YASKAWA

ACサーボパック

Σ-IIシリーズ

安全上のご注意

形式：SGDH-□□□E
SGDM-□□□D
SGDM-□□□DA

製品を安全にお使い頂くために，本書を必ずお読みください。
また，本書をお手元に保管していただくとともに，最終的に本製品をご使用になるユーザー様のお手元に確実に届けられるよう，お取り計らい願います。

AC SERVOPACK

Σ-II Series

SAFETY PRECAUTIONS

Model: SGDH-□□□E
SGDM-□□□D
SGDM-□□□DA

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

MANUAL NO. TOBP S800000 04F

1 Introduction

This safety precautions manual covers Σ-II series SERVOPACK controlling Σ-II series AC servomotor. To properly use the Σ-II series SERVOPACK, read this safety precautions manual and user's manual (see the following table) thoroughly, and retain for easy reference for inspections and maintenance, and so on. Make sure that these manuals reach the end user.

2 Reference Manuals

This table lists related reference manuals:

SERVOPACK Model	Manual Titles	Manual No.
SGDH	Σ-II Series SGM□H/SGDH User's Manual	SIEPS80000005
SGDM	Σ-II Series SGM□H/SGDM User's Manual	SIEPS80000015

3 General Precautions

The following describes general precautions. Note the following to ensure safe application.

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

4 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 series 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:  .

5 Notes for Safe Operation

Read this manual thoroughly before checking products on delivery, storage and transportation, installation, wiring, operation and inspection, and disposal of the AC servo drives.

⚠ WARNING

- Never touch any rotating motor parts while the motor is running.

  Failure to observe this warning may result in injury.
- Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.

  Failure to observe this warning may result in injury.
- Never touch the inside of the SERVOPACKs.

  Failure to observe this warning may result in electric shock.
- Do not remove the terminal cover while the power is ON.

  Failure to observe this warning may result in electric shock.
- Do not touch terminals for five minutes after the power is turned OFF.

  Residual voltage may cause electric shock.
- Do not touch terminals for five minutes after voltage resistance test.

  Residual voltage may cause electric shock.
- Follow the procedures and instructions for trial operation precisely as noted in the relevant User's Manual.

  Malfunctions that occur after the servomotor is connected to the equipment not only damage the equipment, but may also cause an accident resulting in death or injury.
- The multi-turn limit value must be changed only for special applications.

  Changing it inappropriately or unintentionally can be dangerous.
- If the Multi-turn Limit Disagreement alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.

  If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting in a dangerous situation where the machine will move to unexpected positions.
- Do not remove the terminal cover, cables, connectors, or optional items while the power is ON.

  Failure to observe this warning may result in electric shock.

- Connect the ground terminal to electrical codes (ground resistance: 100 Ω or less).

  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.

⚠ WARNING

- Do not damage, press, exert excessive force or place heavy objects on the cables.

  Failure to observe this warning may result in electric shock, stopping operation of the product, or burning.
- Do not modify the product.

  Failure to observe this warning may result in injury or damage to the product.
- Provide an appropriate stopping device on the machine side to ensure safety. A holding brake for a servomotor with brake is not a stopping device for ensuring safety.

  Failure to observe this warning may result in injury.
- Do not come close to the machine immediately after resetting momentary power loss to avoid an unexpected restart. Take appropriate measures to ensure safety against an unexpected restart.

  Failure to observe this warning may result in injury.

■ Checking on Delivery

⚠ CAUTION

- Always use the servomotor and SERVOPACK in one of the specified combinations.

  Failure to observe this caution so may result in fire or malfunction.

■ Storage and Transportation

⚠ CAUTION

- Do not store or install the product in the following places.
  - 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.

  Failure to observe this caution may result in fire, electric shock, or damage to the product.
- Do not hold the product by the cables or motor shaft while transporting it.

  Failure to observe this caution may result in injury or malfunction.
- Do not place any load exceeding the limit specified on the packing box.

  Failure to observe this caution may result in injury or malfunction.
- Do not hold the product by the eyebolt of motor while transporting it.

  Failure to observe this caution may result in injury or malfunction.

⚠ CAUTION

- 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

- Never use the products in an environment subject to water, corrosive gases, inflammable gases, or combustibles.

  Failure to observe this caution may result in electric shock or fire.
- Do not step on or place a heavy object on the product.

  Failure to observe this caution may result in injury.
- Do not cover the inlet or outlet ports and prevent any foreign objects from entering the product.

  Failure to observe this caution may cause internal elements to deteriorate resulting in malfunction or fire.
- Be sure to install the product in the correct direction.

  Failure to observe this caution may result in malfunction.
- Provide the specified clearances between the SERVOPACK and the control panel or with other devices.

  Failure to observe this caution may result in fire or malfunction.
- Do not apply any strong impact.

  Failure to observe this caution may result in malfunction.

■ Wiring

⚠ CAUTION

- Do not connect a three-phase power supply to the U, V, or W output terminals.

  Failure to observe this caution may result in injury or fire.
- Securely connect the power supply terminal screws and motor output terminal screws.

  Failure to observe this caution may result in fire.
- Do not bundle or run power and signal lines together in the same duct. Keep power and signal lines separated by at least 30 cm (11.81 in).
- Use twisted-pair shielded wires or multi-core twisted pair shielded wires for signal and encoder (PG) feedback lines.

  The maximum length is 3 m (118.11 in) for reference input lines and is 20 m (787.40 in) for PG feedback lines. If feedback lines are longer than 20 m (787.40 in), use the 50 m (1968.50 in) cable.
- Do not touch the power terminals for 5 minutes after turning power OFF because high voltage may still remain in the SERVOPACK.

  Make sure the charge indicator is out first before starting an inspection.
- Avoid frequently turning power ON and OFF. Do not turn power ON or OFF more than once per minute.

  Since the SERVOPACK has a capacitor in the power supply, a high charging current flows for 0.2 seconds when power is turned ON. Frequently turning power ON and OFF causes main power devices like capacitors and fuses to deteriorate, resulting in unexpected problems.
- Observe the following precautions when wiring main circuit terminal blocks.

  Failure to observe this caution may result in injury, fire, or malfunction.
  - Remove the terminal block from the SERVOPACK prior to wiring.
  - Insert only one wire per terminal on the terminal block.
  - Make sure that the core wire is not electrically shorted to adjacent core wires.
  - The leakage from the power lines may be extremely large for 400-V SERVOPACK. Be sure to secure the wiring of the power lines.
- Do not connect the SERVOPACK for 100 V and 200 V directly to a voltage of 400 V.

  The SERVOPACK will be destroyed.
- Install the battery at either the host controller or the battery carrying space in the SERVOPACK.

  It is dangerous to install batteries at both simultaneously, because that sets up a loop circuit between the batteries.
- Be sure to wire correctly and securely.

  Failure to observe this caution may result in motor overrun, injury, or malfunction.
- Always use the specified power supply voltage.

  An incorrect voltage may result in burning.
- 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.

⚠ CAUTION

- Take appropriate and sufficient countermeasures for each when installing systems in the following locations.
  - Locations subject to static electricity or other forms of noise.
  - Locations subject to strong electromagnetic fields and magnetic fields.
  - Locations subject to possible exposure to radioactivity.
  - Locations close to power supplies.

  Failure to observe this caution may result in damage to the product.
- Do not reverse the polarity of the battery when connecting it.

  Failure to observe this caution may damage the battery or cause it to explode.

■ Operation

⚠ CAUTION

- Conduct trial operation on the servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.

  Failure to observe this caution may result in injury.
- Before starting operation with a machine connected, change the settings to match the parameters of the machine.

  Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
- Forward run prohibited (P-OT) and reverse run prohibited (N-OT) signals are not effective during zero point search mode using parameter Fn003.
- When using the servomotor for a vertical axis, install the safety devices to prevent workpieces to fall off due to occurrence of alarm or overtravel. Set the servomotor so that it will stop in the zero clamp state at occurrence of overtravel.

  Failure to observe this caution may cause workpieces to fall off due to overtravel.
- When not using the online autotuning, set to the correct moment of inertia ratio.

  Setting to an incorrect moment of inertia ratio may cause vibration.
- Do not touch the SERVOPACK heatsinks, regenerative resistor, or servomotor while power is ON or soon after the power is turned OFF.

  Failure to observe this caution may result in burns due to high temperatures.
- Do not make any extreme adjustments or setting changes of parameters.

  Failure to observe this caution may result in injury due to unstable operation.
- When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation.

  Failure to observe this caution may result in injury.
- Do not use the servo brake of the servomotor for ordinary braking.

  Failure to observe this caution may result in malfunction.

■ Maintenance and Inspection

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

■ Disposal

⚠ CAUTION
• When disposing of the products, treat them as ordinary industrial waste.

6 Checking Products on Delivery

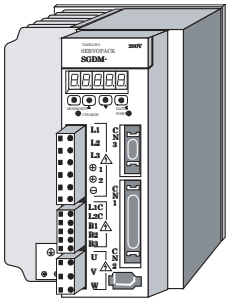
The following procedure is used to check Σ-II Series products upon delivery. Check the following items when Σ-II Series products are delivered.

Check Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates of the SERVOPACK.
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.
Are there any loose screws?	Check screws for looseness using a screwdriver.

If any of the above items are faulty or incorrect, contact your Yaskawa sales representative or the dealer from whom you purchased the products.

7 Warning Label

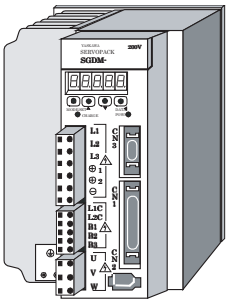
The following illustration shows an example of the SERVOPACK's warning label.
The mounting position of the label differs depending on the model and capacity of the SERVOPACK.

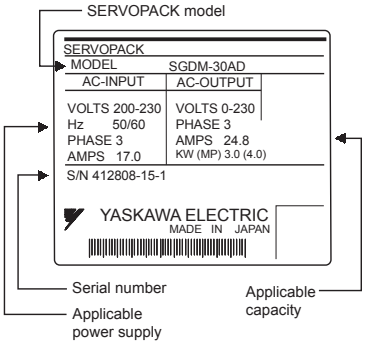


SERVOPACK warning label

8 Nameplate

The following illustration shows an example of the SERVOPACK's nameplate.
The mounting position of the nameplate differs depending on the model and capacity of the SERVOPACK.





9 Installation

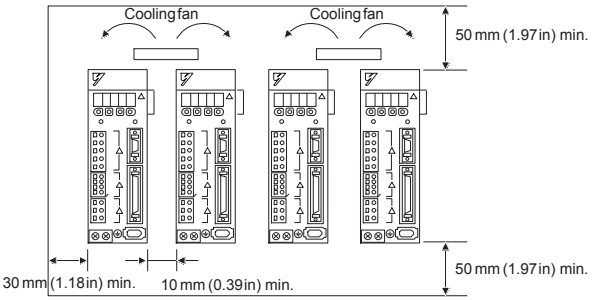
Observe the following precautions when installing SERVOPACK.

- Install SERVOPACK perpendicular to the wall so that the front panel (digital operator mounted face) faces outward.
- Firmly secure the SERVOPACK through two or four mounting holes depending on the SERVOPACK capacity.
- Install SERVOPACK so that SERVOPACK can be cooled by natural convection or fan.

■ Installation Sites

For installation sites, use proper care with the following notes.

Situation	Notes on Installation
When installed in a control panel	• Design the control panel size, unit layout, and cooling method so that the temperature around the periphery of the SERVOPACK does not exceed 55°C. • When installing multiple SERVOPACKs side by side in a control panel, install cooling fans sand provide sufficient space around each SERVOPACK to allow cooling by fan and natural convenction.
When installed near a heating unit	Suppress radiation heat from the heating unit and a temperature rise caused by convection so that the temperature around the periphery of the SERVOPACK does not exceed 55°C.
When installed near a source of vibration	Install a vibration isolator underneath the SERVOPACK to prevent it from receiving vibration.
When installed in a place receiving corrosive gases	Corrosive gases do not immediately affect the SERVOPACK but will eventually cause contactor-related devices to malfunction. Take appropriate action to protect against corrosive gases.
Others	• Avoid installation in a hot and humid place or where excessive dust or iron powder is present in the air. • Be sure there is no condensation or freezing. • Keep the surrounding air temperature 45 °C or less to ensure long-term reliability.



10 Wiring

10.1 Molded-case Circuit Breaker and Fuse Capacity

Main Circuit Power Supply	SERVOPACK Model			Power Supply Capacity per SERVOPACK (kVA)	Current Capacity of the Molded-case Circuit Breaker and the Fuse (A_{rms})*1, *2		Inrush Current		Rated Voltage	
	Capacity (kW)	SGDM-	SGDH-		Main Circuit Power Supply	Control Circuit Power Supply	Main Circuit Power Supply	Control Circuit Power Supply	Fuse	MCCB
Single-phase 100 V	0.03	A3BD A3BDA	A3BE	0.15	4	0.26	32A	30A	250 V	240 V
	0.05	A5BD A5BDA	A5BE	0.25						
	0.10	01BD 01BDA	01BE	0.40						
	0.20	02BD 02BDA	02BE	0.60	6					
Single-phase 200 V	0.03	A3AD A3ADA	A3AE	0.20	4	0.13	63A	60A		
	0.05	A5AD A5ADA	A5AE	0.25						
	0.10	01AD 01ADA	01AE	0.40						
	0.20	02AD 02ADA	02AE	0.75						
	0.40	04AD 04ADA	04AE	1.2	8					
Single-phase 220 V	0.75	–	08AE-S	2.1	11	0.13*4	130A	66A		
	1.50	–	15AE-S	4.0	19					
Three-phase 200 V	0.45	05AD 05ADA	05AE	1.4	4	0.15*4	118A	60A		
	0.75	08AD 08ADA	08AE	1.9	7					
	1.0	10AD 10ADA	10AE	2.3						
	1.5	15AD 15ADA	15AE	3.2	10					
	2.0	20AD 20ADA	20AE	4.3	13		63A			
	3.0	30AD 30ADA	30AE	5.9	17					
	5.0	50ADA	50AE	7.5	28		67A			
	6.0	60ADA	60AE	12.5	32	0.27*4	40A			
	7.5	75ADA	75AE	15.5	41					
	11.0	1AADA	1AAE	22.7	60	0.3*4	80A			
	15.0	1EADA	1EAE	30.9	81					

(cont'd)

Main Circuit Power Supply	SERVOPACK Model			Power Supply Capacity per SERVOPACK (kVA)	Current Capacity of the Molded-case Circuit Breaker and the Fuse (A_{rms})*1, *2		Inrush Current		Rated Voltage	
	Capacity (kW)	SGDM-	SGDH-		Main Circuit Power Supply	Control Circuit Power Supply	Main Circuit Power Supply	Control Circuit Power Supply	Fuse	MCCB
Three-phase 400 V	0.45	–	05DE	1.1	1.6	0.7*4	10A	(24VDC)*3	600 V	480 V
	1.0	–	10DE	2.3	3.4					
	1.5	–	15DE	3.2	4.6					
	2.0	–	20DE	4.9	7.1		20A			
	3.0	–	30DE	6.7	9.7					
	5.0	–	50DE	10.3	14.9		78A			
	6.0	–	60DE	12.4	17.8	1.2*4	20A			
	7.5	–	75DE	15.4	22.3					
	11.0	–	1ADE	22.6	32.7	1.3*4	40A			
	15.0	–	1EDE	30.9	44.6					

* 1. Nominal value at the rated load. The specified derating is required to select an appropriate fuse capacity.
* 2. Cutoff characteristics (25°C): 300% five seconds min. and inrush current of 20ms.
* 3. A preventive circuit for inrush current is not built in the 24 VDC control power supply. The protective circuit must be designed by the customer.
* 4. Make sure the current capacity is accurate. For the SERVOPACK with the cooling fan built-in, an inrush current flows; 200% of the current capacity in the table above for two seconds, when turning ON the control circuit power supply to start the fan working.

Note: 1. Do not use a fast-acting fuse. Because the SERVOPACK's power supply is a capacitor input type, a fast-acting fuse may blow when the power is turned ON.
2. The SGDH and SGDM SERVOPACKs does not include a protective grounding circuit. Install a ground-fault protector to protect the system against overload and short-circuit or protective grounding combined with the molded-case circuit breaker.

10.2 Main Circuit Wiring

SGDH and SGDM SERVOPACKs are suitable under the following conditions.

- With 100 V class: Less than 5000 Arms, 120 V maximum.
- With 200 V class: Less than 5000 Arms, 240 V maximum.
- With 400 V class: Less than 5000 Arms, 480 V maximum.

SERVOPACKs must be used with UL-listed fuses or circuit breakers, in accordance with the National Electrical Code (NEC).

Use 75°C heat-resistant copper wires or an equivalent.

10.3 SERVOPACK Main Circuit Wire Size

■ Cable Types

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

- Wire sizes are selected for three cables per bundle at 40 °C (104 °F) surrounding air temperature with the rated current.
- Use cable with a minimum withstand voltage of 600 V for main circuits.
- If cables are bundled in PVC or metal ducts, consider the reduction ratio of the allowable current.
- Use heat-resistant cables under high surrounding air or panel temperatures where normal vinyl cables will rapidly deteriorate.
- Use cables within the allowable moment of inertia.
- Do not use cables under continuous regenerative state.

The following table shows the wire size and allowable current for three cables. Use a cable whose specifications meet or are less than the values in the table.

- 600-V Heat-resistant Vinyl Cables (HIV)

AWG Size	Nominal Cross Section Diameter mm^2 (in^2)	Configuration Number of wires/mm^2 (in^2)	Conductive Resistance Ω/km	Allowable Current at Surrounding Air Temperature A		
				30°C (86°F)	40°C (104°F)	50°C (122°F)
20	0.5 (0.00078)	19/0.18 (0.00028)	39.5	6.6	5.6	4.5
–	0.75 (0.00116)	30/0.18 (0.00028)	26.0	8.8	7.0	5.5
18	0.9 (0.00140)	37/0.18 (0.00028)	24.4	9.0	7.7	6.0
16	1.25 (0.00193)	50/0.18 (0.00028)	15.6	12.0	11.0	8.5
14	2.0 (0.00310)	7/0.6 (0.00093)	9.53	23	20	16
12	3.5 (0.00543)	7/0.8 (0.00124)	5.41	33	29	24
10	5.5 (0.00853)	7/1.0 (0.00155)	3.47	43	38	31
8	8.0 (0.0124)	7/1.2 (0.00186)	2.41	55	49	40
6	14.0 (0.0217)	7/1.6 (0.00248)	1.35	79	70	57
4	22.0 (0.0341)	7/2.0 (0.00310)	0.85	91	81	66

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

■ Main Circuit Input Terminals (L1, L2, L3), Servomotor Connection Terminals (U, V, W)

Main Circuit Power Supply	Capacity (kW)	SERVOPACK Model		Main Circuit Input Terminals (L1, L2, L3)			Servomotor Connection Terminals (U, V, W)		
		SGDM-	SGDH-	Wire Size (mm^2)	Terminal Screw Size	Tightening Torque (N·m)	Wire Size (mm^2)	Terminal Screw Size	Tightening Torque (N·m)
Single-phase 100 V	0.03	A3BD A3BDA	A3BE	HIV1.25	–	–	HIV1.25	–	–
	0.05	A5BD A5BDA	A5BE						
	0.1	01BD 01BDA	01BE						
	0.2	02BD 02BDA	02BE	HIV2.0					
Single-phase 200 V	0.03	A3AD A3ADA	A3AE	HIV1.25	–	–	HIV1.25	–	–
	0.05	A5AD A5ADA	A5AE						
	0.1	01AD 01ADA	01AE						
	0.2	02AD 02ADA	02AE						
	0.4	04AD 04ADA	04AE	HIV2.0					
Single-phase	0.75	–	08AE-S *	HIV2.0	–	–	HIV1.25	–	–
	1.5	–	15AE-S *	HIV3.5	M4	1.2 to 1.4	HIV2.0	M4	1.2 to 1.4
Three-phase 200 V	0.45	05AD 05ADA	05AE	HIV2.0	–	–	HIV2.0	–	–
	0.75	08AD 08ADA	08AE						
	1.0	10AD 10ADA	10AE						
	1.5	15AD 15ADA	15AE						
	2.0	20AD 20ADA	20AE	HIV3.5	M4	1.2 to 1.4	HIV3.5	M4	1.2 to 1.4
	3.0	30AD 30ADA	30AE				HIV5.5		
	5.0	50ADA	50AE	HIV5.5	M5	1.6 to 2.4	HIV8.0	M5	1.6 to 2.4
	6.0	60ADA	60AE	HIV8.0	M6	2.5 to 3.8	HIV14	M6	2.5 to 3.8
	7.5	75ADA	75AE	HIV14					
	11.0	1AADA	1AAE	HIV22	M8	7.8 to 9.8	HIV22	M8	7.8 to 9.8
	15.0	1EADA	1EAE						
Three-phase 400 V	0.5	–	05DE	HIV1.25	–	–	HIV1.25	–	–
	1.0	–	10DE						
	1.5	–	15DE						
	2.0	–	20DE	HIV2.0	M4	1.2 to 1.4	HIV2.0	M4	1.2 to 1.4
	3.0	–	30DE						
	5.0	–	50DE	HIV3.5	M5	1.6 to 2.4	HIV3.5	M5	1.6 to 2.4
	6.0	–	60DE						
	7.5	–	75DE	HIV5.5			HIV5.5		
	11.0	–	1ADE	HIV8.0	M5	2.0 to 3.0	HIV8.0	M5	2.0 to 3.0
	15.0	–	1EDE	HIV14			HIV14		

* Connect the main power supply to terminals L1 and L3 for SGDH-08AE-S and SGDH-15AE-S. Do not connect to the L2 terminal.

■ Control Power Input Terminals (L1C, L2C), External Regenerative Resistor Terminals (B1, B2)

Main Circuit	Capacity (kW)	SERVOPACK		Control Power Input Terminals			External Regenerative Resistor		
		SGDM-	SGDH-	Wire Size	Terminal	Tightening	Wire Size	Terminal	Tightening
Single-phase 100 V	0.03	A3BD	A3BE	HIV1.25	–	–	HIV1.25	–	–
		A3BDA							
	0.05	A5BD	A5BE						
		A5BDA							
	0.1	01BD	01BE						
		01BDA							
	0.2	02BD	02BE						
		02BDA							
Single-phase 200 V	0.03	A3AD	A3AE	HIV1.25	–	–	HIV1.25	–	–
		A3ADA							
	0.05	A5AD	A5AE						
		A5ADA							
	0.1	01AD	01AE						
		01ADA							
	0.2	02AD	02AE						
		02ADA							
	0.4	04AD	04AE						
		04ADA							
Single-phase	0.75	–	08AE-S	HIV1.25	–	–	HIV1.25	–	–
	1.5	–	15AE-S		M4	1.2 to 1.4		M4	1.2 to 1.4
Three-phase 200 V	0.45	05AD	05AE	HIV1.25	–	–	HIV1.25	–	–
		05ADA							
	0.75	08AD	08AE						
		08ADA							
	1.0	10AD	10AE						
		10ADA							
	1.5	15AD	15AE						
		15ADA							
	2.0	20AD	20AE		M4	1.2 to 1.4	HIV2.0	M4	1.2 to 1.4
		20ADA							
	3.0	30AD	30AE				HIV3.5		
		30ADA							
	5.0	50ADA	50AE				HIV5.5		
	6.0	60ADA	60AE		M4	1.2 to 1.8	HIV8.0	M6	2.5 to 3.8
	7.5	75ADA	75AE						
	11.0	1AADA	1AAE				HIV22	M6	3.5 to 5.0
	15.0	1EADA	1EAE						
Three-phase 400 V	0.5	–	05DE	HIV1.25	–	–	HIV1.25	–	–
	1.0	–	10DE						
	1.5	–	15DE						
	2.0	–	20DE		M4	1.2 to 1.4		M4	1.2 to 1.4
	3.0	–	30DE						
	5.0	–	50DE				HIV2.0		
	6.0	–	60DE				HIV3.5	M5	2.0 to 2.4
	7.5	–	75DE						
	11.0	–	1ADE		M4	1.2 to 1.8	HIV5.5	M5	2.0 to 3.0
	15.0	–	1EDE				HIV8.0		

* Terminal symbols are +24 V and 0 V for three-phase 400 V SERVOPACKs.

■ Ground Terminal ⏚

Main Circuit Power Supply	Capacity (kW)	SERVOPACK Model		Ground Terminal		
		SGDM-	SGDH-	Wire Size (mm^2)	Terminal Screw Size	Tightening Torque (N•m)
Single-phase 100 V	0.03	A3BD	A3BE	HIV2.0 or more	M4	1.2 to 1.4
		A3BDA				
	0.05	A5BD	A5BE			
		A5BDA				
	0.1	01BD	01BE			
		01BDA				
	0.2	02BD	02BE			
		02BDA				
Single-phase 200 V	0.03	A3AD	A3AE	HIV2.0 or more	M4	1.2 to 1.4
		A3ADA				
	0.05	A5AD	A5AE			
		A5ADA				
	0.1	01AD	01AE			
		01ADA				
	0.2	02AD	02AE			
		02ADA				
	0.4	04AD	04AE			
		04ADA				
Single-phase	0.75	–	08AE-S	HIV2.0 or more	M4	1.2 to 1.4
	1.5	–	15AE-S			
Three-phase 200 V	0.45	05AD	05AE	HIV2.0 or more	M4	1.2 to 1.4
		05ADA				
	0.75	08AD	08AE			
		08ADA				
	1.0	10AD	10AE			
		10ADA				
	1.5	15AD	15AE			
		15ADA				
	2.0	20AD	20AE			
		20ADA				
	3.0	30AD	30AE			
		30ADA				
	5.0	50ADA	50AE		M5	1.6 to 2.4
	6.0	60ADA	60AE		M8	7.8 to 9.8
	7.5	75ADA	75AE			
	11.0	1AADA	1AAE			
	15.0	1EADA	1EAE			
Three-phase 400 V	0.5	–	05DE	HIV2.0 or more	M4	1.2 to 1.4
	1.0	–	10DE			
	1.5	–	15DE			
	2.0	–	20DE			
	3.0	–	30DE			
	5.0	–	50DE		M5	1.6 to 2.4
	6.0	–	60DE		M5	2.0 to 2.4
	7.5	–	75DE			
	11.0	–	1ADE		M8	7.8 to 9.8
	15.0	–	1EDE			

■ Signal Line Wire Sizes

Following table shows appropriate cables for CN1 and CN2 SERVOPACK connectors.

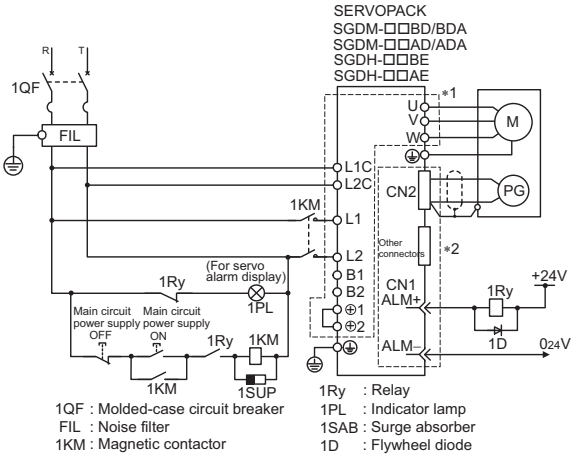
Wire sizes were selected for three cables per bundle at 40°C surrounding air temperature with the rated current.

Connector Name and Signal		Item	Specification
Control I/O Signal Connector	CN1	Cable	Use twisted-pair or shielded twisted-pair wire.
		Applicable wire	AWG24 (0.2 mm^2), AWG26 (0.12 mm^2), AWG28 (0.08 mm^2), AWG30 (0.05 mm^2)
		Finished cable dimension	ϕ16.0 mm (ϕ0.63 in) MAX.
PG Signal Connector	CN2	Cable	Use Yaskawa cable, or shielded twisted-pair wire if Yaskawa cable is not used.
		Applicable wire	AWG24 (0.2 mm^2), AWG26 (0.12 mm^2), AWG28 (0.08 mm^2), AWG30 (0.05 mm^2) Use AWG22 (0.33 mm^2) for the encoder power supply and AWG26 (0.12 mm^2) for other signals. These conditions permit wiring distances up to 20 m (65.6 ft).
		Finished cable dimension	ϕ6.8 mm (ϕ0.27 in) MAX.

10.4 Typical Main Circuit Wiring Examples

Only qualified personnel should perform the wiring. Design the circuit so that the main circuit power supply turns OFF at emergency stop.

■ Single-phase, 100/200 V

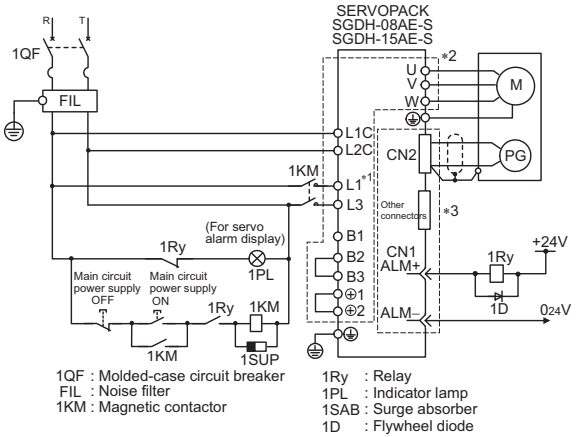


* 1. These circuits are power lines, separated by the protecting separator. Do not touch these terminals when the power is ON to avoid electric shock.

* 2. These circuits are SELV circuits and are separated from all other circuits by double and reinforced insulation. The CN1 input signal is available for sink or source circuits.

Note: Customers must purchase a 24-VDC power supply with a double-shielded enclosure.

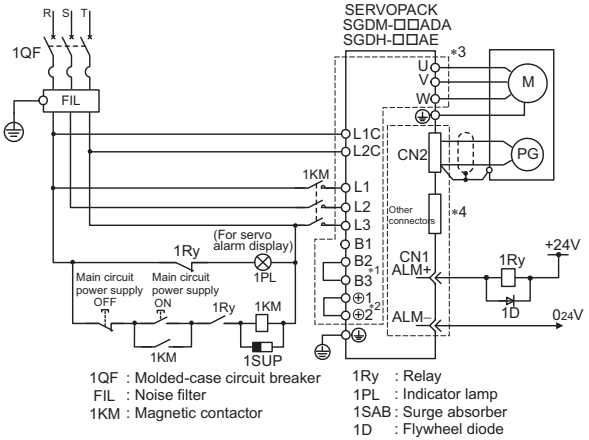
■ Single-phase 220 V, 800 W, 1.5 kW



* 1. The L2 terminal is not used for single-phase 220 V, 800 W, 1.5 kW SERVOPACKs. Do not use this terminal.
* 2. These circuits are power lines, separated by the protecting separator. Do not touch these terminals when the power is ON to avoid electric shock.
* 3. These circuits are SELV circuits and are separated from all other circuits by double and reinforced insulation. The CN1 input signal is available for sink or source circuits.

Note: Customers must purchase a 24-VDC power supply with a double-shielded enclosure.

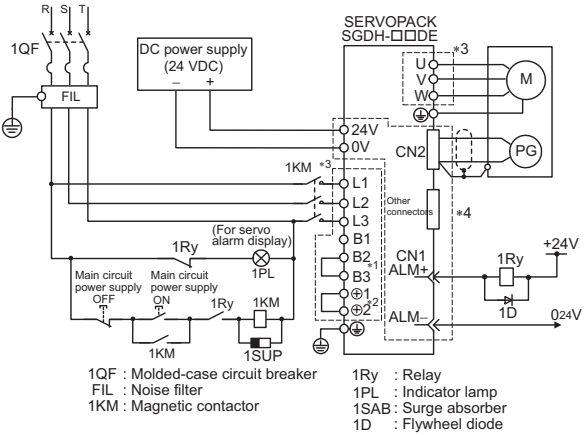
■ Three-phase, 200 V



* 1. SERVOPACKs that are 6-kW or more have no B3 terminal.
* 2. SERVOPACKs that are 6-kW or more have no ⊖1 and ⊖2 terminals. Use the ⊖ terminal.
* 3. These circuits are power lines, separated by the protecting separator. Do not touch these terminals when the power is ON to avoid electric shock.
* 4. These circuits are SELV circuits and are separated from all other circuits by double and reinforced insulation. The CN1 input signal is available for sink or source circuits.

Note: Customers must purchase a 24-VDC power supply with a double-shielded enclosure.

■ Three-phase, 400 V



* 1. SERVOPACKs that are 6-kW or more have no B3 terminal.
* 2. SERVOPACKs that are 6-kW or more have no ⊖1 and ⊖2 terminals. Use the ⊖ terminal.
* 3. These circuits are power lines, separated by the protecting separator. Do not touch these terminals when the power is ON to avoid electric shock.
* 4. These circuits are SELV circuits and are separated from all other circuits by double and reinforced insulation. The CN1 input signal is available for sink or source circuits.

Note: Customers must purchase a 24-VDC power supply with a double-shielded enclosure.

11 Inspection

This section describes the SERVOPACK basic inspections and part replacement period.

■ SERVOPACK Inspection

For inspections and maintenance of the SERVOPACK, follow the inspection procedures in the table below at least once every year.

Item	Frequency	Procedure	Remedy
Clean unit interior and circuit boards	At least once a year	Check for dust, dirt, and oil on surfaces.	Clean with compressed air or cloth.
Loose screws	At least once a year	Check for loose terminal block and connector screws.	Tighten any loose screws.
Defective parts in unit or on circuit boards	At least once a year	Check for discoloration, damage or discontinuities due to heating.	Contact your YASKAWA representative.

■ Part Replacement Period

The following parts are subject to mechanical wear or deterioration over time. To avoid failure, replace these parts at the frequency indicated.

If the SERVOPACK has been already overhauled at Yaskawa, its parameters will be set back to standard settings at shipment. Always check parameters before operating the servomotor.

Parts	Standard Replacement Period	Replacement Method	Operating Conditions
Cooling fan	4 to 5 years	Replace with new part.	• Ambient temperature: annual average 30 °C • Load factor: 80% max. • Operation rate: 20 hours/day max.
Smoothing Capacitor	7 to 8 years	Test. Replace with new part if necessary.	
Relays	–	Test. Replace if necessary.	
Fuse	10 years	Replace with new part.	
Electrolytic Capacitor on Circuit Board	5 years	Test. Replace with new circuit board if necessary.	

12 General Specifications

The following table shows the SERVOPACK general specifications.

Item	Specifications
Surrounding Air/Storage Temperature	0 to +55 °C/-20 to +85 °C
Operating/Storage Humidity	90%RH or less (non-condensing)
Operating Environment	• Installation category (Overvoltage category): III • Pollution degree: 2 • Protection class: 10 • Altitude: 1,000 m max.
Vibration Resistance	4.9 m/s^2
Shock Resistance	19.6 m/s^2
Voltage Resistance	• Voltage: 1,500 V rms AC, for one minute • Braking current: 30 mA • Frequency: 50 Hz or 60 Hz • Voltage applied points 100 V and 200 V SERVOPACK: Between the frame ground and the power where the terminals L1, L2, L3, L1C, L2C, U, V, and W connect. 400 V SERVOPACK: Between the frame ground and the power where the terminals L1, L2, L3, U, V, and W connect.
Insulation Resistance	10 MΩ min. (500 VDC megger) between the frame ground and the power terminals U, V, and W
Overseas Standards (Pending Approval)	• UL Standards: UL508C • EMC Directives: EN61000-6-2, EN55011 (group 1 class A) • Low Voltage Directive: EN50178

13 Installation Conditions of EMC Directive

To adapt a combination of a SGM□H servomotor and a SGDH/SGDM SERVOPACK to EMC Directives (EN55011 group 1 class A and EN61000-6-2), the following conditions must be satisfied.

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

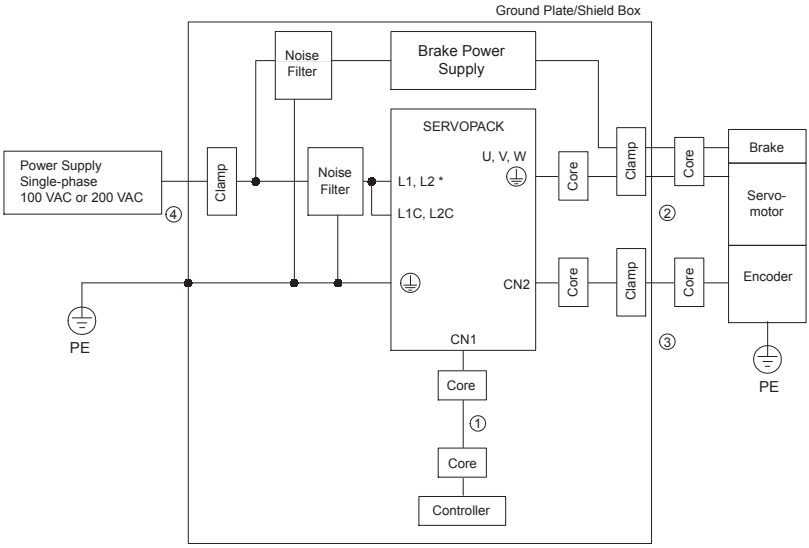
13.1 EMC Installation Conditions

This section describes the installation conditions that satisfy EMC guidelines for each model of the SGDH/SGDM 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.

■ Single-phase 100 V/200 V:

SGDH-A3BE to -02BE (Single-phase 100 VAC, 30 W to 200 W)
SGDH-A3AE to -04AE (Single-phase 200 VAC, 30 W to 400 W)
SGDH-08AE-S (Single-phase 200 VAC, 0.75 kW)
SGDH-15AE-S (Single-phase 200 VAC, 1.5 kW)
SGDM-A3BD, DA to -02BD, DA (Single-phase 100 VAC, 30 W to 200 W)
SGDM-A3AD, DA to -04AD, DA (Single-phase 200 VAC, 30 W to 400 W)

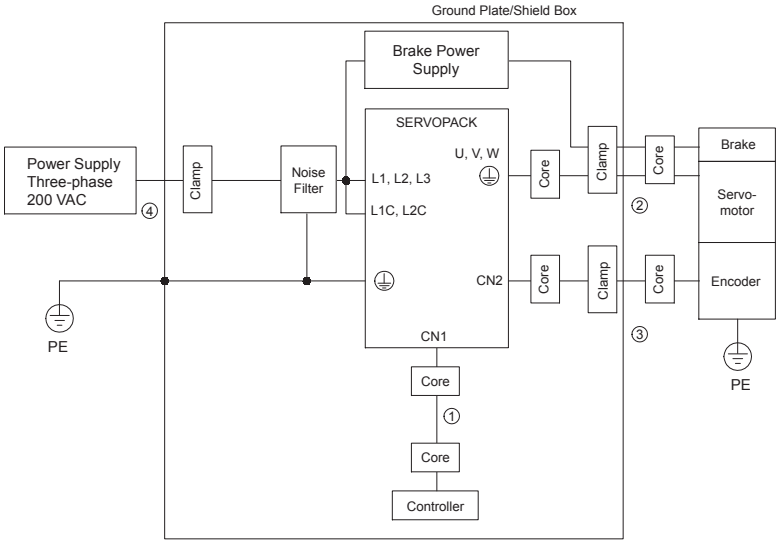


* Connect main power supply to terminals L1-L3 for SGDH-08AE-S and SGDH-15AE-S.

Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Servomotor cable	Shield cable
③	Encoder cable	Shield cable
④	AC Line cable	Shield cable

■ Three-phase 200 V, 5 kW or less:

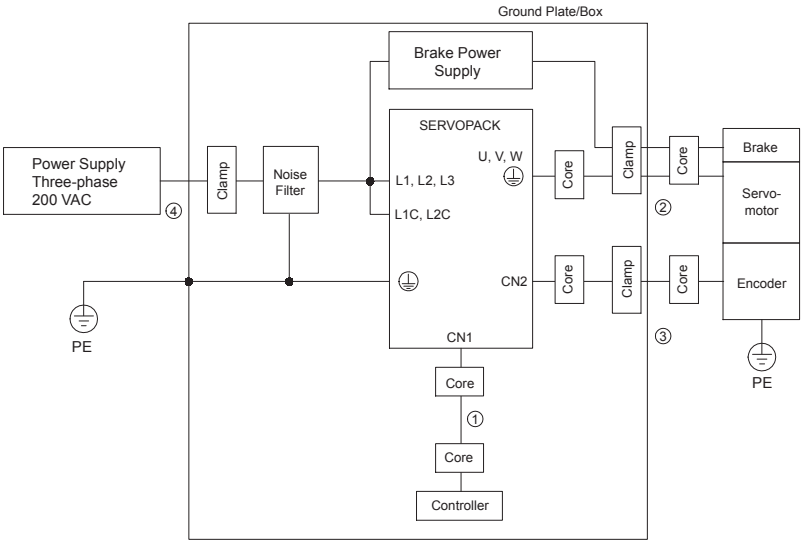
SGDH-05AE to -50AE (Three-phase 200 VAC, 0.5 kW to 5.0 kW)
SGDM-05AD to -30AD (Three-phase 200 VAC, 0.5 kW to 3.0 kW)
SGDM-05ADA to 50ADA (Three-phase 200 VAC, 0.5 kW to 5.0 kW)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Servomotor cable	Shield cable
③	Encoder cable	Shield cable
④	AC Line cable	Shield cable

■ Three-phase 200 V, 6 kW or more:

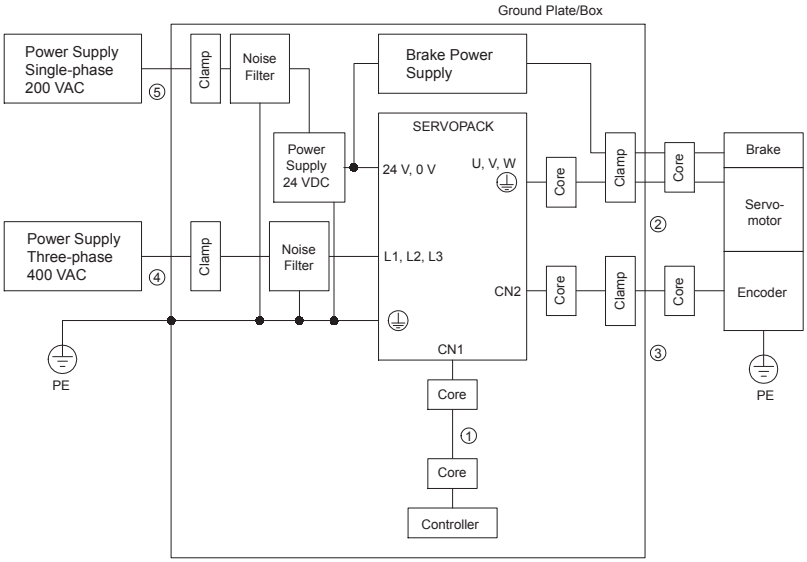
SGDH-60AE to -1EAE (Three-phase 200 VAC, 6.0 kW to 15 kW)
SGDM-60ADA to -1EADA (Three-phase 200 VAC, 6.0 kW to 15 kW)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Servomotor cable	Shield cable
③	Encoder cable	Shield cable
④	AC Line cable	Shield cable

■ Three-phase 400 V:

SGDH-05DE to -1EDE (Three-phase 400 VAC, 0.5 kW to 15 kW)



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Servomotor cable	Shield cable
③	Encoder cable	Shield cable
④	AC Line cable	Shield cable
⑤	AC Line cable	Shield cable

13.2 Hand-held Digital Operator and Analog Monitor Cable

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

13.3 Recommended Noise Filters

Use an block-type noise filter to prevent noise from affecting the power supply line.
Also, install a noise filter on the power supply line for the peripheral devices as necessary.

Main Circuit Power Supply	Capacity (kW)	SERVOPACK Model		Recommended Noise Filter		
		SGDM-	SGDH-	Model	Specifications	Manufacturer
Single-phase 100 V	0.03	A3BD A3BDA	A3BE	FN2070-6/07	Single-phase 250 VAC, 6 A	SCHAFFNER
	0.05	A5BD A5BDA	A5BE			
	0.1	01BD 01BDA	01BE			
	0.2	02BD 02BDA	02BE	FN2070-10/07	Single-phase 250 VAC, 10 A	
Single-phase 200 V	0.03	A3AD A3ADA	A3AE	FN2070-6/07	Single-phase 250 VAC, 6 A	SCHAFFNER
	0.05	A5AD A5ADA	A5AE			
	0.1	01AD 01ADA	01AE			
	0.2	02AD 02ADA	02AE			
	0.4	04AD 04ADA	04AE	FN2070-10/07	Single-phase 250 VAC, 10 A	
Single-phase	0.75	–	08AE-S	FN2070-16/07	Single-phase	SCHAFFNER
	1.5	–	15AE-S	FN350-30/33	Single-phase	
Three-phase 200 V	0.45	05AD 05ADA	05AE	FN258L-7/07	Three-phase 480 VAC, 7 A	SCHAFFNER
	0.75	08AD 08ADA	08AE	FN258L-16/07	Three-phase 480 VAC, 16 A	
	1.0	10AD 10ADA	10AE			
	1.5	15AD 15ADA	15AE			
	2.0	20AD 20ADA	20AE			
	3.0	30AD 30ADA	30AE	FN258L-30/07	Three-phase 480 VAC, 30 A	
	5.0	50ADA	50AE	FMAC-0934-5010	Three-phase 440 VAC, 50 A	TIMONTA
	6.0	60ADA	60AE			
	7.5	75ADA	75AE	FMAC-0953-6410	Three-phase	
	11.0	1AADA	1AAE	FS5559-150-35	Three-phase 480 VAC, 150 A	SCHAFFNER
	15.0	1EADA	1EAE			

Main Circuit Power Supply	Capacity (kW)	SERVOPACK Model		Recommended Noise Filter		
		SGDM-	SGDH-	Model	Specifications	Manufacturer
Three-phase 400 V	0.5	–	05DE	FN258L-7/07	Three-phase 480 VAC, 7 A	SCHAFFNER
	1.0	–	10DE			
	1.5	–	15DE			
	2.0	–	20DE	FN258L-16/07	Three-phase 480 VAC, 16 A	
	3.0	–	30DE			
	5.0	–	50DE	FS5559-35-33	Three-phase 480 VAC, 35 A	
	6.0	–	60DE			
	7.5	–	75DE			
	11.0	–	1ADE	FS5559-80-34	Three-phase 480 VAC, 80 A	
	15.0	–	1EDE			

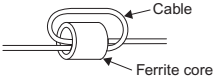
■ Noise Filter for Brake Power Supply

Use an FN2070-6107 made by SCHAFFNER for a servomotor of 400 W or less.

13.4 Cable Core and Cable Clamp

■ Attaching the Ferrite Core

The diagram shows two turns in the cable.
The table shows the cable and the position where the ferrite core is attached.



Cable Name	Mounting Position
I/O signal cable	Near the host controller and the SERVOPACK.
Servomotor cable	Near the SERVOPACK and the servomotor.
Encoder cable	Near the SERVOPACK and the servomotor.

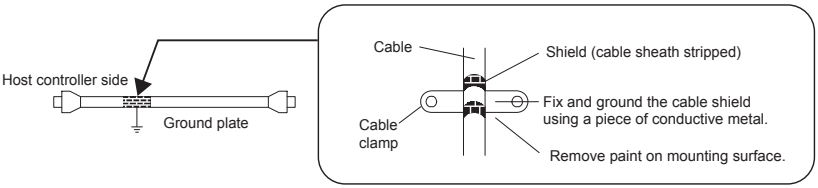
■ Recommended Ferrite Core

Cable Name		Ferrite Core Model	Manufacturer
I/O signal cable		ESD-SR-250	NEC TOKIN Corp.
Encoder cable			
Servomotor main circuit cable	400 W or less		
	500 W or more	PC40T96 × 20 × 70	TDK

■ Fixing the Cable

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

- Example of Cable Clamp



■ Shield Box

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

14 Installation Conditions of UL Standards

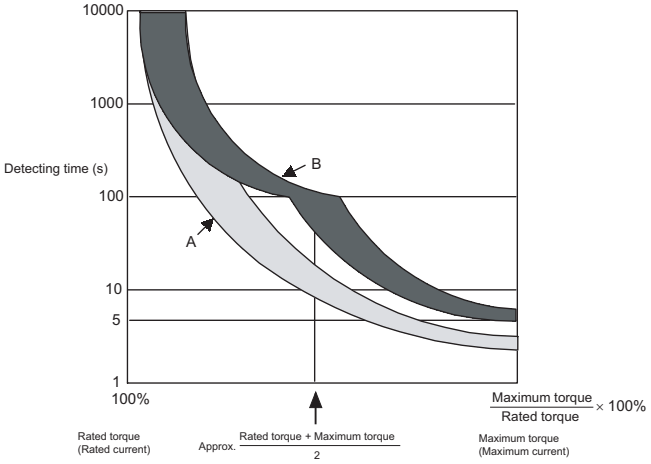
To adapt the following SERVOPACKs to UL Standards, use a corresponding terminal kit for cables to connect the terminals described in the table below.

SERVOPACK Model	Connection Terminals	Terminal Kit Model
SGDH-50DE (-P)	24 V, 0 V (Control circuit power supply input)	Ring terminal provided with the SERVOPACK
SGDH-60AE (-P) SGDH-75AE (-P) SGDH-1AAE (-P)	L1, L2, L3 (Main circuit power supply input) U, V, W (Motor Output)	JZSP-CKT75
SGDH-60DE (-P) SGDH-75DE (-P)		JZSP-CKT75DE
SGDH-1ADE (-P)		JZSP-CKT1ADE
SGDH-1EDE (-P)		JZSP-CKT1EDE
SGDH-1EAE (-P)		JZSP-CKT1E

15 Overload Characteristics

SERVOPACKs have a built-in overload protective function that protects the SERVOPACKs and servomotors from overload. Allowable power for the SERVOPACKs is limited by the overload protective function as shown in the figure below.

The overload detection level is set under hot start* conditions at a servomotor surrounding air temperature of 40°C (104°F).



* A hot start indicates that both the SERVOPACK and the servomotor have run long enough at the rated load to be thermally saturated.

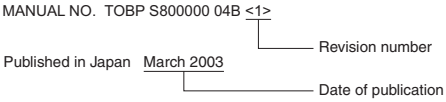
Note: The overload protection characteristics of A and B in the figure are applicable when the SERVOPACK is combined with one of the following servomotors.

A: SGMAH or SGMPH servomotor with a capacity of maximum 400 W.

B: SGMAH or SGMPH servomotors with a capacity more than 400 W and SGMGH, SGMSH, SGMDH, and SGMUH servomotors.

Revision History

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



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August 2012	<13>	Back cover	Revision: Address
March 2012	<12>	Inside of back cover	Addition: Precautions for Korean Radio Waves Act
January 2012	<11>	Back cover	Revision: Address
August 2011	<10>	13.4	Revision: Ferrite core model
November 2010	<9>	Front cover	Revision: Format
		Back cover	Revision: Address, format
September 2010	<8>	10.1	Addition: Rated voltage
		15	Addition: Current description
		Back cover	Revision: Address
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		All chapters	Revision: Operating or ambient temperature → surrounding air temperature
		Back cover	Revision: Address
June 2008	<6>	Back cover	Revision: Address
December 2007	<5>	Back cover	Revision: Address
November 2007	<4>	5	Addition: PL on fumigation
		All chapters	Revision: Surge protector → surge absorber
		Back cover	Revision: Address
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March 2003	<1>	10	Addition: Wiring
		14	Addition: Installation conditions of UL standards
		15	Addition: Overload characteristics
July 2002	–	–	First edition

AC SERVOPACK

Σ-II Series

SAFETY PRECAUTIONS

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针对韩国电波法的注意事项

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