YASKAWA

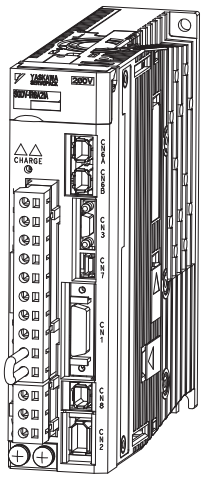
AC Servo Drives

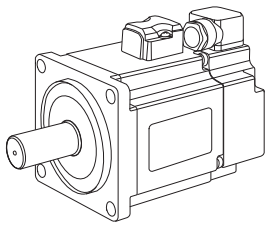
Σ-V-FT Series

USER'S MANUAL

Model: FT005
Rotational Motor
MECHATROLINK-III Communications Reference

SGDV-□□□□21□□□□FT005 SERVOPACK
SGMMV/SGMJV/SGMAV/SGMPS/SGMGV/SGMSV/SGMCV/SGMCS Servomotor





MANUAL NO. SIEP S800001 25F

About this Manual

This manual contains information that is required to design and adjust a Σ-V-FT-series FT005 servo system. An FT005 Servo System uses MECHATROLINK-III communications references and supports rotational coordinate system and triggers at pre-set positions.

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

When you use a Σ-V-FT-series FT005 servo system, read this manual together with the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference*.

Also read the documents that are listed on the next page as required by the application.

■ Reference Table

Information on different items is provided in different user's manuals. Read the correct user's manual as given in the following table.

Item		This Manual	Σ-V Series User's Manual Design and Maintenance, Rotational Motor/ MECHATROLINK-III Communications Reference (Manual No.: SIEP S800000 64)
Outline	Σ-V-FT-series FT005	1.1	–
	Part Names	–	1.2
	SERVOPACK Ratings and Specifications	1.2	–
	SERVOPACK Internal Block Diagrams	–	1.4
	Examples of Servo System Configurations	–	1.5
	SERVOPACK Model Designation	1.3	–
	Inspection and Maintenance	–	1.7
Panel Display and Operation of Digital Operator		–	Chapter 2
Wiring and Connection		–	Chapter 3
Operation		–	Chapter 4
Rotational Coordinate System		Chapter 2	–
Triggers at Pre-set Positions		Chapter 3	–
Adjustments		–	Chapter 5
Utility Functions (Fn□□□)		–	Chapter 6
Monitor Displays (Un□□□)		–	Chapter 7
Fully-closed Loop Control		–	Chapter 8
Troubleshooting		–	Chapter 9
Utility Functions (Fn□□□)		–	Chapter 6
List of Parameters	Σ-V-FT Series FT005 Parameters	Chapter 4	–
	Other Parameters	–	10.1.2
List of MECHATROLINK-III Common Parameters		–	10.1.3
List of Monitor Displays		–	10.2
Parameter Recording Table		–	10.3

■ Description of Technical Terms

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

Term	Meaning
Servomotor	Σ-V Series rotary servomotors (SGMMV, SGMJV, SGMAV, SGMPS, SGMGV, or SGMSV), and Σ-V Series direct drive servomotors (SGMCV or SGMCS)
SERVOPACK	Σ-V-FT Series FT005 MECHATROLINK-III communications reference servo amplifier
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
M-III Model	MECHATROLINK-III communications reference used for SERVOPACK interface
Servo ON	Power to motor ON
Servo OFF	Power to motor OFF
Standard Σ-V SERVOPACK	Σ-V Series SERVOPACKs for use with rotational servomotors with MECHATROLINK-III communications reference
Base Block (BB)	Power supply to motor is turned OFF by shutting off the base current to the power transistor in the current amplifier.
Servo Lock	A state in which the motor is stopped and is in position loop with a position reference of 0.
Main Circuit Cable	Cables which connect to the main circuit terminals, including main circuit power supply cables, control power supply cables, servomotor main circuit cables, and others.

■ 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

- Notation for Reverse Signals

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

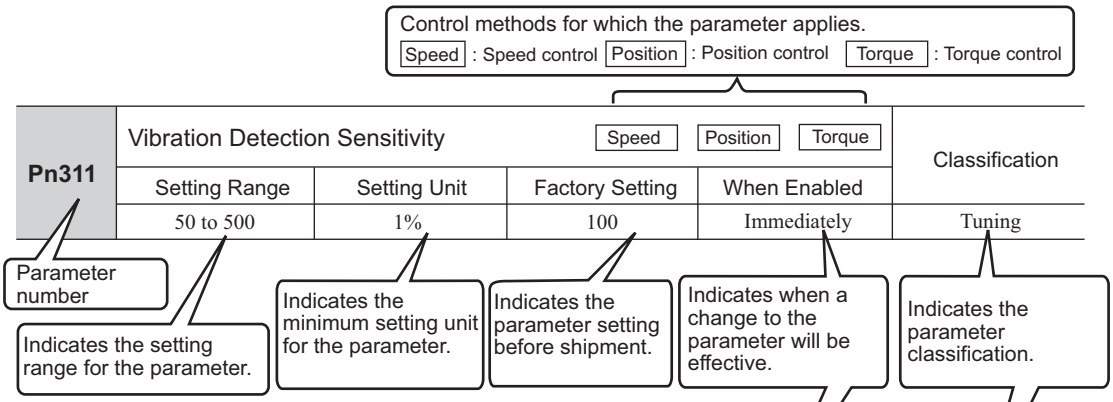
  Notation Example

  $\overline{BK}$ = /BK

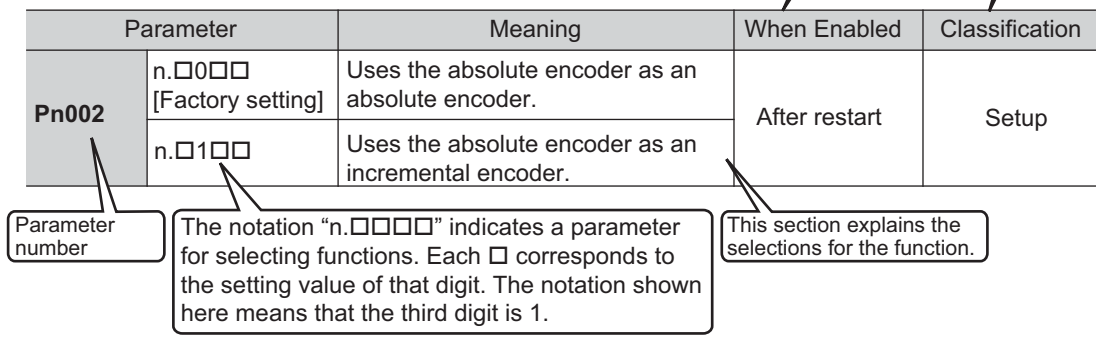
- Notation for Parameters

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

  - Parameters for Numeric Settings

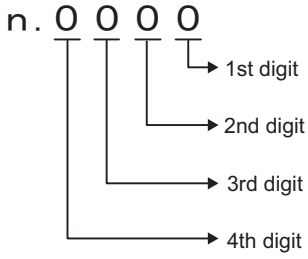


  - Parameters for Selecting Functions



  Notation Example

Digital Operator Display (Display Example for Pn002)



Digit Notation		Setting Notation	
Notation	Meaning	Notation	Meaning
Pn002.0	Indicates the value for the 1st digit of parameter Pn002.	Pn002.0 = x or n.☐☐☐x	Indicates that the value for the 1st digit of parameter Pn002 is x.
Pn002.1	Indicates the value for the 2nd digit of parameter Pn002.	Pn002.1 = x or n.☐☐x☐	Indicates that the value for the 2nd digit of parameter Pn002 is x.
Pn002.2	Indicates the value for the 3rd digit of parameter Pn002.	Pn002.2 = x or n.☐x☐☐	Indicates that the value for the 3rd digit of parameter Pn002 is x.
Pn002.3	Indicates the value for the 4th digit of parameter Pn002.	Pn002.3 = x or n.x☐☐☐	Indicates that the value for the 4th digit of parameter Pn002 is x.

■ Related Manuals

Refer to the following manuals as required.

Name	Selecting Models and Peripheral Devices	Ratings and Specifications	System Design	Panels and Wiring	Trial Operation	Trial Operation and Servo Adjustment	Maintenance and Inspection
Σ-V Series User's Manual Setup Rotational Motor (No.: SIEP S800000 43)				✓	✓		
Σ-V Series Product Catalog (No.: KAEP S800000 42)	✓	✓	✓				
Σ-V Series User's Manual Design and Maintenance Rotational Motor/ MECHATROLINK-III Communications Reference (No.: SIEP S800000 64)			✓		✓	✓	✓
Σ-V Series User's Manual MECHATROLINK-III Standard Servo Profile Commands (No.: SIEP S800000 63)			✓		✓	✓	
Σ-V-FT Series User's Manual Model: FT005, Rotational Motor/ MECHATROLINK-III Communications Reference (this manual)			✓			✓	
Σ-V Series User's Manual Operation of Digital Operator (No.: SIEP S800000 55)					✓	✓	✓
Σ-V Series AC SERVOPACK SGDV Safety Precautions (No.: TOBP C710800 10)	✓			✓			✓
Σ Series Digital Operator Safety Precautions (No.: TOBP C730800 00)							✓
AC SERVOMOTOR Safety Precautions (No.: TOBP C230200 00)				✓			✓

■ Trademarks

MECHATROLINK is a trademark of the MECHATROLINK Members Association.

■ 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 to indicate that grounding is compulsory as follows: 

Safety Precautions

This section describes important precautions that must be followed during storage, transportation, installation, wiring, operation, maintenance, inspection, and disposal. Be sure to always observe these precautions thoroughly.

⚠ WARNING

- Never touch any rotating servomotor parts during operation.
  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 equipment.
- 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 lamp is ON.
  Residual voltage may cause electric shock.
- Follow the procedures and instructions provided in the manuals for the products being used in the trial operation.
  Failure to do so may result not only in faulty operation and damage to equipment, but also in personal injury.
- The output range of the rotational serial data for the Σ-V-FT absolute position detecting system is different from that of earlier systems for 12-bit and 15-bit encoders. As a result, the infinite-length positioning system of the Σ Series must be changed for use with products in the Σ-V-FT Series.
- The multiturn limit value need not be changed except for special applications.
  Changing it inappropriately or unintentionally can be dangerous.
- If the Multiturn Limit Disagreement alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct.
  If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting in a dangerous situation where the machine will move to unexpected positions.
- Do not remove the top front cover, cables, connectors, or optional items from the SERVOPACK while the power is ON.
  Failure to observe this warning may result in electric shock or damage to the equipment.
- Do not damage, pull, 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.
- Do not modify the product.
  Failure to observe this warning may result in injury, damage to the equipment, or fire.
- Provide appropriate braking devices 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.
- Do not come close to the machine immediately after resetting an instantaneous power interruption to avoid an unexpected restart. Take appropriate measures to ensure safety against an unexpected restart.
  Failure to observe this warning may result in injury.

- Connect the ground terminal 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 or damage to the equipment.

■ 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 equipment.
  - Locations subject to direct sunlight
  - Locations subject to temperatures outside the range specified in the storage/installation temperature conditions
  - Locations subject to humidity outside the range specified in the storage/installation humidity conditions
  - Locations subject to condensation as the result of extreme changes in temperature
  - Locations subject to corrosive or flammable gases
  - Locations subject to dust, salts, or iron dust
  - Locations subject to exposure to water, oil, or chemicals
  - Locations subject to shock or vibration
- Do not hold the product by the cables, motor shaft, or encoder 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, flammable 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 or malfunction.
- 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 terminals.
  Failure to observe this caution may result in fire.
- Do not bundle or run the main circuit cables together with the I/O signal cables or the encoder cables in the same duct. Keep the main circuit cables separated from the I/O signal cables and the encoder cables with a gap of at least 30 cm.
  Placing these cables too close to each other may result in malfunction.
- Use shielded twisted-pair cables or screened unshielded twisted-pair cables for I/O signal cables and the encoder cables.
- The maximum wiring length is 3 m for I/O signal cables, 50 m for encoder cables or servomotor main circuit cables, and 10 m for control power supply cables for the SERVOPACK with a 400-V power supply (+24 V, 0 V).
- Do not touch the power supply terminals while the CHARGE lamp 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 to do wiring or inspections.
- Be sure to observe the following precautions when wiring the SERVOPACK main circuit terminal blocks.
  - Do not turn the SERVOPACK power ON until all wiring, including the main circuit terminal blocks, has been completed.
  - Remove detachable main circuit terminals from the SERVOPACK prior to wiring.
  - Insert only one 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-circuits) 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.
- When connecting an External Regenerative Resistor to the SGDV-3R8A, -5R5A, -7R6A, -120A, -180A, -200A, -330A, -1R9D, -3R5D, -5R4D, -8R4D, -120D, or -170D, first remove the lead wire between the B2 and B3 terminals on the SERVOPACK, and then connect the External Regenerative Resistor.
  There is a risk of SERVOPACK failure.
- Always use the specified power supply voltage.
  An incorrect voltage may result in fire or malfunction.
- Make sure that the polarity is correct.
  Incorrect polarity may cause ruptures or damage.
- 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 equipment.
- 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 equipment.
- Do not reverse the polarity of the battery when connecting it.
  Failure to observe this caution may damage the battery, the SERVOPACK or 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 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 or damage to the equipment.
- 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 parameter 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 turn the power ON and OFF more than necessary.
  Do not use the SERVOPACK for applications that require the power to turn ON and OFF frequently. Such applications will cause elements in the SERVOPACK to deteriorate.
  As a guideline, at least one hour should be allowed between the power being turned ON and OFF once actual operation has been started.
- When carrying out JOG operation (Fn002), origin search (Fn003), or EasyFFT (Fn206), forcing movable machine parts to stop does not work for forward overtravel or reverse overtravel. Take necessary precautions.
  Failure to observe this caution may result in damage to the equipment.
- 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 the turning-less function, set the correct moment of inertia ratio (Pn103).
  Setting an incorrect moment of inertia ratio may cause machine vibration.
- Do not touch the SERVOPACK heat sinks, 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 equipment 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 equipment, fire, or injury.
- Do not use the holding brake of the servomotor for braking.
  Failure to observe this caution may result in malfunction.
- An alarm or warning may occur if communications are performed with the host controller while the SigmaWin+ or Digital Operator is operating.
  If an alarm or warning occurs, it may stop the current process and stop the system.

■ Maintenance and Inspection

⚠ CAUTION

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

■ Disposal Precautions

⚠ CAUTION

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

■ 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

■ Warranty Period

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

■ Warranty Scope

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

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

1. Improper handling, abuse, or use in unsuitable conditions or in environments not described in product catalogs or manuals, or in any separately agreed-upon specifications
2. Causes not attributable to the delivered product itself
3. Modifications or repairs not performed by Yaskawa
4. Abuse of 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 any programs (including parameter settings) or the results of program execution of the programs provided by the user or by a third party for use with programmable Yaskawa products.
3. The information described in product catalogs or manuals is provided for the purpose of the customer purchasing the appropriate product for the intended application. The use thereof does not guarantee that there are no infringements of intellectual property rights or other proprietary rights of Yaskawa or third parties, nor does it construe a license.
4. Yaskawa shall not be responsible for any damage arising from infringements of intellectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

(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 system is designed to secure the required level of safety with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
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) Specifications Change

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

Compliance with UL Standards, EU Directives, UK Regulations, Other Safety Standards and China Energy Efficiency Regulations

■ North American Safety Standards (UL)

Product	Model	North American Safety Standards (UL File No.)
SERVOPACK	SGDV	UL508C (E147823)
Rotary Servomotor	• SGMMV • SGMJV • SGMAV • SGMPS • SGMGV • SGMSV	UL 1004-1 UL 1004-6 (E165827) CSA C22.2 No.100
Direct Drive Servomotor	SGMCV	UL 1004-1 UL 1004-6 (E165827) CSA C22.2 No.100

■ EU Directives

CE

Product	Model	EU Directives	Harmonized Standards
SERVOPACK	SGDV	Machinery Directive 2006/42/EC	EN ISO 13849-1: 2015
		EMC Directive 2014/30/EU	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 61800-5-1
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000
Rotary Servomotor	• SGMGV • SGMSV	EMC Directive 2014/30/EU	EN 55011 Group 1, Class A EN 61000-6-2 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 60034-1 EN 60034-5
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000
	• SGMJV • SGMAV • SGMMV • SGMPS	EMC Directive 2014/30/EU	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 60034-1 EN 60034-5
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000
Direct Drive Servomotor	• SGMCV • SGMCS -□□B -□□C -□□D -□□E (Small-capacity, Coreless servomo-tors)*	EMC Directive 2014/30/EU	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Low Voltage Directive 2014/35/EU	EN 60034-1 EN 60034-5
		RoHS Directive 2011/65/EU (EU)2015/863	EN IEC 63000

* For SGMCS, only models with "-E" at the end of model numbers are in compliance with the standards.

■ UK Conformity Assessed (UKCA)

Product	Model	UK Regulations	Designated Standards
SERVOPACK	SGDV	Supply of Machinery (Safety) Regulations S.I. 2008/1597	EN ISO 13849-1: 2015
		Electromagnetic Compatibility Regulations S.I. 2016/1091	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Electrical Equipment (Safety) Regulations S.I. 2016/1101	EN 61800-5-1
		Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations S.I. 2012/3032	EN IEC 63000
Rotary Servomotor	• SGMGV • SGMSV	Electromagnetic Compatibility Regulations S.I. 2016/1091	EN 55011 Group 1, Class A EN 61000-6-2 EN 61800-3 (Category C2, Second environment)
		Electrical Equipment (Safety) Regulations S.I. 2016/1101	EN 60034-1 EN 60034-5
		Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations S.I. 2012/3032	EN IEC 63000
	• SGMJV • SGMAV • SGMMV • SGMPS	Electromagnetic Compatibility Regulations S.I. 2016/1091	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Electrical Equipment (Safety) Regulations S.I. 2016/1101	EN 60034-1 EN 60034-5
		Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations S.I. 2012/3032	EN IEC 63000
Direct Drive Servomotor	• SGMCV • SGMCS -□□B -□□C -□□D -□□E (Small-capacity, Coreless servomotors)*	Electromagnetic Compatibility Regulations S.I. 2016/1091	EN 55011 Group 1, Class A EN 61000-6-2 EN 61000-6-4 EN 61800-3 (Category C2, Second environment)
		Electrical Equipment (Safety) Regulations S.I. 2016/1101	EN 60034-1 EN 60034-5
		Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations S.I. 2012/3032	EN IEC 63000

* For SGMCS, only models with "-E" at the end of model numbers are in compliance with the standards.

Note: We declared the UKCA marking based on the designated standards in the above table.

■ Safety Standards

Product	Model	Safety Standards	Standards
SERVOPACK	SGDV	Safety of Machinery	EN ISO 13849-1: 2015 EN 60204-1
		Functional Safety	EN 61508 series EN 61800-5-2
		Functional Safety EMC	EN 61326-3-1

- Safety Performance

Items	Standards	Performance Level
Safety Integrity Level	EN 61508	SIL2
Probability of Dangerous Failure per Hour	EN 61508	PFH = 1.7×10^{-9} [1/h] (0.17% of SIL2)
Performance Level	EN ISO 13849-1	PL d (Category 3)
Mean Time to Dangerous Failure of Each Channel	EN ISO 13849-1	MTTFd: High
Average Diagnostic Coverage	EN ISO 13849-1	DCavg: Low
Stop Category	EN 60204-1	Stop category 0
Safety Function	EN 61800-5-2	STO
Proof test Interval	EN 61508	10 years

■ China Energy Label for Permanent-Magnet Synchronous Motors

Product	Model	Application Range	Laws and Standards
Rotary Servomotor	SGMJV SGMAV SGMGV SGMSV SGMPS	Rated Voltage 1000 V max. Rated Output 0.55 kW to 90 kW Rated Motor Speed 500 to 3000 min^{-1}	law CEL 038-2020 regulation GB 30253-2013

Note: The following products do not comply with the China Energy Label for permanent-magnet synchronous motors.
- Models with holding brakes
- Models with gears

Contents

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Outline

1.1 Σ-V-FT-series FT005

The Σ-V-FT-series FT005 SERVOPACK supports rotational coordinate systems and triggers at pre-set positions.

For details on rotational coordinate systems, refer to *Chapter 2 Rotational Coordinate System*.

For details on triggers at pre-set positions, refer to *Chapter 3 Triggers at Pre-set Positions*.

1.2 SERVOPACK Ratings and Specifications

This section describes the ratings and specifications of SERVOPACKs.

1.2.1 Ratings

Ratings of SERVOPACKs are as shown below.

(1) SGDV with Single-phase, 100-V Rating

SGDV (Single Phase, 100 V)	R70	R90	2R1	2R8
Continuous Output Current [Arms]	0.66	0.91	2.1	2.8
Instantaneous Max. Output Current [Arms]	2.1	2.9	6.5	9.3
Regenerative Resistor*	None or external			
Main Circuit Power Supply	Single-phase, 100 to 115 VAC $^{+10\%}_{-15\%}$, 50/60 Hz			
Control Power Supply	Single-phase, 100 to 115 VAC $^{+10\%}_{-15\%}$, 50/60 Hz			
Overvoltage Category	III			

* Refer to *3.7 Connecting Regenerative Resistors* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).

(2) SGDV with Single-phase, 200-V Rating

SGDV (Single Phase, 200 V)	120*1
Continuous Output Current [Arms]	11.6
Instantaneous Max. Output Current [Arms]	28
Regenerative Resistor *2	Built-in or external
Main Circuit Power Supply	Single-phase, 220 to 230 VAC $^{+10\%}_{-15\%}$, 50/60 Hz
Control Power Supply	Single-phase, 220 to 230 VAC $^{+10\%}_{-15\%}$, 50/60 Hz
Overvoltage Category	III

∗1. The official model number is SGDV-120A21A008FT005.
∗2. Refer to *3.7 Connecting Regenerative Resistors* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).

(3) SGDV with Three-phase, 200-V Rating

SGDV (Three Phase, 200 V)	R70	R90	1R6	2R8	3R8	5R5	7R6	120	180	200	330	470	550	590	780
Continuous Output Current [Arms]	0.66	0.91	1.6	2.8	3.8	5.5	7.6	11.6	18.5	19.6	32.9	46.9	54.7	58.6	78.0
Instantaneous Max. Output Current [Arms]	2.1	2.9	5.8	9.3	11.0	16.9	17	28	42	56	84	110	130	140	170
Regenerative Resistor*	None or external				Built-in or external							External			
Main Circuit Power Supply	Three-phase, 200 to 230 VAC $^{+10\%}_{-15\%}$, 50/60 Hz														
Control Power Supply	Single-phase, 200 to 230 VAC $^{+10\%}_{-15\%}$, 50/60 Hz														
Overvoltage Category	III														

* Refer to *3.7 Connecting Regenerative Resistors* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).

(4) SGDV with Three-phase, 400-V Rating

SGDV (Three Phase, 400 V)	1R9	3R5	5R4	8R4	120	170	210	260	280	370
Continuous Output Current [Arms]	1.9	3.5	5.4	8.4	11.9	16.5	20.8	25.7	28.1	37.2
Instantaneous Max. Output Current [Arms]	5.5	8.5	14	20	28	42	55	65	70	85
Regenerative Resistor*	Built-in or external						External			
Main Circuit Power Supply	Three-phase, 380 to 480 VAC $^{+10\%}_{-15\%}$, 50/60 Hz									
Control Power Supply	24 VDC ±15%									
Overvoltage Category	III									

* Refer to *3.7 Connecting Regenerative Resistors* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).

1.2.2 Basic Specifications

Basic specifications of SERVOPACKs are shown below.

Drive Method			Sine-wave current drive with PWM control of IGBT	
Feedback			Encoder: 13-bit (incremental), 17-bit, 20-bit (incremental/absolute)	
Operating Conditions	Surrounding Air Temperature		0°C to +55°C	
	Storage Temperature		-20°C to +85°C	
	Ambient Humidity		90% RH or less	With no freezing or condensation
	Storage Humidity		90% RH or less	
	Vibration Resistance		4.9 m/s^2	
	Shock Resistance		19.6 m/s^2	
	Protection Class		IP10	An environment that satisfies the following conditions. • Free of corrosive or flammable gases • Free of exposure to water, oil, or chemicals • Free of dust, salts, or iron dust
	Pollution Degree		2	
	Altitude		1000 m or less	
	Others		Free of static electricity, strong electromagnetic fields, magnetic fields or exposure to radioactivity	
Harmonized Standards			Refer to *Compliance with UL Standards, EU Directives, UK Regulations, Other Safety Standards and China Energy Efficiency Regulations* in the preface for details.	
Mounting			Standard: Base-mounted Optional: Rack-mounted or duct-ventilated	
Performance	Speed Control Range		1:5000 (The lower limit of the speed control range must be lower than the point at which the rated torque does not cause the servomotor to stop.)	
	Speed Regulation*1	Load Regulation	0% to 100% load: ±0.01% max. (at rated speed)	
		Voltage Regulation	Rated voltage ±10%: 0% (at rated speed)	
		Temperature Regulation	25 ± 25 °C: ±0.1% max. (at rated speed)	
	Torque Control Tolerance (Repeatability)		±1%	
	Soft Start Time Setting		0 to 10 s (Can be set individually for acceleration and deceleration.)	

(cont'd)

I/O Signals	Encoder Output Pulse		Phase A, B, C: line driver Encoder output pulse: any setting ratio*2	
	Sequence Input	Input Signals which can be allocated	Number of Channels	7 ch
			Functions	• Homing deceleration switch (/DEC) • External latch (/EXT 1 to 3) • Forward run prohibited (P-OT), reverse run prohibited (N-OT) • Forward external torque limit (/P-CL), reverse external torque limit (/N-CL) Signal allocations can be performed, and positive and negative logic can be changed.
	Sequence Output	Fixed Output	Servo alarm (ALM) output	
		Output Signals which can be allocated	Number of Channels	3 ch
			Functions	• Positioning completion (/COIN) • Speed coincidence detection (/V-CMP) • Rotation detection (/TGON) • Servo ready (/S-RDY) • Torque limit detection (/CLT) • Speed limit detection (/VLT) • Brake (/BK) • Warning (/WARN) • Near (/NEAR) Signal allocations can be performed, and positive and negative logic can be changed.
Communications Function	RS422A Communications (CN3)	Interface	Digital operator (JUSP-OP05A-1-E), personal computer (can be connected with SigmaWin+)	
		1:N Communications	N = Up to 15 stations possible at RS422A	
		Axis Address Setting	Set by parameter	
	USB Communications (CN7)	Interface	Personal computer (can be connected with SigmaWin+)	
		Communications Standard	Complies with standard USB1.1 (12 Mbps).	
LED Display			Panel display (seven-segment), CHARGE, L1, L2, and CN indicators	
MECHATROLINK-III Communications Setting Switches			Rotary Switch (S1, S2)	Position: 16 positions × 2*3
			DIP Switch (S3)	Number of pins: Four pins*3
Analog Monitor (CN5)			Number of points: 2 Output voltage: ± 10 VDC (linearity effective range ± 8 V) Resolution: 16 bits Accuracy: ± 20 mV (Typ) Max. output current: ± 10 mA Settling time (± 1%): 1.2 ms (Typ)	
Dynamic Brake (DB)			Activated when a servo alarm or overtravelling occurs or when the power supply for the main circuit or servomotor is OFF.	
Regenerative Processing			Included *4	
Overtravel Prevention (OT)			Dynamic brake stop, deceleration to a stop, or free run to a stop at P-OT or N-OT	
Protective Function			Overcurrent, overvoltage, insufficient voltage, overload, regeneration error, and so on.	
Utility Function			Gain adjustment, alarm history, JOG operation, origin search, and so on.	

(cont'd)

Safety Function	Input	/HWBB1, /HWBB2: Baseblock signal for power module
	Output	EDM1: Monitoring status of internal safety circuit (fixed output)
	Standards *5	EN ISO13849-1 PL d (Category 3), IEC61508 SIL2
Option Module		Fully-closed module

∗1. Speed regulation by load regulation is defined as follows:

$$\text{Speed regulation} = \frac{\text{No-load motor speed} - \text{Total load motor speed}}{\text{Rated motor speed}} \times 100\%$$

∗2. Refer to *4.4.5 Setting Encoder Output Pulse* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (No.: SIEP S800000 64).
∗3. Refer to *4.1 MECHATROLINK-III Communications Settings* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (No.: SIEP S800000 64).
∗4. For details on regenerative resistors, refer to *1.2.1 Ratings*.
∗5. Perform risk assessment for the system and be sure that the safety requirements are fulfilled.

1.2.3 MECHATROLINK-III Function Specifications

The following table shows the specifications of MECHATROLINK-III.

Function		Specifications
MECHATROLINK-III Communication	Communication Protocol	MECHATROLINK-III
	Station Address	03H to EFH (Max. number of stations: 62) Use the rotary switches S1 and S2 to set the station address.
	Baud Rate	100 Mpbs
	Transmission Cycle	125 µs, 250 µs, 500 µs, 750 µs, and 1.0 ms to 4.0 ms (increments of 0.5 ms)
	Number of Transmission Bytes	16, 32, or 48 bytes per station Use the DIP switch S3 to select the number of words.
Reference Method	Control Method	Position, speed, or torque control with MECHATROLINK-III communication
	Reference Input	MECHATROLINK commands (sequence, motion, data setting/reference, monitoring, or adjustment)
	Profile	MECHATROLINK-III standard servo profile

1.3 SERVOPACK Model Designation

This section shows SERVOPACK model designation.

1st + 2nd + 3rd digits	4th digit	5th + 6th digits	7th digit	8th + 9th + 10th digits	11th + 12th + 13th + 14th + 15th digits
SGDV – 2R8	A	21	B	000	FT005

Series	
SGDV	Σ-V Series
	Σ-V-FT Series

7th digit: Design Revision Order	
A	Other than below
B	• SGDV-R70A□□ • SGDV-R90A□□ • SGDV-1R6A□□ • SGDV-2R8A□□

1st + 2nd + 3rd digits: Current		
Voltage	Code	Max. Allowable Motor Capacity (kW)
100 V	R70	0.05
	R90	0.1
	2R1	0.2
	2R8	0.4
200 V	R70*1	0.05
	R90*1	0.1
	1R6*1	0.2
	2R8*1	0.4
	3R8	0.5
	5R5*1	0.75
	7R6	1
	120*2	1.5
	180	2
	200	3
	330	5
	470*3	6
	550*3	7.5
	590*3	11
	780*3	15
400 V	1R9	0.5
	3R5	1
	5R4	1.5
	8R4	2
	120	3
	170	5
	210*3	6
	260*3	7.5
	280*3	11
	370*3	15

4th digit: Voltage	
Code	Voltage
F	100 V
A	200 V
D	400 V

5th + 6th digits: Interface Specifications	
Code	Interface
21	MECHATROLINK-III communications reference, rotational servomotor

8th + 9th + 10th digits: Hardware Specifications	
Code	Specifications
000	Base-mounted (standard)
001	Rack-mounted*3
002	Varnished
003	Rack-mounted*3 and Varnished
008	Single-phase, 200-V Power Supply (SGDV-120A21A008FT005)
020	Dynamic brake (DB)*4

11th + 12th + 13th + 14th + 15th digits: Function Specification	
Code	Specification
FT005	Rotational coordinate system and triggers at pre-set positions

∗1. These amplifiers can be powered with single or three-phase.
∗2. SGDV-120A21A008FT005, a special version of the 1.5 kW amplifier can be used for single-phase operation.
∗3. SGDV-470A, -550A, -590A, -780A, -210D, -260D, -280D, and -370D are duct-ventilated types.
∗4. A resistor for the dynamic brake is not included. An external resistor for the dynamic brake can only be used with 400-V SERVOPACKs.

2

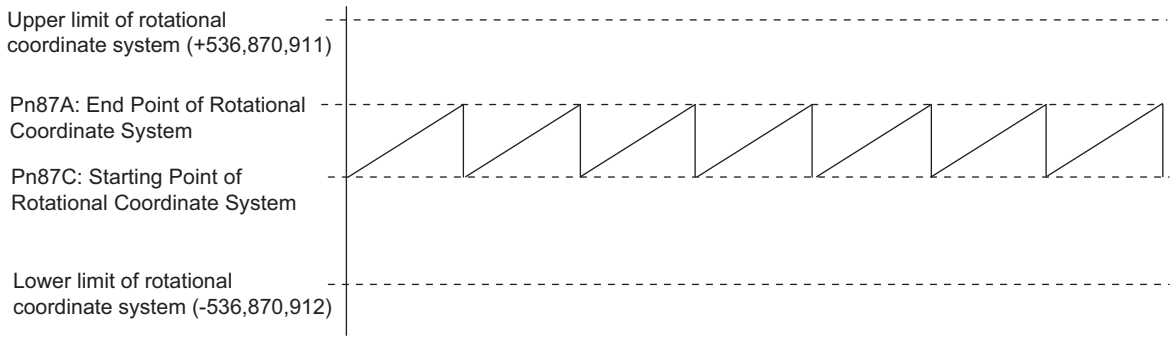
Rotational Coordinate System

2.1 Overview

You can use parameters to change the coordinate range of the position data (command position (CPOS) and feedback position (APOS)). Matching the coordinate range to the rotational system enables using the rotational coordinates from the host controller to control the system.

The rotational coordinates will be in the range that is set with the Starting Point of Rotational Coordinate System (Pn87C) and the End Point of Rotational Coordinate System (Pn87A).

An illustration of operation with the position data (command position (CPOS) and feedback position (APOS)) is given below.



2.2 Basic Specifications

The following table gives the basic specifications of the rotational coordinate system.

IMPORTANT

- The rotational coordinate system is enabled by performing one of the following steps.

  <Absolute Encoder>

  - Sending the Turn Sensor ON command (SENS_ON: 23 hex) from the host controller.

  <Incremental Encoder>

  - Sending the Zero Point Return command (ZRET: 3A hex) from the host controller.
  - Using the Set Coordinates command (POS_SET: 20 hex) from the host controller to set a reference point (REFE = 1).
- If the rotational coordinate system is enabled (Pn87A ≠ 0 or Pn87C ≠ 0), the Software Limit (Pn801.0) and the Software Limit for Reference (Pn801.2) of Application Function Select 6 (Common Parameter No.25) will be disabled.

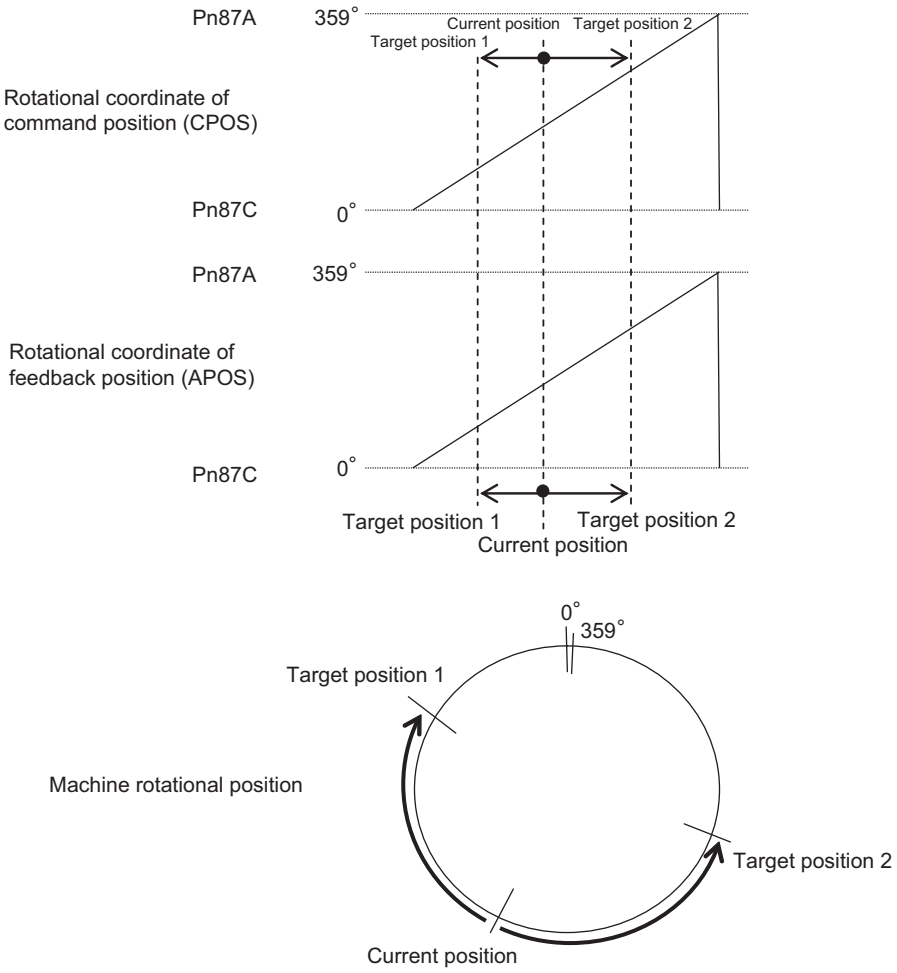
Item	Specification	Parameters
Starting point of rotational coordinate system	-536,870,912 to 0	Pn87C
End point of rotational coordinate system	0 to +536,870,911	Pn87A
Moving method of rotational coordinate system	Four patterns	Pn87E.0

2.3 Basic Operation

This section describes the basic operation of the rotational coordinate system.

You can match the position data (command position (CPOS) and feedback position (APOS)) and machine rotational position to the rotational coordinate system to control the system.

The following figure shows the rotational coordinate system when the 1 revolution of the machine rotational position equals 360°.



2.4 Operating Procedure

2.4.1 Flow of Operation

The following table shows the flow of the operation for the rotational coordinate system.

Step	Operation	Reference
1	Set the starting point and end point of the rotational coordinate system.	2.4.2
2	Set the multiturn limit to match the machine rotational coordinate system. (This step is necessary only for an absolute encoder.)	2.4.3
3	Turn the power supply OFF and ON again, or send the Setup Device command (CONFIG: 04 hex) from the host controller.	–
4	Set the absolute encoder origin offset. (This step is necessary only for an absolute encoder.)	2.4.4
5	Set the moving method of the rotational coordinate system.	2.4.5
6	Perform one of the following operations. <Absolute Encoder> • Send the Turn Sensor ON command (SENS_ON: 23 hex) from the host controller. <Incremental Encoder> • Send the Zero Point Return command (ZRET: 3A hex) from the host controller. • Use the Set Coordinates command (POS_SET: 20 hex) from the host controller to set a reference point (REFE = 1).	–
7	Start operation.	2.4.6

2.4.2 Setting the Rotational Coordinate System

Set the starting point and end point of the rotational coordinate system.

Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classification
Pn87C	4	Starting Point of Rotational Coordinate System	-536870912 to 0	1 reference unit	0	After restart*	Setup
Pn87A	4	End Point of Rotational Coordinate System	0 to +536870911	1 reference unit	0	After restart*	Setup

* When using parameters that are enabled after restarting the SERVOPACK, a CONFIG command must be input or the power must be turned OFF and then ON again.

IMPORTANT

- If Pn87A and Pn87C are set to 0, operation will be performed with linear coordinates (-2,147,483,648 to 2,147,483,647) in the same way as for a standard Σ-V SERVOPACK.
- In Reverse Rotation Mode (Pn000.0 = 1), the motor will operate in the reverse direction, but the settings of Pn87A and Pn87C are applied according to the reference direction.

2.4.3 Setting the Multiturn Limit

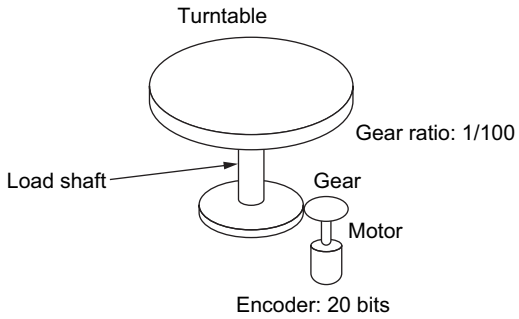
If you use an absolute encoder, set the multiturn limit to match the machine rotational coordinate system. Always set this parameter.

Refer to *4.7.6 Multiturn Limit Setting* in the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK- III Communications Reference* (manual no.: SIEP S800000 64) for details on setting the multiturn limit.

Parameter No.	Size	Name	Setting Range	Setting Unit	Factory Setting	When Enabled
Pn205 (common parameter No. 24)	2	Multiturn Limit Setting	0 to 65,535	1 rev	65535	After restart*

* When using parameters that are enabled after restarting the SERVOPACK, a CONFIG command must be input or the power must be turned OFF and then ON again.

<Setting Example for the Multiturn Limit (Pn205)>



• Conditions: A turntable is controlled with rotational coordinates where one revolution equals 360°, which is equal to 36,000 reference units.
Starting Point of Rotational Coordinate System (Pn87C): 0
End Point of Rotational Coordinate System (Pn87A): 35,999
Gear ratio: 1/100

The gear ratio $\frac{B}{A}$ is $\frac{Pn20E}{Pn210} = \frac{104857600}{36000}$.

With this gear ratio, the motor will turn 100 times for 1 revolution of the turntable. The Multiturn Limit Setting (Pn205) is therefore 100 minus 1, or 99.

IMPORTANT

If the multiturn limit is not set to match the machine rotational coordinate system, the position may become offset.

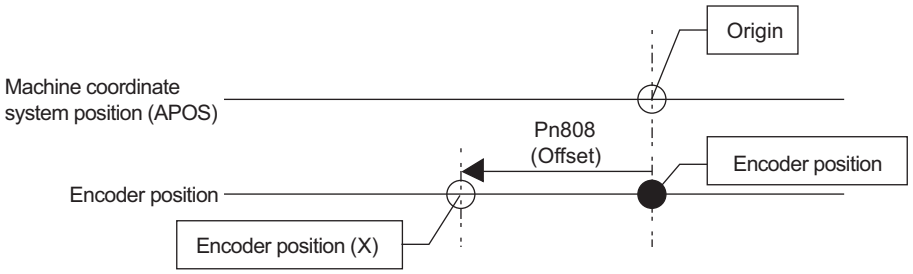
2.4.4 Setting the Absolute Encoder Origin Offset

If you use an absolute encoder, you can set Pn808 to the offset between the encoder position and the machine coordinate system position (feedback position (APOS)).

<Example>
This example shows the settings for when encoder position X is set as the origin (0) of the machine coordinate system.

To set encoder coordinate position X as the machine coordinate origin (0), the following relationship must exist in the parameter settings: Pn87C ≤ Pn808 ≤ Pn87A.
Set Pn808 according to the result of the following equation for the value of the offset.

- When the Offset Is Smaller Than the Value of Pn87C (Starting Point of Rotational Coordinate System):
  Pn808 = Offset + (Pn87A – Pn87C + 1)
- When the Offset Is Larger Than the Value of Pn87A (End Point of Rotational Coordinate System):
  Pn808 = Offset – (Pn87A – Pn87C + 1)
- When the Offset Is between the Values of Pn87C and Pn87A:
  Pn808 = Offset



Parameter No.	Size	Name	Setting Range	Setting Unit	Factory Setting	When Enabled
Pn808 (common parameter No. 23)	4	Absolute Encoder Origin Offset	-1,073,741,823 to 1,073,741,823	1 reference unit	0	Immediately*

* Send the SENS_ON command from the host controller to enable changes to the setting.

If the settings of the parameters are not in the correct relationship (i.e., Pn87C ≤ Pn808 ≤ Pn87A), Parameter Setting Error 2 (alarm number: A.04A) will occur.

Alarm Number	Alarm Name	Alarm Description	Alarm Stop Method	Alarm Reset
A.04A	Parameter Setting Error 2	• Bank member/bank data setting is incorrect. • Absolute encoder origin offset setting is incorrect.	Gr.1*	N/A

* 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.

2.4.5 Setting the Moving Method of the Rotational Coordinate System

Set the moving method of the rotational coordinate system.

IMPORTANT

Change the setting of this parameter when there is no reference (i.e., when DEN = 1). If you change it during operation, the new setting is enabled from the next reference operation.

Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classification
Pn87E	2	Function Switch of Rotational Coordinate System	0000 to 0003	–	0000	Immediately	Setup

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

1st digit: Selection of Moving Method

0	Absolute positioning
1	Positioning for constant negative direction
2	Positioning for constant positive direction
3	Positioning for shortest path

2nd digit: Reserved (Do not change.)

3rd digit: Reserved (Do not change.)

4th digit: Reserved (Do not change.)

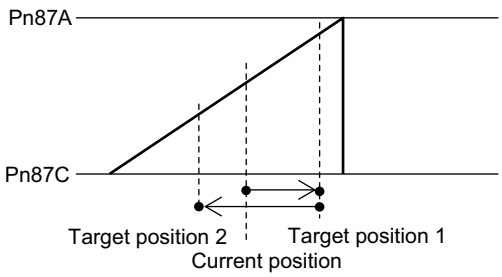
Note: This parameter will become available when Pn87A or Pn87C is not set to 0.

The settings of the moving method are described in the following sections.

(1) Absolute Positioning

Positioning is performed by rotating the motor in the direction of the target position from the current position.

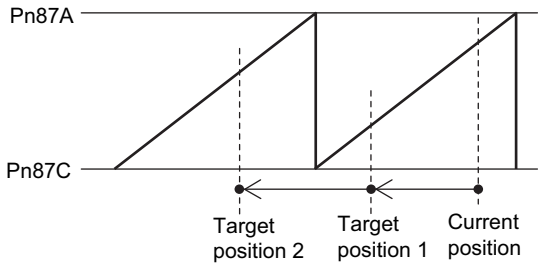
In the following figure, positioning is performed by rotating the motor in the positive direction from the current position to target position 1 and in the negative direction from target position 1 to target position 2.



(2) Constantly Positioning in the Negative Direction

Positioning is performed by rotating the motor in the negative direction from the current position to the target position.

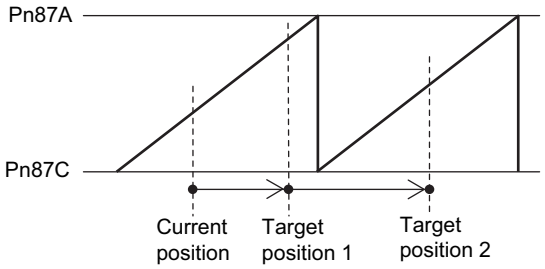
In the following figure, positioning is performed by rotating the motor in the negative direction from the current position to target position 1 and then to target position 2.



(3) Constantly Positioning in the Positive Direction

Positioning is performed by rotating the motor in the positive direction from the current position to the target position.

In the following figure, positioning is performed by rotating the motor in the positive direction from the current position to target position 1 and then to target position 2.

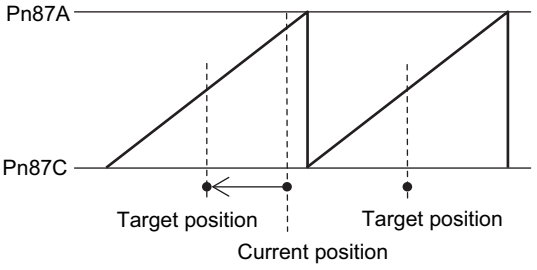


(4) Positioning for the Shortest Path

Positioning is performed by rotating the motor in the direction with the shortest distance from the current position to the target position.

In the following figure, positioning is performed by rotating the motor in the direction with the shortest distance (i.e., the negative direction) from the current position to the target position. (The coordinates of the target position are the same.)

If the distance from the current position to the target position is the same in both the positive and negative directions, the positive direction is used as the moving method.



2.4.6 Servo Command Specification Methods

The following table gives the servo command specification methods for a rotational coordinate system.

Refer to *Chapter 3 Main Commands* in the *Σ-V Series/DC Power Input Σ-V Series/Σ-V Series for Large-Capacity Models User's Manual MECHATROLINK-III Standard Servo Profile Commands* (manual no.: SIEP S800000 63) for details on servo command specification methods.

Servo Command	Specification Method
Set Coordinates command (POS_SET: 20 hex)	Set the coordinate within the range of the rotational coordinate system. Set the coordinate setting (POS_DATA) so that Pn87C ≤ POS_DATA ≤ Pn87A. If you set a value that is not within this range, Data Setting Warning 2 (A.94B) will occur and the command will not be executed.
Interpolation command (INTERPOLATE: 34 hex)	Interpolation feeding is performed within the range of the rotational coordinate system. Set the target position (TPOS) so that Pn87C ≤ TPOS ≤ Pn87A. If you set a value that is not within this range, Data Setting Warning 2 (A.94B) will occur and the command will not be executed. The moving method is determined by the setting of Pn87E.0.
Positioning command (POSING: 35 hex)	Positioning is performed within the range of the rotational coordinate system. Set the target position (TPOS) so that Pn87C ≤ TPOS ≤ Pn87A. If you set a value that is not within this range, Data Setting Warning 2 (A.94B) will occur and the command will not be executed. The moving method is determined by the setting of Pn87E.0.
Feed command (FEED: 36 hex)	Constant-speed feeding is performed. The command specification method is the same as for a standard Σ-V SERVOPACK.
External Input Feed command (EX_FEED: 37 hex)	Positioning within the range of the rotational coordinate system is performed when an external positioning signal is input during a constant-speed feeding operation. The command specification method is the same as for a standard Σ-V SERVOPACK. Refer to *2.4.6 (2) External Input Constant-speed Feeding and External Input Positioning* for the operation sequence up to the final travel distance for external positioning.
External Input Positioning command (EX_POSING: 39 hex)	Positioning within the range of the rotational coordinate system is performed when an external positioning signal is input during positioning to a target position. Set the target position (TPOS) so that Pn87C ≤ TPOS ≤ Pn87A. If you set a value that is not within this range, Data Setting Warning 2 (A.94B) will occur and the command will not be executed. The moving method is determined by the setting of Pn87E.0. The rest of the command specification method is the same as for a standard Σ-V SERVOPACK. Refer to *2.4.6 (2) External Input Constant-speed Feeding and External Input Positioning* for the operation sequence up to the final travel distance for external positioning.
Zero Point Return command (ZRET: 3A hex)	Homing is performed. The command specification method is the same as for a standard Σ-V SERVOPACK. Refer to *2.4.6 (3) Positioning for Homing* for information on the operation sequence up to the final travel distance for homing.
Speed Control command (VELCTRL: 3C hex)	Speed control is performed. The command specification method is the same as for a standard Σ-V SERVOPACK.
Torque (Force) Control command (TRQCTRL: 3D hex)	Torque (force) control is performed. The command specification method is the same as for a standard Σ-V SERVOPACK.

<Related Warnings>

Warning Signal	Warning Name	Warning Description	Reset
A.94B	Data Setting Warning 2 (Out of Range)	Command input data is out of range.	Automatic reset*

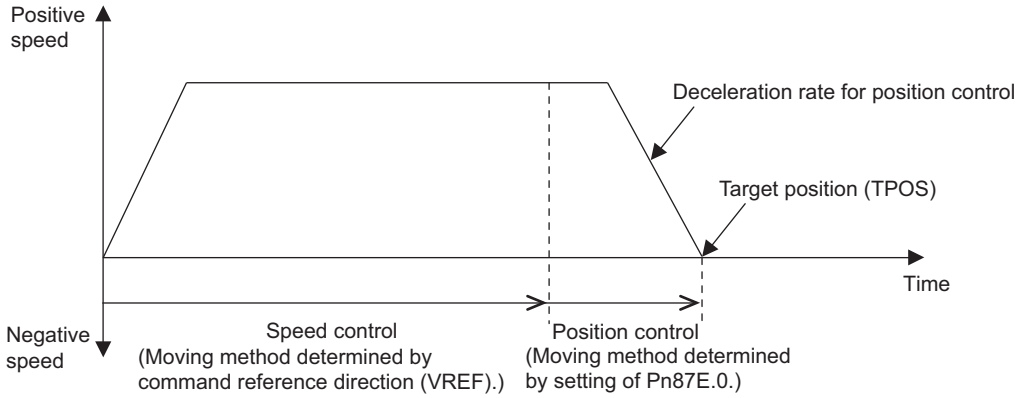
* The warning will automatically be cleared after the correct command is received.

(1) Moving Method after Changing to Position Control during Speed Control, Torque Control, or Constant-speed Control

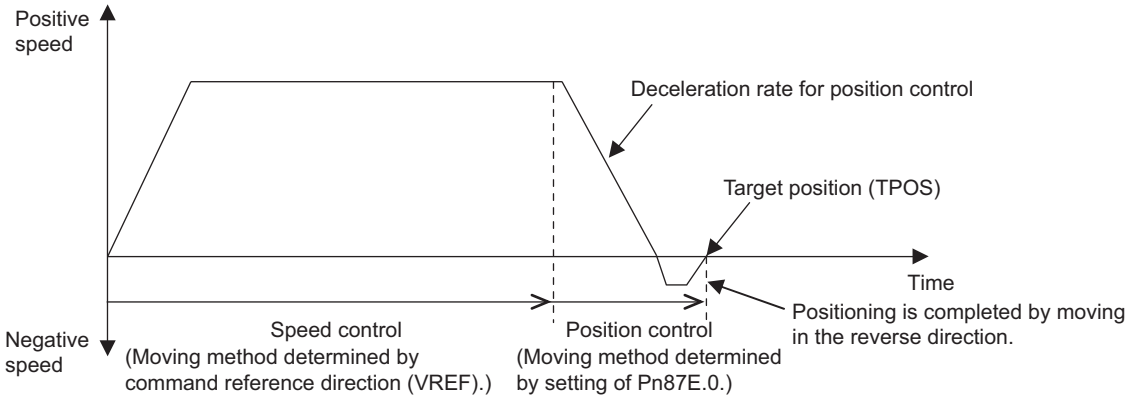
When you change to position control (POSING or EX_POSING) during speed control (VELCTRL), torque control (TRQCTRL), or constant-speed control (FEED or EX_FEED), the moving method for positioning is determined by the setting of Function Switch of Rotational Coordinate System (Pn87E.0).

Examples are given below for changing from speed control to position control.

■ Changing to Position Control in the Same Direction (Pn87E.0) as the Direction of Speed Control (Command Reference Direction)



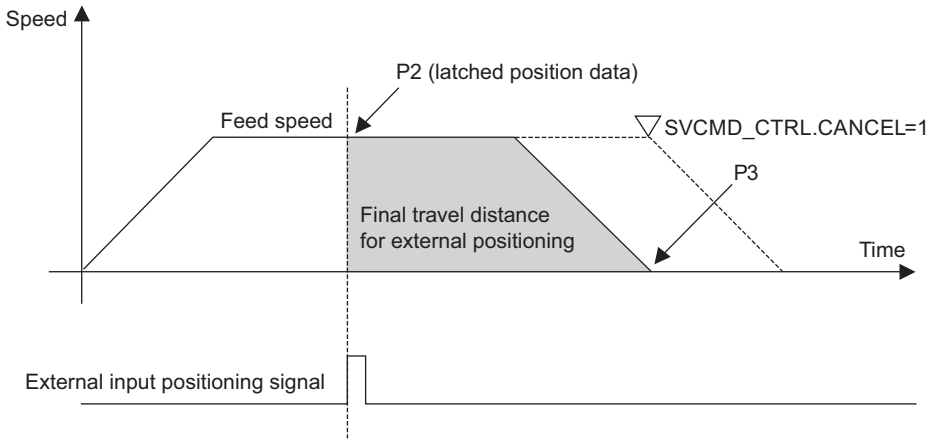
■ Changing to Position Control in the Reverse Direction (Pn87E.0) of the Direction of Speed Control (Command Reference Direction)



Note: If the Function Switch of Rotational Coordinate System (Pn87E.0) is set to absolute positioning (Pn87E.0 = 0) or to positioning for the shortest path (Pn87E.0 = 3), the moving method will depend on the timing of changing to position control.

(2) External Input Constant-speed Feeding and External Input Positioning

If you execute external input constant-speed feeding (EX_FEED) or external input positioning (EX_POSING) when the rotational coordinate system is enabled, positioning is performed within the range of the rotational coordinate system to external input positioning position P3 after latching is performed for the external input positioning signal.

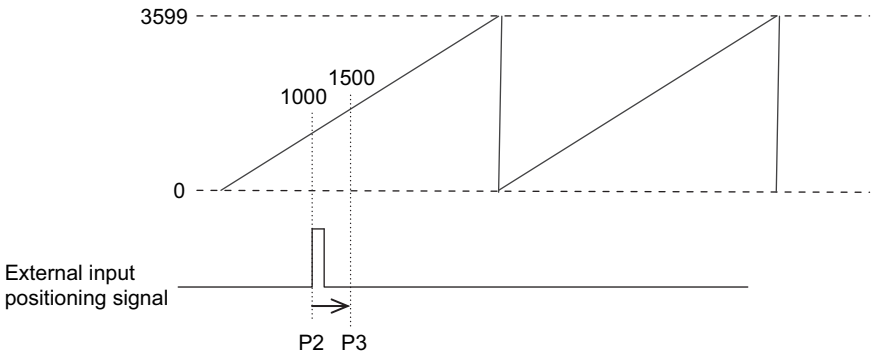


A calculation example for the external input positioning position in the rotational coordinate system, P3, is given below.

Example:

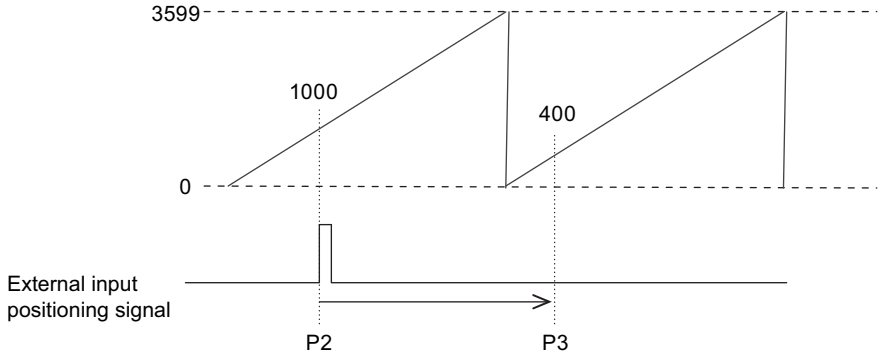
- Conditions: Starting Point of Rotational Coordinate System (Pn87C): 0
  End Point of Rotational Coordinate System (Pn87A): 3,599
  Latched position for external input positioning signal, P2: +1,000
  Final Travel Distance for External Positioning (common parameter 83): +500

External input positioning position P3: 1,000 + 500 = 1,500



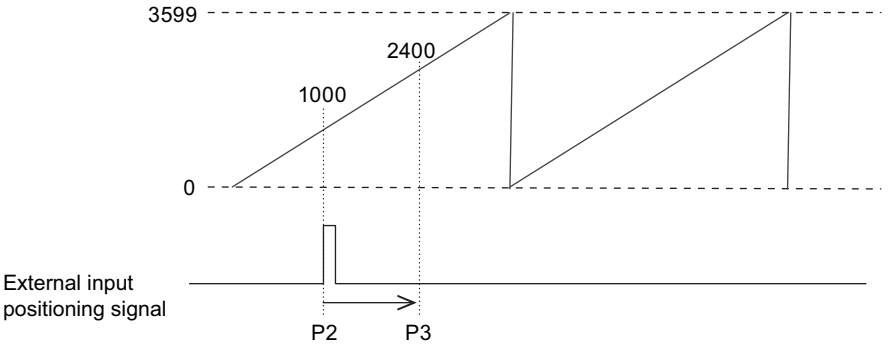
• Conditions: Starting Point of Rotational Coordinate System (Pn87C): 0
End Point of Rotational Coordinate System (Pn87A): 3,599
Latched position for external input positioning signal, P2: 1,000
Final Travel Distance for External Positioning (common parameter 83): +3000

External input positioning position P3: 1,000 + 3,000 – 3,600 (Pn87A – Pn87C + 1) = 400



• Conditions: Starting Point of Rotational Coordinate System (Pn87C): 0
End Point of Rotational Coordinate System (Pn87A): 3,599
Latched position for external input positioning signal, P2: 1,000
Final Travel Distance for External Positioning (common parameter 83): +5,000

External input positioning position P3: 1,000 + 5,000 – 3,600 (Pn87A – Pn87C + 1) = 2,400



The moving method after latching the position is determined by the sign of the value that is set for the Final Travel Distance for External Positioning (common parameter 83).

■ When Final Travel Distance for External Positioning Is Positive

- For positive travel, positioning is performed with positive rotation (the same direction) after latching the position.
- For negative travel, positioning is performed with positive rotation (the reverse direction) after latching the position.

■ When Final Travel Distance for External Positioning Is Negative

- For positive travel, positioning is performed with negative rotation (the reverse direction) after latching the position.
- For negative travel, positioning is performed with negative rotation (the same direction) after latching the position.

(3) Positioning for Homing

If you execute Homing (ZRET) when the rotational coordinate system is enabled, positioning is performed within the range of the rotational coordinate system to the home position after latching the position. The final travel distance after latching the position is set in the Final Travel Distance for Homing (common parameter 86).

The calculation method to the home position is the same as for external input constant-speed feeding (EX_FEED) and external input positioning (EX_POSING).

The moving method after latching is determined by the sign of the value that is set for the Final Travel Distance for Homing (common parameter 86).

■ When Final Travel Distance for Homing Is Positive

- For positive travel, positioning is performed with positive rotation (the same direction) after latching the position.
- For negative travel, positioning is performed with positive rotation (the reverse direction) after latching the position.

■ When Final Travel Distance for Homing Is Negative

- For positive travel, positioning is performed with negative rotation (the reverse direction) after latching the position.
- For negative travel, positioning is performed with negative rotation (the same direction) after latching the position.

2.4.7 Monitoring

(1) Monitoring with Servo Commands

The monitor data, which is output within the range of the rotational coordinate system (Pn87A to Pn87C), are listed below.

Refer to the *Σ-V Series/DC Power Input Σ-V Series/Σ-V Series for Large-Capacity Models User's Manual MECHATROLINK-III Standard Servo Profile Commands* (manual no.: SIEP S800000 63) for details on servo commands.

Monitor Name	Monitor Data		Contents	Unit
	Specification Method	Set Value		
APOS	SEL_MON1 to SEL_MON6	Selected code = 0	Feedback position	1 reference unit
	Monitor Selection 1 (PnB0E)	0000 hex		
	Monitor Selection 2 (PnB10)	0000 hex		
CPOS	SEL_MON1 to SEL_MON6	Selected code = 1	Command position after reference filter	1 reference unit
	Monitor Selection 1 (PnB0E)	0001 hex		
	Monitor Selection 2 (PnB10)	0001 hex		
LPOS1	SEL_MON1 to SEL_MON6	Selected code = 3	Latched position 1	1 reference unit
	Monitor Selection 1 (PnB0E)	0003 hex		
	Monitor Selection 2 (PnB10)	0003 hex		
LPOS2	SEL_MON1 to SEL_MON6	Selected code = 4	Latched position 2	1 reference unit
	Monitor Selection 1 (PnB0E)	0004 hex		
	Monitor Selection 2 (PnB10)	0004 hex		
MPOS	SEL_MON1 to SEL_MON6	Selected code = 9	Command position (Input reference position for the position loop MPOS = APOS+ Position deviation)	1 reference unit
	Monitor Selection 1 (PnB0E)	0009 hex		
	Monitor Selection 2 (PnB10)	0009 hex		
TPOS	Common Monitor 1 (PnB12)	0000 hex	Target position in reference coordinate system	1 reference unit
	Common Monitor 2 (PnB14)	0000 hex		
IPOS	Common Monitor 1 (PnB12)	0001 hex	Reference position before reference filter	1 reference unit
	Common Monitor 2 (PnB14)	0001 hex		
POS_OFSET	Common Monitor 1 (PnB12)	0002 hex	Offset value set with the POS_SET command	1 reference unit
	Common Monitor 2 (PnB14)	0002 hex		
Previous value of LPOS1	Option Monitor 1 Selection (Pn824)	0080 hex	Previous value of latched position 1	1 reference unit
	Option Monitor 2 Selection (Pn825)	0080 hex		
Previous value of LPOS2	Option Monitor 1 Selection (Pn824)	0081 hex	Previous value of latched position 2	1 reference unit
	Option Monitor 2 Selection (Pn825)	0081 hex		

(2) Monitoring with the Digital Operator

Display the monitor data in Monitor Mode to monitor values on the digital operator.

The monitor data, which is output within the range of the rotational coordinate system (Pn87A to Pn87C), are listed below.

Un No.	Sign	Unit	Name	Contents
Un045	Yes	1 reference unit	CPOS	Command position
Un046	Yes	1 reference unit	APOS	Feedback position

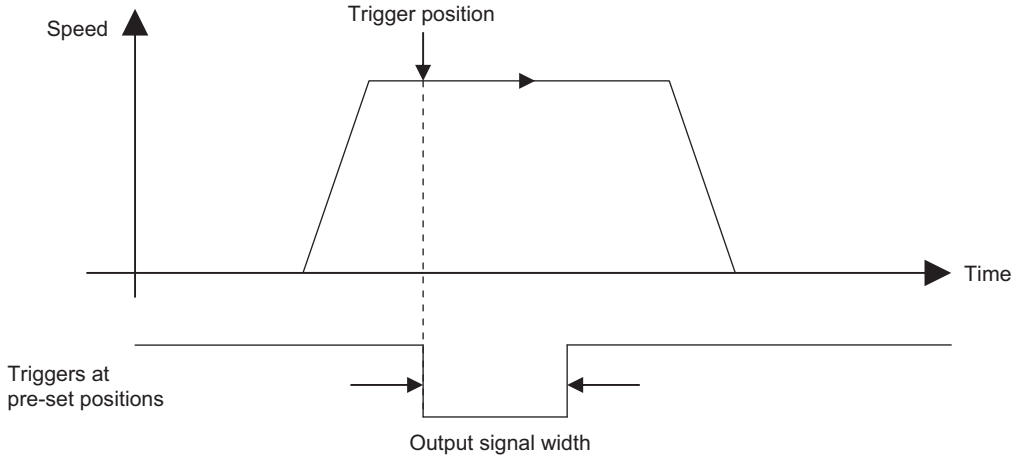
Refer to *2.2 Monitor Mode* in the *Σ-V Series User's Manual Operation of Digital Operator* (manual no.: SIEP S800000 55) for information on other monitor data.

3

Triggers at Pre-set Positions

3.1 Overview

SERVOPACKs output trigger signals at pre-set positions from the I/O signal connector (CN1) when the moving part of a machine passes those pre-set positions.



3.2 Basic Specifications

The following table gives the basic specifications of the triggers at pre-set positions.

IMPORTANT

- Triggers at pre-set positions are enabled by performing one of the following steps.
  <Absolute Encoder>
  - Sending the Turn Sensor ON command (SENS_ON: 23 hex) from the host controller

  <Incremental Encoder>
  - Sending the Zero Point Return command (ZRET: 3A hex) from the host controller
  - Using the Set Coordinates command (POS_SET: 20 hex) from the host controller to set a reference point (REFE = 1)
- When using triggers at pre-set positions with the rotational coordinate system enabled (Pn87A ≠ 0 or Pn87C ≠ 0), set trigger positions 1 to 8 (Pn986 to Pn994) to a value within the range between the starting point (Pn87C) and the end point (Pn87A) of the rotational coordinate system.

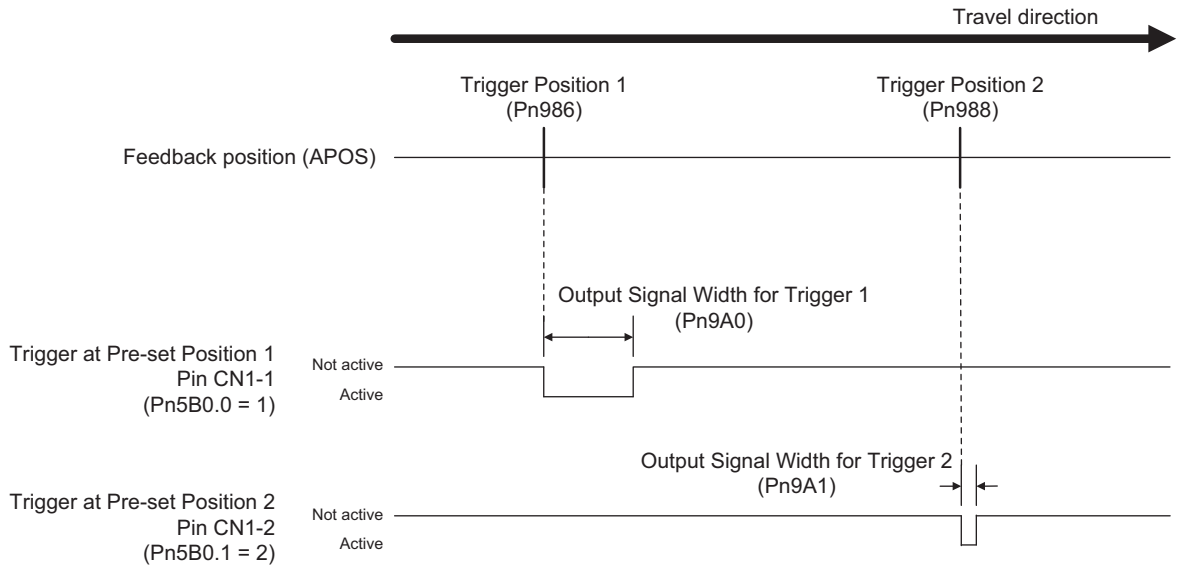
Item	Specification	Parameters
Number of trigger positions settings	8	Pn986 to Pn98E and Pn990 to Pn994
Range for trigger positions settings	-2147483648 to 2147483647 (reference units)	
Output signal width setting range	0 to 65535 ms	Pn9A0 to Pn9A7
Output signals	Allocated to CN1-1, CN1-2, CN1-23, CN1-24, CN1-25, or CN1-26.	Pn5B0 and Pn5B1

3.3 Basic Operation

The following figures show the basic operation of the triggers at pre-set positions.

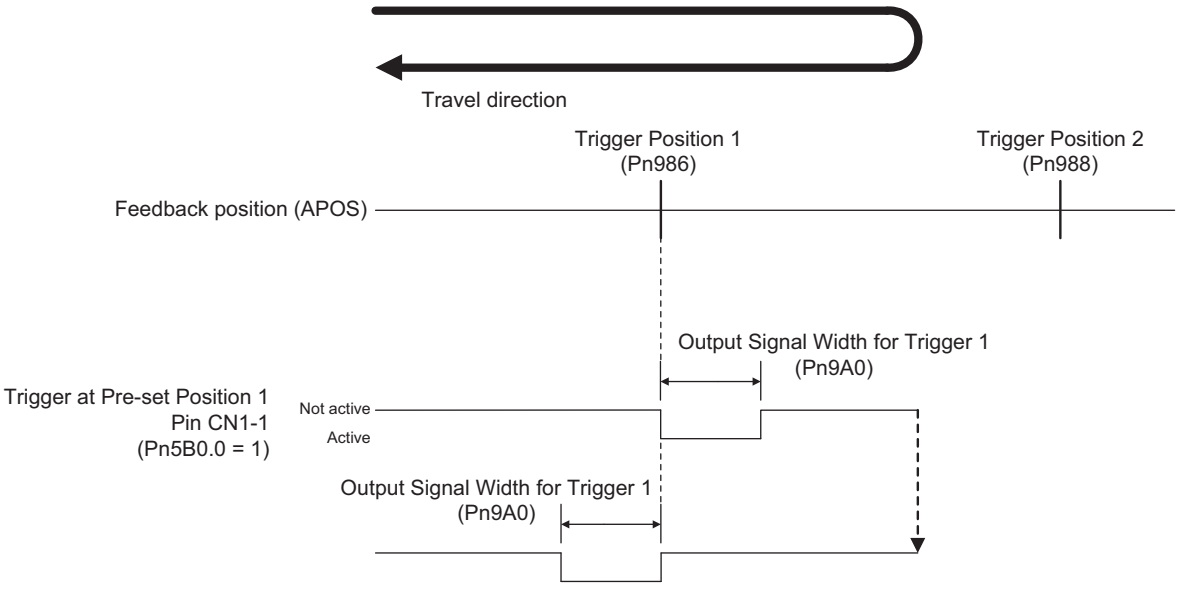
3.3.1 Forward Travel

The following example shows the operation of triggers at pre-set positions for forward travel.



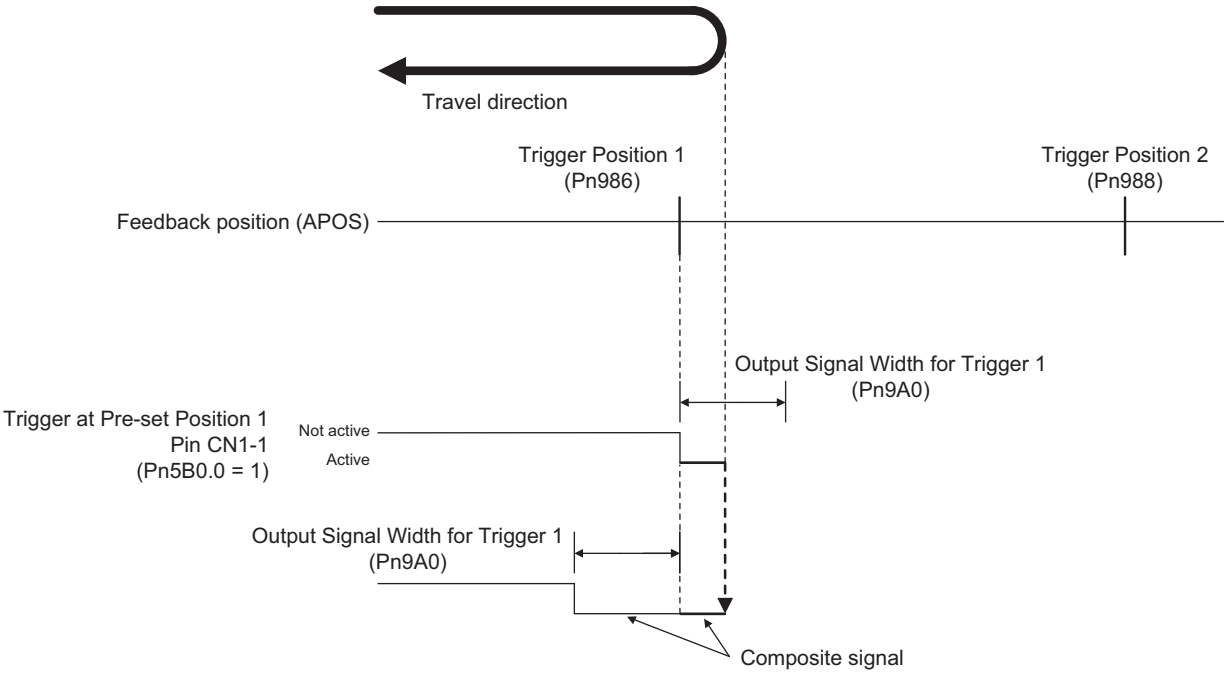
3.3.2 Changing to Reverse from Forward Travel

The following example shows the operation of triggers at pre-set positions when the travel direction is changed.



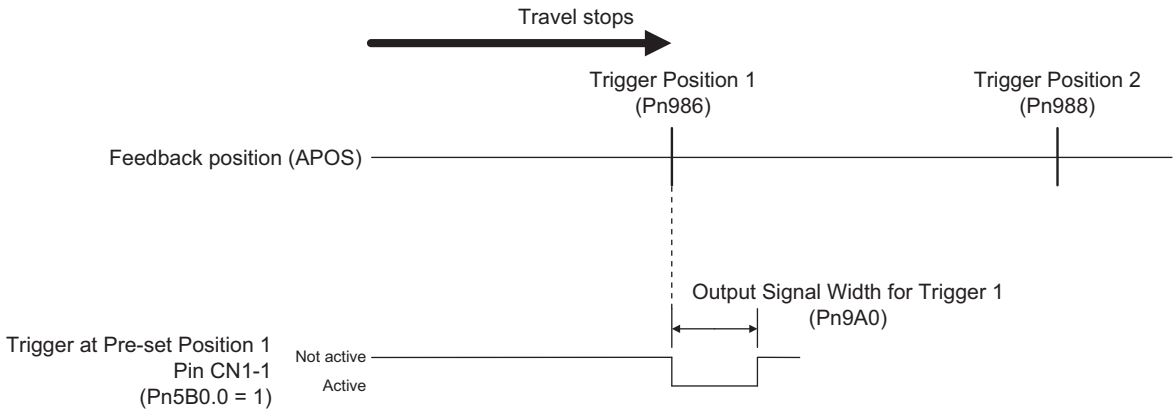
3.3.3 Changing to Reverse from Forward Travel during Output of Trigger Signal at Pre-set Position: Composite Signal Output

The following example shows the operation of trigger signals at pre-set positions if the travel direction is changed when the servomotor passes one of those positions. A signal is output each time the servomotor passes the trigger position, so the composite signal widens the signal width.



3.3.4 Stopping on the Trigger Position

If the moving part of the machine stops on the trigger position, the trigger signal is output for the specified output signal width.



3.4 Operating Procedure

3.4.1 Flow of Operation

The following table shows the basic flow of operation to use the triggers at pre-set positions.

Step	Operation	Reference
1	Allocate the trigger signals at pre-set positions.	3.4.2
2	Turn the power supply OFF and ON again, or send the Setup Device command (CONFIG: 04 hex) from the host controller.	–
3	Set the trigger positions.	3.4.3
4	Set the output signal width.	3.4.4
5	Perform one of the following operations. <Absolute Encoder> • Send the Turn Sensor ON command (SENS_ON: 23 hex). <Incremental Encoder> • Send the Zero Point Return command (ZRET: 3A hex) from the host controller. • Use the Set Coordinates command (POS_SET: 20 hex) from the host controller to set a reference point (REFE = 1).	–
6	Start operation.	–

3.4.2 Trigger Signal Allocations

To use triggers at pre-set positions, trigger signals must be allocated.

IMPORTANT

- When two or more signals are allocated to the same output circuit, a signal is output with OR logic circuit.
- Any changes to the allocations are enabled when the power supply is turned OFF and ON again or the CONFIG command is received.

Refer to the *Interpreting the Output Signal Allocation Tables* and allocate trigger signals.

<Interpreting the Output Signal Allocation Tables>

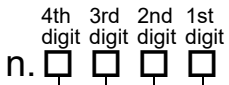
The parameter set values to be used are shown.
Signals are allocated to CN1 pins according to the selected set values.
Values in cells in bold lines are the factory settings.

Output Signal Names and Parameters	CN1 Pin Numbers			Invalid (not use)
	1/ (2)	23/ (24)	25/ (26)	
Triggers at Pre-set Position 1 **Pn5B0.0**	1	2	3	0

Output Signal Names and Parameters	CN1 Pin Numbers			Invalid (not use)
	1/ (2)	23/ (24)	25/ (26)	
Trigger at Pre-set Position 1 **Pn5B0.0**	1	2	3	0
Trigger at Pre-set Position 2 **Pn5B0.1**	1	2	3	0
Trigger at Pre-set Position 3 **Pn5B0.2**	1	2	3	0
Trigger at Pre-set Position 4 **Pn5B0.3**	1	2	3	0
Trigger at Pre-set Position 5 **Pn5B1.0**	1	2	3	0
Trigger at Pre-set Position 6 **Pn5B1.1**	1	2	3	0
Trigger at Pre-set Position 7 **Pn5B1.2**	1	2	3	0
Trigger at Pre-set Position 8 **Pn5B1.3**	1	2	3	0
Pn512.0=1	Polarity inversion of CN1-1(2)			0 (Not invert at factory setting)
Pn512.1=1	Polarity inversion of CN1-23(24)			
Pn512.2=1	Polarity inversion of CN1-25(26)			

Note 1. When two or more signals are allocated to the same output circuit, a signal is output with OR logic circuit.
2. You can also allocate the following output signals. For details, refer to the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).
   - Positioning completion signal (/COIN)
   - Servomotor movement detection signal (/TGON)
   - Torque limit detection signal (/CLT)
   - Brake signal (/BK)
   - Near signal (/NEAR)
   - Speed coincidence detection signal (/V-CMP)
   - Servo ready signal (/S-RDY)
   - Speed limit detection signal (/VLT)
   - Warning signal (/WARN)

Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classi-fication	Profile	Reference Section
Pn5B0	2	Trigger Signal Selection 1	0000 to 3333	–	0000	After restart	Setup	–	–



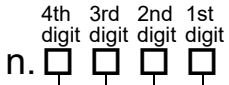
Allocation for Trigger 1	
0	Disabled (the signal output is not used.)
1	Outputs the signal from output terminals CN1-1 and CN1-2.
2	Outputs the signal from output terminals CN1-23 and CN1-24.
3	Outputs the signal from output terminals CN1-25 and CN1-26.

Allocation for Trigger 2	
0 to 3	Uses the same settings as allocation for trigger 1.

Allocation for Trigger 3	
0 to 3	Uses the same settings as allocation for trigger 1.

Allocation for Trigger 4	
0 to 3	Uses the same settings as allocation for trigger 1.

Pn5B1	2	Trigger Signal Selection 2	0000 to 3333	–	0000	After restart	Setup	–	–



Allocation for Trigger 5	
0	Disabled (the signal output is not used.)
1	Outputs the signal from output terminals CN1-1 and CN1-2.
2	Outputs the signal from output terminals CN1-23 and CN1-24.
3	Outputs the signal from output terminals CN1-25 and CN1-26.

Allocation for Trigger 6	
0 to 3	Uses the same settings as allocation for trigger 5.

Allocation for Trigger 7	
0 to 3	Uses the same settings as allocation for trigger 5.

Allocation for Trigger 8	
0 to 3	Uses the same settings as allocation for trigger 5.

Note: When using parameters that are enabled after restarting the SERVOPACK, a CONFIG command must be input or the power must be turned OFF and then ON again.

3.4.3 Setting Trigger Positions

Use the following parameters to set the trigger positions.

Pn986	Trigger Position 1				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn988	Trigger Position 2				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn98A	Trigger Position 3				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn98C	Trigger Position 4				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn98E	Trigger Position 5				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn990	Trigger Position 6				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn992	Trigger Position 7				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup
Pn994	Trigger Position 8				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup

3.4.4 Setting the Output Signal Widths

Use the following parameters to set the output signal widths for the triggers at pre-set positions.

IMPORTANT

If the output signal width for a trigger at a pre-set position is set to 0 ms, the output is disabled.

Pn9A0	Output Signal Width for Trigger 1				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A1	Output Signal Width for Trigger 2				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A2	Output Signal Width for Trigger 3				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A3	Output Signal Width for Trigger 4				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A4	Output Signal Width for Trigger 5				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A5	Output Signal Width for Trigger 6				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A6	Output Signal Width for Trigger 7				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup
Pn9A7	Output Signal Width for Trigger 8				Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 65535	1 ms	0	Immediately	Setup

4

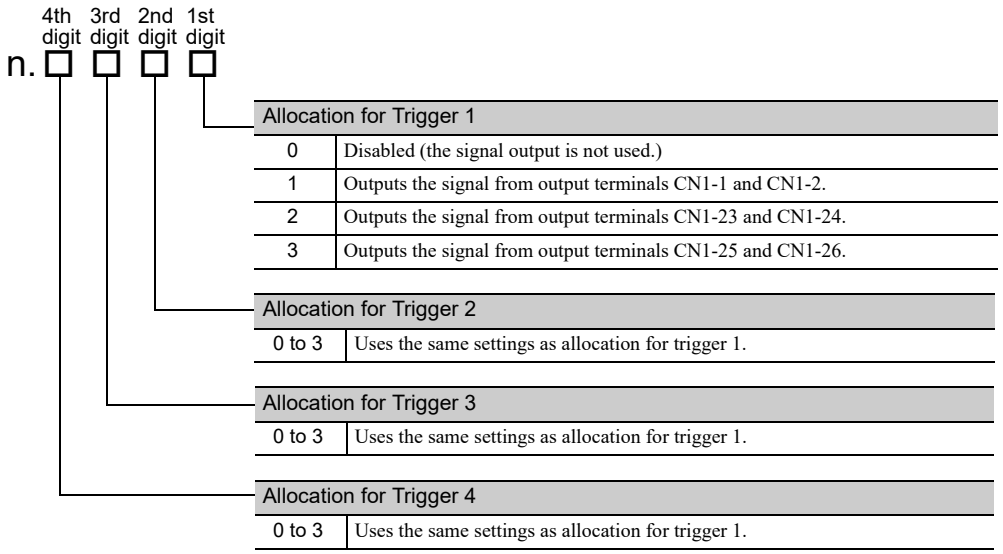
List of Σ-V-FT-series FT005 Parameters

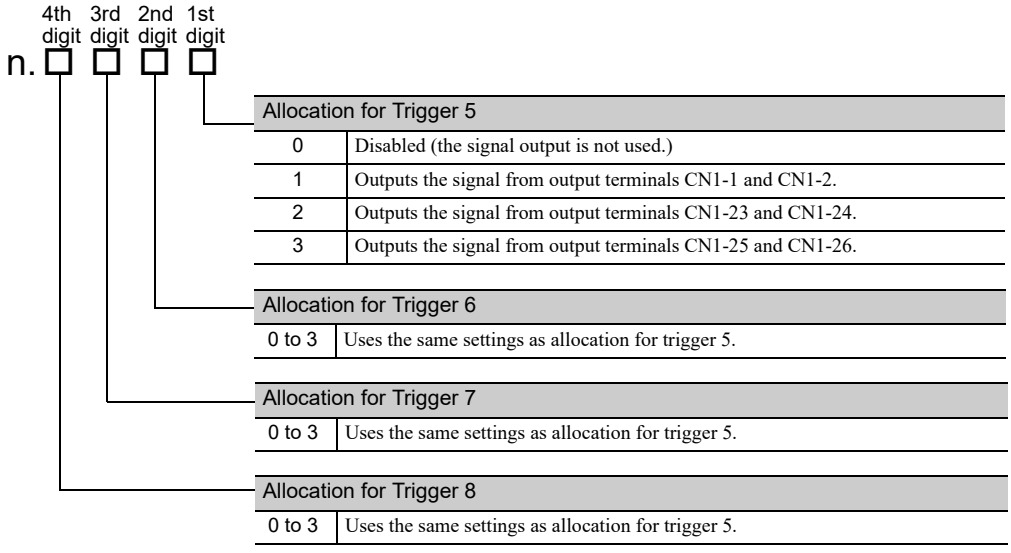
Here, the parameters that are added to the Σ-V-FT-series FT005 and the parameters that have different default settings than those of the Σ-V Standard SERVOPACKs are given. All parameters that are not given here are the same as for the Σ-V Standard SERVOPACKs. For details, refer to the *Σ-V Series User's Manual Design and Maintenance, Rotational Motor/ MECHATROLINK-III Communications Reference* (manual no.: SIEP S800000 64).

4.1 Special Parameters

The following table lists the parameters that differentiate the FT005 from the Σ-V Series standard SERVOPACKs.

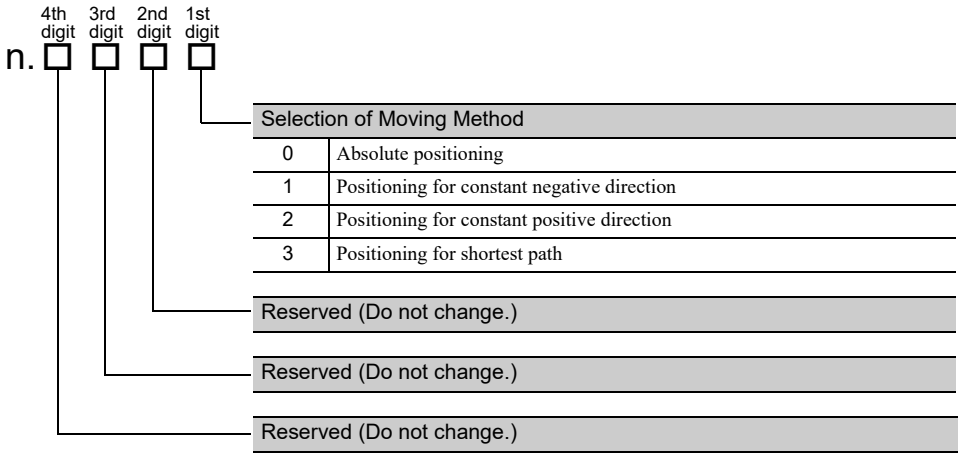
Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classification	Profile	Reference Section
Pn5B0	2	Trigger Signal Selection 1	0000 to 3333	–	0000	After restart	Setup	–	3.4.2
Pn5B1	2	Trigger Signal Selection 2	0000 to 3333	–	0000	After restart	Setup	–	3.4.2
Pn87A	4	End Point of Rotational Coordinate System	0 to +536870911	1 reference unit	0	After restart	Setup	–	2.4.2
Pn87C	4	Starting Point of Rotational Coordinate System	-536870912 to 0	1 reference unit	0	After restart	Setup	–	2.4.2





Note: When using parameters that are enabled after restarting the SERVOPACK, a CONFIG command must be input or the power must be turned OFF and then ON again.

Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classification	Profile	Reference Section
Pn87E[*1]	2	Function Switch of Rotational Coordinate System	0000 to 0003	–	0000	Immediately	Setup	–	2.4.5



Pn986	4	Trigger Position 1	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn988	4	Trigger Position 2	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn98A	4	Trigger Position 3	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn98C	4	Trigger Position 4	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn98E	4	Trigger Position 5	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn990	4	Trigger Position 6	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn992	4	Trigger Position 7	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn994	4	Trigger Position 8	-2147483648 to 2147483647	1 reference unit	0	Immediately	Setup	–	3.4.3
Pn9A0	2	Output Signal Width for Trigger 1	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A1	2	Output Signal Width for Trigger 2	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A2	2	Output Signal Width for Trigger 3	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A3	2	Output Signal Width for Trigger 4	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A4	2	Output Signal Width for Trigger 5	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A5	2	Output Signal Width for Trigger 6	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4
Pn9A6	2	Output Signal Width for Trigger 7	0 to 65535	1 ms	0[*2]	Immediately	Setup	–	3.4.4

Parameter No.	Size	Name	Setting Range	Units	Factory Setting	When Enabled	Classi-fication	Profile	Reference Section
Pn9A7	2	Output Signal Width for Trigger 8	0 to 65535	1 ms	0*2	Immediately	Setup	–	3.4.4

∗1. This parameter will become available when Pn87A or Pn87C is not set to 0.
∗2. A trigger position output signal will not be output if this parameter is set to 0.

4.2 Precaution When Copying Parameters

The digital operator can be used to copy parameters between two FT005 SERVOPACKs in the Σ-V-FT series.

If you copy parameters between a Σ-V-FT-series FT005 SERVOPACK and a different model of SERVOPACK, an alarm A.040 (Parameter setting Error 1) will occur because different numbers of parameters are used.

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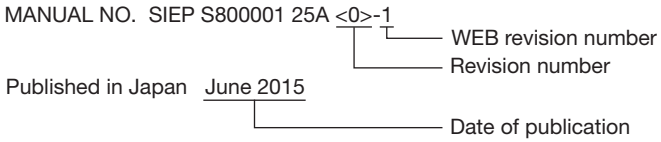
Revision History

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



Date of Publication	Rev. No.	Web Rev. No.	Section	Revised Content
April 2024	<5>	0	All chapters	Addition: SGMCV
			Preface	Partly revised
			Back cover	Revision: Address
March 2023	<4>	0	Preface	Partly revised
			Back cover	Revision: Address
March 2022	<3>	0	Preface	Revision: EU Directives
			Back cover	Revision: Address
January 2020	<2>	0	Preface	Revision: ■ Disposal precautions
			Back cover	Revision: Address
January 2018	<1>	0	All chapters	Partly revised
			Back cover	Revision: Address
June 2015	<0>	1	2.4.4	Revision: Information on absolute encoder origin offset setting
			Front cover	Revision: Format
			Back cover	Revision: Address and format
January 2014	–	–	–	First edition

AC Servo Drives

Σ-V-FT Series

USER'S MANUAL

Model: FT005
Rotational Motor
MECHATROLINK-III Communications Reference

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MANUAL NO. SIEP S800001 25F <5>-0

Published in Japan April 2024
23-4-19
Original instructions