YASKAWA

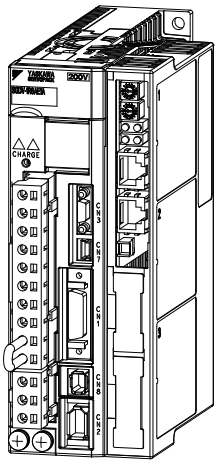
AC Servo Drives

Σ-V Series

USER'S MANUAL

PROFINET Network Module

Model: SGDV-OCB03A



MANUAL NO. SIEP C720829 24B

About this Manual

This manual describes informations required for designing, and maintaining the PROFINET 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
PROFINET Network Module	PROFINET 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, SGMPS, 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	Power to motor ON
Servo OFF	Power to motor OFF
Safety Module	The option module that provides safety functions specified in this manual.
BaseBlock (BB)	Power supply to motor is turned OFF by shutting OFF the base current to the power transistor that supplies power to the motor.
Hardwire BaseBlock Function (HWBB)	Safety function in the SERVOPACK This is the safety function that is equivalent to the Safe Torque Off function defined in IEC 61800-5-2.
Safe BaseBlock Function (SBB function)	This is one of safety functions in the Safety Module. This is the safety function that is equivalent to the Safe Torque Off function defined in IEC 61800-5-2.
Safe BaseBlock with Delay Function (SBB-D function)	This is one of safety functions in the Safety Module. This is the safety function that is equivalent to the Safe Stop 1 function defined in IEC 61800-5-2.
Safe Position Monitor with Delay Function (SPM-D function)	This is one of safety functions in the Safety Module. This is the safety function that is equivalent to the Safe Stop 2 function defined in IEC 61800-5-2.
Safely Limited Speed with Delay Function (SLS-D function)	Stopping function in the Safety Module. This is the safety function that is equivalent to the Safely-Limited Speed function defined in IEC 61800-5-2.
Safe (HWBB) state	The Safety Module is shutting OFF power supply to the motor by executing the HWBB function of SGDV SERVOPACK.

■ 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:

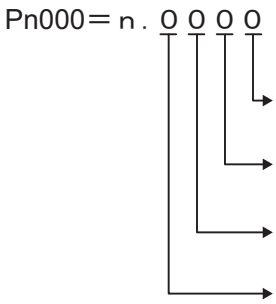
  Example

  The notation for $\overline{BK}$ 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 User's Manual Design and Maintenance Linear Motor Command Option Attachable Type (SIEP S800000 64)		✓		✓	✓	✓
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 User's Manual Setup Linear Motor (SIEP S800000 44)			✓	✓		
Σ-V Series User's Manual Safety Module (SIEP C720829 06)		✓	✓	✓	✓	✓

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 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)			✓			✓

■ Copyrights

■ 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

(1) Details of Warranty

■ Period of Warranty

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

■ Scope of Warranty

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

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

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

(2) Limitations of Liability

1. Yaskawa shall in no event be responsible for any damage or loss of opportunity to the customer that arises due to failure of the delivered product.
2. Yaskawa shall not be responsible for programming (including parameter settings) or the results of program execution if a programmable Yaskawa product was programmed by the user or by a third party.

(3) Suitability for Use

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

(4) Changes to Specifications

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

Applicable Standards

■ North American Safety Standards (UL)

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

* Underwriters Laboratories Inc.

Note: Applicable when the PROFINET 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 • SGMPS • 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 PROFINET 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

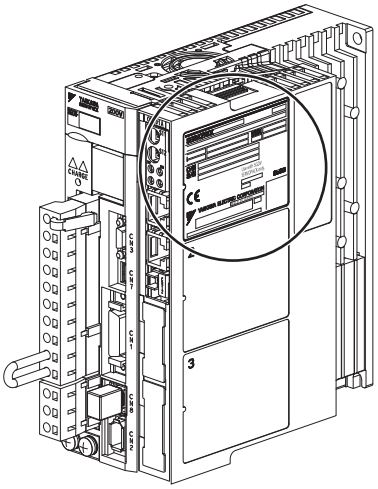
(1) When the PROFINET Network Module is Not Connected to the SERVOPACK

1. Mount the PROFINET 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 PROFINET Network Module is Connected to the SERVOPACK

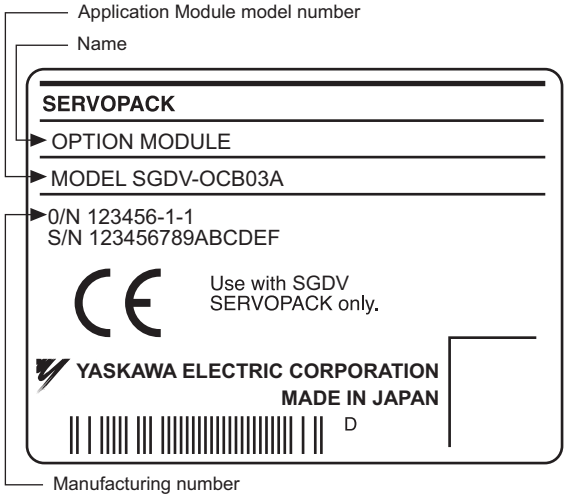
Check the nameplate to confirm that the module that is mounted is the PROFINET Network Module.

The nameplate is located in the following position.



1.2 Nameplate and Model Designation

■ Nameplate Example



Nameplate

■ Model Designation

SGDV – OC B03 A

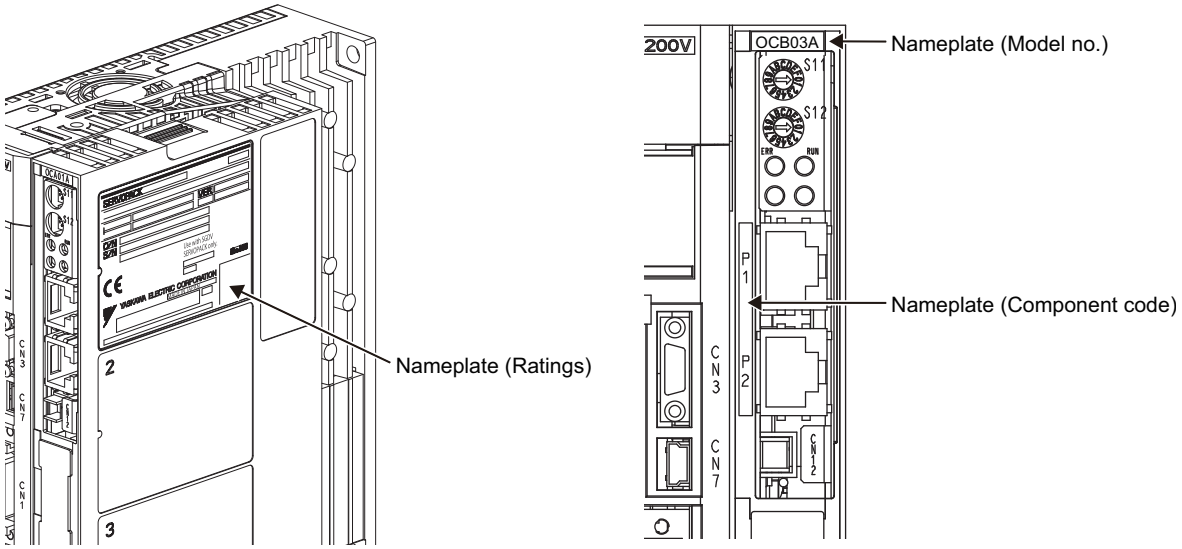
Series	
SGDV	Σ-V Series

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

3rd + 4th + 5th digits: Interface Specifications	
Code	Interface
B03	PROFINET RT

6th digit: Design Revision Order

1.3 Nameplate Location



2

Specifications

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

2.1 Overview

The Σ-V series PROFINET Network Module implements the PROFIdrive profile in PROFINET communication (real-time Ethernet communication).
Moreover, the Σ-V high servo control performance, advanced tuning function, and wide range of actuator controls can be performed via PROFINET.

2.2 PROFINET Technical Terms

2.2.1 Technical Terms

This table lists the terms used in this manual for PROFINET.

Term	Description
Acyclic communication	Communication in which messages are sent only once on request
Array	Parameter consisting of data fields of equal data type
Cyclic communication	Communication in which parameter/process data objects are sent cyclically at pre-defined intervals
DCP	Discovery and Configuration Protocol. A protocol that allows the master controller to find every PROFINET IO device on a subnet.
Fault	Event that leads to tripping of the device
Term	Explanation
GSD file GSDML file	XML-based format device description files in a specified form. Each different slave type on the PROFINET IO network needs to have its own GSD file. GSD files in PROFINET IO are written in GSDML
Sub-Index	Access reference for objects in PROFINET IO
IO controller	Control system with bus initiative. In PROFINET IO terminology, IO controllers are also called master stations
Master	Control system with bus initiative. In PROFINET IO terminology, master stations are also called active stations
Name	Symbolic name of a parameter
Parameter	Value that can be accessed as an object, e.g. variable, constant, signal
Parameter/Process data object	Special object that contains parameter and process data
Process data	Data that contains Controlword and reference value or Statusword and actual value. May also contain other, user-defined control information
IO device	Subordinated bus participant. Also referred to as node
Warning	Signal caused by an existing alarm which does not lead to tripping of the device

2.2.2 Abbreviations

This table lists the abbreviations used in this manual for PROFINET.

Abbreviation	Description
ACT	Actual value
DAP	Device access point
DP	Decentralised periphery
GSDML	General station description markup language
ISW	See “ACT”
MAP	Module access point
PAP	Parameter access point
PD	Process data
PNU	Parameter number
PPO	Parameter/Process data object
PZD	See “PD”
PDO	Process data object
RT	Real time
RPDO	Receive process data object
STW	Controlword

Abbreviation	Description
TPDO	Transmit process data object
ZSW	Statusword

2.2.3 Data Types

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

Code	Data Type	Coding (decimal)	Range
SINT	Signed 8 bit	2	–128 to +127
INT	Signed 16 bit	3	–32768 to +32767
DINT	Signed 32 bit	4	–2147483648 to +2147483627
USINT	Unsigned 8 bit	5	0 to 255
UINT	Unsigned 16 bit	6	0 to 65535
UDINT	Unsigned 32 bit	7	0 to 4294967295
B	Boolean	1	–
FP	Floating Point	8	–
VS	Visible String	9	–
OS	Octet String	10	–
N2	Normalised value 16 bit	113	–
N4	Normalised value 32 bit	114	–

2.2.4 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] = 2301:00h/2301:01h [inc]
Vel. unit	This is the user-defined velocity reference unit set by object 2302h. 1 [Vel. unit] = 2302:00h/2302:01h [inc/sec]
Acc. unit	This is the user-defined acceleration reference unit set by object 2303h. 1 [Acc. unit] = 2303:00h/2303:01h × 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 PROFINET Network Module

2.3.1 General Specifications

This table lists the general specifications of the PROFINET Network Module.

Applicable SERVOPACK		Σ-V Series SGDV-□□□□E□□ SERVOPACK	
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	
IO Signals	Input	Fixed allocation to CN1 connector of SERVOPACK	7 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) • General purpose input (/SI6) No effect function (Can not be used): • External latch inputs (EXT3)
	Output	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)
Other functions	Fully-closed loop control	Supported	
	Safety option card	Not supported	

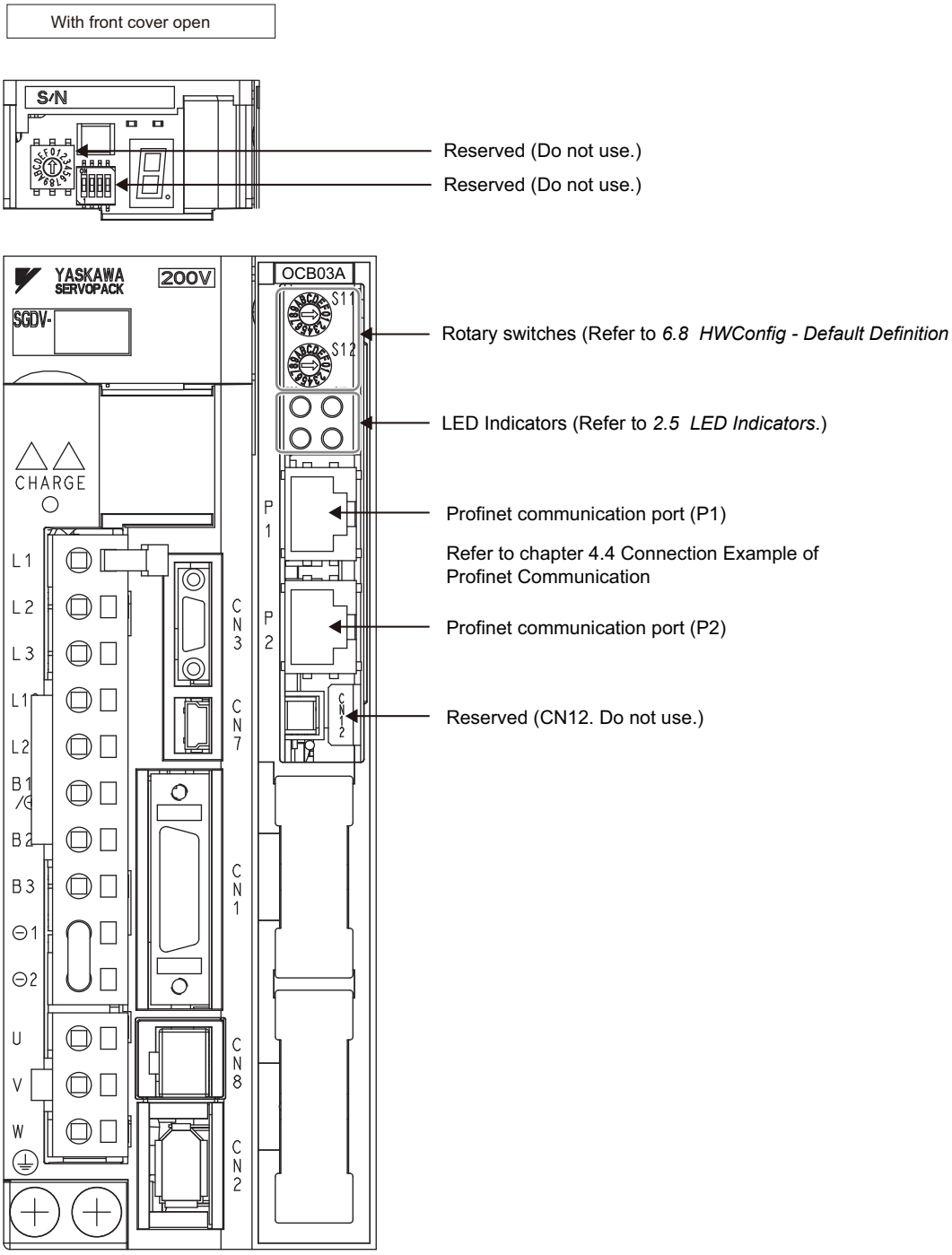
2.3.2 Communication Specifications

Communication Profile	Ethernet PROFINET IO RT Version 2.3
Physical Layer	100BASE-TX (IEEE802.3)
Fieldbus Connection	2× RJ45: CN11A, CN11B, Full duplex, auto-negotiation, auto-crossover
Baud Rate Setting	100 MBit/s

Supported Protocols	RTC - Real time cyclic protocol - RT class1 (not synchronized) RTA - Real time acyclic protocol DCP - Discovery and configuration protocol CL-RPC - Connectionless remote procedure call LLDP - Link layer discovery protocol SNMP - Simple network management protocol
Device Name Setting	DCP
Identification and Maintenance Functions	I&M 0
Topology Recognition	LLDP, SNMP V1, MIB2
Power Supply	5 V ±5%, 500 mA (max.) Supplied internal from drive CN10
LED Indicator	Red (ERR), Green (RUN) PROFINET communicating (Link) x 2
Node Type	IO Device
Acyclic Parameter Access	Base mode parameter access (read/write record)
Cyclic Messaging	Set of pre-defined standard telegrams: • ST1, ST2, ST7, ST9 Pre-defined manufacturer telegram: • Telegram number: 100 Freely configurable telegram • Telegram number: 999 • Dynamic telegram mapping with max. 16 signal entries each (input, output)
Alarm Messaging	Alarm Notification PDU
Standard	IEC 61800-7-1/2/3 Committee Draft
Motor Type	Servo
Axis Type	Rotary, linear
Profile Services	Cyclic messaging Acyclic parameter access mechanism Identification & Maintenance functions (I&M0) Diagnostic and alarm mechanism Fault buffer mechanism
Application Classes	1, 3
PROFIdrive Position Mode	Absolute and relative positioning Supported PROFIdrive position submodes: • MDI submode • Program submode (up to 64 positioning sets) Motion profile type: Linear
PROFIdrive Velocity Mode	Motion profile type: Linear
Homing Functions	CiA402 Supported Methods: 1-6, 17-20, 33, 34, 35 Supported homing methods are: • Homing on the negative limit switch and index pulse • Homing on the positive limit switch and index pulse • Homing on the positive home switch and index pulse • Homing on the negative home switch and index pulse • Homing on the negative limit switch • Homing on the positive limit switch • Homing on the positive home switch • Homing on the index pulse • Homing on the current position Motion profile type: linear Homing persistent in absolute motor encoder
Torque Profile Mode	Torque profile type: linear
Touch Probe Functions	Supported

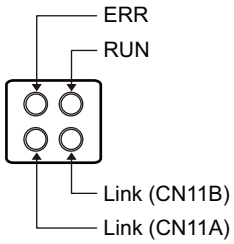
2.4 Part Names of the PROFINET Network Module

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



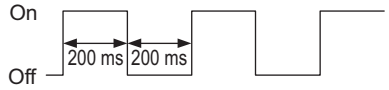
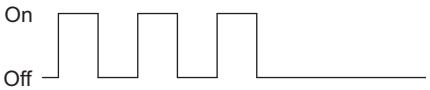
2.5 LED Indicators

This diagram shows details of the LED indicators.



■ RUN

The RUN indicator shows the status of PROFINET communication.

LED Indicator		Description
Display	Pattern	
Off	Continuously OFF	There is no connection to the IO controller.
Blinking		Connection established with I/O Controller and in STOP mode.
On	Continuously ON	Connection established with I/O Controller and in RUN mode.
Flash three times		DCP Flash Signal.

■ ERR

The ERR indicator shows the error status of PROFINET communication.

LED Indicator		Description
Display	Pattern	
Off	Continuously OFF	The device is in working condition.
On	Continuously ON	Communication Error occurred.

■ Link

The Link indicator shows the status of the physical link.

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

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*.

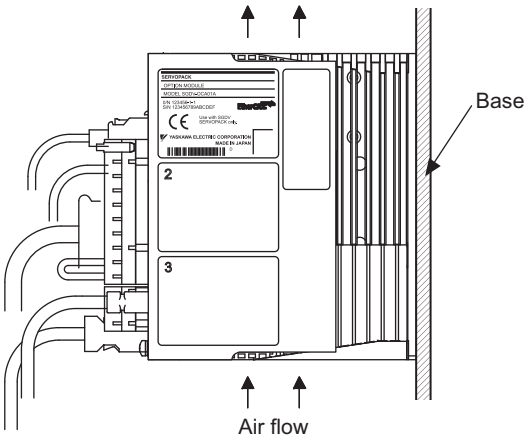
3.2 SERVOPACK Installation

3.2.1 Orientation

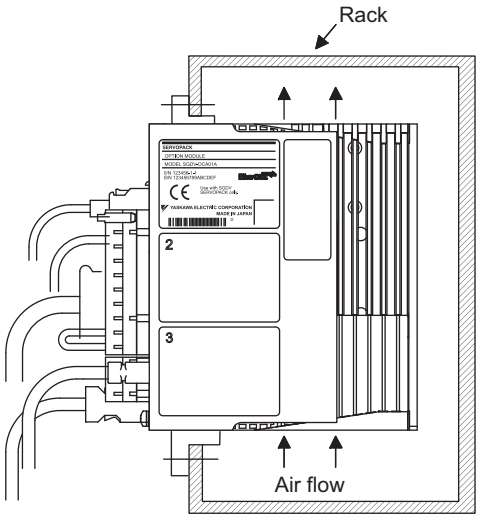
The SERVOPACK is available in models that are base-mounted, models that are rack-mounted, and models that are duct-ventilated. In any case, mount the SERVOPACK with a vertical orientation.

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

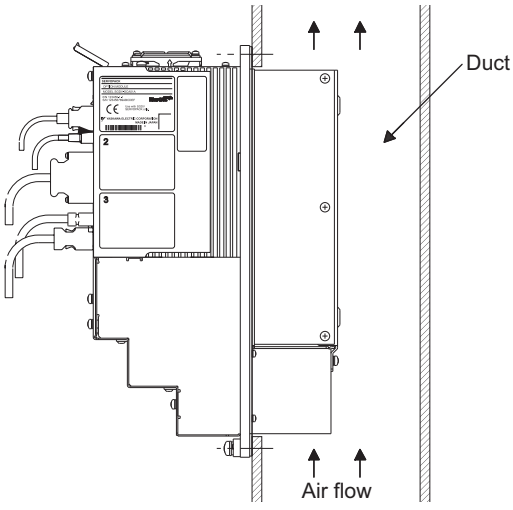
• Base-mounted



• 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.

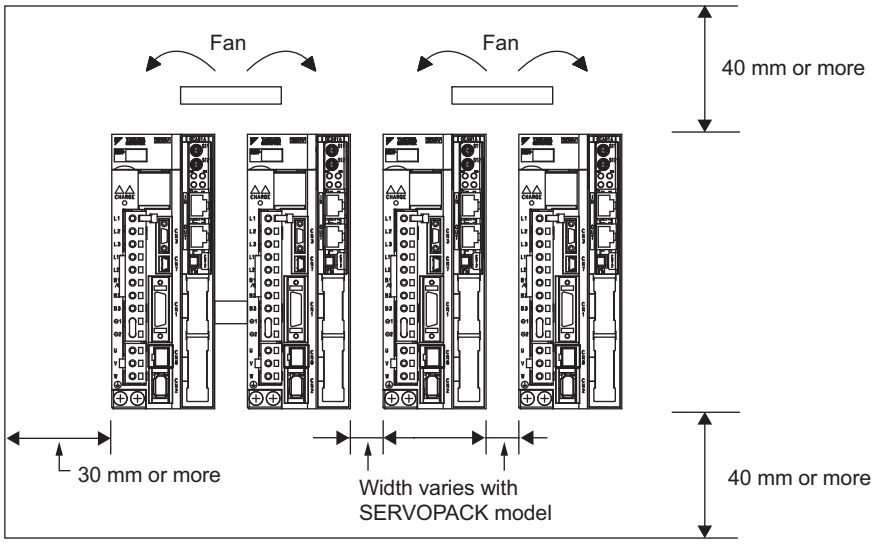
- SERVOPACK Mounting Orientation

  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

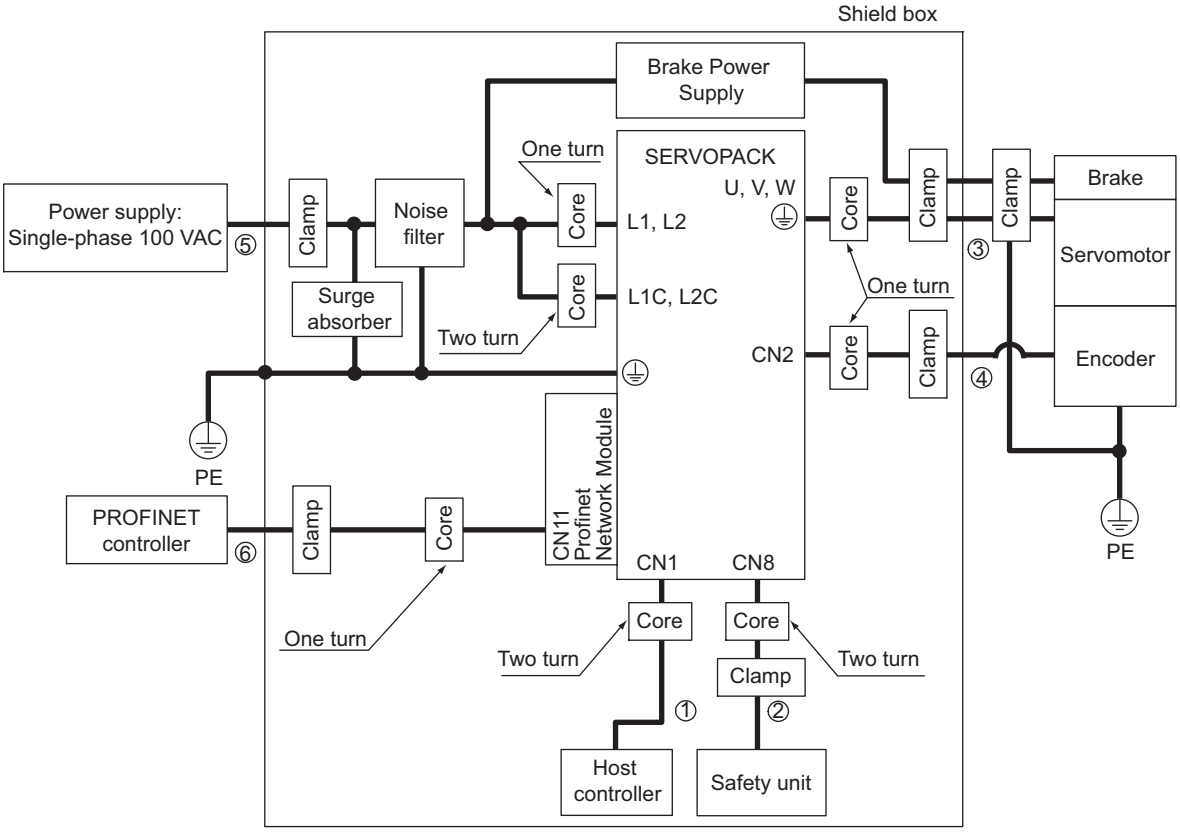
This section describes the recommended installation conditions that satisfy EMC guidelines for each model of the SGDV SERVOPACK. The conditions required for the standard type (base-mounted) of the SERVOPACK are described. Refer to this section for other SERVOPACK models such as the rack-mounted types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

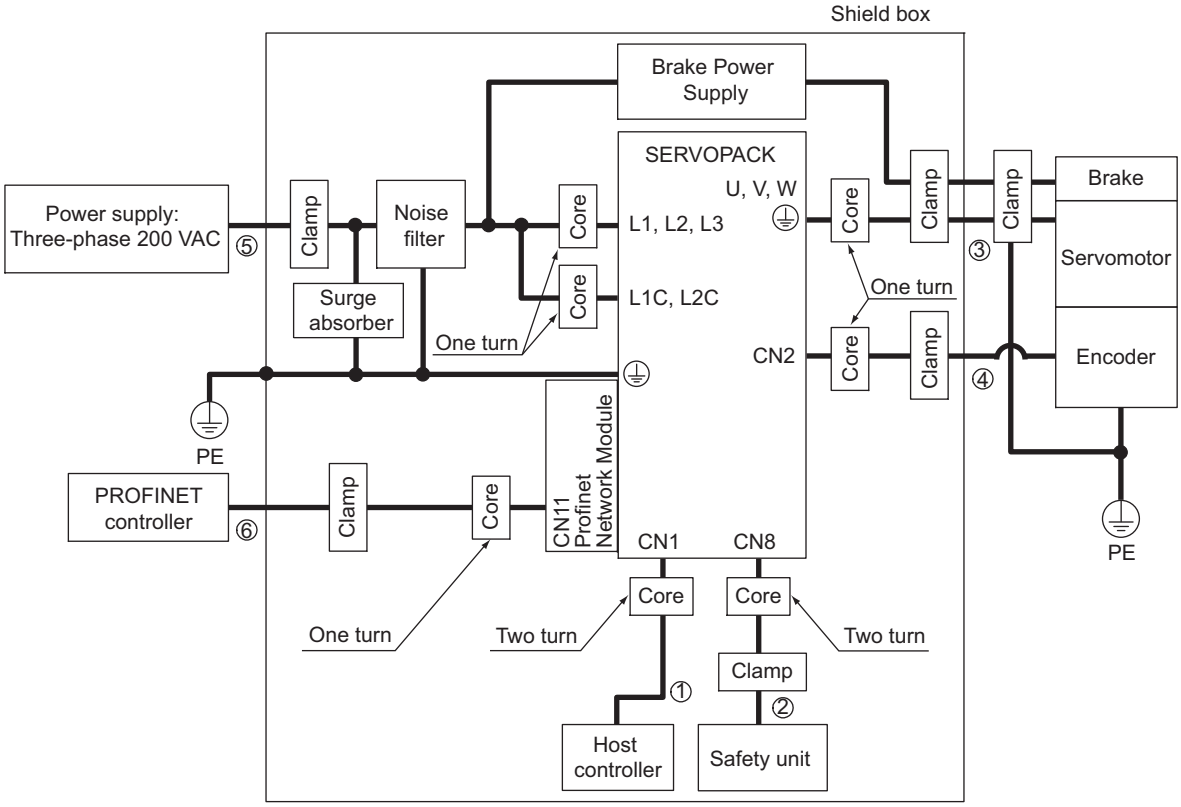
- SGDV-□□□FE1A (□□□ = R70, R90, 2R1, 2R8) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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

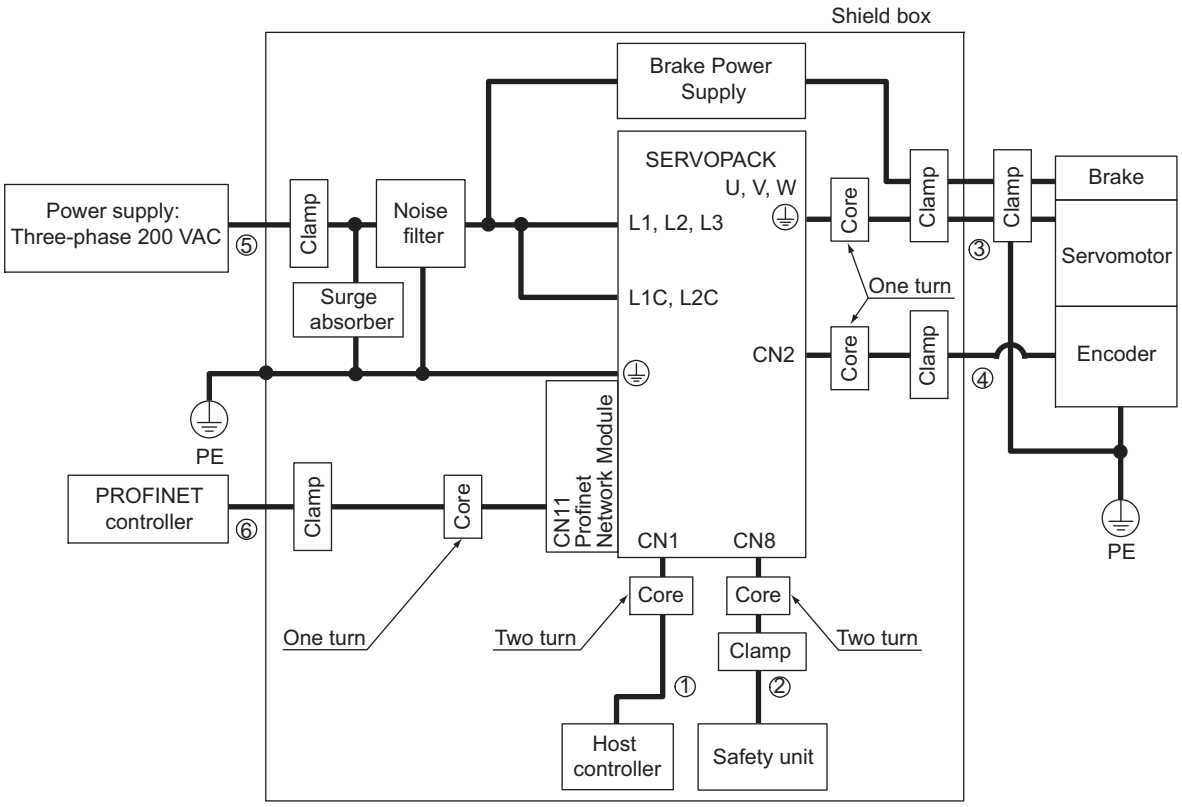
• SGDV-□□□AE1A (□□□ = R70, R90, 1R6, 2R8, 3R8, 5R5, 7R6) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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

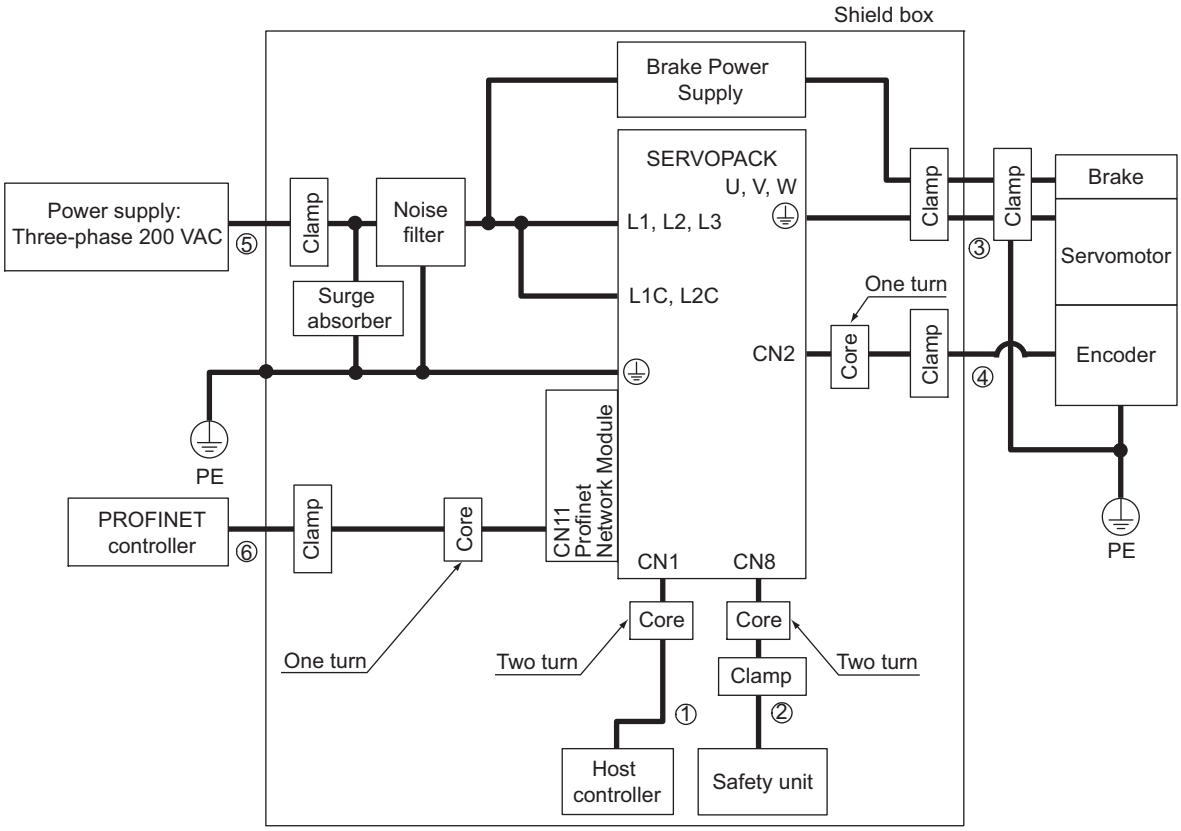
• SGDV-□□□AE1A (□□□ = 120) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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

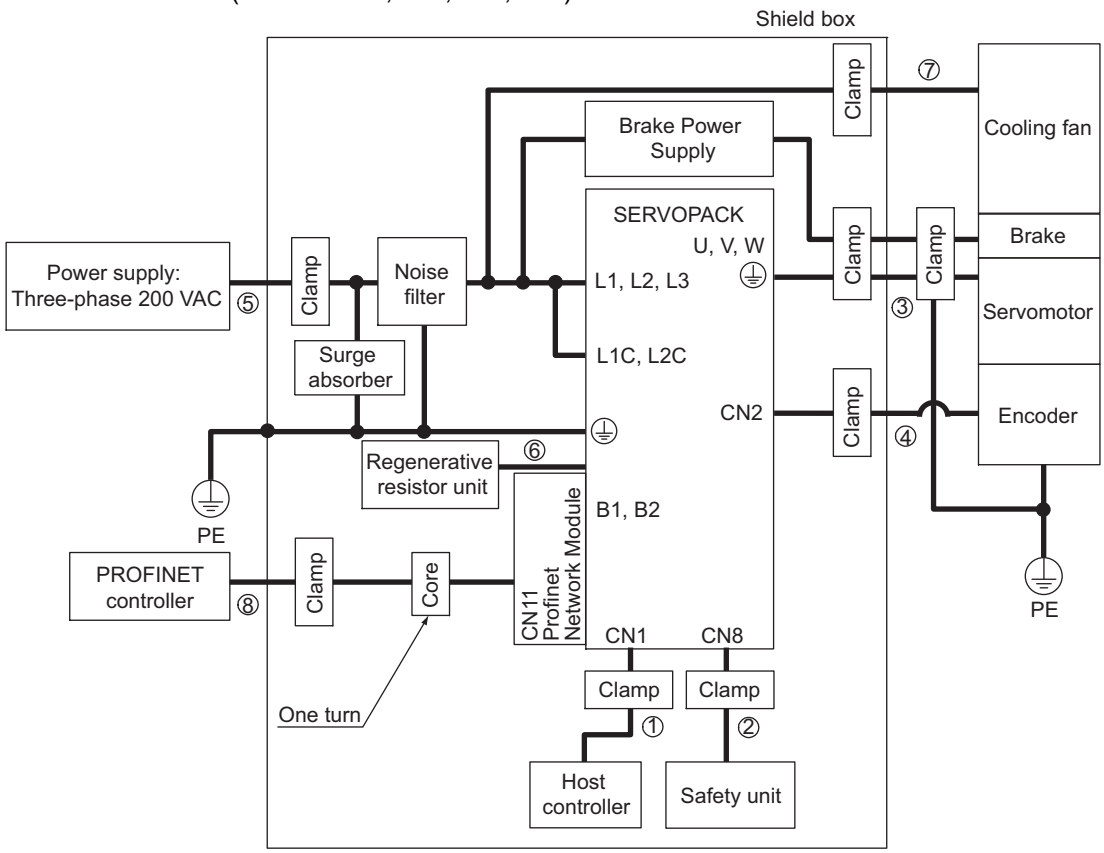
• SGDV-□□□AE1A (□□□ = 180, 200, 330) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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

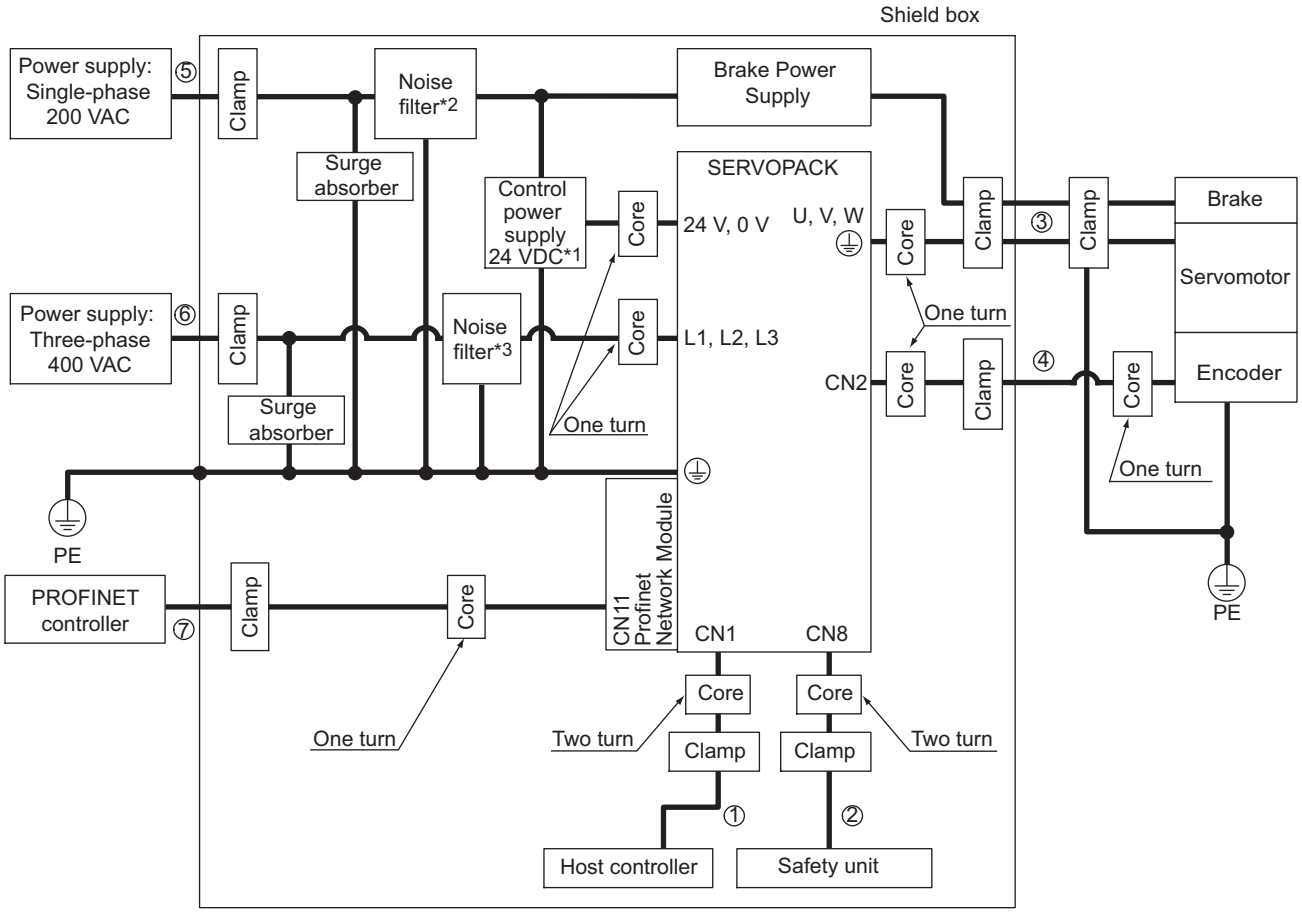
• SGDV-□□□AE1A (□□□ = 470, 550, 590, 780) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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-OCA01A

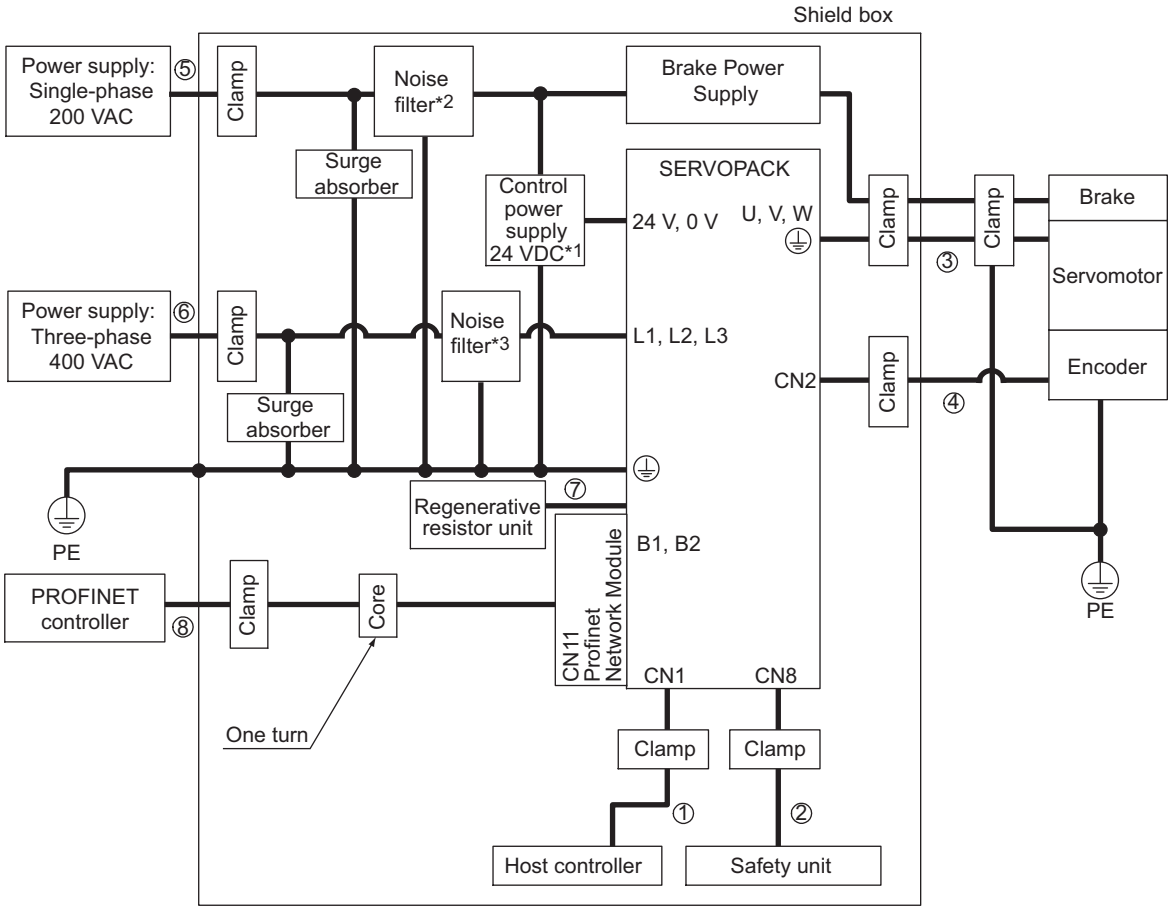


Symbol	Cable Name	Specification
①	IO signal cable	Shield cable
②	Safety signal cable	Shield cable
③	Motor main circuit cable	Shield cable
④	Encoder cable	Shield cable
⑤	Control power cable	Shield cable
⑥	Main circuit cable	Shield cable
⑦	Ethernet communication cable	Shield cable

∗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

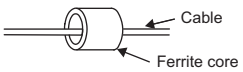
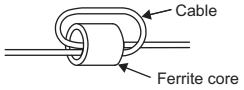
• SGDV-□□□DE1A (□□□ = 210, 260, 280, 370) + SGDV-OCA01A



Symbol	Cable Name	Specification
①	IO 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.

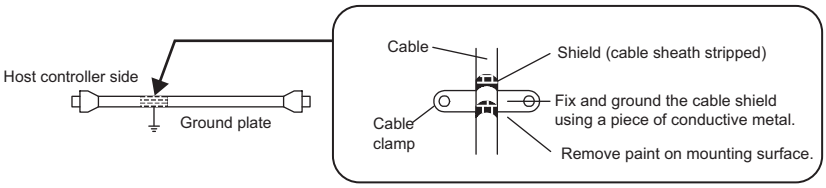
■ Recommended Noise Filter and Surge Absorber

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.

4

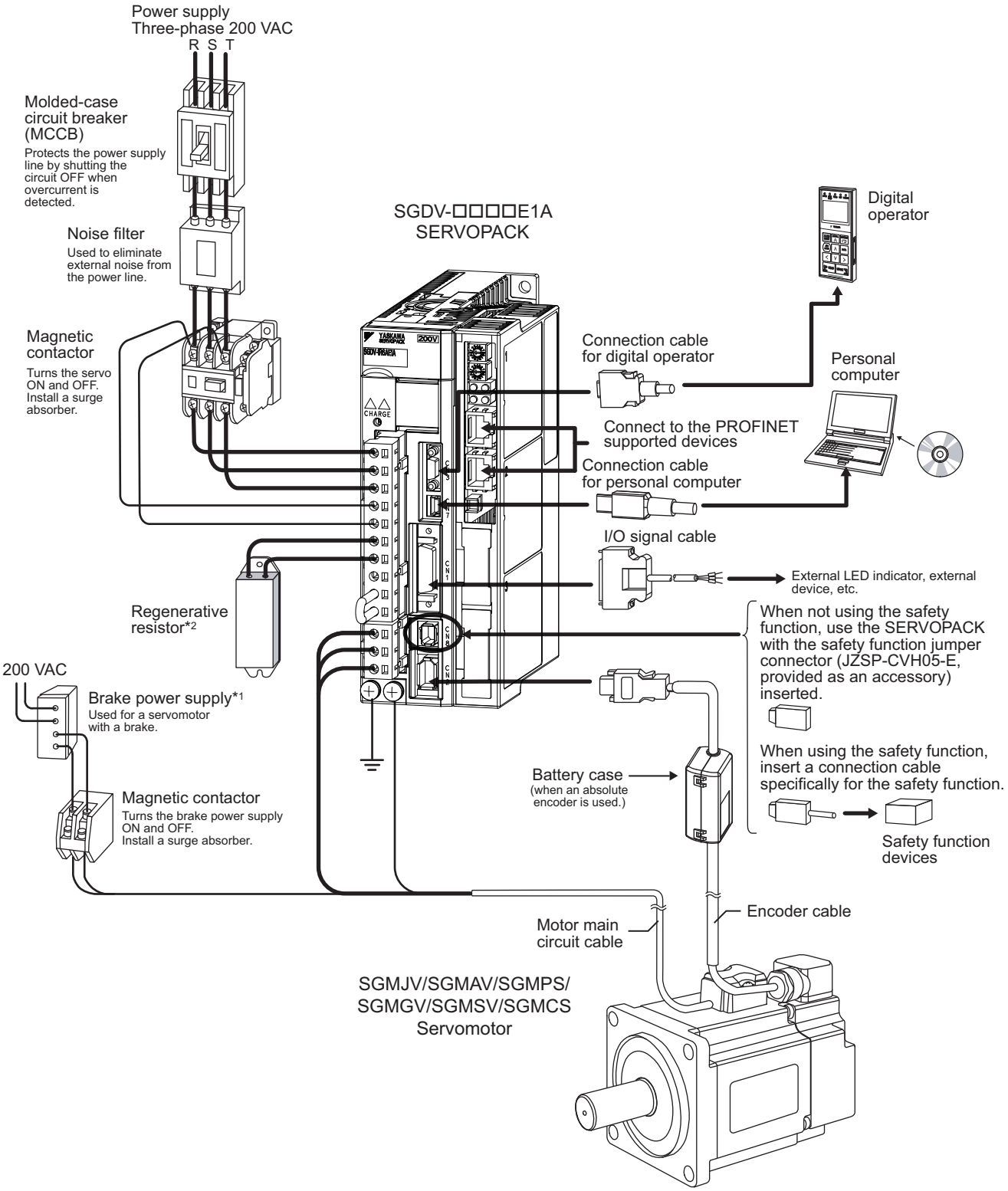
Wiring and Connection

This chapter describes an example of how a system is configured using the PROFINET Network Module, how the I/O signals are connected, and how the cable for PROFINET 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 (/SI1) N-OT (/SI2)	7 8	Forward run prohibited, Reverse run prohibited	Overtravel prohibited: Stops servomotor when movable part travels beyond the allowable range of motion.	5.6
/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.	7.8
/Home (/SI3)	9	Home switch input signal	Connects the Home signal for homing.	7.4
+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	13	General-purpose input signal	General-purpose input signal	8.12 (1)
/SI6	12	General-purpose input signal	General-purpose input signal	–

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

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.	8.12 (1)
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.	–

4.2.2 I/O Signal Connector (CN1) Terminal Layout

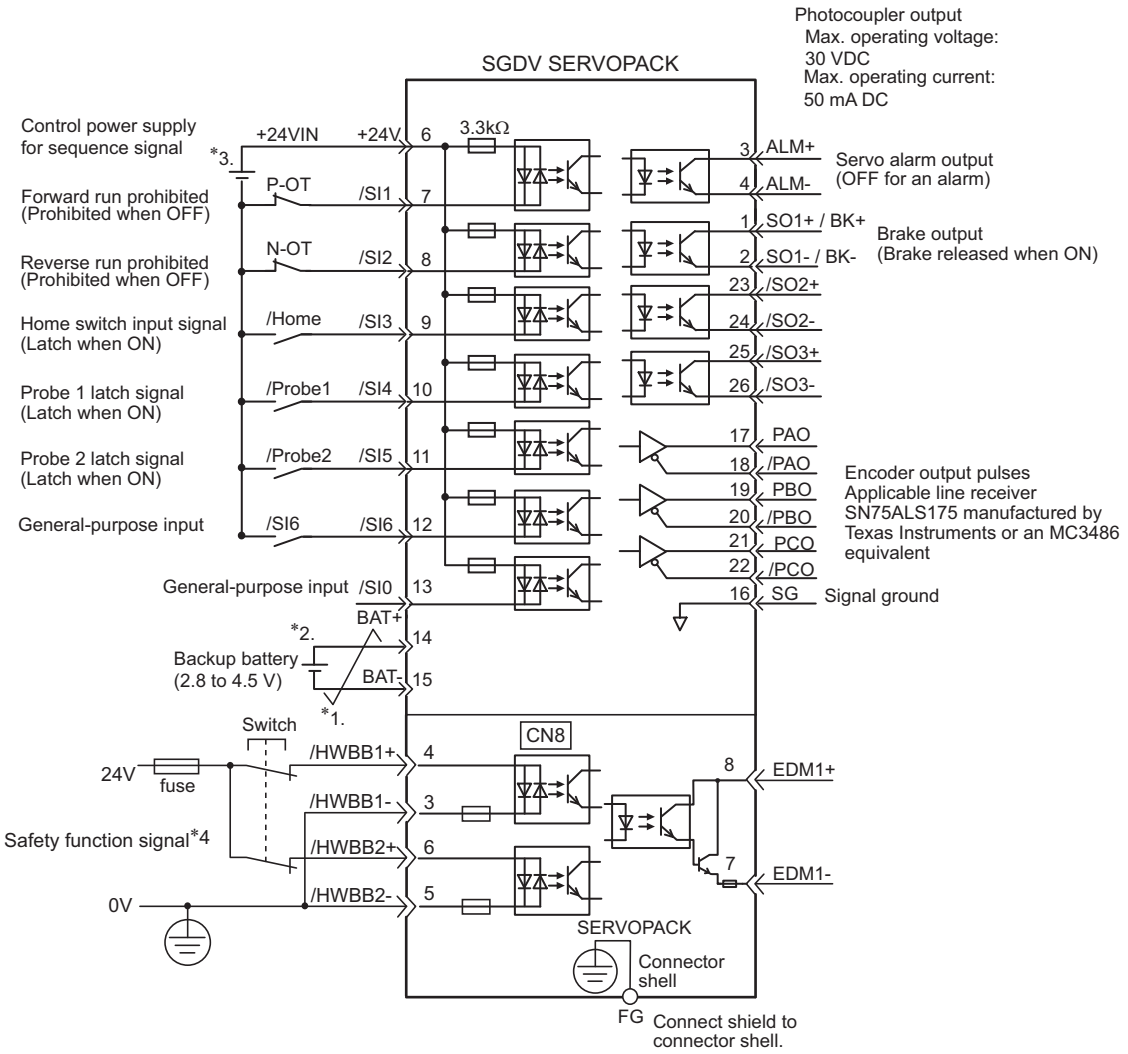
The following table shows the terminal layout of I/O signal connectors (CN1).

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	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.

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.

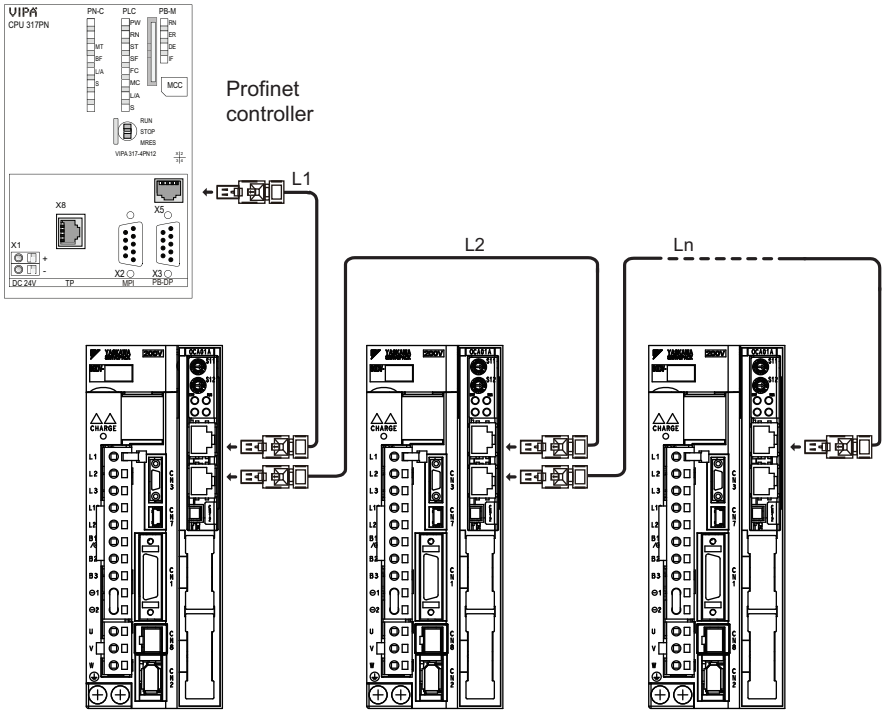
4.3 Connection Example of PROFINET Communication

4.3.1 Connection Example

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

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

Connect CN11A to the IO controller and CN11B to the IO device. If reversed, communication will not be successfully performed.



Note: The maximum length of cables between stations (L1 to Ln) is 100 m.

4.3.2 PROFINET Connector (RJ45)

Connector	Description
CN11A	PROFINET signal
CN11B	PROFINET signal

- 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.

4.3.3 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. 100 m (between the nodes)

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		*5.6 Overtravel*	Pn50A Pn50B Pn001 Pn406
3	Unit Settings	Position	*8.4 (5) User Parameter Configuration* Note: The SERVOPACK electronic gear function is not used with the PROFINET Network Module.	Object 2301:00h* Object 2301:01h*
		Velocity	*8.4 (5) User Parameter Configuration*	Object 2302:00h* Object 2302:01h*
		Acceleration	*8.4 (5) User Parameter Configuration*	Object 2303:00h* Object 2303:01h*
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 turn the power supply OFF and ON.

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 PROFINET Communication

An example of drive operation procedure via PROFINET is shown below. Details on this example can be read in chapter PROFIdrive position mode, MDI submode.

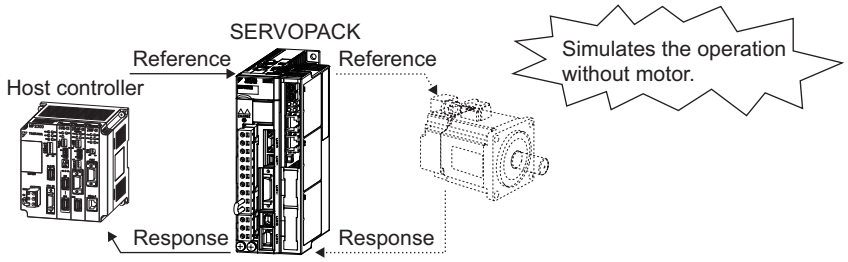
Step	Operation	Reference
1	Confirm whether the power line, Encoder, IO signal and PROFINET cables are correctly connected.	*4.2 I/O Signal Connections* *4.3 Connection Example of PROFINET Communication*
2	Turn ON the power supply to the SERVOPACK. If the power supply is normal, the CHARGE indicator on the SERVOPACK will light.	–
3	Set the Modes of operation to PROFIdrive position mode and set telegram selection to "Standard telegram 9".	*8.5 (5) Modes of Operation* *8.3 (3) Telegram Selection*
4	Store configuration (mode of operation, telegram selection) non-volatile in the option card.	*8.2 (7) Transfer in Non-volatile Memory (Global)*
5	Change the drive state to "S4:Operation" by command of the Controlword. When the power is supplied to the motor, the Statusword indicates "Operation" state.	*Chapter 7 PROFIdrive Drive Profile* *7.1 Device Control* *8.5 (1) STW1 (Controlword)* *8.5 (2) ZSW1 (Statusword)*
6	Set SATZANW to "MDI Submode". Further on, set the Target position, Profile velocity, MDI acceleration, MDI deceleration, and MDI Mode, and then set Controlword to start positioning.*	*8.6 (1) SATZANW - Traversing Block Selection* *8.5 (1) STW1 (Controlword)* *8.6 (11) Target Position* *8.6 (15) Profile Velocity* *8.6 (3) MDI Acceleration* *8.6 (4) MDI Deceleration* *8.6 (5) MDI Mode*
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 *9.4 Troubleshooting Malfunction Based on Operation and Conditions of the Servomotor* to clear the problem.	–

* Use the cyclic objects that are included in "Standard telegram 9".
For details on Standard telegram 9, refer to *6.6.4 Standard Position Telegram (ST7)*.

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.

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 IO 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) STW1 (Controlword)*	Object 6040h Pn404 Pn405
Torque limit controlled from controller.*	*7.6 Profile Torque Mode*	Object 6072h

* Torque limit only available in Profile torque mode.

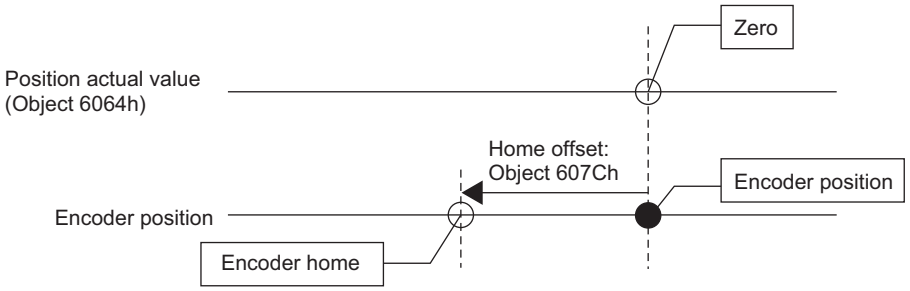
5.5 Absolute Encoders

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

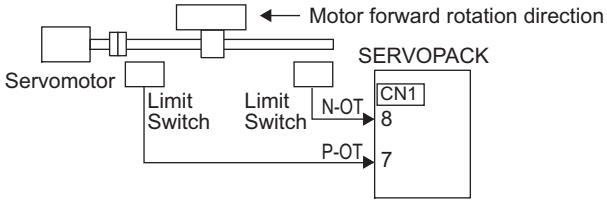
When an absolute encoder is used, an offset can be set between the encoder position and the machine position (Position actual value: Object 6064h). The offset value is set by the reference unit and is added to the Position actual value (Object 6064h) after turning the power supply OFF and ON again or enabling the parameter with Object 2300h.

Index	Sub Index	Name	Data Type	Access	Setting Range	Default Value	EEPROM
607Ch	0	Home offset	DINT	RW	–2147483648 to +2147483627	0	Yes



5.6 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 object Pn001. If the overtravel signal is turned OFF, these statuses will change to 0 (zero).

- Statusword (Object 6041h), Internal limit active (In PROFIdrive profile position mode the Internal limit active is bit 15 in all other cases it is bit 11.)
- Digital Inputs (Object 2521h), Negative limit switch (bit 0), or Positive limit switch (bit 1)

(2) Behavior for Overtravel in Each Mode

Operation Mode	Description
PROFIdrive 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).
PROFIdrive 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).
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 Statusword 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

PROFINET Communication

6.1 General

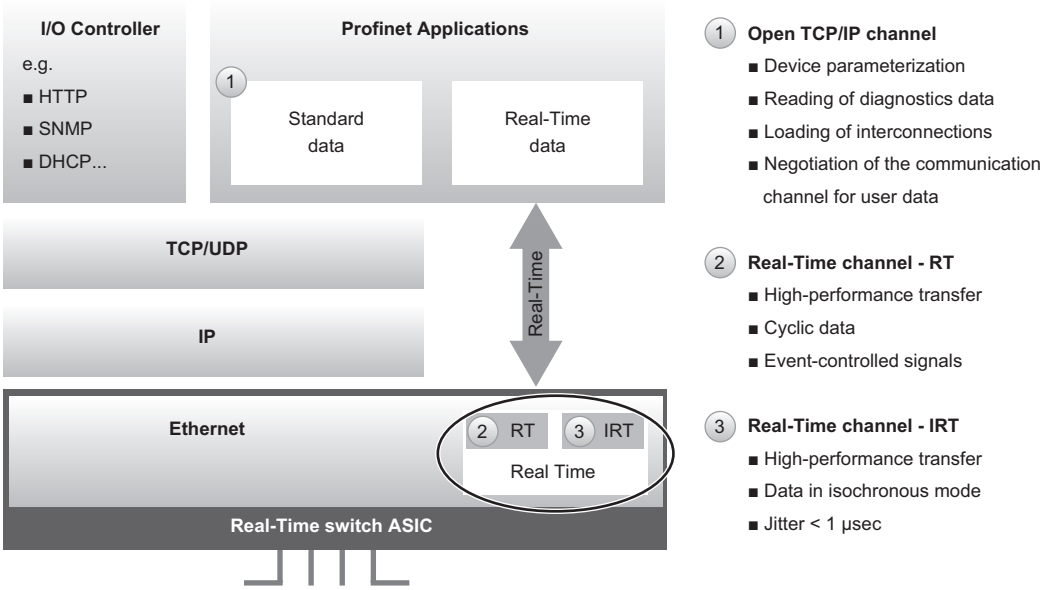
PROFINET IO is a real time protocol based on Ethernet. It is used as high level network for industrial automation applications. PROFINET IO is very similar to PROFIBUS and focuses on the data exchange for programmable controller. A PROFINET IO network consists of following devices:

- IO controller: This is typically the PLC, which controls the whole application.
- IO device: a decentralized IO device (e.g. drive, encoder, sensor), which is controlled by the IO controller.
- IO supervisor: HMI (human machine interface) or PC for diagnostic purposes or commissioning.

The real time channel (RT) is used for IO data and alarm mechanism. In PROFINET IO RT (conformance class A and B), the RT data is transferred via a prioritized Ethernet frame. No special hardware is required. Due to this prioritization a cycle time of less than 10 ms can be achieved.

PROFINET IO IRT is used for more precise timing requirements. Cycle times of less than 1 ms is possible, but also special hardware for IO Devices and switches are required.

All diagnostic and configuration data is transferred via the non real time channel (NRT). For this purpose the common UDP protocol is used. Anyhow, no timing determinism can be guaranteed and typically the cycle times can be more than 100 ms.



6.2 PROFINET Slave Information

The PROFINET IO Slave Information file (GSDML-file, i.e. General Station Description Markup Language file) is available for configuring the PROFINET IO controller and supervisor. The XML-based file contains general information about PROFINET communication settings when setting up the SGDV SERVOPACK.

The GSDML-file consists of two files:

- GSDML-V□.□-Yaskawa-SGDV-OCB03□-yyyymmdd.xml
- Yaskawa-SGDV-OCB03□_N.bmp

6.3 Application and Communication Relation (AR, CR)

Between an IO-Controller and an IO-Device an Application-Relation (AR) is established. With this AR the Communication Relations (CR) with different options are defined:

- Record Data CR for the acyclic parameter data exchanger
- IO Data CR for the cyclic process data exchange
- Alarm CR for the real-time transfer of alarm events

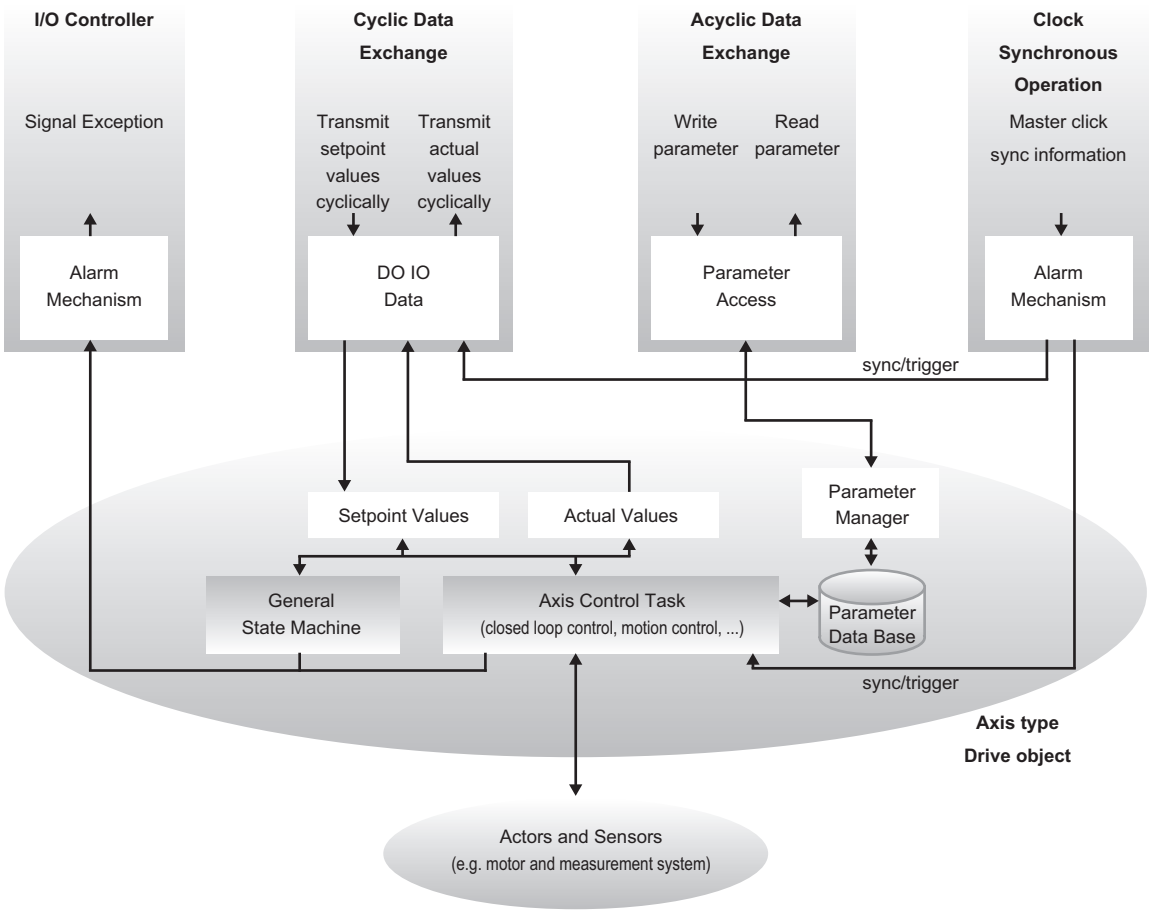
6.4 Drive Objects (DO)

The drive object contains the following items:

- General state machine
- Axis control task
- Parameter manager with parameter data base

Multiple communication channels are used for read/write data values over PROFINET IO. The drive object can be accessed via:

- Cyclic data exchange
- Acyclic data exchange
- Alarm mechanism



The cyclic data exchange includes the transmission/reception of data values like set point values (e.g. Position set point, velocity set point or Controlword) and actual values (actual position value, actual velocity or Statusword) between the master and the drive object. These values are called IO data and are transferred in real time.

The acyclic data is used for configuring the drive, which typically is not time critical. Each DO has an own parameter manager, which handles the access. PROFINET IO uses the non real time channel for this purpose.

The alarm queue is used for signaling the master an exception situations, which are generated through the state machine or the axis control task itself

6.5 Identification and Maintenance Function (I&M)

The purpose of the I&M functions is to provide customer support during commissioning, parameterization and repair of the module. The Option card supports I&M function 0, which can be accessed using the read request of the Record data object (Record Data index AFF0h).

Contents	Size	Description
Header	10 bytes	-
Vendor ID	2 bytes	PROFINET Vendor ID of YASKAWA (0111h)
Order ID	20 bytes	-
Serial Number	16 bytes	Serial number of the Option card
Hardware Revision	2 bytes	Revision of the hardware
Software Revision	4 bytes	Revision of the software
Revision Counter	2 bytes	Number of revision(0000h)
Profile ID	2 bytes	PROFIdrive (3A00h)
Profile Specific Type	2 bytes	No profile specific type (0000h)
I&M Version	2 bytes	e.g. Version 1.1 (0101h)
Supported I&M Functions	2 bytes	I&M0 is supported

6.6 Telegrams

6.6.1 Supported Telegrams

The option card supports PROFIdrive standard telegrams for speed mode and position mode. Further on, a YASKAWA manufacturer specific telegram can be selected. It is also possible to configure the cyclic communication. See following table for details.

Telegram	Size	Operation Modes	Description
ST1 (Standard Telegram 1)	1	Velocity Control	Default setting
ST2 (Standard Telegram 2)	2	Velocity Control	
ST7 (Standard Telegram 7)	7	Position Control	
ST9 (Standard Telegram 9)	9	Position Control	
Manufacturer specific YASKAWA telegram	100 (0 for configuration of PNUs 915 and 916)	Position Control Velocity Control Torque Control Pole Detection	
Free configurable telegram	999	Position Control Velocity Control Torque Control Pole Detection	

A change of the telegram configuration will be activated during initialization phase of the option card, i.e.:

- The settings have to be stored in non-volatile memory (PNU976)
- The option card has to be re-initialized by one of the following options:
  - Command drive reset (PNU972)
  - Power cycle SERVOPACK (including option card)

6.6.2 Standard Speed Telegram (ST1)

Operating Mode PNU930	• 0x0001 (PROFIdrive velocity mode) • 0x80FF (Pole detection mode)	
Mode of Operation (0x6060,0x6061)	• -3 (PROFIdrive velocity mode) • -1 (Pole detection mode)	
Telegram	1	
Application Class	1	
PZD1	STW1	ZSW1
PZD2	NSOLL_A	NIST_A

■ Related objects

Object	PNU	Units, Scaling	Info
STW1	6040h	-	-
ZSW1	6041h	-	-
NSOLL_A	2505h	4000h => 100% of (607Fh/2)	Connected to 60FFh (Vel units)
NIST_A	2506h	4000h => 100% of (607Fh/2)	Connected to 606Ch (Vel units)

6.6.3 Standard Speed Telegram (ST2)

Operating Mode PNU930	• 0x0001 (PROFIdrive velocity mode) • 0x80FF (Pole detection mode)	
Mode of Operation (0x6060,0x6061)	• -3 (PROFIdrive velocity mode) • -1 (Pole detection mode)	
Telegram	2	
Application Class	1	
PZD1	STW1	ZSW1
PZD2	NSOLL_B	NIST_B
PZD3		
PZD4	STW2	ZSW2

■ Related objects

Object	PNU	Units, Scaling	Info
STW1	6040h	-	-
ZSW1	6041h	-	-
STW2	2503h	-	-
ZSW2	2504h	-	-
NSOLL_B	2507h	40000000h => 100% of (607Fh/2)	Connected to 60FFh (Vel units)
NIST_B	2508h	40000000h => 100% of (607Fh/2)	Connected to 606Ch (Vel units)

6.6.4 Standard Position Telegram (ST7)

Operating Mode PNU930	• 0x0002 (PROFIdrive position mode) • 0x80FF (Pole detection mode)	
Mode of Operation (0x6060,0x6061)	• -2 (PROFIdrive position mode) • -1 (Pole detection mode)	
Telegram	7	
Application Class	3	
PZD1	STW1	ZSW1
PZD2	SATZANW	AKTSATZ

■ Related objects

Object	PNU	Units, Scaling	Info
STW1	6040h	-	-
ZSW1	6041h	-	-
SATZANW	2532h	-	-
AKTSATZ	2533h	-	-

6.6.5 Standard Position Telegram (ST9)

Operating Mode PNU930	• 0x0002 (PROFIdrive position mode) • 0x80FF (Pole detection mode)	
Mode of Operation (0x6060,0x6061)	• -2 (PROFIdrive position mode) • -1 (Pole detection mode)	
Telegram	9	
Application Class	3	
PZD1	STW1	ZSW1
PZD2	SATZANW	AKTSATZ
PZD3	STW2	ZSW2
PZD4	MDI_TARPOS	XIST_A
PZD5		
PZD6	MDI_VELOCITY	
PZD7		
PZD8	MDI_ACC	
PZD9	MDI_DEC	
PZD10	MDI_MOD	

■ Related objects

Object	PNU	Units, Scaling	Info
STW1	6040h	-	-
ZSW1	6041h	-	-
STW2	2503h	-	-
ZSW2	2504h	-	-
XIST_A	6064h	Pos unit	-
SATZANW	2532h	-	-
AKTSATZ	2533h	-	-
MDI_TARPOS	607Ah	Pos unit	-
MDI_VELOCITY	6081h	Vel unit	-
MDI_ACC	2536h	FFFFh => 100% of 60C5h	Connected to 6083h (Acc unit)
MDI_DEC	2537h	FFFFh => 100% of 60C6h	Connected to 6084h (Acc unit)
MDI_MOD	2538h	-	-

6.6.6 Manufacturer-specific General Telegram (Telegram 100)

Operating Mode PNU930	• 0x0001 (PROFIdrive velocity mode) • 0x0002 (PROFIdrive position mode) • 0x80FF (Pole detection mode) • 0x8004 (Torque profile mode)

Mode of Operation (0x6060,0x6061)	• -3 (PROFIdrive velocity mode) • -2 (PROFIdrive position mode) • -1 (Pole detection mode) • 4 (Torque profile mode)	
Telegram	100	
Application Class	1, 3	
PZD1	STW1	ZSW1
PZD2	SATZANW	AKTSATZ
PZD3	STW2	ZSW2
PZD4	Mode of Operation (6060h)	Mode of Operation (6061h)
PZD5	Target Position (607Ah)	Position actual value (6064h)
PZD6		
PZD7	Target Velocity (60FFh)	Velocity actual value (606Ch)
PZD8		
PZD9	Target Torque (6071h)	Torque Actual Value (6077h)
PZD10	Touch Probe Function (60B8h)	Touch Probe Status (60B9h)
PZD11	Profile acceleration (6083h)	Touch Probe Value (60BAh)
PZD12		
PZD13	Profile deceleration (6084h)	Following error actual value (60F4h)
PZD14		
PZD15	Profile velocity (6081h)	
PZD16		

■ Related objects

Object	PNU	Units, Scaling	Info
STW1	6040h	-	-
ZSW1	6041h	-	-
STW2	2503h	-	-
ZSW2	2504h	-	-
SATZANW	2532h	-	-
AKTSATZ	2533h	-	-
Mode of Operation	6060h	-	-
Mode of Operation Display	6061h	-	-
Position Actual Value	6064h	Pos unit	-
Target Position	607Ah	Pos unit	-
Profile Velocity	6081h	Vel unit	-
Velocity Actual Value	606Ch	Vel unit	-
Target Torque	6071h	Per thousand of related torque	-
Torque Actual Value	6077h	Per thousand of related torque	-
Profile Acceleration	6083h	Acc unit	-
Profile Deceleration	6084h	Acc unit	-
Following Error Actual Value	60F4h	Pos unit	-
Target Velocity	60FFh	Vel unit	-
Touch Probe Function	60B8h	-	-
Touch Probe Status	60B9h	-	-
Touch Probe Value	60BAh	Pos unit	-

6.6.7 Freely Configurable Telegram

The PZDs 2 to 16 can be freely selected. See chapter *6.7 IO Data Signals* for parameters to be selected. A second way is to read parameter PNU923 (List of all the parameters for signals).

If this telegram is used, a PZD length in a range of 1 to 16 PZDs can be used.

Note:

- If the freely configurable telegram 999 is used, a change of the telegram mapping is active immediately after activation (PNU922 =999).
- Please note that to activate the free configurable telegram if another telegram is active, the sequence described in chapter *6.6.1 Supported Telegrams* to change a telegram has to be performed.

■ Example

- Current telegram configuration: Standard telegram 1 (ST1)
- New telegram configuration: Freely configurable telegram (Changed mapping)
- Sequence to change telegram configuration and mapping of the free configurable telegram:
  - Set PNU922 to “999”
  - Store configuration in non-volatile memory
  - Perform “drive reset” to re-initialize option card
    => telegram 999 with mapping of ST1 is active
  - Set PNU922 to “0”
  - Change mapping of set points/actual values with PNU915 and PNU916
  - Set PNU922 to “999”
    => telegram 999 with changed mapping will be active and validity check of settings is done

Operating Mode PNU930	• 0x0001 (PROFIdrive velocity mode) • 0x0002 (PROFIdrive position mode) • 0x80FF (Pole detection mode) • 0x8004 (Torque profile mode)	
Mode of Operation (0x6060,0x6061)	• -3 (PROFIdrive velocity mode) • -2 (PROFIdrive position mode) • -1 (Pole detection mode) • 4 (Torque profile mode)	
Telegram	999	
Application Class	1, 3	
PZD1	STW1	ZSW1
PZD2 ... 16	Freely selectable	Freely selectable

6.7 IO Data Signals

The following table provides an overview of the values to be used for the freely configurable telegram 999.

Signal No.	Significance	Abbreviation	TPZD / RPZD	Data Type *	Normalization	Interconnection Parameter Normalized (Not normalized)
1	Controlword 1	STW1	RPZD	U16		6040h
2	Statusword 1	ZSW1	TPZD	U16		6041h
3	Controlword 2	STW2	RPZD	U16		2503h
4	Statusword 2	ZSW2	TPZD	U16		2504h
5	Speed setpoint A	NSOLL_A	RPZD	I16	4000h => 100% of (607Fh/2)	2505h (60FFh)
6	Speed actual value A	NIST_A	TPZD	I16		2506h (606Ch)

Signal No.	Significance	Abbreviation	TPZD / RPZD	Data Type *	Normalization	Interconnection Parameter Normalized (Not normalized)
7	Speed setpoint B	NSOLL_B	RPZD	I32	40000000h => 100% of (607Fh/2)	2507h (60FFh)
8	Speed actual value B	NIST_B	TPZD	I32		2508h (606Ch)
21	Digital input	E_DIGITAL	TPZD	U16		2521h
22	Digital output	A_DIGITAL	RPZD	U16		2522h
27	Position setpoint value A	XSOLL_A	RPZD	I32	No	607Ah
28	Position actual value A	XIST_A	TPZD	I32	No	6064h
32	Traversing block selection	SATZANW	RPZD	U16		2532h
33	Actual traversing block	AKTSATZ	TPZD	U16		2533h
34	MDI target position	MDI_TARPOS	RPZD	I32	No	607Ah
35	MDI velocity	MDI_VELOCITY	RPZD	U32	No	6081h
36	MDI acceleration	MDI_ACC	RPZD	U16	FFFFh => 100% of 60C5h	2536h (6083h)
37	MDI deceleration	MDI_DEC	RPZD	U16	FFFFh => 100% of 60C6h	2537h (6084h)
38	MDI mode	MDI_MOD	RPZD	U16		2538h
100	Modes of operation		RPZD	I16		6060h
101	Modes of operation display		TPZD	I16		6061h
102	Position demand value		TPZD	I32		6062h
103	Position actual internal value		TPZD	I32		6063h
104	Velocity demand value		TPZD	I32		606Bh
105	Velocity actual value		TPZD	I32		606Ch
106	Target torque		RPZD	I16		6071h
107	Torque demand		TPZD	I16		6074h
108	Torque actual value		TPZD	I16		6077h
109	Profile acceleration		RPZD	U32		6083h
110	Profile deceleration		RPZD	U32		6084h
111	Torque slope		RPZD	U32		6087h
112	Touch probe mode		RPZD	U32		60B8h
113	Touch probe status		TPZD	U16		60B9h
114	Touch probe pos 1 pos value		TPZD	I32		60BAh
115	Touch probe pos 2 pos value		TPZD	I32		60BCh
116	Following error actual value		TPZD	I32		60F4h
117	Position demand value inc		TPZD	I32		60FCh
118	Target velocity		RPZD	I32		60FFh
119	Target position range		TPZD	I32		2401h
120	Actual position range		TPZD	I32		2402h

* N2, N4 - Data normalized according to PROFIdrive N2, N4 data normalization. The acceleration signal MDI_ACC and MDI_DEC are normalized in the X2 format (x = 16 is equal to 100% Means 60C6h value).

6.8 HWConfig - Default Definition

The PROFINET option card allows to set “operating modes” and “telegram selection” via the two rotary switches of the SGDV-OCB03A.

The SERVOPACK must be turned off when setting the rotary switches. After the settings have been made, turn on the power. During initialization the set values will be applied.

The default settings will be overwritten and the settings are stored in the PNU objects 6060h and 922.

Switch	S11		S12	
	Number (hex)	Mode of Operation (PNU 6060h)	Number (hex)	Telegram selection (PNU 922)
Type of setting	0	-	0	-
	1	-	1	Telegram 1
	2	-	2	Telegram 2
	3	-	3	-
	4	Torque mode	4	-
	5	-	5	-
	6	-	6	-
	7	-	7	Telegram 7
	8	-	8	Telegram 8
	9	-	9	Telegram 9
	A	-	A	-
	B	Pole detection	B	-
	C	PROFIdrive profile position	C	-
	D	PROFIdrive profile velocity	D	-
	E	-	E	Telegram 100
	F	-	F	Telegram 999

7

PROFIdrive 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 STW1 (Object 6040h). The status of the state machine can be revealed by using the Statusword ZSW1 (Object 6041h).

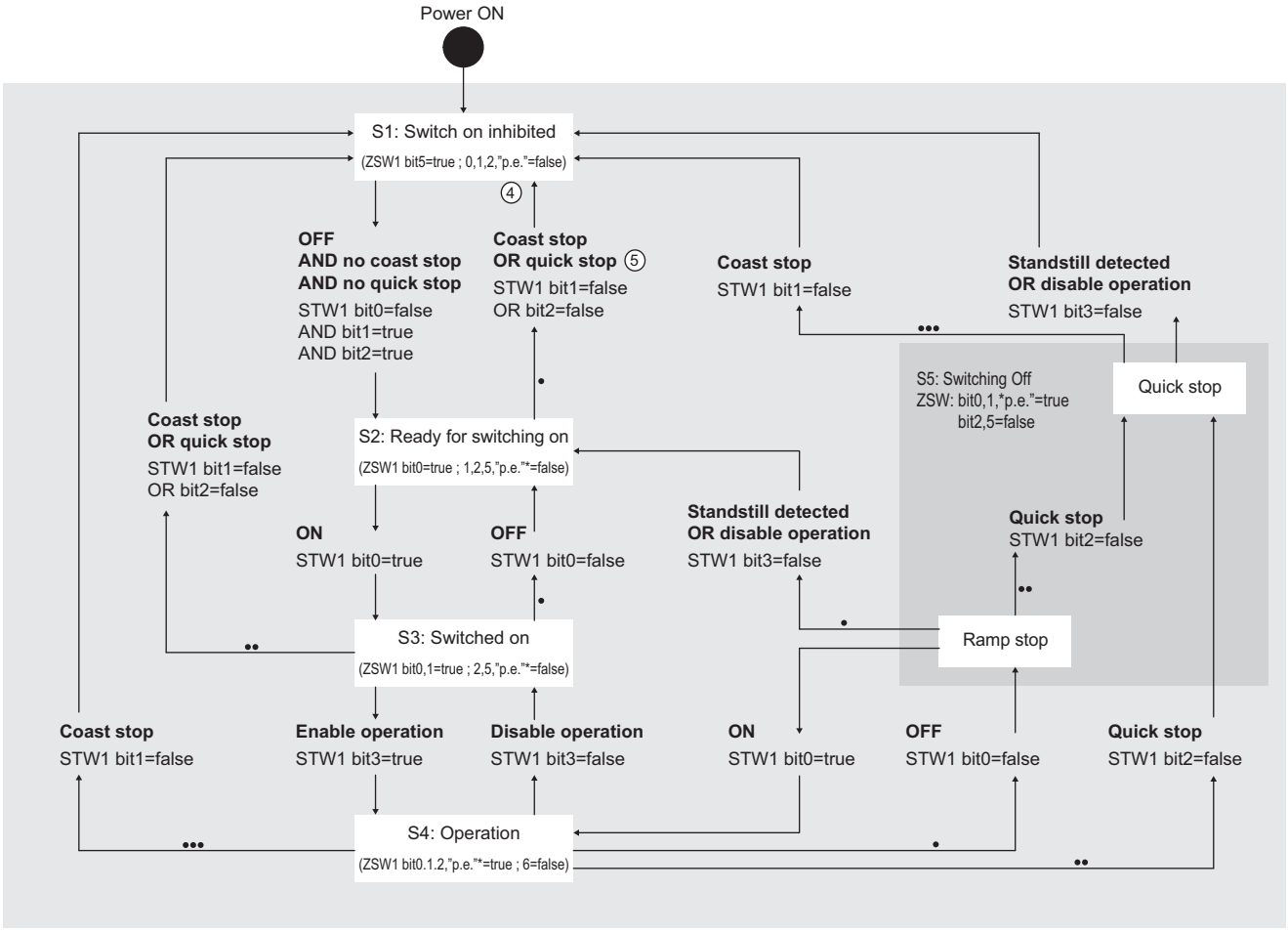
The alarm “abnormal control state” (error code 0x2009) will appear and the servo drive will change into fault state, if one of the following situations occur: during one of the following states certain situations occur:

- the main power is turned off
- HWBB is activated

The alarm only appears under the above mentioned situations during the following states:

- S4: Operation
- S3: Switched on
- Ramp stop
- Quick stop

During operation enable state is STW1 bit10 (controlled by PLC) = FALSE.



Note 1. STW1 bit x,y means these Controlword bits shall be set by the control
2. ZSW1 bit x,y means these Statusword bits indicate the actual state
3. “Standstill detected” is an internal result of a stop operation
4. “p.e.” means “Pulses enabled” optional
5. The internal condition “fault with ramp stop” also activates this transition
6. The more dots are on a line, the higher is the priority.

(1) State Machine Controlling Command

Command	Bits of the Controlword (6040h)					
	Bit10	Bit7	Bit3	Bit2	Bit1	Bit0
S1 to S2	1	–	–	1	1	0
S2 to S3	1	–	0	1	1	1
S3 to S4	1	–	1	1	1	1
(coast stop) S5 to S1 or S4 to S1 or S3 to S1 or S2 to S1	1	–	–	–	0	–
(quick stop) S5 to S1 or S4 to S1 or S3 to S1 or S2 to S1	1	–	–	0	1	–
Ramp stop	1	–	–	1	1	0
Disable operation	1	–	0	1	1	1
Enable operation	1	–	1	1	1	1
Fault reset	1	0 → 1	–	–	–	–

(2) Bits of PROFINET Statusword ZSW1 (6041h)

Bit7	Bit6	Bit3	Bit2	Bit1	Bit0	Transitions
–	0	0	0	0	0	Not ready to switch on
–	1	–	0	0	0	S1: Switching on inhibited
–	0	0	0	0	1	S2: Ready for switching on
–	0	0	0	1	1	S3: Switched on
–	0	0	1	1	1	S4: Operation
–	0	0	0	1	1	S5: Switching off (quick stop)
–	0	0	0	1	1	S5: Switching off (ramp stop)
–	1	1	0	0	0	Fault
1	–	–	–	–	–	Warning is occurred

(3) Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	0	Controlword	RW	RPZD	–	UINT
6041h	0	Statusword	RO	TPZD	–	UINT
605Ah	0	Quick stop option code	RW	No	–	INT
605Dh	0	Halt option code	RW	No	–	INT
6060h	0	Modes of operation	RW	RPZD	–	INT
6061h	0	Modes of operation display	RO	TPZD	–	INT
2503h	0	Controlword 2	RW	RPZD	–	UINT
2404h	0	Statusword 2	RO	TPZD		UINT

(4) Unconfigurable FSA Stop Action

Transition	Transition State	Action *
Ramp stop	S4 → S5	Slow down with the current profile deceleration
Coast stop	S4 → S1	Servo off - Determined by Sigma-5 Pn001.0
Disable operation	S4 → S3	Servo off - Determined by Sigma-5 Pn001.0
Fault	S4 → S1	Slow down in quick stop deceleration (6085h)

* The Servo off stopping method is determined by Sigma-5 Pn001.0. The Sigma5 factory default setting is Stop by dynamic brake (Pn001.0=0) and for PROFIdrive standard compliance the setting should be Pn001.0=2 Coast stop.

7.2 Modes of Operation

The SGDV SERVOPACK supports the following modes of operation:

- PROFIdrive Profile Position mode
- PROFIdrive Profile Velocity mode
- Torque Profile mode
- Pole Detection mode

■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6060h	0	Modes of operation	RW	RPZD	–	INT
6061h	0	Modes of operation display	RO	TPZD	–	INT
3A2h	0	PROFIdrive operating mode	LR	No	–	UINT

■ Dynamic Mode Change

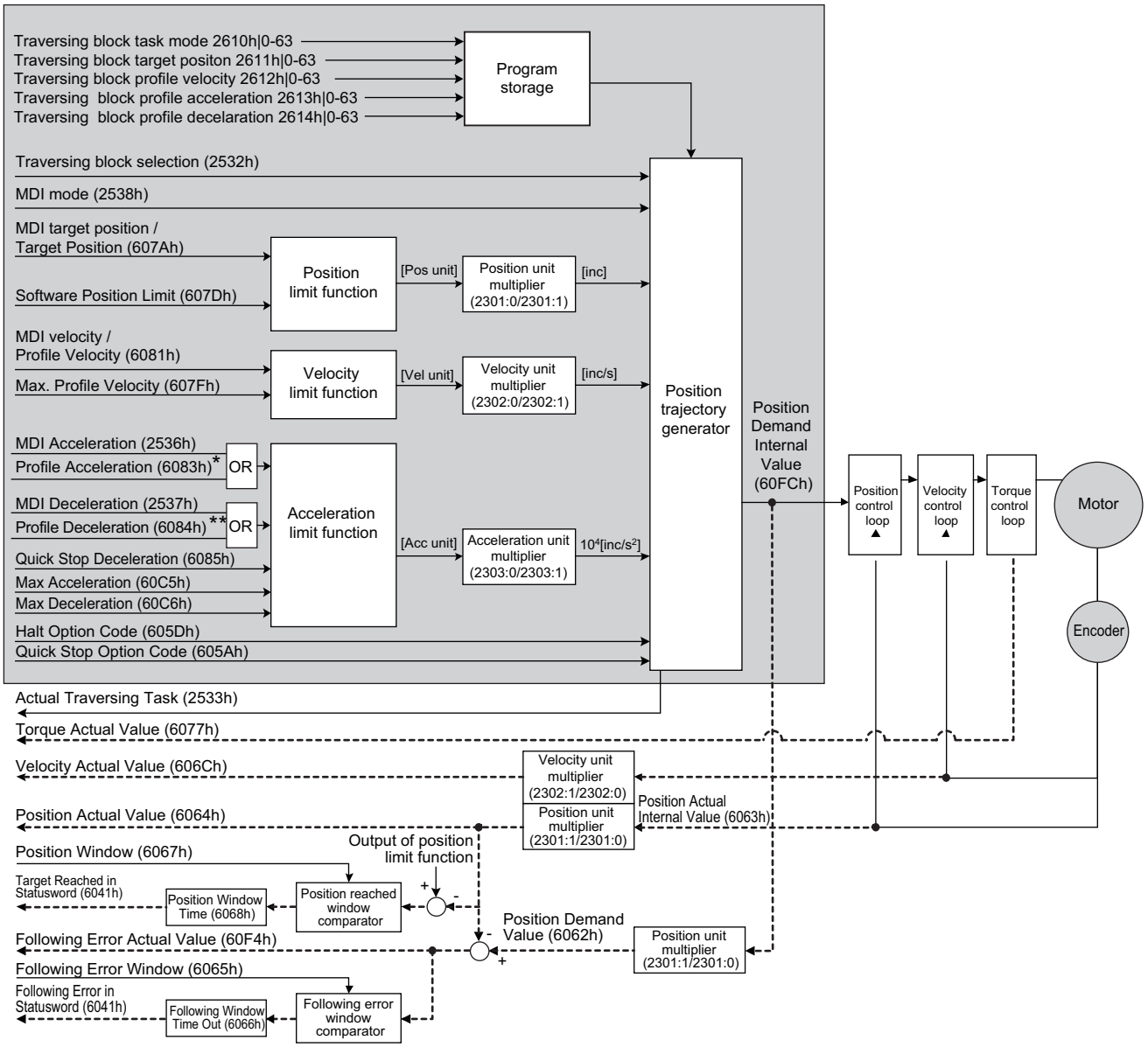
The operation mode can be switched by writing the Object 6060h. The master has the responsibility to update all operation mode specific process data objects together with the selection of the operation mode at the same time.
If the master selects a new operation mode, the SGDV SERVOPACK changes to the 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
PROFIdrive Position mode	Active operation mode: PROFIdrive velocity mode • Operation mode is changed, but motor will be stopped with configured profile velocity (parameter 6085h). After the motor is stopped, a positioning can be started with rising edge of STW1, bit6 (Activate Traversing Task). Active operation mode: Torque mode • Motor will decelerate with configured torque slope (parameter 6087h). After the motor is stopped, a positioning can be started with rising edge of STW1, bit6 (Activate Traversing Task).
PROFIdrive velocity mode	New operation mode will be started immediately.
Torque profile mode	New operation mode will be started immediately.

7.3 PROFIdrive Position Mode

The PROFIdrive 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 PROFIdrive position mode. Refer to the following chapters for details on both available position submodes:

- Program submode
- MDI submode



■ Related Objects

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
6040	0	STW1	RW	RPZD	0	-	UINT
6041	0	ZSW1	RO	TPZD	-	-	UINT
2503	0	STW2	RW	RPZD	0	-	UINT
2504	0	ZSW2	RO	TPZD	-	-	UINT
2532	0	Traversing block selection (SATZANW)	RW	RPZD	0	-	UINT
2533	0	Actual traversing block (AKTSATZ)	RO	TPZD	0	-	UINT
2536	0	MDI acceleration	RW	RPZD	0	N2	UINT
2537	0	MDI deceleration	RW	RPZD	0	N2	UINT
2538	0	MDI mode	RW	RPZD	0	-	UINT
2610	-	Traversing block task mode	-	-	-	-	-
	0...63	Task mode value	RW	No	0	-	UDINT
2611	-	Traversing block target position	-	-	-	-	-
	0...63	Target position value	RW	No	0	Pos units	UDINT
2612	-	Traversing block profile velocity	-	-	-	-	-
	0...63	Profile velocity value	RW	No	0	Vel units	UDINT
2613	-	Traversing block profile acceleration					
	0...63	Profile acceleration value	RW	No	0	Acc units	UDINT
2614	-	Traversing block profile deceleration				Acc units	
	0...63	Profile deceleration value	RW	No	0		UDINT
607A	0	Target position	RW	RPZD	0	Pos units	DINT
607D	-	Software position limit	-	-	-	-	-
	0	Min. position limit	RW	No	0x80000000	Pos units	DINT
	1	Max. position limit	RW	No	0x7FFFFFFF	Pos units	DINT
607F	0	Max. profile velocity	RW	No	Max. motor speed	Vel units	UDINT
6081	0	Profile velocity	RW	RPZD	0	Vel units	UDINT
6077	0	Torque actual value	RO	TPZD	0	0.1%	INT
606C	0	Velocity actual value	RO	TPZD	0	Vel units	DINT
6063	0	Position actual value - inc	RO	TPZD	-	Inc	DINT
6064	0	Position actual value - units	RO	TPZD	-	Pos units	DINT
6062	0	Position demand value	RO	TPZD	0	Pos units	DINT
6083	0	Profile acceleration	RW	RPZD	0	Acc units	UDINT
6084	0	Profile deceleration	RW	RPZD	0	Acc units	UDINT
6085	0	Quick stop deceleration	RW	RPZD	Max. motor deceleration	Acc units	UDINT
60C5	0	Max. acceleration	RW	No	Max. motor acceleration	Acc units	UDINT
60C6	0	Max. deceleration	RW	No	Max. motor deceleration	Acc units	UDINT
605A	0	Quick stop option code	RW	No	2	-	INT
605D	0	Halt option code	RW	No	3	-	INT
606B	0	Velocity demand value	RO	TPZD	0	Vel units	DINT
6067	0	Position window	RW	No	0	Pos units	UINT
6068	0	Position window time	RW	No	0	ms	UINT
6065	0	Following error window	RW	No	0	Pos units	UINT
6066	0	Following window timeout	RW	No	0	ms	

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
60F4	0	Following error actual value	RO	TPZD	0	Pos units	DINT
60FC	0	Position demand value - inc	RO	TPZD	0	Inc	DINT
2400*	0	Position range limit designation	RW	No	0	-	UINT
2401	0	Target position in range	RO	TPZD	0	Pos units	DINT
2402	0	Actual position in range	RO	TPZD	0	Pos units	DINT
607B*	-	Position limit range	-	-	-	-	-
	0	Min. position limit	RW	No	0x80000000	Pos units	DINT
	1	Max. position limit	RW	No	0x7FFFFFFF	Pos units	DINT

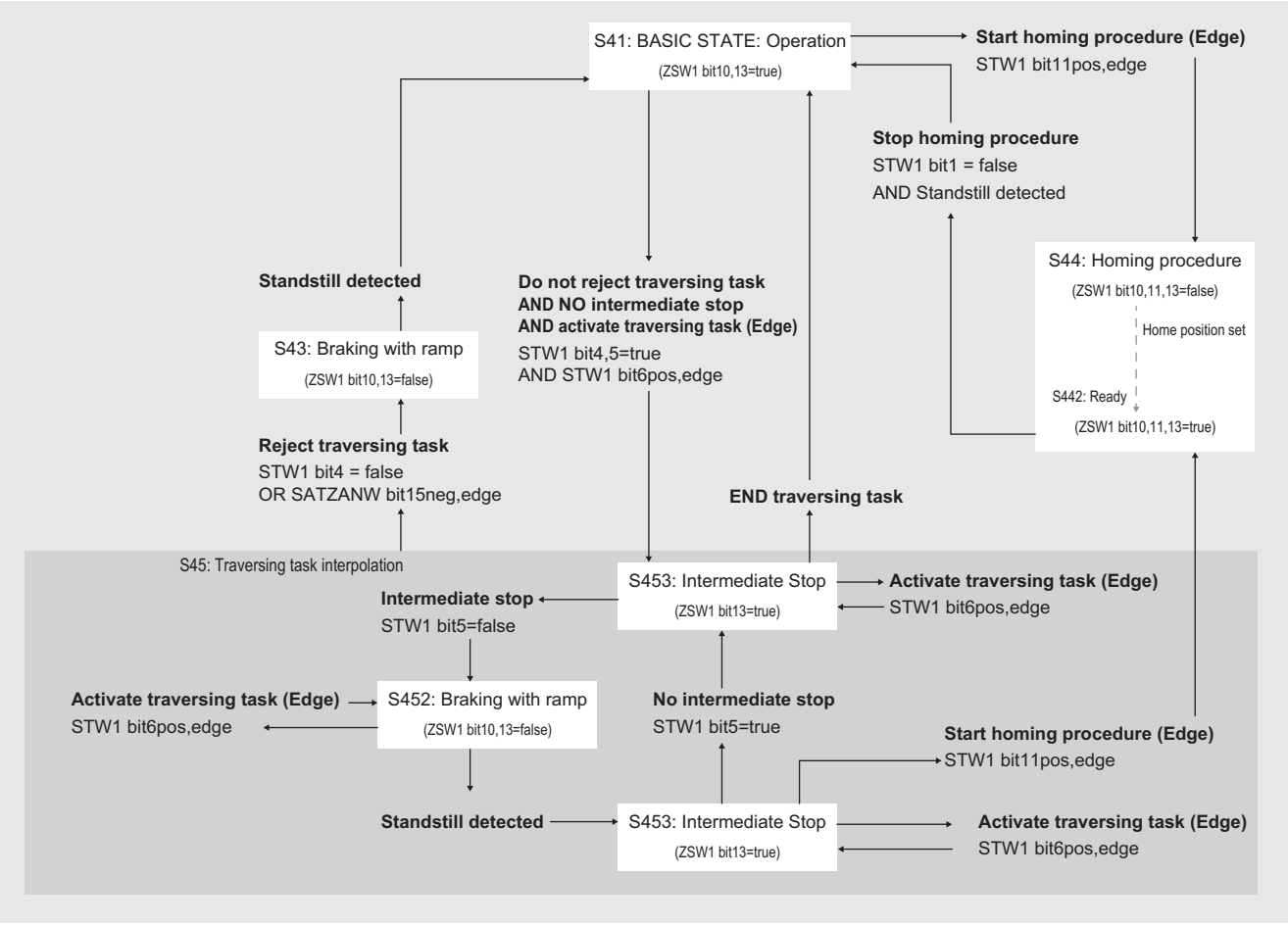
* If software position limits (607Dh) are used, do not change the default values of these parameters. You are allowed to use either software position limits (607Dh) or position range limits (607Bh).

7.3.1 PROFIdrive Position Submodes “Program” and “MDI”

This communication option supports both submodes “Program” and “Manual Data Input” (MDI).

(1) Positioning Mode Extended State Diagram

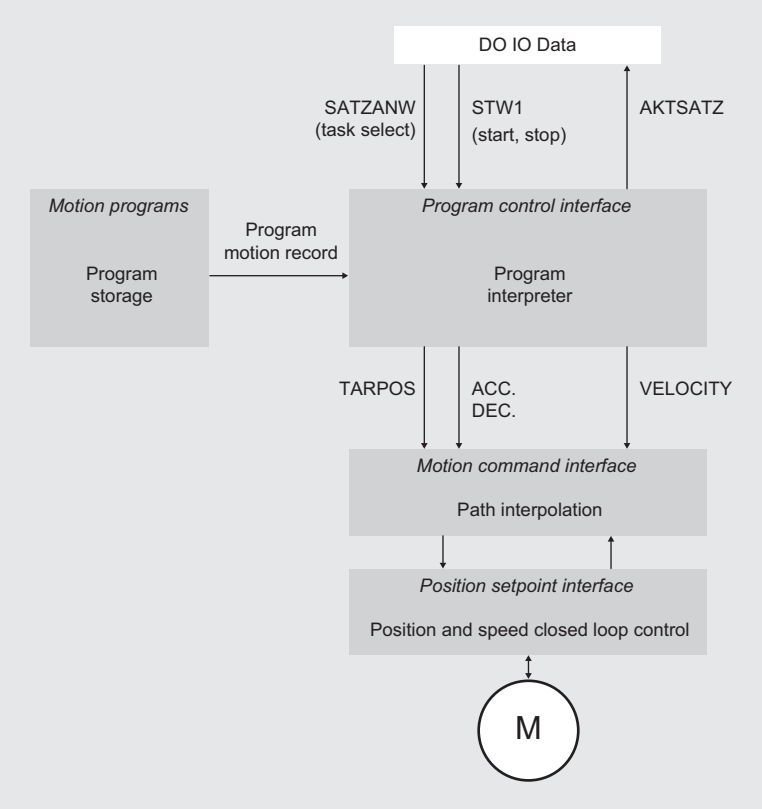
The following figure shows the state diagram of the Profile Positioning mode. This state diagram is valid in general state S4: Operation only.



(2) Program Submode

The motion controller for Program submode consists out of the position closed loop control, the path interpolation, the program interpreter and the program storage (see Figure below). The path interpolation cyclically generates position setpoints for the position closed loop control of the axis. The input to the path interpolation is a motion command which consist out of the new target position (TARPOS), and the velocity, acceleration and deceleration for the calculation of the path from the actual axis position to the new target position. With the Program submode the motion command is provided by the program interpreter out of a motion program. One or several motion programs are stored by motion records in a device specific manor in the program storage. Controlling of the program interpreter is done by the dedicated bits of STW1 and the signal SATZANW out of the DO IO Data.

The start of a motion program or the change to a new program while a program is still running, is done by selecting the first motion record of the new program via SATZANW (while SATZANW Bit15 = 0) and a positive edge of STW1 Bit6. The motion program is than executed by the program interpreter motion record for motion record as long as there is no stop or terminate condition in a motion record and the program is not terminated by STW1 Bit4=0 (reject traversing task). Also the motion of the axis may be stopped intermediately by STW1 Bit5=0 (intermediate stop).



■ Related Objects

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2532	0	Traversing block selection (SATZANW)	RW	RPZD	0	-	-
2610	-	Traversing block task mode	-	-	-	-	-
	0...63	Task mode value (0..63)	RW	No	0	-	UDINT
2611	-	Traversing block target position	-	-	-	-	-
	0...63	Target position value (0..63)	RW	No	0	Pos units	DINT
2612	-	Traversing block profile velocity	-	-	-	-	-
	0...63	Profile velocity value (0..63)	RW	No	0	Vel units	UDINT

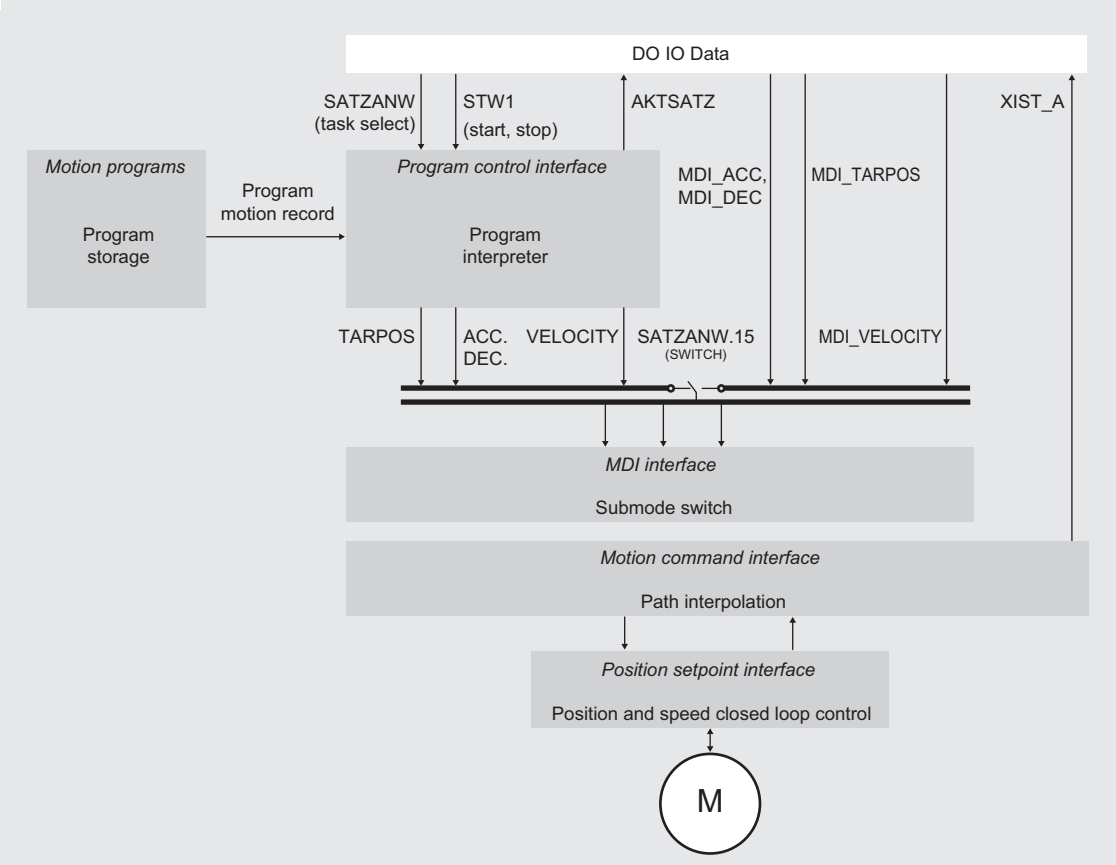
PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2613	-	Traversing block profile acceleration	-	-	-	-	-
	0...63	Profile acceleration value (0..63)	RW	No	0	Acc units	UDINT
2614	-	Traversing block profile deceleration	-	-	-	-	-
	0...63	Profile deceleration value (0..63)	RW	No	0	Acc units	UDINT

(3) MDI Submode

The motion controller for Manual Data Input (MDI) submode comprises in addition to the Program submode components also a submode switch which enables the direct access to the motion command interface from the DO IO Data without using the program interpreter. This gives the advantage of immediate control of the motion command interface by the controller via DO IO DATA. Changeover from the program execution to the MDI interface and vice versa is controlled by Bit15 of SATZANW.

If MDI submode is active, the input for the motion command interface of the path interpolator will be taken out of the signals MDI_TARPOS, MDI_ACC, MDI_DEC and MDI_VELOCITY. These values get valid as input for the calculation of a new path from the actual axis position to the new target position with the rising edge of STW1 Bit6. Controlling of the motion process is done by the dedicated bits of STW1 out of the DO IO Data.

The signal MDI_ACC defines the acceleration of the motion at the beginning of the path, while the signal MDI_DEC defines the deceleration at the end of the path (independent of the absolute motion direction).

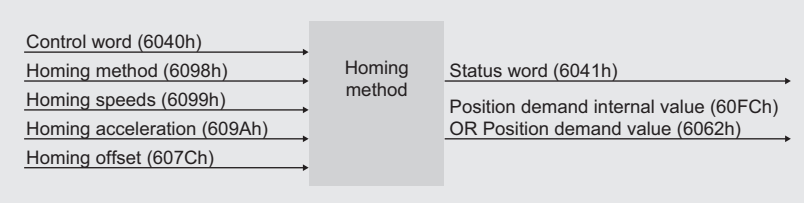


■ Related Objects

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2532	0	Traversing block selection (SATZANW)	RW	RPZD	0	-	UINT
2533	0	Actual traversing block (AKTSATZ)	RO	TPZD	0	-	UINT
607A	0	MDI target position	RW	RPZD	0	Pos units	DINT
6081	0	MDI profile velocity	RW	RPZD	0	Vel units	UDINT
2536	0	MDI acceleration (MDI_ACC)	RW	RPZD	0	N2	UINT
2537	0	MDI deceleration (MDI_DEC)	RW	RPZD	0	N2	UINT
2538	0	MDI mode (MDI_MOD)	RW	RPZD	0	-	UINT

7.4 Homing Function

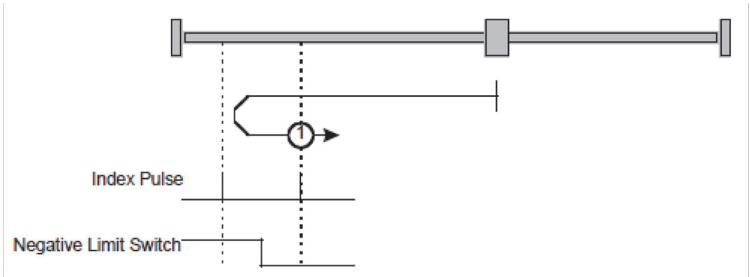
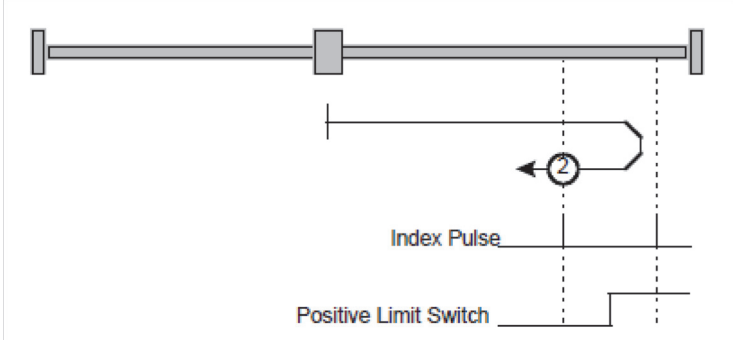
The following figure shows the defined input objects as well as the output objects. The user may specify the speeds, acceleration and the method of homing. There is a further object home offset, which allows the user to displace zero in the user's coordinate system from the home position.

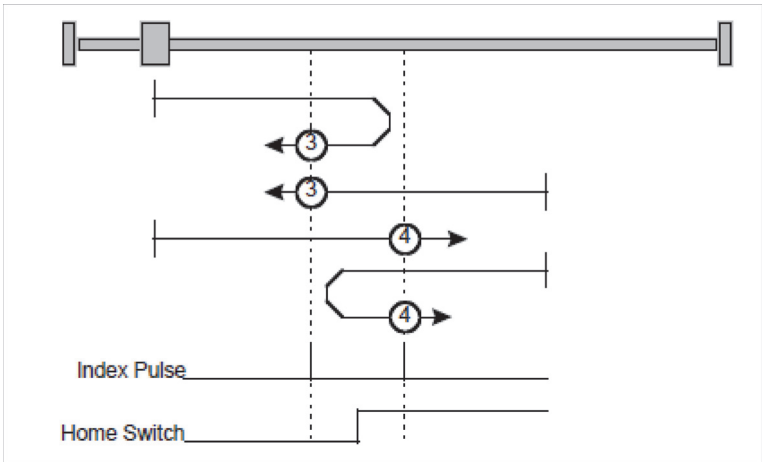
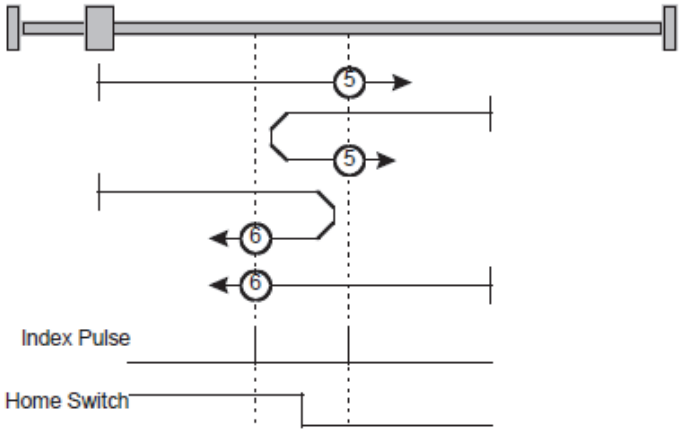
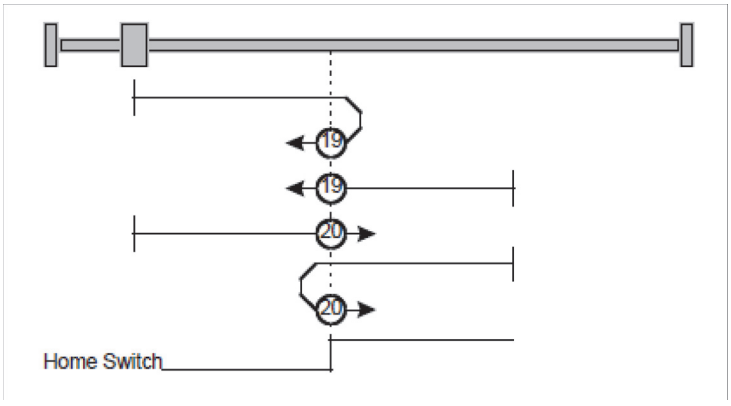


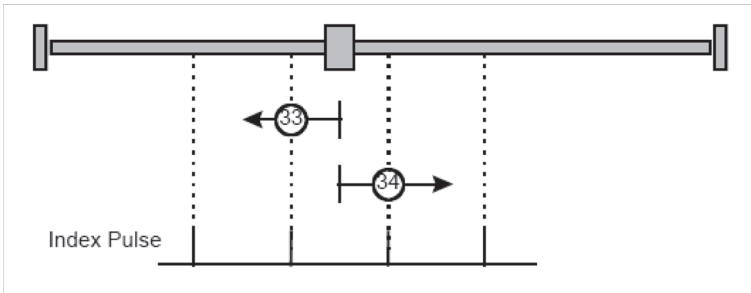
■ Related Objects

Index	Sub	Name	Access	PDO Mapping	Units	Type
6040h	–	Controlword	RW	RPZD	–	UINT
6041h	–	Statusword	RO	RPZD	–	UINT
607Ch	–	Home Offset	RW	No	Pos units	DINT
6098h	–	Homing Method	RW	RPZD	–	SINT
6099h	–	Homing Speeds	–	–	–	–
	1	Speed during search for switch	RW	RPZD	Vel units	UDINT
	2	Speed during search for zero	RW	RPZD	Vel units	UDINT
609Ah	–	Homing Acceleration	RW	RPZD	Acc units	UDINT
60FCh	–	Position demand value - inc	RO	TPZD	Inc	I32
6062h	–	Position demand value	RO	TPZD	Pos units	I32

■ 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**)	

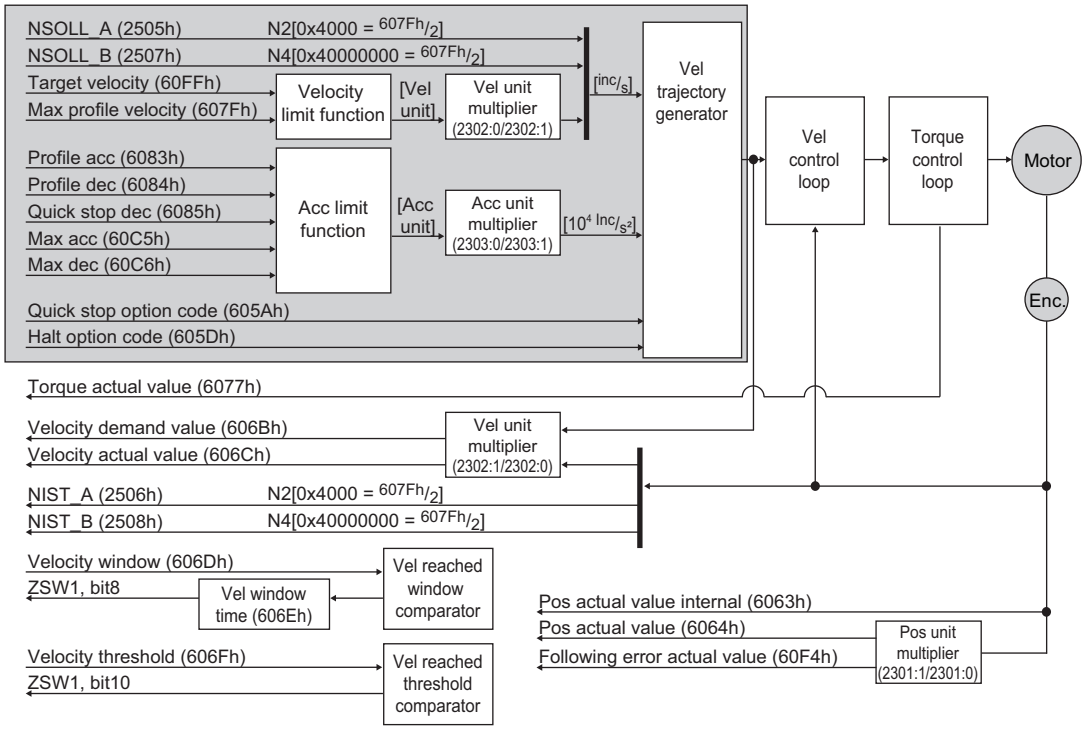
Value	Definitions	Explanation
21 to 32	Other method (Skipped description)	Not supported
33 to 34	Homing on index pulse	
35	Homing on the current position	Supported
36 to 127	Reserved	No effect

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

7.5 PROFIdrive Velocity Mode

In the PROFIdrive 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 PROFIdrive velocity mode.



■ Related Objects

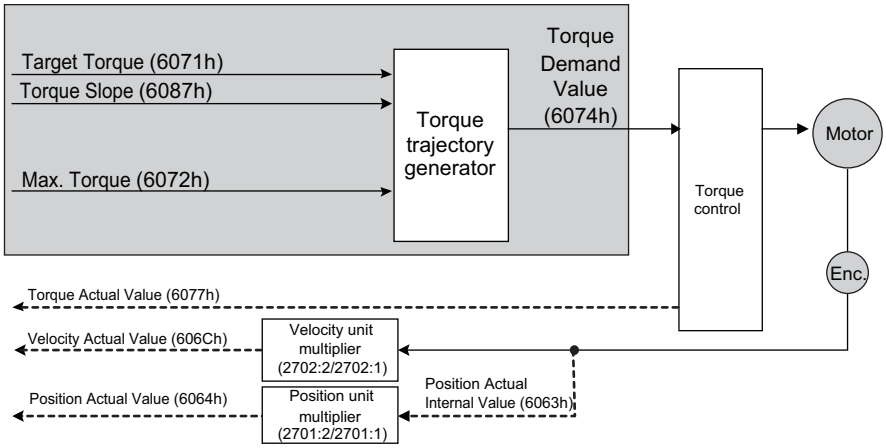
PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
6040	0	Controlword	RW	RPZD	0	-	UINT
6041	0	Statusword	RO	TPZD	-	-	UINT
2503	0	STW2	RW	RPZD	0	-	UINT
2504	0	ZSW2	RO	TPZD	-	-	UINT
2505	0	Speed setpoint A	RW	RPZD	0	N2	INT
2507	0	Speed actual value A	RO	TPZD	0	N2	INT
60FF	0	Target velocity	RW	RPZD	0	Vel units	DINT
2506	0	Speed setpoint B	RW	RPZD	0	N4	DINT
2508	0	Speed actual value B	RO	TPZD	0	N4	DINT
606C	0	Velocity actual value	RO	TPZD	0	Vel units	DINT
6077	0	Torque actual value	RO	TPZD	0	0.1%	INT
6063	0	Position actual value - inc	RO	TPZD	-	Inc	DINT
6064	0	Position actual value - units	RO	TPZD	-	Pos units	DINT
607F	0	Max. profile velocity	RW	No	Max motor speeds	Vel units	UDINT
6083	0	Profile acceleration	RW	RPZD	0	Acc units	UDINT
6084	0	Profile deceleration	RW	RPZD	0	Acc units	UDINT
6085	0	Quick stop deceleration	RW	RPZD	Max motor decel.	Acc units	UDINT

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
60C5	0	Max. acceleration	RW	No	Max motor accel.	Acc units	UDINT
60C6	0	Max deceleration	RW	No	Max motor decel.	Acc units	UDINT
605A	0	Quick stop option code	RW	No	2	-	INT
605D	0	Halt option code	RW	No	3	-	INT
606B	0	Velocity demand value	RO	TPZD	0	Vel units	DINT
606D	0	Velocity window	RW	No	0	Vel units	UINT
606E	0	Velocity window time	RW	No	0	ms	UINT
606F	0	Velocity threshold	RW	No	0	Vel units	UINT
60F4	0	Following error actual value	RO	TPZD	0	Pos units	DINT

7.6 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

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
6063	0	Torque actual value - inc	RO	TPZD	-	Inc	DINT
6064	0	Position actual value - units	RO	TPZD	-	Pos units	DINT
606C	0	Velocity actual value	RO	TPZD	-	Inc	DINT
6071	0	Target torque	RW	RPZD	0	Per thousands of rated torque	INT
6072	0	Max. torque	RW	No	Max motor torque	Per thousands of rated torque	UINT
6074	0	Torque demand value	RO	TPZD	0	Per thousands of rated torque	INT
6077	0	Torque actual value	RO	TPZD	0	Per thousands of rated torque	INT
6087	0	Torque slope	RW	RPZD	0	Per thousands of rated torque per second	UDINT

7.7 Digital Inputs and Outputs

The Digital Inputs and Digital Outputs are used to control the IO signals of the SERVOPACK connector CN1.

■ Related Objects

Index (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2521	-	Digital inputs	RO	TPZD	-	-	UINT
2522	-	Digital outputs	RW	RPZD	0	-	UINT

* The motor rated torque is 100%.

7.8 Touch Probe Function

The position actual value can be latched with the following trigger event:

- Trigger with touch probe 1 input (SERVOPACK CN1 SI4 signal)
- Trigger with touch probe 2 input (SERVOPACK CN1 SI5 signal)
- Trigger with encoder origin signal

The following two touch probe functions can be controlled at the same time:

- touch probe 1 latch function
  - latch control object: 60B8h (Bit0 to 7)
  - latch status object: 60B9h (Bit0 to 7)
  - latch position value is always stored to the Touch probe pos1 pos value (60BAh). (independent of signal logic)
  - Trigger signal: encoder zero signal or probe1 signal (SI4)
- touch probe 2 latch function
  - latch control object: 60B8h(Bit8 to 15)
  - latch status object: 60B9h(Bit8 to 15)
  - latch position value is always stored to the Touch probe pos2 pos value (60BCh). (independent of signal logic)
  - Trigger signal: encoder zero signal or probe2 signal (SI5)

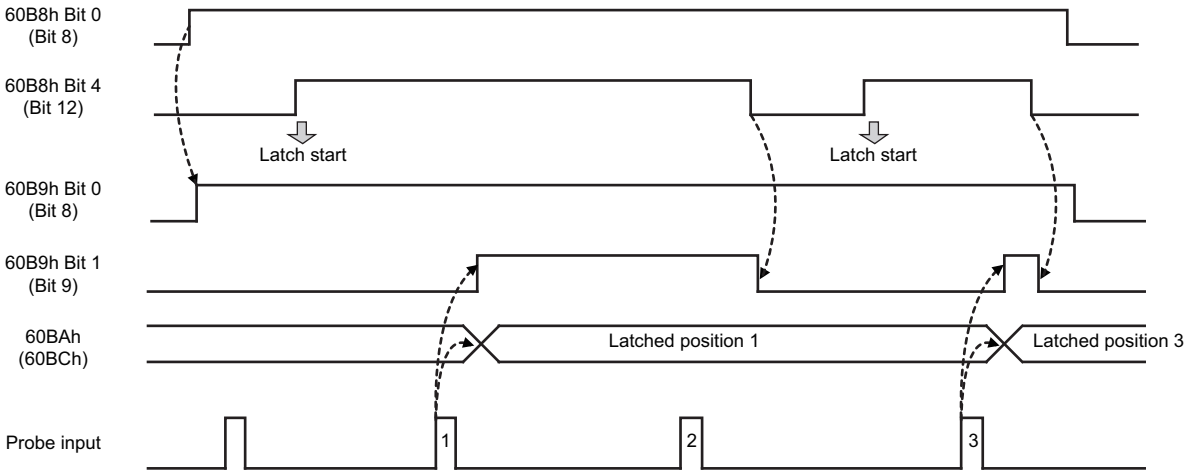
Connector positive/negative logics of SI4 and SI5 signals can be changed on SERVOPACK parameter Pn511.

■ Related Objects

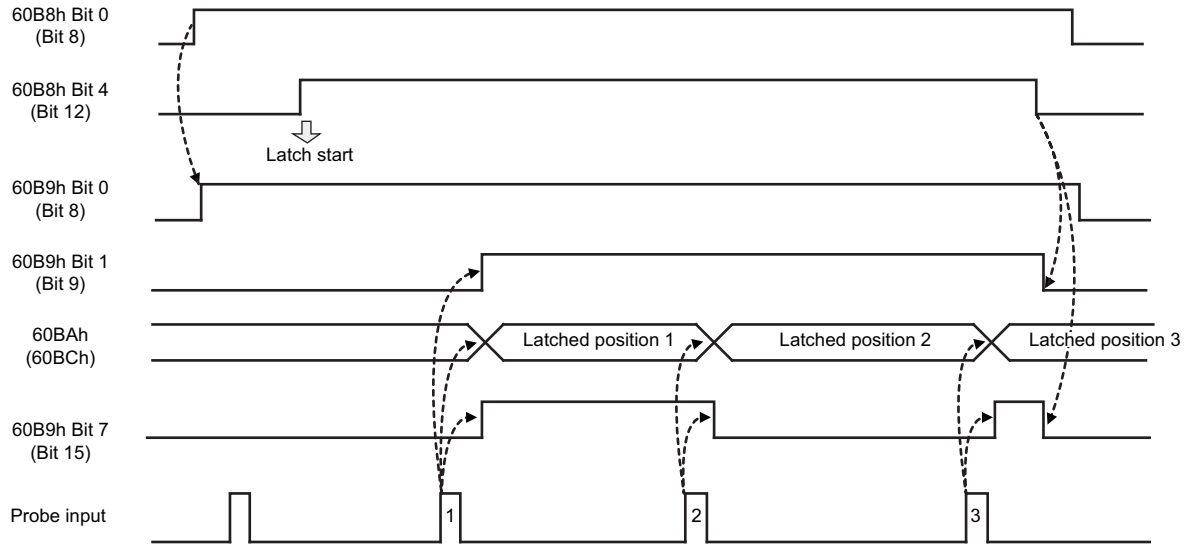
Index (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
60B8	0	Touch Probe Function	RW	RPZD	0	-	UINT
60B9	0	Touch Probe Status	RO	RPZD	-	-	UINT
60BA	0	Touch Probe 1 Position Value	RO	RPZD	-	Pos units	DINT
60BC	0	Touch Probe 2 Position Value	RO	RPZD	-	Pos units	DINT

■ Example of Handshaking Procedure for the Touch Probe Function

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

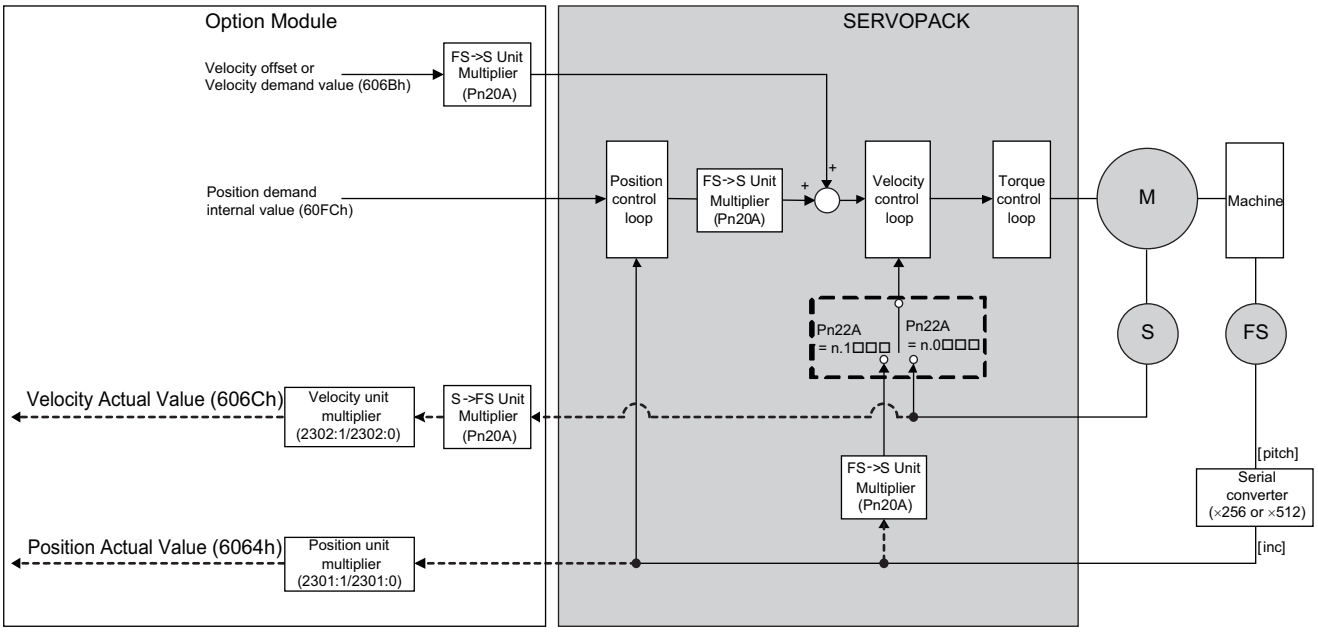


- Continuous Trigger Mode (60B8h bit1 = 1, or bit9 = 1)



7.9 Fully-closed Loop Control

The following figure shows the block diagram of the fully-closed loop control.



■ Setting Parameters

The basic setting procedure of related parameters is shown below.

Step	Description	Setting Parameters
1	Set the speed feedback method during fully-closed loop control.	Pn22A
2	Set the motor rotating direction.	Pn000.0 Pn002.3
3	Set the number of pitches (cycles) of the sine wave for the external scale.	Pn20A
4	Set the electronic gear.	PnB02 PnB04
5	Set the alarm detection level for the external encoder.	Pn51B Pn52A

7.10 Get/Set SERVOPACK Parameter Functionality

SERVOPACK parameters can be read or written.

7.10.1 Get SERVOPACK Parameter

Reading Servo parameter. In order to read SERVOPACK parameter do the following:

1. Write parameter number to PNU 2100h
2. Read the value from PNU 2101h

■ Related Objects

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2100	0	Get parameter - Parameter identify	RW	No	0xFFFF	-	UINT
2101	0	Get parameter - Parameter value	RO	No	0	-	DINT

7.10.2 Set SERVOPACK Parameter

Setting / Writing Servo parameter. In order to set Servo parameter do the following:

1. Write parameter number to PNU 2102h
2. Write the value into PNU 2103h

Note: Do not use a multi-parameter change request with PNUs 2102h and 2103h. Use two separate change parameter requests.

■ Related Objects

PNU (hex)	Sub	Name	Access	PDO Mapping	Default value	Units	Data Type
2102	0	Set parameter - Parameter identify	RW	No	0xFFFF	-	UINT
2103	0	Set parameter - Parameter value	RW	No	0	-	DINT

8

Object Dictionary

8.1 Object Dictionary List

The following table shows the object dictionaries.

Object Dictionaries		Refer to
General Objects	Drive unit identification (964)	8.2
	Profile identification number (965)	8.2
	Drive reset (972)	8.2
	Base mode parameter access service identification (974)	8.2
	DO identification (975)	8.2
	Load device parameter set (976)	8.2
	Transfer to non-volatile memory (global) (977)	8.2
	Name of station (61000)	8.2
	IP of station (61001)	8.2
	MAC of station (61002)	8.2
	Standard gateway of station (61003)	8.2
	Subnet mask of station (61004)	8.2
Communication Objects	DO IO set point data configuring (915)	8.3
	DO IO actual value data configuring (916)	8.3
	Telegram selection (922)	8.3
	List of all parameters for signals (923)	8.3
	PROFIdrive operating mode (930)	8.3
	Fault message counter (944)	8.3
	Fault number (947)	8.3
	Fault situation counter (952)	8.3
	Parameters list (980)	8.3
Manufacturer Specific Objects	Get parameter - parameter identify (2100h)	8.4
	Get parameter - parameter value (2101h)	8.4
	Set parameter - parameter identify (2102h)	8.4
	Set parameter - parameter value (2103h)	8.4
	User parameter configuration (2300h)	8.4
	Position user unit (2301h)	8.4
	Velocity user unit (2302h)	8.4
	Acceleration user unit (2303h)	8.4
	Position range limit designation (2400h)	8.4
	Target position in range (2401h)	8.4
	Actual position in range (2402h)	8.4
	Traversing block selection (2532h)	8.4
	Traversing block selected (2533h)	8.4
	MDI acceleration (2536h)	8.4
	MDI deceleration (2537h)	8.4
	MDI mode (2538h)	8.4
	Traversing block task mode (2610h)	8.4
	Traversing block target position (2611h)	8.4
	Traversing block profile velocity (2612h)	8.4
	Traversing block profile acceleration (2613h)	8.4
	Traversing block profile deceleration (2614h)	8.4

Object Dictionaries		Refer to
Device Control	STW1 (Controlword) (6040h)	8.5
	ZSW1 (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
	STW2 (Controlword 2) (2503h)	8.5
	ZSW2 (Statusword 2) (2504h)	8.5
PROFIdrive Position Mode	Target position / MDI target position (607Ah)	8.6
	Position range limit (607Bh)	8.6
	Software position limit (607Dh)	8.6
	Max profile velocity (607Fh)	8.6
	Profile velocity / MDI velocity (6081h)	8.6
	Profile acceleration (6083h)	8.6
	Profile deceleration (6084h)	8.6
	Quick stop deceleration (6085h)	8.6
	Max. acceleration (60C5h)	8.6
	Max. deceleration (60C6h)	8.6
Homing Function	Speed setpoint A (2505)	8.7
	Speed actual value A (2506)	8.7
	Speed setpoint B (2507)	8.7
	Speed actual value B (2508)	8.7
	Home offset (607Ch)	8.7
	Home method (6098h)	8.7
	Home speed (6099h)	8.7
	Homing acceleration (609Ah)	8.7
Position Control Function	Position demand value (6062h)	8.8
	Position actual value - inc (6063h)	8.8
	Position actual value - units (6064h)	8.8
	Following error window (6065h)	8.8
	Following error time out (6066h)	8.8
	Position window (6067h)	8.8
	Position window time (6068h)	8.8
	Following error actual value (60F4h)	8.8
	Position demand value - inc (60FCh)	8.8
PROFIdrive Velocity Mode	Velocity demand value (606Bh)	8.9
	Velocity actual value (606Ch)	8.9
	Velocity window (606Dh)	8.9
	Velocity window time (606Eh)	8.9
	Velocity threshold (606Fh)	8.9
	Target velocity (60FFh)	8.9
Profile Torque Mode	Target torque (6071h)	8.10
	Max. torque (6072h)	8.10
	Torque demand (6074h)	8.10
	Torque actual value (6077h)	8.10
	Torque slope (6087h)	8.10

Object Dictionaries		Refer to
Touch Probe Function	Touch probe function (60B8h)	8.11
	Touch probe status (60B9h)	8.11
	Touch probe pos1 pos value (60BAh)	8.11
	Touch probe pos2 pos value (60BCh)	8.11
Digital Inputs/Outputs	Digital inputs (2521h)	8.12
	Digital outputs (2522h)	8.12

8.2 General Objects

(1) Drive Unit Identification

All data for Drive Unit identification is included under this parameter, and is made available to the identify service.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
964	Drive unit identification	Array UINT[5]	RO	No	UINT	0	No	-

■ Data Description

Bit	Contents	Value	Comments
0	Manufacturer	0111h	Vendor ID
1	Drive unit type	0B03h	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. PROFINET option card for Sigma-5: SGDV-OCB03A
2	Version (software)		xxyy (decimal) Example: Version 2.1 results in 0201 decimal
3	Firmware date (year)		yyyy (decimal) 2014 → year 2014
4	Firmware date (day/month)		ddmm (decimal) 1901 → 19th of January
5	Number of drive objects (DO)	0001h	-

Note: The code for manufacturer (subindex 0) will be defined by PROFIBUS International (see www.profibus.com)

(2) Profile Identification Number

Displays the PROFIdrive profile number and profile version.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
965	Profile identification number	OS[2]	RO	No	UINT	0329h	-	-

■ Data Description

Bit	Contents	Value	Comments
1	Profile number	03h	PROFIdrive profile
2	Profile version	29h	Version 4.1

Note: When the parameter is read via PROFIdrive, the Octet String 2 data type applies

(3) Drive Reset

Reset of whole drive unit.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
972	Drive reset	UINT	RW	No	0-1	0	-	-

■ Data Description

The reset is possible using the optional parameter P972 in the following manner: The reset is initiated by write accessing P972=1.

Bit	Contents	Value	Comments
0	Initial status (or status after reset)		
1	Power on reset (initiation)		

Note: The write access to P972 (with value 1) results in a drive reset and therefore from the perspective of the Controller in a Drive Unit failure. It cannot be guaranteed that the positive acknowledgment is still sent in time from the Drive Unit or received from the Controller.

(4) Base Mode Parameter Access Service Identification

Description of the features of the Base Mode Parameter Access service.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
974	Base mode parameter access service identification	Array UINT	RO	No	UINT	-	-	-

■ Data Description

Bit	Contents	Value	Comments
0	Max. block length	240	Maximum block length in byte, for the parameter request and response block, which is supported by the parameter manager
1	Max number of parameter requests per multi-parameter request	39	
2	Max. latency per request (n × 10 ms)	0	Maximum latency time for processing a parameter request (time between request and response without time consumed on the communication line for a worst case scenario). The latency time is calculated by multiplication of the value in this subindex with 10 ms. A value =0 indicates that there is no specification available. Note, that the maximum latency time per request also includes additional time consumed for a multi-parameter request (of max. number of parameters).

(5) DO Identification

All data for DO identification is included under this parameter, and is made available to the identify service.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
975	DO identification	Array UINT	RO	No	UINT	-	-	-

■ Data Description

Bit	Contents	Value	Comments
0	Manufacturer	0111h	
1	DO type	000h	
2	Version (Software)		xxyy (decimal) Example: Version 2.1 results in 0201 decimal
3	Firmware date (year)		yyyy (decimal) Example: Year 2014 results in 2014
4	Firmware date (day/month)		ddmm (decimal) Example: 19th of January results in 1901
5	PROFIdrive DO type class (structure)	0001h	PROFIdrive drive object type class
6	PROFIdrive DO sub class 1	0015h	PROFIdrive drive object sub-type class 1
7	Drive object ID (DO-ID)	0001h	

(6) Load Device Parameter Set

Set the whole DU parameter set to default values.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
976	Load device parameter set	UINT	RW	No	0-1	0	-	-

■ Data Description

P976 is used to reset all parameters to the factory setting.

Value	Comments
0	Inactive
1	Resetting all parameters to factory settings. After saving a data set parameter 976 is reset to 0

(7) Transfer in Non-volatile Memory (Global)

Set the whole DU parameter set to default values.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
977	Transfer in non-volatile memory (global)	UINT	RW	No	0-1	0	-	-

■ Data Description

All parameters, i.e. parameters of all axes and the global parameters are saved with this parameter.

Value	Comments
0	Inactive
1	Actual parameters of the device are saved in non-volatile memory After saving a data set, parameter 977 is reset to 0

(8) Name Of Station

This read only parameter contains the Name of Station for the PROFINET IO Network Interface, which is related to this Drive Unit. This is an additional service parallel to the standard PROFINET IO mechanism, which makes the Name of Station also accessible via PROFIdrive Parameter Access.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
61000	Name of station	USINT[240]	RO	No	-	-	Yes	-

(9) IpOfStation

This read only parameter contains the IP Address of the Station for the PROFINET IO Network Interface, which is related to this Drive Unit. This is an additional service parallel to the standard PROFINET IO mechanism, which makes the IP Address of Station also accessible via PROFIdrive Parameter Access.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
61001	IpOfStation	OS[4]	RO	No	-	-	Yes	-

(10) MacOfStation

This read only parameter contains the MAC Address of the Station for the PROFINET IO Network Interface, which is related to this Drive Unit. This is an additional service parallel to the standard PROFINET IO mechanism, which makes the MAC Address of Station also accessible via PROFIdrive Parameter Access.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
61002	MacOfStation	USINT[6]	RO	No	-	-	Yes	-

(11) StandardGatewayOfStation

This read only parameter contains the Next Default Gateway for the Station for the PROFINET IO Network Interface, which is related to this Drive Unit. This is an additional service parallel to the standard PROFINET IO mechanism, which makes the Next Default Gateway of the Station also accessible via PROFIdrive Parameter Access.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
61003	StandardGatewayOfStation	OS[4]	RO	No	-	-	Yes	-

(12) SubnetMaskOfStation

This read only parameter contains the Subnet Mask of the Station for the PROFINET IO Network Interface, which is related to this Drive Unit. This is an additional service parallel to the standard PROFINET IO mechanism, which makes the Subnet Mask of the PROFINET interface also accessible via PROFIdrive Parameter Access.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
61004	SubnetMaskGatewayOfStation	OS[4]	RO	No	-	-	Yes	-

8.3 Communication Objects

(1) DO IO Set Point Data Configuring

The number n of array elements corresponds to the number of DO IO Data in the set point telegram.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
915	DO IO set point data configuring	Array UINT[16]	RW	No	UINT	Mapping of PNU922	Yes	-

(2) DO IO Actual Value Data Configuring

The number n of the array elements corresponds to the number of DO IO Data in the actual value telegram.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
916	DO IO actual value data configuring	Array UINT[16]	RW	No	UINT	Mapping of PNU922	Yes	-

(3) Telegram Selection

Sets the send and receive telegram.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
922	Telegram selection	UINT	RW	No	UINT	1	Yes	-

■ Data Description

The IO Data telegram can be determined by selecting pre-defined standard or manufacturer specific telegram number from the following table.

No.	Comments
0	Telegram may be freely configured (P915[x], P916[x])
1	Standard telegram 1: Speed mode
2	Standard telegram 2: Speed mode
7	Standard telegram 7: Position Mode (program submode)
9	Standard telegram 9: Position Mode (MDI submode)
100	Manufacturer specific telegram
999	Free telegram configuration

The specific set points/actual values can be freely configurable by selecting telegram number P922=0. If P922 is changed to 0, the previous setting of P915[x], P916[x] is kept and the signals configuration is allowed by setting P915[x], P916[x] with the desired signals. Activating the telegram and validity check is done by setting P922=999.

(4) List of All Parameters for Signals

Using parameter P923[Signal number], an assignment is made between the signal numbers and the associated manufacturer-specific parameter numbers. The array index is the number of the signal. Array indices 1 to 99 consist of the standard signals defined in the profile array indices 100 to 65535 contain the device-specific signals if they are defined.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
923	List of all parameters for signals	Array UINT[n]	RO	No	UINT	IO data signals	-	-

■ Data Description

P923[y]: List of all the parameters for signals (y = signal number)

The following is valid for parameter P923[y]:

- There is an entry for all standard signals which the device supports and for the device- specific signals.
- Standard signals which are not supported are identified with the entry 0.
- Gaps between device-specific signal numbers are filled with zeros.

(5) PROFIdrive Operating Mode

This is used to designate the operating mode. Depending on the type of device this parameter is preset by the manufacturer. All numerical values with bit 15 (MSB) = 1 designate manufacturer-specific modes.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
930	PROFIdrive operating mode	UINT	RO	No	UINT	8000h	no	-

■ Data Description

PROFIdrive Mode presentation of actual mode (index 6061h)

Value	Contents		Comments
0001h	PROFIdrive profile velocity mode		
0002h	PROFIdrive profile position mode		
80FFh	Pole detection mode		
8000h	No mode change/no mode assigned		No movement. Usually after power on.
8004h	Torque profile mode		

(6) Fault Message Counter

The fault message counter is increased each time that the fault buffer changes. This means, that it may be guaranteed that the fault buffer may be consistently read-out. Without this parameter, it is not guaranteed that the fault buffer had not changed while reading-out.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
940	Fault message counter	UINT	RO	No	UINT	0	No	-

(7) Fault Number

The fault number is identical to the fault code.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
947	Fault number	UINT	RO	No	UINT	-	No	-

■ Data Description

Refer to fault code.

(8) Fault Situation Counter

Sum of all of the fault situations since the last reset. If this parameter is set to 0 (write), the complete fault buffer is deleted.

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
952	Fault situation counter	UINT	RO	No	UINT	0	No	-

(9) Parameters List

PNU	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
980 to 989	Parameters list	UINT[n]	RO	No	UINT	-	-	-

■ Data Description

The number n of array elements is manufacturer specific. All parameter numbers defined in a device are saved in parameters under the subindices (manufacturer specific and profile parameters). The arrays are assigned in increasing sequence and consecutively. If a subindex contains zero, the end of the list of defined parameters has been reached. If a subindex contains the parameter number of the next list parameter, then the list is continued there. Therefore the PNU980 to 989 are omitted from the Number list of defined parameter. The number list of defined parameter are implemented for every DO. Parameters of the number list which are empty may not be implemented.

8.4 Manufacturer Specific Objects

(1) Get Parameter - Parameter Identify

The parameter number for Get Parameter Procedure.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2100	Get Parameter - Parameter Identify	-	RW	No	UINT	FFFFh	-	-

Note: Reading Servo parameter. In order to read Servo parameter do the following:
1.Write parameter number to PNU 2100h
2.Read the value from PNU 2101h

(2) Get Parameter - Parameter Value

The parameter value for Get Parameter Procedure.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2101	Get Parameter - Parameter Value	-	RO	No	DINT	0	-	-

Note: Reading Servo parameter, refer to PNU 2100h.

(3) Set Parameter - Parameter Identify

The parameter number for Set Parameter Procedure.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2102	Set Parameter - Parameter Identify	-	RW	No	UINT	FFFFh	-	-

Note: Setting Servo parameter. In order to set Servo parameter do the following:
1.Write parameter number to PNU 2102h
2.Write the value to PNU 2103h

(4) Set Parameter - Parameter Value

The parameter value for Get Parameter Procedure.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2103	Set Parameter - Parameter Value	-	RW	No	DINT	0	-	-

Note: Setting Servo parameter, refer to PNU 2102h.

(5) User Parameter Configuration

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2300	User Parameter Configuration	UDINT	RW	No	0-1	1	Yes	-

■ Data Description

Value	Contents	Comments
0	User unit setting enable	The User Units setting procedure is as follow: 1. General state diagram must be PROFIdrive “S1: Switching On Inhibited”. 2. Set the bit to 0. 3. Set the relevant User Units objects. 4. Set the bit to 1 activate the “new” user units. 5. Save user units to non-volatile memory. 6. Perform power cycle to update. After that procedure, the relevant object values will be automatically updated to the “new” units.
1	Activate user unit	

(6) Position User Unit

Position user unit = (Numerator / Denominator) [inc].
(Default setting for position user unit: 1 [inc])

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2301	Position user unit	Array UDINT[2]	RW	No	-	-	Yes	-

■ Data Description

Sub	Description	Value Range	Default Value
0	Numerator	1<= Value range <= 2^{32}-1	1
1	Denominator	1<= Value range <= 2^{32}-1	1

Note: Position user unit ratio must be in the range of 0.001 to 1000 for successful user unit group enable.

(7) Velocity User Unit

Velocity user unit = (Numerator / Denominator) [inc/ms].
(Default setting for velocity user unit: 1 [inc/ms])

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2302	Velocity user unit	Array UDINT[2]	RW	No	-	-	Yes	-

■ Data Description

Sub	Description	Value Range	Default Value
0	Numerator	1<= Value range <= 2^{32}-1	1
1	Denominator	1<= Value range <= 2^{32}-1	1

Note: Velocity user unit ratio is only accepted, if max. motor speed will be in the range of 0 to 2^{31} with new velocity user units.

(8) Acceleration User Unit

Acceleration user unit = (Numerator / Denominator) × 10,000 [inc/s²].
(Default setting for acceleration user unit: 10,000 [inc/s²]).

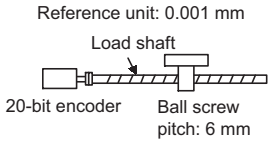
PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2303	Acceleration user unit	Array UDINT[2]	RW	No	-	-	Yes	-

■ Data Description

Sub	Description	Value Range	Default Value
0	Numerator	1<= Value range <= 2^{32}-1	1
1	Denominator	1<= Value range <= 2^{32}-1	1

Note: Acceleration user unit ratio is only accepted, if parameter max. motor acceleration (60C5h) will be in the range of 0 to 2^{31} with new acceleration user units.

■ Case 1: Linear Mechanism System with Ball Screw



- User Requirements and Application Assumptions
  - User defined position reference unit: 0.001 mm
  - User defined velocity reference unit: 0.1 mm/s
  - User defined acceleration reference unit: 0.1 mm/s^2
  - Application assumption data
    Encoder resolution: 20 bits (1048576 inc)
    Ball screw pitch: 6 mm
    Gear ratio: 2/1 (load shaft will rotate once for each time the motor shaft rotates twice.)

- Settings
  - Position User Unit (2301h)
    The number of encoder pulses for each user defined position reference unit:

$$\frac{\text{Encoder resolution} \times \text{Gear ratio [inc]}}{\text{Movement amount per one rotation of load shaft [Pos unit]}}$$

$$= \frac{1048576\ [\text{inc}] \times (2/1)}{6\ [\text{mm}]/0.001\ [\text{mm}]}$$

$$= \frac{2097152}{6000}\ [\text{inc}]$$

Therefore, the object is set as follows.
Object 2301h:01 (Nominator) = 2097152
Object 2301h:02 (Denominator) = 6000

• Velocity User Unit (2302h)

By converting one user defined velocity reference unit [0.1 mm/s] into [inc/ms]:

1 [Vel unit]

$$= \frac{1048576\ [\text{inc}] \times (2/1)}{6\ [\text{mm}]} \times 0.1\ [\text{mm/s}]$$

$$= \frac{2097152}{60}\ [\text{inc/s}] = \frac{2097152}{60000}\ [\text{inc/ms}]$$

Therefore, the object is set as follows.
Object 2302h:01 (Nominator) = 2097152
Object 2302h:02 (Denominator) = 60000

• Acceleration User Unit (2303h)

By converting one user defined acceleration reference unit [0.1 mm/s^2] into [10^4 inc/s^2]

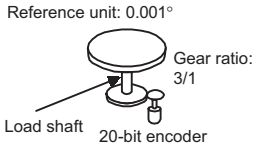
1 [Acc unit]

$$= \frac{1048576\ [\text{inc}] \times (2/1)}{6\ [\text{mm}]} \times 0.1\ [\text{mm/s}^2] \times 10^{-4}$$

$$= \frac{2097152}{6 \times 10^5}\ [10^4\ \text{inc/s}^2]$$

Therefore, the object is set as follows.
Object 2303h:01 (Nominator) = 2097152
Object 2303h:02 (Denominator) = 600000

■ Case 2: Rotary Mechanism System with Rotary Table



• User Requirements and Application Assumptions

• User defined position reference unit: 0.001 deg
• User defined velocity reference unit: 1 deg/s
• User defined acceleration reference unit: 1 deg/s^2
• Application assumption data
Encoder: 20 bits (1048576 inc)
Degree of rotary table movement for each rotation of the load shaft: 360 deg
Gear ratio: 3/1 (one load shaft rotation per three motor shaft rotations)

• Setting

• Position User Unit (2301h)
Number of encoder increments per one user defined position reference unit:

$$\frac{\text{Encoder resolution} \times \text{Gear ratio [inc]}}{\text{Movement amount per one rotation of load shaft [Pos unit]}}$$

$$= \frac{1048576\ [\text{inc}] \times (3/1)}{360\ [\text{deg}]/0.001\ [\text{deg}]}$$

$$= \frac{3145728}{360000}\ [\text{inc}]$$

Therefore, the object is set as follows.
Object 2301h:01 (Nominator) = 3145728
Object 2301h:02 (Denominator) = 360000

• Velocity User Unit (2302h)

By converting one user defined velocity reference unit [1 deg/s] into [inc/ms],

$$1\ [\text{Vel unit}]$$

$$= \frac{1048576\ [\text{inc}] \times (3/1)}{360\ [\text{deg}]} \times 1\ [\text{deg/s}]$$

$$= \frac{3145728}{360}\ [\text{inc/s}] = \frac{3145728}{360000}\ [\text{inc/ms}]$$

Therefore, the object is set as follows.
Object 2302h:01 (Nominator) = 3145728
Object 2302h:02 (Denominator) = 360000

• Acceleration User Unit (2303h)

By converting one user defined acceleration reference unit into [inc/s^2],

$$1\ [\text{Acc unit}]$$

$$= \frac{1048576\ [\text{inc}] \times (3/1)}{360\ [\text{deg}]} \times 1\ [\text{deg/s}^2] \times 10^{-4}$$

$$= \frac{3145728}{360 \times 10^4}\ [10^4\ \text{inc/s}^2]$$

Therefore, the object is set as follows.
Object 2303h:01 (Nominator) = 3145728
Object 2303h:02 (Denominator) = 3600000

(9) Position Range Limit Designation

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2400	Position range limit designation	UINT	RW	No	0-3	0	Yes	-

■ Data Description

Value	Position Range limit designation for:
0	Off
1	Shortest route
2	Fixed rotational direction, positive
3	Fixed rotational direction, negative

Note: When the mode “Shortest route” is selected, the drive always moves the physical shortest distance to the target and adjusts the sign of the running speed accordingly. For the modes “Fixed rotational direction…” the drive moves always in that direction, specified by the appropriate mode.

(10) Target Position in Range

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2401	Target position in range	DINT	RO	TPZD	DINT	-	-	Pos units

(11) Actual Position in Range

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2402	Actual position in range	DINT	RO	TPZD	DINT	-	-	Pos units

8.5 Device Control

(1) STW1 (Controlword)

The controlword consist of bits for:

- the controlling of the state,
- the controlling of operating modes,
- manufacturer specific options.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6040	Controlword	UINT	RW	RPZD	UINT	0	-	-

■ Data Description

Bit	PROFIdrive Profile Data Description	Explanation	
		Status	Description
0	Off	1 - ON	To be set to transition S2 → S3
		0 - OFF	The drive is ramped down along configured profile deceleration (6084h). When the motor is stopped, the drive unit returns to state “S2: Ready For Switching on”. This command is interruptible.
1	Coast stop (Off2)	1 - No Coast Stop (no OFF 2)	To be set for transition S1 → S2.
		0 - Coast Stop (OFF 2)	The ramp down phase is determined on setting of Sigma-5 parameter Pn001.0. When the motor is stopped, the drive unit returns to state “S1: Switching On Inhibited”. This command is not interruptible.
2	Quick stop (Off3)	1 - No Quick Stop (no OFF 3)	To be set for transition S1 → S2.
		0 - Quick Stop (OFF 3)	The ramp down phase is determined on setting of parameter 605Ah (Quick stop option code). When the motor is stopped, the drive unit returns to state “S1: Switching On Inhibited”. This command is not interruptible.
3	Enable operation	1 - Enable Operation	To be set for transition S3 → S4. Change to servo drive state “SERVO_ON”.
		0 - Disable Operation	The ramp down phase is determined on setting of Sigma-5 parameter Pn001.0. When the motor is stopped, the drive unit returns to state “S3: Switched On”. This command is not interruptible.
4...6	Operation mode specific		
7	Fault ack (Reset)		
8...9	Operation mode specific		
10	Control by PLC	Refer to Notes below	
11	Operation mode specific		
12	Negative torque limit	Torque limit enable bit 0: disable 1: enable (refer to Notes below)	
13	Positive torque limit		
14...15	Not used		

Note: Bit 0...3, 8, 10

Command	Bits of the Controlword (6040h)					
	Bit10	Bit7	Bit3	Bit2	Bit1	Bit0
S1 to S2	1	–	–	1	1	0
S2 to S3	1	–	0	1	1	1
S3 to S4	1	–	1	1	1	1
(coast stop) S5 to S1 or S4 to S1 or S3 to S1 or S2 to S1	1	–	–	–	0	–
(quick stop) S5 to S1 or S4 to S1 or S3 to S1 or S2 to S1	1	–	–	0	1	–
Ramp stop	1	–	–	1	1	0
Disable operation	1	–	0	1	1	1
Enable operation	1	–	1	1	1	1
Fault reset	1	0 → 1	–	–	–	–

Note: Bit 12, 13
To use these torque limit, have to set follow Servo Drive Parameter, using 2102h/2103h: Set parameter Manufacturer specific object, before set Enable.
- Pn404 Forward External Torque Limit
- Pn405 Reverse External Torque Limit

For details refer to Sigma-5 user manual, Design/Maintenance.

Note: Bit 4, 5, 6, 8, 9, 11
PROFIdrive position mode

Bit	Value	Definition
4	1	Do not reject traversing task
	0	Reject traversing task. The axis stops according to the current profile deceleration
5	1	No intermediate stop
	0	Intermediate stop. The axis stops according to current profile deceleration
6	0 → 1	Activate traversing task
8	0	Not supported (Always 0)
9	0	Not supported (Always 0)
11	0 → 1	Start homing procedure
	1 → 0	Stop homing procedure. The axis stops according to homing acceleration (609Ah)

PROFIdrive velocity mode

Bit	Value	Definition
4	1	Enable ramp generator
	0	Reset ramp generator. The axis stops according to halt option code (605Dh)
5	1	Unfreeze ramp generator
	0	Freeze ramp generator
6	1	Enable set point
	0	Disable set point. The axis stops according to profile deceleration (6084h)
8	0	Not supported (Always 0)
9	0	Not supported (Always 0)
11	0	Not supported (Always 0)

Profile torque mode

Bit	Value	Definition
4	0	Not supported (Always 0)
5	0	Not supported (Always 0)
6	0	Not supported (Always 0)
8	0	The motion shall be executed or continued
	1	Axis shall be stopped according to the halt option code (605Dh)
9	0	Not supported (Always 0)
11	0	Not supported (Always 0)

(2) ZSW1 (Statusword)

The Statusword indicates the current state of the drive. No bits are latched. The Statusword consist of bits for:

- the current state of the drive,
- the operating state of the mode,
- manufacturer specific options.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6041	Statusword	UINT	RO	TPZD	UINT	No	-	-

■ Data Description

Bit	PROFIdrive Profile Data Description	Explanation
0	Ready to switch on	Refer to Notes below
1	Ready to operate	
2	Operation enabled	
3	Fault	
4	Coast stop (Off2)	
5	Quick stop (Off3)	
6	Switching on inhibited	
7	Warning	
8	Operation mode specific	
9	Control requested	Drive is ready and Controlword (6040h) is processed
10	Target reached	Refer to Notes below Even if a fault occurs or main power is turned off or HWBB becomes active, it complies with the description below.
11...13	Operation mode specific	Refer to Notes below
14	HWBB	Safety state
15	Operation mode specific	Refer to Notes below

Note: Bit 0...7

Bit7	Bit6	Bit3	Bit2	Bit1	Bit0	Transitions
–	0	0	0	0	0	Not ready to switch on
–	1	–	0	0	0	S1: Switching on inhibited
–	0	0	0	0	1	S2: Ready for switching on
–	0	0	0	1	1	S3: Switched on
–	0	0	1	1	1	S4: Operation
–	0	0	0	1	1	S5: Switching off (quick stop)
–	0	0	0	1	1	S5: Switching off (ramp stop)
–	1	1	0	0	0	Fault
1	–	–	–	–	–	Warning is occurred

Note: Internal limit active
If internal limit active of the Statusword is 1, this shall indicate that an internal limit is active. The internal limits are manufacturer-specific. The internal limit active in the following cases:
1. Software position limit
2. N-OT, P-OT limit switch
3. Torque limit
In PROFIdrive profile position mode the Internal limit active is bit 15 in all other cases it is bit 11.

Note: Bit 8, 10, 11, 12, 13, 15
PROFIdrive position mode

Bit	Value	Definition
8	0	Following error out of tolerance range
	1	Following error within tolerance range
10	0	Target not reached
	1	Target reached (The position actual value is located at the end of a traversing task in the positioning window)
11	0	Home position not yet set - no valid home position available
	1	Home position set - homing procedure was executed and home position is valid
12	0 → 1	Traversing task acknowledgment - it is acknowledged that a new traversing task or MDI setpoint was accepted
	1 → 0	Only acknowledgment of Controlword bit 6 negative edge. If the DO general state machine is not in state S4, bit 12 is set to zero
13	0	Drive moving - traversing task is executed. Speed is not equal 0
	1	Drive stopped - signals that a traversing task has been completed or standstill for intermediate stop and stop
15	–	Internal limit active (see above definition)

PROFIdrive velocity mode

Bit	Value	Definition
8	0	Target not reached
	1	Target reached (the difference between the target velocity and the velocity actual value is within the Velocity window longer than the Velocity window time
10	0	Velocity actual value < 606Fh velocity threshold
	1	Velocity actual value >= 606Fh velocity threshold
13	–	Reserved

Profile torque mode

Bit	Value	Definition
10	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
13	–	Reserved

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

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

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
605A	Quick stop option code	INT	RW	No	0...3	2	Yes	-

■ Data Description

Value	Data Description	Explanation
-32768 ... -1	Reserved	-
0	Disable drive function	The stopping method is determined by Pn001.0
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	Reserved	-
5 ... 32767	Reserved	-

Note: Setting values 0-1 are not recommended.

(4) Halt Option Code

In PROFIdrive velocity mode the halt option code determines the action during reset ramp generator bit 4 in Controlword. In PROFIdrive position mode the halt option code determines the action during reject traversing task bit 4 in Controlword.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
605D	Halt option code	INT	RW	No	1 ... 3	3	Yes	-

■ Data Description

Value	Data Description	Explanation
-32768 ... 0	Reserved	-
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 ... 32767	Reserved	-

(5) Modes of Operation

The parameter modes of operation switches the actually chosen operation mode.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6060	Modes of operation	INT	RW	Yes	-3 ... 7	0	Yes	-

■ Data Description

Value	Data Description	Explanation
-127 ... -4	Reserved	-
-3	PROFIdrive profile velocity mode	Supported
-2	PROFIdrive profile position mode	Supported
-1	Pole detection mode	Supported
0	No mode change/No mode assigned	No movement Usually after power on
1 .. 3	Reserved	-
4	Torque profile mode	Supported
5 ... 127	Reserved	-

Note: Reading the modes of operation only shows 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
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 PROFIdrive general state machine transition, the pole detection starts:
1) From S3: Switched on to S4: Operation.

Transition command to S1: Switching On Inhibited 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 S1: Switching On Inhibited state.
Reset application should not be done during pole detection process.

(6) Modes of Operation Display

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).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6061	Modes of operation display	INT	RO	TPZD	SINT	-	-	-

■ Data Description

Refer to data description of *(5) Modes of Operation*.

Note: The actual mode is reflected in the modes of operation display (index 6061h), and not in the modes of operation (index 6060h).

(7) STW2 (Controlword 2)

The Controlword 2 consist of bits for:

- the controlling of the state,
- the controlling of operating modes,
- manufacturer specific options.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2503	STW2 (Controlword 2)	UINT	RO	RPZD	UINT	-	-	-

■ Data Description

Bit	Data Description	Explanation
0 ... 1	reserved	
12 ... 15	Controller sign of life	

Note: Sign-Of-Life supported only if a clock-cycle synchronous application exist.

(8) ZSW2 (Statusword 2)

The Statusword 2 indicates the current state of the drive. No bits are latched. The Statusword 2 consist of bits for:

- the current state of the drive,
- the operating state of the mode,
- manufacturer specific options.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2504	ZSW2 (statusword 2)	UINT	RO	TPZD	UINT	-	-	-

■ Data Description

Bit	Data Description	Explanation
0	Negative limit switch	N-OT
1	Positive limit switch	P-OT
2	Homing switch	/DEC
3	Positive software position limit	
4	Negative software position limit	
5 ... 11	reserved	
12 ... 15	DO sign of life	

Note: Sign of life supported only if a clock-cycle synchronous application exist.

8.6 PROFIdrive Position Mode

(1) SATZANW - Traversing Block Selection

Traversing block selection.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2532	SATZANW	UINT	RW	RPZD	UINT	-	Yes	-

■ Data Description

Bit	Data Description
0 ... 9	Number of the motion record in the program storage intended to start (value range: 0..1023). A minimum number of 64 records (bits 0 to 5) shall be supported by the drive. Bits 0 to 9 are only relevant in Program submode.
10 ... 14	Reserved for future use by PROFIdrive profile.
15	Mode switch for selection of submodes: 1 - Activation of the MDI submode. If there is a program still running (extended state machine not in the Basic State), the positioning interface will change to MDI submode only after the program ends or is terminated (STW1 bit4). 0 - Deactivation of the MDI submode. If there is a MDI motion command still executed the path interpolation shall stop with the current profile deceleration and the MDI motion command shall be rejected.

(2) AKTSATZ - Traversing Block Selected

Traversing block selected.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2533	AKTSATZ	UINT	RO	TPZD	UINT	0	No	-

■ Data Description

Bit	Data Description
0 ... 9	Number of the motion record actually active (executed by the path interpolation). A minimum number of 64 records (bits 0 to 5) shall be supported by the drive. Bits 0 to 9 are only relevant in Program submode (in MDI-submode and while no program is being executed the number should be 0).
10 ... 14	Reserved for future use by PROFIdrive profile.
15	Status of mode switch: 1 - MDI submode active. The input values for the motion record will be taken out of the signals TARPOS, MDI_VELOCITY, MDI_ACC and MDI_DEC. 0 - Program submode active. The initial motion record for the start of the motion task will be taken out of bits 0 to 9 of this signal.

(3) MDI Acceleration

The MDI acceleration is the normalized value to parameter 6083h (profile acceleration). The interpretation of this value is: FFFFh => 100% of 60C5h (max. acceleration).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2536	MDI acceleration	UINT	RW	RPZD	UINT	0	Yes	N2 *

* FFFFh => 100% of 60C5h (max. acceleration)

(4) MDI Deceleration

The MDI deceleration is the normalized value to parameter 6084h (profile deceleration). The interpretation of this value is: FFFFh => 100% of 60C6h (max. deceleration).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2537	MDI deceleration	UINT	RW	RPZD	UINT	0	Yes	N2 *

* FFFFh => 100% of 60C5h (max. acceleration)

(5) MDI Mode

Sets the mode of MDI traversing block.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2538	MDI mode	UINT	RW	RPZD	UINT	0	No	-

■ Data Description

Bit	Data Description
0	1 - Absolute positioning mode. The target position in the signal TARPOS defines the absolute target position for the motion. 0 - Relative positioning mode. The target position in the signal TARPOS defines the relative target position for the motion related to the actual axis position.
1 ... 15	Reserved for future use by PROFIdrive profile.

(6) Traversing Block Task Mode

Sets the influence of the task for the traversing block.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2610	Traversing block task mode	Array UDINT[64]	RW	No	UDINT	0	Yes	-

■ Data Description

Bit	Data Description
0	1- Absolute positioning. The Traversing Block Target Position is defined as absolute target position for the motion. 0 -Relative positioning. The Traversing Block Target Position is defined as relative target position for the motion related to the actual axis position.
1 ... 15	Reserved for future use by PROFIdrive profile
16 ... 31	Reserved

(7) Traversing Block Target Position

The target position is the position that the drive should move to in PROFIdrive position profile mode using the settings of motion Traversing Block parameters such as velocity, acceleration, deceleration.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2611	Traversing block target position	Array UDINT[64]	RW	No	DINT	0	Yes	Pos units

(8) Traversing Block Profile Velocity

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. The profile velocity is given in user defined speed units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2612	Traversing block profile velocity	Array UDINT[64]	RW	No	0 ... 2^{31}-1	0	Yes	Vel units

(9) Traversing Block Profile Acceleration

The profile acceleration for the traversing block is given in user defined acceleration units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2613	Traversing block profile acceleration	Array UDINT[64]	RW	No	0 ... 2^{31}-1	0	Yes	Vel units

(10) Traversing Block Profile Deceleration

The profile deceleration for the traversing block is given in user defined acceleration units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2614	Traversing block profile acceleration	Array UDINT[64]	RW	No	0 ... 2^{31}-1	0	Yes	Vel units

(11) Target Position

The target position is the position that the drive should move to in position profile mode using the current settings of motion control parameters such as velocity, acceleration, deceleration, motion profile type etc.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
607A	Target position	DINT	RW	RPZD	DINT	0	-	Pos units

(12) Position Range Limit

This object shall indicate the configured maximal and minimal position range limits. It shall limit the numerical range of the input value. On reaching or exceeding these limits, the input value shall wrap automatically to the other end of the range. Wrap-around of the input value may be prevented by setting software position limits as defined in software position limit object (607Dh). The values shall be given in user-defined position units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
607B	Position range limit	Array DINT[2]	RW	No	-	-	Yes	Pos units

■ Data Description

Sub	Name	Value Range	Default Value
0	Min position range limit	-2^{31} <= Value range <= 0	-2^{31}
1	Max position range limit	0 <= Value range <= 2^{31}-1	2^{31}-1

Note: Please refer to parameter position range limit designation (2400h).

(13) Software Position Limit

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 setting of Min position limit > Max position is not allowed.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
607D	Software position limit	Array DINT[2]	RW	No	-	-	Yes	Pos units

■ Data Description

Sub	Name	Value Range	Default Value
0	Min position limit	DINT	-2^{31}
1	Max position limit	DINT	$2^{31}-1$

- For Incremental Encoder
  Software position limit values are activated once the homing is completed after power-up.
- For Absolute Encoder
  When an absolute encoder is connected to the SERVOPACK, no homing has to be done, that the software position limits are activated.

(14) Max Profile Velocity

The profile deceleration for the traversing block is given in user defined acceleration units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
607F	Max profile velocity	UDINT	RW	No	0 ... Max motor speed	Max motor speed *	Yes	Vel units

* Max motor speed taken from the driver during initialization.

(15) Profile Velocity

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. The profile velocity is given in user defined speed units. It is converted to position increments per second using the velocity encoder factor.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6081	Profile velocity	UDINT	RW	RPZD	0 ... Max profile velocity	0	Yes	Vel units

(16) Profile Acceleration

The profile acceleration is given in user defined acceleration units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6083	Profile acceleration	UDINT	RW	RPZD	0 ... Max accel.	0	Yes	Acc units

(17) Profile Deceleration

The profile deceleration is given in the same units as profile acceleration. If this parameter is not supported, then the profile acceleration value is also used for deceleration.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6084	Profile deceleration	UDINT	RW	RPZD	0 ... Max decel.	0	Yes	Acc units

(18) Quick Stop Deceleration

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. The quick stop deceleration is given in the same units as the profile acceleration.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6085	Quick stop deceleration	UDINT	RW	RPZD	0 ... Max decel.	Max motor decel.	Yes	Acc units

* The deceleration calculated on the basis of taken value from the driver during initialization.

(19) Max. Acceleration

This object indicates the configured maximal acceleration. It is used to limit the acceleration to an acceptable value in order to prevent the motor and the moved mechanics from being destroyed. The value is given in user-defined acceleration physical units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60C5	Max. acceleration	UDINT	RW	No	0 ... Max motor accel.	Max motor accel.	Yes	Acc units

* Max. motor acceleration calculated on the basis of taken value from the driver during initialization.

Note: Max. motor deceleration is equal to Max. motor acceleration.

(20) Max. Deceleration

This object indicates the configured maximal deceleration. It is used to limit the deceleration to an acceptable value in order to prevent the motor and the moved mechanics from being destroyed. The value is given in the same physical unit as the max acceleration object (60C5h).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60C6	Max. deceleration	UDINT	RW	No	0 ... Max motor decel.	Max motor decel.	Yes	Acc units

* Max. motor deceleration calculated on the basis of taken value from the driver during initialization.

Note: Max. motor deceleration is equal to Max. motor acceleration.

8.7 Homing Function

(1) Home Offset

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

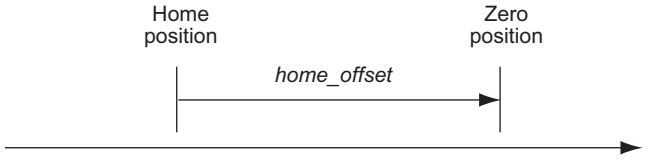
PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
607C	Home offset	DINT	RW	No	DINT	0	Yes	Pos units

- 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

The homing method object determines the method that will be used during homing.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6098	Homing method	INT	RW	No	0 ... 35	0	Yes	-

■ Data Description

Bit	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 index pulse
18	Homing on the positive limit switch - same homing as method 2 without index pulse
19, 20	Homing on the positive home switch - same homing as method 3, 4 without index pulse
33, 34	Homing on index pulse
35	Homing on the current position

(3) Home Speed

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

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6099	Home speed	UDINT[2]	RW	No	-	-	Yes	Vel units

■ Data Description

Sub	Name	Value Range	Default Value
0	Speed during search for switch	0 ... Max motor speed	0
1	Speed during search for zero	0 ... Max motor speed	0

(4) Homing Acceleration

The homing acceleration establishes the acceleration to be used for all accelerations and decelerations with the standard homing modes and is given in acceleration units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
609A	Homing acceleration	UDINT	RW	RPZD	0 ... Max. motor accel.	0	Yes	Acc units

8.8 Position Control Function

(1) Position Demand Value

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

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6062	Position demand value	DINT	RO	TPZD	DINT	No	-	Pos units

(2) Position Actual Internal Value

The actual value of the position measurement device is one of the two input values of the closed loop position control. The data unit is defined as increments.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6063	Position actual internal value	DINT	RO	TPZD	DINT	No	-	Inc

(3) Position Actual Value

This object represents the actual value of the position measurement device in defined units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6064	Position actual value	DINT	RO	TPZD	DINT	No	-	Pos units

(4) Following Error Window

This parameter indicates the configured range of tolerated position values symmetrically to the position demand value. If the position actual value is out of the following error window, a following error occurs. A following error may occur when a drive is blocked, unreachable profile velocity occurs, or at wrong closed-loop coefficients.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6065	Following error window	UDINT	RO	No	0 ... 2^{31}-1	32	Yes	Pos units

(5) Following Error Time Out

A position actual value outside the allowed range of the following error window around a position demand value for longer than the following error time out will toggle the following error bit in the Statusword.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6066	Following error time out	UINT	RW	No	UINT	0	Yes	ms

(6) Position Window

The position window defines a symmetrical range of accepted positions relatively to the target position. If the actual value of the position encoder is within the position window, this target position is regarded as reached.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6067	Position window	UDINT	RW	No	0 ... 2^{31}-1	32	Yes	Pos units

(7) Position Window Time

When the actual position is within the position window during the defined position window time which is given in multiples of milliseconds, the corresponding bit 10 target reached in the Statusword will be set to one.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6068	Position window time	UINT	RW	No	UINT	0	Yes	ms

(8) Following Error Actual Value

This object provides the actual value of the following error.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60F4	Following error actual value	DINT	RO	TPZD	DINT	No	-	Pos units

(9) Position Demand Value - Inc

This output of the trajectory generator in profile position mode is an internal value using increments as unit what is expressed with a position demand value - inc. To save calculation time for some applications, this object is additionally introduced to the position demand value (6062h).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60FC	Position demand value - inc	DINT	RO	TPZD	DINT	No	-	Inc

8.9 PROFIdrive Velocity Mode

(1) Speed Setpoint A

The speed setpoint A is the normalized value to parameter 60FFh (target velocity).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2505	Speed setpoint A	INT	RW	RPZD	INT	0	Yes	N2 *

* 4000h => 100% of max. profile velocity (607Fh / 2)

(2) Speed Actual Value A

The speed actual value A is the normalized value to parameter 606Ch (velocity actual value).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2506	Speed actual value A	INT	RO	TPZD	INT	0	Yes	N2 *

* 4000h => 100% of max. profile velocity (607Fh / 2)

(3) Speed Setpoint B

The speed setpoint B is the normalized value to parameter 60FFh (target velocity).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2507	Speed setpoint B	DINT	RW	RPZD	DINT	0	Yes	N4 *

* 40000000h => 100% of max. profile velocity (607Fh / 2)

(4) Speed Actual Value B

The speed actual value B is the normalized value to parameter 606Ch (velocity actual value).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2508	Speed actual value B	DINT	RO	TPZD	DINT	0	Yes	N4 *

* 40000000h => 100% of max. profile velocity (607Fh / 2)

(5) Velocity Demand Value

The output value of the trajectory generator may be corrected by the output value of the position control function. It is then provided as a demand value for the velocity controller and given in the velocity units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
606B	Velocity demand value	DINT	RO	TPZD	DINT	No	-	Vel units

(6) Velocity Actual Value

The velocity actual value is also represented in velocity units and is coupled to the velocity used as input to the velocity controller.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
606C	Velocity actual value	DINT	RO	TPZD	DINT	No	-	Vel units

(7) Velocity Window

The velocity window monitors whether the required process velocity has been achieved after an eventual acceleration or deceleration (braking) phase.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
606D	Velocity window	UINT	RW	No	UINT	0	Yes	Vel units

(8) Velocity Window Time

The corresponding bit 10 target reached is set in the Statusword when the difference be-tween target velocity and the velocity actual value is within the velocity window longer than the velocity window time.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
606E	Velocity window time	UINT	RW	No	UINT	0	Yes	ms

(9) Velocity Threshold

This object shall indicate the configured velocity threshold that determines if velocity actual value is exceeded or reached to threshold value.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
606F	Velocity threshold	UINT	RW	No	UINT	0	Yes	Vel units

(10) Target Velocity

The target velocity is the input for the trajectory generator and the value is given in velocity units.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60FF	Target velocity	DINT	RW	RPZD	DINT	0	-	Vel units

8.10 Profile Torque Mode

(1) Target Torque

This parameter is the input value for the torque controller in profile torque mode.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6071	Target torque	INT	RW	RPZD	INT	0	-	per thousands of rated torque

(2) Max Torque

This value represents the maximum permissible torque in the motor.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6072	Max torque	UINT	RW	No	UINT	Max motor torque *	Yes	per thousands of rated torque

* Max motor torque taken from the driver during initialization.

(3) Torque Demand

This parameter is the output value of the torque limit function (if the torque control and power-stage function are available).

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6074	Torque demand	INT	RO	TPZD	INT	0	-	per thousands of rated torque

(4) Torque Actual Value

The torque actual value corresponds to the instantaneous torque in the drive motor.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6077	Torque actual value	INT	RO	TPZD	INT	0	-	per thousands of rated torque

(5) Torque Slope

This parameter describes the rate of change of torque.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
6087	Torque slope	UDINT	RW	RPZD	UDINT	$0 \ldots 2^{31}-1$	Yes	per thousands of rated torque per second

8.11 Touch Probe Function

(1) Touch Probe Function

This object indicates the configured function of the touch probe.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60B8	Touch probe function	UINT	RW	RPZD	UINT	0	-	-

Note: Bit 0 to 7 for touch probe 1, bit 8 to 15 for touch probe 2.
60B8h bit2,10 cannot be changed after 60B8h bit 4,12 has been set to 1.

■ Data Description

Bit	Value	Explanation
0	0	Switch off touch probe 1
	1	Enable touch probe 1
1	0	Trigger first event
	1	Continuous
2	0	Trigger with touch probe 1 input
	1	Trigger with zero signal of position encoder
3	-	Reserved
4	0	Switch off sampling at touch probe 1
	1	Enable sampling at touch probe 1
5	-	Not supported
6,7	0	User-defined (not used)
8	0	Switch off touch probe 2
	1	Enable touch probe 2
9	0	Trigger first event
	1	Continuous
10	0	Trigger with touch probe 2 input
	1	Trigger with zero signal of position encoder
11	-	Reserved
12	0	Switch off sampling at touch probe 2
	1	Enable sampling at touch probe 2
13	-	Not supported
14,15	-	User-defined (not used)

(2) Touch Probe Status

This object provides the status of the touch probe.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60B9	Touch probe status	UINT	RW	TPZD	UINT	0	-	-

Note: Bit 0 to 7 for touch probe 1, bit 8 to 15 for touch probe 2.
If the continuous latch is enabled (60B8h bit1=1 or bit9=1, with every update of touch probe value stored the bit7 or bit 15 of 60B9h is toggled.

■ Data Description

Bit	Value	Explanation
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	-	Not supported
3 ... 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	-	Not supported
11 ... 14	-	Reserved
15	0,1	Toggle with every update of touch probe 2 value stored

(3) Touch Probe Pos1 Pos Value

This object shall provide the position value of the touch probe 1.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60BA	Touch probe pos1 pos value	DINT	RO	TPZD	DINT	-	-	Pos units

(4) Touch Probe Pos2 Pos Value

This object shall provide the position value of the touch probe 2.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
60BC	Touch probe pos2 pos value	DINT	RO	TPZD	DINT	-	-	Pos units

8.12 Digital Inputs/Outputs

(1) Digital Inputs

This index defines simple digital inputs for drives.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2521	Digital inputs	UINT	RO	TPZD	UINT	-	-	-

Note: 0 - Signal state is Lo (Close).
1 - Signal state is Hi (Open).
SI0 ... SI6 are user-defined by setting servo parameter. They do not have to be fixed signal.

■ Data Description

Bit	Data Description	Explanation
0	SI0	SI0 port input
1	SI1	SI1 port input
2	SI2	SI2 port input
3	SI3	SI3 port input
4	SI4	SI4 port input
5	SI5	SI5 port input
6	SI6	SI6 port input
7	Reserved	
8	HWBB1	Hardwired base block signal input 1
9	HWBB2	Hardwired base block signal input 2
10 ... 15	Reserved	

(2) Digital Outputs

This index defines simple digital outputs for drives.

PNU (hex)	Name	Data Type	Access	PDO Mapping	Value Range	Default Value	EEPROM	Units
2522	Digital outputs	UINT	RW	RPZD	UINT	0	-	-

Note: SO1 ... SO3 are defined by the user by setting servo parameter.
0 - Switch off command
1 - Switch on command
To output these signals, set servo parameter PN50E, Pn50F and Pn510 to 0.

■ Data Description

Bit	Data Description	Explanation
0	SO1	SO1 port output
1	SO2	SO2 port output
2	SO3	SO3 port output
3 ... 15	Manufacturer specific	No signal reference

9

Troubleshooting

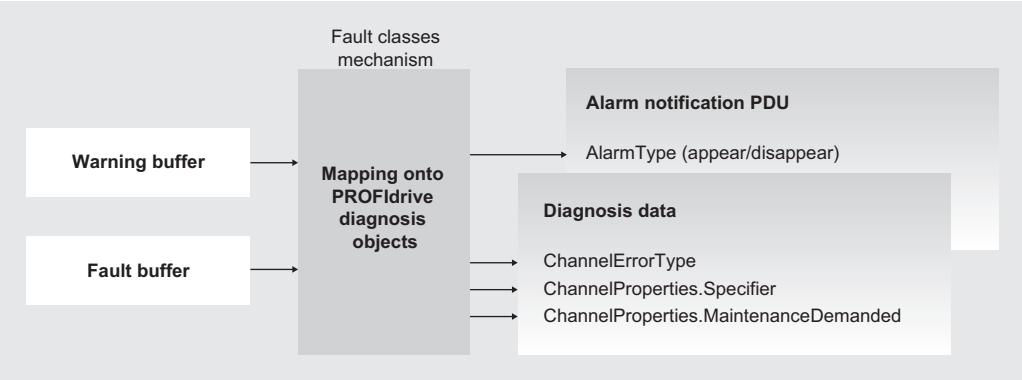
9.1 Alarm Mechanism

9.1.1 Alarm Notification PDU

When a fault or alarm situation occurs in the drive, the Option card will send an alarm notification, which the master station must acknowledge.

Attribute	Description
BlockHeader	-
AlarmType	Diagnosis appears/disappears
API	PROFIdrive profile 0x3A00
SlotNumber	Slot number of the drive object (DO)
SubslotNumber	Subslot number of the subslot to which the diagnosis object relates
ModuleIdentNumber	Module identification number of the DO
SubmoduleIdentNumber	0xFFFF
AlarmSpecifier	Diagnosis type
UserStructureIdentifier	Channel diagnosis data 0x8000
ChannelNumber	Whole submodule 0x8000
ChannelProperties.Type	0
ChannelProperties.Reserved	0
ChannelProperties.MaintenanceRequired	0 = no maintenance required 1 = maintenance required
ChannelProperties.MaintenanceDemanded	0 = no warning 1 = warning present
ChannelProperties.Specifier	0 = no fault 1 = fault present
ChannelProperties.Direction	0
ChannelProperties.Type	0
ChannelErrorType	Error code of drive fault drive alarm

9.1.2 ChannelErrorType



Fault present	Warning present	ChannelProperties	
		Specifier	Maintenance Demanded
0	0	0	0
0	1	0	1
1	0	1	0
1	1	1	0

The ChannelErrorType of the alarm notification PDU is coded as follows:

ChannelErrorType	Description
0x1xxx	For details, refer to chapters “Alarm List for SERVOPACKs with Command Option Attachable Type” and “List of the PROFINET Network Module Alarms”
0x2001	Motion buffer full warning
0x2009	Abnormal control state
0x200B	Impermissible traversing block data
0x3006	Warning: Wrong value received via PZDO
0x3008	Read/Write EEPROM error
0x3009	Communication Error

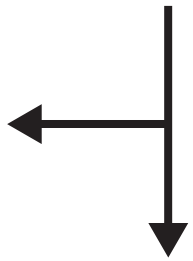
9.1.3 Fault Buffer Mechanism

The PROFIdrive profile provides a fault buffer that can store eight fault situations to PROFIdrive parameters. The table below shows the structure of the fault buffer. The rows are represented by the sub-indices. Error messages are entered in rows, in the sequence they appeared. Each line in the fault buffer represents a fault message, which is a part of a fault situation.

The error must be acknowledged after eliminating the cause. After resetting the error of STW1.bit7, this error is moved from the actual situation memory (PNU947 sub indicies 0-7) to the “fault situation n-1”. This allows subsequent tracking of the faults. The PNU 944 (fault message counter) increments each time the fault buffer changes.

Sub	PNU 947 Fault number
0	e.g. 1F10 Actual fault situation n
1	
2	
3	
4	
5	
6	
7	
8	Fault situation (n-1)
9	
10	
11	
12	
13	
14	
15	
16 ... 23	Fault situation (n-2)
24 ... 31	Fault situation (n-3)
32 ... 39	Fault situation (n-4)
40 ... 47	Fault situation (n-5)
48 ... 55	Fault situation (n-6)
56 ... 63	Fault situation (n-7)

Alarm occured



Fault message counter

PNU 944

n++

e.g. n=1

9.2 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 (ZSW1) (Object 6041h)	Statusword (ZSW1) bit 3 (Fault) turns 1. (Bit 3 is 0 when operation is normal.)
Error Code (Object PNU947)	The alarm code for the current error is stored in object PNU947.
Emergency Message	The controller is notified of the alarm that occurred. (When PROFINET 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.

9.2.1 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

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
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
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

Alarm Code	Alarm Name	Meaning	Servomotor Stop Method	Alarm Reset
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
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

∗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.

Fault Code	Meaning	Description	Operate Alarm Reset	Servomotor Stop Method
0020h ... 0D30h	Alarm/Warning from Sigma-5		Refer to Sigma-5 manual	
0E00h	Command option IF Option card initial error	This alarm is detected when the initial sequence is not completed within 10s. 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	
0E02h	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	
0E03h	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	
0E70h	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	
0E73h	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	
0E80h	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 opera-tion mode is executed.	No	

9.2.2 List of the PROFINET Network Module Alarms

This table lists the alarms of the PROFINET Network Module.

Fault Code	Meaning	Description	Operate Alarm Reset	Servomotor Stop Method	Zero Speed Stop
1EA0h	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	Gr.1	No
1EA1h	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 detect-ed so that the DPM data exchange will not be carried out.	No	Gr.1	No
1EA2h	Command-Option IF Servo Synchronization Error *1	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).	Yes	Gr.1	No
1EA3h	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).	Yes	Gr.1	No
1A4Fh	Profinet Fatal Error	Option Card resource or configuration problem.	-	-	-

9.2.3 Troubleshooting of the PROFINET 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
1EA0h	Command-Option IF Servo Unit Initial Error	Faulty connection between the SERVOPACK and the PROFINET Network Module.	Check the connection between the SERVOPACK and the PROFINET Network Module.	Reconnect the PROFINET Network Module.
		Fault occurred in the PROFINET Network Module.	–	Repair or replace the PROFINET Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
1EA1h	Command-Option IF Memory Check Error	Faulty connection between the SERVOPACK and the PROFINET Network Module.	Check the connection between the SERVOPACK and the PROFINET Network Module.	Reconnect the PROFINET Network Module.
		Fault occurred in the PROFINET Network Module.	–	Repair or replace the PROFINET Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.

(cont'd)

Alarm Code	Alarm Name	Cause	Investigative Action	Corrective Action
1EA2h	Command-Option IF Servo Synchronization Error	The synchronous timing of the SERVOPACK and the PROFINET Network Module fluctuated due to a fluctuation in the synchronous timing of PROFINET communication.	–	Turn the power supply OFF and ON again and then reestablish communication.
		Faulty connection between the SERVOPACK and the PROFINET Network Module.	Check the connection between the SERVOPACK and the PROFINET Network Module.	Reconnect the PROFINET Network Module.
		Fault occurred in the PROFINET Network Module.	–	Repair or replace the PROFINET Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.
1EA3h	Command-Option IF Servo Data Error	A communication error occurred between the SERVOPACK and the PROFINET Network Module due to noise.	–	Implement countermeasures for noise.
		Faulty connection between the SERVOPACK and the PROFINET Network Module.	Check the connection between the SERVOPACK and the PROFINET Network Module.	Reconnect the PROFINET Network Module.
		Fault occurred in the PROFINET Network Module.	–	Repair or replace the PROFINET Network Module.
		Fault occurred in the SERVOPACK.	–	Repair or replace the SERVOPACK.

9.3 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 (ZSW1) (Object 6041h)	Statusword (ZSW1) bit 7 (Warning) turns ON. (Bit 7 is OFF when operation is normal.)
Error Code (Object PNU947)	The warning code for the current error is stored in object PNU947.
Emergency Message	The controller is notified of the warning that occurred. (When PROFINET 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.

9.4 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 PROFINET communication is not established.	Check whether the PROFINET indicators show Operational state.	Change the PROFINET 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 PROFINET communication error may have occurred, and the reference may not be updated.	Check the PROFINET cable and connector wiring.	Correct the PROFINET 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.

10

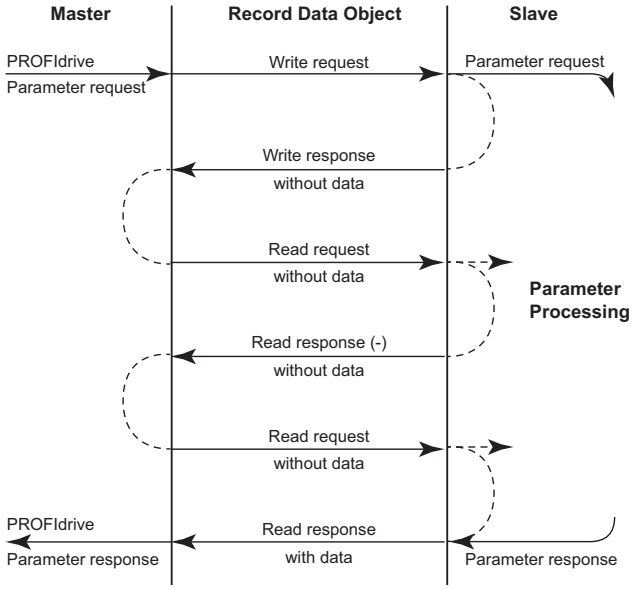
Parameter Access

10.1 Acyclic Parameter Access

A PROFIdrive acyclic parameter access mechanism can be used to access PROFIdrive parameters and drive parameters using an index of B02Eh and the structure in the figure below for write and read requests. Requests and responses between the IO device and the IO controller or the IO supervisor are transferred with “Record Data Objects”.

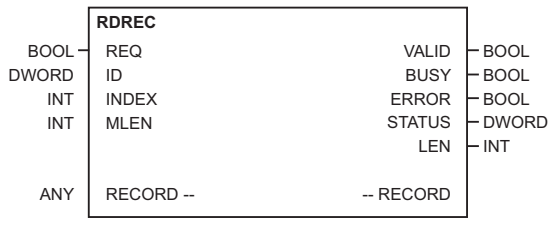
A write request is first sent containing the parameter request. If the write request is valid, the SGDV-OCB03A acknowledges it with “request accepted”. If the write request is invalid, a negative response is returned with an error code.

The master then sends a read request. If the SGDV-OCB03A is still busy performing the internal parameter request, it will return a negative response with an error code. In this case, the master repeats the read request of SGDV-OCB03A and has the PROFIdrive response data ready.

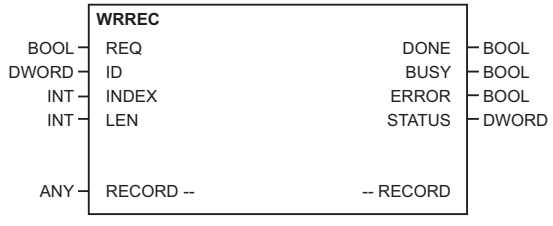


In SIMATIC Manager there are S7 standard FBs (function blocks) available for use of acyclic parameter access (read and write) of PROFIdrive parameter. These function blocks are SFB52 and SFB53:

- write one or more parameter -> SFB53 (write request change)
- write request for one or more parameter -> SFB52 (write request read)



Function block SFB53 “WRREC”
- INDEX: connect the value B02Fh, B02Eh
- write record set the length of the DP-V1 write request to MLEN
- connect the DP-V1 message to RECORD



Function block SFB52 “RDREC”
- INDEX: connect the value B02Fh, B02Eh
- read record set the max. length of the DP-V1 read response
- connect the DP-V1 message to RECORD

The content of the response differs on the write request sent before:

- Read request, called after Write request change –> information whether change request was successful/not successful, e.g. data type mismatch, value too low…)
- Read request, called after Write request read –> values of the requested parameter value(s)

The communication is like following:

- Change parameter request:
  - Write request change
  - Response
  - Read request (optional)
  - Read response (change request successful/not successful, e.g. data type mismatch…) (optional)
- Read parameter request:
  - Write request read
  - Response
  - Read request
  - Read response

All drive parameters can be read and written by performing a read or write with the index value of the corresponding parameter address in the drive. Refer to the drive's Technical Manual for a list of these parameter addresses. Data block contains PROFIdrive specific request or response header.

10.1.1 PROFIdrive Request Header

The following tables show the structure of the telegrams for the request: write parameter.

Fields	Description	Range	Byte/ Word
Request Reference	Unique identification set by the master. Changed for each new request.	1 .. 255	Byte
Request ID	Request type for the issued block.	Request Parameter (01h) Change Parameter (02h)	Byte
DO-ID	To be set to 01h.	0 .. 255	Byte
No. of Parameters	Number of parameters that are present in the request.	1	Byte
Attribute	Type of object being accessed.	Value (10h)	Byte
No. of Elements	Number of array elements accessed or length of string accessed. Set to 0 if non-array parameters are used.	0, 1 .. 234	Byte
Parameter Index (group)	Address of the PROFIdrive parameter that is being accessed.	1 .. 65535	Word
Subindex (parameter)	Addresses the first array element of the parameter. Drive parameter number when accessing drive parameters	0 .. 65535	Word
Format *	Refer to 10.1.5 Format Field 10-6.		Byte
Number of Values *	Number of values following.	1	Byte
Values *	The values of the request. In case of odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value	See Format field

* Only when Request ID is 02h (Change Parameter). The Format, Number of Values, and Value Fields are repeated for other parameters.

10.1.2 PROFIdrive Response Header

The following tables show the structure of the telegrams for the request “write parameter”:

Fields	Description	Range
Response Reference	Mirrored from request.	1 .. 255
Response ID	Response from the slave. In the event that requested services fail, a “not acknowledged” (NAK) response will be indicated.	Request Param OK (01h) Request Param NAK (81h) Change Param OK (02h) Change Param NAK (80h) not supported
DO-ID	To be set to 1.	0 .. 255
No. of Parameters	Number of parameters that are present in the response.	1 .. 37
Format *	Refer to 10.1.5 Format Field 10-6	
Number of Values *	Number of values following.	0 .. 234
Values *	The values of the request. When there is an odd number of bytes, a zero byte is appended to ensure the word structure of the telegram.	Varies based on value.

* Only when Request ID is 01h (Request parameter OK).

The Format, Number of Values, and Value fields are repeated for other parameters.

10.1.3 Write Parameter

Example: write request to change parameter

Byte	Content	Value	Comment
0	Req. Ref.	07h	Request Reference, e.g. 7
1	Req. ID	02h	Change parameter OK
2	Axis No.	01h	Axis 1
3	No. of par.	01h	Number of parameter to be changed
4	Attribute	10h	Type of object being accessed: value
5	No. of Elem.	01h	Number of elements
6	Par. No.	□□□□h	PROFIdrive parameter
8	Subind	0000h	Subindex 0 of the parameter
10	Format	□□h	Data type of “Value”, refer to 2.2.3 Data Types 2-4
11	No. of Val	01h	Number of value
12 ..*	Value	□□□□h	Value of the request

* depends on data type submitted in “Format”

Example: SGDV-OCB03A gives a positive response without values

Byte	Content	Value	Comment
0	Req. Ref.	07h	Request Reference mirrored, e.g. 7
1	Response. ID	02h	Change parameter OK
2	Axis No.	01h	Axis 1
3	No. of par.	01h	Number of parameter to be changed

10.1.4 Read Parameter

Example: write request to read parameter

Byte	Content	Value	Comment
0	Req. Ref.	08h	Request Reference, e.g. 8
1	Req. ID	01h	Request parameter OK
2	Axis No.	01h	Axis 1
3	No. of par.	01h	Number of parameter to be changed
4	Attribute	10h	Type of object being accessed: value
5	No. of Elem.	01h	Number of elements
6	Par. No.	□□□□h	PROFIdrive parameter
8	Subind	00h	Subindex 0 of the parameter

Example: SGDV-OC03A gives a positive response

Byte	Content	Value	Comment
0	Req. Ref.	08h	Request Reference mirrored, e.g. 8
1	Req. ID	01h	Request parameter OK
2	Axis No.	01h	Axis 1
3	No. of par.	01h	Number of parameter to be changed
4	Format	□□h	Data type of “Value”, refer to 2.2.3 Data Types 2-4
5	No. of Val	01h	Value was read
6 ..*	Value	□□h	Value of the parameter

* depends on data type submitted in “Format”

Example: SGDV-OC03A gives a negative response

Byte	Content	Value	Comment
0	Req. Ref.	08h	Request Reference mirrored, e.g. 8
1	Req. ID	81h	Change parameter NAK
2	Axis No.	01h	Axis 1
3	No. of par.	01h	Number of parameter to be changed
4	Format	44h	Data type of “Value”, refer to 10.1.5 Format Field 10-6
5	No. of Val	01h	Value should be read
6	Value	□□□□h	Error code

10.1.5 Format Field

The table below shows the data types for the format field in the PROFIdrive response:

Code	Data type
00h	Reserved
01h .. 38h	Standard data types
39h .. 3Fh	Reserved
40h	Zero
41h	Byte
42h	Word
43h	Double word
44h	Error
45h .. 70h	Reserved
71h .. 7Ch	Standard data types
7Dh .. FFh	Reserved

11

Appendix

11.1 Object List

Description

- VOR = Valid On Reset
- Access:
  - L = Local base mode parameter access
  - G = Global base mode parameter access
  - R = Read Only
  - RW = Read and Write
- PZDO mapping:
  - No = Can not be mapped
  - Yes = May be mapped into PNU915 and PNU916
  - TPZD = May be mapped into PNU916 only

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
915		DO IO data configuring (set point telegram)								
	0	Set point PZD 0	U16	L, RW	No	Yes	6040h	0	0xFFFF	-
	1	Set point PZD 1	U16	L, RW	No	Yes	2505h	0	0xFFFF	-
	2	Set point PZD 2	U16	L, RW	No	Yes	0	0	0xFFFF	-
	3	Set point PZD 3	U16	L, RW	No	Yes	0	0	0xFFFF	-
	4	Set point PZD 4	U16	L, RW	No	Yes	0	0	0xFFFF	-
	5	Set point PZD 5	U16	L, RW	No	Yes	0	0	0xFFFF	-
	6	Set point PZD 6	U16	L, RW	No	Yes	0	0	0xFFFF	-
	7	Set point PZD 7	U16	L, RW	No	Yes	0	0	0xFFFF	-
	8	Set point PZD 8	U16	L, RW	No	Yes	0	0	0xFFFF	-
	9	Set point PZD 9	U16	L, RW	No	Yes	0	0	0xFFFF	-
	10	Set point PZD 10	U16	L, RW	No	Yes	0	0	0xFFFF	-
	11	Set point PZD 11	U16	L, RW	No	Yes	0	0	0xFFFF	-
	12	Set point PZD 12	U16	L, RW	No	Yes	0	0	0xFFFF	-
	13	Set point PZD 13	U16	L, RW	No	Yes	0	0	0xFFFF	-
	14	Set point PZD 14	U16	L, RW	No	Yes	0	0	0xFFFF	-
	15	Set point PZD 15	U16	L, RW	No	Yes	0	0	0xFFFF	-
916		DI IO data configuring (actual value)								
	0	Actual value PZD 0	U16	L, RW	No	Yes	6041h	0	0xFFFF	-
	1	Actual value PZD 1	U16	L, RW	No	Yes	2506h	0	0xFFFF	-
	2	Actual value PZD 2	U16	L, RW	No	Yes	0	0	0xFFFF	-
	3	Actual value PZD 3	U16	L, RW	No	Yes	0	0	0xFFFF	-
	4	Actual value PZD 4	U16	L, RW	No	Yes	0	0	0xFFFF	-
	5	Actual value PZD 5	U16	L, RW	No	Yes	0	0	0xFFFF	-
	6	Actual value PZD 6	U16	L, RW	No	Yes	0	0	0xFFFF	-
	7	Actual value PZD 7	U16	L, RW	No	Yes	0	0	0xFFFF	-
	8	Actual value PZD 8	U16	L, RW	No	Yes	0	0	0xFFFF	-
	9	Actual value PZD 9	U16	L, RW	No	Yes	0	0	0xFFFF	-
	10	Actual value PZD 10	U16	L, RW	No	Yes	0	0	0xFFFF	-
	11	Actual value PZD 11	U16	L, RW	No	Yes	0	0	0xFFFF	-
	12	Actual value PZD 12	U16	L, RW	No	Yes	0	0	0xFFFF	-
	13	Actual value PZD 13	U16	L, RW	No	Yes	0	0	0xFFFF	-
	14	Actual value PZD 14	U16	L, RW	No	Yes	0	0	0xFFFF	-
	15	Actual value PZD 15	U16	L, RW	No	Yes	0	0	0xFFFF	-

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
922	0	Telegram selection	U16	L, RW	No	Yes	1	0	0xFFFF	-
		List of all parameters for signals								
	0	Empty	U16	L, R	No	No	0	-	-	-
	1	Controlword 1 (STW1)	U16	L, R	No	No	6040h	-	-	-
	2	Statusword 1 (ZSW1)	U16	L, R	No	No	6041h	-	-	-
	3	Controlword 2 (STW2)	U16	L, R	No	No	2503h	-	-	-
	4	Statusword 2 (ZSW2)	U16	L, R	No	No	2504h	-	-	-
	5	Speed setpoint A	U16	L, R	No	No	2505h	-	-	-
	6	Speed actual value A	U16	L, R	No	No	2506h	-	-	-
	7	Speed setpoint B	U16	L, R	No	No	2507h	-	-	-
	8	Speed actual value B	U16	L, R	No	No	2508h	-	-	-
	9 ... 20	Empty	U16	L, R	No	No	0	-	-	-
	21	Input (digital)	U16	L, R	No	No	2521h	-	-	-
	22	Output (digital)	U16	L, R	No	No	2522h	-	-	-
	23 ... 31	Empty	U16	L, R	No	No	0	-	-	-
	32	Traversing block selection	U16	L, R	No	No	2532h	-	-	-
	33	Actual traversing block	U16	L, R	No	No	2533h	-	-	-
	34	MDI target position	U16	L, R	No	No	607Ah	-	-	-
	35	MDI velocity	U16	L, R	No	No	6081h	-	-	-
	36	MDI acceleration	U16	L, R	No	No	2536h	-	-	-
	37	MDI deceleration	U16	L, R	No	No	2537h	-	-	-
	38	MDI mode	U16	L, R	No	No	2538h	-	-	-
923	39 ... 99	Empty	U16	L, R	No	No	0	-	-	-
	100	Modes of operation	U16	L, R	No	No	6060h	-	-	-
	101	Modes of operation display	U16	L, R	No	No	6061h	-	-	-
	102	Position demand value	U16	L, R	No	No	6062h	-	-	-
	103	Position actual internal value	U16	L, R	No	No	6063h	-	-	-
	104	Velocity demand value	U16	L, R	No	No	606Bh	-	-	-
	105	Velocity actual value	U16	L, R	No	No	606Ch	-	-	-
	106	Target torque	U16	L, R	No	No	6071h	-	-	-
	107	Torque demand	U16	L, R	No	No	6074h	-	-	-
	108	Torque actual value	U16	L, R	No	No	6077h	-	-	-
	109	Profile acceleration	U16	L, R	No	No	6083h	-	-	-
	110	Profile deceleration	U16	L, R	No	No	6084h	-	-	-
	111	Torque slope	U16	L, R	No	No	6087h	-	-	-
	112	Touch probe mode	U16	L, R	No	No	60B8h	-	-	-
	113	Touch probe status	U16	L, R	No	No	60B9h	-	-	-
	114	Touch probe pos 1 pos value	U16	L, R	No	No	60BAh	-	-	-
	115	Touch probe pos 2 pos value	U16	L, R	No	No	60BCh	-	-	-
	116	Following error actual value	U16	L, R	No	No	60F4h	-	-	-
	117	Position demand internal value	U16	L, R	No	No	60FCh	-	-	-
	118	Target velocity	U16	L, R	No	No	60FFh	-	-	-
	119	Target position in range	U16	L, R	No	No	2401h	-	-	-
	120	Actual position in range	U16	L, R	No	No	2402h	-	-	-
925	0	Sign of life failures	U16	L, RW	No	Yes	1	-	-	-
930	0	PROFIdrive operating mode	U16	L, R	No	No	8000h	-	-	-

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
944	0	Fault message counter	U16	L, R	No	No	0	-	-	-
947		Fault number								
	0 ... 7	Actual fault situation n	U16	L, R	No	No	0	-	-	-
	8 ... 15	Fault situation (n-1)	U16	L, R	No	No	0	-	-	-
	16 ... 23	Fault situation (n-2)	U16	L, R	No	No	0	-	-	-
	24 ... 31	Fault situation (n-3)	U16	L, R	No	No	0	-	-	-
	32 ... 39	Fault situation (n-4)	U16	L, R	No	No	0	-	-	-
	40 ... 47	Fault situation (n-5)	U16	L, R	No	No	0	-	-	-
	48 ... 55	Fault situation (n-6)	U16	L, R	No	No	0	-	-	-
	56 ... 63	Fault situation (n-7)	U16	L, R	No	No	0	-	-	-
952		Fault situation counter	U16	L, RW	No	No	0	-	-	-
964		Drive unit identification								
	0	Manufacturer	U16	G, R	No	No	0111h	-	-	-
	1	Drive unit type	U16	G, R	No	No	0B03h	-	-	-
	2	Software version	U16	G, R	No	No	-	-	-	-
	3	Firmware date (year)	U16	G, R	No	No	-	-	-	-
	4	Firmware date (day/month)	U16	G, R	No	No	-	-	-	-
	5	Number of drive objects (DO)	U16	G, R	No	No	0001h	-	-	-
965		Profile identification number								
	1	Profile number	OS[0]	G, R	No	No	03h	-	-	-
	2	Profile version	OS[1]	G, R	No	No	29h	-	-	-
972	0	Drive reset	U16	G, RW	No	No	0	0	1	-
974		Base mode parameter access service identification								
	0	Max block length	U16	L, R	No	No	240	-	-	-
	1	Max number of parameter requests per multi-parameter request	U16	L, R	No	No	39	-	-	-
	2	Max latency per request	U16	L, R	No	No	0	-	-	-
975		DO identification								
	0	Manufacturer	U16	L, R	No	No	0111h	-	-	-
	1	DO type	U16	L, R	No	No	0000h	-	-	-
	2	Software version	U16	L, R	No	No	-	-	-	-
	3	Firmware date (year)	U16	L, R	No	No	-	-	-	-
	4	Firmware date (day/month)	U16	L, R	No	No	-	-	-	-
	5	PROFIdrive DO type class (structure)	U16	L, R	No	No	0001h	-	-	-
	6	PROFIdrive DO sub class 1	U16	L, R	No	No	0015h	-	-	-
	7	Drive object ID (DO-ID)	U16	L, R	No	No	0001h	-	-	-
976	0	Load device parameter set	U16	G, RW	No	No	0	0	1	-
977	0	Transfer in non-volatile memory (global)	U16	G, RW	No	No	0	0	1	-
980 ... 989		Number list of defined parameter	U16[n]	L, R	No	No	-	-	-	-
61000	0 ... 239	NameOfStation	U8[n]	G, R	No	Yes *2	-	-	-	-
61001	0 ... 3	IpOfStation	OS[n]	G, R	No	Yes *2	0 0 0 0	-	-	-
61002	0 ... 5	MacOfStation	U8[n]	G, R	No	Yes *2	00 20 B5 xx yy zz	-	-	-
61003	0 ... 3	StandardGatewayOfStation	OS[n]	G, R	No	Yes *2	0 0 0 0	-	-	-
61004	0 ... 3	SubnetMaskOfStation	OS[n]	G, R	No	Yes *2	0 0 0 0	-	-	-
2100	0	Get parameter - Parameter identify	U16	RW	No	No	FFFFh	0	0xFFFF	

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
2101	0	Get parameter - Parameter value	U32	R	No	No	0	0x8000 0000	0x7FFF FFFF	
2102	0	Set parameter - Parameter identify	U16	RW	No	No	FFFFh	0	0xFFFF	
2103	0	Set parameter - Parameter value	U32	RW	No	No	0	0x8000 0000	0x7FFF FFFF	
2521	-	Digital inputs	U16	R	TPZDT-PZD	No	-	-	-	-
2522	-	Digital outputs	U16	RW	Yes	No	0	0	0xFFFF	-
6040	-	Controlword	U16	RW	Yes	No	0	0	0xFFFF	-
6041	-	Statusword	U16	R	TPZD	No	0	-	-	-
605A	-	Quick stop option code	I16	RW	No	Yes	2	0	3	-
605D	-	Halt option code	I16	RW	No	Yes	3	1	3	-
6060	-	Modes of operation	I16	RW	Yes	Yes	0	0xFFFD	0x0007	-
6061	-	Modes of operation display	I16	R	TPZD	No	0	-	-	-
2503	-	Controlword 2	U16	RW	Yes	No	0	0x0000	0xFFFF	-
2504	-	Statusword 2	U16	R	TPZD	No	0	-	-	-
2300	-	User parameter configuration	U32	RW	No	Yes	1	0	1	-
2301		Position user unit								
	0	Numerator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
	1	Denominator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
2302		Velocity user unit								
	0	Numerator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
	1	Denominator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
2303		Acceleration user unit								
	0	Numerator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
	1	Denominator	U32	RW	No	Yes	1	1	0xFFFF FFFF	-
607A	0	Target Position	I32	RW	Yes	No	0	0x8000 0000	0x7FFF FFFF	Pos
607B		Position range limit								
	0	Min position range limit	I32	RW	No	Yes	0x8000 0000	0x8000 0000	0	Pos
	1	Max position range limit	I32	RW	No	Yes	0x7FFF FFFF	0	0x7FFF FFFF	
607D		Software position limit								
	0	Min position limit	I32	RW	No	Yes	0x8000 0000	0x8000 0000	0x7FFF FFFF	Pos
	1	Max position limit	I32	RW	No	Yes	0x7FFF FFFF	0x8000 0000	0x7FFF FFFF	Pos
607F	0	Max profile velocity	U32	RW	No	Yes	Max motor speed	0	Max motor speed	Vel
6081	0	Profile velocity	U32	RW	Yes	Yes	0	0	Max profile vel (0x607F)	Vel
6083	0	Profile acceleration	U32	RW	Yes	Yes	0	0	Max accel (0x60C5)	Acc
6084	0	Profile deceleration	U32	RW	Yes	Yes	0	0	Max decel (0x60C6)	Acc
6085	0	Quick stop deceleration	U32	RW	Yes	Yes	Max motor decel	0	Max decel (0x60C6)	Acc
60C5	0	Max acceleration	U32	RW	No	Yes	Max motor accel	0	Max motor accel	Acc
60C6	0	Max deceleration	U32	RW	No	Yes	Max motor decel	0	Max motor decel	Acc
607C	0	Home offset	I32	RW	No	Yes	0	0x8000 0000	0x7FFF FFFF	Pos
6098	0	Homing method	I16	RW	No	Yes	0	0	34	-

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
6099		Homing speed								
	0	Speed during search for switch	U32	RW	No	Yes	0	0	Max motor speed	Vel
	1	Speed during search for zero	U32	RW	No	Yes	0	0	Max motor speed	Vel
609A	0	Homing acceleration	U32	RW	No	Yes	0	0	Max motor accel	Acc
2400	0	Position range limit designation	U16	RW	No	Yes	0	0	3	-
2401	0	Target position in range	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Pos
2402	0	Actual position in range	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Pos
6062	0	Position demand value	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Pos
6063	0	Position actual value - inc	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Inc
6064	0	Position actual value - units	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Pos
6065	0	Following error window	U32	RW	No	Yes	32 (20h)	0	0x7FFF FFFF	Pos
6066	0	Following error time out	U16	RW	No	Yes	0	0	0xFFFF	ms
6067	0	Position window	U32	RW	No	Yes	32 (20h)	0x8000 0000	0x7FFF FFFF	Pos
6068	0	Position window time	U16	RW	No	Yes	0	0	0XFFFF	ms
60F4	0	Following error actual value	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Pos
60FC	0	Position demand value - inc	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Inc
60C2		Interpolation time period								
	0	Interpolation time units	I16	RW	No	Yes	1	1	4	-
2505	0	Speed setpoint A (NSOLL_A)	I16	RW	RPZD	No	0	0x8000	0x7FFF	N2 Vel
2506	0	Speed actual value A (NIST_A)	I16	R	TPZD	No	-	0x8000	0x7FFF	N2 Vel
2507	0	Speed setpoint B (NSOLL_B)	I32	RW	RPZD	No	0	0x8000 0000	0x7FFF FFFF	N4 Vel
2508	0	Speed actual value B (NIST_B)	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	N4 Vel
606B	0	Velocity demand value	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Vel
606C	0	Velocity actual value	I32	R	TPZD	No	-	0x8000 0000	0x7FFF FFFF	Vel
606D	0	Velocity window	U16	RW	No	Yes	0	0x000	0xFFFF	Vel
606E	0	Velocity window time	U16	RW	No	Yes	0	0x000	0xFFFF	ms
606F	0	Velocity threshold	U16	RW	No	Yes	0	0x000	0xFFFF	Vel
60FF	0	Target velocity	I32	RW	RPZD	No	0	0x000	0xFFFF	Vel
6071	0	Target torque	I16	RW	RPZD	No	0	0x8000 0000	0x7FFF FFFF	*1
6072	0	Max torque	U16	RW	No	Yes	Max motor torque	Neg. max motor torque	Max motor torque	*1
6074	0	Torque demand	I16	R	TPZD	No	0	0x8000	0x7FFF	*1
6077	0	Torque actual value	I16	R	TPZD	No	0	0x8000	0x7FFF	*1
6087	0	Torque slope	U32	RW	RPZD	Yes	0	0x0000 0000	0x7FFF FFFF	*2

∗1. Per thousands of rated torque
∗2. Per thousands of rated torque per second

60B8	0	Touch probe function	U16	RW	RPZD	No	0	0	0xFFFF	-
60B9	0	Touch probe status	U16	R	TPZD	No	0	0	0xFFFF	-
60BA	0	Touch probe pos 1 pos value	I32	R	TPZD	No	-	0x8000 000	0x7FFF FFFF	Pos
60BC	0	Touch probe pos 2 pos value	I32	R	TPZD	No	-	0x8000 000	0x7FFF FFFF	Pos
2532	0	Traversing block selection (SATZANW)	U16	RW	RPZD	Yes	0	0x0000	0xFFFF	-
2533	-	Actual traversing block (AKTSATZ)	U16	R	TPZD	No	0	-	-	-
2536	-	MDI acceleration (MDI_ACC)	U16	RW	RPZD	No	0	0	0xFFFF	*3

PNU	Sub	Name	Data Type	Access	PDO Mapping	EEPROM *1	Default Value	Lower Limit	Upper Limit	Unit
2537	-	MDI deceleration (MDI_DEC)	U16	RW	RPZD	No	0	0	0xFFFF	*3
		∗3. Normalized (N2) acc units								
2538	-	MDI mode (MDI_MOD)	U16	RW	RPZD	No	0	0	1	-
2610		Traversing block task mode								
	0	Task mode value 0	U32	RW	No	Yes	0	0	0xFFFF FFFF	-
	1 ... 63	Task mode value 1 ... 63	U32	RW	No	Yes	0	0	0xFFFF FFFF	-
2611		Traversing block target position								
	0	Target position value 0	I32	RW	No	Yes	0	0x8000 0000	0x7FFF FFFF	Pos
	1 ... 63	Target position value 1 ... 63	I32	RW	No	Yes	0	0x8000 0000	0x7FFF FFFF	Pos
2612		Traversing block profile velocity								
	0	Profile velocity value 0	U32	RW	No	Yes	0	0	0x7FFF FFFF	Vel
	1 ... 63	Profile velocity value 1 ... 63	U32	RW	No	Yes	0	0	0x7FFF FFFF	Vel
2613		Traversing block profile acceleration								
	0	Profile acceleration value 0	U32	RW	No	Yes	0	0	0x7FFF FFFF	Acc
	1 ... 63	Profile acceleration value 1 ... 63	U32	RW	No	Yes	0	0	0x7FFF FFFF	Acc
2614		Traversing block profile deceleration								
	0	Profile deceleration value 0	U32	RW	No	Yes	0	0	0x7FFF FFFF	Acc
	1 ... 63	Profile deceleration value 1 ... 63	U32	RW	No	Yes	0	0	0x7FFF FFFF	Acc

∗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. Pn No. is the number of the parameter used for the digital operator and SigmaWin+.

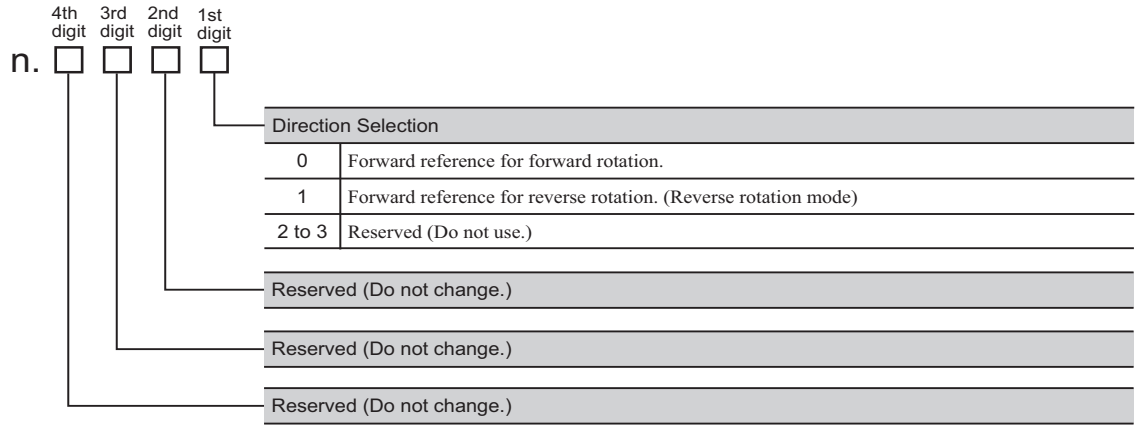
11.2 SERVOPACK Parameters

The following table lists the SERVOPACK parameters. All parameters can be accessed by base mode parameter access mechanism.

<Note>

- Use the objects 2102h (Set parameter - parameter identify) and 2103h (Set parameter - parameter value) to write the parameters via acyclic parameter access functionality. Use the object PNU977 to 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
  - May not be configured as DO IO data
  - Enabled to be stored in the EEPROM (non-volatile memory)
  - In the PROFINET 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



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.)

Pn002	Application Function Select Switch 2	0000 to 4113	–	0000	After restart	UINT

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

Torque Limit Reference Selection for Profinet Network Module

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

Speed Limit Reference Selection for Profinet Network Module

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

Absolute Encoder Usage

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

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)

2nd and 1st 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)

2nd and 1st digits: 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})

3rd digit: Reserved (Do not change.)

4th digit: Reserved (Do not change.)

*1. In the PROFINET 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
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

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

Reserved (Do not change.)

Current Control Method Selection

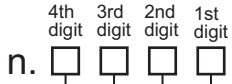
0	Current control method 1
1	Current control method 2

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



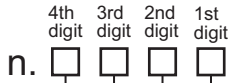
Parameter Display Selection	
0	Setup parameters
1	All parameters

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



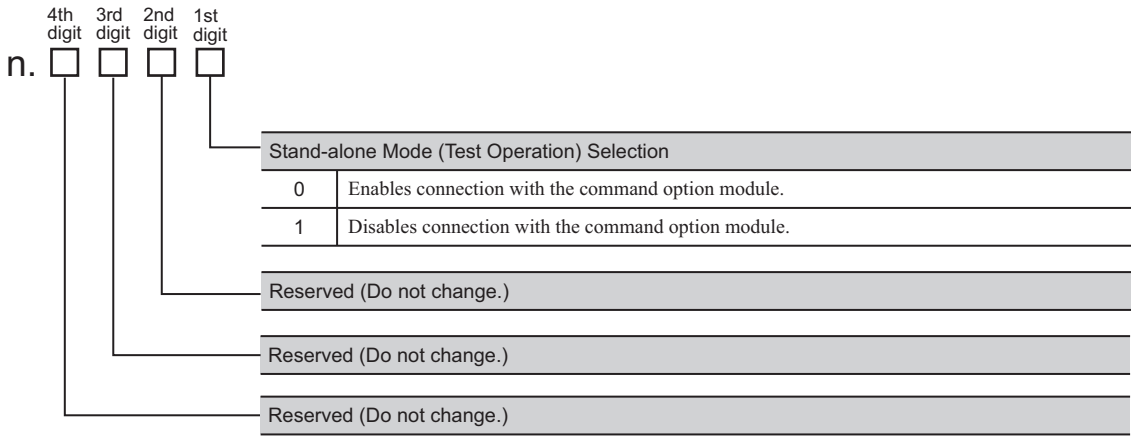
Selection of Test without Motor	
0	Test without motor disabled
1	Test without motor enabled

Encoder Resolution for Test without Motor	
0	13 bits
1	20 bits

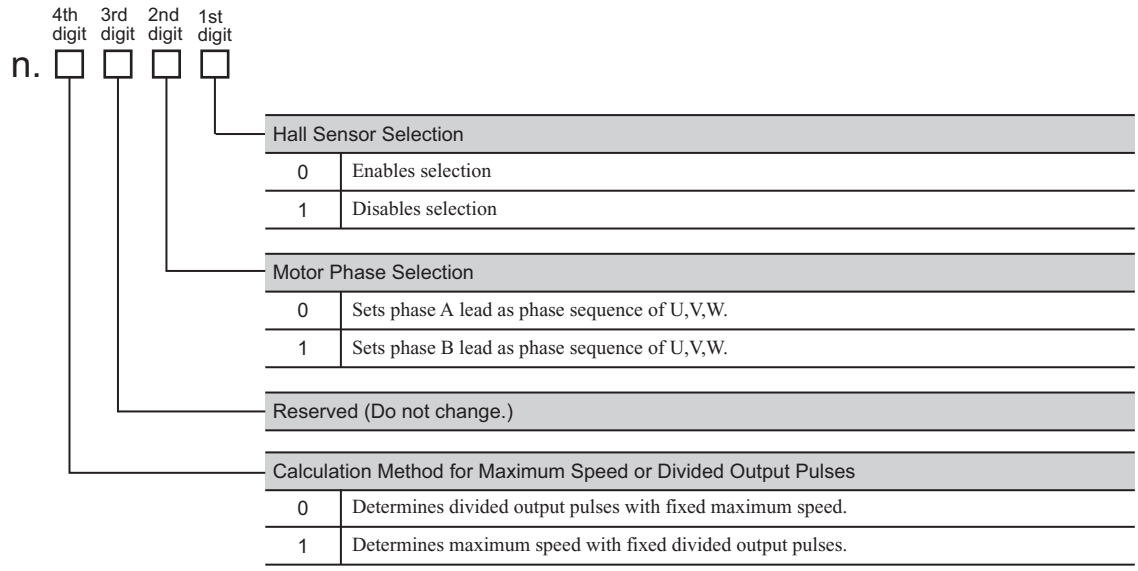
Encoder Type for Test without Motor	
00	Incremental encoder
01	Absolute encoder

Reserved (Do not change.)

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



Pn010	Axis Address Selection (for UART/USB communication)	0000 to 007F	–	0001	After restart	UINT
Pn080	Application Function Select Switch 80	0000 to 1111	–	0000	After restart	UINT

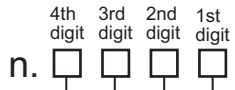


Pn100	Speed Loop Gain	10 to 20000	0.1 Hz	400	Immediately	UINT
Pn101	Speed Loop Integral Time Constant	15 to 51200	0.01 ms	2000	Immediately	UINT
Pn102	Position Loop Gain	10 to 20000	0.1/s	400	Immediately	UINT
Pn103	Moment of Inertia Ratio	0 to 20000	1%	100	Immediately	UINT
Pn104	2nd Speed Loop Gain	10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



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	Mode Switch (speed reference)	0 to 10000	1 min^{-1}	0	Immediately	UINT
Pn10E	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 PROFINET 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

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

Gain Switching Selection Switch*1

0	Manual gain switching (Cannot be used with the Profinet Network Module.)
1	Reserved (Do not change.)
2	Automatic gain switching pattern 1 Changes automatically 1st gain to 2nd gain when the switching condition A is satisfied. Changes automatically 2nd gain to 1st gain when the switching condition A is not satisfied.

Gain Switching Condition A

0	Positioning completion signal (/COIN) ON
1	Positioning completion signal (/COIN) OFF
2	NEAR signal (/NEAR) ON
3	NEAR signal (/NEAR) OFF
4	Position reference filter output = 0 and reference input OFF
5	Position reference input ON

Reserved (Do not change.)

Reserved (Do not change.)

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

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

Model Following Control Selection

0	Does not use model following control.
1	Uses model following control.

Vibration Suppression Selection

0	Does not perform vibration suppression.
1	Performs vibration suppression over the specified frequency.
2	Performs vibration suppression over two different kinds of frequencies.

Vibration Suppression Adjustment Selection

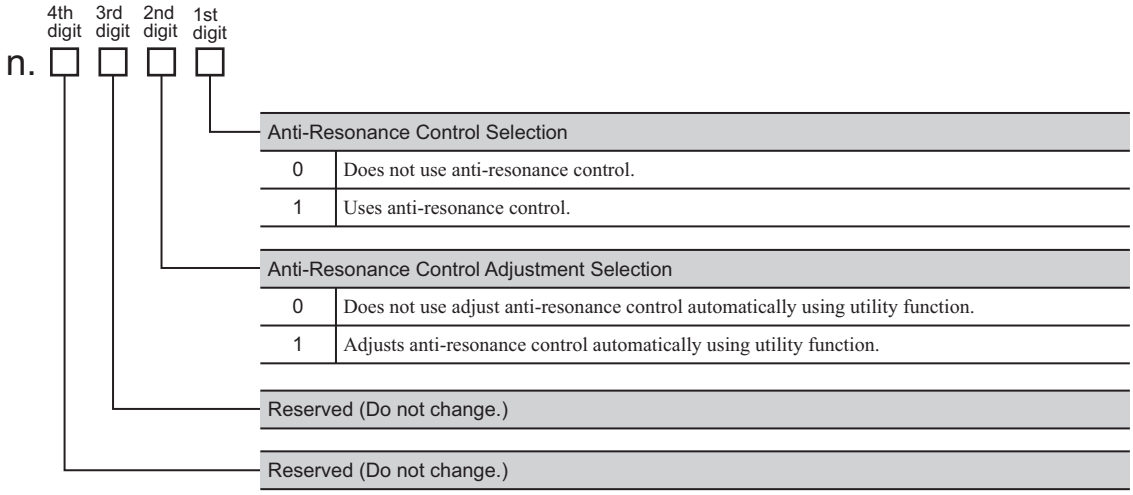
0	Does not adjust vibration suppression automatically using utility function.
1	Adjusts vibration suppression automatically using utility function.

Selection of Speed Feedforward (VFF) / Torque Feedforward (TFF)

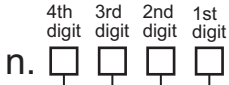
0	Does not use model following control and speed/torque feedforward together.
1	Uses model following control and speed/torque feedforward together.

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.		

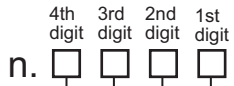
Tuning-less Tuning Level		When Enabled	Data Type
0 to 4	Sets tuning-less tuning level.	Immediately	UINT

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

Pn181	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	Mode Switch (Acceleration)	0 to 30000	1 mm/s^2	0	Immediately	UINT
Pn205	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.)

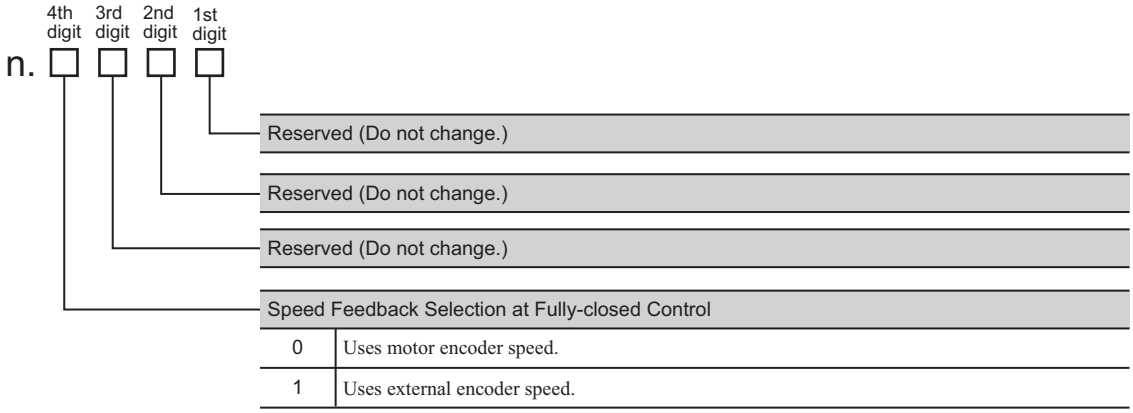
Reserved (Do not change.)

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

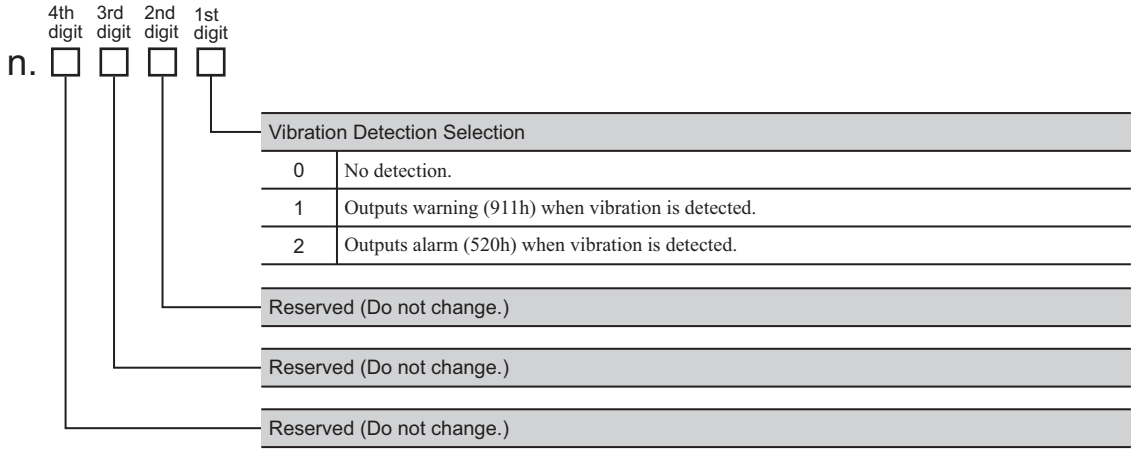
Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn212	Encoder Output Pulses	16 to 1073741824 (2^{30})	1 P/rev	2048	After restart	UDINT
Pn22A	Fully-closed Control Selection Switch	0000 to 1003	–	0000	After restart	UINT



Pn281	Encoder Output Resolution	1 to 4096	1 P/pitch	20	After restart	UINT
Pn282	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 PROFINET Network Module.

Pn304	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	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	JOG Speed	0 to 10000	1 mm/s	50	Immediately	UINT
Pn384	Vibration Detection Level	0 to 5000	1 mm/s	10	Immediately	UINT
Pn385	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	Forward Torque Limit	0 to 800	1%	800	Immediately	UINT
Pn403	Reverse Torque Limit	0 to 800	1%	800	Immediately	UINT

Pn No.	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
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	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.		

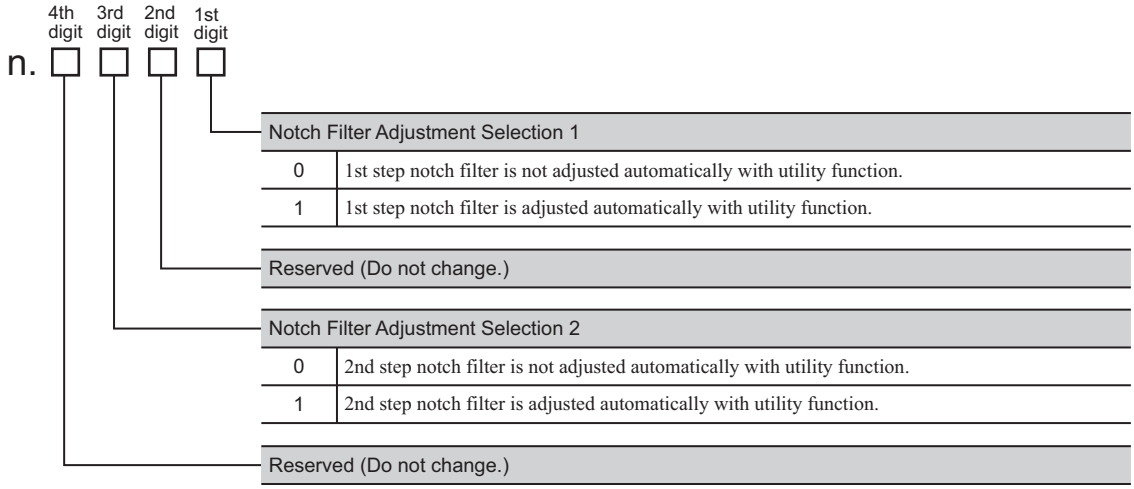
Speed Limit Selection		When Enabled	Data Type
0	Uses the smaller value between motor max. speed and parameter Pn407 as speed limit value.	After restart	UINT
1	Uses the smaller value between overspeed detection speed and parameter Pn407 as speed limit value.		

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

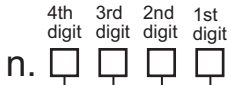


Pn480	Speed Limit during Force Control	0 to 10000	1 mm/s	10000	Immediately	UINT
Pn481	Polarity Detection Speed Loop Gain	1.0 to 2000.0	0.1 Hz	40.0	Immediately	UINT
Pn482	Polarity Detection Speed Loop Integral Time Constant	0.15 to 512.00	0.01 ms	30.00	Immediately	UINT
Pn483	Forward Force Limit	0 to 800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

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

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

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

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

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

Object Index (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.)

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.

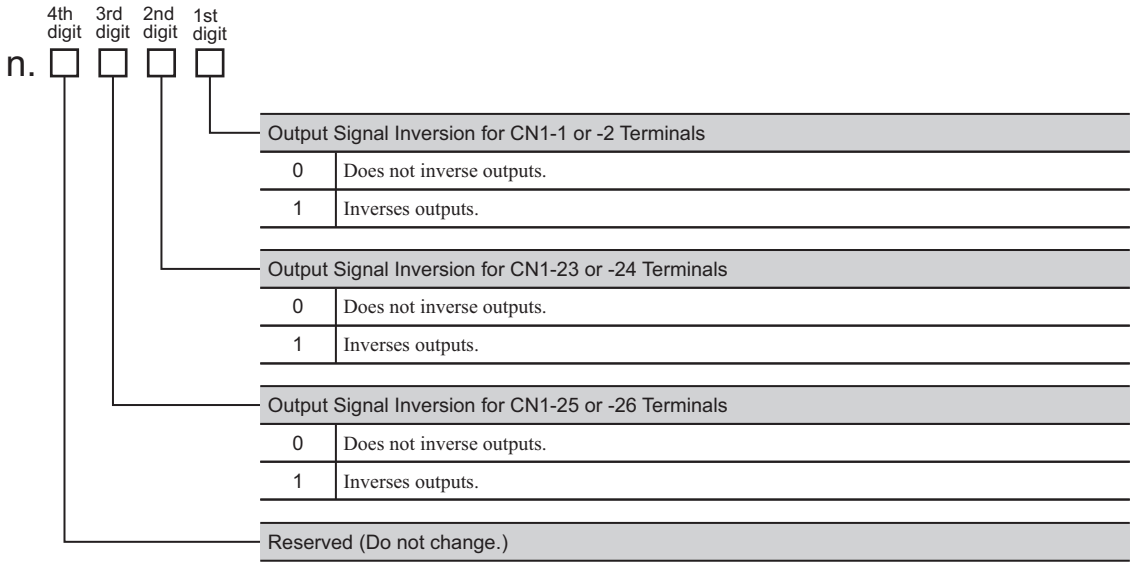
3rd digit: Input Signal Mapping for /Probe2 (/SI5)

0 to F	Same as /Probe1 signal mapping.

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

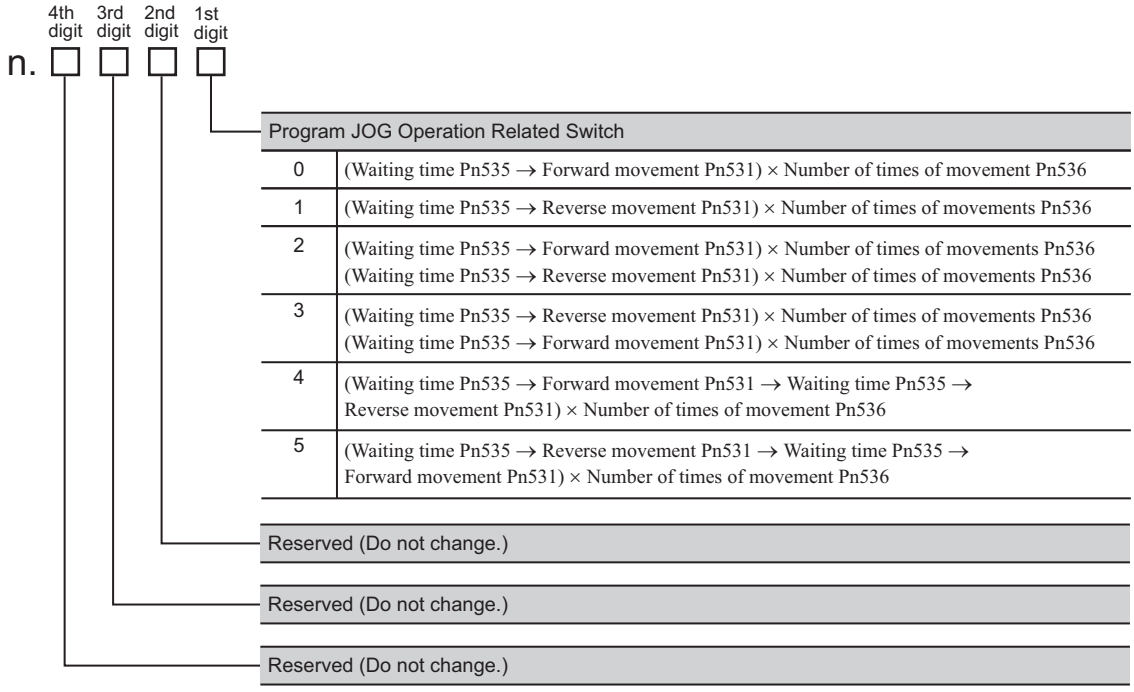
0 to F	Same as /Probe1 signal mapping.

Object Index (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	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	10737418 24	Immediately	UDINT
Pn526	Excessive Position Error Alarm Level at Servo ON	1 to 1073741823 (2^{30}-1)	1 reference unit*1	5242880	Immediately	UDINT
Pn528	Excessive Position Error Warning Level at Servo ON	10 to 100	1%	100	Immediately	UINT
Pn529	Speed Limit Level at Servo ON	0 to 10000	1 min^{-1}	10000	Immediately	UINT
Pn52A	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 PROFINET 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 PROFINET Network Module is used, this parameter is not required to be set. Use the factory setting for this parameter.

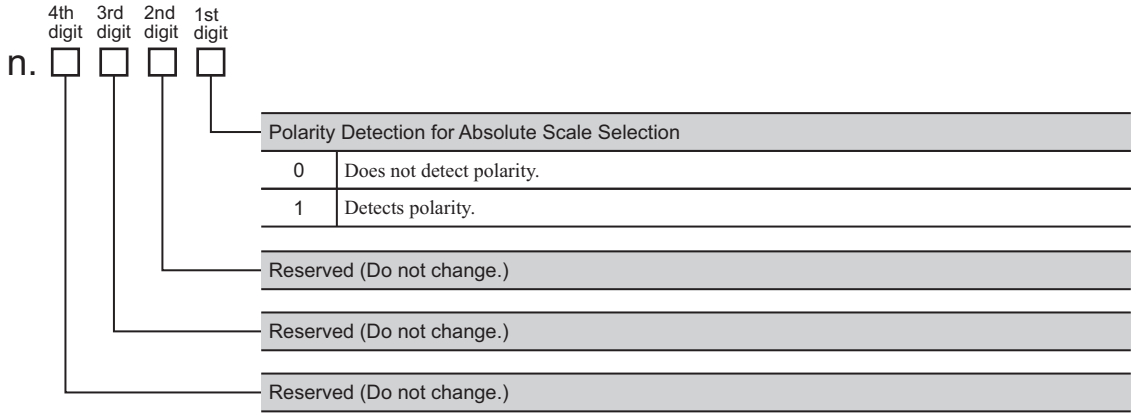
Object Index (Pn No.)	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn530	Program JOG Operation Related Switch	0000 to 0005	–	0000	Immediately	UINT



Pn531	Program JOG Movement Distance	1 to 1073741824 (2^{30})	1 reference unit*1	32768	Immediately	UDINT
Pn533	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	Speed Coincidence Signal Output Width	0 to 100	1 mm/s	10	Immediately	UINT
Pn583	Brake Reference Output Speed Level	0 to 10000	1 mm/s	10	Immediately	UINT

∗1. In the PROFINET 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).

Object Index (Pn No.)	Name	Setting Range	Units	Factory Setting	When Enabled	Data Type
Pn584	Speed Limit Level at Servo ON	0 to 10000	1 mm/s	10000	Immediately	UINT
Pn585	Program JOG Movement Speed	1 to 10000	1 mm/s	50	Immediately	UINT
Pn586	Motor Running Air-cooling Ratio	0 to 100	1%/maxvel	0	Immediately	UINT
Pn587	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).

11.3 PROFINET Parameter Request Error Codes

The following table shows the PROFIdrive parameter request error codes.

Error	Meaning	Used at
0x00	Impermissible parameter number	Access to unavailable parameter
0x01	Parameter value cannot be changed	Change access to a parameter value that cannot be changed
0x02	Low or high limit exceeded	Change access with value outside the limits
0x03	Invalid subindex	Access to unavailable subindex
0x04	No array	Access with subindex to non-indexed parameter
0x05	Incorrect data type	Change access with value that does not match the data type of the parameter
0x06	Setting not permitted (can only be reset)	Change access with value unequal to 0 when this is not permitted
0x07	Description element cannot be changed	Change access to a description element that cannot be changed
0x09	No description data available	Access to unavailable description (parameter value is available)
0x0B	No operation priority	Change access rights without rights to change parameters
0x0F	No text array available	Access to text array that is not available (parameter value is available)
0x11	Request cannot be executed because of operating mode	Access is temporarily not possible for reasons that are not specified in detail Error cause: 1. Attempt to implement mapping when the mapping is not enabled 2. Attempt to set Sigma-5 parameter value (object 2103h) in the Machine state S4: Operation enabled 3. Wrong Machine state for setting User Unit Group Enable (object 2300h).It is only allowed in S1: Switch On Inhibited state 4. Attempt to set Software position limit in Machine state S4: Operation enabled, S5: Switching Off (Ramp Stop/Quick Stop) 5. Attempt to set Position range limit in Machine state S4: Operation enabled, S5: Switching Off (Ramp Stop/Quick Stop) 6. Attempt to set S3: Switched On or S4: Operation enabled in case of main power is off or Safety state (HWBB) 7. Attempt to set pole detection mode in the states except Servo Off 8. Attempt to change operation mode from pole detection mode to other modes before pole detection completion
0x14	Value impermissible	Change access with a value that is within limits but is not permissible for other long- term reasons (parameter with defined single values) Error cause: 1. The command in the Controlword is not allowed 2. Attempt to write not supportable mode to object 6060h 3. The commanded homing method is not supported 4. PZDO communication parameter wrong setting 5. In the objects 2100h and 2101h attempts to read/write value from/to not exist parameter number 6. User Unit Group Enable (object 2300h) - 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 7. Attempt to write value to any object from device profile in case of User Unit Group Enable object 2300h bit 0 not equal to 1 8. Absolute Target Torque is greater than Max Torque 9. Absolute Target Velocity is greater than Max Profile Velocity 10. Attempt to change operation mode to pole detection mode in Servo On states 11. Attempt to move into pole detection mode in case of rotary motor is forbidden
0x15	Response too long	The length of the current response exceeds the maximum transmittable length
0x16	Parameter address impermissible	Illegal value or value that is not supported for the attribute, number of elements, parameter number or subindex, or a combination
0x17	Illegal format	Write request: Illegal format or format of parameter data that is not supported

Error	Meaning	Used at
0x18	Number of values inconsistent	Write request: Number of values of parameter data does not match number of elements at the parameter address
0x19	DO nonexistent	Request to DO, which does not exist
0x20	Parameter text element cannot be changed	Change access to a parameter text element that cannot be changed
0x21	Illegal Request ID	Service not supported
0x22	Too much parameters requests	Permissible number of requested parameter is reached or actually exist
0x65	Vendor-specific error	Vendor-specific error
0x78	PZD map failure	Parameter cannot be mapped to PZD (size mismatch or non-existent)
0x79	PZD memory failure	Parameter cannot be mapped to PZD (out of memory)

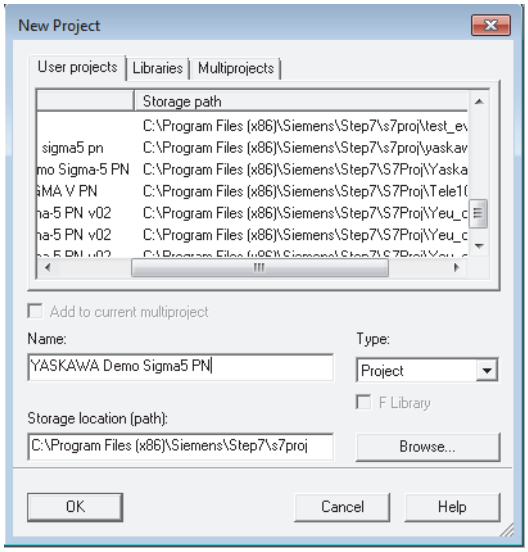
* Manufacturer specific error codes: 0x65 ... 0xFF

12

SIMATIC Manager

12.1 Create new project

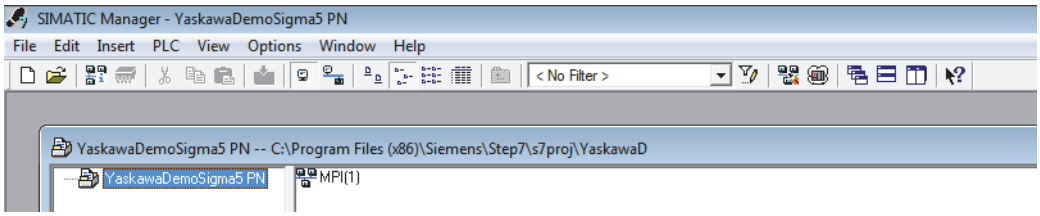
• Open SIMATIC Manager.
• Select “File > New” to set up a new project.

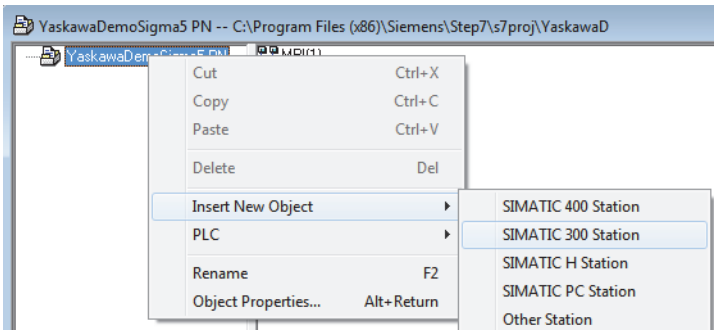


• Enter a project name.
• Do not change the default settings for “Type” and “Storage location (path)”

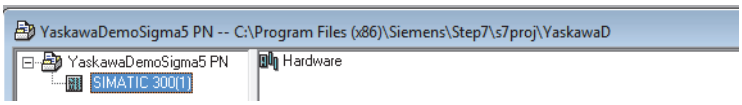
12.2 Add SIMATIC Station

• Right-click on the project and select “Insert New Object > SIMATIC 300 Station”.





The SIMATIC station is shown in the window in the left. The default name “SIMATIC 300(1)” can be changed during insertion or after inclusion.

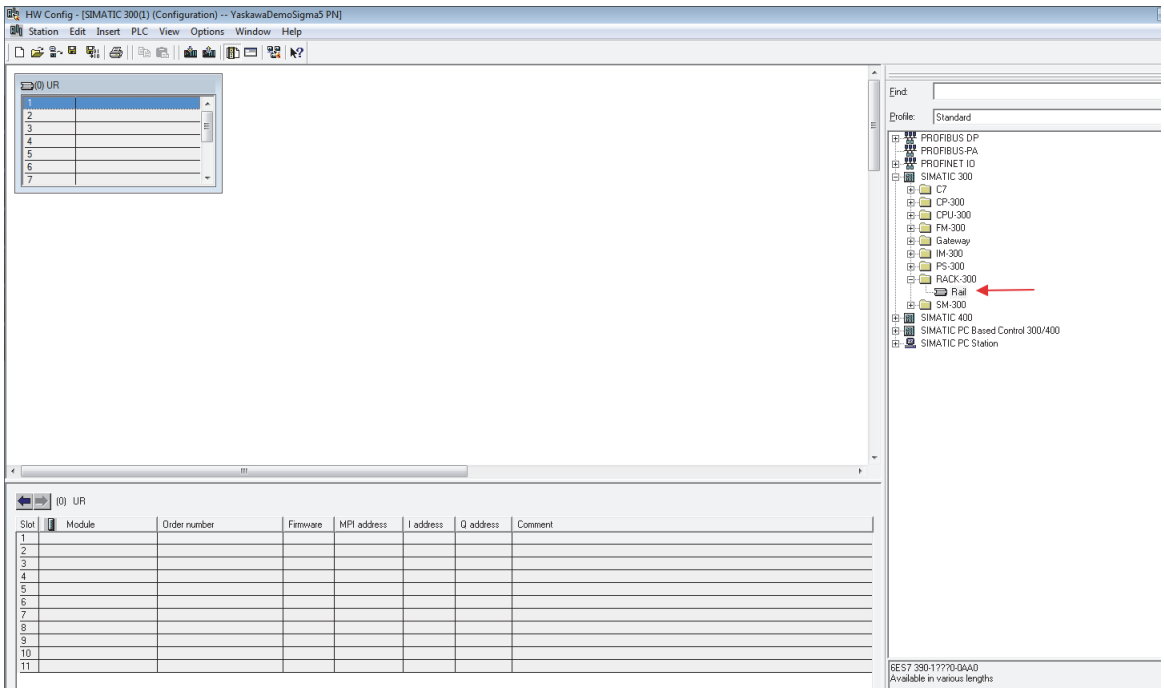


12.3 Setup PLC - HW Config

• To open the “HW Config” tool, double-click “Hardware” in the SIMATIC Manager project, right pane of the project view.

12.3.1 Add mounting rail

• In the hardware catalog, select “SIMATIC 300 > RACK-300 > Rail” and drag it into the hardware configuration window.

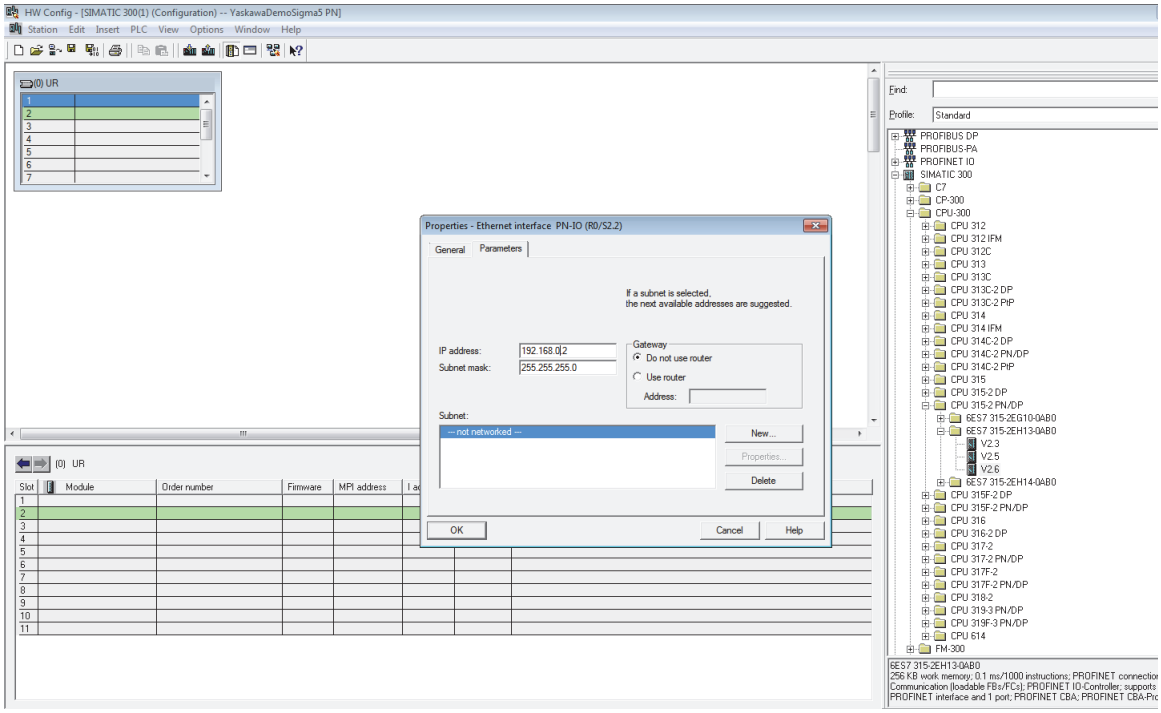


12.3.2 Add CPU

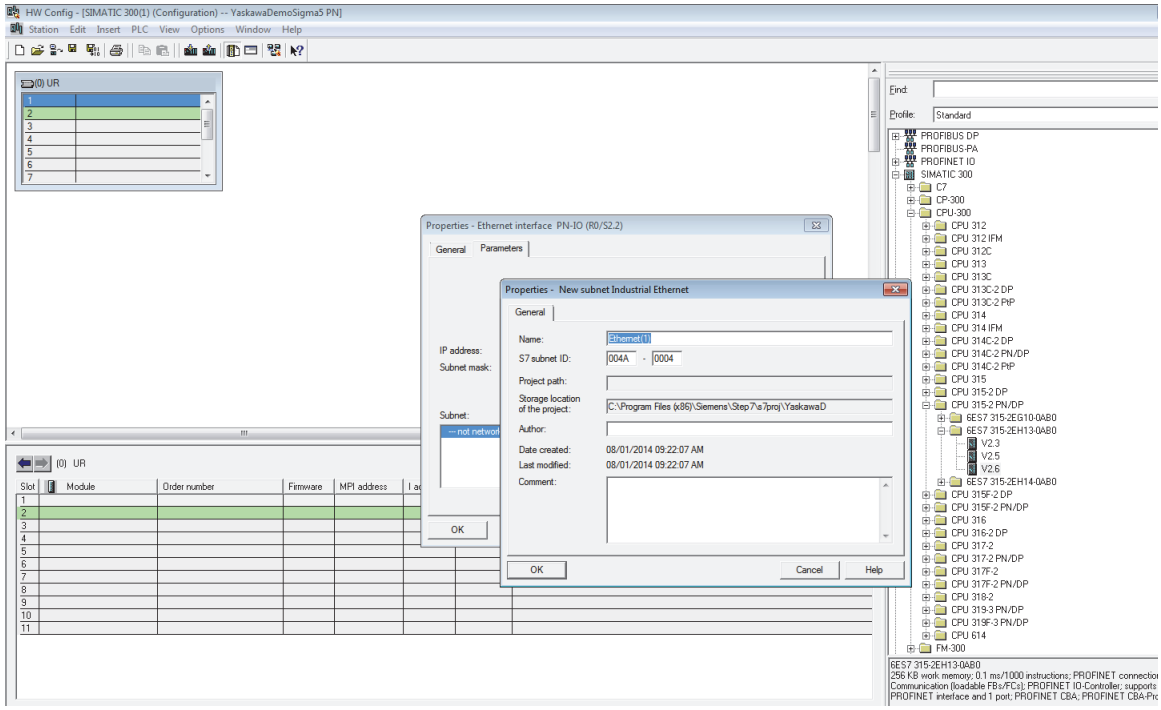
• In the hardware catalog, select “SIMATIC 300 > CPU-300 > CPU 315-2 PN/DP > 6ES7 315-2EH13-0AB0 > V2.6” and drag it into slot 2 of the added rail.

• In the properties window, select an IP address for the PROFInet port (X8).

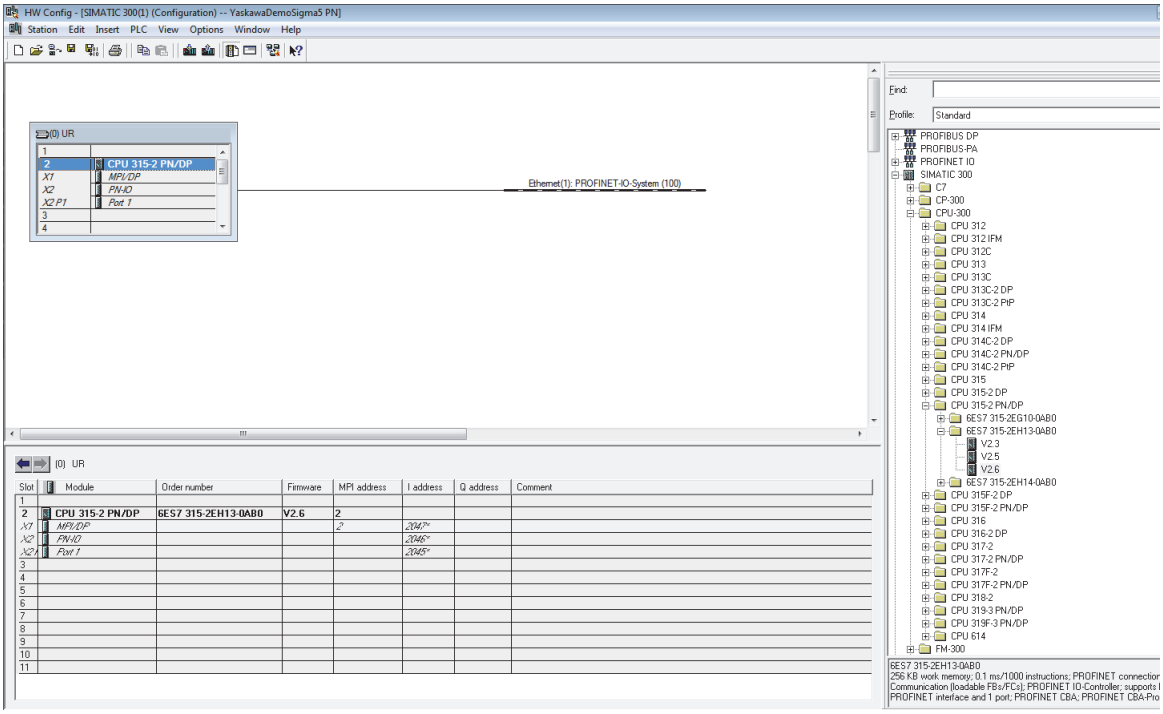
All devices added from now will get an IP address in this address space.



- To include a PROFInet subnet, click the button “New...” in the properties window and select a name for the subnet. The “S7 subnet ID” does not have to be changed.



After all steps are executed, the hardware configuration looks like in the following image:



To comply with the Siemens SIMATIC Manager, the following steps should be executed:

- Start the Siemens HW Config tool (Hardware Configuration tool) and create a new project.
- Insert a mounting rail from hardware catalog.
- Place the following Siemens CPU in slot 2: CPU 315-2EH13 (6ES7 315-2EH13-0AB0 V2.6).
- Configure and connect the integrated PROFIBUS DP master (X3) via the sub module X1 (MPI/DP). In operation mode PROFIBUS the CPU may furthermore be accessed via the MPI interface (X2) with address 2 and 187.5kbit/s.
- Configure the PROFInet IO-controller via the sub module S2 (PN-IO).

12.4 Setup Sigma-5 SERVOPACK

12.4.1 Installation of the GSDML file

Before the servo drive can be configured, it has to be listed in the SIMATIC hardware catalog. The first step to integrate the Sigma-5 drive with PROFInet interface is the installation of the device description file. This GSDML-file (Generic Station Description Markup Language) contains all necessary information necessary for integration and configuration.

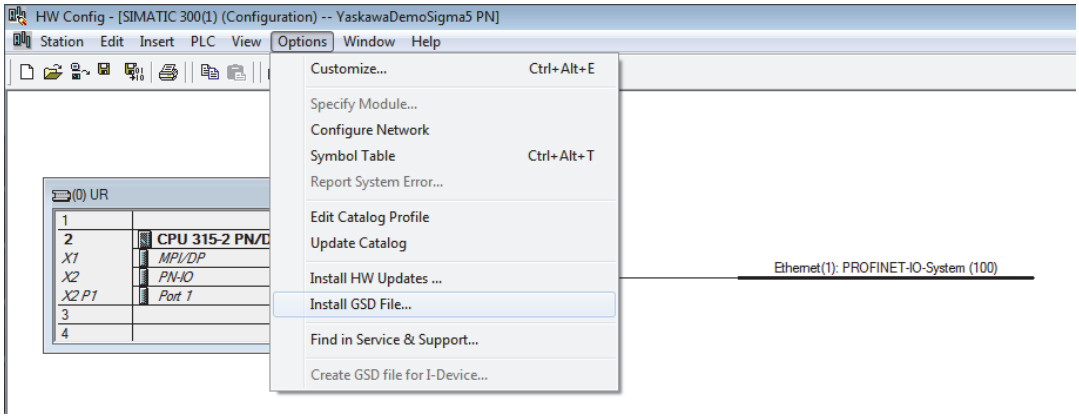
After installation, the Sigma-5 servo drive can be found in the hardware catalog at “PROFINET IO > Additional field devices > Drives > Yaskawa Drives”.

The GSDML file contains 2 files, the XML-file and a bitmap file. For installation both files have to be stored in the same location. The naming of the GSDML file is for example:

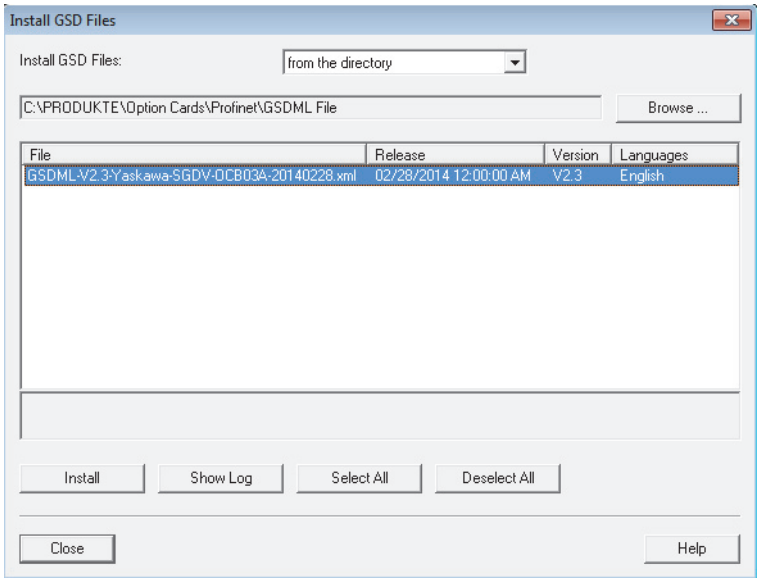
- GSDML-V2.3-Yaskawa-SGDV-OCB03A-20140228.xml
- GSDML-0111-0250-Yaskawa-SGDV-OCB03A_N.bmp

How to install the GSDML file

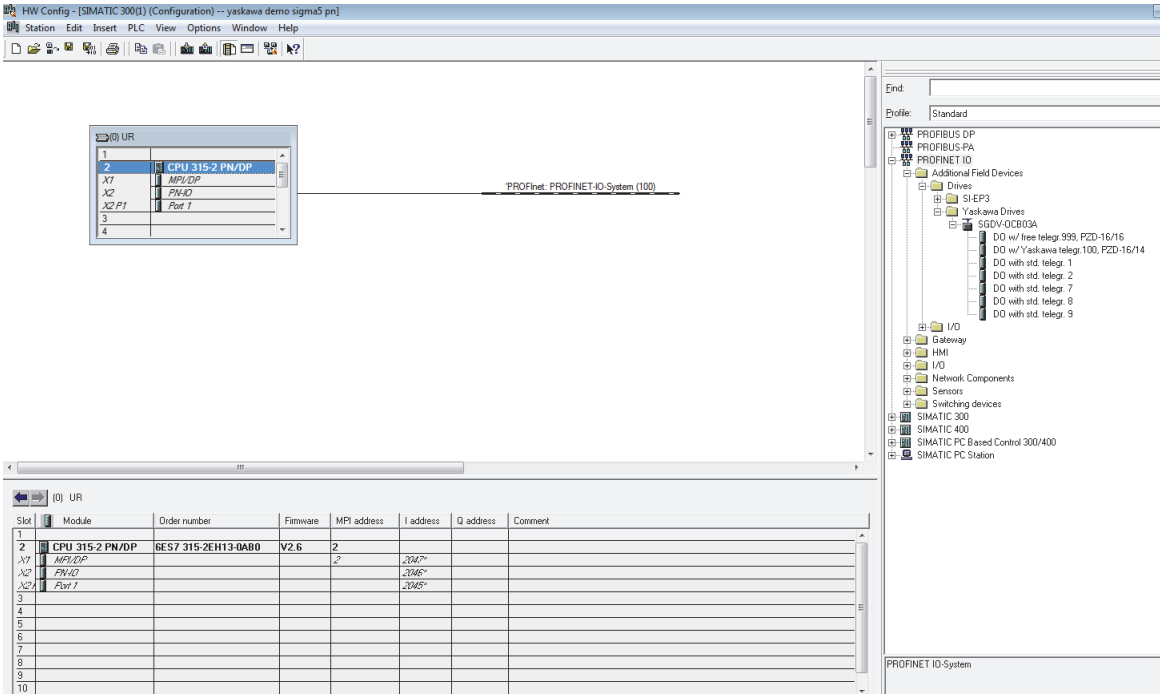
- Select “Options > Install GSD File...”.



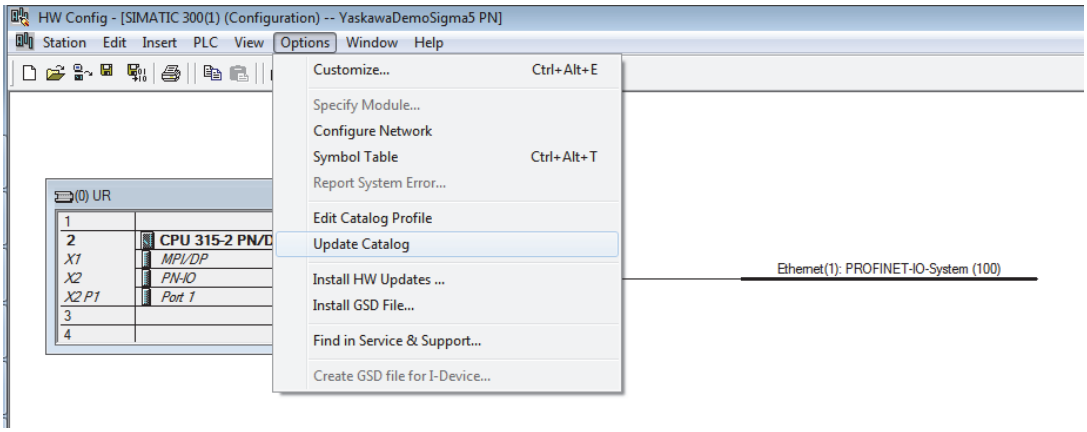
- Click the “Browse...” button to navigate to the location of the GSD file.
  If a bitmap picture representing the servo drive is requested, make sure that the bitmap file is located in the same folder as the GSDML file. A bitmap file is included in the GSDML zip-file.
- Select the GSD file and click the “Install” button to start the installation.



After installing the GSDML file, the Sigma-5 drive should be available in the hardware catalog.

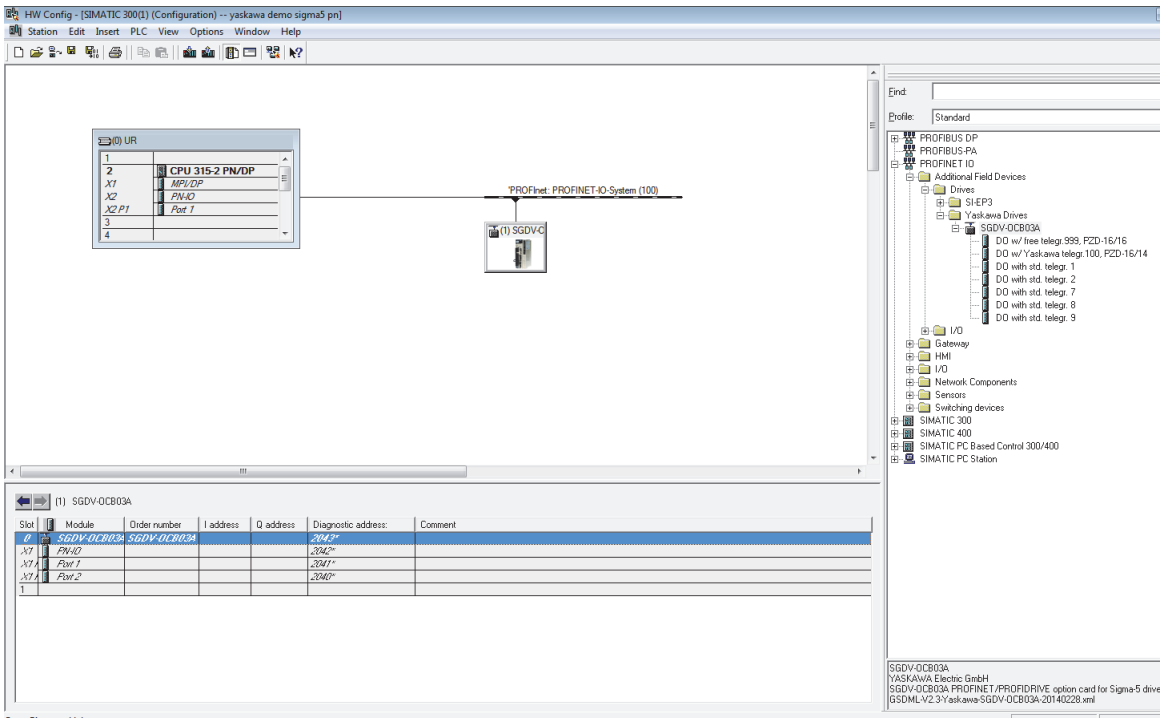


If the Sigma-5 drive is not available, you have to update the catalog manually. Click “Options > Update Catalog”.



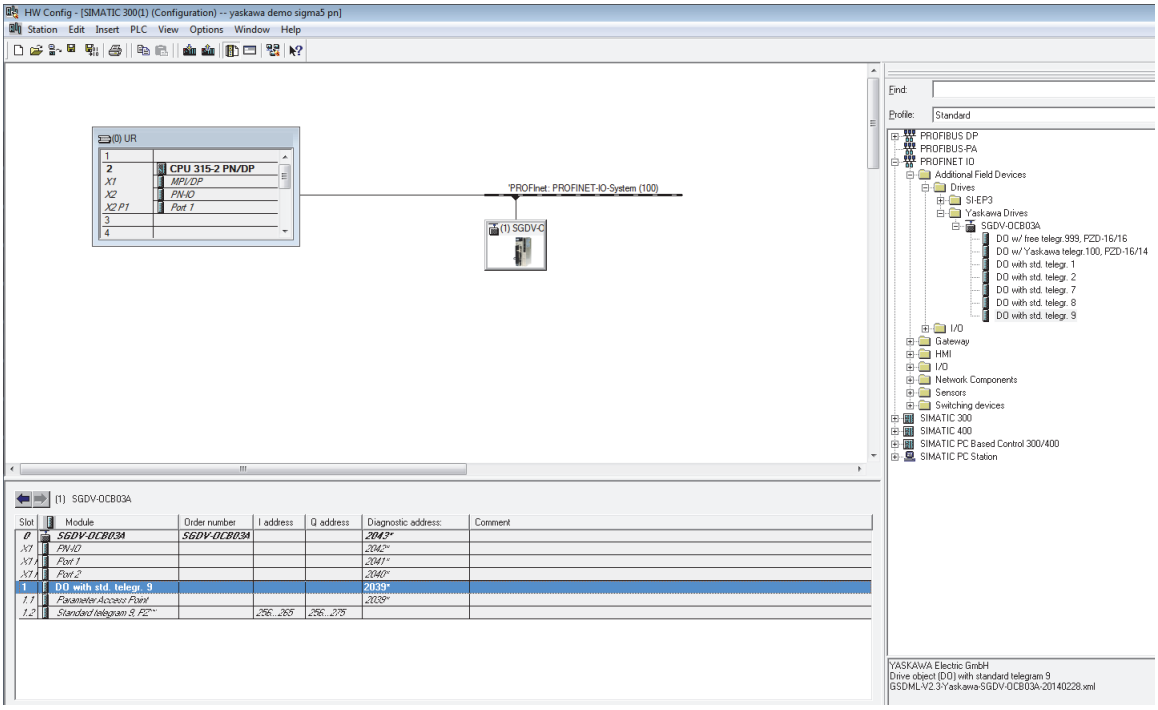
12.4.2 Add Sigma-5 drive

- To add the Sigma-5 SERVOPACK to the PROFInet network, select “PROFINET IO > Additional Field Devices > Drives > Yaskawa Drives” in the hardware catalog.
- Double-click on SGDV-OCB03A.
  A bitmap with the Sigma-5 drive will be shown on the PROFINET-IO System.



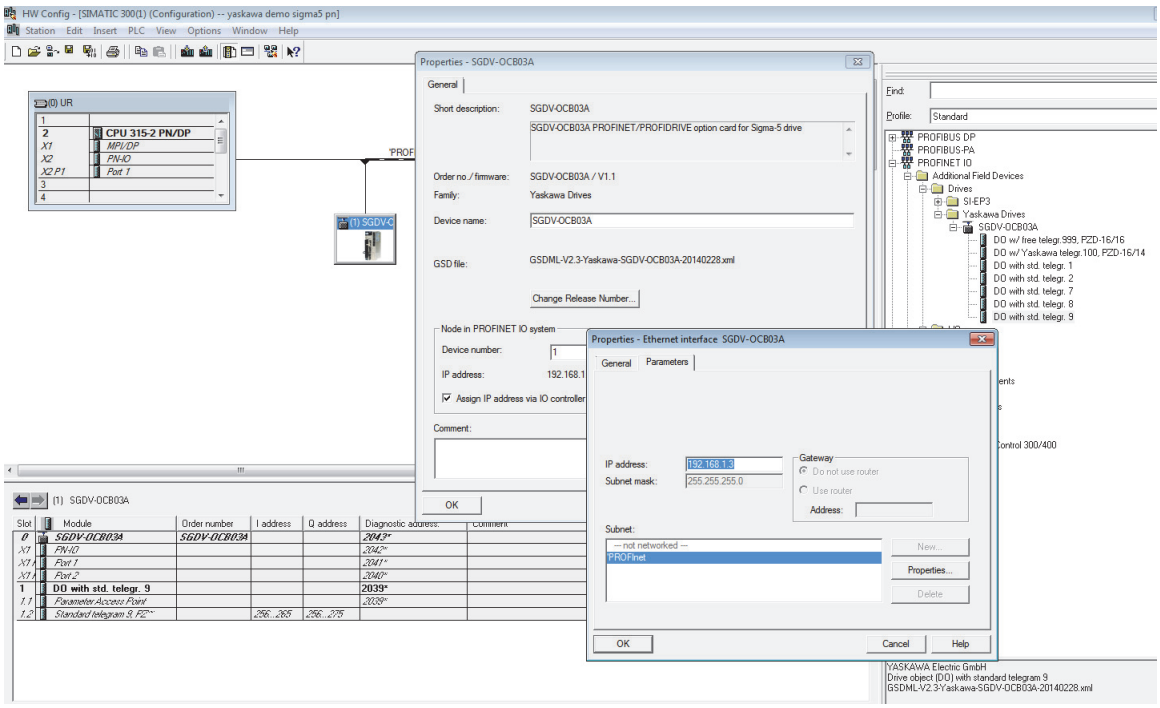
12.4.3 Configure cyclic process data

- Select the added Sigma-5 device. The current telegram configuration of the device is shown on the lower part of the screen.
- To add telegram 9, choose empty line slot 1 and double-click on “DO with std. telegr. 9” in the hardware catalog.



12.4.4 Setup IP configuration

- To change the IP address, double click on the Sigma-5 bitmap at the PROFInet IO-System. The preset IP-address is the next free address to the configured IP address of the PN-IO port of the CPU, which was configured earlier.
- To change the IP-address, click in the button “Ethernet…” in the window “Properties – SGDV-OCB03A”.



Note: The IP-address configured here is the IP-address that is used for communication. If another permanent IP-address or IP-address 0.0.0.0. (default) is set to the Sigma-5 with “HW-Config > Ethernet > Edit Ethernet Node”, the IP-address is temporarily changed to the one set here during startup-phase of the CPU.

12.4.5 Configure cyclic update time

- To change the cycle time for cyclic communication, double-click “PROFInet IO System”.
- Switch to tab “Update Time” and set the cycle times.
  Cycle times down to 1 ms can be set.

12.5 Download hardware configuration

The configuration has to be saved, compiled and downloaded into the CPU. See chapter “12.6 Online configuration” for detailed description of the necessary steps.

12.6 Online configuration

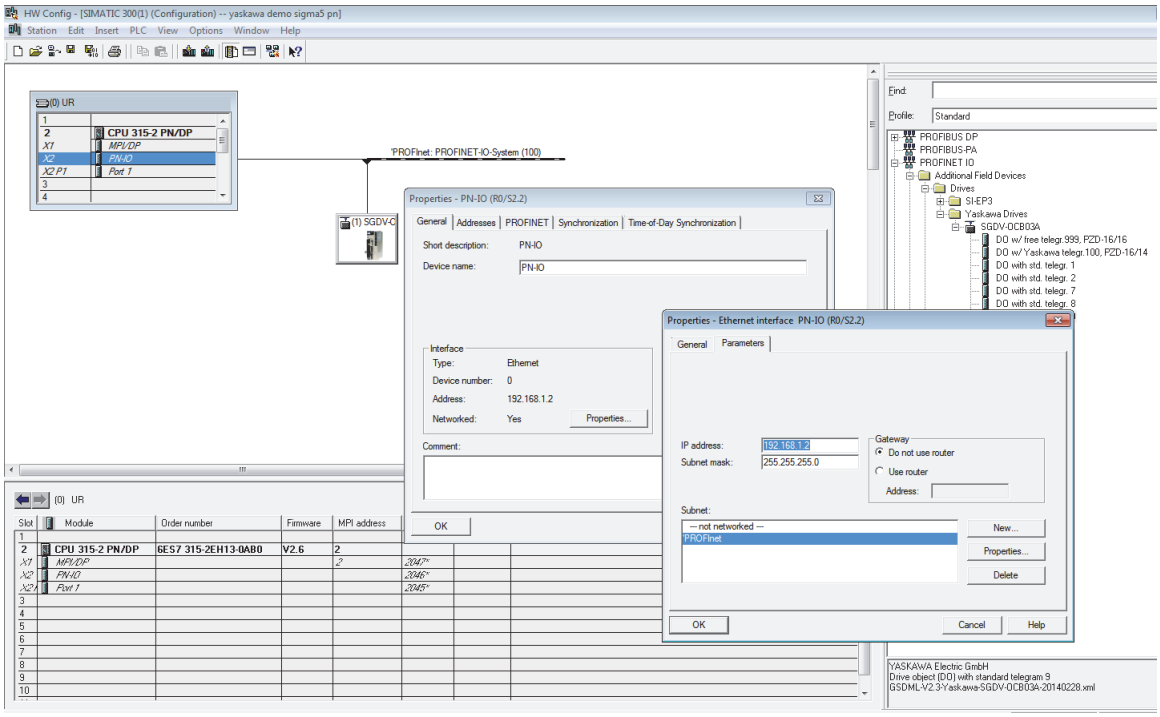
If all the steps of the “Offline” configuration are done, the used components have to be connected and configured.

12.6.1 PLC - Assign IP-configuration

Before the configuration can be downloaded to the PLC, an IP-address has to be assigned to the PN-IO-Controller port. The used IP-configuration can be freely chosen. The IP-address is used for the first download of the hardware configuration only.

To get the configured IP-address:

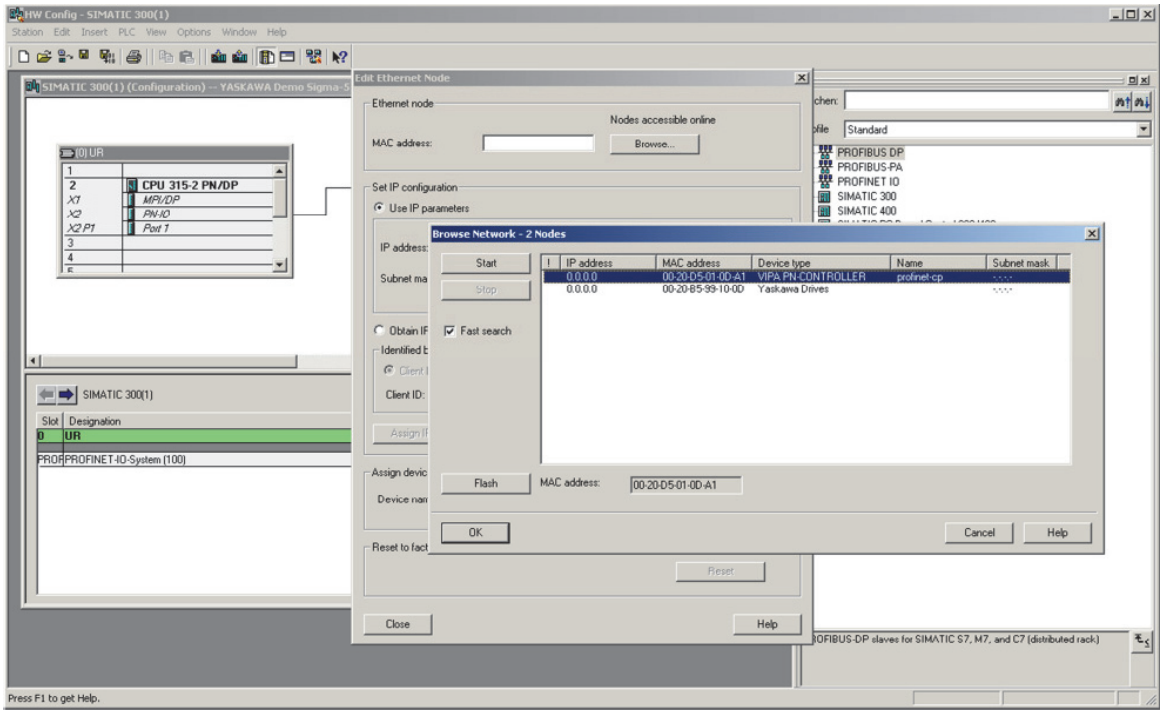
- Double-click on PN-IO (X2) to open the “Properties” window.
- Click button “Properties” to see the IP-configuration (IP-address, subnet mask, router address).



The IP-configuration for download of the hardware configuration has to be assigned to the CPU:

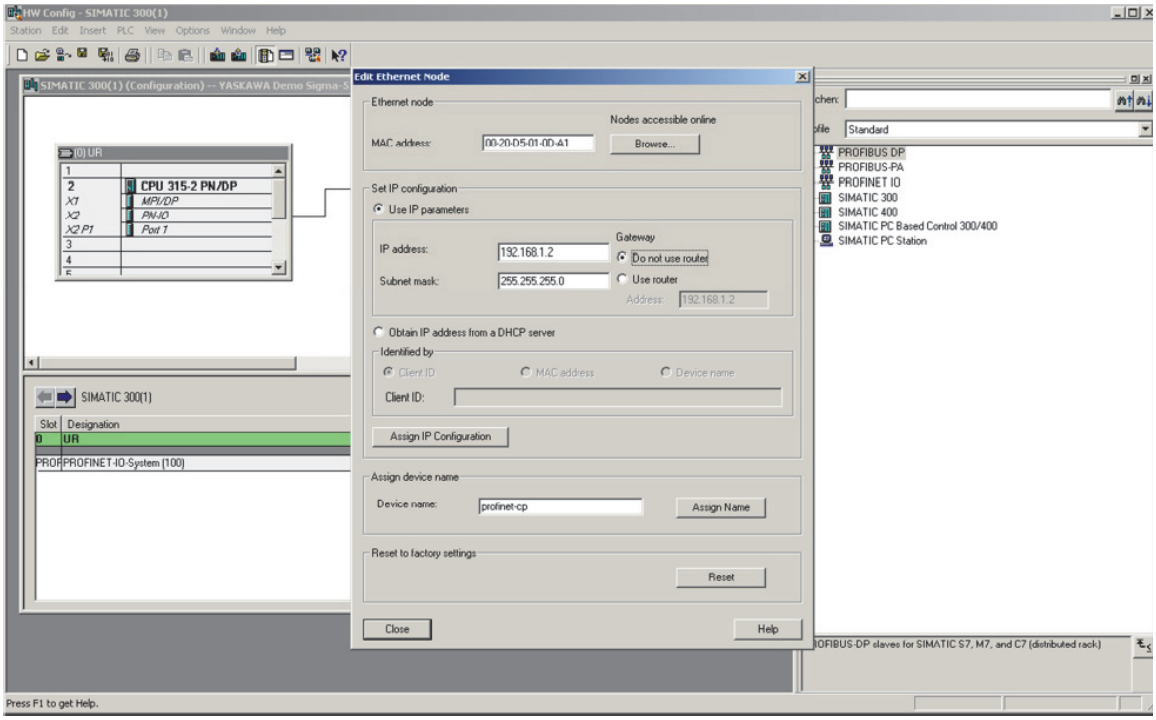
- Open HW-Config.
- Select “PLC > Edit Ethernet Node”.
- Click “Browse…” button

• Select the configured PN-IO-Controller and click “OK”.



• Insert (configured) IP address (e.g. 192.168.1.2) and Subnet mask (e.g. 255.255.255.0) for download of hardware configuration.

• Select “Assign IP Configuration”.

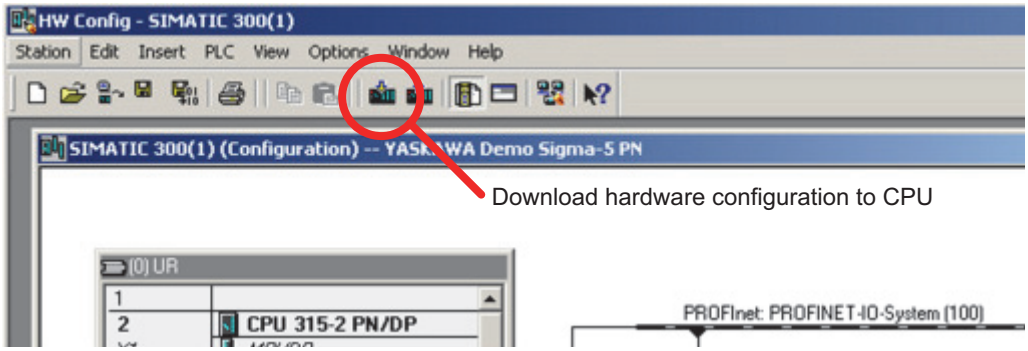


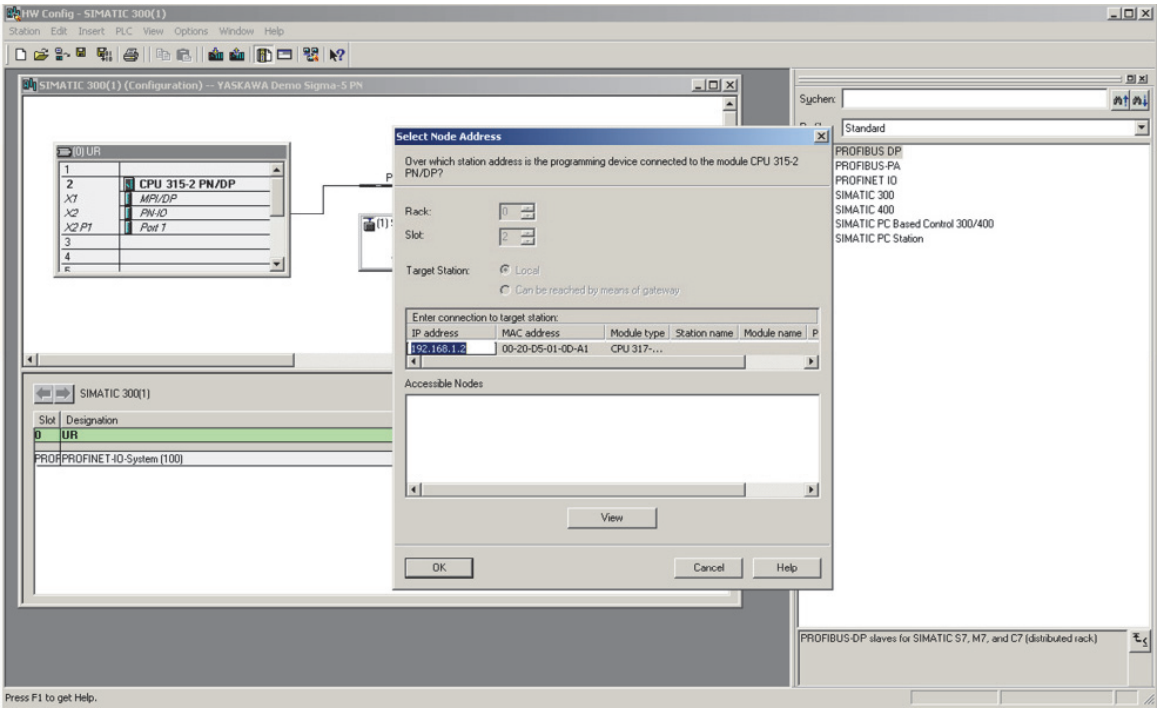
Note: To store the IP-address of the PROFInet port non-volatile, the hardware configuration has to be downloaded. If not, the IP-address will be 0.0.0.0 again after power-cycle of the CPU. Please refer to chapter “*12.6.2 PLC - Download hardware configuration*” for details.

12.6.2 PLC - Download hardware configuration

The hardware configuration has to be downloaded into the CPU.

- Open HW-Config.
- Click “Download to Module” button.
- Select the assigned IP-address and click “OK”. The configuration will be downloaded.





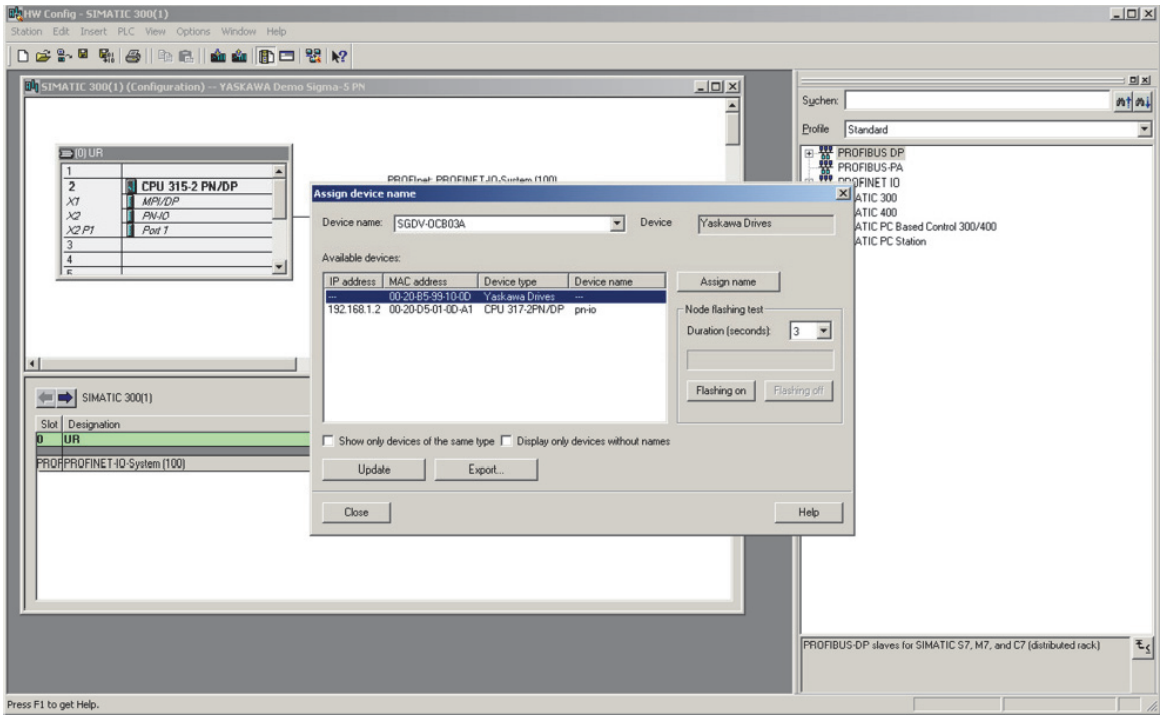
12.6.3 Sigma-5 - Assign device name

After an IP-address has to be assigned to the PROFInet port (X8) of the PN-Controller and the hardware configuration was downloaded, the device name has to be assigned to the Sigma-5 SERVOPACK.

During startup phase the CPU is sending requests, if the configured devices are available. For that, the configured device names of PLC configuration have to be downloaded into the corresponding devices.

The following steps are necessary to assign a device name:

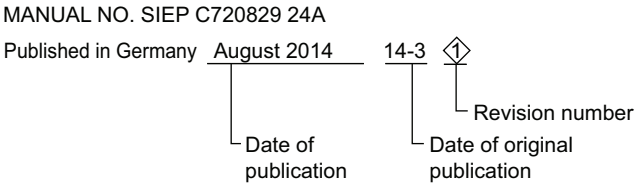
- Select “PLC > Ethernet > Assign Device Name…”
- Select the name you want assign from the drop-down menu.
- Mark the device.
- Click “Assign name”.



The name is transferred to the device and stored in non-volatile memory.

Revision History

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



Date of Publication	Rev. No.	Section	Revised Content
August 2014	1	All	Updated descriptions. Added Chapter 6.8 and Chapter 12
March 2014	–	–	First edition

AC Servo Drives

Σ-V Series

USER'S MANUAL

PROFINET Network Module

IRUMA BUSINESS CENTER (SOLUTION CENTER)
480, Kamifujisawa, Iruma, Saitama 358-8555, Japan
Phone 81-4-2962-5151 Fax 81-4-2962-6138

YASKAWA AMERICA, INC.
2121 Norman Drive South, Waukegan, IL 60085, U.S.A.
Phone (800) YASKAWA (800-927-5292) or 1-847-887-7000 Fax 1-847-887-7310

YASKAWA ELÉTRICO DO BRASIL LTDA.
Avenida Fagundes Filho, 620 São Paulo-SP CEP 04304-000, Brazil
Phone 55-11-3585-1100 Fax 55-11-5581-8795

YASKAWA EUROPE GmbH
Hauptstraβe 185, Eschborn 65760, Germany
Phone 49-6196-569-300 Fax 49-6196-569-398

YASKAWA ELECTRIC UK LTD.
1 Hunt Hill Orchardton Woods Cumbernauld, G68 9LF, United Kingdom
Phone 44-1236-735000 Fax 44-1236-458182

YASKAWA ELECTRIC KOREA CORPORATION
7F, Doore Bldg. 24, Yeoido-dong, Yeoungdungpo-gu, Seoul 150-877, Korea
Phone 82-2-784-7844 Fax 82-2-784-8495

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
151 Lorong Chuan, #04-01, New Tech Park 556741, Singapore
Phone 65-6282-3003 Fax 65-6289-3003

YASKAWA ELECTRIC (SHANGHAI) CO., LTD.
No.18 Xizang Zhong Road. 17F, Harbour Ring Plaza Shanghai 200001, China
Phone 86-21-5385-2200 Fax 86-21-5385-3299

YASKAWA ELECTRIC (SHANGHAI) CO., LTD. BEIJING OFFICE
Room 1011, Tower W3 Oriental Plaza, No.1 East Chang An Ave.,
Dong Cheng District, Beijing 100738, China
Phone 86-10-8518-4086 Fax 86-10-8518-4082

YASKAWA ELECTRIC TAIWAN CORPORATION
9F, 16, Nanking E. Rd., Sec. 3, Taipei 104, Taiwan
Phone 886-2-2502-5003 Fax 886-2-2505-1280

YASKAWA ELECTRIC CORPORATION

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