YASKAWA

AC Servo Drives

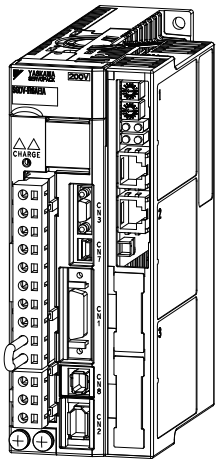
Σ-V Series

USER'S MANUAL

Powerlink Network Module

Model: SGDV-OCB02A

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



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MANUAL NO. YEG SIEP C720829 21A

About this Manual

This manual describes informations required for designing and maintaining the Powerlink Network Module for Σ-V series SERVOPACKs.

Be sure to refer to this manual and perform design and maintenance to select devices correctly.

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

■ Description of Technical Terms

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

Term	Meaning
Powerlink Network Module	Powerlink Network Module for Σ-V series SERVOPACKs.
Cursor	A mark that indicates the input position of data displayed on the digital operator
Servomotor	Σ-V Series SGMJV, SGMAV, SGMEV, SGMGV, SGMSV, or SGMCS (Direct Drive) servomotor Linear Σ Series SGLGW, SGLFW, SGLTW, or SGLC servomotor
SERVOPACK	Σ-V Series SGDV SERVOPACK
Servo drive	A set including a servomotor and SERVOPACK (i.e., a servo amplifier)
Servo System	A servo control system that includes the combination of a servo drive with a host controller and peripheral devices
Servo ON	When power is being supplied to the servomotor
Servo OFF	When power is not being supplied to the servomotor
Base block	Turning OFF the power by shutting OFF the base current of the IGBT for the current amplifier

■ IMPORTANT Explanations

The following icon is displayed for explanations requiring special attention.

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

■ Notation Used in this Manual

- Reverse Symbol Notation

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

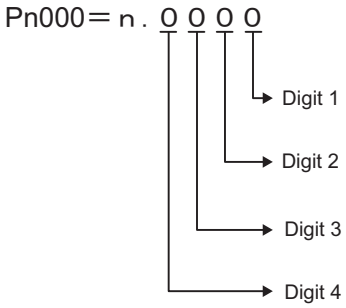
Example

The notation for $\overline{\text{BK}}$ is /BK.

• Parameter Notation

The following two types of notations are used for parameter digit places and settings.

Example



Notation Example for Pn000

Digit Notation		Set Value Notation	
Notation Method	Meaning	Notation Method	Meaning
Pn000.0	Indicates digit 1 of the parameter (Pn000).	Pn000.0 = x or n.□□□x	Indicates that digit 1 of the parameter (Pn000) is x.
Pn000.1	Indicates digit 2 of the parameter (Pn000).	Pn000.1 = x or n.□□x□	Indicates that digit 2 of the parameter (Pn000) is x.
Pn000.2	Indicates digit 3 of the parameter (Pn000).	Pn000.2 = x or n.□x□□	Indicates that digit 3 of the parameter (Pn000) is x.
Pn000.3	Indicates digit 4 of the parameter (Pn000).	Pn000.3 = x or n.x□□□	Indicates that digit 4 of the parameter (Pn000) is x.

■ Manuals Related to the Σ-V Series

Refer to the following manuals as required.

Name	Selecting Models and Peripheral Devices	Ratings and Specifications	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
Σ-V Series User's Manual Design and Maintenance Rotational Motor Command Option Attachable Type (SIEP S800000 60)		✓		✓	✓	✓
Σ-V Series Option Module Safety Precautions (TOBP C720829 00)			✓			
Σ-V Series Command Option Module Installation Guide (TOBP C720829 01)			✓			
Σ-V Series User's Manual Setup Rotational Motor (SIEP S800000 43)			✓	✓		
Σ-V Series Product Catalog (KAEP S800000 42)	✓	✓				
Σ-V Series User's Manual Operation of Digital Operator (SIEP S800000 55)				✓	✓	✓
Σ-V Series AC SERVOPACK SGDV Safety Precautions (TOBP C710800 10)	✓		✓			✓
Σ Series Digital Operator Safety Precautions (TOBP C730800 00)						✓
AC SERVOMOTOR Safety Precautions (TOBP C230200 00)			✓			✓

■ Safety Information

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

⚠ WARNING	Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.
⚠ CAUTION	Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation. In some situations, the precautions indicated could have serious consequences if not heeded.
⃠ PROHIBITED	Indicates prohibited actions that must not be performed. For example, this symbol would be used to indicate that fire is prohibited as follows: 
MANDATORY	Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory: 

Safety Precautions

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

⚠ WARNING

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

- Connect the ground terminal according to local electrical codes (100 Ω or less for a SERVOPACK with a 100 V, 200 V power supply, 10 Ω or less for a SERVOPACK with a 400 V power supply).
  Improper grounding may result in electric shock or fire.

- Installation, disassembly, or repair must be performed only by authorized personnel.
  Failure to observe this warning may result in electric shock or injury.
- The person who designs a system using the safety function (Hard Wire Baseblock function) must have full knowledge of the related safety standards and full understanding of the instructions in this manual.
  Failure to observe this warning may result in injury.

■ Storage and Transportation

⚠ CAUTION

- Do not store or install the product in the following locations.
  Failure to observe this caution may result in fire, electric shock, or damage to the product.
  - Locations subject to direct sunlight
  - Locations subject to ambient operating temperatures outside the range specified in the storage/installation temperature conditions
  - Locations subject to humidity outside the range specified in the storage/installation humidity conditions
  - Locations subject to condensation as the result of extreme changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust, salts, or iron dust
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Do not hold the product by the cables, motor shaft or detector while transporting it.
  Failure to observe this caution may result in injury or malfunction.
- Do not place any load exceeding the limit specified on the packing box.
  Failure to observe this caution may result in injury or malfunction.
- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.
  Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.
  If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

■ Installation

⚠ CAUTION

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

■ Wiring

⚠ CAUTION

- Be sure to wire correctly and securely.
  Failure to observe this caution may result in motor overrun, injury, or malfunction.
- Do not connect a commercial power supply to the U, V, or W terminals for the servomotor connection.
  Failure to observe this caution may result in injury or fire.
- Securely connect the main circuit power supply terminal screws, control power supply terminal screws, and servomotor connection terminal screws.
  Failure to observe this caution may result in fire.
- Do not bundle or run the main circuit cables together with the input/output signal cables or the encoder cables in the same duct. Keep them separated by at least 30 cm.
  Failure to do so may result in malfunction.
- Use shielded twisted-pair wires or multi-core shielded twisted-pair wires for input/output signal cables and the encoder cables.
- I/O signal cables must be no longer than 3 m, encoder cables must be no longer than 50 m, and control power supply cables for the SERVOPACK with a 400 V power supply (+24 V, 0 V) must be no longer than 10 m.
- Do not touch the power terminals while the charge indicator is ON after turning power OFF because high voltage may still remain in the SERVOPACK.
  Make sure the charge indicator is off first before starting an inspection.
- Observe the following precautions when wiring main circuit terminal blocks of the SERVOPACK.
  - Remove the detachable main circuit terminal blocks from the SERVOPACK prior to wiring.
  - Insert only one main power line per opening in the main circuit terminals.
  - Make sure that no part of the core wire comes into contact with (i.e., short-circuit) adjacent wires.
- Install a battery at either the host controller or the SERVOPACK, but not both.
  It is dangerous to install batteries at both ends simultaneously, because that sets up a loop circuit between the batteries.
- Always use the specified power supply voltage.
  An incorrect voltage may result in fire or malfunction.
- Take appropriate measures to ensure that the input power supply is supplied within the specified voltage fluctuation range. Be particularly careful in places where the power supply is unstable.
  An incorrect power supply may result in damage to the product.
- Install external breakers or other safety devices against short-circuiting in external wiring.
  Failure to observe this caution may result in fire.
- Take appropriate and sufficient countermeasures for each form of potential interference when installing systems in the following locations.
  - Locations subject to static electricity or other forms of noise
  - Locations subject to strong electromagnetic fields and magnetic fields
  - Locations subject to possible exposure to radioactivity
  - Locations close to power supplies

  Failure to observe this caution may result in damage to the product.
- Do not reverse the polarity of the battery when connecting it.
  Failure to observe this caution may damage the battery, the SERVOPACK, the servomotor, or cause an explosion.
  Wiring or inspection must be performed by a technical expert.
- Use a 24-VDC power supply with double insulation or reinforced insulation.

■ Operation

⚠ CAUTION

- Always use the servomotor and SERVOPACK in one of the specified combinations.
  Failure to observe this caution so may result in fire or malfunction.
- Conduct trial operation on the servomotor alone with the motor shaft disconnected from the machine to avoid accidents.
  Failure to observe this caution may result in injury.
- During trial operation, confirm that the holding brake works correctly. Furthermore, secure system safety against problems such as signal line disconnection.
- Before starting operation with a machine connected, change the settings to match the parameters of the machine.
  Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
- Do not frequently turn power ON and OFF.
  Since the SERVOPACK has a capacitor in the power supply, a high charging current flows when power is turned ON. Frequently turning power ON and OFF causes main power devices like capacitors and fuses to deteriorate, resulting in unexpected problems.
- When using JOG operations (Fn002), search operations (Fn003), or EasyFFT operations (Fn206), the dynamic brake function does not work for reverse overtravel or forward overtravel. Take necessary precautions.
- When using the servomotor for a vertical axis, install safety devices to prevent workpieces from falling due to alarms or overtravels. Set the servomotor so that it will stop in the zero clamp state when overtravel occurs.
  Failure to observe this caution may cause workpieces to fall due to overtravel.
- When not using turning-less function, set to the correct moment of inertia ratio (Pn103).
  Setting to an incorrect moment of inertia ratio may cause machine vibration.
- Do not touch the SERVOPACK heatsinks, regenerative resistor, or servomotor while power is ON or soon after the power is turned OFF.
  Failure to observe this caution may result in burns due to high temperatures.
- Do not make any extreme adjustments or setting changes of parameters.
  Failure to observe this caution may result in injury or damage to the product due to unstable operation.
- When an alarm occurs, remove the cause, reset the alarm after confirming safety, and then resume operation.
  Failure to observe this caution may result in damage to the product, fire, or injury.
- Do not use the brake of the servomotor for braking.
  Failure to observe this caution may result in malfunction.
- An alarm or warning may be generated if communications are executed with the host controller during operation using SigmaWin+ or the digital operator.
  If an alarm or warning is generated, the process currently being executed may be aborted and the system may stop.

■ Maintenance and Inspection

⚠ CAUTION

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

■ Disposal

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

■ General Precautions

Observe the following general precautions to ensure safe application.
• The products shown in illustrations in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual. • The drawings presented in this manual are typical examples and may not match the product you received. • If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.

Warranty

Details of Warranty

Please refer to the general terms and conditions.

Applicable Standards

■ North American Safety Standards (UL)

	Model	UL* Standards (UL File No.)
SERVOPACK	• SGDV	UL508C (E147823)
Servomotor	• SGMJV • SGMAV • SGMEV • SGMGV • SGMSV	UL1004 (E165827)

* Underwriters Laboratories Inc.

Note: Applicable when the Powerlink Network Module is attached to the SERVOPACKs for the command option attachable type.

■ European Standards

	Model	Low Voltage Directive	EMC Directive		Safety Standards
			EMI	EMS	
SERVOPACK	• SGDV	EN50178 EN61800-5-1	EN55011/A2 group 1 class A EN61800-3	EN61800-3 EN61000-6-2	EN954-1 IEC61508-1 to 4
Servomotor	• SGMJV • SGMAV • SGMEV • SGMGV • SGMSV	IEC60034-1 IEC60034-5 IEC60034-8 IEC60034-9	EN55011/A2 group 1 class A EN61800-3	EN61800-3 EN61000-6-2	–

Note 1. Because SERVOPACKs and servomotors are built into machines, certification is required after installation in the final product.

2. Applicable when the Powerlink Network Module is attached to SERVOPACKs for the command option attachable type.

CONTENTS

1

Checking Products

This chapter describes how to check products upon delivery.

1.1 Checking Products on Delivery

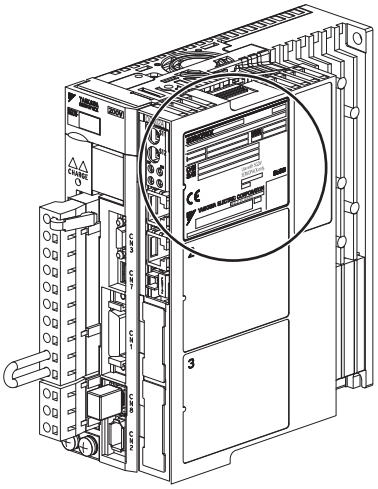
(1) When the Powerlink Network Module is Not Connected to the SERVOPACK

1. Mount the Powerlink Network Module to the SERVOPACK as described in the enclosed *Σ-V Series Command Option Module Installation Guide* (TOBP C720829 01).
   For the location of the nameplate, refer to *1.3 Nameplate Location*.
2. Check the nameplate to confirm that the product is the one that was ordered.
   For the nameplate, refer to *1.2 Nameplate and Model Designation*.

(2) When the Powerlink Network Module is Connected to the SERVOPACK

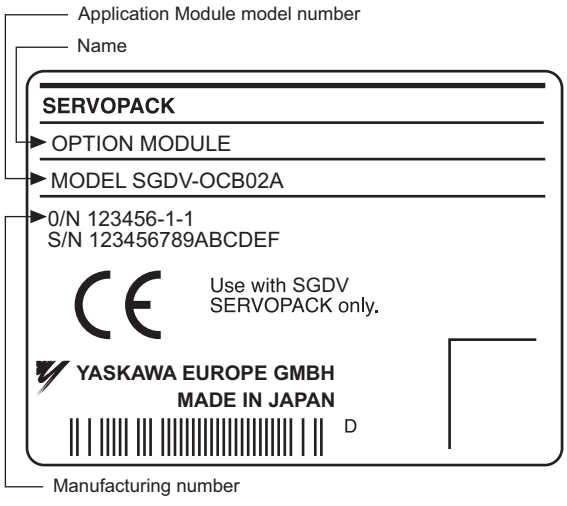
Check the nameplate to confirm that the Module that is mounted is the Powerlink Network Module.

The nameplate is located in the following position.



1.2 Nameplate and Model Designation

■ Nameplate Example



Nameplate

■ Model Designation

SGDV – OC B02 A

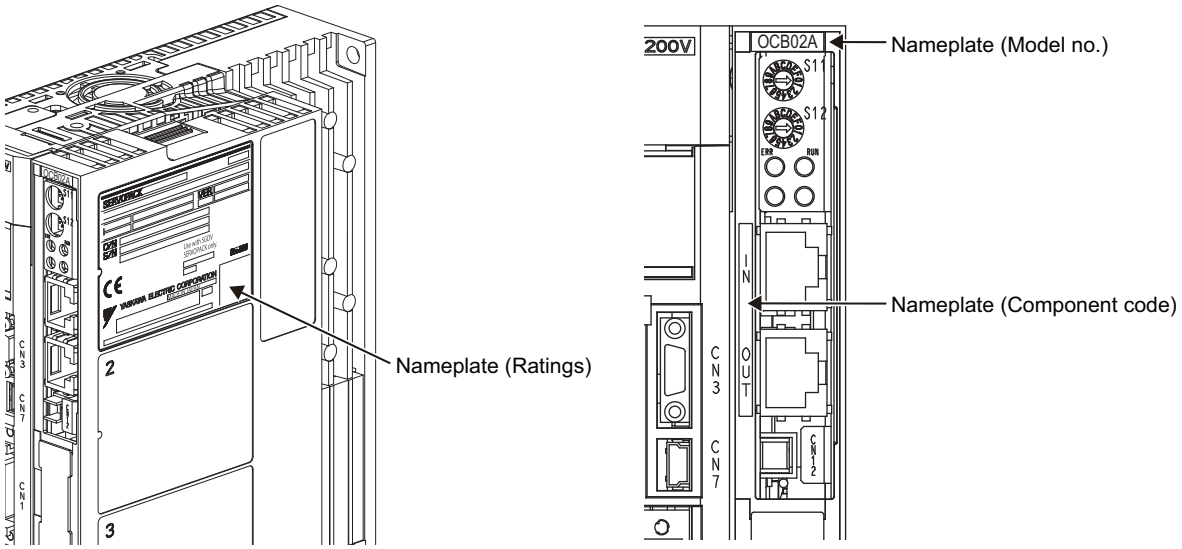
Series	
SGDV	Σ-V Series

1st + 2nd digits: Module Type	
Code	Module
OC	Command option module

3rd + 4th + 5th digits: Interface Specifications	
Code	Interface
B02	Ethernet POWERLINK

6th digit: Design Revision Order

1.3 Nameplate Location



2

Specifications

This chapter gives an overview and describes the specifications of the Ethernet POWERLINK Network Module.

2.1 Overview

The Σ-V series Ethernet POWERLINK Network Module implements the CANopen drive profile DS 402 from CiA402 in Ethernet POWERLINK communication (real-time Ethernet communication).

Position, velocity, and torque control can be performed. An appropriate form of system control can be selected, from simple positioning to high-speed, high-precision locus control.

Moreover, the Σ-V high servo control performance, advanced tuning function, and wide range of actuator controls can be performed via Powerlink.

2.2 Technical Terms

2.2.1 Data Type

This table lists the data types and ranges used in this manual.

Code	Data Type	Range
SINT	Signed 8 bit	–128 to +127
INT	Signed 16 bit	–32768 to +32767
DINT	Signed 32 bit	–2147483648 to +2147483627
USINT	Unsigned 8 bit	0 to 255
UINT	Unsigned 16 bit	0 to 65535
UDINT	Unsigned 32 bit	0 to 4294967295
STRING	String value	–

2.2.2 Data Units

This table describes the data units used in this manual.

Units	Description
Pos. unit	This is the user-defined position reference unit set by object 2301h. 1 [Pos. unit] = 2301:01h/2301:02h [inc]
Vel. unit	This is the user-defined velocity reference unit set by object 2302h. 1 [Vel. unit] = 2302:01h/2302:02h [inc/sec]
Acc. unit	This is the user-defined acceleration reference unit set by object 2303h. 1 [Acc. unit] = 2303:01h/2303:02h × 10^4 [inc/sec^2]
inc	This is the encoder pulse unit. For a 20-bit encoder, the resolution will be 1048576 [inc] per revolution.

2.3 Specifications of the Ethernet Powerlink Network Module

2.3.1 General Specifications

This table lists the general specifications of the Ethernet Powerlink Network Module.

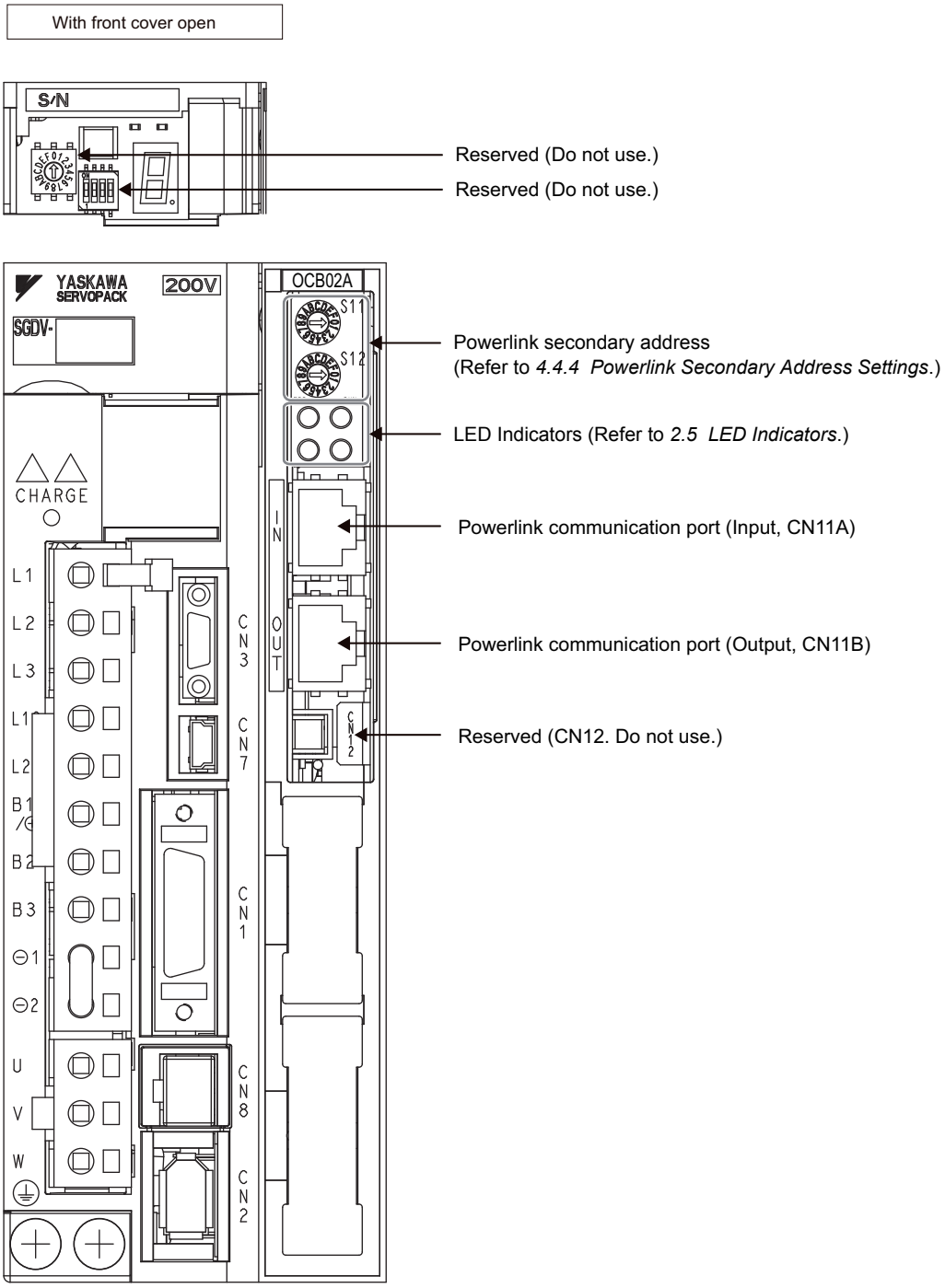
Applicable SERVOPACK			Σ-V Series SGDV-□□□□E1□ SERVOPACK (For rotational servomotor) Σ-V Series SGDV-□□□□E5□ SERVOPACK (For linear servomotor)
Placement			Attached to the SERVOPACK
Power Specification	Power Supply Method		Supplied from the control power supply of the SGDV SERVOPACK.
Operating Conditions	Surrounding Air/Storage Temperature		0°C to +55°C/ -20°C to +85°C
	Ambient/Storage Humidity		90% RH or less (with no condensation)
	Vibration/Shock Resistance		4.9 m/s^2 / 19.6 m/s^2
	Protection Class/ Pollution Degree		Protection class: IP10, Pollution degree: 2 An environment that satisfies the following conditions. • Free of corrosive or explosive gases • Free of exposure to water, oil or chemicals • Free of dust, salts or iron dust
	Altitude		1000 m or less
	Others		Free of static electricity, strong electromagnetic fields, magnetic fields or exposure to radioactivity
I/O Signals	Input signals	Fixed Allocation to CN1 Connector of SERVOPACK	4 inputs Negative limit switch or negative over travel (N-OT) Positive limit switch or positive over travel (P-OT) Reference switch or home switch (/DEC) General purpose input (/SI0) Probe latch inputs (/EXT1,/EXT2) No effect function (Can not use): External latch inputs (EXT3)
	Output signals	Fixed Allocation to CN1 Connector of SERVOPACK	3 outputs Signal allocations and positive/negative logics can be modified. Positioning completion (/COIN) Speed coincidence detection (/V-CMP) Servomotor rotation detection (/TGON) Servo ready (/S-RDY) Torque limit detection (/CLT) Speed limit detection (/VLT) Brake interlock (/BK) Warning (/WARN) NEAR (/NEAR)

2.3.2 Communication Specifications

Powerlink Communications	Communication profile	Ethernet Powerlink version V 2
	Physical layer	100BASE-TX (IEEE802.3)
	Fieldbus connection	2xRJ45; CN11A,CN11B
	Baud Rate Setting	100 MBit/s, half-duplex
	Node Address Setting	Select the address from 1 to 239 using rotary switches: S1,S2
	Communications Power Supply	Supplied from the internal power supply
	LED indicator	Red (ERR), Green (STATUS) Powerlink communicating (L/A) x 2
	Node type	Slave (CN = Controlled Node)
	SDO communication	1 server SDO over ASND and UDP
	PDO communication	Set of pre-defined PDOs type: Set for Servo drive. Supported RPDOs: 1 Supported TPDOs: 1 PDO mapping Dynamic with max. 8 mapping entries, default setting according to IEC 61800-7-301
	MN Guarding	By timeout-monitoring of SoC frames.
Powerlink Drive profiles	Standard	IEC 61800-7-1/2/3 Committee Draft
	Motor type	Servo
	Axis Type	Rotary, Linear
	Homing Modes	Supported Methods: 1-6, 17-20, 35, 33, 34 Motion profile type: linear Homing persistent in absolute motor encoder
	Profile Position mode	Single set point: Yes Set of set-points: Yes Motion Profile type: Linear
	Profile Velocity mode	Motion Profile type: Linear
	Profile Torque mode	Torque Profile type: Linear
	Interpolated Position mode	Buffering: No Interpolated sub-mode: Linear Synchronization by SOC (SYNC) Time Period: 0.5, 1, 2 and 4 ms

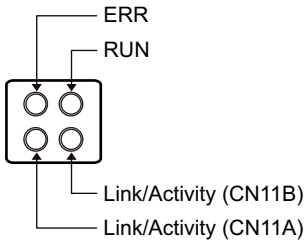
2.4 Part Names of the Powerlink Network Module

The following figure shows the part names of the Powerlink Network Module.



2.5 LED Indicators

This diagram shows details of the LED indicators.



■ RUN

The RUN indicator shows the status of Powerlink communication.

Green LED (STATUS)	State	Flash rates
LED off	NMT_GS_OFF, NMT_GS_INITIALISATION, NMT_CS_NOT_ACTIVE	Constantly off
LED flickering	NMT_CS_BASIC_ETHERNET	Equal on and off times with a frequency of approximately 10 Hz: on for approximately 50 ms and off for approximately 50 ms.
LED single flash	NMT_CS_PRE_OPERATIONAL_1	One short flash (approximately 200ms) followed by a long off phase (approximately 1000 ms).
LED double flash	NMT_CS_PRE_OPERATIONAL_2	A sequence of two short flashes (approximately 200 ms), separated by an off phase (approximately 200ms). The sequence is finished by a long off phase (approximately 1000 ms).
LED triple flash	NMT_CS_READY_TO_OPERATE	A sequence of three short flashes (approximately 200ms), separated by an off phase (approximately 200ms). The sequence is finished by a long off phase (approximately 1000 ms).
LED on	NMT_CS_OPERATIONAL	Constantly on
LED blinking	NMT_CS_STOPPED	Equal on and off times with a frequency of approximately 2,5 Hz: on for approximately 200 ms followed by off for approximately 200 ms.

■ ERR

The ERR indicator shows the error status of Powerlink communication.

Red LED (Error)	State	Description
Off	No error	The device is in working condition.
On	Error	Communication error occurs NMT_GT6 or NMT_CT11

■ Link/Activity

The Link/Activity indicators show the status of the physical link and show activity on this link.

Green LED state	Link	Activity
On	Yes	No
Flickering	Yes	Yes
Off	No	(Not applicable)

3

SERVOPACK Installation

This chapter describes how to install the SERVOPACK.

3.1 SERVOPACK Installation Environment and Applicable Standards

SERVOPACK installation environment and applicable standards are as follows.

3.1.1 Installation Environment

- Surrounding air temperature: 0 to 55°C
- Ambient humidity: 90% RH or less (with no condensation)
- Altitude: 1,000 m or less
- Vibration resistance: 4.9 m/s^2
- Shock resistance: 19.6 m/s^2
- Installation Precautions

  • Mounting in a Control Panel

  To prevent the temperature around the SERVOPACK from exceeding 55°C, take into account the size of the control panel, the layout of the SERVOPACK, and the cooling method. For details, refer to *3.2 SERVOPACK Installation*.

  • Mounting Near a Heating Unit

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

  • Mounting Near a Vibration Source

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

  • Mounting to a Location Exposed to Corrosive Gas

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

  • Other Locations

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

  <Note>

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

  • -20 to +85°C, 90% RH or less (with no condensation)

3.1.2 Installation Conditions for Applicable Standards

Applicable Standards	UL508C EN50178, EN55011/A2 group1 classA, EN61000-6-2, EN61800-3, EN61800-5-1, EN954-1, IEC61508-1 to 4
Operating Conditions	Overvoltage category: III Pollution degree: 2 Protection class: IP10
Installation Conditions	UL Standard and Low Voltage Directive: Satisfy the conditions outlined in *Σ-V Series AC SERVOPACK SGDV Safety Precautions* (TOBP C710800 10) EMC Directive: Certification is required after installation in the user's machine under the conditions outlined in *3.3 EMC Installation Conditions*.

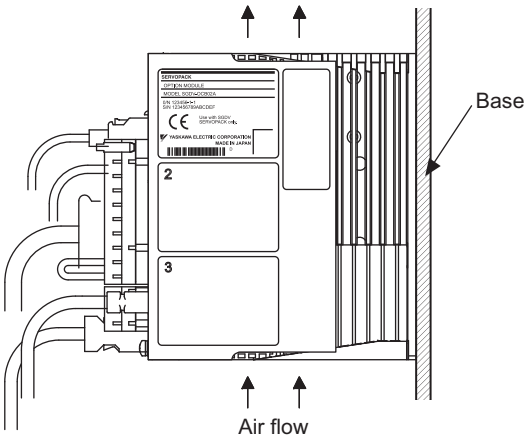
3.2 SERVOPACK Installation

3.2.1 Orientation

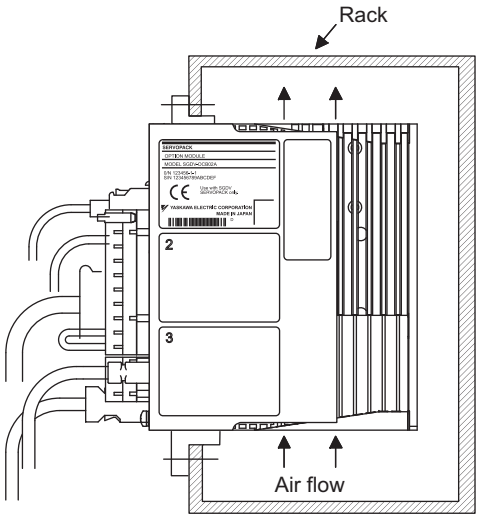
The SERVOPACK is available in models that are base-mounted, models that are rack-mounted, and models that are duct-ventilated. In any case, mount the SERVOPACK with a vertical orientation.

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

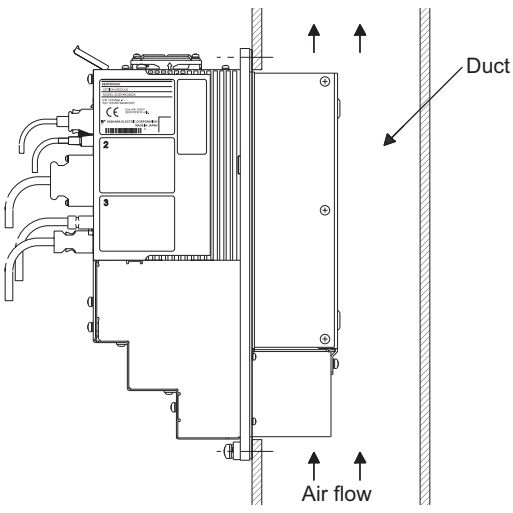
• Base-mounted



• Rack-mounted



• Duct-ventilated



3.2.2 Installation Standards

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

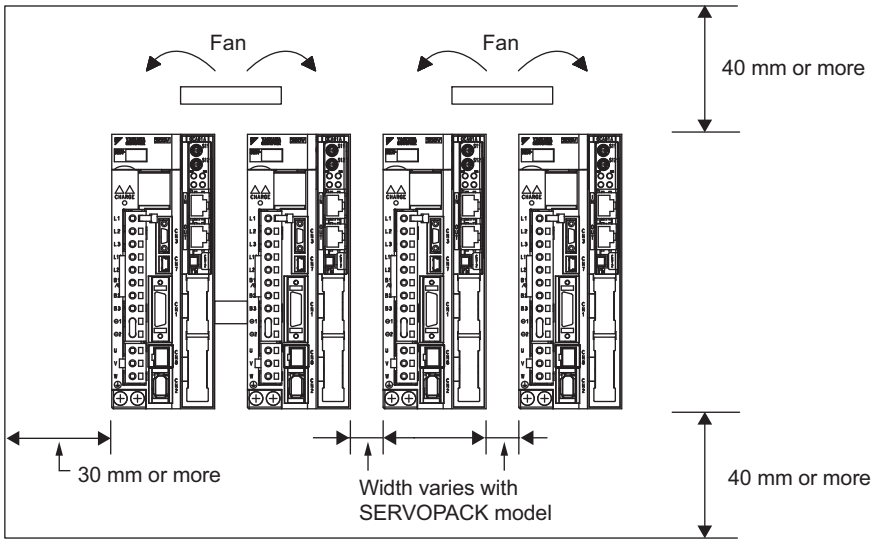
- SERVOPACK Mounting Orientation

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

- Cooling

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

- Mounting SERVOPACKs Side by Side in a Control Panel



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

SERVOPACK Model SGDV-	Side		Top and bottom
	Left	Right	
R70F, R90F, 2R1F, R70A, R90A, 1R6A, 2R8A	1 mm or more		40 mm or more
2R8F, 3R8A, 5R5A, 7R6A	1 mm or more	10 mm or more	
120A, 180A, 200A, 330A, 470A, 550A, 590A, 780A, 1R9D, 3R5D, 5R4D, 8R4D, 120D, 170D, 210D, 260D, 280D, 370D	10 mm or more		

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

- Inside the Control Panel

  The conditions inside the control panel should be the same as the environmental conditions of the SERVOPACK. Refer to *3.1.1 Installation Environment*.

3.3 EMC Installation Conditions

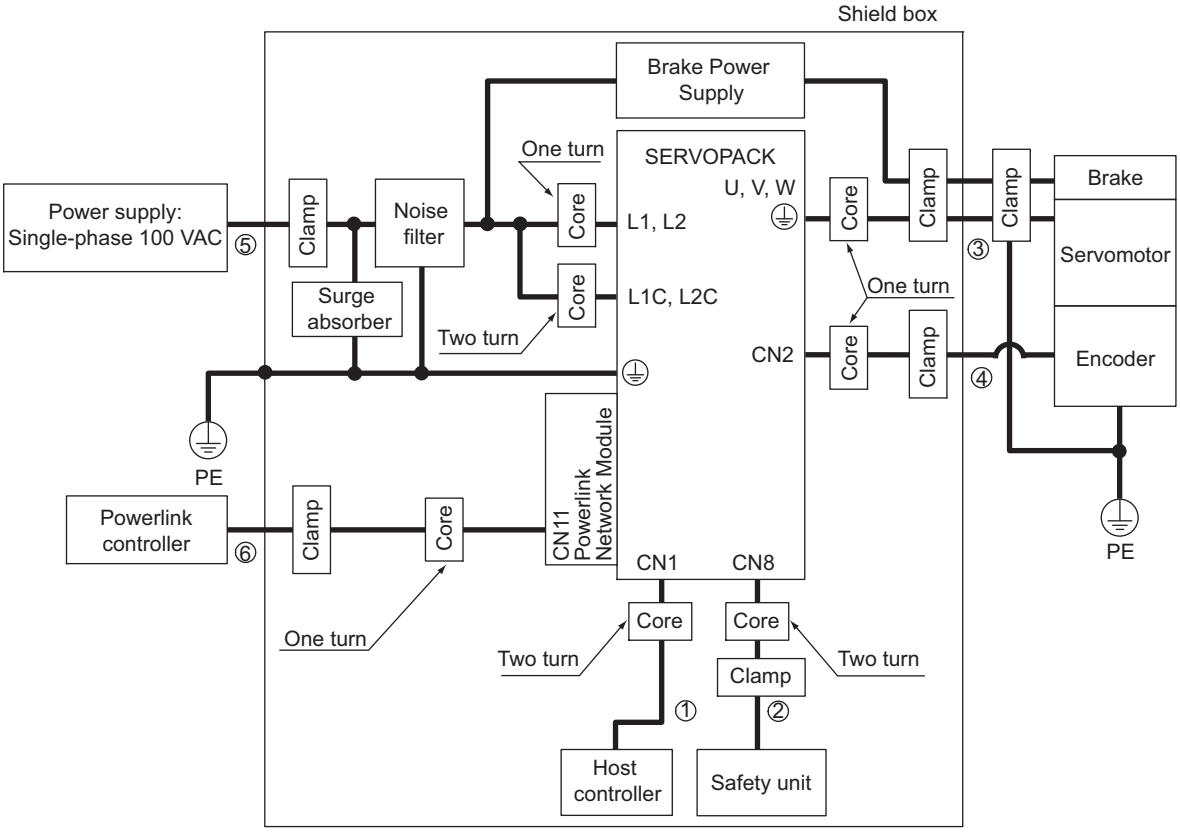
This section describes the recommended installation conditions that satisfy EMC guidelines for each model of the SGDV SERVOPACK. The conditions required for the standard type (base-mounted) of the SERVOPACK are described. Refer to this section for other SERVOPACK models such as the rack-mounted types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

This section describes the EMC installation conditions satisfied in test conditions prepared by Yaskawa. The actual EMC level may differ depending on the actual system's configuration, wiring, and other conditions. However, because this product is built-in, check that the following conditions are still met after being installed in the user's product.

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

■ Single-phase 100 V

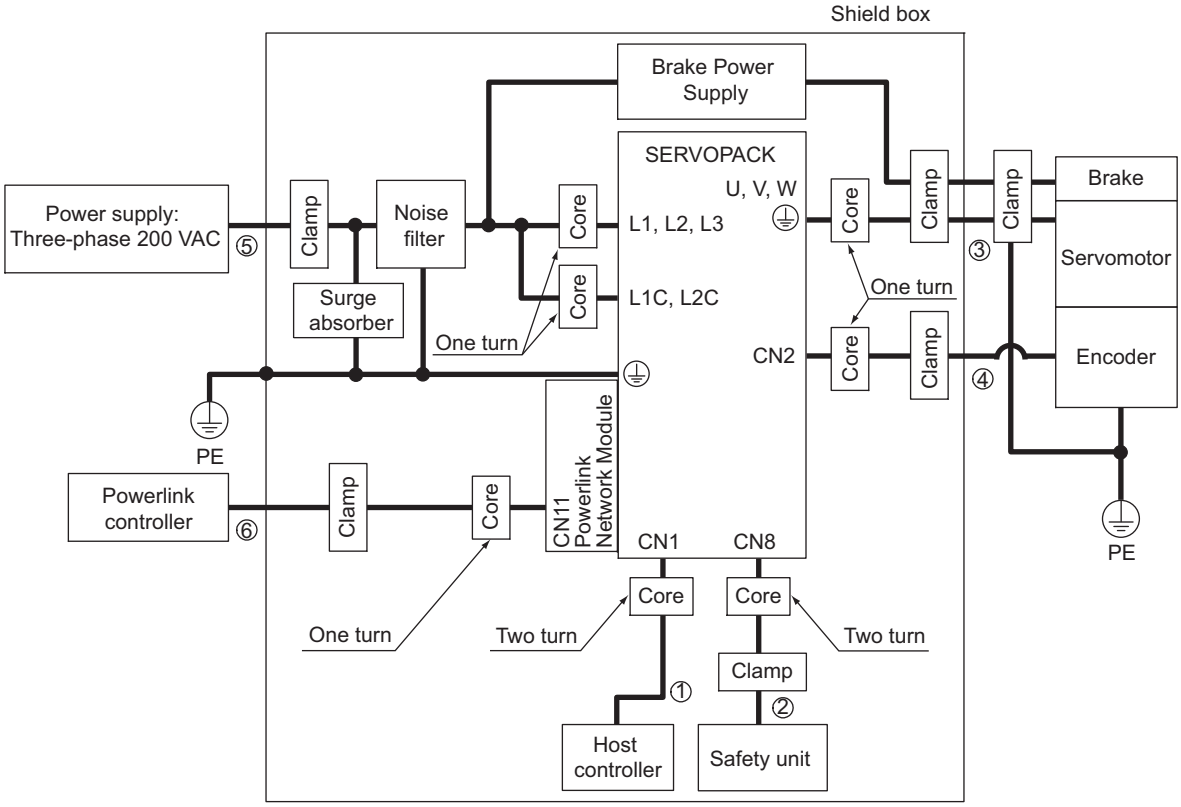
- SGDV-□□□FE1A (□□□ = R70, R90, 2R1, 2R8) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Ethernet communication cable	Shield cable

■ Three-phase 200 V

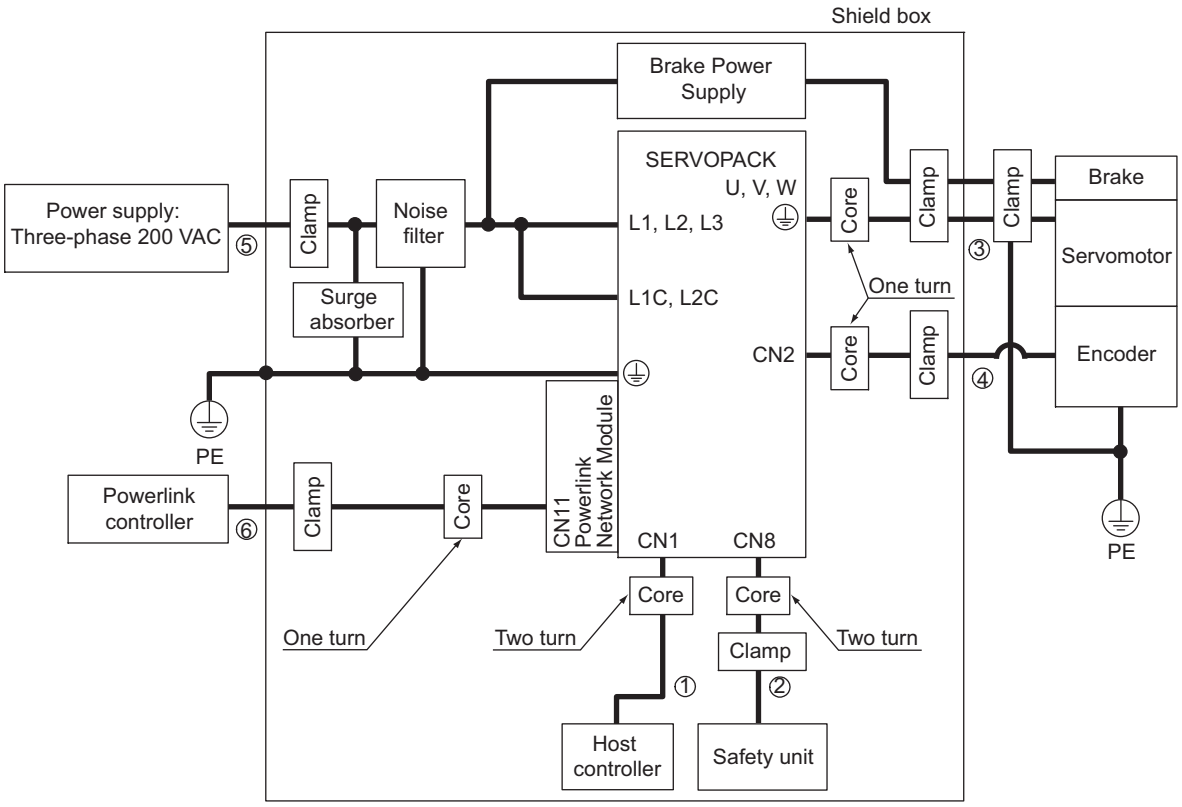
• SGDV-□□□AE1A (□□□ = R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Ethernet communication cable	Shield cable

■ Three-phase 200 V

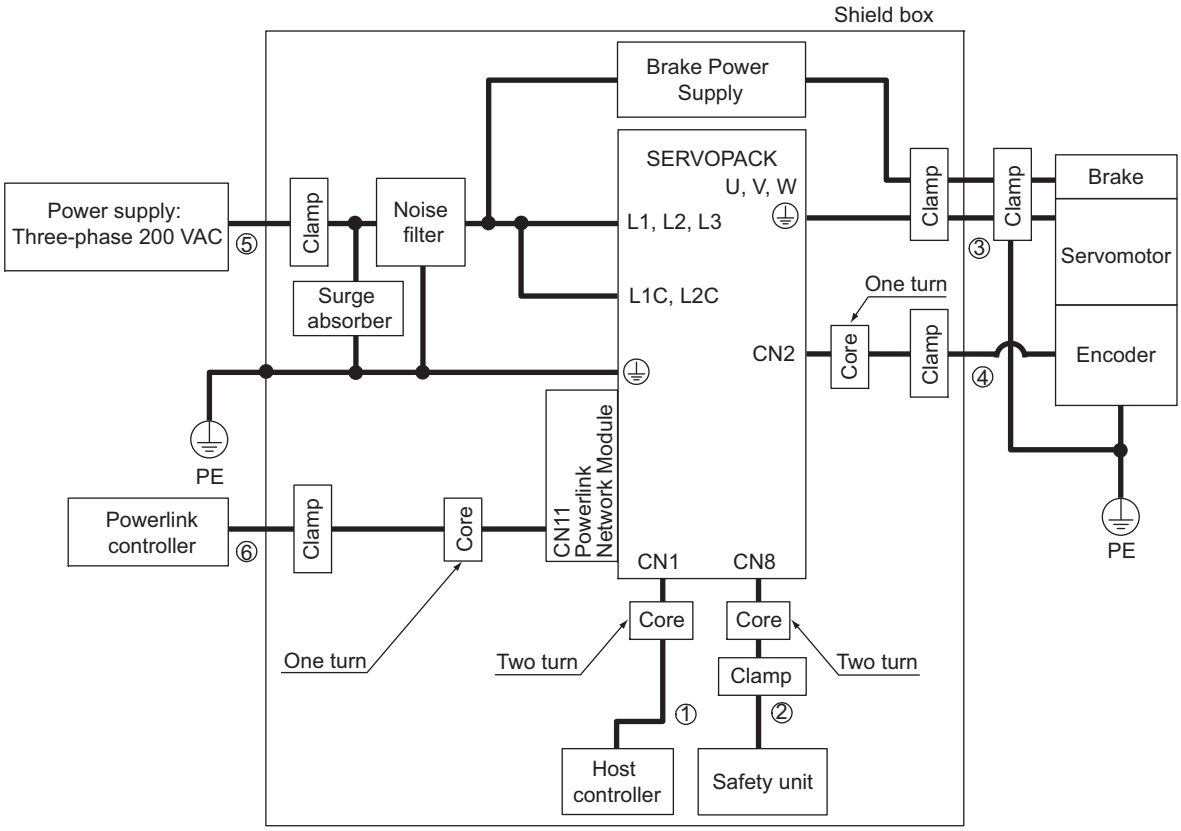
• SGDV-□□□AE1A (□□□ = 120) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Ethernet communication cable	Shield cable

■ Three-phase 200 V

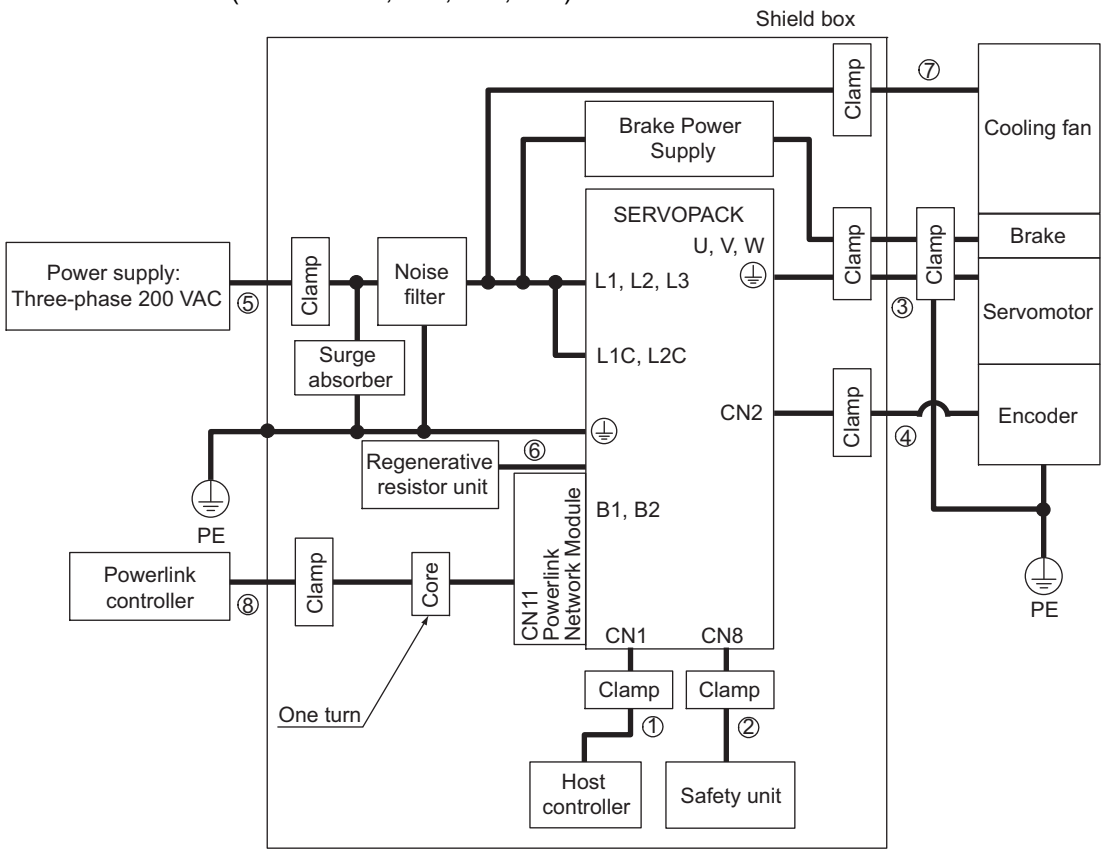
• SGDV-□□□AE1A (□□□ = 180, 200, 330) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Ethernet communication cable	Shield cable

■ Three-phase 200 V

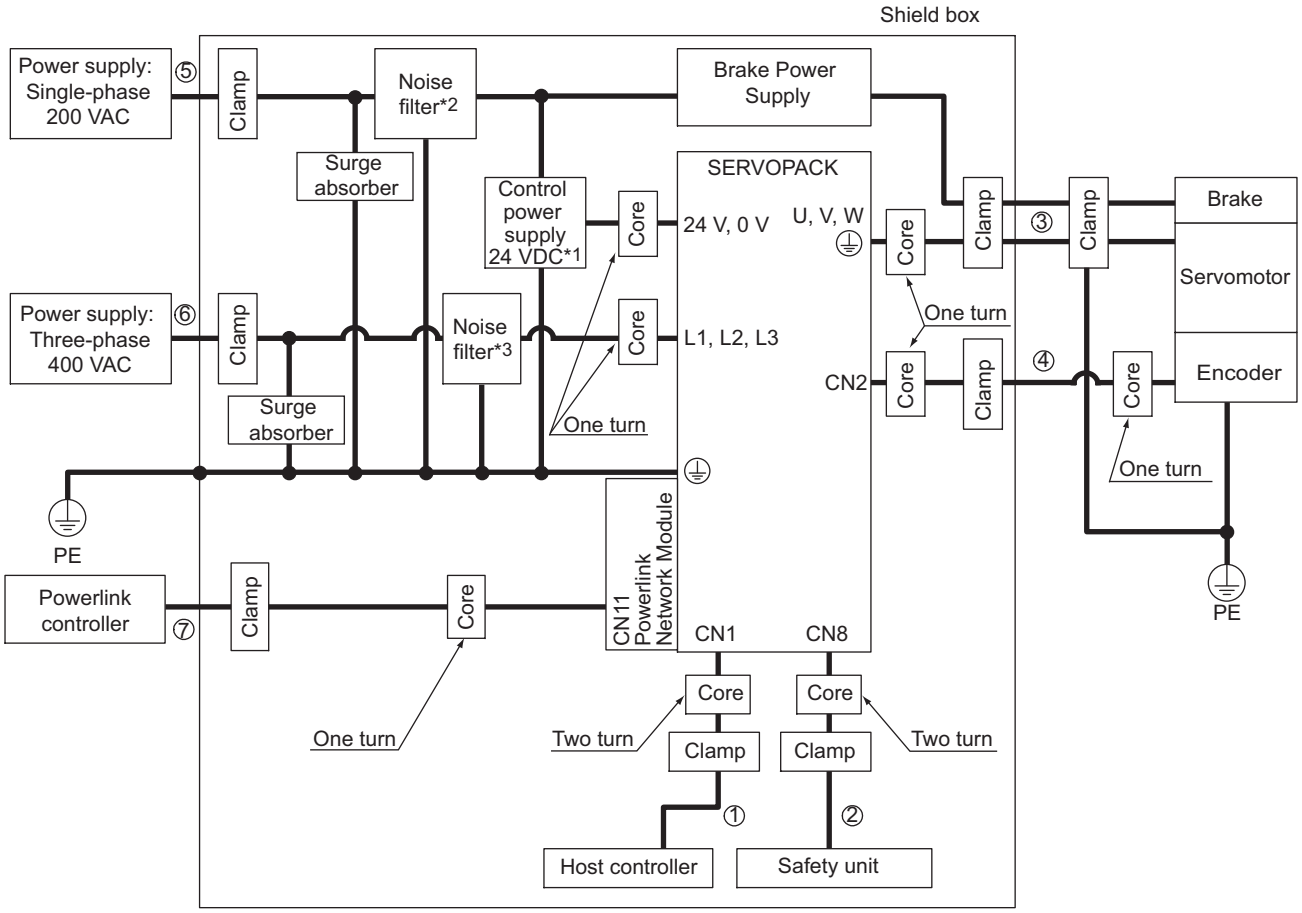
• SGDV-□□□AE1A (□□□ = 470, 550, 590, 780) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Main circuit cable	Shield cable
⑥	Regenerative resistor unit cable	Non-shield cable
⑦	Cooling fan cable	Shield cable
⑧	Ethernet communication cable	Shield cable

■ Three-phase 400 V

• SGDV-□□□DE1A (□□□ = 1R9, 3R5, 5R4, 8R4, 120, 170) + SGDV-OCB02A

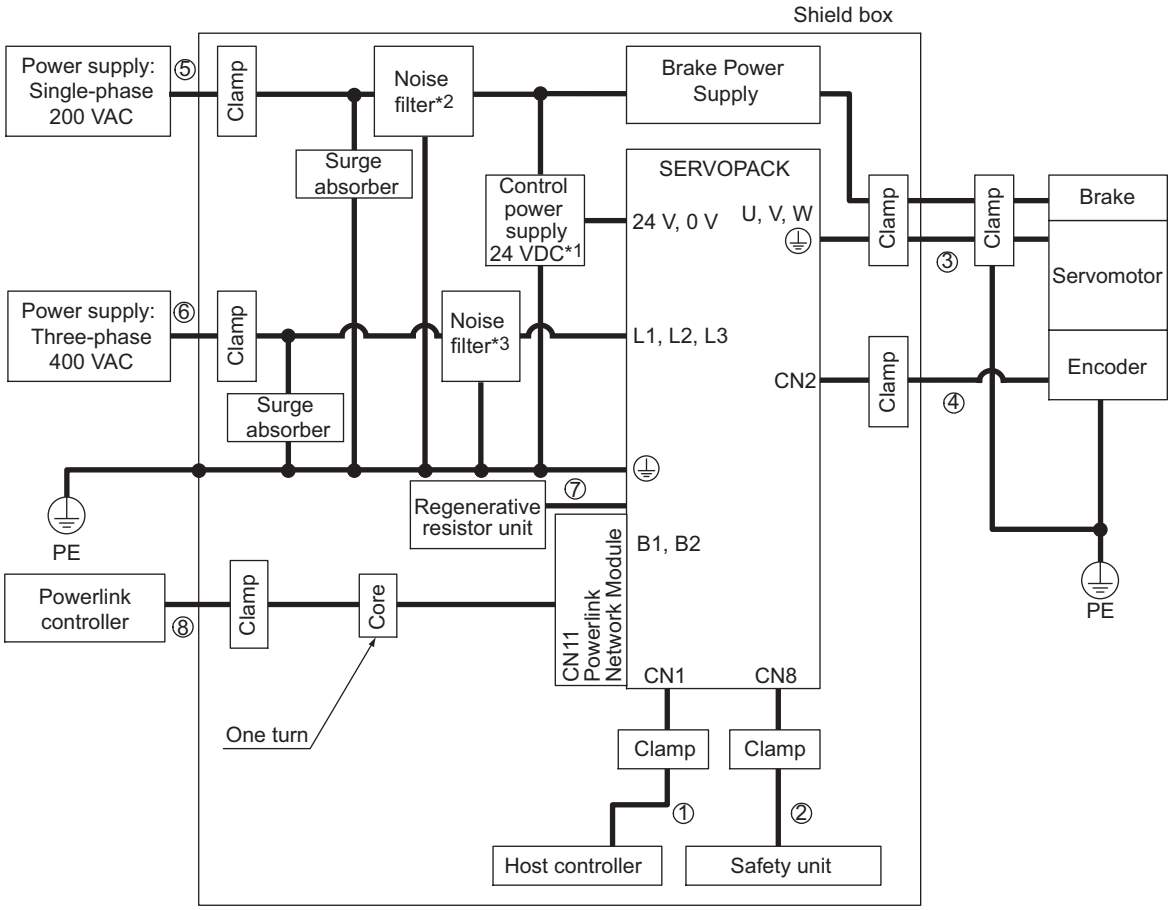


Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Ethernet communication cable	Shield cable

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

■ Three-phase 400 V

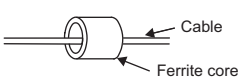
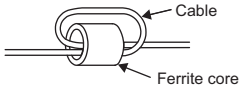
• SGDV-□□□DE1A (□□□ = 210, 260, 280, 370) + SGDV-OCB02A



Symbol	Cable Name	Specification
①	I/O signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Regenerative resistor unit cable	Non-shield cable
⑧	Ethernet communication cable	Shield cable

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

■ Attachment Methods of Ferrite Cores

One turn	Two turn
	

■ Recommended Ferrite Core

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

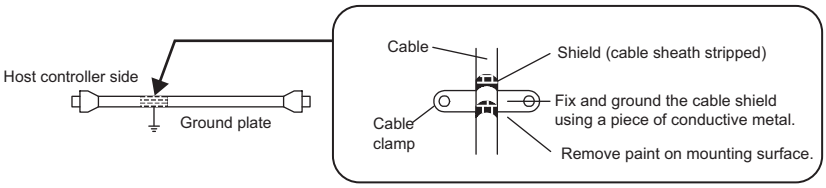
■ Recommended Noise Filter and Surge Absorber

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

■ Fixing the Cable

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

• Example of Cable Clamp



■ Shield Box

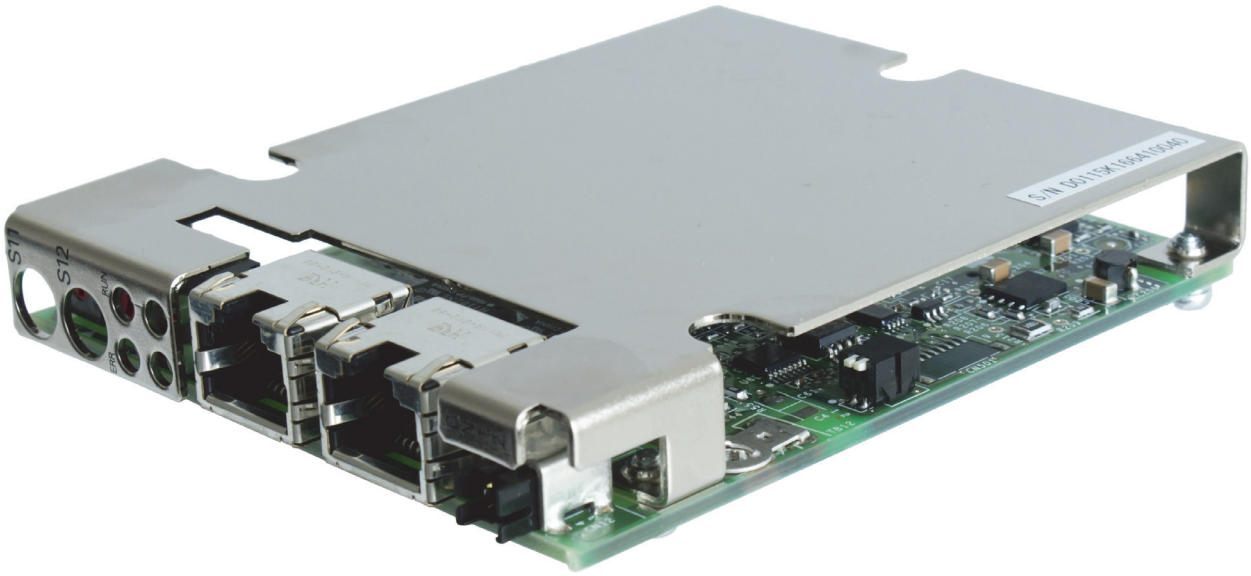
A shield box, which is a closed metallic enclosure, is effective as reinforced shielding against electromagnetic interference (EMI) from SERVOPACKs. The structure of the box should allow the main body, door, and cooling unit to be attached to the ground. The box opening should be as small as possible.

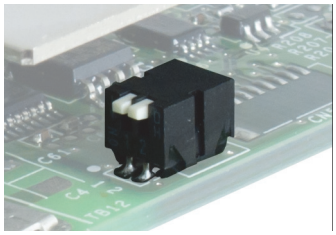
<Note>
Do not connect the digital operator and the analog monitor cable to the SERVOPACK during operations. Connect them only when the machinery is stopped during maintenance.

3.4 DIP Switches on the Powerlink Card

For proper use the DIP switches must be set as follows:

DIP Switch 1: OFF
DIP Switch 2: OFF





4

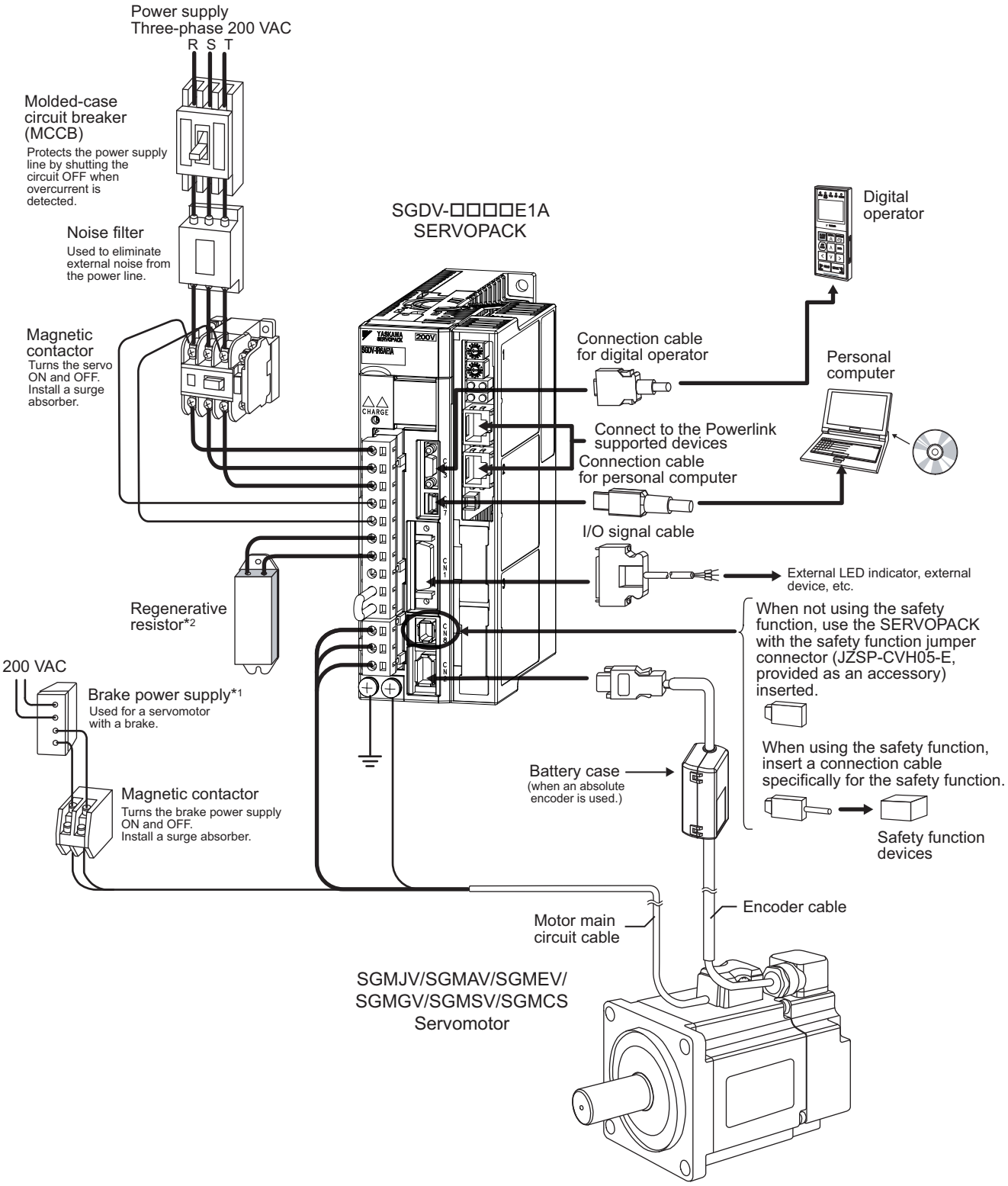
Wiring and Connection

This chapter describes an example of how a system is configured using the Ethernet Powerlink Network Module, how the I/O signals are connected, and how the cable for Powerlink communication is connected.
For details on the main circuit, encoders, safety devices, and regenerative resistors, refer to the following manual.
For more information on safe and stable usage of the servo system, be sure to read the precautions in the section labelled, "IMPORTANT," in the following manual.

- Σ-V Series User's Manual Design and Maintenance
  Rotational Motor/ Command Option Attachable Type
  Chapter 3 Wiring and Connection (SIEP S800000 60)

4.1 System Configuration Diagram

■ Connecting to SGDV-□□□□E1A SERVOPACK



∗1. Use a 24-VDC power supply. (not included.)

∗2. Before connecting an external regenerative resistor to the SERVOPACK, refer to *Σ-V Series User's Manual Design and Maintenance Rotational Motor/ Command Option Attachable Type* (SIEP S800000 60).

Note: The connections and wiring of the power supply of the main circuit and that of the controls differ in accordance with the SERVOPACK to be used. For details, refer to *Σ-V Series User's Manual Design and Maintenance Rotational Motor/ Command Option Attachable Type* (SIEP S800000 60).

4.2 I/O Signal Connections

This section describes the names and functions of I/O signals (CN1). Also terminal layout and connection examples by control method are shown.

4.2.1 I/O Signal (CN1) Names and Functions

The following table shows the names and functions of I/O signals (CN1).

(1) Input Signals

Signal	Pin No.	Name	Function	Reference Section
P-OT N-OT	7 8	Forward run prohibited, Reverse run prohibited	Overtravel prohibited: Stops servomotor when movable part travels beyond the allowable range of motion.	5.7
/Probe1 (/SI4) /Probe2 (/SI5)	10 11	Probe 1 latch signal Probe 2 latch signal	Connects the Probe signals to latch the value of the feedback counter.	7.9
/Home (/SI6)	9	Home switch input signal	Connects the Home signal for homing.	7.5
+24VIN	6	Control power supply for sequence signal	Control power supply input for sequence signals: The 24 VDC power supply is not included. Allowable voltage fluctuation range: 11 to 25 V	–
BAT (+) BAT (-)	14 15	Battery (+) input signal Battery (–) input signal	Connecting pin for the absolute encoder backup battery.	–
/SI0 /SI3	13 12	General-purpose input signal	General-purpose input signal	8.13 (1)

Note 1. The functions allocated to P-OT, N-OT, /Probe1, /Probe2, and /Home input signals can be changed by using the parameters. Refer to *4.3.1 Input Signal Allocations*.

2. If the Forward run prohibited/ Reverse run prohibited function is used, the software can be used to stop the SERVOPACK. If the application does not satisfy the safety requirements, add an external circuit for safety reasons as required.

(2) Output Signals

Signal	Pin No.	Name	Function	Reference Section
ALM+ ALM-	3 4	Servo alarm output signal	Turns OFF when an error is detected.	–
/BK+ (/SO1+) /BK- (/SO1-)	1 2	Brake interlock signal	Controls the brake. The brake is released when the signal turns ON. Allocation can be changed to general-purpose output signals (/SO1+, /SO1-).	–
/SO2+ /SO2- /SO3+ /SO3-	23 24 25 26	General-purpose output signal	General-purpose output signal Note: Set the parameter to allocate a function.	8.13 (2)
PAO /PAO	17 18	Phase-A signal	Output signals of the 90° phase differential for the dividing pulse of the encoder	–
PBO /PBO	19 20	Phase-B signal		
PCO /PCO	21 22	Phase-C signal	Output signal for origin pulse of the encoder	
SG	16	Signal ground	Control circuit = 0 V	–
FG	Shell	Frame ground	Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell.	–

Note: For more information on the allocation of /SO1, /SO2, and /SO3, refer to *4.3.2 Output Signal Allocations.*

4.2.2 I/O Signal Connector (CN1) Terminal Layout

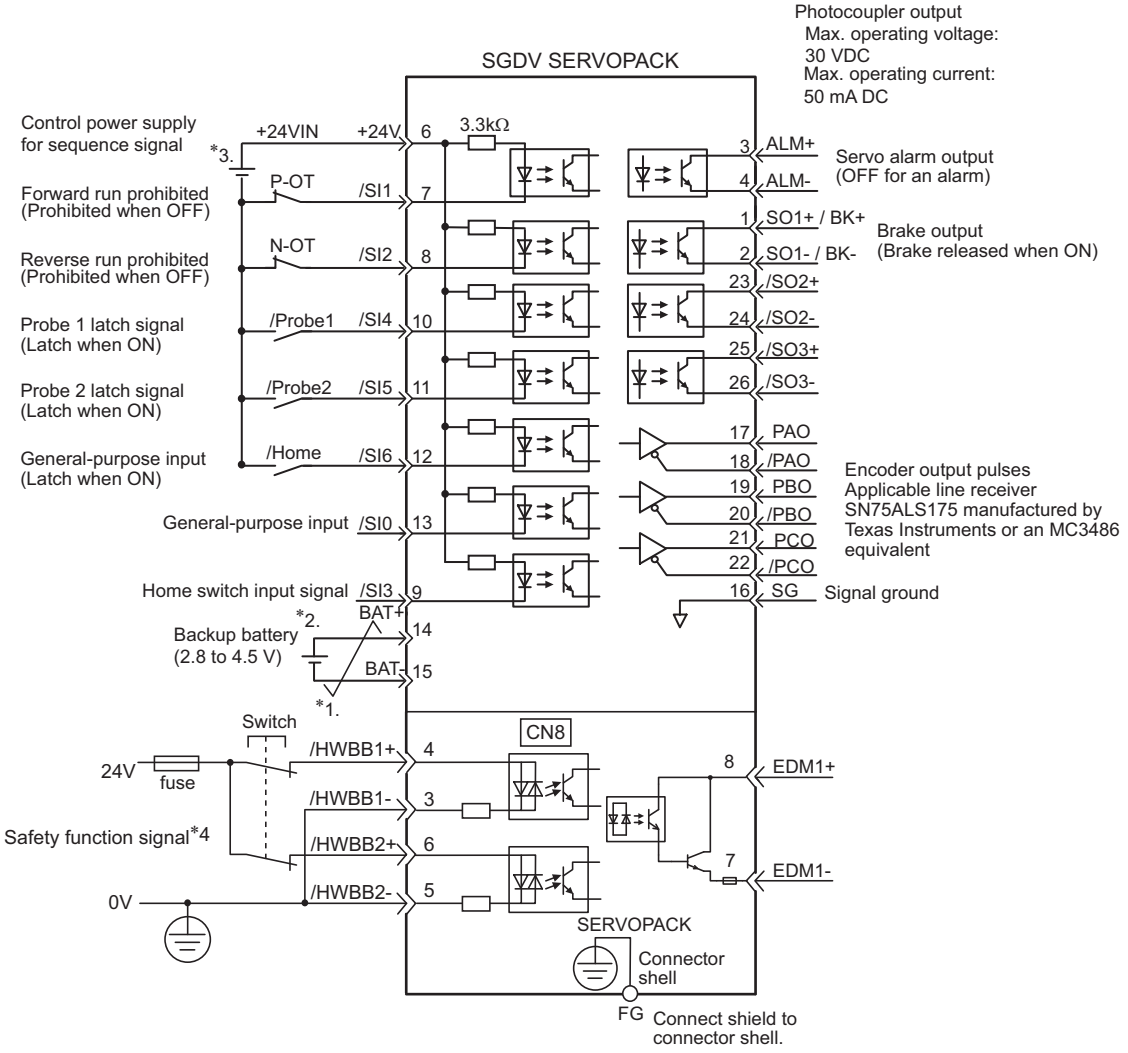
The following table shows the terminal layout of I/O signal connectors (CN1).

1	/BK+ (/SO1+)	Brake output	2	/BK- (/SO1-)	Brake output	14	BAT(+)	Battery (+) input	15	BAT(-)	Battery (-) input
3	ALM+	Servo alarm output	4	ALM-	Servo alarm output	16	SG	Signal ground	17	PAO	Encoder output pulse Phase A
5			6	+24VIN	Control power supply for sequence signal input	18	/PAO	Encoder output pulse Phase A	19	PBO	Encoder output pulse Phase B
7	P-OT (/SI1)	Forward run prohibited input	8	N-OT (/SI2)	Reverse run prohibited input	20	/PBO	Encoder output pulse Phase B	21	PCO	Encoder output pulse Phase C
9	/Home /SI3	Home switch input	10	/Probe1 (/SI4)	Probe 1 latch signal input	22	/PCO	Encoder output pulse Phase C	23	/SO2+	General-purpose input
11	/Probe2 (/SI5)	Probe 2 latch signal input	12	(/SI6)	General-purpose input	24	/SO2-	General-purpose input	25	/SO3+	General-purpose input
13	/SI0	General-purpose input				26	/SO3-	General-purpose input			

Note 1. Do not use unused terminals.
2. Connect the shield of the I/O signal cable to the connector shell.
Connect to the FG (frame ground) at the SERVOPACK connector.
3. The functions allocated to the following input signals can be changed by using the parameters.
Input signals: P-OT, N-OT, /Probe1, /Probe2, /Home
4. The output signals /SO1, /SO2, and /SO3 can be used as the output signal /COIN, /V-CMP, /TGON, /S-RDY, /CLT, /VLT, /BK, /WARN, or /NEAR by setting the parameter Pn50E, Pn50F, or Pn510. For details, refer to *4.3.2 Output Signal Allocations*.

4.2.3 Example of I/O Signal Connections

The following diagram shows a typical connection example.



∗1. ⩘ represents twisted-pair wires.

∗2. Connect when using an absolute encoder. When the encoder cable for the battery case is connected, do not connect a backup battery.

∗3. The 24 VDC power supply is not included. Use a power supply with double insulation or reinforced insulation.

∗4. To turn the servomotor power ON, a safety device must be connected and the wiring to activate the safety function must be done. When not using the safety function, use the SERVOPACK with the plug (JZSP-CVH05-E, provided as an accessory) inserted into the CN8.

Note: The functions allocated to the input signals P-OT, N-OT, /Probe1, /Probe2, and /Home and the output signals /SO1, /SO2, and /SO3 can be changed by using the parameters. Refer to *4.3.1 Input Signal Allocations* and *4.3.2 Output Signal Allocations*.

4.3 I/O Signal Allocations

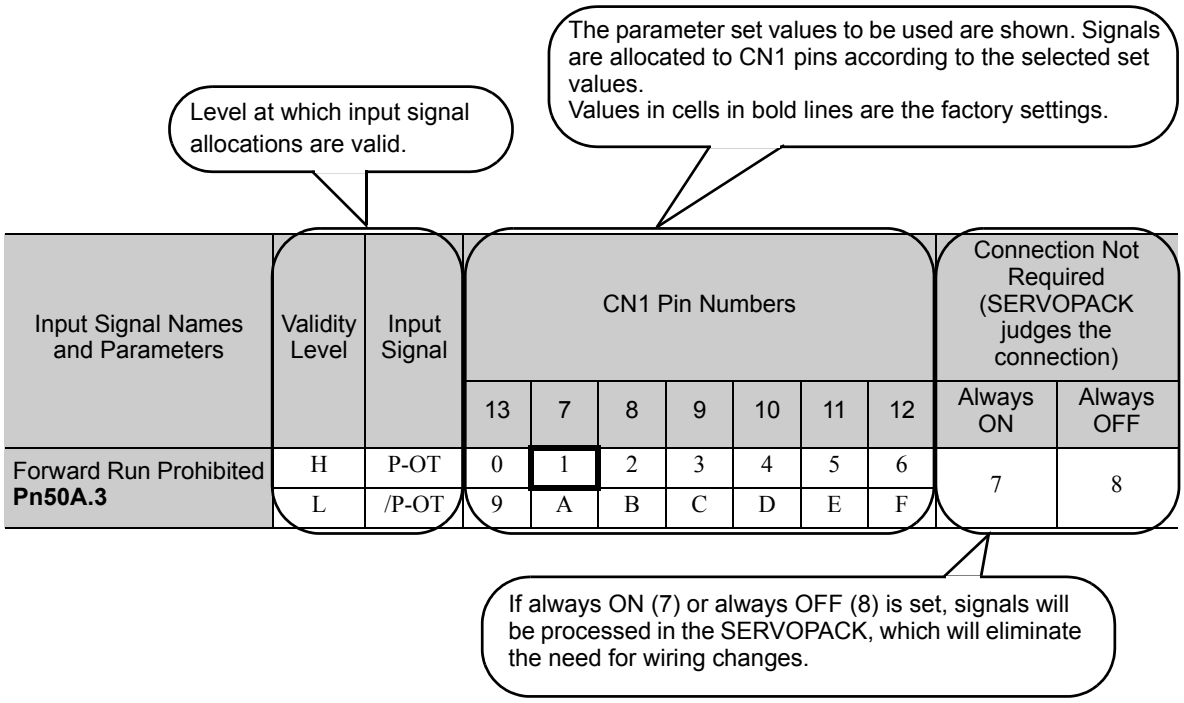
This section describes the I/O signal allocations.

4.3.1 Input Signal Allocations

Input signals are allocated as shown in the following table.

Refer to the *Interpreting the Input Signal Allocation Tables* and change the allocations accordingly.

<Interpreting the Input Signal Allocation Tables>



Input Signal Names and Parameters	Validity Level	Input Signal	CN1 Pin Numbers							Connection Not Required (SERVOPACK judges the connection)	
			13	7	8	9	10	11	12	Always ON	Always OFF
Forward Run Prohibited **Pn50A.3**	H	P-OT	0	**1**	2	3	4	5	6	7	8
	L	/P-OT	9	A	B	C	D	E	F		

Input Signal Names and Parameters	Validity Level	Input Signal	CN1 Pin Numbers							Connection Not Required (SERVOPACK judges the connection)	
			13	7	8	9	10	11	12	Always ON	Always OFF
Forward Run Prohibited **Pn50A.3**	H	P-OT	0	**1**	2	3	4	5	6	7	8
	L	/P-OT	9	A	B	C	D	E	F		
Reverse Run Prohibited **Pn50B.0**	H	N-OT	0	1	**2**	3	4	5	6	7	8
	L	/N-OT	0	A	B	C	D	E	F		
Home Switch Signal **Pn511.0**	L	/Home	*	*	*	*	4	5	**6**	–	8
	H	Home	*	*	*	*	D	E	F		
Probe 1 Latch Signal **Pn511.1**	L	/Probe1	*	*	*	*	**4**	5	6	–	8
	H	Probe1	*	*	*	*	D	E	F		
Probe 2 Latch Signal **Pn511.2**	L	/Probe2	*	*	*	*	4	**5**	6	–	8
	H	Probe2	*	*	*	*	D	E	F		

* Always set to OFF.

IMPORTANT

1. Inverting the polarity of Forward Run Prohibited, and Reverse Run Prohibited signals, i.e. positive logic, will prevent the holding brake from working in case of its signal line disconnection.
   If this setting is absolutely necessary, check the operation and confirm that there are no safety problems.
2. When two or more signals are allocated to the same input circuit, input signal level is valid for all allocated signals.

4.3.2 Output Signal Allocations

Output signals are allocated as shown in the following table.

Refer to the *Interpreting the Output Signal Allocation Tables* and change the allocations accordingly.

<Interpreting the Output Signal Allocation Tables>

The parameter set values to be used are shown.
Signals are allocated to CN1 pins according to the selected set values.
Values in cells in bold lines are the factory settings.

Output Signal Names and Parameters	Output Signal	CN1 Pin Numbers			Invalid (not use)
		1/ (2)	23/ (24)	25/ (26)	
Brake **Pn50F.2**	/BK	1	2	3	0

Output Signal Names and Parameters	Output Signal	CN1 Pin Numbers			Invalid (not use)
		1/ (2)	23/ (24)	25/ (26)	
Positioning Completion **Pn50E.0**	/COIN	1	2	3	0
Speed Coincidence Detection **Pn50E.1**	/V-CMP	1	2	3	0
Rotation Detection **Pn50E.2**	/TGON	1	2	3	0
Servo Ready **Pn50E.3**	/S-RDY	1	2	3	0
Torque Limit Detection **Pn50F.0**	/CLT	1	2	3	0
Speed Limit Detection **Pn50F.1**	/VLT	1	2	3	0
Brake **Pn50F.2**	/BK	1	2	3	0
Warning **Pn50F.3**	/WARN	1	2	3	0
Near **Pn510.0**	/NEAR	1	2	3	0
Output signal polarity inversion **Pn512.0=1**	Polarity inversion of CN1-1(2)				0 (Not invert at factory setting)
Output signal polarity inversion **Pn512.1=1**	Polarity inversion of CN1-23(24)				
Output signal polarity inversion **Pn512.2=1**	Polarity inversion of CN1-25(26)				

IMPORTANT

- The signals not detected are considered as “Invalid.”
- Inverting the polarity of the brake output signal (/BK), i.e. positive logic, will prevent the holding brake from working in case of its signal line disconnection.
  If this setting is absolutely necessary, check the operation and confirm that there are no safety problems.
- If two or more signals are allocated to the same output circuit, a signal is output with OR logic circuit.
- If the output signals are used as general-purpose output signals for Digital Output (Object: 60FEh), disable the settings for Pn50E, Pn50F, and Pn510.

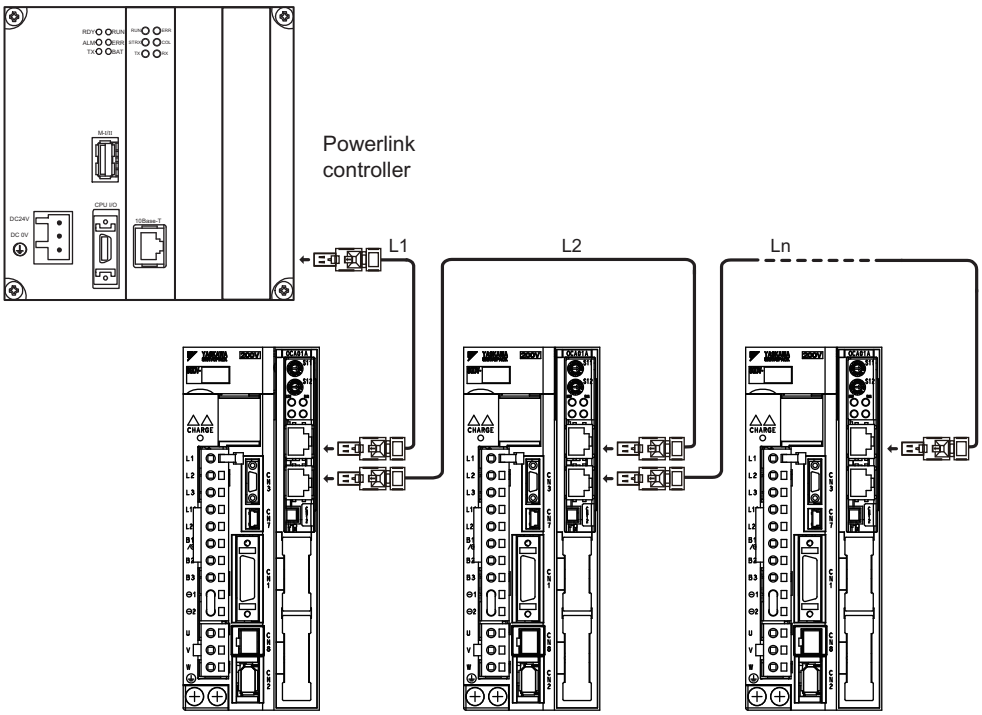
4.4 Connection Example of Powerlink Communication

4.4.1 Connection Example

The following figure shows an example of connections between a host controller and a SERVOPACK using the Powerlink communication.

Connect the connector of the Powerlink communications cable to the connectors, CN11A and CN11B.

Connect CN11A to the master and CN11B to the slave. If reversed, communication will not be successfully performed.



Note: The maximum length of cables between stations (L1 to Ln) is 50 m.

4.4.2 Powerlink Connector (RJ45)

Connector	Description
CN11A	Powerlink signal input
CN11B	Powerlink signal output

- Connector Pin Arrangement

Pin No.	Signal Name	Remarks
1	TD+	Send data
2	TD-	
3	RD+	Receive data
4	–	N.C.*
5	–	N.C.*
6	RD-	Receive data
7	–	N.C.*
8	–	N.C.*

* Pins denoted as N.C. do not connect to any signal.

4.4.3 Ethernet Cable

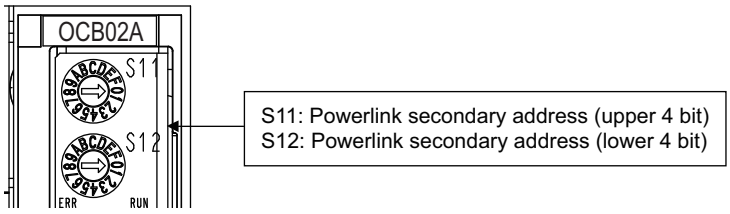
Ethernet cables in CAT5e quality can be used as the connection cables.
Also, requirements of a cable is follows.

Shield type: S/STP or S/UTP
Length: Max. 50 m (between the nodes)

Note: Using other type of cables might lead to noise and communication problems.

4.4.4 Powerlink Secondary Address Settings

The Powerlink secondary address (Station Alias) can be used for identification or for addressing of a device.



(1) General Identification Process during Start Up

During start up the master detects the slaves by using the Auto Increment Addressing. The Identity object will be read from the slave and compared with the values from the master's configuration (which was provided by the Powerlink configuration tool before). So the order of the slaves in the network has to be the same as in the master's configuration. To allow a different network topology a Station Alias is defined.

(2) Example Scenario

With a machining center there might be two identical drives to work in X and Y direction. It might happen that the cabling order is mixed up after a device replacement. To avoid that the drives receive wrong process data, an explicit address of the device is used with a Station Alias.

(3) Identification of Devices with Station Alias

The master reads the Station Alias by using the Auto Increment Addressing. The detected Station Alias will be compared with the values from the master's configuration to get the relation of the network topology and the configured topology.

- Station Alias in Register (0x0012)
  Station Alias is set to the Configured Station Alias register of ESC during power on.
  The value can be read with the following formula:
  Configured Station Alias = (S11 setting) × 16 + (S12 setting)

5

Operation

5.1 Settings for Common Basic Functions

The following table lists basic parameters to be set up for motor operation.

Step	Items		Reference	Objects (Parameters)
1	Servomotor Rotation Direction		*4.2.2 Servomotor Rotation Direction* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn000
2	Overtravel		*5.7 Overtravel*	Pn50A Pn50B Pn001 Pn406
3	Unit Settings	Position	*8.4 Manufacturer Specific Objects* Note: The SERVOPACK electronic gear function is not used with the Powerlink Network Module.	Object 2301:01h Object 2301:02h
		Velocity	*8.4 Manufacturer Specific Objects*	Object 2302:01h Object 2302:02h
		Acceleration	*8.4 Manufacturer Specific Objects*	Object 2303:01h Object 2303:02h
4	Encoder Output Pulses		*4.2.5 Encoder Output Pulses* and *4.2.6 Encoder Output Pulse Setting* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn212
5	Holding Brakes		*4.2.7 Holding Brakes* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn50F Pn506 Pn507 Pn508
6	Stopping Servomotor after Servo OFF Command or Alarm Occurrence		*4.2.8 Stopping Servomotor after Servo OFF Command or Alarm Occurrence* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn001 Pn00B
7	Instantaneous Power Interruption Settings		*4.2.9 Instantaneous Power Interruption Settings* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn509
8	SEMI-F47 Function (Torque Limit Function for Low Power Supply Voltage for Main Circuit)		*4.2.10 SEMI-F47 Function (Torque Limit Function for Low Power Supply Voltage for Main Circuit)* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn008 Pn424 Pn425 Pn509
9	Setting Motor Overload Detection Level		*4.2.11 Setting Motor Overload Detection Level* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)	Pn52B

Note: After the above basic functions have been set, to activate these settings, you must write 1 to object 2300h.

5.2 Trial Operation

5.2.1 Inspection before Trial Operation

Check the following items. If any problems exist, take appropriate measures before trial operation.

(1) Servomotors

- Are all wiring and connections correct?
- Are all nuts and bolts securely tightened?

Note: If a motor with an oil seal is used, check whether the oil shield is not damaged and if there is an oil coat. When performing operation on a servomotor that has been stored for a long period of time, perform the maintenance and inspection according to the procedures described in *Σ-V Series User's Manual Setup Rotational Motor* (SIEP S800000 43).

(2) SERVOPACKs

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

5.2.2 Trial Operation via Powerlink Communication

An example of drive operation procedure via Powerlink is shown below. This example is described in Profile Position mode.

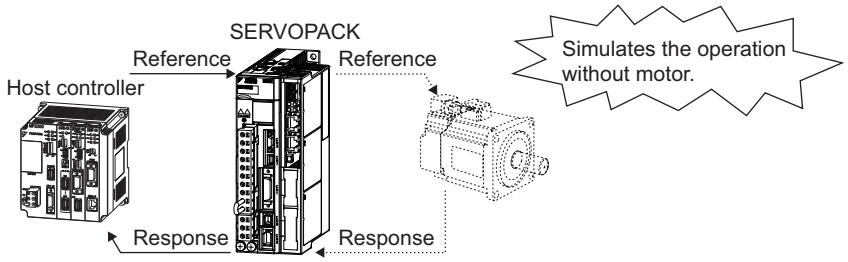
Step	Operation	Reference
1	Confirm whether the power line, Encoder, I/O signal and Powerlink cables are correctly connected.	*4.2 I/O Signal Connections* *4.4 Connection Example of Powerlink Communication*
2	Turn ON the power supply to the SERVOPACK. If the power supply is normal, the CHARGE indicator on the SERVOPACK will light.	–
3	Change the Powerlink communication state to Operational.	*6.5 Powerlink Initialization NMT State Machine*
4	Set the Modes of operation to Profile Position mode.	*8.5 (5) Modes of Operation (6060h)*
5	Change the drive state to "Operation enabled" by command of the Controlword. When the power is supplied to the motor, the Statusword indicates "Operation enabled" state.	*Chapter 7 CiA402 Drive Profile* *7.1 Device Control* *8.5 (1) Controlword (6040h)* *8.5 (2) Statusword (6041h)*
6	Set the Target position, Profile velocity, Profile acceleration, and Profile acceleration, and then set Controlword to start positioning.*	*8.5 (1) Controlword (6040h)* *8.6 (1) Target Position (607Ah)* *8.6 (4) Profile Velocity (6081h)* *8.6 (5) Profile Acceleration (6083h)* *8.6 (6) Profile Deceleration (6084h)*
7	Check the following points while performing in step 6. • Check whether the motor is moving to the reference direction. If motor is moving to reverse direction to the reference, then change the setting of servomotor direction rotation. • Check to make sure that there is no abnormal vibration, noise, or heating. If any abnormality is found, refer to *9.3 Troubleshooting Malfunction Based on Operation and Conditions of the Servomotor* to clear the problem.	–

* Use PDO for objects that are PDO mapped.
For details on PDO mapping, refer to *8.3 PDO Mapping Objects*.

5.3 Test Without Motor Function

The test without motor function is used to check the operation of the host and peripheral devices by simulating the operation of the motor in the SERVOPACK, i.e., without actually operating the motor. This function enables checking wiring and verifying the system and parameters when errors occur while debugging the system, thus shortening the time required for setup work and preventing damage to the equipment that may result from possible malfunctions. The operation of the motor can be checked during performing this function regardless of whether the motor is actually connected or not.

For details, refer to *4.3 Test Without Motor Function* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type* (SIEP S800000 60)



■ Related Parameters

The following parameters are used for the test without motor.

Object Index (Pn No.)		Meaning	When Enabled
Pn00C	n.□□□0	Disables the test without motor. [Factory setting]	After restart
	n.□□□1	Enables the test without motor.	
	n.□□0□	Sets 13 bits as encoder resolution for the test without motor. [Factory setting]	
	n.□□1□	Sets 20 bits as encoder resolution for the test without motor.	
	n.□0□□	Sets incremental encoder as encoder type for the test without motor. [Factory setting]	
	n.□1□□	Sets absolute encoder* as encoder type for the test without motor.	

* External encoders such as encoders for fully-closed loop control are used as incremental encoders.

5.4 Limiting Torque

The SERVOPACK provides the following four methods for limiting output torque to protect the machine. Each method uses the set minimum torque to limit the output.

Limiting Method	Reference	Objects (Parameters)
Torque limited by parameter setting only.	*4.4.1 Internal Torque Limit* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*	Pn402 Pn403
Torque limit set by parameter enabled by I/O input signal.	*4.4.2 External Torque Limit* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*	Pn404 Pn405
Torque limit set by parameter enabled by command from controller.	*8.5 (1) Controlword (6040h)*	Object 6040h (PnB11) Pn404 Pn405
Torque limit controlled from controller.	*8.11 Profile Torque Mode*	Object 6072h

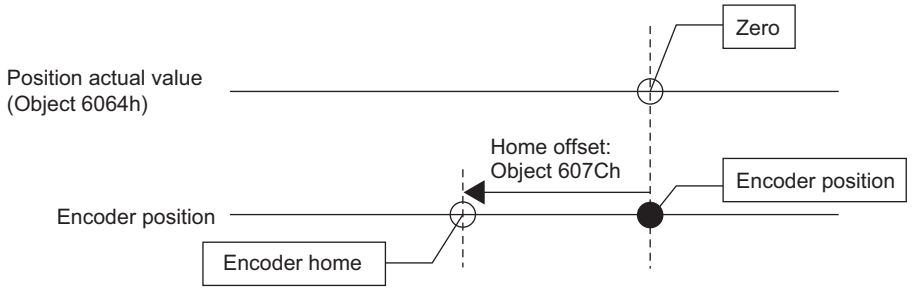
5.5 Absolute Encoders

For details on absolute encoder settings, refer to *4.5 Absolute Encoders* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*.

■ Absolute Encoder Home Offset

When an absolute encoder is used, an offset can be set between the encoder position and the machine position (Position actual value: Object 6064h). The offset value is set by the reference unit and is added to the Position actual value (Object 6064h).

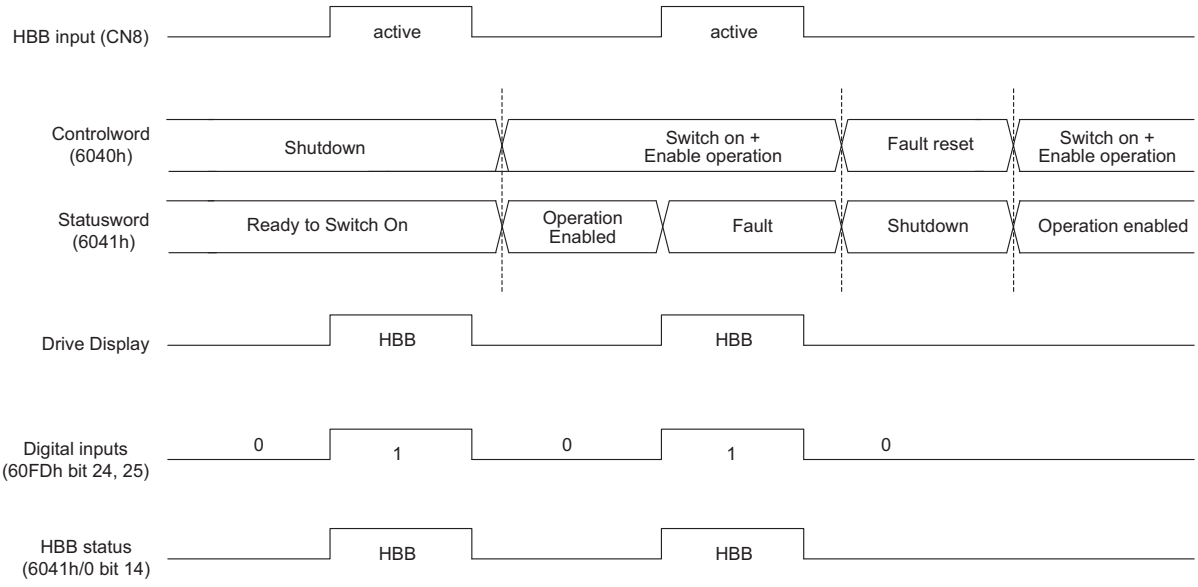
Index	Sub Index	Name	Data Type	Access	Setting Range	Default Value
607Ch	0	Home offset	DINT	RW	–536870912 to 536870911	0



5.6 Safety Function

Safety functions are hard-wired into the SGDV SERVOPACK. If the HBB signal is active during motor operation, the power to the motor will be forcibly shut off and the motor will be stopped according to the setting of the 1 digit of parameter Pn001.

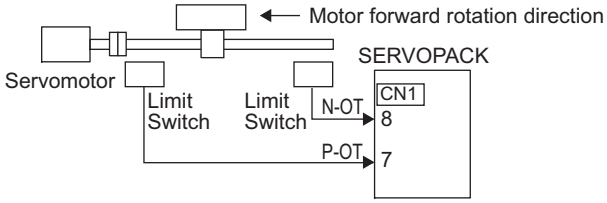
The following diagram shows the status of the safety functions when the Powerlink Network Module is connected.



For details, refer to *4.6 Safety Function* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*.

5.7 Overtravel

The overtravel limit function forces movable machine parts to stop by turning on a limit switch if they exceed the allowable range of motion.



<Note>

- Overtravel may not be required for rotating applications such as rotary tables and conveyors. If overtravel is not required, disable the overtravel signal allocations in parameters Pn50A and Pn50B.
- For details on overtravel wiring, signal settings, and stopping methods, refer to *4.2.3 Overtravel* in *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*.

(1) Status during Overtravel

When an overtravel signal is input, the status of the following objects will be set to 1. Then the servomotor will stop according to the overtravel stop method selected in Pn001. If the overtravel signal is turned OFF, these statuses will change to 0 (zero).

- Statusword (Object 6041h), Internal limit active (bit 11)
- Digital Inputs (Object 60FDh), Negative limit switch (bit 0), or Positive limit switch (bit 1)

(2) Behavior for Overtravel in Each Mode

Operation Mode	Description
Profile position mode	• When the overtravel signal is activated while the motor is moving to its target, the motor stops rotating and the target reached bit in the statusword will be active. • In the overtravel state, positioning (return operations) will start only when a target position is specified in the reverse direction of the present overtravel signal for Position actual value (e.g., for P-OT, a command to move in the negative direction).
Interpolated position mode	• When the overtravel signal is activated while the motor is moving to its target, the motor stops rotating and the target reached bit in the statusword will be active. • In the overtravel state, positioning (return operations) will start only when a target position is specified in the reverse direction of the present overtravel signal for Position actual value (e.g., for P-OT, a command to move in the negative direction).
Profile velocity mode	• In the overtravel state, the motor will start only when a speed is specified in the reverse direction of the overtravel signal (e.g., for P-OT, a target velocity in the negative direction).
Profile torque mode	• In the overtravel state, torque will be generated only when torque is specified in the reverse direction of the overtravel signal (e.g., for P-OT, torque in the negative direction).

Note: If the overtravel signal is activated, the error bit in the status word will remain inactive as long as no error codes or alarms were detected.

IMPORTANT

- For safety when using the overtravel function, monitor the Statusword (object 6041h) or OT signal status in *Digital Inputs* at the host controller, and use the Halt command (Controlword, bit 8: 1) to stop the motor if overtravel occurs. Do not output any other commands until the motor stops.
  After the motor stops, perform a reset operation.
- If the OT signal status changes within a short period, the host controller may not monitor the change of the OT signal. Be sure to correctly select, install, and wire the limit switch to prevent chattering, malfunction, and other problems.

6

Powerlink Communication

6.1 Powerlink functional principle

Ethernet POWERLINK (EPL) is a communication profile for Real-Time Ethernet (RTE). It extends Ethernet according to the IEEE 802.3 standard with mechanisms to transfer data with predictable timing and precise synchronization. The communication profile meets timing demands typical for high-performance automation and motion applications. It does not change basic principles of the Fast Ethernet Standard IEEE 802.3 but extends it towards Real-Time Ethernet. Thus it is possible to leverage and continue to use any standard Ethernet silicon, infrastructure component or test and measurement equipment like a network analyzer.

Key features

- Ease-of-Use to be handled by typical automation engineers without in-depth Ethernet network knowledge

- up to 240 networked real-time nodes in one network segment

- deterministic communication guaranteed

    . IAONA Real-Time Class 4, highest performance

    . minimum cycle time of . 200 Ïs

    . minimum jitter of < 1 Ïs, for precise synchronization of networked nodes

- direct peer-to-peer communication of all nodes (publish/subscribe)

- “Hot Plugging” functionality

- Seamless integration into other networks via routing

- Standard Compliant

    . IEEE 802.3u Fast Ethernet

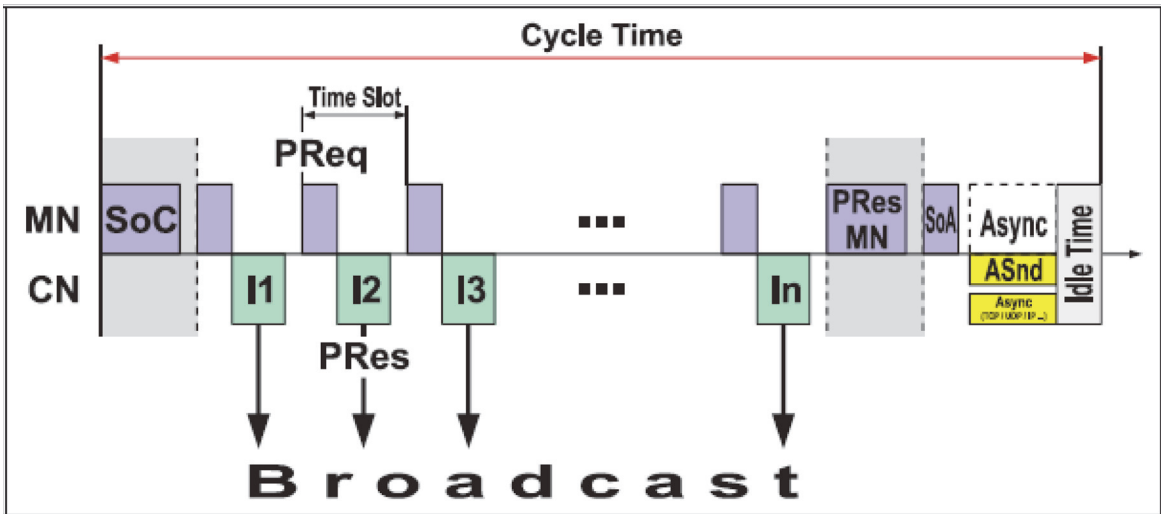
    . IP based protocols supported, e.g. UDP

    . Integration with CANopen Profiles EN50325-4 for device interoperability

6.2 Powerlink cycle time, time slot principle

POWERLINK is based on standard Ethernet with CSMA/CD technique which is afflicted with collisions, but with the time slot method this problem will be avoided. In a POWERLINK network only one node may send at the same time, thus POWERLINK is also applicable for hard real time requirements.

Network access is managed by a master, the EPL Managing Node (MN). A node can only be granted the right to send data on the network via the MN. Further the MN synchronizes all connected nodes. The remaining nodes, Controlled Nodes (CN), react to its instruction. The figure below shows a complete EPL communication cycle.



Communication is effected with the time slot principle mentioned already above. Each configured CN is accessed cyclically by the MN. At the beginning of an EPL cycle, the MN is sending a .Start of Cycle. frame to all nodes via Ethernet multicast, which is used by the CNs for synchronization purposes. After that the MN sends a .Poll Request. to the first node, which then transmits the received data to the outputs (I1) and records new process data. After a predefined time all configured CNs are accessed by the MN.

For this purpose the MN sends further *PReqs* to the nodes. The *PReq* contains output data for the node and serves as transmission request. If a configured CN receives the *PReq*, he saves the input data and sends a .Poll Response. with the data recorded with the *SoC* as broadcast (I1..In). Thus it is possible for all other CNs, “to monitor” these transmitted data. Cyclical communication is terminated by an “End of Cycle” frame. After that there is an asynchronous period while user-defined communication can be performed and is initiated by a “Start of Asynchronous” frame.

SoC: Start of Cycle

PRes (MN): Poll Response Managing Node --> End of Cycle

PReq: Poll Request

PRes: Poll Response

SoA: Start of Asynchronous

ASnd: Asynchronous Send

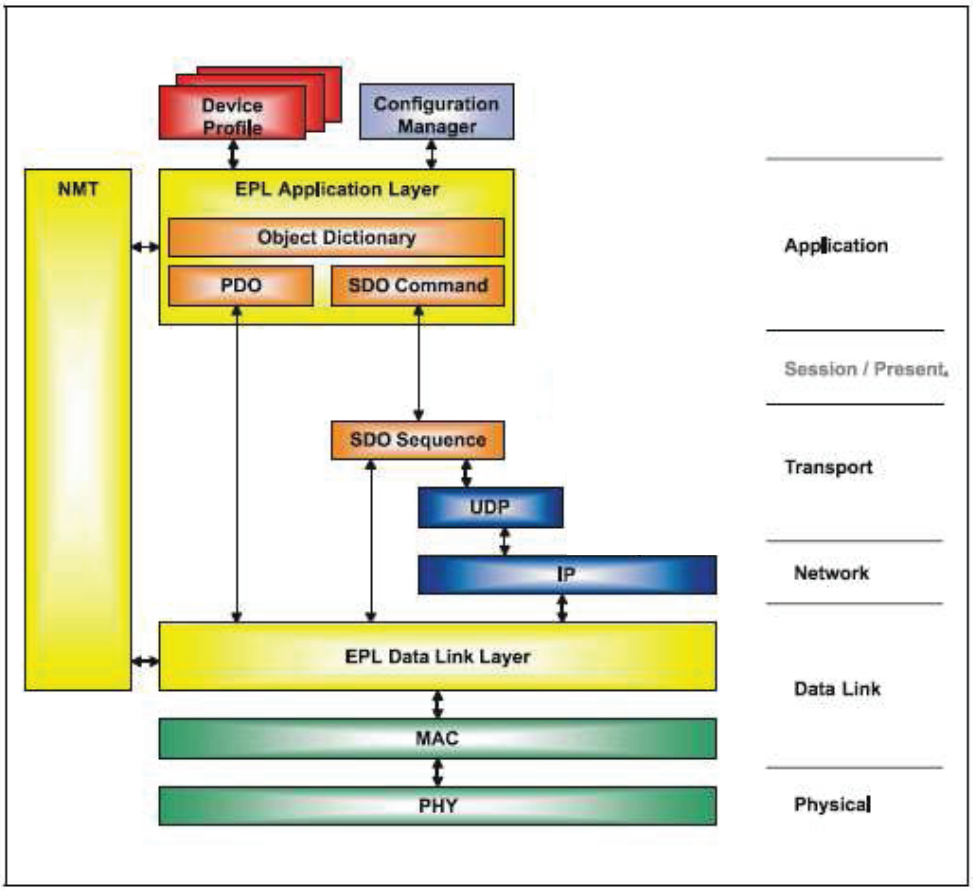
MN: Managing Node

CN: Controlled Node

Ix: Isochronous data, Process data

6.3 Powerlink Device Architecture

The following figure shows the device architecture of the SGDV Ethernet Powerlink Network Module.



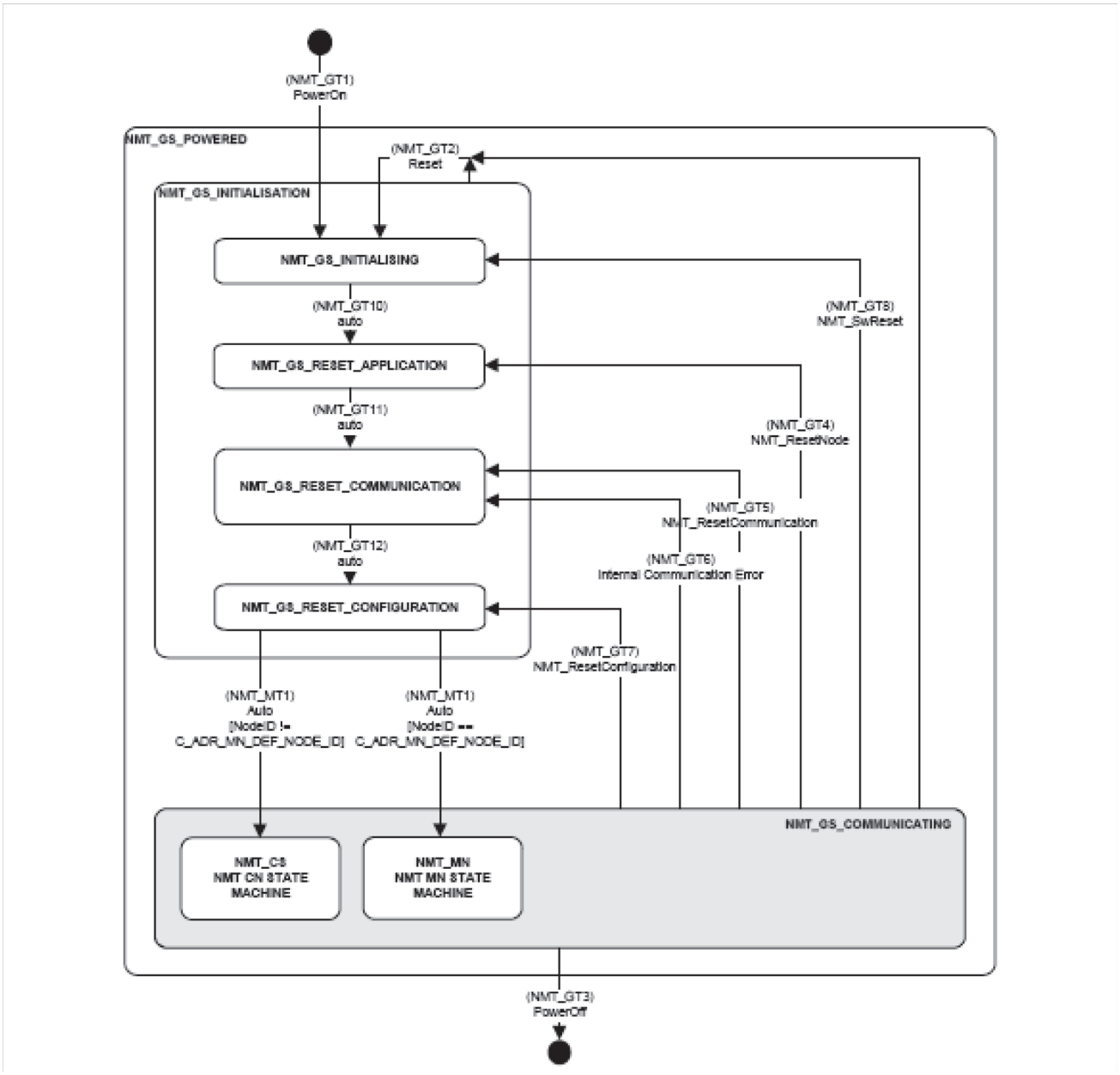
The Powerlink Network Module is composed of the Powerlink communication in the data link layer and CANopen drive profile (DS402) in the application layer.
CANopen-based data communication generally differentiates between data packets that are Process Data Objects (PDO), Service Data Objects (SDO), or Network Management Objects (NMT).
PDOs carry "raw" real-time data without protocol overhead, and therefore put data transfer capacities to maximum use. These communication objects are send cycle by cycle, and in broadcast style. In contrast, SDOs transmit parameter data that is used for network device configuration. In this case, data is transferred via point-to-point connections. The Network Management service monitors the status of devices on the network, and uses a Master-Slave connection for communication between the devices and the controller. Data pertaining to this service are called Network Management Objects.

6.4 Powerlink Slave Information

The Powerlink Slave Information file (XDD file, i. e. **X**ML **D**evice **D**escription file) is available for configuring the Powerlink master.
The XDD file contains general information about Powerlink communication settings when setting the SGDV SERVOPACK.

6.5 Powerlink Initialization NMT State Machine

The NMT state machine determines the behavior of the communication function unit.Both, Managing Node and Controlled Node start up by common initialization process (Common Initialization NMT State Machine). At the end of this process, the measuring system passes the CN-specific state machine “NMT CN State Machine” and the Managing Node passes the MN-specific state machine “NMT MN State Machine”. The MN-specific state machine is not part of this description.



State	Description
NMT_GS_POWERED	Superordinate state Valid after POWER ON.
NMT_GS_INITIALISATION	Superordinate state Is present automatically after system start. Initialization of network functionality.
NMT_GS_INITIALISING (*)	Sub-state Is present automatically after *POWER ON*, *Hardware* or *Software Reset* (NMT_GT2),or the reception of a *NMTSwReset* (NMT_GT8) command (*2). Main initialization of the node.
NMT_GS_RESET_APPLICATION(*)	Sub-state Is present automatically after completion of the previous state, or the reception of a *NMTResetNode* command. Manufacturer-specific- and device parameter are set to their POWER ON values.
NMT_GS_RESET_COMMUNICATION(*1)	Sub-state Is present automatically after completion of the previous state, or the recognition of an internal communication error or the reception of a *NMTResetCommunication* command. Communication parameters are set to their POWER ON values.
NMT_GS_RESET_CONFIGURATION(*1)	Sub-state Is present automatically after completion of the previous state, or the reception of a *NMTResetConfiguration* command. Generation of the active device configuration.
NMT_GS_COMMUNICATING	Superordinate state Is present automatically after completion of the previous state, or the reception of a *NMTSwReset* (NMT_GT8), *NMTResetNode*(NMT_GT4), *NMTResetCommunication*(NMT_GT5) or *NMTResetConfiguration*(NMT_GT7) command, or the recognition of an internal communication error (NMT_GT6). Includes the MN- or CN-specific state machine. According to the type of node a MN enters the MN-specific state machine and a CN enters the CN-specific state machine.

The shown states are device internal states and aren't signaled over the network by an individual NMT-Status command.

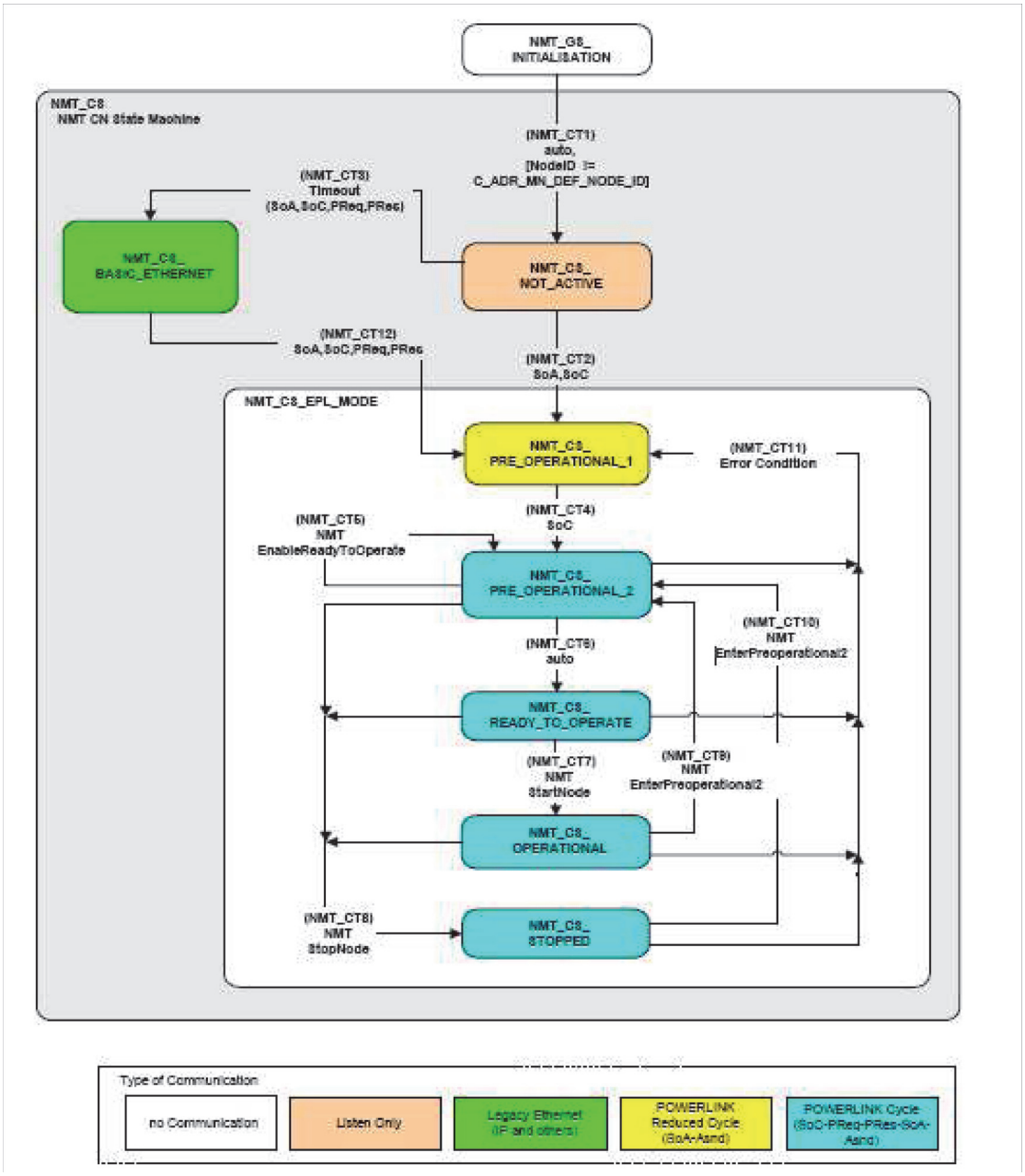
(*) After transition to the above state will cause a transition to the PDS FSA *fault reaction* state.

(*1) After transition to the above state will cause a transition to the PDS FSA *fault reaction* state, if the PDS FSA is in *Switch on, Operation enabled* or in *Quickstop* state.

(*2) After receiving a *NMTSwReset* (NMT_GT8) first the servopack is being reset and then the option card. The servopack reset success depends on the servopack state.

6.6 NMT CN State Machine

The NMT CN State Machine is controlled by the *Common Initialization NMT State Machine* and is a sub-state of *NMT_GS_POWERED* and *NMT_GS_COMMUNICATING.*



State	Description
NMT_CS_NOT_ACTIVE	*NMT_CS_NOT_ACTIVE* is a non-permanent state, which is present by the CN automatically after *POWER ON*, if the initialization phase could be executed error free. The CN is passive (listen only), observes the network traffic, does not send any frames and is waiting for MN commands. The node is able to recognize NMTReset commands sent via *ASnd*. The transition from *NMT_CS_NOT_ACTIVE* to *NMT_CS_PRE_OPERATIONAL_1* is triggered by a *SoA* or *SoC* frame. The transition from *NMT_CS_NOT_ACTIVE* to *NMT_CS_BASIC_ETHERNET* is triggered by timeout for *SoC*, *PReq*, *PRes* and *SoA* frames.
NMT_CS_PRE_OPERATIONAL_1 (*)	The CN sends a frame only if the MN has authorized it to do so by a *SoA AsyncInvite command*, there is no PDO communication. First the connected CNs is identified. This is performed with an *IdentRequest* message of the MN and is acknowledged by an *IdentResponse* message of the CNs. If required the CN shall download its configuration data from a configuration server. Both processes may be completely or partially shifted to *NMT_CS_PRE_OPERATIONAL_2*, if the MN is not in *NMT_MS_PRE_OPERATIONAL_1* respectively leaves *NMT_MS_PRE_OPERATIONAL_1* before the CN has completed its configuration.The transition from *NMT_CS_PRE_OPERATIONAL_1* to *NMT_CS_PRE_OPERATIONAL_2* is triggered by a *SoC* frame.
NMT_CS_PRE_OPERATIONAL_2	In this state the CN-configuration is completely finished. The node is queried by the MN via *PReq*. The received PDO data may be invalid and may differ to the PDO mapping requirements. The PDO data received from the MN via *PReq* and from other CNs and the MN via *PRes* are ignored by the CN. The transmitted *PRes* frames may differ to the PDO mapping requirements. The data are declared invalid by not setting the *RD flag*. There is no processing of the process data. The CN responds to *AsyncInvite commands* via *SoA*. If not invited by the MN, there is no Ethernet frame transmission in this state. Precondition for the transition from *NMT_CS_PRE_OPERATIONAL_2* to *NMT_CS_READY_TO_OPERATE* is the reception of an *NMTEnableReadyToOperate* command. The transition is triggered by the MN if the application is ready for operation. The transition from *NMT_CS_PRE_OPERATIONAL_2* to *NMT_CS_PRE_OPERATIONAL_1* is triggered if an error is detected. The transition from *NMT_CS_PRE_OPERATIONAL_2* to *NMT_CS_STOPPED* is triggered by reception of NMT state command *NMTStopNode*.

State	Description
NMT_CS_READY_TO_OPERATE	With this state the CN signals its readiness to operation to the MN. The CN responds via *PRes* when queried via *PReq* by the MN and is included into the cyclic data exchange. However, the process input data, sent via *PRes* frames of the measuring system to the MN, are defined as invalid by the *RD flag*.The CN responds to *AsyncInvite commands* via *SoA*. If not invited by the MN, there is no Ethernet frame transmission in this state. The length of the *PRes* frame is equal to configured size of object *NMT_CycleTiming_REC.PResActPayloadLimit_U16*. The transmitted data correspond to the requirements defined by the PDO mapping. The transition from *NMT_CS_READY_TO_OPERATE* to *NMT_CS_OPERATIONAL* is triggered by the reception of NMT state command *NMTStartNode*. The transition from *NMT_CS_READY_TO_OPERATE* to *NMT_CS_PRE_OPERATIONAL_1* is triggered if an error is detected. The transition from *NMT_CS_READY_TO_OPERATE* to *NMT_CS_STOPPED* is triggered by reception of NMT state command *NMTStopNode*.
NMT_CS_OPERATIONAL	This is the normal operating state of the CN. Now, active process data exchange between MN and CN over *PReq* and *PRes* messages is possible. The CN responds to *AsyncInvite commands* via *SoA*. If not invited by the MN, there is no standard Ethernet frame transmission in this state. The length of the *PRes* frame is equal to configured size of object *NMT_CycleTiming_REC.PResActPayloadLimit_U16*. The transmitted data correspond to the requirements defined by the PDO mapping. The transition from *NMT_CS_OPERATIONAL* to *NMT_CS_PRE_OPERATIONAL_2* is triggered by the reception of NMT state command *NMTEnterPreOperational2*. The transition from *NMT_CS_OPERATIONAL* to *NMT_CS_PRE_OPERATIONAL_1* is triggered if an error is detected. The transition from *NMT_CS_OPERATIONAL* to *NMT_CS_STOPPED* is triggered by reception of NMT state command *NMTStopNode*.

State	Description
NMT_CS_STOPPED(*)	In this state, the node is largely passive. *NMT_CS_STOPPED* is used for controlled shutdown of a selected CN while the system is still running. The node does not participate in cyclic frame exchange, but still observes *SoA* frames and does not respond via *PRes* when queried by the MN via*PReq*. The CN responds to *AsyncInvite commands* via *SoA*. If not invited by the MN, there is no standard Ethernet frame transmission in this state. The transition from *NMT_CS_STOPPED* to *NMT_CS_PRE_OPERATIONAL_2* is triggered by the reception of NMT state command *NMTEnterPreOperational2*. The transition from *NMT_CS_STOPPED* to *NMT_CS_PRE_OPERATIONAL_1* is triggered if an error is detected.
NMT_CS_BASIC_ETHERNET	In the *NMT_CS_BASIC_ETHERNET* state the node can perform only Legacy Ethernet communication according to IEEE 802.3, or transmit *ASnd* frames. On the reception of a *SoC*, *PReq*, *PRes* or *SoA* frame the CN immediately change over to *NMT_CS_PRE_OPERATIONAL_1*. In Basic Ethernet Mode the network medium is accessed according to CSMA/CD, thus the network communication is collision-prone and non-deterministic. Data between the nodes are preferentially exchanged via UDP/IP. The large extension of the maximum topology of an Ethernet POWERLINK Network conflicts with the topology rules of IEEE 802.3. Due to this fact, CSMA/CD might work poorly in large EPL networks. EPL nodes shouldn't operate in Basic Ethernet Mode, when the node is part of an automation system. Basic Ethernet Mode is provided for point to point configurations, to be used for node setup and service purpose only.

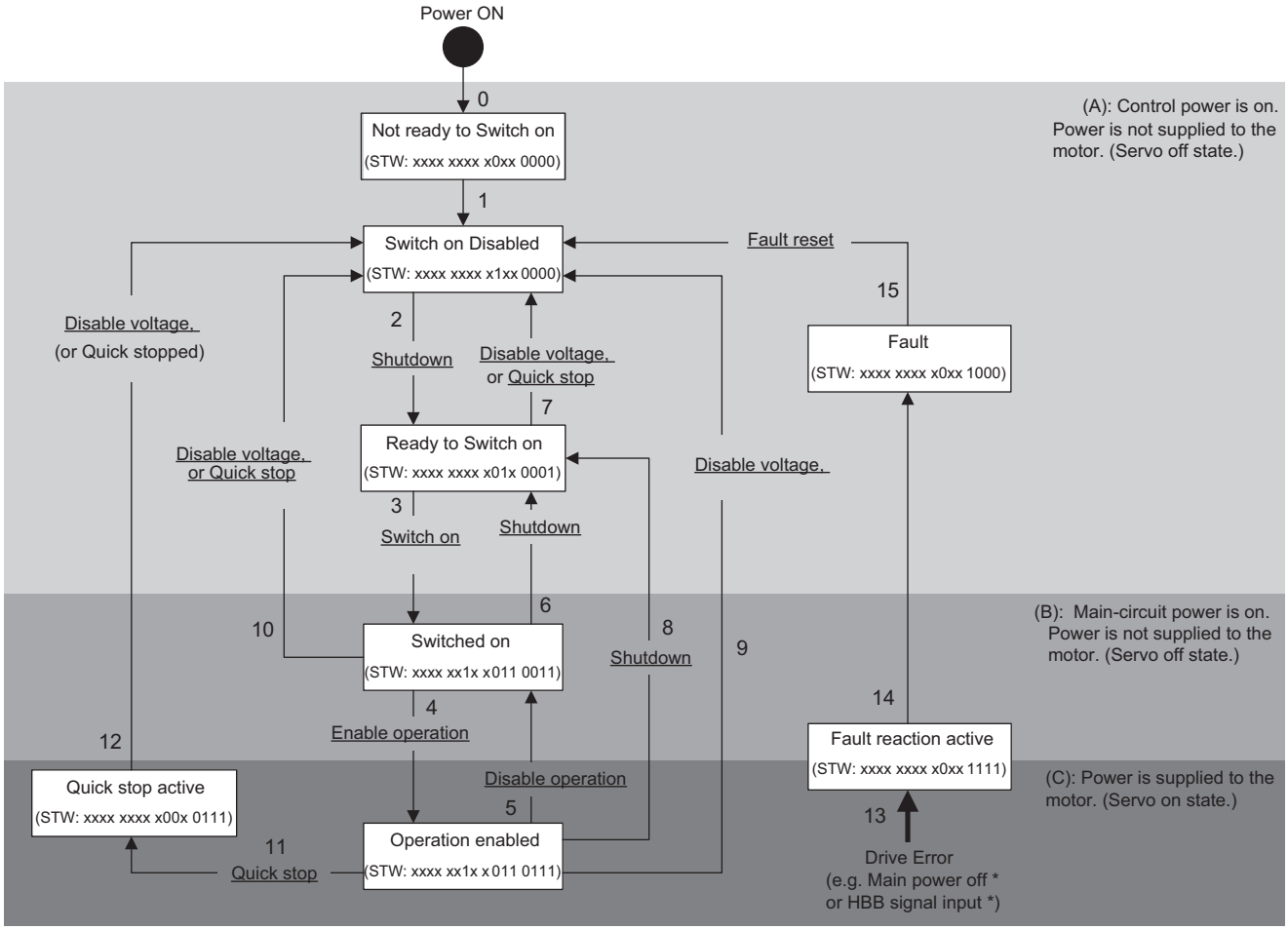
(*) After transition to the above state will cause a transition to the PDS FSA *fault reaction* state, if the PDS FSA is in *Switch on, Operation enabled* or in *Quickstop* state.

7

CiA402 Drive Profile

7.1 Device Control

The device control of the SGDV SERVOPACK can be used to carry out all the motion functions in the corresponding modes. The state machine is controlled through the Controlword (Object 6040h). The status of the state machine can be revealed by using the Statusword (Object 6041h).



Note 1. ☐ shows state.
2. STW means the Statusword of Object 6041h.
3. _____ (underline) means the control command of Object 6040h.
4. *** If during the following FSA state: Operation Enable, Switch on or Quick stop the main power will be turned off or HWBB will be active, the alarm: Abnormal control state will appear and go into Fault state.**

(1) State Machine Controlling Command

Command	Bits of the Controlword (6040h)					Transitions
	Bit7	Bit3	Bit2	Bit1	Bit0	
Shutdown	0	–	1	1	0	2, 6, 8
Switch on	0	0	1	1	1	3
Switch on + Enable operation	0	1	1	1	1	3 + 4
Disable voltage	0	–	–	0	–	7, 9, 10, 12
Quick stop	0	–	0	1	–	7, 10, 11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4
Fault reset	0 → 1	–	–	–	–	15

(2) Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	–	Controlword	RW	Yes	–	UINT
6041h	–	Statusword	RO	Yes	–	UINT
605Ah	–	Quick Stop Option Code	RW	No	–	INT
605Dh	–	Halt Option Code	RW	No	–	INT

(3) Unconfigurable FSA Stop Action

Transitions	Transitions number	Action (*)
Shutdown	8	Servo off
Disable voltage	9	Servo off
Disable operation	5	Slow down in Profile Deceleration (0x6084)
Fault reaction active	13	Slow down in Quick Stop Deceleration (0x6085)

7.2 Modes of Operation

The SGDV SERVOPACK supports the following modes of operation:

- Profile Position mode
- Homing mode
- Interpolated Position mode
- Profile Velocity mode
- Torque Profile mode

■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6060h	–	Modes of Operation	RW	Yes	–	SINT
6061h	–	Modes of Operation Display	RO	Yes	–	SINT
6502h	–	Supported Drive Modes	RO	No	–	UDINT

■ Dynamic Mode Change

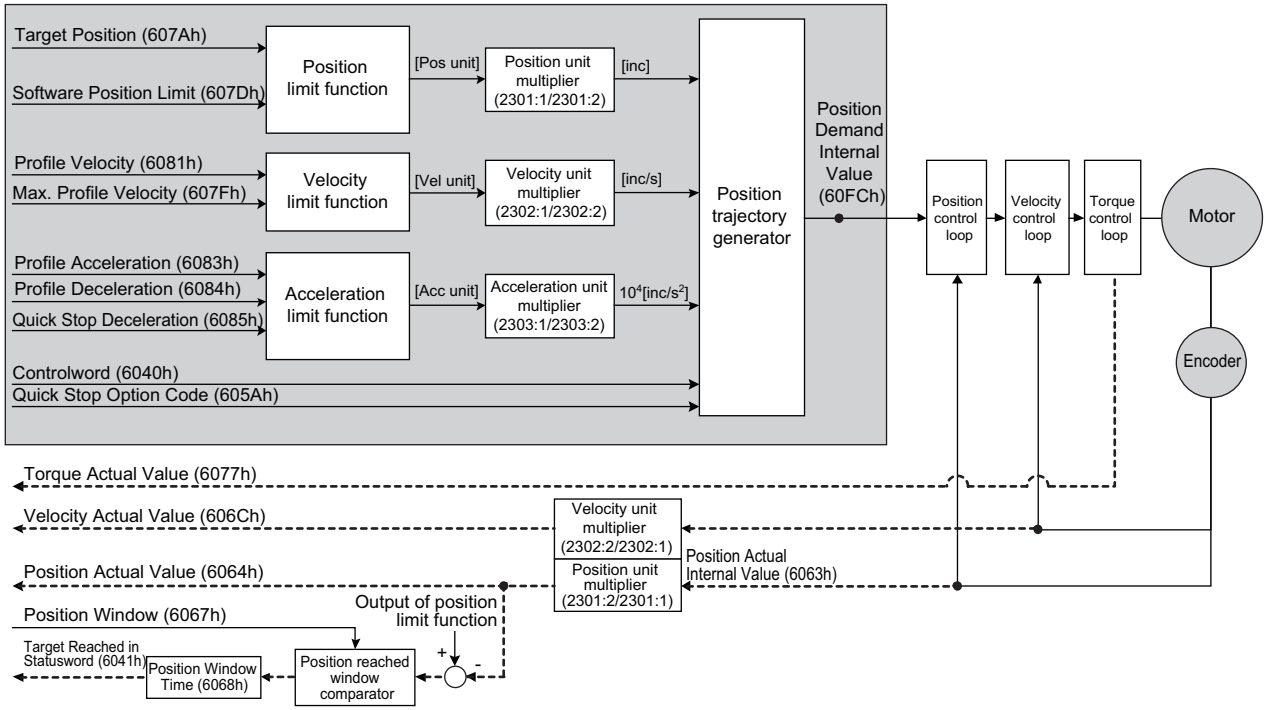
The operation mode can be switched by writing the Object 6060h. The master has the responsibility to update all operation mode specific process data objects together with the selection of the operation mode at the same time.
If the master selects a new operation mode, the SGDV SERVOPACK changes to the new operation mode immediately.
The following table shows the behavior at the changing a new operation mode from the other mode.

New Operation Mode	Behavior at the Changing a New Operation Mode
Profile Position mode	Controlword bit4 = 0: Operation mode is changed, but motor will be stopped. Controlword bit4 = 1: New positioning will be started immediately.
Homing mode	Controlword bit4 = 0: Operation mode is changed, but motor will be stopped. Controlword bit4 = 1: Homing will be started immediately.
Interpolated Position mode	Controlword bit4 = 0: Operation mode is changed, but motor will be stopped. Controlword bit4 = 1: New positioning will be started immediately.
Profile Velocity mode	New operation mode will be started immediately.
Torque Profile mode	New operation mode will be started immediately.

7.3 Profile Position Mode

The Profile Position mode is used to start positioning to the Target position with the Profile velocity and the Profile acceleration.

The following figure shows the block diagram of the Profile Position mode.



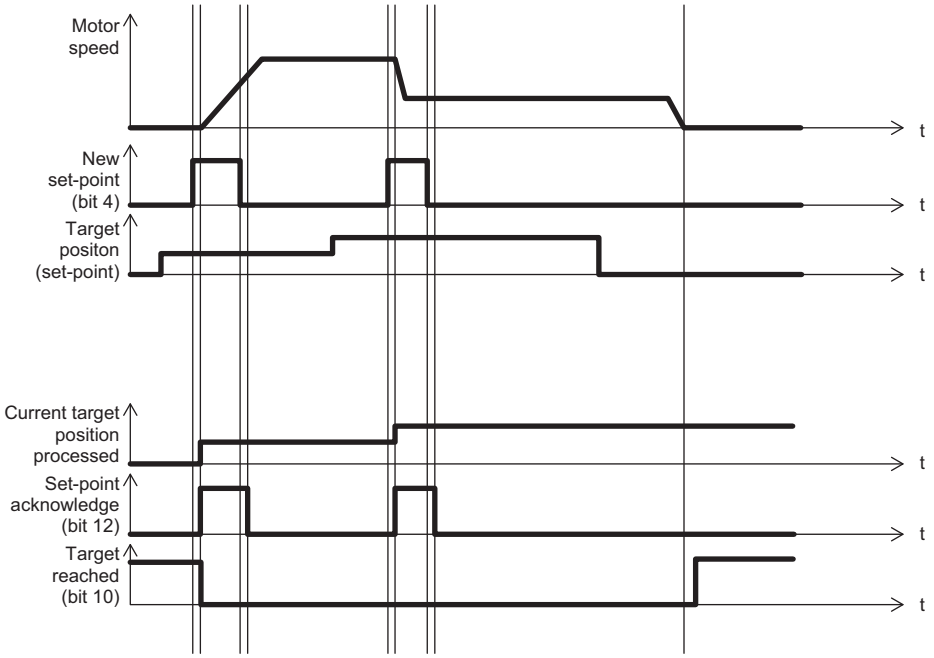
■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	–	Controlword	RW	Yes	–	UINT
6041h	–	Statusword	RO	Yes	–	UINT
607Ah	–	Target Position	RW	Yes	Pos units	DINT
607Dh	–	Software Position Limit	–	–	–	–
	1	Min. position limit	RW	No	Pos units	DINT
	2	Max. position limit	RW	No	Pos units	DINT
607Fh	–	Max. Profile Velocity	RW	No	Vel units	UDINT
6081h	–	Profile Velocity	RW	Yes	Vel units	UDINT
6083h	–	Profile Acceleration	RW	Yes	Acc units	UDINT
6084h	–	Profile Deceleration	RW	Yes	Acc units	UDINT
6085h	–	Quick Stop Deceleration	RW	Yes	Acc units	UDINT

In Profile Position mode, the following two methods can be used to start positioning.

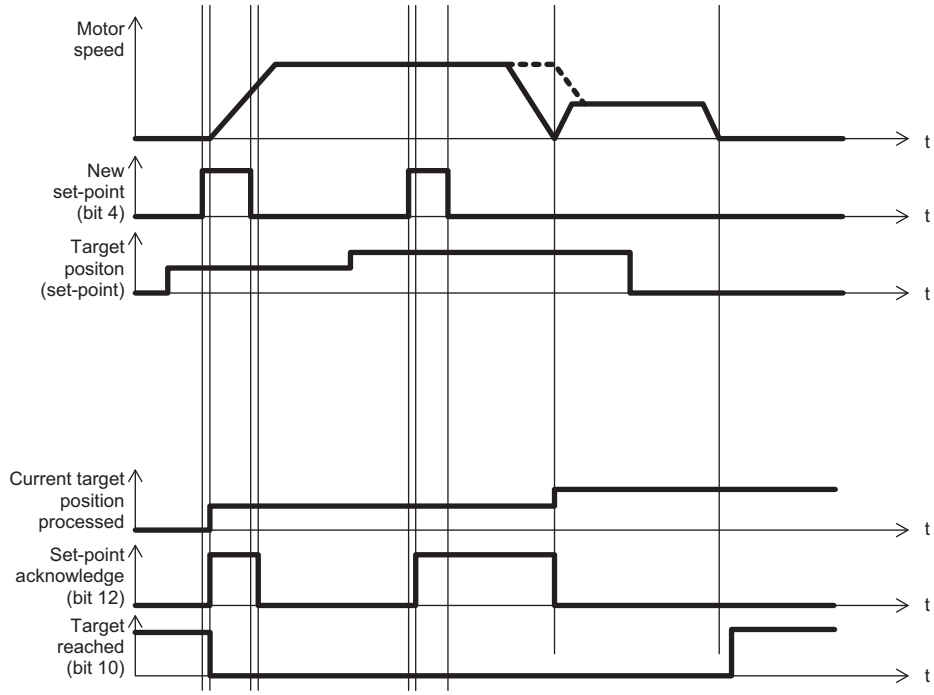
- Single Set-point (*change set immediately* bit of Controlword is 1)

  When a set-point is in progress and a new set-point is validated by the new set-point (bit 4) in the Controlword, the new set-point shall be processed immediately.



- Set of Set-points (*change set immediately* bit of Controlword is 0)

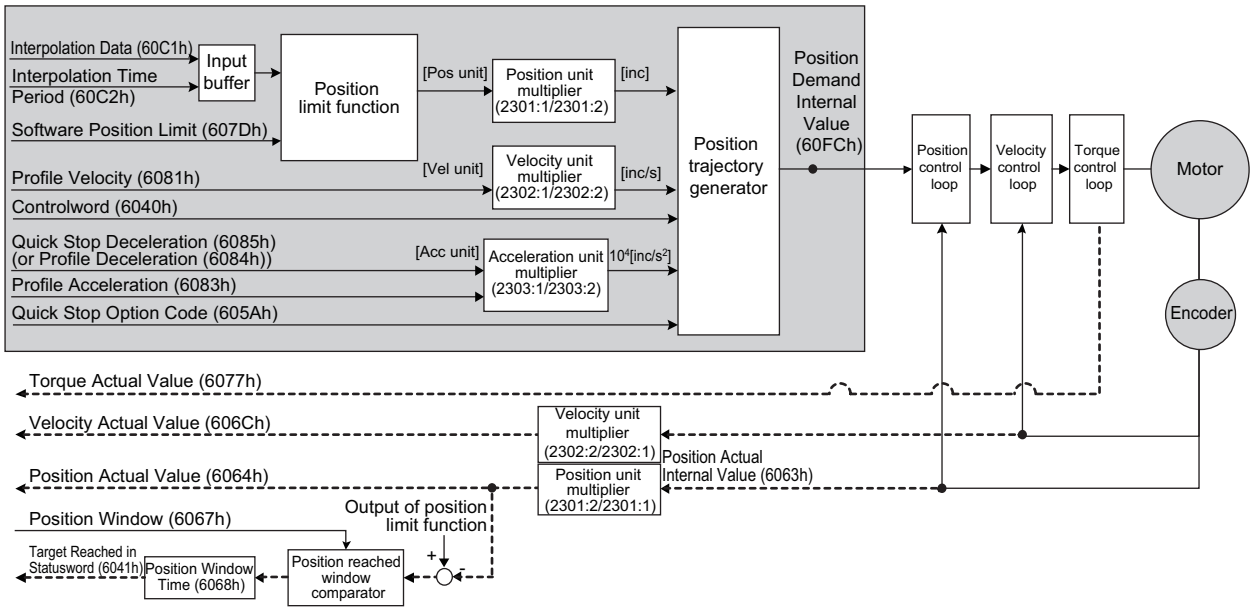
  When a set-point is in progress and a new set-point is validated by the new set-point (bit 4) in the Controlword, the new set-point shall be processed only after the previous has been reached.
  The additional dotted line segment in the following figure shows the actual speed if the *change of set point* bit (bit 9) is set to 1.



7.4 Interpolated Position Mode

The Interpolated Position mode is used to control multiple coordinated axes or a single axis with the need for time-interpolation of set-point data. The Interpolated Position mode normally uses time synchronization mechanisms for a time coordination of the related drive units.
The interpolation time period defines the update cycle of the interpolation data.
The intercycle interpolation will be performed based on this settings.
The interpolation data is interpreted as absolute value.

The following figure shows the block diagram of the Interpolated Position mode.



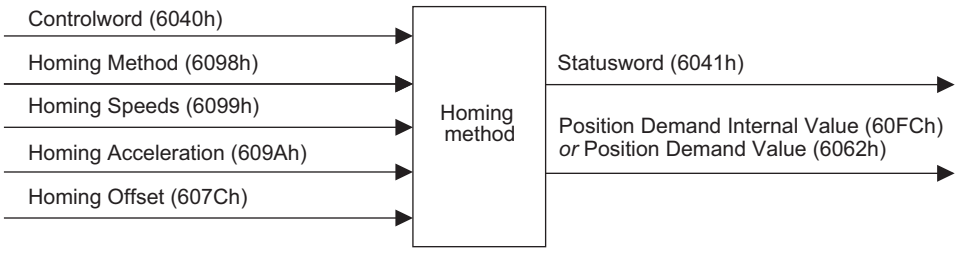
■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	–	Controlword	RW	Yes	–	UINT
6041h	–	Statusword	RO	Yes	–	UINT
60C1h	1	Interpolation Data	RW	Yes	Pos units	DINT
607Dh	–	Software Position Limit	–	–	–	–
	1	Min. position limit	RW	No	Pos units	DINT
	2	Max. position limit	RW	No	Pos units	DINT
6084h	–	Profile Deceleration	RW	Yes	Acc units	UDINT
6085h	–	Quick Stop Deceleration	RW	Yes	Acc units	UDINT
60C2h	–	Interpolation Time Period	–	–	–	–
	1	Interpolation time period	RW	Yes	–	USINT
	2	Interpolation time index	RW	Yes	–	SINT

Note: The objects 6081/0, 6083/0 and 6084/0 must have a different value than 0 to start interpolation.

7.5 Homing

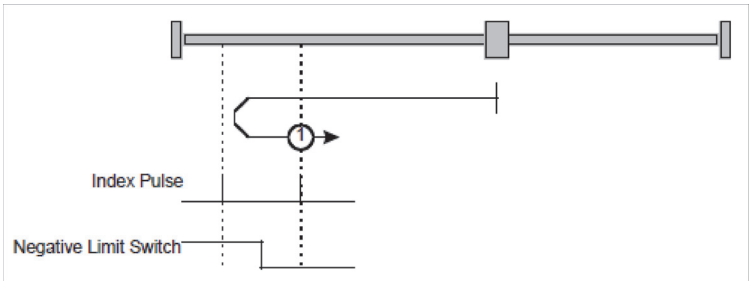
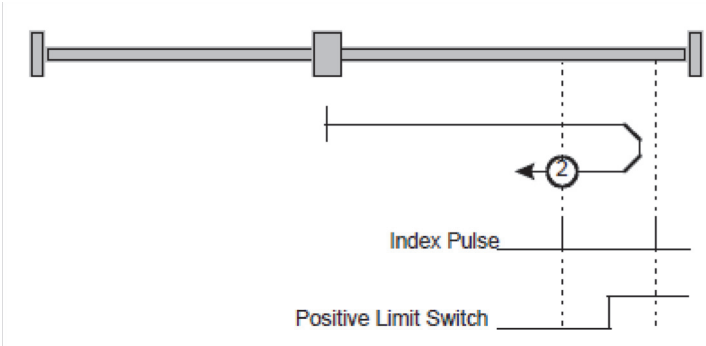
The following figure shows the defined input objects as well as the output objects. The user may specify the speeds, acceleration and the method of homing. There is a further object home offset, which allows the user to displace zero in the user's coordinate system from the home position.

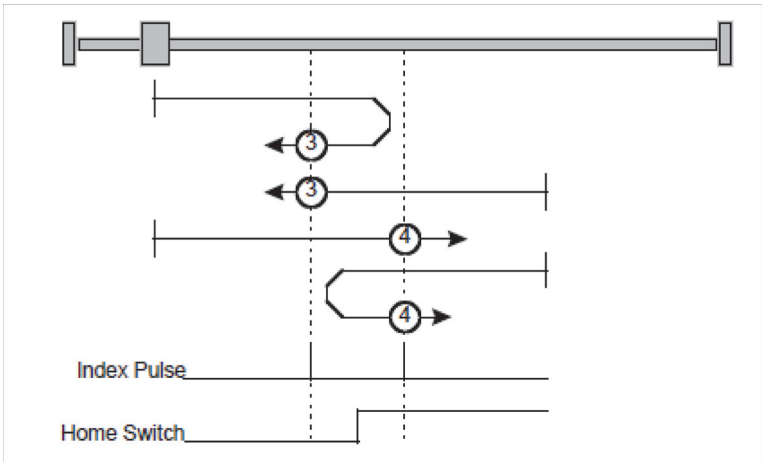
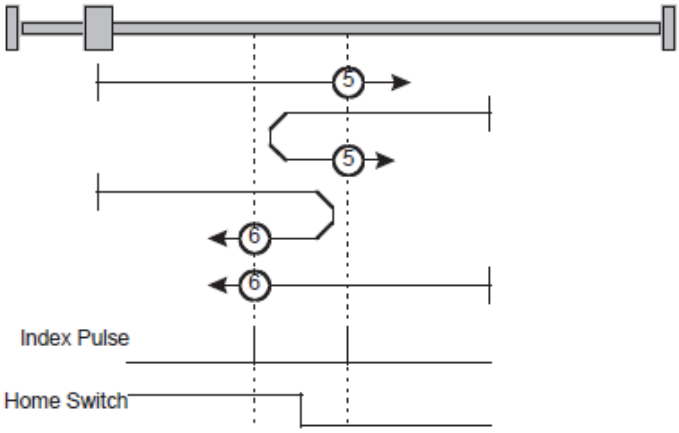
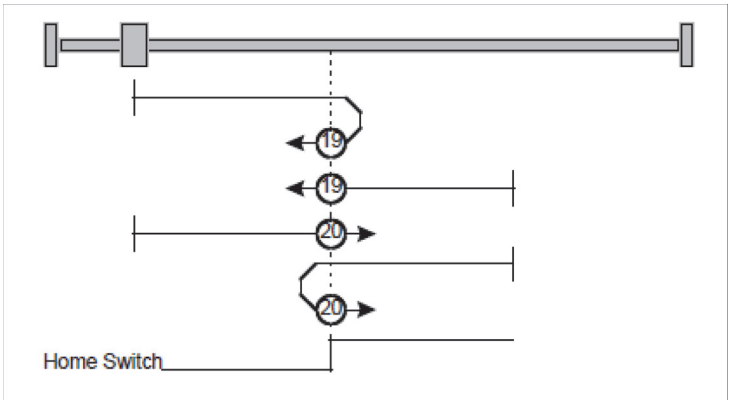


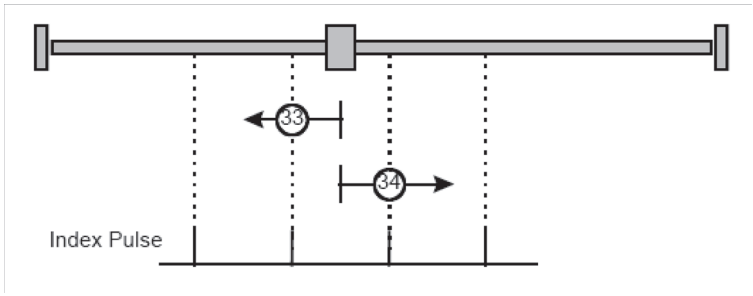
■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	–	Controlword	RW	Yes	–	UINT
6041h	–	Statusword	RO	Yes	–	UINT
607Ch	–	Home Offset	RW	No	Pos units	DINT
6098h	–	Homing Method	RW	Yes	–	SINT
6099h	–	Homing Speeds	–	–	–	–
	1	Speed during search for switch	RW	Yes	Vel units	UDINT
	2	Speed during search for zero	RW	Yes	Vel units	UDINT
609Ah	–	Homing Acceleration	RW	Yes	Acc units	UDINT

■ Homing Method (6098h)

Value	Definitions	Explanation
0	No homing operation required	No homing (Default value)
1	Homing on the negative limit switch and index pulse	
2	Homing on the positive limit switch and index pulse	

Value	Definitions	Explanation
3 to 4	Homing on the positive home switch and index pulse	
5 to 6	Homing on the negative home switch and index pulse	
7 to 16	Other method (Skipped description)	Not supported
17	Homing on the negative limit switch Same homing as method 1 (**without an index pulse**)	Refer to method 1
18	Homing on the positive limit switch Same homing as method 2 (**without an index pulse**)	Refer to method 2
19 to 20	Homing on the positive home switch Same homing as method 3 and 4 (**without an index pulse**)	

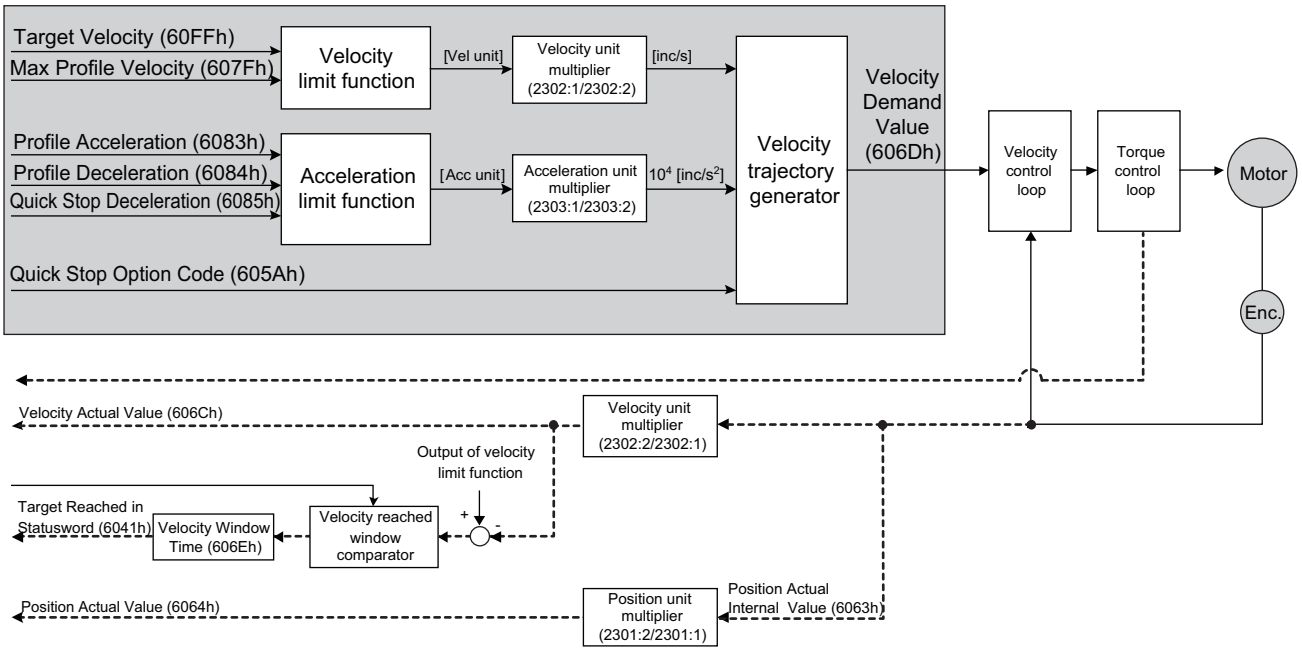
Value	Definitions	Explanation
21 to 32	Other method (Skipped description)	Not supported
33 to 34	Homing on index pulse	
35	Homing on the current position	Supported
36 to 127	Reserved	No effect

Note: The index pulse is recognized as the encoder zero signal (phase-C).

7.6 Profile Velocity Mode

In the Profile Velocity mode, the speed is output in accordance with the Profile acceleration and Profile deceleration, until it reaches the target velocity.

The following figure shows the block diagram of the Profile Velocity mode.



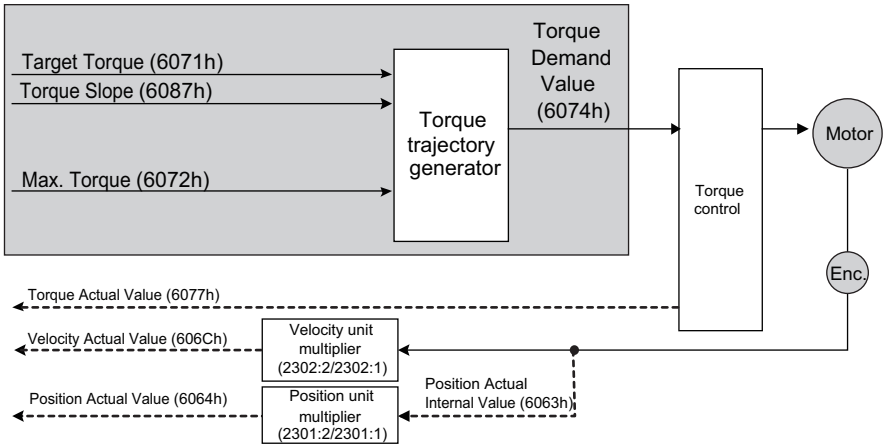
■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
60FFh	–	Target Velocity	RW	Yes	Vel units	DINT
607Fh	–	Max. Profile Velocity	RW	No	Vel units	UDINT
6083h	–	Profile Acceleration	RW	Yes	Acc units	UDINT
6084h	–	Profile Deceleration	RW	Yes	Acc units	UDINT
6085h	–	Quick Stop Deceleration	RW	Yes	Acc units	UDINT
606Bh	–	Velocity Demand Value	RO	Yes	Vel units	DINT
606Ch	–	Velocity Actual Value	RO	Yes	Vel units	DINT
606Dh	–	Velocity Window	RW	No	Vel units	UINT
606Eh	–	Velocity Window Time	RW	No	ms	UINT

7.7 Profile Torque Mode

In the Profile Torque mode, the torque is output to the target torque based on the torque slope setting.

The following figure shows the block diagram of the Profile Torque mode.



■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6071h	–	Target Torque	RW	Yes	0.1% *	INT
6087h	–	Torque Slope	RW	Yes	0.1%/s *	UDINT
6074h	–	Torque Demand Value	RO	Yes	0.1% *	INT
6077h	–	Torque Actual Value	RO	Yes	0.1% *	INT
6072h	–	Max. Torque	RW	Yes	0.1% *	UINT

* The motor rated torque is 100%.

7.8 Digital Inputs and Outputs

The Digital Inputs and Digital Outputs are used to control the I/O signals of the SERVOPACK CN1.

Index	Sub	Name	Access	PDO Mapping	Units	Type
60FDh	–	Digital Inputs	RO	Yes	–	UDINT
60FEh	–	Digital Outputs	–	–	–	–
	1	Physical outputs	RW	Yes	–	UDINT
	2	Bit mask	RW	No	–	UDINT

7.9 Touch Probe Function

The feedback position can be latched with the following trigger events:

- Trigger with touch probe 1 input (SERVOPACK CN1 /Probe1 (SI4) signal)
- Trigger with touch probe 2 input (SERVOPACK CN1 /Probe2 (SI5) signal)
- Trigger with encoder zero signal (C-phase)

The following two touch probe functions can be used at the same time.

<Touch Probe 1 Latch function>
- Latch Control object: 60B8h (Bit 0 to 7)
- Latch Status object: 60B9h (Bit 0 to 7)
- Latch Position is always stored to the Touch Probe1 Position Value (60BAh).
- Trigger signal: Encoder zero signal or /Probe1 signal (SI4)

<Touch Probe 2 Latch function>
- Latch Control object: 60B8h (Bit 8 to 15)
- Latch Status object: 60B9h (Bit 8 to 15)
- Latch Position is always stored to the Touch Probe2 Position Value (60BCh).
- Trigger signal: /Probe2 signal (SI5)

Connector pin allocations and positive/negative logics of /Probe1 (SI4) and /Probe2 (SI5) signals can be changed on the SERVOPACK (Pn511).

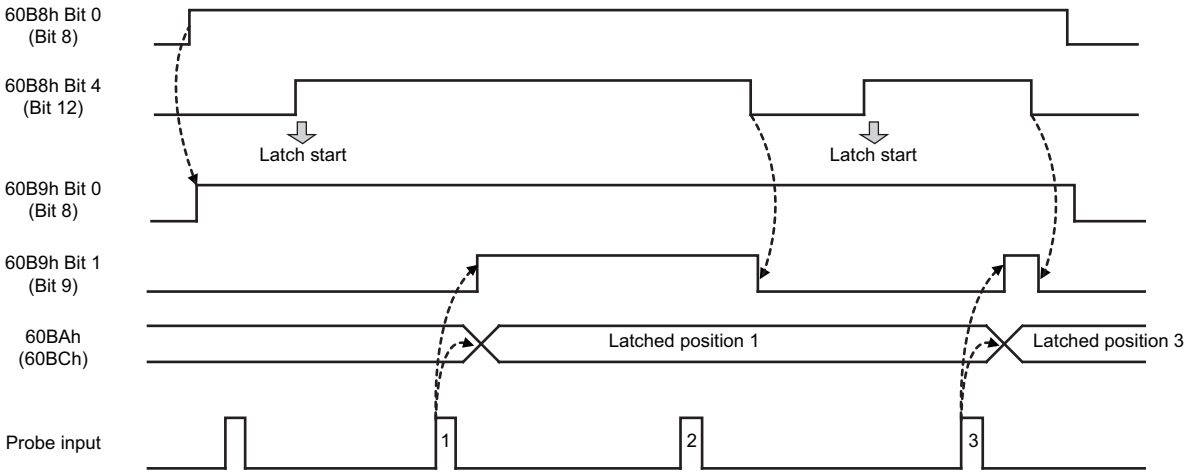
Note: When the homing function is executing, touch probe 1 function cannot be used. If touch probe 1 function was already enabled, touch probe 1 will be switched off.

■ Related Objects

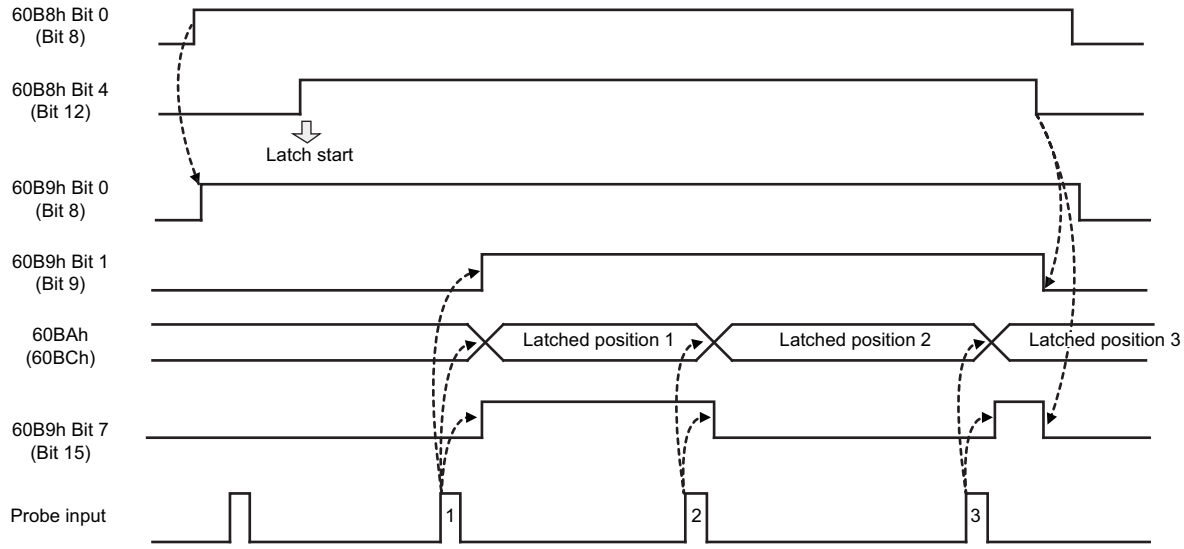
Index	Sub	Name	Access	PDO Mapping	Units	Type
60B8h	–	Touch Probe Function	RW	Yes	–	UINT
60B9h	–	Touch Probe Status	RO	Yes	–	UINT
60BAh	–	Touch Probe 1 Position Value	RO	Yes	Pos units	DINT
60BCh	–	Touch Probe 2 Position Value	RO	Yes	Pos units	DINT

■ Example of Handshaking Procedure for the Touch Probe Function

- Single Trigger Mode (60B8h bit1 = 0, or bit9 = 0)



- Continuous Trigger Mode (60B8h bit1 = 1, or bit9 = 1)



8

Object Dictionary

8.1 Object Dictionary List

The following table shows the object dictionaries.

Object Dictionaries		Refer to
General Objects	Device Type (1000h)	8.2
	Error Register (1001h)	8.2
	Error History (1003h)	8.2
	Manufacturer Device Name (1008h)	8.2
	Store Parameters (1010h)	8.2
	Restore Default Parameters (1011h)	8.2
	Identity Object (1018h)	8.2
PDO Mapping Objects	Receive PDO Communication (1400h)	8.3
	Receive PDO Mapping (1600h)	8.3
	Transmit PDO Communication (1800h)	8.3
	Transmit PDO Mapping (1A00h)	8.3
Manufacturer Specific Objects	SERVOPACK Parameters (2100h - 2101h)	8.4
	Monitor Object (2211h)	8.5
	User Parameter Configuration (2300h)	8.4
	Position User Unit (2301h)	8.4
	Velocity User Unit (2302h)	8.4
	Acceleration User Unit (2303h)	8.4
Device Control	Controlword (6040h)	8.5
	Statusword (6041h)	8.5
	Quick Stop Option Code (605Ah)	8.5
	Halt Option Code (605Dh)	8.5
	Modes of Operation (6060h)	8.5
	Modes of Operation Display (6061h)	8.5
	Supported Drive Modes (6502h)	8.5
Profile Position Mode	Target Position (607Ah)	8.6
	Software Position Limit (607Dh)	8.6
	Max. Profile Velocity (607Fh)	8.6
	Profile Velocity (6081h)	8.6
	Profile Acceleration (6083h)	8.6
	Profile Deceleration (6084h)	8.6
	Quick Stop Deceleration (6085h)	8.6
Homing Mode	Home Offset (607Ch)	8.7
	Homing Method (6098h)	8.7
	Homing Speeds (6099h)	8.7
	Homing Acceleration (609Ah)	8.7
Position Control Function	Position Demand Value (6062h)	8.8
	Position Actual Internal Value (6063h)	8.8
	Position Actual Value (6064h)	8.8
	Position Demand Internal Value (60FCh)	8.8
	Position Window (6067h)	8.8
	Position Window Time (6068h)	8.8
Interpolated Position Mode	Interpolation Data Record (60C1h)	8.9
	Interpolation Time Period (60C2h)	8.9

Object Dictionaries		Refer to
Profile Velocity Mode	Velocity Demand Value (606Bh)	8.10
	Velocity Actual Value (606Ch)	8.10
	Velocity Window (606Dh)	8.10
	Velocity Window Time (606Eh)	8.10
	Target Velocity (60FFh)	8.10
Profile Torque Mode	Target Torque (6071h)	8.11
	Max. Torque (6072h)	8.11
	Torque Demand Value (6074h)	8.11
	Torque Slope (6087h)	8.11
	Motor Rated Torque (6076h)	8.11
	Torque Actual Value (6077h)	8.11
Touch Probe Function	Touch Probe Function (60B8h)	8.12
	Touch Probe Status (60B9h)	8.12
	Touch Probe 1 Position Value (60BAh)	8.12
	Touch Probe 2 Position Value (60BCh)	8.12
Digital Inputs/Outputs	Digital Inputs (60FDh)	8.13
	Digital Outputs (60FEh)	8.13

8.2 General Objects

Abbreviations: VOR = Valid On Reset
TPDO = May be mapped into TPDO only

(1) Device Type (1000h)

The object at index 1000h describes the type of device and its functionality.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1000h	0	Device Type	UDINT	RO	No	0x00420192

■ Data Description

Bit 31 16 15 0

Additional information	Device profile number

Additional information: 0042 (Servo drive)
Device profile number: 0192 (DS402)

(2) Error Register (1001h)

This object is an error register for the device. The value of this object is stored in a part of emergency message.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1001h	0	Error Register	USINT	RO	TPDO	0x00

■ Data Description

Bit	Data Meaning	Explanation
0	Generic error	0: No error, 1: Error
1-7	Reserved	0: Always

(3) Error History (1003h)

This object displays the error history of the device.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1003h	0	Number of entries	USINT	RW	TPDO	0-254
	1-254	Error entry	-	RO	No	-

An error entry has the following format:

Octet offset	Field	Abbr.	Description	Value
0 .. 1	Entry Type	type	see the following table	Unsigned16
2 .. 3	Error Code	code	Depending on the Entry Type the error codes are described in the device profiles, device descriptions or the communication profile.	Unsigned16
4 .. 11	Time Stamp	time	SoC Nettime from the cycle when the error/event was detected.	Unsigned64
12 .. 19	Manufacturer Error	add	This field contains device profile error information.	Unsigned64

Description of one entry

All elements of the Error Entry shall be stored and transferred in little endian format.

Octet	Bit	Value	Description
0 .. 1	15 (status)	0	ERR_History entry
		1	Status Entry in StatusResponse frame (Bit 14 shall be sent to 0)
	14 (send)	0	ERR_History only
		1	Additional to the ERR_History, the entry shall also be entered into the Emergency Queue of the Error Signaling.
	13 .. 12 (mode)	0h	Not allowed in ERR_History. Entries with this mode may only be used by the Error Signaling itself to indicate the termination of the History Entries in the StatusResponse frame.
		1h	An error has occurred and is active.
		2h	An active error was cleared.
		3h	An error / event occurred.
	11 .. 0 (profile)	000h	Reserved
		001h	The field “Error Code” contains a vendor specific error code.
		002h	The field “Error Code” contains Powerlink communication profile specific errors.
		003h .. FFFh	The field “Error Code” contains device profile specific errors.

(4) Manufacturer Device Name (1008h)

This object contains the name of the Sigma V Powerlink Option Card (SGDV-OCB02A).

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1008h	0	Manufacturer Device Name	STRING	RO	No	SGDV-OCB02A

(5) Store Parameters (1010h)

With this object, the setting values of the “valid on reset” objects and the PDO mapping objects (1600h and 1A00h) can be stored in the non-volatile memory.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1010h	0	Largest subindex supported	USINT	RO	No	1h - 7Fh
	1	Save all parameters	UDINT	RW	No	0x00000000 to 0xFFFFFFFF (Default: 0x00000001)

This object enables saving data written in defined objects. The device saves parameters on command. By reading data of an object entry, the SERVOPACK provides its capability to save the values.

Bit	Value	Meaning
1	0	The SGDV SERVOPACK does not save parameters autonomously
	1	The SGDV SERVOPACK saves parameters autonomously
0	0	The SGDV SERVOPACK does not save parameters on command
	1	The SGDV SERVOPACK saves parameters on command

In order to avoid storage of parameters by mistake, storage is only executed when a specific signature is written to the appropriate sub-index. The signature that shall be written is “save.”

Signature	MSB			LSB
ASCII	e	v	a	s
hex	65h	76h	61h	73h

By writing “save” to Sub-Index 1, the values of the mentioned above objects are stored.

Note 1. If a wrong signature is written, the SGDV SERVOPACK refuses to store and responds with Abort SDO Transfer.
2. If the storing parameters are executing, 0 will be returned by read this object.
3. Sub-Index 1 can be written only in Switch on Disabled state (Servo off state).
4. After storing the objects by Sub-Index 1, power on reset is necessary to transit into the Operation Enabled state.

(6) Restore Default Parameters (1011h)

With this object, the default values of the "valid on reset" objects and the PDO mapping objects (1600h and 1A00h) can be restored.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1011h	0	Largest subindex supported	USINT	RO	No	1h - 7Fh
	1	Restore default values	UDINT	RW	No	0x00000000 to 0xFFFFFFFF (Default: 0x00000001)

By reading data of an object entry, the SERVOPACK provides its capability to restore default values.

Bit	Value	Meaning
0	0	Device does not restore default parameters
	1	Device restores default parameters

In order to avoid restoring of parameters by mistake, restoring is only executed when a specific signature is written to the appropriate sub-index. The signature that shall be written is "load."

Signature	MSB			LSB
ASCII	d	a	o	l
hex	64h	61h	6Fh	6Ch

By writing "load" to Sub-Index 1, the values of the mentioned above objects are restored.

Note 1. If a wrong signature is written, the SGDV SERVOPACK refuses to restore and responds with Abort SDO Transfer.
2. Sub-Index 1 can be written only in Switch on Disabled state (Servo off state).
3. During "restoring values" 0 will be returned by read this object.
4. The default values are set as valid after the SGDV SERVOPACK has been reset or power cycled.
5. If the restoring failed, the device responds with an Abort SDO Transfer.

(7) Identity Object (1018h)

The object contains general information about the device.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1018h	0	Number of entries	USINT	RO	No	4
	1	Vendor ID	UDINT	RO	No	0x010000E7
	2	Product code *1	UDINT	RO	No	00000B02h*1
	3	Revision number	UDINT	RO	No	–
	4	Serial number *2	UDINT	RO	No	0x00000000*2

*1. In this area the type (ID) of the Option Card is stored. The values represented as "❑" in the substrate model SGDV-OC❑❑❑A are stored as a data.
*2. Serial number is not used. (always 0)

8.3 PDO Mapping Objects

Powerlink allows the user to map objects into Process Data Objects (PDOs) to use these PDOs for real time data transfer.

PDO Mapping configuration defines which objects in a PDO will include.

Each Mapping entry (Sub-Index 1 to 8) is defined as follows.

	UNSIGNED64				
Bits	63 ... 48	47 ... 32	31 ... 24	23 ... 16	15 ... 0
Name	Length	Offset	Reserved	Sub-index	Index
Encoding	UNSIGNED16	UNSIGNED16	-	UNSIGNED8	UNSIGNED16

Structure of PDO Mapping Entry

Octet Offset	Name	Description
0 - 1	Index	Index of the object to be mapped
2	Sub-Index	Sub-index of the object to be mapped
3	reserved	for alignment purpose
4 - 5	Offset	Offset related to start of PDO payload (Bit count)
6 - 7	Length	Length of the mapped object (Bit count)

Mapping entries (Sub-Index 1 - 8) has to be set after Sub-Index 0 was written to 0.

(1) Receive PDO Communication (1400h)

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1400h	0	Number of entries	USINT	-	No	2 (Default: 2)
	1	NodeID_U8	USINT	RO	No	0 to 255
	2	MappingVersion_U8	USINT	RW	No	0 to 255

(1) Receive PDO Mapping (1600h)

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1600h	0	Number of objects in this PDO	USINT	RW	No	0 to 8 (Default: 3)
	1	Mapping entry 1	UNSIGNED 64	RW	No	Default: 6040/0
	2	Mapping entry 2	UNSIGNED 64	RW	No	Default: 607A/0
	3	Mapping entry 3	UNSIGNED 64	RW	No	Default: 60FF/0
	4	Mapping entry 4	UNSIGNED 64	RW	No	Default: 0
	5	Mapping entry 5	UNSIGNED 64	RW	No	Default: 0
	6	Mapping entry 6	UNSIGNED 64	RW	No	Default: 0
	7	Mapping entry 7	UNSIGNED 64	RW	No	Default: 0
	8	Mapping entry 8	UNSIGNED 64	RW	No	Default: 0

(1) Transmit PDO Communication (1800h)

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1800h	0	Number of entries	USINT	-	No	2 (Default: 2)
	1	NodeID_U8	USINT	RO	No	0 to 255
	2	MappingVersion_U8	USINT	RW	No	0 to 255

(2) Transmit PDO Mapping (1A00h)

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
1A00h	0	Number of entries	USINT	RW	No	0 to 8 (Default: 3)
	1	Mapping entry 1	UNSIGNED 64	RW	No	Default: 6041/0
	2	Mapping entry 2	UNSIGNED 64	RW	No	Default: 6064/0
	3	Mapping entry 3	UNSIGNED 64	RW	No	Default: 606C/0
	4	Mapping entry 4	UNSIGNED 64	RW	No	Default: 0
	5	Mapping entry 5	UNSIGNED 64	RW	No	Default: 0
	6	Mapping entry 6	UNSIGNED 64	RW	No	Default: 0
	7	Mapping entry 7	UNSIGNED 64	RW	No	Default: 0
	8	Mapping entry 8	UNSIGNED 64	RW	No	Default: 0

8.4 Manufacturer Specific Objects

(1) SERVOPACK Parameters (Get Parameter 2100h - Set Parameter 2101h)

For reading the values of the parameters, 2100h must be used. The wanted parameter must be written to 2100/1h and its value will be read from 2100/1h afterwards.

For writing values to the parameters, 2101h must be used. The wanted parameter must be written to 2101/1h and the wanted value must be written to 2101/1h afterwards.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2100h	0	Number of entries	-	RO	No	2
	1	Parameter identify	UINT	RW	No	0 to 65535
	2	Parameter value	DINT	RO	No	-2147483648 to 2147483627

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2101h	0	Number of entries	-	RO	No	2
	1	Parameter identify	UINT	RW	No	0 to 65535
	2	Parameter value	DINT	RW	No	-2147483648 to 2147483627

(2) Read servo monitor (2211h)

This object enables using the Sigma-5 “Monitor mode (Un.000- 012)”.
Reading Monitor data of Sigma-5:
In order to read Monitor data of Sigma-5 do the following:

1. Write Un number to subindex 1
2. Read the value from subindex 2

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2211h	0	Number of entries	-	RO	No	2
	1	Monitor identify	USINT	RW	No	0 - 0x12
	2	Monitor value	DINT	RO	No	-2147483648 to 2147483627

(3) User Parameter Configuration (2300h)

This object enables all User parameter settings, and initializes the all position values.

Before restarting operation without turning the power supply OFF and then ON again after having changed the following objects, this object must be executed to enable new settings.

• Object 2301h, 2302h and 2303h

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2300h	0	User Unit Group Enable	UDINT	RW	No	0 to 1 (Default: 0)

■ Procedure

1. Change FSA state to “Switch on Disabled.”
2. Set new parameter setting value.
3. Set object 2300h to 1 for activating the “new” user settings.
   When processing is completed, the value of object 2300h is reset to 0.

(4) Position User Unit (2301h)

This object sets the user defined position reference unit [Pos unit].

The user defined position reference unit is calculated by the following formula:
1 [Pos unit] = (Numerator/Denominator) [inc]

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2301h	0	Number of entries	USINT	RO	No	2
	1	Numerator	UDINT	RW	No	1 to 1073741823 (Default: 1)
	2	Denominator	UDINT	RW	No	1 to 1073741823 (Default: 1)

(5) Velocity User Unit (2302h)

This object sets the user defined velocity reference unit [Vel unit].

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2302h	0	Number of entries	USINT	RO	No	2
	1	Numerator	UDINT	RW	No	1 to 1073741823 (Default: 1)
	2	Denominator	UDINT	RW	No	1 to 1073741823 (Default: 1)

(6) Acceleration User Unit (2303h)

This object sets the user defined acceleration reference unit [Acc unit].

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
2303h	0	Number of entries	USINT	RO	No	2
	1	Numerator	UDINT	RW	No	1 to 1073741823 (Default: 1)
	2	Denominator	UDINT	RW	No	1 to 1073741823 (Default: 1)

(7) Example for ballscrew application

1. User requirements and application data

1) User position unit = 0.001 mm

2) User velocity unit = 1 mm/sec

3) User acceleration unit

Type 1: = 1/1000 (0.1 %) of the calculated acceleration for the target application.

Type 2: = 1 mm/sec^2.

4) Application data

Encoder = 20 bit (1048576 counts/rev)

The movement for 1 motor revolution = 2 mm.

5) User acceleration type 1 “Time Constant” data for top speed

Top speed = 1000 mm/sec (60 m/min).

Calculated acceleration time to top speed = 80 msec.

Note: calculated acceleration for the target application = 12500 mm/sec^2 = 1.275G.

2. Setting

1) Position user unit (2301h): Number of encoder counts for One user position unit

Number of encoder counts for 1 mm (1000 user position units).

= {(1048576 counts/rev) / (2 mm/rev)} * 1 mm = 524288 counts.

Numerator = 524288

Denominator = 1000

2) Velocity user unit (2302h): Number of encoder counts per msec for One user velocity unit.

Number of encoder counts per sec for 1 mm/sec (1 user velocity unit).

= {(1048576 counts/rev) / (2 mm/rev)} * 1 mm = 524288 counts/sec: 1000 msec.

Numerator = 524288

Denominator = 1000

3) Acceleration user unit (2303h): Number of encoder counts increments per msec. for One user acceleration unit.

Type 1

Number of encoder counts per msec for top speed = 1000 mm/sec = 1mm/msec

= {(1048576 counts/rev) / (2 mm/rev)} * 1mm/msec = 524288 counts/msec.

Numerator = 524288

Denominator = 80 *1000

Type 2

Number of encoder counts per msec for 1 mm/sec = 524288 counts/msec.

Number of encoder counts increments / msec for 1 mm/sec = 524288/1000*1000.

Numerator = 524288 * 100

Denominator = 1000 *1000

(8) Example for rotary table application

1. User requirements and application data

Note: Deg, Rev = dimension for rotary table, deg, rev = servomotor dimension

1) User position unit = 0.001 Deg

2) User velocity unit =1 Deg/sec

3) User acceleration unit

Type 1: = 1/1000 (0.1 %) of the calculated acceleration for the target application.

Type 2: = 1 Deg/sec^2.

4) Application data

Encoder = 20 bit (1048576 counts/rev)

The rotary table moves 36 Degrees for 1 motor revolution.

5) User acceleration type 2 “Time Constant” data for top speed = 10 Rev/sec (3600 Deg/rev)

Top speed = 10 Rev/sec (3600 Deg/sec).

Calculated acceleration time to top speed = 80 msec.

Note: calculated acceleration for the target application = 45000.

2. Setting

1) Position user unit (2301h): Number of encoder counts for One user position unit

Number of encoder counts for One user position unit = 0.001 Deg.

= {(1048576 counts/rev) / (36 Deg/rev)} * 0.001 Deg = 1048576/36 counts/sec: 1000 msec.

Numerator = 1048576

Denominator = 36*1000

2) Velocity user unit (2302h): Number of encoder counts per msec for One user velocity unit

Number of encoder counts per sec for One user velocity unit = 1 Deg/sec.

= {(1048576 counts/rev) / (36 Deg/rev)} * 1 Deg/sec = 1048576/36 counts/sec: 1000 msec.

Numerator = 1048576

Denominator = 36*1000

3) Acceleration user unit (2303h): Number of encoder counts increments per msec. for One user acceleration unit.

Type 1

Number of encoder counts per msec. for top speed = 3600 Deg/sec = 3.6 Deg/msec

= {(1048576 counts/rev) / (36 Deg/rev)} * 3.6 Deg/msec =1048576/10

Numerator = 1048576*100

Denominator = 10*80 *1000

Type 2

Number of encoder counts per msec. for 1 Deg/sec.

= {(1048576 counts/rev) / (36 Deg/rev)} /1000 msec =1048576/10/36*1000

Number of encoder counts increments per msec for 1 Deg/sec

=1048576/(36*1000*1000)

Numerator = 1048576 * 100

Denominator = 36*1000 *1000

(9) Example for linear motor application

1. User requirements and application data

A linear motor moves a distance AB = 1.4 m.

The motor acceleration and deceleration is equal to 5000 mm/s^2.

The cruising velocity is equal to 1000 mm/s.

The linear scale pitch is equal to 20 µm and an 8 bit serial converter is connected to the motor.

2. User settings and configuration:

Position user units:

- Numerator = 2301h/1h = 2^8 (resolution of serial converter) = 256 dec
- Denominator = 2301h/2h = 20 dec (linear scale pitch)

Velocity user units:

Numerator = 2302h/1h = 2^8 (resolution of serial converter) = 256 dec

Denominator = 2302h/2h = 20 dec (linear scale pitch)

User acceleration units:

Numerator 2303h/1h = 2^8/20 * 1000 (resolution of serial converter/linear scale pitch * 1000) = 256/20 * 1000 dec = 12800

Denominator 2303h/2h = 10000 dec

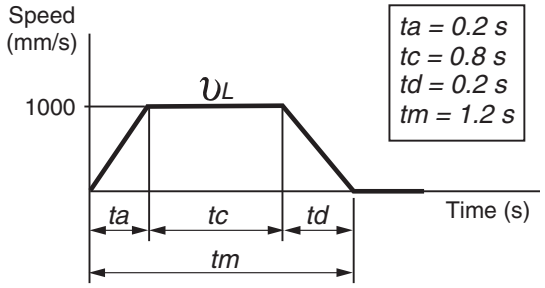
3. Profile position objects:

Profile velocity = 6081h/1h = 1000 dec

Profile acceleration = 6083h/1h = 5000 dec

Profile deceleration = 6084h/1h = 5000 dec

Target Position = 607Ah/1h = 1400000 dec



8.5 Device Control

(1) Controlword (6040h)

The Controlword consists of bits for the controlling of the drive state, the controlling of operating modes and manufacturer specific options.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6040h	0	Controlword	UINT	RW	Yes	0 to 0xFFFF (Default: 0)

■ Controlword Bits

Bit No	Function	Description
0	Switch on	See <*Details on Bits 0 - 3 and 7*>.
1	Enable voltage	
2	Quick stop	
3	Enable operation	
4 to 6	Operation mode specific	See <*Details on Bits 4 to 9*>.
7	Fault reset	See <*Details on Bits 0 - 3 and 7*>.
8	Halt	
9	Operation mode specific	Not supported
10	– (Not used)	No effect
11	Positive Torque Limit	0: Torque Limit disable. 1: Torque Limit enable.
12	Negative Torque Limit	
13 to 15	– (Not used)	No effect

<Details on Bits 0 - 3 and 7>

- Bit 0 - 3 and 7: for the controlling command of the drive state

Command	Bit of the Controlword				
	Bit7	Bit3	Bit2	Bit1	Bit0
Shutdown	0	–	1	1	0
Switch on	0	0	1	1	1
Switch on + Enable operation	0	1	1	1	1
Disable voltage	0	–	–	0	–
Quick stop	0	–	0	1	–
Disable operation	0	0	1	1	1
Enable operation	0	1	1	1	1
Fault reset	0 → 1	-	-	-	-

IMPORTANT

- In order to be able to achieve SERVO ON, a supported mode of operation must be set to the object 6060h. Without providing 6060h with a mode of operation, the SDO abort code 0x08000022 will appear at the moment “7” is given to 6040h.

Bit 11&12 (Positive torque limit/Negative torque limit Enable/Disable)

To use these torque limit, you have to set follow Servo Drive Parameter,
using 2101h: Set parameter, Manufacturer specific object, before set Enable.
Pn404 Forward External Torque Limit
Pn405 Reverse External Torque Limit
(refer to Sigma-5 user manual, Design/Maintenance, for detail.)

<Details on Bits 4 to 9>

- Bit 4, 5 and 9: for the controlling of Profile position mode

Bit9	Bit5	Bit4	Definition
0	0	0 → 1	Positiong shall be completed (target reached) before the next one gets started
0	1	0 → 1	Next positioning shall be started immediately
1	-	-	Not supported

- Bit 6 and 8: for the controlling of Profile position mode

Bit	Function	Value	Definition
6	Abs/rel	0	Target position is an absolute value.
		1	Target position is a relative value.
8	Halt	0	Positioning is executed or continued.
		1	Stop axis according to halt option code (605Dh)

- Bit 4, 5, 6, 8 and 9: for the controlling of Homing mode

Bit	Function	Value	Definition
4	Homing operation start	0	Do not start homing procedure
		1	Start or continue homing procedure
5	–	0	Reserved
6	–	0	Reserved
8	Halt	0	Enable bit 4
		1	Stop axis according to halt option code (605Dh)
9	–	0	Reserved

- Bit 4, 5, 6, 8 and 9: for the controlling of Interpolated position mode

Bit	Function	Value	Definition
4	Enable interpolation	0 → 1	Interpolated position mode start
		1 → 0	Interpolated position mode stop
5	–	0	Reserved
6	–	0	Reserved
8	Halt	0	Execute instruction of bit 4
		1	Stop axis according to halt option code (605Dh)
9	–	0	Reserved

• Bit 4, 5, 6, 8 and 9: for the controlling of Profile velocity/torque mode

Bit	Function	Value	Definition
4	–	0	Reserved
5	–	0	Reserved
6	–	0	Reserved
8	Halt	0	The motion is executed or continued.
		1	Stop axis according to halt option code (605Dh)
9	–	0	Reserved

(2) Statusword (6041h)

The Statusword indicates the current state of the drive. No bits are latched.
The Statusword consists of bits for the current state of the drive and the operating state of the mode and manufacturer specific options.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6041h	0	Statusword	UINT	RO	Yes	0

■ Statusword Bits

Bit	Status	Description
0	Ready to switch on	See <*Details on Bits 0 to 7*>.
1	Switched on	
2	Operation enabled	
3	Fault	
4	Voltage enabled	
5	Quick stop	
6	Switch on disabled	
7	Warning	
8	Manufacturer specific	No effect (Always 0)
9	Remote	Controlword (6040h) is processed (Always 1)
10	Target reached	See <*Details on Bits 10, 12, and 13*>. *Note: Even if a fault occurs or main power is turned off or HWBB becomes active, it complies with the description stated below.*
11	Internal limit active / Torque limit active	See <*Details on Bit 11*>.
12 to 13	Operation mode specific	See <*Details on Bits 10, 12, and 13*>.
14	HWBB	Safety state (STO)
15	Manufacturer specific	No effect (Always 0)

<Details on Bits 0 to 7>

• Bit 0 to 7: for the current state of the drive

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0	Drive State
–	0	–	–	0	0	0	0	Not ready to switch on
–	1	–	–	0	0	0	0	Switch on disabled
–	0	1	–	0	0	0	1	Ready to switch on
–	0	1	–	0	0	1	1	Switched on
–	0	1	–	0	1	1	1	Operation enabled
–	0	0	–	0	1	1	1	Quick stop active
–	0	–	–	1	1	1	1	Fault reaction active
–	0	–	–	1	0	0	0	Fault
–	–	–	1	–	–	–	–	Main Power On
1	–	–	–	–	–	–	–	Warning is occurred

<Details on Bit 11>

If bit 11 (internal limit active) of the statusword is 1, this shall indicate that an internal limit is active. The internal limits are manufacturer-specific. (Explanation of DS402)

The internal limit active in the following cases:
1. Software position limit
2. N-OT, P-OT limit switch

<Details on Bits 10, 12, and 13>

- Bit 10, 12 and 13: for Profile position mode

Bit No	Description	Value	Definition
10	Target reached	0	Halt (Bit 8 in Controlword) = 0: Target position not reached Halt (Bit 8 in Controlword) = 1: Axis decelerates
		1	Halt (Bit 8 in Controlword) = 0: Target position reached Halt (Bit 8 in Controlword) = 1: Velocity of axis is 0
12	Set-point acknowledge	0	Previous set-point already processed, waiting for new set-point
		1	Previous set-point still in process, set-point overwriting shall be accepted
13	Reserved	–	No effect

- Bit 10, 12 and 13: for Homing mode

Bit13	Bit12	Bit10	Definition
Homing error	Homing attained	Target reached	
0	0	0	Homing procedure is in progress
0	0	1	Homing procedure is interrupted or not started
0	1	0	Homing is attained, but target is not reached
0	1	1	Homing procedure is completed successfully
1	0	0	Homing error occurred, velocity is not 0
1	0	1	Homing error occurred, velocity is 0
1	1	–	Reserved

• Bit 10, 12 and 13: for Interpolated position mode

Bit	Status	Value	Definition
10	Target reached	0	Target position not (yet) reached (if Halt bit in last controlword was 0) or axle decelerates (if Halt bit in last controlword was 1)
		1	Target position reached (if Halt bit in last controlword was 0) or axle has velocity 0 (if halt bit in last controlword was 1)
12	Ip mode active	0	ip mode inactive In case of one of the following condition: 1) The Star IP in the control word (bit 4) was not 1 in the previous Interpolation Cycle. 2) The motor stops after Halt or Quick Stop command
		1	ip mode active After all of the following condition are met: 1) The Star IP in the control word (bit 4) was 1 in the previous Interpolation Cycle. 2) There is no Halt or Quick Stop command
13	Reserved	–	No effect

• Bit 10, 12 and 13: for Profile velocity mode

Bit	Status	Value	Definition
10	Target reached	0	Halt (Bit 8 in Controlword) = 0: Target not reached Halt (Bit 8 in Controlword) = 1: Axis decelerates
		1	Halt (Bit 8 in Controlword) = 0: Target reached Halt (Bit 8 in Controlword) = 1: Velocity of axis is 0
12	Speed	0	Speed is not equal 0
		1	Speed is equal 0
13	Reserved	–	No effect

• Bit 10, 12 and 13: for Profile torque mode

Bit	Status	Value	Definition
10	Target reached	0	Halt (Bit 8 in Controlword) = 0: Target torque not reached Halt (Bit 8 in Controlword) = 1: Axis decelerates
		1	Halt (Bit 8 in Controlword) = 0: Target torque reached Halt (Bit 8 in Controlword) = 1: Velocity of axis is 0
12	Reserved	–	No effect
13	Reserved	–	No effect

• Bit 10, 12 and 13: for Pole detection mode

Bit13	Bit12	Bit10	Definition
0	0	–	None
0	1	–	Pole detection completed
1	0	–	Pole detection in process
1	1	–	Reserved

(3) Quick Stop Option Code (605Ah)

The parameter quick stop option code determines what action should be taken if the Quick Stop function is executed.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
605Ah	0	Quick Stop Option Code	INT	RW	No	0 - 3, 5 - 7 (Default: 2)

■ Data Description

Value	Data Description	Explanation
-32768 ... -1	Manufacturer Specific	No effect
0	Disable drive function	Supported
1	Slow down on slow down ramp	Supported
2	Slow down on quick stop ramp	Supported
3	Slow down on the current limit	Supported
4	Slow down on the voltage limit	Not supported
5	Slow down on slow down ramp and stay in QUICK STOP	Supported
6	Slow down on quick stop ramp and stay in QUICK STOP	Supported
7	Slow down on the current limit and stay in QUICK STOP	Supported
8	Slow down on the voltage limit and stay in QUICK STOP	Not supported
9 ... 32767	Reserved	No effect

(4) Halt Option Code (605Dh)

The parameter halt option code determines what action should be taken if the bit 8 (halt) in the Controlword is active.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
605Dh	0	Halt Option Code	INT	RW	No	1 to 3 (Default: 1)

■ Data Description

Value	Data Description	Explanation
1	Slow down on slow down ramp	Supported
2	Slow down on quick stop ramp	Supported
3	Slow down on the current limit	Supported

(5) Modes of Operation (6060h)

The master writes to the *modes of operation* object in order to select the operation mode. The drive device provides the *modes of operation display* object to indicate the actual activated operation mode.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6060h	0	Modes of Operation	SINT	RW	Yes	-1 to 7 (Default: 0)

■ Data Description

Value	Data Description	Explanation
-1	Pole detection mode	Supported
0	No mode change/No mode assigned	No movement. Usually after power on.
1	Profile Position mode	Supported
2	Velocity mode	Not supported
3	Profile Velocity mode	Supported
4	Profile Torque mode	Supported
5	Reserved	No effect
6	Homing mode	Supported
7	Interpolated position mode	Supported

Note:

A read of modes of operation shows only the value of modes of operation. The actual mode of the drive is reflected in the object modes of operation display. It may be changed by writing to modes of operation.

Appendix

Object 6060h can be written several times with the same value as SDO.

Setting pole detection mode of operation enables the pole detection in which a magnetic pole of linear motor connected to Sigma-5 can be detected. When an incremental linear scale is used, the detected phase information will not be saved and thus, the mode of operation is required at every power-on.

When an absolute linear scale is used, detected information will be saved into both Sigma-5 and the scale connected to Sigma-5. In the following CiA 402 FSA transition, the pole detection starts:

1) From Ready to Switch on to Switch on

2) From Ready to Switch on to Operation Enabled.

Transition command to Switch On Disable during the pole detection will not stop the pole detection immediately only after the pole detection completion. Then the driver will be is servo off and in Switch On Disable state.

Reset application should not be done during pole detection process.

(6) Modes of Operation Display (6061h)

The modes of operation display show the current mode of operation.
The meaning of the returned value corresponds to that of the modes of operation option code (index 6060h).

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6061h	0	Modes of Operation Display	SINT	RO	Yes	0

(7) Supported Drive Modes (6502h)

This object gives an overview of the implemented operating modes in the device.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6502h	0	Supported Drive Modes	UDINT	RO	TPDO	006Dh

■ Data Description

Bit	Supported Modes	Definition
0	Pp (Profile Position mode)	1: Supported
1	Vl (Velocity mode)	0: Not supported
2	Pv (Profile Velocity mode)	1: Supported
3	Tq (Torque Profile mode)	1: Supported
4	Reserved	0: No effect
5	Hm (Homing mode)	1: Supported
6	Ip (Interpolated Position mode)	1: Supported
7 - 15	Reserved	0: No effect
16 - 31	Manufacturer specific	0: No effect

8.6 Profile Position Mode

(1) Target Position (607Ah)

This object is the target position in the Profile Position mode.

In Profile Position mode, the value of this object is interpreted as either an absolute or relative value depending on the abs/rel flag of Controlword.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
607Ah	0	Target Position	DINT	RW	Yes	–2147483648 to +2147483647 (Default: 0) [Pos. unit]

(2) Software Position Limit (607Dh)

Software position limit contains the sub-parameters min position limit and max position limit.

These parameters define the absolute position limits for the position demand value and the position actual value.

Every new target position must be checked against these limits.

The limit positions are specified in position units (same as target position) and are always relative to the machine home position.

Software limit change is not allowed in Operation enable and Quick Stop state.

Movement operation from out of limits condition is allowed only to the negative direction of the software limit.

The software limits will be disabled if Min position limit > Max position is given.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
607Dh	0	Number of entries	USINT	RO	No	2
	1	Min. position limit	DINT	RW	Yes	–2147483648 to 2147483647 (Default: Depending on the motor type)
	2	Max. position limit	DINT	RW	Yes	–2147483648 to 2147483647 (Default: Depending on the motor type)

(3) Max. Profile Velocity (607Fh)

The max. profile velocity is the maximum allowed speed in either direction during a profiled move. It is given in the same units as profile velocity.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
607Fh	0	Max. Profile Velocity	UDINT	RW	Yes	0 to Max. motor speed (Default: Max. motor speed)

(4) Profile Velocity (6081h)

The profile velocity is the velocity normally attained at the end of the acceleration ramp during a profiled move and is valid for both directions of motion.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6081h	0	Profile Velocity	UDINT	RW	Yes	0 to Max. profile velocity (Default: 0) [Vel. unit]

(5) Profile Acceleration (6083h)

This object specifies the acceleration for profile modes.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6083h	0	Profile Acceleration	UDINT	RW	Yes	0 to Max. acceleration (Default: 0)

(6) Profile Deceleration (6084h)

This object specifies the deceleration for profile modes.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6084h	0	Profile Deceleration	UDINT	RW	Yes	0 to Max. deceleration (Default: 0)

(7) Quick Stop Deceleration (6085h)

The quick stop deceleration is the deceleration used to stop the motor if the ‘Quick Stop’ command is given and the Quick Stop Option Code (see 605Ah) is set to 2.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6085h	0	Quick Stop Deceleration	UDINT	RW	Yes	0 to Max. deceleration

8.7 Homing Mode

(1) Home Offset (607Ch)

The home offset is the difference between the zero position for the application and the machine home position (found during homing).

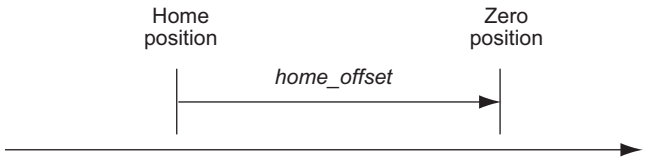
Index	Sub	Name	Data Type	Access	PDO Mapping	Value
607Ch	0	Home Offset	DINT	RW	No	–536870912 to +536870911 (Default: 0) [Pos. unit]

- For Incremental Encoder

  During the homing the machine home position is found and once the homing is completed the zero position is offset from the home position by adding the home offset to the home position.

- For Absolute Encoder

  When an absolute encoder is connected to the SERVOPACK, the home offset is added to the encoder absolute position (the position actual value) in power up phase.



(2) Homing Method (6098h)

This object specifies the homing method. For details, refer to *7.5 Homing*.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6098h	0	Homing Method	SINT	RW	Yes	0 - 6, 17 -20, 33 - 35 (Default: 0)

■ Data Description

Value (Method)	Data Description
0	No homing operation required
1	Homing on the negative limit switch and index pulse
2	Homing on the positive limit switch and index pulse
3, 4	Homing on the positive home switch and index pulse
5, 6	Homing on the negative home switch and index pulse
17	Homing on the negative limit switch - Same homing as method 1 (without an index pulse)
18	Homing on the positive limit switch - Same homing as method 2 (without an index pulse)
19, 20	Homing on the positive home switch - Same homing as method 3, 4 (without an index pulse)
33, 34	Homing on index pulse
35	Homing on the current position

(3) Homing Speed (6099h)

This object entries define the speeds used during homing and is given in user velocity units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6099h	0	Number of entries	USINT	RO	No	2
	1	Speed during search for switch	UDINT	RW	Yes	0 to Max. profile velocity
	2	Speed during search for zero	UDINT	RW	Yes	0 to Max. profile velocity

(4) Homing Acceleration (609Ah)

This object specifies the acceleration and deceleration for homing in user defined acceleration reference units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
609Ah	0	Homing Acceleration	UDINT	RW	Yes	0 to Max. acceleration

8.8 Position Control Function

(1) Position Demand Value (6062h)

This object provides the demanded position value in user position units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6062h	0	Position Demand Value	DINT	RO	TPDO	– [Pos. unit]

(2) Position Actual Internal Value (6063h)

This object provides the current feedback position in encoder pulse units [inc].

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6063h	0	Position Actual Internal Value	DINT	RO	TPDO	– [inc]

(3) Position Actual Value (6064h)

This object represents the actual value of the encoder position in defined user position units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6064h	0	Position Actual Value	DINT	RO	TPDO	– [Pos. unit]

(4) Position Demand Internal Value (60FCh)

This object provides the output of the trajectory generator in position mode. This value is given in increments of the position encoder.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60FCh	0	Position Demand Internal Value	DINT	RO	TPDO	– [inc]

(5) Position Window (6067h)

This object specifies the positioning completed width for the target position. When the drive complets outputting of the reference to the target position, and the time specified by object 6068h has passed after the distance between the Target Position and the Position Actual Value falls within the value of this object, bit 10 (Target reached) of Statusword is set to 1.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6067h	0	Position Window	UDINT	RW	No	0 to 1073741823 (Default: 32) [Pos. unit]

(6) Position Window Time (6068h)

When the drive completed outputting the reference to the target position, and the time specified by this object has passed after the distance between the Target Position and the Position Actual Value became within the value of object 6067h, the bit 10 (Target reached) of Statusword is set to 1.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6068h	0	Position Window Time	UINT	RW	No	0 to 65535 (Default: 0) [ms]

8.9 Interpolated Position Mode

(1) Interpolation Data Record (60C1h)

This object represents the interpolation position reference in Interpolated Position mode.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60C1h	0	Number of entries	USINT	RO	No	1
	1	Interpolation data record	DINT	RW	Yes	–2147483648 to +2147483647 (Default: 0) [Pos. unit]

(2) Interpolation Time Period (60C2h)

This object defines the update cycle of the interpolated position reference.

This object can be changed only in Switch on Disabled state.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60C2h	0	Number of entries	USINT	RO	No	2 (Default: 2)
	1	Interpolation time units	USINT	RW	No	See note *1 below
	2	Interpolation time index	SINT	RW	No	–3, –4 (Default: –3)

Interpolation time = (Object 60C2:01h) × $10^{(\text{Object 60C2:02h})}$ [sec]

*1: Supported values are 1, 2, 4 in case of Interpolation time index (0x60C2/2) is -3.
Supported values are 5, 10, 20, 40 in case of Interpolation time index (0x60C2/2) is -4.

8.10 Profile Velocity Mode

(1) Velocity Demand Value (606Bh)

This object provides the output value of the velocity trajectory generator or the output value of the position control function.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
606Bh	0	Velocity Demand Value	DINT	RO	TPDO	– [Vel. unit]

(2) Velocity Actual Value (606Ch)

This object provides the actual velocity value derived from the position encoder.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
606Ch	0	Velocity Actual Value	DINT	RO	TPDO	– [Vel. unit]

(3) Velocity Window (606Dh)

This object indicates the configured velocity window.

When the time specified by the Velocity Window Time (Object 606Eh) has passed after the difference between the target velocity and the velocity actual value falls within the value of this object, bit 10 (Target reached) of Statusword is set to 1.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
606Dh	0	Velocity Window	UINT	RW	No	0 to 65535 (Default: 0) [Vel. unit]

(4) Velocity Window Time (606Eh)

When the time specified by the Velocity Window Time (Object 606Eh) has passed after the difference between the target velocity and the velocity actual value falls within the value of this object, bit 10 (Target reached) of Statusword is set to 1.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
606Eh	0	Velocity Window Time	UINT	RW	No	0 to 65535 (Default: 0) [ms]

(5) Target Velocity (60FFh)

This object specifies the target velocity for Profile Velocity mode in user defined velocity reference units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60FFh	0	Target Velocity	DINT	RW	Yes	–2147483648 to +2147483647 (Default: 0) [Vel. unit]

8.11 Profile Torque Mode

(1) Target Torque (6071h)

This object specifies the input value of torque reference value for Torque Control mode. Set the value in units of 0.1% of the motor rated torque.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6071h	0	Target Torque	INT	RW	Yes	–32768 to +32767 (Default: 0) [0.1%]

(2) Max. Torque (6072h)

This object sets the maximum output torque to the motor. Set the value in units of 0.1% of the motor rated torque.

The maximum motor torque is automatically set in this object when the power is turned ON.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6072h	0	Max. Torque	UINT	RW	Yes	0 to 65535 (Default: max. motor torque) [0.1%]

(3) Torque Demand Value (6074h)

This object indicates the currently output torque reference value. The value is indicated in units of 0.1% of the motor rated torque.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6074h	0	Torque Demand Value	INT	RO	TPDO	– [0.1%] (Default: 0)

(4) Torque Slope (6087h)

This object sets the torque output slope to be used in Profile Torque mode. Set the amount of change per second in units of 0.1% of the motor rated torque.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6087h	0	Torque Slope	UDINT	RW	Yes	0 to 2147483647 (Default: 0) [0.1%/s]

(5) Motor Rated Torque (6076h)

This object indicates the motor rated torque (rated force for linear servomotors). The value is indicated in units of m Nm for rotational servomotors, and m･N for linear servomotors.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6076h	0	Motor Rated Torque	UDINT	RO	No	– [mNm] or [mN]

(6) Torque Actual Value (6077h)

For SGDV SERVOPACKs, this object specifies the same setting as the torque reference output value.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
6077h	0	Torque Actual Value	INT	RO	TPDO	– [0.1%] (Default: 0)

8.12 Touch Probe Function

(1) Touch Probe Function (60B8h)

This object indicates the configured function of the touch probe.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60B8h	0	Touch Probe Function	UINT	RW	Yes	0 to 0xFFFF (Default: 0)

■ Data Description

Bit	Value	Definition
0	0	Switch off touch probe 1
	1	Enable touch probe 1
1	0	Single trigger mode (Latches the position at the first trigger event.)
	1	Continuous trigger mode (Latches the position every trigger event.)
2	0	Triggers with the probe 1 input (SERVOPACK CN1/Probe 1 (S14) signal).
	1	Triggers with the encoder zero signal (phase-C).
3	–	Reserved
4	0	Switch off sampling at touch probe 1
	1	Enable sampling at touch probe 1
5 to 7	–	Reserved
8	0	Switch off touch probe 2
	1	Enable touch probe 2
9	0	Single trigger mode (Latches the position at the first trigger event.)
	1	Continuous trigger mode (Latches the position every trigger event.)
10	0	Triggers with the probe 2 input (SERVOPACK CN1/Probe 2 (S15) signal).
	1	Reserved
11	–	Reserved
12	0	Switch off sampling at touch probe 2
	1	Enable sampling at touch probe 2
13 to 15	–	Reserved

Note: Bit 0 to 7: For touch probe 1
Bit 8 to 15: For touch probe 2

When the homing function is executing, touch probe 1 function cannot be used. If touch probe 1 function was already enabled, touch probe 1 will be disabled.

(2) Touch Probe Status (60B9h)

This object provides the status of the touch probe.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60B8h	0	Touch Probe Status	UINT	RO	TPDO	(Default: 0)

■ Data Description

Bit	Value	Definition
0	0	Touch probe 1 is switched off
	1	Touch probe 1 is enabled
1	0	Touch probe 1 no value stored
	1	Touch probe 1 value stored
2 to 6	–	Reserved
7	0, 1	toggle with every update of Touch probe 1 value stored *
8	0	Touch probe 2 is switched off
	1	Touch probe 2 is enabled
9	0	Touch probe 2 no value stored
	1	Touch probe 2 value stored
10 to 14	–	Reserved
15	1	toggle with every update of Touch probe 2 value stored *

* If the continuous latch is enabled (Object 60B8 bit1 = 1, or bit9 = 1), bit7 or bit15 of Object 60B9h is toggled with every update of touch probe value stored.

(3) Touch Probe 1 Position Value (60BAh)

This object provides the position value of the touch probe 1. The value is given in user position units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60BAh	0	Touch Probe 1 Position Value	DINT	RO	TPDO	(Default: 0) [Pos. unit]

(4) Touch Probe 2 Position Value (60BCh)

This object provides the position value of the touch probe 2. The value is given in user position units.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60BCh	0	Touch Probe 2 Position Value	DINT	RO	TPDO	(Default: 0) [Pos. unit]

8.13 Digital Inputs/Outputs

(1) Digital Inputs (60FDh)

This object indicates the digital inputs state of CN1 of the SGDV SERVOPACK.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60FDh	0	Digital Inputs	UDINT	RO	TPDO	(Default: 0)

■ Data Description

Bit	Signal	Description
0	N-OT: Negative limit switch	0: Switched off, 1: Switched on
1	P-OT: Positive limit switch	0: Switched off, 1: Switched on
2	Home switch	0: Switched off, 1: Switched on
3 to 15	–	Reserved
16	SI0:CN1-13pin	0: Switched off (Open), 1: Switched on (Close)
17	SI1:CN1-7pin	0: Switched off (Open), 1: Switched on (Close)
18	SI2:CN1-8pin	0: Switched off (Open), 1: Switched on (Close)
19	SI3:CN1-9pin	0: Switched off (Open), 1: Switched on (Close)
20	SI4:CN1-10pin	0: Switched off (Open), 1: Switched on (Close)
21	SI5:CN1-11pin	0: Switched off (Open), 1: Switched on (Close)
22	SI6:CN1-12pin	0: Switched off (Open), 1: Switched on (Close)
23	–	Reserved
24	HWBB1	Hardwired base block signal input 1 (0: Open, 1: Close)
25	HWBB2	Hardwired base block signal input 2 (0: Open, 1: Close)
26 to 31	–	Reserved

Note:

0 - Signal state is Lo (Close)

1 - Signal state is Hi (Open)

SI0 - SI6 are defined by the user by setting Servo parameter.

They don’t have to be fixed signal.

(2) Digital Outputs (60FEh)

This object controls the digital outputs state of CN1 of the SGDV SERVOPACK.

Sub-index 1 is used to control the physical outputs state. Sub-index 2 determines which physical bits of Sub-Index 1 are enabled.

If the SERVOPACK status output functions (Pn50E, Pn50F, and Pn510) are assigned, the status will be output using the set value of this object as well as OR logic.

Index	Sub	Name	Data Type	Access	PDO Mapping	Value
60FEh	0	Number of entries	USINT	RO	No	2
	1	Physical outputs*1	UDINT	RW	Yes	0 to 0xFFFFFFFF (Default: 0)
	2	Bit mask*2	UDINT	RW	No	0 to 0xFFFFFFFF (Default: 0x000C0000)

∗1. Data description of Physical outputs:

Bit	Signal	Description
0 to 15	–	Reserved
16	SO1: CN1 1-2 pin	0: Switch off, 1: Switch on
17	SO2: CN1 23-24 pin	0: Switch off, 1: Switch on
18	SO3: CN1 25-26 pin	0: Switch off, 1: Switch on
19 to 31	–	Reserved

∗2. Data description of Output mask:

Bit	Signal	Description
0 to 15	–	Reserved
16	SO1: CN1 1-2 pin	0: Disable physical output, 1: Enable
17	SO2: CN1 23-24 pin	0: Disable physical output, 1: Enable
18	SO3: CN1 25-26 pin	0: Disable physical output, 1: Enable
19 to 31	–	Reserved

Note:

Setting of bit mask

0 - Disable

1 - Enable

The Output mask (0x60FE/2) is made to secure the physical outputs from sudden change by Output (0x60FE/1).

Therefore, in order to prevent unintended results of the physical outputs it is user's obligation to set and verify the Output mask (0x60FE/2) value before any Output (0x60FE/1) assignment.

It is recommended that read and write of Output mask (0x60FE/2) are done only by SDO command.

However reading the value of 60FE is possible, it does not reflect the actual value of the digital outputs. Reading the status of the digital outputs is possible using the 2211 object.

9

Troubleshooting

9.1 Troubleshooting

The SERVOPACK stops the servomotor by one of the methods described below, and displays the alarm status.

■ Status Display

SERVOPACK Panel Display	The alarm code is displayed. Example: A. → 0 → 1 → 0
Digital Operator	The alarm code is displayed.
Statusword (Object 6041h)	Statusword bit 3 (Fault) turns 1. (Bit 3 is 0 when operation is normal.)
Error Code (Object 1003h)	The alarm code for the current error is stored in object 1003h.
Emergency Message	The controller is notified of the alarm that occurred. (When Powerlink communication is not stable, the controller may not be notified.)

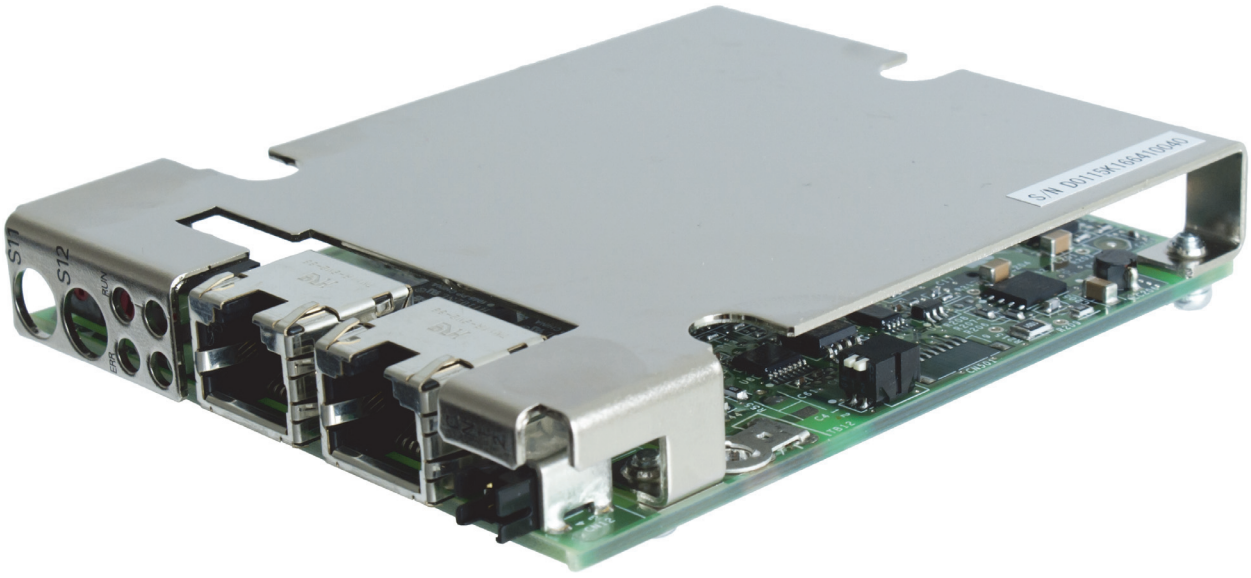
■ Alarm Stopping Method

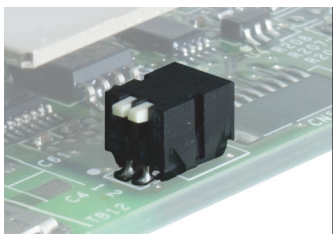
Gr.1: The servomotor is stopped according to the setting in Pn001.0 if an alarm occurs. Pn001.0 is factory-set to stop the servomotor by applying the DB.

Gr.2: The servomotor is stopped according to the setting in Pn00B.1 if an alarm occurs. Pn00B.1 is factory-set to stop the servomotor by setting the speed reference to "0." The servomotor under torque control will always use the Gr.1 method to stop. By setting Pn00B.1 to 1, the servomotor stops using the same method as Gr.1. When coordinating a number of servomotors, use this alarm stop method to prevent machine damage that may result due to differences in the stop method.

■ DIP Switch Setting

Please make sure that the DIP switches should be in OFF-state. Otherwise the Powerlink card will not be detected properly by the SERVOPACK.





9.1.1 Alarm List for SERVOPACKs with Command Option Attachable Type

The following table provides a list of SERVOPACK alarms.

For details on causes of SERVOPACK alarms, and countermeasures to take, refer to *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*.

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
020h	Parameter Checksum Error 1	The data of the parameter in the SERVOPACK is incorrect.	Gr.1	N/A
021h	Parameter Format Error 1	The data of the parameter in the SERVOPACK is incorrect.	Gr.1	N/A
022h	System Checksum Error 1	The data of the parameter in the SERVOPACK is incorrect.	Gr.1	N/A
030h	Main Circuit Detector Error	Detection data for power circuit is incorrect.	Gr.1	Available
040h	Parameter Setting Error 1	The parameter setting is outside the allowable setting range.	Gr.1	N/A
041h	Encoder Output Pulse Setting Error	The encoder output pulse setting (pulse unit) (Pn212) is outside the allowable setting range or not satisfies the setting conditions.	Gr.1	N/A
042h	Parameter Combination Error	Combination of some parameters exceeds the setting range.	Gr.1	N/A
044h	Semi-closed/Fully-closed Loop Control Parameter Setting Error	The settings of the fully-closed option module and Pn00B.3, Pn002.3 do not match.	Gr.1	N/A
04Ah	Parameter Setting Error 2	There is an error in settings of parameters reserved by the system.	Gr.1	N/A
050h	Combination Error	The SERVOPACK and the servomotor capacities do not match each other.	Gr.1	Available
051h	Unsupported Device Alarm	The device unit unsupported was connected.	Gr.1	N/A
080h[*1]	Linear Scale Pitch Setting Error	The setting of the linear scale pitch (Pn282) has not been changed from the default setting.	Gr.1	N/A
0b0h	Cancelled Servo ON Command Alarm	The Host controller reference was sent to turn the Servo ON after the Servo ON function was used with the utility function.	Gr.1	Available
100h	Overcurrent or Heat Sink Overheated	An overcurrent flowed through the IGBT. Heat sink of the SERVOPACK was overheated.	Gr.1	N/A
300h	Regeneration Error	Regenerative circuit or regenerative resistor is faulty.	Gr.1	Available
320h	Regenerative Overload	Regenerative energy exceeds regenerative resistor capacity.	Gr.2	Available
330h	Main Circuit Power Supply Wiring Error	• Setting of AC input/DC input is incorrect. • Power supply wiring is incorrect.	Gr.1	Available
400h	Overvoltage	Main circuit DC voltage is excessively high.	Gr.1	Available
410h	Undervoltage	Main circuit DC voltage is excessively low.	Gr.2	Available
450h	Main-Circuit Capacitor Overvoltage	The capacitor of the main circuit has deteriorated or is faulty.	Gr.1	N/A
510h	Overspeed	The servomotor speed is excessively high.	Gr.1	Available
511h	Overspeed of Encoder Output Pulse Rate	The motor speed upper limit of the set encoder output pulse (pulse unit) (Pn212) is exceeded.	Gr.1	Available
520h	Vibration Alarm	Vibration at the motor speed was detected.	Gr.1	Available
521h	Autotuning Alarm	Vibration was detected while performing tuning-less function.	Gr.1	Available
550h[*1]	Maximum Speed Setting Error	The Pn385 setting is greater than the maximum speed.	Gr.1	Available
710h	Overload: High Load	The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings.	Gr.2	Available
720h	Overload: Low Load	The motor was operating continuously under a torque largely exceeding ratings.	Gr.1	Available
730h **731h**	Dynamic Brake Overload	When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor.	Gr.1	Available

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
740h	Overload of Surge Current Limit Resistor	The main circuit power was frequently turned ON and OFF.	Gr.1	Available
7A0h	Heat Sink Overheated	The heat sink of the SERVOPACK exceeded 100°C.	Gr.2	Available
7ABh	Built-in Fan in SERVOPACK Stopped	The fan inside the SERVOPACK stopped.	Gr.1	Available
810h[*2]	Encoder Backup Error	All the power supplies for the absolute encoder have failed and position data was cleared.	Gr.1	N/A
820h	Encoder Checksum Error	The checksum results of encoder memory is incorrect.	Gr.1	N/A
830h[*2]	Absolute Encoder Battery Error	The battery voltage was lower than the specified value after the control power supply is turned ON.	Gr.1	Available
840h	Encoder Data Error	Data in the encoder is incorrect.	Gr.1	N/A
850h	Encoder Overspeed	The encoder was rotating at high speed when the power was turned ON.	Gr.1	N/A
860h	Encoder Overheated	The internal temperature of encoder is too high.	Gr.1	N/A
890h[*1]	Encoder Scale Error	A linear scale fault occurred.	Gr.1	N/A
891h[*1]	Encoder Module Error	An encoder fault occurred	Gr.1	N/A
8A0h[*3]	External Encoder Error	External encoder is faulty.	Gr.1	Available
8A1h[*3]	External Encoder Error of Module	Serial converter unit is faulty.	Gr.1	Available
8A2h[*3]	External Encoder Error of Sensor (Incremental)	External encoder is faulty.	Gr.1	Available
8A3h[*3]	External Encoder Error of Position (Absolute)	The external encoder position data is incorrect.	Gr.1	Available
8A5h[*3]	External Encoder Overspeed	The overspeed from the external encoder occurred.	Gr.1	Available
8A6h[*3]	External Encoder Overheated	The overheat from the external encoder occurred.	Gr.1	Available
b31h	Current Detection Error1 (Phase-U)	The current detection circuit for phase-U is faulty.	Gr.1	N/A
b32h	Current Detection Error 2 (Phase-V)	The current detection circuit for phase-V is faulty.	Gr.1	N/A
b33h	Current Detection Error 3 (Current detector)	The detection circuit for the current is faulty.	Gr.1	N/A
bF0h	System Alarm 0	“Internal program error 0" occurred in the SERVOPACK.	Gr.1	N/A
bF1h	System Alarm 1	“Internal program error 1" occurred in the SERVOPACK.	Gr.1	N/A
bF2h	System Alarm 2	“Internal program error 2" occurred in the SERVOPACK.	Gr.1	N/A
bF3h	System Alarm 3	“Internal program error 3" occurred in the SERVOPACK.	Gr.1	N/A
bF4h	System Alarm 4	“Internal program error 4" occurred in the SERVOPACK.	Gr.1	N/A
C10h	Servo Overrun Detected	The servomotor ran out of control.	Gr.1	Available
C20h[*1]	Phase Detection Error	An error occurred in phase detection.	Gr.1	N/A
C21h[*1]	Hall Sensor Error	A hall sensor error occurred.	Gr.1	N/A
C22h[*1]	Phase Information Disagreement	Magnetic detection failed.	Gr.1	N/A
C50h[*1]	Polarity Detection Error	Magnetic detection failed.	Gr.1	N/A
C51h[*1]	Overtravel Detection at Polarity Detection	An overtravel signal was detected during polarity detection.	Gr.1	Available
C52h[*1]	Polarity Detection Uncompleted	The servo has been turned ON while polarity detection was not yet complete.	Gr.1	Available
C53h[*1]	Out of Range for Polarity Detection	The moving distance exceeded the set value of Pn48E in middle of detection.	Gr.1	N/A
C54h[*1]	Polarity Detection Error 2	Magnetic detection failed.	Gr.1	N/A

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
C80h	Absolute Encoder Clear Error and Multi-turn Limit Setting Error	The multi-turn for the absolute encoder was not properly cleared or set.	Gr.1	N/A
C90h	Encoder Communications Error	Communications between the SERVOPACK and the encoder is not possible.	Gr.1	N/A
C91h	Encoder Communications Position Data Error	An encoder position data calculation error occurred.	Gr.1	N/A
C92h	Encoder Communications Timer Error	An error occurs in the communications timer between the encoder and the SERVOPACK.	Gr.1	N/A
CA0h	Encoder Parameter Error	Encoder parameters are faulty.	Gr.1	N/A
Cb0h	Encoder Echoback Error	Contents of communications with encoder is incorrect.	Gr.1	N/A
CC0h[*2]	Multi-turn Limit Disagreement	Different multi-turn limits have been set in the encoder and the SERVOPACK.	Gr.1	N/A
CF1h[*3]	Feedback Option Module Communications Error (Reception error)	Reception from the feedback option module is faulty.	Gr.1	N/A
CF2h[*3]	Feedback Option Module Communications Error (Timer stop)	Timer for communications with the feedback option module is faulty.	Gr.1	N/A
d00h	Position Error Pulse Overflow	Position error pulses exceeded parameter (Pn520).	Gr.1	Available
d01h	Position Error Pulse Overflow Alarm at Servo ON	Position error pulses accumulated too much.	Gr.1	Available
d02h	Position Error Pulse Overflow Alarm by Speed Limit at Servo ON	After a position error pulse has been input, Pn529 limits the speed if the Servo ON command is received. If Pn529 limits the speed in such a state, this alarm occurs when the position references are input and the number of position error pulses exceeds the value set for parameter Pn520 (Excessive Position Error Alarm Level).	Gr.2	Available
d10h[*3]	Motor-load Position Error Pulse Overflow	Position error between motor and load is excessive when fully-closed position control is used.	Gr.2	Available
d30h[*1]	Position Data Overflow	The position data exceeded ±1879048192.	Gr.1	N/A
E00h	Command Option Module IF Initialization Timeout Error	Communications initialization failed between the SERVOPACK and the command option module.	Gr.2	Available
E02h	Command Option Module IF Synchronization Error 1	A synchronization error occurred between the SERVOPACK and the command option module.	Gr.1	Available
E03h	Command Option Module IF Communications Data Error	An error occurred in the data of communications between the SERVOPACK and the command option module.	Gr.1	Available
E70h	Command Option Module Detection Failure Alarm	Detection of the command option module failed.	Gr.1	N/A
E71h	Safety Option Module Detection Failure Alarm	Detection of the safety option module failed.	Gr.1	N/A
E72h[*3]	Feedback Option Module Detection Failure Alarm	Detection of the feedback option module failed.	Gr.1	N/A
E73h	Unsupported Command Option Module Alarm	A non-supported command option module was connected.	Gr.1	N/A
E74h	Unsupported Safety Option Module Alarm	A non-supported safety option module was connected.	Gr.1	N/A
E75h[*3]	Unsupported Feedback Option Module Alarm	A non-supported feedback option module was connected.	Gr.1	N/A
E80h	Command Option Module Detection Disagreement Alarm	The command option module was replaced with a different model.	Gr.1	N/A
Eb1h	Safety Device Signal Input Timing Error	There is an error in the timing of the safety function input signal.	Gr.1	N/A

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
F10h	Main Circuit Cable Open Phase	With the main power supply ON, voltage was low for more than 1 second in phase-R, -S or -T.	Gr.2	Available
CPF00	Digital Operator Transmission Error 1	Digital operator (JUSP-OP05A) fails to communicate with the SERVOPACK (e.g., CPU error).	–	N/A
CPF01	Digital Operator Transmission Error 2		–	N/A

∗1. May occur if a linear servomotor is connected.
∗2. May occur if a rotational servomotor is connected.
∗3. May occur if a fully-closed option module is mounted.

9.1.2 List of the Powerlink Network Module Alarms

This table lists the alarms of the Powerlink Network Module.

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
0EA0h	Command-Option IF Servo Unit Initial Error	The initial sequence between the Powerlink Network Module and the SERVOPACK was not completed within 10s.	Gr.1	N/A
0EA1h	Command-Option IF Memory Check Error	The communication memory of the Powerlink Network Module and the SERVOPACK is broken.	Gr.1	N/A
0EA2h	Command-Option IF Servo Synchronization Error *	The data exchange between the Powerlink Network Module and the SERVOPACK was not synchronized.	Gr.1	Available
0EA3h	Command-Option IF Servo Data Error *	The communication data between the Powerlink Network Module and the SERVOPACK was inappropriate.	Gr.1	Available
0A03h	Node ID setting error	Node ID is not one of the allowable addresses	Gr. 1	Available
0A10h	Device Error		Gr.1	Available

9.1.3 Troubleshooting of the Powerlink Network Module Alarms

Refer to the following table to identify the cause of an alarm and the action to be taken. Contact your Yaskawa representative if the problem cannot be solved by the described corrective action.

Alarm Code	Alarm Name	Cause	Investigative Action	Corrective Action
0EA0h	Command-Option IF Servo Unit Initial Error	Faulty connection between the SERVOPACK and the Powerlink Network Module.	Check the connection between the SERVOPACK and the Powerlink Network Module.	Reconnect the Powerlink Network Module.
		Fault occurred in the Powerlink Network Module.	–	Repair or replace the Powerlink Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
0EA1h	Command-Option IF Memory Check Error	Faulty connection between the SERVOPACK and the Powerlink Network Module.	Check the connection between the SERVOPACK and the Powerlink Network Module.	Reconnect the Powerlink Network Module.
		Fault occurred in the Powerlink Network Module.	–	Repair or replace the Powerlink Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
0EA2h	Command-Option IF Servo Synchronization Error	The synchronous timing (Sync0) of the SERVOPACK and the Powerlink Network Module fluctuated due to a fluctuation in the synchronous timing of Powerlink communication.	–	Turn the power supply OFF and ON again and then reestablish communication.
		Faulty connection between the SERVOPACK and the Powerlink Network Module.	Check the connection between the SERVOPACK and the Powerlink Network Module.	Reconnect the Powerlink Network Module.
		Fault occurred in the Powerlink Network Module.	–	Repair or replace the Powerlink Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
0EA3h	Command-Option IF Servo Data Error	A communication error occurred between the SERVOPACK and the Powerlink Network Module due to noise.	–	Implement countermeasures for noise.
		Faulty connection between the SERVOPACK and the Powerlink Network Module.	Check the connection between the SERVOPACK and the Powerlink Network Module.	Reconnect the Powerlink Network Module.
		Fault occurred in the Powerlink Network Module.	–	Repair or replace the Powerlink Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
0A03h	Node ID setting error	Wrong settings of the Node address.	Check the two rotary switches.	Set an appropriate Node ID.
0A10h	Device Error	–	–	Turn the power supply OFF and ON again and then reestablish communication.

9.2 Warning Displays

When a warning is detected, the SERVOPACK indicates the warning status as described below, and continues operating the servomotor.

■ Status Display

SERVOPACK Panel Display	The warning code is displayed. Example: A. → 9 → 1 → 0
Digital Operator	The warning code is displayed.
Statusword (Object 6041h)	Statusword bit 7 (Warning) turns ON. (Bit 7 is OFF when operation is normal.)
Error Code (Object 1003h)	The warning code for the current error is stored in object 1003h.
Emergency Message	The controller is notified of the warning that occurred. (When Powerlink communication is not stable, the controller may not be notified.)

■ List of Warnings

The following table provides a list of SERVOPACK warnings.

For details on causes of SERVOPACK warnings, and countermeasures to take, refer to *Σ-V series User's Manual Design and Maintenance Rotational Motor/Command Option Attachable Type (SIEP S800000 60)*.

Warning Code	Warning Name	Meaning
900h	Position Error Pulse Overflow	Position error pulse exceeded the parameter settings (Pn520 × Pn51E/100).
901h	Position Error Pulse Overflow Alarm at Servo ON	When the servo turns ON, the position error pulses exceeded the parameter setting (Pn526 × Pn528/100).
910h	Overload	This warning occurs before the overload alarms (710h or 720h) occur. If the warning is ignored and operation continues, an overload alarm may occur.
911h	Vibration	Abnormal vibration at the motor speed was detected. The detection level is the same as 520h. Set whether to output an alarm or warning by "Vibration Detection Switch" of Pn310.
920h	Regenerative Overload	This warning occurs before the regenerative overload alarm (320h) occurs. If the warning is ignored and operation continues, a regenerative overload alarm may occur.
921h	Dynamic Brake Overload	This warning occurs before Dynamic Brake Overload (731h) alarm occurs. If the warning is ignored and operation continues, a dynamic brake overload alarm may occur.
930h	Absolute Encoder Battery Error	This warning occurs when the absolute encoder battery voltage is lowered.
971h	Undervoltage	This warning occurs before Undervoltage (410h) alarm occurs. If the warning is ignored and operation continues, an undervoltage alarm may occur.

Note 1. Warning code is not outputted without setting Pn001.3 =1 (Outputs both Alarm Codes and Warning Codes.)
2. If Pn008.2 = 1 (Do not detect warning) is selected, no warnings will be detected.

9.3 Troubleshooting Malfunction Based on Operation and Conditions of the Servomotor

Troubleshooting for the malfunctions based on the operation and conditions of the servomotor is provided in this section.

Be sure to turn OFF the servo system before troubleshooting items shown in bold lines in the table.

Problem	Probable Cause	Investigative Actions	Corrective Actions
Servomotor Does Not Start	A servo ON command was not input.	Check that the Controlword (object 6040h) is set to *Operation enabled*.	Set the Controlword (object 6040h) value correctly.
	The torque limit reference is set too low.	Check the torque limit reference.	The torque limit reference is set too high.
	The Operation mode is not set.	Check whether the Operation mode (object 6060h) is set.	Set the Operation mode (object 6060h) correctly.
	A software limit is in effect.	Check whether the target position exceeds the limit.	Specify a target position within the limit range.
	The Powerlink communication is not established.	Check whether the Powerlink indicators show Operational state.	Change the Powerlink communication state to *Operational*.
	The forward run prohibited (P-OT) and reverse run prohibited (N-OT) input signals are turned OFF.	Check the P-OT and N-OT input signals and the input signal allocation parameters (Pn50A, Pn50B).	Turn P-OT or N-OT input signal ON. Or, disable the P-OT and N-OT input signal allocations.
	The safety input signal (/HWBB1 or /HWBB2) remains OFF.	Check the /HWBB1 or /HWBB2 input signal.	Set the /HWBB1 or /HWBB2 input signal to ON. When not using the safety function, mount the safety function jumper connector (provided as an accessory) on the CN8.
	An alarm is occurring.	Check the panel display to see whether an alarm is occurring.	Remove the cause of the alarm, and then restart operation.
	Overloaded	Run under no load and check the load status.	Reduce load or replace with larger capacity servomotor.
	Servomotor or encoder wiring disconnected.	Check the wiring.	Correct the wiring.
	The main circuit power supply is not ON.	Check whether the main circuit power supply is connected.	Wire the main circuit power supply correctly.
	The control power supply is not ON.	Check whether the control power supply is connected.	Wire the control power supply correctly.
Servomotor Moves Instantaneously, and then Stops	Servomotor wiring is incorrect.	Check the servomotor wiring.	Correct the wiring.
Servomotor Speed Unstable	An Powerlink communication error may have occurred, and the reference may not be updated.	Check the Powerlink cable and connector wiring.	Correct the Powerlink cable and connector wiring.
	The controller is not updating the reference data in the regular cycle.	Trace the reference data and check whether it is being updated in the regular cycle.	Send the reference data in the regular cycle.
	Wiring connection to servomotor is defective.	Check connections of main circuit cable (phases-U, -V, and -W) and encoder connectors.	Tighten any loose terminals or connectors.

Problem	Probable Cause	Investigative Actions	Corrective Actions
Dynamic Brake Does Not Operate	Improper Pn001.0 setting	Check the setting of parameter Pn001.0.	Correct the parameter setting.
	DB resistor disconnected	Check if excessive moment of inertia, motor overspeed, or DB frequently activated occurred. If any of these occurred, it is possible that DB resistance may have been disconnected.	Replace the SERVOPACK, and lighten the load. To prevent the resistor from being disconnected, take measures to reduce the load.
	DB drive circuit fault	–	Replace the SERVOPACK.
Abnormal Noise from Servomotor	The servomotor largely vibrated during execution of tuning-less function.	Check the servomotor speed waveform.	Reduce the load so that the moment of inertia ratio becomes within the allowable value, or increase the load level or lower the tuning level for the tuning-less level setting (Fn200).
	Mounting is not secured.	Check if there are any loose mounting screws.	Tighten the mounting screws.
		Check if there is misalignment of couplings.	Align the couplings.
		Check if there are unbalanced couplings.	Balance the couplings.
	Bearings are defective.	Check for noise and vibration around the bearings.	Replace the servomotor.
	Vibration source at the driven machine	Check for any foreign matter, damage, or deformations on the machinery's movable parts.	Contact the machine manufacturer.
	Noise interference due to incorrect input/output signal cable specifications	The input/output signal cables must be tinned annealed copper twisted-pair or shielded twisted-pair cables with a core of 0.12 mm^2 min.	Use the specified input signal wires.
	Noise interference due to length of input/output signal cable.	Check the length of the input/output cable.	The input/output cable length must be no more than 3 m.
	Noise interference due to incorrect encoder cable specifications.	The encoder cable must be tinned annealed copper twisted-pair or shielded twisted-pair cables with a core of 0.12 mm^2 min.	Use the specified encoder cable.
	Noise interference due to length of encoder cable wiring	Check the length of the encoder cable.	The encoder cable must be no more than 20 m.
	Noise interference due to damaged encoder cable	Check if the encoder cable is damaged or bent.	Replace the encoder cable and modify the encoder cable layout.
	Excessive noise to the encoder cable	Check if the encoder cable is bundled with high-current line or near a high-current line.	Correct the encoder cable layout so that no surge is applied.
	FG potential varies because of influence of machines such as welders at the servomotor.	Check if the machines are correctly grounded.	Ground machines correctly, and prevent diversion to the FG at the PG side.
	SERVOPACK pulse counting error due to noise interference	Check if there is noise interference on the input/output signal line from the encoder.	Take measures against noise in the encoder wiring.
	Excessive vibration and shock to the encoder	Check if vibration from the machine occurred or servomotor installation is incorrect (mounting surface accuracy, fixing, alignment, etc.).	Reduce vibration from the machine, or secure the servomotor installation.
	An encoder fault occurred.	–	Replace the servomotor.

Problem	Probable Cause	Investigative Actions	Corrective Actions
Servomotor Vibrates at Frequency of Approx 200 to 400 Hz	Unbalanced servo gains	Check to see if the servo gains have been correctly adjusted.	Execute the advanced autotuning.
	Speed loop gain value (Pn100) too high.	Check the speed loop gain value (Pn100). Factory setting: Kv = 40.0 Hz	Reduce the speed loop gain (Pn100).
	Position loop gain value (Pn102) too high.	Check the position loop gain value (Pn102). Factory setting: Kp = 40.0/s	Reduce the position loop gain (Pn102).
	Incorrect speed loop integral time constant (Pn101) setting	Check the speed loop integral time constant (Pn101). Factory setting: Ti = 20.0 ms	Correct the speed loop integral time constant (Pn101) setting.
	Incorrect moment of inertia ratio data (Pn103)	Check the moment of inertia ratio setting (Pn103).	Correct the moment of inertia ratio (Pn103) setting.
High Rotation Speed Overshoot on Starting and Stopping	Unbalanced servo gains	Check to see if the servo gains have been correctly adjusted.	Execute the advanced autotuning.
	Speed loop gain value (Pn100) too high	Check the speed loop gain value (Pn100). Factory setting: Kv = 40.0 Hz	Reduce the speed loop gain (Pn100).
	Position loop gain value (Pn102) too high	Check the position loop gain value (Pn102). Factory setting: Kp = 40.0/s	Reduce the position loop gain (Pn102).
	Incorrect speed loop integral time constant (Pn101) setting	Check the speed loop integral time constant (Pn101). Factory setting: Ti = 20.0 ms	Correct the speed loop integral time constant setting (Pn101).
	Incorrect moment of inertia ratio data (Pn103)	Check the moment of inertia ratio setting (Pn103).	Correct the moment of inertia ratio setting (Pn103).
Overtravel (OT)	Forward or reverse run prohibited signal is input.	Check the external power supply (+24 V) voltage for the input signal.	Correct the external power supply (+24 V) voltage.
		Check if the overtravel limit switch operates properly.	Correct the overtravel limit switch.
		Check if the overtravel limit switch is wired correctly.	Correct the overtravel limit switch wiring.
		Check the settings for Pn50A and Pn50B.	Set the parameters correctly.
	Forward or reverse run prohibited signal malfunctioning.	Check the fluctuation of the input signal external power supply (+24 V) voltage.	Stabilize the external power supply (+24 V) voltage.
		Check if the overtravel limit switch operates correctly.	Stabilize the operation of the overtravel limit switch.
		Check if the overtravel limit switch wiring is correct. (check for damaged cables or loose screws.)	Correct the overtravel limit switch wiring.
	Incorrect forward or reverse run prohibited signal (P-OT/N-OT) allocation (parameters Pn50A.3, Pn50B.0)	Check if the P-OT signal is allocated in Pn50A.3.	If another signal is allocated in Pn50A.3, select P-OT.
		Check if the N-OT signal is allocated in Pn50B.0.	If another signal is allocated in Pn50B.0, select N-OT.
	Incorrect servomotor stop method selection	Check Pn001.0 and Pn001.1 when the servomotor power is OFF.	Select a servo mode stop method other than “coast to stop.”
		Check Pn001.0 and Pn001.1 when in torque control.	Select a servo mode stop method other than “coast to stop.”
Servomotor Overheated	Ambient temperature too high	Measure the servomotor ambient temperature.	Reduce the ambient temperature to 40°C or less.
	Servomotor surface dirty	Visually check the surface.	Clean dust and oil from the surface.
	Servomotor overloaded	Check the load status with monitor.	If overloaded, reduce load or replace the SERVOPACK and the servomotor with larger capacity.

Application hint for B&R controller users:

The B&R master overwrites the default values of the objects at boot up. This behaviour can't be changed. Some objects in the YASKAWA drive are write protected (such as user units, etc.). Therefore the B&R controller will detect some SDO abort messages at boot up which will force the controller to end up in the "SERV mode". Such kind of behaviour will be experienced in versions of ‘Automation Studio’ which do not include the Yaskawa drive "SGDV-OCB02A" under the "POWERLINK Device Library". Additionally, these versions require the upload of the XDD file.

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Appendix

10.1 Object List

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
1000h	0	Device Type	UDINT	RO	No	00420192h	–	–	–
1001h	0	Error Register	USINT	RO	TPDO	–	–	–	–
1003h	Error history								
	0	Number of entries	USINT	RW	TPDO	–	0	254	–
	1-254	Error entry	–	RO	No	–	–	–	–
1006h	0	Cycle length	UDINT	RW, VOR	No	1000 unconfigurable	–	–	–
1008h	0	Manufacturer Device Name	STRING	RO	No	SGDV-OCB02A	–	–	–
1010h	Store Parameters								
	0	Number of entries	USINT	RO	No	–	1	127	–
	1	Save all parameters	UDINT	RW	No	0x00000001	–	–	–
1011h	Restore Default Parameters								
	0	Number of entries	USINT	RO	No	–	1	127	–
	1	Restore all default parameters	UDINT	RW	No	0x00000001	–	–	–
1018h	Identity Object								
	0	Number of entries	USINT	RO	No	4	1	4	–
	1	Vendor ID	UDINT	RO	No	010000E7h	–	–	–
	2	Product code	UDINT	RO	No	00000B02h	–	–	–
	3	Revision number	UDINT	RO	No	–	–	–	–
	4	Serial number	UDINT	RO	No	0	–	–	–
1020h	Verify configuration								
	0	Number of entries	–	RO	No	2	2	4	–
	1	Configuration Date	UDINT	RW, VOR	No	0	0	4294967295	–
	2	Configuration Time	UDINT	RW, VOR	No	0	0	4294967295	–
1030h	NMT Interface Group								
	0	Number of entries	–	RO	No	9	1	9	–
	1	Interface Index	UINT	RO	No	1	1	10	–
	2	Interface Description	STRING	RO	No	YASKAWA-SGDV-OCB02A-V1	–	–	–
	3	Interface Type	USINT	RO	No	6	–	–	–
	4	Interface Mtu	UINT	RO	No	1500	–	–	–
	5	Interface Physical Address	STRING	RO	No	0020B5000001	–	–	–
	6	Interface Name	STRING	RO	No	eplcn0	–	–	–
	7	Interface Operational Status	USINT	RO	No	0	0	1	–
	8	Interface Administration Status	USINT	RW	No	1	0	255	–
	9	Valid	BOOLEAN	RW	No	FALSE	TRUE	FALSE	–
1300h	0	SDO Sequence Layer Timeout	UDINT	RW, VOR	No	30000	0	4294967295	ms
1C0A	DLL CN Collision Record								
	0	Number of entries	–	RO	No	3	–	–	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
1C0Bh	DLL CN Loss of Soc Record								
	0	Number of entries	−	RO	No	3	–	–	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–
1C0Ch	DLL CN Loss of SoA Record								
	0	Number of entries	−	RO	No	3	–	–	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–
1C0Dh	DLL CN Loss of PReq Record								
	0	Number of entries	−	RO	No	3	–	–	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–
1C0Eh	DLL CN Loss of Jitter Record								
	0	Number of entries	−	RO	No	3	–	–	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–
1C0Fh	DLL CN CRC Error Record								
	0	Number of entries	−	RO	No	3	1	3	–
	1	Cumulative counter	UDINT	RW	No	0	0	4294967295	–
	2	Threshold counter	UDINT	RO	No	0	0	4294967295	–
	3	Threshold	UDINT	RW	No	15	0	4294967295	–
1C13h	0	DLL CN Soc Jitter Range	UDINT	RW	No	2000	0	4294967295	ns
1C14h	0	DLL CN Loss of Soc Tolerance	UDINT	RW	No	100000	0	4294967295	ns
1E40h	NWL Ip Address Table 0h Record								
	0	Number of entries	−	RO	No	5	1	5	–
	1	If Index	UINT	RO	No	0	–	–	–
	2	IP Address	UDINT	RO	No	0xC0A864xx (xx = Node ID)	–	–	–
	3	Netmask IP Address	UDINT	RO	No	0xFFFFFF00	–	–	–
	4	Reassemble Max Size	UINT	RO	No	0	–	–	–
	5	Default Gateway IP Address	UDINT	RW	No	0xC0A864FE	–	–	–
1E4Ah	NWL Ip Group Record								
	0	Number of entries	−	RO	No	2	2	3	–
	1	Forwarding	BOOLEAN	RO	No	FALSE	TRUE	FALSE	–
	2	Default TTL	UINT	RW	No	64	0	65535	–
1F82h	0	NMT Feature Flags	UDINT	RO	No	0xE7	–	–	–
1F83h	0	NMT EPL version	USINT	RO	No	0x20	–	–	–
1F8Ch	0	NMT Current State	USINT	RO	TPDO	0x1C, NMT_CS_NOT_ACTIVE	–	–	–

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
1F93h	NMT EPL Node ID Record								
	0	Number of entries	–	RO	No	2	2	3	–
	1	Node ID	USINT	RO	No	–	–	–	–
	2	Node ID by Hardware	BOOLEAN	RO	No	TRUE	–	–	–
1F98h	NMT Cycle Timing Record								
	0	Number of entries	–	RO	No	9	1	9	–
	1	Isochronous Tx max Payload	UINT	RO	No	1490	0	1500	–
	2	Isochronous Rx max Payload	UINT	RO	No	1490	0	1500	–
	3	PRes Max Latency	UDINT	RO	No	2000	0	4294967295	ns
	4	PReq Act Payload Limit	UINT	RW, VOR	No	36	36	1490	–
	5	PRes Act Payload Limit	UINT	RW, VOR	No	36	36	1490	–
	6	ASnd Max Latency	UDINT	RO	No	2000	0	4294967295	ns
	7	Multiple Cycle Counter	USINT	RW, VOR	No	0	–	–	–
	8	ASync MTU	UINT	RW, VOR	No	300	300	1500	–
	9	Prescaler	UINT	RW, VOR	No	2	0	1000	–
1F99h	0	NMT CN Basic Ethernet Timeout	UDINT	RW, VOR	No	5000000	0	4294967295	–
1F9Ah	0	NMT Hostname	STRING	RW	No	–	–	–	–
1F9Eh	0	NMT Reset Command	USINT	RW	No	255	40-43	255	–
1400h	Receive PDO Communication								
	0	Number of entries	USINT	–	No	2	_	_	–
	1	NodeID_U8	USINT	RO	No	0	0	255	–
	2	MappingVersion_U8	USINT	RW	No	0	0	255	–
1600h	1st Receive PDO Mapping								
	0	Number of entries	USINT	RW	No	3	0	8	–
	1	Mapping entry 1	u64	RW	No	0x10000000006040	0	0xFFFFFFFFFFFFFFFF	–
	2	Mapping entry 2	u64	RW	No	0x2000780000607A	0	0xFFFFFFFFFFFFFFFF	–
	3	Mapping entry 3	u64	RW	No	0x200078000060FF	0	0xFFFFFFFFFFFFFFFF	–
	4	Mapping entry 4	u64	RW	No	0	0	0xFFFFFFFFFFFFFFFF	–
	5	Mapping entry 5	u64	RW	No	0	0	0xFFFFFFFFFFFFFFFF	–
	6	Mapping entry 6	u64	RW	No	0	0	0xFFFFFFFFFFFFFFFF	–
	7	Mapping entry 7	u64	RW	No	0	0	0xFFFFFFFFFFFFFFFF	–
	8	Mapping entry 8	u64	RW	No	0	0	0xFFFFFFFFFFFFFFFF	–
1800h	Transmit PDO Communication								
	0	Number of entries	USINT	–	No	2	_	_	–
	1	NodeID_U8	USINT	RO	No	0	0	255	–
	2	MappingVersion_U8	USINT	RW	No	0	0	255	–

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
1A00h	1st Transmit PDO Mapping								
	0	Number of entries	USINT	RW	No	8	0	8	–
	1	Mapping entry 1	u64	RW	No	0x10000000006041	0	0xFFFFFFFF	–
	2	Mapping entry 2	u64	RW	No	0x20001000006064	0	0xFFFFFFFF	–
	3	Mapping entry 3	u64	RW	No	0x2000100000606C	0	0xFFFFFFFF	–
	4	Mapping entry 4	u64	RW	No	0	0	0xFFFFFFFF FFFFFFFF	–
	5	Mapping entry 5	u64	RW	No	0	0	0xFFFFFFFF FFFFFFFF	–
	6	Mapping entry 6	u64	RW	No	0	0	0xFFFFFFFF FFFFFFFF	–
	7	Mapping entry 7	u64	RW	No	0	0	0xFFFFFFFF FFFFFFFF	–
	8	Mapping entry 8	u64	RW	No	0	0	0xFFFFFFFF FFFFFFFF	–
2100h	Get Parameter								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Parameter identify	UINT	RW	No	FFFFh	0	65535	–
	2	Parameter value	DINT	RO	No	0	-2147483648	2147483627	–
2101h	Set Parameter								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Parameter identify	UINT	RW	No	FFFFh	0	65535	–
	2	Parameter value	DINT	RW	No	0	-2147483648	2147483627	–
2211h	Read Servo Monitor								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Monitor identify	USINT	RW	No	2	0	12h	–
	2	Monitor value	DINT	RO	No	0	-2147483648	2147483627	–
2300h	0	User unit group enable	USINT	RW	No	1	0	1	–
2301h	Position user unit								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Numerator	UDINT	RW	No	1	0	4294967295	–
	2	Denominator	UDINT	RW	No	1	0	4294967295	–
2302h	Velocity user unit								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Numerator	UDINT	RW	No	1	0	4294967295	–
	2	Denominator	UDINT	RW	No	1	0	4294967295	–
2303h	Acceleration user unit								
	0	Number of entries	–	RO	No	2	–	–	–
	1	Numerator	UDINT	RW	No	1	0	4294967295	–
	2	Denominator	UDINT	RW	No	1	0	4294967295	–
2400h	0	Position Range Limit Designation	USINT	RW	No	0	0	3	–
2401h	0	Target Position in Range	DINT	RW	TPDO	0	-2147483648	2147483627	Pos unit
2402h	0	Actual Position in Range	DINT	RO	TPDO	0	-2147483648	2147483627	Pos unit
6040h	0	Controlword	UINT	RW	Yes	0	0	0xFFFF	–
6041h	0	Statusword	UINT	RO	Yes	–	–	–	–
605Ah	0	Quick Stop Option Code	INT	RW	No	2	0	4	–
605Dh	0	Halt Option Code	INT	RW	No	1	0	4	–
6060h	0	Modes of Operation	SINT	RW	Yes	0	0	10	–
6061h	0	Modes of Operation Display	SINT	RO	Yes	0	–	–	–

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
6062h	0	Position Demand Value	DINT	RO	TPDO	–	–	–	Pos. unit
6063h	0	Position Actual Internal Value	DINT	RO	TPDO	–	–	–	Inc
6064h	0	Position Actual Value	DINT	RO	TPDO	–	–	–	Pos. unit
6067h	0	Position Window	UDINT	RW	No	30	0	1073741823	Pos. unit
6068h	0	Position Window Time	UINT	RW	No	0	0	65535	ms
606Bh	0	Velocity Demand Value	DINT	RO	TPDO	–	–	–	Vel. Unit
606Ch	0	Velocity Actual Value	DINT	RO	TPDO	–	–	–	Vel. Unit
606Dh	0	Velocity Window	UINT	RW	No	20000	0	65535	Vel. Unit

∗1. Write “Save” into the object 1010h. The current parameter data will be saved as a batch in the EEPROM.
If the objects are modified by the digital operator or SigmaWin+, the data will be directly stored in the EEPROM.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
606Eh	0	Velocity Window Time	UINT	RW	No	0	0	65535	ms
6071h	0	Target Torque	INT	RW	Yes	0	–32768	32767	0.1%
6072h	0	Max. Torque	UINT	RW	Yes	Motor max. torque	0	65535	0.1%
6074h	0	Torque Demand Value	INT	RO	Yes	–	–	–	0.1%
6077h	0	Torque Actual Value	INT	RO	Yes	–	–	–	0.1%
607Ah	0	Target Position	DINT	RW	Yes	0	–2147483648	2147483647	Pos. unit
607Bh	Position Range Limit								
	0	Number of entries	USINT	RO	No	2	–	–	–
	1	Min. position range limit	DINT	RW	Yes	–2147483648	–2147483648	0	Pos. unit
	2	Max. position range limit	DINT	RW	Yes	2147483647	0	2147483647	Pos. unit
607Ch	–	Home Offset	DINT	RW	No	0	–536870912	536870911	Pos. unit
607Dh	Software Position Limit								
	0	Number of entries	USINT	RO	No	2	–	–	–
	1	Min. position limit	DINT	RW	No	0	–536870912	536870911	Pos. unit
	2	Max. position limit	DINT	RW	No	0	–536870912	536870911	Pos. unit
607Fh	0	Max. Profile Velocity	UDINT	RW	Yes	Max. Motor speed	0	Max. motor speed	Vel. Unit
6081h	0	Profile Velocity	UDINT	RW	Yes	0	0	Max. profile velocity	Vel. Unit
6083h	0	Profile Acceleration	UDINT	RW	Yes	0	0	Max. acceler-ation	Acc. Unit
6084h	0	Profile Deceleration	UDINT	RW	Yes	0	0	Max. deceler-ation	Acc. Unit
6085h	0	Quick Stop Deceleration	UDINT	RW	Yes	Deceleration taken from the driver during initial-ization	0	Max. deceler-ation	Acc. Unit
6087h	0	Torque Slope	UDINT	RW	Yes	0	0	2147483647	0.1 %/s
6098h	0	Homing Method	SINT	RW	Yes	35	0	35	–
6099h	Homing Speeds								
	0	Number of entries	USINT	RO	No	2	–	–	–
	1	Speed during search for switch	UDINT	RW	Yes	0	0	Max. profile velocity	Vel. Unit
	2	Speed during search for zero	UDINT	RW	Yes	0	0	Max. profile velocity	Vel. Unit
609Ah	0	Homing Acceleration	UDINT	RW	Yes	0	0	Max. acceler-ation	Acc. Unit
60B8h	0	Touch Probe Function	UINT	RW	Yes	0	0	0xFFFF	–
60B9h	0	Touch Probe Status	UINT	RO	Yes	–	–	–	–
60BAh	0	Touch Probe 1 position Value	DINT	RO	Yes	–	–	–	Pos. unit
60BCh	0	Touch Probe 2 position Value	DINT	RO	Yes	–	–	–	Pos. unit
60C1h	Interpolation Data Record								
	0	Number of entries	USINT	RO	No	1	–	–	–
	1	Interpolation data record	DINT	RW	Yes	0	–2147483648	2147483647	Pos. unit

∗1. Write “Save” into the object 1010h. The current parameter data will be saved as a batch in the EEPROM.
If the objects are modified by the digital operator or SigmaWin+, the data will be directly stored in the EEPROM.

Index	Sub Index	Name	Data Type	Access	PDO Mapping	Default Value	Lower Limit	Upper Limit	Unit
60C2h	Interpolation Time Period								
	0	Highest sub-index supported	USINT	RO	Yes	2	2	2	–
	1	Interpolation time period	USINT	RW	Yes	1	1 *2	4 *2	–
			USINT	RW	Yes	–	5 *3	40 *3	–
	2	Interpolation time index	SINT	RW	Yes	–3	–4	–3	–
60C5h		Max. acceleration	UDINT	RW	Yes	Max. motor acceleration	0	Max. motor acceleration	–
60C6h		Max. deceleration	UDINT	RW	Yes	Max. motor deceleration	0	Max. motor deceleration	–
60FCh	0	Position Demand Internal Value	DINT	RO	Yes	–	–	–	Inc
60FDh	0	Digital Inputs	UDINT	RO	Yes	–	–	–	–
60FEh	Digital Outputs								
	0	Number of entries	USINT	RO	No	2	–	–	–
	1	Physical outputs	UDINT	RW	Yes	0	0	0xFFFFFFFF	–
	2	Bit mask	UDINT	RW	No	0x000C0000	0	0xFFFFFFFF	–
60FFh	0	Target Velocity	DINT	RW	Yes	0	–2147483648	2147483647	Vel. Unit
6502h	0	Supported Drive Modes	UDINT	RO	No	0x03ED	–	–	–

∗1. Write “Save” into the object 1010h. The current parameter data will be saved as a batch in the EEPROM.
If the objects are modified by the digital operator or SigmaWin+, the data will be directly stored in the EEPROM.
∗2. Supported values are 1, 2, 4 in case of Interpolation time index (0x60C2/2) is -3.
∗3. Supported values are 5, 10, 20, 40 in case of Interpolation time index (0x60C2/2) is -4.

10.2 SERVOPACK Parameters

The following table lists the SERVOPACK parameters. All parameters can be accessed by SDO communication.

<Note>

- Use the object 1010h to write the parameters via SDO communication and store the setting values in the non-volatile memory in the SERVOPACK.
- If the parameters are modified by the digital operator or SigmaWin+, the data will be directly stored in the non-volatile memory.
- All SERVOPACK parameters have the following access attributes:
  - Read/Write enabled
  - PDO mapping disabled
  - Enabled to be stored in the EEPROM (non-volatile memory).
  - In the Powerlink Network Module, the reference units of the SERVOPACK parameters are encoder pulses (units: inc.).

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn000	Basic Function Select Switch 0	0000 to 00B3	–	0000	After restart	UINT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

Direction Selection

0	Forward reference for forward rotation.
1	Forward reference for reverse rotation. (Reverse rotation mode)
2 to 3	Reserved (Do not use.)

Reserved (Do not change.)

Reserved (Do not change.)

Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn001	Application Function Select Switch 1	0000 to 1122	–	0000	After restart	UINT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

Servomotor power OFF or Alarm Gr.1 Stop Mode

0	Stops the motor by applying DB (dynamic brake).
1	Stops the motor by applying dynamic brake (DB) and then releases DB.
2	Makes the motor coast to a stop state without using the dynamic brake (DB).

Overtravel (OT) Stop Mode

0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting).
1	Sets the torque of Pn406 to the maximum value, decelerate the servomotor to a stop, and then sets it to servolock state.
2	Sets the torque of Pn406 to the maximum value, decelerates the servomotor to a stop, and then sets it to coasting state.

AC/DC Power Input Selection

0	Not applicable to DC power input: Input AC power supply through L1, L2 (, and L3) terminals.
1	Applicable to DC power input: Input DC power supply between B1/ + and −, or input DC power supply between B1 and −2.

Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn002	Application Function Select Switch 2	0000 to 4113	–	0000	After restart	UINT

n.□□□□ (4th digit, 3rd digit, 2nd digit, 1st digit)

1st digit: Torque Limit Reference Selection for Powerlink Network Module

1	Enables the torque limit reference from the command option module. (Automatically set by the Powerlink Network Module.)

2nd digit: Speed Limit Reference Selection for Powerlink Network Module

0	Disables the speed limit reference when torque limit is used from the command option module. (Automatically set by the Powerlink Network Module.)

3rd digit: Absolute Encoder Usage

0	Uses absolute encoder as an absolute encoder.
1	Uses absolute encoder as an incremental encoder.

4th digit: External Encoder Usage

0	Do not use external encoder.
1	Uses external encoder in forward rotation direction.
2	Reserved (Do not change.)
3	Uses external encoder in reversed rotation direction.
4	Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn006	Application Function Select Switch 6	0000 to 005F	–	0002	Immediately	UINT

n.□□□□ (4th digit, 3rd digit, 2nd digit, 1st digit)

1st and 2nd digits: Analog Monitor 1 Signal Selection

00	Motor speed (1 V/1000 min^{-1})
01	Speed reference (1 V/1000 min^{-1})
02	Torque reference (1 V/100%)
03	Position error (0.05 V/1 reference unit) *1
04	Position amplifier error (after electronic gears) (0.05 V/ 1 encoder pulse unit)
05	Position reference speed (1 V/1000 min^{-1})
06	Reserved (Do not change.)
07	Motor-load position error (0.01 V/1 reference unit) *1
08	Positioning completion (positioning completed: 5 V, positioning not completed: 0 V)
09	Speed feedforward (1 V/1000 min^{-1})
0A	Torque feedforward (1 V/100%)
0B	Active gain (1st gain: 1 V, 2nd gain: 2 V)
0C	Completion of position reference (completed: 5 V, not completed: 0 V)
0D	External encoder speed (1 V/1000 min^{-1})

3rd digit: Reserved (Do not change.)

4th digit: Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn007	Application Function Select Switch 7	0000 to 005F	–	0000	Immediately	UINT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

Analog Monitor 2 Signal Selection

00	Motor speed (1 V/1000 min^{-1})
01	Speed reference (1 V/1000 min^{-1})
02	Torque reference (1 V/100%)
03	Position error (0.05 V/1 reference unit) *1
04	Position amplifier error (after electronic gears) (0.05 V/ 1 encoder pulse unit)
05	Position reference speed (1 V/1000 min^{-1})
06	Reserved (Do not use.)
07	Motor-load position error (0.01 V/1 reference unit) *1
08	Positioning completion (positioning completed: 5 V, positioning not completed: 0 V)
09	Speed feedforward (1 V/1000 min^{-1})
0A	Torque feedforward (1 V/100%)
0B	Active gain (1st gain: 1 V, 2nd gain: 2 V)
0C	Completion of position reference (completed: 5 V not completed: 0 V)
0D	External encoder speed (1 V/1000 min^{-1})

Reserved (Do not change.)

Reserved (Do not change.)

∗1. In the Powerlink Network Module, the reference units of the SERVOPACK parameters are encoder pulses (units: inc.).

Pn008	Application Function Select Switch 8	0000 to 7121	–	4000	After restart	UNIT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

Lowered Battery Voltage Alarm/Warning Selection

0	Outputs alarm (A.830) for lowered battery voltage.
1	Outputs warning (A.930) for lowered battery voltage.

Function Selection for Insufficient voltage

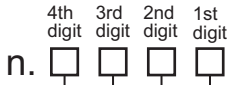
0	Disables detection of insufficient voltages.
1	Detects warning and limits torque by host controller.
2	Detects warning and limits torque by Pn424 and Pn425.

Warning Detection Selection

0	Detects warning.
1	Does not detect warning.

Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn009	Application Function Select Switch 9	0000 to 0111	–	0010	After restart	UINT



Reserved (Do not change.)

Current Control Method Selection

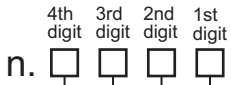
0	Current control method 1
1	Current control method 2

Speed Detection Method Selection

0	Speed detection 1
1	Speed detection 2

Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn00B	Application Function Select Switch B	0000 to 1111	–	0000	After restart	UINT



Parameter Display Selection

0	Setup parameters
1	All parameters

Alarm Gr.2 Stop Method Selection

0	Stops the motor by setting the speed reference to "0."
1	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting)

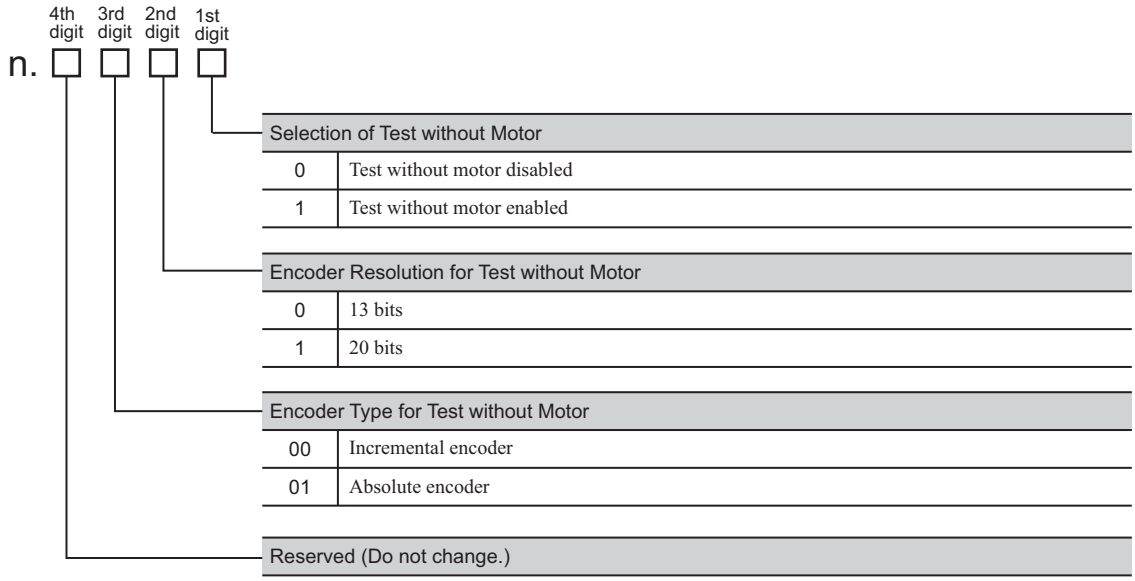
Power Supply Method for Three-phase SERVOPACK

0	Three-phase power supply
1	Single-phase power supply

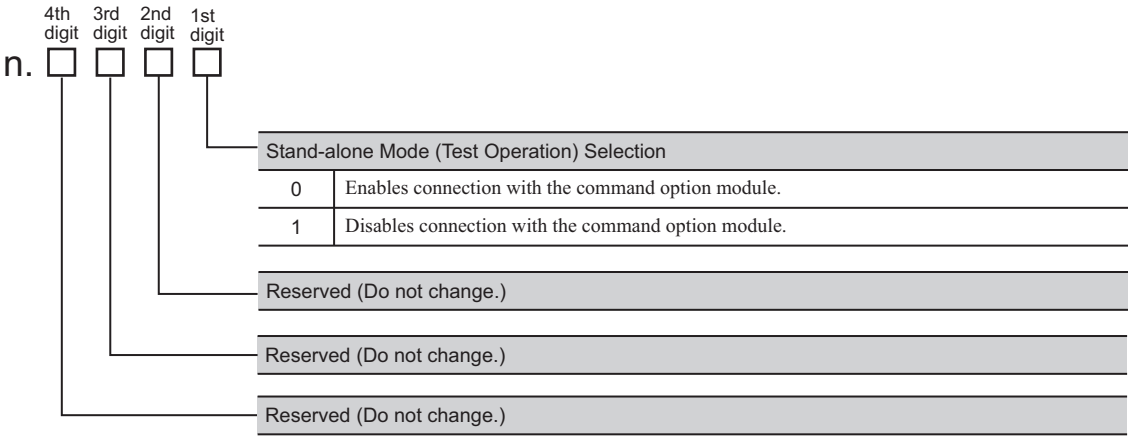
Semi-closed Encoder Usage Method

0	Uses the encoder connected to the SERVOPACK.
1	Uses the encoder connected to the feedback option module.

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn00C	Application Function Select Switch C	0000 to 0111	–	0000	After restart	UINT

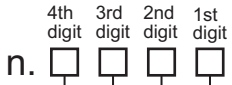


Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn00D	Application Function Select Switch D	0000 to 0001	–	0000	After restart	UINT



Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn010	Axis Address Selection (for UART/USB communication)	0000 to 007F	–	0001	After restart	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn080[*2]	Application Function Select Switch 80	0000 to 1111	–	0000	After restart	UINT



Hall Sensor Selection

0	Enables selection
1	Disables selection

Motor Phase Selection

0	Sets phase A lead as phase sequence of U,V,W.
1	Sets phase B lead as phase sequence of U,V,W.

Reserved (Do not change.)

Calculation Method for Maximum Speed or Divided Output Pulses

0	Determines divided output pulses with fixed maximum speed.
1	Determines maximum speed with fixed divided output pulses.

Pn100	Speed Loop Gain	10 to 20000	0.1 Hz	400	Immediately	UINT
Pn101	Speed Loop Integral Time Constant	15 to 51200	0.01 ms	2000	Immediately	UINT
Pn102	Position Loop Gain	10 to 20000	0.1/s	400	Immediately	UINT
Pn103	Moment of Inertia Ratio	0 to 20000	1%	100	Immediately	UINT
Pn104	2nd Speed Loop Gain	10 to 20000	0.1 Hz	400	Immediately	UINT
Pn105	2nd Speed Loop Integral Time Constant	15 to 51200	0.01 ms	2000	Immediately	UINT
Pn106	2nd Position Loop Gain	10 to 20000	0.1/s	400	Immediately	UINT
Pn109	Feedforward Gain	0 to 100	1%	0	Immediately	UINT

*2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).

Pn10A	Feedforward Filter Time Constant	0 to 6400	0.01 ms	0	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn10B	Application Function for Gain Select Switch	0000 to 5334	–	0000	–	UINT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

Mode Switch Selection		When Enabled	Data Type
0	Uses internal torque reference as the condition (Level setting: Pn10C)	Immediately	UINT
1	Uses speed reference as the condition (Level setting: Pn10D)		
2	Uses acceleration as the condition (Level setting: Pn10E)		
3	Uses position error pulse as the condition (Level setting: Pn10F)		
4	No mode switch function available		

Speed Loop Control Method		When Enabled	Data Type
0	PI control	After restart	UNIT
1	I-P control		
2 and 3	Reserved (Do not change.)		

Reserved (Do not change.)

Reserved (Do not change.)

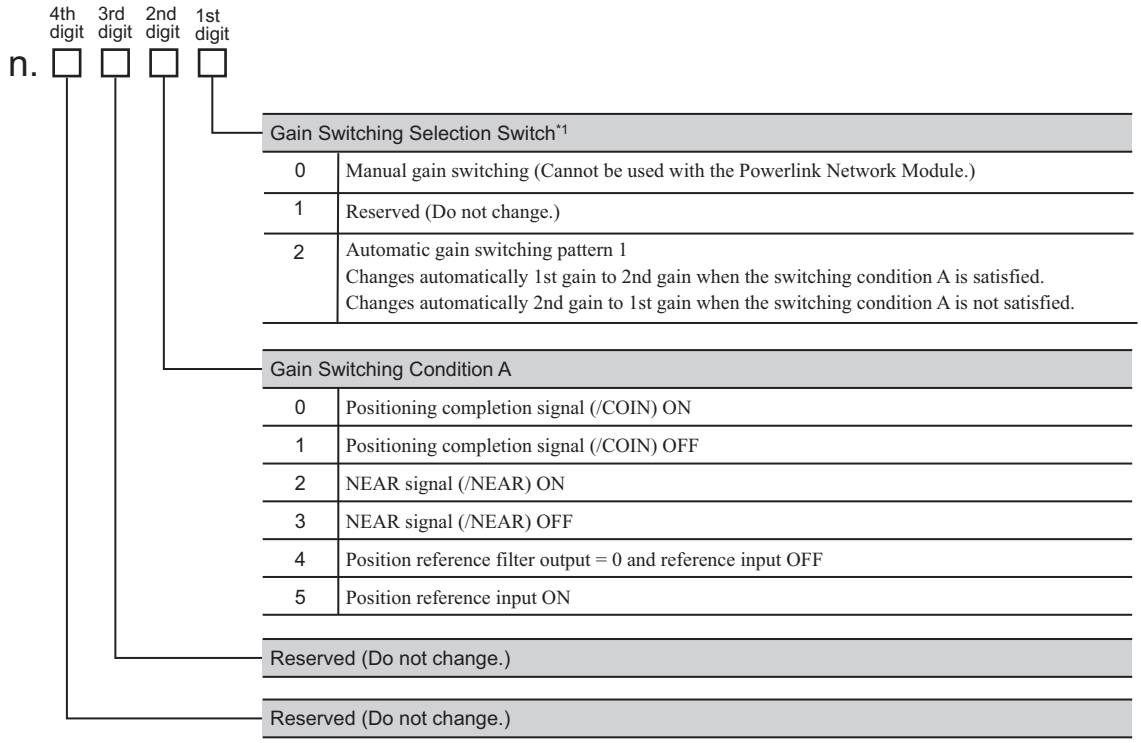
Pn10C	Mode Switch (torque reference)	0 to 800	1%	200	Immediately	UINT
Pn10D[*3]	Mode Switch (speed reference)	0 to 10000	1 min^{-1}	0	Immediately	UINT
Pn10E[*3]	Mode Switch (acceleration)	0 to 30000	1 min^{-1}/ s	0	Immediately	UINT
Pn10F	Mode Switch (position error pulse)	0 to 10000	1 reference unit[*1]	0	Immediately	UNIT
Pn11F	Position Integral Time Constant	0 to 50000	0.1 ms	0	Immediately	UINT
Pn121	Friction Compensation Gain	10 to 1000	1%	100	Immediately	UINT
Pn122	2nd Gain for Friction Compensation	10 to 1000	1%	100	Immediately	UINT
Pn123	Friction Compensation Coefficient	0 to 100	1%	0	Immediately	UINT
Pn124	Friction Compensation Frequency Correction	-10000 to 10000	0.1 Hz	0	Immediately	UINT
Pn125	Friction Compensation Gain Correction	1 to 1000	1%	100	Immediately	UINT
Pn131	Gain Switching Time 1	0 to 65535	1 ms	0	Immediately	UINT
Pn132	Gain Switching Time 2	0 to 65535	1 ms	0	Immediately	UINT

∗1. In the Powerlink Network Module, the reference units of the SERVOPACK parameters are encoder pulses (units: inc.).

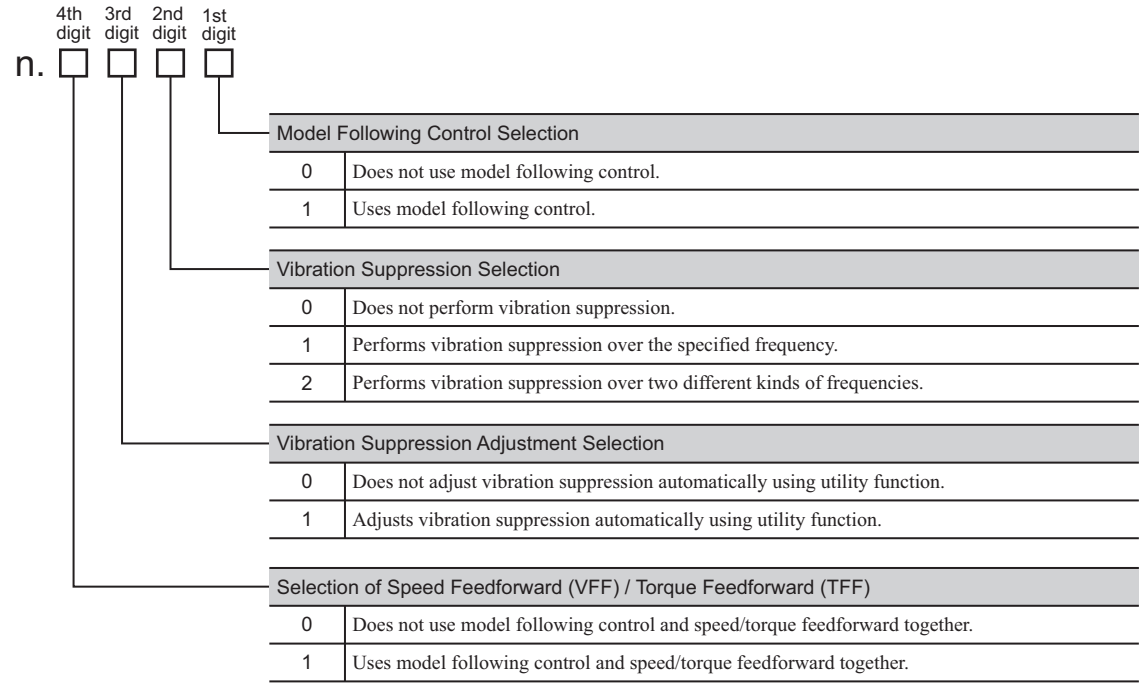
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).

Pn135	Gain Switching Waiting Time 1	0 to 65535	1 ms	0	Immediately	UINT
Pn136	Gain Switching Waiting Time 2	0 to 65535	1 ms	0	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn139	Automatic Gain Changeover Related Switch 1	0000 to 0052	–	0000	Immediately	UINT

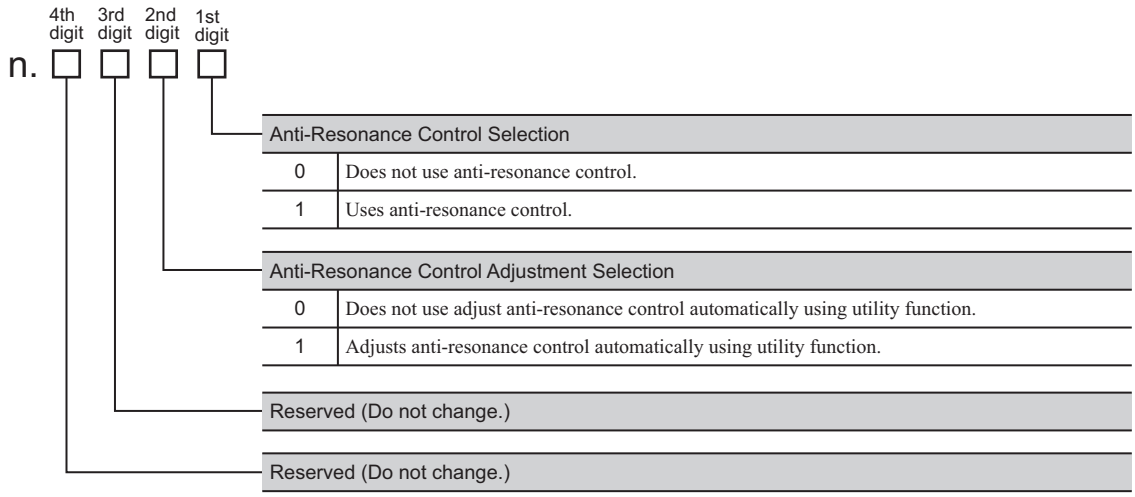


Pn13D	Current Gain Level	100 to 2000	1%	2000	Immediately	UINT
Pn140	Model Following Control Related Switch	0000 to 1121	–	0100	Immediately	UINT



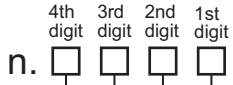
Pn141	Model Following Control Gain	10 to 20000	0.1/s	500	Immediately	UINT
Pn142	Model Following Control Gain Compensation	500 to 2000	0.1%	1000	Immediately	UINT
Pn143	Model Following Control Bias (Forward Direction)	0 to 10000	0.1%	1000	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn144	Model Following Control Bias (Reverse Direction)	0 to 10000	0.1%	1000	Immediately	UINT
Pn145	Vibration Suppression 1 Frequency A	10 to 2500	0.1 Hz	500	Immediately	UINT
Pn146	Vibration Suppression 1 Frequency B	10 to 2500	0.1 Hz	700	Immediately	UINT
Pn147	Model Following Control Speed Feedforward Compensation	0 to 10000	0.1%	1000	Immediately	UINT
Pn148	2nd Model Following Control Gain	10 to 20000	0.1/s	500	Immediately	UINT
Pn149	2nd Model Following Control Gain Compensation	500 to 2000	0.1%	1000	Immediately	UINT
Pn14A	Vibration Suppression 2 Frequency	10 to 2000	0.1 Hz	800	Immediately	UINT
Pn14B	Vibration Suppression 2 Compensation	10 to 1000	1%	100	Immediately	UINT
Pn160	Anti-Resonance Control Related Switch	0000 to 0011	–	0010	After restart	UINT



Pn161	Anti-Resonance Frequency	10 to 20000	0.1 Hz	1000	Immediately	UINT
Pn162	Anti-Resonance Gain Compensation	1 to 1000	1%	100	Immediately	UINT
Pn163	Anti-Resonance Damping Gain	0 to 300	1%	0	Immediately	UINT
Pn164	Anti-Resonance Filter Time Constant 1 Compensation	-1000 to 1000	0.01 ms	0	Immediately	UINT
Pn165	Anti-Resonance Filter Time Constant 2 Compensation	-1000 to 1000	0.01 ms	0	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn170	Tuning-less Function Rated Switch	0000 to 2411	–	1401	–	UINT



Tuning-less Function Selection		When Enabled	Data Type
0	Tuning-less function disabled	After restart	UINT
1	Tuning-less function enabled		

Control Method during Speed Control		When Enabled	Data Type
0	Uses as speed control.	After restart	UINT
1	Uses as speed control and uses the host controller for position control.		

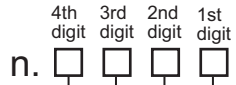
Tuning-less Tuning Level		When Enabled	Data Type
0 to 4	Sets tuning-less tuning level.	Immediately	UINT

Tuning-less Load Level		When Enabled	Data Type
0 to 2	Sets tuning-less load level.	Immediately	UINT

Pn181[*2]	Mode Switch (Speed Reference)	0 to 10000	1 mm/s	0	Immediately	UINT

∗2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).

Pn182[*2]	Mode Switch (Acceleration)	0 to 30000	1 mm/s^2	0	Immediately	UINT
Pn205[*3]	Multiturn Limit	0 to 65535	1 rev	65535	After restart	UINT
Pn207	Position Control Function Switch	0000 to 2210	–	0010	After restart	UINT



Reserved (Do not change.)

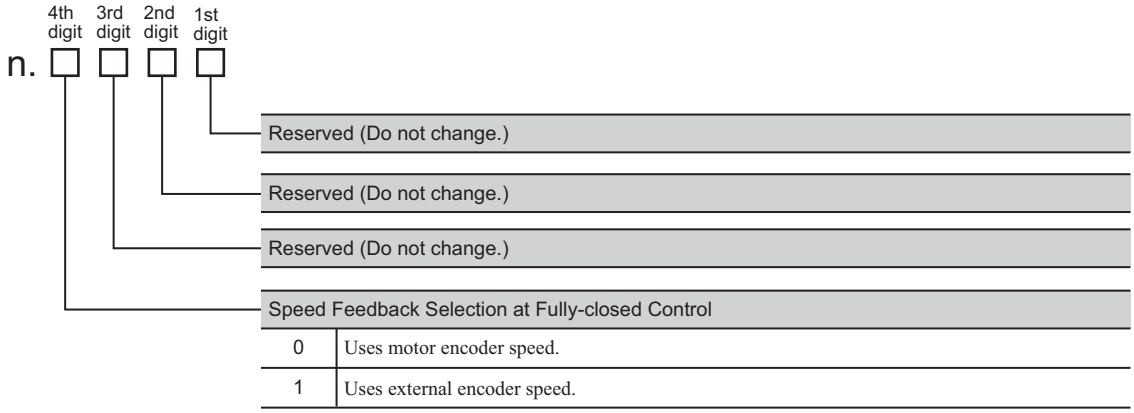
Reserved (Do not change.)

Reserved (Do not change.)

COIN Output Timing	
0	Outputs when the position error absolute value is the same or less than the positioning completion width (Pn522).
1	Outputs when the position error absolute value is the position completion width (Pn522) or less and the reference after position reference filtering is 0.
2	When the absolute value of the position error is below the positioning completed width setting (Pn522), and the position reference input is 0.

Pn20A[*3]	Number of External Encoder Pitch	4 to 1048576	1 pitch/rev	32768	After restart	UDINT
Pn20E[*4]	Electronic Gear Ratio (Numerator)	1 to 1073741824 (2^{30})	1	4	After restart	UDINT
Pn210[*4]	Electronic Gear Ratio (Denominator)	1 to 1073741824 (2^{30})	1	1	After restart	UDINT

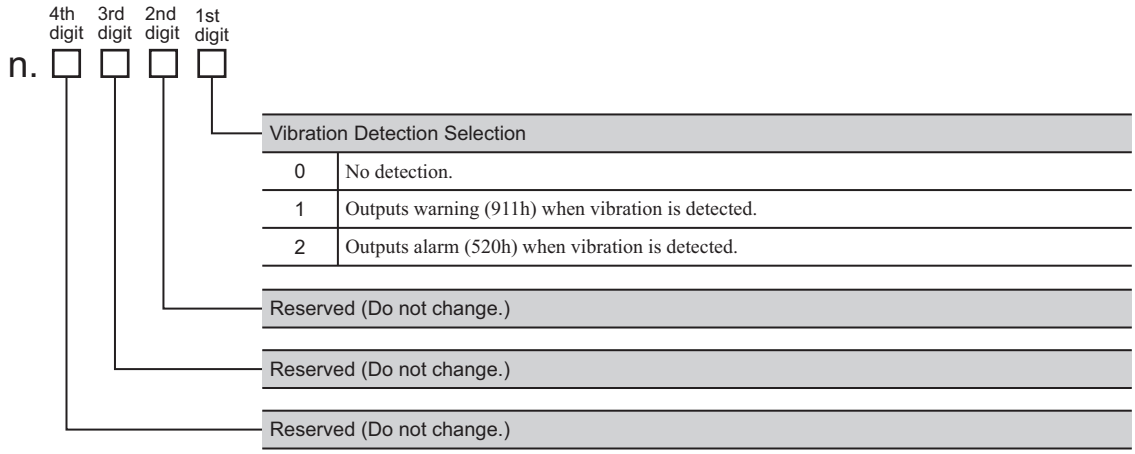
Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn212[*3]	Encoder Output Pulses	16 to 1073741824 (2^{30})	1 P/rev	2048	After restart	UDINT
Pn22A	Fully-closed Control Selection Switch	0000 to 1003	–	0000	After restart	UINT



Pn281	Encoder Output Resolution	1 to 4096	1 P/pitch	20	After restart	UINT
Pn282[*2]	Linear Scale Pitch	0.00 to 65536.00	0.01 μm	0	After restart	UINT

∗2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).
∗4. This parameter is automatically set to 1 by the Powerlink Network Module.

Pn304[*3]	JOG Speed	0 to 10000	1 min^{-1}	500	Immediately	UINT
Pn305	Soft Start Acceleration Time	0 to 10000	1 ms	0	Immediately	UINT
Pn306	Soft Start Deceleration Time	0 to 10000	1 ms	0	Immediately	UINT
Pn310	Vibration Detection Switch	0000 to 0002	–	0000	Immediately	UINT



Pn311	Vibration Detection Sensibility	50 to 500	1%	100	Immediately	UINT
Pn312[*3]	Vibration Detection Level	0 to 5000	1 min^{-1}	50	Immediately	UINT
Pn324	Moment of Inertia Calculating Start Level	0 to 20000	1%	300	Immediately	UINT
Pn383[*2]	JOG Speed	0 to 10000	1 mm/s	50	Immediately	UINT
Pn384[*2]	Vibration Detection Level	0 to 5000	1 mm/s	10	Immediately	UINT
Pn385[*2]	Motor Max. Speed	1 to 100	100 mm/s	50	After restart	UINT
Pn401	1st Step 1st Torque Reference Filter Time Constant	0 to 65535	0.01 ms	100	Immediately	UINT
Pn402[*3]	Forward Torque Limit	0 to 800	1%	800	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn403[*3]	Reverse Torque Limit	0 to 800	1%	800	Immediately	UINT
Pn404	Forward External Torque Limit	0 to 800	1%	100	Immediately	UINT
Pn405	Reverse External Torque Limit	0 to 800	1%	100	Immediately	UINT
Pn406	Emergency Stop Torque	0 to 800	1%	800	Immediately	UINT
Pn407[*3]	Speed Limit during Torque Control	0 to 10000	1 min^{-1}	10000	Immediately	UINT

∗2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).

Pn408

Torque Related Function Switch	0000 to 1111	–	0000	–	UNIT

n. □ (4th digit) □ (3rd digit) □ (2nd digit) □ (1st digit)

1st Step Notch Filter Selection		When Enabled	Data Type
0	N/A	Immediately	UINT
1	Uses 1st step notch filter for torque reference.		

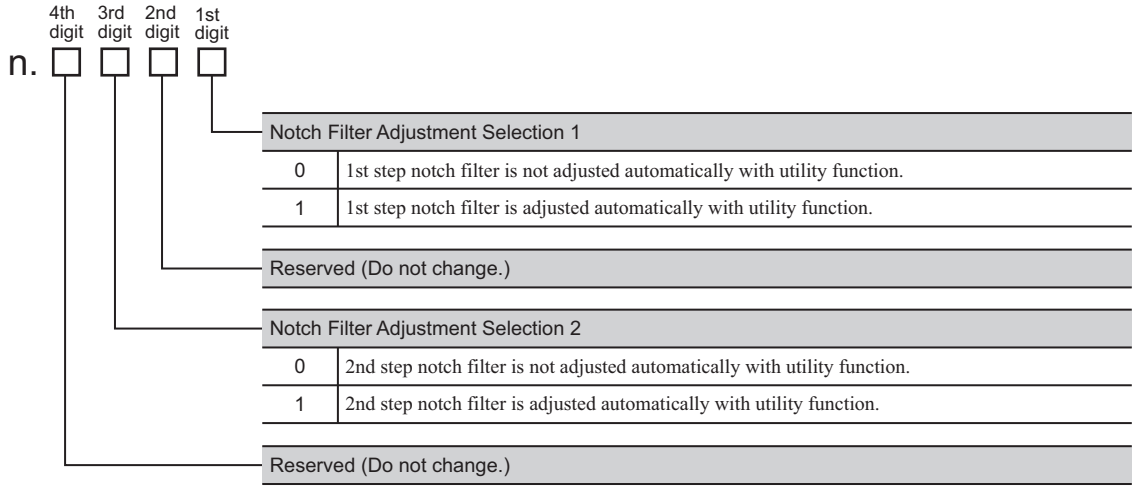
Speed Limit Selection		When Enabled	Data Type
0	Uses the smaller value between motor max. speed and parameter Pn407 as speed limit value.	After restart	UINT
1	Uses the smaller value between overspeed detection speed and parameter Pn407 as speed limit value.		

2nd Step Notch Filter Selection		When Enabled	Data Type
0	N/A	Immediately	UINT
1	Uses 2nd step notch filter for torque reference.		

Friction Compensation Function Selection		When Enabled	Data Type
0	Disables use friction compesation function.	Immediately	UINT
1	Enables friction compsation function.		

Pn409	1st Notch Filter Frequency	50 to 5000	1 Hz	5000	Immediately	UINT
Pn40A	1st Notch Filter Q Value	50 to 1000	0.01	70	Immediately	UINT
Pn40B	1st Notch Filter Depth	0 to 1000	0.001	0	Immediately	UINT
Pn40C	2nd Notch Filter Frequency	50 to 5000	1 Hz	5000	Immediately	UINT
Pn40D	2nd Notch Filter Q Value	50 to 1000	0.01	70	Immediately	UINT
Pn40E	2nd Notch Filter Depth	0 to 1000	0.001	0	Immediately	UINT
Pn40F	2nd Step 2nd Torque Reference Filter Frequency	100 to 5000	1 Hz	5000	Immediately	UINT
Pn410	2nd Step 2nd Torque Reference Filter Q Value	50 to 100	0.01	50	Immediately	UINT
Pn412	1st Step 2nd Torque Reference Filter Time Constant	0 to 65535	0.01 ms	100	Immediately	UINT
Pn424	Torque Limit at Main Circuit Voltage Drop	0 to 100	1%	50	Immediately	UINT
Pn425	Release Time for Torque Limit at Main Circuit Voltage Drop	0 to 1000	1 ms	100	Immediately	UINT
Pn456	Sweep Torque Reference Amplitude	1 to 800	1%	15	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn460	Notch Filter Adjustment Switch	0000 to 0101	–	0101	Immediately	UINT

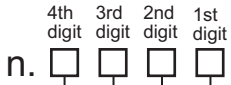


Pn480[*2]	Speed Limit during Force Control	0 to 10000	1 mm/s	10000	Immediately	UINT
Pn481[*2]	Polarity Detection Speed Loop Gain	1.0 to 2000.0	0.1 Hz	40.0	Immediately	UINT
Pn482[*2]	Polarity Detection Speed Loop Integral Time Constant	0.15 to 512.00	0.01 ms	30.00	Immediately	UINT
Pn483[*2]	Forward Force Limit	0 to 800	1%	30	Immediately	UINT
Pn484[*2]	Reverse Force Limit	0 to 800	1%	30	Immediately	UINT
Pn485[*2]	Polarity Detection Reference Speed	0 to 100	1 mm/s	20	Immediately	UINT
Pn486[*2]	Polarity Detection Reference Accel/Decel Time	0 to 100	1 ms	25	Immediately	UINT
Pn487[*2]	Polarity Detection Constant Speed Time	0 to 300	1 ms	0	Immediately	UINT
Pn488[*2]	Polarity Detection Reference Waiting Time	50Å`500	1 ms	100	Immediately	UINT
Pn48E[*2]	Polarity Detection Range	1 to 65535	1 mm	10	Immediately	UINT
Pn490[*2]	Polarity Detection Load Level	0 to 20000	1%	100	Immediately	UINT
Pn495[*2]	Polarity Detection Confirmation Force Reference	0 to 200	1%	100	Immediately	UINT
Pn498[*2]	Polarity Detection Allowable Error Range	0 to 30	1 deg	10	Immediately	UINT
Pn502[*3]	Rotation Detection Level	1 to 10000	1 min^{-1}	20	Immediately	UINT
Pn503[*3]	Speed Coincidence Signal Output Width	0 to 100	1 min^{-1}	10	Immediately	UINT
Pn506	Brake Reference - Servo OFF Delay Time	0 to 50	10 ms	0	Immediately	UINT

∗2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).

Pn507[*3]	Brake Reference Output Speed Level	0 to 10000	1 min^{-1}	100	Immediately	UINT
Pn508	Waiting Time for Brake Signal When Motor Running	10 to 100	10 ms	50	Immediately	UINT
Pn509	Instantaneous Power Cut Hold time	20 to 1000	1 ms	20	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn50A	Input Signal Selection 1	0000 to FFF1	–	1881	After restart	UINT



Reserved (Do not change.)

Reserved (Do not change.)

Reserved (Do not change.)

P-OT Signal Mapping

0	Forward run allowed when CN1-13 input signal is ON (L-level)
1	Forward run allowed when CN1-7 input signal is ON (L-level)
2	Forward run allowed when CN1-8 input signal is ON (L-level)
3	Forward run allowed when CN1-9 input signal is ON (L-level)
4	Forward run allowed when CN1-10 input signal is ON (L-level)
5	Forward run allowed when CN1-11 input signal is ON (L-level)
6	Forward run allowed when CN1-12 input signal is ON (L-level)
7	Forward run prohibited
8	Forward run allowed
9	Forward run allowed when CN1-13 input signal is OFF (H-level)
A	Forward run allowed when CN1-7 input signal is OFF (H-level)
B	Forward run allowed when CN1-8 input signal is OFF (H-level)
C	Forward run allowed when CN1-9 input signal is OFF (H-level)
D	Forward run allowed when CN1-10 input signal is OFF (H-level)
E	Forward run allowed when CN1-11 input signal is OFF (H-level)
F	Forward run allowed when CN1-12 input signal is OFF (H-level)

*3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn50B	Input Signal Selection 2	0000 to FFFF	–	8882	After restart	UINT

n. □ □ □ □ (4th digit, 3rd digit, 2nd digit, 1st digit)

N-OT Signal Mapping (Refer to 4.2.3)

0	Reverse run allowed when CN1-13 input signal is ON (L-level).
1	Reverse run allowed when CN1-7 input signal is ON (L-level).
2	Reverse run allowed when CN1-8 input signal is ON (L-level).
3	Reverse run allowed when CN1-9 input signal is ON (L-level) .
4	Reverse run allowed when CN1-10 input signal is ON (L-level).
5	Reverse run allowed when CN1-11 input signal is ON (L-level).
6	Reverse run allowed when CN1-12 input signal is ON (L-level).
7	Reverse run prohibited.
8	Reverse run allowed.
9	Reverse run allowed when CN1-13 input signal is OFF (H-level).
A	Reverse run allowed when CN1-7 input signal is OFF (H-level).
B	Reverse run allowed when CN1-8 input signal is OFF (H-level).
C	Reverse run allowed when CN1-9 input signal is OFF (H-level).
D	Reverse run allowed when CN1-10 input signal is OFF (H-level).
E	Reverse run allowed when CN1-11 input signal is OFF (H-level).
F	Reverse run allowed when CN1-12 input signal is OFF (H-level).

Reserved (Do not change.)

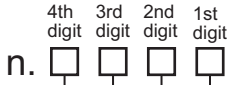
/P-CL Signal Mapping

0	ON when CN1-13 input signal is ON (L-level)
1	ON when CN1-7 input signal is ON (L-level)
2	ON when CN1-8 input signal is ON (L-level)
3	ON when CN1-9 input signal is ON (L-level)
4	ON when CN1-10 input signal is ON (L-level)
5	ON when CN1-11 input signal is ON (L-level)
6	ON when CN1-12 input signal is ON (L-level)
7	Sets signal ON.
8	Sets signal OFF.
9	OFF when CN1-13 input signal is OFF (H-level)
A	OFF when CN1-7 input signal is OFF (H-level)
B	OFF when CN1-8 input signal is OFF (H-level)
C	OFF when CN1-9 input signal is OFF (H-level)
D	OFF when CN1-10 input signal is OFF (H-level)
E	OFF when CN1-11 input signal is OFF (H-level)
F	OFF when CN1-12 input signal is OFF (H-level)

/N-CL Signal Mapping

0 to F	Same as /P-CL signal mapping

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn50E	Output Signal Selection 1	0000 to 3333	–	0000	After restart	UINT



Positioning Completion Signal Mapping (/COIN)

0	Disabled (the above signal is not used.)
1	Outputs the signal from CN1-1, 2 output terminal.
2	Outputs the signal from CN1-23, 24 output terminal.
3	Outputs the signal from CN1-25, 26 output terminal.

Speed Coincidence Detection Signal Mapping (/V-CMP)

0 to 3	Same as /COIN

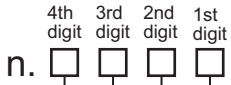
Servomotor Rotation Detection Signal Mapping (/TGON)

0 to 3	Same as /COIN

Servo Ready Signal Mapping (/S-RDY)

0 to 3	Same as /COIN

Pn50F	Output Signal Selection 2	0000 to 3333	–	0100	After restart	UINT



Torque Limit Detection Signal Mapping (/CLT)

0	Disabled (the above signal is not used.)
1	Outputs the signal from CN1-1, 2 output terminal.
2	Outputs the signal from CN1-23, 24 output terminal.
3	Outputs the signal from CN1-25, 26 output terminal.

Speed Limit Detection Signal Mapping (/VLT)

0 to 3	Same as /CLT

Brake Signal Mapping (/BK)

0 to 3	Same as /CLT

Warning Signal Mapping (/WARN)

0 to 3	Same as /CLT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn510	Output Signal Selection 3	0000 to 0033	–	0000	After restart	UINT

n. □ □ □ □ (4th digit, 3rd digit, 2nd digit, 1st digit)

1st digit: Near Signal Mapping (/NEAR)

0	Disabled (the above signal is not used.)
1	Outputs the signal from CN1-1, -2 terminal.
2	Outputs the signal from CN1-23, -24 terminal.
3	Outputs the signal from CN1-25, -26 terminal.

2nd digit: Reserved (Do not change.)

3rd digit: Reserved (Do not change.)

4th digit: Reserved (Do not change.)

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn511	Input Signal Selection 5	0000 to FFFF	–	6543	After restart	UINT

n. □ □ □ □ (4th digit, 3rd digit, 2nd digit, 1st digit)

1st digit: Reserved (Do not change.)

2nd digit: Input Signal Mapping for /Probe1 (/SI4)

4	Inputs the signal from CN1-10 input terminal.
5	Inputs the signal from CN1-11 input terminal.
6	Inputs the signal from CN1-12 input terminal.
7	Sets signal ON.
8	Sets signal OFF.
D	Inputs the reverse signal from CN1-10 input terminal.
E	Inputs the reverse signal from CN1-11 input terminal.
F	Inputs the reverse signal from CN1-12 input terminal.
0 to 3 9 to F	Sets signal OFF.

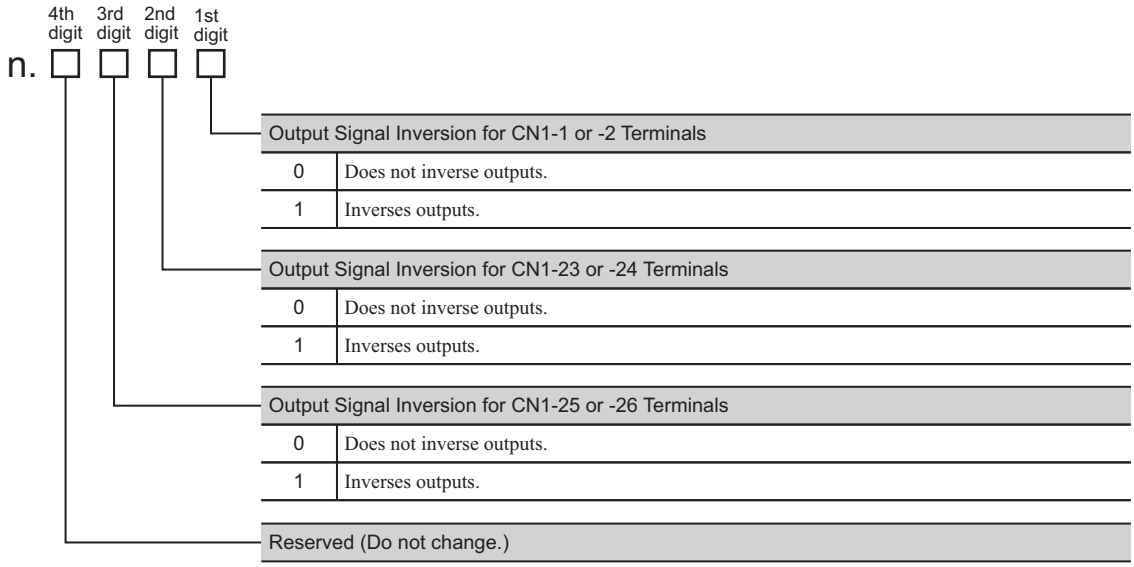
3rd digit: Input Signal Mapping for /Probe2 (/SI5)

0 to F	Same as /Probe1 signal mapping.

4th digit: Input Signal Mapping for /Home (/SI6)

0 to F	Same as /Probe1 signal mapping.

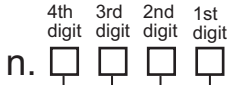
Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn512	Output Signal Inverse Setting	0000 to 0111	–	0000	After restart	UINT



Pn51B[*3]	Excessive Error Level Between Servomotor and Load Positions	1 to 1073741824 (2^{30})	1 reference unit[*1]	1000	Immediately	UDINT
Pn51E	Excessive Position Error Warning Level	10 to 100	1%	100	Immediately	UINT
Pn520	Excessive Position Error Alarm Level	1 to 1073741823 (2^{30}-1)	1 reference unit[*1]	5242880	Immediately	UDINT
Pn522	Positioning Completed Width	0 to 1073741824 (2^{30})	1 reference unit[*1]	7	Immediately	UDINT
Pn524	NEAR Signal Width	1 to 1073741824 (2^{30})	1 reference unit[*1]	1073741824	Immediately	UDINT
Pn526[*5]	Excessive Position Error Alarm Level at Servo ON	1 to 1073741823 (2^{30}-1)	1 reference unit[*1]	5242880	Immediately	UDINT
Pn528[*5]	Excessive Position Error Warning Level at Servo ON	10 to 100	1%	100	Immediately	UINT
Pn529[*5]	Speed Limit Level at Servo ON	0 to 10000	1 min^{-1}	10000	Immediately	UINT
Pn52A[*3]	Multiplier per One Fully-closed Rotation	0 to 100	1%	20	Immediately	UINT
Pn52B	Overload Warning Level	1 to 100	1%	20	Immediately	UINT
Pn52C	Derating of Base Current at Detecting Overload of Motor	10 to 100	1%	100	After restart	UINT

∗1. In the Powerlink Network Module, the reference units of the SERVOPACK parameters are encoder pulses (units: inc.).
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).
∗5. If the Powerlink Network Module is used, this parameter is not required to be set. Use the factory setting for this parameter.

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn530	Program JOG Operation Related Switch	0000 to 0005	–	0000	Immediately	UINT



Program JOG Operation Related Switch

0	(Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536
1	(Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536
2	(Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536
3	(Waiting time Pn535 → Reverse movement Pn531) × Number of times of movements Pn536 (Waiting time Pn535 → Forward movement Pn531) × Number of times of movements Pn536
4	(Waiting time Pn535 → Forward movement Pn531 → Waiting time Pn535 → Reverse movement Pn531) × Number of times of movement Pn536
5	(Waiting time Pn535 → Reverse movement Pn531 → Waiting time Pn535 → Forward movement Pn531) × Number of times of movement Pn536

Reserved (Do not change.)

Reserved (Do not change.)

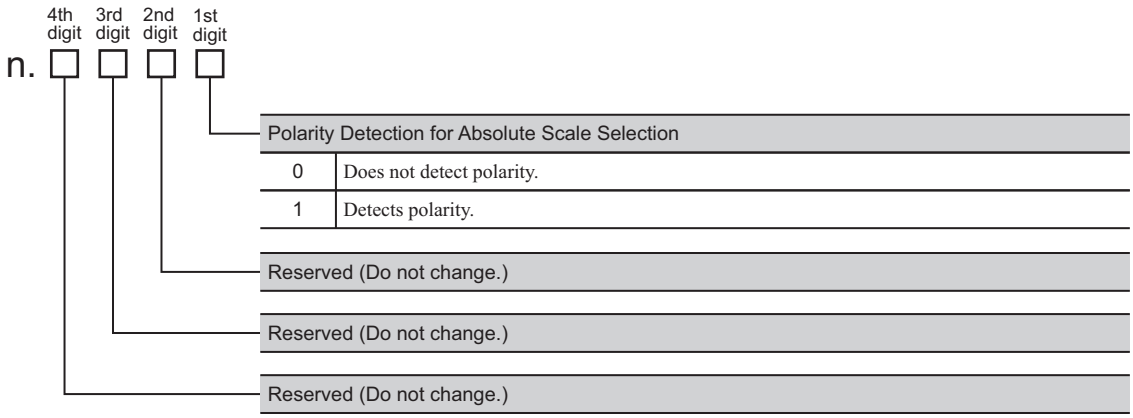
Reserved (Do not change.)

Pn531	Program JOG Movement Distance	1 to 1073741824 (2^{30})	1 reference unit*1	32768	Immediately	UDINT
Pn533*3	Program JOG Movement Speed	1 to 10000	1 min^{-1}	500	Immediately	UINT
Pn534	Program JOG Acceleration/Deceleration Time	2 to 10000	1 ms	100	Immediately	UINT
Pn535	Program JOG Waiting Time	0 to 10000	1 ms	100	Immediately	UINT
Pn536	Number of Times of Program JOG Movement	0 to 1000	1 time	1	Immediately	UINT
Pn550	Analog Monitor 1 Offset Voltage	-10000 to 10000	0.1 V	0.0	Immediately	UNIT
Pn551	Analog Monitor 2 Offset Voltage	-10000 to 10000	0.1 V	0.0	Immediately	UINT
Pn552	Analog Monitor Magnification (×1)	-10000 to 10000	×0.01	100	Immediately	UINT
Pn553	Analog Monitor Magnification (×2)	-10000 to 10000	×0.01	100	Immediately	UINT
Pn560	Remained Vibration Detection Width	1 to 3000	0.1%	400	Immediately	UINT
Pn561	Overshoot Detection Level	0 to 100	1%	100	Immediately	UINT
Pn582*2	Speed Coincidence Signal Output Width	0 to 100	1 mm/s	10	Immediately	UINT
Pn583*2	Brake Reference Output Speed Level	0 to 10000	1 mm/s	10	Immediately	UINT

∗1. In the Powerlink Network Module, the reference units of the SERVOPACK parameters are encoder pulses (units: inc.).
∗2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).
∗3. This parameter is exclusive for SERVOPACKs to be used with rotational servomotors (model: SGDV-□□□□E1).

Pn584*2	Speed Limit Level at Servo ON	0 to 10000	1 mm/s	10000	Immediately	UINT
Pn585*2	Program JOG Movement Speed	1 to 10000	1 mm/s	50	Immediately	UINT
Pn586*2	Motor Running Air-cooling Ratio	0 to 100	1%/maxvel	0	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn587[*2]	Polarity Detection for Absolute Scale Selection	0000 to 0001	–	0000	Immediately	UINT
Pn600	Regenerative Resistor Capacity	Depends on SERVOPACK Capacity	10 W	0	Immediately	UINT



*2. This parameter is exclusive for SERVOPACKs to be used with linear servomotors (model: SGDV-□□□□E5).

10.3 Error code

The following table shows the SDO abort codes for SDO communication errors.

Entry Type				Error code	Manufacturer specific Error Field	Name/Description
Status (Bit 15)	Send (Bit 14)	Mode (Bits 12..13)	Profile (Bits 0..11)			
0	1	3	0x192	0x5530	0x0002 8008	Read/Write EEPROM error
0	1	3	0x002	0x8161	0x0000 0000	E_DLL_BAD_PHYS_MODE
0	1	3	0x002	0x8164	0x0000 0000	E_DLL_CRC_TH
0	1	3	0x002	0x8163	0x0000 0000	E_DLL_COLLISION_TH
0	1	3	0x192	0x8200	0x0003 8006	Wrong value received via PDO
0	1	1/2	0x002	0x8210	0x0000 0000	PDO not processed due to length error
0	1	1/2	0x002	0x8211	0x0000 0000	Wrong mapping version
0	1	3	0x002	0x8235	0x0000 0000	E_DLL_JITTER_TH
0	1	3	0x002	0x8242	0x0000 0000	E_DLL_LOSS_PREQ_TH
0	1	3	0x002	0x8244	0x0000 0000	E_DLL_LOSS_SOA_TH
0	1	3	0x002	0x8245	0x0000 0000	E_DLL_LOSS_SOC_TH
0	1	3	0x192	0xFF00	0x0000 0A03 *	Wrong Node ID. Address is out of the allowable range
0	1	3	0x192	0xFF00	0x0000 0A10 *	Device Error. Error in setting DPM interrupt
0	1	3	0x192	0xFF00	0x0000 0EA0 *	Command-Option IF Servo Unit Initial Error
0	1	3	0x192	0xFF00	0x0000 0EA1 *	Command-Option IF Memory Check Error
0	1	3	0x192	0xFF00	0x0000 0EA2 *	Command-Option IF Servo Synchronization Error
0	1	3	0x192	0xFF00	0x0000 0EA3 *	Command-Option IF Servo Data Error
0	1	3	0x192	0xFF00	0x0002 0007	Wrong Sync period. The Sync messages arrival are not fit with interpolation time period (0x60C2/1)
0	1	3	0x192	0xFF00	0x0002 0009	Abnormal control state
0	1	3	0x192	0xFF00	0x0002 8003	Reset - Reset command had been sent.
0	1	3	0x192	0xFF00	0x0002 8004	NMT Stop
0	1	3	0x192	0xFF00	0x0002 8009	Communication Error
0	1	3	0x192	0xFF00	0x0003 0001	Motion buffer full warning
0	1	3	0x192	0xFF00	0x0000xxxx/ 0x0001xxxx *	xxxx-Other Sigma-5 Alarm&Warning (Refer to Sigma-5 user manual)

* : The error is reported also Sigma-5 amplifier.

Error code chart 1 (detected by Powerlink option card).

Fault code (same as display A.xxx)	Attribute (Bit) 16	Attribute (Bit) 17	Meaning	Description	Zero speed Stop	Store EEPROM of servo unit	Operate Alarm reset
0x0EA0	0	1	Command-Option IF Servo Unit Initial Error	This alarm is detected when the initial sequence is not completed within 10 s. The timeout period (between the power on and the completion of DPM initial sequence) is provided for both Option Card and Servo Unit. This alarm is not allowed for an "alarm reset", and the sequence is stopped after the alarm is detected.	No	Yes	No
0x0EA1	0	1	Command-Option IF Memory Check Error	Option Card detects this alarm if there is a "verify" error during the memory check in the DPM initial sequence. This alarm is not allowed for an "alarm reset" , and the sequence is stopped after the alarm is detected so that the DPM data exchange will not be carried out.	No	Yes	No
0x0EA2	0	1	Command-Option IF Servo Synchronization Error	Option Card detects this alarm if the WDC of the cyclic data refreshed by Servo Unit is not updated properly. After detecting the alarm, the cyclic data except for the WDC is disabled, and the data is enabled back again to be refreshed when the WDC comes back to a normal state (WDC is defined as normal when it is successfully refreshed for 16 consecutive times).	No	Yes	Yes
0x0EA3	0	1	Command-Option IF Servo Data Error	Option Card detects this alarm if the checksum of the cyclic data refreshed by Servo Unit is inappropriate. After detecting the alarm, the cyclic data is disabled, and the data is enabled back again to be refreshed when the WDC comes back to a normal state (WDC is defined as normal when it is successfully refreshed for 16 consecutive times).	No	Yes	Yes
0x0A03	0	1	NodeID setting error	NodeID address is out of the allowable.	No	Yes	Yes
0x0A10	0	1	Device Error		No	Yes	No

Error code chart 2 (detected by Servo unit).

Fault code (Same as Display A.xxx)	Attribute (Bit) 16	Attribute (Bit) 17	Meaning	Description	Operate Alarm reset
0x00xx...c 0Dxx	X	0	Alarm/Warning from Sigma-5	Same code of Sigma-5 Alarm/Warning A.xxx	See Sigma-5 manual
0x0E00	0	0	Command-Option IF Option Card Initial Error	This alarm is detected when the initial sequence is not completed within 10 s. The timeout period (between the power on and the completion of DPM initial sequence) is provided for both Option Card and Servo Unit. This alarm is not allowed for an "alarm reset", and the sequence is stopped after the alarm is detected.	No
0x0E02	0	0	Command-Option IF Option Card Synchronization Error	Servo Unit detects this alarm if the WDC of the cyclic data refreshed by Option Card is not updated properly. After detecting the alarm, the cyclic data except for the WDC is disabled, and the data is enabled back again to be refreshed when the WDC comes back to a normal state (WDC is defined as normal when it is successfully refreshed for 16 consecutive times).	Yes
0x0E03	0	0	Command-Option IF Option Card Data Error	Servo Unit detects this alarm if the checksum of the cyclic data refreshed by Option Card is inappropriate. After detecting the alarm, the cyclic data is disabled, and the data is enabled back again to be refreshed when the WDC comes back to a normal state (WDC is defined as normal when it is successfully refreshed for 16 consecutive times).	Yes
0x0E70	0	0	Error of Command-Option Card not Detected	Upon power on, Servo Unit confirms a Board ID signal output from Option Card. This alarm is detected if Servo Unit determines that Option Card is not connected. After the alarm detection, the DPM data exchange will not be carried out.	No
0x0E73	0	0	Error of Command-Option Card not Supported	Upon power on, Servo Unit confirms a Board ID signal output from Option Card. This alarm is detected if "Board ID" or "OpType (Option Card ID)" set during "DPM Initial Sequence" is found to be out of supported range.	No
0x0E80	0	0	Error of Command-Option Card not Matching	Upon power on, Servo Unit confirms a Board ID signal output from Option Card. This alarm is detected if "OpType (Option Card ID)" set during "DPM Initial Sequence" is different from the Board ID obtained upon previous power on. It is to notify that Option Card has been replaced by another type. After the alarm detection, the DPM data exchange will be continued. This alarm cannot be reset unless "Fn014" in an operation mode is executed.	No

10.4 SDO Abort Code List

The following table shows the SDO abort codes for SDO communication errors.

Value	Meaning
0x0504 0005	Out of memory
0x0601 0001	Attempt to read a write only object
0x0601 0002	Attempt to write a read only object
0x0602 0000	Object does not exist in the object dictionary
0x0604 0041	Object can not be mapped to the PDO
0x0604 0042	The number and length of the objects to be mapped would exceed PDO length
0x0604 0043	General parameter incompatibility reason
0x0606 0000	Access failed due to an hardware error Error cause: a)The EEPROM operation is failed
0x0607 0010	Data type does not match, length of service parameter does not match
0x0609 0011	Sub-index does not exist
0x0609 0030	Invalid value for parameter Error cause: a) The command in the controlword is not allowed. b) Attempt to write not supportable mode to object 0x6060. c) The commanded homing method is not supported. d) PDO communication parameter wrong setting. e) In the objects 0x2100 and 0x2101 attempts to read/write value from/to not exist parameter number. f) User Unit Group Enable (object 0x2300)- If after attempting to enable the user unit the Max motor Acceleration/Velocity in user unit is greater than 2^31 or the Position user unit ratio is greater than 1000 or less than 0.001 . g) Attempt to write value to any object from device profile in case of User Unit Group Enable object 0x2300 not equal to 1. h) Attempt to write value to objects 0x3101, 0x3106, 0x3107 , 0x3108 and 0x3109 in case of wrong password value in the object 0x3100. i) Absolute Target Torque is greater than Max Torque. j) Absolute Target Velocity is greater than Max Profile Velocity. k) Attempt to change operation mode to pole detection mode in Servo On states l) Attempt to move into pole detection mode in case of rotary motor is forbidden
0x0609 0031	Value of parameter written too high
0x0609 0032	Value of parameter written too low
0x0609 0036	Maximum value is less than minimum value. Error cause: a) Max Software Position Limit less than Min Software Position Limit.
0x0800 0000	General error
0x0800 0020	Data can not be transferred or stored to the application. Error cause: a)Wrong storage signature for Save,Clear,or Load operations .
0x0800 0022	Data can not be transferred or stored to the application because of the present device state. Error cause: a) Attempt to implement mapping when the mapping is not enabled. b) Attempt to set Sigma V parameter value (object 0x2101) in the CIA-402 FSA state OPERATION ENABLED c) Wrong CIA-402 FSA state for setting User Unit Group Enable (object 0x2300).It is only allowed in SWITCH ON DISABLED state. d) Attempt to set Software position limit in CIA-402 FSA state OPERATION ENABLED or QUICK STOP. e) Attempt to set Position range limit in CIA-402 FSA state OPERATION ENABLED or QUICK STOP. f) Attempt to set Switch On or Operation Enabled in case of main power is off or Safety state (HWBB). g) Attempt to set pole detection mode in the states except Servo Off. h) Attempt to change operation mode from pole detection mode to other modes before pole detection completion.

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

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AC Servo Drives

Σ-V Series

USER'S MANUAL

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