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AC Servo Drives

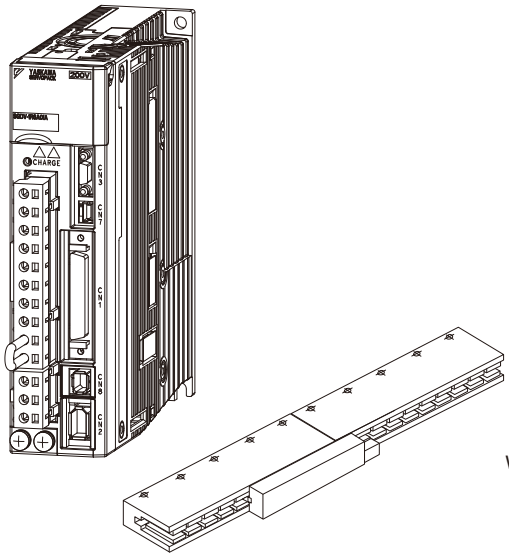
Σ-V Series

USER'S MANUAL Setup

Linear Motor

SGLGW/SGLFW/SGLTW/SGLC/SGT Servomotors
SGDV SERVOPACK

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Overview of Setup 1
Installation 2
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MANUAL NO. SIEP S800000 44B

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About this Manual

This manual describes procedures required for installation, wiring, and connecting Σ-V Series servo drives, including a JOG operation for linear 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
Cursor	Input position indicated by Digital Operator
Linear Servomotor	Σ-V Series SGLGW, SGLFW, SGLTW, or SGLC linear servomotor, or SGT linear slider
SERVOPACK	Σ-V Series SGDV SERVOPACK
Servo Drive	A set including a linear servomotor and SERVOPACK (i.e., a servo amplifier)
Servo System	A servo control system that includes the combination of a servo drive with a host controller and peripheral devices
Analog Pulse Model	Analog voltage and pulse-train reference used for SERVOPACK interface.
M-II Model	MECHATROLINK-II communications reference used for SERVOPACK interface.
M-III Model	MECHATROLINK-III communications reference used for SERVOPACK interface.
Command Option Attachable Type	SERVOPACK for which a command option module can be installed.
Servo ON	Power to motor ON
Servo OFF	Power to motor OFF
Base Block (BB)	Power supply to motor is turned OFF by shutting off the base current to the power transistor in the current amplifier.
Linear Scale Connection Cables	A set of cables including a cable for connecting serial converter unit, a cable for connecting linear scale, and a cable for connecting hall sensor

■ 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

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

■ Manuals Related to the Σ-V Series

Refer to the following manuals as required.

Name	Selecting Models and Peripheral Devices	Ratings and Specifi-cations	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
Σ-V Series Product Catalog (KAEP S800000 42)	✓	✓					
Σ-V Series User's Manual Design and Maintenance Linear Motor/Analog Voltage and Pulse Train Reference (SIEP S800000 47)		✓	✓	✓		✓	✓ *
Σ-V Series User's Manual Design and Maintenance Linear Motor/ MECHATROLINK-II Communications Reference (SIEP S800000 48)		✓	✓	✓		✓	✓ *
Σ-V Series User's Manual MECHATROLINK-II Command (SIEP S800000 54)			✓		✓	✓	

(cont'd)

Name	Selecting Models and Peripheral Devices	Ratings and Specifi-cations	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
Σ-V Series User's Manual Operation of Digital Operator (SIEP S800000 55)					✓	✓	✓
Σ-V Series User's Manual MECHATROLINK-III Command (SIEP S800000 63)			✓		✓	✓	
Σ-V Series User's Manual Design and Maintenance Linear Motor/ MECHATROLINK-III Communications Reference (SIEP S800000 65)		✓	✓	✓		✓	✓ *
Σ-V Series User's Manual Design and Maintenance Linear Motor/ Command Option Attachable Type (SIEP S800000 66)		✓	✓	✓		✓	✓
Σ-V Series User's Manual Indexer Module (SIEP C720829 02)		✓	✓	✓		✓	✓ *
Σ-V Series User's Manual EtherCAT (CoE) Network Module (SIEP C720829 04)		✓	✓	✓		✓	✓ *
AC SERVOMOTOR Safety Precautions (TOBP C230200 00)				✓			✓
Σ-V Series AC SERVOPACK SGDV Safety Precautions (TOBP C710800 10)	✓			✓			✓
Σ-V Series Option Module Safety Precautions (TOBP C720829 00)	✓			✓			✓

(cont'd)

Name	Selecting Models and Peripheral Devices	Ratings and Specifi-cations	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
Σ-V Series Command Option Module Installation Guide (TOBP C720829 01)	✓			✓			✓
Σ-V Series Indexer Module Installation Guide (TOBP C720829 02)	✓			✓			✓
Σ-V Series Feedback Option Module Installation Guide (TOBP C720829 03)	✓			✓			✓
Σ Series Digital Operator Safety Precautions (TOBP C730800 00)							✓

* Refer to these manuals for troubleshooting of problems which may occur during setup. (Troubleshooting which is common for command option modules is described in *Σ-V Series User's Manual Design and Maintenance Linear Motor/Command Option Attachable Type* (SIEP S800000 66).

■ 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: 

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

- If you have a pacemaker or any other electronic medical device, do not go near the magnetic way of the linear servomotor.
  Failure to observe this warning may result in the malfunction of the medical device.
- Be sure to use nonmagnetic tools when installing or working close to the linear servomotor.
  (Example: a beryllium-copper alloy hexagonal wrench set, made by NGK Insulators, Ltd.)
- Never touch the lienar servomotor or machinery during operation.
  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.
- Before wiring, install the SERVOPACK and the linear servomotor.
  Failure to observe this warning may result in electric shock.
- 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 while the power is ON.
  Failure to observe this warning may result in electric shock.
- After the power is turned OFF or after a voltage resistance test, do not touch terminals while the charge indicator is ON.
  Residual voltage may cause electric shock.
- 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.
- 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.
- Do not modify the product.
  Failure to observe this warning may result in injury, fire, or damage to the product.

⚠ WARNING

- Provide an appropriate braking device on the machine side to ensure safety.
  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 100, 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.
- 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 instructions in *Σ-V Series User's Manual Design and Maintenance* (SIEP S800000 47/48/65/66).
  Failure to observe this warning may result in injury or damage to the product.

■ Storage and Transportation

⚠ CAUTION

- Be sure to store the magnetic way in the package that was used for delivery.
- 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 carry the linear servomotor by its cables.
  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.
- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.
  Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.
  If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

■ Installation

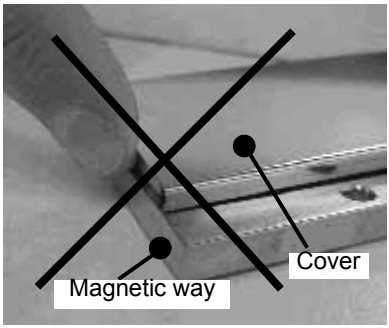
⚠ CAUTION

- When unpacking and installing magnetic way, check that no metal fragments or magnetized objects near the magnetic because they may be affected by the magnetic attraction of the magnetic way.
  Failure to observe this caution may result in injury or damage to the magnetic way's magnets.
- Do not use the magnetic way near metal or other magnetized objects.
  Failure to observe this caution may result in injury.

■ Installation (cont'd)

⚠ CAUTION

- Do not place clocks, magnetic cards, floppy disks, or measuring instruments close to the magnetic way.
  Failure to observe this caution may result in malfunction or damage to these items by the magnetic force.
- Securely mount the linear servomotor onto the machine.
  If the linear servomotor is not mounted securely, it may loosen during operation.
- Do not carry the magnetic way by its magnet protection cover.
  Failure to observe this caution may result in injury by the cover's edge or the shape of the cover may become distorted.



- When removing the dummy plate for reducing magnetic force used for the SGLFW magnetic way, pay attention to the magnetic attraction of the magnetic way. Do not place the removed plate close to the magnetic way.
  Failure to observe this caution may result in injury or damage to the magnetic way's magnets or the magnet protection cover.
- Install SERVOPACKs, linear servomotors, and regenerative resistors on nonflammable objects.
  Installation directly onto or near flammable objects may result in fire.
- 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 or malfunction.
- 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

- Be sure to wire correctly and securely.
  Failure to observe this caution may result in motor overrun, injury, or malfunction.
- Securely tighten the cable connector screws and securing mechanism.
  If the connector screws and securing mechanism are not secure, they may loosen during operation.
- Use cables with a radius, heat resistance, and flexibility suitable for the system.
- If the SERVOPACK malfunctions, turn OFF the main circuit's power supply of the SERVOPACK.
  The continuous flow of a large current may cause fire.
- Use a noise filter to minimize the effects of electromagnetic damage.
  Failure to observe this caution may result in electromagnetic damage to electronic devices used near the SERVOPACK.
- Do not connect a commercial power supply to the U, V, or W terminals for the linear servomotor connection.
  Failure to observe this caution may result in injury or fire.
- Securely connect the main circuit power supply terminals and linear servomotor connection terminals.
  Failure to observe this caution may result in fire.
- Do not bundle or run the main circuit cables together with the I/O signal cables or the linear scale connection 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 I/O signal cables and the linear scale connection cables.
- The maximum cable length is 3 m for the I/O signals, 20 m for the linear servomotor main circuit, 20 m for the serial converter unit, 15 m for the linear scale, 15 m for the hall sensor, and 10 m for control power supply cables for the SERVOPACK with a 400-V power supply (+24 V, 0 V).
- Do not touch the power terminals while the charge indicator is ON after turning power OFF because high voltage may still remain in the SERVOPACK.
  Make sure the charge indicator is off first before starting wiring and inspection.
- Be sure to observe the following precautions when wiring the SERVOPACK main circuit terminals has been completed.
  - Do not turn ON the power to the SERVOPACK until all wiring including main circuit terminals has been completed.
  - 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.
- Do not connect the SERVOPACK for 200 V directly to a voltage of 400 V.
  The SERVOPACK will be destroyed.
- Always use the specified power supply voltage:
  Failure to observe this caution may result in fire or product failure.

■ Wiring (cont'd)

⚠ CAUTION

- Make sure that the polarity is correct.
  Incorrect polarity may cause ruptures or damage.
- 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.
  Failure to observe this caution may result in damage to the product.
  • 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 supplies
  Failure to observe this caution may result in damage to the product.
- Wiring or inspection must be performed by a technical expert.
- Use a 24 VDC power supply with double insulation or reinforced insulation
- Failures caused by incorrect wiring or wrong voltage application in the brake circuit may damage the equipment or cause an accident resulting in death or injury. Follow the procedures and instructions for wiring and trial operation precisely as described in this manual.
- Leakage current may increase depending on the type of noise filter and the grounding conditions.
  When using a detector or a breaker for leakage current, select the appropriate one by considering the type of noise filter and the ground conditions. For details, contact the manufacturer of the noise filter.
- Incorrect wiring or incorrect voltage application to the output circuit may cause short-circuit.
  The above failures will prevent the holding brake from working, which may damage the machine or cause an accident resulting in death or injury.
- Inverting the polarity of the brake signal (/BK), i.e. positive logic, will prevent the holding brake from working in case of its signal line disconnection. If this setting is absolutely necessary, check the operation and confirm that there are no safety problems.

■ Operation

⚠ CAUTION

- Do not stand within the machine's range of motion during operation.
  Failure to observe this caution may result in injury.
- Always use the linear servomotor and SERVOPACK in one of the specified combinations.
  Failure to observe this caution may result in fire or malfunction.

■ Operation (cont'd)

⚠ CAUTION

- If the SERVOPACK, the absolute linear scale, or the linear servomotor is replaced, the polarity detection function must be executed again.
  Failure to observe this caution may result in the linear servomotor moving in an unpredictable manner.
- Before operation, install a limit switch or stopper on the end of the slider to prevent unexpected movement.
  Failure to observe this caution may result in injury.
- During trial operation, confirm that the holding brake works correctly. Furthermore, secure system safety against problems such as signal line disconnection.
- 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.
  - Frequently turning power ON and OFF causes elements inside the SERVOPACK to deteriorate. Do not use the servo drive with an application that requires frequently turning power ON and OFF.
  - After the actual operation starts, the allowable interval for turning power ON and OFF is one hour or longer.
- When carrying out JOG operation (Fn002), origin search (Fn003), or Easy-FFT (Fn206), forcing movable machine parts to stop does not work for forward overtravel or reverse overtravel. Take necessary precautions.
  Failure to observe this caution may result in damage to the equipment.
- When using the linear servomotor for a vertical axis, install safety devices to prevent workpieces from falling due to alarms or overtravels. Set the linear 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.
- When not using turning-less function, set the correct mass ratio (Pn103).
  Setting an incorrect mass ratio may cause machine vibration.
- Do not touch the SERVOPACK heatsinks, regenerative resistor, or linear 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 changes in the settings of parameters.
  Failure to observe this caution may result in injury or damage to the product due to unstable operation.
- If an alarm occurs, shut down the main circuit power supply.
  Failure to observe this caution may result in fire due to regenerative resistor overheating caused by regenerative transistor failure.
- 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.
- 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 linear servomotor. 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 copying the previous SERVOPACK parameters to the new SERVOPACK. Failure to observe this caution may result in damage to the product. • Be sure to eliminate static electricity before operating buttons and switches inside the front cover. 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. • 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.

Warranty

(1) Details of Warranty

■ Period of Warranty

The period of warranty for a product that was purchased (hereafter “delivered product”) is one year from the time of delivery to the location specified by the customer or 18 months from the time of shipment from the Yaskawa factory, whichever is sooner.

■ Scope of Warranty

Yaskawa shall replace or repair a defective product free of change if a defect attributable to Yaskawa occurs during the period of warranty above. Defects due to the delivered product reaching the end of its service life and replacement of parts that require replacement or that have a limited service life are also outside the scope of this warranty.

Failures that occur for any of the following causes are outside the scope of the warranty.

1. Using or handling the product under conditions or in environments not described in product catalogs or manuals, or separately agreed-upon specifications
2. Causes not attributable to the delivered product itself
3. Modifications or repairs not performed by Yaskawa
4. Using the delivered product in a manner in which it was not originally intended
5. Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from Yaskawa
6. Events for which Yaskawa is not responsible, such as natural or human-made disasters

(2) Limitations of Liability

1. Yaskawa shall in no event be responsible for any damage or loss of opportunity to the customer that arises due to failure of the delivered product.
2. Yaskawa shall not be responsible for programming (including parameter settings) or the results of program execution if a programmable Yaskawa product was programmed by the user or by a third party.
3. The information described in product catalogs or manuals is provided for the purpose of the customer purchasing the appropriate product for the intended application. The use thereof does not guarantee that there are no infringements of intellectual property rights or other proprietary rights of Yaskawa or third parties, nor does it construe a license.
4. Yaskawa shall not be responsible for any damage arising from infrigements of intelectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

(3) Suitability for Use

1. It is the customer's responsibility to confirm conformity with any standards, codes, or regulations that apply if the Yaskawa product is used in combination with any other products.
2. The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
3. Consult with Yaskawa to determine whether use in the following applications is acceptable. If use in the application is acceptable, use the product with extra allowance in ratings and specifications, and provide safety measures to minimize hazards in the event of failure.
   - Outdoor use, use involving potential chemical contamination or electrical interference, or use in conditions or environments not described in product catalogs or manuals
   - Nuclear energy control systems, combustion systems, railroad systems, aviation systems, vehicle systems, medical equipment, amusement machines, and installations subject to separate industry or government regulations
   - Systems, machines, and equipment that may present a risk to life or property
   - Systems that require a high degree of reliability, such as systems that supply gas, water, or electricity, or systems that operate continuously 24 hours a day
   - Other systems that require a similar high degree of safety
4. Never use the product for an application involving serious risk to life or property without first ensuring that the required safety has been designed into the system with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
5. The circuit examples and other application examples described in product catalogs and manuals are for reference. Check the functionality and safety of the actual devices and equipment to be used before using the product.
6. Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

(4) Changes to Specifications

The names, specifications, appearance, and accessories of products in product catalogs and manuals may be changed at any time based on improvements and other reasons. When a catalog or a manual is revised, the catalog or manual code is updated and the new catalog or manual is published as a next edition. Consult with your Yaskawa representative to confirm the actual specifications before purchasing a product.

Applicable Standards

■ North American Safety Standards (UL)

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	Model	UL* Standards (UL File No.)
SERVOPACK	SGDV	UL508C (E147823)

* Underwriters Laboratories Inc.

■ European Standards

	Model	Low Voltage Directive	EMC Directive		Safety Standards
			EMI	EMS	
SERVOPACK	SGDV	EN50178 EN61800-5-1	EN55011/A2 group 1 class A EN61800-3	EN61800-3 EN61000-6-2	EN954-1 IEC61508-1 to 4

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

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Revision History

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1

Overview of Setup

This chapter describes how to set up the Σ-V series of servo drives.

This chapter describes the flow of the setup procedure from installation until a JOG operation. A panel operator, a digital operator, and SigmaWin+, which is an engineering tool that can be used with a PC, are available to set up a servo drive.
The panel operator is included with the SERVOPACK of analog pulse models, and the digital operator and SigmaWin+ are sold separately.

⚠ CAUTION

- 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.

IMPORTANT

Be sure to read *5.2 Inspection and Checking before Trial Operation*.

Step	Item	Description	Reference
1	Installation and mounting	Install the linear servomotor, linear scale, and SERVOPACK according to the installation conditions.	*Chapter 2 Installation*
↓			
2	Wiring and connections	Wire and connect the SERVOPACK main circuit, regerative resistor, linear servomotor, and linear scale.	*Chapter 3 Wiring and Connection*
↓			
3	Check points before trial operation	For a safe and correct trial operation, inspect and check the following items before trial operation. • Linear servomotor • SERVOPACK • Wiring for main circuit power supply, linear servomotor, and linear scale	*5.2 Inspection and Checking before Trial Operation* *(1) Linear Servomotors* *(2) SERVOPACKs* *(3) Checking the Main Circuit Power Supply, Linear Servomotor, and Linear Scale Wirings*
↓			
4	SERVOPACK 's parameter setting	Set the following parameters of the SERVOPACK. • Linear scale pitch (Pn282) • Hall sensor selection (Pn080.0) • Motor phase selection (Pn080.1) • Overtravel signal allocation (Pn50A.3, Pn50B.0) • Force limits (Pn483, Pn484)	*5.3 Setting the SERVOPACK Parameters* *5.3.1 Setting and Checking the Linear Scale Pitch* *5.3.2 Hall Sensor Selection* *5.3.3 Motor Phase Selection* *5.3.4 Setting the Overtravel Signals* *5.3.5 Setting the Force Limits*
↓			
5	Origin setting	When using an absolute linear scale manufactured by Mitutoyo Corporation, execute the origin setting (Fn020).	*5.4 Execution of Origin Setting (Fn020)*
↓			
6	Polarity detection	Execute the polarity detection.	*5.5 Polarity Detection*
↓			
7	JOG operation	Perform a JOG operation for the linear servomotor using: • Panel operator (for analog pulse models only), • Digital operator, or • SigmaWin+	*5.6 JOG Operation* *5.6.1 JOG Operation Using a Panel Operator* *5.6.2 JOG Operation Using a Digital Operator* *5.6.3 JOG Operation Using SigmaWin+*

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2

Installation

This chapter describes how to install the linear servomotor and the SERVOPACK.

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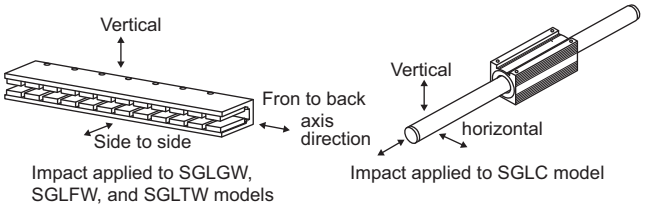
2.1 Installation Environment and Applicable Standards

The installation environment and the applicable standards for linear servomotors and SERVOPACKs are described in this section.

2.1.1 Linear Servomotor Installation Environment

- Ambient temperature: 0°C to 40°C
- Ambient humidity: 20% to 80% RH or less (with no condensation)
- Altitude: 1, 000 m or less
- Vibration resistance: The linear servomotor will withstand the following vibration acceleration in three directions: vertical, side to side, and front to back.

Servomotor Model		Vibration Acceleration at Flange	
SGLGW SGLFW SGLTW		three directions	49 m/s^2
SGLC	Moving Coil	three directions	24.5 m/s^2
	Magnetic Way	axis direction	24.5 m/s^2
		vertical, horizontal	4.9 m/s^2



Impact applied to SGLGW, SGLFW, and SGLTW models

Impact applied to SGLC model

■ Impact Resistance: The linear servomotor will with stand the following impact acceleration.

Servomotor model	Impact acceleration
SGLGW SGLFW SGLTW	196 m/s^2 × twice
SGLC	98 m/s^2 × twice

■ 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
- Free of high magnetic field

2.1.2 SERVOPACK Installation Environment

■ Surrounding air temperature: 0°C to 55°C

■ Ambient humidity: 90% RH or less (with no condensation)

■ Altitude: 1,000 m or less

■ Vibration resistance: 4.9 m/s^2

■ Shock resistance: 19.6 m/s^2

■ 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 SERVOPACK Installation*.

- 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.

- 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.

  Note: When storing the SERVOPACK with the power OFF, store it in an environment with the following temperature and humidity:
  - -20°C to +85°C, 90% RH or less. (with no condensation)

2.1.3 Installation Conditions for Applicable Standards

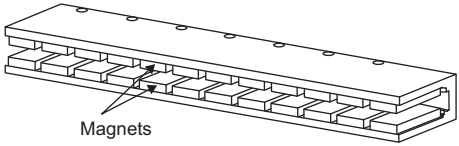
Applicable Standards	UL508C EN50178, EN55011/A2 group1 classA, EN61000-6-2, EN61800-3, EN61800-5-1, EN954-1, IEC61508-1 to 4
Operating Conditions	Overvoltage Category: III Pollution degree: 2 Protection class: IP10
Installation Conditions	UL Standard and Low Voltage Directive: Satisfy the conditions outlined in *Σ-V Series AC SERVOPACK SGDV Safety Precautions* (TOBP C710800 10) EMC Directive: Certification is required after installation in the user's machine under the conditions outlined in *2.5 EMC Installation Conditions* of this manual.

2.2 Linear Servomotor Installation

2.2.1 SGLGW and SGLGM Linear Servomotors (Coreless Type)

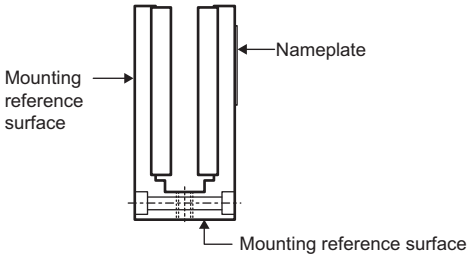
(1) Magnetic Way Installation

The SGLGM magnetic way comprises a U-channel steel track with opposing magnets attached to the inner faces. Make sure that no foreign particles (magnetic objects) are caught between the magnets when installing the magnetic way.



Use the following procedure to install SGLGM magnetic ways.

1. After checking the magnetic way's two mounting reference surfaces, place the magnetic way on the reference surface of the machine base, making sure that hands are kept clear.

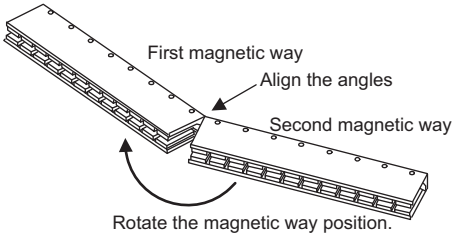


2. Place the magnetic way on the reference surface of the machine and secure it with bolts.

Magnetic Way Model SGLGM-	Bolt size	Tightening torque (N·cm)
30□□□□	M4	360 to 500
40□□□□	M5	720 to 1010
60□□□□		

Note: Use hexagonal socket head bolts (tensile strength Class 10.9).

3. When joining magnetic ways together, place the second magnetic way temporarily in line with and at least 30 mm apart from the first magnetic way.
Next, after aligning the angles of bolt sockets on the magnetic way's connecting surfaces, move the second magnetic way to join the first magnetic way. Connect the second and first magnetic ways together. And, after confirming the mounting position, secure the second magnetic way using bolts. Make sure that fingers do not get jammed due to the magnetic attraction between magnetic ways.

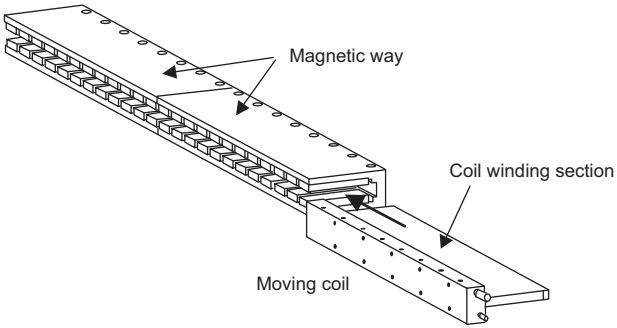


(2) Moving Coil Installation

The SGLGW moving coil is constructed of an aluminum base and a resin-coated coil winding section. Handle the moving coil with care and do not subject the coil winding section to shock. Doing so may cause injury or damage to the moving coil.

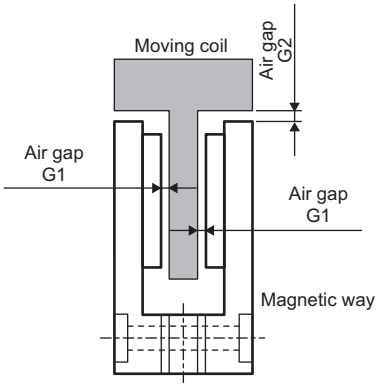
Use the following procedure to install the SGLGW moving coil.

1. Insert the coil winding section of the moving coil between the magnets of the magnetic way that has already been installed. Next, install the moving coil on the movable table supported by the linear guide. Install the moving coil on the movable table supported by the linear guide. Make sure that the air gap between the moving coil's coil winding section and magnetic way's magnets is the specified distance.



The relationship between the dimensions and positioning between the moving coil's coil winding section and magnetic ways's magnets is shown here. Maintain the following air gaps when installing. Make sure that the moving coil and magnetic way do not interfere with each other during the stroke.

Moving Coil Model SGLGW-	Dimensions in mm	
	Air gap G1	Air gap G2
30A050□□	0.85 ± 0.3	1 ± 0.3
30A080□□	0.95 ± 0.3	1 ± 0.3
40A□□□□□	0.8 ± 0.3	1 ± 0.3
60A□□□□□	0.8 ± 0.3	1 ± 0.3



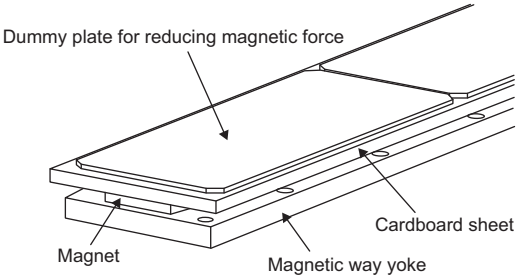
2. Move the moving coil back and forth several times over the magnetic way from end to end, making sure that the moving coil and magnetic way are not touching each other and that no foreign objects such as magnetic particles are present.

2.2.2 SGLFW and SGLFM Linear Servomotors (F-type Iron Core)

(1) Magnetic Way Installation

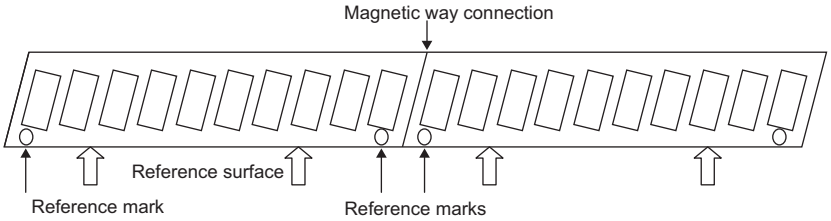
The SGLFM magnetic way is packed with a cardboard sheet covering the magnetic surface, above which is a thin, rectangular steel plate.

The steel plate is a dummy plate used to reduce the influence of magnetic force on the surrounding environment. When removing the plate, make sure that fingers are kept clear and that the magnet and magnet protection cover are not damaged.



Use the following procedure to install the SGLFM magnetic way.

1. Remove the dummy plate used to reduce magnetic force and the cardboard sheet from the magnetic way's magnetic surface.
2. Align the reference marks (approx. 4-mm dia. indentations) on the side of the magnetic way with the reference surface of the machine base, keeping fingers clear to prevent injury.



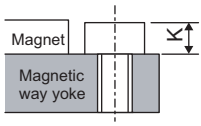
3. While placing the magnetic way on the machine base reference surface, secure it with bolts.

Magnetic Way Model SGLFM-	Bolt size	Tightening torque (N·cm)
20□□□□	M4	360 to 500
35□□□□		
50□□□□	M5	720 to 1010

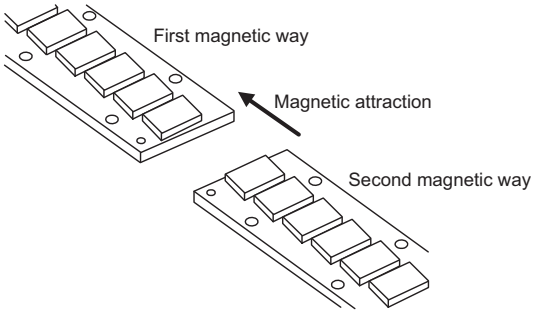
Note: Use hexagonal socket head bolts (tensile strength Class 10.9).

Note: The magnetic way's magnets exert strong magnetic attraction. Make sure that steel bolts or wrenches are kept away from the magnets. Always use bolts with a head height according to the dimensions shown in the following table.

Magnet Way Model SGLFM-	Bolt size	Head height K in mm
20□□□□	M4	4.2 max.
35□□□□		
50□□□□	M5	5.2 max.



4. When joining magnetic ways together, place the second magnetic way temporarily in line with and at least 30 mm apart from the first magnetic way. Next, match the direction of the magnetic ways (using the indentations as reference (approx. dia. 4 mm)). (Refer to the diagram in step 2.) Next, while holding the magnetic ways down so that they are not raised, push the second magnetic way against the first magnetic way and secure it with bolts. The magnetic ways may snap together due to the strong magnetism. Keep fingers clear to avoid injury.



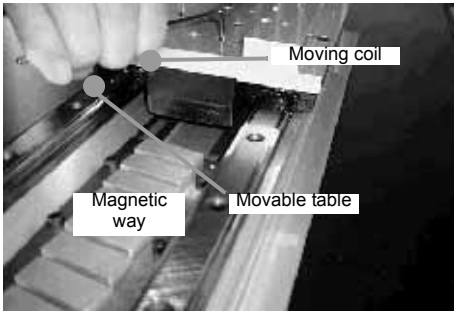
Note: To ensure your safety, install the moving coil before installing the second and subsequent magnetic ways. For details, refer to *(2) Moving Coil Installation*.

(2) Moving Coil Installation

The SGLFW moving coil is constructed of an aluminum or steel base and iron core, with a resin-coated coil winding section. Make sure that the coil winding section is not subjected to shock during installation. Shock may cause injury or damage to the moving coil.

Use the following procedure to install the SGLFW moving coil.

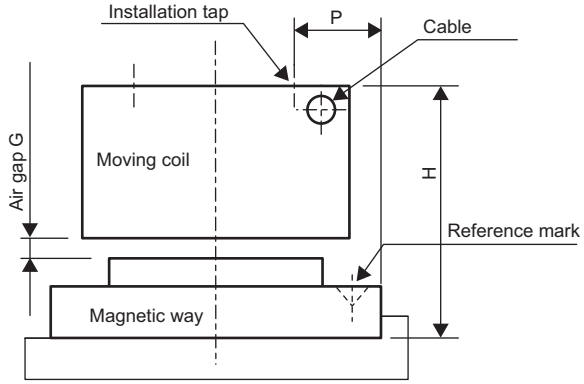
1. Install the moving coil on the movable table supported by the linear guide in line with the already installed magnetic way.
Make sure that the air gaps between the moving coil and magnetic way's magnets is the specified distance.



Maintain the following air gaps when installing. Make sure that the moving coil and magnetic way do not interfere with each other during the stroke.

Moving Coil Model SGLFW-	Dimensions in mm		
	H	P	Air gap G
20A□□□A□	45 ± 0.1	22 ± 0.2	1 ± 0.3 (0.8) *
35A□□□A□		21 ± 0.2	
50A□□□B□	58 ± 0.1	25.8 ± 0.2	

* The value in parentheses is the dimension when the magnet protection cover is used.

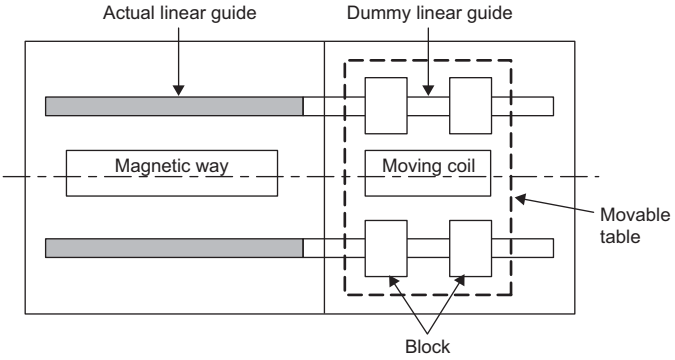


Linear servomotor side view
(Viewed from the side where the cable extends from the moving coil)

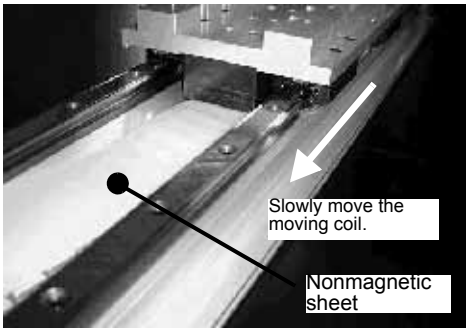
IMPORTANT

When two or more magnetic ways are used, first install one of the magnetic ways, and then install the moving coil in the available space. If using only one magnetic way, and the linear guide is not long enough extend up to the position needed to temporarily place the moving coil in line with the magnetic way, mount a dummy linear guide to the actual linear guide as shown in the figure below.

- Mounting a dummy linear guide



2. Insert a thin nonmagnetic (preferably resin) sheet (approximately 0.5-mm thick) in the air gap between the moving coil and magnetic way. Then, and move the moving coil toward the magnetic way.



IMPORTANT

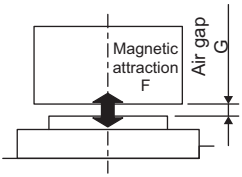
Always be aware of the strong magnetism of the magnetic way and keep fingers and tools at a safe distance, especially when the moving coil is near the magnetic way. The moving coil will be strongly attracted to the magnetic way. When the specified dimensions of the air gaps between the moving coil and the magnetic way are secured, it is not necessary to insert nonmagnetic sheets into the air gaps. (see the table of dimensions in step 1.)

3. Move the moving coil back and forth several times over the magnetic way from end to end, making sure that the moving coil is not touching the magnetic way and that no foreign objects (such as magnetic particles) are present. Use a nonmagnetic (brass or stainless steel) gap gauge to check that the air gap between the moving coil and the magnetic way is even.

(3) Magnetic Attraction

The linear servomotor is constructed of an opposing moving coil and magnetic way. Therefore, the moving coil is subjected to magnetic attraction as shown in the following table (calculated value). Consider the magnetic attraction when designing the system.

Moving Coil Model SGLFW-	Air gap G*1 in mm	Magnetic attraction F*2
20A090A□	0.7	410
20A120A□		600
35A120A□		1100
35A230A□		2100
50A200B□		2700



*1. Indicates an air gap value of -0.3 mm relative to the design value.
*2. Indicates the magnetic attraction for the maximum force.

2.2.3 SGLTW and SGLTM Linear Servomotors (T-type Iron Core)

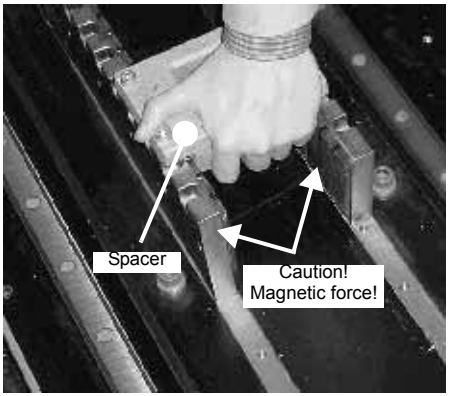
(1) Magnetic Way Installation

The SGLTM magnetic way is packed with two yokes securely positioned with an aluminum spacer.

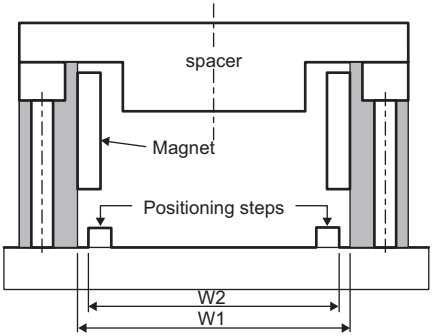
> IMPORTANT
>
> Do not remove the spacers until the magnetic way is temporarily fixed to the system.

Use the following procedure to install the SGLTM magnetic way.

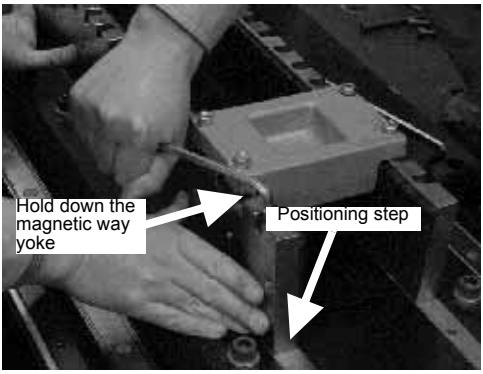
1. With the spacers attached, place the magnetic way on both positioning steps. Make sure that the machine and magnetic way are not scratched or dented when positioning the magnetic way. Set the dimensions of these positioning steps to match the W2 dimensions in the following table.



Magnetic Way Model SGLTM-	Dimensions in mm	
	W1 (Dimensions at shipment)	W2 (Recommended machine base value)
20□□□□	71.5 ± 1	70 ± 0.15
35□□□□		
40□□□□	113 ± 1	111.8 ± 0.15
80□□□□		
35□□□H	91.5 ± 1	90 ± 0.15
50□□□H		



2. Insert the mounting bolts into one of the two magnetic way yokes and tighten lightly by hand. Next, while firmly holding down the magnetic way yoke onto the positioning step, tighten the bolts firmly.



Magnetic Way Model SGLTM-	Bolt size	Tightening torque (N·cm)
20□□□□	M6	1220 to 1710
35□□□□		
35□□□H	M6	1220 to 1710
50□□□H		

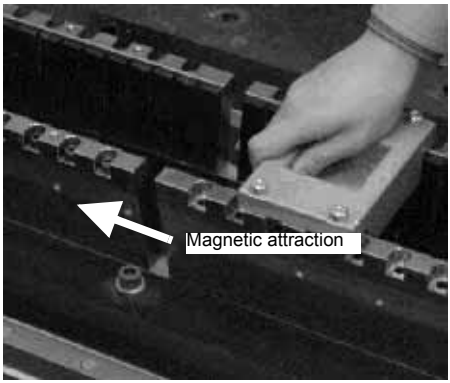
Note: The following conditions apply to these values.
- Machine material: Steel
- Hexagonal socket head bolts (tensile strength Class 10.9)

3. After removing the spacer fixing bolts from the side of the already installed magnetic way yoke, firmly hold the other magnetic way yoke onto the positioning step, while firmly tightening the bolts. Make sure that the magnetic way yokes do not slip into the path of the moving coil.

4. Unscrew the rest of the spacer fixing bolts to remove the spacer. Check where the spacer was fixed to see if there are any mounting holes. If there are, insert bolts into them and tighten the bolts.

5. When joining magnetic ways together, place the second magnetic way temporarily in line with and at least 30 mm apart from the first magnetic way. Next, while pushing the second magnetic way against the first magnetic way, secure it with bolts. Keep fingers clear to prevent them from being jammed between the magnetic ways due to the magnetic attraction pulling the magnetic ways together.

Follow the same procedure as in steps 1 to 4 to install subsequent magnetic ways.



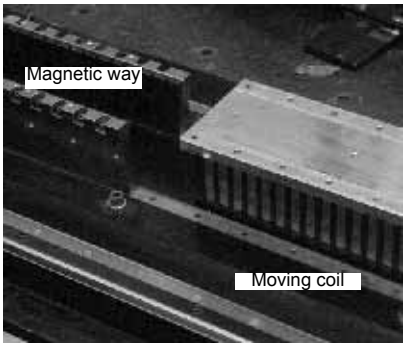
Note: To ensure your safety, install the moving coil before installing second and subsequent magnetic ways. For details, refer to *(2) Moving Coil Installation*.

(2) Moving Coil Installation

The SGLTW moving coil is constructed of an aluminum or steel base and iron core, with a resin-coated coil winding section. Make sure that the coil winding section is not subjected to shock during installation. Shock may damage the moving coil.

Use the following procedure to install the SGLTW moving coil.

1. Install the moving coil on the movable table supported by the linear guide in line with the already installed magnetic way.
Make sure that the air gaps between the moving coil and magnetic way's magnets is the specified distance.

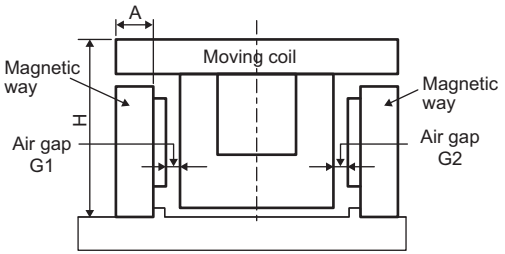


Maintain the following air gaps when installing. Make sure that the moving coil and magnetic way do not interfere with each other during the stroke.

Moving Coil Model SGLTW-	Dimensions in mm		
	H	A	Air gap G1,G2
20A□□□A□	55 ± 0.3	15 ± 0.1	1 ± 0.3 (0.8)*
35A□□□A□	70 ± 0.3		
35A□□□H□	70 ± 0.3	15 ± 0.1	1 ± 0.3 (0.8)*
50A□□□H□	85 ± 0.3	19.1 ± 0.1	

* The value in parentheses is the dimensions when the magnet protection cover is used.

2.2.3 SGLTW and SGLTM Linear Servomotors (T-type Iron Core)

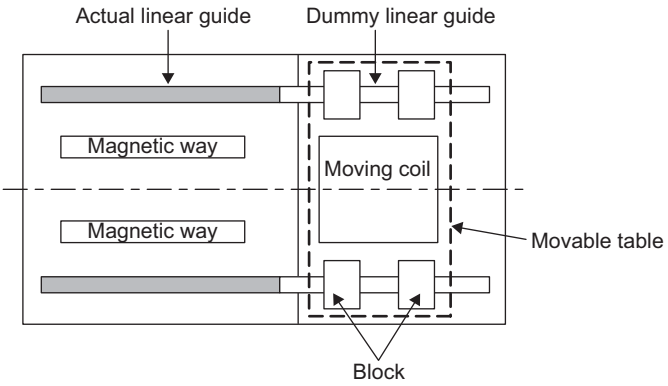


Linear servomotor side view
(Viewed from the side where the cable extends from the coil assembly)

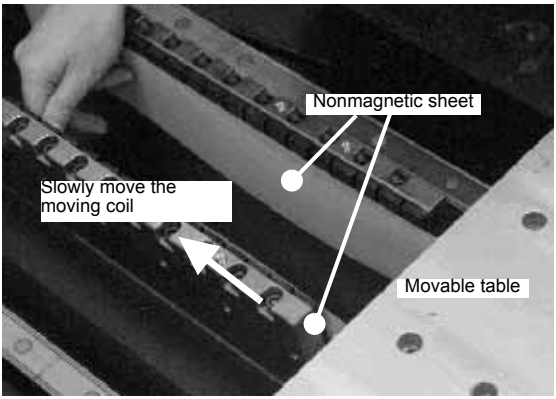
IMPORTANT

When two or more magnetic ways are used, first install one of the magnetic ways, and then install the moving coil in the available space.If using only one magnetic way, and the linear guide is not long enough extend up to the position needed to temporarily place the moving coil in line with the magnetic way, mount a dummy linear guide to the actual linear guide as shown in the figure below.

- Mounting a dummy linear guide



2. Insert a thin nonmagnetic (preferably resin) sheet (approximately 0.5-mm thick) in the air gap between the moving coil and magnetic way. Then, move the moving coil slowly toward the magnetic way.



IMPORTANT

Always be aware of the strong magnetism of the magnetic way and keep fingers and tools at a safe distance, especially when the moving coil is near the magnetic way. The moving coil will be strongly attracted to the magnetic way. When the specified dimensions of the air gaps between the moving coil and the magnetic way are secured, it is not necessary to insert nonmagnetic sheets into the air gaps. (see the table of dimensions in step 1.)

3. Move the moving coil back and forth several times over the magnetic way from end to end, making sure that the moving coil is not touching the magnetic way and that no foreign objects (such as magnetic particles) are present. Use a nonmagnetic (brass or stainless steel) gap gauge to check that the air gap between the moving coil and magnetic way is even (tolerance: ± 0.3 mm).

(3) Magnetic Attraction

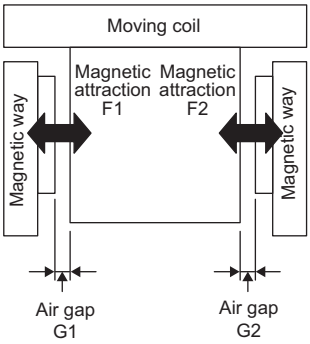
The linear servomotor is constructed of an opposing moving coil and magnetic way. So, the magnetic attraction is offset when the air gaps between the moving coils and the magnetic way are even.

However, achieving an even air gap is difficult due to the accuracy of the linear servomotor itself and the customer's machine, and because of errors in the assembly of the linear servomotor at installation. Consider the magnetic attraction values (calculated values) shown in the following table when designing the system.

Moving Coil Model SGLTW-	Air gap G1*1 in mm	Air gap G2*1 in mm	Magnetic attraction F1*2 (N)	Magnetic attraction F2*2 (N)	Attraction difference ΔF (N)
20A170A□	1.3	0.7	760	1030	270
20A320A□			1510	2040	530
35A170A□	1.3	0.7	1330	1800	470
35A170H□			1330	1800	470
35A320A□			2650	3570	920
50A170H□	1.3	0.7	1900	2600	700

∗1. Indicates an air gap when one side is +0.3 mm and the other side −0.3 mm relative to the design values.

∗2. Indicates the magnetic attraction at maximum force.



2.2.4 SGLC Linear Servomotors (Cylinder Type)

(1) Components

The magnetic way consists of the following parts.

- Pipe (made of stainless steel)
- Magnet in the pipe

Make sure not to get your fingers or other objects caught in the magnetic way because a strong magnetic attraction is generated in the area surrounding the magnetic way.

The moving coil consists of the following parts.

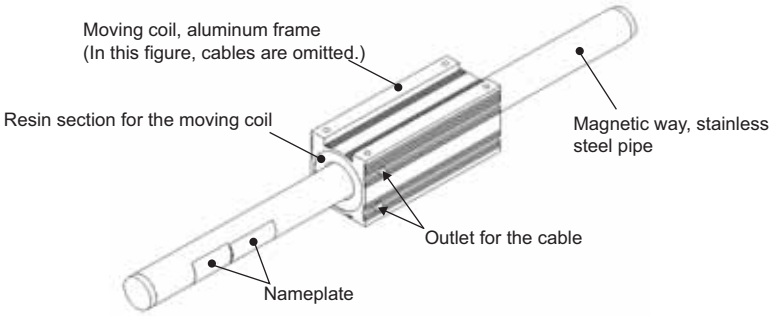
- Outer frame (made of aluminum)
- Resin section for protecting winding
- Cables for motor main circuit or hall sensor

If force is applied to the resin section, injury or damage to the product may result.

(2) State of Delivery

This product is delivered with a resin piece inserted between the moving coil and the magnetic way to protect the winding.

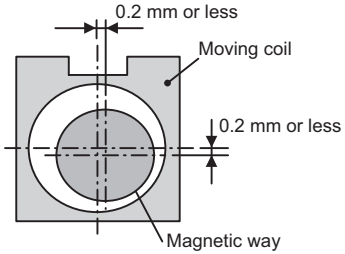
> **IMPORTANT**
>
> For safety reasons, mount the linear servomotors onto a machine with the moving coil attached to the magnetic way of the linear servomotor. If the moving coil must be separated from the magnetic way for any reason, make sure not to get your fingers or other objects caught in the magnetic way. A strong magnetic attraction is generated.



(3) Installation Procedure

1. Install the linear guide and the parts for supporting the magnetic way on the machine side.

- Set the positions of the parts for supporting the magnetic way after checking the outer dimension of the magnetic way referring to *Table 2.1*.
- In most case, the length of the magnetic way is regarded as the side where the nameplate 0.1 mm thick indicating the ratings and a caution about the magnetic attraction.
- Construct the machine so that the difference between the centers of the cross-sectional surfaces of the magnetic way and the moving coil should be within 0.2 mm. Refer to the following diagram.



2. Take the product out of the package with the moving coil and the magnetic way being combined (same as the state when the product is delivered).

3. Insert both ends of the magnetic way in the supporting parts, and fix them with bolts.

- Refer to *Table 2.1 Dimensions of the Magnetic Way (Selected models only)*.

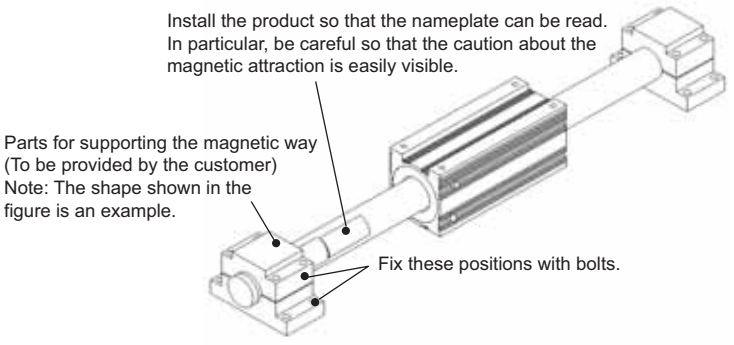
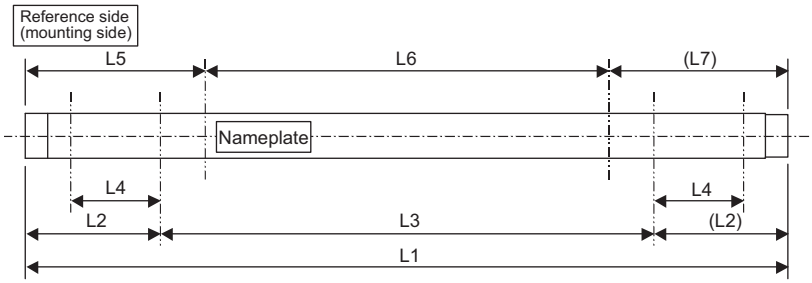


Table 2.1 Dimensions of the Magnetic Way (Selected models only)

Magnetic Way Model SGLCM-	Total Length of Magnetic Way L1 (mm)	Position of Support Section L2 (mm)	Driving Range of Coil Assembly L3 (mm)	Length of Support Section L4 (mm)	Range outside the Guaranteed Force * L5 (mm)	Range within the Guaranteed Force L6 (mm)	Range outside the Guaranteed Force * L7 (mm)
D16300A	300 ± 1.6	30	240	25	37.5 ± 0.3	225 ± 1.2	37.5
D16510A	510 ± 2.5	45	420	40	52.5 ± 0.3	405 ± 2.1	52.5
D16750A	750 ± 3.0	45	660	40	52.5 ± 0.3	645 ± 2.5	52.5
D20350A	350 ± 1.6	35	280	30	45 ± 0.3	260 ± 1.2	45
D20590A	590 ± 2.5	50	490	45	60 ± 0.3	470 ± 2.1	60
D20870A	870 ± 3.0	50	770	45	60 ± 0.3	750 ± 2.5	60
D25450A	450 ± 1.6	45	360	37	57.5 ± 0.3	335 ± 1.2	57.5
D25750A	750 ± 2.5	60	630	52	72.5 ± 0.3	605 ± 2.1	72.5
D251110A	1110 ± 3.0	60	990	52	72.5 ± 0.3	965 ± 2.5	72.5
D32600A	600 ± 1.6	60	480	52	75 ± 0.3	450 ± 1.2	75
D321020A	1020 ± 2.5	90	840	82	105 ± 0.3	810 ± 2.1	105
D321500A	1500 ± 3.0	90	1320	82	105 ± 0.3	1290 ± 2.5	105

*If a part of the moving coil is located within this range, predetermined characteristics cannot be satisfied.



4. After mounting the movable table provided by the customer on the linear guide, transfer the movable table onto the moving coil and secure them with bolts.

- Carefully lay wiring so that no cables are caught, and fix them to the movable table.
- For the recommended tightening torque of the bolts for fixing the moving coil, refer to *Table 2.2 Moving Coil and Recommended Tightening Torque*.

Table 2.2 Moving Coil and Recommended Tightening Torque

Moving Coil Model SGLCW-	Nominal Diameter of Bolts	Tightening torque (N·cm)
D16□□□□□	M3	100
D20□□□□□	M4	220
D25□□□□□	M5	450
D32□□□□□	M6	760

Note: Use hexagon socket head cap screws made of austenite stainless steel (equivalent to the strength class A2-70.)

5. Remove the part made of resin between the moving coil and the magnetic way. Be careful not to get your fingers or other objects caught between the moving coil and the magnetic way because a strong magnetic attraction is generated between them.

6. Perform several full strokes with the movable table, and make sure that the table may not come into contact with the magnetic way. (The size of the gaps is not specified.)

(4) Others

■ Magnetic Attraction between Moving Coil and Magnetic Way

Because the steel yoke is embedded in the moving coil to generate force, magnetic attraction generates between the moving coil and the magnetic way. When the gap between the moving coil and the magnetic way is uniform, the magnetic attraction on the moving coil is offset.

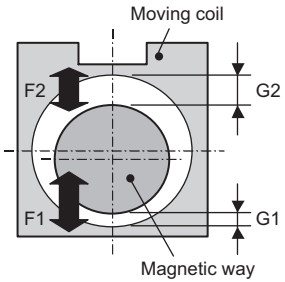
A uniform gap is difficult to obtain, however, because it depends upon the precision of the moving coil and the magnetic way products, deflection of the magnetic way, precision of the equipment of the customer, and assembly error at the time of mounting the motors. In case of non-uniform gap, the attraction shown in *Table 2.3* is generated. When designing the equipment, take into account the attraction.

Table 2.3 Magnetic Attraction (calculated value)

Moving Coil Model SGLCW-	Design Value of Gap (mm)	Gap G1 *1 (mm)	Gap G2*1 (mm)	Difference of Attraction F1-F2*2 (N)
D16A085A□	1.0	0.3	1.7	20
D16A115A□				30
D16A145A□				40
D20A100A□	1.25	0.4	2.1	25
D20A135A□				38
D20A170A□				50
D25A125A□	1.5	0.5	2.5	50
D25A170A□				75
D25A215A□				100
D32A165A□	1.75	0.5	3.0	80
D32A225A□				120
D32A285A□				160

∗1. Indicates the gap of the machine when a dislocation of approximately 70% in comparison to the designed value occurs.
∗2. Indicates the magnetic attraction at the time of maximum force.
Note: For the conditions other than those mentioned above, contact Yaskawa representative separately.

The figure shown on the right is an example in which a non-uniform gap occurs. Actually, magnetic attraction may be generated and extended in all directions because of an assembling error or other reasons.

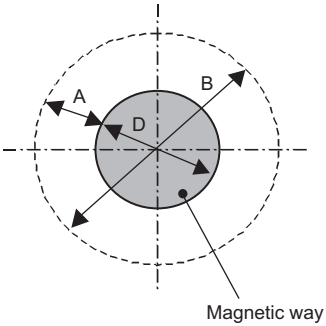


■ Leakage Flux of the Magnetic Way

The following table shows the leakage flux of the magnetic way.

Table 2.4 Leakage Flux

Moving Coil Model SGLCW-	Diameter of Magnetic Way D (mm)	Places Where the Leakage Flux is 10 Gausses or More	
		Distance from the Surface of the Magnetic Way A (mm)	Diameter B (mm)
D16□□□	16	80 or less	176 or less
D20□□□	20	100	220
D25□□□	25	120	265
D32□□□	32	140	312



2.3 Linear Scale Installation and Adjustment

2.3.1 Installation Conditions

The magnetic flux leaked from a linear servomotor may lead to malfunction of the linear scale. To avoid such malfunction, determine the linear scale installation location in such environment that the magnetic field strength on the linear scale mounted surface satisfy the following condition.

For the environmental conditions other than magnetic field, refer to the specifications of the corresponding linear scale.

Manufacturer	Model	External Magnetic Field Strength
Sony Manufacturing Systems Corporation	SR75/77	5 [mT] max.
	SR85/87	
	SL710/PL101	0.5 [mT] max.
Mitutoyo Corporation	ST78□A	3 [mT] max.

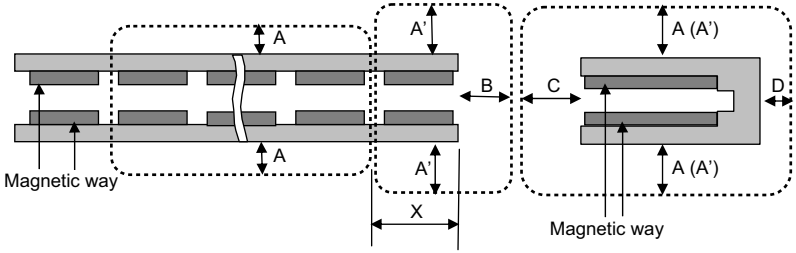
The guideline for installation position of each linear servomotor in relation to the linear scale is shown in the following pages.

When the linear scale mounting material and/or the linear servomotor magnetic way mounting material are magnetic, installing the linear servomotor on the position described on the following pages may not satisfy the condition of magnetic field strength. Use non-magnetic material such as stainless steel and aluminium for the mounting body, or provide magnetic shielding structure such as magnetic separator between the linear servomotor magnetic way and the linear scale, and install the lienar scale on the position described in the following pages.

If your machine configuration does not allow the installation of the lienar servomotor and the lienar scale such way as described on the following pages, measure the magnetic field strength on the position where the linear scale is actually installed, and take a counter measure for the magnetic field strength not to exceed the value specified in the above table.

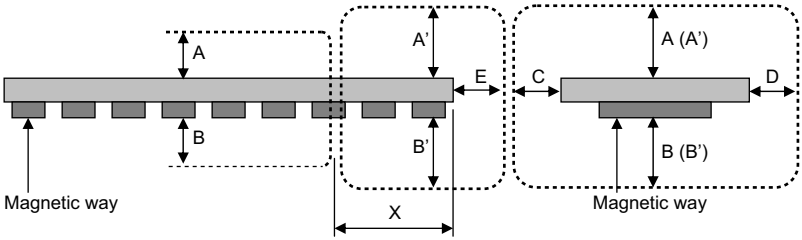
2.3.1 Installation Conditions

(1) SGLGM



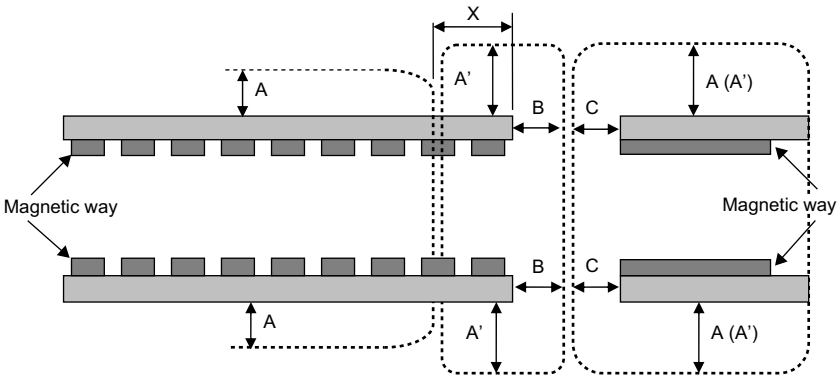
Magnetic Way Model SGLGM-	Distance from Magnetic Way Surface (mm)					
	A	A'	B	C	D	X
90□□□□	10 min.	160 min.	70 min.	70 min.	5 min.	42 min.

(2) SGLFM



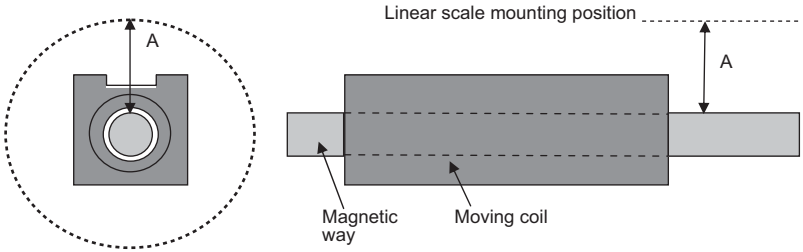
Magnetic Way Model SGLFM-	Distance from Magnetic Way Surface (mm)							
	A	A'	B	B'	C	D	D	X
1Z□□□□	10 min.	10 min.	70 min.	120 min.	20 min.	20 min.	30 min.	22.5 min.

(3) SGLTM



Magnetic Way Model SGLTM-	Distance from Magnetic Way Surface (mm)				
	A	A'	B	C	X
80□□□□	10 min.	10 min.	30 min.	20 min.	22.5 min.

(4) SGLCM



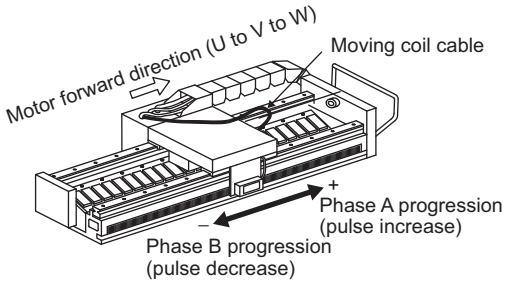
Magnetic Way Model SGLCM-	Distance A from Magnetic Way Surface (mm)
D16A□□□□□	60 min.
D20A□□□□□	70 min.
D25A□□□□□	90 min.
D32A□□□□□	130 min.

2.3.2 Installation

Install the linear scale so that the linear servomotor forward direction and linear scale count up direction are the same.

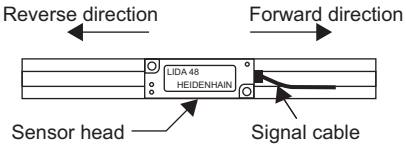
> **IMPORTANT**
>
> If the linear servomotor forward direction and linear scale count up direction do not match and the linear servomotor is run in this state, the linear servomotor may not operate or may overrun.

When using Σ-V series linear servomotors, the linear servomotor forward direction (moving coil's movement direction when current flows through phases U, V, and W, in that order) is toward the side from which the linear servomotor main circuit cable is extended.The analog 1-V p-p voltage input from the incremental linear scale to the serial converter unit is counted during phase A (cos signal) progression.



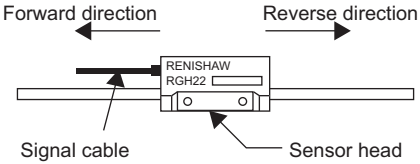
Note: When the direction of the linear servomotor and the direction in which the linear scale counts pulses are reversed because of wiring or other factors, set the parameter Pn080.1=1 (Sets phase B lead as phase sequence of U, V, W).

(1) Heidenhain Linear Scale



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the right.

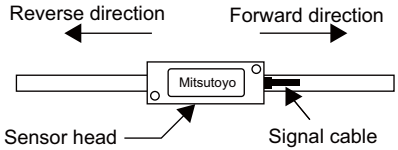
(2) Renishaw Linear Scale



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the left.

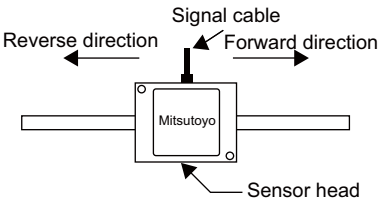
(3) Mitutoyo Linear Scale

■ ST781A□ and ST783A□



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the left.

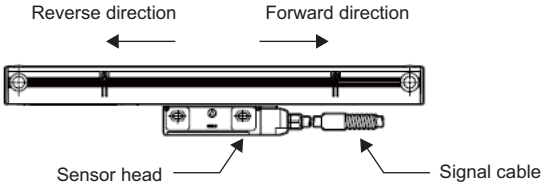
■ ST782A□ and ST784A□



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the right.

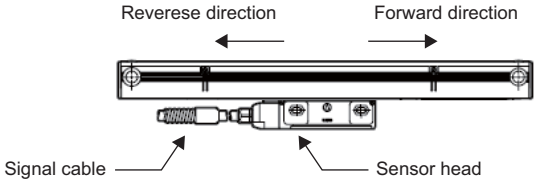
(4) Sony Manufacturing Systems Linear Scale

■ SR75-□□□R, SR85-□□□R, SR77-□□□R, and SR87-□□□R



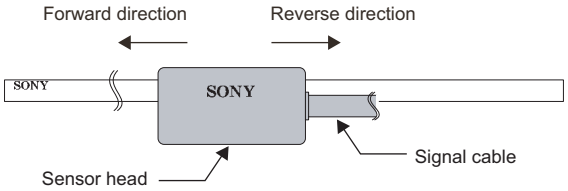
When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the right.

■ SR75-□□□L, SR85-□□□L, SR77-□□□L, and SR87-□□□L



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the right.

■ SL700, SL710, SL720, and SL730



When installed as shown in the diagram on the left, operation is performed in the forward direction when the sensor head is moved to the left.

2.3.3 Adjustment

When the linear scale is an open type, adjust the head installation. For details on the adjustment method, contact the manufacturer of the scales.
When the linear scale is a sealed type, adjustment is not required. However, the dimensional tolerances for installation must be maintained.

2.4 SERVOPACK Installation

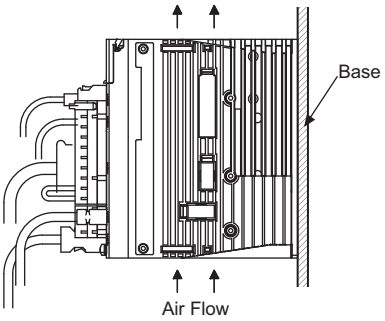
2.4.1 Orientation

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

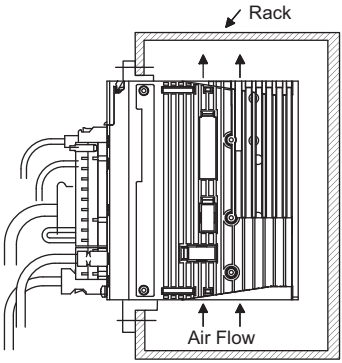
Firmly secure the SERVOPACK to the mounting surface, using either two or four mounting holes depending on the SERVOPACK capacity.

Note: For SERVOPACKs of command option attachable type, installation conditions may differ depending on the attached option module. For details, refer to the user's manual for each option module.

- Base-mounted

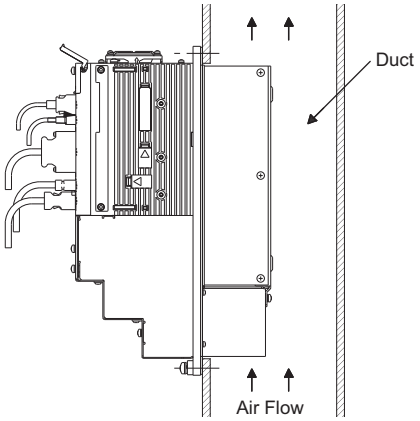


- Rack-mounted



2.4.1 Orientation

- Duct-ventilated



2.4.2 Installation Standards

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

Note: For SERVOPACKs of command option attachable type, installation conditions may differ depending on the attached option module. For details, refer to the user's manual for each option module.

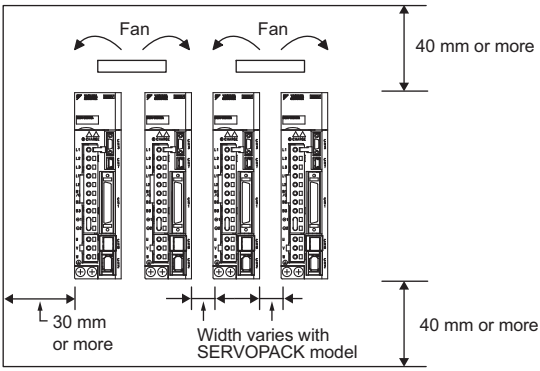
- SERVOPACK Mounting Orientation

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

- Cooling

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

- Mounting SERVOPACKs Side by Side in a Control Panel



Leave sufficient space on each side and at the top and the bottom of each SERVOPACK. The width on each side varies in accordance with the models of the SERVOPACKS used.

SERVOPACK Model SGDV-	Side		Top and bottom
	Left	Right	
R70F, R90F, 2R1F, R70A, R90A, 1R6A, 2R8A	1 mm or more		40 mm or more
2R8F, 3R8A, 5R5A, 7R6A	1 mm or more	10 mm or more	
120A, 180A, 200A, 330A, 550A, 1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D, 260D	10 mm or more		

Also install cooling fans above the SERVOPACKs to disperse local pockets of warmer air around the SERVOPACKs.

- Inside the Control Panel

The conditions inside the control panel should be the same as the environmental conditions of the SERVOPACK. Refer to *2.1.2 SERVOPACK Installation Environment*.

2.5 EMC Installation Conditions

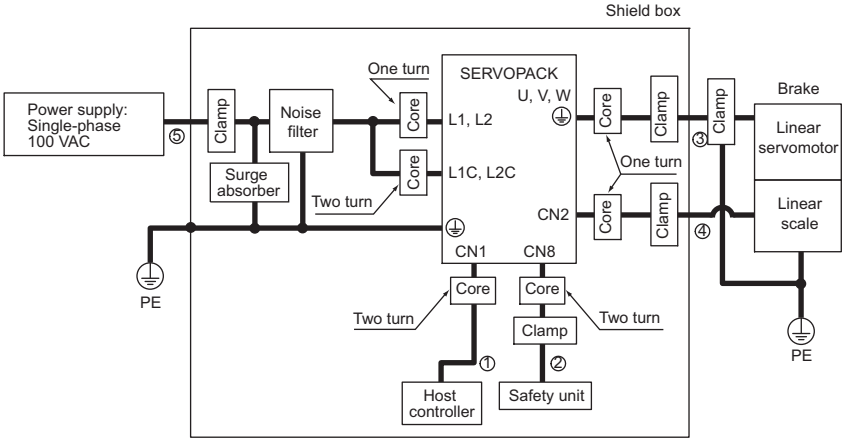
This section describes the recommended installation conditions that satisfy EMC guidelines for each model of the SGDV SERVOPACK. The conditions required for the standard type (base-mounted) of SERVOPACK are described. Refer to this section for other SERVOPACK models such as the rack-mounted types as 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. However, because this product is built-in, check that the following conditions are still met after being installed in the user's product.

The applicable standards are EN55011/A2 group 1 class A, EN61800-3, and EN61000-6-2.

2.5.1 SGDV-□□□□05A (Analog Pulse Model)

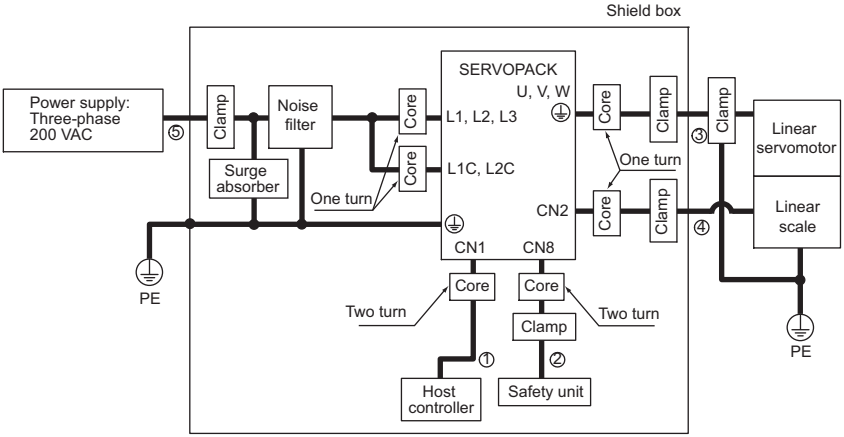
■ Single-phase 100 V, SGDV-□□□F05A (□□□ = R70, R90, 2R1, 2R8)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable

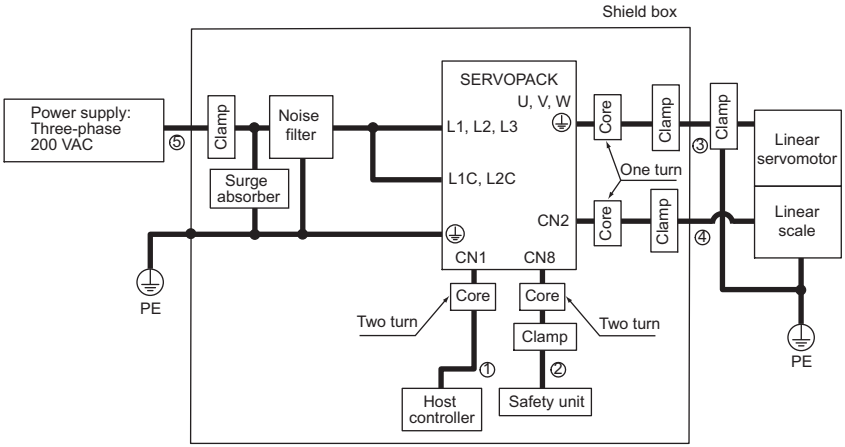
2.5.1 SGDV-□□□□05A (Analog Pulse Model)

■ Three-phase 200 V, SGDV-□□□A05A (□□□ = R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable

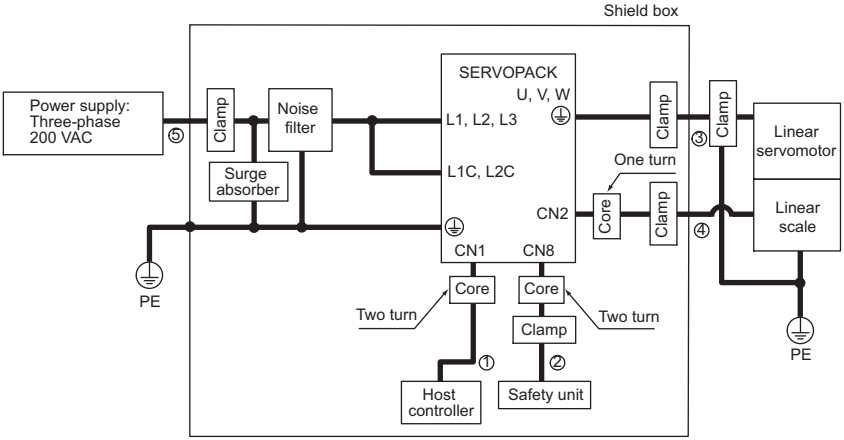
■ Three-phase 200 V, SGDV-120A05A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable

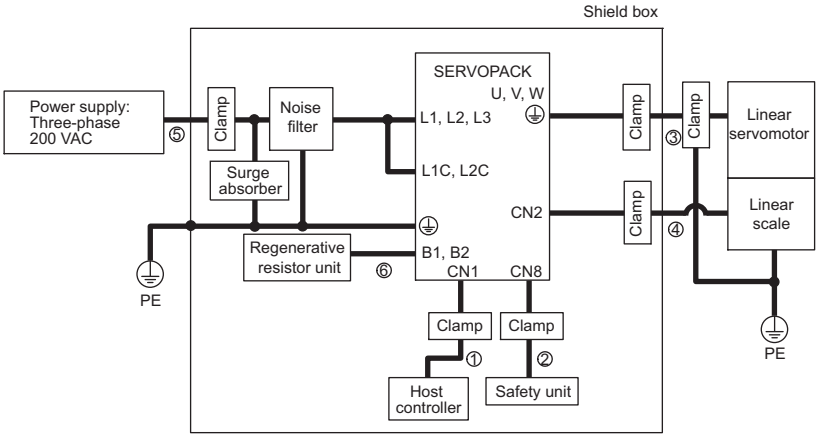
2.5.1 SGDV-□□□□05A (Analog Pulse Model)

■ Three-phase 200 V, SGDV-□□□A05A (□□□ = 180, 200, 330)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable

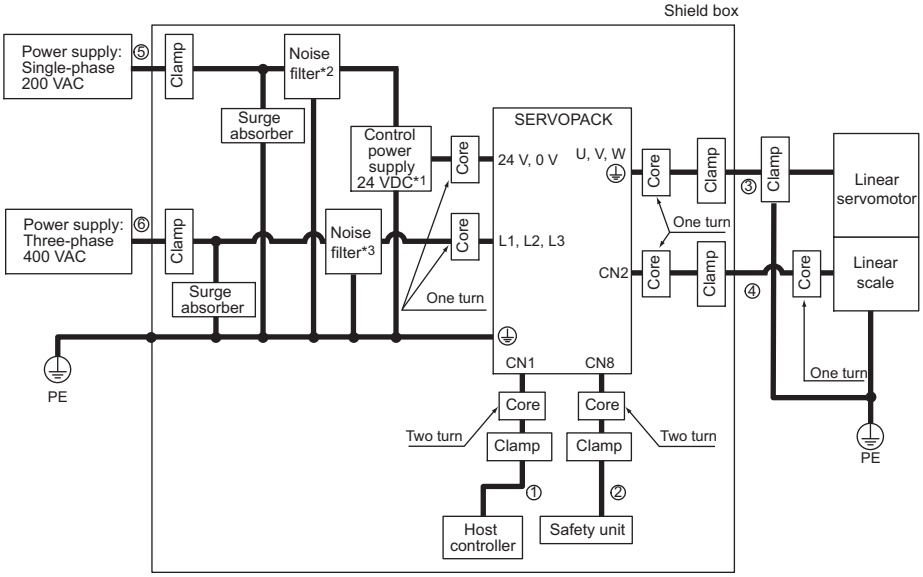
■ Three-phase 200 V, SGDV-550A05A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Regenerative resistor unit cable	Non-shield cable

2.5.1 SGDV-□□□□05A (Analog Pulse Model)

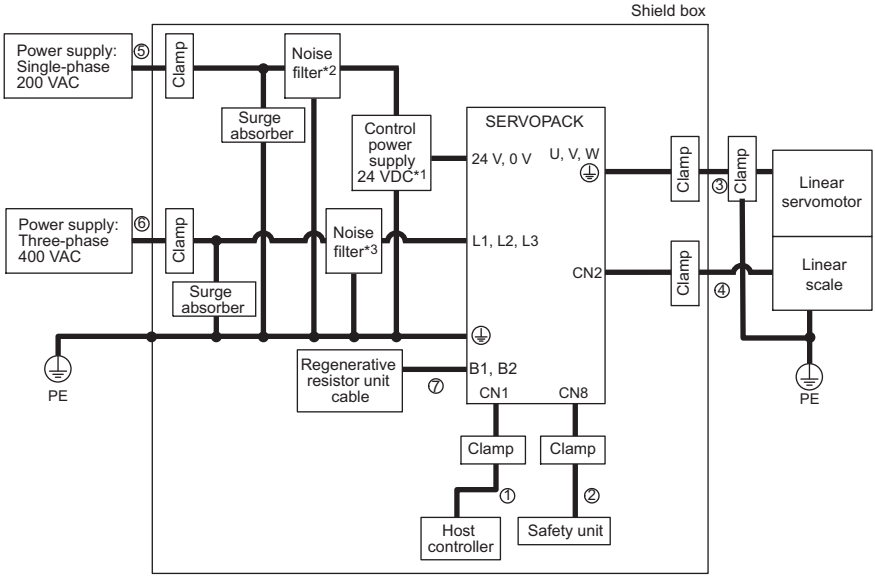
■ Three-phase 400 V, SGDV-□□□D05A (□□□ = 1R9, 3R5, 5R4, 8R4, 120, 170)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable

∗1. Products that have received CE marking are recommended for the 24 VDC power supply.
∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)
∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

■ Three-phase 400 V, SGDV-260D05A

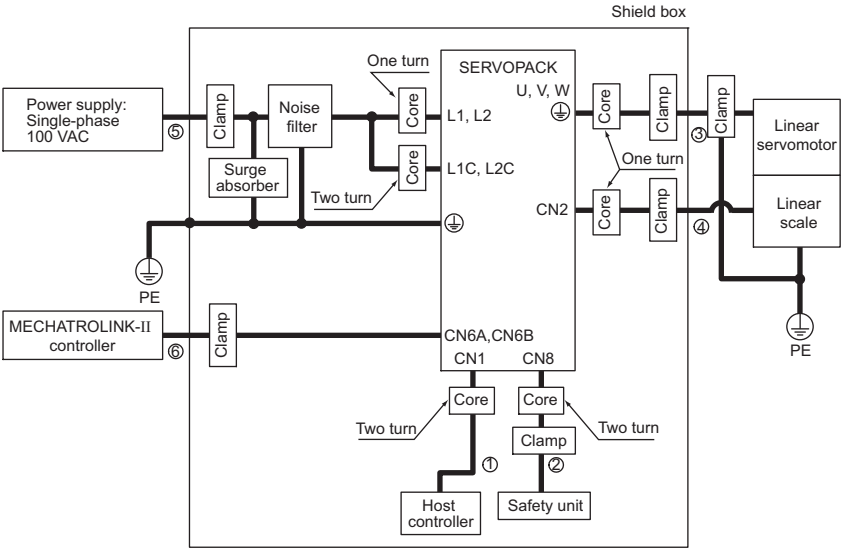


Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Regenerative resistor unit cable	Non-shield cable

∗1. Products that have received CE marking are recommended for the 24 VDC power supply.
∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)
∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

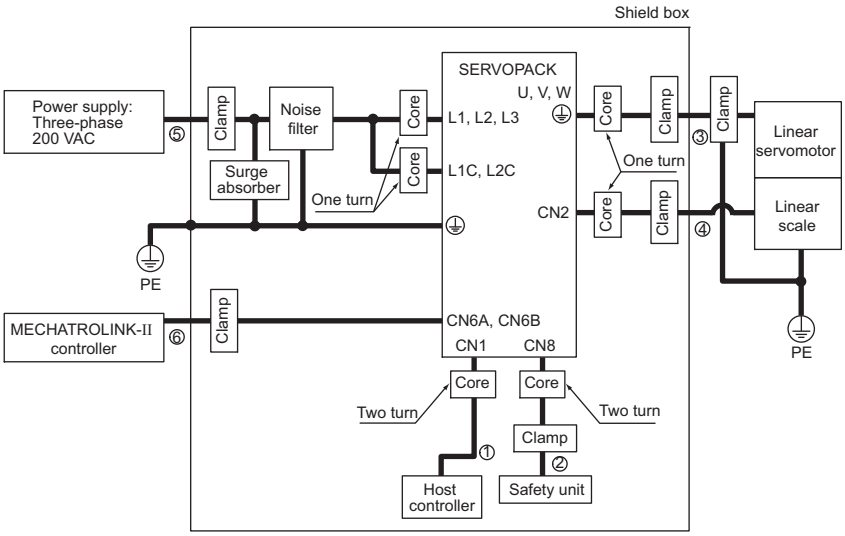
2.5.2 SGDV-□□□□15A (M-II Model)

■ Single-phase 100 V, SGDV-□□□F15A (□□□ = R70, R90, 2R1, 2R8)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-II communication cable	Shield cable

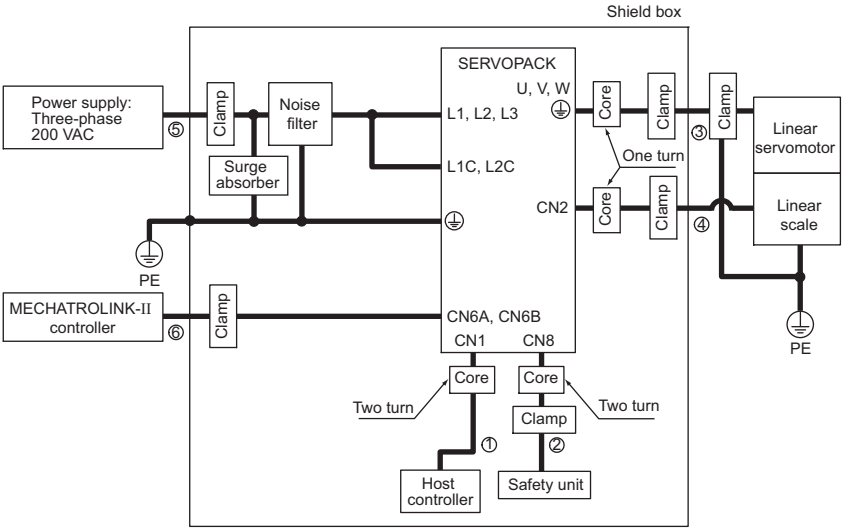
■ Three-phase 200 V, SGDV-□□□A15A (□□□ = R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-II communication cable	Shield cable

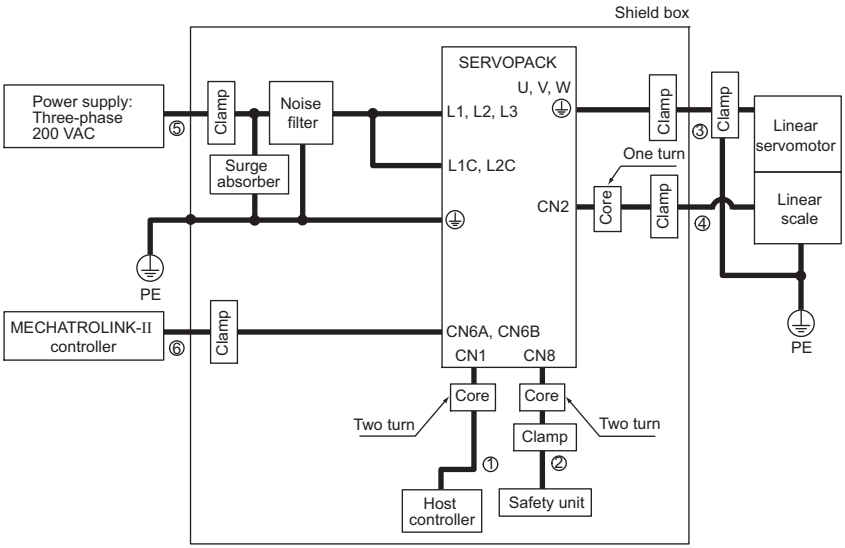
2.5.2 SGDV-□□□□15A (M-II Model)

■ Three-phase 200 V, SGDV-120A15A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-II communication cable	Shield cable

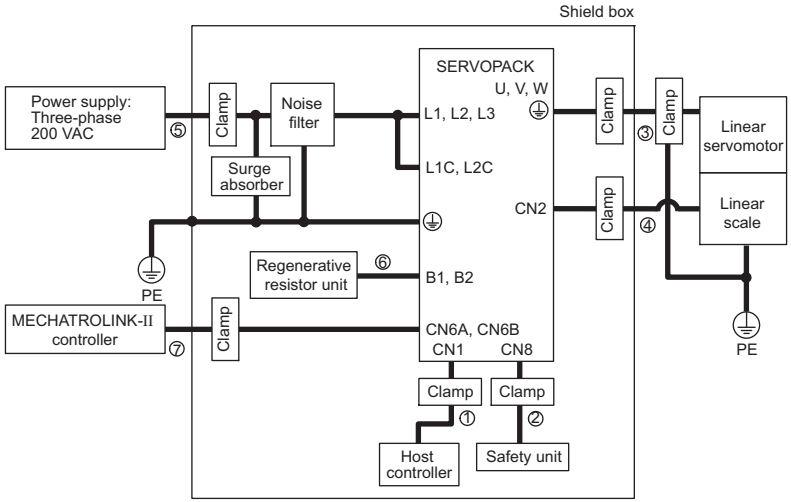
■ Three-phase 200 V, SGDV-□□□A15A (□□□ = 180, 200, 330)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-II communication cable	Shield cable

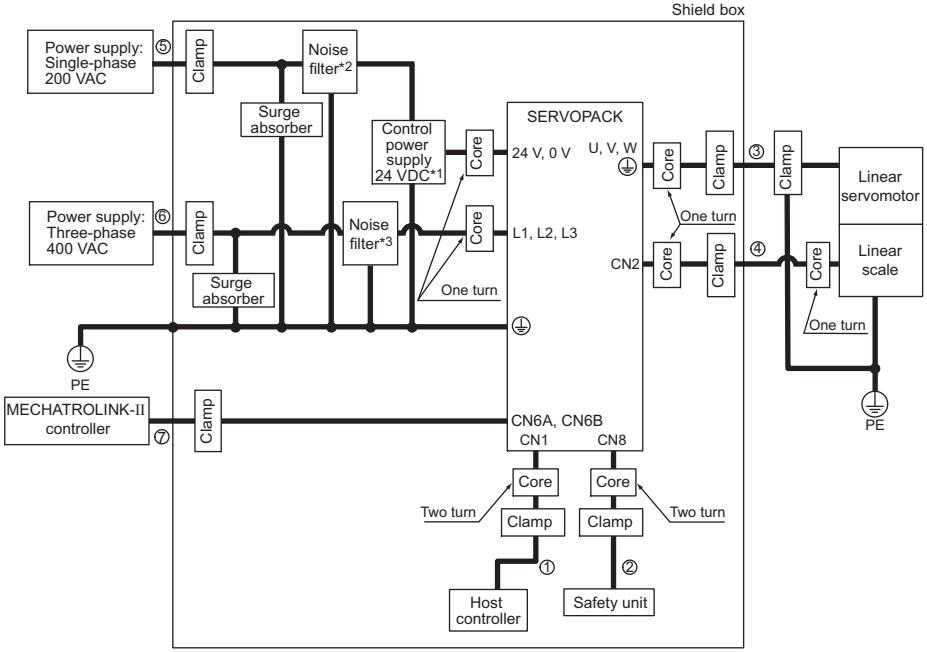
2.5.2 SGDV-□□□□15A (M-II Model)

■ Three-phase 200 V, SGDV-550A15A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Regenerative resistor unit cable	Non-shield cable
⑦	MECHATROLINK-II communication cable	Shield cable

■ Three-phase 400 V, SGDV-□□□D15A (□□□ = 1R9, 3R5, 5R4, 8R4, 120, 170)

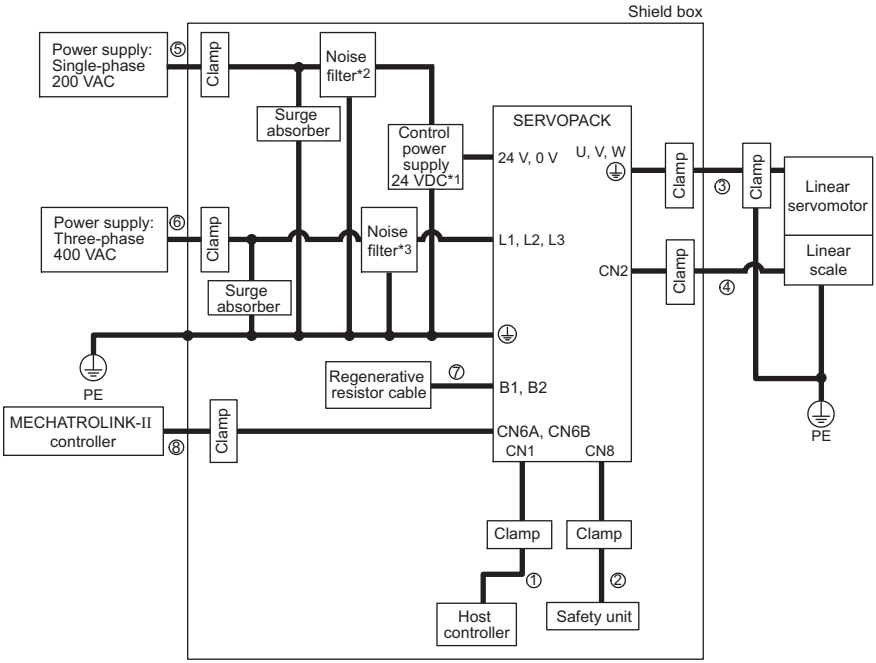


Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	MECHATROLINK-II communication cable	Shield cable

∗1. Products that have received CE marking are recommended for the 24 VDC power supply.
∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)
∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

2.5.2 SGDV-□□□□15A (M-II Model)

■ Three-phase 400 V, SGDV-260D15A

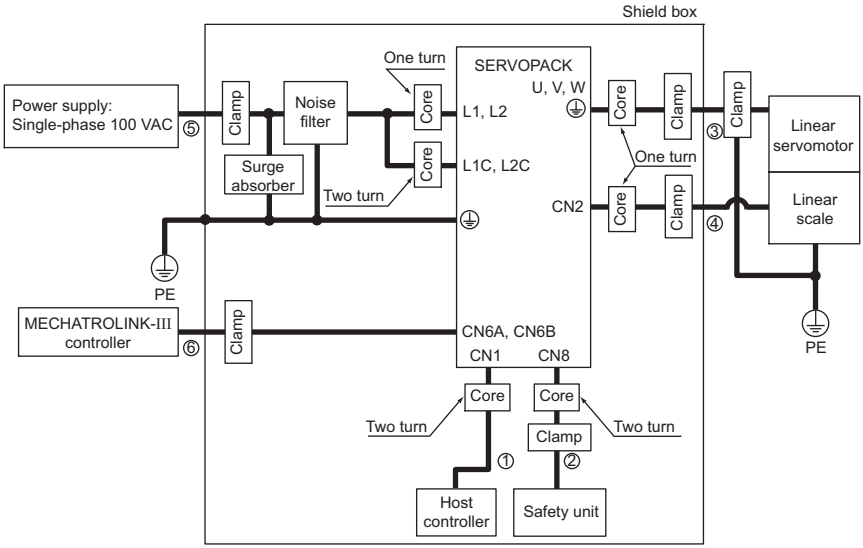


Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Regenerative resistor unit cable	Non-shield cable
⑧	MECHATROLINK-II communication cable	Shield cable

∗1. Products that have received CE marking are recommended for the 24 VDC power supply.
∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)
∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

2.5.3 SGDV-□□□□25A (M-III Model)

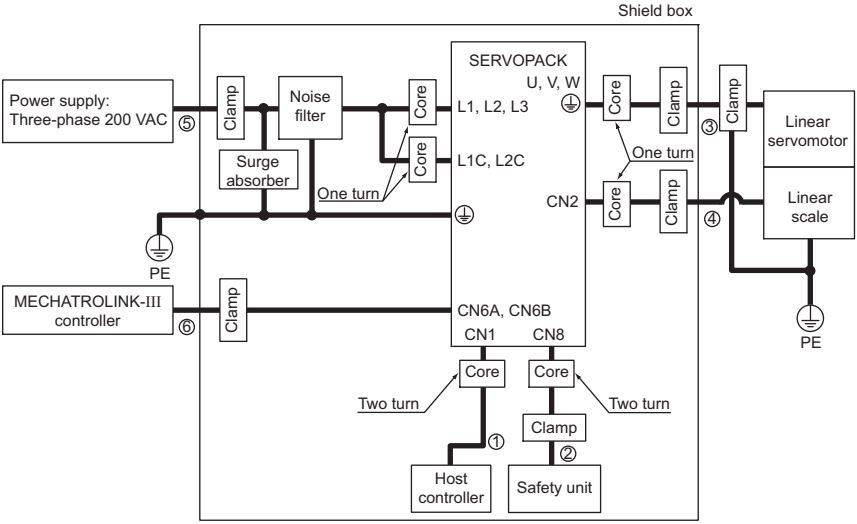
■ Single-phase 100 V, SGDV-□□□F25A (□□□ = R70, R90, 2R1, 2R8)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-III communication cable	Shield cable

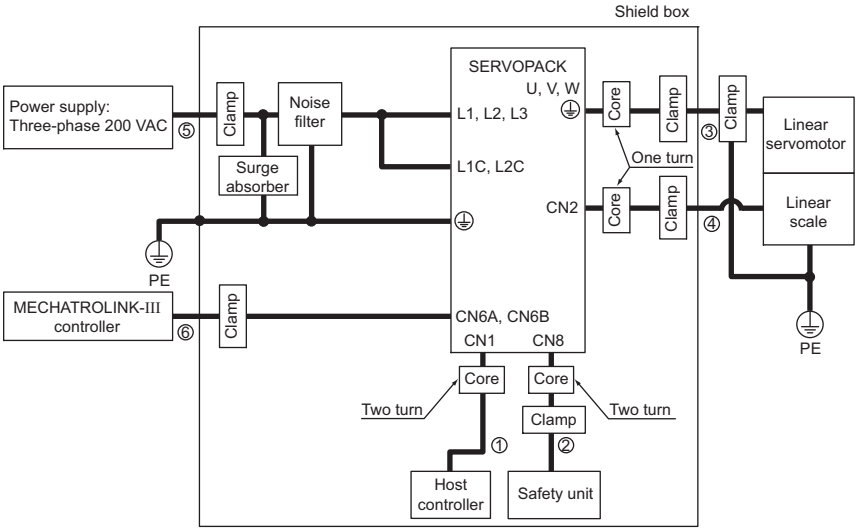
2.5.3 SGDV-□□□□25A (M-III Model)

■ Three-phase 200 V, SGDV-□□□A25A (□□□ =R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-III communication cable	Shield cable

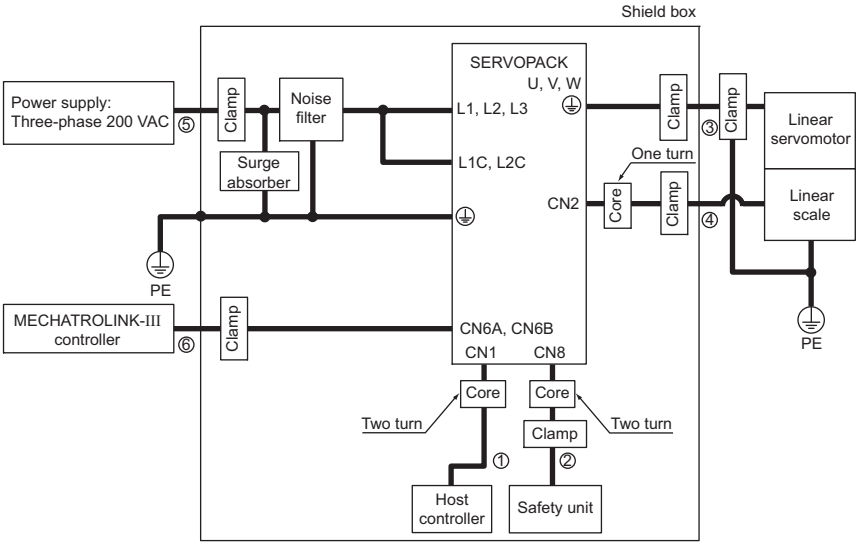
■ Three-phase 200 V, SGDV-120A25A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-III communication cable	Shield cable

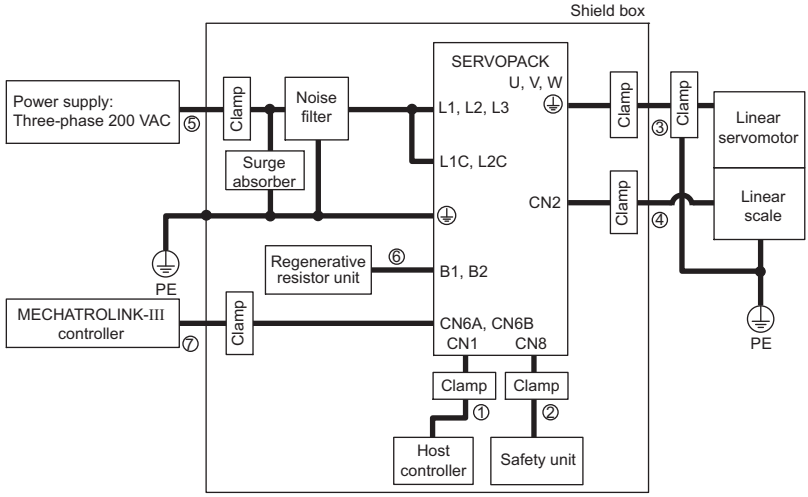
2.5.3 SGDV-□□□□25A (M-III Model)

■ Three-phase 200 V, SGDV-□□□A25A (□□□ = 180, 200, 330)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	MECHATROLINK-III communication cable	Shield cable

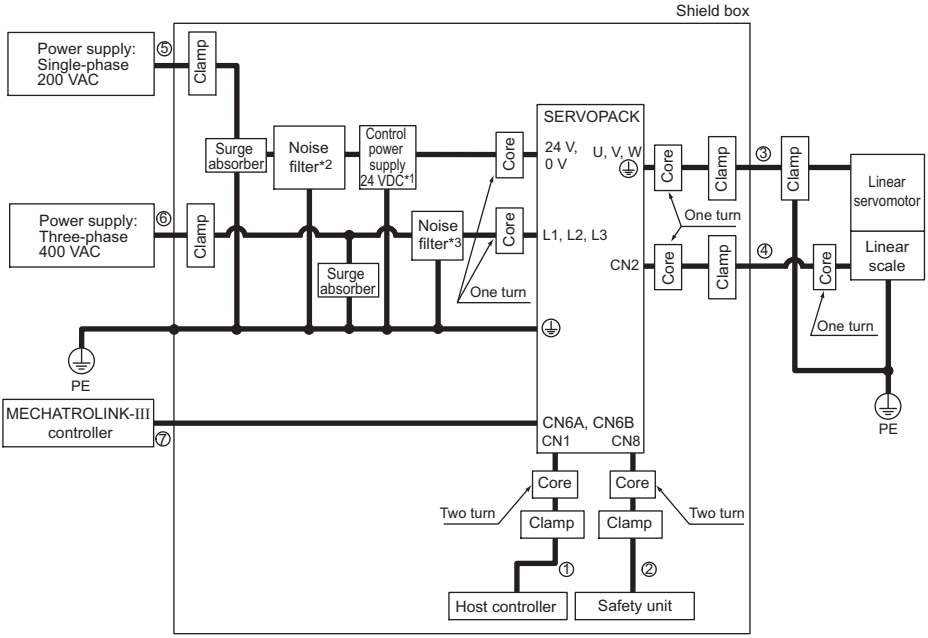
■ Three-phase 200 V, SGDV-550A25A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Regenerative resistor unit cable	Non-shield cable
⑦	MECHATROLINK-III communication cable	Shield cable

2.5.3 SGDV-□□□□25A (M-III Model)

■ Three-phase 400 V, SGDV-□□□D25A (□□□ = 1R9, 3R5, 5R4, 8R4, 120, 170)



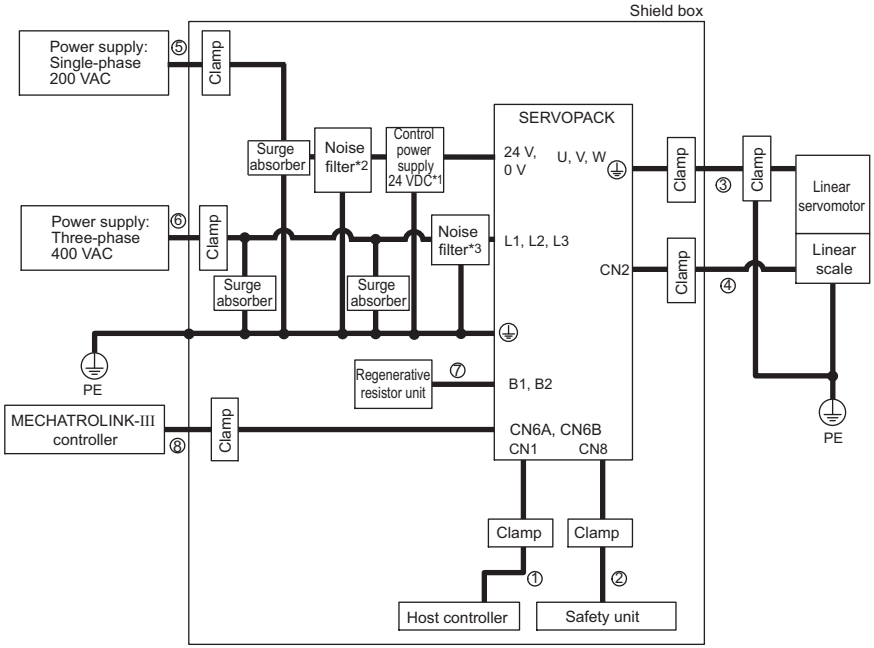
Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	MECHATROLINK-III communication cable	Shield cable

∗1. Products that have received CE marking are recommended for the 24 VDC power supply.

∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)

∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

■ Three-phase 400 V, SGDV-260D25A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Cable for safety unit	Shield cable
③	Linear servomotor main circuit cable	Shield cable
④	Linear scale connection cables	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Regenerative resistor unit cable	Non-shield cable
⑧	MECHATROLINK-III communication cable	Shield cable

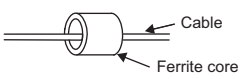
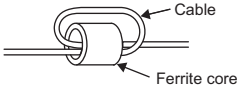
∗1. Products that have received CE marking are recommended for the 24 VDC power supply.
∗2. Install the following noise filter on the power line between the single-phase 200 V power supply and the 24 VDC power supply.
Model number: FN2070-6/07 (SCHAFFNER)
∗3. For more information on this filter, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

2.5.4 SGDV-□□□□E5A (Command Option Attachable Type)

For SERVOPACKs of command option attachable type, EMC installation conditions may differ depending on the attached option module. For details, refer to the user's manual for each option module.

2.5.5 Other Precautions

(1) Attachment Methods of Ferrite Cores

One turn	Two turn
	

(2) Recommended Ferrite Core

Cable Name	Ferrite Core Model	Manufacturer
Linear servomotor main circuit cable	ESD-SR-250	NEC TOKIN Corp.

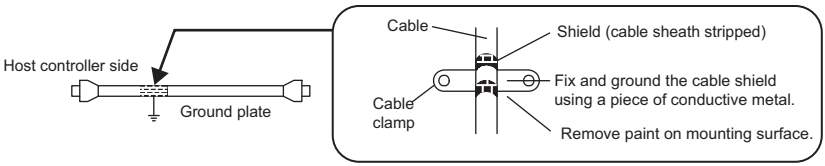
(3) Recommended Noise Filter and Surge Absorber

For more information on recommended noise filters and surge absorbers, refer to *Σ-V Series Product Catalog*. (KAEP S800000 42)

(4) Fixing the Cable

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

- Example of Cable Clamp



(5) Shield Box

A shield box, which is a closed metallic enclosure, is effective as reinforced shielding against electromagnetic interference (EMI) from SERVOPACKs. 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.

Note: 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.

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3

Wiring and Connection

This chapter describes how to set up the wiring and connections required for trial operation.
For more information on the wiring and connection, refer to the following manuals.

- Σ-V Series User's Manual Design and Maintenance Linear Motor/ Analog Voltage and Pulse Train Reference (SIEP S800000 47)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/ MECHATROLINK-II Communications Reference (SIEP S800000 48)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/ MECHATROLINK-III Communications Reference (SIEP S800000 65)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/ Command Option Attachable Type (SIEP S800000 66)

3.1 Precautions for Wiring 3-3

3.2 System Configuration Diagram 3-4
- 3.2.1 Connecting to SGDV-□□□□05A SERVOPACK (Analog Pulse Model) 3-4
- 3.2.2 Connecting to SGDV-□□□□15A SERVOPACK (M-II Model) 3-8
- 3.2.3 Connecting to SGDV-□□□□25A SERVOPACK (M-III Model) 3-12
- 3.2.4 Connecting to SGDV-□□□□E5A SERVOPACK (Command Option Attachable Type) 3-16

3.3 Main Circuit Wiring 3-20
- 3.3.1 Main Circuit Terminals 3-20
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3.1 Precautions for Wiring

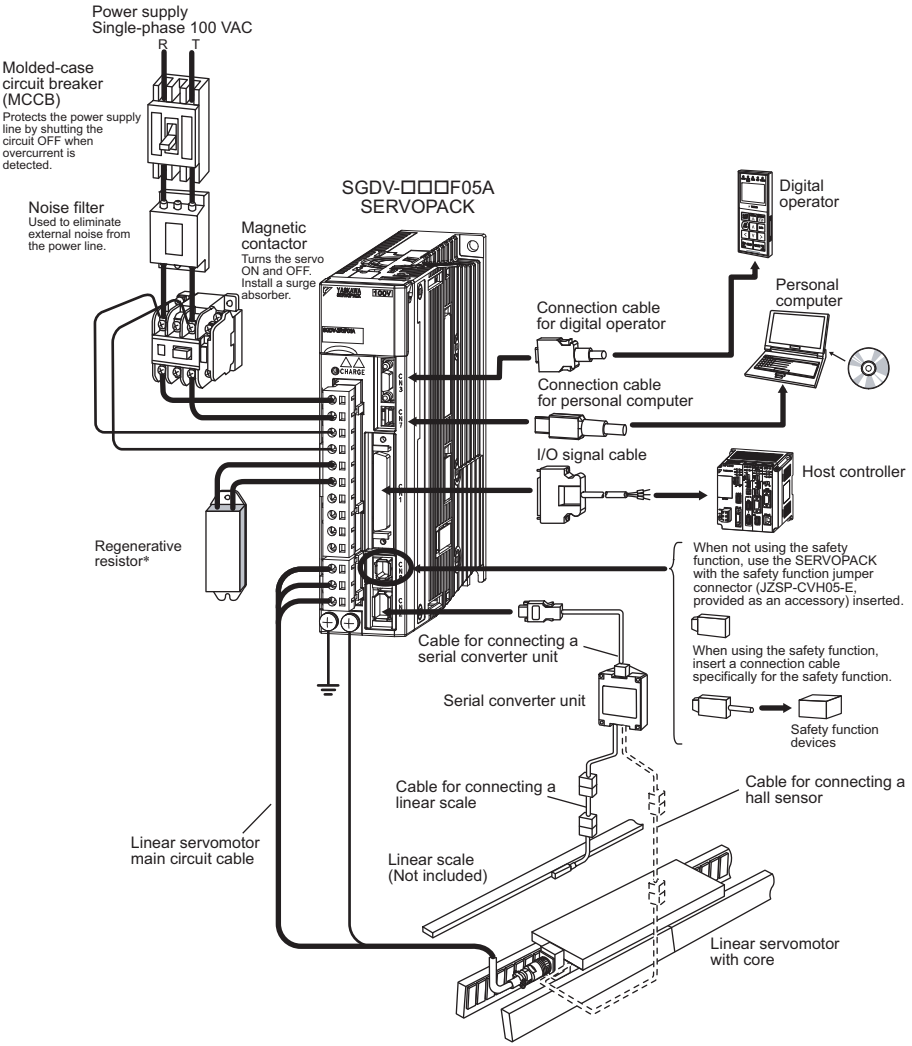
⚠ CAUTION

- Be sure to wire correctly and securely.
  Failure to observe this caution may result in motor overrun, injury, or malfunction.
- Do not bundle or run the main circuit cables together with the I/O signal cables or the linear scale connection 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 I/O signal cables and the linear scale connection cables.
- The maximum cable length is 3 m for the I/O signals, 20 m for the linear servomotor main circuit, 20 m for serial converter unit, 15 m for the linear scale, 15 m for the hall sensor, and 10 m for control power supply cables for the SERVOPACK with a 400-V power supply (+24 V, 0V).
- Do not touch the power terminals while the charge indicator is ON after turning power OFF because high voltage may still remain in the SERVOPACK.
  Make sure the charge indicator is off first before starting wiring and inspection.
- Leakage current may increase depending on the type of noise filter and the grounding conditions.
  When using a detector or a breaker for leakage current, select the appropriate one by considering the type of noise filter and the grounding conditions.
  For details, contact the manufacturer of the noise filter.
- Incorrect wiring or incorrect voltage application to the output circuit may cause short-circuit.
  The above failures will prevent the holding brake from working, which may damage the machine or cause an accident resulting in death or injury.
- Inverting the polarity of the brake signal (/BK), i.e. positive logic, will prevent the holding brake from working in case of its signal line disconnection.
  If this setting is absolutely necessary, check the operation and confirm that there are no safety problems.

3.2 System Configuration Diagram

3.2.1 Connecting to SGDV-□□□□05A SERVOPACK (Analog Pulse Model)

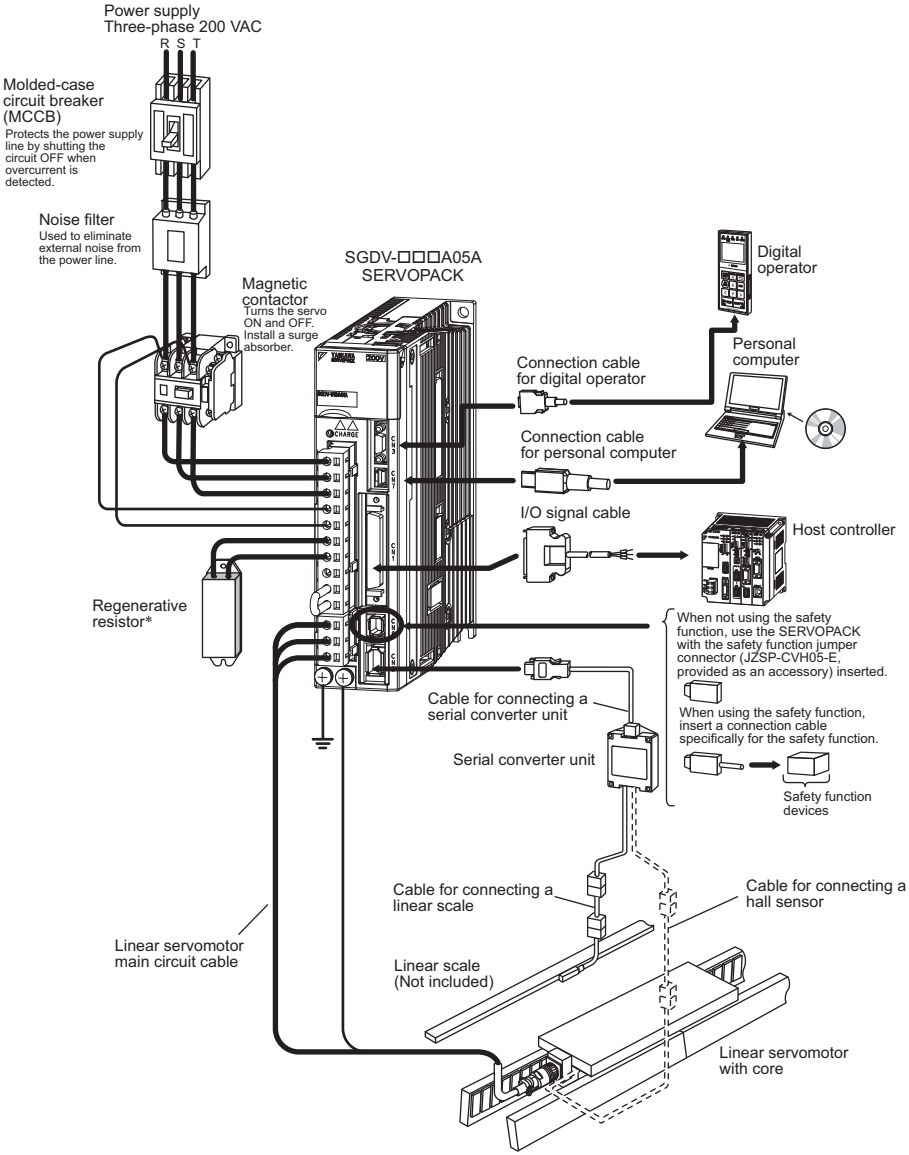
(1) SGDV-□□□F05A



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(2) SGDV-□□□A05A SERVOPACK

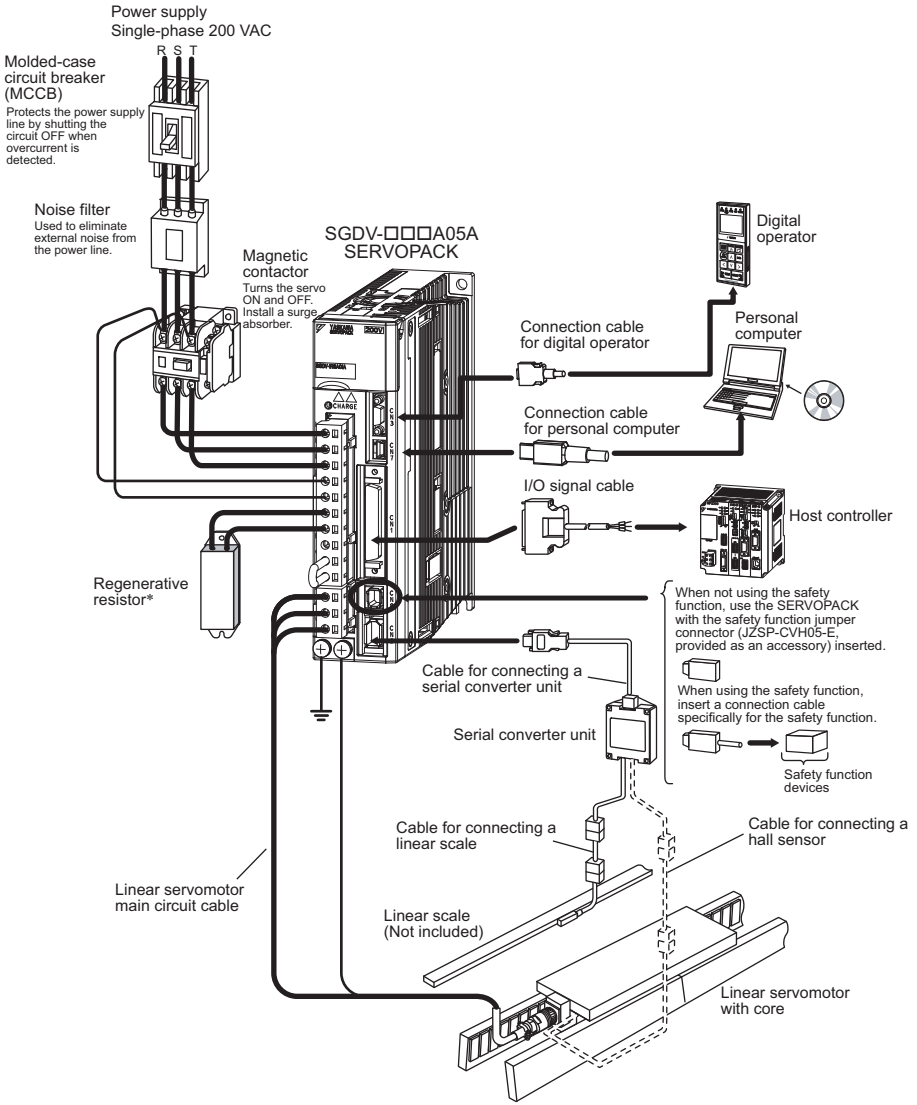
■ Using a Three-phase, 200-V Power Supply



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

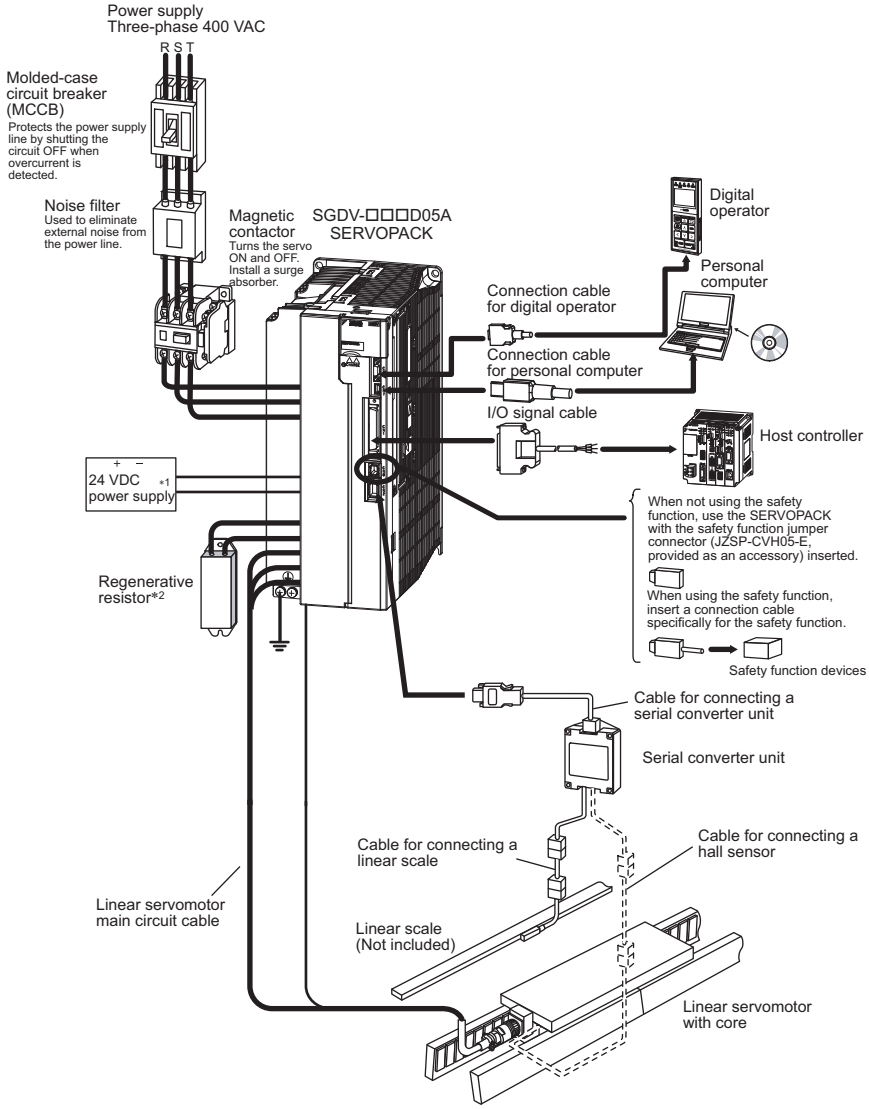
■ Using a Single-phase, 200-V Power Supply

The Σ-V Series SERVOPACK for a 200-V power supply input has input specifications for a three-phase power supply, but some models can also be used with a single-phase 200-V power supply. For details, refer to *Σ-V Series User's Manual Design and Maintenance Linear Motor/Analog Voltage and Pulse Train Reference* (SIEP S800000 47).



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(3) SGDV-□□□D05A

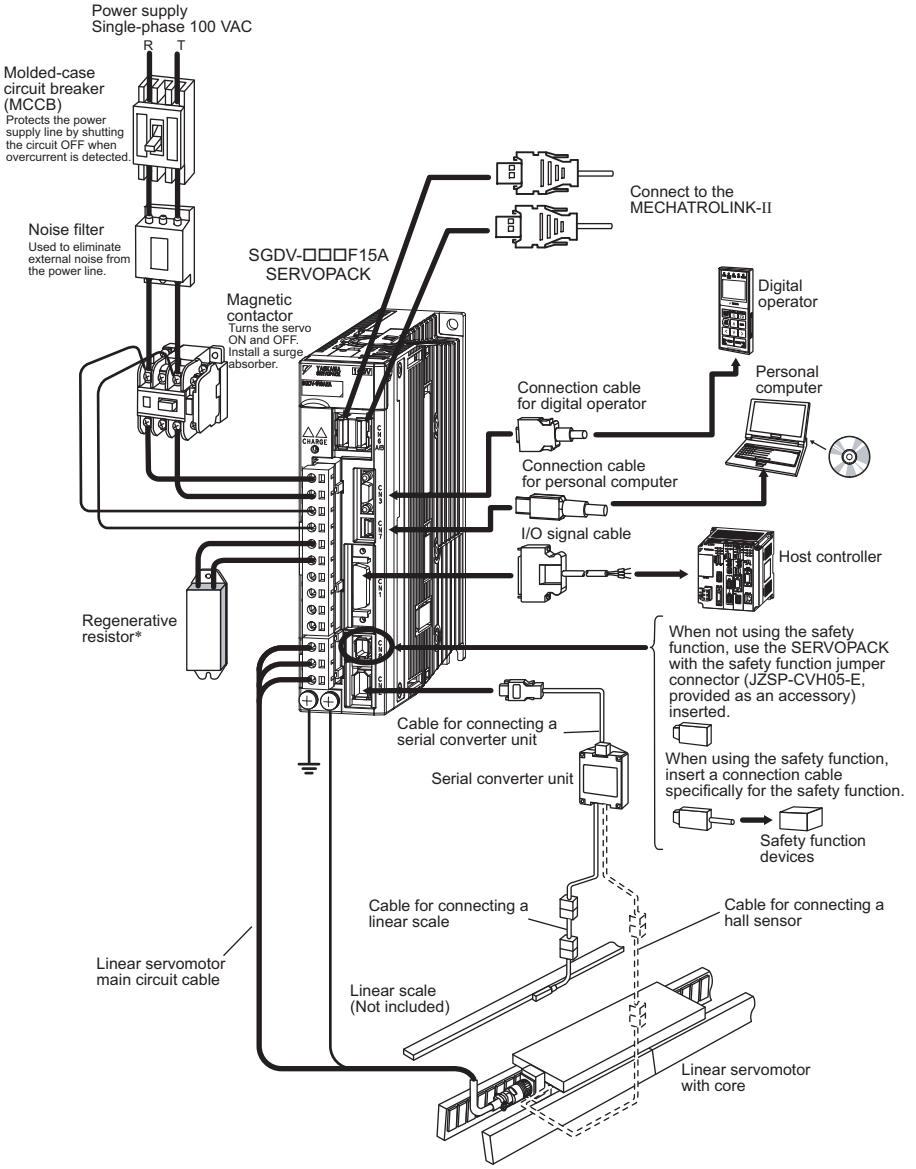


∗1. Use a 24 VDC power supply with double insulation or reinforced insulation. (The power supply is not included)

∗2. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

3.2.2 Connecting to SGDV-□□□□15A SERVOPACK (M-II Model)

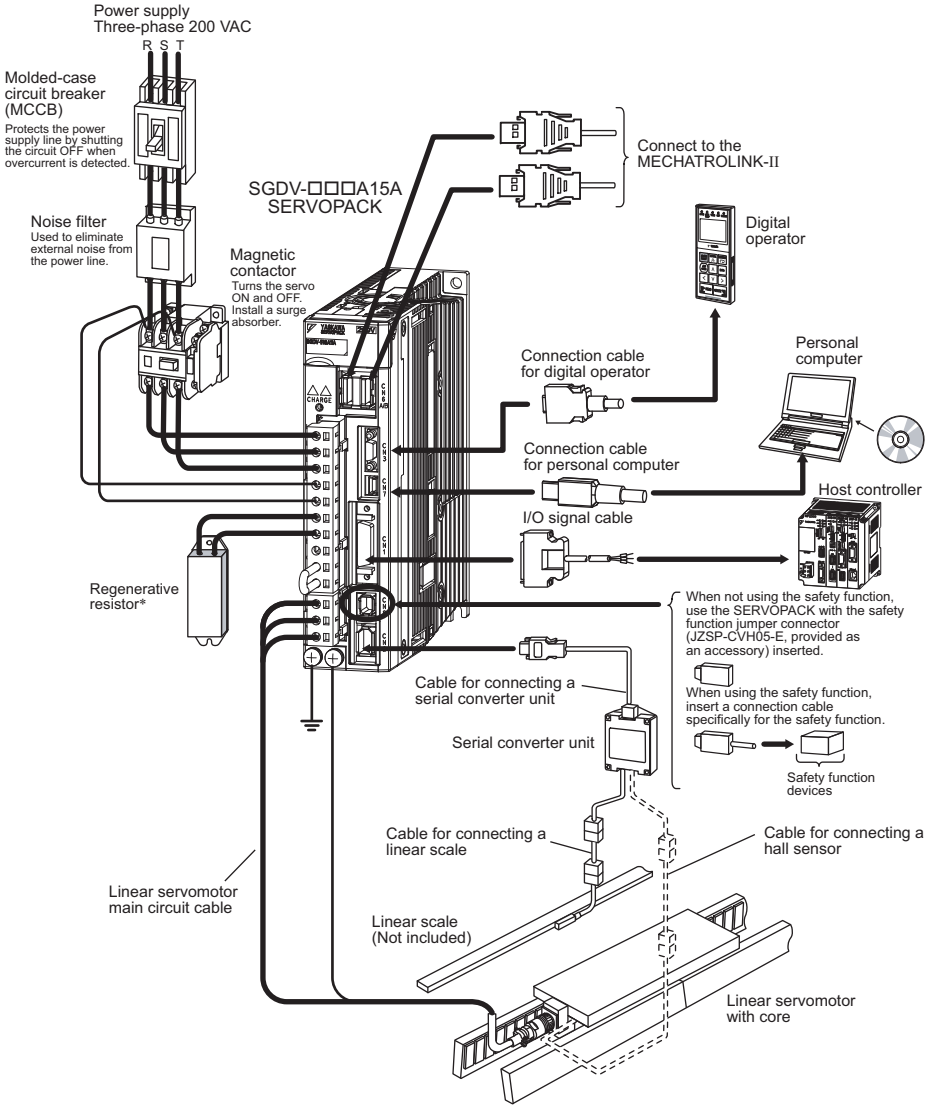
(1) SGDV-□□□F15A



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(2) SGDV-□□□A15A

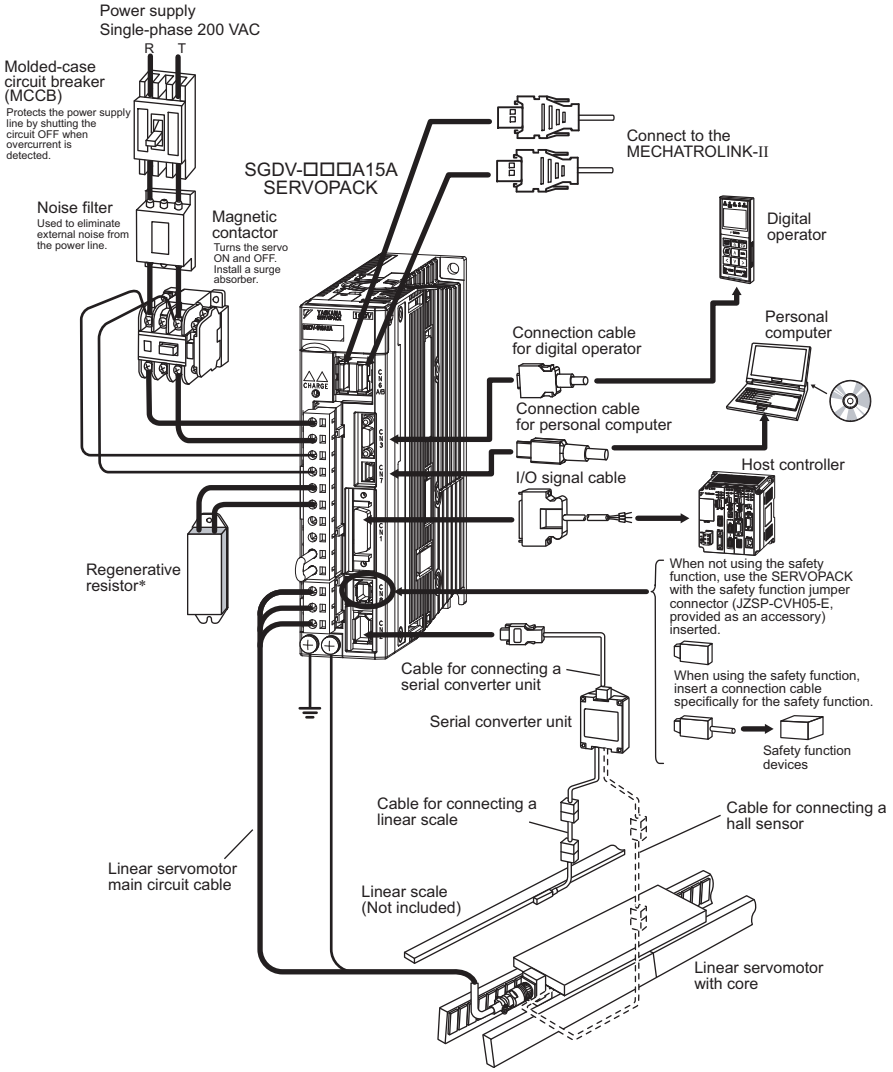
■ Using a Three-phase, 200-V Power Supply



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

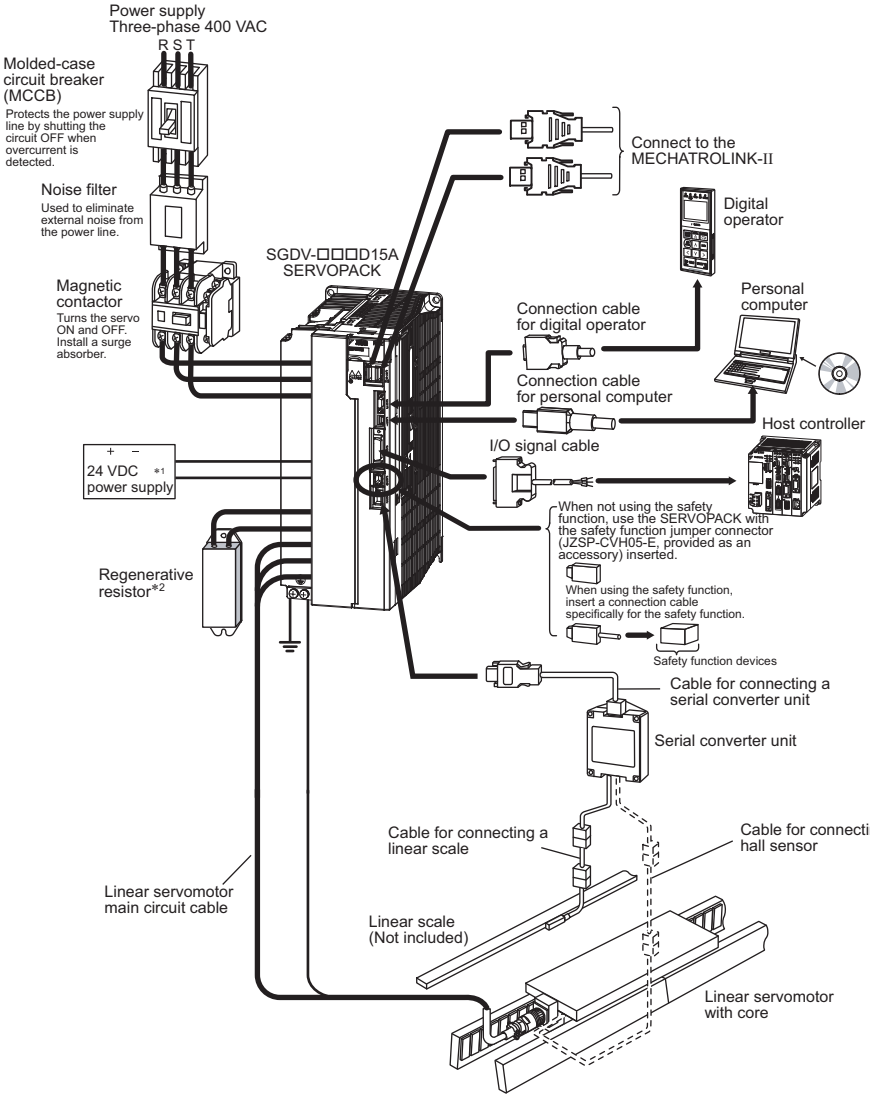
■ Using a Single-phase, 200-V Power Supply

The Σ-V Series SERVOPACK for a 200-V power supply input has input specifications for a three-phase power supply, but some models can also be used with a single-phase 200-V power supply. For details, refer to *Σ-V Series User's Manual Design and Maintenance Linear Motor/MECHATROLINK-II Communications Reference* (SIEP S800000 48).



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(3) SGDV-□□□D15A

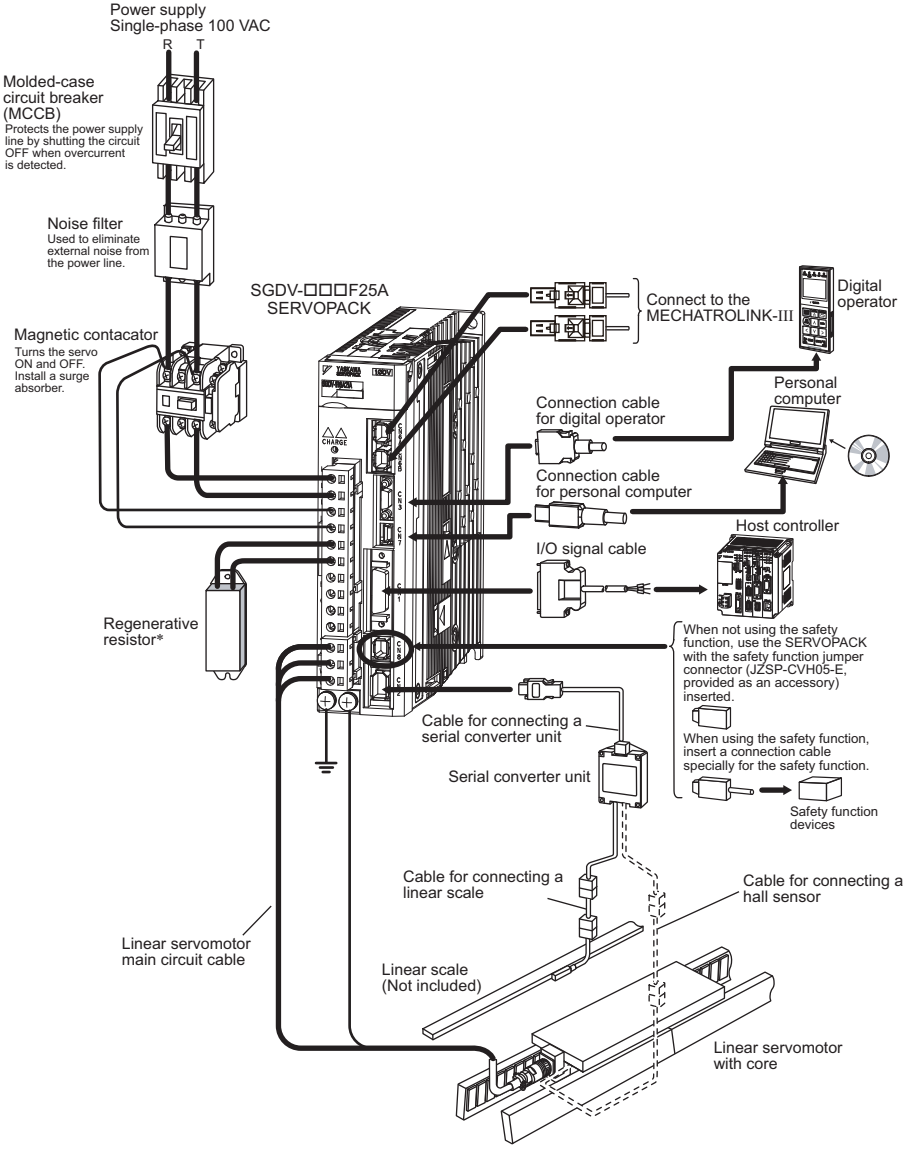


∗1. Use a 24 VDC power supply with double insulation or reinforced insulation. (The power supply is not included)

∗2. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

3.2.3 Connecting to SGDV-□□□□25A SERVOPACK (M-III Model)

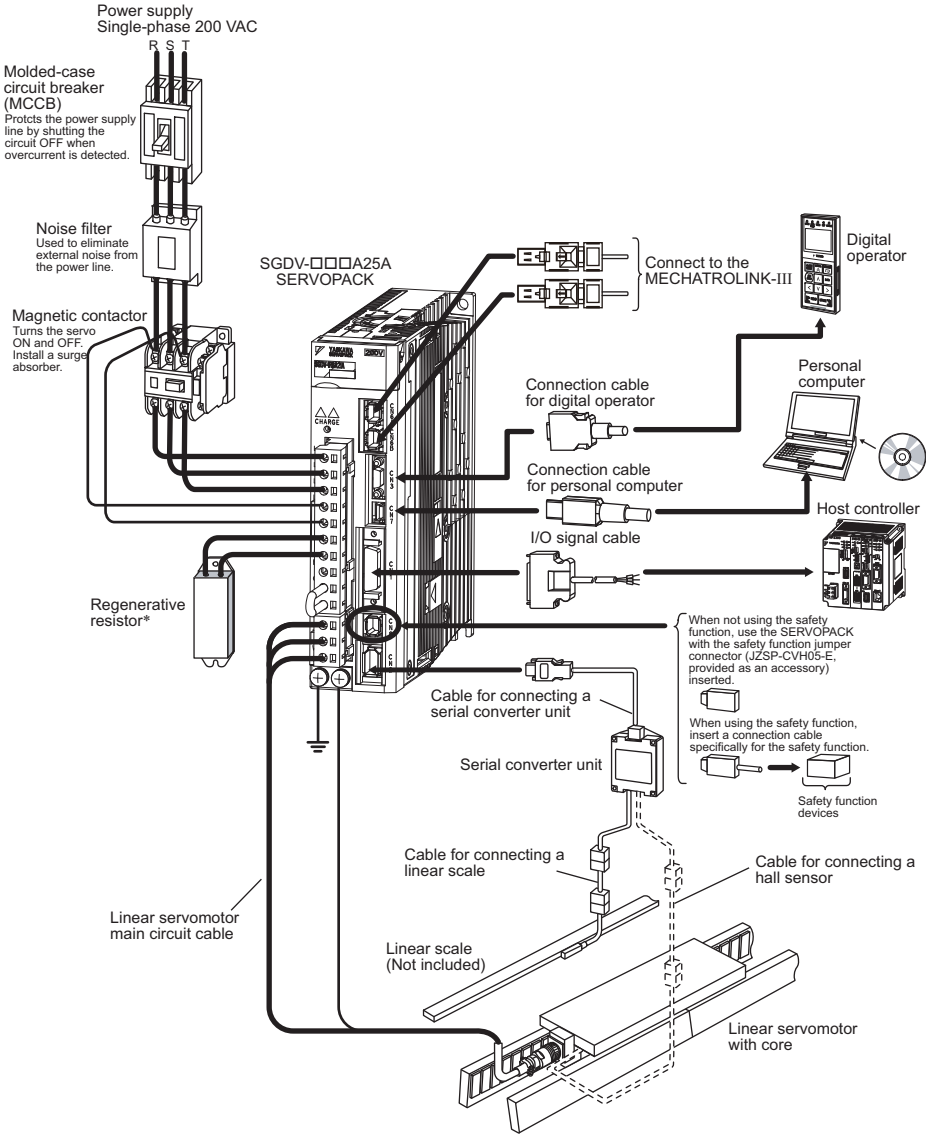
(1) SGDV-□□□F25A



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(2) SGDV-□□□A25A

■ Using a Three-phase, 200-V Power Supply

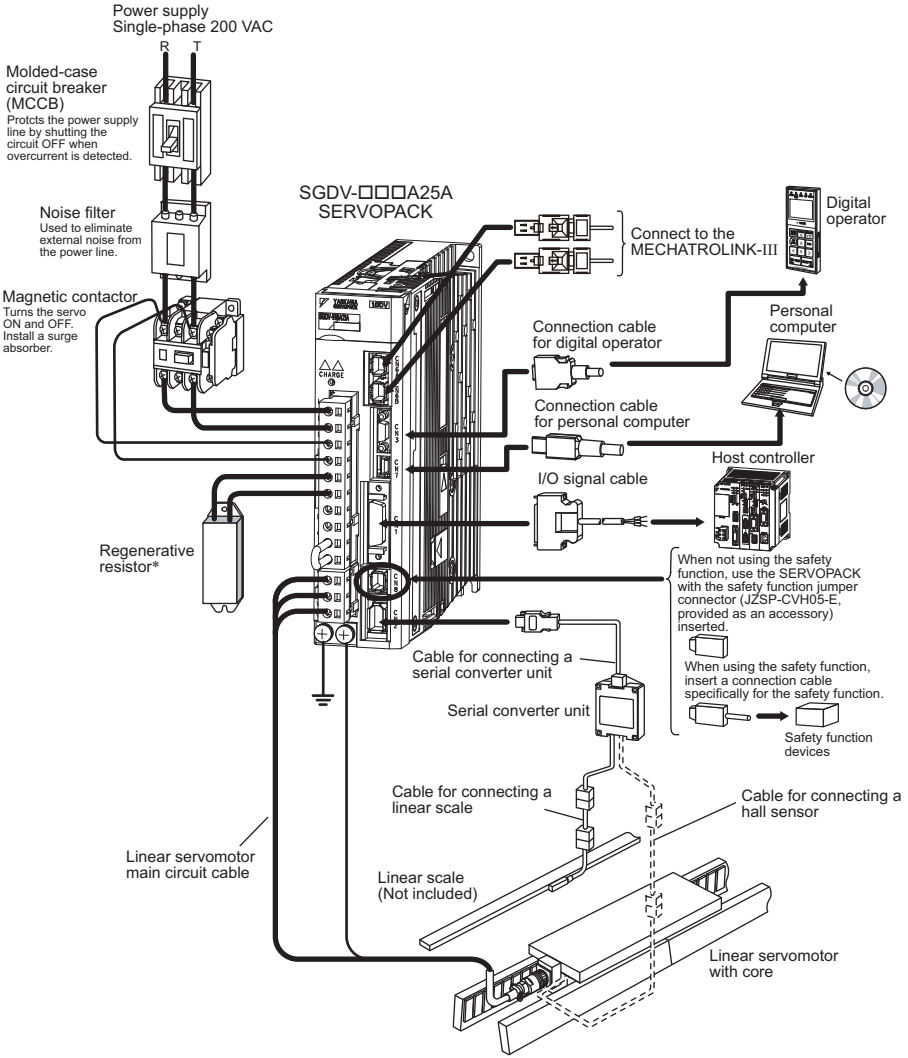


* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

3.2.3 Connecting to SGDV-□□□□25A SERVOPACK (M-III Model)

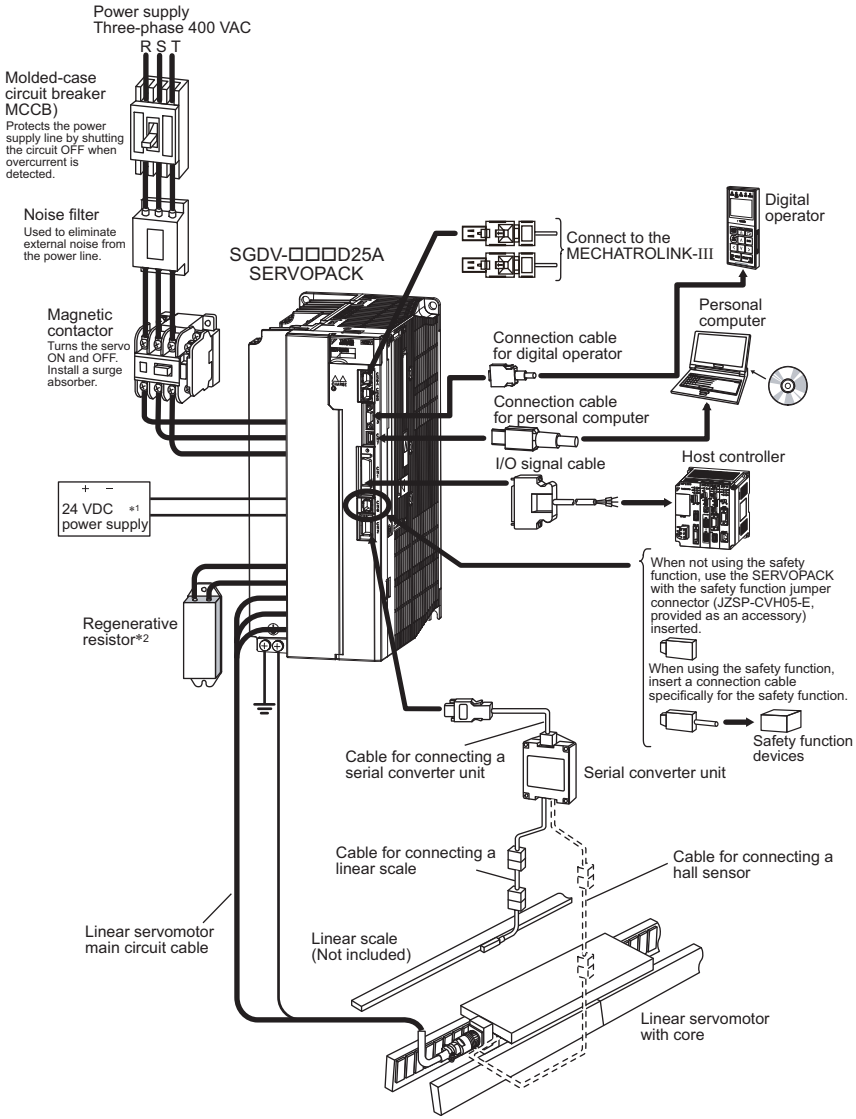
■ Using a Single-phase, 200-V Power Supply

The Σ-V Series SERVOPACK for a 200-V power supply input has input specifications for a three-phase power supply, but some models can also be used with a single-phase 200-V power supply. For details, refer to *Σ-V Series User's Manual Design and Maintenance Linear Motor/MECHATROLINK-III Communications Reference* (SIEP S800000 65).



* Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

(3) SGDV-□□□D25A

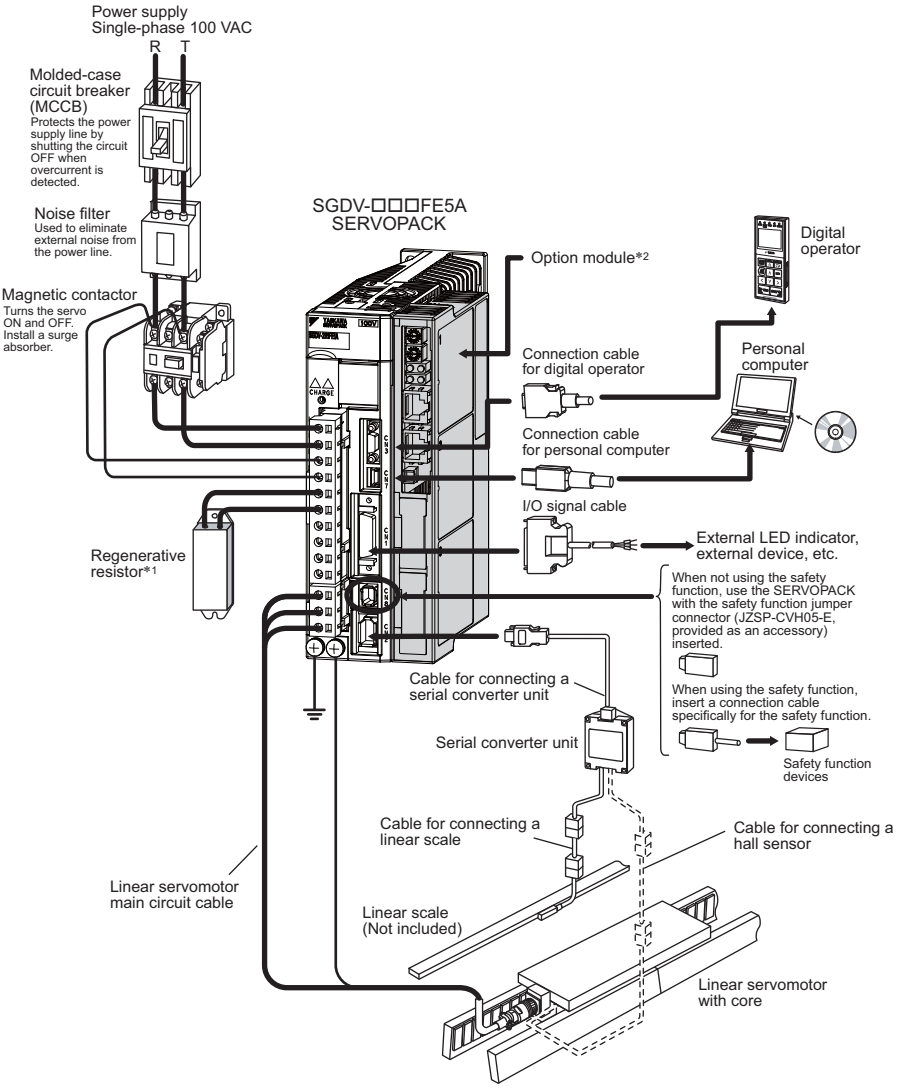


∗1. Use a 24 VDC power supply with double insulation or reinforced insulation. (The power supply is not included)

∗2. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

3.2.4 Connecting to SGDV-□□□□E5A SERVOPACK (Command Option Attachable Type)

(1) SGDV-□□□FE5A

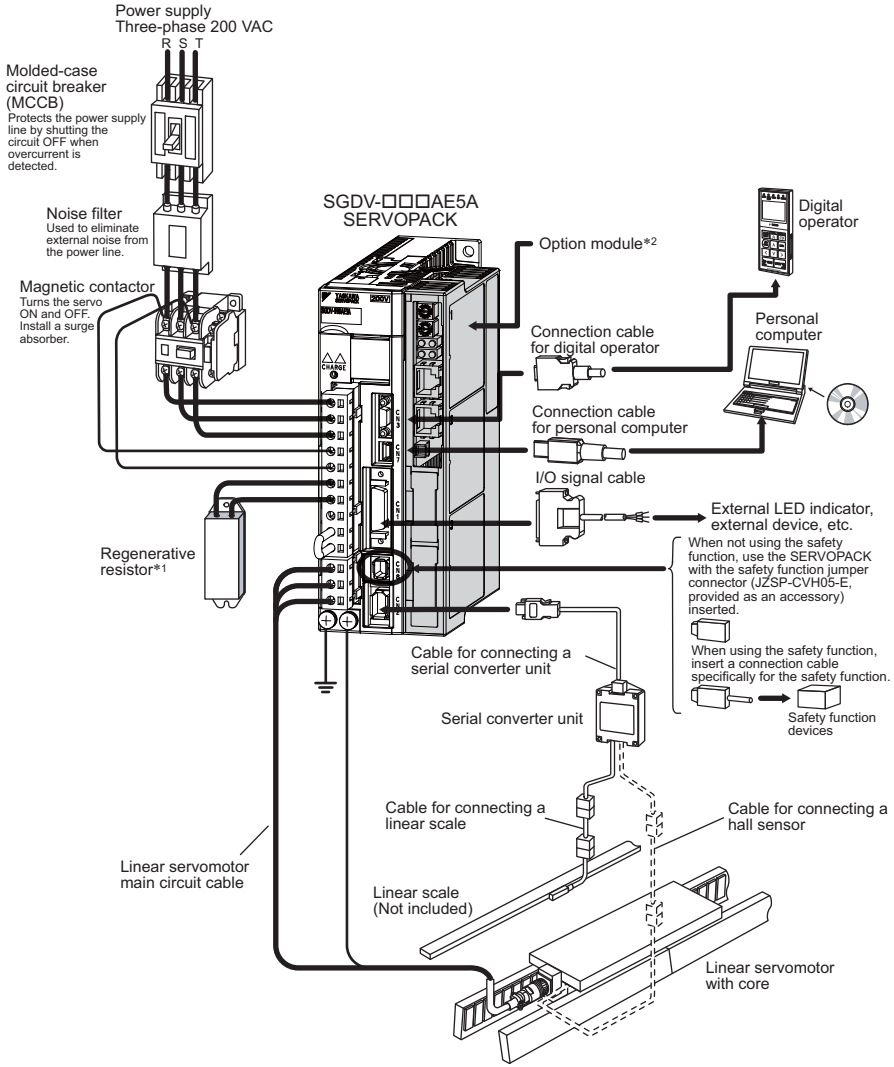


∗1. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

∗2. For connection to the command option module, refer to the user's manual of the corresponding option module.

(2) SGDV-□□□AE5A

■ Using a Three-phase, 200-V Power Supply



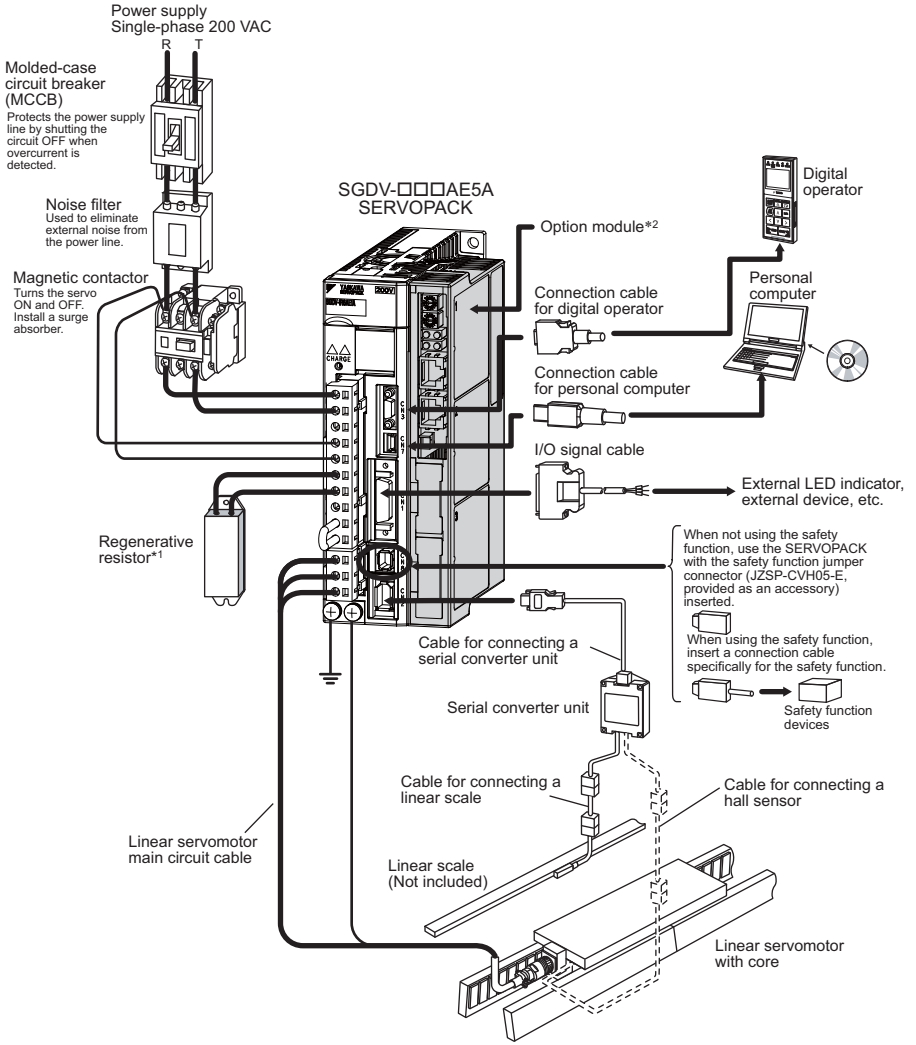
∗1. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

∗2. For connection to the command option module, refer to the user's manual of the corresponding option module.

3.2.4 Connecting to SGDV-□□□□E5A SERVOPACK (Command Option Attachable Type)

■ Using a Single-phase, 200-V Power Supply

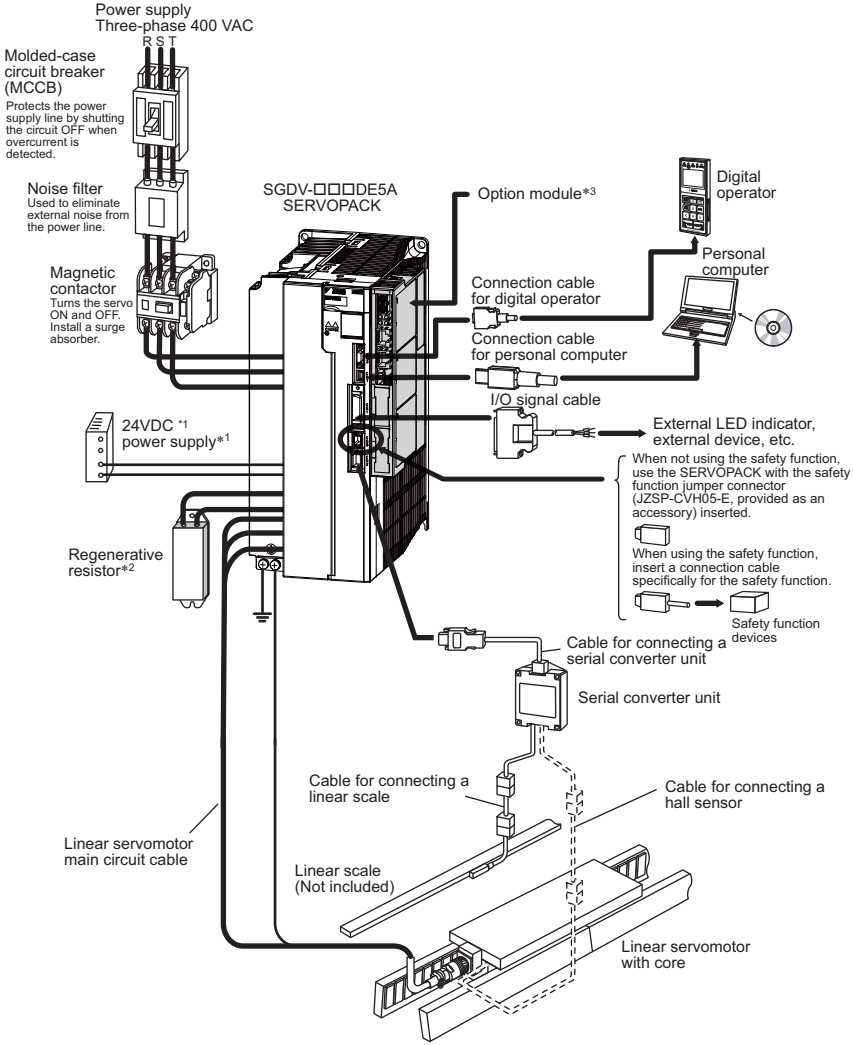
The Σ-V Series SERVOPACK for a 200-V power supply input has input specifications for a three-phase power supply, but some models can also be used with a single-phase 200-V power supply. For details, refer to *Σ-V Series User's Manual Design and Maintenance Linear Motor/Command Option Attachable Type* (SIEP S800000 66).



∗1. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

∗2. For connection to the command option module, refer to the user's manual of the corresponding option module.

(3) SGDV-□□□DE5A



∗1. Use a 24-VDC power supply with double insulation or reinforced insulation. (The power supply is not included)

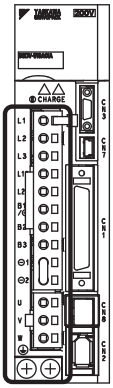
∗2. Before connecting an external regenerative resistor to the SERVOPACK, refer to *3.4 Connecting Regenerative Resistors*.

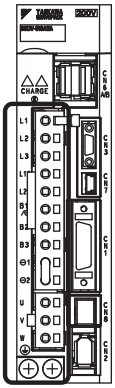
∗3. For connection to the command option module, refer to the user's manual of the corresponding option module.

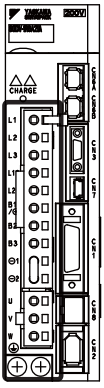
3.3 Main Circuit Wiring

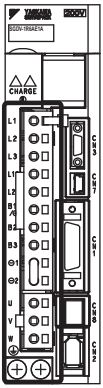
The names and specifications of the main circuit terminals required for trial operation are given below.

3.3.1 Main Circuit Terminals


Analog Pulse Models


M-II Models


M-III Models


Command Option Attachable Types

Terminal Symbols	Name	Model SGDV-□□□□	Description
L1, L2	Main circuit input terminals	□□□F	Single-phase 100 to 115 V, +10% to -15% (50/60 Hz)
L1, L2, L3		□□□A	Three-phase 200 to 230 V, +10% to -15% (50/60 Hz)
		□□□D	Three-phase 380 to 480 V, +10% to -15% (50/60 Hz)
L1C, L2C	Control power input terminals	□□□F	Single-phase 100 to 115 V, +10% to -15% (50/60 Hz)
		□□□A	Single-phase 200 to 230 V, +10% to -15% (50/60 Hz)
24V, 0V		□□□D	24 VDC, ±15%

(cont'd)

Terminal Symbols	Name	Model SGDV-□□□□	Description
B1/⊕, B2*1	External regenerative resistor terminals	R70F, R90F, 2R1F, 2R8F, R70A, R90A, 1R6A, 2R8A	If the regenerative capacity is insufficient, connect an external regenerative resistor (option) between B1/⊕ and B2.
		3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A, 1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D	If the regenerative capacity is insufficient, remove the wire or short bar that shorts the connection between B2 and B3, and connect an external regenerative resistor (option) between B1/⊕ and B2.
		550A, 260D	Connect a regenerative resistor unit (option) between B1/⊕ and B2.
⊖1, ⊖2*2	DC reactor connection terminals for power supply harmonic suppression	□□□A □□□D	If a countermeasure against power supply harmonic waves is needed, connect a DC reactor between ⊖1 and ⊖2.
B1/⊕	Main circuit plus terminals	□□□A □□□D	Use when DC power supply input is used.
⊖2 or ⊖	Main circuit minus terminals	□□□A □□□D	
U, V, W	Linear servomotor connection terminals	Use for connecting to the linear servomotor.	
⏚	Ground terminals (×2)	Use for connecting the power supply ground terminal and linear servomotor ground terminal.	

*1. Do not open short-cicuit B1/⊕ and B2 terminals. Doing so may damage the SERVOPACK.

*2. The ⊖1 and ⊖2 is short-circuited with a jumper at the factory.

3.3.2 When Using a Standard Power Supply Input (Single-phase 100 V, Three-phase 200 V, or Three-phase 400 V)

(1) Wire Types

Use the following type of wire for main circuit.

Cable Type		Allowable Conductor Temperature (°C)
Symbol	Name	
IV	600 V polyvinyl chloride insulated wire	60
HIV	600 V grade heat-resistant polyvinyl chloride insulated wire	75

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

- 600 V grade heat-resistant polyvinyl chloride insulated wire (HIV)

AWG Size	Nominal Cross Section Diameter (mm^2)	Configuration (Number of Wires/mm^2)	Conductive Resistance (Ω/km)	Allowable Current at Surrounding Air Temperature (A)		
				30°C	40°C	50°C
20	0.5	19/0.18	39.5	6.6	5.6	4.5
19	0.75	30/0.18	26.0	8.8	7.0	5.5
18	0.9	37/0.18	24.4	9.0	7.7	6.0
16	1.25	50/0.18	15.6	12.0	11.0	8.5
14	2.0	7/0.6	9.53	23	20	16
12	3.5	7/0.8	5.41	33	29	24
10	5.5	7/1.0	3.47	43	38	31
8	8.0	7/1.2	2.41	55	49	40
6	14.0	7/1.6	1.35	79	70	57
4	22.0	7/2.0	0.85	91	81	66

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

(2) SERVOPACK Main Circuit Wires

The wires used in the SERVOPACK main circuit are described below.

IMPORTANT

- Wire sizes are selected for three cables per bundle at 40°C surrounding air temperature with the rated current.
- Use a wire with a minimum withstand voltage of 600 V for the main circuit.
- If cables are bundled in PVC or metal ducts, take into account the reduction of the allowable current.
- Use a heat-resistant wire under high surrounding air or panel temperatures, where polyvinyl chloride insulated wires will rapidly deteriorate.

■ Single-phase, 100 V

Terminal Symbols	Terminal Names	SERVOPACK Model SGDV-□□□F			
		R70	R90	2R1	2R8
L1, L2	Main circuit power input terminals	HIV1.25		HIV2.0	
L1C, L2C	Control power input terminals	HIV1.25			
U, V, W	Linear servomotor connection terminals	HIV1.25			
B1/ ⊕ , B2	External regenerative resistor connection terminals	HIV1.25			
⏚	Ground terminal	HIV2.0 or higher			

■ Three-phase, 200 V

Terminal Symbols	Terminal Names	SERVOPACK Model SGDV-□□□A											
		R70	R90	1R6	2R8	3R8	5R5	7R6	120	180	200	330	550
L1, L2, L3	Main circuit power input terminals	HIV1.25			HIV2.0					HIV3.5		HIV 5.5	HIV 14.0
L1C, L2C	Control power input terminals	HIV1.25											
U, V, W	Linear servomotor connection terminals	HIV1.25				HIV2.0				HIV 3.5	HIV 5.5	HIV 8.0	HIV 14.0
B1/ ⊕ , B2	External regenerative resistor connection terminals	HIV1.25								HIV 2.0	HIV 3.5	HIV 5.5	HIV 8.0
⏚	Ground terminal	HIV2.0 or higher											

3.3.2 When Using a Standard Power Supply Input (Single-phase 100 V, Three-phase 200 V, or Three-phase 400 V)

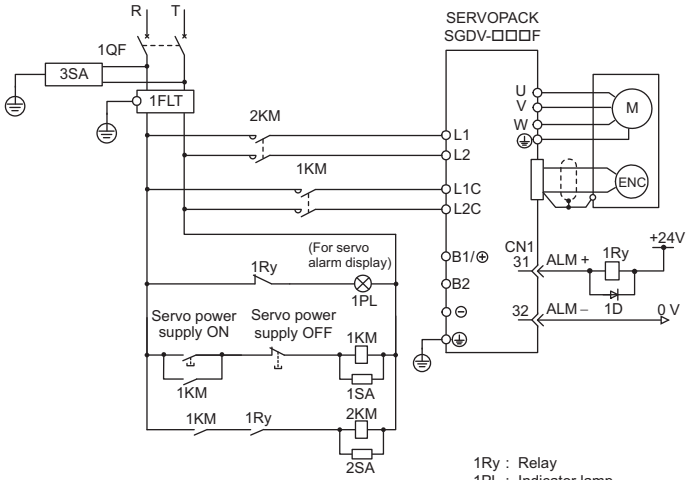
■ Three-phase, 400 V

Terminal Symbols	Terminal Names	SERVOPACK Model SGDV-□□□D						
		1R9	3R5	5R4	8R4	120	170	260
L1, L2, L3	Main circuit power input terminals	HIV1.25			HIV2.0		HIV3.5	HIV 5.5
24 V, 0 V	Control power input terminals	HIV1.25						
U, V, W	Linear servomotor connection terminals	HIV1.25			HIV2.0		HIV3.5	HIV5.5
B1/ ⊕ , B2	External regenerative connection terminals	HIV1.25					HIV2.0	HIV3.5
⏚	Ground terminal	HIV2.0 or higher						

(3) Typical Main Circuit Wiring Examples

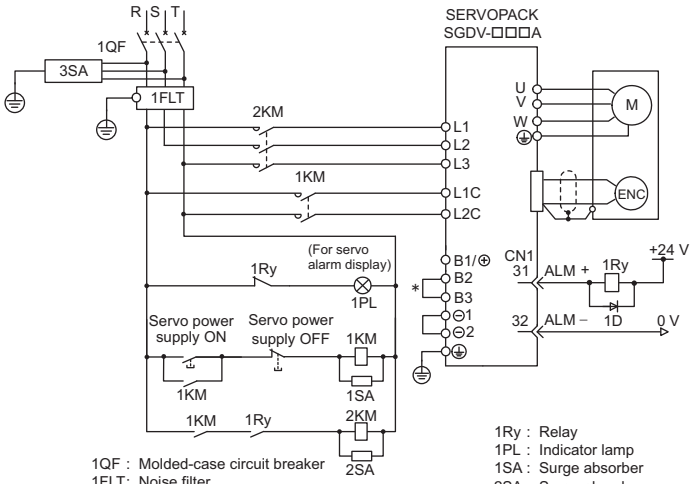
The following wiring examples show the Σ-V Series SGDV SERVOPACK (Analog pulse model).

■ Single-phase 100 V, SGDV-□□□F (SGDV-R70F, R90F, 2R1F, 2R8F)



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

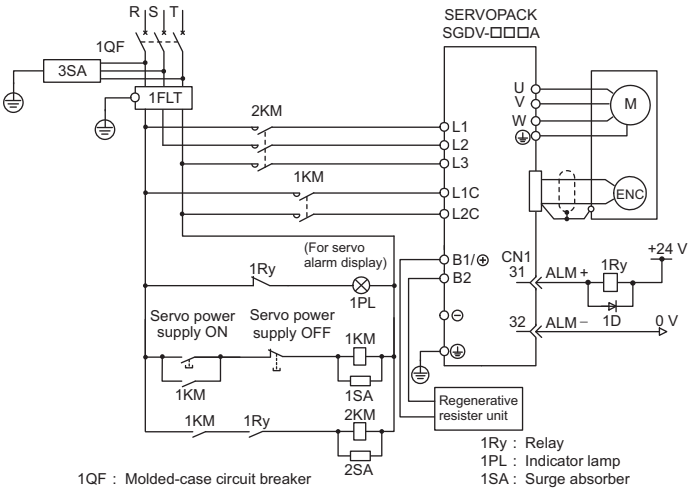
■ Three-phase 200 V, SGDV-□□□A (SGDV-R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A)



∗ For SGDV-R70A, R90A, 1R6A, and 2R8A SERVOPACKs, the short-circuit between B2 and B3 is not required. Do not short the connection between B2 and B3.

Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

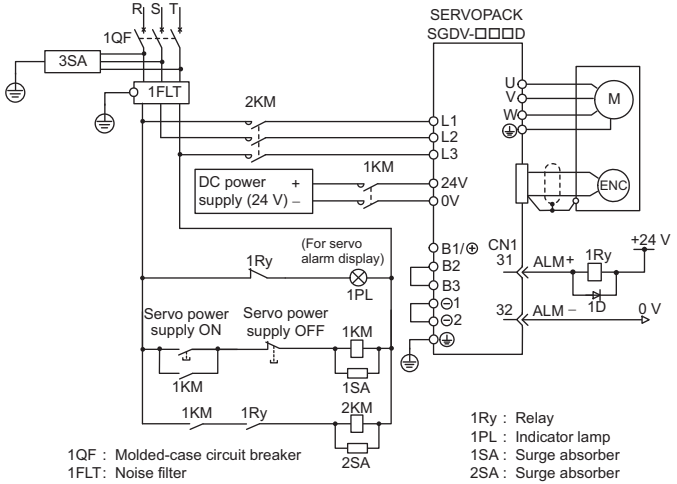
■ Three-phase 200 V, SGDV-□□□A (SGDV-550A))



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

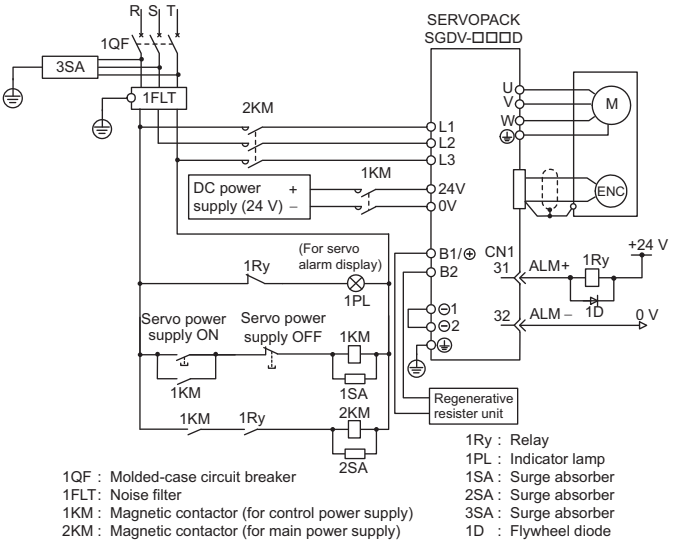
3.3.2 When Using a Standard Power Supply Input (Single-phase 100 V, Three-phase 200 V, or Three-phase 400 V)

■ Three-phase 400 V, SGDV-□□□D
(SGDV-1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D)



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

■ Three-phase 400 V, SGDV-□□□D (SGDV-260D)



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

3.3.3 When Using the SERVOPACK with a Single-phase 200 V Power Input

Some models of Σ-V series three-phase 200 V power input SERVOPACK can be used also with a single-phase 200 V power supply.

The following models support single-phase 200 V power input.
SGDV-R70A, -R90A, -1R6A, -2R8A, -5R5A

When using the SERVOPACK with single-phase, 200 V power input, set parameter Pn00B.2 to 1.

(1) Parameter Setting

■ Single-phase Power Input Selection

Parameter		Meaning	When Enabled	Classification
Pn00B	n.□0□□ [factory setting]	Enables use of three-phase power supply for three-phase SERVOPACK.	After restart	Setup
	n.□1□□	Enables use of single-phase power supply for three-phase SERVOPACK.		

⚠ WARNING

- If a single-phase 200 V is input to a single-phase 200 V power input supported SERVOPACK without having changed the setting of Pn00B.2 to 1 (single-phase power input), the main circuit cable open phase alarm (A.F10) will be detected.
- If a single-phase 200 V is input to the SERVOPACK models that do not support single-phase power input, the main circuit cable open phase alarm (A.F10) will be detected.
- When using a single-phase 200 V power supply, the SERVOPACK may not be able to produce the same linear servomotor force-speed characteristics as using a three-phase 200 V power input. Refer to the diagram of each motor force-speed characteristics in *Σ-V Series Product Catalog* (KAEPS80000042).

(2) Main Circuit Power Input

Connect a single-phase 200 V power supply of the following specifications to L1 and L2 terminals. The specifications of the power supplies other than the main circuit power supply are the same as for three-phase power supply input.

Terminal Symbols	Terminal Name	Model SGDV-□□□A	Ratings
L1, L2	Main circuit power input terminals	R70, R90, 1R6, 2R8, 5R5	Single-phase 200 V to 230 V, +10% to −15% (50/60Hz)
L3*	−		None

* Do not use L3 terminal.

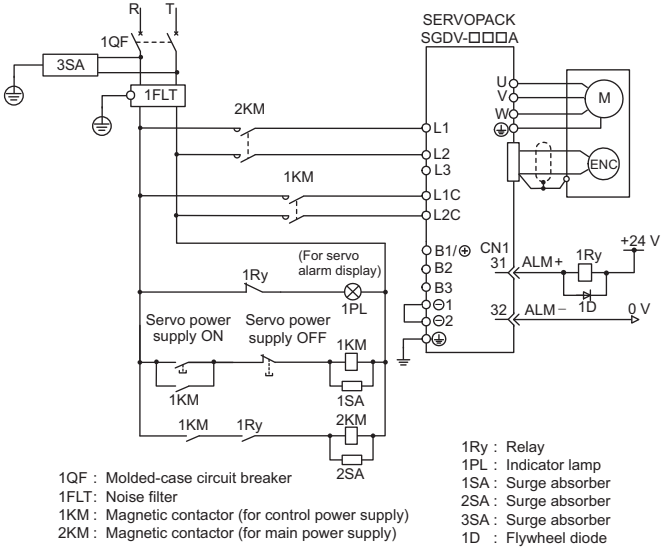
(3) SERVOPACK Main Circuit Wires

Terminal Symbols	Terminal Names	形式 SGDV-□□□A				
		R70	R90	1R6	2R8	5R5
L1, L2	Main circuit power input terminals	HIV1.25			HIV2.0	
L1C, L2C	Control power input terminals	HIV1.25				
U, V, W	Linear servomotor connection terminals	HIV1.25				HIV 2.0
B1/⊕, B2	External regenerative resistor connection terminals	HIV1.25				
⏚	Ground terminal	HIV2.0 or higher				

(4) Wiring Example with a Single-phase 200 V Power Supply Input

The following wiring example shows the Σ-V series SGDV SERVOPACK (Analog pulse model).

■ Single-phase 200 V Power Input Supported SERVOPACK Models SGDV-R70A, -R90A, -1R6A, -2R8A, and -5R5A



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

3.3.4 When Using the SERVOPACK with a DC Power Input

(1) Parameter Setting

When using the SERVOPACK with a DC power input, make sure to set the parameter Pn001.2 to 1 before inputing DC power.

Parameter		Meaning	When Enabled	Classification
Pn001	n.□0□□	Enables use of AC power input.	After restart	Setup
	n.□1□□	Enables use of DC power input.		

Observe the following warnings.

⚠ WARNING

- Either AC or DC power can be input to the 200 V and 400 V SERVOPACKs. Always set Pn001.2 to 1 to specify a DC power input before inputting DC power. Only AC power can be input to the 100 V SERVOPACKs.
  If DC power is input without changing the parameter setting, the SERVOPACK's internal elements will burn and may cause fire or equipment damage.
- With a DC power input, time is required to discharge electricity after the main power supply is turned OFF. A high residual voltage may remain in the SERVOPACK after the power supply is turned OFF. Be careful not to get an electric shock.
- Install fuses on the wires if DC power is used.
- Linear servomotor returns a regenerated energy to the power supply. The SERVOPACK that can use a DC power supply is not capable of processing the regenerated energy. Provide measures to process the regenerated energy on the power supply.
- With a DC power input, connect an external inrush current limit circuit.
  Failure to observe this caution may result in damage to the product.

(2) DC Power Supply Input Terminals for the Main and Control Circuits

■ Three-phase, 200 V SGDV-□□□A
(□□□ = R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6, 120, 180, 200, 330)

Terminal Symbols	Terminal Names	Specifications
B1/ ⊕ , B2	Main circuit plus terminals	270 to 320 VDC
⊖ 2	Main circuit minus terminal	0 VDC
L1C, L2C	Control power input terminals	200 to 230 VAC

■ Three-phase, 200 V SGDV-□□□A (□□□ = 550)

Terminal Symbols	Terminal Names	Specifications
B1/ ⊕ , B2	Main circuit plus terminals	270 to 320VDC
⊖ 2	Main circuit minus terminal	0 VDC
L1C, L2C	Control power input terminals	200 to 230VAC

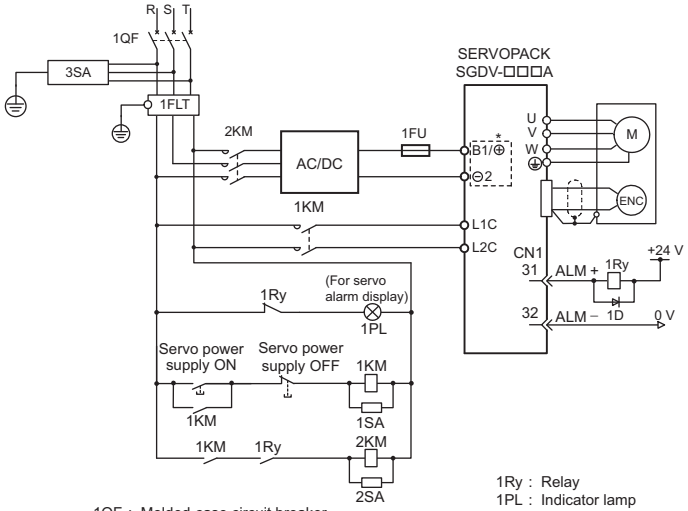
■ Three-phase, 400 V SGDV-□□□D
(□□□ = 1R9, 3R5, 5R4, 8R4, 120, 170, 260)

Terminal Symbols	Terminal Names	Specifications
B1/ ⊕ , B2	Main circuit plus terminals	513 to 648VDC
⊖ 2	Main circuit minus terminal	0 VDC
L1C, L2C	Control power input terminals	24 VDC ±15%

(3) Wiring Examples with a DC Power Input

The following examples show the Σ-V series SGDV SERVOPACK (Analog pulse model).

■ Three-phase, 200 V SGDV-□□□A

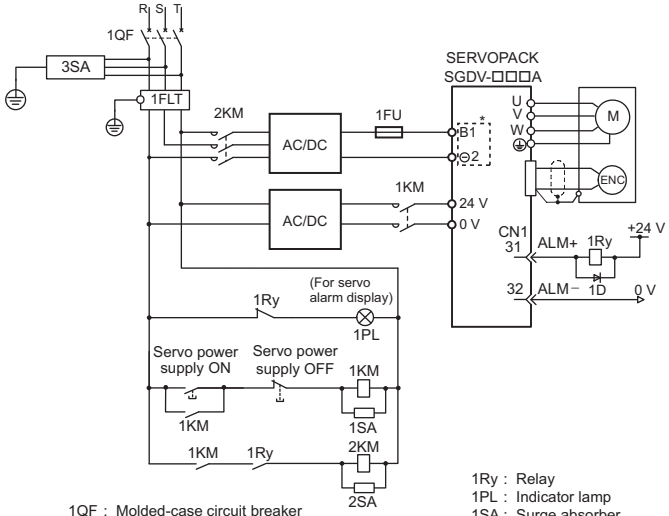


1QF : Molded-case circuit breaker
1FLT: Noise filter
1KM : Magnetic contactor (for control power supply)
2KM : Magnetic contactor (for main power supply)

1Ry : Relay
1PL : Indicator lamp
1SA : Surge absorber
2SA : Surge absorber
3SA : Surge absorber
1D : Flywheel diode

Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM− terminal is CN1-4.

■ Three-phase, 400 V SGDV-□□□D



1QF : Molded-case circuit breaker
1FLT: Noise filter
1KM : Magnetic contactor (for control power supply)
2KM : Magnetic contactor (for main power supply)

1Ry : Relay
1PL : Indicator lamp
1SA : Surge absorber
2SA : Surge absorber
3SA : Surge absorber
1D : Flywheel diode

* The terminal names differ depending on the SERVOPACK model. Refer to *(2) Main Circuit and Control Power Inputs*.

Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM− terminal is CN1-4.

3.3.5 When Using More Than One SERVOPACK

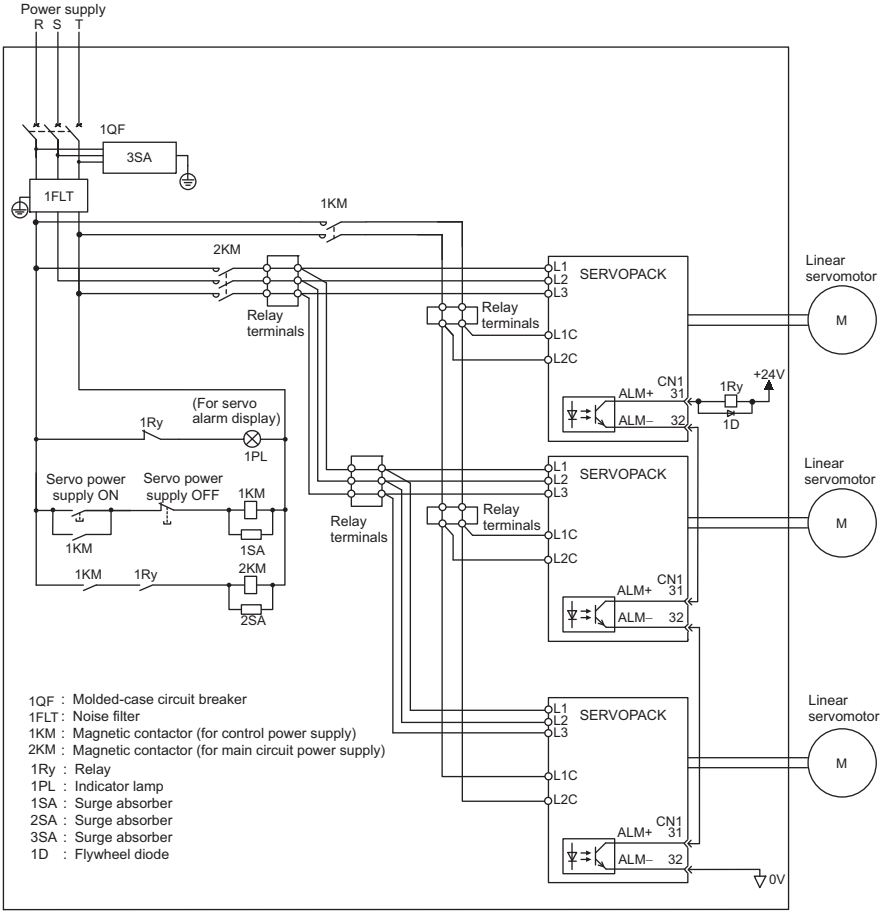
This section shows an example of the wiring when more than one SERVOPACK is used and the precautions.

■ Wiring Example (Analog pulse model)

The following example shows the Σ-V series SGDV SERVOPACK (Analog pulse model).

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.



Note: For M-II model, M-III model, and command option attachable type SERVOPACKs, the pin number of ALM+ terminal is CN1-3, and that of ALM– terminal is CN1-4.

3.3.6 General Precautions for Wiring

IMPORTANT

- Use a molded-case circuit breaker (1QF) or fuse to protect the main circuit.
  The SERVOPACK connects directly to a commercial power supply; it is not isolated through a transformer or other device.
  Always use a molded-case circuit breaker (1QF) or fuse to protect the servo system from accidents involving different power system voltages or other accidents.
- Install a ground fault detector.
  The SERVOPACK does not have a built-in protective circuit for grounding. To configure a safer system, install a ground fault detector against overloads and short-circuiting, or install a ground fault detector in combination with a molded-case circuit breaker.
- Do not frequently turn power ON and OFF.
  - Frequently turning power ON and OFF will causes elements inside the SERVOPACK to deteriorate. Do not use the servo drives for an application that requires frequently turning ON and OFF the power supply.
  - After the actual operation starts, the allowable interval for turning ON and OFF is one hour or longer.

To ensure safe, stable application of the servo system, observe the following precautions when wiring.

Use the connecting cables specified in the *Σ-V Series Product Catalog* (KAEP S800000 42). Design and arrange the system so that each cable will be as short as possible.

- Use shielded twisted-pair wires or shielded multi-core twisted-pair wires for I/O signal cables and the linear scale connection cables.
- The maximum cable length is 3 m max. for I/O signal cables, 20 m max. for linear servomotor main circuit, 20 m for the serial converter unit, 15 m for the linear scale, and 15 m for the hall sensor.

Observe the following precautions when wiring the ground.

- Use a cable as thick as possible (at least 2.0 mm^2)
- Grounding to a resistance of 100 Ω or less for 100-V, 200-V SERVOPACKs, 10 Ω or less for 400-V SERVOPACK is recommended.
- Be sure to ground at only one point.
- Ground the linear servomotor directly if the linear servomotor is insulated from the machine.

The signal cable conductors are as thin as 0.2 mm^2 or 0.3 mm^2. Do not impose excessive bending force or tension.

3.3.7 Wiring the Spring Type Main Circuit Terminal Connector

Two types of main circuit terminals are available: a connector type and a terminal screw type.

- SERVOPACKs with terminal screws:
  SGDV-180A, 200A, 330A, 550A, 8R4D, 120D, 170D, 260D
- SERVOPACKs with connectors:
  SGDV-R70F, R90F, 2R1F, 2R8F, R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, 120A, 1R9D, 3R5D, 5R4D

A spring connector is used for SERVOPACKs with connectors.

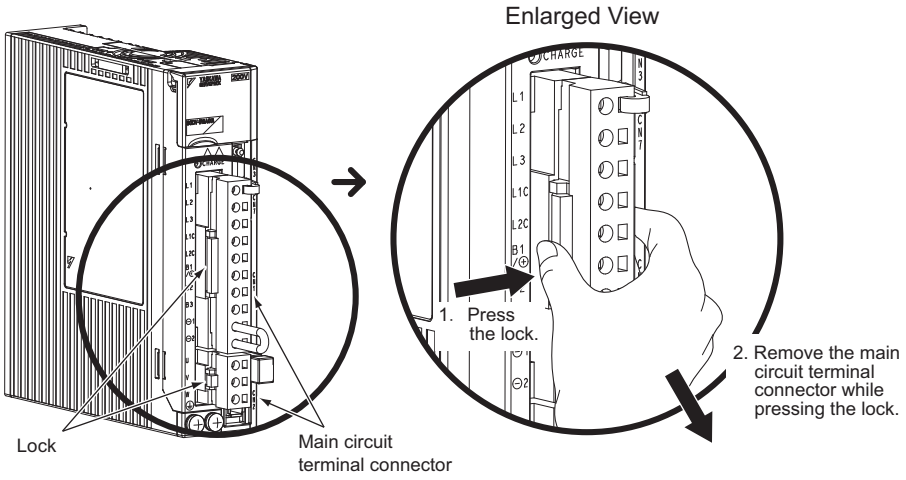
The following section describes how to wire the main circuit terminal using a connector.

⚠ CAUTION

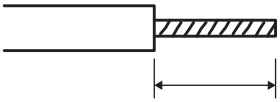
- Observe the following precautions when wiring main circuit terminal connectors.
  - For the SERVOPACKs with connectors, remove detachable main circuit terminal connectors from the SERVOPACK prior to wiring.
  - Insert only one main circuit cable per opening in the main circuit terminal connector.
  - Make sure that no part of the core wire comes into contact with (i.e., short-circuit) adjacent wires.

■ Wiring Procedure

1. Remove the main circuit terminal connector from the SERVOPACK.



2. Strip the end of the wires.



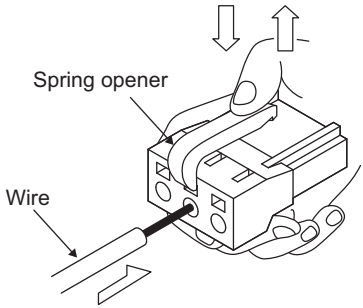
Applicable wire sizes:
Refer to *3.3.2 (2) SERVOPACK Main Circuit Wires*.

3. Open the wire terminal on the terminal connector housing with a tool, using the following methods. Either method can be used to open the wire terminal.

- Using a spring opener

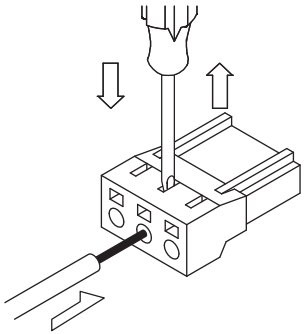
  Use the spring opener provided with the SERVOPACK to open the wire terminal as shown in the diagram.

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



- Using a screwdriver

  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.



4. Insert the wire core into the opening, and then secure the wire into position by removing the opener or screwdriver to close the opening.

5. Make all the required connections in the same way.

6. Attach the connector to the SERVOPACK.

3.4 Connecting Regenerative Resistors

If the capacity to absorb regenerative energy is insufficient, use the following procedure to connect an external regenerative resistor and set the regenerative resistor capacity in the parameter Pn600.

To learn how to select a regenerative resistor, and for detailed specifications, refer to *Σ-V Series Product Catalog* (KAEP S800000 42).

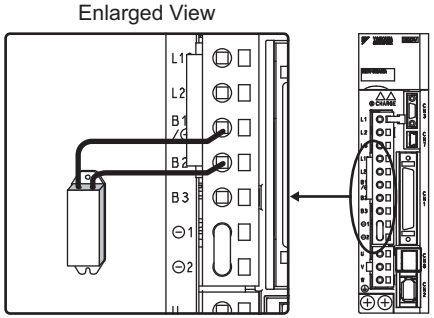
> **⚠ WARNING**
>
> - Be sure to connect the regenerative resistor correctly. Do not short-circuit between B1/⊕ and B2.
>
> Failure to observe this warning may result in fire or damage to the regenerative resistor or SERVOPACK.

3.4.1 Connecting Regenerative Resistor

This section describes how to connect a regenerative resistor.

(1) SERVOPACKs: Model SGDV-R70F, R90F, 2R1F, 2R8F, R70A, R90A, 1R6A, or 2R8A

Connect an external regenerative resistor between B1/⊕ and B2 terminals. After connecting a resistor, set the regenerative resistor capacity. Refer to *3.4.2 Setting the Regenerative Resistor Capacity* for information on how to set the regenerative resistor capacity.

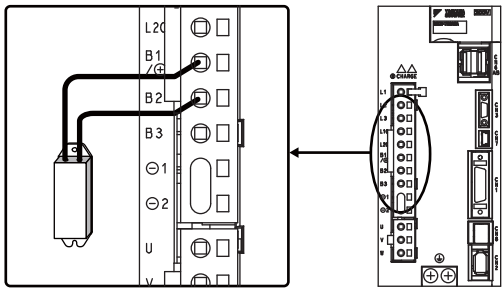


(2) SERVOPACKs: Model SGDV-3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A, 1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D

Disconnect the wiring between the SERVOPACK's B2 and B3 terminals and connect an external regenerative resistor between the B1/⊕ and B2 terminals. After connecting a resistor, set the regenerative resistor capacity. Refer to *3.4.2 Setting the Regenerative Resistor Capacity* for information on how to set the regenerative resistor capacity.

Note: Be sure to take out the lead wire between the B2 and B3 terminals.

Enlarged View



(3) SERVOPACKs: Model SGDV-550A, 260D

No built-in regenerative resistor is provided, so the external regenerative resistor is required. The following regenerative resistor units are available as option:

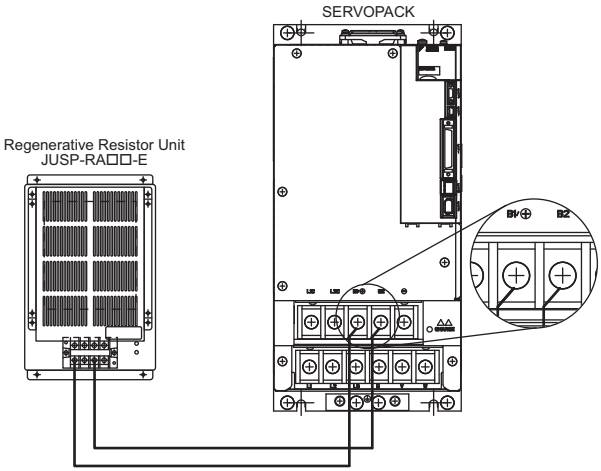
Note: The regenerative resistor unit is constructed from a number of resistors.

Main Circuit Power Supply	SERVOPACK Model SGDV-	Applicable Regenerative Resistor Unit	Resistance (Ω)	Specifications
Three-phase 200 V	550A	JUSP-RA05-E	3.13	Eight 25 Ω (220 W) resistors are connected in parallel.
Three-phase 400 V	260D	JUSP-RA18-E	18	Two series of two 18 Ω (220 W) resistors each are connected in parallel.

Connect a regenerative resistor unit between B1/⊕ and B2 terminals.

3.4.1 Connecting Regenerative Resistor

When using one of the aforementioned regenerative resistor units, set Pn600 to 0W (factory setting). If using any other regenerative resistor, set Pn600 to the capacity of the connected regenerative resistor.



3.4.2 Setting the Regenerative Resistor Capacity

When an external regenerative resistor is connected, make sure to set the regenerative resistor capacity using the parameter Pn600.

⚠ WARNING

- If 0 is set to the parameter Pn600 while an external regenerative resistor is connected, the generative overload alarm (A.320) may not be detected. If the generative overload alarm (A.320) is not detected correctly, the external regenerative resistor may be damaged and an injury or fire may result. Be sure to set the parameter Pn600 to the capacity of the connected external regenerative resistor.

Pn600 — Regenerative Resistor Capacity — Speed | Position | Force

Setting Range	Unit	Factory Setting	When Enabled	Classification
0 to SERVOPACK capacity	10 W	0	Immediately	Setup

Be sure to set this parameter when installing an external regenerative resistor to the SERVOPACK. Set the regenerative resistor capacity within tolerance value. The set value differs depending on the cooling method of external regenerative resistor:

- For natural air cooling method: Set the value maximum 20% of the actually installed regenerative resistor capacity (W).
- For forced air cooling method: Set the value maximum 50 % of the actually installed regenerative resistor capacity (W).

(Example)100 W external regenerative resistor with natural cooling method
100 W × 20% = 20 W, therefore, Pn600 = 2 (units: 10 W)

Note: 1. When the set value is improper, the generative overload alarm (A.320) is detected.
2. The factory setting of "0" is the value when the SERVOPACK's built-in regenerative resistor is used.

IMPORTANT

- When the external regenerative resistors for power are used at the rated load ratio, the resistor temperature increases to between 200 °C and 300 °C. The resistors must be used at or below the rated values. Check with the manufacturer for the resistor's load characteristics.
- For safety, use the external resistors with thermoswitches.

3.5 Linear Scale Connections

This section describes connection examples between linear scale and SERVOPACK, and the terminal layout of the connector CN2 for connecting a linear scale.

3.5.1 Linear Scale Signal (CN2) Names and Functions

The following table shows the names and functions of the linear scale signals (CN2).

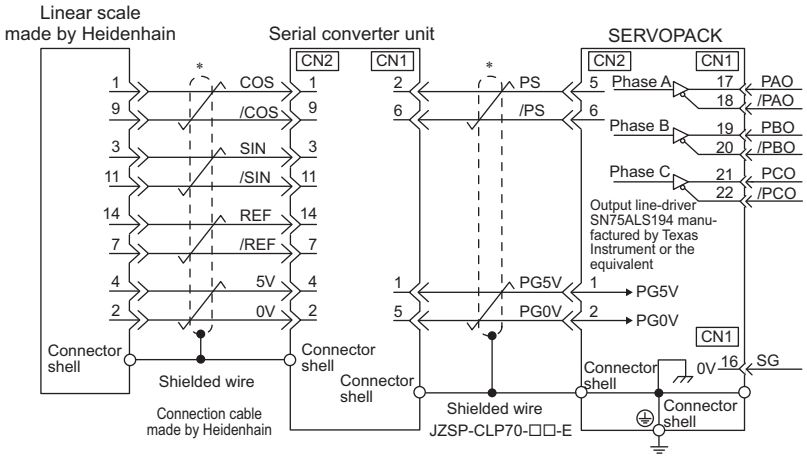
Signal Name	Pin Number	Function
PG 5 V	1	Linear scale power supply +5 V
PG 0 V	2	Linear scale power supply 0 V
–	3*	–
–	4*	–
PS	5	Serial data (+)
/PS	6	Serial data (–)
Shield	Shell	–

* The pins 3 and 4 are connected to the internal circuit. Do not use them.

3.5.2 Linear Scale Connection Examples

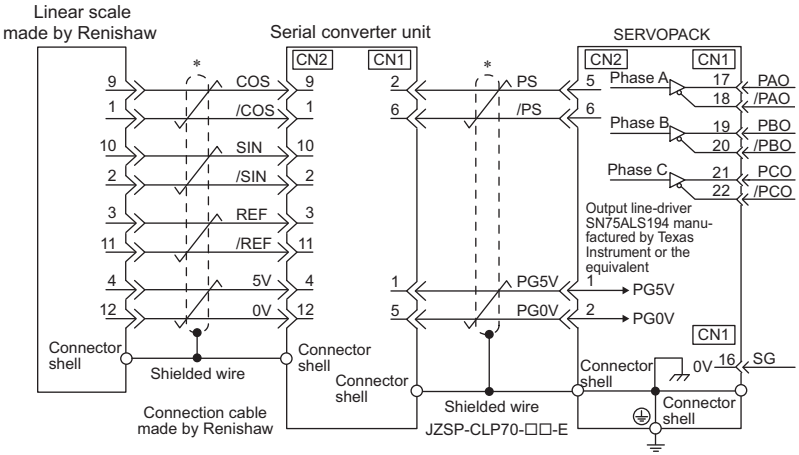
The following diagrams show linear scale connection examples.

(1) Linear Scale Made by Heidenhain



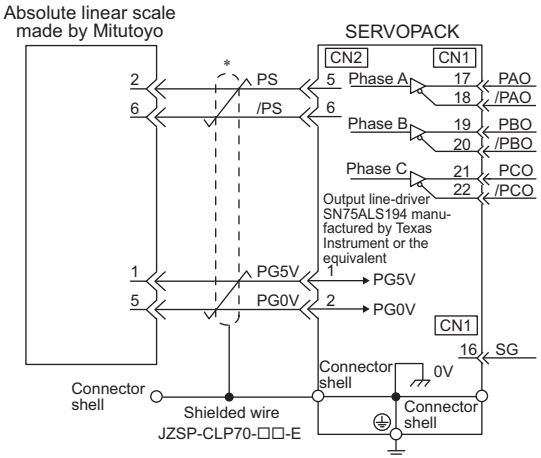
* represents shielded twisted-pair wires.

(2) Linear Scale Made by Renishaw



* represents shielded twisted-pair wires.

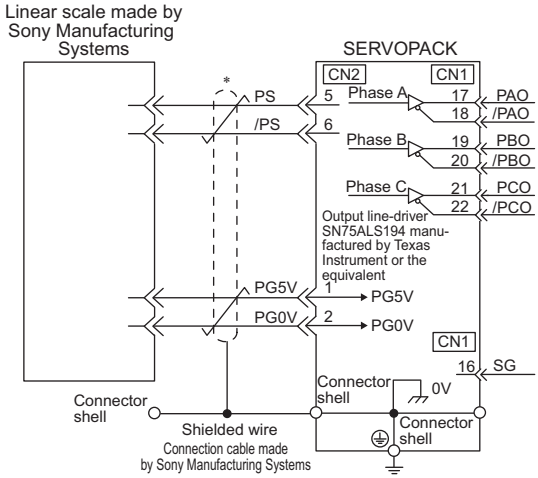
(3) Linear Scale Made by Mitutoyo



* represents shielded twisted-pair wires.

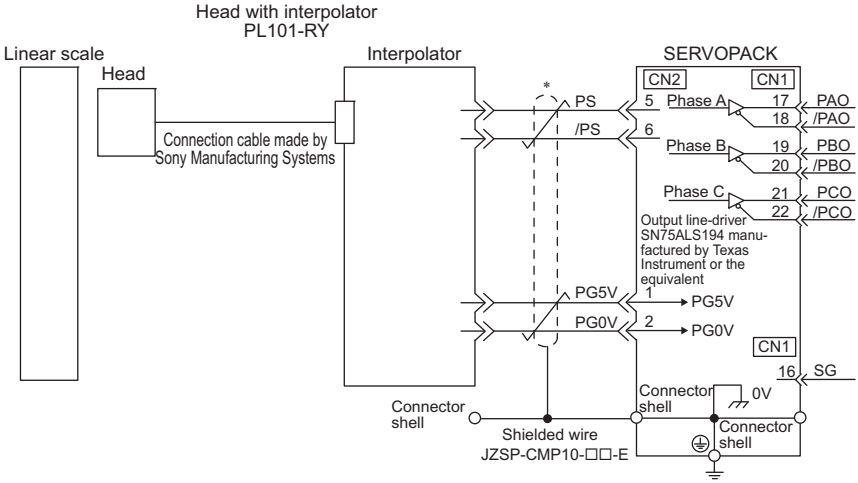
(4) Linear Scale Made by Sony Manufacturing Systems

■ SR75, SR85, SR77, SR87



* represents shielded twisted-pair wires.

■ SL700, SL710, SL720, SL730



* represents shielded twisted-pair wires.

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4

Safety Function

This chapter describes the safety functions.

4.1 Outline 4-2
4.2 Hard Wire Base Block (HWBB) Function 4-3
4.3 Safety Function Signal (CN8) Names and Functions 4-4
4.4 Precautions When Not Using the Safety Function 4-4
4.5 When Using the Safety Function 4-5

4.1 Outline

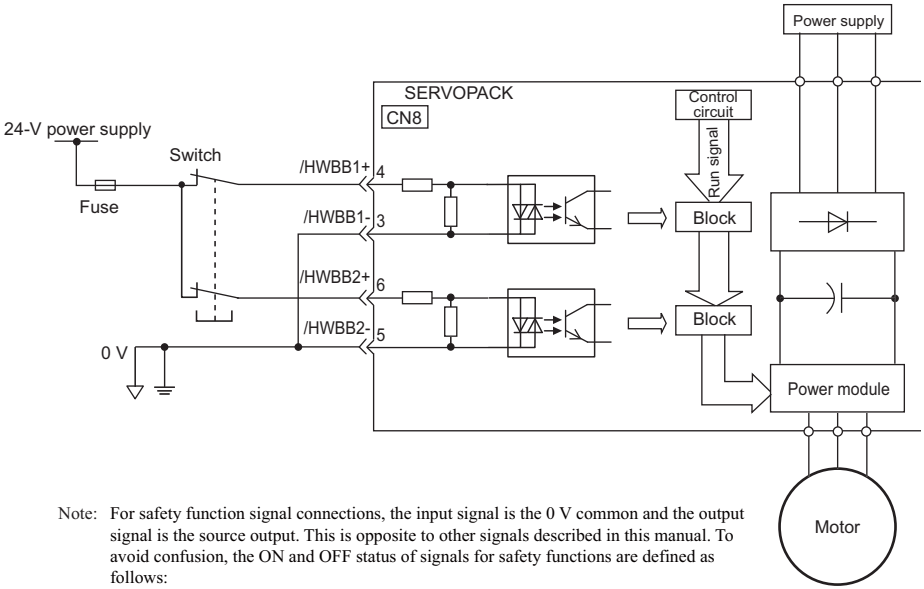
The safety function is incorporated in the SERVOPACK to reduce the risk associated with the machine by protecting workers from injury and by securing safe machine operation. Especially when working in hazardous areas inside the safeguard, as for machine maintenance, it can be used to avoid adverse machine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

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.

- Σ-V Series User's Manual
  Design and Maintenance Linear Motor/Analog Voltage and Pulse Train Reference (SIEP S800000 47)
- Σ-V Series User's Manual
  Design and Maintenance Linear Motor/MECHATROLINK-II Communications Reference (SIEP S800000 48)
- Σ-V Series User's Manual
  Design and Maintenance Linear Motor/MECHATROLINK-III Communications Reference (SIEP S800000 65)
- Σ-V Series User's Manual
  Design and Maintenance Linear Motor/Command Option Attachable Type (SIEP S800000 66)

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.)



Note: For safety function signal connections, the input signal is the 0 V common and the output signal is the source output. This is opposite to other signals described in this manual. To avoid confusion, the ON and OFF status of signals for safety functions are defined as follows:

ON: The state in which the relay contacts are closed or the transistor is ON and current flows into the signal line.

OFF: The state in which the relay contacts are open or the transistor is OFF and no current flows into the signal line.

⚠ WARNING

- Perform risk assessment for the system and confirm that the safety requirements with the following standards are fulfilled before using the HWBB function.
  EN954-1 Category3
  IEC61508-1 to 4 SIL2

4.3 Safety Function Signal (CN8) Names and Functions

The following table shows the terminal layout of safety function signals (CN8).

Pin No.	Signal Name	Function	
1*	–	–	–
2*	–	–	–
3	/HWBB1-	Hard wire baseblock input 1	Hard wire baseblock input Baseblock (motor current off) when OFF
4	/HWBB1+		
5	/HWBB2-	Hard wire baseblock input 2	
6	/HWBB2+		
7	EDM1-	Monitored circuit status output 1	ON when the /HWBB1 and the /HWBB2 signals are input and the SERVOPACK enters a baseblock state.
8	EDM1+		

* The pins 1 and 2 are connected to the internal circuit. Do not use them.

4.4 Precautions When Not Using the Safety Function

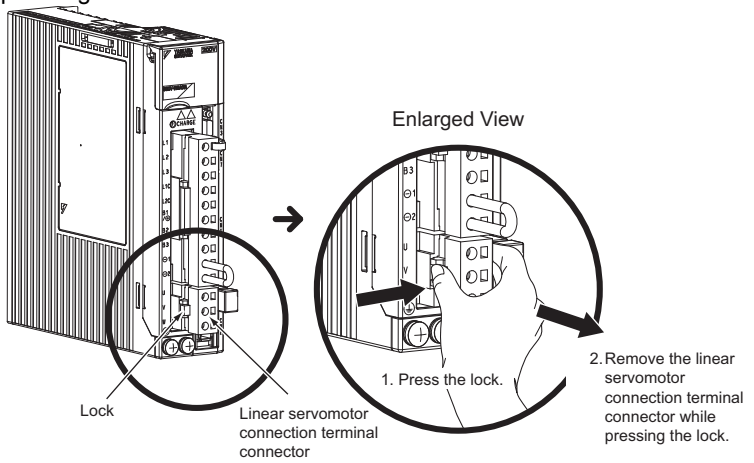
When not using the safety function or when performing a JOG operation, use the SERVOPACK with the safety function jumper connector (JZSP-CVH05-E, provided as an accessory) inserted. If the SERVOPACK is used without the jumper connector inserted into CN8, no current will flow to the motor and no motor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

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

4.5 When Using the Safety Function

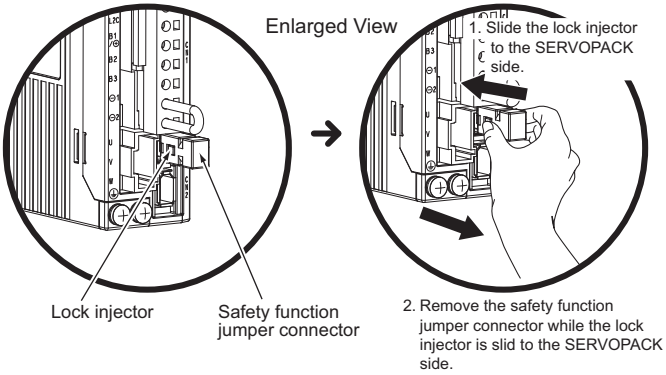
Connect a safety device using the following procedure.

1. <When using the SERVOPACK SGDV-R70F, R90F, 2R1F, R70A, R90A, 1R6A, 2R8A, 1R9D, 3R5D, or 5R4D>
Remove the linear servomotor connection terminal connector while pressing the lock.



<When using a SERVOPACK other than above>
It is not necessary to remove the linear servomotor connection terminal connector. Proceed to the next step.

2. Slide the lock injector of the safety function jumper connector to the SERVOPACK side to unlock and remove the safety function jumper connector.



Note: The safety function jumper connector may be damaged if it is removed without being unlocking.

3. Connect a safety device to CN8.

Note: When not using the safety function, use the SERVOPACK with the safety function jumper connector inserted in CN8. If the SERVOPACK is used without the jumper connector inserted into CN8, no current will flow to the motor and no motor force will be output. In this case, "Hbb" will be displayed on the Panel Operator or the Digital Operator.

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5

Trial Operation (Checking Linear Servomotor Operation)

This chapter describes how to perform trial operation.

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5.1 Outline

The trial operation described here is a JOG operation for linear servomotors not connected to machinery (without a load). The purpose of this trial operation is to check whether the SERVOPACK and linear servomotor are properly connected and whether the linear servomotor is operating correctly.

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

- Σ-V Series User's Manual Design and Maintenance Linear Motor/Analog Voltage and Pulse Train Reference (SIEP S800000 47)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/MECHATROLINK-II Communications Reference (SIEP S800000 48)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/MECHATROLINK-III Communications Reference (SIEP S800000 65)
- Σ-V Series User's Manual Design and Maintenance Linear Motor/Command Option Attachable Type (SIEP S800000 66)

⚠ CAUTION

- Before conducting trial operation, always make sure that an emergency stop can be immediately executed.

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.

(1) Linear 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?

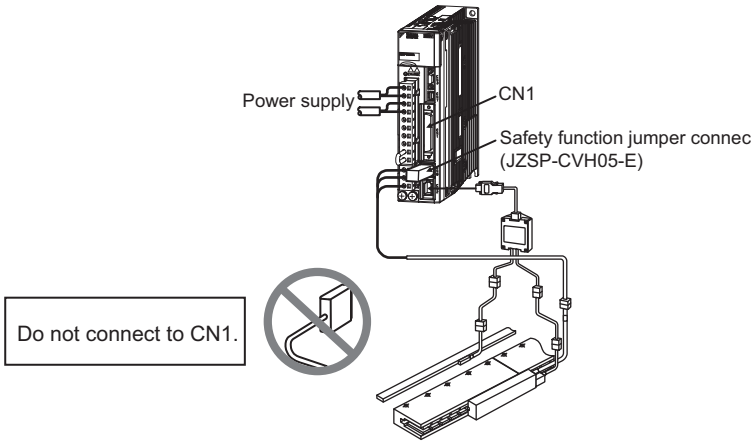
(2) SERVOPACKs

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

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

(3) Checking the Main Circuit Power Supply, Linear Servomotor, and Linear Scale Wirings

Once again, check the main circuit power supply, linear servomotor, and linear scale wiring that was described in *Chapter 3 Wiring and Connection*.
Perform a trial operation with the safety function jumper connector (JZSP-CVH05-E, provided as an accessory) inserted into the CN8 connector.



Make sure that the following cables are correctly connected.

- Main circuit cable
- Linear servomotor main circuit cable
- Cable for connecting the serial converter unit
- Cable for connecting the linear scale
- Cable for connecting the hall sensor

5.3 Setting the SERVOPACK Parameters

Set the following SERVOPACK parameters.

- Linear scale pitch (Pn282)
- Hall sensor selection (Pn080.0)
- Motor phase selection (Pn080.1)
- Overtravel signal mapping (Pn50A.3, Pn50B.0)
- Force limit (Pn483, Pn484)

5.3.1 Setting and Checking the Linear Scale Pitch

(1) When Using a Serial Converter Unit

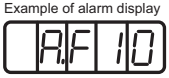
Turn ON the control power supply.
When the power is supplied normally, the panel operator on the front panel of the SERVOPACK will show the following display. A linear scale pitch setting error (A.080) will be displayed, but does not indicate an error. Set the linear scale pitch (Pn282) according to the scale being used. After setting validation of the control power, the A.080 alarm will be cleared, and the settings will be enabled.

Normal status



If an alarm other than A.080 is displayed, as shown in the following diagram, the wiring for the power supply circuit, the linear servomotor main circuit cable or the cable for connecting the serial converter unit is the probable cause. Shut down the power supply, specify the location causing the alarm, and take corrective measures so that the display returns to the above normal status. For details on alarms, refer to the corresponding SERVOPACK or command option module user's manual (see ■ *Manuals Related to the Σ-V Series* in About this Manual.)

Example of alarm display

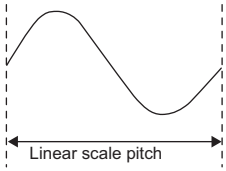


Pn282	Linear Scale Pitch		Speed / Position / Force	
	Setting Range	Setting Unit	Factory Setting	When Enabled
	0 to 6553600	0.01 μm	0	After restart

If the linear scale pitch (Pn282) is not set correctly, the linear servomotor cannot be controlled. Make sure that the correct value is set before operating the linear servomotor.

When using a SERVOPACK right after factory shipment, the alarm A.080 (Linear Scale Pitch Setting Error) will be displayed but does not indicate an error. This alarm is generated to remind the user to set Pn282. Set Pn282 to a correct value and turn OFF the power then ON again. The alarm A.080 will be cleared.

When using a serial converter unit model JZDP-D00□-□□□, the SERVOPACK uses 1/256 the distance of the scale pitch as a minimum feedback pulse. (The count is performed in the serial converter unit using 1/256 of the linear scale pitch.)



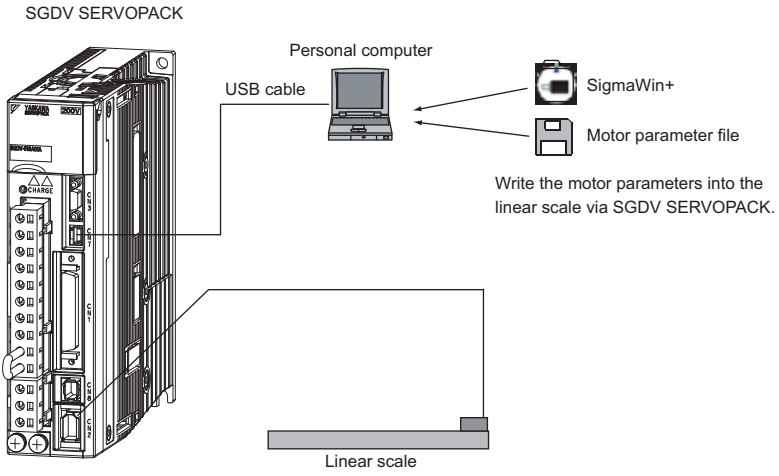
Linear scale pitch (Pn282)
= Distance of one cycle of the analog voltage feedback signal from linear scale

(2) When Not Using a Serial Converter Unit

When not using a serial converter unit (when connecting a linear scale directly to the SERVOPACK), the motor parameters must be written into the linear scale via the SERVOPACK using the SigmaWin+ software engineering tool.

⚠ WARNING

- Before writing the parameters, check the motor and linear scale data.
  Writing incorrect parameters may cause motor overrun or burnout, resulting in damage to the product or fire.



■ Setup Procedure

1. Prepare the motor parameters to be written into the linear scale and the SigmaWin+ software version 3.01 or later.
2. Install SigmaWin+ in a personal computer.
3. Use a standard USB cable to connect the personal computer to the SERVOPACK CN3 port.
   Start SigmaWin+ to write the motor parameters into the linear scale via the SERVOPACK.
   (Refer to SigmaWin+ Operation Manual for information on how to write parameters using SigmaWin+.)

IMPORTANT

- Note that no motor parameters contain the serial number data. Serial numbers cannot be checked by using the SERVOPACK monitoring function.
  If SigmaWin+ or the utility function Fn01E (SERVOPACK and servomotor ID Display) is used to monitor the serial number, "**********" will be displayed.

■ Precautions

- If the scale parameters have not been written in the linear scale, A.CA0 (Encoder Parameter Error) will occur when the power is turned ON. Contact the linear scale manufacturer.
- If the motor parameters have not been written in the linear scale A.CA0 (Encoder Parameter Error) will not occur when the power is turned ON. Monitor the motor data using the monitoring function to see if the motor parameters are saved in the linear scale. If they are not saved, write the motor parameters and then turn the power OFF and then ON again to monitor the servomotor data.
  If the motor parameters have not been written, the following alarms will occur when the power is turned ON:
  A.550 (Maximum Speed Setting Error), A.041 (Encoder Output Pulse Setting Error)
  A.040 (Parameter Setting Error 1), A.050 (Combination Error)
  A.710 (Overload: High Load), A.720 (Overload: Low Load)
  A.C90 (Encoder Communications Error)

■ How to Monitor the Motor Data Using the Digital Operator

• When the motor parameters have already been written

Step	Display after operation	Keys	Operation
1	A.550 −FUNCTION− Fn01B:Vibl_vllmit Fn01E:SvMotOp ID Fn020:S−Orig Set Fn080:Pole Detect	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of Utility Function. Press the ∧ or ∨ Key to select Fn01E.
2	A.550 −Sv&Mot ID− Driver SGDV−2R8A15A D0039C5466100 20 07.04 200V, 400W SERVOPACK model	DATA	Press the DATA Key. The SERVOPACK model being used will be displayed.
3	A.550 −Sv&Mot ID− Motor SGLGW−□□□□□□ ********** 05.02 200V, 360W Connected servomotor model	DATA	Press the DATA Key again. The connected servomotor model will be displayed. Note: If the linear scale data is not saved in the SERVOPACK, nothing will be displayed under Motor.
4	A.550 −Sv&Mot ID− Encoder JZDP−■□□□−△△△ ********** 07.04 09bit−ABS Connected linear scale model	DATA	Press the DATA Key again. The linear scale model will be displayed. Note: If the linear scale data is not saved in the SERVOPACK, nothing will be displayed under Encoder.

• When the motor parameters have not yet been written

Procedure	Display after operation	Keys	Operation
1	A.550 −FUNCTION− Fn01C:Vibl_vllmit Fn01E:SvMotOp ID Fn020:S−Orig Set Fn080:Pole Detect	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of Utility Function. Press the ∧ or ∨ Key to select Fn01E.
2	A.550 −Sv&Mot ID− Driver SGDV−2R8A01A D0039C546610020 07.04 200V, 400W SERVOPACK model	DATA	Press the DATA Key. The SERVOPACK model being used will be displayed.
3	A.550 −Sv&Mot ID− Motor 00.00 100V, W Connected servomotor model	DATA	Press the DATA Key again. The connected servomotor model will be displayed. Note: If the linear scale data is not saved in the SERVOPACK, nothing will be displayed under Motor.
4	A.550 −Sv&Mot ID− Encoder JZDP−■□□□ ********** 07.04 09bit−ABS Connected linear scale model	DATA	Press the DATA Key again. The linear scale model will be displayed. Note: If the linear scale data is not saved in the SERVOPACK, nothing will be displayed under Encoder.

• When Using SigmaWin+

Start SigmaWin+. Click ***Monitor*** in the main menu and then click ***Product Information***.

Note: The linear scale pitch can be checked by using the monitor mode parameters Un084 (Linear Scale Pitch) and Un085 (Linear Scale Pitch Index).

Example

When Un084 = 800, and Un085 = 6

Linear scale pitch = $Un084 \times 10^{Un085}$ [pm] = 800×10^{6} [pm] = 800 [μm]

5.3.2 Hall Sensor Selection

(1) Linear Servomotor with Hall Sensor

For a linear servomotor with hall sensor, use the factory setting: Pn080.0 = 0

(2) Linear Servomotor without Hall Sensor

For a linear servomotor without hall sensor, select *Disables selection* for the parameter Pn080.0. The factory setting is Pn080.0 = 0 (Enables selection), so change the setting to Pn080.0 = 1 (Disables selection). After having changed the setting, turn OFF the power supply and then ON to enable new setting.

Parameter		Meaning	When Enabled
Pn080	n.□□□0	Enables selection [factory setting]	After restart
	n.□□□1	Disables selection	

When Pn080.0 = 0 is set without connecting a hall sensor, the alarm A.C21 (Hall Sensor Error) will occur when the power supply is turned ON.

5.3.3 Motor Phase Selection

Check the following feedback signals to the SERVOPACK, and set the motor phase sequence using the paraneter Pn080.1.

- Check whether the signals from the linear scale are correctly received.
- Check whether the forward direction and linear scale count direction are the same.

IMPORTANT

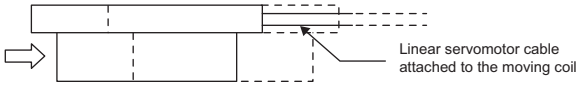
1. Before checking the feedback signals, be sure to set Pn000.0 to 0 (linear scale counting-up (phase-A advance) direction as forward direction).
2. Be sure to check the feedback signals before operating the linear servomotor. If the linear servomotor is operated without checking the feedback signals, the linear servomotor may not run, or overrun may occur.

■ Checking the Signals from the Linear Scale

1. Turn ON the control power to the SERVOPACK and set to servo OFF status.
2. Displays the monitor mode parameter Un00D (Feedback Pulse Counter) on the panel operator or digital operator.
3. Move the linear servomotor from end to end of the stroke by hand, and check whether the correct number of feedback pulses is returned.

<Example>

Using a linear scale with a scale pitch of 20 μm, if the linear servomotor is moved only 1 cm by hand in the linear scale's count direction, the number of feedback pulses will be as follows:
1 cm/ (20 μm/256) = 128,000 pulses



When the linear servomotor is moved by hand to the side along the cable and the value of Un00D is 128000, it is confirmed that the SERVOPACK received the signal correctly.

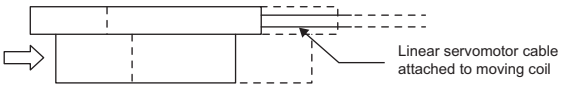
Note: The actual monitor display will deviate by the error in movement distance only, so a value that is close to the above value is acceptable.

Note:

- When the Value of the Un00D is incorrect
  If the Un00D value is not displayed correctly, the following conditions may be present. Check the conditions and take appropriate countermeasures.
- The scale pitch of the linear scale does not match.
  If the scale pitch set in Pn282 is different from the actual scale pitch, the assumed number of feedback pulses will not be returned. Check the specifications of the linear scale.
- The linear scale has not been adjusted.
  If the linear scale is not adjusted, the linear scale's output signal level will drop and the count will not be correct. Check that the linear scale is correctly adjusted. For details, contact the scale's manufacturer.
- The wiring between the linear scale and serial converter unit is not correct.
  If the wiring is not correct, a normal count will not be performed. Rewire the devices correctly.

■ Checking the Concurrence between the Linear Scale Count Direction and the Linear Servomotor Forward Direction

Next, move the moving coil by hand in the direction of the side along the cable, and check that the Un00D monitor is counting up.



When the linear servomotor is moved by hand to the side along the cable, if the value of Un00D is a countup value, confirmation is completed.

Note: When the Value of the Un00D is counted down
When the value of the Un00D is a counted down, set the parameter Pn080.1 = 1 (Sets phase B lead as phase sequence of U, V, W). Enable the setting by turning OFF the power and then ON again.

■ Related Parameter

Parameter		Meaning	When Enabled
Pn080	n.□□0□	Sets phase A lead as phase sequence of U, V, W (factory setting)	After restart
	n.□□1□	Sets phase B lead as phase sequence of U, V, W	

5.3.4 Setting the Overtravel Signals

Polarity detection cannot start in overtravel state.
When using the overtravel function, connect the signal wires and use in base block status. When not using the overtravel function, set the parameters Pn50A.3 to 8 (Forward run allowed) and Pn50B.0 to 8 (Reverse run allowed). The setting validation is required to enable the settings.

5.3.5 Setting the Force Limits

To prevent danger during setup of the linear servomotor, the factory settings for the forward force limit (Pn483) and reverse force limit (Pn484) parameters are set to a small value (factory setting: 30%).

If the force limits are set after the steps described in *5.3.1 Setting and Checking the Linear Scale Pitch* and *5.3.2 Hall Sensor Selection*, overrun will not occur. Increase the value in the parameters up to the required force. Set the value to the maximum value if no particular restricting conditions apply.

Pn483	Forward Force Limit			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 800	1%	30	Immediately
Pn484	Reverse Force Limit			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 800%	1%	30	Immediately

Note: If the force limit is set too high, polarity detection may not operate normally

5.4 Execution of Origin Setting (Fn020)

When using an absolute linear scale model ST78□A□ manufactured by Mitutoyo Corporation, execute the origin setting.

⚠ CAUTION

- Be sure to set the linear servomotor to the servo OFF state before executing the origin setting function.
- Make sure that the parameter Fn010 (Write Prohibited Setting) is not set to prohibite writing.
- After execution of the origin setting, the servo ready (/S-RDY) signal will become inactive and the servo will be unable to draw power since the system position data has been changed. Always turn the power supply OFF and then ON again after execution of origin setting.
- After execution of the origin setting, the motor phase data in the SERVOPACK will be lost. Execute the polarity detection (Fn080) and save the motor phase data in the SERVOPACK.
- Origin setting using the utility function is required only for the initial setup.
  If the position data is carelessly changed, the origin of the linear scale will be changed and the machine may move in unexpected ways, resulting in damage to the product or injury.

The origin setting can be executed by using either the digital operator or panel operator.

■ Using the Panel Operator

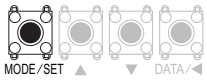
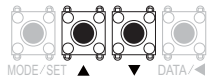
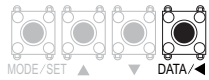
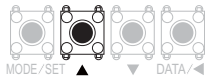
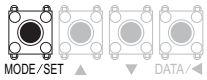
Step	Display after operation	Keys	Operation
1	BB –FUNCTION– Fn01F:FBOpMot ID Fn020:S–Orig Set Fn030:Soft Reset Fn080:Pole Detect	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of Utility., and select Fn020 using the ∧ or ∨ Key.
2	BB Scale Origin Set ORGSET1	DATA	Press the DATA Key. The screen will change to the Fn020 (Origin Setting) main window.
3	BB Scale Origin Set ORGSET5	∧ or ∨	Press the ∧ or ∨ Key to select ORGSET5.

(cont'd)

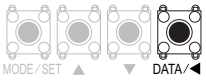
Step	Display after operation	Keys	Operation
4	B B Scal Origin Set	DATA	Press the DATA Key to start the origin setting. During origin setting, "Scale Origin Set" will be displayed blinking. When the origin setting is completed, the display stops blinking, and the status will be changed as BB→DONE→A.941*.
5			To enable the setting, turn OFF the power to the SERVOPACK and then ON again.

* With SGDV SERVOPACK that support MECHATROLINK-II or MECHATROLINK-III, "A.941" will not be shown, and "BB" will be displayed instead.

■ Using the Panel Operator

Step	Display after operation	Keys	Operation
1	Fn000		Press the MODE/SET Key to select the Utility Function mode.
2	Fn020		Press the UP or DOWN Key to select Fn020.
3	0SEt1		Press the DATA/SHIFT Key for approximately one second. The display shown on the left will appear.
4	0SEt5		Keep pressing the UP Key until 0SET5 appears. Note: If the correct key is not properly pressed, No_oP will be displayed blinking and the display will return to that of step 1.
5	donE (Displayed blinking)		Press the MODE/SET Key to set the scale origin. When the origin is set, donE is displayed blinking for approximately one second.
6	0SEt5	One second after	The display donE is changed to OSET5.

(cont'd)

Step	Display after operation	Keys	Operation
7			Press the DATA/SHIFT Key for approximately one second. The display will return to Fn020.
8	Turn OFF the power to the SERVOPACK and then ON again to enable the setting.		

5.5 Polarity Detection

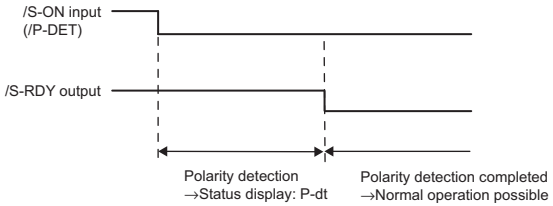
When using a linear servomotor without hall sensor, execute the polarity detection.

Make sure that the following conditions are satisfied when executing the polarity detection.

- There will be no danger around the linear servomotor when the linear servomotor moves approximately 10 mm.
  (The linear servomotor may move approximately 5 cm in the case the polarity detection fails. The distance the linear servomotor moves in such case may differ depending on many factors.)
- The scale pitch is within 100 μm. (within 40 μm is recommended when using an incremental linear scale.)
- Minimum unequal external force on the linear servomotor (5% of the rated force maximum is recommended.)
- The mass ratio is 50 times greater or less.
- On a horizontal axis.
- Friction on the guide is a few percentages of the rated force (air slide not used).

IMPORTANT

1. The linear servomotor is turned ON during polarity detection, so take measures to avoid electric shock. The linear servomotor will make large movements during detection, so take the machine's range of motion into consideration and do not stand near the any moving parts.
2. Polarity detection depends on many factors, such as mass ratio, friction, and cable tension. If any error occurs because of one of these factors, polarity detection may failed.



5.5.1 When Using an Incremental Linear Scale

(1) Executing the Utility Function: Polarity Detection (Fn080)

To adjust the polarity of linear servomotor, use the following utility function: Polarity Detection (Fn080).

The following items must be confirmed before executing the polarity detection.

- The parameter Fn010 (Writing Prohibited Setting) is not set to prohibit writing.
- Linear servomotor is turned OFF.

The polarity detection can be executed by using either the digital operator or panel operator.

■ Using the Digital Operator

Step	Display after operation	Keys	Operation
1	BB –FUNCTION– Fn030:Soft Reset Fn080:Pole Detect Fn200:TuneLvl Set Fn201:AAT	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of Utility Function. Press the ∧ or ∨ Key to select FN080.
2	BB Magnetic Pole Detect Level=40	∧ ∨ < > DATA	Press the DATA Key. The Fn080 (Polarity Detection) execution window will open. To adjust the level: Press the < or > Key to move the cursor from/to the digit. Press the ∧ or ∨ Key to change the value of each digit.
3	BB Magnetic Pole Detect Start :[JOGSVON] Return:[SET]	DATA	Press the DATA Key. The display shown on the left will appear.
4	P DET Magnetic Pole Adjustment Return:[SET]	JOG SVON	Press the JOG SVON Key. The linear servomotor will be in servo ON status and the polarity detection will start. During the polarity detection, “Magnetic Pole Adjustment” is displayed blinking. When the polarity detection is complete, the linear servomotor will be in servo OFF status.

(cont'd)

Step	Display after operation	Keys	Operation
5	BB Magnetic Pole Detect Return:[SET]		When the polarity detection is complete, the display shown on the left will appear.
6	BB –FUNCTION– Fn030:Soft Reset Fn080:Pole Detect Fn200:TuneLvl Set Fn201:AAT	MODE/SET	Press the MODE/SET Key. The display will return to the Utility Function main menu.

■ Using the Panel Operator

Step	Display after operation	Keys	Operation
1	Fn000	MODE/SET ▲ ▼ DATA/◀	Press the MODE/SET Key to select the Utility Function mode.
2	Fn080	MODE/SET ▲ ▼ DATA/◀	Press the UP or DOWN Key to select Fn080.
3	-PdEt	MODE/SET ▲ ▼ DATA/◀	Press the DATA/SHIFT Key for approximately one second. The display shown on the left will appear.
4	.PdEt	MODE/SET ▲ ▼ DATA/◀	Press the MODE/SET Key to start the polarity detection.
5	-PdEt		When the polarity detection is complete, the display shown on the left will appear. The linear servomotor will be in the servo OFF status.
6	Fn080	MODE/SET ▲ ▼ DATA/◀	Press the DATA/SHIFT Key for approximately one second. The display will return to Fn080.

5.5.2 When Using an Absolute Linear Scale

(1) Executing the Utility Function: Polarity Detection (Fn080)

To adjust the polarity of linear servomotor, use the following utility function: Polarity Detection (Fn080). Because this function is used as part of the initial setup, it is usually not necessary to execute this function a second time.

⚠ CAUTION

- If the SERVOPACK, the absolute linear scale, or the linear servomotor is replaced, the polarity detection function must be executed again.
  Failure to observe this caution may result in the linear servomotor moving in an unpredictable manner.

The following items must be confirmed before executing the polarity detection.

- The parameter Fn010 (Writing Prohibited Setting) is not set to prohibit writing.
- Linear servomotor is turned OFF.

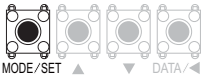
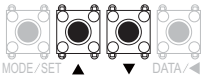
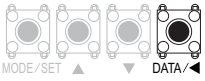
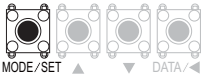
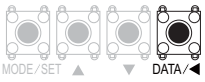
The polarity detection can be executed by using either the digital operator or panel operator.

■ Using the Digital Operator

Step	Display after operation	Keys	Operation
1	BB –FUNCTION– Fn030:Soft Reset Fn080:Pole Detect Fn200:TuneLvl Set Fn201:AAT	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of Utility Function. Press the ∧ or ∨ Key to select Fn080.
2	BB Magnetic Pole Detect Level=40	∧ ∨ < > DATA	Press the DATA Key. The Fn080 (Polarity Detection) execution window will open. To adjust the level, Press the < or > Key to move the cursor from/to the digit. Press the ∧ or ∨ Key to change the value of each digit.
3	BB Magnetic Pole Detect Start :[JOGSVON] Return:[SET]	DATA	Press the DATA Key. The display shown on the left will appear.
4	P DET Magnetic Pole Adjustment Return:[SET]	JOG SVON	Press the JOG SVON Key. The linear servomotor will be in servo ON status and the polarity detection will start. During the polarity detection, “Magnetic Pole Adjustment” is displayed blinking. When the polarity detection is complete, the linear servomotor will be in servo OFF status.
5	BB Magnetic Pole Detect Return:[SET]		When the polarity detection is complete, the display shown on the left will appear.
6	BB –FUNCTION– Fn030:Soft Reset Fn080:Pole Detect Fn200:TuneLvl Set Fn201:AAT	MODE/SET	Press the MODE/SET Key. The display will return to the utility function main menu.
7	Turn OFF the power to the SERVOPACK and then ON again to enable the setting.		

5.5.2 When Using an Absolute Linear Scale

■ Using the Panel Operator

Step	Display after operation	Keys	Operation
1	Fn000		Press the MODE/SET Key to select the Utility Function mode.
2	Fn080		Press the UP or DOWN Key to select Fn080.
3	-PdEt		Press the DATA/SHIFT Key for approximately one second. The display shown on the left will appear.
4	.PdEt		Press the MODE/SET Key to start the polarity detection.
5	-.PdEt		When the polarity detection is complete, the display shown on the left will appear. The linear servomotor will be in servo OFF status.
6	Fn080		Press the DATA/SHIFT for approximately one second. The display will return to Fn080.
7	Turn OFF the power to the SERVOPACk and then ON again to enable the setting.		

5.5.3 Troubleshooting for Polarity Detection Errors

Refer to the following table for troubleshooting if polarity detection is not completed normally.

No.	Problem	Cause	Countermeasure
1	Polarity detection error (A.C50)	Parameter settings are incorrect.	The settings for linear scale pitch (Pn282) and motor phase selection (Pn080.1) may not be appropriate for the device. Check the linear scale specifications and feedback signal conditions.
		Noise is present in the scale signal.	When the detection reference is repeatedly output several times in the same direction, noise may occur in the scale signal, resulting in malfunction. Check that the FG of the serial converter unit and linear servomotor is connected to FG of the SERVOPACK, and that FG of the SERVOPACK is connected to the power supply FG. Also check that the encoder cable is securely sealed.
		The moving coil is being subjected to an external force.	If the moving coil is subjected to a graviry or/and an external force such as cable tension, and the speed feedback is not 0 regardless of a 0 detection reference, polarity detection will be poor. Reduce the external force and make the speed feedback 0. If the external force can not be reduced, increase the value of the changes in the sequence input signal allocation for each signal (Pn481).
		The linear scale resolution is rough.	When the linear scale pitch is 100 μm min., the SERVOPACK cannot detect correct speed feedback. Use a linear scale with good scale pitch precision (within 40 μm is recommended). Alternatively, increase the value of the polarity detection reference speed (Pn485). The range of linear servomotor movement at polarity detection, however, will increase.
2	Overtravel detection at polarity detection (A.C51)	The OT signal was detected during polarity detection	The alarm A.C51 occurs when the OT signal is detected during polarity detection.Before executing the polarity detection, place the motor to the position where the OT signal is not detected.

5.5.3 Troubleshooting for Polarity Detection Errors

No.	Problem	Cause	Countermeasure
3	Polarity detection uncompleted (A.C52)	<Analog Pulse Model> • Polarity detection was not yet complete. • The /PDET signal was not input.	Input the /PDET signal.
		<M-II Model/M-III Model/Command Option Attachable Type> The servo has been turned ON under the following circumstances. • An absolute linear scale is being used. • The polarity detection selection for the absolute linear scale was set to not execute. (Pn587.0=0) • Polarity was not yet detected.	When using an absolute linear scale, set Pn587.0 to 1 to execute polarity detection.
4	Out of range for polarity detection (A.C53)	The movement distance during detection exceeds the range set for Pn48E.	An alarm occurs when the motor movement distance during detection becomes out of the range set for Pn48E. If the command distance has not been changed from the factory set value, the motor might have been moved for some reason. Check for the cause and take a proper measure.
5	Polarity detection error 2 (A.C54)	An external force was applied to the linear servomotor.	Increase the value of the polarity detection confirmation force reference (Pn495). Increase the value of the polarity detection allowable error range (Pn498). (Note that increasing the allowable error will also increase the servomotor temperature.)

5.5.4 Related Parameters

Pn481	Changes the sequence input signal allocation for each signal			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	10 to 20000	0.1 Hz	400	Immediately
Pn482	Polarity Detection Speed Loop Integral Time Constant			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	15 to 51200	0.01 ms	3000	Immediately
Pn485	Polarity Detection Reference Speed			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 100	1 mm/s	20	Immediately
Pn486	Polarity Detection Reference Accel/Decel Time			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 100	1 ms	25	Immediately
Pn487	Polarity Detection Reference Constant Speed Time			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 300	1 ms	0	Immediately
Pn488	Polarity Detection Reference Waiting Time			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	50 to 500	1 ms	100	Immediately
Pn48E	Polarity Detection Range			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	1 to 65535	1 mm	10	Immediately
Pn490	Polarity Detection Load Level			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 20000	1 %	100	Immediately
Pn495	Polarity Detection Confirmation Force Reference			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 200	1%	100	Immediately
Pn498	Polarity Detection Allowable Error Range			Speed Position Force
	Setting Range	Setting Unit	Factory Setting	When enabled
	0 to 30	1°	10	Immediately

5.6 JOG Operation

After setting and checking the items described in the previous sections, conduct a JOG operation as follows.

The JOG operation is the function used to check the movement of the linear servomotor in speed control without connecting the SERVOPACK to the host controller.

⚠ WARNING

- When turning ON the servo for the first time after installation and wiring, stand away from the linear servomotor as overrun may occur.

⚠ CAUTION

- During a JOG operation, the overtravel function is disabled. So take the machine's range of motion into consideration.

Note: If possible, execute the JOG operation without connecting a load to the linear servomotor (no-load operation).

■ Check Items Before Execution

Check the following items before executing the JOG operation.

- The parameter Fn010 (Writing Prohibited Setting) is not set to prohibit writing.
- The main circuir power supply is ON.
- No alarm is occurring.
- The HWBB function is disabled.
- The linear servomotor is in servo OFF status.
- The JOG speed is properly set considering the the motion range of the machine to be connected to the linear servomotor.
  Set the JOG speed using the parameter Pn383.

Pn383	JOG Speed [Speed] [Position] [Force]				Classification
	Setting Range	Unit	Factory Setting	When Enabled	
	0 to 10000	1 mm/s	50	Immediately	Setup

1. Turn ON the control power and main circuit power supplies.
2. Use the panel operator, digital operator, or SigmaWin+ to move the linear servomotor in JOG operation.
3. Check that the linear servomotor properly moves from one end to the other end of the stroke.

IMPORTANT

The tuning-less function is by default set enabled. When the tuning-less function is enabled, the gain may be so increased to cause vibration during no-load operation. If vibration occurs, disable the tuning-less function by setting the parameter Pn170.0 to 0.

■ When Noises from the Linear Servomotor Cause a Problem

Select the Speed Detection 2 by setting the parameter Pn009.2 (Speed Detection Method Selection) to 1. And, turn OFF the power to the SERVOPACK and then ON again to enable the setting. It will be effective for the scale with a relatively long scale pitch.

Parameter		Meaning	When Enabled	Classification
Pn009	n.□0□□	Selects the speed detection 1 [factory setting)	After restart	Tuning
	n.□1□□	Selects the speed detection 2.		

If noises still cause a problem after having changed the speed detection method, use the current gain level setting function to change the current gain level.

The current gain level setting function reduces noises by adjusting the parameter value for current control inside the SERVOPACK in accordance with the parameter value for the speed loop gain (Pn100). To change the parameter value for current control, the current gain level must be changed from 2000%, which is the default value of Pn13D to disable this function. This function is always disabled in force control mode (Pn000.1 = 2).

Pn13D	Current Gain Level		Speed Position		Classification
	Setting Range	Unit	Factory Setting	When Enabled	
	100 to 2000	1%	2000	Immediately	Tuning

Note: If the set value of Pn13D is decreased, the level of noise will be lowered, but the responsiveness of the SERVOPACK will also be degraded. Lower the current gain level to one at which SERVOPACK responsiveness can be secured.

After having checked the above items, increase the values for the force limit function (Pn483 and Pn484) up to the required force. Set the value to the maximum value 800% if no particular restricting conditions apply.

Setup is finished when all these checks have been completed.

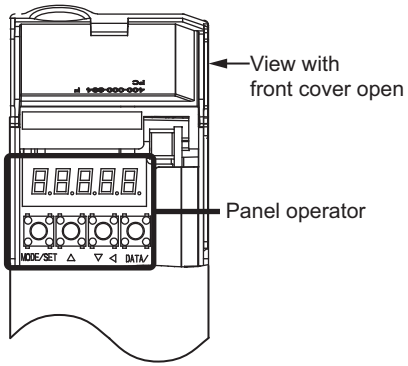
Note:

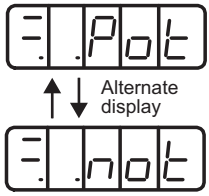
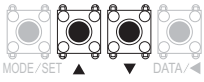
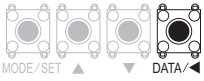
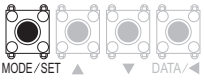
- Unsuccessful Trial Operations
  An unsuccessful trial operation could be attributed to the following conditions. Check the conditions and take appropriate measures.
- The force reference is saturated because the load is too heavy, or the jog speed is too fast.
  Lower the jog speed or lighten the load.
- The linear servomotor is moving slightly and then stops.
  The linear servomotor and linear scale are not in agreement. Check the wiring, scale pitch setting, linear scale count, and whether the motor forward direction matches the scale count direction.
- Polarity detection is not being performed normally.
  Refer to *5.5 Polarity Detection* to execute the polarity detection.

5.6.1 JOG Operation Using a Panel Operator

This section describes the procedure for executing a JOG operation using a panel operator.

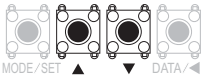
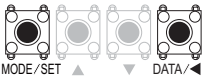
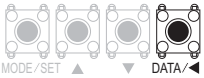
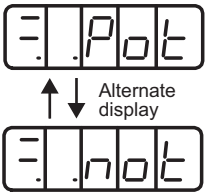
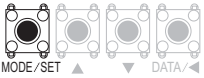
The panel operator is located under the front cover of the SERVOPACK (analog pulse models only).



Step	Display after operation	Keys	Operation
1			Turn ON the power to the SERVOPACK. The forward run prohibited (P-OT) or reverse run prohibited (N-OT) message is displayed. When the JOG operation is executed, P-OT and N-OT are automatically disabled.
2			Press the MODE/SET Key to select the utility function mode.
3			Press the UP or DOWN Key to select Fn002.
4			Press the DATA/SHIFT Key for approximately one second. The display shown on the left will appear.
5			Press the MODE/SET Key. The linear servomotor will be in servo ON status.

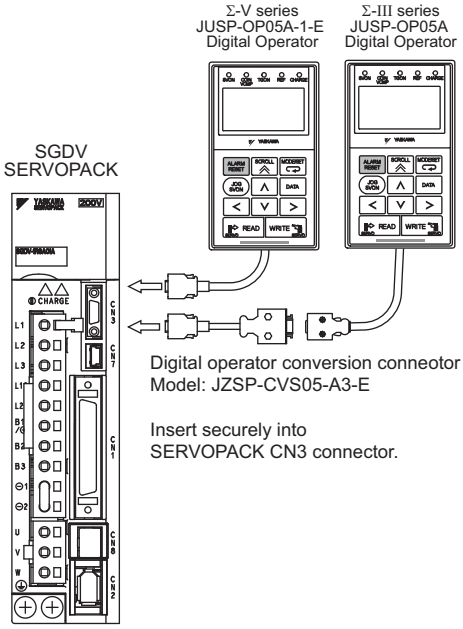
5.6.1 JOG Operation Using a Panel Operator

(cont'd)

Step	Display after operation	Keys	Operation
6			Press the UP Key to move the linear servomotor in the forward direction or press the DOWN Key to move it in reverse. The linear servomotor will move at the speed set in the parameter Pn383 while the key is being pressed.  Forward direction  Reverse direction
7			Press the MODE/SET Key. The linear servomotor will be in servo OFF status. Note: The linear servomotor can be also in servo OFF status by pressing the DATA/SHIFT Key for approximately one second.
8			Press the DATA/SHIFT Key for approximately one second. "Fn002" is displayed again.
9			Press the MODE/SET Key to return to the initial display (step 1).

5.6.2 JOG Operation Using a Digital Operator

This section describes the procedure for executing a JOG operation using a digital operator.
Connect the digital operator to the SERVOPACK CN3 connector.



The digital operator can be connected or removed while the SERVOPACK power is ON.
The operation procedure is explained with the parameter Pn000.0 set to 0 (linear scale counting up direction as the forward direction).

Step	Display after operation	Keys	Operation
1	BB −PRM/MON− Un000= 00000 Un002= 00000 Un008= 0000000000 Un00D= 0000000000		Turn ON the power to the SERVOPACK. The initial window will appear, and then the parameter/monitor mode will appear.
2	BB −FUNCTION− Fn000:Alm History Fn002:JOG Fn003:Z−Search Fn004:Program JOG	MODE/SET ∧ ∨	Press the MODE/SET Key to view the main menu of the Utility Function. Press the ∧ or ∨ Key to select Fn002.

5.6.2 JOG Operation Using a Digital Operator

(cont'd)

Step	Display after operation	Keys	Operation
3	BB −JOG− Pn383=00500 Un000= 00000 Un002= 00000 Un00D=000000000	DATA	Press the DATA Key. The display will change to the execution display of Fn002.
4	BB −JOG− Pn383=00500 Un000= 00000 Un002= 00000 Un00D=000000000	DATA	Press the DATA Key. The cursor will move to the setting data of JOG speed (Pn383).
5	BB −JOG− Pn383=01000 Un000= 00000 Un002= 00000 Un00D=000000000	< > ∧ ∨	Press the < or > Key, and the ∨ or ∧ Key to set the JOG speed to 1000 (mm/s).
6	BB −JOG− Pn383=01000 Un000= 00000 Un002= 00000 Un00D=000000000	DATA	Press the DATA Key. The set value is input, and the cursor will move to the parameter number.
7	RUN −JOG− Pn383=01000 Un000= 00000 Un002= 00000 Un00D=000000000	JOG SVON	Press the JOG SVON Key. "RUN" will be displayed in the status field, and the linear servomotor will be in servo ON status.
8	RUN −JOG− Pn383=01000 Un000= 00000 Un002= 00000 Un00D=000000000	∧ ∨	Press the ∧ (Forward direction) or ∨ (Reverse direction) Key. The linear servomotor will move at the set speed while the key is being pressed.  Forward direction  Reverse direction
9	BB −JOG− Pn383=01000 Un000= 00000 Un002= 00000 Un00D=000000000	JOG SVON	After confirming that the linear servomotor moves correctly, press the JOG SVON Key. "BB" will be displayed in the status field, and the linear servomotor will be in servo OFF status.

(cont'd)

Step	Display after operation	Keys	Operation
10	BB −FUNCTION− Fn000: Alm History Fn002: JOG Fn003: Z−Search Fn004: Program JOG	MODE/SET	Press the MODE/SET Key. The display will return to the main menu of the Utility Function.
11	BB −PRM/MON− Un000= 00000 Un002= 00000 Un008= 0000000000 Un00D= 0000000000	MODE/SET	Press the MODE/SET Key twice. The display will return to the initial window (step 1).

■ Alarm Display

An alarm is automatically displayed if a problem occurs for some reason. Check the alarm referring to the user's manual for the corresponding SERVOPACK or command option module (refer to *■ Manuals Related to the Σ-V Series* on page iv) and apply the appropriate measures.

```
A. 710          −ALARM−
A. 710  000012071960
1: 720  000000326510
2: 511  000000090430
3: −−−
```

■ Error Display

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.

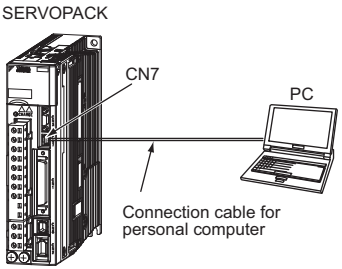
```
CPF00
COM−ERR(OP&SV)
```

```
CPF01
COM−ERR(OP&SV)
```

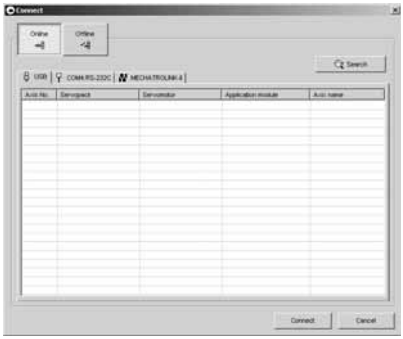
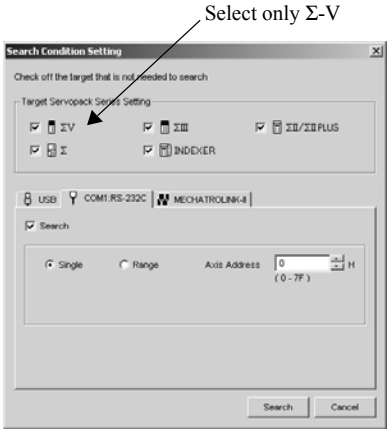
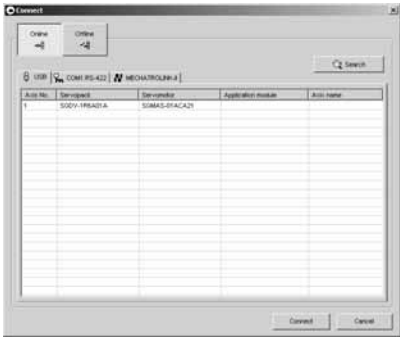
5.6.3 JOG Operation Using SigmaWin+

This section describes the procedure for executing a JOG operation using SigmaWin+.

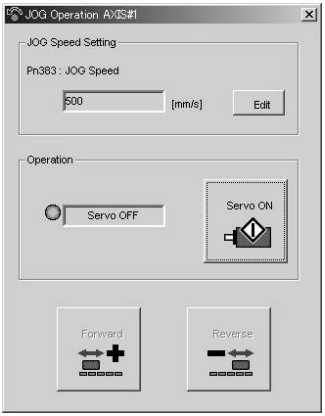
In the following example, test-run procedures are explained using the JOG operation window of Test Run on the main menu of SigmaWin+.

Step	Operation	Display
1	• Connect a computer. Use a connection cable to connect a SERVOPACK to a computer which has SigmaWin+ installed.  JZSP-CVS06-02-E	
2	• Start SigmaWin+ and open the main window. (1) Turn ON the SERVOPACK. (2) Turn ON the computer. (3) Double click the YE_Applications folder on the desktop. (4) Double click the SigmaWin+ icon to display the SigmaWin+ startup screen.	 YE_Applications  SigmaWin+ English Edition  Startup Screen

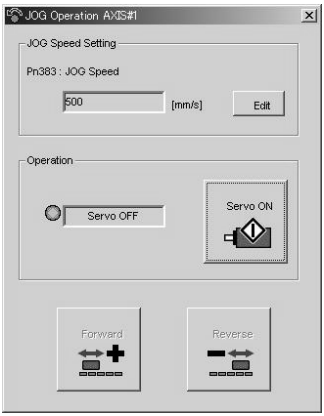
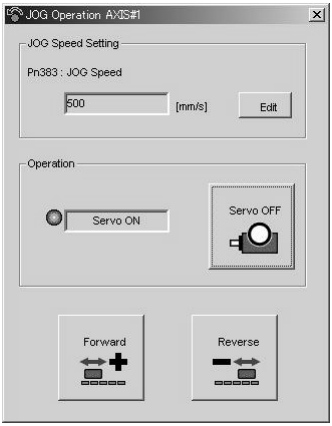
(cont'd)

Step	Operation	Display
2 (cont'd)	(5) Once SigmaWin+ is started, the connection window is displayed. Note: Offline is used for operation with no SERVOPACK connected. Click Search to search for the connected SERVOPACK.	 Connection Window
	(6) Search Condition Setting window is open. Select Σ-V(ΣV), and click Search. A dialog box will open first to tell you a search has started, and then the search result will be shown in the connection window. Note: If the message, "Servopack not found" is displayed, refer to *2.2 Selecting a SERVOPACK* of SigmaWin+ English Edition Online Manual (YE_Applications -> Manual).	 Search Condition Setting Window
	(7) Select the SERVOPACK to be connected. Click Connect. (Place the cursor over the SERVOPACK to be connected, and then click on it.) The main window of SigmaWin+ will then open.	

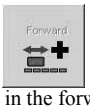
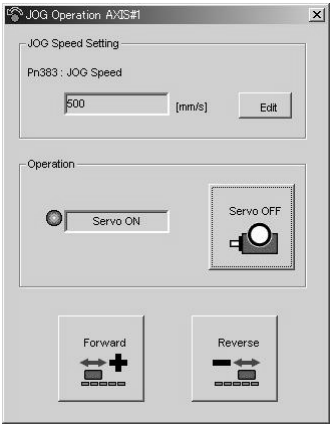
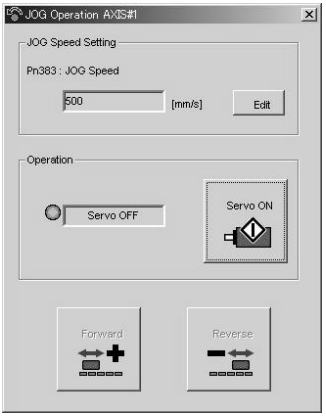
(cont'd)

Step	Operation	Display
3	• Run test operation. (1) Select Test Run first, and then select Jog (J) from the menu on the main window.	Test Run (R) → Jog (J)  Main Window
	(2) Warnings for the JOG operation window will be displayed. Read them and click OK.	 Warnings for the JOG Operation Window
	(3) The JOG operation window is open.	 JOG Operation Window

(cont'd)

Step	Operation	Display
4	• Set the JOG speed The motor speed is set to 500 [mm/s]. Click Edit if you need to change it.	
5	• Servo ON Click Servo ON. The display changes from **Servo OFF** to **Servo ON** and is lit in green.	

(cont'd)

Step	Operation	Display
6	• Start JOG operation. When you click , the linear servomotor will move in the forward direction. When you click , it will move in reverse. Confirm that the linear servomotor correctly moves while the button is being clicked. At the same time, carefully inspect the linear servomotor's condition and check the following points in particular. If a problem is found, correct it. • Is there any unusual vibration? • Is there any unusual sound? • Is the temperature rising unusually high?	
7	• Servo OFF Click . (Screen display will return to the display shown at step 4.)	
8	• Terminate JOG operation. Click  to close the JOG operation window.	You will return to the main window.

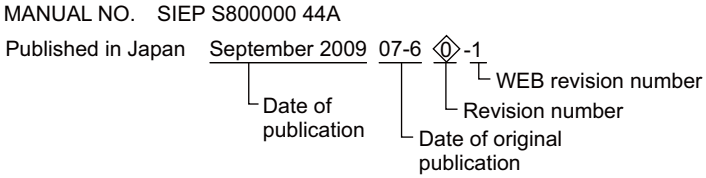
Refer to SigmaWin+ online manual for details. Follow the steps below to view the online manual.

<How to view the online manual>

1. Turn ON the computer.
2. Open the YE_Applications folder.
3. Open the Manual folder.
4. Open SigmaWin+ English Edition Online Manual.

Revision History

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



Date of Publication	Rev. No.	WEB Rev. No.	Section	Revised Content
January 2010	◇1	0	All chapters	Completely revised
September 2009	◇0	1	Preface	Addition: Warranty
			Back cover	Revision: Address
June 2007		0	–	First edition

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AC Servo Drives

Σ-V Series

USER'S MANUAL Setup

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