1.0 ms	1.5 ms	2.0 ms	2.5 ms	3.0 ms	3.5 ms	4.0 ms
17	1	6	14	22	30	30	30	30	30
32	0	3	8	14	20	25	30	30	30

\* When the transmission cycle is 0.25 ms, set the communications cycle as a multiple of 0.5 ms.

- Note: 1. When the number of stations actually connected is less than the maximum number of stations that can be connected, the remaining stations can be used as communications retry stations. [Number of communications retry stations that can be set = Maximum number of stations that can be connected - Number of actual stations connected + 1 (up to 7 retry stations)]
2. When no communications retries are used, the maximum number of stations that can be connected is increased by one.
  3. When the C2 master is connected, the maximum number of stations that can be connected is decreased by one.
  4. A repeater (JAPMC-REP2000-E) is required to connect more than 16 stations.

- 2.** Set the station address based on the following table, using the rotary switch (SW1) and pin 3 of the DIP switch (SW2) in combination.

Station Address	SW1	SW2 Pin 3	Station Address	SW1	SW2 Pin 3
Disabled	0	OFF	50H	0	ON
41H *	1	OFF	51H	1	ON
42H	2	OFF	52H	2	ON
43H	3	OFF	53H	3	ON
44H	4	OFF	54H	4	ON
45H	5	OFF	55H	5	ON
46H	6	OFF	56H	6	ON
47H	7	OFF	57H	7	ON
48H	8	OFF	58H	8	ON
49H	9	OFF	59H	9	ON
4AH	A	OFF	5AH	A	ON
4BH	B	OFF	5BH	B	ON
4CH	C	OFF	5CH	C	ON
4DH	D	OFF	5DH	D	ON
4EH	E	OFF	5EH	E	ON
4FH	F	OFF	5FH	F	ON

\* The factory setting is 41H (SW2 pin 3 = OFF, SW1 = 1).

- 3.** After the settings have been completed, turn ON the SERVOPACK power supply again.

## 4 Safety Function

The safety function is incorporated in the SERVOPACK to reduce the risk associated with the machine by protecting workers from injury and by securing safe machine operation. Especially when working in hazardous areas inside the safeguard, as for machine maintenance, it can be used to avoid adverse machine movement.

### WARNING

- The person who designs a system using the safety function (Hard Wire Base-block function) must have full knowledge of the related safety standards and full understanding of the following manuals.
    - $\Sigma$ -V Series SGM□V/SGDV User's Manual  
Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS80000045)
    - $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference (SIEPS80000046)
- Failure to observe this warning may result in injury.

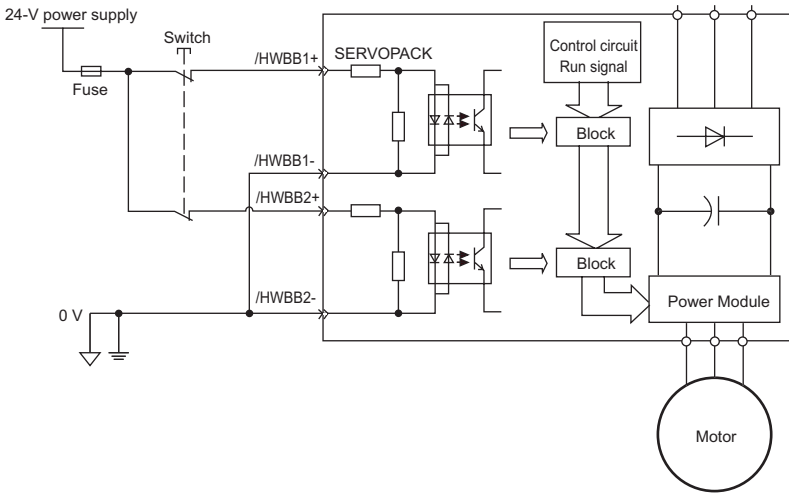
### 4.1 Precautions When Not Using the Safety Function

When not using the safety function, use the SERVOPACK with the safety function jumper connector (JZSP-CVH05-E, provided as an accessory) inserted. If the SERVOPACK is used without the jumper connector inserted into CN8, no current will flow to the motor and no torque will be output.

When Hbb is displayed on the panel operator and digital operator, the motor is base-blocked by the safety function. Check to see if the JZSP-CVH05-E jumper connector is correctly inserted into CN8.

## 4.2 Hard Wire Base Block (HWBB) Function

The Hard Wire Base Block function (hereinafter referred to as HWBB function) is a safety function designed to baseblock the motor (shut off the motor current) by using the hardwired circuits: Each circuit for two channel input signals blocks the run signal to turn off the power module, and the motor current is shut off. (Refer to the diagram below.)



### ⚠ WARNING

- Perform risk assessment for the system and confirm that the safety requirements with the following standards are fulfilled before using the HWBB function.  
EN954 Category3  
IEC61508 SIL2

The following risks can be estimated even if the HWBB function is used. These risks must be included in the risk assessment.

- The motor will rotate in an application where external force is applied to the motor (for example, gravity on the vertical axis). Take measures to secure the motor, such as installing a mechanical brake.
- The motor may move within the electric angle of 180 degrees in case of the power module failure, etc. The number of rotations or movement distance depends on the motor type as shown below.

Rotary motor: 1/6 rotation max. (rotation angle at the motor shaft)

Direct-drive motor: 1/20 rotation max. (rotation angle at the motor shaft)

Linear motor: 30 mm max.



- The HWBB function does not shut off the power to the servodrive or electrically isolates it.  
Take measures to shut off the power to the servodrive when performing maintenance on it, etc.

### 4.3 Signals for Safety Function (CN8 connector)

Signal Name	Pin No.	Function
/HWBB1+	4	Hard wire baseblock input Baseblock (motor current off) when OFF
/HWBB1-	3	
/HWBB2+	6	
/HWBB2-	5	
EDM1+	8	Monitored circuit status output ON when the HWBB function is normally activated.
EDM1-	7	

---

## 5 Trial Operation (Checking Servomotor Operation)

This chapter describes how to perform trial operation.

The trial operation described here is for the servomotor without load. The purpose of this trial operation is to check whether the SERVOPACK and servomotor are properly connected and whether the servomotor is operating normally.

To conduct trial operation executed from the host controller for the servomotor without load, or for the servomotor connected to the machine, refer to the following manuals.

- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS8000045).
- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference (SIEPS8000046).

### CAUTION

- Conduct trial operation on the servomotor alone with the motor shaft disconnected from the machine to avoid any unexpected accidents. If it is unavoidable to perform trial operation while connected to a machine, then always make sure that an emergency stop can be immediately executed.
- Conduct trial operations on the servomotor alone, with the motor shaft disconnected from the machine to avoid accidents.  
Failure to observe this caution may result in injury.

### 5.1 Types of Trial Operation

There are four type of trial operation, as listed below, depending on the type of SERVOPACK and the device configuration.

#### ■ Using a Panel Operator

Trial operation is performed using the panel operator of an analog pulse SERVOPACK.

→5.3 *Trial Operation Using a Panel Operator*

#### ■ Using a Digital Operator

Trial operation is performed using an optional digital operator.

→5.4 *Trial Operation Using a Digital Operator*

### ■ Using MECHATROLINK-II Communications

Trial operation is performed using MECHATROLINK-II communications.

Trial operation is executed from a host controller using MECHATROLINK-II communications.

To conduct trial operation using MECHATROLINK-II Communications, refer to  *$\Sigma$ -V Series SGM $\square$ V/SGDV User's Manual Design and Maintenance Rotational Motor/ MECHATROLINK-II Communications Reference (SIEPS8000046)*.

### ■ Using SigmaWin+

Trial operation is performed using SigmaWin+. For information on this method, refer to the online SigmaWin+ help on the personal computer.

## 5.2 Inspection and Checking before Trial Operation

To ensure safe and correct trial operation, inspect and check the following items before starting trial operation.

### ■ Servomotors

Inspect and check the following items, and take appropriate measures before performing trial operation if any problem exists.

- Are all wiring and connections correct?
- Are all nuts and bolts securely tightened?
- If the servomotor has an oil seal, is the seal undamaged and is the motor oiled?

Note: When performing trial operation on a servomotor that has been stored for a long period of time, perform the inspection according to the procedures described in 6.2 *Causes and Corrective Actions for Problems Determined from Servomotor Operation and Status*.

### ■ SERVOPACKs

Inspect and check the following items, and take appropriate measures before performing trial operation if any problem exists.

- Are all wiring and connections correct?
- Is the correct power supply voltage being supplied to the SERVOPACK?

## ■ Servomotors with Brakes

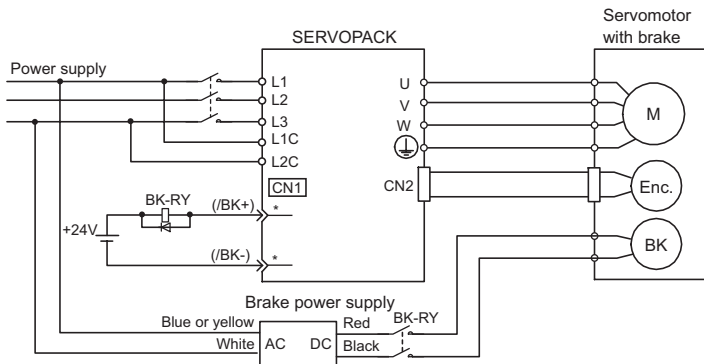
When performing trial operation using a servomotor with a brake, use a brake interlock signal as shown below.

A brake control relay can be installed on either the AC or DC side. To reduce brake activating time, install it on the DC side. Be sure to check the brake activating time before using it. When opening/closing the brake power supply circuit relay on the DC side, be sure to provide surge protectors both near the brake coil and built in the brake power supply circuit to protect the brake coil from damage due to surge voltage.

### • Wiring Example

- 90 VDC servomotors

Use the SERVOPACK sequence output signal (/BK) and the brake power supply to operate the holding brake. The following diagram shows a standard wiring example.



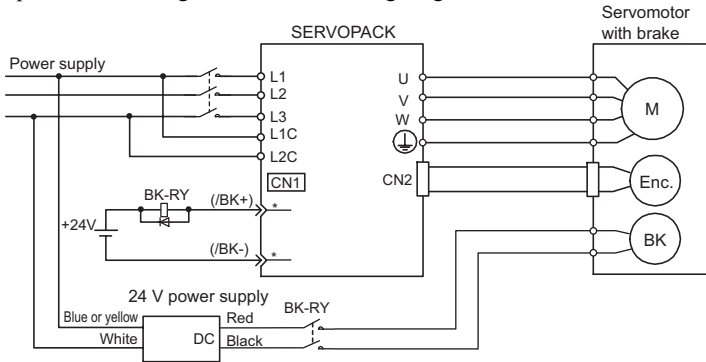
BK-RY: Brake control relay

Brake power supply Input voltage of 200 V: LPSE-2H01-E  
Input voltage of 100 V: LPDE-1H01-E

\* The output terminal allocated in Pn50F.2.

- 24 VDC servomotors

Use the SERVOPACK sequence output signal (/BK) and the brake power supply to operate the holding brake. The following diagram shows a standard wiring example.



BK-RY: Brake control relay

24-V power supply: To be provided by customer.

\* The output terminal allocated in Ph50F.2.



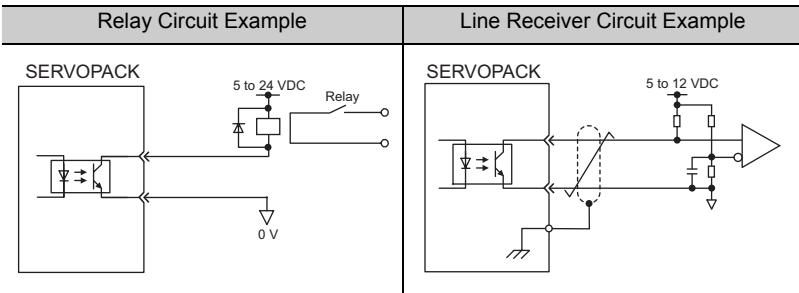
The brake signal (/BK) cannot be used with the factory settings. Output signals must be allocated. Make this setting as described under *Brake Signal (/BK) Allocation* below.

- Brake Interlock Signal

Sets the output signal for controlling the brake. The brake signal is not allocated under the factory settings, so it must be allocated before it can be used.

Type	Signal Name	Connector Pin No.	Output Status	Meaning
Output	/BK	Not allocated. (Must be allocated.)	ON (Low level)	Releases the brake.
			OFF (High level)	Applies the brake.

The brake interlock (/BK) signal is configured using a photocoupler output circuit. Connect it through a relay circuit or a line receiver circuit.



Note: The maximum allowable voltage and current capacities for photocoupler output circuits are as follows:

- Voltage: 30 VDC
- Current: 50 mA DC

- Brake Signal (/BK) Allocation

The brake signal (/BK) is not allocated in the factory settings. Allocate this signal in Pn50F.

Parameter		Connector Pin Terminal		Meaning
		+ Terminal	- Terminal	
Pn50F	n.□0□□	–	–	The /BK signal is not used. (Factory setting)
	n.□1□□	CN1-25	CN1-26	The /BK signal is output through CN1-25 and CN1-26.
	n.□2□□	CN1-27	CN1-28	The /BK signal is output through CN1-27 and CN1-28.
	n.□3□□	CN1-29	CN1-30	The /BK signal is output through CN1-29 and CN1-30.

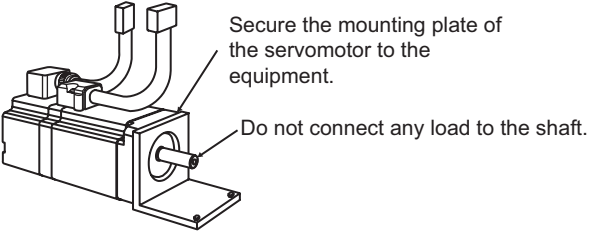
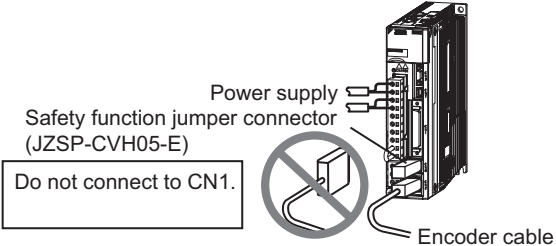


IMPORTANT

If multiple signals are allocated to the same output terminal, the signals will be output as the logical OR of the signal status. To enable only the /BK signal, either disable or allocate to other output terminals the other signals that are currently allocated to the same output terminal as the /BK signal.

### 5.3 Trial Operation Using a Panel Operator

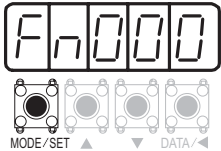
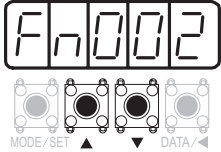
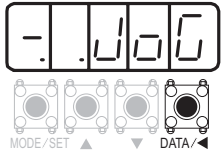
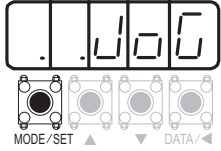

This section describes the procedure for executing trial operation using the panel operator of an analog pulse SERVOPACK. The JOG operation (Fn002) is used in this procedure.

Step	Operation	Reference
1	<p>Installing the Servomotor and SERVOPACK.</p> <p>Install the servomotor and SERVOPACK according to the installation conditions. Secure the mounting plate (flange) of the servomotor to the equipment.</p>  <p>Secure the mounting plate of the servomotor to the equipment.</p> <p>Do not connect any load to the shaft.</p> <p>Note:</p> <ul style="list-style-type: none"> <li>• Be sure to secure the servomotor to the equipment, or the servomotor may turn over when it starts rotating.</li> <li>• Do not connect anything to the servomotor shaft.</li> </ul>	Chapter 2 Installation
2	<p>Checking the Main Power Supply Circuit, Servomotor, and Encoder Wiring</p> <p>Once again, check the main power supply circuit, Servomotor, and encoder wiring that was described in <i>Chapter 3 Wiring</i>. Perform a trial operation with the safety function jumper connector (JZSP-CVH05-E, provided as an accessory) inserted into the CN8 connector. When using a safety function after the trial operation, refer to <i>Chapter 4 Safety Function</i>.</p>  <p>Power supply</p> <p>Safety function jumper connector (JZSP-CVH05-E)</p> <p>Do not connect to CN1.</p> <p>Encoder cable</p>	Chapter 3 Wiring

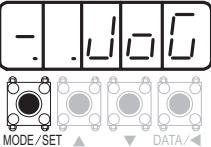
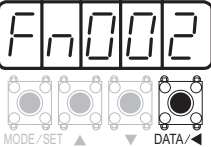


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Step	Operation	Reference
<p>3</p>	<p><b>Turning ON the Power</b></p> <p>Turn ON the power to the SERVOPACK. If the power is correctly supplied, the panel operator displays will be as shown below. The displays mean forward run prohibited (P-OT) and reverse run prohibited (N-OT).</p> <p>&lt;Supplemental Information&gt;</p> <p>The P-OT and N-OT settings are enabled in the factory settings, so they are shown in the diagram below alternately. When the JOG operation is executed in step 4, P-OT and N-OT are automatically disabled.</p> <div data-bbox="258 437 805 517" style="text-align: center;"> <p>The diagram shows two rectangular boxes representing the panel operator display. The left box contains the characters 'P.O.T' and the right box contains 'N.O.T'. A double-headed arrow points between the two boxes, indicating they alternate.</p> </div> <p style="text-align: center;">Alternate display</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="258 571 477 622"> <p>Forward run prohibited (P-OT) display</p> </div> <div data-bbox="564 571 784 622"> <p>Reverse run prohibited (N-OT) display</p> </div> </div> <p>If anything else is displayed, it indicates that an error has occurred.</p> <div data-bbox="404 676 648 756" style="text-align: center;"> <p>The diagram shows a rectangular box representing the panel operator display with the characters 'F10' displayed.</p> </div> <p style="text-align: center;">(Error display example)</p> <p>The F10 shown in the display example is an alarm that indicates that the servomotor main circuit cable or encoder cable wiring is incorrect. If an alarm display appears, find the problem and correct it.</p>	<p style="text-align: right;"><i>Chapter 6 Trouble-shooting</i></p>
<p>4</p>	<p><b>Performing Trial Operation</b></p> <p>Perform trial operation using the JOG operation (Fn002). The panel operator is located inside the front cover in the top front of the SERVOPACK.</p> <div data-bbox="331 995 721 1353" style="text-align: center;"> <p>The diagram shows a cross-section of the SERVOPACK front cover. The top cover is open, and the panel operator is visible inside. An arrow points to the top cover with the text 'View with front cover open'. Another arrow points to the panel operator with the text 'Panel Operator'. The panel operator has a display showing '00000' and several buttons below it.</p> </div> <p>The JOG operation procedure is described in steps 5 to 11.</p>	

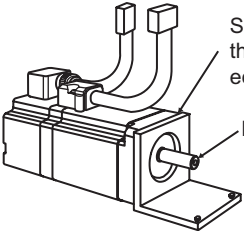
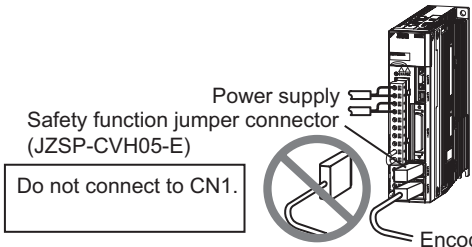
Step	Operation	Reference
5	<p>Press the MODE/SET Key to select the utility function mode.</p> 	
6	<p>Press the Up or Down Cursor Key to select Fn002.</p> 	
7	<p>Press the DATA/SHIFT Key for approximately one second. The JOG operation will then be ready to start, as shown below.</p> 	
8	<p>Press the MODE/SET Key. The servomotor will go into servo ON status.</p> 	
9	<p>Press the Up Cursor Key to rotate the servomotor in the forward direction and the Down Cursor Key to rotate it in reverse. The servomotor will operate while the key is being pressed.</p>  <p>Confirm that servomotor operation is correct. At the same time, carefully inspect the servomotor condition and check the following points in particular. If a problem is found, correct it.</p> <ul style="list-style-type: none"> <li>• Is there any abnormal vibration?</li> <li>• Are there any abnormal sounds?</li> <li>• Is the temperature rising abnormally?</li> </ul>	<p><i>Chapter 6 Trouble-shooting</i></p>

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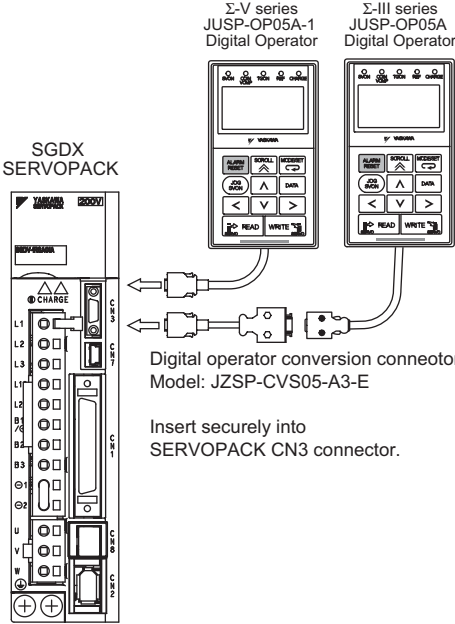
Step	Operation	Reference
10	<p>Press the MODE/SET Key. The servomotor will go into servo OFF status.</p>  <p>&lt;Supplemental Information&gt; The servomotor can be returned to servo OFF status by pressing the DATA/SHIFT Key for approximately one second.</p>	
11	<p>Press the DATA/SHIFT Key for approximately one second.</p>  <p>The display will return to the utility function mode.</p>	
12	This completes the trial operation.	

## 5.4 Trial Operation Using a Digital Operator

This section describes the procedure for executing trial operation using a panel operator (optional). The JOG operation (Fn002) is used in this procedure.

Step	Operation	Reference
1	<p>Installing the Servomotor and SERVOPACK.</p> <p>Install the servomotor and SERVOPACK according to the installation conditions. Secure the mounting plate (flange) of the servomotor to the equipment.</p>  <p>Note:</p> <ul style="list-style-type: none"> <li>• Be sure to secure the servomotor to the equipment, or the servomotor may turn over when it starts rotating.</li> <li>• Do not connect anything to the servomotor shaft.</li> </ul>	<p><i>Chapter 2 Installation</i></p>
2	<p>Checking the Main Power Supply Circuit, Servomotor, and Encoder Wiring</p> <p>Once again, check the main power supply circuit, Servomotor, and encoder wiring that was described in <i>Chapter 3 Wiring</i>. Perform a trial operation with the safety function jumper connector (JZSP-CVH05-E, provided as an accessory) inserted into the CN8 connector. When using a safety function after the trial operation, refer to <i>Chapter 4 Safety Function</i>.</p> 	<p><i>Chapter 3 Wiring</i></p>

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Step	Operation	Reference
3	<p><b>Connecting the Digital Operator</b></p> <p>Connect the digital operator to the SERVOPACK CN3 connector.            A <math>\Sigma</math>-III series JUSP-OP05A digital operator can be used for a <math>\Sigma</math>-V series SERVOPACK by using a digital operator conversion connector (JZSP-CVS05-A3-E).</p>  <p style="text-align: center;">Digital operator conversion connector Model: JZSP-CVS05-A3-E</p> <p style="text-align: center;">Insert securely into SERVOPACK CN3 connector.</p> <p><b>&lt;Supplemental Information&gt;</b>            The digital operator can be connected or removed while the SERVOPACK power is ON.</p>	

Step	Operation	Reference
4	<p><b>Changing the Display Mode</b></p> <p>Turn ON the power to the SERVOPACK. The initial display will appear, followed by the parameter/monitor mode display.</p> <p>JOG operations are executed for trial operation using a digital monitor.</p> <p>JOG operation (Fn002) is a utility function, press the MODE/SET Key to change display mode to utility function mode.</p> <pre>       graph TD         A([Power ON]) --&gt; B["File list loading Please wait...."]         B --&gt; C["BB      -PRM/MON- Un000= 00000 Un002= 00000 Un008= 0000000000 Un00D= 0000000000"]         C --&gt; D["BB      -FUNCTION- Fn207: V-Monitor Fn000: Alm History Fn002: JOG Fn003: Z-Search"]         D --&gt; E["BB      -COPY- 1: SERVO→OP 2: OP→SERVO 3: VERIFY 4: LIST"]         E --&gt; F["A. 710      -ALARM- A: 710 00001207196 1: 720 00000032651 2: 511 00000009043 3: ---"]       </pre> <p><b>Note:</b></p> <p>An alarm is automatically displayed if a problem occurs for some reason. Refer to the troubleshooting section and apply the appropriate measures. The following messages will be displayed if a communications error occurs between the SERVOPACK and the digital operator due to a connection problem (such as poor connector contact). Check the connections and turn the power ON again. If the problem still persists, the digital operator or SERVOPACK must be replaced.</p>	<p>Σ-V Series SGM□V/SGDV User's Manual Operation of Digital Operator (SIEPS8000055)</p>

(cont'd)

Step	Operation	Reference
4 (cont'd)	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">           CPF00 COM-ERR(OP&amp;SV)         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;">           CPF01 COM-ERR(OP&amp;SV)         </div> </div>	
5	<p>Performing Trial Operation Perform trial operation using the JOG operation (Fn002). Check to confirm that the display for the utility function mode appears. If the display for another mode appears, refer to step 4 and change to the utility function mode.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">           BB            -FUNCTION-            Fn207: V-Monitor            Fn000: Alm History            Fn002: JOG            Fn003: Z-Search         </div>	<p>Σ-V Series SGM□V/SGDV User's Manual Operation of Digital Operator (SIEPS80000055)</p>
6	<p>Selecting JOG Operation (Fn002) In the utility function mode, press the Up or Down Cursor Key to select Fn002.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">           BB            -FUNCTION-            Fn207: V-Monitor            Fn000: Alm History            Fn002: JOG            Fn003: Z-Search         </div>	
7	<p>Servo ON Press the JOG SVON Key. The servomotor will go into the servo ON status, and RUN will be displayed as the status.</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">           RUN                    -JOG-            Pn304=01000            Un000= 00000            Un002= 00000            Un00D=0000000         </div> <p>If RUN is not displayed, refer to 6.2 Causes and Corrective Actions for Problems Determined from Servomotor Operation and Status and take appropriate measures.</p>	

Step	Operation	Reference
8	<p>Starting the JOG Operation</p> <p>Press the Up Cursor Key to rotate the servomotor in the forward direction, and the Down Cursor Key to rotate it in reverse. The servomotor will operate while the key is being pressed.</p> <div data-bbox="306 341 678 501" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre> RUN                - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 </pre> </div> <p>Confirm that servomotor operation is correct. At the same time, carefully inspect the servomotor condition and check the following points in particular. If a problem is found, correct it.</p> <ul style="list-style-type: none"> <li>• Is there any abnormal vibration?</li> <li>• Are there any abnormal sounds?</li> <li>• Is the temperature rising abnormally?</li> </ul>	<i>Chapter 6 Trouble-shooting</i>
9	<p>Servo OFF</p> <p>Press the JOG SVON Key.</p> <p>The servomotor will go into the servo OFF status, and BB will be displayed as the status.</p> <div data-bbox="306 764 678 924" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre> BB                - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 </pre> </div>	
10	<p>Ending the JOG Operation</p> <p>Press the MODE/SET Key to return to the main menu of the utility function mode.</p> <div data-bbox="306 1035 678 1195" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <pre> BB                - FUNCTION - F n 2 0 7 : V - M o n i t o r F n 0 0 0 : A l m H i s t o r y F n 0 0 2 : J O G F n 0 0 3 : Z - S e a r c h </pre> </div>	
11	This completes the trial operation.	



## 6 Troubleshooting

This chapter describes the problems that can occur during setup and suggests measures for correcting them.

### 6.1 Alarm Causes and Corrective Actions

This section describes the alarms that may be displayed during setup, along with their probable causes and suggested measures for correcting them.

For alarms not described here, refer to the following manuals.

- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS80000045).
- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference (SIEPS80000046).

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.020*1: Parameter Checksum Error 1 (The parameter data in the SERVOPACK is incorrect.)	The power supply voltage suddenly dropped.	Measure the power supply voltage.	Set the power supply voltage within the specified range, and set Fn005 to initialize the parameter.
	The power supply went OFF while changing a parameter setting.	Note the circumstances when the power supply went OFF.	Set Fn005 to initialize the parameter and then set the parameter again.
	The number of times that parameters were written exceeded the limit.	Were the parameters frequently changed through the host controller?	The SERVOPACK may be faulty. Repair or replace the SERVOPACK. Reconsider the method of writing parameters.
	Malfunction caused by noise from the AC power supply or grounding line, static electricity noise, etc.	Turn the power supply ON and OFF several times. If the alarm still occurs, there may be noise interference.	Take counter measures against noise.
	Gas, water drops, or cutting oil entered the SERVOPACK and caused failure of the internal components.	Check the installation conditions.	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	A SERVOPACK fault occurred.	Turn the power supply ON and OFF several times. If the alarm still occurs, the SERVOPACK is faulty.	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.021*1: Parameter Format Error 1 (The parameter data in the SERVOPACK is incorrect.)	The software version of SERVOPACK that caused the alarm is older than that of the written parameter.	Check Fn012 to see if the set software version agrees with that of the SERVOPACK. If not, an alarm may occur.	Write the parameter of another SERVOPACK of the same model with the same software version. Then turn the power OFF and then ON again.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.022*1: System Checksum Error 1 (The parameter data in the SERVOPACK is incorrect.)	The power supply voltage suddenly dropped.	Measure the power supply voltage.	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	The power supply went OFF while set- ting an utility function.	Note the circumstances when the power supply went OFF.	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	A SERVOPACK fault occurred.	Turn the power supply ON and OFF several times. If the alarm still occurs, the SER- VOPACK is faulty.	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.023*1: Parameter Password Error 1 (The parameter data in the SERVOPACK is incorrect.)	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.030*1: Main Circuit Detector Error	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.040*1: Parameter Setting Error 1 (The parameter set- ting was out of the allowable setting range.)	The SERVOPACK and servomotor capaci- ties do not match each other.	Check the combination of SERVOPACK and servomo- tor capacities.	Select the proper combina- tion of SERVOPACK and servomotor capacities.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	The parameter setting is out of the specified range.	Check the setting ranges of the parameters that have been changed.	Set the parameter Un203 to a value within the specified range.
	The electronics gear ratio is out of the set- ting range.	Check the electronic gear ratio. The ratio must satisfy: 0.001 < (Pn20E/Pn210) < 1000.	Set the electronic gear ratio in the range: 0.001 < (Pn20E/Pn210) < 1000.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.041*1: Encoder Output Pulse Setting Error	The encoder output pulse (Pn212) is out of the setting range and does not satisfy the setting conditions.	Check the parameter Pn212.	Set Pn212 to a correct value.
A.042*1: Parameter Combination Error	Occurred when the power was turned ON after having changed the electronic gear ratio (Pn20E/Pn210) or the servomotor to one with a different number of encoder pulses.	Are the detection conditions satisfied?*6	Reduce the electronic gear ratio (Pn20E/Pn210).
	Occurred after having changed the setting of Pn533 "Program JOG Movement Speed."	Are the detection conditions satisfied?*6	Increase the setting for Pn533 "Program JOG Movement Speed."
	Occurred when the power was turned ON to carry out advanced autotuning (Fn017) after having changed the electronic gear ratio (Pn20E/Pn210) or the servomotor to one with a different number of encoder pulses.	Are the detection conditions satisfied?*6	Reduce the electronic gear ratio (Pn20E/Pn210).
A.044*1: Fully-closed Loop Control Parameter Setting Error	The setting of the option card does not match with those of Pn00B.3 and Pn002.3.	Check the settings of the option card, Pn00B.3, and Pn002.3.	The setting of option card must be compatible with the settings of Pn00B.3 and Pn002.3. Mount an option card or replace the mounted option card with an appropriate model. Or change the parameter setting.
A.04A*2: Parameter Setting Error 2	For a 4-byte parameter bank, no registration in two consecutive bytes for two bank members.		Change the number of bytes for bank members to an appropriate value.
	The total amount of bank data exceeds 64. (Pn900 × Pn901 > 64)		Reduce the total amount of bank data to 64 or less.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*2. These errors occur in SERVOPACKs using MECHATROLINK-II.

$$*6. \text{Pn533} [\text{min}^{-1}] \times \frac{2 (\text{Encoder resolution})}{6 \times 105} \leq \frac{\text{Pn210}}{\text{Pn20E}}$$

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.050*1: Combination Error (The SERVOPACK and servomotor capacities do not correspond.)	The SERVOPACK and servomotor capac- ities do not match each other.	Check the capacities to see if they satisfy the following condition: (Servomotor capacity)/ (SERVOPACK capacity) $\leq$ 1/4, or (Servomotor capac- ity)/(SERVOPACK capac- ity) $\leq$ 4.	Select the proper combina- tion of SERVOPACK and servomotor capacities.
	An encoder fault occurred.	Replace the servomotor and see if the alarm occurs again.	Replace the servomotor (encoder).
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.051*1: Unsupported Product Alarm	An unsupported serial converter unit, serial encoder, or external encoder is connected to the SERVOPACK.	Check the product specifica- tions, and select the correct model.	Select the correct combina- tion of units.
A.0b0*1: Cancelled Servo ON Command Alarm	After executing the utility function to turn ON the power to the motor, the Servo ON command was sent from the host control- ler.	—	Restart the system including the host controller.
A.100*1: Overcurrent or Heat Sink Overheated (An overcurrent flowed through the IGBT or heat sink of SERVOPACK over- heated.)	Incorrect wiring or contact fault of power supply cable or motor main circuit cable.	Check the wiring. Refer to <i>3.1 Main Circuit Wiring</i> (SIEPS80000045/46).	Correct the wiring.
	Short-circuit or ground fault of power supply cable or motor main circuit cable.	Check for short-circuits across the servomotor termi- nal phase-U, -V, and -W, or between the grounding and servomotor terminal U, V, or W. Refer to <i>3.1 Main Circuit</i> <i>Wiring</i> (SIEPS80000045/ 46).	Some cables may be dam- aged. Repair or replace damaged cables.
	Short-circuit or ground fault inside the servo- motor.	Check for short-circuits across the servomotor termi- nal phase-U, -V, and -W, or between the grounding and servomotor terminal U, V, or W. Refer to <i>3.1 Main Circuit</i> <i>Wiring</i> (SIEPS80000045/ 46).	The servomotor may be faulty. Repair or replace the servomotor.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
<p>A.100*1: Overcurrent or Heat Sink Overheated (An overcurrent flowed through the IGBT or heat sink of SERVOPACK overheated.) (cont'd)</p>	Short-circuit or ground fault inside the servomotor.	Check for short-circuits across the servomotor connection terminals U, V, and W on the SERVOPACK, or between the grounding and terminal U, V, or W. Refer to <i>3.1 Main Circuit Wiring (SIEPS80000045/46)</i> .	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	Incorrect wiring or contact fault of the regenerative resistor.	Check the wiring. Refer to <i>3.6 Connecting Regenerative Resistors (SIEPS80000045/46)</i> .	Correct the wiring.
	The dynamic brake (DB: Emergency stop executed from the SERVOPACK) was frequently activated, or the DB overload alarm occurred.	Check the resistor power consumption monitor Un00B to see how many times the DB has been used. Or, check the alarm trace back monitor Fn000 to see if the DB overload alarm A.730 or A.731 was reported.	Change the SERVOPACK model, operation conditions, or the mechanism so that the DB does not need to be used so frequently.
	The generated regenerative energy exceeded the SERVOPACK regenerative energy processing capacity.	Check the regenerative load ratio monitor Un00A to see how many times the regenerative resistor has been used.	Check the operation condition including overload, and reconsider the regenerative resistor value.
	The SERVOPACK regenerative resistance is too small.	Check the regenerative load ratio monitor Un00A to see how many times the regenerative resistor has been used.	Change the regenerative resistance value to a value larger than the SERVOPACK minimum allowable resistance value.
	A heavy load was applied while the servomotor was stopped or running at a low-speed.	Check to see if the operating conditions are outside servodrive specifications.	Reduce the load applied to the servomotor or increase the operation speed.
	Malfunction caused by noise interference.	Improve the wiring or installation environment, such as by reducing noise, and check to see if the alarm recurs.	Take counter measures for noise, such as correct wiring of the FG. Use an FG wire size equivalent to the SERVOPACK main circuit wire size.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.100*1: Overcurrent or Heat Sink Overheated (An overcurrent flowed through the IGBT or heat sink of SERVOPACK overheated.) (cont'd)	A SERVOPACK fault occurred.	-	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
A.300*1: Regeneration Error	Regenerative resistor capacity (Pn600) is set to a value other than 0 for a SGDVR70, -R90, -1R6, or -2R8 SERVOPACK, and an external regenerative resistor is not con- nected.	Check the external regenera- tive resistor connection and Pn600.	Connect the external regenera- tive resistor, or set Pn600 to 0 if no regenerative resis- tor is required.
	The jumper between the power supply ter- minals B2 and B3 is removed.	Confirm that a jumper is mounted between the power supply terminals B2 and B3.	Correctly mount a jumper.
	The external regenera- tive resistor is incor- rectly wired, or is removed or discon- nected.	Check the external regenera- tive resistor connection.	Correctly connect the exter- nal regenerative resistor.
	The power supply voltage exceeds the specified limit.	Measure the power supply voltage.	Set the power supply volt- age within the specified range.
	The external regenera- tive resistor capacity or the regenerative resistance is incorrect.	Check the external regenera- tive resistor to see if the capacity is appropriate.	Change the regenerative resistance to a correct value or use an external regenera- tive resistor of appropriate capacity.
	Insufficient SERVO- PACK capacity or insufficient regenera- tive resistor capacity caused regenerative power to continuously flow back.	Reconsider the capacity selection.	Reconsider the capacity selection.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.300*1: Regeneration Error (cont'd)	Regenerative power continuously flowed back because negative load was continuously applied.	Check the load to the servomotor during operation.	Reconsider the system including servo, machine, and operation conditions.
	The load moment of inertia exceeds the allowable value.	Check the load moment of inertia.	Reconsider the capacity selection.
	A SERVOPACK fault occurred.	—	While the main circuit power supply is OFF, turn the control power supply OFF and then turn ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.320*1: Regenerative Overload	The power supply voltage exceeds the specified limit.	Measure the power supply voltage.	Set the power supply voltage within the specified range.
	Incorrect external regenerative resistance. Insufficient servo amplifier capacity or regenerative resistor capacity. Or, regenerative power has been continuously flowing back.	Check the operation condition or the capacity.	Change the regenerative resistance, regenerative resistor capacity, or SERVOPACK capacity. Reconsider the operation conditions using the capacity selection software SigmaSize+, etc.
	Regenerative power continuously flowed back because negative load was continuously applied.	Check the load to the servomotor during operation.	Reconsider the system including servo, machine, and operation conditions.
	The setting of parameter Pn600 is smaller than the external Regenerative Resistor's capacity.	Check the external regenerative resistor connection and Pn600.	Set the parameter Pn600 to a correct value.
	The external regenerative resistance is too high.	Check the regenerative resistance.	Change the regenerative resistance to a correct value or use an external regenerative resistor of appropriate capacity.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
<b>A.330*1:</b> <b>Main Circuit Power Supply Wiring Error</b> (Detected when the power to the main circuit is turned ON.)	The regenerative resistor disconnected when the SERVOPACK power voltage was increased.	Measure the resistance of the regenerative resistor.	When using a regenerative resistor built in the SERVOPACK: Repair or replace the SERVOPACK. When using an external regenerative resistor: Replace the external regenerative resistor.
	In the AC power input mode, DC power was supplied.	Check the power supply to see if it is a DC power supply.	Correct the settings to match the actual power supply specifications.
	In the DC power input mode, AC power was supplied.	Check the power supply to see if it is a AC power supply.	Correct the settings to match the actual power supply specifications.
	Regenerative resistor capacity (Pn600) is not set to 0 even though the regenerative resistor is disconnected.	Is the regenerative resistor connected? If it is, check the regenerative resistor capacity.	Set Pn600 to 0.
	A SERVOPACK fault occurred.	–	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
<b>A.400*1:</b> <b>Overvoltage</b> (Detected when the SERVOPACK's main circuit DC voltage is one of the values below. 200 VAC SERVO-PACKs: 410 VDC or more 400 VAC SERVO-PACKs: 820 VDC or more) (Detected when the power to the main circuit is turned ON)	For 200 VAC SERVO-PACKs: The AC power supply voltage exceeded 290 V. For 400 VAC SERVO-PACKs: The AC power supply voltage exceeded 580 V. For 200 VAC SERVO-PACKs with DC power supply input: The power supply voltage exceeded 410 V. For 400 VAC SERVO-PACKs with DC power supply input: The power supply voltage exceeded 820 V.	Measure the power supply voltage.	Set AC power supply voltage within the specified range.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.



(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
<b>A.400*1:</b> <b>Overvoltage</b> (Detected when the SERVOPACK's main circuit DC voltage is one of the values below. 200 VAC SERVO-PACKs: 410 VDC or more 400 VAC SERVO-PACKs: 820 VDC or more) (Detected when the power to the main circuit is turned ON) (cont'd.)	The power supply is unstable, or was influenced by a lightning surge.	Measure the power supply voltage.	Improve the power supply conditions by installing a surge protector, etc. Then, turn the power supply ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	For 200 VAC SERVO-PACKs: The servomotor accelerated/decelerated with the AC power voltage between 230 and 270 V. For 400 VAC SERVO-PACKs: The servomotor accelerated/decelerated with the AC power voltage between 480 and 560 V.	Check the power supply voltage and the speed and torque/force during operation.	Set AC power supply voltage within the specified range.
	The external regenerative resistance is too high for the actual operation conditions.	Check the operation conditions and the regenerative resistance.	Select a regenerative resistance value appropriate for the operation conditions and load.
	The load moment of inertia exceeded the allowable value.	Confirm that the load moment of inertia is within the allowable range.	Increase the deceleration time, or reduce the load.
	A SERVOPACK fault occurred.	—	Turn the control power OFF and then ON again while the main circuit power supply is OFF. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.410*1: Undervoltage (Detected when the SERVOPACK's main circuit DC voltage is one of the values below. 200 VAC SERVO-PACKS: 170 VDC or less 400 VAC SERVO-PACKS: 340 VDC or less.) (Detected when the power to the main circuit is turned ON.)	For 200 VAC SERVO-PACKS: The power supply is 120 V or less. For 400 VAC SERVO-PACKS: The power supply is 240 V or less.	Measure the power supply voltage.	Set the power supply voltage within the specified range.
	The power supply voltage dropped during operation.	Measure the power supply voltage.	Increase the power supply capacity.
	Occurrence of instantaneous power interruption.	Measure the power supply voltage.	Set the power supply voltage within the specified range. When the instantaneous power cut hold time Pn509 is set, decrease the setting.
	The SERVOPACK fuse is blown out.	—	Repair or replace the SERVOPACK, connect an AC/DC reactor, and run the SERVOPACK.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.510*1: Overspeed (The servomotor speed exceeds the maximum.)	The order of phases U, V, and W in the servomotor wiring is incorrect.	Check the servomotor wiring.	Confirm that the servomotor is correctly wired.
	A reference value exceeding the overspeed detection level was input.	Check the input value.	Reduce the reference value or adjust the gain.
	The motor speed overshoot occurred.	Check the servomotor speed waveform.	Reduce the reference input gain, adjust the servo gain, or reconsider the operation conditions.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.511*1: Overspeed of Rate Encoder Output Pulse	The encoder output pulse output frequency exceeded the limit.	Check the encoder output pulse output setting.	Decrease the setting of the encoder output pulse (Pn212).

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.511*1: Overspeed of Rate Encoder Output Pulse (cont'd)	The encoder output pulse output frequency exceeded the limit because the servomotor speed was too high.	Check the encoder output pulse output setting and servomotor speed.	Decrease the servomotor speed.
A.520*1: Vibration Alarm	Abnormal vibration was detected at the servomotor rotation speed.	Check for abnormal noise from the servomotor, and check the speed and torque/force waveform during operation.	Reduce the servomotor speed or reduce the speed loop gain (Pn100).
	The moment of inertia ratio (Pn103) value is greater than the actual value or is greatly changed.	Check the load moment of inertia.	Set the moment of inertia ratio (Pn103) to an appropriate value.
A.521*1: Autotuning Alarm (Vibration was detected while performing tuning-less function.)	The servomotor vibrated considerably while performing tuning-less function (factory setting).	Check the servomotor speed waveform.	Reduce the load so that the load moment of inertia ratio falls within the allowable value, or reduce the load level or the gain level using the tuning-less function utility function (Fn200).
	The servomotor vibrated considerably during advanced autotuning.	Check the servomotor speed waveform.	Execute advanced autotuning.
A.710*1: A.720*1: Overload A.710: High Load A.720: Low Load	Incorrect wiring or contact fault of servomotor and encoder.	Check the wiring.	Confirm that the servomotor and encoder are correctly wired.
	Operation beyond the overload protection characteristics.	Check the servomotor overload characteristics and executed run command.	Reconsider the load conditions and operation conditions. Or, increase the servomotor capacity.
	Excessive load was applied during operation because the servomotor was not driven due to mechanical problems.	Check the executed run command and servomotor speed.	Remove the mechanical problems.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.730*1: A.731*1: Dynamic Brake Overload (Detected with SGDV-3R8A, -5R5A, -1R9D, -3R5D, -5R4D, -8R4D, -120D, or -170D SERVO- PACKS.)	The servomotor rotates because of external force.	Check the operation status.	Take measures to ensure the servomotor will not rotate because of external force.
	The rotating energy at a DB stop exceeds the DB resistance capacity.	Check the DB resistor power consumption monitor (Un00B) to see how many times the DB has been used.	<ul style="list-style-type: none"> <li>Reduce the servomotor reference speed.</li> <li>Reduce the load moment of inertia.</li> <li>Reduce the number of times of the DB stop operation.</li> </ul>
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.740*1: Overload of Surge Current Limit Resistor (The main circuit power is turned ON/OFF too frequently.)	The inrush current limit resistor operation frequency at the main circuit power supply ON/OFF operation exceeds the allowable range.	Check how often the power supply has been turned ON/OFF.	Reduce the frequency of turning the main circuit power supply ON/OFF to less than once per minute.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.7A0*1: Heat Sink Overheated (Detected when the heat sink temperature exceeds 100°C.)	The ambient temperature is too high.	Check the ambient temperature using a thermostat.	Decrease the ambient temperature by improving the SERVOPACK installation conditions.
	The overload alarm has been reset by turning OFF the power too many times.	Check the alarm trace back monitor (Fn000) to see if the overload alarm was reported.	Change the method for resetting the alarm.
	Excessive load or operation beyond the regenerative energy processing capacity.	Check the accumulated load ratio monitor Un009 to see the load during operation, and the regenerative load ratio monitor Un00A to see the regenerative energy processing capacity.	Reconsider the load and operation conditions.
	Incorrect SERVO-PACK installation orientation or/and insufficient space around the SERVO-PACK.	Check the SERVOPACK installation conditions.	Install the SERVOPACK correctly as specified.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.7A0*1: Heat Sink Overheated (Detected when the heat sink temperature exceeds 100°C.) (cont'd)	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.7AB*1: Built-in Fan in SERVOPACK Stopped	The fan inside the SERVOPACK stopped.	Check for foreign matter or debris inside the SERVOPACK.	Remove foreign matter or debris from the SERVOPACK. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.810*1: Encoder Backup Error (Detected on the encoder side) (Only when an absolute encoder is connected.)	Alarm occurred when the power to the absolute encoder was initially turned ON.	Check to see if the power was turned ON initially.	Set up the encoder (Fn008).
	The encoder cable disconnected, and connected again.	Check to see if the power was turned ON initially.	Confirm the connection and set up the encoder (Fn008).
	The power from both the PG power supply (+5 V) and the battery power supply from the SERVOPACK is not being supplied.	Check the encoder connector battery or the connector contact status.	Replace the battery or take similar measures to supply power to the encoder, and set up the encoder (Fn008).
	An absolute encoder fault occurred.	—	If the alarm cannot be reset by setting up the encoder again, replace the encoder.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.820*1: Encoder Checksum Error (Detected on the encoder side.)	An encoder fault occurred.	—	Set up the encoder again using Fn008. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.830*1: Absolute Encoder Battery Error (Detected when the battery voltage is lower than the speci- fied value 2 to 4 sec- onds after the control power supply is turned ON.) (Only when an abso- lute encoder is con- nected.)	The battery connection is incorrect.	Check the battery connec- tion.	Reconnect the battery.
	The battery voltage is lower than the speci- fied value 2.7 V.	Measure the battery voltage.	Replace the battery and turn the control power supply ON.
	A SERVOPACK fault occurred.	—	The SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.840*1: Encoder Data Error (Detected on the encoder side.)	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servo- motor may be faulty. Repair or replace the servomotor.
	Malfunction of encoder because of noise interference, etc.	—	Correct the wiring around the encoder by separating the encoder cable from the main circuit cable or by checking the grounding and other wiring.
A.850*1: Encoder Overspeed (Detected when the control power supply was turned OFF and then ON again.) (Detected on the encoder side.)	The servomotor was running at $200 \text{ min}^{-1}$ or higher when the control power supply was turned ON.	Check the speed monitor (Un000) to confirm the ser- vomotor speed when the power is turned ON.	Reduce the servomotor speed to a value less than $200 \text{ min}^{-1}$ , and turn ON the control power supply.
	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servo- motor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.860*1: Encoder Overheated (Only when an absolute encoder is connected.) (Detected on the encoder side.)	The ambient temperature around the servomotor is too high.	Measure the ambient temperature around the servomotor.	The ambient temperature must be 40°C or less.
	The servomotor load is greater than the rated load.	Check the accumulated load ratio monitor (Un009) to see the load.	The servomotor load must be within the specified range.
	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.891*1: Encoder Module Error	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
A.8A0*3: External Encoder Error of Scale	An external encoder fault occurred.	—	Repair or replace the external encoder.
A.8A1*3: External Encoder Error of Module	An external encoder fault occurred.	—	Repair or replace the external encoder.
	A serial converter unit fault occurred.	—	Repair or replace the serial converter unit.
A.8A2*3: External Encoder Error of Sensor (Incremental)	An external encoder fault occurred.	—	Repair or replace the external encoder.
A.8A3*3: External Encoder Error of Position (Absolute)	An absolute external encoder fault occurred.	—	The absolute external encoder may be faulty. Refer to the encoder manufacturer's instruction manual for corrective actions.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*3. These errors occur when using a feedback option card.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.b10*1: Speed Reference A/D Error (Detected when the servo is ON.)	A malfunction occurred in the speed reference input sec- tion.	—	Clear and reset the alarm and restart the operation.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
A.b11*1: Speed Reference A/D Data Error	A malfunction occurred in the detec- tion section of the speed reference A/D conversion data. (Not an alarm.)	—	Clear and reset the alarm and restart the operation.
	A malfunction occurred in the speed reference input sec- tion.	—	Clear and reset the alarm and restart the operation.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
A.b20*1: Reference Torque Input Read Error (Detected when the servo is ON.)	A malfunction occurred in the reading section of the torque reference input.	—	Clear and reset the alarm and restart the operation.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
A.b31*1: Current Detection Error 1 (Phase-U)	The current detection circuit for phase U is faulty.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.



(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.b32*1: Current Detection Error 2 (Phase-V)	The current detection circuit for phase V is faulty.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.b33*1: Current Detection Error 3 (Current Detector)	The detection circuit for the current is faulty.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
	The servomotor main circuit cable is disconnected.	Check for disconnection of the motor main circuit cable.	Correct the servomotor wiring.
A.b6A*2: MECHATROLINK Communications ASIC Error 1	SERVOPACK MECHATROLINK communication section fault.	—	Replace the SERVOPACK.
A.b6b*2: MECHATROLINK Communications ASIC Error 2	SERVOPACK MECHATROLINK communication section fault.	—	Replace the SERVOPACK.
A.bF0*1: System Alarm 0 (Scan C error)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.bF1*1: System Alarm 1 (CPU stack memory)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.bF2*1: System Alarm 2 (Current control program processing error)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*2. These errors occur in SERVOPACKs using MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.bF3*1: System Alarm 3 (Scan A error)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.bF4*1: System Alarm 4 (CPU watchdog timer error)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.C10*1: Servo Overrun Detected (Detected when the servo is ON.)	The order of phases U, V, and W in the servomotor wiring is incorrect.	Check the servomotor wiring.	Confirm that the servomotor is correctly wired.
	An encoder fault occurred.	—	If the alarm still occurs after turning the power OFF and then ON again, even though the servomotor is correctly wired, the servomotor may be faulty.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.C80*1: Absolute Encoder Clear Error and Multi-turn Limit Setting Error	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.C90*1: Encoder Communications Error	Contact fault of encoder connector or incorrect encoder wiring.	Check the encoder connector contact status.	Re-insert the encoder connector and confirm that the encoder is correctly wired.
	Encoder cable disconnection or short-circuit. Or, incorrect cable impedance.	Check the encoder cable.	Use the encoder cable with the specified rating.
	Corrosion caused by improper temperature, humidity, or gas Short-circuit caused by intrusion of water drops or cutting oil Connector contact fault caused by vibration.	Check the operating environment.	Improve the operating environmental conditions, and replace the cable. If this does not solve the problem, repair or replace the SERVOPACK.
	Malfunction caused by noise interference.	—	Correct the wiring around the encoder to avoid noise interference (Separate the encoder cable from the main circuit cable, improve grounding, etc.)
	A SERVOPACK fault occurred.	—	Connect the servomotor to another SERVOPACK, and turn ON the control power. If no alarm occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.C91*1: Encoder Communications Position Data Error	The noise interference occurred on the input/output signal line because the encoder cable is bent and the sheath is damaged.	Check the encoder cable and connector.	Confirm that there is no problem with the encoder cable layout.
	The encoder cable is bundled with a high-current line or near a high-current line.	Check the encoder cable layout.	Confirm that there is no surge voltage on the encoder cable.
	The FG potential varies because of influence from machines on the servomotor side, such as the welder.	Check the encoder cable layout.	Properly ground the device to separate from the encoder FG.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.C92*1: Encoder Communications Timer Error	Noise interference occurred on the input/output signal line from the encoder.	—	Take counter measures against noise.
	Excessive vibration and shocks were applied to the encoder.	Check the operating environment.	Reduce the machine vibration or correctly install the servomotor.
	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.CA0*1: Encoder Parameter Error	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.Cb0*1: Encoder Echoback Error	The encoder wiring and contact are incorrect.	Check the encoder wiring.	Correct the encoder wiring.
	Noise interference occurred due to incorrect encoder cable specifications.	—	Use tinned annealed copper twisted-pair or shielded twisted-pair cable with a core of at least 0.12 mm <sup>2</sup> .
	Noise interference occurred because the wiring distance for the encoder cable is too long.	—	The wiring distance must be 20 m (65.6 ft) max.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.Cb0*1: Encoder Echoback Error (cont'd)	The FG potential varies because of influence from machines on the servomotor side, such as the welder.	Check the encoder cable and connector.	Make the grounding for the machine separately from encoder side FG.
	Excessive vibration and shocks were applied to the encoder.	Check the operating environment.	Reduce the machine vibration or correctly install the servomotor.
	An encoder fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the servomotor may be faulty. Repair or replace the servomotor.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.CC0*1: Multi-turn Limit Disagreement	When using a direct-drive (DD) servomotor, the multi-turn limit value (Pn205) is different from that of the encoder.	Check Pn205.	Correct the setting of Pn205 (0 to 65,535).
	The multi-turn limit value of the encoder is different from that of the SERVOPACK. Or, the multi-turn limit value of the SERVOPACK has been changed.	Check Pn205 of the SERVOPACK.	Execute Fn013 at the occurrence of alarm.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.CF1*3: Feedback Option Card Communications Error (Reception Error)	Wiring of cable between serial converter unit and SERVOPACK is incorrect or contact is faulty.	Check the external encoder wiring.	Correct the cable wiring.
	The specified cable is not used between serial converter unit and SERVOPACK.	Confirm the external encoder wiring specifications.	Use the specified cable.
	Cable between serial converter unit and SERVOPACK is too long.	Measure the external encoder cable length.	Use 20-m cable max.
	Sheath of cable between serial converter unit and SERVOPACK is broken.	Check the external encoder cable.	Replace the cable.
A.CF2*3: Feedback Option Card Communications Error (Timer Stop)	Noise interferes with the cable between serial converter unit and SERVOPACK.	—	Correct the wiring around serial converter unit, e.g., separating input/output signal line from main circuit cable or grounding.
	A serial converter unit fault occurred.	—	Replace the serial converter unit.
	A SERVOPACK fault occurred.	—	Replace the SERVOPACK.
A.d00*1: Position Error Pulse Overflow [Position error exceeded the value set in the excessive position error alarm level (Pn520)]	The contact in the servomotor U, V, and W wirings is faulty.	Check the motor main circuit cable connection.	Confirm that there is no contact fault in the motor wiring of encoder wiring.
	The SERVOPACK gain is low.	Check the SERVOPACK gain to see if it is too low.	Increase the servo gain (using the parameters such as Pn100 and Pn102.)
	The reference speed of the position reference mode is too fast.	Reduce the reference pulse frequency, and operate the SERVOPACK.	Reduce the position reference pulse frequency or reference acceleration. Or, reconsider the electronic gear ratio.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*3. These errors occur when using a feedback option card.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.d00*1: Position Error Pulse Overflow [Position error exceeded the value set in the excessive position error alarm level (Pn520)] (cont'd)	The position reference acceleration is too fast.	Reduce the reference accel- eration, and operate the SERVOPACK.	Apply the smoothing func- tion, such as using position reference acceleration/ deceleration time constant (Pn216).
	Setting of the param- eter Pn520 (Excessive Position Error Alarm Level) is low against the operating condi- tion.	Check the alarm level (Pn520) to see if it is set to an appropriate value.	Set the parameter Pn520 to proper value.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
A.d01*1: Position Error Pulse Overflow Alarm at Servo ON	When setting not to clear position error pulses, the servomo- tor rotated while the servo was OFF, resulting in position error pulse overflow.	Check the error counter while servo is OFF (Un008).	Set position error pulses to be cleared while in servo OFF status. Or, correct the excessive position error alarm level (Pn520).
A.d02*1: Position Error Pulse Overflow Alarm by Speed Limit at Servo ON	The servo was turned ON while the position error pulses accumu- lated, and the refer- ence pulse was input while the servomotor was running at the speed limit (Pn529). As a result, the posi- tion error count exceeded the exces- sive position error alarm level (Pn520).	Check the error counter while servo is OFF (Un008).	Set position error pulses to be cleared while in servo OFF status. Or, correct the excessive position error alarm level (Pn520). Or, adjust the speed limit level (Pn529) when servo turns ON.
A.d10*3: Motor-load Position Error Pulse Overflow	Motor rotation direc- tion and scale installa- tion direction are opposite.	Check the servomotor rota- tion direction and the scale installation direction.	Install the scale in the oppo- site direction, or reverse the setting of the external encoder usage method (Pn002.3).
	Mounting of the load (e.g., stage) and scale joint installation are incorrect.	Check the scale mechanical connection.	Check the mechanical joints.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*3. These errors occur when using a feedback option card.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.E02*2: COM Alarm 2 (WDC + SyncFlag Synchronization Error)	A parameter was changed by the digital operator or the personal computer during MECHATROLINK-II communications.	Confirm the way the parameters are edited.	Stop changing parameters using digital operator or personal computer during MECHATROLINK-II communications.
	MECHATROLINK-II transmission cycle fluctuated.	—	Remove the cause of transmission cycle fluctuation at host controller.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.E40*2: MECHATROLINK-II Transmission Cycle Setting Error	Setting of MECHATROLINK-II transmission cycle is out of specifications range.	Check the MECHATROLINK-II transmission cycle setting.	Set the transmission cycle to the proper value.
A.E50*2: MECHATROLINK-II Synchronization Error	WDT data of host controller was not updated correctly.	Check the WDT data updating for the host controller.	Update the WDT data at the host controller correctly.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.E51*2: MECHATROLINK-II Synchronization Failed	WDT data of host controller was not updated correctly at the synchronization communications start, and synchronization communications could not start.	Check the WDT data updating for the host controller.	Update the WDT data at the host controller correctly.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.

\*2. These errors occur in SERVOPACKs using MECHATROLINK-II.



(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.E60*2: MECHATROLINK-II Communications Error (Reception Error)	MECHATROLINK-II wiring is incorrect.	Check the MECHATROLINK-II wirings.	Correct the MECHATROLINK-II wiring. Connect the terminator correctly.
	MECHATROLINK-II data reception error occurred due to noise interference.	—	Take measures against noise. Check the MECHATROLINK-II communications cable and FG wiring and take measures such as adding ferrite core on the MECHATROLINK-II communications cable.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.E61*2: MECHATROLINK-II Transmission Cycle Error (Synchronization Interval Error)	MECHATROLINK-II transmission cycle fluctuated.	Check the MECHATROLINK-II transmission cycle setting.	Remove the cause of transmission cycle fluctuation at host controller.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.EA0*2: DRV Alarm 0 (SERVOPACK failure)	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.EA1*2: DRV Alarm 1 (SERVOPACK initial access error)			

\*2. These errors occur in SERVOPACKs using MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.EA2*2: DRV Alarm 2 (SERVOPACK WDC error)	A parameter was changed by the digital operator or the personal computer during MECHATROLINK-II communications.	Confirm the way the parameters are edited.	Stop changing parameters using digital operator or personal computer during MECHATROLINK-II communications.
	MECHATROLINK-II transmission cycle fluctuated.	Check the MECHATROLINK-II transmission cycle setting.	Remove the cause of transmission cycle fluctuation at host controller.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.Eb1*1: Safety Function Signal Input Timing Error	The lag between activations of the input signals /HWBB1 and /HWBB2 for the HWBB function is one second or more.	Measure the time lag between the /HWBB1 and /HWBB2 signals.	The output signal circuits or devices for /HWBB1 and /HWBB2 or the SERVOPACK input signal circuits may be faulty. Alternatively, the input signal cables may be disconnected. Repair or replace them.
A.ED0*2: Internal Command Error	A parameter was changed by the digital operator or the personal computer during MECHATROLINK-II communications.	Confirm the way the parameters are edited.	Stop changing parameters using digital operator or personal computer during MECHATROLINK-II communications.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SERVOPACK may be faulty. Repair or replace the SERVOPACK.
A.ED1*1: Command Execution Timeout	A timeout error occurred when using an MECHATROLINK command.	Check the motor status when the command is executed.	Execute the SV_ON or SENS_ON command only when the motor is not running.
		Check the external encoder status when the command is executed.	Execute the SENS_ON command only when an external scale is connected.

\*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHATROLINK-II.

\*2. These errors occur in SERVOPACKs using MECHATROLINK-II.

(cont'd)

Alarm: Alarm Name	Cause	Investigative Actions	Corrective Actions
A.F10*1: Main Circuit Cable Open Phase (With the main power supply ON, voltage was low for more than 1 second in an R, S, or T phase.) (Detected when the main power supply was turned ON.)	The three-phase power supply wiring is incor- rect.	Check the power supply wir- ing.	Confirm that the power sup- ply is correctly wired.
	The three-phase power supply is unbalanced.	Measure the voltage at each phase of the three-phase power supply.	Balance the power supply by changing phases.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.
CPF00*1: Digital Operator Transmission Error 1*4	The contact between the digital operator and the SERVOPACK is faulty.	Check the connector contact.	Insert securely the connec- tor or replace the cable.
	Malfunction caused by noise interference	—	Keep the digital operator or the cable away from noise sources.
CPF01*1: Digital Operator Transmission Error 2*5	A digital operator fault occurred.	—	Disconnect the digital oper- ator and then re-connect it. If the alarm still occurs, the digital operator may be faulty. Repair or replace the digital operator.
	A SERVOPACK fault occurred.	—	Turn the power supply OFF and then ON again. If the alarm still occurs, the SER- VOPACK may be faulty. Repair or replace the SER- VOPACK.

- \*1. These errors occur in SERVOPACKs using analog pulse reference input/MECHA-TROLINK-II.
- \*4. This alarm occurs when communications are still disabled five seconds after the digital operator power supply is turned ON.
- \*5. This alarm occurs when there are five consecutive errors in data received at the digital operator, or when there are three consecutive transmissions in which no data is received from the SERVOPACK for one second or longer.

## 6.2 Causes and Corrective Actions for Problems Determined from Servomotor Operation and Status

This section shows the probable causes of problems that can be determined from servomotor operation and status, and suggests measures for countering them.

For problems not described here, refer to the following manuals.

Be sure to first turn OFF the servo system power supply before performing any of the inspections or taking any of the actions shown in the boxes outlined in bold lines in the table below.

- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/Analog Voltage and Pulse Train Reference (SIEPS80000045).
- $\Sigma$ -V Series SGM□V/SGDV User's Manual Design and Maintenance Rotational Motor/MECHATROLINK-II Communications Reference (SIEPS80000046).

Problem	Probable Cause	Investigative Actions	Corrective Actions
Servomotor Does Not Start	The control power supply is not ON.	Check voltage between power supply terminals.	Correct the power circuit.
	The main circuit power supply is not ON.	Check the voltage between power supply terminals.	Correct the power circuit.
	Wiring of I/O signal connector CN1 faulty or disconnected.	Check if the connector CN1 is properly inserted and connected.	Correct the connector CN1 connection.
	Servomotor or encoder wiring disconnected.	Check the wiring.	Correct the wiring.
	Overloaded	Run under no load and check the load status.	Reduce load or replace with larger capacity servomotor.
	Speed/position references not input	Check reference input pins.	Input speed/position references correctly.
	Motion command not input	Check the command sent from the host controller.	Input motion command correctly.
	Setting for Pn50A to Pn50D "Input Signal Selection" is incorrect.	Check settings of parameters Pn50A to Pn50D.	Correct the settings for Pn50A to Pn50D "Input Signal Selection."
	Encoder type differs from parameter setting (Pn002.2).	Check setting of parameter Pn002.2.	Set parameter Pn002.2 to the encoder type being used.
	Servo ON (/S-ON) input signal stays OFF.	Check settings of parameters Pn50A.0 and Pn50A.1.	Set the parameters to turn the Servo ON (/S-ON) input signal ON.
	Servo ON (SV_ON) command is not sent.	Check the command sent from the host controller.	Send the Servo ON (SV_ON) command.

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
Servomotor Does Not Start (cont'd)	Sensor ON (SENS_ON) command is not sent.	Check the command sent from the host controller.	Send the command in the correct SERVOPACK sequence.
	/P-CON input function setting is incorrect.	Check parameter Pn000.1.	Set parameters to match the application.
	SEN input is OFF.	Check the ON/OFF status of the SEN input.	If using an absolute encoder, turn the SEN input signal ON.
	Reference pulse mode selection is incorrect.	Check the Pn200.0 setting and the reference pulse status.	Match the Pn200.0 setting and the reference pulse status.
	Speed control: Speed reference input is incorrect.	Check V-REF and SG to confirm if the control method and the input are agreed.	Correct the control mode selection parameter, or the input.
	Torque control: Torque reference input is incorrect.	Check V-REF and SG to confirm if the control method and the input are agreed.	Correct the control mode selection parameter, or the input.
	Position control: Reference pulse input is incorrect.	Check Pn200.0 reference pulse form or sign + pulse signal.	Correct the control mode selection parameter, or the input.
	Position error pulse clear (CLR) input is turned ON.	Check CLR or /CLR input pins (CN1-14 and -15).	Turn CLR or /CLR input signal OFF.
	The forward run prohibited (P-OT) and reverse run prohibited (N-OT) input signals are turned OFF.	Check P-OT or N-OT input signal.	Turn P-OT or N-OT input signal ON.
	A SERVOPACK fault occurred.		Replace the SERVOPACK.
Servomotor Moves Instantaneously, and then Stops	Servomotor wiring is incorrect.	Check the servomotor wiring.	Correct the wiring.
	Encoder wiring is incorrect.	Check the encoder wiring.	Correct the wiring.
Servomotor Speed Unstable	Wiring connection to servomotor is defective.	Check connections of main circuit cable (phases-U, -V, and -W) and encoder connectors.	Tighten any loose terminals or connectors.

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
Servomotor Rotates Without Reference Input	Speed control: Speed reference input is incorrect.	Check V-REF and SG to confirm if the control method and the input are agreed.	Correct the control mode selection parameter, or the input signal.
	Torque control: Torque reference input is incorrect.	Check V-REF and SG to confirm if the control method and the input are agreed.	Correct the control mode selection parameter, or the input signal.
	Speed reference offset is incorrect.	The SERVOPACK offset is adjusted incorrectly.	Adjust the SERVOPACK offset.
	Position control: Reference pulse input is incorrect.	Check Pn200.0 reference pulse form or sign + pulse signal.	Correct the control mode selection parameter, or the input signal.
	A SERVOPACK fault occurred.		Replace the SERVOPACK.
Dynamic Brake Does Not Operate	Improper Pn001 setting	Check the setting of parameter Pn001.0.	Correct the parameter setting.
	DB resistor disconnected	Check if excessive moment of inertia, motor overspeed, or DB frequently activated occurred.	Replace the SERVOPACK, and lighten the load.
	DB drive circuit fault		There is a defective component in the DB circuit. Replace the SERVOPACK.
Abnormal Noise from Servomotor	Mounting is not secured.	Check if there are any loose mounting screws.	Tighten the mounting screws.
		Check if there is misalignment of couplings.	Align the couplings.
		Check if there are unbalanced couplings.	Balance the couplings.
	Bearings are defective.	Check for noise and vibration around the bearings.	If there are any problems, contact your Yaskawa representative.
	Vibration source at the driven machine	Check for any foreign matter, damage, or deformations on the machinery's movable parts.	If there are any problems, contact the machine manufacturer.
	Noise interference due to incorrect input/output signal cable specifications	The input/output signal cables must be tinned annealed copper twisted-pair or shielded twisted-pair cables with a core of 0.12 mm <sup>2</sup> min.	Use the specified input signal wires.

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
Abnormal Noise from Servomotor (cont'd)	Noise interference due to length of input/output signal cable.	Check the length of the input/output cable.	The input/output cable length must be no more than 3 m (9.84 ft), and the impedance a few hundred ohm max.
	Noise interference due to incorrect encoder cable specifications.	The encoder cable must be tinned annealed copper twisted-pair or shielded twisted-pair cables with a core of 0.12 mm <sup>2</sup> min.	Use the specified encoder cable.
	Noise interference due to length of encoder cable wiring	Check the length of the encoder cable.	The encoder cable must be no more than 20 m (65.6 ft).
	Noise interference due to damaged encoder cable	Check if the encoder cable is damaged or bent.	Replace the encoder cable and modify the encoder cable layout.
	Excessive noise to the encoder cable	Check if the encoder cable is bundled with high-current line or near a high-current line.	Correct the encoder cable layout so that no surge is applied.
	FG potential varies because of influence of machines such as welders at the servomotor.	Check if the machines are correctly grounded.	Ground machines correctly, and prevent diversion to the FG at the PG side.
	SERVOPACK pulse counting error due to noise interference	Check if there is noise interference on the input/output signal line from the encoder.	Take measures against noise in the encoder wiring.
	Excessive vibration and shock to the encoder	Check if vibration from the machine occurred or servomotor installation is incorrect (mounting surface accuracy, fixing, alignment, etc.).	Reduce vibration from the machine, or secure the servomotor installation.
	An encoder fault occurred.		Replace the servomotor.
Servomotor Vibrates at Frequency of Approx 200 to 400 Hz	Speed loop gain value (Pn100) too high.	Check the speed loop gain value (Pn100). Factory setting: Kv = 40.0 Hz	Reduce the speed loop gain (Pn100).
	Position loop gain value (Pn102) too high.	Check the position loop gain value (Pn102). Factory setting: Kp = 40.0/s	Reduce the position loop gain (Pn102).
	Incorrect speed loop integral time constant (Pn101) setting	Check the speed loop integral time constant (Pn101). Factory setting: Ti = 20.0 ms	Correct the speed loop integral time constant (Pn101) setting.
	Incorrect moment of inertia ratio data (Pn103)	Check the moment of inertia ratio data (Pn103).	Correct the moment of inertia ratio (Pn103) setting.

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
High Rotation Speed Overshoot on Starting and Stopping	Speed loop gain (Pn100) value too high	Check the speed loop gain value (Pn100). Factory setting: $K_v = 40.0$ Hz	Reduce the speed loop gain (Pn100).
	Position loop gain value (Pn102) too high	Check the position loop gain value (Pn102). Factory setting: $K_p = 40.0/s$	Reduce the position loop gain (Pn102).
	Incorrect speed loop integral time constant (Pn101) setting	Check the speed loop integral time constant (Pn101). Factory setting: $T_i = 20.0$ ms	Correct the speed loop integral time constant (Pn101) setting.
	Incorrect moment of inertia ratio data (Pn103)	Check the moment of inertia ratio (Pn103) setting.	Correct the moment of inertia ratio (Pn103) setting. Use the mode switch functions (Pn10C to Pn10F).
Absolute Encoder Position Difference Error (The position saved in the host controller when the power was turned OFF is different from the position when the power was next turned ON.)	Noise interference due to improper encoder cable specifications	The encoder cable must be tinned annealed copper twisted-pair or shielded twisted-pair cables with a core of $0.12 \text{ mm}^2$ min.	Use encoder cable with the specified specifications.
	Noise interference due to length of encoder cable.	Check the encoder cable length.	The encoder cable length must be no more than 20 m (65.6 ft).
	Noise interference due to damaged encoder cable	Check if the encoder cable is bent or if its sheath is damaged.	Replace the encoder cable and correct the encoder cable layout.
	Excessive noise interference at the encoder cable	Check if the encoder cable is bundled with a high-current line or near high-current line.	Change the encoder cable layout so that no surge is applied.



(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions	
Absolute Encoder Position Difference Error (The position saved in the host controller when the power was turned OFF is different from the position when the power was next turned ON.) (cont'd)	FG potential varies because of influence of machines such as welders at the servomotor.	Check if the machines are correctly grounded.	Ground machines correctly, and prevent diversion to the FG at the PG side.	
	SERVOPACK pulse counting error due to noise interference	Check if there is noise interference on the input/output signal line from the encoder.	Take measures against noise in the encoder wiring.	
	Excessive vibration and shock to the encoder	Check if vibration from the machine occurred or servomotor installation is incorrect (mounting surface accuracy, fixing, alignment, etc.).	Reduce vibration from the machine, or secure the servomotor installation.	
	An encoder fault occurred.		Replace the servomotor.	
	A SERVOPACK fault occurred. (The pulse count does not change.)		Replace the SERVOPACK.	
	Host controller multi-turn data reading error	Check the error detection at the host controller.	Correct the error detection section of the host controller.	
		Check if the host controller is executing data parity checks.	Execute a multi-turn data parity check.	
		Check noise in the input/output signal line between the SERVOPACK and the host controller.	Take measures against noise, and again execute a multiturn data parity check.	
	Overtravel (OT) (Movement over the zone specified by the host controller)	Forward or reverse run prohibited signal is input. P-OT (CN1-42 or CN1-7) or N-OT (CN1-43 or CN1-8) is at H level.	Check the external power supply (+24 V) voltage for the input signal.	Correct the external power supply (+24 V) voltage.
			Check if the overtravel limit switch operates properly.	Correct the overtravel limit switch.
Check if the overtravel limit switch is wired correctly.			Correct the overtravel limit switch wiring.	
Forward or reverse run prohibited signal malfunctioning (P-OT or N-OT signal sometimes changes).		Check the fluctuation of the input signal external power supply (+24 V) voltage.	Stabilize the external power supply (+24 V) voltage.	
		Check if the overtravel limit switch operates correctly.	Stabilize the operation of the overtravel limit switch.	
		Check if the overtravel limit switch wiring is correct. (check for damaged cables or loose screws.)	Correct the overtravel limit switch wiring.	

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
Overtravel (OT) (Movement over the zone specified by the host controller) (cont'd)	Incorrect forward or reverse run prohibited signal (P-OT/N-OT) allocation (parameters Pn50A.3, Pn50B.0)	Check if the P-OT signal is allocated in Pn50A.3.	If another signal is allocated in Pn50A.3, select P-OT.
		Check if the N-OT signal is allocated in Pn50B.0.	If another signal is allocated in Pn50B.0, select N-OT.
	Incorrect servomotor stop method selection	Check Pn001.0 and Pn001.1 when servo is OFF.	Select a servo mode stop method other than "coast to stop."
		Check Pn001.0 and Pn001.1 when in torque control mode.	Select a servo mode stop method other than "coast to stop."
	Improper overtravel position setting	Check the overtravel (OT) position setting.	If the distance to the OT position is too short compared to the coasting distance, correct the setting.
Improper overtravel limit switch position setting	Check if the distance to the overtravel limit switch (OTLS) is too short compared to the coasting distance.	Correct the OTLS position.	
Position Error (Without Alarm)	Noise interference due to improper encoder cable specifications	The encoder cable must be tinned annealed copper twisted-pair or shielded twisted-pair cable with a core of 0.12 mm <sup>2</sup> min.	Use encoder cable with the specified specifications.
	Noise interference due to length of encoder cable	Check the encoder cable length.	The encoder cable length must be no more than 20 m (65.6 ft).
	Noise influence due to damaged encoder cable	Check if the encoder cable is bent or if its sheath is damaged.	Replace the encoder cable and correct the encoder cable layout.
	Excessive noise interference to encoder cable	Check if the encoder cable is bundled with a high-current line or near a high-current line.	Change the encoder cable layout so that no surge is applied.
	FG potential varies because of influence of machines such as welders at the servomotor.	Check if the machines are correctly grounded.	Ground machines correctly, and prevent diversion to the FG at the PG side.
	SERVOPACK pulse count error due to noise	Check if the input/output signal line from the encoder is influenced by noise.	Take measures against noise in the encoder wiring.
	Excessive vibration and shock to the encoder	Check if vibration from the machine occurred or servomotor installation is incorrect (mounting surface accuracy, fixing, alignment, etc.).	Reduce the machine vibration or mount the servomotor securely.

(cont'd)

Problem	Probable Cause	Investigative Actions	Corrective Actions
Position Error (Without Alarm) (cont'd)	Unsecured coupling between machine and servomotor	Check if a position error occurs at the coupling between machine and servomotor.	Secure the coupling between the machine and servomotor.
	Noise interference due to improper I/O signal cable specifications	The I/O signal cable must be twisted-pair or shielded twisted-pair cable with a core of 0.12 mm <sup>2</sup> min. and tinned annealed copper twisted wire.	Use input signal cable with the specified specifications.
	Noise interference due to length of I/O signal cable	Check the I/O signal cable length.	The I/O signal cable length must be no more than 3 m (9.84 ft), and the impedance several hundred ohm max.
	An encoder fault occurred. (The pulse count does not change.)		Replace the SERVOPACK.
	A SERVOPACK fault occurred.		Replace the SERVOPACK.
Servomotor Overheated	Ambient temperature too high	Measure the servomotor ambient temperature.	Reduce the ambient temperature to 40°C (104°F) or less.
	Servomotor surface dirty	Visually check the surface.	Clean dust and oil from the surface.
	Servomotor overloaded	Run under no load and check the load status.	Reduce load or replace with larger capacity servomotor.

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## Revision History

The revision dates and numbers of the revised manuals are given at the bottom of the back cover.

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# AC Servodrive

# $\Sigma$ -V Series

# USER'S MANUAL

# Setup

## Rotational Motor

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