Σ-Ⅱ Series SGM□H/SGDH

USER'S MANUAL

SGMAH/SGMPH/SGMGH/SGMSH/SGMDH/SGMUH Servomotors
SGDH SERVOPACK

YASKAWA

MANUAL NO. SIEPS80000005C

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About this Manual

■ Intended Audience

This manual is intended for the following users.

- Those selecting Σ-II Series servodrives or peripheral devices for Σ-II Series servodrives.
- Those wanting to know about the ratings and characteristics of Σ-II Series servodrives.
- Those designing Σ-II Series servodrive systems.
- Those installing or wiring Σ-II Series servodrives.
- Those performing trial operation or adjustments of Σ-II Series servodrives.
- Those maintaining or inspecting Σ-II Series servodrives.

■ Description of Technical Terms

The terms in this manual are defined as follows:

- Servomotor or motor = Σ-II Series SGMAH, SGMPH, SGMGH, SGMSH, SGMDH, SGMUH servomotor.
- SERVOPACK = Σ-II Series SGDH amplifier.
- Servodrive = A set including a servomotor and servo amplifier.
- Servo System = A servo control system that includes the combination of a servodrive with a host computer and peripheral devices.
- Parameter number = Numbers that the user inputs toward the SERVOPACK.

■ Indication of Reverse Signals

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:

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

■ Quick access to your required information

Read the chapters marked with ✓ to get the information required for your purpose.

Chapter	SERVOPACKs, Servomotors, and Peripheral Devices	Ratings and Character-istics	System Design	Panel Configura-tion and Wiring	Trial Operation and Servo Adjustment	Inspection and Maintenance
Chapter 1 Outline	✓					
Chapter 2 Selections	✓					
Chapter 3 Specifications and Dimensional Drawings	✓	✓	✓	✓		
Chapter 4 SERVOPACK Specifications and Dimensional Drawings	✓	✓	✓	✓		
Chapter 5 Specifications and Dimensional Drawings of Cables and Peripheral Devices	✓	✓	✓	✓		
Chapter 6 Wiring			✓	✓	✓	
Chapter 7 Digital Operator/Panel Operator			✓		✓	
Chapter 8 Operation					✓	
Chapter 9 Adjustments						✓
Chapter 10 Inspection, Maintenance, and Troubleshooting						✓
Chapter 11 Appendix	✓		✓		✓	✓

■ Visual Aids

The following aids are used to indicate certain types of information for easier reference.

IMPORTANT

- Indicates important information that should be memorized, including precautions such as alarm displays to avoid damaging the devices.

- Indicates supplemental information.

◀ EXAMPLE ▶

- Indicates application examples.

- Indicates definitions of difficult terms or terms that have not been previously explained in this manual.

Related Manuals

Refer to the following manuals as required.

Manual Name	Manual Number	Contents
Σ-II Series SGM□H/SGDM Digital Operator Operation Manual	TOE-S800-34	Provides detailed information on the operating method of JUSP-OP02A-2 type Digital Operator (option device).
Σ-II Series SERVOPACKs Personal Computer Monitoring Software Operation Manual	SIE-S800-35	Describes the using and the operating methods on software that changes the local personal computer into the monitor equipment for the Σ-II Series servomotor.
Σ-II Series SGDH Fully Closed Interface Unit User's Manual Type: JUSP-FC100	SIE-C718-5	Provides detailed information on the fully closed control of the JUSP-FC100 interface unit.
Σ-II Series SGDH MECHATROLINK Interface Unit User's Manual Type: JUSP-NS100	SIE-C718-4	Provides detailed information on the MECHATROLINK communications.
Σ-II Series SGDH DeviceNet Interface Unit User's Manual Type: JUSP-NS300	SIE-C718-6	Describes the DeviceNet communications.
Σ-II Series Indexer Application Module User's Manual Type: JUSP-NS600	SIE-C718-9	Provides detailed information on the positioning by the communications and the contact points.

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 as follows to indicate that fire is prohibited:  .

MANDATORY Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory:  .

The warning symbols for ISO and JIS standards are different, as shown below.

ISO	JIS
	

The ISO symbol is used in this manual.

Both of these symbols appear on warning labels on Yaskawa products. Please abide by these warning labels regardless of which symbol is used.

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 servodrive.

⚠ 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 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 described in this 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 multiturn limit value must be changed only for special applications.
  Changing it inappropriately or unintentionally can be dangerous.
- If the Multiturn Limit Disagreement alarm (A.CC) occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.
  If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting in a dangerous situation where the machine will move to unexpected positions.
- Do not remove the front cover, cables, connectors, or optional items while the power is ON.
  Failure to observe this warning may result in electric shock.
- 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.
- 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.
- Connect the ground terminal to electrical codes (ground resistance: 100 Ω or less).
  Improper grounding may result in electric shock or fire.

⚠ WARNING

- Installation, disassembly, or repair must be performed only by authorized personnel.
  Failure to observe this warning may result in electric shock or injury.
- Do not modify the product.
  Failure to observe this warning may result in injury or damage to the product.

■ Checking on Delivery

⚠ CAUTION

- Always use the servomotor and SERVOPACK in one of the specified combinations.
  Failure to observe this caution 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 or installation temperature conditions.
  - Locations subject to humidity outside the range specified in the storage or 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.

■ 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 parts 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 terminals and motor output terminals.
  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).
  Failure to observe this caution may result in malfunction.
- 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.
- Do not touch the power terminals for five minutes after turning power OFF because high voltage may still remain in the SERVOPACK.
  Make sure the charge indicator is turned OFF 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 such as capacitors and fuses to deteriorate, resulting in unexpected problems.
- Observe the following precautions when wiring main circuit terminal blocks.
  - 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.
- 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 SERVOPACK of the encoder.
  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 including power supply lines.

  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 normal 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

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

- Do not disassemble the servomotor.
  Failure to observe this caution may result in electric shock or injury.

■ Disposal

⚠ CAUTION

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

■ 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.
- 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.

1

Outline

1.1 Checking Products

The following procedure is used to check the AC servodrives of Σ-II Series products on delivery.

1.1.1 Check Items

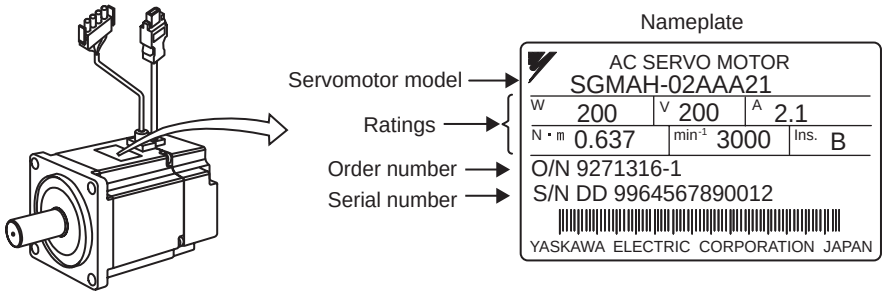
Check the following items when Σ-II Series products are delivered.

Check Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates on the servomotor and SERVOPACK. (Refer to the descriptions of model numbers in the following section.)
Does the servomotor shaft rotate smoothly?	The servomotor shaft is normal if it can be turned smoothly by hand. Servomotors with brakes, however, cannot be turned manually.
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.

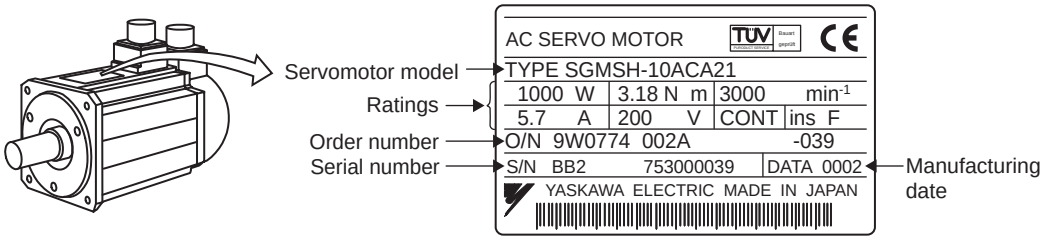
If any of the above items are faulty or incorrect, contact your Yaskawa representative or the dealer from whom you purchased the products.

1.1.2 Servomotors

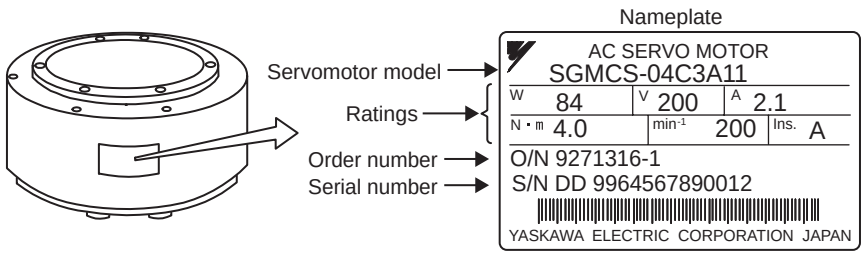
•SGMAH and SGMPH



•SGMGH / SGMSH / SGMDH

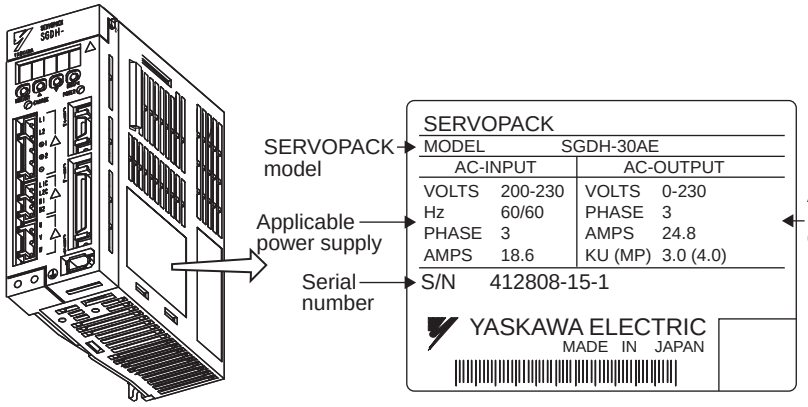


•SGMCS

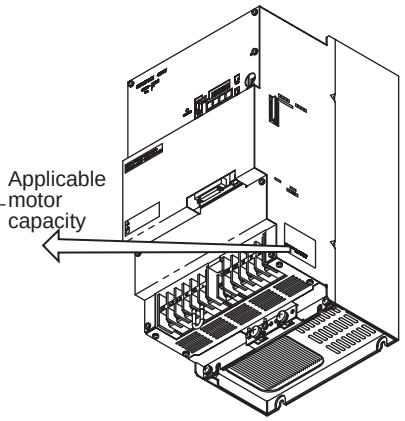


1.1.3 SERVOPACKs

• SGDH for 30 W to 5.0 kW



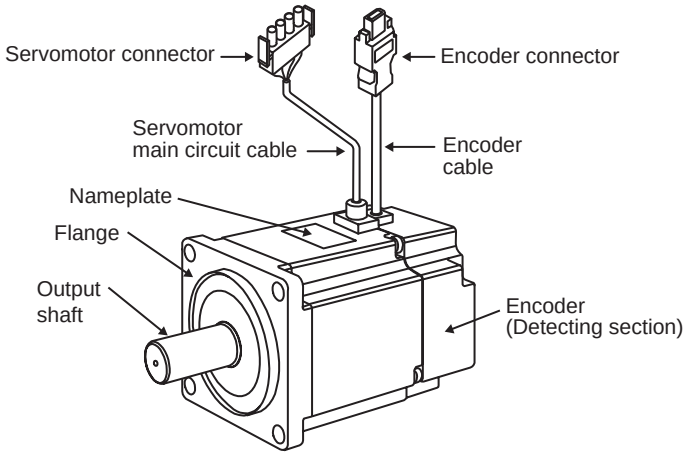
• SGDH for 6.0 kW to 15.0 kW



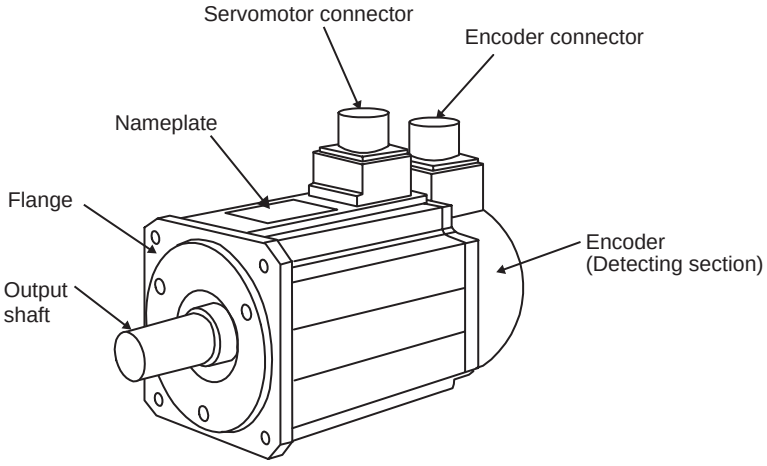
1.2 Product Part Names

1.2.1 Servomotors

(1) SGMAH and SGMPH Without Gears and Brakes

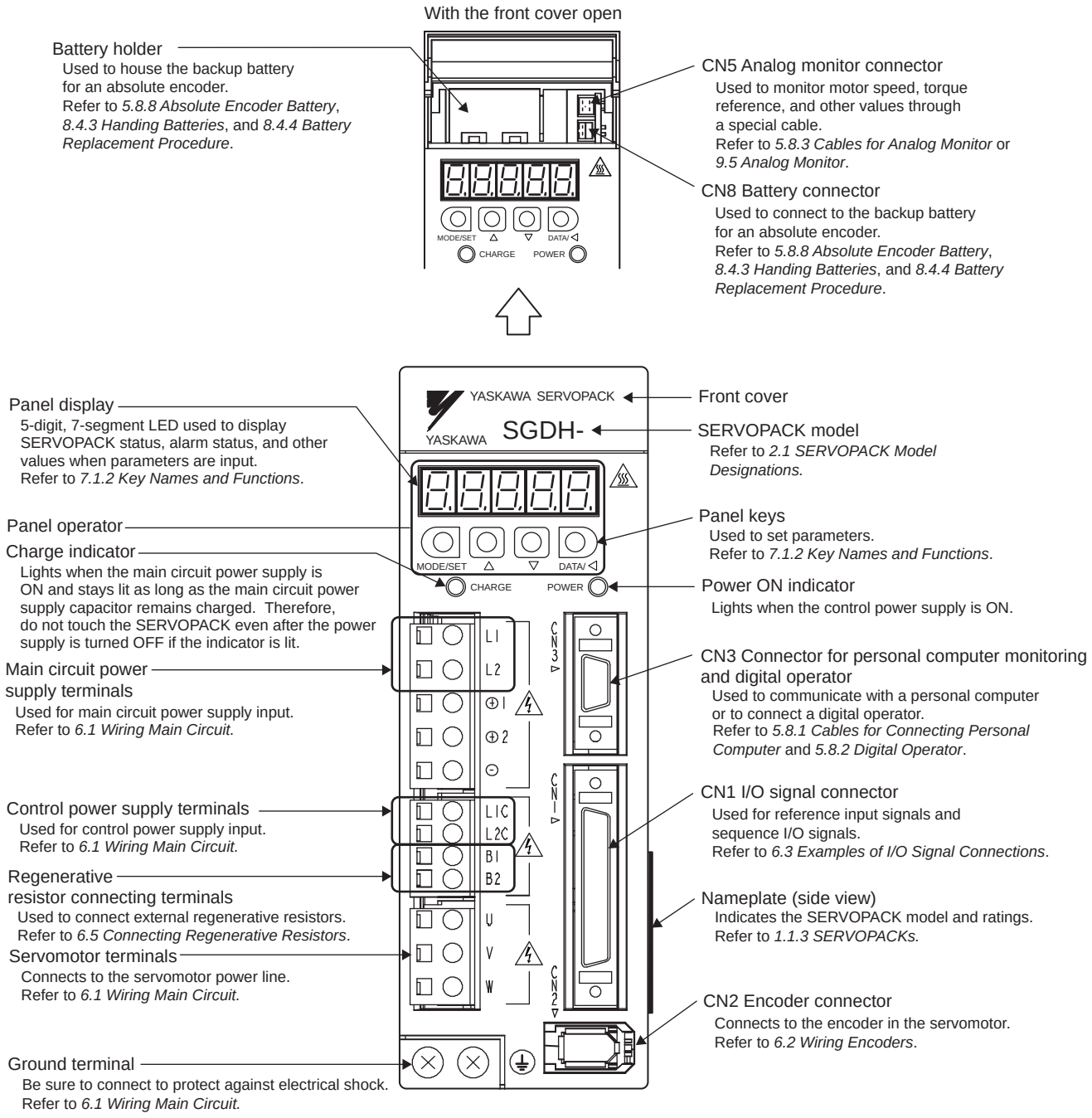


(2) SGMGH/SGMSH/SGMDH/SGMUH Without Gears and Brakes



1.2.2 SERVOPACKs

(1) SGDH for 30 W to 5.0 kW

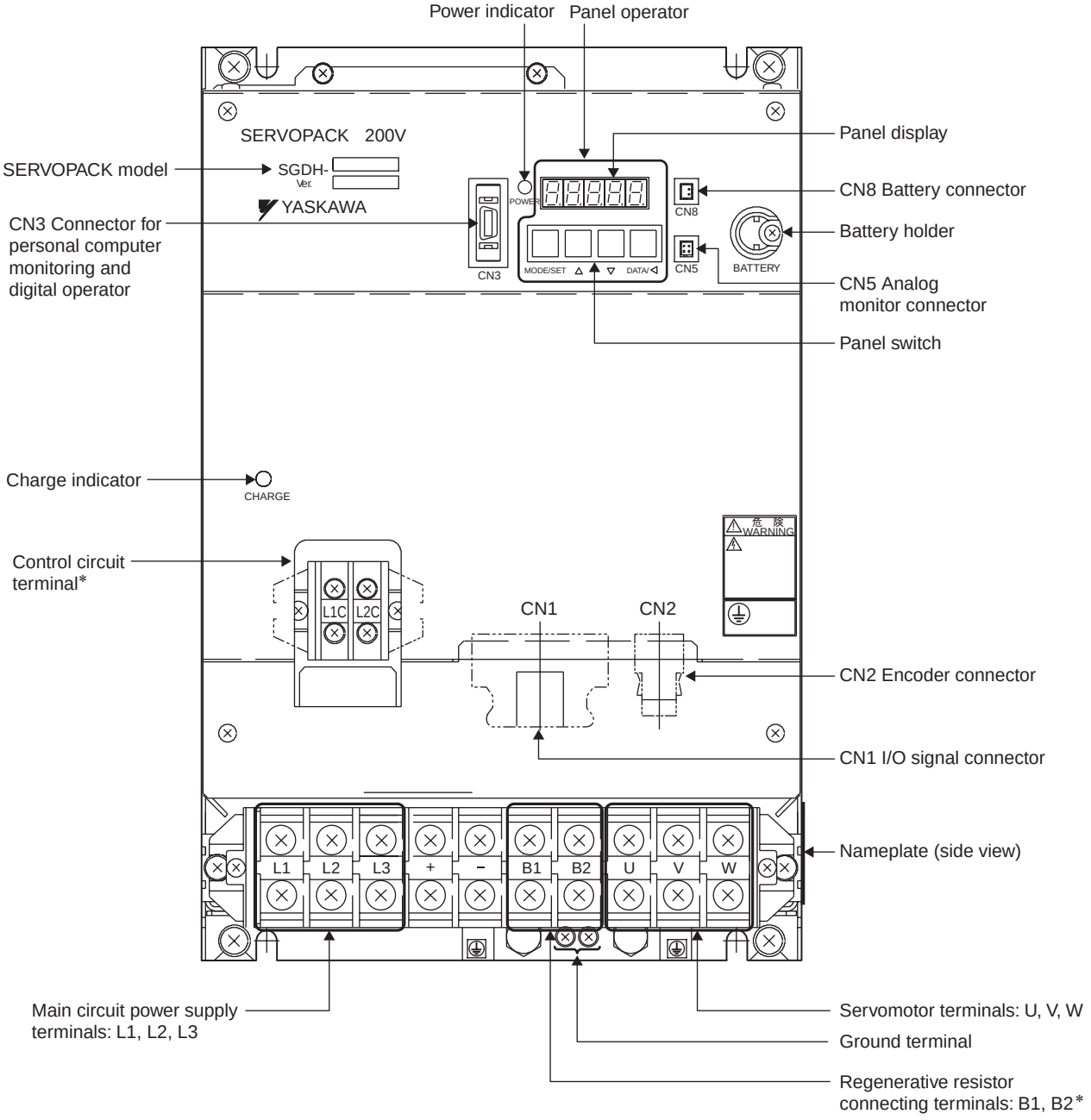


INFO

■ Connecting terminal of DC Reactor

For connecting a reactor, refer to *6.4.8 DC Reactor for Harmonic Suppression*.

(2) SGDH for 6.0 kW to 15.0 kW



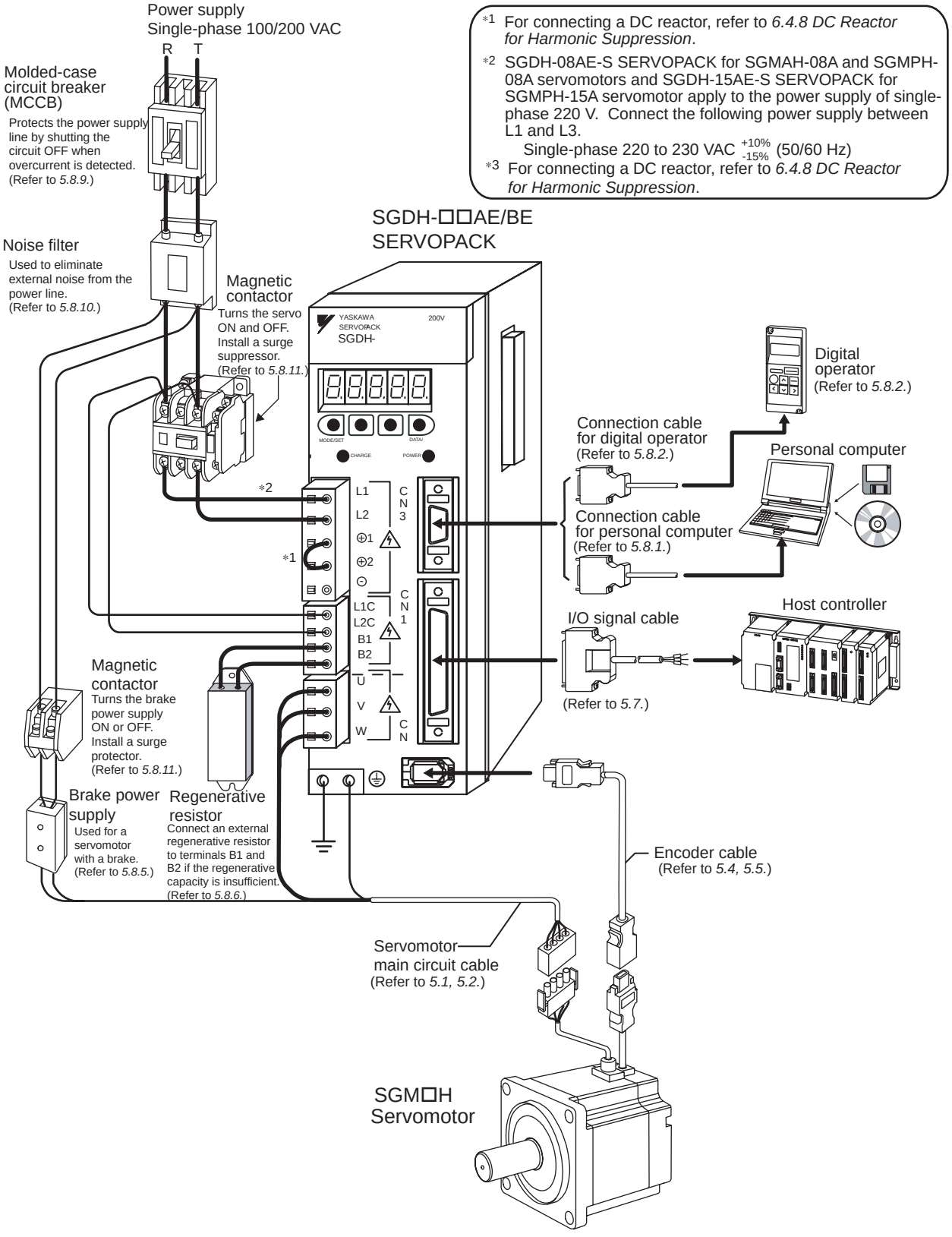
* Control circuit terminal and regenerative resistor connecting terminals differ the position of the terminal block by the SERVOPACK model.
Refer to *Chapter 4 SERVOPACK Specifications and Dimensional Drawings* for details.

SERVOPACK Model	Reference
SGDH-60AE, 75AE	4.7.7, 4.9.1
SGDH-60DE, 75DE	4.7.8, 4.9.2
SGDH-1AAE, 1EAE	4.7.9, 4.9.3
SGDH-1ADE, 1EDE	4.7.10, 4.9.4

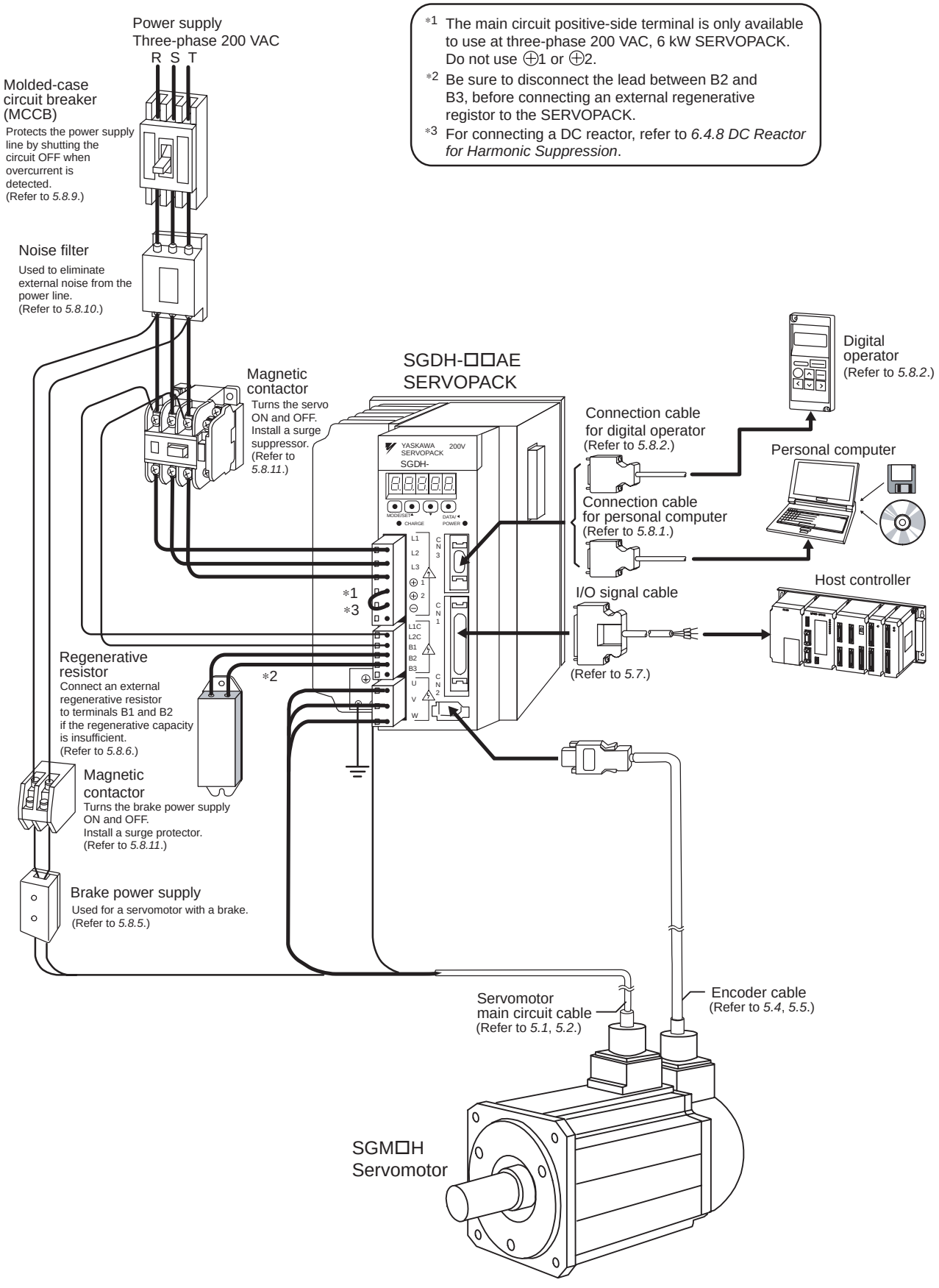
1.3 Examples of Servo System Configurations

This section describes examples of basic servo system configuration.

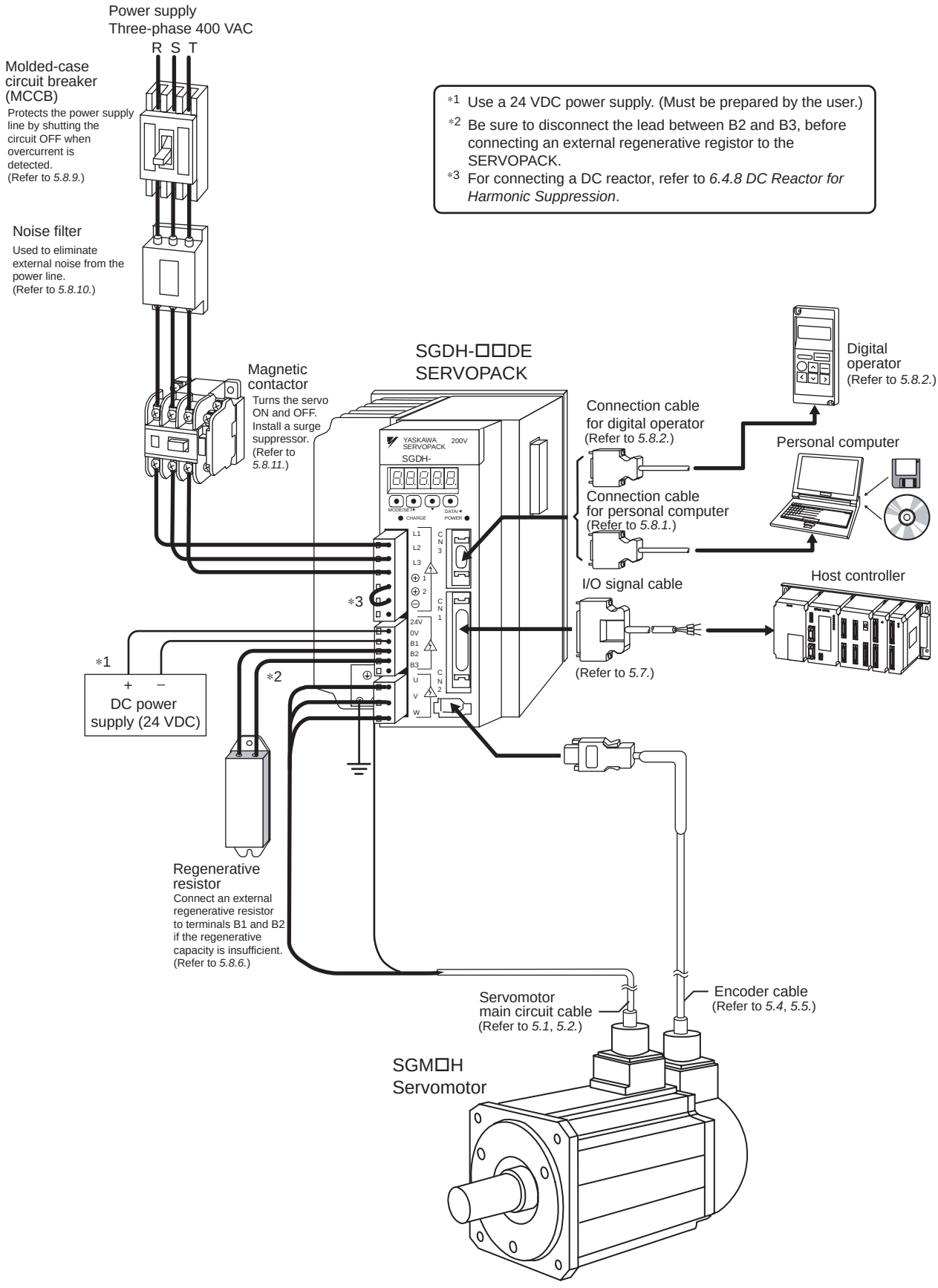
1.3.1 Single-phase, 100 V, 200 V and 220 V Main Circuit



1.3.2 Three-phase, 200 V Main Circuit



1.3.3 Three-phase, 400 V Main Circuit



1.4 Applicable Standards

Σ-II Series servodrives conform to the following overseas standards.

1.4.1 North American Safety Standards (UL, CSA)

Model		UL*1 Standards (UL File No.)	CSA*2 Standards	Certifications
SERVOPACK	• SGDH	UL508C(E147823)	CSA C22.2 No.14	UL
Servomotor	• SGMAH • SGMPH • SGMGH • SGMSH • SGMDH • SGMUH*3	UL1004(E165827)	CSA C22.2 No.100	

* 1. Underwriters Laboratories Inc.
* 2. Canadian Standards Association.
* 3. SGMUH servomotors of 4.0 kW do not conform to these standards.

1.4.2 CE Marking

Model		Low Voltage Directive	EMC Directive		Certifications
			EMI	EMS	
SERVOPACK	• SGDH	EN50178	EN55011 class A group 1	EN50082-2 or EN61000-6-2	TÜV PS*
Servomotor	• SGMAH • SGMPH • SGMGH • SGMSH • SGMDH • SGMUH	IEC60034-1 IEC60034-5 IEC60034-8 IEC60034-9			

* TÜV Product Services GmbH

Note: For installation conditions, refer to *6.4.3 Installation Conditions of EMC Directives.*
Because SERVOPACKs and servomotors are built-in type, reconfirmation is required after being installed in the final product.

2

Selections

2.1 Servomotor Model Designations

This section explains how to check the servomotor model and ratings. The alphanumeric codes after SGM□H indicate the specifications.

2.1.1 Model SGMAH (3000 min^{-1})

(1) Without Gears

1st + 2nd digits	3rd digit	4th digits	5th digits	6th digits	7th digits
SGMAH –	02	A	A	A	2	1

1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A:200V,B:100V,D:400V		
Code	Rated Output	A	B	D
A3	0.03	○	○	–
A5	0.05	○	○	–
01	0.1	○	○	–
02	0.2	○	○	–
03	0.3	–	–	○
04	0.4	○	–	–
07	0.65	–	–	○
08	0.75	○	–	–

○: Available

4th digit: Serial Encoder		
Code	Specifications	Remarks
1	16-bit absolute encoder *1	Standard
4	16-bit absolute encoder *1 with super capacitor	Option
A	13-bit incremental encoder *2	Standard
B	16-bit incremental encoder *1	Option

5th digit: Design Revision Order	
Code	Specifications
A	Fixed

6th digit: Shaft End		
Code	Specifications	Remarks
2	Straight without key	Standard
4	Straight with key	Option
6	Straight with key and tap	
8	Straight with tap	

7th digit: Brake and Oil Seal	
Code	Specifications
1	Without options
B	With 90-VDC brake
C	With 24-VDC brake
D	With oil seal and 90-VDC brake
E	With oil seal and 24-VDC brake
S	With oil seal

*1. The number of encoder pulses: 16384 P/Rev.
*2. The number of encoder pulses: 2048 P/Rev.

(2) With Gears

1st + 2nd digits	3rd digit	4th digit	5th digit	6th digit	7th digit	8th digit	9th digit
SGMAH – 01	A	A	A	H	1	2	B

1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A:200V,B:100V,D:400V		
Code	Rated Output	A	B	D
A3	0.03	○	○	–
A5	0.05	○	○	–
01	0.1	○	○	–
02	0.2	○	○	–
03	0.3	–	–	○
04	0.4	○	–	–
07	0.65	–	–	○
08	0.75	○	–	–

○: Available

4th digit: Serial Encoder		
Code	Specifications	Remarks
1	16-bit absolute encoder *1	Standard
4	16-bit absolute encoder *1 with super capacitor	Option
A	13-bit incremental encoder *2	Standard
B	16-bit incremental encoder *1	Option

*1 The number of encoder pulses: 16384 P/Rev.

*2 The number of encoder pulses: 2048 P/Rev.

5th digit: Design Revision Order	
Code	Specifications
A	Fixed

6th digit: Gear Type		8th digit: Shaft End Code
Code	Specifications	
G	HDS planetary low-backlash gear	0
H	HDS planetary low-backlash gear	2・6・8
J	Standard backlash gear	2・6

8th digit: (Shaft End Code): 2, 6

6th digit; Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage					
	Code	Specifi-cations	A3A	A5A	01A	02A	04A	08A
			A3B	A5B	01B	02B		
J (Stan-dard)	1	1/5	○	○	○	○	○	○
	3	3/31	○	○	○	○	○	○
	7	1/33	○	○	○	○	○	○
	C	1/21	○	○	○	○	○	○

○: Available

9th digit: Brake	
Code	Specifications
1	Without brake
B	With 90-VDC brake
C	With 24-VDC brake

8th digit: Shaft End		6th digit: Gear Type Code		
Code	Specifications	G	H	J
0	No shaft	○	–	–
2	Straight without key	○	○	○
6	Straight with key and tap	○	○	○
8	Straight with tap	○	○	–

○: Available

8th digit: (Shaft End Code): 0

6th digit; Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage					
	Code	Specifi-cations	A3A	A5A	01A	02A	04A	08A
			A3B	A5B	01B	02B	–	–
			–	–	–	–	03D	07D
G (Low-back-lash)	1	1/5	○	○	○	○	○	○
	2	1/9	○	○	–	–	–	–
	7	1/33	○	○	○	○	○	○
	B	1/11	–	–	○	○	○	○
	C	1/21	○	○	○	○	○	○

○: Available

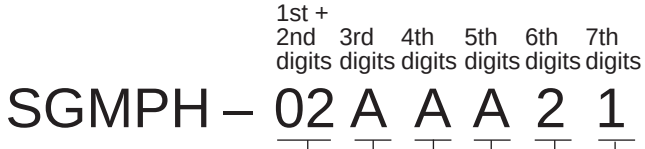
8th digit: (Shaft End Code): 2, 6, 8

6th digit; Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage					
	Code	Specifi-cations	A3A	A5A	01A	02A	04A	08A
			A3B	A5B	01B	02B	–	–
			–	–	–	–	03D	07D
H (Low-back-lash)	1	1/5	○	○	○	○	○	○
	2	1/9	○	○	–	–	–	–
	7	1/33	○	○	○	○	○	○
	B	1/11	–	–	○	○	○	○
	C	1/21	○	○	○	○	○	○

○: Available

2.1.2 Model SGMPH (3000 min^{-1})

(1) Without Gears



1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A:200V,B:100V,D:400V		
Code	Rated Output	A	B	D
01	0.1	○	○	–
02	0.2	○	○	○
04	0.4	○	–	○
08	0.75	○	–	○
15	1.5	○	–	○

○: Available

4th digit: Serial Encoder		
Code	Specifications	Remarks
1	16-bit absolute encoder *1	Standard
4	16-bit absolute encoder *1 with super capacitor	Option
A	13-bit incremental encoder*2	Standard
B	16-bit incremental encoder*1	Option

*1 The number of encoder pulses: 16384 P/Rev.
*2 The number of encoder pulses: 2048 P/Rev.

5th digits: Design Revision Order	
Code	Specifications
A	Fixed
E	IP67 water-proof specifications

6th digit: Shaft End		
Code	Specifications	Remarks
2	Straight without key	Standard
4	Straight with key	Option
6	Straight with key and tap	
8	Straight with tap	

7th digit: Brake and Oil Seal	
Code	Specifications
1	Without options
B	With 90-VDC brake
C	With 24-VDC brake
D	With oil seal and 90-VDC brake
E	With oil seal and 24-VDC brake
S	With oil seal

(2) With Gears

1st + 2nd digits	3rd digits	4th digits	5th digits	6th digits	7th digits	8th digits	9th digits
SGMPH –	01	A	A	A	H	1	2	B

1st + 2nd digit: Rated Output (kW)		3rd digit: Voltage A:200V,B:100V,D:400V		
Code	Rated Output	A	B	D
01	0.1	○	○	–
02	0.2	○	○	○
04	0.4	○	–	–
08	0.75	○	–	○
15	1.5	○	–	○

○: Available

4th digit: Serial Encoder		
Code	Specifications	Remarks
1	16-bit absolute encoder *1	Standard
4	16-bit absolute encoder *1 with super capacitor	Option
A	13-bit incremental encoder*2	Standard
B	16-bit incremental encoder*1	Option

*1 The number of encoder pulses: 16384 P/Rev.

*2 The number of encoder pulses: 2048 P/Rev.

5th digit: Design Revision Order	
Code	Specifications
A	Fixed
E	IP67 water-proof specifications

6th digit: Gear Type		8th digit: Shaft End Code
Code	Specifications	
G	HDS planetary low-backlash gear	0
H	HDS planetary low-backlash gear	2・6・8
J	Standard backlash gear	2・6

(2) Rated Output1.5 kW

① 8th digit (Shaft End Code): 0

6 digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage
	Code	Specifications	15A / 15D
G (Low-backlash)	1	1/5	–
	7	1/33	○
	B	1/11	–
	C	1/21	○

○: Available

② 8th digit (Shaft End Code): 2, 6, 8

6 digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage
	Code	Specifications	15A / 15D
H (Low-backlash)	1	1/5	○
	7	1/33	–
	B	1/11	○
	C	1/21	–

○: Available

9th digit: Brake	
Code	Specifications
1	Without brake
B	With 90-VDC brake
C	With 24-VDC brake

8th digit: Shaft End		6th digit: Gear TypeCode		
Code	Specifications	G	H	J
0	No shaft	○	–	–
2	Straight without key	–	○	○
6	Straight with key and tap	–	○	○
8	Straight with tap	–	○	–

○: Available

(1) Rated Output: 0.1 kW to 0.75 kW

① 8th digit (Shaft End Code): 0

6 digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage			
	Code	Specifications	01A	02A	04A	08A
			01B	02B	–	–
			–	02D	04D	08D
G (Low-backlash)	1	1/5	○	○	○	○
	7	1/33	○	○	○	○
	B	1/11	○	○	○	○
	C	1/21	○	○	○	○

○: Available

②8th digit (Shaft End Code): 2, 6, 8

6 digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage			
	Code	Specifications	01A	02A	04A	08A
			01B	02B	–	–
			–	02D	04D	08D
H (Low-backlash)	1	1/5	○	○	○	○
	7	1/33	○	○	○	○
	B	1/11	○	○	○	○
	C	1/21	○	○	○	○

○: Available

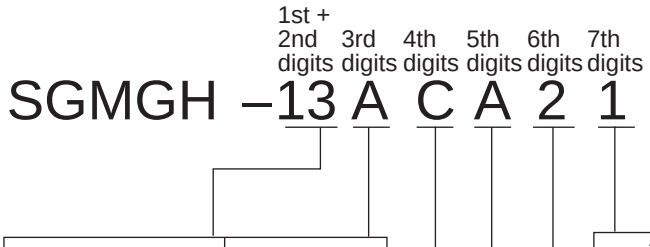
8th digit (Shaft End Code): 2, 6

6 digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage				
	Code	Specifications	01A	02A	04A	08A	15A
			01B	02B	–	–	–
			–	02D	04D	08D	15D
H (Low-backlash)	1	1/5	○	○	○	○	○
	3	3/31	○	○	○	○	○
	7	1/33	○	○	○	○	○
	C	1/21	○	○	○	○	○

○: Available

2.1.3 Model SGMGH (1500 min^{-1})

(1) Without Gears



1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A:200V,D:400V	
Code	Rated Output	A	D
05	0.45	○	○
09	0.85	○	○
13	1.3	○	○
20	1.8	○	○
30	2.9	○	○
44	4.4	○	○
55	5.5	○	○
75	7.5	○	○
1A	11.0	○	○
1E	15.0	○	○

○: Available

7th digit: Brake and Oil Seal	
Code	Specifications
1	Without options
B	With 90-VDC brake
C	With 24-VDC brake
D	With oil seal and 90-VDC brake
E	With oil seal and 24-VDC brake
S	With oil seal

6th digit: Shaft End		
Code	Specifications	Remarks
2	Straight without key	Standard
3	Taper 1/10, with parallel key	Option
5	Taper 1/10, with woodruff key	
6	Straight with key and tap	

4th digit: Serial Encoder		
Code	Specifications	Remarks
2	17-bit absolute encoder *	Standard
C	17-bit incremental encoder *	

* The number of encoder pulses: 32768 P/Rev.

5th digit: Design Revision Order	
Code	Specifications
A	Standard
C	For high-performance machine tool (4.4 kW or less)

(2) With Gears

SGMGH – 20 A C A L 1 4 B

(1st + 2nd digits, 3rd digits, 4th digits, 5th digits, 6th digits, 7th digits, 8th digits, 9th digits)

9th digit: Brake	
Code	Specifications
1	Without brake
B	With 90-VDC brake
C	With 24-VDC brake

8th digit: Shaft End		6th digit: Gear Type Code		
Code	Specifications	L	S	T
4	Straight with key	○	–	–
6	Straight with key and tap	–	○	○

○: Available

1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A:200V,D:400V	
Code	Rated Output	A	D
05	0.45	○	○
09	0.85	○	○
13	1.3	○	○
20	1.8	○	○
30	2.9	○	○
44	4.4	○	○
55	5.5	○	○
75	7.5	○	○
1A	11.0	○	○

○: Available

6th digit: Gear Type	
Code	Specifications
L	IMT planetary low-backlash gear (Flange type)
S	Standard backlash gear (Foot mounting type)
T	Standard backlash gear (Flange type)

5th digit: Design Revision Order	
Code	Specifications
A	Standard
C	For high-performance machine tool

4th digit: Serial Encoder		
Code	Specifications	Remarks
2	17-bit absolute encoder *	Standard
C	17-bit incremental encoder *	

* The number of encoder pulses: 32768 P/Rev.

6th digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage											
	Code	Specifications	05A	05D	09A	09D	13A	13D	20A	20D	30A	30D	44A	44D
L (Low-backlash)	1	1/5	○	○	○	○	○	○	○	○	○	○	○	–
	2	1/9	○	○	○	○	○	○	○	○	○	○	○	–
	5	1/20	○	○	○	○	○	○	○	○	○	○	–	–
	7	1/29	○	○	○	○	○	○	○	○	–	–	–	–
	8	1/45	○	○	○	○	○	○	–	–	–	–	–	–

○: Available

6th digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage															
	Code	Specifications	05A	05D	09A	09D	13A	13D	20A	20D	30A	30D	44A	44D	55A	55D	75A	75D
S (Standard)	A	1/6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	–	–
	B	1/11	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	C	1/21	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	7	1/29	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

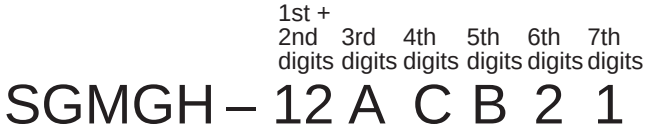
○: Available

6th digit: Gear Type Code	7th digit: Gear Ratio		1st + 2nd + 3rd digits: Code of the Rated Output and Voltage															
	Code	Specifications	05A	05D	09A	09D	13A	13D	20A	20D	30A	30D	44A	44D	55A	55D	75A	75D
T (Standard)	A	1/6	○	○	○	○	○	○	○	○	○	○	○	○	○	○	–	–
	B	1/11	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	C	1/21	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	7	1/29	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

○: Available

2.1.4 Model SGMGH (1000 min^{-1})

(1) Without Gears



1st + 2nd digits: Rated Output (kW)		3rd digit: Voltage A: 200V
Code	Rated Output	A
03	0.3	○
06	0.6	○
09	0.9	○
12	1.2	○
20	2.0	○
30	3.0	○
40	4.0	○
55	5.5	○

○: Available

4th digit: Serial Encoder		
Code	Specifications	Remarks
2	17-bit absolute encoder*	Standard
C	17-bit incremental encoder*	

* The number of encoder pulses: 32768 P/Rev.

5th digit: Design Revision Order	
Code	Specifications
B	Standard
D	For high-performance machine tool

6th digit: Shaft End		
Code	Specifications	Remarks
2	Straight without key	Standard
3	Taper 1/10, with parallel key	Option
5	Taper 1/10, with woodruff key	
6	Straight with key and tap	

7th digit: Brake and Oil Seal	
Code	Specifications
1	Without options
B	With 90-VDC brake
C	With 24-VDC brake
D	With oil seal and 90-VDC brake
E	With oil seal and 24-VDC brake
S	With oil seal