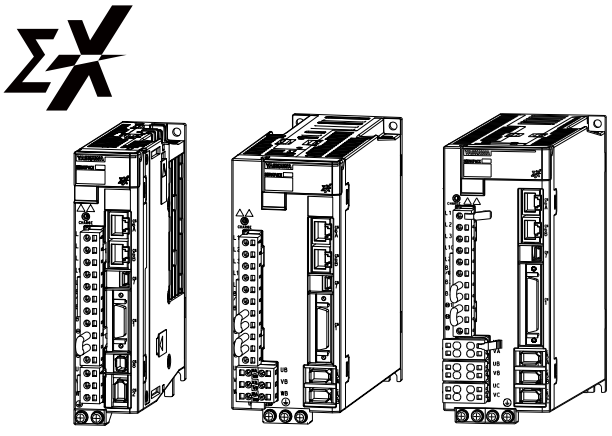
YASKAWA

Σ-X-Series AC Servo Drive

Σ-XS/Σ-XW/Σ-XT SERVOPACK Hardware Option Specifications Dynamic Brake

Product Manual

Model: SGDXS-□□□□□□□□0020
SGDXW-□□□□□□□□0020
SGDXT-□□□□□□□□0020



MANUAL NO. SIEP C710812 14C

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Preface and General Precautions

i.1 About this Manual

This document describes the Σ-X-series AC servo drives (SGDX□-□□□□□□□0020) with the dynamic brake hardware option. This manual contains the specifications that are different from SERVOPACKs without the dynamic brake hardware option.

For all other information, refer to the product manual for a standard SERVOPACK.

Read and understand this manual and the standard SERVOPACK product manual to ensure correct usage of the Σ-X-series AC servo drives.

Keep this manual and the standard SERVOPACK product manual in a safe place so that they can be referred to whenever necessary.

i.2 Finding Information

Information on SERVOPACKs that support the dynamic brake hardware option specifications is provided in different manuals depending on the topic. Use the following table to find what information is provided in this manual and what information is provided in the standard SERVOPACK product manuals given in the table.

Item		This Document	Σ-XS SERVOPACK			Σ-XW SERVOPACK		Σ-XT SERVOPACK	
			Analog Voltage/ Pulse Train References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References
			Manual No.: SIEP C710812 01	Manual No.: SIEP C710812 02	Manual No.: SIEP C710812 03	Manual No.: SIEP C710812 04	Manual No.: SIEP C710812 05	Manual No.: SIEP C710812 16	Manual No.: SIEP C710812 17
Basic information on SERVOPACKs	About the dynamic brake hardware option specifications	1.1	–						
	Nameplate	1.2							
	Part names	1.3							
	Interpreting model numbers	1.4							
	Other basic information not listed above	–	Chapter 1						
Selecting a SERVOPACK	Combination of a servomotor and SERVOPACK	2.1	–						
	External dimensions	2.2							
	Other selection information not listed above	–	Chapter 2						
Selecting a dynamic brake resistor		Chapter 3	–						
SERVOPACK installation		–	Chapter 3						
Wiring and connecting SERVOPACKs			Chapter 4						
Wiring and connecting a dynamic brake resistor		Chapter 4	–						
Basic information required for settings before operation	Motor stopping methods for servo OFF and alarms	5.2							
	Motor stopping method for overtravel	5.3							
	Setting the dynamic brake resistor allowable energy consumption and dynamic brake resistance	5.4							
	Other basic functions not listed above	–	Chapter 5						

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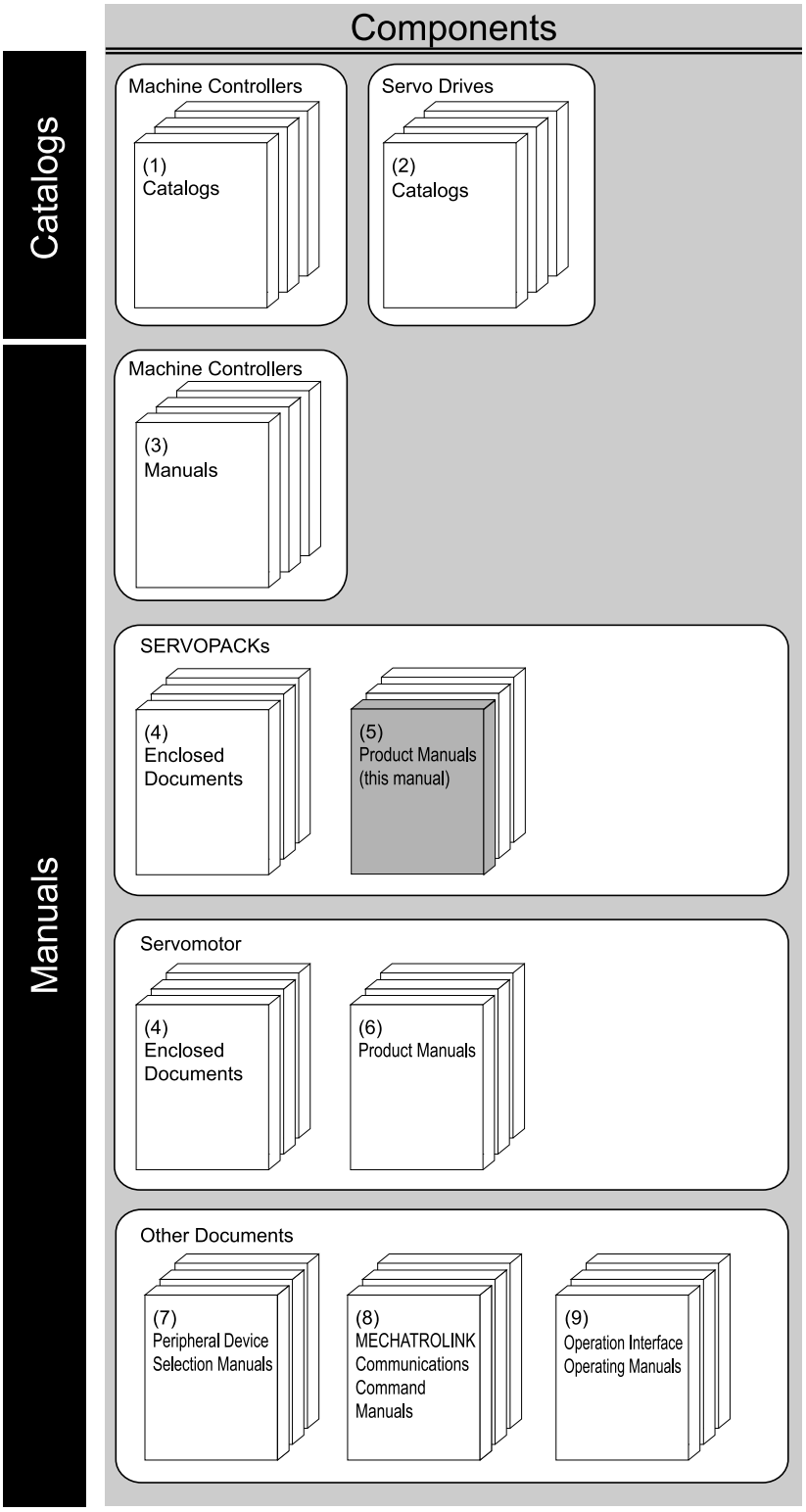
Item		This Document	Σ-XS SERVOPACK			Σ-XW SERVOPACK		Σ-XT SERVOPACK	
			Analog Voltage/ Pulse Train References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References	MECHATROLINK-4/III Communications References	with EtherCAT Communications References
			Manual No.: SIEP C710812 01	Manual No.: SIEP C710812 02	Manual No.: SIEP C710812 03	Manual No.: SIEP C710812 04	Manual No.: SIEP C710812 05	Manual No.: SIEP C710812 16	Manual No.: SIEP C710812 17
Application functions		–	Chapter 6						
Trial operation and actual operation			Chapter 7						
Tuning			Chapter 8						
Monitoring			Chapter 9						
Fully-closed loop control			Chapter 10			–			
Σ-LINK II function			Chapter 11			Chapter 10			
Safety function			Chapter 12			–			
Maintenance	Troubleshooting related to the dynamic brake hardware option specifications	Chapter 6	–						
	All other troubleshooting	–	Chapter 13			Chapter 11			
Panel displays and panel operator procedures		–	Chapter 14	–					
Parameter lists	Parameters related to the dynamic brake hardware option specifications	Chapter 7	–						
	All other parameters	–	Chapter 15	Chapter 14		Chapter 12			
Interpreting LED displays		–	–	15.1		13.1			
Interpreting panel displays			–	15.2		13.2			
Examples of connections to host controllers			16.1	–					
Corresponding SERVOPACK and SigmaWin+ function names			16.2	15.3		13.3			
Monitor displays for the dynamic brake hardware option specifications		8.1	–						
Coasting distance when stopping with the dynamic brake		8.2	–						
Data for coasting distance calculation		8.3	–						

i.3 Related Documents

The relationships between the documents that are related to the servo drives are shown in the following figure. The numbers in the figure correspond to the numbers in the table on the following pages. Refer to these documents as required.



i.3.1 Related Documents

(1) Machine Controllers Catalogs

You can check for products related to YASKAWA machine controllers. Refer to these documents as required.

(2) Servo Drives Catalogs

Document Name	Document No.	Description
AC Servo Drives Sigma-X Series	KAEP C710812 03	Provides detailed information on Σ-X-series AC servo drives, including features and specifications.

(3) Machine Controllers Manuals

The machine controller to use depends on the SERVOPACK that is used. Refer to the manual for the machine controller as required.

(4) Enclosed Documents

Document Name	Document No.	Description
Σ-X-Series AC Servo Drive Σ-XS/Σ-XW SERVOPACK Safety Precautions	TOMP C710812 00	Provides detailed information for the safe usage of Σ-X-series SERVOPACKs.
Σ-X-Series AC Servo Drive Σ-XT SERVOPACK Safety Precautions	TOMP C710812 16	
Σ-X-Series AC Servo Drive Σ-LINK II Sensor Hub Instructions	TOMP C710812 06	Provides detailed information for the safe usage of the Σ-LINK II sensor hub, as well as specifications, installation, and connection information.
Σ-X-Series AC Servo Drive Σ-LINK II Booster Unit Instructions	TOMP C710812 08	Provides detailed information for the safe usage of the Σ-LINK II booster unit, as well as specifications, installation, and connection information.
Σ-V-Series/Σ-V-Series for Large-Capacity Models/Σ-7-Series/Σ-X-Series Installation Guide Fully-closed Module	TOBP C720829 03	Provides detailed procedures for installing the fully-closed module in a SERVOPACK.
AC Servo Drive Rotary Servomotor Safety Precautions	TOBP C230260 00	Provides detailed information for the safe usage of rotary servomotors and direct drive servomotors.

(5) SERVOPACK Product Manuals

Document Name	Document No.	Description
Σ-X-Series AC Servo Drive Σ-XS SERVOPACK with MECHATROLINK-4/III Communications References Product Manual	SIEP C710812 01	Provides detailed information on selecting Σ-X-series Σ-XS or Σ-XW SERVOPACKs; installing, connecting, setting, testing in trial operation, tuning, monitoring, and maintaining servo drives; and other information.
Σ-X-Series AC Servo Drive Σ-XS SERVOPACK with EtherCAT Communications References Product Manual	SIEP C710812 02	
Σ-X-Series AC Servo Drive Σ-XS SERVOPACK Analog Voltage/Pulse Train References Product Manual	SIEP C710812 03	
Σ-X-Series AC Servo Drive Σ-XW SERVOPACK with MECHATROLINK-4/III Communications References Product Manual	SIEP C710812 04	
Σ-X-Series AC Servo Drive Σ-XW SERVOPACK with EtherCAT Communications References Product Manual	SIEP C710812 05	
Σ-X-Series AC Servo Drive Σ-XT SERVOPACK with MECHATROLINK-4/III Communications References Product Manual	SIEP C710812 16	Provides detailed information on selecting Σ-X-series Σ-XT SERVOPACKs; installing, connecting, setting, testing in trial operation, tuning, monitoring, and maintaining servo drives; and other information.
Σ-X-Series AC Servo Drive Σ-XT SERVOPACK with EtherCAT Communications References Product Manual	SIEP C710812 17	
Σ-X-Series AC Servo Drive Σ-XW SERVOPACK Hardware Option Specifications HWBB Function Product Manual	SIEP C710812 13	Provides information on servo drives equipped with the HWBB safety function (SGDXW-□□□□40□1000 and SGDXW-□□□□A0□1000). The differences in specifications from SERVOPACKs not equipped with the HWBB are given in this manual.
Σ-X-Series AC Servo Drive Σ-XS/Σ-XW/Σ-XT SERVOPACK Hardware Option Specifications Dynamic Brake Product Manual	SIEP C710812 14	Provides information on Σ-X-series AC servo drives (SGDX□-□□□□□□□0020) with the dynamic brake option. The differences in specifications from SERVOPACKs without the dynamic brake option are given in this manual.

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Document Name	Document No.	Description
Σ-X-Series AC Servo Drive Σ-XW SERVOPACK with MECHATROLINK-4/III Communications References FT Specification for Gantry Applications Product Manual	SIEP C710812 19	Provides information on the gantry application function and torque/force assist in the Σ-X-series Σ-XW SERVOPACK.
Σ-X-Series AC Servo Drive Σ-XW SERVOPACK with EtherCAT Communications References FT Specification for Gantry Applications Product Manual	SIEP C710812 20	

(6) Servomotor Product Manuals

Document Name	Document No.	Description
Σ-X-Series AC Servo Drive Rotary Servomotor Product Manuals	SIEP C230210 00	Provide detailed information on selecting, installing, and connecting the Σ-X-series servomotors.

(7) Peripheral Device Selection Manual

Document Name	Document No.	Description
Σ-X-Series AC Servo Drive Peripheral Device Selection Manual	SIEP C710812 12	Provides the following information in detail for Σ-X-series servo systems. • Cables: Models, dimensions, wiring materials, connector models, and connection specifications • Peripheral devices: Models, specifications, diagrams, and selection (calculation) methods

(8) MECHATROLINK Communications Command Manuals

Document Name	Document No.	Description
Σ-7/Σ-X-Series AC Servo Drive MECHATROLINK-III Communications Standard Servo Profile Command Manual	SIEP S800001 31	Provides detailed information on the MECHATROLINK-III communications standard servo profile commands that are used for a Σ-7/Σ-X-series servo system.
Σ-7/Σ-X-Series AC Servo Drive MECHATROLINK-4 Communications Standard Servo Profile Command Manual	SIEP S800002 32	Provides detailed information on the MECHATROLINK-4 communications standard servo profile commands that are used for a Σ-7/Σ-X-series servo system.

(9) Operation Interface Operating Manuals

Document Name	Document No.	Description
System Integrated Engineering Tool MPE720 Ver.7 User's Manual	SIEP C880761 03	Describes in detail how to operate MPE720 version 7.
Σ-7/Σ-X-Series AC Servo Drive Digital Operator Operating Manual	SIEP S800001 33	Describes the operating procedures for a digital operator for a Σ-7/Σ-X-series servo system.
AC Servo Drive Engineering Tool SigmaWin+ Operation Manual	SIET S800001 34	Provides detailed operating procedures for the SigmaWin + engineering tool for a Σ-7/Σ-X series servo system.

i.4 Using This Manual

i.4.1 Technical Terms Used in This Manual

The following terms are used in this manual.

Term	Meaning
servomotor	A generic term for a rotary servomotor or linear servomotor that can be driven by this SERVOPACK.
rotary servomotor	A generic term used for a Σ-X-series rotary servomotor (SGMXJ, SGMXA, SGMXP, SGMXG, SGM7M) or a Σ-7-series direct drive servomotor (SGM7D, SGM7E, SGM7F). The descriptions will specify when direct drive servomotors are excluded.
linear servomotor	A generic term used for a Σ-7-series linear servomotor (SGLG, SGLF, SGLT).
SERVOPACK	• A Σ-X-series Σ-XS servo amplifier with analog voltage/pulse train references. • A Σ-X-series Σ-XS servo amplifier with MECHATROLINK-4/III communications references. • A Σ-X-series Σ-XS servo amplifier with EtherCAT communications references. • A Σ-X-series Σ-XW servo amplifier with MECHATROLINK-4/III communications references. • A Σ-X-series Σ-XW servo amplifier with EtherCAT communications references. • A Σ-X-series Σ-XT servo amplifier with MECHATROLINK-4/III communications references. • A Σ-X-series Σ-XT servo amplifier with EtherCAT communications references.
servo drive	The combination of a servomotor and SERVOPACK.
servo system	A servo control system that includes the combination of a servo drive with a host controller and peripheral devices.
servo ON	Supplying power to the motor.
servo OFF	Not supplying power to the motor.
base block (BB)	Shutting OFF the power supply to the motor by shutting OFF the base current to the power transistor in the SERVOPACK.
dynamic brake (DB)	A brake that performs a quick stop of a servomotor by connecting resistance between the servomotor terminals.
servo lock	A state in which the motor is stopped and is in a position loop with a position reference of 0.
main circuit cable	One of the cables that connect to the main circuit terminals, including the main circuit power supply cable, control power supply cable, and servomotor main circuit cable.
SigmaWin+	The engineering tool for setting up and tuning servo drives or a computer in which the engineering tool is installed.

i.4.2 Differences in Terms for Rotary Servomotors and Linear Servomotors

There are differences in the terms that are used for rotary servomotors and linear servomotors. This manual primarily describes rotary servomotors. If you are using a linear servomotor, you need to interpret the terms as given in the following table.

Rotary Servomotor	Linear Servomotor
torque	force
moment of inertia	mass
rotation	movement

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Rotary Servomotor	Linear Servomotor
forward rotation and reverse rotation	forward movement and reverse movement
CW + CCW pulse trains	forward and reverse pulse trains
rotary encoder	linear encoder
absolute rotary encoder	absolute linear encoder
incremental rotary encoder	incremental linear encoder
unit: min^{-1}	unit: mm/s
unit: N·m	unit: N

i.4.3 Notation for Alarm and Parameter Numbers When Using EtherCAT Communications

Alarm and parameter numbers differ between EtherCAT communications and other communications. This manual describes the alarm and parameter numbers for communications other than EtherCAT communications. For EtherCAT communications, interpret the alarm and parameter numbers as follows:

Item	Example in Communications Other Than EtherCAT Communications	Example in EtherCAT Communications		
		Single Axis or Axis A	Axis B	Axis C
Alarm Number	A.042	042h		
	A.730	730h		
Parameter Number	Pn001	2001h	2801h	3001h
	Pn100	2100h	2900h	3100h
	Pn20E	220Eh	2A0Eh	320Eh
	Pn30A	230Ah	2B0Ah	330Ah
	Pn406	2406h	2C06h	3406h
	Pn533	2533h	2D33h	3533h
	Pn601	2601h	2E01h	3601h

i.4.4 Notation Used in this Manual

(1) Notation for Reverse Signals

The names of reverse signals (i.e., ones that are valid when low) are written with a forward slash (/) before the signal abbreviation.

Notation Example

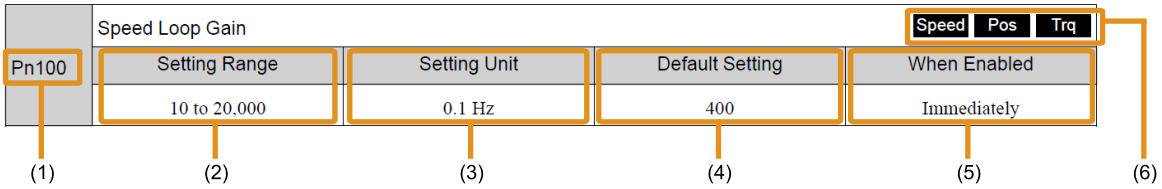
$\overline{BK}$ is written as /BK.

(2) Notation for Parameters

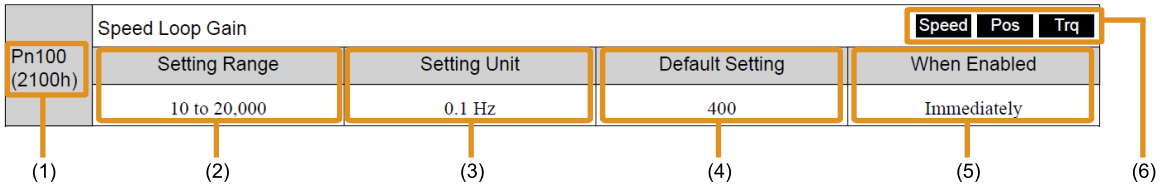
The notation depends on whether the parameter requires a numeric setting (parameter for numeric setting) or requires the selection of a function (parameter for selecting functions).

(a) Parameters for Numeric Settings

- SERVOPACKs wih Analog Voltage/Pulse Train Reference or MECHATROLINK-4/III Communications Reference



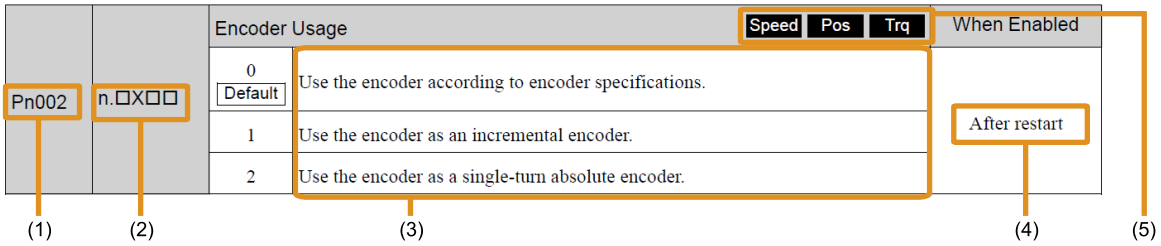
- SERVOPACKs wih EtherCAT Communications Reference



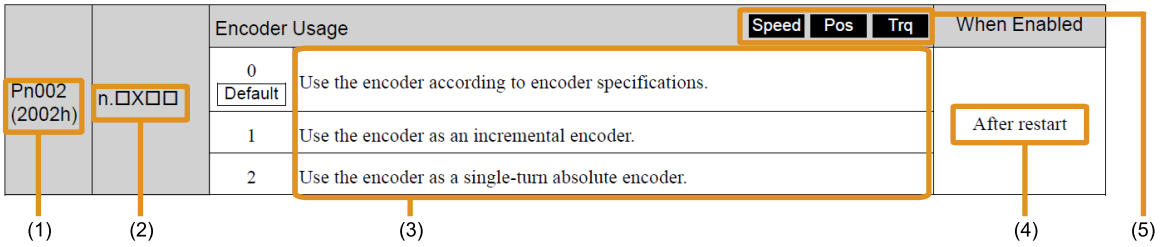
No.	Description
(1)	• SERVOPACKs wih Analog Voltage/Pulse Train Reference or MECHATROLINK-4/III Communications Reference Parameter number • SERVOPACKs wih EtherCAT Communications Reference Parameter number and object index number The object index number is used when accessing an object over EtherCAT communications. When you use Σ-XW or Σ-XT SERVOPACKs, if Common is given here, the parameter applies to all axes. If you change the setting of an axis, the new setting will be applied to other axes.
(2)	This is the setting range for the parameter.
(3)	This is the setting unit (setting increment) that you can set for the parameter.
(4)	This is the parameter setting before shipment.
(5)	This is when any change made to the parameter will become effective.
(6)	The control methods for which the parameters apply are given. Speed: A parameter that can be used in speed control. Pos: A parameter that can be used in position control. Trq: A parameter that can be used in torque control. "Torque" is used even for linear servomotor parameters. Grayed-out icons (Speed, Speed, Speed) indicate parameters that cannot be used in the corresponding control method.

(b) Parameters for Selecting Functions

- SERVOPACKs wih Analog Voltage/Pulse Train Reference or MECHATROLINK-4/III Communications Reference



- SERVOPACKs wih EtherCAT Communications Reference



<table>
<tr><th>No.</th><th>Description</th></tr>
<tr><td>(1)</td><td>
• SERVOPACKs wih Analog Voltage/Pulse Train Reference or MECHATROLINK-4/III Communications Reference
Parameter number
• SERVOPACKs wih EtherCAT Communications Reference
Parameter number and object index number
The object index number is used when accessing an object over EtherCAT communications.
When you use Σ-XW or Σ-XT SERVOPACKs, if Common is given here, the parameter applies to all axes. If you change the setting of an axis, the new setting will be applied to other axes.
</td></tr>
<tr><td>(2)</td><td>
The notation “n.□□□□” indicates a parameter for selecting functions. The digit shown as "X" is the content being explained in this parameter.
Notation Example
n. 0 0 0 0
Notation Examples for Pn002
<table>
<tr><th colspan="2">Digit Notation</th><th colspan="2">Numeric Value Notation</th></tr>
<tr><th>Notation</th><th>Meaning</th><th>Notation</th><th>Meaning</th></tr>
<tr><td>Pn002 = n.□□□X</td><td>Indicates the first digit from the right in Pn002.</td><td>Pn002 = n.□□□1</td><td>Indicates that the first digit from the right in Pn002 is set to 1.</td></tr>
<tr><td>Pn002 = n.□□X□</td><td>Indicates the second digit from the right in Pn002.</td><td>Pn002 = n.□□1□</td><td>Indicates that the second digit from the right in Pn002 is set to 1.</td></tr>
<tr><td>Pn002 = n.□X□□</td><td>Indicates the third digit from the right in Pn002.</td><td>Pn002 = n.□1□□</td><td>Indicates that the third digit from the right in Pn002 is set to 1.</td></tr>
<tr><td>Pn002 = n.X□□□</td><td>Indicates the fourth digit from the right in Pn002.</td><td>Pn002 = n.1□□□</td><td>Indicates that the fourth digit from the right in Pn002 is set to 1.</td></tr>
</table>
</td></tr>
<tr><td>(3)</td><td>This column explains the selections for the function.
In the above example, the first line gives an explanation of when Pn002 = n.□0□□ is set.</td></tr>
<tr><td>(4)</td><td>This is when any change made to the parameter will become effective.</td></tr>
<tr><td>(5)</td><td>
The control methods for which the parameters apply are given.
Speed: A parameter that can be used in speed control.
Pos: A parameter that can be used in position control.
Trq: A parameter that can be used in torque control. "Torque" is used even for linear servomotor parameters.
Grayed-out icons (Speed, Speed, Speed) indicate parameters that cannot be used in the corresponding control method.
</td></tr>
</table>

i.4.5 Engineering Tools Used in This Manual

This manual uses the interfaces of the SigmaWin+ for descriptions.

The interfaces and procedures contained in this manual are currently in development and may differ from the actual specifications.

i.4.6 Trademarks

- EtherCAT is a registered trademark of and patented technology licensed by Beckhoff Automation GmbH, Germany.
- Safety over EtherCAT is a registered trademark of and patented technology licensed by Beckhoff Automation GmbH, Germany.
- QR code is a trademark of Denso Wave Inc.
- MECHATROLINK is a trademark of the MECHATROLINK Members Association.
- Σ-LINK is a trademark of the MECHATROLINK Members Association.
- Other product names and company names are the trademarks or registered trademarks of their respective companies. “TM” and the ® mark do not appear with product or company names in this manual.

i.4.7 Visual Aids

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


Important

Indicates precautions or restrictions that must be observed.
Also indicates alarm displays and other precautions that will not result in machine damage.


Term

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

Information Indicates supplemental information to deepen understanding or useful information.

i.5 Safety Precautions

i.5.1 Safety Information

To prevent personal injury and equipment damage in advance, the following signal words are used to indicate safety precautions in this document. The signal words are used to classify the hazards and the degree of damage or injury that may occur if a product is used incorrectly. Information marked as shown below is important for safety. Always read this information and heed the precautions that are provided.

⚠ DANGER

Indicates precautions that, if not heeded, are likely to result in loss of life, serious injury, or fire.

⚠ WARNING

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

⚠ CAUTION

Indicates precautions that, if not heeded, could result in relatively serious or minor injury, or in fire.

NOTICE

Indicates precautions that, if not heeded, could result in property damage.

i.5.2 Safety Precautions That Must Always Be Observed

(1) General Precautions

⚠ DANGER

Read and understand this manual to ensure the safe usage of the product.

Keep this manual in a safe, convenient place so that it can be referred to whenever necessary. Make sure that it is delivered to the final user of the product.

Do not remove covers, cables, connectors, or optional devices while power is being supplied to the SERVOPACK.

There is a risk of electric shock, operational failure of the product, or burning.

⚠ WARNING

Use a power supply with specifications (number of phases, voltage, frequency, and AC/DC type) that are appropriate for the product.

There is a risk of burning, electric shock, or fire.

Connect the ground terminals on the SERVOPACK and servomotor to ground poles according to local electrical codes (100 Ω max).

There is a risk of electric shock or fire.

Do not attempt to disassemble, repair, or modify the product.

There is a risk of fire or failure. The warranty is void for the product if you disassemble, repair, or modify it.

⚠ CAUTION

The SERVOPACK heat sinks, regenerative resistors, external dynamic brake resistors, servomotors, and other components can be very hot while power is ON or soon after the power is turned OFF. Implement safety measures, such as installing covers, so that hands and parts such as cables do not come into contact with hot components.

There is a risk of burning.

For a 24-VDC power supply, use a power supply device with double insulation or reinforced insulation.

There is a risk of electric shock.

Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch cables.

There is a risk of failure, damage, or electric shock.

The person who designs the system that uses the hard wire base block safety function must have a complete knowledge of the related safety standards and a complete understanding of the instructions in this document.

There is a risk of injury, product damage, or machine damage.

Do not place the product in locations where it is subject to water, corrosive gases, flammable gases, potentially explosive atmospheres, or near flammable materials.

There is a risk of electric shock or fire.

NOTICE

Do not attempt to use a SERVOPACK or servomotor that is damaged or that has missing parts.

Install external emergency stop circuits that shut OFF the power and stops operation immediately when an error occurs.

In locations with poor power supply conditions, install the necessary protective devices (such as AC reactors) to ensure that the input power is supplied within the specified voltage range.

There is a risk of damage to the SERVOPACK.

Use a noise filter to minimize the effects of electromagnetic interference.

Electronic devices used near the SERVOPACK may be affected by electromagnetic interference.

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

Do not touch a SERVOPACK or servomotor with wet hands.

There is a risk of product failure.

(2) Storage Precautions

⚠ CAUTION

Do not place an excessive load on the product. (Follow all instructions on the packages.)

There is a risk of injury or damage.

NOTICE

Do not install or store the product in any of the following locations.

- **Locations that are subject to direct sunlight**
- **Locations that are subject to surrounding temperatures that exceed product specifications**
- **Locations that are subject to relative humidities that exceed product specifications**
- **Locations that are subject to condensation as the result of extreme changes in temperature**
- **Locations that are subject to corrosive or flammable gases**
- **Locations that are near flammable materials**
- **Locations that are subject to dust, salts, or iron powder**
- **Locations that are subject to water, oil, or chemicals**
- **Locations that are subject to vibration or shock that exceeds product specifications**
- **Locations that are subject to radiation**

If you store or install the product in any of the above locations, the product may fail or be damaged.

(3) Transportation Precautions

⚠ CAUTION

Transport the product in a way that is suitable to the mass of the product.

Do not use the eyebolts on a SERVOPACK or servomotor to move the machine.

There is a risk of damage or injury.

When you handle a SERVOPACK or servomotor, be careful of sharp parts, such as the corners.

There is a risk of injury.

Do not place an excessive load on the product. (Follow all instructions on the packages.)

There is a risk of injury or damage.

NOTICE

Do not hold onto the front cover or connectors when you move a SERVOPACK.

There is a risk of the SERVOPACK falling.

SERVOPACK or servomotor is a precision device. Do not drop it or subject it to strong shock.

There is a risk of failure or damage.

Do not subject connectors to shock.

There is a risk of faulty connections or damage.

NOTICE

If disinfectants or insecticides must be used to treat packing materials such as wooden frames, plywood, or pallets, use a method other than fumigation. For example, use heat sterilization (core temperature of 56°C or higher for 30 minutes or longer). Treat the packing materials before the product is packaged instead of using a method that treats the entire packaged product.

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.

Do not overtighten the eyebolts on a SERVOPACK or servomotor.

If you use a tool to overtighten the eyebolts, the tapped holes may be damaged.

(4) Installation Precautions

⚠ CAUTION

Install the servomotor or SERVOPACK in a way that will support the mass given in technical documents.

Install SERVOPACKs, servomotors, regenerative resistors, and external dynamic brake resistors on nonflammable materials.

Installation directly onto or near flammable materials may result in fire.

Provide the specified clearances between the SERVOPACK and the control panel as well as with other devices.

There is a risk of fire or failure.

Install the SERVOPACK in the specified orientation.

There is a risk of fire or failure.

Do not step on or place a heavy object on the product.

There is a risk of failure, damage, or injury.

Do not allow any foreign matter to enter the SERVOPACK or servomotor.

There is a risk of failure or fire.

NOTICE

Do not install or store the product in any of the following locations.

- **Locations that are subject to direct sunlight**
- **Locations that are subject to surrounding temperatures that exceed product specifications**
- **Locations that are subject to relative humidities that exceed product specifications**
- **Locations that are subject to condensation as the result of extreme changes in temperature**
- **Locations that are subject to corrosive or flammable gases**
- **Locations that are near flammable materials**
- **Locations that are subject to dust, salts, or iron powder**
- **Locations that are subject to water, oil, or chemicals**
- **Locations that are subject to vibration or shock that exceeds product specifications**
- **Locations that are subject to radiation**

If you store or install the product in any of the above locations, the product may fail or be damaged.

Use the product in an environment that is appropriate for the product specifications.

If you use the product in an environment that exceeds product specifications, the product may fail or be damaged.

NOTICE

SERVOPACK or servomotor is a precision device. Do not drop it or subject it to strong shock.

There is a risk of failure or damage.

Always install a SERVOPACK in a control panel.

Do not allow any foreign matter to enter a SERVOPACK or a servomotor with a cooling fan and do not cover the outlet from the servomotor's cooling fan.

There is a risk of failure.

(5) Wiring Precautions

⚠ DANGER

Do not change any wiring while power is being supplied.

There is a risk of electric shock or injury.

⚠ WARNING

Wiring and inspections must be performed only by qualified engineers.

There is a risk of electric shock or product failure.

Check all wiring and power supplies carefully.

Incorrect wiring or incorrect voltage application to the output circuits may cause short-circuit failures. If a short-circuit failure occurs as a result of any of these causes, the holding brake will not work. This could damage the machine or cause an accident that may result in death or injury. There is also a risk that some parts damaged by the short-circuit failure may fall from the SERVOPACK.

Connect the AC or DC power supplies to the specified SERVOPACK terminals.

- **Connect an AC power supply to the L1, L2, and L3 terminals and the L1C and L2C terminals on the SERVOPACK.**
- **Connect a DC power supply to the B1/⊕ and ⊖ 2 terminals and the L1C and L2C terminals on the SERVOPACK.**

There is a risk of failure or fire.

If you use a SERVOPACK with the dynamic brake hardware option, connect an external dynamic brake resistor that is suitable for the machine and equipment specifications to the specified terminals.

There is a risk of unexpected operation, machine damage, burning, or injury when an emergency stop is performed.

⚠ CAUTION

Wait for at least 20 minutes (or 100 minutes when using DC power supply input) after turning OFF the power and then make sure that the CHARGE indicator is not lit before starting wiring or inspection work. Do not touch the main circuit terminals while the CHARGE indicator is lit because high voltage may still remain in the SERVOPACK even after turning OFF the power.

There is a risk of electric shock.

Observe the precautions and instructions for wiring and trial operation precisely as described in this document.

Failures caused by incorrect wiring or incorrect voltage application in the brake circuit may cause the SERVOPACK to fail, damage the equipment, or cause an accident resulting in death or injury.

⚠ CAUTION

Check the wiring to be sure it has been performed correctly. Connectors and pin layouts are sometimes different for different models. Always confirm the pin layouts in technical documents for your model before operation.

There is a risk of failure or malfunction.

Connect wires to main circuit terminals and motor connection terminals securely with the specified methods and tightening torque.

Insufficient tightening may cause wires and terminal blocks to generate heat due to faulty contact, possibly resulting in fire.

Use shielded twisted-pair cables or screened unshielded multi-twisted-pair cables for I/O signal cables and encoder cables.

The maximum wiring length is 3 m for I/O signal cables and 50 m for servomotor main circuit cables and encoder cables.

Observe the following precautions when wiring the SERVOPACK's main circuit terminals.

- **Turn ON the power to the SERVOPACK only after all wiring, including the main circuit terminals, has been completed.**
- **If a connector is used for the main circuit terminals, remove the main circuit connector from the SERVOPACK before you wire it.**
- **Insert only one wire per insertion hole in the main circuit terminals.**
- **When you insert a wire, make sure that the conductor wire (e.g., whiskers) does not come into contact with adjacent wires and cause a short-circuit.**

Install molded-case circuit breakers and other safety measures to provide protection against short circuits in external wiring.

There is a risk of fire or failure.

NOTICE

Whenever possible, use the cables specified by Yaskawa. If you use any other cables, confirm the rated current and application environment of your model and use the wiring materials specified by Yaskawa or equivalent materials.

Securely tighten connector screws and lock mechanisms.

Insufficient tightening may result in connectors falling off during operation.

Do not bundle power lines (e.g., the main circuit cable) and low-current lines (e.g., the I/O signal cables or encoder cables) together or run them through the same duct. If you do not place power lines and low-current lines in separate ducts, separate them by at least 30 cm.

If the cables are too close to each other, malfunctions may occur due to noise affecting the low-current lines.

Install a battery at either the host controller or on the encoder cable.

If you install batteries both at the host controller and on the encoder cable at the same time, you will create a loop circuit between the batteries, resulting in a risk of damage or burning.

When connecting a battery, connect the polarity correctly.

There is a risk of battery rupture or encoder failure.

(6) Operation Precautions

⚠ WARNING

Before starting operation with a machine connected, change the settings of the switches and parameters to match the machine.

Unexpected machine operation, failure, or personal injury may occur if operation is started before appropriate settings are made.

Do not radically change the settings of the parameters.

There is a risk of unstable operation, machine damage, or injury.

Install limit switches or stoppers at the ends of the moving parts of the machine to prevent unexpected accidents.

There is a risk of machine damage or injury.

For trial operation, securely mount the servomotor and disconnect it from the machine.

There is a risk of injury.

Forcing the motor to stop for overtravel is disabled when the Jog, Origin Search, or Easy FFT utility function is executed. Take necessary precautions.

There is a risk of machine damage or injury.

When an alarm occurs, the servomotor will coast to a stop or stop with the dynamic brake according to the SERVOPACK option and settings. The coasting distance will change with the moment of inertia of the load and the external dynamic brake resistance. Check the coasting distance during trial operation and implement suitable safety measures on the machine.

Do not enter the machine's range of motion during operation.

There is a risk of injury.

Do not touch the moving parts of the servomotor or machine during operation.

There is a risk of injury.

Perform the correct operation with the servomotor connected to the machine.

There is a risk of machine damage or personal injury.

⚠ CAUTION

Design the system to ensure safety even when problems, such as broken signal lines, occur. For example, the P-OT and N-OT signals are set in the default settings to operate on the safe side if a signal line breaks. Do not change the polarity of this type of signal.

When overtravel occurs, the power to the motor is turned OFF and the brake is released. If you use the servomotor to drive a vertical load, set the servomotor to enter a zero-clamped state after the servomotor stops. Also, install safety devices (such as an external brake or counterweight) to prevent the moving parts of the machine from falling.

⚠ CAUTION

Always turn OFF the servo before you turn OFF the power. If you turn OFF the main circuit power or control power during operation before you turn OFF the servo, the servomotor will stop as follows:

- **If you turn OFF the main circuit power during operation without turning OFF the servo, the servomotor will stop abruptly with the dynamic brake.**
- **If you turn OFF the control power without turning OFF the servo, the stopping method that is used by the servomotor depends on the model of the SERVOPACK. For details, refer to the manual for the SERVOPACK.**
- **If you use a SERVOPACK with the dynamic brake hardware option, the servomotor stopping methods will be different from the stopping methods used without the option or with other hardware options.**

Do not use the dynamic brake for any application other than an emergency stop.

There is a risk of failure due to rapid deterioration of elements in the SERVOPACK and the risk of unexpected operation, machine damage, burning, or injury.

NOTICE

When you adjust the gain during system commissioning, use a measuring instrument to monitor the torque waveform and speed waveform and confirm that there is no vibration.

If a high gain causes vibration, the servomotor will be damaged quickly.

Do not frequently turn the power ON and OFF. After you have started actual operation, allow at least one hour between turning the power ON and OFF (as a guideline). Do not use the product in applications that require the power to be turned ON and OFF frequently.

The elements in the SERVOPACK will deteriorate quickly.

An alarm or warning may occur if communications are performed with the host controller while the SigmaWin+ or digital operator is operating.

If an alarm or warning occurs, it may interrupt the current process and stop the system.

After you complete trial operation of the machine and facilities, use the SigmaWin+ to back up the settings of the SERVOPACK parameters. You can use them to reset the parameters after SERVOPACK replacement.

If you do not copy backed up parameter settings, normal operation may not be possible after a faulty SERVOPACK is replaced, possibly resulting in machine or equipment damage.

(7) Maintenance and Inspection Precautions

⚠ DANGER

Do not change any wiring while power is being supplied.

There is a risk of electric shock or injury.

⚠ WARNING

Wiring and inspections must be performed only by qualified engineers.

There is a risk of electric shock or product failure.

⚠ CAUTION

Wait for at least 20 minutes (or 100 minutes when using DC power supply input) after turning OFF the power and then make sure that the CHARGE indicator is not lit before starting wiring or inspection work. Do not touch the main circuit terminals while the CHARGE indicator is lit because high voltage may still remain in the SERVOPACK even after turning OFF the power.

There is a risk of electric shock.

Before you replace a SERVOPACK, back up the settings of the SERVOPACK parameters. Copy the backed up parameter settings to the new SERVOPACK and confirm that they were copied correctly.

If you do not copy backed up parameter settings or if the copy operation is not completed correctly, normal operation may not be possible, possibly resulting in machine or equipment damage.

NOTICE

Discharge all static electricity from your body before you operate any of the buttons or switches inside the front cover of the SERVOPACK.

There is a risk of equipment damage.

(8) Troubleshooting Precautions

⚠ DANGER

If the safety device (molded-case circuit breaker or fuse) installed in the power supply line operates, remove the cause before you supply power to the SERVOPACK again. If necessary, repair or replace the SERVOPACK, check the wiring, and remove the factor that caused the safety device to operate.

There is a risk of fire, electric shock, or injury.

⚠ WARNING

The product may suddenly start to operate when the power supply is recovered after a momentary power interruption. Design the machine to ensure human safety when operation restarts.

There is a risk of injury.

⚠ CAUTION

When an alarm occurs, remove the cause of the alarm and ensure safety. Then reset the alarm or turn the power OFF and ON again to restart operation.

There is a risk of injury or machine damage.

If the Servo ON signal is input to the SERVOPACK and an alarm is reset, the servomotor may suddenly restart operation. Confirm that the servo is OFF and ensure safety before you reset an alarm.

There is a risk of injury or machine damage.

Always insert a magnetic contactor in the line between the main circuit power supply and the main circuit terminals on the SERVOPACK so that the power can be shut OFF at the main circuit power supply.

If a magnetic contactor is not connected when the SERVOPACK fails, a large current may flow continuously, possibly resulting in fire.

⚠ CAUTION

If an alarm occurs, shut OFF the main circuit power supply.

There is a risk of fire due to a regenerative resistor overheating as the result of regenerative transistor failure.

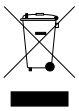
Install a ground fault detector against overloads and short-circuiting or install a molded-case circuit breaker combined with a ground fault detector.

There is a risk of SERVOPACK failure or fire if a ground fault occurs.

The holding brake on a servomotor will not ensure safety if there is the possibility that an external force (including gravity) may move the current position and create a hazardous situation when power is interrupted or an error occurs. If an external force may cause movement, install an external braking mechanism that ensures safety.

(9) Disposal Precautions

- Correctly discard the product as stipulated by regional, local, and municipal laws and regulations. Be sure to include these contents in all labelling and warning notifications on the final product as necessary.



(10) General Precautions

- Figures provided in this document are typical examples or conceptual representations. There may be differences between them and actual wiring, circuits, and products.
- The products shown in illustrations in this document are sometimes shown with their covers or protective guards removed to illustrate detail. Always replace all covers and protective guards before you use the product.
- If you need a new copy of this document because it has been lost or damaged, contact your nearest Yaskawa representative or one of the offices listed on the back of this document.
- This document is subject to change without notice for product improvements, specifications changes, and improvements to the manual itself. We will update the document number of the document and issue revisions when changes are made.
- Any and all quality guarantees provided by Yaskawa are null and void if the customer modifies the product in any way. Yaskawa disavows any responsibility for damages or losses that are caused by modified products.

i.6 Warranty

i.6.1 Details of Warranty

(1) Warranty Period

The warranty period for a product that was purchased (hereinafter called the “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.

(2) Warranty Scope

Yaskawa shall replace or repair a defective product free of charge if a defect attributable to Yaskawa occurs during the above warranty period. This warranty does not cover defects caused by the delivered product reaching the end of its service life and replacement of parts that require replacement or that have a limited service life.

This warranty does not cover failures that result from any of the following causes.

- Improper handling, abuse, or use in unsuitable conditions or in environments not described in product catalogs or manuals, or in any separately agreed-upon specifications
- Causes not attributable to the delivered product itself
- Modifications or repairs not performed by Yaskawa
- Use of the delivered product in a manner in which it was not originally intended
- Causes that were not foreseeable with the scientific and technological understanding at the time of shipment from Yaskawa
- Events for which Yaskawa is not responsible, such as natural or human-made disasters

i.6.2 Limitations of Liability

- 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.
- Yaskawa shall not be responsible for any programs (including parameter settings) or the results of program execution of the programs provided by the user or by a third party for use with programmable Yaskawa products.
- 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.
- Yaskawa shall not be responsible for any damage arising from infringements of intellectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

i.6.3 Suitability for Use

- 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.
- The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
- 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
- Never use the product for an application involving serious risk to life or property without first ensuring that the system is designed to secure the required level of safety with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
- 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.
- Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

i.6.4 Specifications Change

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. The next editions of the revised catalogs or manuals will be published with updated code numbers. Consult with your Yaskawa representative to confirm the actual specifications before purchasing a product.

i.7 Compliance with UL Standards, EU Directives, and Other Safety Standards

Certification marks for the standards for which the product has been certified by certification bodies are shown on nameplate. Products that do not have the marks are not certified for the standards.

Refer to the servomotor manual for compliant standards of servomotors.

i.7.1 North American Safety Standards (UL)

Product	Model	North American Safety Standards (UL File No.)
SERVOPACK	• SGDXS • SGDXW	UL 61800-5-1 (E147823), CSA C22.2 No.274

Information SGDXT: Certification is pending.

i.7.2 EU Directives

CE

Product	Model	EU Directives	Harmonized Standards
SERVOPACK	SGDXS	Machinery Directive 2006/42/EC	EN 62061 EN 61800-5-2
		EMC Directive 2014/30/EU	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 61800-5-1
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000
		WEEE Directive 2012/19/EU	–
	SGDXW	EMC Directive 2014/30/EU	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 61800-5-1
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000
		WEEE Directive 2012/19/EU	–

Note:

- We declared the CE Marking based on the harmonized standards in the above table. These products complied with the corresponding IEC standards. For the edition of each standard, refer to declaration of conformity.
- These products are for industrial use. In home environments, these products may cause electromagnetic interference and additional noise reduction measures may be necessary.

Information SGDXT: Certification is pending.

1

Basic Information on SERVOPACKs

This chapter provides information required to select SERVOPACKs, such as part names and SERVOPACK models.

1.1 About the Dynamic Brake Hardware Option Specifications

⚠ CAUTION

Do not use the dynamic brake for any application other than an emergency stop.

There is a risk of failure due to rapid deterioration of elements in the SERVOPACK and the risk of unexpected operation, machine damage, burning, or injury.

1.1.1 What Is Dynamic Braking?

If the servo turns OFF due to a loss of power or an emergency stop triggered by an alarm during servomotor operation, the SERVOPACK can no longer control the servomotor. Therefore, the servomotor will continue to coast when the servo is turned OFF until all of the kinetic energy from its speed and moment of inertia is expended. Only an extremely small amount of kinetic energy is expended when the servo is turned OFF. This results in an extremely long coasting distance, which can damage the machinery or cause personal injury.

Dynamic braking uses a coasting servomotor as a power generator to brake the servomotor. The servomotor's kinetic energy is converted to electrical energy and is expended as heat through a resistor to stop the servomotor.

1.1.2 Capabilities of SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications

A SERVOPACK that supports the dynamic brake hardware option specifications does not have a built-in dynamic brake resistor, and you can achieve the following things with it by using an external dynamic brake resistor or by not connecting a resistor at all.

Note:

Standard SERVOPACKs include a built-in dynamic brake. However, because the dynamic brake is built in, the brake torque is fixed and there is a limit to the amount of kinetic energy that can be processed by the servomotor.

(1) Reduction of Brake Torque When Stopping with the Dynamic Brake

The brake torque can be adjusted according to the rigidity of the machine to prevent scattering of conveyor objects caused by dynamic braking either by increasing the resistance of the dynamic brake resistor or by not connecting the resistor at all.

(2) Application to Equipment or Machines with a Higher Load Moment of Inertia Than the Allowable Load Moment of Inertia in the Standard Specifications

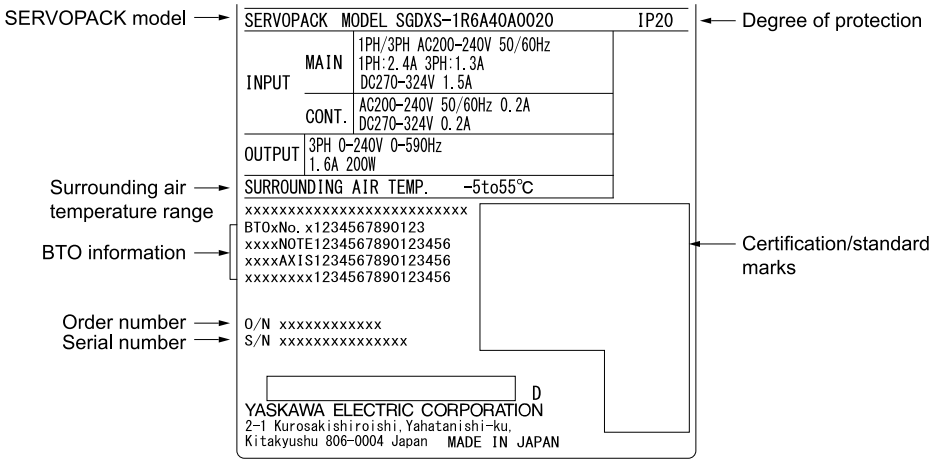
The dynamic brake can be applied to a machine with a high load moment of inertia by increasing the energy capacity of the dynamic brake resistor. If a dynamic brake resistor is not connected, dynamic braking can be disabled to allow the servomotor to be turned by the machine.

The following specification is different for different SERVOPACK models.

SERVOPACK Model		Specification
SGDXS-	R70A to 2R8A	No dynamic brake
SGDXW-	1R6A to 2R8A	
SGDXT-	1R6A to 2R8A	
SGDXS-	3R8A to 780A	External dynamic brake resistor
SGDXW-	5R5A to 7R6A	

1.2 Interpreting the Nameplate

The following basic information is provided on the nameplate.



1.3 Part Names

This section describes the connection terminals for an external dynamic brake resistor. All other names are the same as those for a standard SERVOPACK. Refer to the standard SERVOPACK product manual.

The external dynamic brake resistor terminals are used to connect an external dynamic brake resistor. The terminal specifications and location depend on the SERVOPACK model. Refer to the following section for the connection procedure.

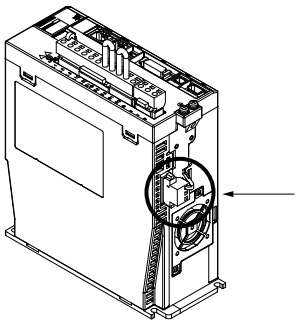
☞ *4.2.5 Connecting Dynamic Brake Resistors on page 77*

1.3.1 SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A

These models do not support the dynamic brake hardware option specifications, so they do not have external dynamic brake resistor terminals.

1.3.2 SGDXS-3R8A to -330A

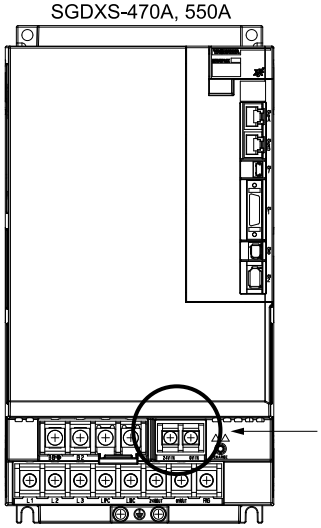
The SGDXS-3R8A to -330A have external dynamic brake resistor terminals on the bottom of the SERVOPACK.



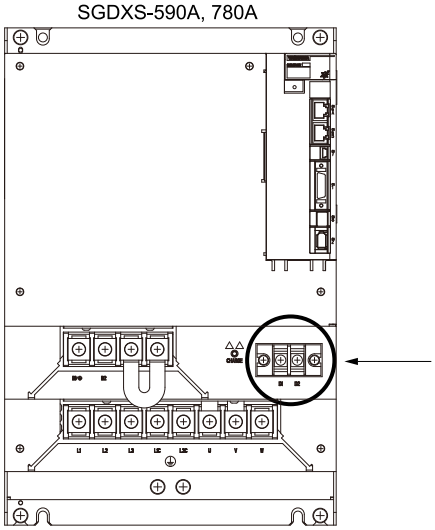
1.3.3 SGDXS-470A to -780A

The SGDXS-470A to -550A have external dynamic brake resistor terminals on the front of the SERVOPACK next to the CHARGE indicator.

SGDXS-470A, 550A

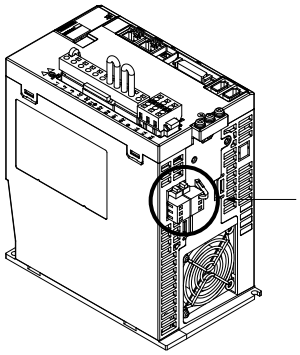


SGDXS-590A, 780A



1.3.4 SGDXW-5R5A, -7R6A

The SGDXW-5R5A and -7R6A have external dynamic brake resistor terminals on the bottom of the SERVOPACK.



1.4 Interpreting Model Numbers

1.4.1 Interpreting Σ-XS SERVOPACK Model Numbers

SGDXS - R70 A 40 A 0020 00 B

Σ-X-Series Σ-XS model | 1st+2nd+3rd digits | 4th digit | 5th+6th digits | 7th digit | 8th+9th+10th+11th digits | 12th+13th digits | 14th digit

1st+2nd+3rd digits Maximum Applicable Motor Capacity

Voltage	Code	Specification
Three-Phase, 200 VAC	R70*1	0.05 kW
	R90*1	0.1 kW
	1R6*1	0.2 kW
	2R8*1	0.4 kW
	3R8	0.5 kW
	5R5*1	0.75 kW
	7R6	1.0 kW
	120	1.5 kW
	180	2.0 kW
	200	3.0 kW
	330	5.0 kW
	470	6.0 kW
	550	7.5 kW
	590	11 kW
	780	15 kW

4th digit Voltage

Code	Specification
A	200 VAC

5th+6th digits Interface*2

Code	Specification
00	Analog voltage/pulse train reference
40	MECHATROLINK-4/III communications reference
A0	EtherCAT communications reference

7th digit Design Revision Order

A

8th+9th+10th+11th digits Hardware Options Specification

Code	Specification	Applicable Models
0020	No dynamic brake	SGDXS-R70A to -2R8A
	External dynamic brake resistor	SGDXS-3R8A to -780A

12th+13th digits FT Specification

Code	Specification
None	None
00	

14th digit BTO Specification (under development)

Code	Specification
None	None
B	BTO specification

*1 You can use these models with either a single-phase or three-phase input.
*2 The same SERVOPACKs are used for both rotary servomotors and linear servomotors.

1.4.2 Interpreting Σ-XW SERVOPACK Model Numbers

SGDXW - 1R6 A 40 A 0020 00 B

Σ-X-Series Σ-XW model | 1st+2nd+3rd digits | 4th digit | 5th+6th digits | 7th digit | 8th+9th+10th+11th digits | 12th+13th digits | 14th digit

1st+2nd+3rd digits Maximum Applicable Motor Capacity per Axis

Voltage	Code	Specification
Three-Phase, 200 VAC	1R6*1	0.2 kW
	2R8*1	0.4 kW
	5R5*1, *2	0.75 kW
	7R6	1.0 kW

4th digit Voltage

Code	Specification
A	200 VAC

5th+6th digits Interface*3

Code	Specification
40	MECHATROLINK-4/III communications reference
A0	EtherCAT communications reference

7th digit Design Revision Order

A

8th+9th+10th+11th digits Hardware Options Specification

Code	Specification	Applicable Models
0020	No dynamic brake	SGDXW-1R6A to -2R8A
	External dynamic brake resistor	SGDXW-5R5A to -7R6A

12th+13th digits FT Specification

Code	Specification
None	None
00	

14th digit BTO Specification (under development)

Code	Specification
None	None
B	BTO specification

*1 You can use these models with either a single-phase or three-phase input.
*2 If you use the SERVOPACK with a single-phase 200 VAC supply input, derate the load ratio to 65%. An example is given below. If the load ratio of the first axis is 90%, use a load ratio of 40% for the second axis so that average load ratio for both axes is 65%. ((90% + 40%)/2 = 65%)

*3 The same SERVOPACKs are used for both rotary servomotors and linear servomotors.

1.4.3 Interpreting Σ-XT SERVOPACK Model Numbers

SGDXT - 1R6 A 40 A 0020 00 B

Σ-X-Series Σ-XT model | 1st+2nd+3rd digits | 4th digit | 5th+6th digits | 7th digit | 8th+9th+10th+11th digits | 12th+13th digits | 14th digit

1st+2nd+3rd digits Maximum Applicable Motor Capacity per Axis

Voltage	Code	Specification
Three-Phase, 200 VAC	1R6*1	0.2 kW
	2R8*1	0.4 kW

4th digit Voltage

Code	Specification
A	200 VAC

5th+6th digits Interface*2

Code	Specification
40	MECHATROLINK-4/III communications reference
A0	EtherCAT communications reference

7th digit Design Revision Order

A

8th+9th+10th+11th digits Hardware Options Specification

Code	Specification
0020	No dynamic brake

12th+13th digits FT Specification

Code	Specification
None	None
00	

14th digit BTO Specification (under development)

Code	Specification
None	None
B	BTO specification

*1 You can use these models with either a single-phase or three-phase input.
*2 The same SERVOPACKs are used for both rotary servomotors and linear servomotors.

2

Selecting a SERVOPACK

This chapter provides information required to select SERVOPACKs, such as specifications and external dimensional drawings.

2.1 Combinations of Servomotors and SERVOPACKs

The maximum allowable load moment of inertia depends on the servomotor and SERVOPACK combination.

> **Important** The maximum allowable load moments of inertia listed here are determined by the durability of the dynamic brake circuit, the regenerative processing circuit, and the servomotor. Do not exceed the allowable load moment of inertia values given in the table when you select an external regenerative resistor.

2.1.1 Combinations of Rotary Servomotors and SERVOPACKs

Servomotor Model		Capacity	Servomotor Rotor Moment of Inertia [×10⁻⁴kgm²]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio *1, *2	
				SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
SGMXJ (medium inertia, small capacity) 3000 min⁻¹	A5A	50 W	0.0421	R70A	1R6A *3, 2R8A *3	1R6A *3, 2R8A *3	35	35
	01A	100 W	0.0659	R90A				
	C2A	150 W	0.0946	1R6A	1R6A, 2R8A *3	1R6A, 2R8A *3		
	02A	200 W	0.263				25	10
	04A	400 W	0.486	2R8A	2R8A, 5R5A *3, 7R6A *3	2R8A	25	5
	06A	600 W	0.8	5R5A	5R5A, 7R6A	–	20	15
	08A	750 W	1.59				15	8
SGMXA (low inertia, small capacity) 3000 min⁻¹	A5A	50 W	0.022	R70A	1R6A *3, 2R8A *3	1R6A *3, 2R8A *3	40	40
	01A	100 W	0.034	R90A				
	C2A	150 W	0.0461	1R6A	1R6A, 2R8A *3	1R6A, 2R8A *3		
	02A	200 W	0.139				30	25
	04A	400 W	0.216	2R8A	2R8A, 5R5A *3, 7R6A *3	2R8A	20	15
	06A	600 W	0.315	5R5A	5R5A, 7R6A	–	20	20
	08A	750 W	0.773				30	15
	10A	1.0 kW	0.969	120A	–		30	20
	15A	1.5 kW	2.00				20	10
	20A	2.0 kW	2.47	180A			20	10
	25A	2.5 kW	3.19	200A			20	10
	30A	3.0 kW	7.00				15	5
	40A	4.0 kW	9.60	330A				
	50A	5.0 kW	12.3					
	70A	7.0 kW	12.3	550A				

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Servomotor Model		Capacity	Servomotor Rotor Moment of Inertia [×10⁻⁴kgm²]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio *1, *2	
				SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
SGMXP (medium inertia, flat) 3000 min⁻¹	01A	100 W	0.0594	R90A	1R6A *3, 2R8A *3	1R6A *3, 2R8A *3	25	25
	02A	200 W	0.263	2R8A	2R8A, 5R5A *3, 7R6A *3	2R8A	15	10
	04A	400 W	0.409				10	6
	08A	750 W	2.10	5R5A	5R5A, 7R6A	–	5	5
	15A	1.5 kW	4.02	120A	–		5	3
SGMXG (medium inertia, medium capacity) 1500 min⁻¹	03A	300 W	2.48	3R8A	5R5A *3, 7R6A *3	–	8.4	8.4
	05A	450 W	3.33				8.4	8.4
	09A	850 W	13.9	7R6A			8	2
	13A	1.3 kW	19.9	120A	–		9	2
	20A	1.8 kW	26	180A			7	5
	30A *4	2.4 kW	46	200A			4	2.2
		2.9 kW	46	330A			5	4
	44A	4.4 kW	67.5				5	2
	55A	5.5 kW	89	470A			5	3.5
	75A	7.5 kW	125	550A			4	2.2
	1AA	11 kW	242	590A			4	2.2
	1EA	15 kW	303	780A			2	1.5
SGM7M (Low Inertia, Ultra-small Capacity) 3000 min⁻¹	A1A	11 W	2.54	R90A	1R6A, 2R8A *3		30	30
	A2A	22 W	4.49					
	A3A	33 W	6.81	1R6A				

*1 Values for rotor moment of inertia of a servomotor without a holding brake.

*2 Values when servomotors are operating at the maximum number of rotations. Refer to the following manual for other values.

Σ-X-Series Rotary Servomotor Product Manual (Manual No.: SIEP C230210 00)

*3 If you use this combination, performance may not be as good, e.g., the control gain may not increase, in comparison with using a Σ-XS SERVOPACK.

*4 The capacity depends on the SERVOPACK that is used with the servomotor.

2.1.2 Combinations of Direct Drive Servomotors and SERVOPACKs

(1) SGM7D (Outer Rotor with Core)

Servomotor Model SGM7D-	Rated Torque N·m	Servomotor Rotor Moment of Inertia [×10^{-4}kgm^2]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
30F	30.0	960	120A	–	–	2500	200
58F	58.0	1190		–	–	3500	150
90F	90.0	1420		–	–	4000	150
1AF	110	1670		–	–	5000	130
01G	1.30	55.0	2R8A	–	–	130	130
05G	5.00	75.0		–	–	300	300
08G	8.00	120	120A	–	–	2000	400
18G	18.0	150		–	–	3000	350
24G	24.0	190		–	–	4000	300
34G	34.0	230		–	–	4000	250
45G	45.0	270		–	–	4000	200
03H	3.00	25.0	2R8A	–	–	600	600
28I	28.0	1800	120A	–	–	800	50
70I	70.0	2000		–	–	2000	100
1ZI	100	2300		–	–	2500	90
1CI	130	2850		–	–	3000	80
2BI	220	3400		–	–	100	100
2DI	240	4000		–	–	150	150
06 J	6.00	150		–	–	700	350
09 J	9.00	210		–	–	900	250
18 J	18.0	240		–	–	2500	240
20 J	20.0	260		–	–	2000	220
38 J	38.0	330		–	–	2000	180
02K	2.06	60.0	2R8A	–	–	200	200
06K	6.00	70.0		–	–	350	350
08K	8.00	80.0		–	–	25	25
06L	6.00	220		–	–	450	450
12L	12.0	220		–	–	20	20
30L	30.0	370	120A	–	–	3500	60

(2) SGM7E (Small Capacity, Coreless, Inner Rotor)

Servomotor Model SGM7E-	Rated Torque N·m	Servomotor Rotor Moment of Inertia [×10⁻⁴kgm²]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
02B	2	28.0	2R8A			10	10
05B	5	51.0					
07B	7	77.0					
04C	4	77.0					
10C	10	140				5	5
14C	14	220				3	3
08D	8	285					
17D	17	510					
25D	25	750					
16E	16	930	5R5A		–		
35E	35	1430					

(3) SGM7F

- Small Capacity, With Core, Inner Rotor

Servomotor Model SGM7F-	Rated Torque N·m	Servomotor Rotor Moment of Inertia [×10⁻⁴kgm²]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
02A	2	8.04	2R8A			25	25
05A	5	14.5				35	35
07A	7	19.3					
04B	4	16.2				25	25
10B	10	25.2				40	40
14B	14	36.9	5R5A		–	45	45
08C	8	56.5	2R8A			15	15
17C	17	78.5	5R5A		–	25	25
25C	25	111	7R6A				
16D	16	178	5R5A			10	10
35D	35	276	7R6A *1 , 120A	7R6A *1		15	15

*1 For this combination, use the following derated values for the rated output and rated rotation speed.

- Rated output: 1000 W
- Rated rotation speed: 270 min^{-1}

- Medium Capacity, With Core, Inner Rotor

Servomotor Model SGM7F-	Rated Torque N·m	Servomotor Rotor Moment of Inertia [×10⁻⁴kgm²]	SERVOPACK Model			Allowable Load Moment of Inertia Ratio	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
45M	45	388	7R6A		–	3	3
80M	80	627	120A	–			
80N	80	865					
1AM	110	1360	180A				
1EN	150	2470	200A				
2ZN	200	3060					

2.1.3 Combinations of Linear Servomotors and SERVOPACKs

(1) SGLG (Coreless)

- Used with Standard-Force Magnetic Way

Servomotor Model SGLGW-	Rated Force N	Maximum Force N	SERVOPACK Model			Maximum Allowable Payload [kg]	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
30A050C	12.5	40	R70A	1R6A		1.7	1.7
30A080C	25	80	R90A			3.4	3.4
40A140C	47	140				5.9	5.9
40A253C	93	280	1R6A			12	12
40A365C	140	420	2R8A			18	18
60A140C	70	220	1R6A			9.9	9.9
60A253C	140	440	2R8A			19	19
60A365C	210	660	5R5A		–	48	48
90A200C	325	1300	120A	–		110	110
90A370C	550	2200	180A			190	190
90A535C	750	3000	200A			260	260

- Used with High-Force Magnetic Way

Servomotor Model SGLGW-	Rated Force N	Maximum Force N	SERVOPACK Model			Maximum Allowable Payload [kg]	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
40A140C	57	230	1R6A			12	12
40A253C	114	460	2R8A			24	24
40A365C	171	690	3R8A	5R5A	–	58	58
60A140C	85	360	1R6A			18	18
60A253C	170	720	3R8A	5R5A	–	61	61
60A365C	255	1080	7R6A			91	91

(2) SGLF (With F-type Iron Cores)

Servomotor Model SGLFW2-	Rated Force N	Maximum Force N	SERVOPACK Model			Maximum Allowable Payload [kg]	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
30A070A	45	135	1R6A			5.6	5.6
30A120A	90	270				11	9.4
30A230A *1	180	540	3R8A	–		34	34
	170	500	2R8A			20	10

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Servomotor Model SGLFW2-	Rated Force N	Maximum Force N	SERVOPACK Model			Maximum Allowable Payload [kg]	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
45A200A	280	840	5R5A		–	64	58
45A380A *1	560	1680	180A	–		110	110
		1500	120A			110	95
90A200A	560	1680				140	130
90A380A	1120	3360	200A			290	160
90A560A	1680	5040	330A			440	360
1DA380A	1680	5040	200A			710	690
1DA560A	2520	7560	330A			1000	1000

*1 The force depends on the SERVOPACK that is used with the servomotor.

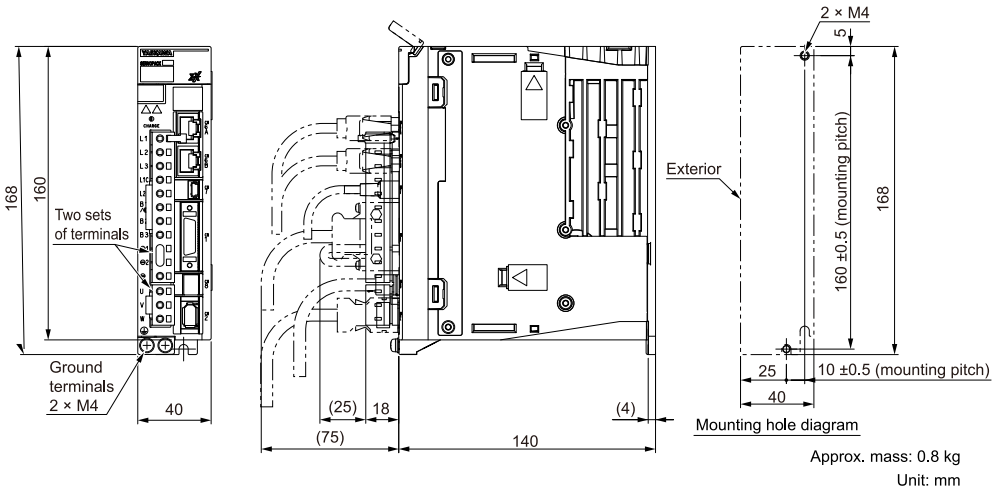
(3) SGLT (With T-type Iron Cores)

Servomotor Model SGLTW-	Rated Force N	Maximum Force N	SERVOPACK Model			Maximum Allowable Payload [kg]	
			SGDXS-	SGDXW-	SGDXT-	SERVOPACKs That Support the Dynamic Brake Hardware Option Specifications	Other SERVOPACKs
20A170A	130	380	3R8A	5R5A	–	25	25
20A320A	250	760	7R6A			50	50
20A460A	380	1140	120A	–		76	76
35A170A	220	660	5R5A			44	44
35A170H	300	600				40	33
35A320A	440	1320	120A	–		88	88
35A320H	600	1200				82	67
35A460A	670	2000	180A			130	130
40A400B	670	2600				280	280
40A600B	1000	4000	330A			440	440
50A170H	450	900	5R5A			95	92
50A320H	900	1800	120A	–		190	190
80A400B	1300	5000	330A			690	690
80A600B	2000	7500	550A			1000	1000

2.2 External Dimensions

All SERVOPACKs that support the dynamic brake hardware option specifications are base-mounted. The external dimensions are the same for all interfaces.

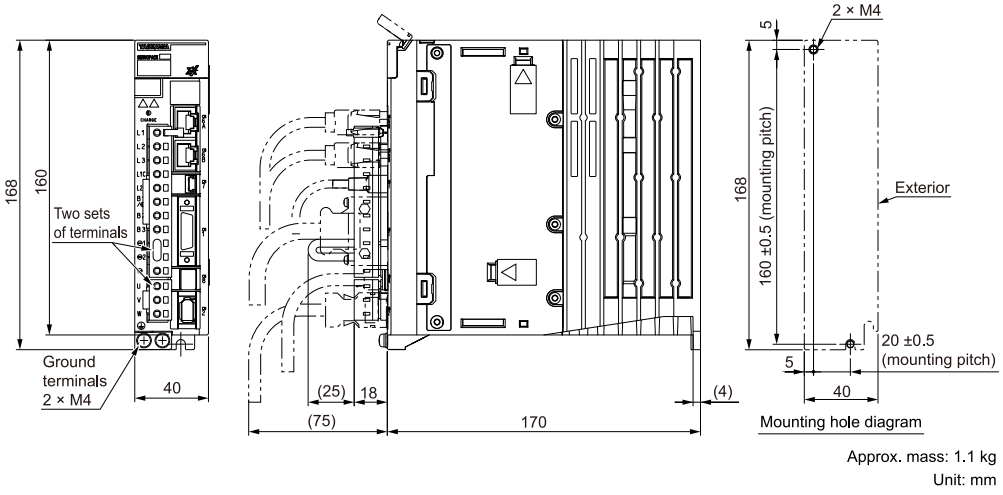
2.2.1 SGDXS-R70A, -R90A, -1R6A



Note:

There are no dynamic brake resistor terminals.

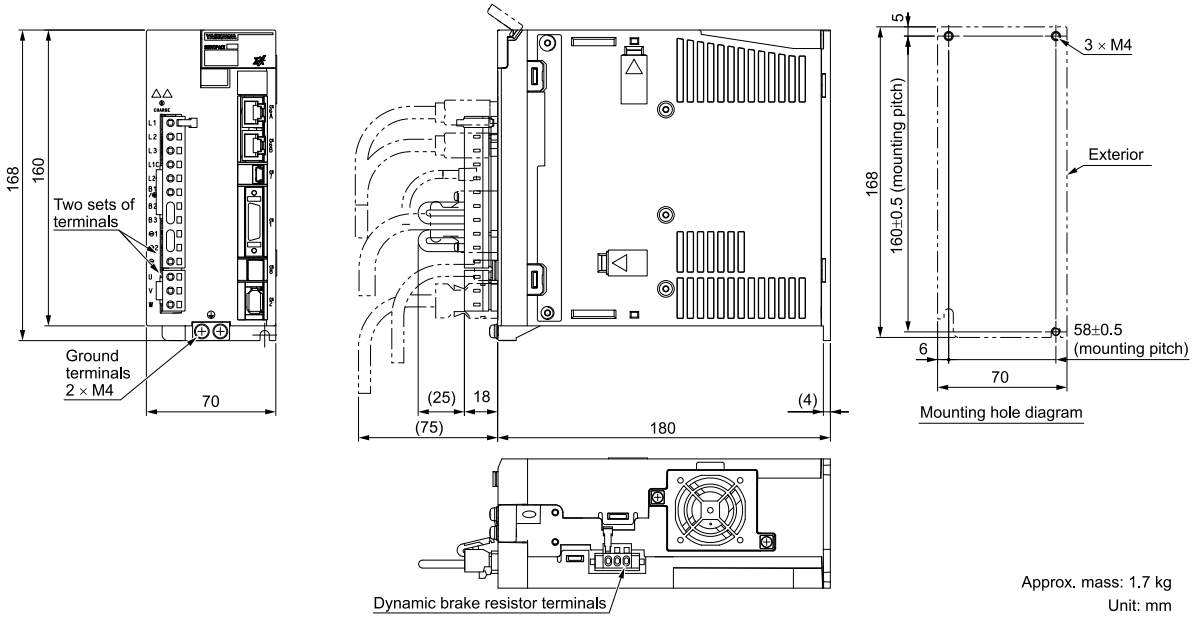
2.2.2 SGDXS-2R8A



Note:

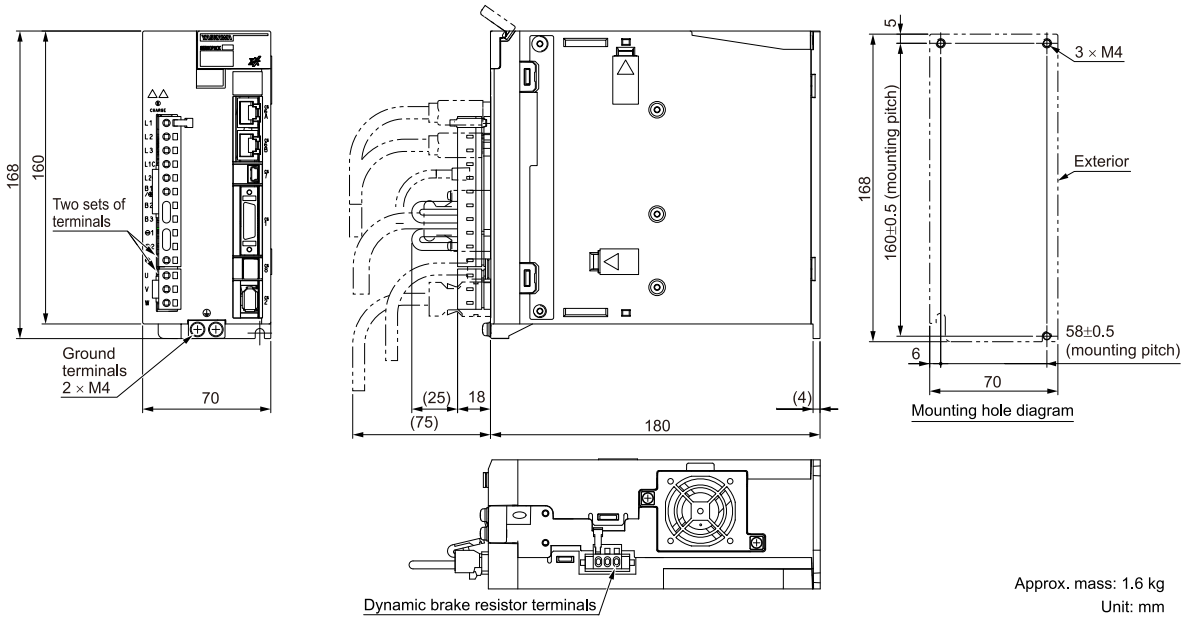
There are no dynamic brake resistor terminals.

2.2.3 SGDXS-3R8A



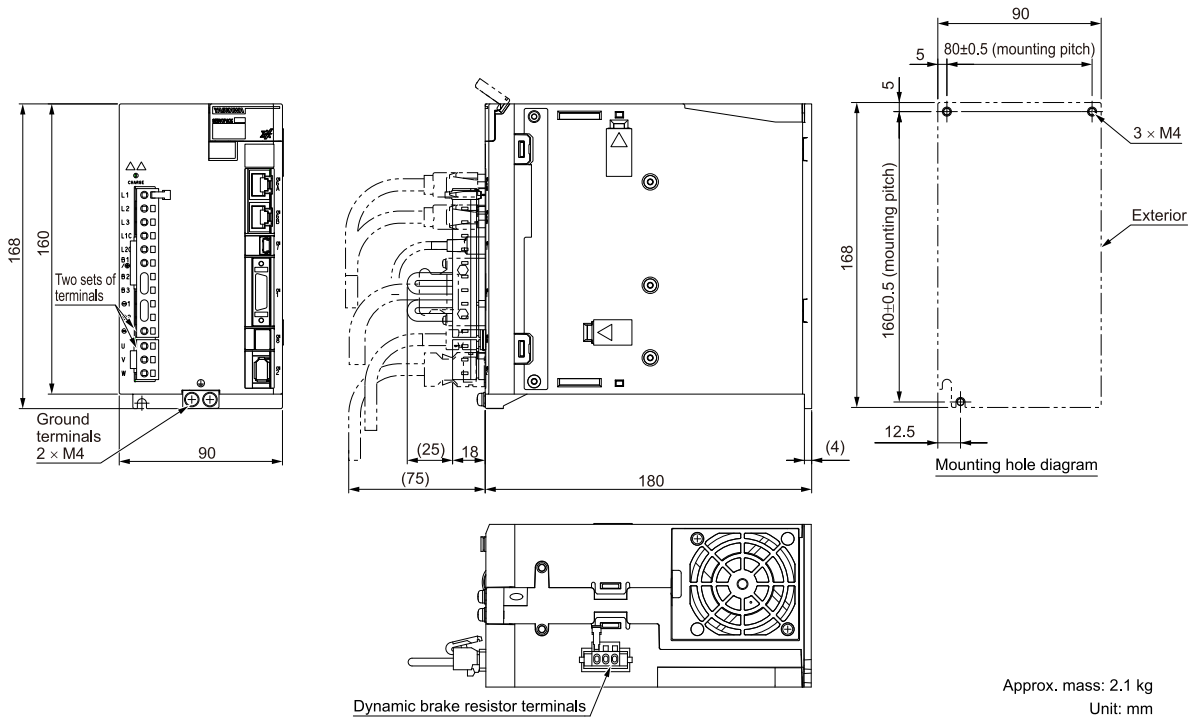
Approx. mass: 1.7 kg
Unit: mm

2.2.4 SGDXS-5R5A, -7R6A



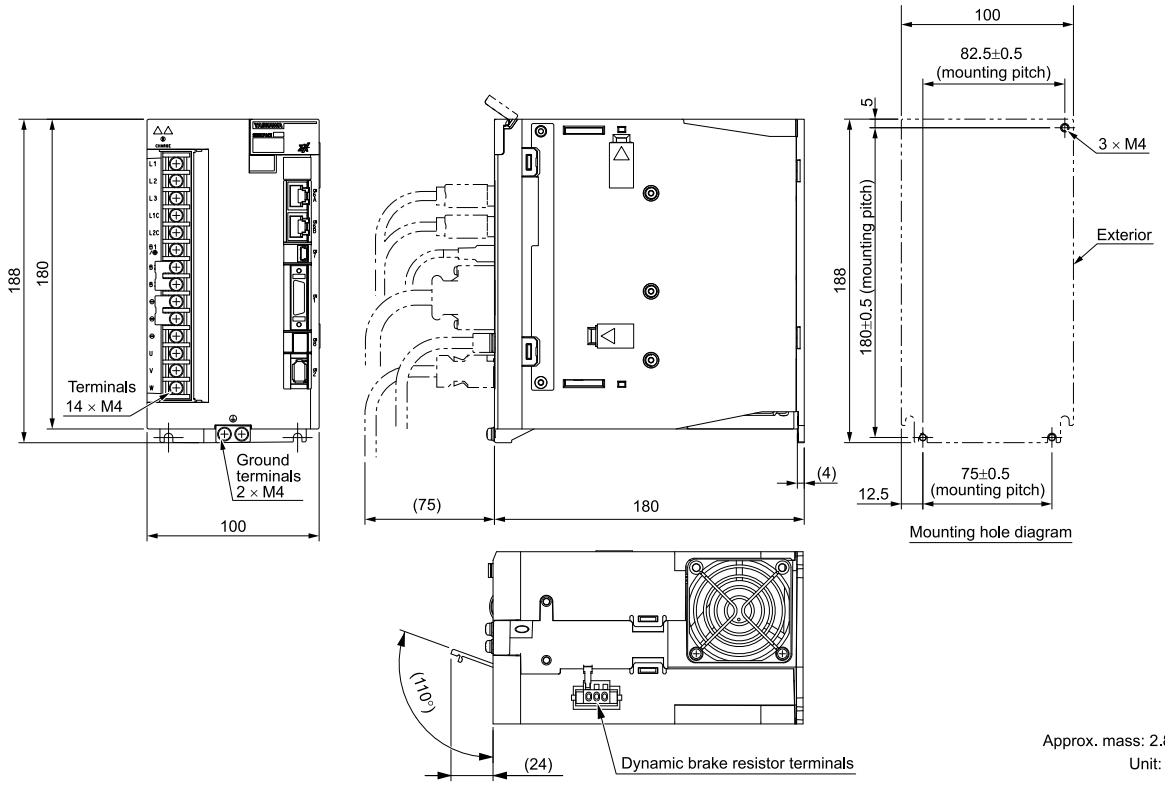
Approx. mass: 1.6 kg
Unit: mm

2.2.5 SGDXS-120A



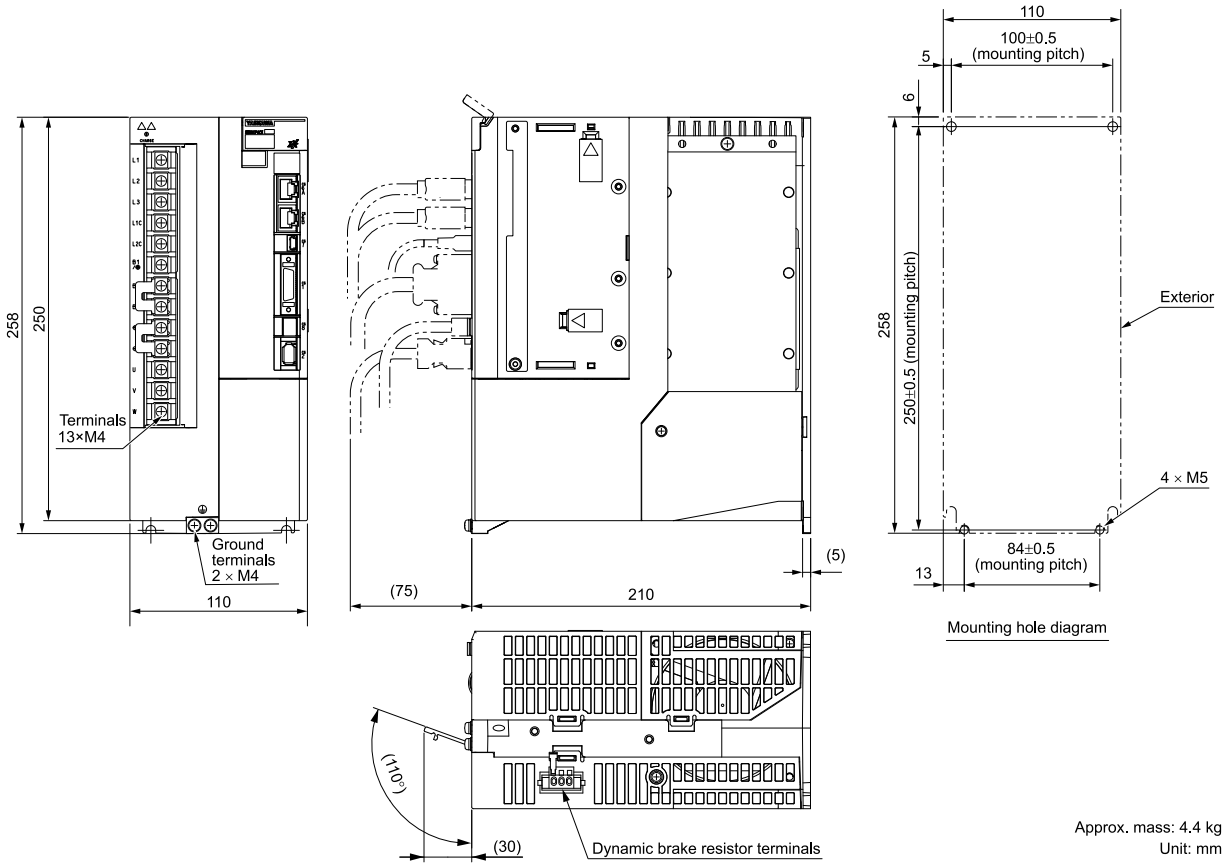
Approx. mass: 2.1 kg
Unit: mm

2.2.6 SGDXS-180A, -200A



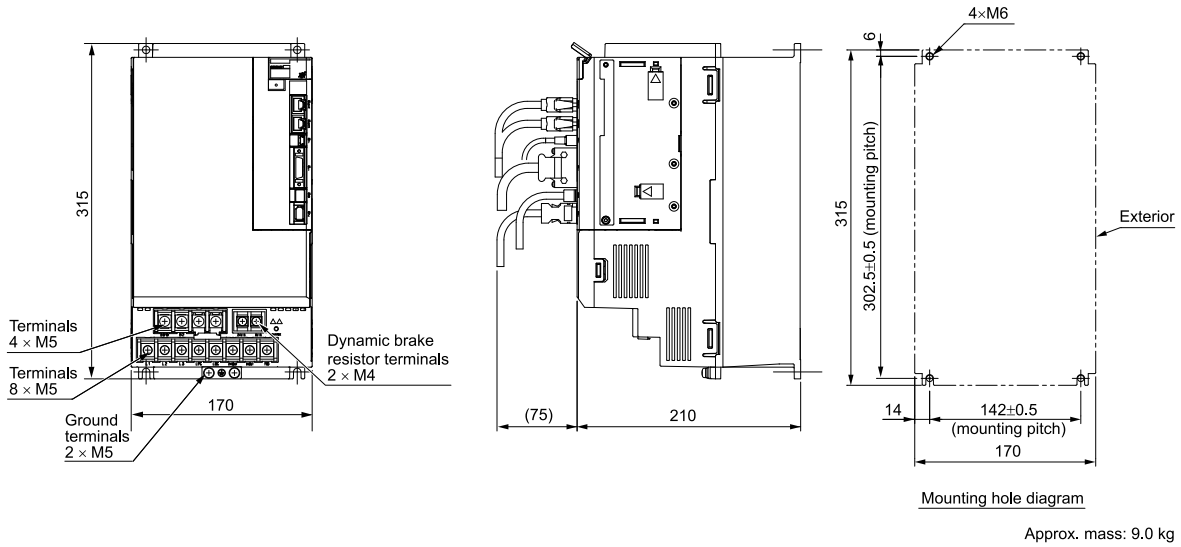
Approx. mass: 2.8 kg
Unit: mm

2.2.7 SGDXS-330A



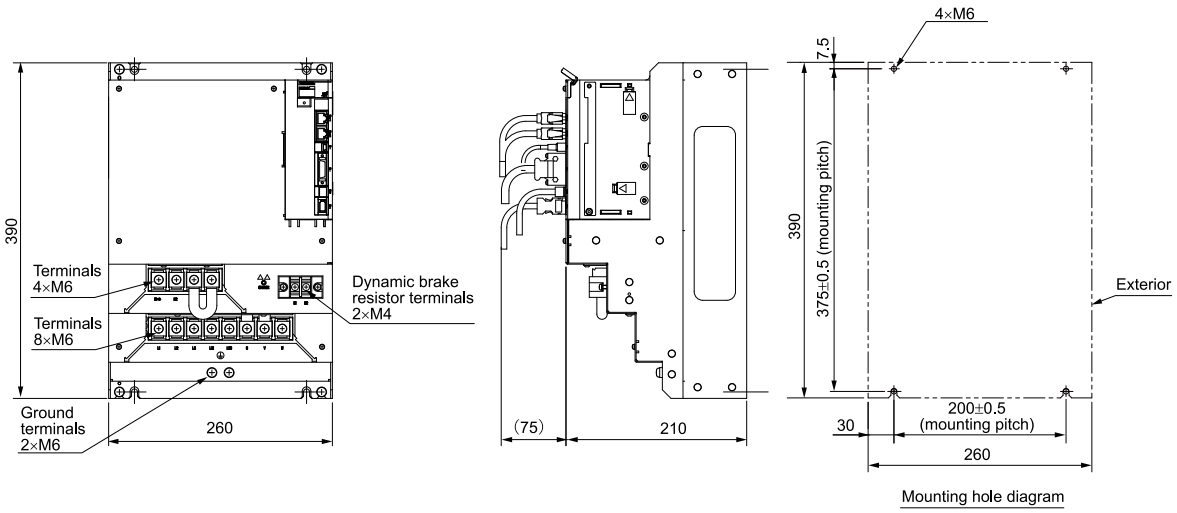
Approx. mass: 4.4 kg
Unit: mm

2.2.8 SGDXS-470A, -550A



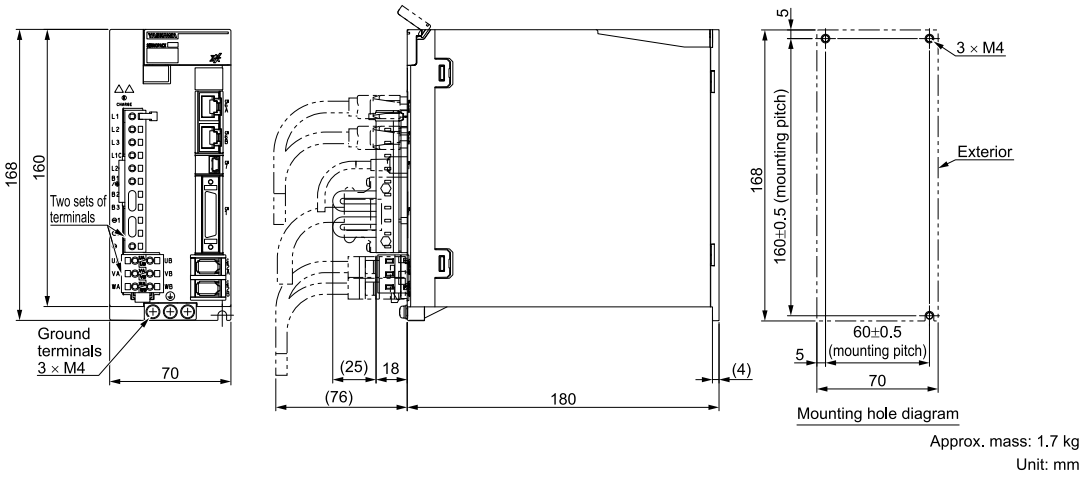
Approx. mass: 9.0 kg
Unit: mm

2.2.9 SGDXS-590A, -780A



Approx. mass: 16 kg
Unit: mm

2.2.10 SGDXW-1R6A, -2R8A

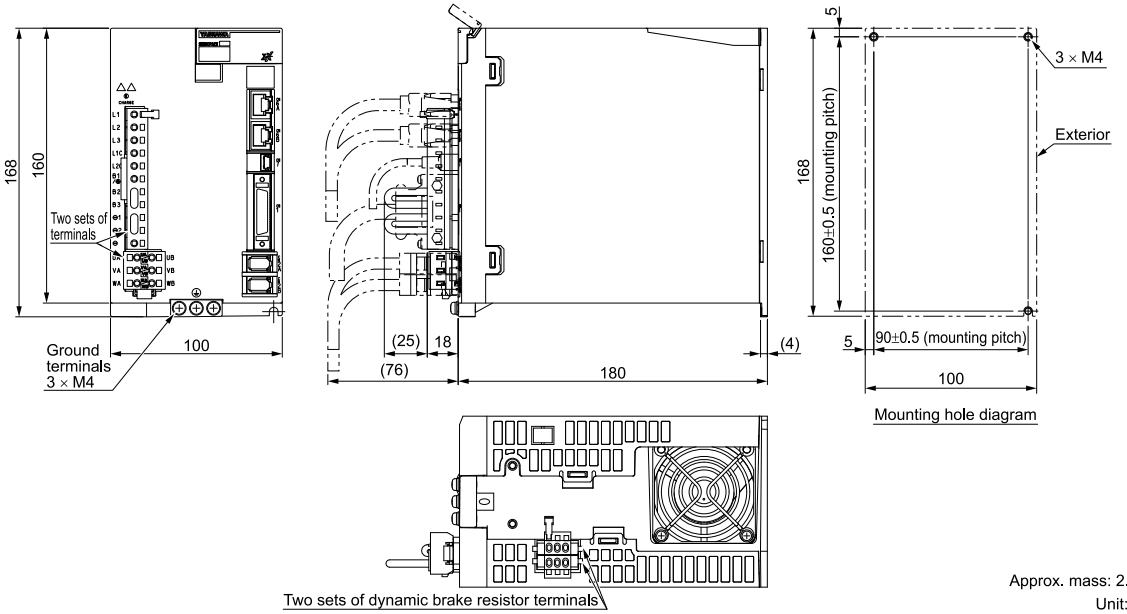


Approx. mass: 1.7 kg
Unit: mm

Note:

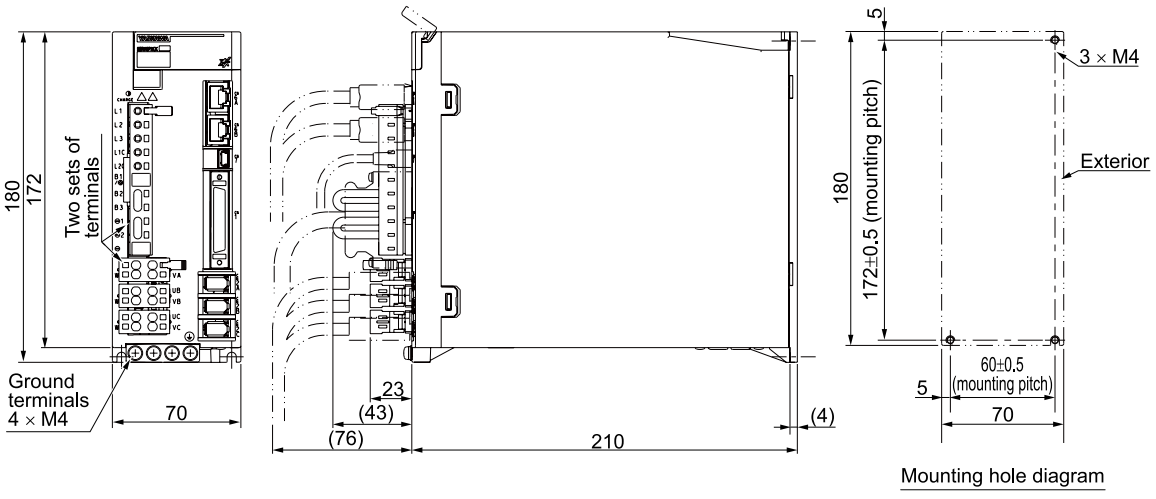
There are no dynamic brake resistor terminals.

2.2.11 SGDXW-5R5A, -7R6A



Approx. mass: 2.4 kg
Unit: mm

2.2.12 SGDXT-1R6A, -2R8A



Approx. mass: 2.3 kg
Unit: mm

Note:

There are no dynamic brake resistor terminals.

3

Selecting a Dynamic Brake Resistor

This chapter describes the flow and selection methods used to select an external dynamic brake resistor.

3.1 Precautions

⚠ WARNING

Use an external dynamic brake resistor that matches the specifications for the relevant equipment or machine. Always evaluate the dynamic brake operation on the actual equipment or machine to confirm that there are no problems with the coasting distance or durability of the dynamic brake resistor. If necessary, select another dynamic brake resistor and install any necessary safety devices in the machine.

There is a risk of unexpected operation, machine damage, burning, or injury when an emergency stop is performed.

The dynamic brake resistor cannot be used if the motor is turned by the machine after stopping due to a power interruption or error. Coast the motor to a stop instead.

Failure to do so may cause the dynamic brake resistor or SERVOPACK to burn or may cause injury.

⚠ CAUTION

Do not use the dynamic brake for any application other than an emergency stop.

There is a risk of failure due to rapid deterioration of elements in the SERVOPACK and the risk of unexpected operation, machine damage, burning, or injury.

3.2 Selection Flow

Follow these steps to select an appropriate external dynamic brake resistor.

Step	Description	Reference
1	Determining the resistance of the dynamic brake resistor	*3.3 Determining the Resistance of the Dynamic Brake Resistor on page 60*
2	Calculating the energy consumption of the dynamic brake resistor	*3.4 Calculating the Energy Consumption of the Dynamic Brake Resistor on page 69*
3	Presenting the required specifications to the resistor manufacturer	*3.5 Presenting the Required Specifications to the Resistor Manufacturer on page 70*

Note:

Refer to the following section for information on calculating the dynamic brake coasting distance.

☞ *8.2 Coasting Distance When Stopping with the Dynamic Brake on page 97*

3.3 Determining the Resistance of the Dynamic Brake Resistor

3.3.1 How to Determine the Resistance of the Dynamic Brake Resistor

Refer to the servomotor's characteristic graph to determine the dynamic brake resistance that will satisfy the restrictions to the instantaneous maximum brake torque of the equipment or machine.

Refer to the following section for servomotor characteristic graphs.

☞ *3.3.2 Brake Torque and Dynamic Brake Resistance Characteristics on page 61*

⚠ WARNING

Do not set the resistance of the dynamic brake resistor to a value less than the minimum allowed resistance.

There is a risk of burning in the SERVOPACK or servomotor, damage to the machine, or injury.

Important

- Increasing the dynamic brake resistance will also increase the coasting distance proportionally.
- The following SERVOPACKs do not support a dynamic brake. For these SERVOPACKs, the brake torque is limited to the friction of the servomotor and the equipment or machine.
  - SGDXS-R70A to -2R8A
  - SGDXW-1R6A, -2R8A
  - SGDXT-1R6A, -2R8A

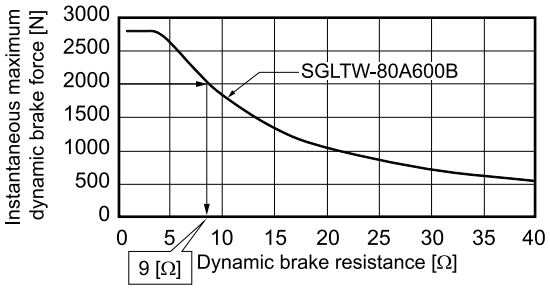
If the brake torque does not require reduction, set the resistance of the connected dynamic brake resistor according to the built-in dynamic brake resistance shown in the following table.

Model		Minimum Allowable Dynamic Brake Resistance (±5%)	Built-in Dynamic Brake Resistance (±5%)
SGDXS-	R70A to 2R8A	–	–
	3R8A to 7R6A	6 Ω	6.8 Ω
	120A	3.5 Ω	3.5 Ω
	180A, 200A	3 Ω	3 Ω
	330A	1.5 Ω	1.5 Ω
	470A	1 Ω	1 Ω
	550A	1.6 Ω	1.6 Ω
	590A, 780A	0.6 Ω	0.6 Ω
SGDXW-	1R6A, 2R8A	–	–
	5R5A, 7R6A	6 Ω	6.8 Ω
SGDXT-	1R6A, 2R8A	–	–

Example

Under the following conditions, the dynamic brake resistance would be 9 [Ω].

- Linear servomotor model: SGLTW-80A600B
- Brake force limit: 2000 [N]



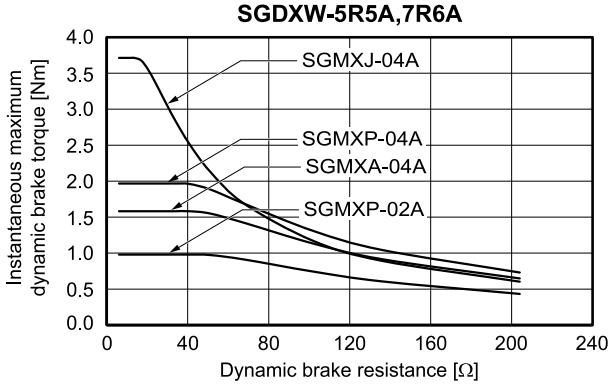
3.3.2 Brake Torque and Dynamic Brake Resistance Characteristics

The following figures show the relationship between the instantaneous maximum dynamic brake torque and dynamic brake resistance of the servomotor.

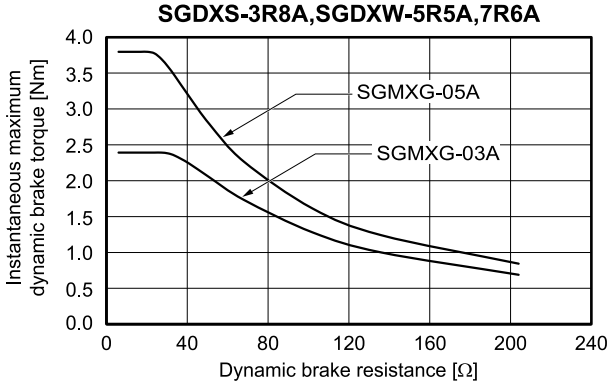
(1) For Rotary Servomotor

The following graphs show the servomotors that can be used with each model of SERVOPACK.

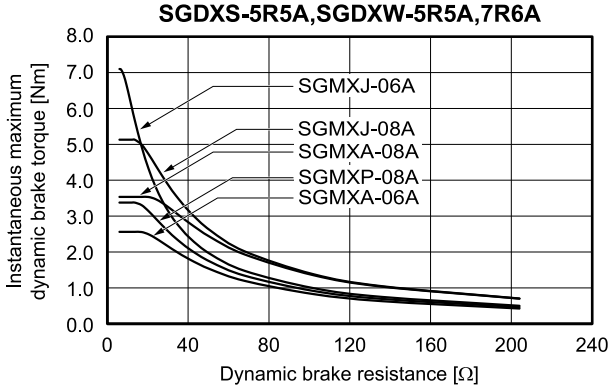
SGDXW-5R5A,7R6A



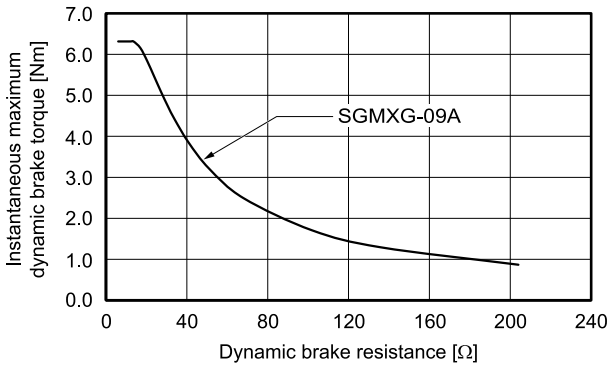
SGDXS-3R8A,SGDXW-5R5A,7R6A



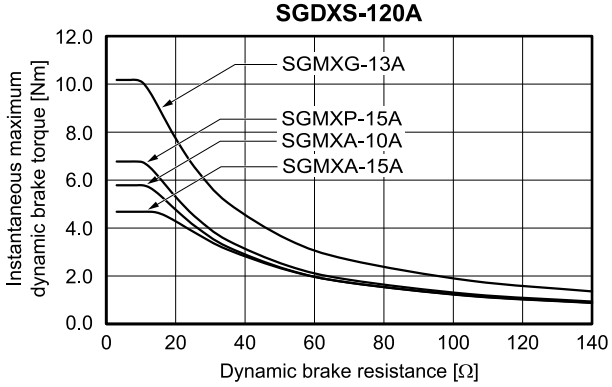
SGDXS-5R5A,SGDXW-5R5A,7R6A



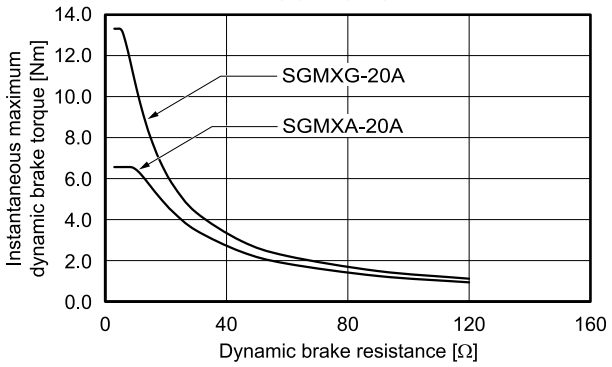
SGDX□-7R6A



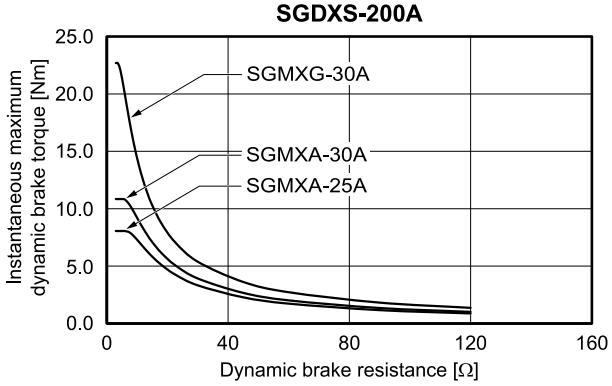
SGDXS-120A



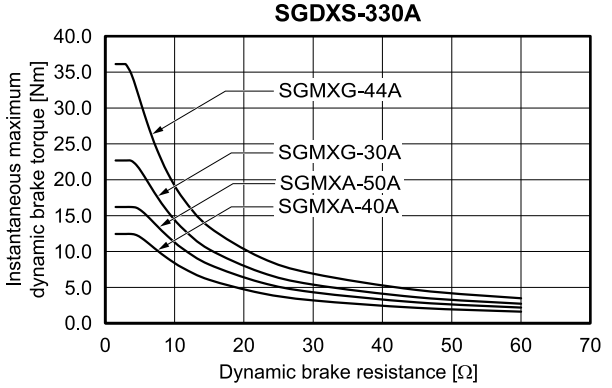
SGDXS-180A

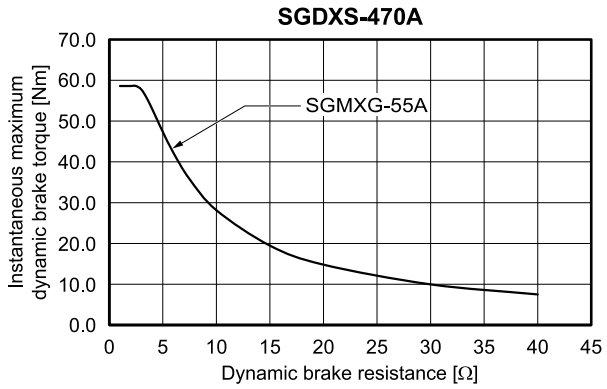


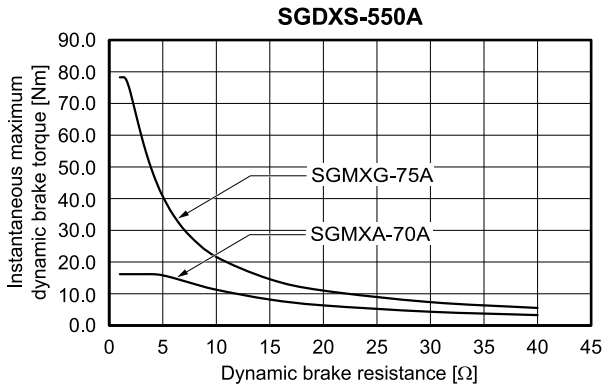
SGDXS-200A

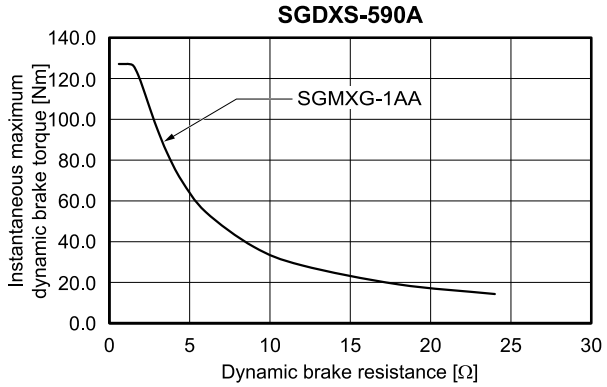


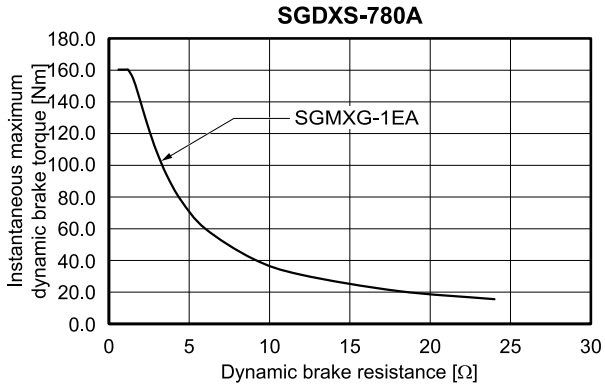
SGDXS-330A







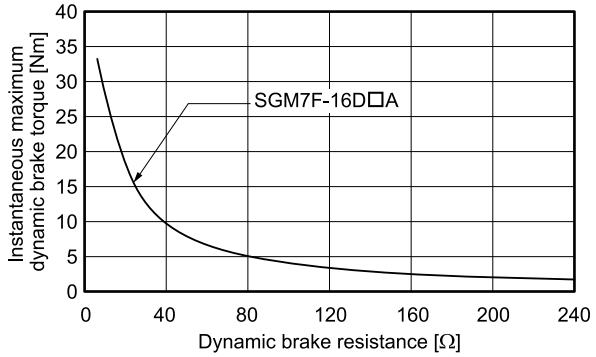


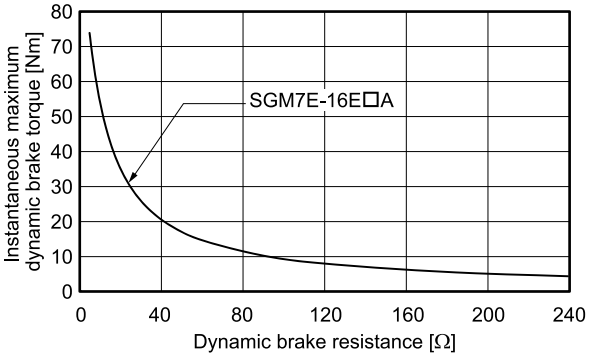


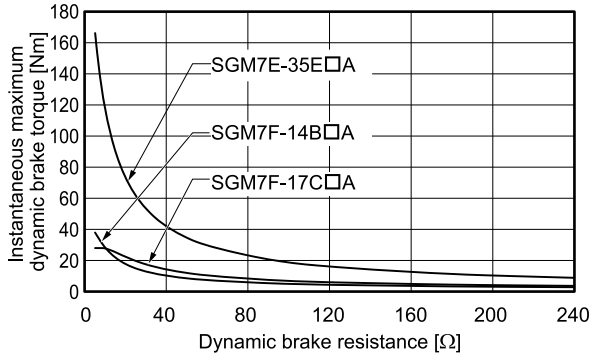
(2) For Direct Drive Servomotors

The following graphs show the servomotors that can be used with each model of SERVOPACK.

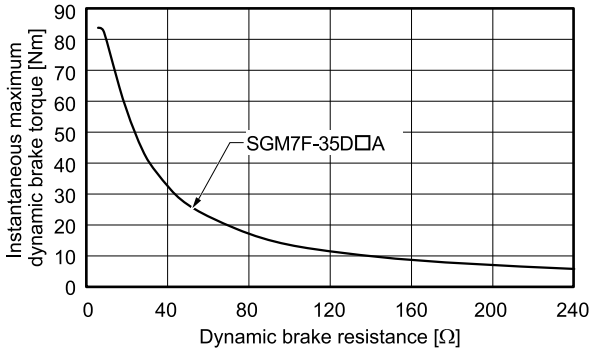
(a) SGDX□-5R5A

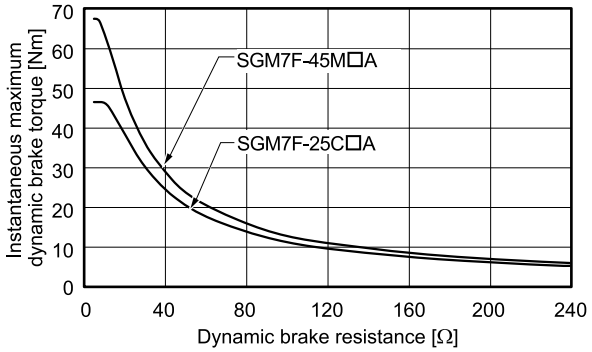




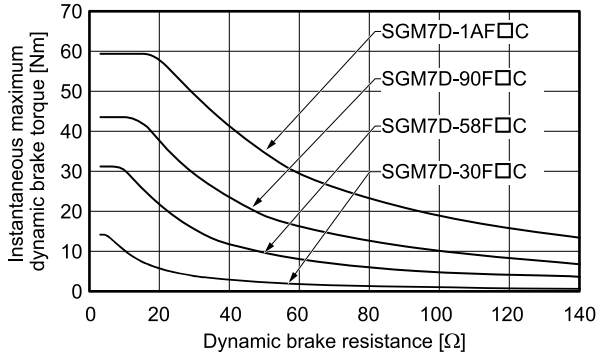


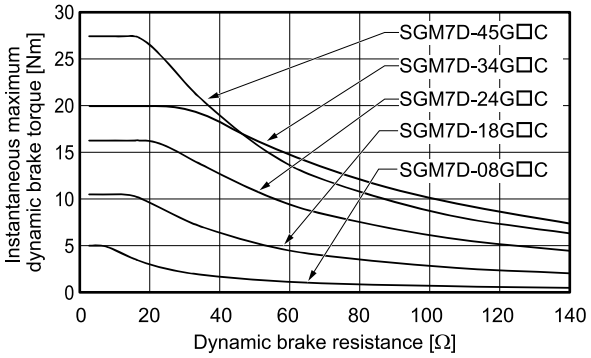
(b) SGDX□-7R6A

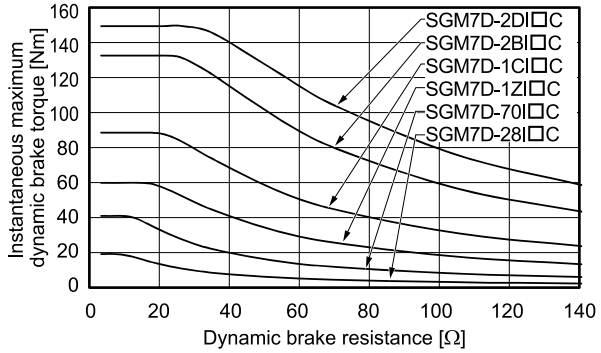

Instantaneous maximum dynamic brake torque [Nm]
90
80
70
60
50
40
30
20
10
0
SGM7F-35D□A
0
40
80
120
160
200
240
Dynamic brake resistance [Ω]

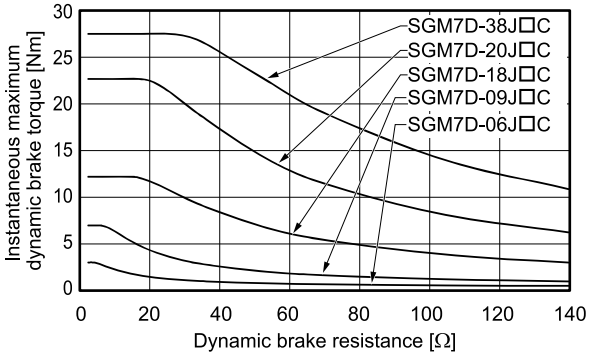

Instantaneous maximum dynamic brake torque [Nm]
70
60
50
40
30
20
10
0
SGM7F-45M□A
SGM7F-25C□A
0
40
80
120
160
200
240
Dynamic brake resistance [Ω]

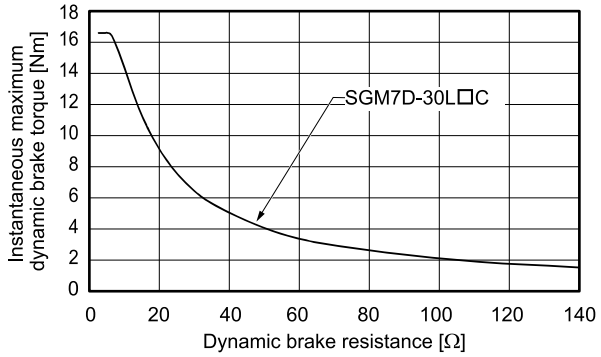
(c) SGDXS-120A

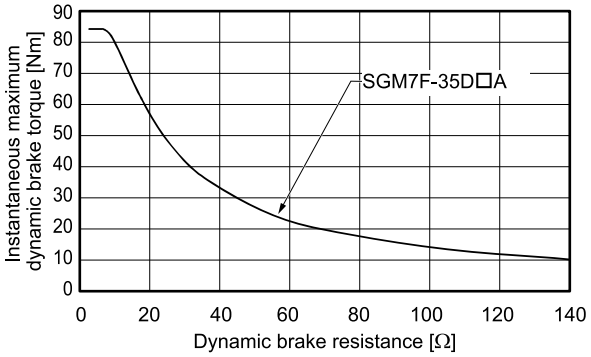

SGM7D-1AF□C
SGM7D-90F□C
SGM7D-58F□C
SGM7D-30F□C
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]

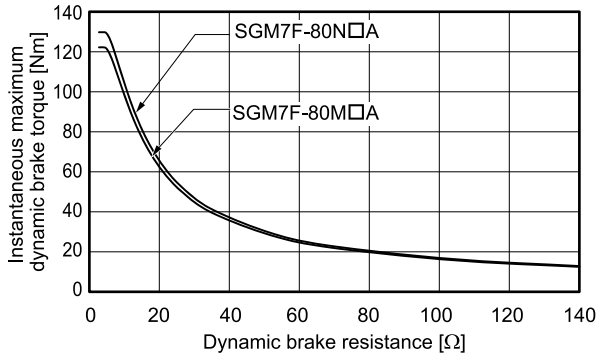

SGM7D-45G□C
SGM7D-34G□C
SGM7D-24G□C
SGM7D-18G□C
SGM7D-08G□C
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]


SGM7D-2DI□C
SGM7D-2BI□C
SGM7D-1CI□C
SGM7D-1ZI□C
SGM7D-70I□C
SGM7D-28I□C
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]

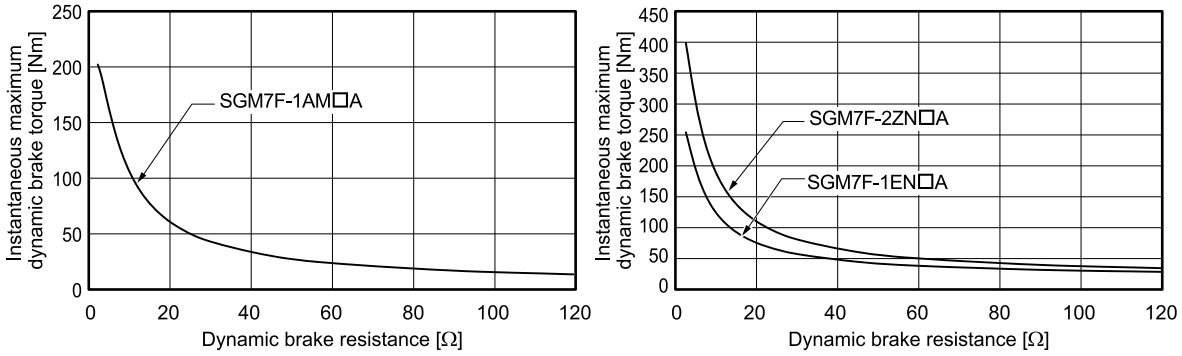

SGM7D-38J□C
SGM7D-20J□C
SGM7D-18J□C
SGM7D-09J□C
SGM7D-06J□C
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]


SGM7D-30L□C
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]


SGM7F-35D□A
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]


SGM7F-80N□A
SGM7F-80M□A
Instantaneous maximum dynamic brake torque [Nm]
Dynamic brake resistance [Ω]

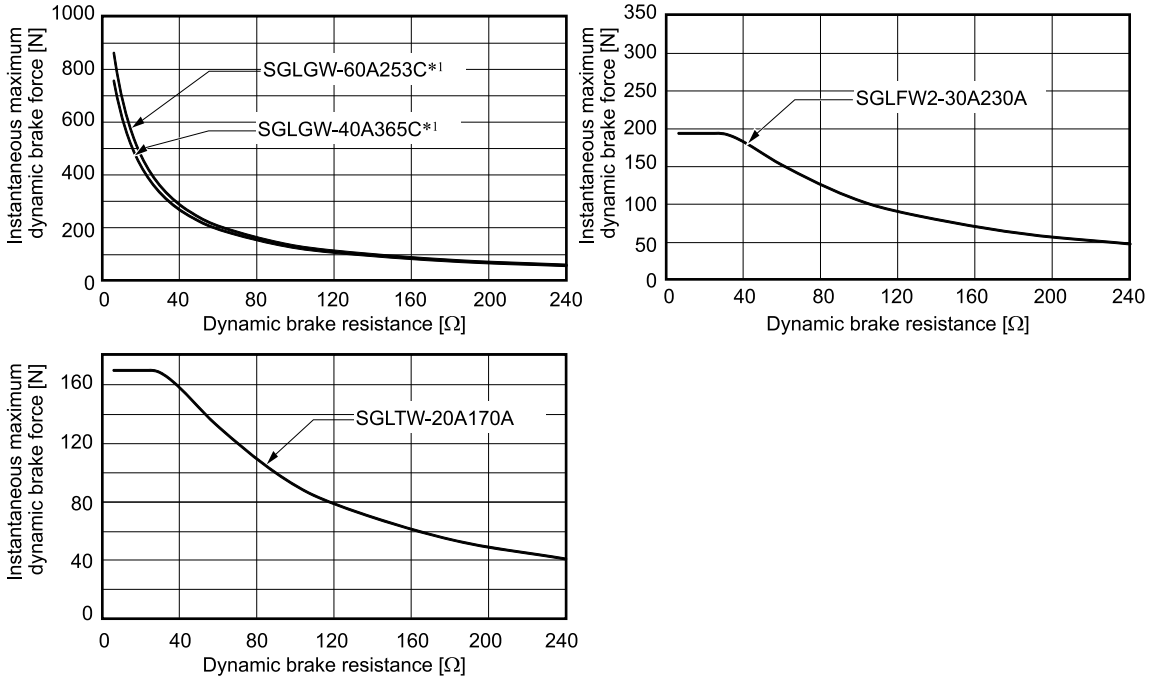
(d) SGDXS-180A



(3) For Linear Servomotor

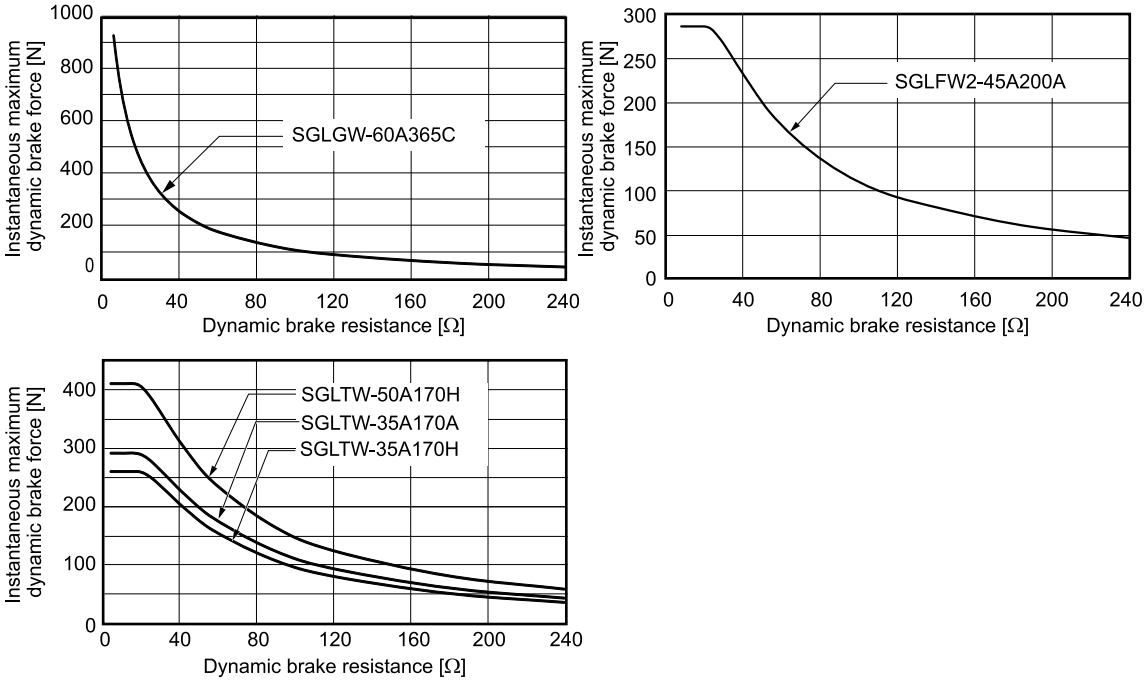
The following graphs show the servomotors that can be used with each model of SERVOPACK.

(a) SGDXS-3R8A, SGDXW-2R8A, -5R5A

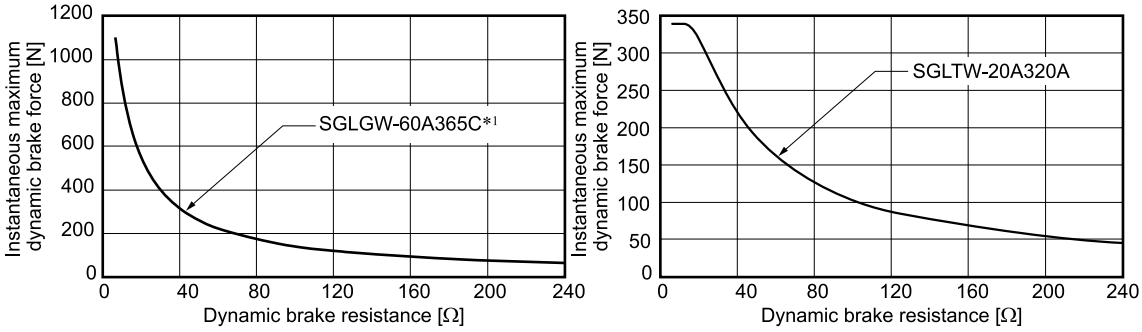


*1 These values are for combinations with high-force magnetic ways.

(b) SGDX□-5R5A

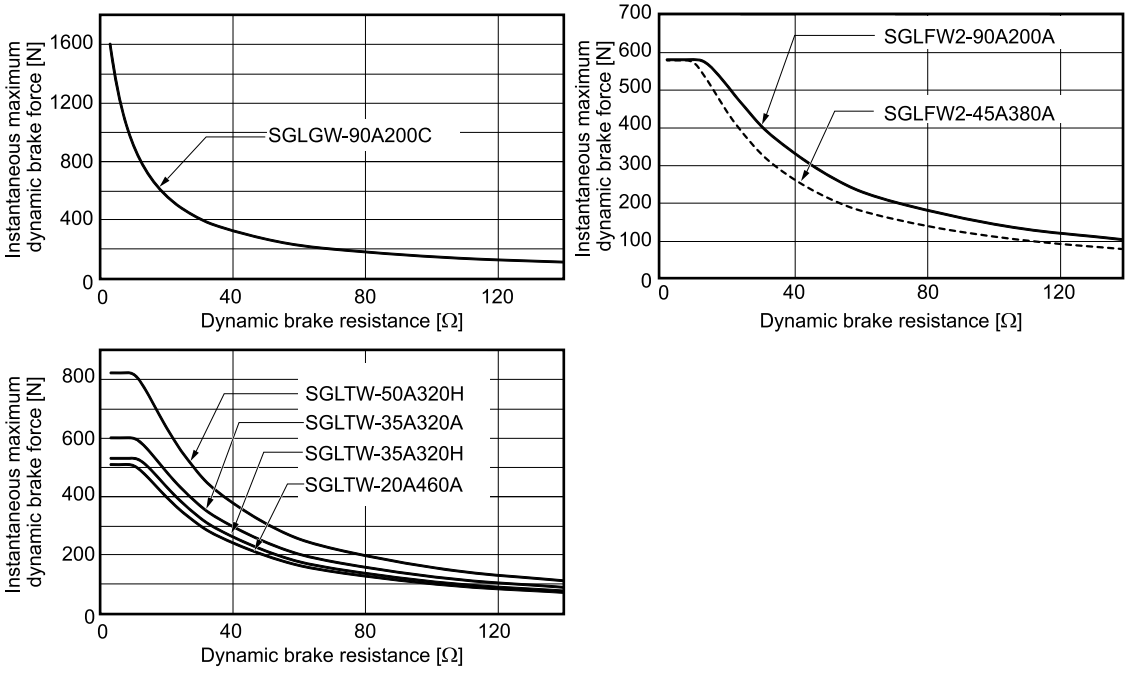


(c) SGDX□-7R6A

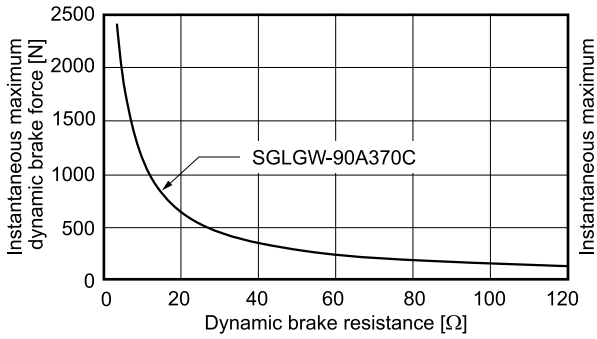


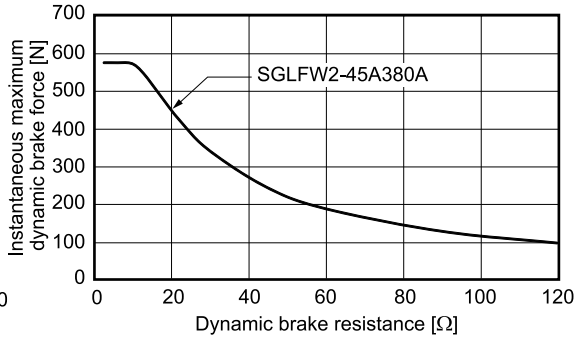
*1 These values are for combinations with high-force magnetic ways.

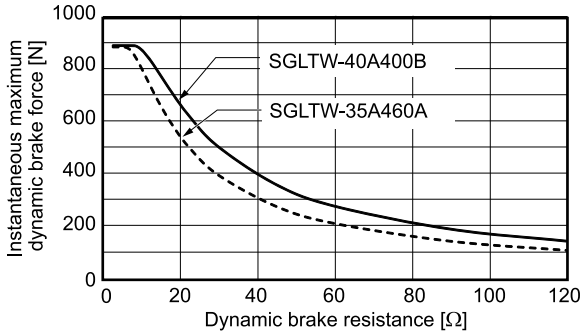
(d) SGDXS-120A



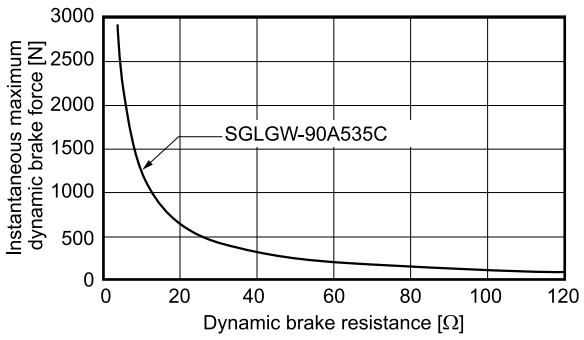
(e) SGDXS-180A

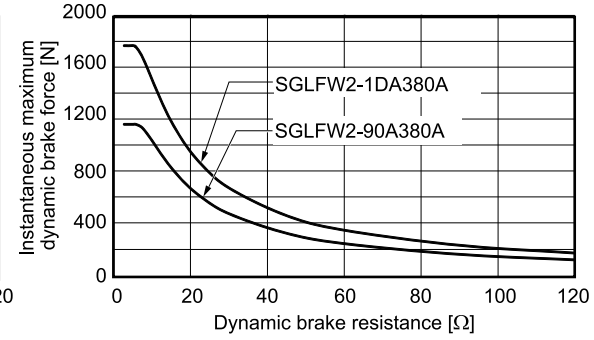




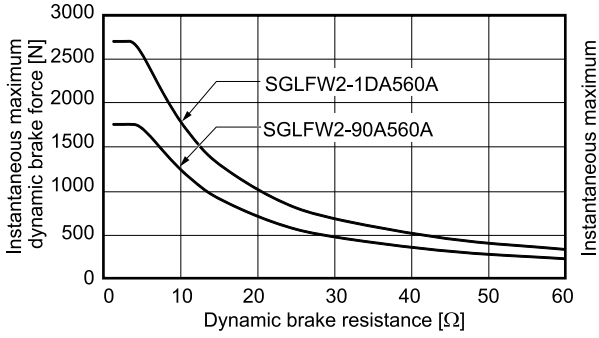


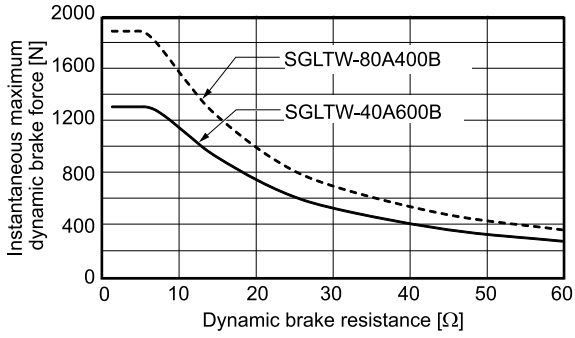
(f) SGDXS-200A



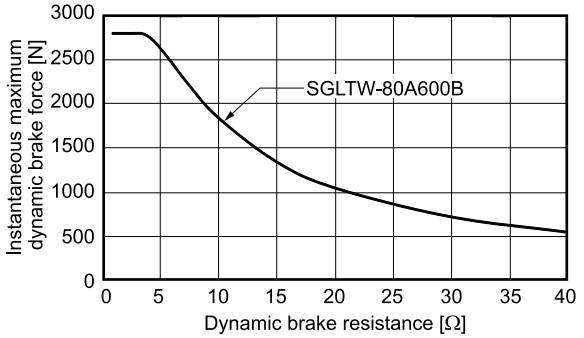


(g) SGDXS-330A





(h) SGDXS-550A



3.4 Calculating the Energy Consumption of the Dynamic Brake Resistor

Calculate the energy that must be consumed by the resistance for one dynamic brake stop.

To simplify the energy consumption calculation, assume that all the kinetic energy until the servomotor stops is consumed by the dynamic brake resistor and use the following formula.

Out of all possible operation patterns, use the one which maximizes the kinetic energy of the servomotor.

3.4.1 For Rotary Servomotor

Energy consumption of the dynamic brake resistor: E_{DB} [J]

Rotor moment of inertia *1 : J_M [kg·m^2]

Load moment of inertia: J_L [kg·m^2]

Motor speed just before stopping with the dynamic brake: N [min^{-1}]

*1 For detailed information on the rotor moment of inertia, refer to the catalog or servomotor product manual.

$$E_{DB} = \frac{1}{2} \times (J_M + J_L) \times \left(\frac{2\pi}{60} \times N \right)^2$$

3.4.2 For Linear Servomotor

Energy consumption of the dynamic brake resistor: E_{DB} [J]

Moving coil mass *1 : m_M [kg]

Load mass: m_L [kg]

Motor speed just before stopping with the dynamic brake: v [m/s]

*1 For detailed information on moving coil mass, refer to the catalog or servomotor product manual.

$$E_{DB} = \frac{1}{2} \times (m_M + m_L) \times v^2$$

3.5 Presenting the Required Specifications to the Resistor Manufacturer

Provide the following information to the manufacturer of your resistors and select a dynamic brake resistor that is appropriate for the required specifications.

Required Information for Resistor Selection	Reference
Resistance [Ω]	*3.3 Determining the Resistance of the Dynamic Brake Resistor on page 60*
Resistor energy consumption for one operation of the dynamic brake [J]	*3.4 Calculating the Energy Consumption of the Dynamic Brake Resistor on page 69*
Number of dynamic brake operations (estimated number of emergency stops required during the product life of your system)	–
Wire sizes and crimp terminals **Note:** The applicable wire sizes depend on the SERVOPACK model.	*4.2.1 Terminal Symbols and Terminal Names on page 74* *4.2.2 Wire Sizes and Tightening Torques on page 75*

<Resistor Selection Example for a Dynamic Brake that Operates 1000 Times>

Resistor Energy Consumption	Model	Manufacturer
1000 J max.	RH120 Series	Iwaki Musen Kenkyusho Co., Ltd.
2000 J max.	RH220 Series	
10000 J max.	RH500 Series	

Refer to the following manual for the external dimensions of the dynamic brake resistor and other parts in the selection example.

Σ-X-Series Peripheral Device Selection Manual (Manual No.: SIEP C710812 12)

4

Wiring and Connecting a Dynamic Brake Resistor

This chapter provides information required to wire and connect dynamic brake resistors.

4.1 Wiring and Connecting SERVOPACKs

⚠ DANGER

Do not change any wiring while power is being supplied.

There is a risk of electric shock or injury.

⚠ WARNING

Wiring and inspections must be performed only by qualified engineers.

There is a risk of electric shock or product failure.

Check all wiring and power supplies carefully.

Incorrect wiring or incorrect voltage application to the output circuits may cause short-circuit failures. If a short-circuit failure occurs as a result of any of these causes, the holding brake will not work. This could damage the machine or cause an accident that may result in death or injury. There is also a risk that some parts damaged by the short-circuit failure may fall from the SERVOPACK.

Connect the AC or DC power supplies to the specified SERVOPACK terminals.

- **Connect an AC power supply to the L1, L2, and L3 terminals and the L1C and L2C terminals on the SERVOPACK.**
- **Connect a DC power supply to the B1/⊕ and ⊖ 2 terminals and the L1C and L2C terminals on the SERVOPACK.**

There is a risk of failure or fire.

If you use a SERVOPACK with the dynamic brake hardware option, connect an external dynamic brake resistor that is suitable for the machine and equipment specifications to the specified terminals.

There is a risk of unexpected operation, machine damage, burning, or injury when an emergency stop is performed.

⚠ CAUTION

Wait for at least 20 minutes (or 100 minutes when using DC power supply input) after turning OFF the power and then make sure that the CHARGE indicator is not lit before starting wiring or inspection work. Do not touch the main circuit terminals while the CHARGE indicator is lit because high voltage may still remain in the SERVOPACK even after turning OFF the power.

There is a risk of electric shock.

Observe the precautions and instructions for wiring and trial operation precisely as described in this document.

Failures caused by incorrect wiring or incorrect voltage application in the brake circuit may cause the SERVOPACK to fail, damage the equipment, or cause an accident resulting in death or injury.

Check the wiring to be sure it has been performed correctly. Connectors and pin layouts are sometimes different for different models. Always confirm the pin layouts in technical documents for your model before operation.

There is a risk of failure or malfunction.

Connect wires to main circuit terminals and motor connection terminals securely with the specified methods and tightening torque.

Insufficient tightening may cause wires and terminal blocks to generate heat due to faulty contact, possibly resulting in fire.

Use shielded twisted-pair cables or screened unshielded multi-twisted-pair cables for I/O signal cables and encoder cables.

⚠ CAUTION

The maximum wiring length is 3 m for I/O signal cables and 50 m for servomotor main circuit cables and encoder cables.

Observe the following precautions when wiring the SERVOPACK's main circuit terminals.

- **Turn ON the power to the SERVOPACK only after all wiring, including the main circuit terminals, has been completed.**
- **If a connector is used for the main circuit terminals, remove the main circuit connector from the SERVOPACK before you wire it.**
- **Insert only one wire per insertion hole in the main circuit terminals.**
- **When you insert a wire, make sure that the conductor wire (e.g., whiskers) does not come into contact with adjacent wires and cause a short-circuit.**

Install molded-case circuit breakers and other safety measures to provide protection against short circuits in external wiring.

There is a risk of fire or failure.

NOTICE

Whenever possible, use the cables specified by Yaskawa. If you use any other cables, confirm the rated current and application environment of your model and use the wiring materials specified by Yaskawa or equivalent materials.

Securely tighten connector screws and lock mechanisms.

Insufficient tightening may result in connectors falling off during operation.

Do not bundle power lines (e.g., the main circuit cable) and low-current lines (e.g., the I/O signal cables or encoder cables) together or run them through the same duct. If you do not place power lines and low-current lines in separate ducts, separate them by at least 30 cm.

If the cables are too close to each other, malfunctions may occur due to noise affecting the low-current lines.

Install a battery at either the host controller or on the encoder cable.

If you install batteries both at the host controller and on the encoder cable at the same time, you will create a loop circuit between the batteries, resulting in a risk of damage or burning.

When connecting a battery, connect the polarity correctly.

There is a risk of battery rupture or encoder failure.

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 an earth leakage breaker.
  The SERVOPACK does not have a built-in ground fault protective circuit. To configure a safer system, install a ground fault detector against overloads and short-circuiting, or install a ground fault detector combined with a molded-case circuit breaker.
- Do not turn the power ON and OFF more than necessary.
  - Do not use the SERVOPACK for applications that require the power to be turned ON and OFF frequently. Such applications will cause elements in the SERVOPACK to deteriorate.
  - After you have started actual operation, allow at least one hour between turning the power supply ON and OFF (as a guideline).

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

- Use the cables specified by Yaskawa. Design and arrange the system so that each cable is as short as possible.
- Refer to the following manual for information on the specified cables.
  Σ-X-Series Peripheral Device Selection Manual (Manual No.: SIEP C710812 12)
- The signal cable conductors are as thin as 0.2 mm^2 or 0.3 mm^2. Do not subject them to excessive bending stress or tension.

4.2 Dynamic Brake Resistor Connections

Connectors or terminal blocks are used to wire a dynamic brake resistor.

SERVOPACK Model	Description of Wiring of Dynamic Brake Resistor Terminals
SGDXS-R70A to -2R8A SGDXW-1R6A, -2R8A SGDXT-1R6A, -2R8A	Dynamic brake resistors do not need to be wired (These SERVOPACKS are not equipped with dynamic brake resistor terminals because they do not support the dynamic brake hardware option.)
SGDXS-3R8A to -330A SGDXW-5R5A, -7R6A	Connect the external dynamic brake resistor with the enclosed connectors.
SGDXS-470A to -780A	Connect the external dynamic brake resistor to the terminal block.

The location and dimensions depend on the model of the SERVOPACK. For details, refer to the following section.

☞ *1.3 Part Names on page 38*

☞ *2.2 External Dimensions on page 51*

For information on connections other than to the dynamic brake resistor terminals, refer to the standard SERVOPACK product manual.

4.2.1 Terminal Symbols and Terminal Names

⚠ CAUTION

Wire all connections correctly according to the following table.

If the wiring is not correct, there is a risk of SERVOPACK failure or fire.

SERVOPACK Model	Terminal Symbols	Terminal Name	Specification
SGDXS-	D1, D2	Dynamic brake resistor connection terminal	These terminals are used to connect an external dynamic brake resistor for a SERVOPACK. **Note:** The SGDXS-R70A to -2R8A are not equipped with dynamic brake resistor terminals.
SGDXW-	D1A, D2A	Dynamic brake resistor connection terminal for axis A	These terminals are used to connect an external dynamic brake resistor for a SERVOPACK. **Note:** The SGDXW-1R6A and 2R8A are not equipped with dynamic brake resistor terminals.
	D1B, D2B	Dynamic brake resistor connection terminal for axis B	
SGDXT-	–	–	**Note:** The Σ-XT SERVOPACKs are not equipped with dynamic brake resistor terminals.

4.2.2 Wire Sizes and Tightening Torques

SERVOPACK Model		Terminal Symbols	Wire Size	Screw Size	Tightening Torque [N·m]
SGDXS-	R70A, R90A, 1R6A, 2R8A	- (Not equipped with dynamic brake resistor terminals)			
	3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A	D1, D2	AWG14 (2.0 mm²) to AWG18 (0.9 mm²) *1	–	–
	470A, 550A	D1, D2	AWG12 (3.5 mm²) to AWG18 (0.9 mm²) *1	M4	1.0 to 1.2
	590A, 780A	D1, D2	AWG12 (3.5 mm²) to AWG18 (0.9 mm²) *1	M4	1.6 to 1.8
SGDXW-	1R6A, 2R8A	- (Not equipped with dynamic brake resistor terminals)			
	5R5A, 7R6A	D1A, D2A, D1B, D2B	AWG14 (2.0 mm²) to AWG18 (0.9 mm²) *1	–	–
SGDXT-	1R6A, 2R8A	- (Not equipped with dynamic brake resistor terminals)			

*1 Any wire sizes within the ranges given in this table can be used for the external dynamic brake resistor.

4.2.3 Crimp Terminals and Insulating Sleeves

For SGDXS-470A to 780A SERVOPACKs, use crimped terminals and insulating sleeves to connect the dynamic brake resistor to the terminal block. Do not allow the crimp terminals to come close to adjacent terminals or the case.

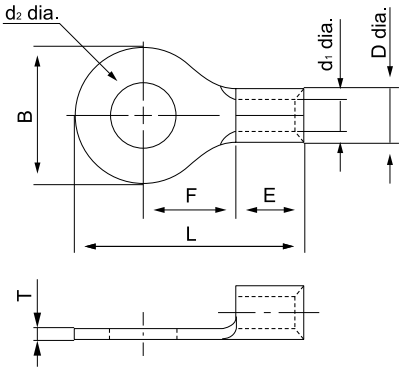
To comply with UL standards, you must use UL-compliant closed-loop crimp terminals and insulating sleeves for the main circuit terminals. Use the tool recommended by the crimp terminal manufacturer to attach the crimp terminals.

The following tables give the recommended tightening torques, closed-loop crimp terminals, and insulating sleeves in sets. Use the set that is suitable for your model and wire size.

SERVOPACK Model		Screw Size	Tightening Torque [N·m]	Crimp Terminal Horizontal Width	Recommended Wire Size	Crimp Terminal Model	Crimping Tool	Insulating Sleeve Model
						From J.S.T. Mfg. Co., Ltd.		From Tokyo Dip Co., Ltd.
SGDXS-	470A, 550A	M4	1.0 to 1.2	9.9 mm max.	AWG12 (3.5 mm²)	5.5-S4	YHT-2210	TP-005
					AWG14 (2.0 mm²)	R2-4		TP-003
					AWG16 (1.25 mm²)			
					AWG18 (0.9 mm²)	R1.25-4		
	590A, 780A	M4	1.6 to 1.8	10.6 mm max.	AWG12 (3.5 mm²)	5.5-S4	YHT-2210	TP-005
					AWG14 (2.0 mm²)	R2-4		TP-003
					AWG16 (1.25 mm²)			
					AWG18 (0.9 mm²)	R1.25-4		

(1) Crimp Terminal Dimensional Drawing

(a) Crimp Terminal Models: R1.25-4, R2-4, 5.5-S4



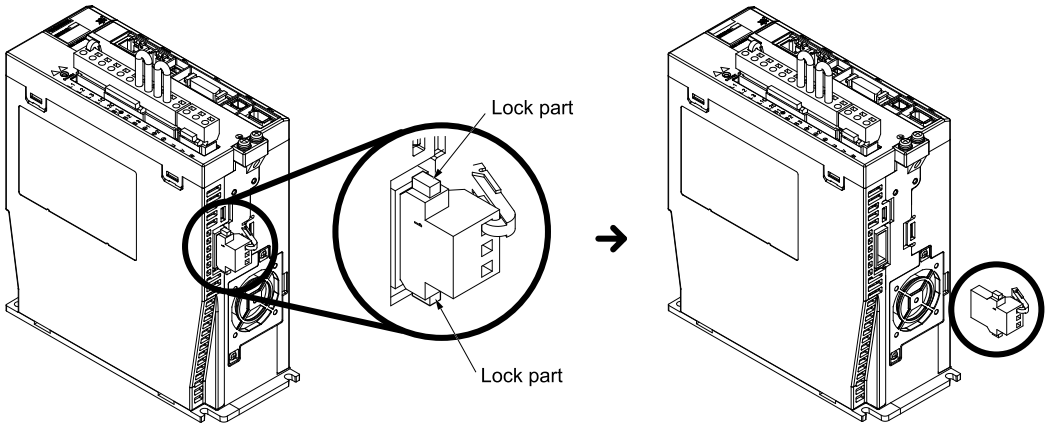
Crimp Terminal Model	Dimensions (mm)							
	d_2 dia.	B	L	F	E	D dia.	d_1 dia.	T
R1.25-4	4.3	8	15.8	7	4.8	3.4	1.7	0.8
R2-4		8.5	16.8	7.8		4.1	2.3	
5.5-S4		7.2	15.7	5.9	6.2	5.6	3.4	1.0

4.2.4 Dynamic Brake Resistor Connector Wiring Procedure

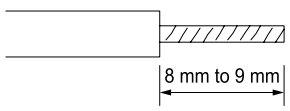
Prepare one of the following tools before wiring the dynamic brake resistor connector.

- Spring opener
  This is provided with the SERVOPACK. (It is attached to the dynamic brake resistor connector. The spring opener that is provided with the main circuit connector cannot be used.)
  (You can also use a model J-FAT-OT spring opener from J.S.T. Mfg. Co., Ltd.)
- Flat-blade screwdriver
  Commercially available screwdriver with tip width of 3.0 mm to 3.5 mm

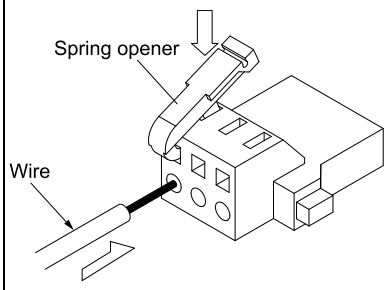
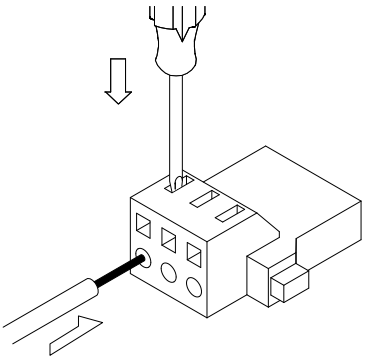
1. **Remove the dynamic brake resistor connector from the SERVOPACK. Press and hold the lock with your finger, then pull out the connector.**



2. **Remove the sheath from the wire to connect.**



3. **Open the wire insertion hole on the terminal connector with the tool. There are the following two ways to open the insertion hole. Use either method.**

Using a Spring Opener	Using a Flat-blade Screwdriver
Press the spring opener in the direction of the arrow to open the connector. 	Firmly insert a flat-blade screwdriver into the screwdriver insertion hole to open the wire insertion hole. 

4. **Insert the conductor into the wire insertion hole. Then, remove the spring opener or flat-blade screwdriver.**
5. **Make all other connections in the same way.**
6. **When you have completed wiring, attach the connectors to the SERVOPACK.**

4.2.5 Connecting Dynamic Brake Resistors

⚠ WARNING

Wire dynamic brake resistors correctly. Do not connect the following terminals directly to each other: D1 and D2, D1A and D2A, or D1B and D2B.

There is a risk of burning in the SERVOPACK or servomotor, damage to the machine, or injury.

⚠ CAUTION

Mount dynamic brake resistors only on nonflammable materials. Do not mount them on or near any flammable material.

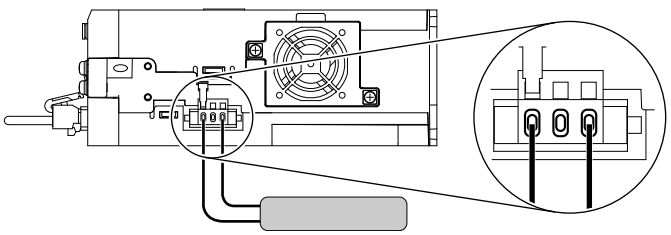
There is a risk of fire.

(1) SERVOPACK Models SGDXS-3R8A, 5R5A, 7R6A, 120A, 180A, 200A, 330A

1. **Connect the dynamic brake resistor to the D1 and D2 terminals on the SERVOPACK.**

Note:

1. The D1 terminal is connector pin 1, and the D2 terminal is connector pin 3. Do not connect anything to pin 2 (the center pin).
2. Terminal symbols (D1 and D2) are provided on the dynamic brake resistor connector.

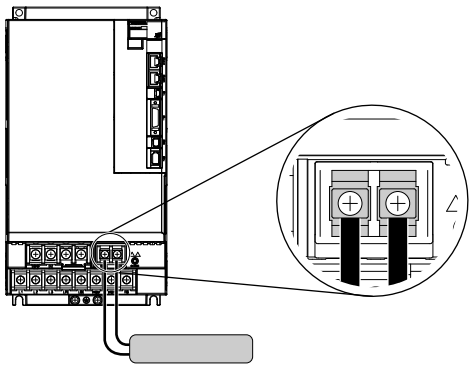


2. **Set Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) and Pn604 (Dynamic Brake Resistance).**

   Refer to the following section for details on the settings.
   5.4 Setting the Dynamic Brake Resistor Allowable Energy Consumption and Dynamic Brake Resistance on page 85

(2) SERVOPACK Models SGDXS-470A, 550A, 590A, 780A

1. **Connect the dynamic brake resistor to the D1 and D2 terminals on the SERVOPACK.**



2. **Set Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) and Pn604 (Dynamic Brake Resistance).**

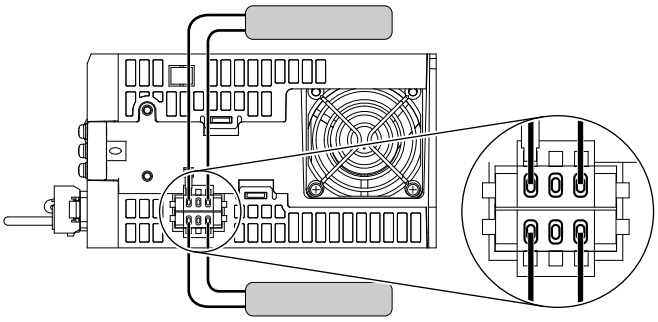
   Refer to the following section for details on the settings.
   5.4 Setting the Dynamic Brake Resistor Allowable Energy Consumption and Dynamic Brake Resistance on page 85

(3) SERVOPACK Models SGDXW-5R5A, -7R6A

1. **Connect dynamic brake resistors to the D1A and D2A terminals and the D1B and D2B terminals on the SERVOPACK.**

   Note:

   1. The D1□ terminal is connector pin 1, and the D2□ terminal is connector pin 3. Do not connect anything to pin 2 (the center pin).
   2. Terminal symbols (D1□ and D2□) are provided on the dynamic brake resistor connector.



2. **Set Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) and Pn604 (Dynamic Brake Resistance) for each axis.**

   Refer to the following section for details on the settings.
   5.4 Setting the Dynamic Brake Resistor Allowable Energy Consumption and Dynamic Brake Resistance on page 85

5

Basic Functions That Require Setting before Operation

This chapter describes the setting methods for the following settings, which are some of the required settings before operating the servo system: the dynamic brake resistances and the stopping methods used when the servo is turned OFF, when an alarm occurs, and when overtravel occurs.

5.1 Outline

This section describes the settings related to dynamic braking. These settings must be made before operating a servo system. For information on basic functions not listed in the following table, refer to the standard SERVOPACK product manual.

Function	Reference
Stopping method for servo OFF	*5.2.1 Stopping Method for Servo OFF on page 81*
Servomotor stopping method for alarms	*5.2.2 Servomotor Stopping Method for Alarms on page 82*
Motor stopping method for overtravel	*5.3 Motor Stopping Method for Overtravel on page 84*
Setting the dynamic brake resistor allowable energy consumption and dynamic brake resistance	*5.4 Setting the Dynamic Brake Resistor Allowable Energy Consumption and Dynamic Brake Resistance on page 85*

5.2 Motor Stopping Methods for Servo OFF and Alarms

Set the parameters to specify the motor stopping methods to use when the servo is turned OFF and when an alarm occurs. Refer to the following section for details on the settings.

☞ *5.2.1 Stopping Method for Servo OFF on page 81*

☞ *5.2.2 Servomotor Stopping Method for Alarms on page 82*

There are the following four stopping methods.

Motor Stopping Method	Meaning
Stopping by Applying the Dynamic Brake	The electric circuits are internally connected to stop the servomotor quickly.
Coasting to a Stop	The motor stops naturally due to friction during operation.
Zero-speed Stopping	The speed reference is set to 0 to stop the servomotor quickly.
Decelerating to a Stop	Emergency stop torque is used to decelerate the motor to a stop.

There are the following three conditions after stopping.

Status after Stopping	Meaning
Dynamic Brake Applied	The electric circuits are internally connected to hold the servomotor.
Coasting	The SERVOPACK does not control the servomotor. (The machine will move in response to a force from the load.)
Zero Clamping	A position loop is created and the servomotor remains stopped at a position reference of 0. (The current stop position is held.)

Important

- The dynamic brake is used for emergency stops. The dynamic brake circuit will operate frequently if the power is turned ON and OFF or the servo is turned ON and OFF while a reference input is applied to start and stop the servomotor. This may result in deterioration of the internal elements in the SERVOPACK. Use speed input references or position references to start and stop the servomotor.
- To minimize the coasting distance of the servomotor to come to a stop when an alarm occurs, zero-speed stopping is the default method for alarms to which it is applicable. However, depending on the application, stopping with the dynamic brake may be more suitable than using a zero-speed stop.
  For example, when coupling two shafts (twin-drive operation), machine damage may occur if a zero-speed stopping alarm occurs for one of the coupled shafts and the other shaft stops with a dynamic brake. In such cases, change the stopping method to the dynamic brake.
- If you turn OFF the main circuit power supply or control power supply during operation before you turn OFF the servo for a SERVOPACK that supports the dynamic brake hardware option specifications, the servomotor stopping method depends on the SERVOPACK model as shown in the following table.

Condition		Servomotor Stopping Method	
SERVOPACK Model	External Dynamic Brake Resistor	Main Circuit Power Turned OFF before Turning OFF the Servo	Control Power Turned OFF before Turning OFF the Servo
SGDXS-R70A, -R90A, -1R6A, -2R8A SGDXW-1R6A, -2R8A SGDXT-1R6A, -2R8A		Coasting to a stop	
SGDXS-3R8A, -5R5A, -7R6A, -120A, -180A, -200A SGDXW-5R5A, -7R6A	Not connected	Coasting to a stop	
	Connected	Stopping by applying the dynamic brake	
SGDXS-330A, -470A, -550A, -590A, -780A	Not connected	Coasting to a stop	
	Connected	Stopping by applying the dynamic brake	Coasting to a stop

5.2.1 Stopping Method for Servo OFF

Set the stopping method for when the servo is turned OFF in Pn001 = n.□□□X (Motor Stopping Method for Servo OFF and Group 1 Alarms).

To use the dynamic brake to stop the motor, set Pn001 to n.□□□0 or n.□□□1.

For a SERVOPACK that does not support a dynamic brake or for a SERVOPACK that supports an external dynamic brake but to which an external dynamic brake resistor is not connected, set Pn001 to n.□□□2 (Coast the motor to a stop without the dynamic brake).

Parameter		Servomotor Stopping Method	Status after Servomotor Stops	When Enabled	Classification
Pn001	n.□□□0	Dynamic brake *1	Dynamic brake *1	After restart	Setup
	n.□□□1		Coasting		
	n.□□□2	Coasting	Coasting		

*1 If an external dynamic brake resistor is not connected, the servomotor will coast to a stop.

Note:

1. If Pn001 is set to n.□□□0 (stop the motor by applying the dynamic brake) and the servomotor is stopped or operates at a low speed, braking force may not be generated, just like it is not generated for coasting to a stop.
2. If Pn001 is set to n.□□□0 (stop the motor by applying the dynamic brake) when using an SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A (no dynamic brake), an A.042 (Parameter Combination Error) alarm will occur.

Default settings vary depending on the SERVOPACK model, as follows.

SERVOPACK Model		Default Setting
SGDXS-R70A to -2R8A SGDXW-1R6A, -2R8A SGDXT-1R6A, -2R8A	No dynamic brake	Pn001 = n.□□□2
SGDXS-3R8A to -780A SGDXW-5R5A to -7R6A	External dynamic brake resistor	Pn001 = n.□□□0

5.2.2 Servomotor Stopping Method for Alarms

There are two types of alarms, group 1 (Gr. 1) alarms and group 2 (Gr. 2) alarms. A different parameter is used to set the stopping method for alarms for each alarm type.

To determine if the triggered alarm is Gr.1 or Gr.2, refer to the standard SERVOPACK product manual.

(1) Motor Stopping Method for Group 1 Alarms

When a group 1 (Gr. 1) alarm occurs, the servomotor will stop according to the setting of Pn001 = n.□□□X. The default setting is to stop by applying the dynamic brake.

Refer to the following section for details.

☞ *5.2.1 Stopping Method for Servo OFF on page 81*

(2) Motor Stopping Method for Group 2 Alarms

When a group 2 (Gr. 2) alarm occurs, the servomotor will stop according to the settings of the following three parameters. The default setting is for zero clamping.

- Pn001 = n.□□□X (Motor Stopping Method for Servo OFF and Group 1 Alarms)
- Pn00A = n.□□□X (Motor Stopping Method for Group 2 Alarms)
- Pn00B = n.□□X□ (Motor Stopping Method for Group 2 Alarms)

However, during torque control, the group 1 stopping method is always used. If you set Pn00B to n.□□1□ (apply dynamic brake or coast servomotor to a stop), you can use the same stopping method as group 1. If you are coordinating a number of servomotors, you can use this stopping method to prevent machine damage that may result because of differences in the stopping method.

The following table shows the combinations of the parameter settings and the resulting stopping methods.

Parameter			Servomotor Stopping Method	Status after Servomotor Stops	When Enabled	Classification
Pn00B	Pn00A	Pn001 *1				
n.□□0□ (default setting)	–	n.□□□0	Zero-speed stopping	Dynamic brake *2	After restart	Setup
		n.□□□1		Coasting		
		n.□□□2				
n.□□1□	–	n.□□□0	Dynamic brake *2	Dynamic brake *2		
		n.□□□1		Coasting		
		n.□□□2	Coasting			
n.□□2□	n.□□□0 (default setting)	n.□□□0	Dynamic brake *2	Dynamic brake *2		
		n.□□□1		Coasting		
		n.□□□2	Coasting			
	n.□□□1	n.□□□0	Motor is decelerated using the torque set in Pn406 as the maximum torque.	Dynamic brake *2		
		n.□□□1		Coasting		
		n.□□□2				
	n.□□□2	n.□□□0		Coasting		
		n.□□□1				
		n.□□□2				
	n.□□□3	n.□□□0	Motor is decelerated according to setting of Pn30A.	Dynamic brake *2		
		n.□□□1		Coasting		
		n.□□□2				
	n.□□□4	n.□□□0		Coasting		
		n.□□□1				
		n.□□□2				

*1 Default settings vary depending on the SERVOPACK model. For details, refer to the following section.
☞ 5.2.1 Stopping Method for Servo OFF on page 81

*2 If an external dynamic brake resistor is not connected, the servomotor will coast to a stop.

Note:

1. If Pn001 is set to n.□□□0 (stop the motor by applying the dynamic brake) when using an SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A (no dynamic brake), an A.042 (Parameter Combination Error) alarm will occur.
2. The setting of Pn00A is ignored if Pn001 is set to n.□□0□ or n.□□1□.
3. The setting of Pn00A = n.□□□X is enabled for position control and speed control. During torque control, the setting of Pn00A = n.□□□X will be ignored and only the setting of Pn001 = n.□□□X will be used.
4. For more information on Pn406 (Emergency Stop Torque), refer to the standard SERVOPACK product manual.
5. For more information on Pn30A (Deceleration Time for Servo OFF and Forced Stops), refer to the standard SERVOPACK product manual.

5.3 Motor Stopping Method for Overtravel

You can set the stopping method of the servomotor when overtravel occurs in Pn001 = n.□□XX (Motor Stopping Method for Servo OFF and Group 1 Alarms and Overtravel Stopping Method).

Parameter		Servomotor Stopping Method *1*	Status after Servomotor Stops	When Enabled	Classification
Pn001	n.□□00	Dynamic brake *2*	Coasting	After restart	Setup
	n.□□01				
	n.□□02	Coasting			
	n.□□1□	Deceleration according to setting of Pn406 *3*	Zero clamp		
	n.□□2□		Coasting		
	n.□□3□	Deceleration according to setting of Pn30A *3*	Zero clamp		
	n.□□4□		Coasting		

*1 You cannot decelerate a servomotor to a stop during torque control. The servomotor will be stopped with the dynamic braking or coast to a stop (according to the setting of Pn001 = n.□□□X (Motor Stopping Method for Servo OFF and Group 1 Alarms)), and then the servomotor will enter a coasting state.

*2 The servomotor will coast to a stop if a SERVOPACK that does not support the dynamic brake hardware option is used (SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A), or if it is not connected to an external dynamic brake resistor.

*3 For detailed information on settings, refer to the standard SERVOPACK product manual.

Note:

If Pn001 is set to n.□□□0 (stop the motor by applying the dynamic brake) when using an SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A (no dynamic brake), an A.042 (Parameter Combination Error) alarm will occur.

Refer to the standard SERVOPACK product manual for information on stopping methods other than those for overtravel.

Default settings vary depending on the SERVOPACK model, as follows.

SERVOPACK Model		Default Setting
SGDXS-R70A to -2R8A SGDXW-1R6A, -2R8A SGDXT-1R6A, -2R8A	No dynamic brake	Pn001 = n.□□02
SGDXS-3R8A to -780A SGDXW-5R5A to -7R6A	External dynamic brake resistor	Pn001 = n.□□00

5.4 Setting the Dynamic Brake Resistor Allowable Energy Consumption and Dynamic Brake Resistance

If an external dynamic brake resistor is connected, you must set Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) and Pn604 (Dynamic Brake Resistance).

⚠ WARNING

If you connect an external dynamic brake resistor, set Pn601 and Pn604 to suitable values.

Failure to set these parameters will cause A.730 (Dynamic Brake Overload) to be detected incorrectly and can destroy the external dynamic brake resistor, cause unintended operation during an emergency stop, cause damage to the machine, and cause burning or injury.

When you select an external dynamic brake resistor, make sure that it has a suitable allowable energy consumption and resistance.

There is a risk of personal injury or fire.

⚠ CAUTION

Mount dynamic brake resistors only on nonflammable materials. Do not mount them on or near any flammable material.

There is a risk of fire.

Pn601	Dynamic Brake Resistor Allowable Energy Consumption			Speed Pos Trq
	Setting Range	Setting Unit	Default Setting	When Enabled
	0 to 65535	10 J	0	After restart
Pn604	Dynamic Brake Resistance			Speed Pos Trq
	Setting Range	Setting Unit	Default Setting	When Enabled
	0 to 65535	10 mΩ	0	After restart

Set Pn601 to the energy consumption of the dynamic brake resistor that you calculated when selecting the connected external dynamic brake resistor or the allowable energy consumption of the resistor as reported by the manufacturer.

Refer to the following section for details on the energy consumption of the dynamic brake resistor.

☞ *3.4 Calculating the Energy Consumption of the Dynamic Brake Resistor on page 69*

Note:

An A.042 alarm (Parameter Combination Error) will occur if Pn601 and Pn604 are not set on a SERVOPACK that supports an external dynamic brake resistor (SGDXS-3R8A to 550A or SGDXW-5R5A to 7R6A).

6

Maintenance

This chapter provides information on the meaning of, causes of, and corrections for alarms related to the dynamic brake hardware option specifications.

6.1 Alarms Related to the Dynamic Brake Hardware Option Specifications

6.1.1 List of Alarms

This section gives the alarm names, alarm meanings, alarm stopping methods, alarm reset possibilities, and alarm code outputs for alarms related to the dynamic brake hardware option specifications.

(1) Servomotor Stopping Method for Alarms

Refer to the standard SERVOPACK product manual for information on the motor stopping method when an alarm occurs.

(2) Alarm Reset Possibility

Yes: You can use an alarm reset to clear the alarm. However, this assumes that the cause of the alarm has been removed.

No: You cannot clear the alarm.

(3) List of Alarms

Alarm Number	Alarm Name	Alarm Meaning	Servomotor Stopping Method	Alarm Reset Possibility	Alarm Code Output		
					ALO1	ALO2	ALO3
A.042	Parameter Combination Error	• The combination of some parameters exceeds the setting range. • The required parameters (Pn001, Pn601, and Pn604) have not been set.	Gr.1	No	H	H	H
A.730	Dynamic Brake Overload	When the dynamic brake was applied, the rotational or linear kinetic energy exceeded the capacity of the dynamic brake resistor.	Gr.1	Yes	L	L	L

6.1.2 Troubleshooting Alarms

This section provides information on the causes of and corrections for alarms related to the dynamic brake hardware option specifications. Contact your Yaskawa representative if you cannot solve a problem with the corrections given in the table.

◆ A.042:Parameter Combination Error

Possible Cause	Confirmation	Correction	Reference
The speed of program jogging went below the setting range when the electronic gear ratio (Pn20E/Pn210) or the servomotor was changed.	Check if the setting of the electronic gear ratio (Pn20E/Pn210) satisfies the conditions given in the preparations for program jogging.	Decrease the setting of the electronic gear ratio (Pn20E/Pn210).	–
The speed of program jogging went below the setting range when Pn533 or Pn585 (Program Jogging Movement Speed) was changed.	Check if the setting of Pn533 or Pn585 satisfies the conditions given in the preparations for program jogging.	Increase the setting of Pn533 or Pn585.	–
The travel speed during autotuning without a host reference went below the setting range when the electronic gear ratio (Pn20E/Pn210) or the servomotor was changed.	Check if the setting of the electronic gear ratio (Pn20E/Pn210) satisfies the conditions given in the preparations for autotuning without a host reference.	Decrease the setting of the electronic gear ratio (Pn20E/Pn210).	–
Pn001 (Application Function Selections 1), Pn601 (Dynamic Brake Resistor Allowable Energy Consumption), and Pn604 (Dynamic Brake Resistance) are not set correctly.	• Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) or Pn604 (Dynamic Brake Resistance) is set to 0, even though using the dynamic brake to stop is specified in the parameters (Pn001 = n.□□□0 or Pn001 = n.□□□1). • Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) or Pn604 (Dynamic Brake Resistance) is not set to 0, even though coasting the motor to stop without using the dynamic brake is specified in the parameters (Pn001 = n.□□□2).	Set Pn001 (Application Function Selections 1), Pn601 (Dynamic Brake Resistor Allowable Energy Consumption), and Pn604 (Dynamic Brake Resistance) to the correct values.	93

◆ A.730:Dynamic Brake Overload

Possible Cause	Confirmation	Correction	Reference
The servomotor was rotated by an external force.	Check the operation status.	Implement measures to ensure that the motor will not be rotated by an external force.	–
When the servomotor was stopped with the dynamic brake, the rotational or linear kinetic energy exceeded the capacity of the dynamic brake resistor.	Check the power consumed by the DB resistor to see how frequently the DB is being used.	Reconsider the following: • Reduce the servomotor command speed. • Decrease the moment of inertia ratio or mass ratio. • Reduce the frequency of stopping with the dynamic brake.	–
A failure occurred in the SERVOPACK.	–	The SERVOPACK may be faulty. Replace the SERVOPACK.	–

6.2 Troubleshooting Based on the Operation and Conditions of the Servomotor

This section provides troubleshooting for problems related to the dynamic brake hardware option specifications based on the operation and conditions of the servomotor, including causes and corrections.

6.2.1 Dynamic Brake Does Not Operate

Possible Cause	Confirmation	Correction	Reference
The setting of Pn001 = n.□□□X (Motor Stopping Method for Servo OFF and Group 1 Alarms) is not suitable.	Check the setting of Pn001 = n.□□□X.	Correct the setting of Pn001 = n.□□□X.	–
Dynamic brake resistor is disconnected.	Check the moment of inertia, motor speed, and dynamic brake frequency of use. The dynamic brake resistor may be disconnected if there was excessive moment of inertia, excessive motor speed, excessive use of the dynamic brake, or if a suitable external dynamic brake has not been selected.	Turn OFF the power to the servo system. Replace the SERVOPACK. To prevent disconnection, reduce the load.	–
There was a failure in the dynamic brake drive circuit.	–	Turn OFF the power to the servo system. There is a defective component in the dynamic brake circuit. Replace the SERVOPACK. Take measures to reduce the load in order to prevent damage to the dynamic brake drive circuit.	–
The external dynamic brake resistor is not connected properly.	Check the connection status.	Turn OFF the power to the servo system. Connect the selected dynamic brake resistor correctly.	–

6.2.2 An External Dynamic Brake Resistor Cannot Be Connected

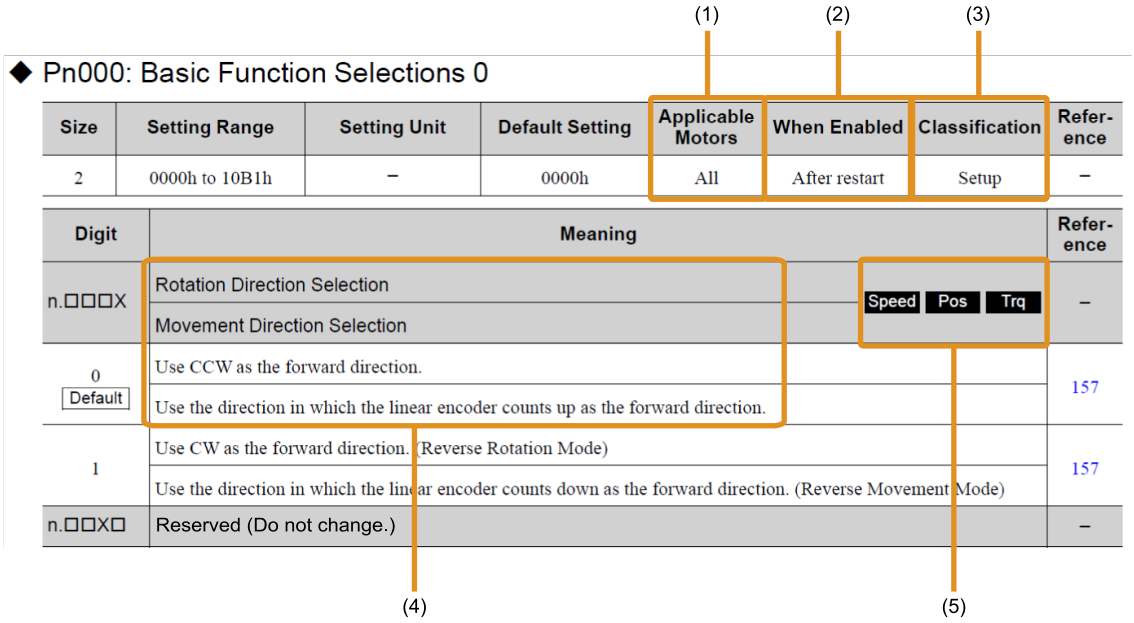
Possible Cause	Confirmation	Correction	Reference
A SERVOPACK to which an external dynamic brake resistor cannot be connected (SGDXS-R70A to 2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A) is in use.	Check the SERVOPACK model.	Turn OFF the power to the servo system. Select another SERVOPACK. (Use a SERVOPACK that accepts an externally connected dynamic brake resistor or a standard SERVOPACK.)	–

7

Parameter Lists

This chapter provides information on parameters related to the dynamic brake hardware option specifications.

7.1 Servo Parameters: Interpreting the Parameter Lists



No.	Item	Meaning
(1)	Applicable Motors	Indicates the types of servomotors to which the parameter applies. • All: The parameter is used for both rotary servomotors and linear servomotors. • Rotary: The parameter is used for only rotary servomotors. • Linear: The parameter is used for only linear servomotors. If this item differs by digit, it is added to the digit table. Rotary servomotor terms are used for parameters that are applicable to all servomotors. If you are using a linear servomotor, you need to interpret the terms accordingly. For details, refer to the following section. ☞ *i.4.2 Differences in Terms for Rotary Servomotors and Linear Servomotors on page 16*
(2)	When Enabled	Indicates when a change to the parameter will be effective. “After restart” indicates parameters that will be effective after one of the following is executed. • The power is turned OFF and ON again. • The CONFIG (Device setup request) command is sent. • A software reset is executed. If this item differs by digit, it is added to the digit table.
(3)	Classification	There are the following two classifications. • Setup • Tuning For detailed information, refer to the standard SERVOPACK product manual.
(4)	Digit Name and Setting Description	If there are differences in the parameters for rotary servomotor and linear servomotor, information is provided for both. • Top row: For rotary servomotors • Bottom row: For linear servomotors
(5)	Control Mode	Speed: A parameter that can be used in speed control. Position: A parameter that can be used in position control. Torque: A parameter that can be used in torque control. "Torque" is used even for linear servomotor parameters. Grayed-out icons (Speed, Speed, Speed) indicate parameters that cannot be used in the corresponding control method. For parameters for numeric settings, this item is added next to the parameter name. For parameters for selecting functions, this item is added to each digit in the table.

7.2 List of Parameters

◆ Pn001: Application Function Selections 1

Size	Setting Range	Setting Unit	Default Setting	Applicable Motors	When Enabled	Classification	Refer-ence
2	0000h to 1142h	–	000□h	All	After restart	Setup	–

Digit	Meaning
n.□□□X	Motor Stopping Method for Servo OFF and Group 1 Alarms Speed Pos Trq
0 Default	Stop the motor by applying the dynamic brake.
1	Stop the motor by the applying dynamic brake and then release the dynamic brake.
2	Coast the motor to a stop without the dynamic brake.
n.□□X□	Overtravel Stopping Method Speed Pos Trq
0 Default	Apply the dynamic brake or coast the motor to a stop (use the stopping method set in Pn001 = n.□□□X).
1	Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque and then servo-lock the motor.
2	Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque and then let the motor coast.
3	Decelerate the motor to a stop using the deceleration time set in Pn30A and then servo-lock the motor.
4	Decelerate the motor to a stop using the deceleration time set in Pn30A and then let the motor coast.
n.□X□□ Common	Main Circuit Power Supply AC/DC Input Selection Speed Pos Trq
0, 1	Refer to the standard SERVOPACK product manual.
n.X□□□	Warning Code Output Selection Speed Pos Trq
0, 1	Refer to the standard SERVOPACK product manual.

Note:

Default settings vary depending on the SERVOPACK model.

• SGDXS-R70A to -2R8A, SGDXW-1R6A, -2R8A, and SGDXT-1R6A, -2R8A (no dynamic brake): Pn001 = n.0002

• SGDXS-3R8A to -780A and SGDXW-5R5A, -7R6A (external dynamic brake resistor): Pn001 = n.0000

◆ Pn601: Dynamic Brake Resistor Allowable Energy Consumption Speed Pos Trq

Size	Setting Range	Setting Unit	Default Setting	Applicable Motors	When Enabled	Classification	Refer-ence
2	0 to 65535	10 J	0	All	After restart	Setup	–

◆ Pn604: Dynamic Brake Resistance Speed Pos Trq

Size	Setting Range	Setting Unit	Default Setting	Applicable Motors	When Enabled	Classification	Refer-ence
2	0 to 65535	10 mΩ	0	All	After restart	Setup	–

8

Appendices

The appendices provide information on monitor displays for the dynamic brake hardware option specifications and dynamic brake coasting distances.

8.1 Monitor Displays for the Dynamic Brake Hardware Option Specifications

You can monitor the dynamic brake hardware option specifications with the SigmaWin+ or with the Un numbers in the SERVOPACK.

SigmaWin+		SERVOPACK	
Menu Bar Button	**Name [Unit]**	**Un No.**	**Name [Unit]**
Motion Monitor	Dynamic Brake Resistor Allowable Energy Consumption [%]	Un03B	Dynamic Brake Resistor Allowable Energy Consumption [%] The percentage of the setting of Pn601 (Dynamic Brake Resistor Allowable Energy Consumption) is displayed.

8.2 Coasting Distance When Stopping with the Dynamic Brake

When stopping with the dynamic brake, the motor continues to rotate due to inertia until the motor's energy has been completely expended.

The travel distance during this period is called the coasting distance.

The coasting distance must be confirmed on the actual equipment, but you can use the following formula to calculate an approximate value.

⚠ WARNING

The calculated value of the coasting distance is a guideline. There may be error between the calculated value and the actual coasting distance. Always evaluate the dynamic brake operation on the actual equipment or machine to confirm that there are no problems with the coasting distance.

There is a risk of machine damage or injury.

8.2.1 For Rotary Servomotor

$$\theta = J \cdot \left\{ \alpha \cdot (R_D + Z_m) \cdot N_{m0} + \beta \cdot \frac{1}{R_D + Z_m} \cdot N^3_{m0} \right\} \quad [\text{deg}]$$

The above formula is based on the following conditions.

- θ [deg]: Coasting distance (mechanical angle)
- J [kgm^2]: Moment of inertia (motor moment of inertia + load moment of inertia)
- R_D [Ω]: Selected dynamic brake resistance
- N_{m0} [min^{-1}]: Motor speed just before stopping with the dynamic brake
- α, β: Coasting distance coefficients *1
- Z_m: Characteristic impedance *2

*1 Refer to the following section for details on the coasting distance coefficient.
☞ 8.3.1 Coasting Distance Coefficients on page 98

*2 Refer to the following section for details on the characteristic impedance.
☞ 8.3.2 Characteristic Impedance on page 99

8.2.2 For Linear Servomotor

$$L_m = M \cdot \left\{ \alpha \cdot (R_D + Z_m) \cdot v_{m0} + \beta \cdot \frac{1}{R_D + Z_m} \cdot v^3_{m0} \right\} \quad [\text{m}]$$

The above formula is based on the following conditions.

- L_m [m]: Coasting distance
- M [kg]: Conveying weight (moving coil mass + load weight)
- R_D [Ω]: Selected dynamic brake resistance
- V_{m0} [m/s]: Motor speed just before stopping with the dynamic brake
- α, β: Coasting distance coefficients *1
- Z_m: Characteristic impedance *2

*1 Refer to the following section for details on the coasting distance coefficient.
☞ 8.3.1 Coasting Distance Coefficients on page 98

*2 Refer to the following section for details on the characteristic impedance.
☞ 8.3.2 Characteristic Impedance on page 99

8.3 Data for Coasting Distance Calculation

This section provides information on the coasting distance coefficients and characteristic impedance required to calculate the coasting distance.

8.3.1 Coasting Distance Coefficients

The following table shows the relationship between the servomotor and coasting distance coefficients α and β.

(1) For Rotary Servomotor

Servomotor Model	Coasting Distance Coefficients	
	α	β [×10-6]
SGMXJ-04A	35.08	100.98
SGMXJ-06A	42.80	22.63
SGMXJ-08A	30.43	61.01
SGMXA-04A	31.34	623.07
SGMXA-06A	50.09	148.56
SGMXA-08A	30.43	128.36
SGMXA-10A	35.45	41.19
SGMXA-15A	33.30	31.97
SGMXA-20A	32.96	34.33
SGMXA-25A	35.83	20.99
SGMXA-30A	30.73	13.52
SGMXA-40A	38.65	8.15
SGMXA-50A	28.44	6.54
SGMXA-70A	28.44	6.54
SGMXP-02A	47.66	1120.02
SGMXP-04A	30.13	412.40
SGMXP-08A	45.95	93.14
SGMXP-15A	29.84	74.67
SGMXG-03A	17.24	494.99
SGMXG-05A	14.26	237.63
SGMXG-09A	14.07	87.07
SGMXG-13A	13.09	36.01
SGMXG-20A	18.59	14.82
SGMXG-30A	15.27	6.21
SGMXG-44A	11.99	3.12
SGMXG-55A	8.33	1.71
SGMXG-75A	11.35	0.70
SGMXG-1AA	5.45	0.55
SGMXG-1EA	5.02	0.38
SGM7D-30F	0.35	666.91

Servomotor Model	Coasting Distance Coefficients	
	α	β [×10-6]
SGM7D-1AF	0.02	595.57
SGM7D-08G	1.31	1501.75
SGM7D-18G	0.31	1423.33
SGM7D-24G	0.14	1310.21
SGM7D-34G	0.08	1480.48
SGM7D-45G	0.10	648.86
SGM7D-28I	0.22	625.89
SGM7D-70I	0.05	546.26
SGM7D-1ZI	0.02	572.13
SGM7D-1CI	0.01	468.15
SGM7D-2BI	0.01	465.81
SGM7D-2DI	0.00	629.22
SGM7D-06J	3.56	1875.52
SGM7D-09J	0.96	1159.65
SGM7D-18J	0.24	1466.78
SGM7D-20J	0.11	923.57
SGM7D-38J	0.06	1140.28
SGM7D-30L	0.66	270.41
SGM7E-16E	0.33	9.45
SGM7E-35E	0.08	3.45
SGM7F-14B	0.97	30.28
SGM7F-17C	0.64	107.53
SGM7F-25C	0.28	81.94
SGM7F-16D	0.93	46.62
SGM7F-35D	0.18	38.95
SGM7F-45M	0.15	74.36
SGM7F-80M	0.13	23.76
SGM7F-80N	0.13	21.84
SGM7F-1AM	0.15	7.86
SGM7F-1EN	0.13	5.75

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Servomotor Model	Coasting Distance Coefficients	
	α	β [×10-6]
SGM7D-58F	0.09	558.00
SGM7D-90F	0.04	578.86

Servomotor Model	Coasting Distance Coefficients	
	α	β [×10-6]
SGM7F-2ZN	0.08	3.59

(2) For Linear Servomotor

Linear Servomotor Model	Coasting Distance Coefficients	
	α [×10-4]	β [x10-4]
SGLGW-40A365C (used with a high-force magnetic way)	3.01	0.78
SGLGW-60A253C (used with a high-force magnetic way)	2.89	0.61
SGLGW-60A365C	3.90	0.37
SGLGW-60A365C (used with a high-force magnetic way)	2.89	0.27
SGLGW-90A200C	2.85	0.42
SGLGW-90A370C	2.85	0.10
SGLGW-90A535C	2.85	0.046
SGLFW2-30A230A	4.16	78.33
SGLFW2-45A200A	3.80	39.21
SGLFW2-45A380A	3.80	9.80
SGLFW2-90A200A	2.58	14.34
SGLFW2-45A380A	3.80	9.80
SGLFW2-90A380A	2.58	3.54
SGLFW2-1DA380A	1.14	3.47
SGLFW2-90A560A	2.58	1.57

Linear Servomotor Model	Coasting Distance Coefficients	
	α [×10-4]	β [x10-4]
SGLFW2-1DA560A	1.14	1.52
SGLTW-20A170A	4.67	92.22
SGLTW-35A170A	3.80	37.64
SGLTW-35A170H	4.24	42.00
SGLTW-50A170H	1.92	38.55
SGLTW-20A320A	4.67	23.28
SGLTW-20A460A	4.67	10.34
SGLTW-35A320A	3.80	9.16
SGLTW-35A320H	4.24	10.50
SGLTW-50A320H	1.92	9.73
SGLTW-35A460A	3.80	4.13
SGLTW-40A400B	1.77	8.77
SGLTW-40A600B	1.77	4.05
SGLTW-80A400B	1.09	3.16
SGLTW-80A600B	1.09	1.42

8.3.2 Characteristic Impedance

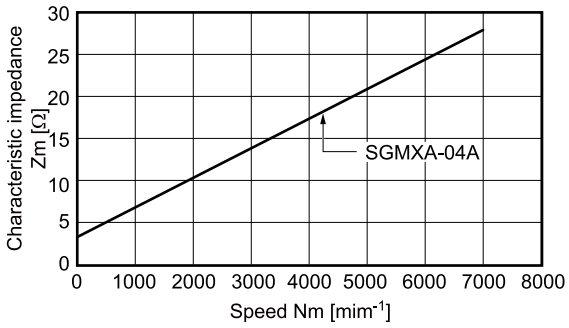
The following figures show the relationship between the characteristic impedance and servomotor speed.

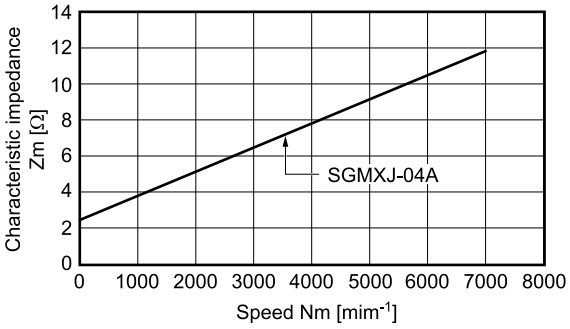
Refer to the graph for your servomotor and obtain the characteristic impedance Z_m from the speed immediately before a dynamic brake stop.

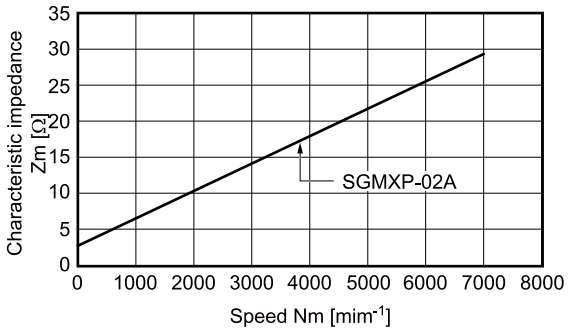
(1) For Rotary Servomotor

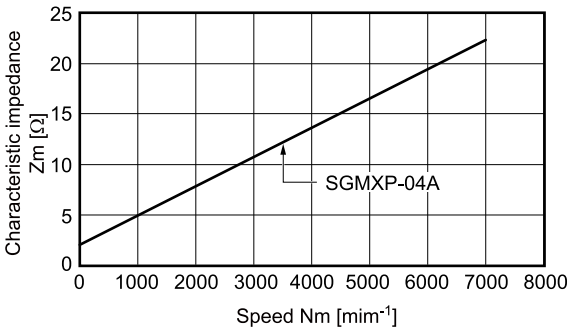
The following graphs show the servomotors that can be used with each model of SERVOPACK.

(a) SGDXS-2R8A, SGDXW-2R8A, -5R5A, -7R6A

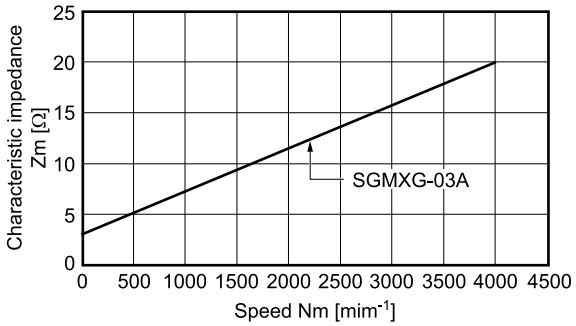


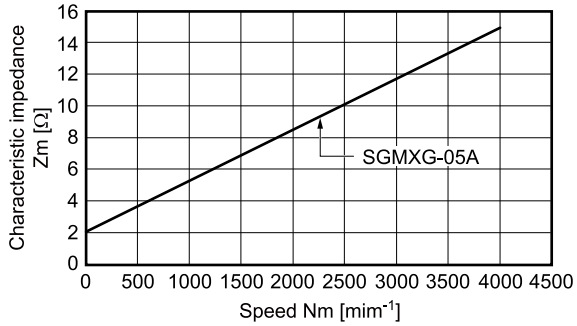




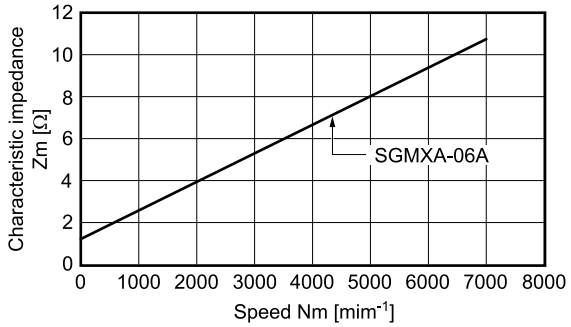


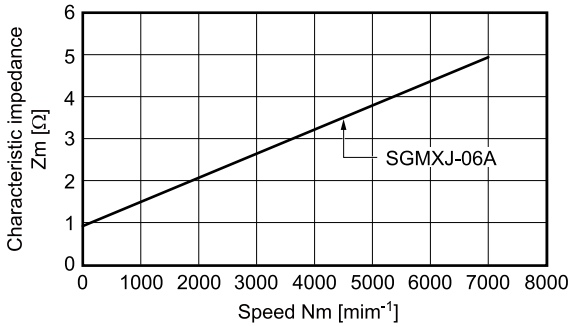
(b) SGDXS-3R8A, SGDXW-5R5A, -7R6A

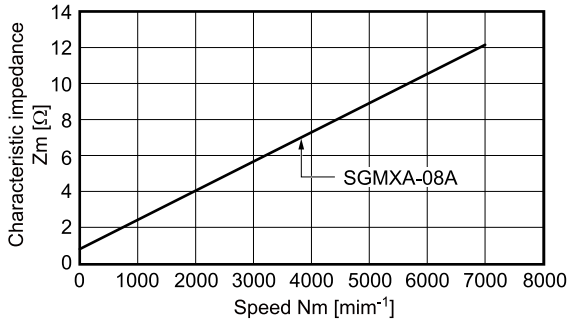


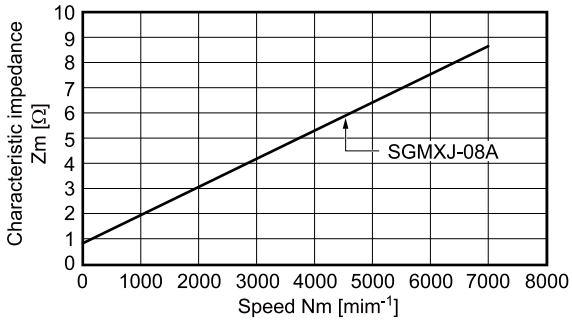


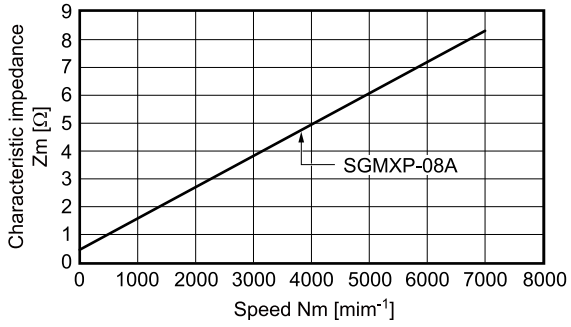
(c) SGDXS-5R5A, SGDXW-5R5A, -7R6A



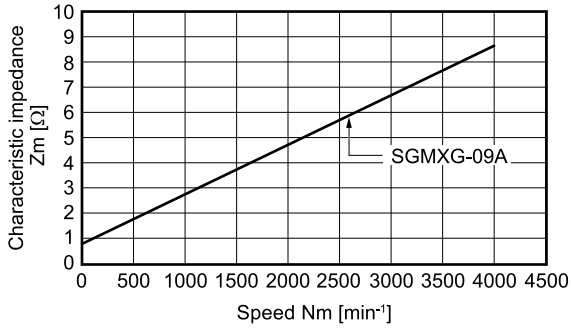




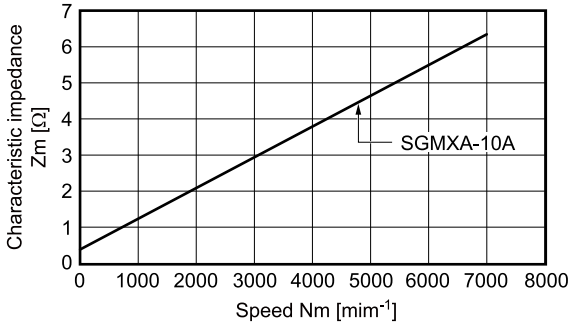


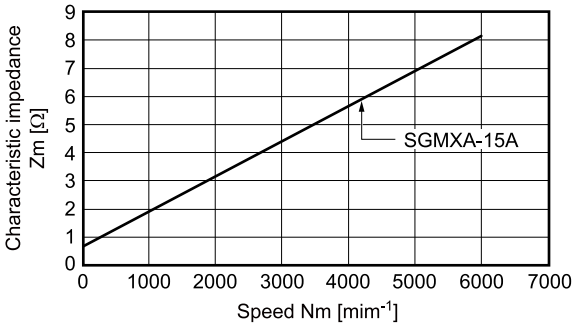


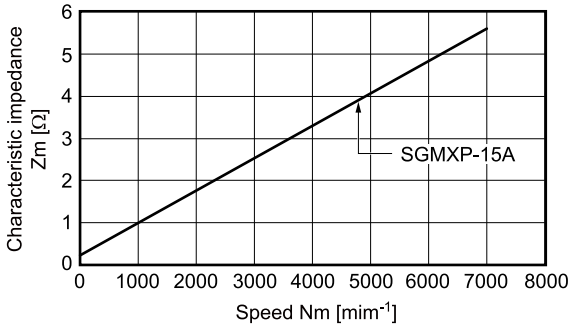
(d) SGDX□-7R6A

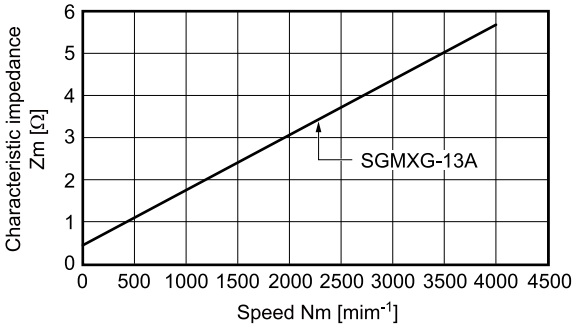


(e) SGDXS-120A

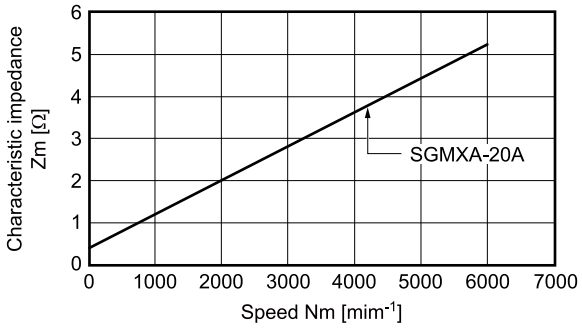


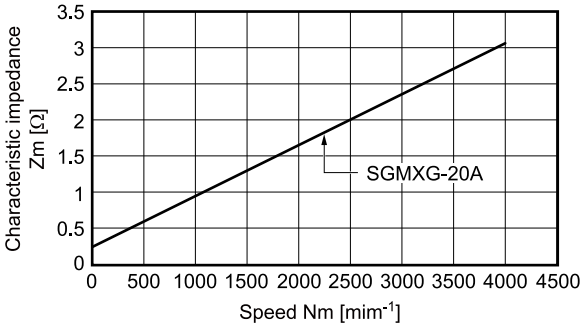




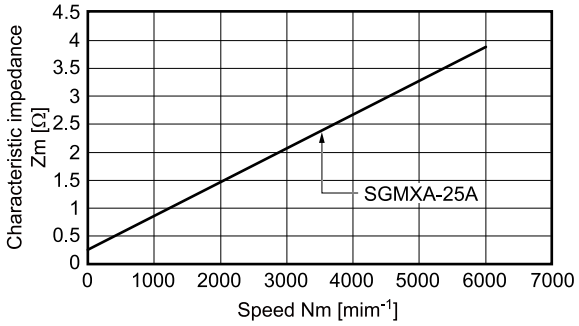


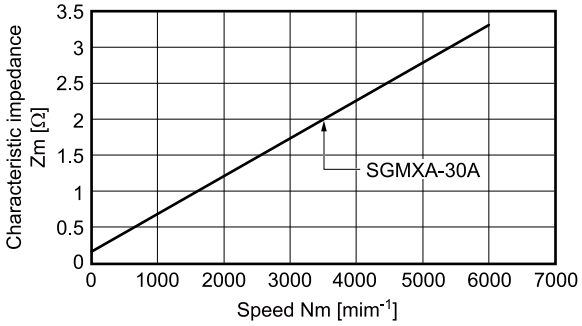
(f) SGDXS-180A

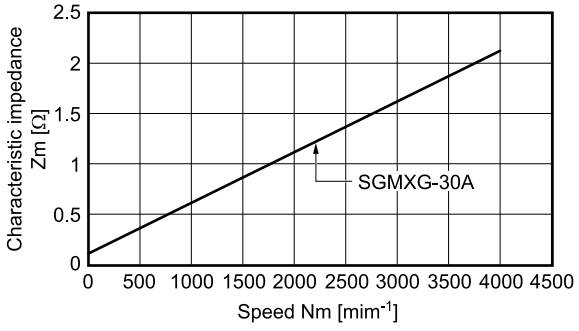




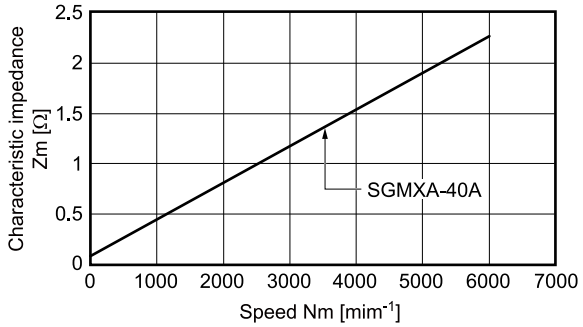
(g) SGDXS-200A

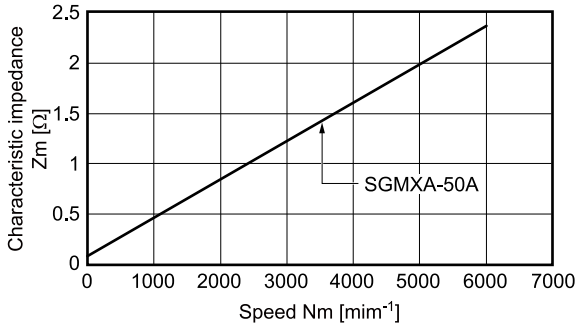


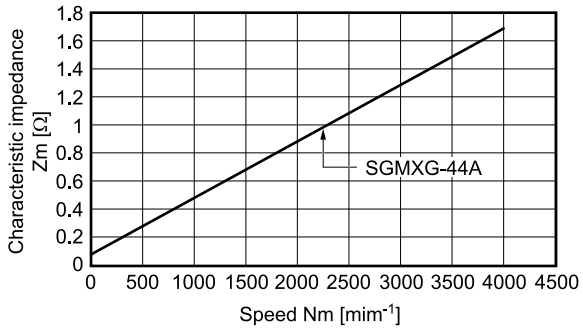




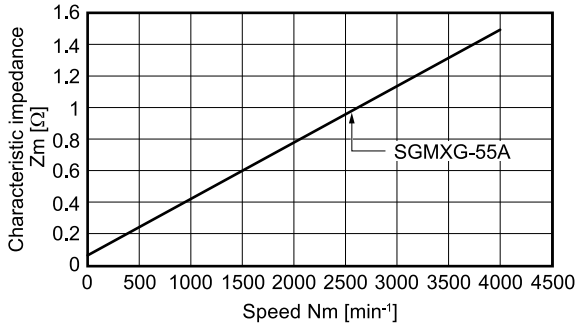
(h) SGDXS-330A



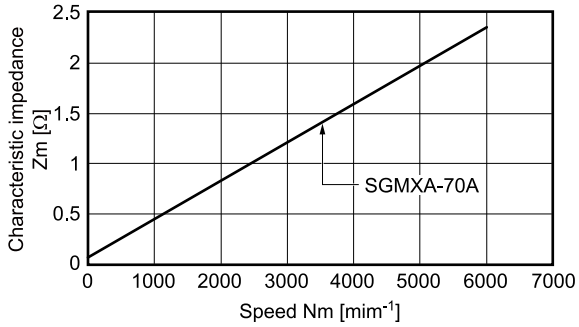


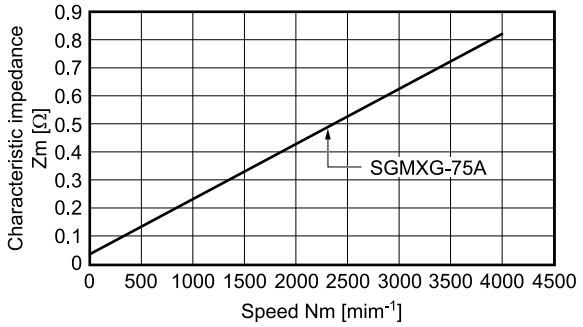


(i) SGDXS-470A

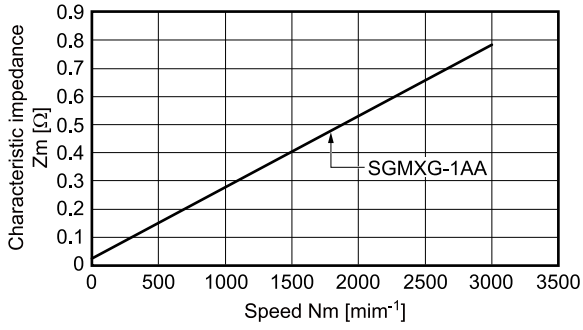


(j) SGDXS-550A

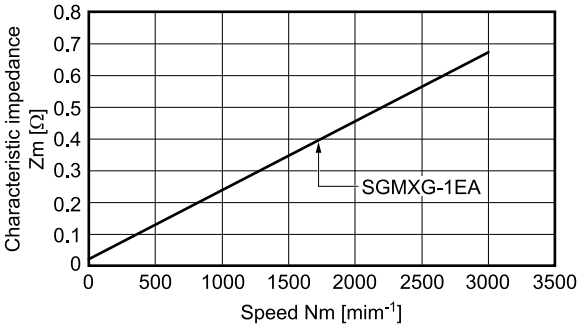




(k) SGDXS-590A



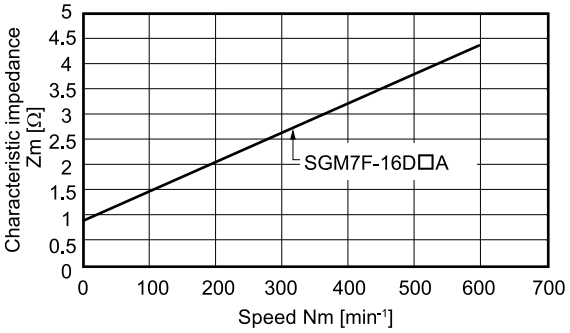
(l) SGDXS-780A

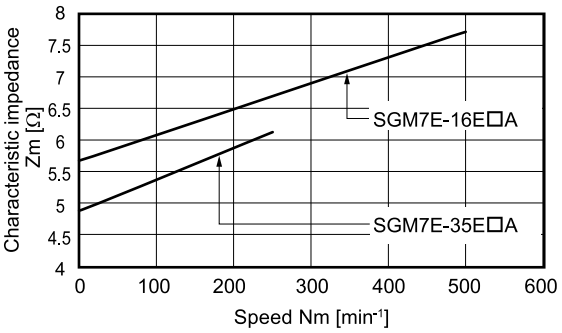


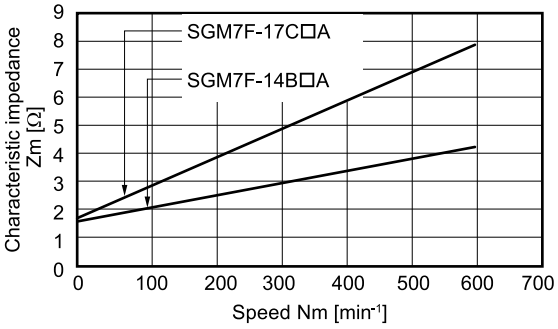
(2) For Direct Drive Servomotors

The following graphs show the servomotors that can be used with each model of SERVOPACK.

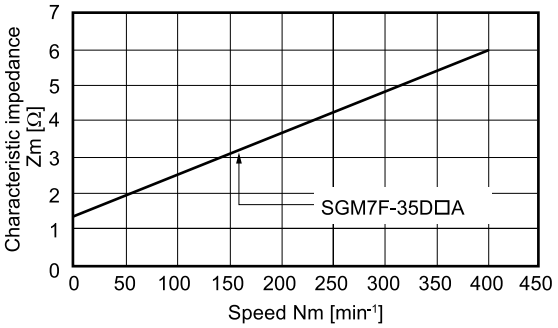
(a) SGDX□-5R5A

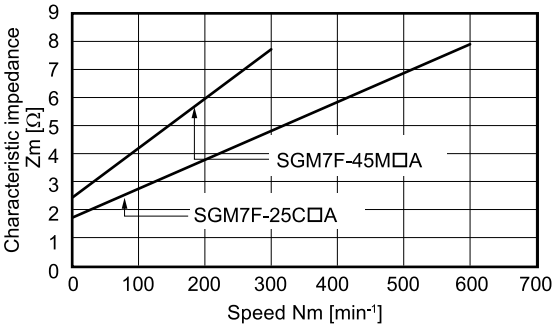




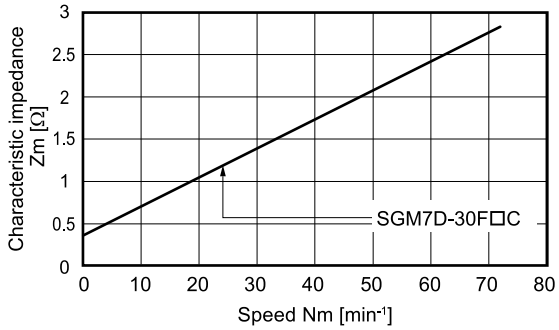


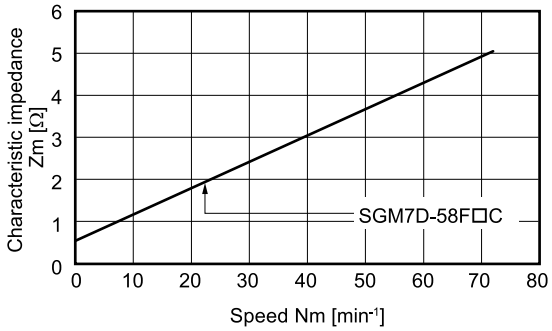
(b) SGDX□-7R6A

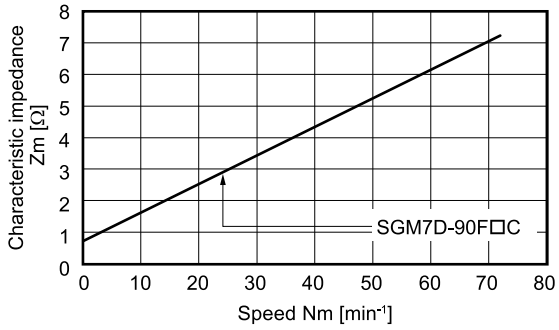


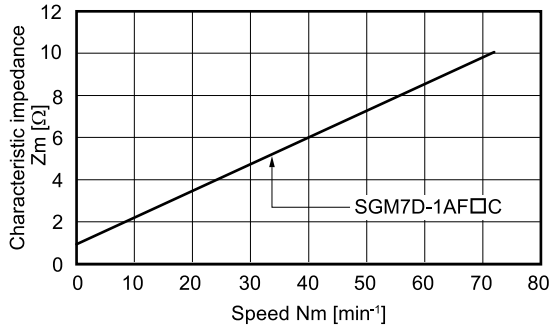


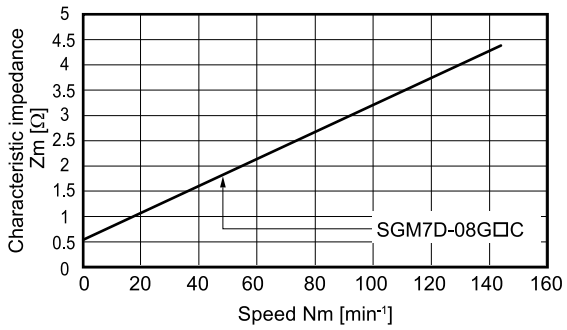
(c) SGDXS-120A

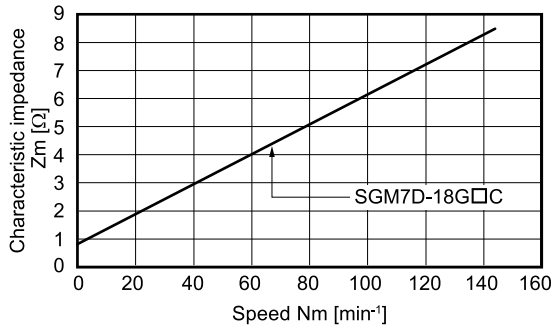

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-30F□C

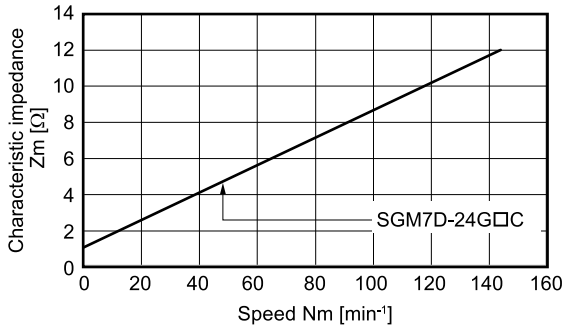

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-58F□C

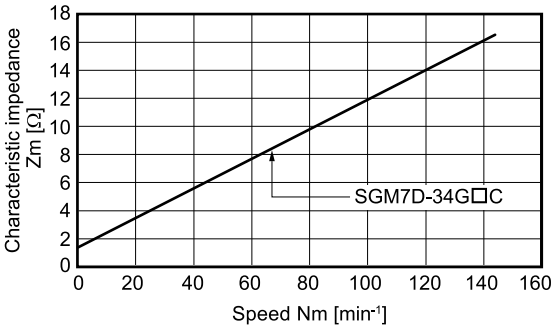

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-90F□C

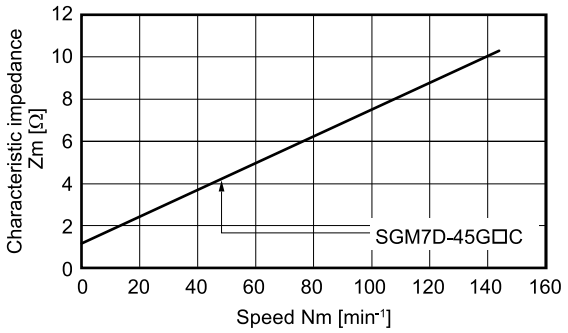

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-1AF□C

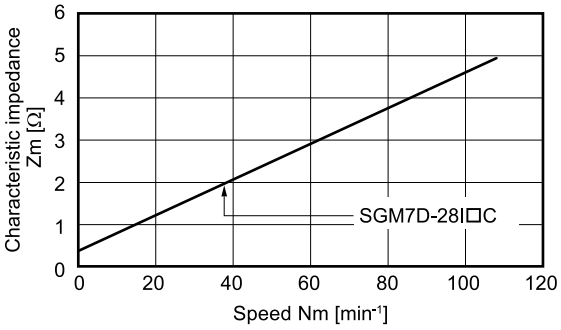

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-08G□C

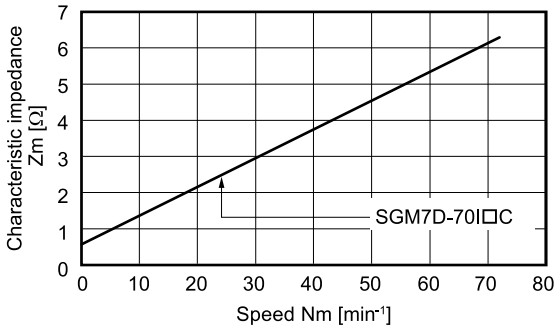

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-18G□C

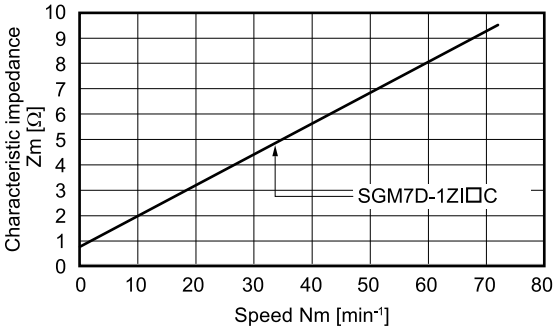

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-24G□C

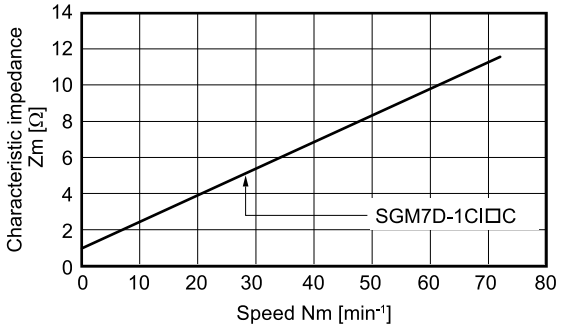

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-34G□C

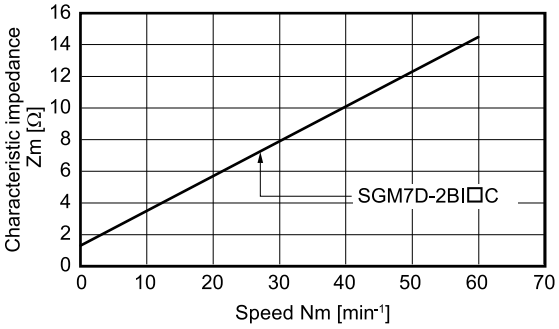

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-45G□C

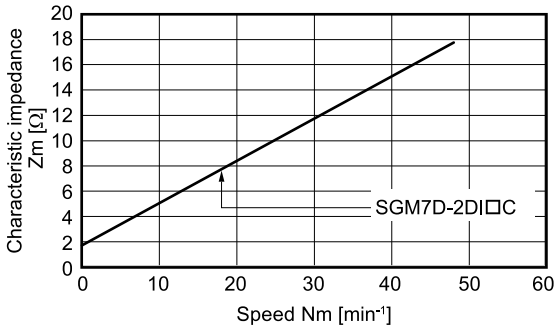

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-28I□C

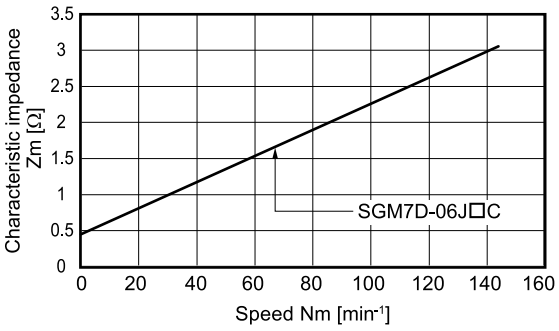

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-70I□C

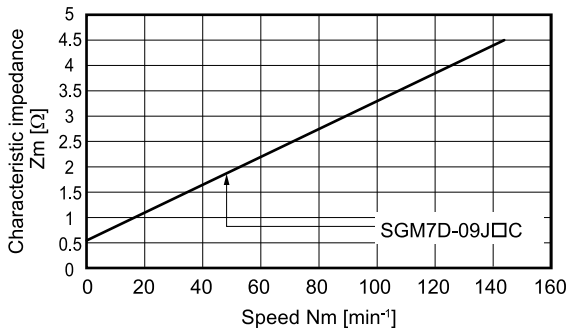

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-1ZI□C

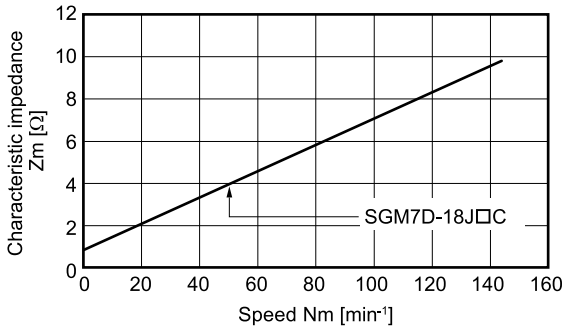

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-1CI□C

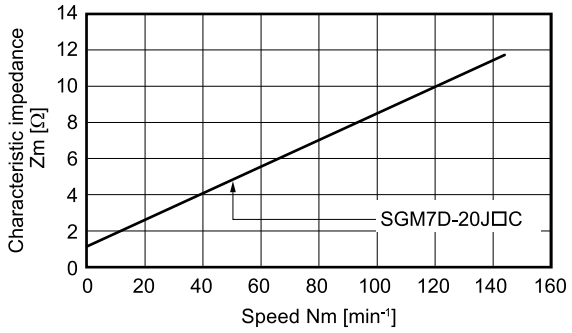

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-2BI□C

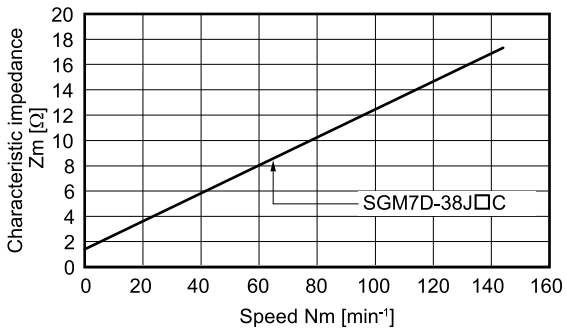

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-2DI□C

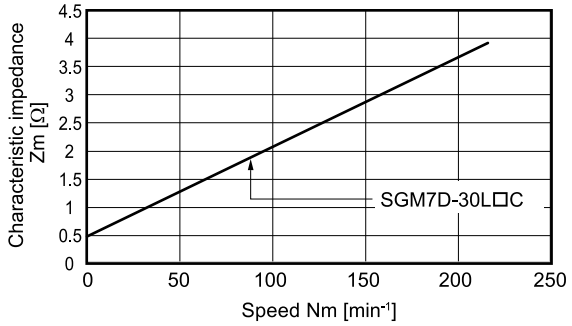

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-06J□C

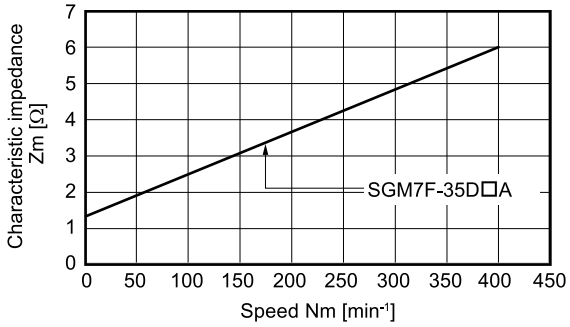

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-09J□C

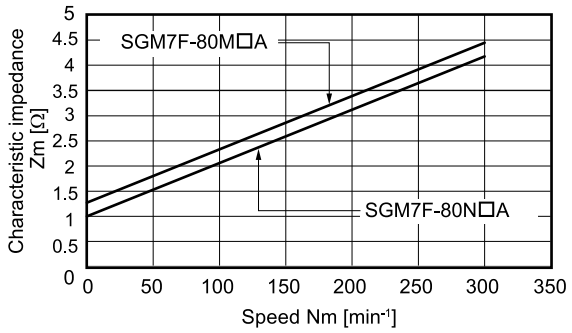

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-18J□C


Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-20J□C

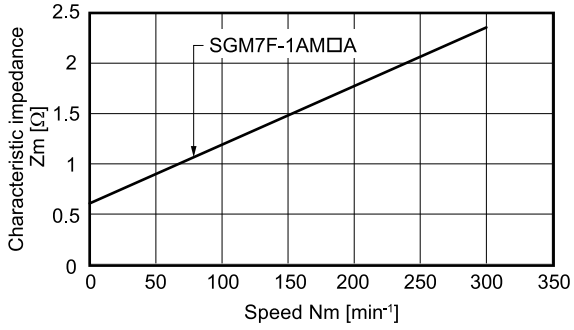

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-38J□C


Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7D-30L□C

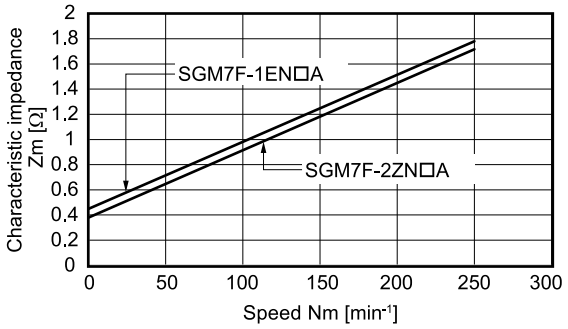

Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7F-35D□A


Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7F-80M□A
SGM7F-80N□A

(d) SGDXS-180A


Characteristic impedance Zm [Ω]
Speed Nm [min-1]
SGM7F-1AM□A

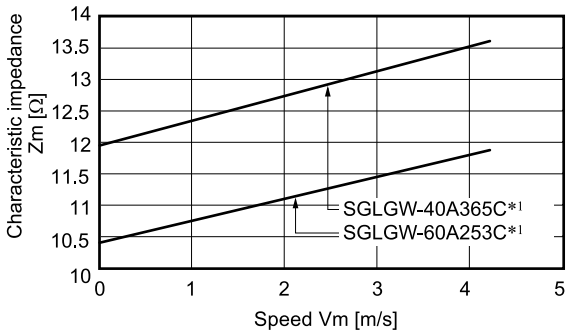
(e) SGDXS-200A

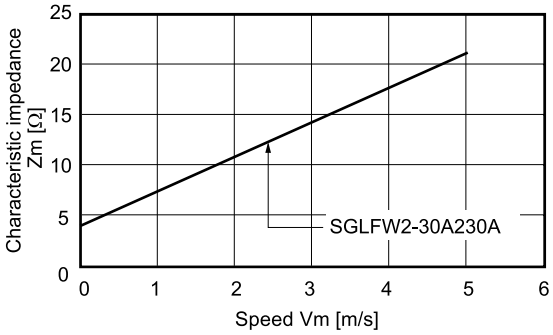


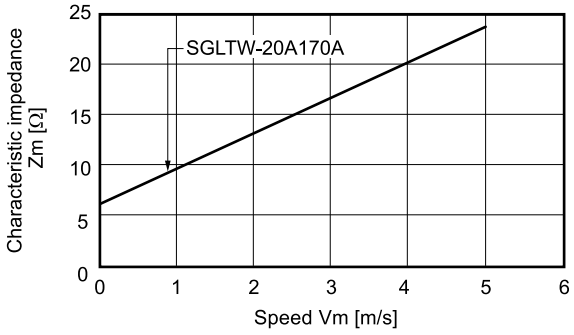
(3) For Linear Servomotor

The following graphs show the servomotors that can be used with each model of SERVOPACK.

(a) SGDXS-3R8A, SGDXW-2R8A, -5R5A

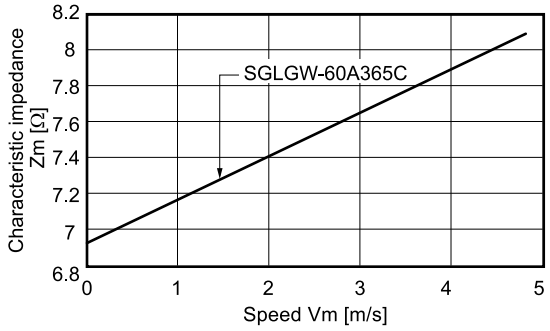


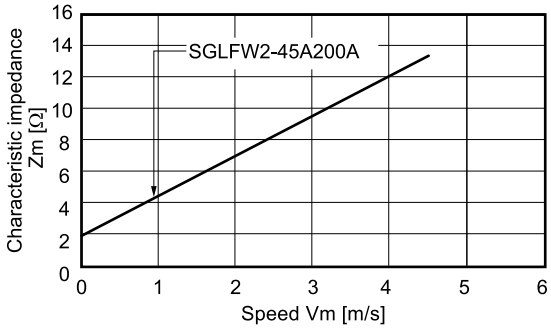


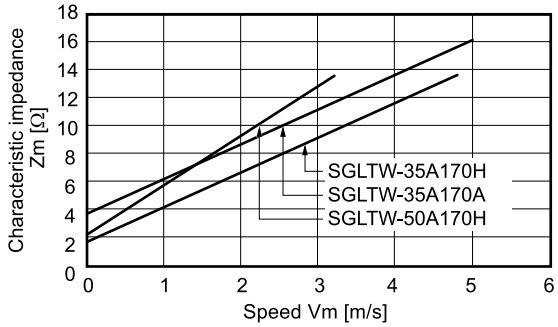


*1 These values are for combinations with high-force magnetic ways.

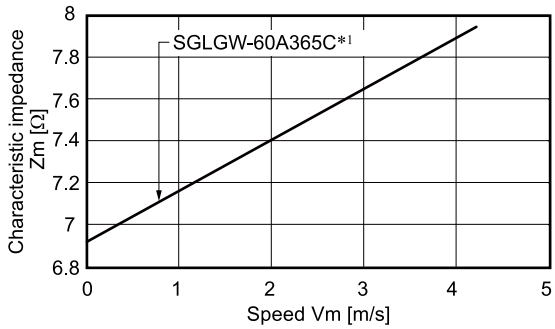
(b) SGDX□-5R5A

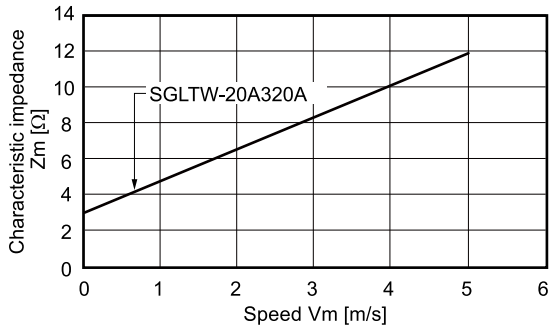






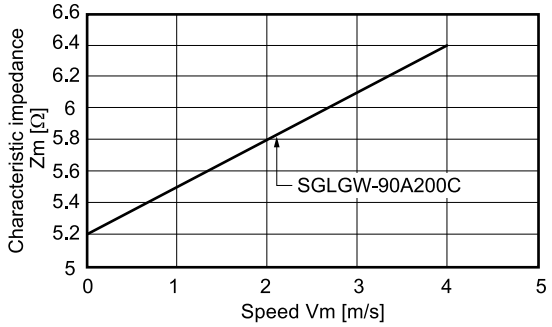
(c) SGDX□-7R6A

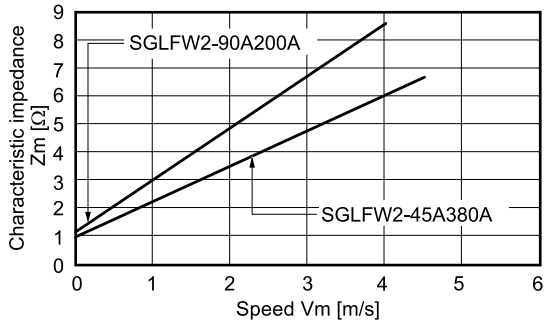


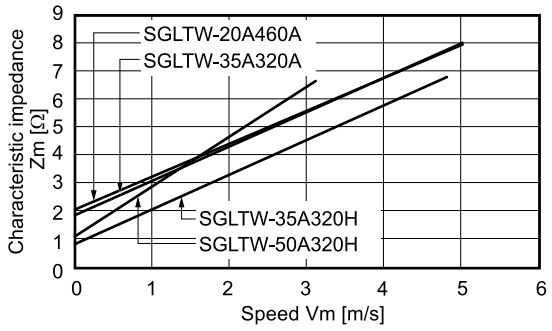


*1 These values are for combinations with high-force magnetic ways.

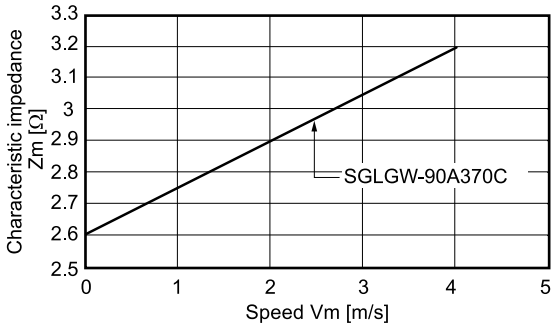
(d) SGDXS-120A

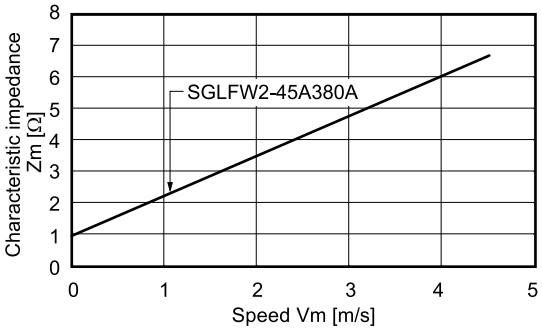


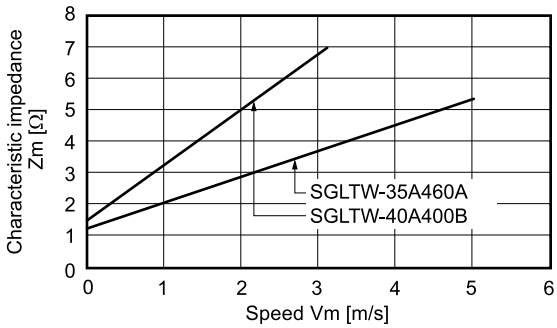




(e) SGDXS-180A







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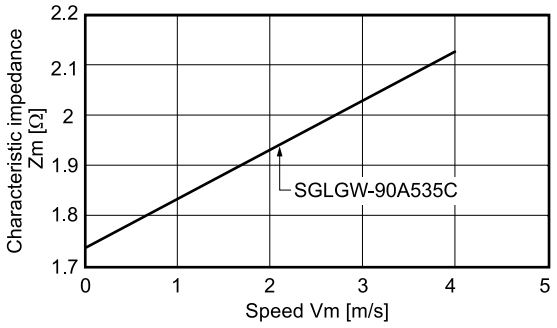

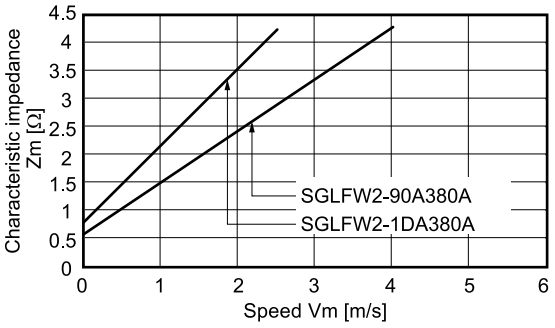

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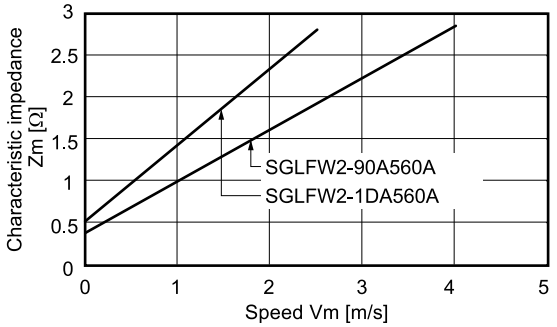

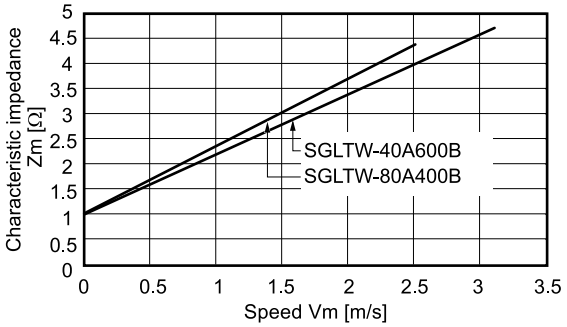

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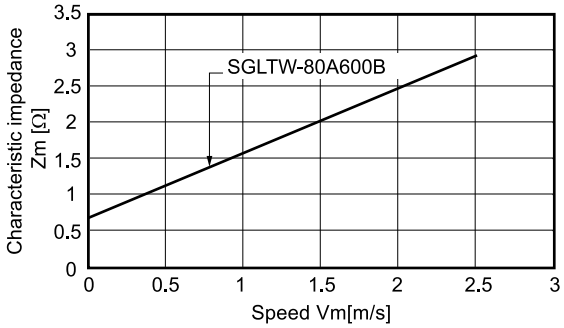

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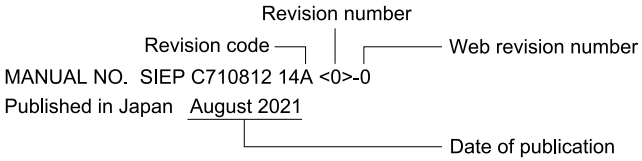
Revision History

The date of publication, revision code, revision number, and web revision number are given at the bottom right of the back cover. Refer to the following example.



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					Addition: Description of SGM7M
				Back cover	Revision: Address
March 2022	B	<1>	0	All chapters	• Addition: SGDXS-550A, -780A • Addition: SGMXA-15 to 70, SGMXP, SGMXG-03, -05, -1A, -1E
August 2021	A	<0>	0	–	First edition

Σ-X-Series AC Servo Drive

Σ-XS/Σ-XW/Σ-XT SERVOPACK Hardware Option Specifications Dynamic Brake

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